Report:

Climate Technology Centre & Network (CTCN): National Water and Sewerage Authority, Grenada (NAWASA) – Improvement of water supply management through a GIS based monitoring and control system for water loss reduction in Grenada

Project Output 2: Review of GIS systems and recommendations for future development

Deliverable 2A: Report presenting the evaluation of type and quality of all available spatial data

1. Introduction

The following report updated and issued on the 5th July 2019 was developed by the Wood/GISCAD team as a core deliverable of UNIDO/CTCN project entitled "Improvement of water supply management through a GIS based monitoring and control system for water loss reduction in Grenada". This project was delivered in collaboration with technical staff within the National Water and Sewerage Authority of Grenada (NAWASA).

The scope of the technical note relates to the following objectives of Output 2 of the project:

- Evaluation of the type and quality of all available spatial data.

2. Review of available spatial data

A detailed review of the current GIS systems and datasets used by NAWASA and partner organisations was undertaken at the start of the study. This review was largely informed by the series of face-to-face meetings held at the NAWASA head office in St George's, Grenada and government agencies in early May 2019.

2.1 Current NAWASA data systems

The meetings held in early May 2019 highlighted the following characteristics of the spatial data systems currently used by NAWASA.

- Data management - NAWASA's current GIS data is currently managed on individual standalone PCs/laptops as a series of individual ESRI shapefile (vector layers) or grid-based images files

(.jpg or .tif). The meetings also identified that there is no current centralised database used for management for this data.

- Data Register - There is no current data register which records standard metadata details for the core data held by NAWASA. A structure for this register and initial population will also be undertaken under the scope of Output 2;
- NAWASA GIS pipeline data – it is estimated that about 60% of pipeline location are recorded in a digital GIS form, with data recently created for the Greater St George and south west part of the island being the most accurate and up-to-date. Older pipeline data/information was identified during the review but there are no metadata records which define the source, accuracy and quality of the data included. A key element of work undertaken during Output 2 will be to enhance the availability of the networked pipeline data for the purposes of the DMA assessment in selected areas.
- NAWASA GIS District Metered Area (DMA) meters – This information is currently held in an ESRI shapefile defining 34 DMA locations across the island. Most of these locations are defined a unique DMA reference ID but several points are currently unassigned and to be aligned with the DMA boundary dataset – see below.
- NAWASA GIS DMA boundaries - This information is currently held in an ESRI shapefile defining 34 DMA boundaries across the island. Most of these locations are defined a unique DMA reference ID but several boundaries are currently unassigned.
- NAWASA GIS Customer meter locations – NAWASA estimate that around 70% of customer meters are mapped in GIS format but more needs to be done to improve quality of the data available. This information is currently held in a series of 199 individual shapefiles, with each file defining a single route area used to undertake manual monthly meter readings.
- NAWASA GIS other data – NAWASA also holds additional GIS data covering area served, meter route areas; sewer system, tanks and boreholes and infrastructure details – including water valves etc. No metadata records exist for these datasets.
- Customer / meter / finance system – NAWASA currently uses a Canadian Software product called Northstar for the management of its customer accounts and meter reading data. This information is stored using a structured SQL Server back-end database. This includes two key SQL tables of interest: "pu_water_meter" (key metering details) and "pu_water_hist" (historical metering values but around 4 million records).
- Other GIS data sources – Meetings held with representatives of the Ministry of Agriculture, Forestry and Fisheries also highlighted the potential access to additional GIS data sources which could be used to support the future operational activities. These datasets included 2018 digital aerial imagery and Lidar (detailed elevation) survey data; and older land use (2009), soils and geology layers.

2.2 Ministry of Agriculture and Land data holdings

A meeting was held with representatives of the Ministry of Agriculture and Land on the 6th May 2019. This meeting highlighted the availability of the following datasets relevant to NAWASA's future work:

- Airborne elevation and imagery surveys – a series of updated digital dataset was recently created for the ministry under a World Bank funded project. This work was delivered by Fugro.

  Available datasets include: detailed Lidar DSM and DTM 50cm elevation data; 20cm resolution digital three band, RGB (true-colour) and Infra-Red (IR) and derived contours at 0.5m intervals.

These datasets are held as a series of 1km tiled datasets in both WGS84 and National Grid project formats.

- Land use map – the latest digital land use map (ESRI shapefile format) held by the Ministry dates from 2009. The ministry expects to use the new lidar survey data to create a new map but work on this has yet to commence.
- Soils map – the Ministry also holds a digital soils map, but the source data is understood to many decades old. The Ministry has plans to update the dataset and has developed a specification. However, no work on developing a new dataset has been completed to-date.
- Geology – a comprehensive geology map created was also created but all information including detailed notes/information were lost during the 1983 US invasion of the island. The dataset has been provided to the Wood team by the Ministry in ESRI shapefile format.
- Historical aerial photography – the Ministry holds hardcopy aerial photography from a series of API flights flown from 1940s-1990s. This is mostly black and white imagery with the only colour photos from 1990s. There is an ongoing project to scan and rectify images for government ministries.
- Hydrology – the Ministry undertakes manual recording of river flow data for selected locations. and has plans to install more pressure sensors in the future.
- Satellite imagery – the Ministry holds some detailed satellite imagery acquired after Hurricane Ivan (2004). This includes Quickbird and Ikonos imagery covering the whole island.
- Watershed – the Ministry also holds basic shapefile of watersheds created from 50m DTM. The dataset has been provided to the Wood team in ESRI shapefile format. The Ministry is expecting to create a new watersheds dataset from the new lidar data, but this works has yet to commence.
- Copies of the available geology, land-use, soils and watershed datasets and sample extracts of the latest Fugro terrain and imagery survey were provided to the Wood team during May 2019. These datasets were provided under a licence agreement signed by NAWASA and Wood plc.

2.3 Ministry of Works, Physical Development and Public Utilities data holdings

A meeting was also held with representatives of the Ministry of Works, Physical Development and Public Utilities on the 6th May 2019. This meeting highlighted that the ministry uses digital mapping datasets produced and managed by other government departments. This include land use and terrain data held and/or managed by the Ministry of Agriculture and Land.

The meeting also confirmed that planning applications are currently submitted and managed using paper/filing systems. However, the department are keen to move to digital recording of planned boundaries, start date, completion data and selected features of the site (size, floors etc.). NAWASA confirmed that access to this data in a digital format would be extremely helpful to future planning work of NAWASA and agreement to have further discussion on this going forward.

Discussion also covered the National Physical Development Plan (last version 2003) which is designed to give broad guidance on development areas. However detailed decisions are largely taken through more community-based area plans and development orders.

2.4 Data register

Table 1 outlined the key datasets which were obtained during the original in-country meeting and through subsequent contact during May and June 2019. These datasets were integrated into a PostgreSQL/PostGIS database during June 2019 and early July 2019. These details were also included in a searchable catalogue which will be accessible to QGIS users within NAWASA. A final data list will be produced as an Excel document at a later stage of the study, as required by the contract. This will include additional datasets (including NAWASA customer meter records) which may be sourced during the remainder of the study.

Table 1 Project – Preliminary data register

Dataset	Date Acquired	Custodian	Contact
NAWASA - resource locations - tanks and boreholes	02/04/2019	NAWASA	dbruno@nawasa.gd
NAWASA customer data - samples for 5 route areas	08/05/2019	NAWASA	dbruno@nawasa.gd
NAWASA DMA boundaries	27/06/2019	NAWASA	dbruno@nawasa.gd
NAWASA DMA meter locations	27/06/2019	NAWASA	dbruno@nawasa.gd
NAWASA hydrants	02/04/2019	NAWASA	dbruno@nawasa.gd
NAWASA meters	17/05/2019	NAWASA	dbruno@nawasa.gd
NAWASA pipeline network - April 2019 data	14/06/2019	NAWASA	dbruno@nawasa.gd
NAWASA pipeline network - Extra May 2019 data	14/06/2019	NAWASA	dbruno@nawasa.gd
NAWASA pressure reducing values	02/04/2019	NAWASA	dbruno@nawasa.gd
NAWASA sewer boundary area - April 2019	02/04/2019	NAWASA	dbruno@nawasa.gd
NAWASA sewer stations	02/04/2019	NAWASA	dbruno@nawasa.gd
Fugro DSM digital surface - 2018 sample data	04/06/2019	Ministry of Agriculture and Land	landuse@moa.gov.gd
Fugro DSM digital terrain - 2018 sample data	04/06/2019	Ministry of Agriculture and Land	landuse@moa.gov.gd
Fugro Infra-red imagery - 2018 sample data	04/06/2019	Ministry of Agriculture and Land	landuse@moa.gov.gd
Fugro Infra-red imagery - 2018 sample data	04/06/2019	Ministry of Agriculture and Land	landuse@moa.gov.gd
Grenada geology map	04/06/2019	Ministry of Agriculture and Land	landuse@moa.gov.gd
Grenada land use 2009	04/06/2019	Ministry of Agriculture and Land	landuse@moa.gov.gd
Grenada soils map	04/06/2019	Ministry of Agriculture and Land	landuse@moa.gov.gd
Grenada watersheds map	04/06/2019	Ministry of Agriculture and Land	landuse@moa.gov.gd

Issued by

Neil Thurston

.....

Approved by

Neil Thurston

.....

Copyright and non-disclosure notice

Third party disclaimer

Management systems

This document has been produced by Wood Environment & Infrastructure Solutions UK Limited in full compliance with our management systems, which have been certified to ISO 9001, ISO 14001 and OHSAS 18001 by LRQA.