Technology Fact Sheet for Adaptation

Hydrological models[i]

Technology:	Hydrological Models
Technology characteristics	
Introduction	Hydrologic models are simplified, conceptual representations of a part of the hydrologic cycle. They are primarily used for hydrologic prediction and for understanding hydrologic processes. Two major types of hydrologic models can be distinguished: • Stochastic Models. These models are black box systems, based on data and using mathematical and statistical concepts to link a certain input (for instance rainfall) to the model output (for instance runoff). Commonly used techniques are regression, transfer functions, neural networks and system identification. These models are known as stochastic hydrology models. • Process-Based Models. These models try to represent the physical processes observed in the real world. Typically, such models contain representations (infiltration and percolation) of surface runoff, subsurface flow, evapotranspiration, and channel flow, but they can be far more complicated. These models are known as deterministic hydrology models. Deterministic hydrology models can be subdivided into single-event models and continuous simulation models. Recent research in hydrologic modelling tries to have a more global approach to the understanding of the behaviour of hydrologic systems to make better predictions and to face the major challenges in water resources management
Institutional and organizational requirements	Hydrological models for forecasting and for improved water resource management to be tailor made for local water organizations such as CWA and WRU. Tailor made models are required by WRU so as to fit the local context and adapt to their requirements.
Operation and maintenance	Operation and maintenance consist essentially of regular training, and expert services that will be required for particular situation analysis. Technical support in the field of IT and hydrology will also be needed.
Endorsement by experts	The USGS (USA) has been a leader in the development of hydrologic and geochemical simulation models since the 1960's. USGS 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.
Adequacy for current climate	Not climate dependent, but will be a very useful tool that will improve water resource management in the face of climate change.
Size of beneficiaries group	The public at a large – as this will involved better water resource management. The local water organizations, who will be provided with a decision making tool, especially during crisis periods.

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Disadvantages	• If staff is not well trained, this facility can behave as a black box and lead to wrong decisions. • Off shelf softwares have a number of limitations and are often not developed to take into consideration tropical basaltic conditions. • This can lead to the water organization being too dependent on the provider and the developer of the software.
Capital costs	
Cost to implement adaptation options	The price of a hydrological model varies with the level of complexity provided for in the model and also varies with the technical support that comes with the software. A simple hydrological model that is used for educational purposes will be around 1000US$ while a much complex model at organizational level will start as form 10,000US$. Tailor made complex softwares, including regular capacity building and technical support will involve higher costs. **COST: 1000$ (US) to around 10,000$(US)** **More complex and site specific requirements will increase the costs.**
Additional cost to implement adaptation option, compared to "business as usual" (extra storage capacity)	Computer facilities and networking within the organizations and with sister organizations. Costs: 1000 US$ per computer Total costs: 20,000$ for 10 computers, assessories and networking requirements.
Development impacts, indirect benefits	
Reduction of vulnerability to climate change, indirect	
Economic benefits Employment Investment	 Creation of jobs as this will require skilled workforce and a dedicated unit. Can indirectly lead to investments as the result of implementing the model will be improved water resource management.
Social benefits Income Learning Health	 The decrease in water wastage will contribute to productive and economic livelihood purposes. Training elements from capacity building Increases per capita water availability. Lack of water can have serious health effects and allow for the spread of disease and illness if the reductions continue for even modest lengths of time.
Environmental benefits	Promotion of improve water resource management leading to less wastage and controlled development in the water infrastructure sector.
Local context	
Opportunities and Barriers	Barriers are seen owing to: -Lack of such a system even at very low level of complexity has resulted in a lack of trained personnel presently. - Lack of a dedicated unit at the local water institutions who can take this responsibility. These translate in opportunities for the setting up of a dedicated unit, appropriate

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	capacity building and technical support at national level. To capacitate local water institution to take this responsibility in terms of capacity building, expenditure and equipments.
Market potential	The technology is relatively small-scale, proven and less capital-intensive. It has market potential nationwide, specially for similar small island states.
Status	Not used presently.
Timeframe	The implementation of a relatively simpler form of a hydrological model which is to be used for analysis and forecasting at national level can start almost immediately. This will at the same time involve the need to purchase the IT accessories needed and the need for capacity building. The model will have to be developed so that it takes into consideration also online data acquisition, once the telemetry systems have been set up and are operational.
Acceptability to local stakeholders	Easy to accept by stakeholders concerned.

[i] **This fact sheet has been extracted from TNA Report – Technology Needs Assessment Reports For Climate Change Adaptation – Mauritius. You can access the complete report from the TNA project website http://tech-action.org/**