



WATER RESOURCES RESEARCH GRANT PROPOSAL

Title: Water Data Management Systems Integration with Models

Focus Categories: M&P

Descriptors: Water Resources Management, GIS, Database, Modeling, Planning.

Duration: 3/2000 to 2/2001

| | | | |
|-------------------------------------|--------------|-------------|------------|
| FY - Federal Funds: | (\$28,197) | (\$28,197) | (0) |
| | Total | Direct | Indirect |
| Non-Federal Funds Allocated: | (\$56,922) | (\$32,319) | (\$24,603) |
| | Total | Direct | Indirect |

Principal Investigators

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Congressional District of University Performing Research: 2nd

Critical Problems

Efficient management and planning related to water resources necessitate an integrated decision support system based on the latest advancements in database, modeling, and GIS techniques. One of the problems is the integration of different data as well as models in such an integrated system.

Results/Benefits:

The proposed research is the first step towards the development of a statewide informational and decision tool for the management of water resources. The focus is on the integration of physical models in existing database management systems.

Nature, Scope and Objectives of the Research

Accurate information is vital to sound decision-making. A critical management issue faced by government is to improve the availability and usefulness of water-related information, regardless of whether it is generated by government or other contributing sectors. Currently, several state and federal agencies collect information for research and/or resource management purposes. These organizations do not necessarily plan together regarding computer architecture, decision support systems, or the manner in which information is classified, stored and/or electronically shared. In the absence of a single overarching authority or a master plan to integrate existing data, the ability to maximize water use decisions is significantly compromised.

In order to facilitate decision making, there is a lot of development towards integrated decision support systems which combine advanced modeling techniques with software engineering to create integrated solutions for water and natural resources management. Such systems support integration of databases, GIS, models and analytical tools into a common, easy to use, framework.

There are several problems in developing such an integrated management system. First, there are various database models available including relational, spatial and geo-relational databases. There are various formats of GIS based systems (MapInfo, ARC/VIEW, etc). There are many sources of information related to water resource management but these may be in paper format or various nonconforming electronic formats. Finally, there are various analytical tools which can be used to model and analyze the information included in the databases.

In Rhode Island, there are many agencies and groups involved with water resources data collection and management issues. The RI Water Resources Board (WRB) is in the process of developing a long-range technology plan that has as one of its most significant features, the establishment of electronic systems to accommodate water supply system management data. In 1999, the WRB entered into a cooperative agreement with the US Geological Survey to study and amass data in the Wood Pawcatuck watershed. Partners in Resource Protection (PRP), a local stakeholder group, is implementing the RI Watershed Approach in the Wood-Pawcatuck watershed early in 2000. This has been identified as a "Priority Watershed" according to the Unified Watershed Assessment developed under the federal Clean Water Action Plan.

The ultimate goal of the proposed research is to build a statewide water information network containing water data pertinent to all watersheds. This will be eventually containing physical, spatial and even financial criteria. It will be accessible online to multiple users and the public. The main idea is to improve upon the existing knowledge base and information architecture already in place, to join or integrate systems wherever feasible, and design new network components that are likely to be necessary. This approach will help government and users of information operate more efficiently by eliminating data redundancy between information providers, by linking multiple

databases to their respective geographic data and centralizing or sharing the maintenance and distribution points of water-related data.

The proposed research project consists a first phase towards achieving the overall goal. The **objectives** of this first phase are to provide the background information needed for the successful integration of management data and various analytical models. Specifically, the following objectives will be pursued:

- a) Collect information on water data management systems employed in various states.
- b) Collect information on various models available for the analysis, visualization and use of the data to support management decisions.
- c) Investigate the integration of such models with data management systems.
- d) Identify the water resources related data available in Rhode Island including their format.
- e) Recommend additional data needed for a sound decision making system.
- f) Provide a recommendation on an integrated data management system.

Methods, Procedures and Facilities

The objectives outlined above will be achieved in three tasks. During **Task 1**, agencies in all states will be surveyed to collect information on water resources management systems employed. The survey will also include research facilities at various universities where integrated decision support systems are currently under development. Information on various analytical models for water resource modeling/simulation will be collected. Availability of various GIS systems for Rhode Island will be studied. Integration needs and procedures between the models and the database systems will be investigated. A computer/software system will be implemented.

Task 2 of the project will include the study of water resources data availability in Rhode Island. Various agencies and groups will be contacted and literature will be examined to establish the current availability as well as needs on such data. Of particular importance will be the nature and format of the data and how they can be integrated into the decision support system.

Task 3 of the project will summarize the findings of the work and make a recommendation on the steps needed to implement a decision support system including software, models, integration between the two, data availability and needs.

Related Research

One of the most complete integrated data/modeling systems available is the program HAZUS developed by the Federal Emergency Management Agency (FEMA) for natural disaster loss prediction. The content of the system is not necessarily water resources but the philosophy and procedures followed are a model for the development of similar integrated systems. The system combines a vast array of data on constructed facilities, analytical models of natural disasters including earthquakes, hurricanes, floods, etc, analytical models/fragilities of impact of such disasters on the built environment, financial data, and various analytical and mapping tools. There is a version for the MapInfo system and a version for the ARC/VIEW system. The integration approaches followed on this system will be examined in the proposed project.

Several water resources management information systems have been developed aimed at specific applications. A generalized one is the WaterWare system, developed in Austria, which is an integrated model-based information and decision support system for water resources management.

Progress Review

This is a new project.