



THE SUSTAINABLE WATER RESOURCES ROUNDTABLE
Sustainability of the nation's water resources through indicators and research

Sustainable Water Resources Roundtable Meeting
National Weather Service, Silver Spring Metro Center Building II, 1325 East West Highway
2nd Floor conference room, #2385, December 7, 2004
Proceedings

Participants

Paul Barlow, U. S. Geological Survey
David Berry, SWRR, Manager
Graham Bullock, Kennedy School of Government
Warren Flint, Five E's Unlimited
Paul Freedman, Limno-Tech Inc and WEF
Peter Fricke, NOAA Fisheries
Richard Fristik, U.S. Army Corps of Engineers
Stephen Gasteyer, Rural Community Ass't Program
Ted Heintz, White House CEQ
Rob Hendricks, USDA Forest Service,
Brian Hill, US EPA, Mid-Continent Ecology Division
John Ingram, Hydrologic Development, NWS NOAA
Rhonda Kranz, Ecological Society of America
Patty Lawrence, NRCS, USDA
Ian MacFarlane, National Assn of State Foresters
Rees Madsen, BP

Elizabeth Mills, NOAA Ocean & Coastal Management
Brand Niemann, US EPA
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Lauren Pidot, Nat. Council for Science & Environment
Stephen Ragone, NGWA
James Renthall, Bureau of Land Management
Richard F. Schwer, Dupont Company
Diane Segal, Institute for Water Resources
Patricia Sinicropi, Water Environment Federation
Eugene Stakhiv, Institute for Water Resources
Hal Stanford, NOAA/NOS/NCCOS
Ethan T. Smith, SWRR Coordinator
Karen Solari, USDA Forest Service
Paul Souza, US Fish & Wildlife Service
Colin Voigt, USDI - BLM
John Wells, Minnesota Environmental Quality Board

Proceedings

Thirty-two participants attended the **Sustainable Water Resources Roundtable Meeting** on Indicators held at NOAA, Silver Spring, MD on December 7, 2004. Participants were mainly affiliated with government agencies (NOAA, USGS, EPA, USACE, USDA, National Council for Science on the Environment), but also with NGOs (Ecological Society, National Groundwater Association), private firms (Dupont, BP, Limnotech,) and other entities such as the Rural Community Assistance Program.

The day was divided between presentations and group work sessions. For the first breakout sessions, participants divided into groups with three focuses: Economics, Ecological, and Social. Each group reviewed previous work done in its section, refined categories, added and deleted indicators; and identified overarching and key indicators appropriate for its section. In the final breakout, some participants formed a "crosscutting" group to discuss ways to consolidate the indicators developed by all three groups above and to short-list overarching and key indicators.

David Berry, SWRR Manager, opened the meeting followed by **Elizabeth Mills, Office Of Ocean and Coastal Resource Management, NOAA**, who welcomed participants to NOAA.

National Indicator Efforts, of which SWRR is a part, were updated by **Ted Heintz, CEQ**, who summarized the connection to the Roundtable Network, the White House Council on Environmental Quality's indicator effort and recent indicator work by the GAO in his presentation, "Recent Developments in National Indicator Efforts."

Broad Efforts to Improve Statistical Indicators

- OECD Forum on Key National Indicators
- GAO Report: Informing Our Nation
- National Academies' Key National Indicator Initiative
- GAO Report: Environmental Indicators
- CEQ Coordination on Environmental Indicators: Toward a National System of Indicators

OECD Forum on Key National Indicators:

- Sponsored by the OECD which has 30 member countries
- Attended by over 500 people, including from the U.S. the Comptroller General, and the Chief Statistician
- Shared recent progress in the development and use of statistical indicators on economic, environmental and social conditions

GAO Report: Informing Our Nation

- Release announced by Comptroller General David Walker in keynote address to the OECD Forum
- Surveys wide range of indicator efforts
- Contrasts topical and comprehensive indicators sets
- Emphasizes the need for a comprehensive set of national indicators
- Explores institutional options

National Academies' Key National Indicator Initiative

- Emerged from the NAS/GAO Forum
- Objective: a comprehensive set of indicators
- Secretariat and leadership provided by the National Academies
- Broad and high level participation
- \$1m grant to support development of a prototype set of Key National Indicators and an interactive website

GAO Report: Environmental Indicators

- Requested by the House Science Committee
- Surveys objectives, uses and challenges
- Finds lack of indicators able to provide a comprehensive picture of the environment
- Identifies challenges: sound development process, data, coordination and integration
- Recommends that CEQ develop institutional arrangements for coordination

CEQ Coordination Efforts

- The Interagency Working Group on Indicator Coordination
- The Roundtable Network's Integration and Synthesis Group

Vision in the CEQ

Interagency Working Group Framework

- The Federal Government and non-Federal partners will develop, maintain and continuously improve a national system to report

- Indicators on natural and environmental resources, and
- Indicators on closely related human health, social and economic factors.

Projects Developing Indicator Sets on Natural and Environmental Resources

- EPA Report on the Environment
- Heinz Center Report on the State of the Nation's Ecosystems
 - Sustainable Resource Roundtables on: Forests, Rangelands, Minerals, and Water Resources.

Roundtable Network Integration and Synthesis Group Objectives

- Develop a conceptual framework, based on systems models, in which to place indicators of sustainability.
- Provide a strong theoretical foundation for further integration and synthesis.
- Provide a basis for integrated sustainability assessments of mixed resource systems.

John Wells, State of Minnesota, gave a review of the St. Paul meeting Criteria and Indicators (C&I) and candidate indicator lists addressing qualities of good indicators.

SWRR Progress to Date on Criteria & Indicators

- Concepts
- Factors
- Criteria: Social, Economic and Ecological
- Categories & sub-categories
- Indicators

The General Systems Perspective

Factors

- Consider the condition and capacity of social, ecological and economic systems
- Focus on what's most relevant to sustainability
- Adopt appropriate time horizon and scale
- Demonstrate integrity
- Be understandable

Social Criteria

- Social well being resulting from the use of water resources
- Social well being resulting from the use of water-related ecological resources
- Social conditions that impact water resources [*delete, but use in overarching intro section*]
- Social capacity for the management of water and related land resources for sustainability
- External dependence

Economic Criteria

- Capacity to make water of appropriate quality and quantity available for human uses
- Economic well being resulting from use of water and affected land resources
- Economic costs resulting from management practices and infrastructure
- Capacity to achieve economic value resulting from the use of water-related ecological resources

- Capacity to manage land use to maintain or enhance the quality or quantity of water

Ecological Criteria

Capacity to make water of appropriate quality and quantity available to support ecosystems at multiple spatial and temporal scales

- Integrity of water-dependent ecosystems at multiple spatial and temporal scales
- Ecological, social & economic group “clean up” work
 - Resolve criteria & categories issues
 - Assess and fix or add indicators
- Begin to select overarching & headline indicators

The remainder of the morning session was dedicated to breakout groups that met to discuss economic, social, ecological criteria and indicators. Prior to forming groups, discussion focused on scale (i.e. developing indicators for work at the local versus national level) and targeted audience (i.e. professionals and technicians in the field versus politicians and public). There was concern that too many indicators would end up being useless. **Ted Heinz**, advocated for a long list of indicators from which people would pick and choose depending on their end goal; a list that would accommodate both the local, regional, and national scale from less to more aggregated indicators. The breakouts worked on duplication within sets, and to fill gaps. They then began to select overarching indicators and top 10 sustainability topics or indicators in each set to focus on what decision makers in all sectors must know in order to move toward sustainability of water resources.

The afternoon plenary session on criteria and indicators began with a presentation by **David Berry** and **Tim Smith** to eliminate overlaps among groups (to eliminate or merge into overarching indicators) and to standardize the formats of the three groups, followed by Breakout Groups and discussion.

Warren Flint, Five E's Unlimited, presented “Indicator Analysis Across Systems,” and noted that over the last nine months SWRR has carried out a very detailed and intensive review of the interdisciplinary nature of water resource sustainability. Warren summarized that after establishing a sustainability framework, SWRR participants explored stakeholder core values for water resources, established a vision for water resource sustainability, and developed a set of criteria that further clarified a future view for water sustainability in the US. Evaluation of these criteria led to the delineation of categories important in measuring the sustainability of water resources in social, economic, and ecologic systems and capital. This review, research, and analysis resulted in the identification of almost 400 potential indicators of social, economic, and ecologic water resource sustainability. Now SWRR must carefully evaluate these indicators for their implication, relevance, and ability to measure progress (or lack thereof), integrity, and understanding.

Flint proposed a systematic process that temporarily disregards the relationship of indicators to their respective criteria or categories in order to understand their intended implications for comprehensive sustainability measures towards efforts to synthesize and integrate the indicator data. Final indicator products can be re-evaluated in the context of their originating criteria or categories to provide an added dimension for preferred indicators. From that set of indicators, working backwards through the original categories and criteria, the necessary rationale can be developed that will support each preferred indicator, a proposed set of about 30. This evaluation process assumes that each separate “systems” group is satisfied with the detail provided by the final set of system-related indicators. His process to identify a set of indicators was in four parts:

Identify a set of indicators usable by all water resource stakeholders.

1) Comparison of Indicators, Irrespective of System/Criteria Placement

- a. Look for duplication across categories, criteria, and systems, social, economic, ecologic.
 - Are differently categorized indicators providing identical information?

- If so, will combining these indicators provide more compelling information?
- b. Does an indicator possess the ability to provide important information about more than one system?

2) **Integrity of the Indicator** - What does the indicator REALLY say?

- a. Does the indicator measure what is really intended?
- b. Does the indicator provide good information of the “big picture” and of trends over time?
- Are the condition and/or capacity of the water resource category placed in relative terms by the indicator?
 - Are the condition and capacity of the water resource category measurable according to direction and rate of change -- are these improving or declining?
 - Can sustainability criteria be judged as better in one place than in another by applying the indicator?

3) **Indicator Importance**

- a. Definitively articulate the implications from a measured indicator's change. What importance do these implications have as top subject areas for water resources on the national agenda?
- b. Will the average person understand each preferred indicator? or is it too complex?
- c. How does the final list of preferred indicators address the original intent of their defined categories and criteria?

4) **Interdisciplinary (across system) Evaluation of Indicators**

- a. Are each of the three systems (social, economic, ecologic) equally characterized by number of preferred indicators?
- b. How many of the preferred indicators reach across (tell us something about) at least two systems?
- c. How many of the preferred indicators reach across all three systems?
- d. Does each indicator have the potential to serve as a learning (educational) tool for the general public? Or is it too complex?

David Berry discussed “Approaches to the Sustainable Water Resources Roundtable Report” SWRR has history to draw upon in that three other roundtables have created reports:

- The Forest Roundtable Report shows 67 indicators organized by criteria with actual data for each indicator shown graphically
- The Rangeland Roundtable Report shows 64 indicators organized by criteria. Most indicators have no actual data shown
- The Minerals Roundtable Report shows 54 indicator categories organized by criteria. Some indicator categories have multiple indicators – a total of 82 indicators most of which do not show actual data but some sample indicators are “populated”
- The Water Roundtable currently has selected (not including gaps filled today):

	Criteria	Categories	Subcategories	Indicators
• Social System	5	17	57	63
• Economic System	5	19	54	186
• Ecological System	2	7	23	108
• TOTAL	12	43	134	357

- 357 indicators is a lot for a report and could be overwhelming to read not to mention gathering data and writing
- We can create a process to streamline our work and report

Possible SWRR Report Outline:

- Executive summary
- Acknowledgements
- Introduction (sustainability and water resources)
- Chapter on SWRR conceptual framework
- Chapter on overarching and key indicators (with data presented)
- Chapters on each criteria listing all the indicators for each
- Conclusions and future work

For standardization of the presentation the report writing team can work from a template or typical indicator outline:

- Importance of the indicator
- Indicator name and description
- Geographical variation
- Scale (local, regional or national level)
- Data availability and/or show data
- Clarity of the indicator data to stakeholders

The session concluded with a discussion of key indicators to be considered independent of the three criteria sets.

Reports from Breakout Groups on Criteria and Indicators: Economic, Social, and Ecological

Economic: The Economic Group completed its discussion of criteria and indicators and created a draft set which will be circulated separately. The group began to consider what the short list of key indicators should be and began a list:

1. Net availability of water
2. Population
3. Commodity value of water
4. Gallons of water use

Social: Summary of results from the “Social” group

Participants: Peter Fricke, Stephen Gasteyer, John Wells, Karen Solari, John Ingram, Ted Heintz, Robert Hendricks, Diane Segal

The group was comprised of participants from diverse backgrounds: economists, engineers and sociologists. Most discussion was about social aspects of water, looking for common ideas and understanding. The entire discussion was dedicated to refining the categories of indicators, with minimal discussion of individual indicators.

The group compressed the criteria from 5 to 2:

- combined criteria 1 and 2 into the category “links between water and human well being”
- combined criteria 3 and 4 into “social involvement into water issues / social capacity”
- integrated criterion 5, “external dependency of water / social aspects of water transfers”, into the above categories.
- Main/key indicators:
 - Measure the proportion of population who place a “spiritual” value on water
 - Indicator for values – retain indicator for personal contribution as proxy for other values.

- Need an indicator for community's aesthetic value of water (guidelines for policy).
- Overarching indicator: Census data (population, demography)

Ecological Group

Criterion 1, Indicator

Category 1: water quality indicators

Physical and chemical indicators were examined to see if they could be collapsed into one sub-category of factors to describe the current state of the water quality. The group said they required more time to ensure agreement for a "top 10" list but gave some initial indications. For example, they considered percentage of stream miles that meet CWA standards (fishable and swimmable) to be an excellent summary criterion. Biological indicators were reduced to algae, invertebrates, and vertebrates.

Indicator Category 2: water quantity indicators

Groundwater criteria were examined to reduce to volume, depth, transience, flow, and extent. The group also tried to find some measurement of groundwater baseflow and its contribution to base streamflow.

Lakes and reservoirs, coasts, streams and rivers, estuaries, wetlands, precipitation and snowpack. The group did not reach a consensus on these six criteria and needed more time here to reduce them to measurable and definable criteria.

Indicator Category 3, Human water-works infrastructure indicators.

The group proposed changing the category to "Indicators of Potential Human Causal Factors." The "land use" subcategory is as broadly classified as the "causal" factors. The group was unable to significantly reduce these criteria.

Criteria 2, Integrity of Water-Dependent Ecosystems at Multiple Spatial and Temporal Scales

The group was able to reduce and consolidate somewhat and tried to combine much of the biotic indicators into an Index of Biological Integrity (IBI), but was unable to complete this criterion.

Crosscutting Breakout Group (submitted by Warren Flint)

Now that the universe of sustainable water resource indicators have been identified by the roundtable (with the exception of a few possible gaps) it is important for SWRR to truly evaluate these indicators for their implication, relevance, ability to measure progress/decline, integrity, and understanding. At the SWRR December 7, 2004 Meeting a small group of participants convened to discuss how the roundtable might proceed with the evaluation of all data on indicators developed by SWRR to-date and identify "highlight" indicators for focus in the final report that SWRR will be producing in 2005. The Breakout discussion indicated the daunting process before the entire roundtable with regards to the amount of indicator data that has been produced. Each individual in the breakout group expressed their own preference with regards to dealing with this large data base and two predominate approaches emerged.

- 1) From what we might refer to as the **top-down approach**, it was suggested that SWRR identify those major, overarching topic (subject) areas that relate to the sustainability of water resources and then "populate" these topic areas from the 350+ indicators that have been developed over the last year to highlight "key" indicators. Identifying these overarching topic areas would relate directly to the set of criteria that have already evolved from the SWRR process (in association with the 3 systems - economic, social, ecologic) and would thus also characterize the multi-disciplinary stakeholder "vision" for sustainable water resources 20-50 years from now that has been evolving during the SWRR dialogue. Ted Heintz provided an initial list of the kinds of overarching topics that might emerge to fuel further discussion on this approach, which include:

- Gross water availability (annual flow capacity, stocks, and variability)
- Net water availability for withdrawals and amounts withdrawn from the environment (annual flow capacity and variability) (economic criterion 1. the availability is a measure of capacity, the withdrawal is current performance)
- Water “left” in the environment (annual flow capacity, stocks, and variability)
- Water quality (in the environment, in drinking water) (ecological criterion 1)
- Capacity of infrastructure for water withdrawal, distribution and use (economic criterion 1)
- Uses of withdrawn water (this is an indicator category under economic criterion 1 which is a capacity criterion, but it is a better measure of current performance than of capacity)
- Water dependent resources and conditions (stocks, flow capacities and flows) (ecological criterion 2, economic criterion 2 and social criterion 1)
- Uses of water dependent resources and conditions
- Economic benefits (net of economic costs) from uses of water and water dependent resources (economic criterion 2)
- Social effects of uses of water and water dependent resources (social criterion 1)
- Social capacity to manage water resources (social criterion 2)
- “External” drivers: economic growth and development, population and population change, land cover and land use.

2) Others in the breakout group were concerned that information, learning, and the identity of cross-system relationships among all the indicators that SWRR has developed to-date might be compromise if we only took the top-down approach described above. Therefore, some in the group felt more comfortable in an analysis and evaluation process that began with the 350+ indicators, temporarily divorced from their originating category, criteria, and system assignment. This analysis/evaluation process could aptly be named the **bottom-up approach**. This strategy would allow the chance to “get inside” the indicators relative to one another and learn what their intended implications are for comprehensive sustainability measures towards efforts to synthesize and integrate the indicator data as a whole. Developing a set of “factors” to use in evaluating each indicator, similar to what John Wells has already proposed, would enhance the consistent evaluation of indicators by all those involved. These factors might include:

- Duplication – are some indicators saying the same thing?
- Implication – what is the measure really saying, especially when linked back to its category/criteria?
- Relevance – importance related to (a) demonstrating sustainability, (b) the bigger picture, and (b) top national concerns (subjects).
- Ability to measure progress/decline – are things getting better or worse?
- Integrity – is it measurable; is it telling us what we expect; is it scientifically grounded; and is there data available?
- Understanding – does the average citizen know what it means; does the measure teach the public something about water resources?

Once this process is completed the final indicator products could then be re-evaluated in the context of their originating criteria/category/system to provide an added dimension of understanding for each indicator that remains (“headline” indicators), to highlight and develop the rationale that will support each preferred indicator for the eventual user’s added understanding.

Although the above indicator evaluation strategies come-at the issue of “highlight” indicator identification from alternative approaches, it might be possible to incorporate both strategies into a well-designed and effectively facilitated workshop process that would culminate in the integration of the two approaches to identify the ideal set of “headline” indicators for sustainable water resources. That would allow those more comfortable with either the top-down or bottom-up approaches respectively, to work in their preferred strategy toward the goal of integration of the findings. The Crosscutting breakout group believed that this proposal could be accomplished with the involvement of SWRR participants that are willing to, and can commit at least 5 consecutive days of intensive work on this effort, preferably in a place that is isolated from other distractions.

If the SWRR Steering Committee wants to consider the idea of a 5-day workshop, then it must be assumed that the separate “system” groups will have all their indicators accurately articulated and their criteria and categories sufficiently defined to effectively/efficiently enhance the integration process. The kinds of topics that could be considered in the design and facilitation of this workshop might include the following:

- Agreement on factors to use for evaluating the value of a water resource sustainability indicator.
- Identification of those “overarching” topics for water resource sustainability that represent our vision for the future (separate workshop participant track) and analysis of the indicator set to find those indicators that will offer best measurement of these topics.
- Analysis and evaluation of those “key” indicators that best represent cross-system measures for water resource sustainability (separate workshop participant track).
- Integration of the overarching topics work with the key indicator work to develop consensus on the “headline” indicators that best represent our vision for sustainable water resources, from the selection of similar indicators by the two separate approaches.
- Review of the originating categories, criteria, and system definitions for each chosen “highlight” indicator to provide the rationale for their use.
- Identification of available data sets to support the chosen indicators and/or assignment of responsible participants to seek out data sets.
- Discussion of the SWRR Final Report design and content.

The final products from this workshop would be circulated to the entire SWRR participant list for their review and comment. Based upon the feed-back from this complete roundtable review, it will probably be possible to move forward with the analysis and illustration of available data sets supporting the selected “highlight” indicators and development of the Final Report process.

Future SWRR Meetings

The group discussed upcoming SWRR meetings including a small meeting focused on tightening up the indicators to be held in February, a meeting somewhere in the south where a new group of participants could review and comment on the indicators and a meeting in April at the University of Michigan to focus on water research and opportunities for collaboration.