T2T

C18-0356-1270 Montserrat Data Gateway: End of Project Report

Pelembe T., I. Marengo, Ryan L., Brickle P., Gregory A., (2019) **Montserrat Data Portal. Project report. South Atlantic Environmental Research Institute. Pp 17**

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BACKGROUND AND CONTEXT

SAERI aspires to be a world renowned, environmental research institute. SAERI has the infrastructure and capacity to conduct environmental research throughout the South Atlantic and beyond. It has significant grant and project management and delivery experience which includes several previous EU and Darwin Initiative projects. SAERI is the only regionally-focussed, regionally-based environmental organisation in the South Atlantic Overseas Territories, and since its establishment in 2012, it has grown over the last 5 years to become a well-established, well-respected Institute. For more information, see our website: www.south-atlantic-research.org.

SAERI is an organisation that has **expertise working in small islands** both in the South Atlantic and the Caribbean. It understands island scales and resource limitations and devises practical solutions that are feasible to implement at an island scale.

SAERI has, over the last 5 years, focussed on the development and implementation of information management systems for small islands, it continues to refine and adapt these via a 'solutions-based' approach, expanding its work to include long term sustainable partnerships with other academic institutions in UK (including the University of Dundee) to provide additional support for the development of innovative tools, 'big data' archiving and analysis.

Over the last 2 years in collaboration with JNCC, SAERI has worked with the **Government of Montserrat** on a data management project. Our on island project manager – Lavern Ryan-Rogers coordinated the collection of metadata for over 100 data sets within MATHLE which were collated in a metadata catalogue http://landinfo.gov.ms/Metadata.aspx. that was launched in Montserrat in early 2018..

The Montserrat Data Gateway project is a continuation of that work and we will ensure that the data portal that is built will link to both the Government of Montserrat's existing data infrastructure and the metadata catalogue.

SAERI was contracted by the JNCC to undertake the Date Gateway Project in Montserrat towards the latter part of 2018 working with JNCC and the Government of Montserrat (GOM). This followed on from the earlier phase of the data management for Montserrat which focussed on developing an online metadata catalogue for GOM

This document is the end of project report that reports on the delivery of the project against the objectives.

PROJECT OBJECTIVES

The project objectives were to:

A. Design, develop, test and deploy a fully functional web based mapping system (Data Portal) for the display of spatial data to be hosted on the Government of Montserrat IT infrastructure.

B. Design, develop, test and deploy a fully functional website and interface in the existing GIS unit (WebGIS).

C. Train key Government of Montserrat personnel in the upload and use of the data portal and webGIS.

PROJECT STEERING GROUP

A Project Steering group was set up at the beginning of the contract – the following diagram outlines the relationships. This builds on the previous governance structure that was developed for Phase 1 of the Montserrat data management project.

BRIEF DESCRIPTION OF STRUCTURE

- **Project Steering Committee:** Responsible for oversight of the delivery and implementation of the project: GoM (Director Melissa O'Garro, GIS, IT) SAERI (Tara Pelembe, Dr Paul Brickle, Teresa Bowers); JNCC (Amanda Gregory) + On island co-ordinator (Lavern Rogers-Ryan); MATLHE (Mrs Eulyn Greaves) and DITES (Mr Denzil West and Mr Dave Williams) and Dr iLaria Marengo (SAERI technical team lead) – draft TORs for the PSG are provided in Annex 1.

- **On island Co-ordinator.** The on island coordinator will provide the liaison with the Government of Montserrat and will also input into the technical team

IMPLEMENTATION OF PROJECT OBJECTIVES

The following provides a summary of the implementation of the project objectives

OBJECTIVE A SET UP A STEERING GROUP COMPRISING, GOVERNMENT OF MONTSERRAT KEY PERSONNEL (EG. GIS, IT), JNCC, CONTRACTOR AND ON-ISLAND COORDINATOR.

The steering group had regular meetings at various locations since the project start up on the 14th of November. In addition several on-island meetings held by JNCC IT Service Manager allowed for the Montserrat IT team (DITES) to be fully engaged in discussions regarding the project objectives and necessary actions for their implementation. From January 2019 onwards weekly Skype meetings were arranged between the developers of the data services and the island co-ordinator to identify what the services would look like in order to meet the needs of the officers at GOM. The main objective of those meetings was to build tools that addressed the local requirements in terms of data discovery, accessibility and visualisation. For example, the design of the webGIS was based on the inputs (including ideas and data) provided by the on island coordinator.

A series of more technical meetings were held between JNCC, DITES and SAERI about the hardware, software and their configuration and networking required to support the installation of the server containing the data repository, webGIS and data portal for GOM.

The overarching steering group meetings complemented by targeted meetings focussed on specific areas that required trouble-shooting or problem solving seemed to work well for project implementation. However confirming meeting dates and participation was challenging at times. The on island coordinator and the interim visits to Montserrat by JNCC staff during the project were an important component of ensuring continued project engagement and progress on island.

One of the solutions required for the delivery of the overarching project was the server configuration. Detailed discussions were held between project partners to find a solution that allowed four data services running on Linux in a server run by Windows. Two Operating Systems (OS) are required because the data services provided by the project are all based on open source software and have Linux has native environment, while Windows is the OS which DITES uses and is familiar with. The various discussions resulted in JNCC developing a final design of the IT system (see figure 1) which was set up and tested in the UK (at the JNCC offices) first and then deployed in Montserrat at DITES in the last week of March

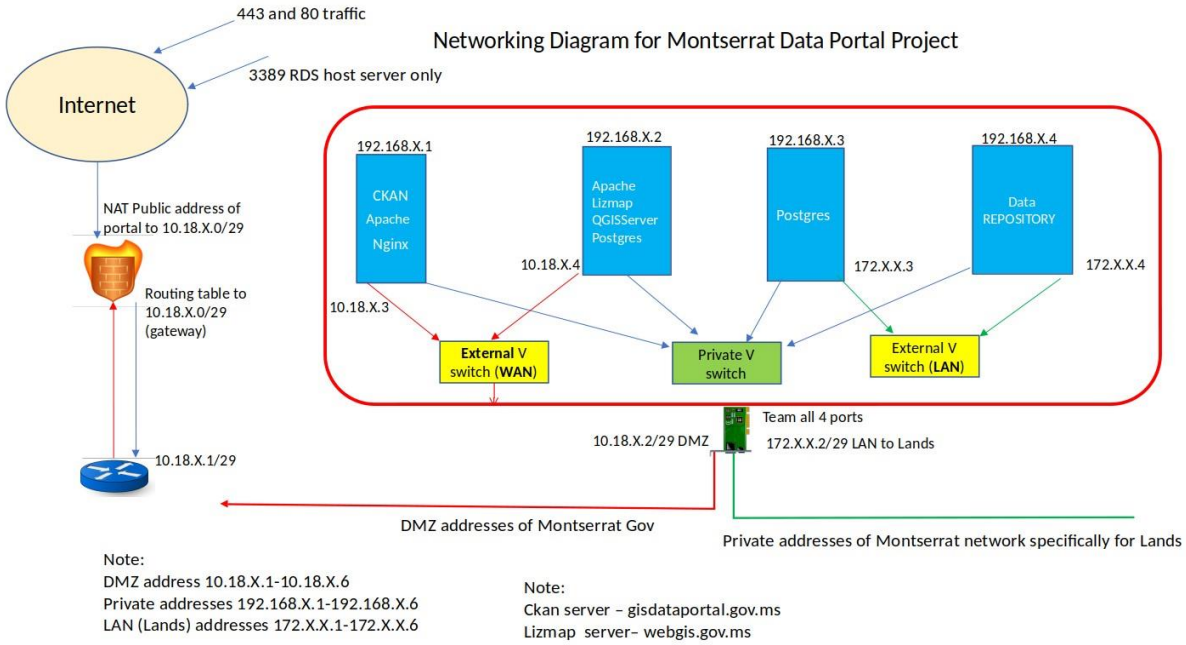

Figure 1: **Final networking diagram and IT system to host the data services for the Government of Montserrat**

In brief, the solution found provided DITES with a Windows server containing four virtual machines (VMs) operated by Linux. These VMs are all sitting within Windows virtualisation environment, HyperV, and are accessible by the internal network of GOM (green lines in Figure 1) and by the external network (red lines in figure 1). As the diagrams shows, only the webGIS and data portals are public facing.

The physical server was sent from JNCC to Dundee and then transported to Montserrat by the SAERI team in March. The server was initially located at the Physical Planning Unit, GIS Centre and then moved to its final destination in DITES.

OBJECTIVE B. DESIGN, DEVELOP AND TEST DATA PORTAL

The SAERI technical team worked together with the on island coordinator to scope and define the type of access to metadata/data required by the Montserrat users. CKAN, the open source software on which the data portal is based, was customised to host the metadata schema used by GOM. Logos for the metadata topic categories were found on the web (www.flaticon.com) and logos of GOM organisations were provided directly by the on island coordinator. Access to restricted datasets is through a data request form, however, the accompanying terms and conditions are still in a draft form and will be made publicly available after GOM Attorney General approval. The data portal is also set up to allow the creation of users and access permissions for the datasets. For example, the data manager can open data to users belonging to a specific government department/specified organisation while the same data are kept restricted to everyone else.

The virtual machine containing the pilot version of the data portal, postgres database and the components of the webGIS data portal (QGIS server, postgres and lizmap), were provided to JNCC IT Service Manager to be assembled into the physical server to test their compatibility with the Hyper-V virtualisation environment.

The spatial datasets that matched the metadata records provided by the on island coordinator, were identified from the bulk of the datasets found in the GIS Centre data folders and were loaded onto the data repository and organised into folders/subfolders which reflect the classification system provided by the topic categories of the metadata ISO19115.
The content of the metadata catalogue has been reviewed and adapted to be consistent in all its fields, for example it was ensured that the spatial coordinate system matched up with the local British West Indies Grid, that the access limitation text followed a set of pre-defined list and that the association to the topic categories was correct. Indication of the location of the datasets was provided in the field called “original_title”. This specification was important as the data portal obtains the information on where to find the dataset from this field. Once the metadata file was completed it was loaded into CKAN.
The preparation of the main page of the data portal was carried out while in parallel the various python scripts were run and tested. Having the team on island for this stage of the project enabled multiple strands of work to be carried out simultaneously while ensuring their compatibility with each other and with on-island systems and data requirements. It proved a very effective approach that we recommend be considered for future implementation of projects of this nature.

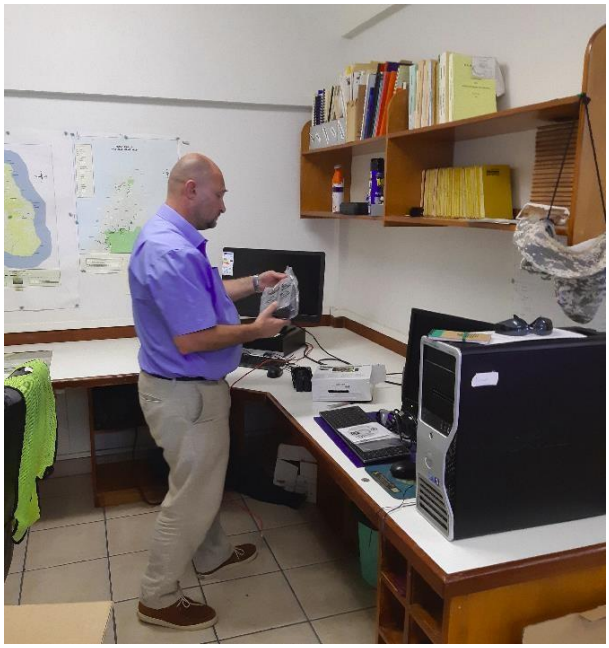

Figure 2: SAERI team (Dr iLaria Marengo, Andrew Brooks (UoD) and Jorge Batista Echevarria) at work in Montserrat developing and testing the data portal (top) and Carl Cilenti (JNCC) taking care of the hosting server at DITES premises (bottom)

The deployment of the data portal and its publication online involved the direct participation of DITES. I IT government officers played a major role in making the data portal live. They created the network and connect the physical server to the internet/intranet, set up a mailing system for the data request forms and ensured that the access to the two public facing services was in place.
On Thursday the 28th of March the data portal was officially launched and it is available at this page https://gisdataportal.gov.ms

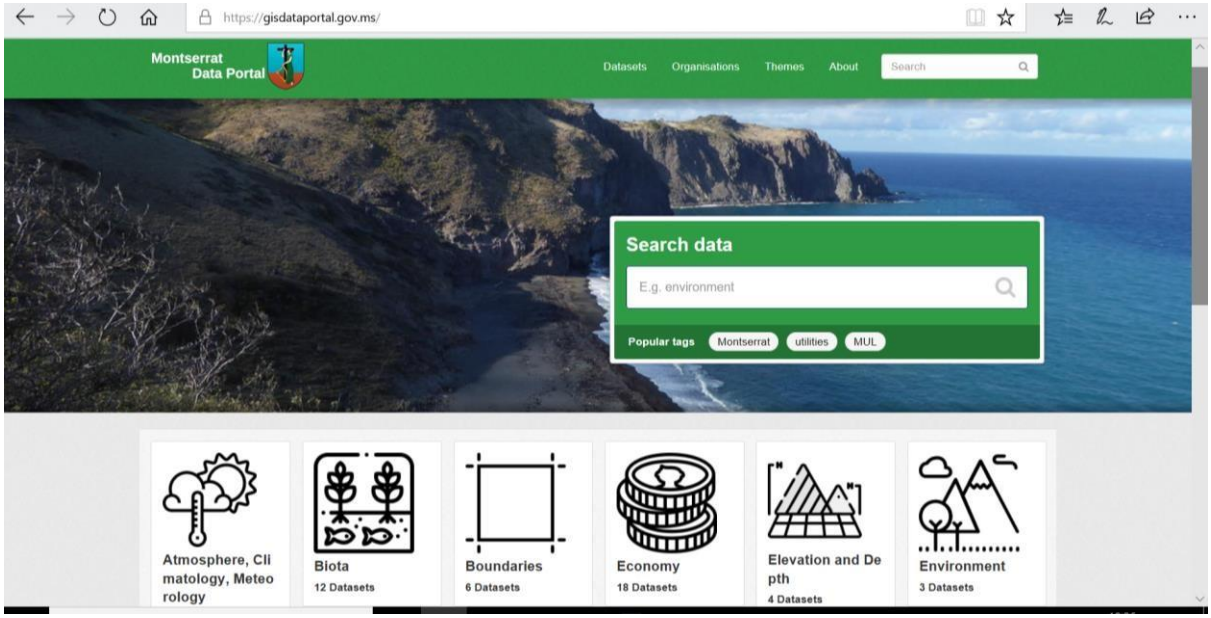

Figure3 : Screenshot of the frontend of the Montserrat Data Portal

The Montserrat data portal currently holds 107 GOM datasets from 8 Ministry of Agriculture, Trade, Housing, Lands and Environment (MATHLE) departments with the GIS department providing the largest number (71).

OBJECTIVE C. DESIGN AND BUILD AND TEST WEBSITE AND INTERFACE (WEBGIS):

The first spatial datasets were sent by the island coordinator to the SAERI technical team in January and these data have been put into a QGIS project and displayed using symbology agreed with the island coordinator. Skype meetings between SAERI and GOMdefineed the look of the future WebGIS project Additional face-face consultations were enabled when both the on-island coordinator (funded by JNCC) and the SAERI technical lead met at a QGIS conference in Spain. These consultations consolidated the content and the appearance of the WebGIS. And further decisions on styles, layer order and content of the abstract of the webGIS were taken. For completeness, the most relevant fields from the metadata record of each dataset were included in the webGIS project.

The webGIS for GOM focusses on providing the main baseline data. As agreed with the on island coordinators, other webGIS projects will follow and will be more "theme-specific", for instance they will provide data and information on the marine and terrestrial environment, on disaster management and so on.

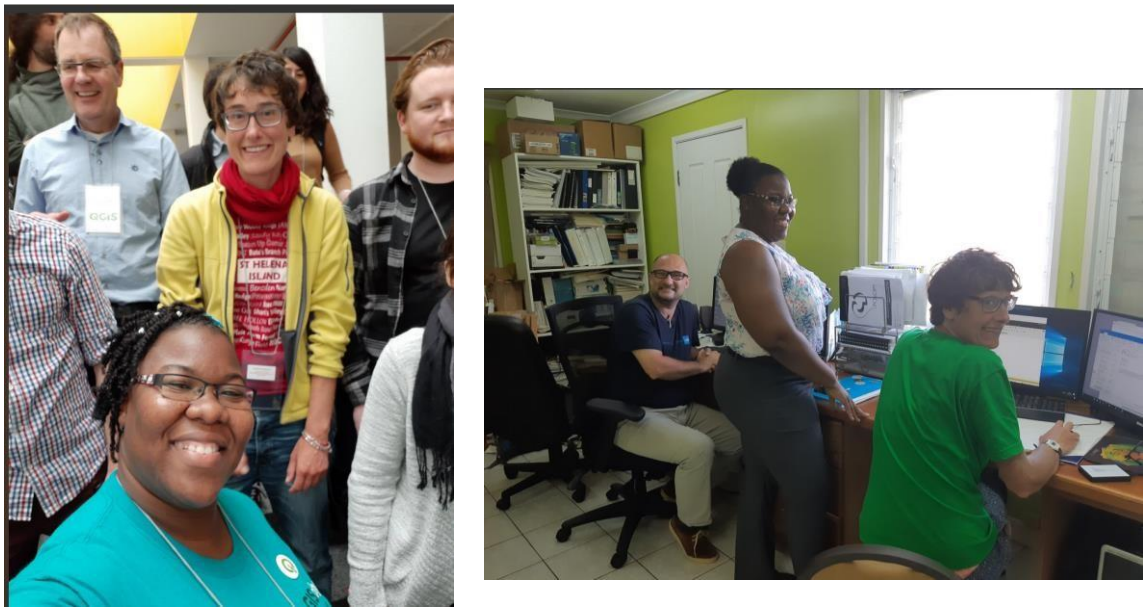

Figure 3: Finalising the webGIS at A Coruna QGIS users and developers international conference (left) and in Montserrat at GIS Centre office with Carl Cilenti (JNCC) providing remote desktop access to the virtual machine (right).

The webGIS was deployed in Montserrat and it is operated by one of the VMs sitting in the virtualisation environment on the physical server.

The WebGIS was officially launched on the 28th of March and it is available at the https://webgis.gov.ms webpage.

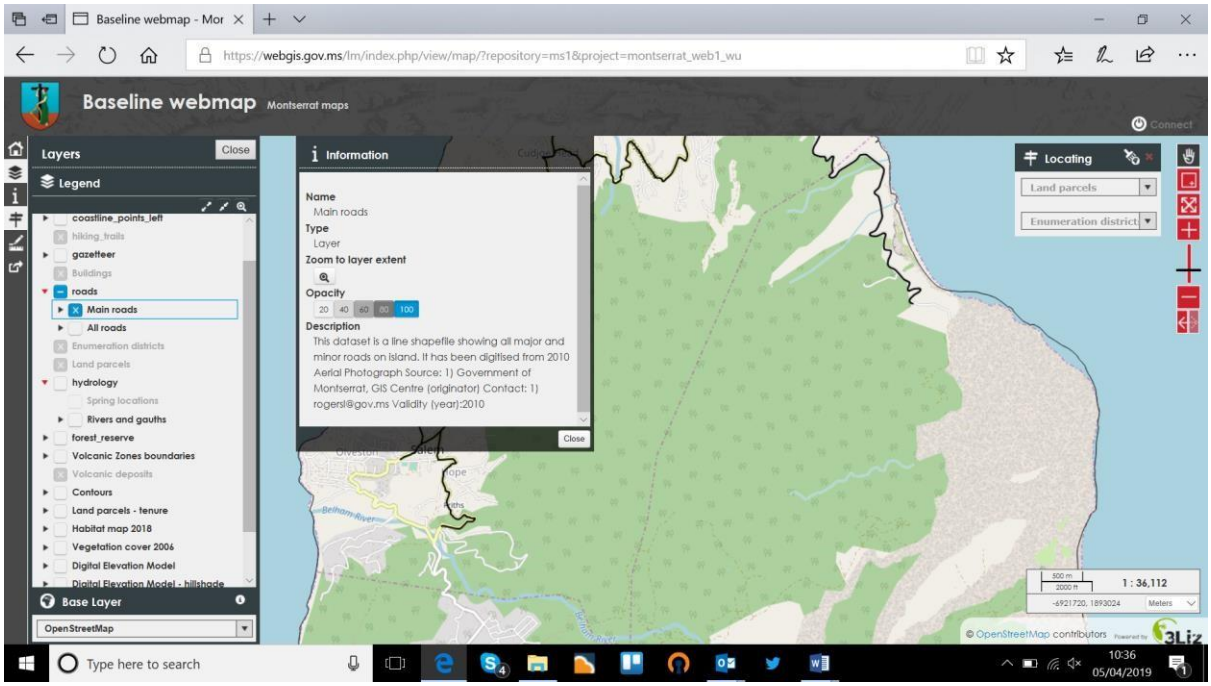

Figure 4: Screenshot of the Montserrat WebGIS

OBJECTIVE D. TRAIN KEY GOVERNMENT OF MONTSERRAT PERSONNEL IN THE UPLOAD AND USE OF THE DATA PORTAL AND WEBGIS

Training the GOM officers in the use and understanding of both the data portal and the webGIS services is paramount as both tools will be managed, and used, locally. The on-island co-ordinator undertook two days of 'on the job' training in WebGIS and the data portal (27th and 28 March). The principal is that on-the-job training in this context is more valuable than a generic training course, as the former is geared towards developing the specific skills required to manage the systems that have been set up in Montserrat.

WebGIS training was also provided for 2 other GOM staff – Nicole Durberry and Rondell Meade who will both be key WebGIS users.

In addition, the on-island coordinator will run follow-up 'mini' training sessions with potential users to demonstrate the WebGIS so that there is wider awareness about its availability and wider confidence in its use to help to encourage wider and more regular interactions with spatial data across MATLHE and GOM in general.

Additional follow up remote training and 'call down' assistance will be provided to GOM officers as required over the next two months to enable a smooth transition to long-term sustainability on island.

KEY SUCCESSES

- The development of an Online Data Portal was one of the main objectives, and is also seen as one of the key successes of this project. Building on the creation of a metadata catalogue in the first phase of the project, a comprehensive record of all the datasets available for the Ministry are now linked with the actual data and all open datasets can be previewed and downloaded from this facility.
- The development of an open WebGIS, another project objective is also a success. It will aid the GIS Department in providing visualization of datasets to other users as well as enhancing

the role and function of other Departments in their use of Spatial data for decision making within the Government of Montserrat.

- Capacity and technical expertise has been built locally, especially in the area of open source software. The GOM GIS Team have been actively learning and will be directly responsible for future updates to the system. Knowledge can be easily transferred to other stakeholders on island.
- Networking and working relationships have been enhanced during the implementation of this project. The GIS and IT Teams on Montserrat have built long-term partnerships with all persons working on this project. This will be a good platform for any future engagements between the UK, the Falkland Islands and Montserrat.

CHALLENGES

- Ensuring regular communication was one of the challenges of this project ranging from the use of Skype for initial meetings to ensuring that the connection was good enough to share videos and screens in order to discuss set-up of data portal and web GIS, to confirming meetings times and attendance. However this was mitigated through face-face meetings where possible and through have a 2 week window at the end of the project where the team was on island to be able to deploy the portal and webGIS
- With tight end-of (UK) financial year deadlines, there were a number of related activities on Montserrat built into March 2019 (including the QGIS training) which meant that the GOM team could not be fully available for the two week period, however this was mitigated through daily debriefs with the on-island coordinator across both weeks.
- Inevitable in-situ set-up and trouble-shooting delays reduced the time available for post deployment training of key staff. However as mentioned above, an additional 2 months of 'call down' support and training will be provided remotely to continue on the job training for GOM staff as required.

IMPACT

- Having an online Data Portal allows for users to be easily made aware of all the datasets which are publicly available and any restrictions in the use of any other datasets. The data portal not only ensures longevity of the data but also enables partnerships and working collaborations as it exposes the metadata (and the open data) to the public and gives them that visibility that can attract interest from researchers, NGOs and other public/private sectors.
- There has been and will continue to be a reduction in the time taken to respond to queries and requests about available data, thereby enhancing GOM efficiency.
- Having an open WebGIS enables easier access to, and therefore encourages for the use of evidence in decision making across the GOM as a whole, as WebGIS is a tool that doesn't require any GIS knowledge making it accessible to all.
- Thanks to its simplicity, webGIS conveys data into a user-friendly visualisation tool from which not only it is possible to become aware of the existent data but it is also easy to identify data gaps and formalise project to address them.
- The data portal and the WebGIS are based on open source, and therefore there are no long-term licensing charges or fees.
- The portal that has been developed for Montserrat can easily be rolled out to other Overseas Territories. St. Helena have expressed an interest in having something similar, and it is SAERIs intention to 'roll out' the model to the Falklands as well.

RECOMMENDATIONS

The project has been innovative in its approach to data management, bringing with it opportunities and challenges, but with significant impact as outlined above. The following recommendations include those specific to this project, and others that link to the wider application of the work beyond Montserrat

- **Phase III:** It is recommended that there is a Phase III of the project which will include not only further support and training to the use of Open Source software within the GOM but the addition of other types of data services such as those for collecting data on the field from remote devices and the management of big data, like Earth Observation data. For example, government officers will benefit from the use of tools such as Qfield and Open Data Kit for collecting data off-line and while on field survey. Once again, as based on open source, the tools will not have additional licence costs and will allow for customisations and multiple users. Earth Observation data and techniques are going to be used more frequently and will need of a different data management system due to the volume, frequency, and variety of sources (aerial, drone, satellite, sonars etc). This approach will lead to the further development of a comprehensive set of data management tools for GOM.
- **Further promotion and use of open source data services and tools:** using open source results not only in a change to the working tools but it implies also the adoption of new concepts and a different approach to data. It is recommended that emphasis is put into the benefits of open source, which are not isolated to the economics (open source comes with no licence fees) but are much wider and include openness to data and information, promotion of data sharing and incentive to learn "how to build its own tools" and become self-sufficient and knowledgeable. This combination enables wider application and use of the tools. We recommend the continued encouragement of the use of open source data services across the Overseas Territories
- **Training Courses:** more training courses in the use of Linux, PostgreSQL and QGIS could to be carried out to support the long term use of the open source based tools delivered by this phase of the T2T project. Courses can be delivered both remotely, and on- island. Developing on-island skill in this area enables regionally-based trainers to be developed, enabled and encouraged to play cross-territory training roles in the region (as demonstrated in the approach to the QGIS training delivered by SAERI for JNCC in Montserrat in March). MAERI could be the delivery body for the training courses as it will allow officers from other Caribbean Islands to participate and become aware of the tools developed in Montserrat (and make Montserrat a model of open source in the Caribbean) and of what Open Source can do to their individual islands.
- **Extend the data documentation to all other ministries:** in order to ensure that the data management process initiated with the T2T partnership has a positive impact on the management of all the data collected in Montserrat, it is important that the process of harvesting metadata is extended to other ministries.
- **Data management policy:** The draft Montserrat data management policy still needs to be taken through the GoM Policy process in the future until it reaches the stage that it is formally adopted.

ACKNOWLEDGEMENTS

This project was delivered through a multi-party partnership and we would like to thank everyone who has been a part of this. The JNCC for funding, relationship building, oversight and technical support. The Government of Montserrat for its continued support and engagement, in particular MATHLE and DICE. The University of Dundee for its technical input

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ANNEX 1: UPDATE OF PROJECT DELIVERY AGAINST TIMELINE

	2018				2019			
	NOV	**DEC**	**JAN**	**Update end of Jan**	**FEB**	**MAR**	**Update 22/03/2019**	**End of project update**
A Set up a Steering Group comprising, Government of Montserrat key personnel (eg GIS, IT), JNCC, contractor and onisland coordinator (individual TBC).								
i) First Steering group meeting to be held within week of contract confirmation				completed			n/a	
ii) Meetings to be held (via remote systems) as agreed by the Steering Group				ongoing			Ongoing	completed
iii) coordination with other projects that are being undertaken in Montserrat				ongoing			ongoing	completed
B. Design, Develop and Test data portal				**Ongoing**				
i) Design an appropriate data portal in collaboration with appropriate GoM Departments and agencies;								completed
ii) Data to be displayed for decision makers and planners allow for information to be integrated from a range of subjects; iii) Build the data portal linked to existing metadata catalogue and data infrastructure;								completed completed completed
iii) Test the data portal upload, display and functionality with GoM.				Initial prototype completed			See below	
iv) Deliver data portal							Final adjustments being made in Montserrat	completed
C. Design and build and test website and interface (WebGIS):								
i) design an appropriate web based front-end interface building upon existing GIS systems;								completed
ii) enable access to all data across departments;								completed

iii) data to be displayed and downloaded with a link to 'who to contact' easy access for decision makers and planners to integrate relevant data into decision making; iv) make data accessible to the public. It is understood that some datasets should not be publicly accessed therefore the data portal will have agreed 'levels of accessibility'.				First draft of WebGIS discussed with GOM				completed completed

v) The project will deliver a database design document outlining and illustrating the structure of the database and the defined relationships within.							WebGIS has been developed and will go live next week.	completed
D. Train key Government of Montserrat personnel in the upload and use of the data portal and WebGIS								
i) Deliver training to key GoM personnel on how to operate and interact with the Data portal and WebGIS **in Montserrat**				Not yet required.			Training to take place next week.	Completed although remote training will be delivered to the on island coordinator in the next three months