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GBON National Contribution Plan of Saint Vincent and the Grenadines

Systematic Observations
Financing Facility

**Weather
and climate
data for
resilience**



GBON National Contribution Plan Saint Vincent and the Grenadines

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Module 1. National Target toward GBON Compliance

St. Vincent and the Grenadines is an independent island state located in the Eastern Caribbean. It lies between latitudes 13.0° and 13.3°N, and longitudes 61.1° and 61.3°W. Its territory consists of the main island of Saint Vincent and, south of that, two-thirds of the northern part of the Grenadines, a chain of 32 smaller islands, most of which are unpopulated.

The capital and largest city is Kingstown. The country has an area of approximately 369 km² plus an Exclusive Economic Zone in the Caribbean Area with an additional extent of approximately 70,000 km², and a population of approximately 110,000 inhabitants. Thus, the overall population density is quite high, but unevenly dispersed.

The GBON Global Gap Analysis conducted by WMO in June 2023 (Table 1), took also SVG into account. Considering SVG a SIDC, the Analysis has stated that the country is responsible for providing data from a single surface station as well as a single upper air station. However, the upper air station in Barbados covers SVG as well, in terms of GBON.

SVG possess, relatively to its land size, quite a large marine Exclusive Economic Zone and therefore, it might be of great benefit to a future project to install at least one marine surface station in the sea surrounding SVG.

Table 1. GBON National Contribution Target (standard density, 500 km radius for surface stations and 1000km radius for upper air station)

Type of station	Baseline (Results of the GBON National Gap Analysis)				GBON National Contribution Target	
	Target (# of stations)	GBON-compliant stations (#)	Gap		To improve	New
			New	To improve		
Surface	1	0	0	1	1	0
Upper-air	1	1 (Barbados)	0	0	0	0
Marine Surface	-	-	-	-	0	1

1.1 Surface stations

SVG has not designed any surface station as its International GBON Station. All of the four existing stations of the Meteorological Services are not GBON-compliant, mostly unable, due to communication challenges, to transmit data on a real-time basis to the headquarters or/and to the GTS. Out of these stations, the station located in Arnos Valle (Table 2 and Figure 1) seems to be the most suitable to be designated as a future GBON station, for two main reasons:

- a. the station is located in between Arnos Valle and Kingstown, or practically in the middle of the main urban area of the country. Thus, presenting the relevant meteorological data for a large percentage of the population and thus essential in terms of Early Warnings.
- b. This is the only station, which has a (more or less) continuous measurement history, beginning from 1979. Thus, the only one relevant now for climate services.

Table 2: Current and planned AWS in SVG

Station Name	Lat	Lon
Arnos Vale	13.146111° N	-61.209167° W

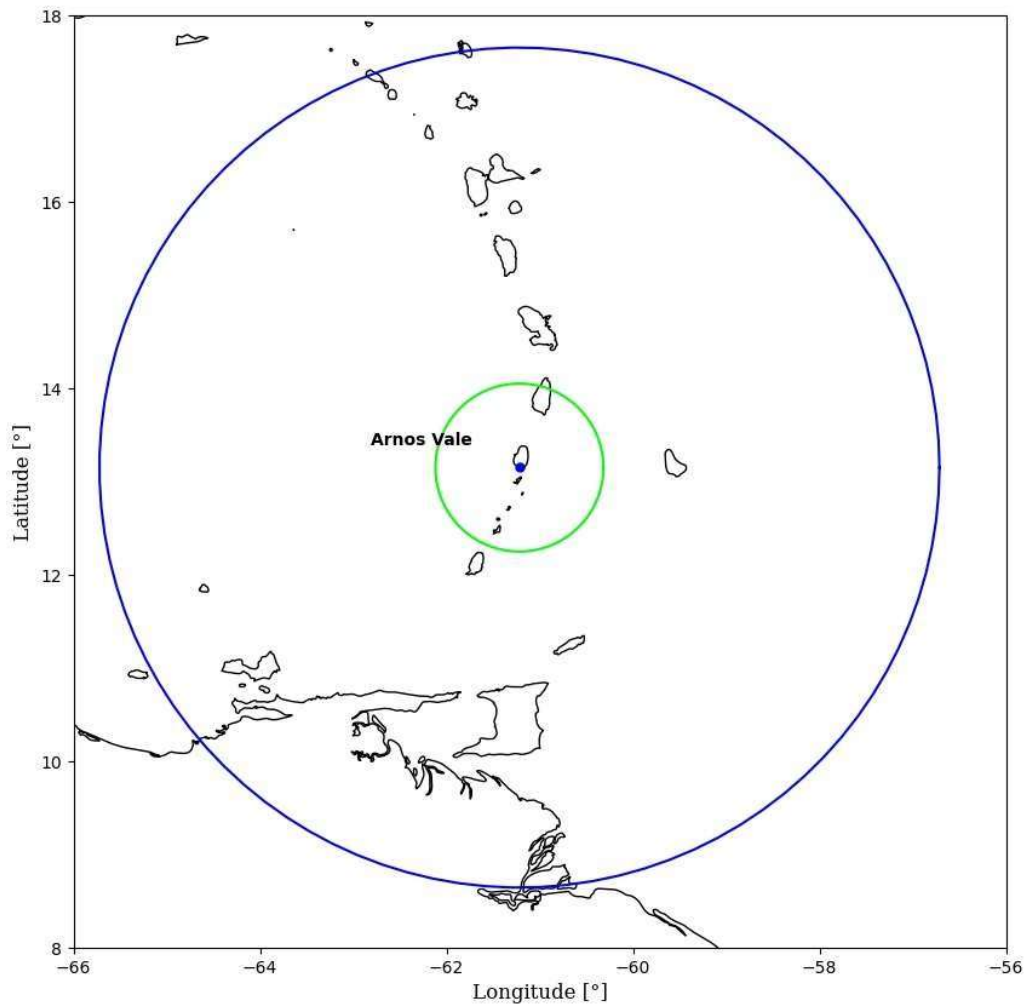


Figure 1. A map with the existing surface station for a low-resolution GBON (500 km, blue circle). The Green Circle is surrounding the entirety of SVG.

1.2 Upper air station

Despite the fact, the GBON standard requires SVG to operate at least one upper air station, it is recommended to take into account the already existing upper-air operational station in Barbados. The spatial resolution required for SIDSs is 1000 km, whereas the distance between the countries is around 300 kms. Thus, the upper air station in Barbados covers also the requirements of SVG (as can be seen in Figure 2). Thus, it is recommended to waive SVG from this requirement. This recommendation is reinforced by the [decision 3.1/1](#) on the regional design of the upper-air component of the Global Basic Observing Network (GBON), which defines the upper-air stations that consist the GBON upper-air network of the Caribbean Region.

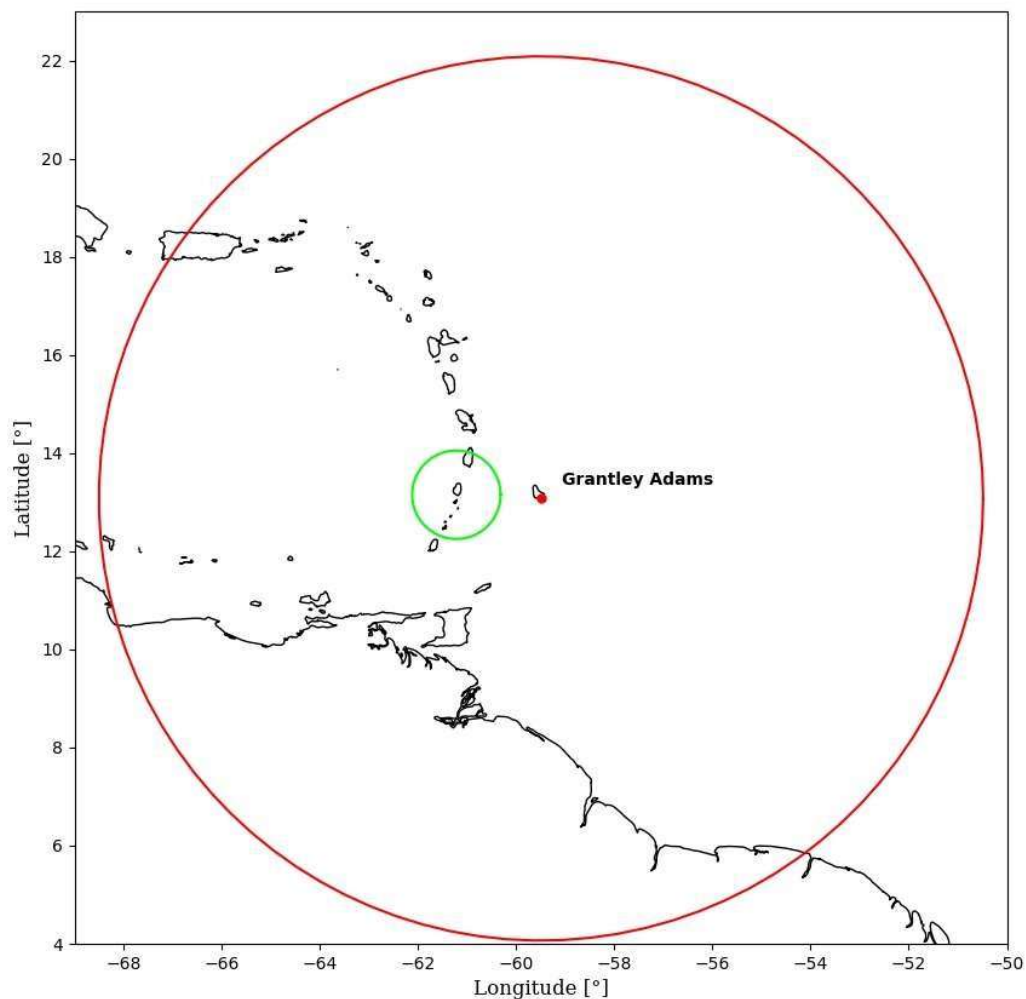


Figure 2. A map with the existing upper-air station for a low-resolution GBON (500km, red circle). The Green Circle is surrounding the entirety of SVG (and most of St. Vincent)

Module 2. GBON Business Model and Institutional Development

2.1. Assessment of national governmental and private organizations of relevance for the operation and maintenance of GBON

SVGMS is the national meteorological service agency, a unit under the Aviation Services Department, which is under the auspices of the Ministry of National Security, Disaster Management and Immigration of St. Vincent and the Grenadines. It is the official provider of weather and climate information and related products and services for the country.

Since its foundation back in 1960, the SVGMS is operating without an accompanying legal act defining its goals, roles and responsibilities.

A Model Hydro-Meteorological Bill and Meteorological Policy for the legislative framework for English-speaking CARICOM (Caribbean Community), including SVG, were prepared by the Caribbean Meteorological Organization (CMO) Headquarters in 2021 with funding from the Climate Risk and Early Warning Systems (CREWS) Caribbean Project 1.0 and Environment and Climate Change Canada (ECCC). After adaptation of the model legislation to national circumstance and the legal structure of SVG, the legislation process has commenced in SVG, but is still not finalized.

In other related laws, such as the National Emergency and Disaster Management Act (2006), the Central Water and Sewage Act (1991) and the Waste Management Act (2000), there is no reference to SVGMS.

The SVGMS has functioning partnerships with different governmental and semi-governmental institutions, like the National Emergency Management Organization (NEMO), the Central Water and Sewerage Authority (CWSA) and the Ministry of Agriculture. However, these partnerships are very often based on informal and personal contacts, rather than being formalized (through legislation and/or MoUs). Moreover, there is a complete array of additional relevant partners inside the governmental structure of SVG, with whom no partnership exists yet, like the Ministry of Tourism, Marine and Port Authority and the Ministry of Environment. Currently, there are no partnerships in place with the private sector.

Out of these partnerships, the one with CWSA is the most relevant for the SOFF activities. CWSA is operating currently five so-called climate stations (so their purpose is not so much to provide real-time data, but more of climatic information for planning) and hence, its technicians have already quite a good acquaintance with meteorological surface stations, both manual and AWSs.

Recommendations:

- a. It is of high importance to support the SVGMS in its ongoing efforts toward finalizing the legislation process of the already existing draft bill, providing a solid, up-to-date and coherent legislative framework around the activities and mandate of the SVGMS. This action would gear the development of the SVGMS and would bring appropriate organizational and governance structure for additional funding acquisition. National and international advocacy (with the support of the Caribbean Meteorological Organisation (CMO), which has supported the legislative effort since its inception) towards this action should highlight the importance of the SVGMS as a national critical infrastructure that is essential for the well-being of the nation as well as to facilitate inflow of mostly governmental resources.
- b. Following from the item above, there should be an increased national budget allocation for the SVGMS, to ensure the sustainability of the modern observational network supported by SOFF, beyond the investment and early compliance horizons. This budget should include a continuous employment of a full-time technician (the current one is about to retire in less than two years and has to dedicate large parts of his working time to shifts, as a forecaster and other assignments).

- c. As mentioned beforehand, the most relevant partnership SVGMS has, in this respect, is its partnership with CWSA. This partnership should be expanded in the following directions:
1. Formalizing the partnership with a comprehensive and coherent MoU, that should include also a clear and long-term undertaking of CWSA to support the maintenance and calibration of SVGMS' AWSs (and vice versa).
 2. CWSA is operating its own network of AWSs (as well as hydro stations) in different locations and thus has experience and knowhow acquired in installing, operating and maintaining these.
 3. CWSA has a small, but well qualified team of technicians, who are used to deal with AWSs and has also its own vehicles. CWSA also has its own IT personnel and their own data management system.
 4. The MoU should include also a well-planned SOP for the optimal use of the joined pool of technicians for the maintenance and calibration of both networks.
 5. The technicians of both entities should receive additional joint training within the curriculum of Carribean Institute of Meteorology and Hydrology (CIMH), as well as any other external training possibility (of the AWSs producer, for example).
 6. The two entities should also aspire towards future procurement of identical AWSs, based upon the AWS that will be chosen for the future GBON station. Such a joined procurement will lead, eventually, towards a harmonized national meteorological network, thus strengthening its long-term sustainability.
 7. The MoU should also include a full data sharing policy between the two entities, in real-time.
 8. The MoU might also include creating a backup for the national data archive at SVGMS, at CWSA's.
 9. Thanks to the planned shared pool of technicians, CWSA would be able also to support the maintenance of the GBON station at the airport. only in case of both SVGMS and CWSA being able to procure identical AWSs, both organisations could share also spare parts, and as for calibration – sign a joined contract, which might reduce the costs.
 10. For calibration – two possibilities should be considered. The first would be the calibration labs of CIMH. However, as currently CIMH has limited calibration capabilities (currently, CIMH does not operate a wind tunnel and faces challenges with its pressure calibration capabilities. Another limitation is that its calibration facilities are suitable for calibration of sensors produced from certain vendors) as well as parameters), the second option that should be considered, would be using the vendor's own calibration labs. Thus, sending the sensors oversee on a constant base. WRMA does not have any calibration lab, nor has the capacity to maintain one.
- d. As also depicted in the sections below, stakeholder and end-user engagement coordinated activities should occur. Stakeholders are considered to be those entities, which can benefit from the services, contribute to the services as well as the government structures that should provide

the framework for the SVGMS operations. Regional entities, such as CMO and WMO Regional offices for RA IV (North American and RA III (South America) should be engaged in this process as well, to leverage and capitalize upon potential regional-level cooperation) coordinated activities should occur. This engagement should include the following specific actions:

1. Yearly stakeholder workshop, if possible, facilitated by a community member that is familiar with institutional whereabouts at national and international levels. This workshop should bring together key government institutions, as well as the private sector. This workshop would not only serve to strengthen the business model taken, but would also open the possibility of exploring other potential approaches, while in turn exploring additional sources of revenue that may add to the long-term sustainability of the network. These workshops can also trigger regional capitalization and act as a platform for engagements of both the governmental and private sectors of Saint Vincent and the Grenadines.
- e. Outreach to large tourism and fishing operators (such as hotels, cruises, etc.) in order to determine whether any observational stations (surface or marine) are operated by these entities. In the event that they do, assess their quality against WMO standards, to explore their owners' willingness to share their data internationally and to assess whether these stations will be operated well into the future. It is highly possible that large hotels or/and large cruise ships have or might have meteorological measurements, even summing up to a complete meteorological station. In any case, such stations could serve only as additional stations to the GBON ones or as potential back-ups, but NOT as standard GBON stations.

2.2. Assessment of potential GBON sub-regional collaboration

The Caribbean Region comprises mainly of Small Islands Developing States (SIDSs), which are located in relatively close proximity to one another, thus a regional and sub-regional cooperation and collaboration are not only recommended, but can be considered as essential.

- ☐ There are however several potential collaborations for optimization of the operations of the network deployed. The following have been identified:
- ☐ Regionally, SVG is a member state of the Caribbean Community (CARICOM). The Caribbean Meteorological Organisation (the CMO), established in 1973, is a specialized agency and institution of CARICOM and its role is to coordinate the joint scientific and technical activities in weather, climate and water – related sciences in sixteen (16) English-speaking Caribbean countries, including SVG. As such, CMO is supporting the SVGMS with its current meteorological legislation efforts as well as integrating the WIS2 protocol into the data dissemination system of the SVGMS. As part of this quite unique regional cooperation, just recently, the representatives of the NMSs of the region, led by CMO, have agreed on a common regional upper-air stations network design. According to which, the upper-air station operated by the Barbados Meteorological Service should also cover, in terms of the GBON requirements, SVG.

- The Caribbean Institute for Meteorology and Hydrology (CIMH), which is a part of CMO, is responsible for training as well as calibration services for CMO's Members as well as hosting Regional Instrument Centre. The current calibration capacities of the CIMH include pressure and precipitation. CIMH is working hard on trying and rehabilitating its calibration capabilities of temperature and humidity. In addition, CIMH is hosting the main regional data backup server for the region as well as providing some quality check services.
- Other regional and national relevant entities might include also the university of the West Indies, the Cuban Meteorological Service (operating a wind tunnel, for example) and regional and sub-regional cooperation with some or all of the Members of CARICOM (and the entire Caribbean Region).
- It is also to be noted that strong cooperation exists at an informal level among several countries of the region. Such relationship can be further exploited to enable country-to-country support, sharing of spare parts and/or field verification equipment. Since SVG does have the same implementing entity (WFP) and peer advisor (GeoSphere Austria) like Santa Lucia and Dominica, it will be discussed, and if agreed, to be included in the SOFF Investment Proposal to start from a sub-regional approach, where the NMSs of these three countries cooperate under the SOFF umbrella,

Recommendations

- a. As mentioned above (and later elaborated in module 2.5), the SVGMS, together with the support from SOFF, CARICOM and CMO, should aspire towards a successful completion of the legislative process, so that the SVGMS will have a full mandate to operate its network, together with ensuring full governmental support with resources for this cause.
- b. The CMO, together with the SVGMS, should take into consideration the long-term sustainability of the WIS2 procedure as it helps SVG to develop, especially in terms of the future IT personnel, who are expected to sustain this system in the long term (also for the entire region under CARICOM).
- c. The CIMH should be used as much as possible for providing the required training for the current and future staff, related to the station network. However, it should be taken into account that CIMH might not be able to answer all the training needs of the SVGMS. In such a case, additional training possibilities should be explored (WMO Moodle platform, relevant training activities organized by WMO Regional Training Centres (RTCs), Maryland University, Reading University, vendor training courses, etc.).
- d. As for calibration, it seems that the SVGMS will have to seek for opportunities in addition to CIMH – such as the Cuban Meteorological Service and/or most probably by engaging the private sector in the process.
- e. Regional and sub-regional cooperation should include one or more of the following activities: joined tenders for equipment, a shared pool of spare parts, creation of a virtual knowledge and experience sharing community of the technical staff of the NMSs, dedicated to the operation and maintenance of stations, sharing the actual staff in cases of an immediate need and more

f. However, one of the chief obstacles for many years in having such a regional or sub-regional cooperation in the field of operation and maintenance of surface stations networks was the multitude of vendors, stations models, etc. purchased or donated to different countries in the region. Hence, this NCP calls clearly for working towards a harmonization of regional and sub-regional networks. This can be done either by using common technical specifications (developed by CIMH currently) and comply with applicable WMO standards and guidance, by joined tenders (via the implementing entities, as SVG shares the same implementing entity as other countries in the region – WFP, OR via CMO). The main purpose should be having a single agreed station model or models for the entire region, but also such that it can withstand the environmental conditions of the region. The approach should be included in the agreed SOFF implementation arrangements in the SOFF Investment proposal.

2.3. Assessment of a business model to operate and maintain the network

Given the size of SVG and the heavy manpower, technical and financial constraints of the SVGMS, it is at this stage advisable to consider an operation under a hybrid public private business model (State/National Meteorological and Hydrological Service owned and Private Partner operated (GBON infrastructure), in which the stations are owned by the SVGMS, but part of the maintenance is performed by a private company (at least for the next few years) is recommended, with a future perspective of arriving towards a fully public business model. In such an approach, the SVGMS would be responsible for the operations, most of the maintenance as well as replacement of the equipment considering the life cycle of the specific equipment and its replacement after the end of the life-cycle, whereas the private sector could support with high-level maintenance and calibration.

However, for any private company, the relatively small size and activities required for SVG might be considered a no-go. Hence, such a model can be achieved only within a regional or a sub-regional joined approach. In addition, such a model will require an update of the meteorological bill, as the existing one includes only a purely public business model. Moreover, due to the high sensitivity of the Caribbean Countries to major weather events, such a Public Private Partnership should be well defined, so to avoid complications, especially before and during such events.

The suggested business model has the following Risks:

Risk	Impact	Likelihood	Control Measures
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Financial risk – changing funding based on political governance changes, leading to limited or discontinued budget and resources	Medium	Medium – might be aggravated by the current outdated legislative framework around the role and responsibility of the SVGMS.	Through political leverage and stakeholders' engagement, push the legislation forward as well as increase the visibility of the SVGMS. Moreover. By expanding the commercial activity of SVGMS, as another source of revenue.
Sustainability challenges – low flexibility on adapting to changing circumstances or if	High	High – the main challenge is	Creation of a pool of technicians, involving also CWSA as well as the technicians from the neighbouring

political forces drive into other directions		the very small staff of SVGMS (currently only a single technician, about to retire)	countries (especially Santa Lucia and Dominica)
Market competition – potential competition with the private sector and leading to distorted markets	Low	Low – since there is no private sector operating weather information in the region.	Through the legislation, make SVGMS the main meteorological authority of the country and hence, solidify its status, also budget wise. In addition, in case of an interest from private companies in related commercial activity in SVG, strive towards a private-public partnership rather a competition.
Quality of the services – due to limited resources	High	Medium due to limited Human/Financial resources, and infrastructure	Strengthening the SVGMS through legislation, visibility increase, stabilization of observation network

Management competence – due to lack of personnel or corresponding training to manage a larger and more complex service	Medium	Low – it is envisaged that training at management level occurs and should bring best practices and know-how into a growing organization. The main challenge is staff recruitment for	Workshops and special training for the manager and its supporting team on management, together with the parallel staff from Santa Lucia and Dominica.
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		management support	
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Limited legal frameworks and data policies in place that limit the exploitation of the new capacities	Medium	Medium—according to the existing legal framework, the data produced by the SVGMS is a public good. The same goes with the future legislative efforts. However, the new act should clearly state that the SVGMS is the only governmental body authorized to provide permissions for privately owned stations.	Through political leverage and stakeholders engagement, forwarding and pushing the legislation towards, hopefully, a full implementation
Data gaps usually due to “operate to fail” approach triggered by constrained resources	Medium	Medium – very limited manpower	Through the pool of technicians shared with Santa Lucia and Dominica and through a shared spare parts pool with these countries (as well as with CSWA) ensure a strengthened availability of trained technicians as well as spare parts.
Station accessibility and maintenance logistics, associated with getting to	Medium	Medium – the stations on St. Vincent are	The GBON station is located inside of the airport and hence, there should no be major issue with the accessibility

the stations for maintenance due to local conditions (roads, rivers), vehicles, boats, weather and access to finance,		quite accessible throughout the year. However, stations on the Grenadines are more difficult to access due to limited marine transportation possibilities	
Logistics	Medium	Medium	A stronger and formalized cooperation with CSWA will improve the logistics capabilities of SVGMS
Ineffective monitoring and tracking of the network and its related purchases etc	Low	Low – the SVGMS already have quite a good monitoring procedure in place, together with an experienced staff in procurement.	An additional training on that matter for the management and related staff

A sudden end to the contractual agreement	Medium	Low - The contractual relations should also include the corresponding exit clauses with timeframes and conditions.	The contractual agreement will be signed by all three countries (also Santa Lucia and Dominica) making it way weightier
Reputational risks, if they see the weather service matching with a private (strong) corporate.	Medium	Medium - as long as the relations will be well defined.	In case a private sector interest will pop up, strive immediately towards a public-private partnership and/or a better definition of the relations
Manpower/Technological risks - in case SVGMS (together with the CIMH) would not be able to replace the private company	Medium	Medium – due to the very small technical staff of SVGMS	Thanks to the shared pool of technicians as well as the additional support of SOFF to CIMH (through the projects for its member countries), increasing vastly the available related technical staff. A better cooperation between the three countries – SVG, Santa Lucia and Dominica might lead also to a decreased technological risk, especially with a joined ITC support

A detailed financial plan is to be prepared in the Funding Request for the Investment Phase to ensure a pragmatic and actionable approach is taken and in preparation for minor modifications in the plan according to the Implementing Entity (IE) guidance. However, the costing of the new infrastructure will be based on the World Bank activities including the estimation of Total Ownership Costs detailed in “Charting a Course for Sustainable Hydrological and Meteorological Observation Networks in Developing Countries” by Grimes et al. 2022, considering not only purchase costs but all the surrounding costs related to maintenance and operation.

Currently, the only source of income for SVGMS is the government, covering only the salaries of the employees as well as basic maintenance and operation of the existing facilities. It does not include any new investments, procurement of equipment, software or spare parts. SVGMS is totally depend upon

external projects for procurement of these ones. In case of a damaged equipment and/or outdated software, the SVGMS must search additional projects to cover these costs.

Hence, at this stage, without any other related projects, it is highly recommended that SOFF will fully carry these costs. However, through the different activities envisaged under the SOFF proposed plan, including stakeholders' engagement, political leverage, and more – SVGMS could strive towards an increased governmental budget allocation in the future, which might cover more and more of the necessary parts required to maintain a GBON network.

2.4. Assessment of existing national strategies and projects related to observing networks

Currently, there is a strategic plan in action (for the years 2021 until 2026). The plan was created through a collaboration with the CMO, with funding from CREWS and ECCC. Its main priorities include an enabling policy, improving the institutional and system environment of SVGMS, strengthening of infrastructure capacity (including observations), for delivery of effective weather, water and climate services, and establishment of partnerships to ensure a successful risk communication and to build up human capacity to strengthen operational services. It also includes a risk management plan. The implementation of the strategic plan is monitored annually by means of reports and meetings.

However, in the related target of strategic plan, the results are far from being satisfying: a. Install new/upgrade equipment for rapid onset hazard detections, tide and marine observations by 2024. The situation has not changed much since the mission to SVG in the beginning of 2024.

Currently, there is a single internationally funded project related to SVGMS, which might be of relevance. A cloud-based WIS2 node was created, through a MoU between CMO and WMO. The node was designed to facilitate the international transmission of data from the stations.

However, the new WIS2 node for the region, hosted by WMO currently, is to be covered by CREWS only till the end of 2027. to facilitate the international transmission of data from the stations. However, the main problem has remained the stations themselves, incapable of transmitting data in real-time. This way or another, for the facilitation of sustainability and regional cooperation, the NCP is recommending to install a fully new station, according to the agreed regional or sub-regional future standards.

In addition, previous projects under CREWS and with the support of CMO, have brought to a fully prepared legislation package, which SOFF can take on and try to bring it into full implementation. Such a legislation could lead, eventually, to a more solid budgetary support to the SVGMS.

2.5. Review of the national legislation of relevance for GBON

Since its foundation back in 1960, the SVGMS is operating without an accompanying legal act defining its goals, roles and responsibilities.

A model legislative framework for the English-speaking Member States of CARICOM (Caribbean Community), including SVG, was prepared by the Caribbean Meteorological Organization (CMO) and

endorsed by its members in 2021. After some adaptations to the legal structure of SVG, the legislation process has commenced in SVG, but is still not finalized, for already four years.

In other related laws, such as the National Emergency and Disaster Management Act (2006), the Central Water and Sewage Act (1991) and the Waste Management Act (2000), there is no explicit reference to SVGMS. However, the National Emergency and Disaster Management Act speaks of disaster alert advance schedules storm warnings, hurricane watches and warnings, which are under the purview of the SVGMS.

The main overall recommendation is to make all possible efforts, in coordination with the Ministry of Transportation and perhaps also with the support of CREWS Caribbean 2.0, to effectively push towards the finalization of the legislation and approval of the new Act. While steering the political agenda as a whole is beyond the capacities or intentions of the activities within SOFF, advocacy towards the establishment of this updated legal framework will be performed in all the instances possible. In order to reward and trigger the needed dialogues, it is recommended to make use of the planned stakeholder engagement workshops (Module 4) to include an action item at the policy level and advocate for a general support of the stakeholders with the legislative process. This should be supported by bilateral engagements with decision-making bodies. This engagement should be facilitated by those actors that can interface across institutions. The Peer Advisor shall as well support the interaction with the different national stakeholders in SVG.

It is also to be considered as a recommendation that, at the time of procurement or purchasing of the stations (spare parts and all related infrastructures) regulated taxes and potential custom fees should be properly accounted for. All regulations related to tax, customs or international shipping will be considered at the time of procurement by the IE.

Module 3. GBON Infrastructure Development

3.1. Design the surface and upper-air observing network and observational practices

As described in the NGA, the requirement of SVG to be GBON compliant is for one (1) surface and one (1) upper air station as shown in Fig 1 and 2 above. The implementation of these stations must consider the following:

1. Accessibility – since the location for the single surface station to represent SVG is located in the premises of the former international airport, which is itself located in the very heart of the main urban conglomerate of SVG, the location is quite easily accessible through the year
2. Environmental conditions and station resilience – the planned station is located in the very heart of the city (thus prone to air pollution and antropogenic dust), but also relatively close to the shoreline (thus exposed to high humidity and salinity). Hence, only an AWS that was proven to function well under these constraints should be installed aiming at true robustness and sustainability.
3. Security and safety – although the planned station is located in the very heart of the urban region, it still is located outside of any governmental facilities, thus prone to possible vandalism and theft.
4. Maintenance – the main challenge related to maintenance is the extremely constrained technical manpower of SVGMS (a technician, who is about to retire soon) and the difficulty in recruiting skilled technical staff (due to the quite small job market, as well as high competition from other economic sectors). However, the following concept for developing an O&M plan should become the baseline:
 - a. SVG should have two sets of sensors and additional equipment. One will be used as the operational set, whereas the second will be used a spare part as well as a temporary replacement for the first set sensors, when these are sent for calibration (see 5).
 - b. The station should be monitored by SVGMS' observers and forecasters on a real time base for suspicious observations (unrealistic or much beyond the usual climatology of the station), who should document any issue and in case of a need, update the technician.
 - c. Part of SVGMS' staff should be provided a basic training for the maintenance of station, so they could perform, at least, the basic maintenance of the station.
 - d. Additional support could come from the technicians of CWSA and through MoUs with Dominica and St. Lucia, also from their technical staff.
 - e. Basic maintenance (check and cleaning, simple fixes) should be performed on a biweekly base OR immediately after the monitoring showed issues.
 - f. Preventive maintenance should be performed twice a year by SVGMS' technician with the support of the technicians' pool.
 - g. Only in the case of a severe damage/total failure, which could not be fixed locally, the specific instrument or equipment should be sent to its producing vendor. The damaged piece should be replaced immediately by a corresponding spare part.

- h. Each sensor should have a documentation, including its entire history – fixes, calibration, issues, etc. The document should be constantly updated by the technician of SVGMS.
 - i. . Again, a regional single agreed vendor can facilitate an easier and better regional and sub-regional cooperation.
5. Calibration – it should be performed, according to the following concept:
 - a. Due to the importance and relatively easy immediate access to the station, it should be verified against the field verification tool. In the first year, once a month (also for training purposes). From the second year, the frequency can be reduced to once in two months.
 - b. Due to not-existing calibration possibilities in the country itself, there will be a necessity to send each one of the sensors (as well as the field verification equipment) for a calibration. Priority will be given to CIMH for calibration. In case, CIMH is incapable of dealing with certain sensors, these ones should be sent overseas to the closest lab of their producer.
 - c. It is highly recommended to create a joined calibration schedule for SVG together with Santa Lucia and Dominica, so that in each case, not more of one sensor of each kind will be missing in all three countries.
 - d. Naturally, in case a sensor from the station will be sent for calibration, it should be replaced immediately by its corresponding spare part.
 6. Data communication and transmission – the current automatic stations report using the cellular network, but this network is far from covering the entire country with reasonable stability and bandwidth. The new station will transmit using the cellular network. However, as a back-up, it is highly recommended also to consider adding a modem, for transmission through NOAA satellites (or any other relevant potential satellite system). However, it has additional implications, as additional power supply and the need to purchase additional modems for all of the stations becomes necessary.
 7. Serving as a climate station – actually, the longest series of data in SVG was and still is obtained in this location, back to the late 70's. Moreover, thanks to its position in a large empty field, without nearby large obstacles, makes it a perfect location to represent the climate of the larger metropolitan Kingston, which due to its relative density, does not have too many large empty spaces.

As already above mentioned, SVG does not need to operate its own upper-air station, as the station located in Bridgetown, Barbados, is already covering, in terms of GBON, the entire territory of SVG.

In addition, the design, planning and budgeting of the network should consider all the costs related to procurement of the necessary equipment for building up the surface station network (sensors, modems, fences, transport) for the continuous operation and maintenance (vehicle, transport for maintenance, ICT, licensing, single field computer and field verification toolkit, spare parts and common equipment), training, management and administrative workload among others. As for spare parts, due to the limitation caused by having a single station, it is highly recommended to explore three options (or even to combine them): a. to purchase at least 1 additional set of sensors, also a supplementary equipment, when the main

one is sent abroad for calibration. b. to explore a sharing of spare parts procedure with neighboring countries (in case there will be a joined tender or at least agreed technical specifications on a regional or sub-regional scale). In such a case, an additional set could be purchased and stored at the CIMH's headquarters (not an additional set per country, but rather 1-2 for all of the countries operating the same type of stations. However, transportation might be a challenge as well. c. though the contractual agreement with the private vendor, should assure an easy and fast access to the spare parts inventory of the company. However, transportation and its speed-of-delivery might be an issue here as well.

The current Regional WIGOS Centre (RWC) for SVG is the centre in Trinidad and Tobago. As one of the activities suggested by this current plan is to check the current metadata related to the suggested station location and then create a continuous updating protocol for the metadata. The protocol should also include a continuous feedback from the RWC regarding the quality of received observations in real and near-real time.

In addition, the SVGMS should purchase services from a foreign private company (high-level maintenance – severe damage to any equipment, which cannot be fixed locally).

During the implementing period of 1.5 years the goal would be to strive towards a full surface GBON compliance (including a marine station, if future funds will allow so. Fig 1 and Table 1).

The National Contribution Plan suggests to engage CIMH and CMO in a joined development of the necessary technical specifications, which would be considered to the regional recommended set, with the aim of having a much more harmonious regional network, allowing in its turn a strengthened cooperation between the different countries, and eventually for a much more solid sustainability. Implementing Plan to reach GBON low-resolution (1.5 year)

Aim: Bringing the country into a GBON compliance. During this tranche, the following actions will be necessary:

Technical components:

1. Through cooperation with CMO and CIMH, developing a set of technical specifications to serve for procurement of stations through all the SOFF countries in the region, based on the recommended [set of specifications](#) by WMO Task Team on GBON Implementation.
2. Perform full stations (surface AWS) procurement procedure - The procurement, where agreed in the implementation arrangement in the Investment Proposal, led by the SVGMS, with the support of the Implementing entity (IE, in this case, the World Food Programme, the WFP) and advised by the peer advisor, should also explore potential maintenance plans and spare parts acquisition. Following the regional gains, a dialogue will be established with the neighboring SOFF countries, regionally and sub-regionally (especially Saint Lucia and Dominica) to try to achieve best value for money in the procurement actions and / or follow-up maintenance plans. It is highly recommended that, in the case of the surface stations, the SVGMS should proceed with using the technical requirements of the CIMH, subject to review by the Peer Advisor to ensure that the proposed specifications are fully aligned with applicable GBON standards and requirements.

3. Once procurement is achieved for the single surface AWS to:
 - a. transport, create the necessary local arrangements (civil works, fences, etc.) and deploy the single surface station, according to Table 1 and Fig 1.
 - b. Perform the procurement and installation of the necessary additional ICT equipment corresponding vendor offers and quality control and assurance mechanisms. The hardware should also include the hardware that would allow for the receipt, storage, processing, transfer, etc of the data that this station will be recording/reporting.
 - c. To procure an additional set of instruments for a surface station, to serve as spare parts.
4. To formalise the relations with CSWA, so that the maintenance of the station (and other stations) could be performed in a full cooperation.
5. To reach out and come into formalized contractual relations with potential private companies, to provide high-level maintenance (for damages, that cannot be fixed by the local staff) for the stations' network and calibration services (for these sensors, which CIMH is unable to calibrate) for the single surface station (and the sensors). These relations should include clear definitions of the responsibilities of the private company/ies, its liability, as well as exit clauses. As mentioned beforehand, it should also include possibilities for: a. continuation of the relations in the longer-term. b. training services for the staff of the SVGMS. c. the possibility of making effective use of the available company's spare parts stock. d. the possibility of expanding the maintenance services provided by the company/ies, in the event that the SVGMS is incapable of solely executing this function. These relationships should be supported closely by the IE and the Peer Advisor.

Human capacity development:

1. Make the necessary arrangements with the CIMH and additional potentially relevant training providers, to perform relevant training for the current technical staff of the SVGMS, as well as build a new training procedure for the future staff, hopefully together with other NMSs of neighbouring countries. The training should cover technical and scientific aspects related to both manual and automatic stations. The training should address A) maintenance of the stations, B) training for the ICT infrastructure envisioned for the stations, including data management/storage/transfer/dissemination/QC, etc. and C) management (best management practices). The management aspect should be aimed at generating the organizational and managerial knowhow to prepare for the growth of the weather service. This specific management topic may be coordinated with WMO ETR and will be also supported by the Peer Advisor, which may host a specific meeting at the Peer Advisor's facilities to share best practices and know-how.
2. Support the SVGMS in locating a new technician and in addition to train some of the other employees with basic technical training.

Governance and stakeholder engagement:

1. Establish advocacy to all the relevant governmental stakeholders. This advocacy action will take advantage of the planned stakeholder engagement workshops, which will offer a unique set-up to discuss the criticality for the nation of a well-functioning weather service, particularly with the

coming climate change effects. The advocacy will be triggered by bilateral discussions and be supported by the peer advisor, CMO (Headquarters and CIMH), other NMHSs in the region, representatives of the WMO regional office and relevant national actors where possible. This advocacy should be used to push towards completion of the legislative process of the Meteorology Bill, encouraging the government to increase the budgetary allocations to the SVGMS (also through a potential cost-recovery process for at least the aviation services).

2. Establish dialogues with stakeholders that may have specific actions or interests in the country that can be synergised aiming at a better usage of respective resources and boosting cooperation.

3.2. Design of the ICT infrastructure and services

The Information and Communication technology (ICT) infrastructure for a meteorological network is crucial for its operation and, more importantly within the SOFF scope, for the data transmission and dissemination in real-time. The infrastructure must consider very critical aspects that can largely modify the costs and should be carefully considered at the time of preparing the funding proposal:

1. Data loggers
2. Transmission: cellular network, providing access to the NOAA/NESDIS GOES Data Collection System (DCS) for Data Collection Platforms (DCPs). It is important to note that cellular Data s can be unreliable and unstable at times. Hence, it is highly recommended also to add a possibility for satellite transmission (through NOAA or other satellites)
3. Power supply: Wired supply is preferable but also solar power is OK (1 m² Solar Panel = 100W Peak), Akku to bridge breakdowns in power supply or to store solar power for the night: 50-100 Ah Solar power should take first priority here instead of a wired supply being preferable as most of our AWSs are at remote locations. Even if there is utility power at the site, this can be unstable and unpredictable at times. If we are speaking in terms of having redundancy, solar power still takes priority and a wired supply can be a secondary power source at locations where this is possible.
4. Sensors for surface stations: Temperature, Humidity, Precipitation, Wind speed and direction, pressure are the basic sensors.
5. The single surface station, as already above mentioned, will be positioned in the heart of the main urban area of SVG,

It is to be noted that sustainability requires that a budget is allocated to the ICT for the lifespan of the network as for the complete ICT supporting infrastructure the ITC itself and with proper back-up and data storage and data services systems. The budget should cater for additional servers for redundancy and possible offsite backups of the Direct Readout Ground Stations central database.

Currently, SVG is already using to the Caribbean WIS2 node, established through a MoU between CMO, and WMO, through the MoU between CMO and WMO WIS section.. However, the project will cover the costs of the cloud hosting only till the end of 2027. Since there is no other immediately clear funding source, it would be recommended that the cost will be covered by SOFF in both of the

investment as well as the Compliance phases, until another funding source could be assured (most probably the governmental one).

Dataflow from station to wis2box

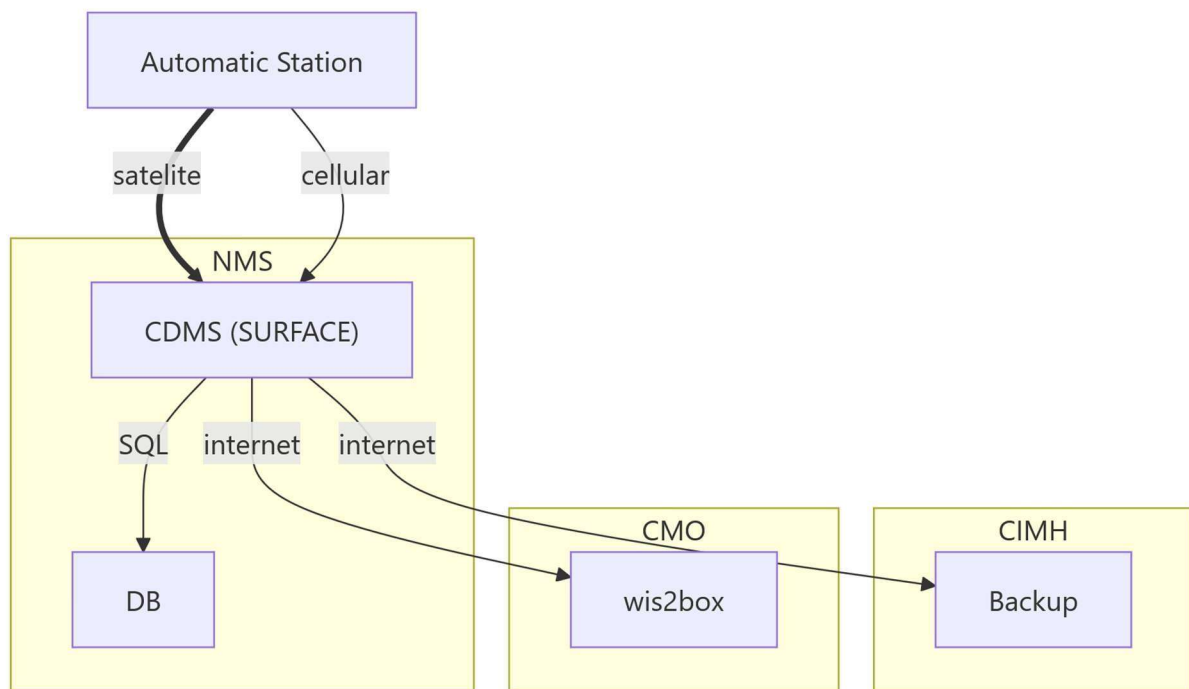


Figure 3. A suggested dataflow from station to wis2box as well as the national and regional backups.

3.3. Design the data management system

Currently, there is no functioning operational data management system in SVG. The observations are typed and transmitted manually through the WIS2 web interface. Still, this method is far of being sustainable nor close to real-time.

Hence, following the example set by Dominica (and other CARICOM Members' NMHSs, it is highly recommended to:

- a. Explore for external possibilities for hosting the DMS and its linkage to WIS2, through:
 1. The already existing cloud hosting provider for the Caribbean WIS2 node.
 2. Governmental or CARICOM's virtual cloud.
 - 3.. Commercial virtual cloud. The cloud should include a sufficient storage capability. The virtual server should work on the base of UNIX (preferably UBUNU), as it is the natural environment for the Data Management System mentioned in c.
- b. With support of the Belize and Dominica NMSs, the [surface CDMS](#) software should be installed, tested and been operationalize on this virtual server.
- c. The new installed station (and others) will be connected to the virtual server.

- d. One of the main features of this DMS is its WIS2 libraries, to be configured so that the data will be sent automatically to the two “locations” – to the Caribbean WIS2 Node as well the CIMH Backup.
- e. A new working station, which will serve as the gateway to the external server should be purchased, with a sufficient storage capacity. The station should be equipped with , a backup generator as well as surge protectors. It might be advisable to take into consideration an optional dedicated internet connection. At the working station should a SQL Archive be installed.
- f. One of the main features of this DMS is its WIS2 libraries, to be configured so that the data will be sent automatically to the three “locations” – to the Caribbean WIS2 Node, the national data archive as well the CIMH Backup.
- g. In case of a failure with the first server, the DMS on the second one will be configured so that it could serve as backup WIS2 transmitter. Redundancy might be the key for a long-term sustainability here.
- h. As mentioned beforehand, The transmission of data from an observing station to the national data management system should already be performed through reliable communications infrastructure. The main transmission will be done through the local cellular network. However, for sustainability reasons, it is also highly recommended to consider installing a satellite modem, so that the station would be also able to transmit through NOAA/NESDIS GOES Data Collection System (DCS)
- i. An inclusion of additional layer of cyber security for the ICT infrastructure of SVGMS should be considered.
- j. The surface CDMS System will also allow:
 - i. event driven or interactive data ingest/process/publishing pipelines.
 - ii. visualization of stations/data on interactive maps.
 - iii. discovery metadata management and publishing.
 - iv. download/access of data from WIS 2 network to your local environment.
 - v. standards-based data services and access mechanisms.
 - vi. robust and extensible plugin framework. Write your own data processing engines and integrate seamlessly into wis2box.
 - k.

In any case, due to little to no IT expertise at the SVGMS, it is recommended to follow a regional approach (as well as support from the ITC Department of the government of SVG), for the sake of sustainability and interoperability.

Last, it will be the role of the IE, supported by the Peer Advisor, to ensure that not only the purchasing of the equipment is performed but installed, operated and managed within the Investment Phase and for its sustainable future.

3.4. Environmental and sustainability considerations

The procurement specifications will include also, as much as possible, elements, such as: prioritization of equipment with low energy use, minimal hazardous materials, and ecofriendly packaging. Anybody dealing with the stations: the local communities, the SVGMS 'staff as well as the employees will be trained and encouraged to use sustainable and eco-friendly practices for procurement, maintenance, disposal and calibration.

The single AWS deployed, will undergo maintenance as per funding request to make use of the lifecycle and extend it as possible. It will also be GBON compliant in terms of requirements and characteristics. Sustainability shall be also boosted by synergizing maintenance, calibration and training with other initiatives and ongoing programmes. It is also important to highlight that the stations' locations are to be optimized so that maintenance is facilitated by being deployed in or near populated areas.

Strong government commitment is expected. Awareness creation at the policy and political levels of government about the importance of improving the availability of the real-time accurate meteorological data, which have a direct positive impact on the quality of weather forecasts, thus helping in ex-ante climate risk management and improving the safety and well-being of the population will create buy-in and ensure sustainability of the initiatives. Moreover, the need to enhance climate preparedness by enhancing the capacity for climate data collection, analysis and dissemination is an explicit request from the government. The support provided to SVGMS is expected to be well received and the investments safeguarded since improvement of climate services is a critical need for the country. The linkage to CMO (Headquarters and CIMH) and other potential future partners for capacity building will ensure sustained support from the regional centre of which SVG is a member.

Module 4. GBON Human Capacity Development Modul

4.1. Assessment of human capacity gaps

The staff of SVGMS is composed of:

- Management: 1.
- Forecasting: 2
- Technical support staff: 1 (about to retire) ● Observers: 8.

Out of the 12 employees, 8 are female (75%). As can be seen from this list, the SVGMS is soon to be lacking any skilled technical staff or any IT staff. For the successful implementation of the SOFF activities in the country, there is a clear requirement of having both, either in-house and/or through cooperation and/or through outsourcing.

In any case, the SVGMS does need to hire a full-time technician (who should get the full training required, as elaborated in 4.2), but also providing the other (existing or future) personnel, at least basic

technical training. Another option is, via a MoU with CSWA, using the technicians of CSWA (after a necessary complementary training) for the operation and maintenance of the network. As for IT – it seems that the solution should be a mixed one – providing some basic IT training to the staff of SVGMS and for a higher-level IT development, explore opportunities in the government of SVG, through CIMH and perhaps even together with a private vendor.

Clearly, any project that aims at establishing an observational network requires a strong and well-crafted plan for human capacity. This plan should encompass augmenting the existing workforce of the institution, an addition of a new staff along with enhancing the background and technical expertise to perform the required duties. But also to include exploration of additional technical and IT support beyond the limited scope of the SVGMS.

4.2. Design capacity development activities for technical staff

Even for such a small NMS as SVGMS, it is more than mandatory to have at least one person, whose main responsibility is providing technical services for the entire institution as a whole, and especially for operation and maintenance of the station network. Unless such a person would be recruited till the commence of the investment phase of SOFF, the suggested plan sees it of the highest importance to include recruitment of such a person and providing her/him, a full training plan, as elaborated next.

A training and capacity development plan is required with clear objectives that have measurable milestones and that are aligned with the SVGMS strategic goals in the short and long terms. The plan should be tailored to the initial levels of expertise of the staff members and the levels that are expected to be achieved. In order to do so, a structured curriculum has to be designed that covers the technical skills and basic knowledge with a mixture of practical and theoretical components. The training should be focused and tailored to specific individuals (or groups of individuals) trying to develop focal points of expertise rather than making general training to all staff members.

Different training plans should be created to fit the suggested capabilities of the following staff:

- a. A full training programme for the newly technical person, including the required knowledge in meteorology, mechanical, electrical and transmission engineering as well as ITC. Such training is provided by CIMH since years.

- b. A basic technical training programme for the rest of the/chosen employees of SVGMS.

- c. Complementary training programme for allocated technical staff from CSWA and perhaps additional governmental entities, having relation to the work of the SVGMS (Ministry of Agriculture, for example).

As stated above in this document, the training will build on cooperation that will be established under the SOFF umbrella, the following are envisaged:

1. Further Cooperation with CIMH, the university of the West Indies and more, regionally.

2. Exploring other training opportunities, through universities and institutions, especially in the US and the UK.
3. Exploring training opportunities with NOAA, NCEP, NCAR and similar institutions in the US.
4. Exploring the possibilities of an on-job-training in other NMHSs, especially such, which operate in similar environmental conditions (Barbados, Jamaica, Dominican Republic, etc.)
5. Enhance of usage of WMO specific training through specific contacts with the Education and Training Programme (ETRP) of WMO.

The different training plans should at a minimum, include the following components (on different levels, according to the related trained staff):

- Weather observations and weather parameters: this training should offer the fundamentals to move towards station operations. It should provide a basic understanding of the siting criteria for observing stations, including WMO CIMO standards, and give a basic understanding of the parameters that are critical, their interrelations and basic meteorological background information with a focus on observations and guidelines, functionality and fundamental principles, maintenance of mechanic and electronic components (rules and procedures), data collection, storage (data logger) and general concepts of data transfer.
- Station components and maintenance: the relevant technicians (from SVGMS, CSWA, etc.) should be assigned and trained for the maintenance of stations (SOFF and CREWS). The operations and maintenance should also include the managerial aspects on generation of SOPs and checklists. Very important to highlight and focus on in-situ maintenance, maintenance of mechanic and electronic components
- Calibration: As the calibration will be performed externally, there is only a necessity of a basic training regarding traceability and use of the field verification equipment.
- Data performance: The Investment Phase should also ensure that the National Meteorological Service has a good understanding of, and practical knowledge in, managing WIGOS metadata, using WDQMS, and working with Regional WIGOS Centres to follow up on any data performance issues. This will be included as part of the Peer Advisor support during the Investment Phase
- IT, ICT and potentially HPC or cloud services: the lack of IT personnel will need to be addressed with one of a few options (recruiting a new person, dedicated to IT, using an existing employee with IT background, cooperation with another governmental entity having IT capabilities) to handle all aspects relates to communication, server operations (SVGMS operation center) and similar services. They may also facilitate the in-house programming of simplified but effective data quality and data management procedures. This training should include Ubuntu, Linux, docker and Python at a minimum. The training should work on configuration and administration of hardware (server, networks, clients) and software (operative systems, databases, communication)
- Data transfer and WIS2 this will be coordinated with CMO Headquarters, through a MoU with WMO (currently lasting till the end of 2027 and should be covered by SOFF after this date)

,which is already operating a WIS2 Node as a regional platform will address the deployment of WIS2 in a box system for the international transmission as well as for the additional capacities the tool has to offer that can assist in other activities of the SVGMS.

- Best practices in data quality and quality management: this should support the IT training to enable that there is a quality management system in house that can evolve according to the SVGMS needs. This training should offer knowledge on the value chain and its components where QM is needed as well as usability of benchmarking.
- BCT-CMO Headquarters and the Trinidad and Tobago are nodes of the RA IV Regional WIGOS Centre with responsibility English-speaking Caribbean, including SVG. CMO Headquarters has worked with SVG on incident management of observation data quality.

It is to be noted that other international training courses can complement the program. Those courses could comprise the freely available courses from COMET (Cooperative Program for Operational Meteorology, Education and Training), EUMETSAT (European Organization for the Exploitation of Meteorological Satellites), EUMETCAL (European Meteorological Computer Assisted Learning) and others, which offer the opportunity to enhance personal and institutional knowledge easily and remotely in many instances.

4.3. Design capacity development activities for senior management

A weather service is a complex institution that requires effective capacity development activities that empower senior and junior management to lead with excellence and drive the organization toward success and, in this case, the very needed growth. The design of the development activities for management is crucial to ensure the right skills and knowledge to lead effectively. This design should consider the organization's main strategic goals and competences that want to be achieved and be aligned with the mission of the SSMS. It is also very important to customize the activities to the reality of the organization in a gradual approach and with a pragmatic and realistic perspective adapting to the specific needs and evolving capacity. The capacity development activities at this initial stage should focus on:

- Developing leadership skills, including strategic thinking, decision-making and communication.
- Change management, especially in the evolving nature of SOFF, it is important to gather the skills to lead and manage change within the organization and its staff members.
- Financial training and financial management and budgeting. Managers need to familiarize themselves with financial statements, resource allocation and the financial implications of the decisions taken.
- Project management training and Measurement and evaluation through the definition of key performance indicators to assess effectiveness of the activities.
- Strategic planning and regional networking, especially within the UN arena to develop action plans that have cross-sectorial approaches and optimize networks to achieve strategic national objectives.

- Enhancement of communication skills to become the spokesperson of the organization and establish the high-level dialogues required and drive decisions towards the organization's strategies.
- Technology and digital literacy, to leverage technologies as required.

The training plan should include the following specific components:

- An exchange to benchmark with another well-established weather service: taking advantage of the collaboration with the Peer Advisor institution, a visit to WMO and GeoSphere Austria facilities to exchange best practices.
- Exchange with WMO ETR to identify training activities on management. Potentially participate in Senior Management Capacity Building courses.
- Training on project management: identify a course (remote) to establish basic knowledge of administrative skills for project management and KPIs (also for the senior technical staff).
- Financing training: to gather the expertise and tools to handle costing of projects, budgets, and basic day to day operations of a weather service.

4.4. Gender and CSOs considerations

The Caribbean Region as a whole and particularly SVG are considered to be, in terms of international evaluation, as one of the most gender-equal regions and countries in the world. Even SVGMS is more than fulfilling the internal quota for the SOFF activities and has more than 50% of the staff related to SOFF are female (currently 75%!).

However, since it is a well-known fact that weather and climate disasters affect those most vulnerable, and gender, age and illness are critical factors that may exacerbate the impacts. The integration of gender perspectives with the involvement of civil society must be included in all aspects, especially when it comes to a government-based institution. This integration should be covered at governance, policymaking, development and dissemination and response levels and should have participative approaches to facilitate the engagement and give the voice to those usually unrepresented.

Hence, in all of the workshops arranged and coordinated through the suggest NCP, it is important to foresee that the percentage of females in the different workshops will strive constantly to 50%. Due to the strong connection this NCP envisages for entities as CSWA, the same will relate to their participation in the different workshops, as well as the training activities.

In addition, in within the investment phase, it is recommended to initiate a complete gender assessment that should be repeated at the end of the phase to monitor the progression and success of the implemented actions. Gender balance will be encouraged at every procurement and training action with a growing quota with the years address gender opportunities while at the same time advocating for the rights of marginalized. The outcomes of the workshops are to be included as formal recommendations for the SOFF activities and be used as guidelines to promote equity and equality.

Thus, in summary:

- A minimum of female participation should be kept in all of the different workshops and courses.
- In different workshops, a special part will be dedicated to further promoting the gender equality subject.
- A complete gender assessment will be performed before and after the investment phase.

Module 5. Risk Management Framework

5.1 Assess the risks of the observing network and propose mitigation measures

- SVGMS' quality management system or a risk management framework are only partially in place. While ideally the organization should follow the ISO standards, the current state of the institution is still not fully ISO-compliant (with the potential exception of the meteorological services for aviation, as ISO-compliance there is mandatory). However, a proper management of risks is required during and after the SOFF investment phase to prevent potential setbacks and adapt as agile as possible to an emerging risk. In addition, understanding the role of the Implementing Entity, the risk management should follow the internal approaches existing at IE and that will facilitate the execution of the investment phase.
- The two main types of risks involved with the future sustainability of the observations network are 1. manpower shortages. 2. a limited SOFF-supported observational network.
- As for the manpower issues, as already mentioned above, the main obstacle lies with the fact, that the sole technician of the SVGMS is soon to retire and there is no IT dedicated personnel. As for the limited SOFF-supported observational network - One might say that a network of several stations is by far more sustainable (and effective) than a network of a single station. However, as the budget of SVGMS is quite small, any sustainable expansion of the observational network is under a big question mark. At the same time, no NMS can justify having a full person dedicated to maintenance of a single station. Considerable political lobbying, together with an engagement of the different stakeholders should push the government to enhance and strengthen the SVGMS in both aspects – a. justifying the need for additional stations. b. and with additional stations, justifying the need for additional technical support. In addition, searching for additional potential income sources for the SVGMS (cost-recovery mechanism for the aviation sector, additional services for the tourism sector, etc.) should also allow the SVGMS to allocate more resources for the benefit of its employees. In addition, there is no other way to achieve sustainability with the observation network in SVG, without cooperation in the fields of maintenance, operation and calibration on the national (with CSWA), subregional (neighbouring countries, s.a. Saint Lucia, Grenada, Barbados or Dominica) and regional levels (through, CMO Headquarters, CIMH, the CMO Technical Organ) and potentially, together with the private sector. Cooperation on the national level can ensure an immediate technical support, the one on the sub-regional level can assist with knowledge and experience transfer, spare parts sharing and even a joined “technicians’

pool”. The regional one can ensure support for the calibration part, whereas a potential support from the private sector can be looked at as “emergency support” as well highlevel maintenance.

- d. In addition, taking into consideration that SVG is mostly under a tropical marine climate, with the addition of potential volcanic ash spread in the air, should be taken into account in choosing the right station type. Thus, making use only of equipment proved to be durable, robust and well operating in these conditions (high humidity and temperatures, high salinity, insects and birds, Saharan dust, as well as potentially a volcanic ash, etc.). One should also keep in mind that in order to have enough spare parts even for a single station requires having an additional complete set of sensors. With the future expansion of the network, the ratio of spare parts/stations could decrease. In any case, in order to achieve a long-term sustainability, the equipment installed in SVG should follow subregional or regional guidelines – a harmonious sub-regional or even regional observational network will be much easier to manage and way more sustainable. This can be achieved only via joined tenders with neighbouring countries, via a regional tender or at least using identical technical specifications for SVG, as well as for the other countries in region.
- e. In order to make all the process clearer and more transparent and with a better mechanism dealing with risk management, the entire investment phase will be managed by a special steering committee, headed by the director of SVGMS and including also members from the WFP, GeoSphere Austria, CMO Headquarters, CMO as well as a representative from the ministry of transportation of SVG, assisted by a technical team core, including members from the SVGMS, GeoSphere Austria and CIMO. The steering committee will meet on a two-monthly base and/or by need. It will examine, approve and evaluate any activity under the investment phase plan, get periodical and special reports over the activities and in case of changes, adapt the activities to the potential situations.
- f. The table below describes the most critical risks that may be encountered to be added to those presented in the business model selection.

Table 5: summary of risks for a hybrid public-private business (State/National Meteorological and Hydrological Service owned and Private Partner operated model).

Risk	Risk level	Likelihood	Impact	Monitoring and evaluation	Risk Mitigation Measures
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Noncompliance with fiduciary and procurement standards in some SOFF activities	Low	Unlikely	Major	Any procurement process, technical specification or change of these will be monitored by the steering committee, with the assistance of the technical core team	Any non-compliance found will be discussed by the steering committee and measures will be taken with the advice of CMO, the SOFF secretariat and with coordination with the other Caribbean SOFF countries
SOFF-funded investments cause	Low	Unlikely	Minor	SVGMS staff will use part of their monthly resources to assess these impacts.	These reports will be brought into the immediate knowledge of the steering committee and in case of an
environmental or social impacts					immediate need, the committee will convene ad-hoc and take measures

NMHS staff depart after being trained	High	Likely	Major	At each regular meeting, the Steering Committee is informed by the SVGMS Manager of any changes to SVGMS' staff, particularly those relevant to the observational network.	Through a strong political leverage and advocacy, SOFF, together with CREWS, will help pushing the government of SVG to recognise the significant importance of the SVGMS' staff, with a strong emphasise to put a special focus on the recruitment and training of additional and future employees for SVGMS. In addition, through national and subregional cooperation, part of the technical support will be provided by other entities, either on a permanent base or adhoc, according to the needs.
Slow implementation and delays in procurement, installation and capacity building activities	Medium	Unlikely	Major	At the kick-off meeting of the investment phase, a clear time schedule for the project will be established, together with milestones. Monthly reports will be issued with the progress in the different activities	The reports would be examined by the steering committee during its fixed meetings. In case of an expected considerable delay, the steering committee will convene according to the need, with the mandate to take immediate measures.

After the conclusion of the Investment phase, GBON data are not collected or shared or are shared of insufficient quality	Low	Possible	Moderate	As part of the investment phase, a central data management will be installed at SVGMS, providing monthly reports of the availability and basic quality check of the data. The observers and forecasters of SVGMS will be responsible for adding their own comments on the monthly reports.	These reports, together with the stations themselves, will be monitored continuously by the staff of the SVGMS. The steering committee will examine monthly reports and deal with appearing major issues.
Destruction or theft of SOFF financed equipment and infrastructure	Low	Possible	Major	Continuous monitoring by the SVGMS' staff. The station will be visited often on a fixed base.	The abovementioned reports will allow knowing whether any equipment was damaged or stolen. However, the SOFF station is located not far from the headquarters and its fences will be strengthened with the possible addition of a surveillance camera.

Countries cannot make optimal use of data, including accessing or using improved forecasts products from the Global Producing Centers throughout the	Medium	Possible	Moderate	The forecasters will report on a monthly base to the director of the SVGMS, as for the use of this data. In addition, the peer advisor, with the support of CMO, will make external checks.	SVGMS, through SOFF, CREWS, EW4All and other initiatives, will seek to constantly improve the knowledge and know-how of its relevant employees, with the support of CMO Headquarters, CIMH, the peer advisor, as well as future additional partners, such as NCEP, The University of the West Indies and more.
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hydromet value chain					
Meteorological conditions that affect the deployment activities by limiting accessibility to sites and constructions as needed.	Low	Unlikely	Major	The manager of the SVGMS will get continuous information from the forecasters and observers.	And update the working plan accordingly. However, again, as the SOFF station is located in the very heart of the urban region, the location is less prone for problematic meteorological conditions.

Limited availability of potential staff members to be trained to ensure full operations of the network.	High	Likely	Major	Monthly reports of the manager of SVGMS to the steering committee.	A strong political leverage and advocacy with the aim of increasing substantially and addition of new vacancies. Strengthening and building upon existing and future cooperation on the national and subregional levels. Thus creating a pool of additional technicians from other entities in SVG itself and around it.
Contractual or financial issues with renewing the working agreement with the private vendor, providing high-	Medium	Possible	Moderate	The contracts and the financial status with the private vendor will be monitored on a constant base by the steering committee.	The initial contract for the investment phase will be constructed with a deep thought on future potential implications and change. The SVGMS will aspire towards using its own capacities in the most
level maintenance and calibration					optimal way, together with building upon national and sub-regional cooperation, and relying on the private vendor only in vital issues

Risks related to constant power supply and communication.	Medium	Possible	major	Monthly and real-time automatic reports of the data management system. The observers of SVGMS will check the WQDMS on a continuous base, creating direct connections to the Global Computation Centers.	Any alert of untransmitted data, either locally or internationally, will be examined immediately by the technical staff of the SVGMS. The stations will be equipped with the best possible solar power supply and batteries, to be replaced on a yearly base.
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Module 6. Transition to SOFF investment phase

The transition to the SOFF investment phase is to be based on the Readiness Phase deliverables and, in particular, this NCP that has been drafted in coordination with the beneficiary country and the implementing entity

Summary of GBON National Contribution Plan

Provide summary of GBON National Contribution Plan by filling this table

Components	Recommended activities
Module 2. GBON business model and institutional development	1. Initiate advocacy actions to promote the finalization of the corresponding legislative framework around the SVGMS mandate and activities.
	2. Strengthen the cooperation with the CMO and CIMH and explore other potential training providers, outside of the Caribbean Region.
	3. Explore opportunities inside of SVG for engaging the national governmental and private companies operating in the country.
	4. Foster approaches through bilateral and multilateral discussions of other Caribbean SOFF countries (Dominica, Saint. Lucia, etc.). Also through other regional associations.
Module 3. GBON infrastructure development	1. Perform a full surface station deployment. This includes all the procurement, preparation, and required ICT actions
	2. Follow a milestone approach to ensure the capacity is deployed in a robust and sustainable manner to ensure the longevity of the network and its operations.
	3. Initiate stakeholder engagement activities to promote engagement, seek for business opportunities and generate an advocacy platform for SVGMS activities and role as a national critical infrastructure.
	4. Engage the private sector with high-level maintenance and calibration services.

Module 4. GBON human capacity development	1. Through political lobbying, stakeholders' engagement and exploring additional income sources, to improve the remuneration for the current and future employees of the SVGMS.
	2. Establish a tailored technical training plan for the current and expected staff, as well as potential partnering organizations.
	3. Strengthen the cooperation and training plan with the CIMH and the University of the West Indies. Explore training opportunities outside of CARICOM.
	4. Initiate training on higher management aspects including an exchange visit at the Peer Advisor facilities and WMO in Geneva
	5. Through direct engagement, monitoring and awareness raising, to ensure a better gender-balanced approach.
Module 5. Risk Management	1. Through the IE, the CMO and supported by the Peer Advisory and Beneficiary Country, monitor the evolution of the investment phase through the identified risks and initiate mitigation actions as required. 2. To engage the private sector with providing the services, the SVGMS staff is currently unable to provide. 4. Procurement of a robust and durable station, adoptable to environmental conditions in SVG.
Module 6. Transition to SOFF investment phase	Transition performed in a coordinated manner with the beneficiary country, the IE and the peer advisor following the agreed National Contribution Plan. The funding request will be also based on the activities agreed in this National Contribution Plan.

Report completion signatures

Peer Advisor signature

Andreas Schöffhauser

Beneficiary Country signature



WMO Technical Authority signature

Alta Fiel