

NOAA Response to the SAB-ESMWG
Recommendations on Guidelines for NOAA's Integrated Ecosystem Assessment Program
March 2011

NOAA thanks the Science Advisory Board (SAB) for its thoughtful review of and comments on NOAA's evolving Integrated Ecosystem Assessment (IEA) efforts. The group's interest in and support of NOAA's IEA program is appreciated and welcomed.

SAB recommendation

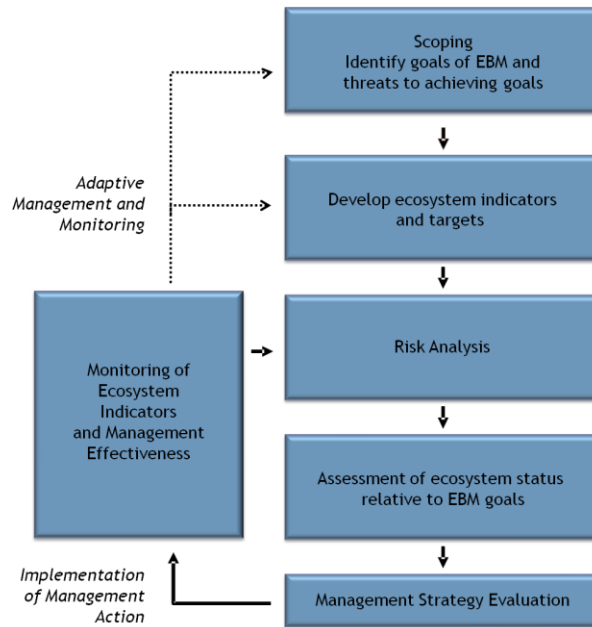
The main recommendation of the SAB is that "NOAA develop guidance for scientists, managers and their partners to develop timely and effective IEAs". NOAA will, over the next year, work to develop a guidance document that lays out the general methodological approach for IEAs, based on experience implementing IEAs to date. Similar to many previous ecosystem-based approaches to management (e.g., multi-species stock assessments, fisheries ecosystem plans, and coastal and spatial marine planning), transitioning from the conceptual to on-the-ground implementation of IEAs is a nascent and considerable task. Thus, how IEAs are established and the exact products that will result is difficult to predict until the full IEA process is implemented and completed, in one or more regions, so that pioneering successes and failures can be mined for lessons-learned and best practices. Nonetheless, NOAA cannot wait until a full IEA region is completed to convey IEA guidance. NOAA sees this as a positive challenge that requires creative thinking and problem-solving by the IEA program and its partners.

Here, NOAA will illustrate how the existing IEA framework, implementation documents and training efforts can contribute to guidance for regional IEA development and address the SAB recommendations. As presented in the letter report, it is clear that the SAB vision of IEAs coincides with what NOAA's IEA framework is meant to accomplish (See Table). The main elements discussed in the letter – strong and continued stakeholder engagement, unambiguous goals and early identification of management objectives, ecosystem interactions including socio-economic considerations, quantification of tradeoffs, identification of data gaps, decision-support system using data and models, and routine updates of assessments – are all integral components of NOAA's IEA process. The alignment of elements outlined by the SAB and NOAA IEA components illustrates NOAA is on the right path, yet NOAA recognizes that the IEA vision must be better communicated to its constituencies and customers.

The IEA Framework

The NOAA IEA program has a clear and systematic approach for the development and implementation of IEAs in NOAA's eight regional ecosystems, which mirror the Large Marine Ecosystems used for Coastal and Marine Spatial Planning. Although there is no single source document that guides IEA development, there is a defined framework and methodology to guide the application of IEAs in each region. This

conceptual framework is based on established, formal decision theory (Keeney RL & Raiffa H 1993) and peer-reviewed work to develop fisheries management strategies (Caddy JF 1999; Sainsbury KJ et. al. 2000; Smith ADM 2007), which can be expanded to include non-fisheries elements of the ecosystem for an IEA. The IEA framework has been published in the peer-reviewed literature (e.g., Levin et. al. 2009) and contains several necessary elements or steps that relate to each other in the following iterative loop:



Additionally, NOAA and partners (Natural Capital Project, several universities, and the National Center for Ecological Analysis and Synthesis) have published an article that illustrates the systematic IEA process (Tallis et al., 2009). This article details case studies depicting the implementation of the process as well as proposes an additional indicator threshold step that could be included in the process.

How the IEA process/framework aligns with SAB recommendations

NOAA defines Integrated Ecosystem Assessments as: “a synthesis and quantitative analysis of information on relevant physical, chemical, ecological and human processes in relation to specified ecosystem management objectives”. By design, NOAA’s IEA approach is a “Decision-Support System” that uses diverse data and ecosystem models to forecast future conditions; evaluates alternative management scenarios; and assesses economic and ecological tradeoffs to guide decisions, implement, and evaluate management actions relative to pre-determined objectives. The system further enables revision of the IEA (adaptive management), and identification of data and information gaps. The approach requires close and continual work with relevant stakeholders and managers throughout the process to identify priority management issues in order to provide them with robust decision-support information. Each of the steps in the loop contributes to this system in the following ways that coincide with SAB vision of IEAs:

IEA Framework	SAB Vision
<p>Scoping: Working closely with stakeholders and managers, priority management issues and targets to be addressed through the IEA process are identified and clearly defined. This is a critical step that enables the iteration of the remaining steps of the IEA process. Scale (ie. geographic scope) and scope of the identified issue(s) drive the assessment process. Engagement with stakeholders and managers begins, but does not end here. Continual communication is needed throughout the process.</p>	<ul style="list-style-type: none"> -Unambiguous goals; early identification of policy and management objectives -Geographic scope of assessment -Relationship to other EBM processes -ID of ongoing methods for stakeholder engagement.
<p>Indicator development: Following scoping of goals, indicators are identified, tested, and prioritized to measure ecosystem status; and evaluate management scenarios, tradeoffs, socio-economic impacts, and management performance.</p>	<ul style="list-style-type: none"> -Broad consideration of key interactions among ecosystem components -ID of data gaps, key risks and uncertainties
<p>Risk analysis: Identifies relationship between each indicator and potential threats to assess current state of each and probability that an indicator will reach an undesired state.</p>	<ul style="list-style-type: none"> -Broad consideration of key interactions among ecosystem components. -Consideration of ecological, social and economic processes driving the current system; how they are may change in the future -ID of data gaps, key risks and uncertainties
<p>Assessment of Ecosystem Status: Integration of indicators and risk analysis to establish overall status.</p>	<ul style="list-style-type: none"> -Broad consideration of key interactions among ecosystem components. -Consideration of ecological, social and economic processes driving the current system; how they are may change in the future -ID of data gaps, key risks and uncertainties
<p>Management Strategy Evaluation (MSE): Building on previous steps, MSE allows: evaluation of management actions, relative to performance and effectiveness; assessment of action relative to target and linked elements in the system (including socio-economic); facilitates analysis of trade-offs within and across plans; and provides manager or stakeholder with informed management options.</p>	<ul style="list-style-type: none"> -Broad consideration of key interactions among ecosystem components. -Consideration of ecological, social and economic processes driving the current system; how they are may change in the future -ID of data gaps; key risks and uncertainties -Quantification of trade-offs among ecosystem services potentially resulting from current, future management decisions

<p>Monitoring and Evaluation: Once the manager or stakeholder chooses the option they feel is the best approach and implements it, this step facilitates monitoring against the defined indicators to assess effectiveness which enables adaptive management.</p>	<p>Process for external peer review and routine updates of the assessments</p>
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Regional consistency through a national framework

The national framework provides IEA practitioners a consistent, yet flexible, architecture to meet regional needs. Headquarters IEA staff serve a coordinating function to ensure regional IEA implementation adheres to the national framework and facilitates communication within and among regions.

While IEAs are in their infancy, transfer of IEA architecture, methods, and information occurs across regions. This happens informally, via e-mail and phone, as well as formally in IEA planning and ecosystem modeling workshops (e.g., Atlantis workshop in the Gulf of Mexico and a model and ecosystem indicator workshop for IEAs in the northeast), and data management demonstrations by the NOAA National Coastal Data Development Center to facilitate expansion of data services to each region. Discussions are underway to establish an annual NOAA IEA Principal Investigator meeting (pending funding) to facilitate the exchange of data analysis, modeling techniques, progress on IEA implementation, and sharing of best practices and lessons learned between regions. NOAA expects that progress will be iterative as experience implementing IEAs is gained.

Next Steps

Much like the SAB, NOAA recognizes that scoping and outreach to relevant stakeholders must be comprehensively addressed if the IEA process is to be successful. It is understood that only through adequate stakeholder outreach that management objectives will be thoroughly vetted and expectations transparently managed. Additionally, through such action the IEA methodology can be communicated for enhanced understanding and guidance about the framework. Such processes, however, are not trivial and require extensive resources (e.g., fiscal, personnel, and time). Thus, this element has lagged behind some of NOAA's other IEA work. It is acknowledged that scoping and stakeholder engagement is critically important and though it has been slow to take hold, NOAA recognizes this as a significant issue and is making efforts to improve this step of the IEA process.

For example, one peer-reviewed publication by IEA partners in NOAA (deReynier et al., 2010) discusses the importance and necessary elements for bringing stakeholders, managers, and scientists together through all steps of the IEA process. This document details a five-step IEA scoping process: (1) Education; (2) Regional stakeholder meetings; (3) Communication of stakeholder meeting results; (4) Ecosystem-wide stakeholder meetings; and (5) Communication of ecosystem-wide stakeholder meeting

results. This can and should be repeated through multiple steps/phases of the IEA process (e.g., management objective identification, indicator development, management strategy evaluation).

Within regions, the IEA teams are engaging with relevant councils (e.g., fishery management councils), regional bodies (e.g., West Coast Governors Agreement; Gulf of Mexico Alliance), and academic institutes (e.g., Northern Gulf Institute) to not only educate and communicate to the community, but to identify and leverage additional expertise and capacity in each region. These Federal and non-Federal interactions are regionally specific and are not limited to those mentioned here. These relationships will be fostered and enhanced as IEAs gain momentum. Additionally, NOAA has plans to engage local Sea Grant extension offices, National Estuarine Research Reserve System staff, and fisheries management and sanctuary advisory councils to learn from and leverage their processes and experiences.

Finally, and importantly, NOAA's IEA and CMSP programs have been working closely together to define how our complementary efforts towards the implementation of an ecosystem approach intersect and align, and in particular how IEAs can contribute to the needs of CMSP (please see NOAA's sister response to this IEA response). One aspect of this of relevance to scoping and outreach is that the IEA regional teams will be working with the CMSP regional teams to learn from, participate in, and benefit from the outreach and stakeholder engagement through the CMSP Regional Planning Bodies. Based on the needs identified by CMSP Regional Planning Bodies, IEAs could contribute to CMS planning in two ways: (i) by filling critical information gaps to develop plans; and (ii) by informing sectoral management decisions made by action agencies implementing the plans.

By focusing efforts on stakeholder engagement and regional planning needs, NOAA hopes to foster a thorough understanding of and to enable the provision of guidance about the IEA approach in all eight NOAA regional ecosystems where the IEA approach will be implemented.

Conclusion

NOAA's IEA approach has a clear methodology and framework, and although not in the form of a "guidance document," there are some products under development which, when completed, will be made available to the SAB (e.g., "Technical background for an Integrated Ecosystem Assessment of the California Current" that describes the methods used to engage stakeholder input on ecosystem indicators and a scientific method select meaningful; an executive summary of this document for education and outreach purposes; a website <http://www.st.nmfs.noaa.gov/st7/iea/>). These existing IEA products, those mentioned from the peer-review literature, as well as a more robust stakeholder engagement and outreach effort, can contribute to the development of general guidance for IEAs.

NOAA would welcome and appreciate further dialog from the SAB on how NOAA might, over the next year, develop approaches for both outreach and guidance materials, including a generalized work plan, for IEA practitioners and end users. This could be accomplished by forming a subgroup of the SAB-ESMWG to work directly with IEA staff on communication approaches.

In conclusion, NOAA thanks the SAB for its effort and support. NOAA wishes to sustain a dialog so as to benefit from continued insight and guidance from the SAB as the IEA effort grows and evolves nationally across each of NOAA's eight regional ecosystems.

References

- Caddy JF (1999) Fisheries management in the twenty-first century: Will new paradigms apply. *Rev Fish Biol Fish* 9: 1–43.
- deReynier, Y. L., P. S. Levin, and N. L. Shoji. (2010). Bringing stakeholders, scientists, and managers together through an integrated ecosystem assessment process. *Marine Policy* 34:534-540
- Keeney RL, Raiffa H (1993) *Decisions with multiple objectives: Preferences and value tradeoffs*. Cambridge (UK): Cambridge University Press. 592 p.
- Levin PS, Fogarty MJ, Murawski SA, Fluharty D (2009) Integrated Ecosystem Assessments: Developing the Scientific Basis for Ecosystem-Based Management of the Ocean. *PLoS Biol* 7(1): e1000014. doi:10.1371/journal.pbio.1000014
- Sainsbury KJ, Punt AE, Smith ADM (2000) Design of operational management strategies for achieving fishery ecosystem objectives. *ICES J Mar Sci* 57: 731–741
- Smith ADM, Fulton EJ, Hobday AJ, Smith DC, Shoulder P (2007) Scientific tools to support the practical implementation of ecosystem-based fisheries management. *ICES J Mar Sci* 64: 633–639
- Tallis, H., Levin, P.S., Ruckelshaus, M., Lester, S.E., McLeod, K.L., Fluharty, D.L., Halpern, B.S. (2010) The many faces of ecosystem-based management: making the process work today in real places. *Marine Policy* 34: 340-348