BACKGROUND

In 2016, in an effort to explore how improved access to water resource data impacts water management decisions, the S. D. Bechtel, Jr. Foundation (Foundation) funded the development of two demonstration projects. These projects were intended to: (1) develop and test decision support tools to meet the real-world needs of decision-makers; (2) create tools with the potential to operate at scale; and (3) provide proof-of-concept to agencies and policymakers that enhanced data integration and analytics improves decision-making.

The demonstration projects were funded based on the recommendations of an Advisory Committee composed of consultants, academics, nongovernmental organizations (NGOs) and funders. The two projects were the Shasta Operations for Winter Run (SHOWR) application and the Groundwater Recharge Assessment Tool (GRAT). Despite the Foundation’s best efforts to ensure that both demonstration projects would be used long-term for decision-making, at present, only one tool, GRAT, has been used for decision-making in some capacity. There are a variety of reasons, which were not obvious at the time of project selection, why the SHOWR application has not been adopted for decision-making. However, evaluation of the tool development process indicates that there was an insufficient understanding of the complex decision-making process being targeted for tool development, including the legal and regulatory requirements for making data and decisions publicly available. Additionally, despite having statements of support from project partners, it became clear shortly after the project began that not all of the tool objectives had been sufficiently scoped or agreed to with project partners prior to tool funding.

Observing minimal use of the SHOWR application prompted research to better understand the factors affecting the adoption of tools to support water management decisions and develop concrete guidance for foundations, funding agencies, tool developers and/or individuals involved in the development of tools to support water management decisions. As part of this process, a tool evaluation team undertook extensive document analysis, observed tool development meetings and conducted 98 semi-structured interviews with tool developers, NGOs, state and federal agency employees, consultants, academics and others involved in the development of more than ten tools to support water management decisions. Key findings from this analysis can be found at: https://purl.stanford.edu/cb612zf3515. Our findings highlight the complexity of developing tools to support water management decisions and provide recommendations to support long-term tool adoption. Our research synthesizes lessons from several tools that have been used
for water management decisions for ten or more years. A key lesson from these success stories is that developing a clear tool development plan is crucial for long-term success.

The following template for a Request for Proposals (RFP) solicitation attempts to integrate the lessons learned from this work. While this RFP does not guarantee tool adoption for decision support, it incorporates lessons learned from a variety of tools that we believe will mitigate the concerns outlined above and result in more robust decision support tools. This RFP is designed primarily for tool funders; however, tool developers, state and federal agency representatives and others involved in tool development may also benefit from the lessons and processes captured in this RFP. The suggestions included in the RFP are intended as guidance that will need to be tailored to individual tool development processes.

REQUEST FOR PROPOSALS TEMPLATE

Project Overview, Funding Phases and Reporting Requirements

It is the intent of the [Funder] to promote innovative projects that go beyond the current state of water data management. As such, priority will be given to projects that include each of the following: (1) demonstrate a clear understanding of the decision-making process(es) being targeted for tool development and (2) validate support for tool development from all project partners, but particularly from the entities directly involved in the decision-making process. Successful proposals will be funded in three phases, as summarized below (Figure 1).

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1 We use the terms “tool” and “data platform” as generic shorthand for any of the different kinds of applications that we analyzed for this study. These included dashboard-style web applications, desktop or cloud-based data integration and visualization programs, and multi-purpose online portals with a variety of web-based tools and downloadable software, data, and models.
**Figure 1.** Overview of project proposal requirements and funding phases, tasks and reporting requirements for successful proposals. See text below for additional information on requirements for each project phase.

<table>
<thead>
<tr>
<th>Proposal</th>
<th>Phase 1</th>
<th>Phase 2</th>
<th>Phase 3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>General description</strong></td>
<td>Submit a proposal as outlined in this document. Successful proposals will receive funding in three phases.</td>
<td>Tool developers and project partners should use two funded workshops to develop a tool development memo.</td>
<td>Development, review and testing of a prototype decision support tool.</td>
</tr>
</tbody>
</table>
| **Specific tasks** | Proposals must include:  
- A project overview and objectives (Sec. 1)  
- A description of the Project Team (Sec. 2)  
- A description of the current decision-making process (Sec. 3)  
- A project description (Sec. 4)  
- Other requirements (Sec. 5) | The tool development memo must include:  
- Project title and overview  
- A description of tool objective(s)  
- A description of tool governance  
- A revised data management plan, tool summary and linkage to decision making (Sec. 4.1, 4.2 and 4.3)  
- Phase 2 and 3 metrics for tool evaluation (Sec. 4.4)  
- An updated project budget and timeline (Sec. 4.5) | Prototype tool development must include:  
- A technical review involving experts from a range of backgrounds  
- Tool testing  
- Full tool development must include 3-6 month of testing with decision-makers. |
| **Reporting** | Full proposals must be submitted for consideration. | A tool development memo must be submitted to the funder within six weeks of the second workshop. | Phase 2 reporting includes:  
- A technical review summary report  
- Phase 2 summary report | A Phase 3 final report should be submitted with 12 weeks of completing final tool testing. |

**Phase 1 – Tool Scoping and Proposal Refinement**

The first phase of funding will be used to host two data platform development workshops. These workshops should, at a minimum, be used to reach agreement between project partners (defined in Section 2 below) on tool objectives, governance, data management, technical tool specifications, Phase 2 and 3 metrics for tool evaluation, project budget and timeline.

All project partners must send at least one representative to both tool development workshops. Project partner representatives must agree to be signatories to the tool development memo written following the workshops (see Phase 1 reporting requirements below). The [Funder] or a representative for the [Funder] must be allowed to attend the tool development workshops. At the [Funder’s] discretion, a third-party will conduct interviews with project partners to assess their perception of tool value for the decision-making process, their ability and willingness to release any datasets that are not currently publicly available and their long-term commitment to tool development.
Phase 1 – Reporting requirements

The project proponent must write and submit a tool development memo to the funder within six weeks of the second project workshop. This memo should be jointly developed with project partners, who must agree to be signatories to the document. The document should include:

- The project title and overview.
- The data platform’s objective(s), including the entities that will benefit from the tool, its geographic scope and a description of the tool’s ability to scale to other areas or applications.
- A description of tool governance, including how decisions for platform development will be made, a plan for long-term funding and maintenance, agreement on what components of the tool will be publicly available and the role of each project partner in tool development.
- Revised versions of the data management plan, technical tool summary and linkage to decision-making described in sections 4.1, 4.2 and 4.3 of this document.
- Phase 2 and 3 metrics for tool evaluation.
- A revised budget and project schedule with milestones. The budget should provide the total cost of the project and the amount of funding requested from the [Funder]. Clear explanations for any deviations from the original project budget or timeline should be included. An important element of funding consideration will include commitment to provide additional financial or in-kind support to the project; as such, all sources of support should be included along with the project budget.

Phase 2 – Tool Prototyping

Assuming congruence between the tool development memo, workshop observation and funder interviews (where applicable), Phase 2 funding will be provided for the development and testing of a prototype. Early in Phase 2, the data platform must undergo a technical review involving technical experts from a range of backgrounds related to the decision-making process being targeted for tool development. Reviewers could include, but are not limited to academics, state and/or federal agency representatives, consultants and NGOs. The technical review process should include review of data, models or other analytical instruments being used in platform development, the development timeline and budget. Feedback from this process should be synthesized by the project proponent who, in collaboration with the project partners, tool developer and funders, should decide how feedback from the review will be incorporated into tool development.

Once the prototype version of the tool is complete, developers should proceed with testing for 6 to 12 months. Ideally, platform testing should occur in an operational environment that can inform decision-making and incorporate feedback from end users. Feedback from the testing phase should be summarized in the Phase 2 summary report.

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2 Funders may want to consider only awarding a portion of the total funding required for tool development. For example, Funders will provide 75% of the budget required for development and testing of the tool prototype. The remaining funding must be provided by the project proponent, partner entities, grants or other means.

3 The term end user refers to the individual(s) within the decision-making body that will actually be using the tool. These individuals are often technical personnel. Depending on the tool, end users may also include stakeholders (defined in Section 1 of this document) affected by the decision-making process.
Phase 2 – Reporting requirements

- **Technical review summary report** – This report should be submitted to [Funder] within eight weeks of completing the technical review process. It should include a list of the individuals included in the technical review process accompanied by a brief biography outlining their area of expertise; a summary of feedback from the review process, as well as the anticipated means of resolving or incorporating the feedback; and a revised technical tool development plan. Where there is inconsistency of opinions or disagreement in how best to address feedback from the technical review, justification for not incorporating the feedback must be included in the summary report.

- **Phase 2 summary report** – This report should be developed and submitted to the [Funder] within eight weeks of prototype testing. This report should include (1) the tool objective(s); (2) an overview of the technical components of the tool and how they will improve the decision-making process; (3) a summary of the tool testing process and feedback, including any metrics used for tool evaluation; (4) an explanation of any changes, amendments or additional functionality to be undertaken during Phase 3 tool development; (5) a revised budget and schedule for Phase 3 of tool development, including a plan for long-term support and housing for the tool and (6) Phase 3 tool evaluation metrics. Note that the [Funder] may not provide all funds solicited. Thus, the project proponent and project partners should include any additional financial or in-kind support for tool development.

Phase 3 – Tool Development

Assuming successful development, testing and use of the prototype tool in Phase 2, funding (or a portion of funding) will be provided for full tool development. Once the full version of the tool is developed, it should be tested with decision-makers and end users for 3 to 6 months. Results from the testing phase should be summarized in the Phase 3 final report.

Phase 3 – Reporting requirements

- **Phase 3 final report** – A Final Report should be submitted within 12 weeks of completing final platform testing. The report should provide an overview of the project and objectives, and a description of the data management and visualization tools used to meet those objectives. The final report should provide lessons learned about project design, implementation and budget. Lessons should focus on how well the project performed in achieving the project objectives and provide recommendations for project modifications.

- The [Funder] desires that lessons learned from the project be communicated to other regions. A communications strategy will be developed during project implementation in concert with the [Funder] outlining the means (e.g., newsletter, email, webpage, conferences etc.) for communicating project results and lessons learned to interested parties.

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4 Similar to Phase 2, funders may want to consider only awarding a portion of the total funding required for tool development. They may consider decreasing the percentage of funding in Phase 3 as a means of preparing tool developers for ongoing tool maintenance ownership. For example, Funders will provide 60% of the budget required for tool development. The remaining funding must be provided by the project proponent, partner entities, grants or other means.
Proposal Requirements

The following sections describe the components required for the proposal to be considered for funding. Whenever possible, proposals should be co-developed with project partners, including high-level decision makers and key technical personnel within the decision-making entities.

A complete proposal must be submitted to [Funder] by [Insert proposal due date here]. Successful projects will be funded in three phases as outlined above.

SECTION 1: Project Overview, Problem Statement and Objectives

Provide the project name, a project description including the project area, a description of the problem being addressed, project objectives, project partners (see Section 2 for definition), the entities that will benefit from the tool and, where applicable, stakeholders. For the purposes of this project, we define stakeholders as groups or entities (e.g., cities and counties, environmental groups, disadvantaged communities or others) affected by the water management decision(s) being targeted for tool development. Also include an overview of water management decisions that are anticipated to be improved as a result of project implementation. Specific details related to objectives and the decision-making process are to be provided in Sections 3 and 4 of the proposal.

SECTION 2: Project Team

The project team requires a project proponent (to whom the grant will be awarded), who will be responsible for identifying project partners. In addition to project partners (defined below), the project proponent is encouraged to include stakeholder groups affected by the water management decision(s) being targeted for tool development.

Provide a description of the primary project proponent, including a brief description of the entity’s role in water resources management. Include summary information on the agency’s purpose and operations and motivation for tool development. Describe all project partners, including consultants, and their intended role(s) in the tool development process. Be specific about each project partner’s motivation, role, expertise and experience as it pertains to the tool being proposed. Describe any additional key persons (name, title, affiliation, role) responsible for project implementation.

For the purpose of this proposal, project partners are defined as entities that will be part of the tool development team in one or more of the following capacities:

1. They are one of the entities directly involved in the water management decisions being targeted for tool development. Within these entities, project proponents should identify both high-level decision makers and key technical personnel to guide tool design.
2. They are one of the entities responsible for collecting, processing or providing data to support the water management decisions being targeted for tool development.
3. They are a consultant or technical developer who is part of the tool development team.

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5 Identifying key technical personnel at the target organization to understand and integrate their needs and workflows into tool design is likely to improve tool adoption long-term.
SECTION 3: Current Decision-Making Process

Provide a description of current operations for the system being targeted for tool development, including a description of:

- The physical system (i.e., where, what, how has the system changed, why the tool is necessary).
- Who currently operates and relies on the system being targeted.
- The entities involved in the decision-making process, and their role and authority in the process (i.e., who is making the decisions and what information is being used to make the decisions).
- The legal, regulatory and policy requirements surrounding system operation (i.e., what are the laws and policies governing management of the system, are the policies being used consistently).
- The data currently used in system operation, who currently collects the data, where it is housed, its format and its accessibility. For data that are not publicly available include an explanation on how those data will be accessed, reformatted and integrated into the tool.
- The current computer platforms, programs, models, other technical tools or workflows currently being used to inform the decision-making process.
- Similar tools currently being used or developed for water management and an explanation of how this tool is different and necessary.
- Any data deficiencies associated with the decision-making process, as well as a plan to remedy these deficiencies.

In addition to ensuring that the current decision-making process is sufficiently understood prior to tool development, information collected in this section will serve as a baseline against which tool implementation and outcomes can be compared.

SECTION 4: Project Description

Describe the specific elements of the proposed project, as defined below, including the various types of data that will be used in project design and implementation, and how the data will be managed, analyzed and visualized. As described later in this section, a clear statement of how the proposed project will advance decision-making beyond the current situation described in Section 3 is particularly important.

4.1 Data Description and Management

4.1.1 Data Description

Describe all data types used in the decision-making process outlined in Section 3. Also describe any additional data that are not currently being used in the decision-making process that would be added during tool development. For each data type, identify:

- The type of data (e.g. streamflow, groundwater levels, land use, ecologic, model outputs etc).
- Whether the data are currently being used in the decision-making process or would be newly integrated into the process.
- Whether the data are publicly available.
- The condition of each dataset (i.e., do the data require cleanup or confirmation of interoperability before they are useful).
- Whether there are adequate data standards and metadata in place for each dataset.
- The data source and how each dataset is (or will be) acquired.
- How the data are currently stored, managed and shared.
- How the data are currently governed and whether there are protocols in place for data sharing.
4.1.2 Data Management

Provide a description of the proposed data management system or platform that will be used to integrate, standardize, manage and maintain project data. Include details about how data that is not currently available will be accessed and integrated into the platform. The data management system should allow easy expansion to include additional data types. Please note that the preference is to use open data systems wherever possible.

4.2 Tool Description and Documentation

Describe the tool that is being proposed, including a description of:

- Tool design and specific tool components, including data analysis, visualization or other components.
- The analytical methods being used in tool development, including rationale for their selection.
- The technologies that will be used to develop the tool.
- Protocols for tool documentation, code repository and testing.
- Tool ownership, copyright and intellectual property rights. These considerations will be particularly important where tool developers are working with proprietary software or where individuals or agencies are contributing to tool development.

4.3 Linkage to Decision-Making

A key component of the project will be the linkage between innovative data visualization and decision-making. Describe specific water management decision(s) that will be improved as a result of project implementation, including expected outcomes that will result in more sustainable water management for meeting the needs of people and nature. Include a description of how specific project products (e.g., data integration, analytics or visualizations) will be used in decision-making. This section should focus on linking the existing management policies and processes to ensure they align with tool development.

Describe how the proposed tool(s), coupled with the data management system, will improve the current decision-making process. Where new visualization or analytic methods are needed, provide descriptions of how these tools will be linked to the data analysis and decision-making process. Include a description of the specific types of visualizations, their format and how access to the visualizations will be provided to stakeholders and interested parties. Analytical methods should include a clear explanation of how they will support the decision-making process.

4.4 Metrics

Describe the specific metrics that will be used in each phase of tool development to evaluate the project against the objectives described in Section 1. Where applicable, describe the current use of metrics to evaluate existing water management objectives. Describe how the project will result in improvements to the current decision-making outlined in Section 3 above and the metrics that will be used to assess improvements. The [Funder] may choose to support an external team of evaluators, with the goal of creating a framework by which to quantify the value of data-driven decision-making. In such a case, the project proponent and partners must allow the evaluators to attend tool development meetings and facilitate any other evaluation components including interviews.
4.5 Budget and Schedule

4.5.1 Budget

The [Funder] intends to provide grant funds on the order of [Insert funding range here]. To qualify for grant funds, the project proponent must provide a detailed budget for the project, including anticipated costs for project administration, data gathering and management, platform development, meetings and report preparation. These costs should be broken down across the three project phases outlined in the Project Overview section above.

For each phase, provide a breakdown of estimated time and expenses for in-house personnel, consultant costs, hardware and software. Provide the total cost of the project and the amount of funding requested from the Foundation. An important element of funding consideration will include commitment to provide additional financial or in-kind support to the project; as such, please include all sources of support with the project budget.

Recognizing that the budget and timeline will be refined during each phase of tool development, project proponents should identify areas of the budget and schedule that are most uncertain and likely to change based on feedback from project partners. Wherever possible, a range of budget numbers should be included.

4.5.2 Schedule

Provide a project schedule with key milestones broken down into the three phases of tool development outlined above. The project schedule should include:

1. Phase 1
   a. Formation of the project team
   b. Timing for the two project workshops
   c. Expected submittal date for the tool development memo

2. Phase 2
   a. Timing for data collection, collation and integration
   b. Timing of decisions on analytical, visualization and other tool components
   c. Timing and proposed duration for the technical tool review
   d. Revised tool framework based on feedback from technical review
   e. Completion of prototype tool
   f. Expected submittal data for the Phase 2 summary report

3. Phase 3
   a. Timing and duration for final tool development
   b. Expected submittal date for Final Report
SECTION 5: Other Requirements

5.1 Project Commitments

Project funding will require the demonstration of commitment from the project proponent and project partners. The proposal should contain Statements of Commitment from partner entities, including board resolutions if applicable and a list of key personnel dedicated to the project. Statements of Commitment should, at a minimum, clearly articulate the broad objectives of the project; the proposed functionality for the tool and its usefulness for the decision-making process; the partner entity's commitment to tool development; their role in tool development and financial or in-kind contributions.

5.2 Reporting Requirements

See reporting details for individual project phases listed in the Project Overview section above.

5.3 Submittal Requirements

A complete project proposal containing the elements described in this RFP should be submitted to [insert name and contact information here] no later than [insert due date here].
Recommended Citation:
