Ministério das Finanças
e do Fomento Empresarial
Unidade de Gestão
de Projetos Especiais

UNIDADE DE GESTÃO DE PROJECTOS ESPECIAIS

IMPROVING CONNECTIVITY AND URBAN INFRASTRUCTURE IN CABO VERDE PROJECT

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TERMS OF REFERENCE

Collection of aerophotogrammetric data and base cartography drawing of the main urban centers of Cabo Verde.

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Index

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1 Framework

The Government of the Republic of Cabo Verde has received a US$40 million loan from the International Development Association - IDA/World Bank (hereinafter referred to as the "World Bank") to finance the Urban Connectivity and Infrastructure Improvement Project (ICUIP), which aims to improve access to climate-resilient urban and transport infrastructure in selected areas of Cabo Verde. The project consists of five components:

- **Component 1: Resilient urban and community infrastructure -** rehabilitate public spaces and improve key public assets for community use, climate change adaptation and mitigation, and local economic development.
- **Component 2: Improving Transport Connectivity and Resilience -** rehabilitating or upgrading inter-urban and rural roads to ensure year-round access and reduce transportation costs for selected communities in Cabo Verde.
- **Component 3: Technical Assistance -** Capacity building and technical assistance activities for improved urban management, connectivity and transportation that are resilient to climate change.
- **Component 4: Project Management and Implementation -** Support for project management and implementation.
- **Component 5: Emergency Response -** enabling rapid response to potential future crises.

To this end, it intends to use part of the funds for consultancy services, including aerophotogrammetric data collection and the production of basic cartography s of the main urban centers of Cabo Verde.

2 Justification

The Republic of Cabo Verde is comprised of ten islands and several urban centers, each with distinctive features that reflect the country's rich cultural and geographic diversity. Accurate

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and up-to-date Cartography of these urban centers is crucial for sustainable development, efficient resource management, and land use planning. Given the advancements in technology and the constant changes in the urban environment, it would be beneficial to review and update existing cartography.

Decree-Law No. 31/2008, of October 20, establishes the principles and rules to be followed in the production of cartography in Cabo Verde, and Article 20 establishes that the National Cartographic Plan (PCN) must be valid for four years. The PCN defines the different scales to be adopted in the production of basic and derived cartography, vector and image, the methods for obtaining them and the definition of indicative periods to be respected in their updating.

In accordance with the relevant legislation, the National Institute of Management and Territory (INGT) has the important task of promoting and updating basic national cartography in order to support the entire territorial management process. In light of the ever-changing nature of our territory, particularly in urban areas, it is of the utmost importance to maintain up-to-date cartography in order to facilitate effective planning. It would be beneficial to optimize procedures involving all stakeholders, such as the INGT, other government entities, municipalities, and property owners, with the aim of reducing the high costs associated with producing cartography.

In this sense, it is more efficient to have correctly georeferenced baseline information and the knowledge to easily perform updates when necessary than to rely on projects that have long intervals between updates of existing cartographies. This approach allows for more flexible adaptation to changes in the territory, ensuring accurate and efficient territorial management.

In Cabo Verde, the last urban cartography was carried out in 2010, and since then there have been no cartography updates at 1.000 or 1:2.000 scale. The national basic cartography has also been updated to 1:10.000 in the same period.

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The NCP has an indicative updating period of 5 (five) years for the islands of Santiago and São Vicente, 7 (seven) years for the islands of Sal, Boa Vista and Maio, and 10 (ten) years for the other islands.

Since the date of the last cartography, significant changes have taken place in the main urban centers of Cabo Verde. Population growth, urban expansion, infrastructure development, transportation development and environmental changes are factors that have directly influenced the morphology of urban areas. Consequently, a detailed review and comprehensive update is essential to ensure that cartographic information is reliable, accurate and useful to the various sectors of Cape Verdean society.

The update of the cartographic of Cabo Verde's urban centers will have several tangible benefits:

- Improve urban planning, enabling central and local authorities to make more informed and effective decisions;
- Facilitate the development of infrastructure, transportation and public services that meet the real needs of urban areas;
- Promote economic growth, tourism and investment by providing accurate information to investors and entrepreneurs;
- Strengthen urban resilience by integrating environmental considerations and risks into future development decisions.

It is essential to have up-to-date, real-world information about the territory whenever it is necessary to manage disaster risks, assess hazards or emergency response, and plan for urban development as a whole. Unfortunately, this information is not always available from local authorities, and even when it is, it is not always up-to-date.

Cartography is essential for land management. Buildings and major structures are one of the most important sources of information about people and land, and are fundamental to urban planning and public policy formulation. Critical infrastructure such as public transportation,

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power and water distribution networks, and postal and delivery services rely heavily on up-to-date cartographies of acceptable accuracy and reliability.

3 Objective

The general objective of these terms of reference is to produce a 1:2.000 scale basic cartography of the towns and villages of Cabo Verde.

4 Deliverables

The digital aerial photograph shall be produced in accordance with the specifications set forth in these Terms of Reference and with the national legislation on geodesy, cartography and other complementary legislation. It will be submitted to the INGT for quality control and approval, based on the Ministerial Order no. 9/2021 of January 25, which establishes the rules for the preparation and approval of basic cartographies.

The table below shows the general (not exhaustive) characteristics to be considered when drawing up cartographic of urban centers.

Table 1: General characteristics (not exhaustive) for the basic cartographic of the urban centers.

Item	Description
Area to be cartographed	These are the boundaries of the cities and towns to be cartographed (the section with the polygons for each of the urban centers).
Adjacent Sheets and Connections	The cartography must be delivered in sheets, scale 1:2.000, and when the data is divided into sheets, their connections are checked from a positional and consistency viewpoint.
Positional Quality	Both basic cartographic raster and vector must respect the positional quality of these specifications, which is measured using statistical indicators derived from the comparison between the actual positioning of the data and its cartographic representation.
Completeness	The company must pay attention to the presence or absence of objects in the cartographed dataset, regardless of whether their classification

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	is correct or not, and its quality sub-elements are Omission (lack of elements in the cartography) and Commission (excess of elements in the cartography), in relation to the reality of the terrain.
Topological consistency	The company must check, through automatic and interactive processes, the topological rules of the objects and the consistency of the data and its relationships, namely discontinuities, nodes, loops, etc., *overshoots*, *undershoots*, etc.
Format	The cartographic to be submitted must be in digital format.
Scale	1:2.000
Scale	1:2.000

The general characteristics (not limited to) to be considered for the aerial photographs to be taken are given in the table below.

Table 2: General characteristics (not limited to) for aerial photography capture.

Item	Description
Radiometric and Spectral Resolution	The company must analyze the corresponding histograms for each spectral band that makes up the image, determining the effective use of pixel values and also their saturation. The images shall have sufficient contrast and radiometric quality to ensure good object identification. The references for the acceptable values are those given in this ToR.
Format	The cartographic s to be submitted must be in digital format.
Longitudinal overlap	75% a 85%
Side overlap	65% a 75%

For each region under analysis, a minimum of one flight will be performed, consistently adhering to best practices while considering optimal weather and safety conditions. Each flight, or series of flights, will require photogrammetric support to guide the aerial photographs, using photogrammetric points (PF). The approach adopted for data acquisition can make use of technologies such as PPK (Precise Positioning by Post-Processing) and RTK (Real-Time Positioning), using Cabo Verde's National Network of Permanent Stations

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(ReNEP-CV), thus reducing the need for PFs in the field and, consequently, the time and cost involved in the image acquisition process.

The table below shows the 24 cities of Cabo Verde as areas to be cartographed, with a total surface area of approximately 31,412 (thirty-one thousand four hundred and twelve) hectares.

Tabela 1: Listagem das 24 cidades abrangidas e respetiva área

Island	Municipalities	Towns	Areas (hectares)
Boavista	Boa Vista	City of Sal Rei	3877
Brava	Brava	City of Nova Sintra	80,47
Fogo	Mosteiros	City of Igreja	468
	Santa Catarina Do Fogo	City of Cova Figueira	185
	São Filipe	City of São Filipe	717
Maio	Maio	City of Porto Inglês	2432
Sal	Sal	City of Espargos	2271
	Sal	City of Santa Maria	884
Santiago	Santa Cruz	City of Pedra Badejo	369
	São Miguel	City of Calheta de São Miguel	345
	São Lourenço dos Órgãos	City of João Teves	195
	São Salvador do Mundo	City of Achada Igreja (Cidade dos Picos)	318
	Tarrafal	City of Mangui (City of Tarrafal)	1701
	Praia	City of Praia	4563
	São Domingos	City of Várzea de Igreja	442
	Santa Catarina	City of Assomada	823
	Ribeira Grande de Santiago	City of Santiago de Cabo Verde	1885
Santo Antão	Porto Novo	City of Porto Novo	3751
	Ribeira Grande de Santo Antão	City of Ponta do Sol	381
	Paul	City of Pombas	267

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	Ribeira Grande de Santo Antão	City of Ponta do Sol	311
São Nicolau	Ribeira Brava	City of Ribeira Brava	358
	Tarrafal de São Nicolau	Cidade do Tarrafal	1937
São Vicente	São Vicente	City of Mindelo	2852

In addition to the cities mentioned above, it is also necessary to cartograph the villages, as shown in the table below, which total approximately 21,591 (twenty-one thousand five hundred and ninety-one) hectares.

Table 4: List of covered villages and their area

Island	Parish	Vila	Area (hectares)
Boavista	Santa Isabel	Vila de Rabil	5102,49
Brava	Nossa Senhora do Monte	Vila de Nossa Senhora do Monte	206,94
Fogo	Nossa Senhora da Conceição	Vila de Patim	820,66
	São Lourenço	Vila de Ponta Verde	823,25
Maio	Nossa Senhora da Luz	Vila de Calheta	2092,27
	Nossa Senhora da Luz	Vila de Barreiro	1462,10
Sal	Nossa Senhora Das Dores	Vila de Palmeira	1047,47
Santiago	Santa Catarina	Vila de Ribeira da Barca	555,17
	Santa Catarina	Vila de Achada Falcão	939,94
	Santa Catarina	Vila de Chã de Tanque	596,10
	Santo Amaro Abade	Vila de Achada Tenda	606,08
	Santo Amaro Abade	Vila de Ribeira Das Pratas	476,33
	São Miguel Arcanjo	Vila de Achada Monte	331,85
Santo Antão	Santo Crucifixo	Vila de Coculi	484,96
	São João Baptista	Vila de Ribeira das Patas	1804,17
	São Pedro Apostolo	Vila de Chã de Igreja	876,42
São Nicolau	Nossa Senhora Da Lapa	Vila de Fajã de Baixo	367,64
	Nossa Senhora Do Rosario	Vila de Juncalinho	1238,48
	São Francisco De Assis	Vila de Praia Branca	1759,45

The end products to be delivered are:

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4.1 Basic Cartography Raster - Orthophotomaps.

The table below shows the requirements for the basic cartography in raster format - orthophotomap - to be provided by each area to be cartographed. These requirements will be validated in accordance with the provisions of Decree No. 9/2021, which establishes the rules for the issuance and homologation of basic and thematic cartography in the Republic of Cabo Verde:

Table 5: Requirements for the Base Cartography in the Raster Format

Orthophotomaps	Parameters
Pixel Size	0,10 m
Planimetric accuracy	0.25 m
Horizontal reference system	WGS 84 / Cabo Verde National (EPSG:4826)
Format	.geotiff ou .ecw

4.2 Digital Terrain Model

The digital terrain model must be generated from the vector data of the "altimetry" theme ("contour line" and "datum") and the rest of the geographic information collected in the field in 3 dimensions, but also from a surface obtained independently or derived from the above vector information.

For each area to be surveyed, the INGT will provide a list of geodetic benchmarks with known orthometric coordinates, which will be used to define the local vertical datum.

Table 6: Digital model requirements

Orthophotomaps	Parameters
Spatial Resolution	2 .0 m

Avenida Amilcar Cabral, Ex. Edifício do BCV, 4º Andar
CP nº 145, Plateau, Cidade da Praia - República de Cabo Verde
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Planimetric Accuracy	0.30 m
Reference System	Local Datum
Format	(tif, geottif)

4.3 Basic Vector Cartographic

Vector Cartographic corresponds to the database of natural and artificial phenomena that occur on the national terrestrial territory and that are considered essential and relevant for its knowledge and characterization.

The table below shows the real world entities to be cartographed, which correspond to objects in the vector cartographic database.

Table 7: Real-world entities to be cartographed, which correspond to the objects in the vector cartography database

Categories	Description	Entities
Hydrography	Hydrographic features and associated natural or man-made structures.	Streams
		Water lines
Constructions	Identification and geographic characterization of existing buildings in the area	Linear construction
		Polygonal construction
		Buildings
		Points of interest
Infrastructure and equipment	All infrastructure (utilities) and public services in the area.	Public administration and sovereign bodies
		Electric cable
		Water pipe
		Associated telecommunications element
		Equipment for collective use
Altimetry (datum points and contour lines)	Description of the Earth's surface referenced to the official altimetric datum.	Quoted Points
		Contour lines
Road network		National Roads

Avenida Amilcar Cabral, Ex. Edifício do BCV, 4º Andar
CP nº 145, Plateau, Cidade da Praia - República de Cabo Verde
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	Identification and geographic characterization of existing road networks.	Municipal roads
		Streets, Alleys, Avenues, and Other Classifications

The table below shows the requirements for basic vector cartographic, which must be submitted in sheets, each file with the sheet code. Validation of these requirements will be carried out in accordance with the provisions of Decree No. 9/2021, which establishes the rules for the granting and approval of basic and thematic cartographic in the Republic of Cabo Verde.

Table 8: Basic vector cartographic requirements

Orthophotomaps	**Parameters**
Planimetric Positioning Accuracy	0.25 m
Altimetric Positioning Accuracy	0.40 m
Vertical Reference System	Local Datum (defined by INGT)
Format	.dgn e shp
Legend File	.lyr ou .sld

4.4 INGT technician capacity building

The company should provide training for INGT technicians in the cartographic production using drones, covering the acquisition and cartographic data processing. This training should last one week, 35 hours, and be conducted in person on the island of Santiago. The training should include theoretical and practical content on the entire process of producing detailed cartographic.

All the equipment (drone + GNSS + software) is the responsibility of the supplier. INGT will guarantee the logistic aspects of the activity, namely a training room with computers for the students and transportation for the field activities.

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4.5 Environmental and social aspects

The consultancy will be carried out in accordance with the World Bank's environmental and social standards and the legal and regulatory framework applicable in the country and linked to the project through its environmental and social instruments, namely the Environmental and Social Management Framework (ESMF), the Stakeholder Involvement Plan (PEPI/SEP), the Environmental and Social Commitment Plan (PCAS/ESCP) and the Resettlement Policy Framework (QPR/RPF), all approved and published by the Government of Cabo Verde and the World Bank. These require the company to:

1. Sign the company's Code of Conduct against Gender-Based Violence/Exploitation and Sexual Abuse/Harassment (GBV/EAS/AS) and Violence Against Children (VCC),
2. Ensure that all employees with responsibility for implementing the planned activities sign the individual Code of Conduct against Gender-Based Violence/Exploitation and Sexual Abuse/Sexual Harassment (GBV/EAS/AS) and against Violence against Children (VCC),
3. Conduct an awareness session for all employees on GBV/ASA, grievance mechanism and labor management procedures.

4.6 Deliverables

The selected Consultant shall complete the Project within 12 (twelve) months from the date of signing the Contract in accordance with the Fee Schedule defined for each part of the Contract.

Products delivered in accordance with the Fee Schedule will be approved by the Recipient, after which invoices may be submitted for payment in accordance with the Fee Schedule below.

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Table 9: Products and their delivery times % of payment

Products	Activities	Deadlines	Payment after customer approval
P1: Inception Report which includes a detailed work plan	It should include all the tasks to be carried out, the material and human resources, a description of the methodology to be used for each of the activities, and a detailed timetable for carrying out the tasks.	15 days after the signing of the contract	10%
P2: Basic raster and vector cartographic	The company must provide raster and vector cartographic in the following groups: a) GROUP I - Ilha de Santiago, Fogo e Brava;	4 months after the signing of the contract	30%
	b) GROUP II – Maio, Boavista e Sal;	7 months after the signing of the contract	20%
	c) GROUP III – Santo Antão, São Vicente e São Nicolau.	11 months after the signing of the contract	20%
P3: INGT Technicians Training Report	It should describe the results of the content covered, the methodology, and include the results of the student evaluation.	12 months after the signing of the contract	10%
P4: *Final Report*	It should describe the initial results, progress, difficulties encountered and those foreseen in the implementation of the project..	12 months after the signing of the contract	10%

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Total		12 months	

5 Profile of the candidate's consulting firm

This technical assistance must be provided by a company with at least 5 (five) years of experience and with a multidisciplinary technical team coordinated by one of its members, which must include at least specialists in the fields of cartography, geodesy, photogrammetry and geographic information systems, with relevant professional experience in the field and of recognized standing.

The firm must demonstrate that it has sufficient geographic equipment and qualified technicians to perform the work in the various specialties and to produce results in accordance with the specifications and within the established timeframes.

The firm must include a minimum of 4 (four) key specialists as listed below, who may combine functions in no more than two different areas, and ensure that the team identified below is dedicated exclusively and full-time to the project throughout the implementation phase.:

- **1 (one) Project Coordinator - Team Leader**

Must have at least a degree in Cartographic/Geographic Engineering or related fields, at least 10 (ten) years of experience, including at least 2 (two) years as a manager of similar projects. Must have experience in supervising and practicing urban cartography, geodesy, topography and cartographic data processing. Must be fluent in written and spoken Portuguese.

- **1 (one) Geodesy Specialist**

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Must have at least a degree in Cartographic Engineering /Geography/Geomatics or related fields with a specialization in Geodesy and at least 10 (ten) years of experience in data acquisition and processing using GNSS. Must be fluent in written and spoken Portuguese.

- **1 (one) Photogrammetry Specialist**

Must have at least a Bachelor's degree in Cartography/Geography/Geomatics Engineering or related field with specialization in Aerial Photogrammetry and at least 10 (ten) years of experience in photogrammetric data collection and processing. Must be fluent in written and spoken Portuguese. Technical specialists in topography and/or GIS with proven experience in this role will also be considered for this position.

- **1 (one) cartographic data processing specialist**

Must have at least a degree in Cartographic Engineering/Geography/Geomatics or related fields, with at least 10 (ten) years of experience in cartographic data processing; extensive experience in the use of cartographic software. Must be fluent in written and spoken Portuguese. Technicians specialized in topography and/or GIS with proven experience in this field will also be considered for this position.

Note: It is the responsibility of the company to determine the number of technicians required for the restitution (vectorization) work. However, the company must provide a list and resume of the restitution technicians to be assigned to the project.

6 Duration

The total duration of this consultancy is 12 (twelve) months.

7 Intellectual and technical property

The products developed at the request of the beneficiary for this consultancy remain the intellectual property of the National Institute for Territorial Management (INGT), as well as all their elements.

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8 Work Organization

The work performed by the company must be consistent with the above objectives and the vision presented for the company. The company must present a working methodology based on the following principles:

- Ensure effective communication between the consultants and the INGT and UGPE team.
- Ensure a common understanding of the work expected.
- Be flexible in managing expectations and adjusting process flows.
- Anticipate and manage project risks.

The methodology must be adapted to meet the objectives of the INGT within the established timeframe and guarantee quality products.

The reports must be developed in Portuguese and the products must be sent to UGPE and INGT in Portuguese, in digital format and on paper.

9 Contract

A lump sum contract is signed. Compensation payments are tied to the approval of the contract products, and reimbursable expenses are paid upon presentation of expense receipts at actual cost.