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**Sustainable Water Resources Management**

**Effective Water Resources Management by Using Web-enabled sensors and communication networks**

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**Abstract**

One of the key factors for improving the water use efficiency and conservation would be the establishment of a framework for efficient and dynamic management of database for water through use of latest technologies including ICT tools. Sensors and Big Data gathering allow real time monitoring of water quantity and quality, precision irrigation, smart leakage detection, enabling better planning and decision-making. Advanced Artificial Intelligence and Geographic Information Systems are transforming large-scale measurement; while internet and wireless technologies, intelligent decision support systems and other innovations are impacting across the water sector. Web-enabled sensors and communication networks provide an opportunity for water stakeholders to obtain information in near real time about physical and environmental variables such as temperature, soil moisture levels and rainfall. Smart metering technologies can also provide individuals, businesses and water companies with information in near real time about their own water use, thus raising awareness about usage, locating leakages and offering better control over water demand.

**NASA providing training program on water resources and disaster management**

The launch of several Earth Observation (EO) sensors from advanced satellites provides world-wide continuous measurements on various hydrological components which are essential input data for hydrological modeling. The data gaps due to lack of on-the-ground monitoring of water resources around the world are now available using satellite acquisition. Thus, satellite products and sophisticated computational techniques for the management of water can play an important role in present and future of water resources. The satellite remote sensing for hydrological applications includes, but not limited to rainfall (Global Precipitation Measurements (GPM) and Tropical Rainfall Measuring Mission (TRMM); Soil moisture (Soil Moisture Active Passive (SMAP) and Soil Moisture Ocean Salinity (SMOS); Actual Evapotranspiration (Surface Energy Balance System); Mapping Evapotranspiration with Internalized Calibration (METRIC) and Surface Energy Balance Algorithm for Land (SEBAL); Groundwater level monitoring by Gravity Recovery and Climate Experiment (GRACE). Using satellite data and GIS, water bodies such as rivers, lakes, dams and reservoirs can be mapped in 3D. The spatial water availability maps can be generated. The concerned authorities can use the information for identifying the sites or regions that need effective protection and management and decisions can be made regarding the sustainable management of water resources in the identified regions. The GIS can be used effectively for this purpose to combine different hydro geological themes objectively and analyze those systematically for demarcating the potential zone. There are several urban applications where satellite based remotely sensed data are being applied, namely; urban sprawl / urban growth trends, mapping and monitoring land use / land cover, urban change detection and updating, urban utility and infrastructure planning, urban land use zoning, urban environment and impact assessment, urban hydrology, urban management and modeling.

**Conclusions**

The success of smart water management depends not only upon improving the ICT technology itself; it depends upon expert knowledge and the collaboration of multiple stakeholders, including from water, industry, urban planning and environment. The use of fast growing mobile-based networks and Apps allowing for rapid, reliable decisions on monitoring, acquiring and processing real-time data on water level, rainfall, runoff, water quality and leakage detection, needs to be promoted. It is now up to all of us to use technologies and data wisely and to work together to better inform operational, maintenance and planning decisions in water management. Using drone [technology](http://www.scidev.net/sub-saharan-africa/enterprise/technology/) could cut labour and costs spent in collecting data for maize breeding by at least ten per cent . With increased demand for better seeds to adapt to [changing climate](http://www.scidev.net/sub-saharan-africa/environment/climate-change/), breeders have turned to unmanned aerial vehicles (UAVs) - drones for precise gathering of [data](http://www.scidev.net/sub-saharan-africa/enterprise/data/) from the field to enable more efficient maize breeding in most of Southern Africa. The use of drones to collect data may be an efficient way if you look at large acreages.

This paper highlights the latest developments in optimizing water resources utilization by using state of the art Information technology applications in various parts of the world.

**Key words**: Rivers, lakes, dams and reservoirs 3D mapping, urban environment and impact assessment, urban hydrology, urban management and modeling.

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