A Revisit of Water Distribution Challenges in FPI using Advanced Geospatial and Data-Driven Approaches

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1.0 Introduction

Where an infrastructure is experiencing aging and expanding to meet the growing demands of a growing populace, overseeing its operation and maintenance becomes a herculean task especially where the network of the utilities (pipes, boreholes, pumps, wells, reservoirs, and treatment plants) is complex.The dearth of coordinated data and information about the existing utilities/facilities to manage and efficiently distribute water on the school campus necessitates this academic intervention.The study aims at using Geospatial technology such as drone, differential GPS, Geographic information Systems (GIS) to collect spatial data about the environment and the locations of the water utilities on the campus with the view to mapping the location of water facilities and supply decision making information towards addressing the epileptic water supply issues on campus.

Materials and methods

Drone (Phantom DJ) was flown over the campus to collect spatial data of the existing campus's utilities such as pipeline networks, pump stations, water treatment facilities, valves and hydrants and storage facilities etc. Other information were obtained from the works and service department of the institution in the form sketches and social surveys. Field work entailed physical identification and location of existing utilities using the Garmin hand held GPS. Buffer analysis, Neighborhood analysis and spatial query were performed for retrieval and generation of meaningful information from the data base using GIS structured query language (SQL) syntax. This enabled such question as 'what is type of water tank and its capacity is at a particular location?', 'where are leakages likely to be found in the pipeline network?', 'how many facilities is a particular water utility servicing o can serve at a period?' etc to be addressed by the data base created. The results of the queries showed the units/departments with the largest water requirements on campus.

Results and Discussion

The study showed that there are nine bore holes, two overhead tanks and twenty three deep wells spread across the institution (East, West and Gbokoto campuses). The two overhead tanks are situated in both East and west campuses. Seventeen of the wells are distributed around the east campus of the school, while five are located in the west campus and only one in Gbokoto campus. The study mapped water distribution system and analyzed the infrastructurefor optimal performance and maintenance.

Conclusion

The study has influenced the digitalization of analogue detail of the facilities and demonstrated GIS ability in analysing and controling spatial data for decision making. The drone mapping of the facilities has also rendered more accuracy to existing map such measurements can be confirmed in-house without site visitation. Furthermore, the data collected in this study are relevant for future water distribution diagnoses, decision making and management of other water related facilities on campus. There's the urgent need to address the incessant distribution of water in the campus.AI, GIS, historical water usage data, population growth, weather patterns, and other factors can be used to predict future water demand in different buildings on campuses.

Keyword: Data, Drone, Geospatial, Planning, Utilities, Water Distribution