



May 23, 2018

Memorandum for the Record

FROM: NOAA Observing System Council (NOSC)

SUBJECT: Guidance on the Process to Define, Design, Execute, Review & Report on Observing Systems Value and Impact Assessments

1. Introduction and Scope:

NOAA continuously faces questions regarding the global observing systems - questions such as “what observations provide the best return on investment?” and “what combination of observing systems is optimal?” NOAA must assess the value and mission impact of current and future observing systems to answer these questions.

Further, Weather Research and Forecasting Innovation Act of 2017 contained the following language in Title I, Section 107, “must undertake Observing System Simulation Experiments (OSSE) to assess the value and benefits of observing capabilities and systems. OSSEs must be conducted before: (1) acquisition of major government-owned or government-leased operational observing systems with a lifecycle cost of more than \$500 million, and (2) purchase of any major new commercially provided data with a lifecycle cost of more than \$500 million.”

We use a variety of methods to perform these assessments, depending on the mission applications in question (e.g., numerical weather prediction, ocean prediction, situational awareness, etc.). These methods range from (1) expert-based systems such as the NOAA Observing System Impact Analysis (NOSIA) tool, to more quantitative assessment tools such as (2) information-content assessment tools to quantify the inherent value of specific sensors, (3) Observing System Experiments (OSE) to assess impact of current real data on specific applications, and (4) OSSEs as cited in the Weather Act to assess future observing systems. Regardless of the particular assessment, however, the experiment must be framed and reported to best inform investment/divestment decisions.

The NOSC provides the following guidance for performing and documenting these impact assessments to ensure technical consistency and peer-review and to ensure NOAA’s response to stakeholder questions are comprehensive and include a clearly supportable NOAA position.



2. Why is a process needed?

An impact assessment focuses on specific observing systems as they relate to specific performance metrics of specific mission applications. The outcome of the assessment and its extensibility are critically dependent on precisely how the experiment was framed. There are also many critical investment/divestment decision factors, such as real cost, opportunity costs, partnership implications, exploitability and sustainability, that are not addressed by assessment experiments. Accordingly, while impact assessments are important inputs to decision making, results delivered alone and out of context can lead to poorly informed decisions by NOAA, DOC, OMB, and/or Congress. As the governing body for NOAA observing systems, the NOSC has identified the need to plan, execute and report on impact assessment experiments in context of the decisions they are to support and include NOAA line and staff office stakeholders (as appropriate) in each step of the process, with well-understood content development and review responsibilities.

3. Process:

Formulation Stage: The formulation stage is to accurately define what questions need to be answered. Sponsors, users, and potential members of the experiment team must hold a kick-off session to discuss, formulate, and prioritize the questions to be addressed. The outcome of the formulation stage should be documented consensus, in plain language on (1) what decisions are being informed, (2) whether an OSE/OSSE is the right analysis tool or whether an alternative approach should be considered, (3) what applications systems will be tested (global NWP, Hurricane WRF, ..), (4) what is the expected geophysical information impact (e.g., what metrics to use), and (5) what the limitations of the analysis are likely to be.

Experiments Design Stage: Once the questions are clearly formulated, the executors of the assessments will develop an experiment plan, which will include description of the experiments to be undertaken: what configurations and what systems will be used, what periods, what metrics will be assessed, etc. These could be formulated in coordination with the interested sponsors. At the conclusion of this stage, an Experiment Design Review (EDR) should be held. The review team should include the director or deputy director of NOAA's Quantitative Observing System Assessment Program (QOSAP), and may be extended to include other SMEs at the discretion of the sponsor.

Execution: The execution of the impact assessments experiments should include regular tag-ups to keep sponsors and stakeholders apprised of progress and to highlight any potential issues.

Review Stage: Once the assessments have been completed, a final review of the technical assessment should take place. The same review team, or extended at the discretion of the sponsor or the NOSC, should be reconvened to perform a final technical peer review of the results.

Reporting Stage:

- (a) The report should follow the outline below and be led by the QOSAP team in conjunction with the line office sponsoring the experiment. Inputs and vetting should be sought from other line offices that might be impacted by the potential decision that might result.

- (b) To maintain the integrity of the scientific work, the technical presentation should be attached to the report as an appendix.
- (c) A first draft of the report will be routed, after vetting by the technical review team, to the sponsor of the study.
- (d) The sponsor will add the appropriate sections (see outline below) to the report to put this information in context. At this stage, the sponsor will route the draft version of the report to other impacted line offices for a technical review.
- (e) The report will be routed to the communications division to ensure comprehensiveness and that it is written in plain language and does not contain complicated technical statements.
- (f) Budget and Legislative affairs should then review for potential unintended consequences of the report, to bring to the sponsor's attention. At this stage, the final report should be reviewed, a second time, by the other line offices.

Report Template:

Report on the Impact Assessment of XX on the NOAA Environmental System(s) YY

1. Introduction and Context

- a. What questions were asked and why
- b. What metrics were chosen and why
- c. What observing systems were assessed
- d. What systems were used to assess the impact and why

2. Analysis Performed

- a. What we did in layman's terms
- b. Describe the methodology (OSE, OSSE, Other)

3. Results in Context

- a. Interpret the results in layman's terms
- b. Discuss confidence in results and uncertainties
- c. Discuss extensibility of the results (assumptions, limitations, caveats)
- d. Are these results consistent with other studies
- e. Discuss how this contributes to NOAA investment decisions
- f. What other factors are needed to support a decision, e.g. cost, schedule, alternatives

4. Conclusion

- a. What can and what cannot be drawn from these results

- b. State NOAA position/take on the results based on technical findings and strategic/tactical considerations as discussed in section 3.
- c. What are the answers to the questions asked in section 1a

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