Sector	Water Resources
Subsector/ Category	Planning
Technology	GIS Mapping and modelling for water catchment protection
Scale of Application	National
Availability	This technology can be considered new for Guyana. To date, there is no known capacity for the modelling of water catchment in Guyana. However, there is national capacity in digitizing/ GIS mapping applied to water resources.

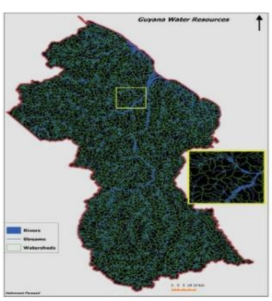
Technology Characteristics

Introduction

Guyana is regarded as the ‘land of many waters’. Numerous rivers flow into the Atlantic Ocean, generally in a northward direction. There are fourteen major river basins and eight man-made conservancies. The river basins, for example, Waini, Pomeroon, Potaro, Mazaruni, Cuyuni, Supenaam, Canje (tributary of Berbice), Boerasirie, Mahaica, Mahaicony, Abary, Demerara, Berbice and the Essequibo combine to provide large quantities of surface water. The Essequibo is the largest and has its source south to the border with Brazil. Many creeks also flow into the large, as well as smaller rivers. The Corentyne river is the border river with Suriname, from its source till the sea. It is considered that the entire flow of this river is generated both in Guyana (50 percent) and in Suriname (50 percent). The conservancies are located in the “backland” or upper stream catchment areas and comprise water-retaining embankments and structures (FAO, 2015).

Water catchment typically describes the area around a water source, where rainfall naturally collects and feeds into the source. Catchment areas can vary in size, from a few square meters, as in the case of small streams to thousands of square kilometers for rivers & lakes. These catchments are “functional geographical areas” that integrate a variety of environmental processes, such as climate variability and climate change, and human impacts on landscapes.

The benefit of water catchment mapping and modelling is to achieve an integrated approach to natural resource management through a comprehensive view of water and land uses within the catchment areas. Remote sensing technology can provide pertinent information on surface and groundwater flows, run off rates, delivery of flows and constituents into river systems. When used in hydrological models, remote sensed data can be converted to the type of information useful to water resource systems operators. With such information on water catchment, areas can be demarcated, micro-catchment areas identified, buffer zones established and water safety plans developed (FAO,2011).



Water Resources Map of Guyana. Watersheds generated from SRTM 30m with a minimum areas size of 40,000m2. Using Qgis and GRASS GIS.
Source: Geospatial Ideas, 2011

Institutional /Organizational	The Ministry of Natural Resources and the Environment Protection Agency are the institutions responsible for the protection of natural resources in Guyana. Other key stakeholder institutions are, the Guyana Lands and Surveys Commission, the Hydro-meteorological Department of the Ministry of Agriculture and the Guyana Water Inc.
Adequacy for Current Climate	Not climate dependent. Will build Guyana's capacity in water resource planning and management.
Size of Potential Beneficiary	The general public, including, water resource managers, natural resource managers, land use planners, researchers, households, farmers, fisheries, miners and manufacturers. Local water managers will be provided with updated information/ expertise/tools for a more scientific basis in water management.
Disadvantages	• Require specialized skills in GIS and modelling; • Changing pace/ cost of this technology and the limitations of off-the-shelf models; • Operating cost may be high initially due to the need for data collection and specialized training; and • Diffusion at community levels may be slower due to the lack of financial and human resources.
Endorsement by experts	This technology is readily available in North America. The US Geological Survey (USGS)) has been providing leading services in the development of hydrologic simulation models since the 1960's. The models are widely used to predict responses of hydrologic systems to changing stresses, such as increases in precipitation or ground-water pumping rates, as well as to predict the fate and movement of solutes and contaminants in water (TNA FS).
Capital Costs	
Cost to implement/Operate/Maintain	*Implementation:* • Will include costs for engineering hardware and software components, such as, computers (desktop & field notebooks), servers, data collection, GIS tools, numerical models and training/capacity building. Price for models vary with the level of complexity required and can range from USD1000 -10,000. Where there are existing resources available locally, such as, GIS expertise, this can be utilized. Software can be open-sourced or procure license; and • A conservative estimate for the implementation of this technology is USD 55,000. *Operation/Maintenance*: • This cost is likely to be moderate and will primarily include fees for software subscription (if purchased), equipment updating and ongoing capacity building.
Development Benefits – direct/indirect benefits	
Adaptation benefits	• Improve the overall capacity in water management for all categories of water users; and • Enhance Guyana's capacity to prepare/adapt to the impacts due to a changing climate.
Economic benefits	• Employment opportunities for technical core staff, as well as, persons in local communities and water user groups; and • Can stimulate investments due to improved water management, such as in agriculture and industry.

Social benefits	• Increased awareness and knowledge of ground water resources; • Community empowerment through participation in local water management programs; • Contribute to livelihood security due to reduced wastage; and • Improved health due to increased water availability and improved water safety.
Environmental benefits	• Promote water security in terms of clean and safe water sources; • Contribute to the health of water ways and ecosystems due to improved protection; • Strengthen capacity to manage forest/bush fires, control erosion and monitor biodiversity changes; and • Provide scientific data for decision making.
Local Context	
Status of Technology	This technology does not currently exist.
Market potential	Has potential for the development of a national network of water catchment monitoring. Can also be integrated with Regional framework for water catchment protection with basin states as in the Amazon basin.
Acceptability to stakeholders	Has high acceptability among water resource managers, researchers and users.
Opportunities and Barriers	*Opportunities:* • Can contribute to the development of local water management plans; and • Will promote more effective water management when applied efficiently. *Barriers:* • May be perceived as too complex, resulting in loss of interest; • Lack of/Low level of commitment to undertake responsibility; and • Difficulty in retaining trained staff
Time Frame	Medium to long term.

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