REPUBLIC OF CABO VERDE

TERMS OF REFERENCE (TOR)

STRENGTHENING OF THE HEALTH INFORMATION SYSTEM AND ELECTRONIC PRESCRIPTION

1. INTRODUCTION

The Government of the Republic of Cabo Verde has received from the International Development Association (World Bank) a Credit (Credit) in the amount of 15 million US dollars ($15 000 000) toward the cost of the project for Harmonizing and Improving Statistics in West Africa (HISWAP)/Cabo Verde, designed to strengthen the statistical system of participating countries and regional bodies in Africa to produce, disseminate and enhance the use of core economic and social statistics, and intends to apply part of the proceeds for consulting services. The Ministry of Health (MS) is the government department which is responsible for formulating proposals relating to the definition of the national health policy and corresponding legislative measures, implementing and supervising their application and evaluating their respective results.

In the context of the country's development, the health sector is increasingly called upon to guarantee the population the best possible level of physical, mental and social well-being, ensuring the protection and promotion of health, on the one hand, and the prevention, treatment and rehabilitation of illness, on the other.

Health policy shall abide by the principles that govern the National Health Service (SNS), namely: universality of access to services at all levels of health care; solidarity among all in guaranteeing the right to health and in contributing to the financing of health care;

equity in the distribution of resources and in the use of services; the safeguarding of human dignity and the preservation of the physical and moral integrity of users and providers; and professional deontology and ethics in the provision of services.

Among the priorities of the MS, as explained in the Government Program of the X Legislature, are the reorganization and re-qualification of the SNS, with a view to improving quality, responses, effective access to health care for all Cabo Verdeans, and the reduction of waiting times for consultations and access to diagnostic resources.

The Health Information System (SIS) is defined by the World Health Organization (WHO) as ***a mechanism for collecting, processing, analyzing and transmitting the information needed to plan, organize, operationalize and evaluate health services, thus facilitating monitoring and the control of activities carried out by service providers through local indicators, and the formulation and evaluation of health policies, plans and programs.***

The government of Cabo Verde has defined as a priority the implementation of the ***Digital Governance*** project, which is part of the **SNS** project, integrating all of the information from the SNS services (public and private) in a single technological platform, which aims to:

- Provide transparency in resource management;
- Improve response to priority diseases and streamline evidence-based decisions;
- Move to paperless processes;
- Integrate in a single digital platform all public and private initiatives that contribute to the improvement of the citizen's health status.

Under the Digital Governance axis, efforts are underway to effectively implement a system that meets the above-mentioned objectives, aiming to facilitate the planning, management and dissemination of data and health information for decision-making based on evidence. The SIS project has been developing by diferent partners of the MS and, in these terms, it is intended to implement part of the UPGRADE OF THE HEALTH INFORMATION AND ELECTRONIC PRESCRIPTION SYSTEM PROJECT integrated in the government's strategy in the field of Digital Governance, as measures that will improve the quality and relevance of health information, indirectly improving the quality of the National Health Service.

2. CURRENT SITUATION

The SIS is being used in all SNS structures in its financial component through the banking module and DUC (Single Billing Document). The registration management module underwent a recent upgrade and is being used in the structures of the SNS on the island of Santiago.

With the change in the service paradigm in Cabo Verdean public administration and taking into account that the project is at an advanced stage of improving service in central and regional hospitals, funded by the United Nations and implemented by the Secretary of State for Public Administration, Casa do Cidadão (Citizen's House) and the Ministry of Health in partnership with the Operational Nucleus for the Information Society (NOSI), the implementation of the Service Management module has started, which has already been developed and tested at the Santa Rita Vieira Regional Hospital (HRSRV) and is currently being implemented in the other structures of the MS (Ministry of Health).

The Laboratory Management module has already been developed by NOSI, and is in the final test phase for its implementation in all SNS structures.

The already developed admission management module was upgraded for use in the management of COVID19 vaccines.

M1 (Medicine One), the application used for the management of the patient's single medical record, is currently only being used in the health structures of the City of Praia (Health Centers and Central Hospital) for several reasons which we will now point out:

- The high cost of management, use, and maintenance of 19% of the license fee per year;
- Excessively high license price;
- Dependence on the company in any cases of errors;
- Network/communication that does not meet the requirements of M1 (Medicine One).

DHIS2 (District Health Information System), an application used by the SNS to manage aggregated data and individual data for COVID19, is already in production in all SNS structures and for all public health programs.

Nha Card is also a Plataform that is being use by the MS/SNS for request digital health certificates, which is integrated with the SIS and DHS2.

The following products have been developed so far by NOSI in SIS:

MODULES	DESCRIPTIONS	STATUS
MANAGEMENT MODULE	SHIFTS	Done
	SCHEDULES	Done
ADMISSION MODULE	CONSULTATION APPOINTMENT	Done
	LABORATORY APPOINTMENT	Done
	IMAGING APPOINTMENT	Done
	IMMUNIZATION	Done only for COVID19

Table 1 – Products developed by NOSI in SIS.

3. EXPECTED RESULTS

3.1. Object

The Ministry of Health aims to hire a firm to develop new modules of the health information system and electronic prescriptions project for the SNS, with the objective of to include all clinical epidemiological and management information in a single health platform (single and digital clinical process) within a maximum period of 18 months.

3.2. New modules

The UPGRADE OF THE HEALTH INFORMATION AND ELECTRONIC PRESCRIPTION SYSTEM PROJECT will promote a shift in the service paradigm in the SNS, integrating primary, secondary and tertiary care in the same platform including clinical and epidemiological information and management of both the public and private sectors, and will facilitate the standardization of information. The process of developing the new modules might imply in the necessity to review the system architecture of the SIS.

In articulation with the Ministry of Health teams, the company will be responsible for performing the system analysis, implementing, testing, documenting, and roll-out at the health facilities the new modules of the SIS solution. It is expected that at least three new modules are completed roll-out.

TASKS	MODULES
ADMISSION MODULE	GRAPHIC TRACINGS
OUTPATIENT SOLUTION	EXTERNAL CONSULTATION
	EMERGENCY SERVICE
	OPERATING ROOM
	CONSULTATIONS IN OTHER NON-MEDICAL SPECIALTIES
	EMERGENCY OBSERVATION SERVICE
	ELECTRONIC PRESCRIPTIONS AND SICK LEAVE

SPECIAL OUTPATIENT SOLUTION	MOTHER AND CHILD SERVICES
	PRENATAL CONSULTATIONS (AT LEAST 3)
	IMMUNIZATION OF THE MOTHER
	HIV AND HGHBS ANALYSIS
	CHILDBIRTH
	CHILD FOLLOW-UP
SOLUTION FOR INTERNMENT	ANESTHESIA CONSULTATION
	CONFIRMATION OF SURGERY
	OPERATING ROOM RESERVATION
	BED RESERVATION
	RECORD OF SURGICAL TECHNIQUE
	RECORD OF SURGICAL TIMES
	REGISTRATION OF MATERIALS AND MEDICINES USED
	PATIENT ADMISSION
	CREATION OF A CLINICAL AND NURSING PROCESS
	THERAPY RECORD

Table 2 – Modules to be developed.

3.3. Main Gains

The SIS solution should be able to provide these flowing advantages:

- Having a unique, digital medical record;
- Ease of maintenance;
- Inclusion of the private sector;
- Integration with all existing subsystems;
- Move to paperless clinical processes;
- Secure availability of information in accordance with the authorizations;

- Having information for decision making at local and central levels in a timely manner;
- Optimization of treatment expenses.

4. WILL ALLOW FOR

The SIS solution should allow:

- Integrating the user registration system with the CNI (National Identification Registry);
- Integrating with contributory and non-contributory social protection systems;
- Integrating with the drug registration system;
- Integrating with the drug management system both from the importer/distributor/producer, as well as with the pharmacy solutions;
- Define a single citizen's record in the SNS;
- Move to paperless drug prescription;
- Prescribing by only using INN (International Nonproprietary Name);
- Record diagnoses using ICD 10 (International Coding of Diseases);
- Change the service paradigm;
- Electronic prescription;
- Mandatory prescribing using the INN (International Nonproprietary Name);
- Record diagnoses only using ICD10/ICD11 (International Coding of Diseases);
- Availability and quality of the communications network;
- Portability;
- Integration;
- Interoperability.

5. Technological Infrastructure

The Ministry of Health will provide the following technological infrastructure in which the SIS solution must be deployed and operate.

The SIS solution should be deployed on an infrastructure composed of two discrete environments:

- The production environment, hosts the servers, software, services and the storage, in order for SIS to work and be made available to the end users. It is the environment that is monitored and analyzed constantly for performance in order to track problems soon enough, before performance issues reach the end users;
- The staging environment, which is a complete copy of the production environment (software infrastructure), with a main purpose to be used for testing of new software releases, configurations, upload of files for testing purposes, and anything related to information that need to be validated before going public on the production environment;
- A system for automated deployment, scaling, and management of containerized applications (ex. CI/CD, Kubernetes);

5.1. Hosting Service Provider Minimum Requirements

The SIS solution hosting will be a responsibility of the Ministry of Health and it is required that hosting provided be located in Cabo Verde. The provider of the SIS solution should estimate the minimum requirements for the hosting services for each of the following items:

- **Servers capacity** (ex: CPU, RAM, Storage, Overall infrastructure) to guarantee scalability and None or minimum downtime during scaling is accepted.
- **Backup Supporting Service** for full system image backups (snapshots) or granular service backup of the available servers. Snapshots on demand or scheduled.
- **Bandwidth** for high availability serving multiple connection requests at servers and clients.

- **Connection for** high-speed network connection between instances for instant communication between Application and Database servers.

6. COMPANY TASKS

In articulation with the Ministry of Health teams, the company will be responsible for the following tasks:

TASKS	DESCRIPTIONS
TASK 1	• Preparation of a plan for the development, implementation and integration of existing modules and those to be developed within the scope of this project;
TASK 2	• Survey of each module to be developed in conjunction with SNS technicians;
TASK 3	• Analyze each module and validate it in conjunction with SNS technicians;
TASK 4	• Propose a development language compatible with the modules already developed in IGRP Web;
TASK 5	• Develop and deliver the manuals of all modules to be developed as well as the APIs for future integrations;
TASK 6	• Integrate the developed and existing modules;
TASK 7	• Implementation in Santiago Island SNS;
TASK 8	• In conjunction with NOSI, the Ministry of Health's technological partner, design and implement all APIs for integration with the modules for user management, laboratory, and the electronic prescription repository;
TASK 9	• On-the-job training of SNS technicians; during the entire process of analysis, development, testing and delivery of the product for a team of technicians indicated by the Ministry of Health;
TASK 10	• Guaranteed system maintenance for a period of 6 months after delivery and acceptance of the final product.

Table 2 – Company Tasks in SIS.

7. PRODUCTS TO BE DELIVERED

The SIS Project should allow the delivery of the following products:

PRODUCTS	DESCRIPTIONS	DELIVERY TIME	PERCENTAGE
INITIAL REPORT 1	Inception plan with methodology of development.	15 days	5%
DELIVERABLE 2	Report on SIS architecture, inventory of existing modules, description of development's technologies adopted.	45 days	5%
DELIVERABLE 3	Report on detailed chronogram of development and roll-out prioritized modules.	30 days	5%
DELIVERABLE 4	Module I developed without license and usage limits with their respective APIs for future integrations. Module tested and functioning in at least two health facilities. Module summaries report, containing the user and maintenance manuals in Portuguese.	120 days (Could be adjusted based on detailed chronogram of Deliverable 3)	20%
DELIVERABLE 5	Module II developed without license and usage limits with their respective APIs for future integrations. Module tested and functioning in at least two health facilities. Module summaries report, containing the user and maintenance manuals in Portuguese.	120 days (Could be adjusted based on detailed chronogram of Deliverable 3)	20%

DELIVERABLE 6	Module III developed without license and usage limits with their respective APIs for future integrations. Module tested and functioning in at least two health facilities. Module summaries report, containing the user and maintenance manuals in Portuguese.	120 days (Could be adjusted based on detailed chronogram of Deliverable 3)	20%
DELIVERABLE 7	Final Report: Summarizing all the work developed and the scope of regularization actions and the documentation: Architecture, installation manual, intervention manual, administration manual, user manual and test plan .	90 days (Could be adjusted based on detailed chronogram of Deliverable 3)	10%
DELIVERABLE 8	Maintenance plan for 6 months from the date of signature of the system acceptance terms.	6 months after the final report.	15%

Table 3 – SIS Project Deliverables.

8. COMPANY PROFILE AND TEAM COMPOSITION

8.1. Company

The expected results will be ensured by a company with the following profile:

- More than 7 years of experience in developing and implementing health information system solutions;
- Proven experience in developing and implementing information systems;
- Have developed more than 5 (five) projects in the area of health information system;
- In-depth knowledge of the health sector;
- Mastery of the Portuguese language and knowledge of English;
- Experience in implementing information systems that meet the challenges of interoperability, integration, and portability.

8.2. Team

The assignment will be performed in Praia, Cabo Verde.

Part of the development of the SIS solution can be performed at the HQ of the Vendor.

The company must present a minimum team with the following experts:

- **Team Leader**: degree in information technology or related areas, minimum 10 years of experience in the area of services and health systems from the perspective of health information systems;
- **Analyst**: degree in information technology or related areas with at least 5 years of experience as an analyst in the area of health services and systems from the perspective of health information systems;
- **Programmers**: 3 Programmers, degree in computing, mathematics or related areas with 5 years of experience in the development and programming of information systems;
- **Web designer:** with a minimum of 5 years of experience as a web designer and who is responsible for the system's image.

9. DURATION AND PLACE OF SERVICE PROVISION

The total duration for the execution of this work is 18 (eighteen) months, plus 6 (six) months of local supervised operation.

The place of service is in the Ministry of Health as a representative of the SNS structures, namely:

- **Three Regional Hospitals:**
  - Hospital Ramiro Figueira (Sal);
  - Hospital São Francisco de Assis (São Filipe – Fogo);
  - Hospital João Morais (Ribeira Grande – Santo Antão);
- **Thirty-two Health Centers:**
  - Ten Islands: 22 Municipalities;
  - Two Health Stations: those of São Vicente and Praia.

10. JOINT DEVELOPMENT

NOSI has long been the technological partner par excellence of the Ministry of Health, whether in the development of solutions, maintenance, training and implementation, and especially in providing network and storage solutions.

NOSI will provide technical assistance for the selected provider about the software architecture of SIS, provide technical documentation of existents modules, support the development based on IGRP Web platform and other official solutions required by the Government of Cabo Verde.

Taking into account that the existing solutions were developed by NOSI, we propose that in this project, the integration tasks be done jointly.

Negotiations as well as contracts with NOSI are the sole responsibility of the Ministry of Health.

11. TECHNOLOGY REQUIREMENTS

All the technologies used in the development process of the SIS project are included in the table, but the tools and other technologies for development this project can be open source.

IGRP WEB		
NAME	**FUNCTIONALITIES**	**DESCRIPTIONS**
TECHNOLOGY USED	**1. IGRP WEB**	• It is desirable (not mandatory) that the new solutions are developed on the IGRP Web platform, as it is an innovative product that provides an integrated package of solutions for Electronic Governance, aimed at a Holistic approach to Administration; • Consequently, it bases its entire logic on the principle of "*Write Once, Read Many*", that is, information is not duplicated within the Administration and can be accessed across institutions.
	2. TALEND	• O *Talend* é utilizado no desenvolvimento da aplicação **SIS** no processo de extração, limpeza e carga de dados; • *Talend* is used in the development of the **SIS** application in the process of extracting, cleaning and loading data; • *Talend* is an *Eclipse-based Open-Source* data integration project that supports ETL (Extract Transform and Load) driven implementations, and is provided for local deployment. *Talend Open Studio* is primarily used for integration between operating systems, as well as for ETL for *Business Intelligence* and *Data Warehousing* , and for migration; • *Talend* offers a completely new vision, reflected in the way it uses technology in its business model.
	3. WSO2	• WSO2 is used in the development of the **SIS** application in the initial phase, in the process of loading data previously stored in Oracle by *IGRP PL/SQL*, which will be processed and stored in the *PostgreSQL* database;

		• WSO2 offers a platform of *middleware* products which is computer software that provides services for software applications beyond those available through the operating system . • WSO2 is a major contributor to Apache Web services projects, https://es.wikipedia.org/wiki/Apache_Software_Foundation including Apache Axis2, Rampart Apache, Apache Synapse, Apache Axiom and many more.
	4. PDEX	• PDEX is the state's main integration and interoperability platform. All integration for data interoperability between state institutions must be done via the PDEX platform. This platform provides secure and robust security mechanisms for accessing data stored in critical government databases via APIs. • APIs are made available on an online store where developers can explore, subscribe and consume them. Each API has its own documentation that includes the input parameters, the data that is returned, the respective endpoints and the access conditions. • The consumption of an API requires prior authorization by the entity responsible for the data. After the required authorization, the technical responsible for the API ensures the appropriate settings for its consumption, including the provision of an account if it does not yet exist and the assignment of specific permissions. Any API dealing with personal data requires the authorization of the National Data Protection Commission (CNPM) as part of the authorization process. The application owner, MS, must conduct the authorization process. • Each API follows a REST architecture and is characterized by a web address protected by standard authorization mechanisms like OAuth 2.0.
	5. AUTENTIKA	• Autentika is Cape Verde's state electronic identity and authentication management platform. It facilitates secure and

		trusted identification between citizens and online service providers. To improve the experience of using these services, Autentika provides the Single Sign-on (SSO) service; • In order for the application to authenticate its users via Autentika, it must be registered as a service provider on it; • For the registration it will be necessary to provide login redirect url and logout redirect url to the Autentika team. With this registration, the Autentika team provides a unique identifier for the application (Client ID) and a secret key (Client Secret) unique to the application. With these data, the application can be coded to connect with Autentika's single sign-on solutions via OpenID Connect or similar mechanisms. More details on the integration and authentication flow can be found at: ○ https://autentika.gov.cv/authenticationendpoint/desenvolvedores.do.

Table 4 – SIS Project Technology Requirements.

12. INTEGRATION

The **SIS** application is integrated, via service, and the modules to be developed must be integrated in addition to the registration system (Patient identification) with different systems, namely:

IGRP WEB		
MODULE	**FUNCTIONALITIES**	**DESCRIPTION**
WEB SERVICES	**INPS**	The **SIS** will integrate with the INPS to issue Medical Leave and Electronic Prescription and also to consult Users with active rights.
	RNI/SNIAC - DONE	The **SIS** must integrate with the RNI/SNIAC. To register the user, a search must be made in the RNI database (ID/Birth Certificate), to identify and confirm the user.
	DGCI - DONE	The **SIS** should integrate with the DGCI. To register the user, a search must be made in the DGCI database (NIF - Tax ID), to identify and confirm the user.
	ERIS	The **SIS** will integrate with ERIS for the national drug registration process (List of Medications).
	PN	The SIS has to be integrate with Policia Nacional for the Violence Complaint cases.
	CSU	The SIS has to be integrate with Cadastro Social Único to search patients with some vulnerabilities.
	CNPS	The SIS has to be integrate with CNPS to search for non constributory systems Patients.
	NATIONAL ELECTRONIC REVENUE REPOSITORY	The **SIS** must integrate with the Repository, where all prescriptions prescribed by the Health structures, public and private, will be registered.
	LABORATORY MACHINES	For the purpose of laboratory tests.
	PAKS	Integrate all imaging, video, and other exams.

Table 5 – SIS Project Integration.

13. CONSULTING TERMS

A “lump sum” contract will be signed with remuneration paid upon approval of the products presented and reimbursable costs paid upon submission of receipts for expenses incurred at actual cost.

14. SUPERVISION AND COORDINATION

The supervision, management and coordination of the consultancy is the responsibility of the Ministry of Health and the Special Projects Management Unit (UGPE) of the Ministry of Finance.

15. INTELLECTUAL AND TECHNICAL PROPERTY OF PRODUCTS TO BE DEVELOPED

The products developed at the request of the beneficiary will remain under the intellectual property of the Ministry of Health as well as all its elements.