Watershed Planning and Evaluation Tools

Research Need
Watershed planning goes beyond project planning (for specific USACE projects) towards more comprehensive and strategic evaluations and analyses that include diverse political, geographic, physical, institutional, technical, and stakeholder considerations. Watershed planning addresses identified water resources needs from any source, regardless of agency responsibilities, and provides a joint vision of a desired end state that may include recommendations for potential involvement by USACE, other federal agencies, or non-federal interests.

In conducting watershed planning, USACE uses its planning capability in a broader sense, to meet the changing water resources needs of the nation. Ultimately, watershed assessments should inform multiple audiences and decision makers at all levels of government, and provide a strategic roadmap to inform future investment decisions by multiple agencies. A system-wide watershed planning tool that integrates water quantity, water quality, ecological data, and uncertainty with stakeholder values and regulatory requirements is needed to effectively evaluate and integrate watershed management alternatives to achieve multiple objectives.

Project Objectives & Plan
ERDC-EL, ERDC-CHL, IWR-HEC and others will develop software and tools for Watershed Assessment Teams, informing modeling of watersheds, rivers, and reservoirs and enabling more effective alternatives comparison and stakeholder communication. These tools will include:

- Serious Games to support Stakeholder Collaboration
- Satellite Data Tools to support Systems Analysis
- Weather Generator to support Systems Analysis
- Vulnerability Assessment Tools for Future Risks
Pilot studies will be conducted in: South Pacific Division, Chesapeake Bay & CA Central Valley and Sacramento Watershed. A tabletop version of the Serious Games concept has been developed and demonstrated within USACE; the game concept is being refined as a Stakeholder communication tool enabling stakeholders with widely varying technical backgrounds to understand the tradeoffs of various project alternatives; a later interactive module is planned as a follow-on effort. The Satellite Data Time Series Animation Proof of Concept has been developed and will be applied to a concept case study; this tool will enable not only systems analysis but also effective stakeholder communication, by visually illustrating the spatial impacts of various watershed project alternatives.

An atmospheric module and a weather generator are under development that will exploit the connection between climate and weather, capturing the causal mechanism – the weather regime – and addressing certain deficiencies in current modeling capabilities, including:

- Disparity of resolution between catchment being modeled and general circulation models
- Lack of understanding of how drought influences flood, and vice versa
- Inability to model low flow events or reproduce long term drought events

**Payoff**

To date, limited effort has been put into developing multi-criteria decision frameworks to evaluate potential actions across a watershed, thus the development of the complement of system-wide watershed planning tools encompassed by this effort. This R&D will provide capabilities currently not available to the USACE planning community, increasing their ability to successfully assess projects on a watershed scale for multiple objectives, scenarios, and criteria, resulting in a more efficient planning process and greater optimization of management and restoration alternatives over a watershed scale.

**Products**

**Technical Reports (TRs)**


Kucharski et al (in preparation). Vulnerability Based Risk Mitigation and Robust Plan Selection at the Iolanda Water Treatment Plant. ERDC/EL TR-XX-XX, U.S. Army Engineer Research and Development Center, Vicksburg, Mississippi. (Leveraged from project activities/findings)

Olszewski and Kucharski (in preparation). Identifying Critical Storm Durations for Flood Risk Management Systems based on Maximum Risk Conditions. ERDC/EL TR-XX-XX, U.S. Army Engineer Research and Development Center, Vicksburg, Mississippi. (Leveraged from project activities/findings)
Conference Presentations/Webinars/Workshops
August 15 – 16, 2017 Watershed Planning and Evaluation Tools Scoping Workshop in Davis, CA, bringing together experts, developers and end users for the watershed assessment tools to be developed under this work unit.

September 25 – 26, 2017 Collaborative Risk Informed Decision Analysis Training Workshop at USAID (HQ funded - leveraged from project activities/findings to date)


Project Activities
Multi-agency coordination to identify needs of planners dealing with complicated watershed alternatives analysis and optimization, and stakeholder communication. Development of a cross section of tools pertaining to climate and water supply/flooding projections, use of time series satellite images for alternatives impacts visualization, and planning-oriented serious games stakeholder communication tools.

¹Project Alias – Work Unit Documentation Title: Watershed Planning and Evaluation Tools