

Vision Area	Key Question (If relevant)	LO	Comment	Status	Response
General	NA	SAB	Urge NOAA to maintain a strong and well-articulated focus on the health, diversity, productivity and sustainability of the nation's marine and coastal ecosystems.		This is emphasized in the opening paragraph of Vision Area 2.
General		SAB	Did not see reference to the two NOAA high-level priorities; namely (1) produce the best weather system in the world and (2) grow the American economy through the sustainable management of marine resources, or the "Blue Economy." Those should be referenced up front.		Reference is located in "Summary of Vision Areas and Key Questions", Paragraph 4.
General	NA	SAB	Wonder if this should be called a "plan" per se. A plan generally includes milestones, budget, priorities and other relevant benchmarks against which one can measure progress. I believe the previous document was called "Research and Development at NOAA." This plan could be an update to that or called something like NOAA Research and Development Strategy or Priority Areas		Added text to the first paragraph under the Purpose section of the introduction that explains the purpose of this Plan - to provide direction on NOAA's R&D - and the mechanisms by which implementation will occur. Calling the document the NOAA R&D Plan maintains consistency with previous documents (e.g., Research and Development at NOAA: Five Year Research and Development Plan 2013-2017).
General	NA	SAB	It's not clear who the audience of the R&D Strategic Plan is? Is it for the NOAA administration to help strategic choices or is to the science community, the media, the public, etc.?		Anticipated internal and external uses of the Plan are included in the Purpose section of the introduction. While the document as a whole is intended to provide information for anyone interested in NOAA R&D activities, targeted executive summaries will be provided for more focused audiences (e.g., Congress)
General	NA	SAB	Be clear about the audience for the Plan. Narrow the audience down so that the plan is useful. The SAB believes the audience for this Plan should be internal; then consider how third parties that influence the NOAA budget might use the Plan.		Anticipated internal and external uses of the Plan are included in the Purpose section of the introduction. While the document as a whole is intended to provide information for anyone interested in NOAA R&D activities, targeted executive summaries will be provided for more focused audiences (e.g., Congress)
General	NA	SAB	What's the time period? A real strategic plan needs to define the scope. Are we looking for the strategy for the next year, next 5 years, next 10 years?		Time frame is 7 years (2020-2026), Purpose section.
General	NA	SAB	A strategic plan is basically about meeting goals with specific strategies, establishing priorities and the resources to meet those priorities. Don't see any of that.		Added text to the Purpose section of the introduction that reads "NOAA will use this document for planning and prioritizing projects and guiding investments for NOAA and NOAA-funded R&D areas. Prioritization of the projects and activities that NOAA undertakes, based on budget realities and emerging needs, are captured in Line Office annual guidance and operating plans."
General	NA	SAB	Overall there is much to like about the outline. - It's rooted in the framework of higher-level NOAA, DoC, and executive branch planning, and Congressional legislation - It's focused on a few key, broad questions - It aims at improving the services across NOAA's product line/portfolio - It addresses R2S transition issues - It emphasizes evaluation Suggest each of the "vision areas" be relabeled" as goals. There is an overarching vision for the document and the three areas are really goals to attain the vision in my opinion.		Calling these vision areas allows for multiple goals under each topic.
General	NA	SAB	Suggest rewording each of the highlighted questions under each vision/goal to be a positive statement rather than a question. For example, "How can forecasts and warnings for severe weather and other environment phenomena be improved" to "Improve forecasts and warnings for severe weather and other environment phenomena" or even something like "Reduce impacts of severe weather and environment phenomena (natural disasters)."		The key questions represent the lack of some knowledge or capability that is needed to achieve NOAA's vision areas. Unanswered questions provide the impetus to do R&D.
General	NA	SAB	Instead of structuring the R&D Plan around a series of questions, use simple, declarative statements that relate to the NOAA mission. Each of the highlighted questions could be labeled as objectives under each goal		The key questions represent the lack of some knowledge or capability that is needed to achieve NOAA's vision areas. Unanswered questions provide the impetus to do R&D.
General	NA	SAB	Hard to tell if each bullet is a separate R&D area or whether they are just factors to be considered under each question, but that is a detail to be sorted out in the plan.		The key questions represent the lack of some knowledge or capability that is needed to achieve NOAA's vision areas. Unanswered questions provide the impetus to do R&D.
General	NA	SAB	As indicated in the outline, it is hard to find key areas of emphasis, such as Polar Science, Water Prediction, Observations and Data Management, and Decision and Social Science Assessments. These areas of emphasis are buried in the long list of research areas.		The bullets in the outline have been converted to R&D objectives under the key questions
General	NA	SAB	Overall, believe the key elements are included in the outline, along with the public comments that were solicited		The key areas of emphasis are indicated by the key questions, which are represent the lack of some knowledge or capability that is needed to achieve NOAA's vision areas
General	NA	SAB	Whatever the plan is called, it cannot appear as an unconstrained list and in some way needs to relate to the budget. Not suggesting including the budget, but the "plan" has to have budget realism for implementation and to be relevant.		Comment does not suggest change.
General	NA	SAB	Address research-to-practice or "bench-to-bedside" analyses.		Added text "Prioritization of the projects and activities that NOAA undertakes, based on budget realities and emerging needs, are captured in Line Office annual guidance and operating plans."
General		SAB	Though the enabling condition "partnerships" is mentioned in the intro, it does not appear to be picked up for discussion in the topic areas.		Reference is located in Guiding Principles for R&D section, "Transitioning Research to Operations....."
General		SAB	The situation analysis should help inform and illuminate overarching themes, topics, and approaches to R&D in the opening section, including identifying cross-cutting topics relevant in general and throughout the plan. These include the cross-cutting relevance of: social sciences, climate research, data science and how NOAA will address, ensuring access, quality and relevance; transdisciplinary research that cuts across the "stovepipes" of NOAA line offices; integration, to include human impacts on earth systems-the complexity and how NOAA will address interfaces in the research enterprise		Partnerships are discussed in the introduction and the guiding principles. Specific partnerships are outside of the scope of the plan. They will be determined by the individual projects/activities conducted to meet the plan's objectives and are recorded in the NOAA Research and Development Database.
General		SAB			A cross-cutting themes section has been added to map where where topics can be found across key questions. For the transdisciplinary research and integration topics, text has been added to the Summary of Vision Areas and Key Questions section that states "Since its creation, the NOAA vision, mission areas, and science activities have been guided by the applicable authorities that drive NOAA as a science-based agency with focused disciplines (e.g. fisheries, oceans, research, satellites, weather). NOAA has matured as an agency, past focus on R&D within a single discipline toward increasing integration between multiple disciplines (e.g. biological, physical, economic, social, behavioral sciences), with increased partnerships that research pressing topics to address the needs of the diverse communities NOAA serves. Cross-NOAA R&D includes transdisciplinary efforts that vastly improve the use of new and established observational tools (e.g. advanced satellites, drones) to efficiently characterize and predict the state of the atmosphere, the ocean-air interface, the interface of fresh-salt water, and parameters needed to mitigate effects of climate change. "

			Begin the R&D Plan with a statement of how the world looks—akin to a high-level situation analysis of key context that affects NOAA's R&D and description of some of the current key drivers that relate to the NOAA mission.. The R&D plan is a visionary document about how scientific research should be done in the 21st Century and the impact of the results of that science on people's lives and the resources NOAA helps to manage.		The "Mission and Vision" and "Purpose" sections of the document talk about the context for NOAA R&D and current key drivers related to NOAA's mission. In addition, each key question has an introductory paragraph that relates the relevance of NOAA R&D to people/property/resources.
General		SAB			
General		SAB	After setting the stage as above, go into details in the Plan in terms of the Vision Areas posed in the outline.		Details of the vision areas can be found in "Summary of Vision Areas and Key Questions" in the introduction
			State the objectives of the Plan clearly and prioritize key principles and themes. Narrow the items covered in the Plan to what is realistic and attainable in a six or seven-year period.		
General		SAB			The objectives in the Plan are stated in bullet format under each key question, and the document is intended for the next 7 years
			Enabling Elements for R&D could reference the need for garnering political support and integration (using a systems framework).		
Intro	NA	SAB			The enabling elements for R&D are taken from NAO 216-115a. Garnering political support is outside the scope of NOAA's R&D Plan.
			There seems to be a stronger focus on research/science than on development		
					We agree. This is consistent with the transition funnel, recommended in the 2004-2005 SAB review, which explains the top of the R&D funnel as research, narrowing towards development and transition. The reasoning behind this approach is that not all research is successful or a good candidate for development and transition, therefore, NOAA utilizes more research than development.
Intro	NA	SAB			
			Since NOAA infrastructure is extensive and critical, it might be useful to discuss it separately from partnerships.		Facilities and Infrastructure are listed separate from partnerships under "Guiding Principles for R&D", consistent with NAO 216-115a.
Intro	NA	SAB			
			Reducing societal impacts is not possible without studying how society responds dynamically to threats. It is not sufficient to put all of social science research into one bullet under Vision Area 3.		Social science has been added to Vision Area 1 through the addition of key question 1.4 (and subsequent objectives) which reads "How can NOAA enhance communications, products, and services to enable informed decision-making?". Social science has been added to Vision Area 2 through the addition of key question 2.7 (and subsequent objectives) which reads "How can NOAA utilize and improve socioeconomic information to enhance the sustainability of ecosystem services, public engagement practices, and economic benefits?".
Vision Area 1		1.1 SAB			
			How can improved forecasts be used for better responses to save life and property? Address how system, community and individual responses can avoid climate change and mitigate its impact.		Objectives related to this topic have been added via key question 1.4 and read "Assess how people receive, interpret, perceive, and respond to weather, water, climate, and space information, especially warnings, with respect to protective action decision-making" and "Enhance the integration of social, behavioral, and economic science into weather, water, and climate research and development to understand how to blend forecast advancements with societal needs and response."
Vision Area 1		1.1 SAB			Major findings of the NASEM report include research on the weather enterprise system, factors influencing risk assessments and responses, and messaging. These topics are addressed in key question 1.4.
			Section only tangentially addresses societal impacts, with general terms for subtopics (decision support, risk communication). Human activities are missing in this vision statement. Recommendation: Incorporate the vision from the 2018 NASEM report "Integrating Social and Behavioral Sciences within the Weather Enterprise" throughout Vision Area 1.		
Vision Area 1		1.1 SAB			
			Forecasts and warnings may be made more useful by understanding and addressing the socioeconomic issues that influence whether and under what conditions people hear or heed these warnings		Objectives related to this topic can be found in key question 1.4 and read "Advance understanding of decision-making needs, capacity, and use of weather, water, climate, and space weather information", "Define and implement optimal predictive information content, including risk thresholds, uncertainty, and lead-times, to design products and services that enable decision-making and maximize effectiveness of forecast improvements", and "Assess how people receive, interpret, perceive, and respond to weather, water, climate, and space information, especially warnings, with respect to protective action decision-making."
Vision Area 1		1.1 SAB			These research topics can fit under the objectives listed in key question 1.4.
			Add research on risk perception, trusted sources, the role of experience in judging threats, as well as further research on risk communication. Harness potential for complementary social science to allow NOAA to more fully achieve its goal.		
Vision Area 1		1.1 SAB			
			Outside the Weather Bill, major changes in technology, science, and involvement of the private sector in the weather enterprise need to be captured. Many other agencies provide data, models, and science that enable NOAA's weather enterprise (e.g., NASA, DoE, DOI, NSF, etc.). NOAA should be expanding into other areas—e.g., better air quality forecasting, wildfire smoke forecasting, etc. Therefore, NOAA should take a leadership role in bringing together all the players—academia, other agencies, private sector, and NGOs—to help design the NOAA weather enterprise for the next decades		The objective under key question 1.2 "Advance research on atmospheric chemistry, composition, and processes, identifying their influence on air quality, climate, and weather systems." encompasses air quality, wildfire smoke, etc. Implementation is outside the scope of this plan.
Vision Area 1		1.2 SAB			
			Use of atmospheric chemistry to understand and better predict weather and climate is crucial: example, boundary layer.		Objective under key question 1.2: "Advance research on atmospheric chemistry, composition, and processes, identifying their influence on air quality, climate, and weather systems." The plan does not go into further specifics, as this is more appropriate at the line office/ program / lab level.
Vision Area 1		1.2 SAB			
			The only topics related even vaguely to climate change are in Vision Area 1. Climate change research is an important component of the NOAA mission and deserves more prominent discussion		At the end of the document is a "Cross Cutting Themes" table which addresses themes such as climate change that can be found in objectives across vision areas and key questions. Under key question 2.1 "Increase knowledge and understanding of the mechanisms and combined effects of environmental changes resulting from atmospheric, ocean, and land-based forces on marine species and ecosystems. Develop analytical models and tools to understand and quantify impacts of environmental change in large marine ecosystems and species of interest, including protected species. Expand the ability to predict changes in ecosystems and ecosystem components in response to environmental drivers (e.g., climate, extreme weather, pollution, altered habitats)." Under key question 2.2 "Develop environmental indicators that facilitate increased ecosystem understanding and sustainable coastal development and recreational fishing. " Under key question 2.4 "Understand the processes and impacts of temperature, ocean acidification, sea level rise, and harmful algal blooms on marine organisms, ecosystems, and coastal communities."
Vision Area 1		SAB			

Vision Area 1	1.2 SAB	<p>It is encouraging to see state of the Climate included. However, the outline blurs/blends together elements on climate change impacts and existing observed changes with elements relevant to modeling and projections of change. These should be more clearly distinguished and delineated.</p> <p>These are good questions but expect to see in a strategic plan "strategies", which include actions, trade-offs and establishing of priorities.</p>	<p>Under the objectives listed for key question 1.2 modeling and projections of change are found in the first five objectives and impacts are listed in the objectives 6 and 7.</p>
Vision Area 1	SAB		<p>Added text to the Purpose section of the introduction that reads "NOAA will use this document for planning and prioritizing projects and guiding investments for NOAA and NOAA-funded R&amp;D areas. Prioritization of the projects and activities that NOAA undertakes, based on budget realities and emerging needs, are captured in Line Office annual guidance and operating plans."</p> <p>Key Question phrasing changed to "How can the utility of space weather products and services be enhanced?"</p>
Vision Area 1	1.3 SAB	<p>Question 3 implies that the current services are sub-standard. Should it be more focused on enhancing utility of space weather products and services?</p> <p>Add "integrated framework" to the high precision GHG monitoring</p>	
Vision Area 1	SAB	<p>Integrate social, behavioral, physical and data sciences to design and achieve an effective R&amp;D enterprise that moves research into practice in partnership with the diverse communities NOAA serves</p>	<p>When the objectives were written, GHG monitoring was encompassed in and required to achieve several objectives, and therefore not specifically mentioned. In doing so, GHG monitoring is integrated into several objectives.</p> <p>Added text to the 3rd to last paragraph of the Purpose section of the introduction "useful applications that benefit the communities NOAA serves". Changed the Summary of Vision Areas and Key Question first paragraph, last sentence to read "NOAA has matured as an agency, past focus on R&amp;D within a single discipline toward increasing integration between multiple disciplines (e.g. biological, physical, economic, social, behavioral sciences), with increased partnerships that research pressing topics to address the needs of the diverse communities NOAA serves .</p>
Vision Area 2	SAB	<p>Beyond (useful) economic dimensions, there is social science research on what decision-makers need to support decision-making as well as what they don't need and the barriers to adaptation that are most significant. That type of insight would be very valuable to inform the development of adaptation methods and manuals.</p>	<p>Added objective to key question 1.4 to read "Advance understanding of decision-making needs, capacity, and use of weather, water, climate, and space weather information."</p>
Vision Area 2	SAB	<p>Recommendations from the 2018 NASEM report apply: social and behavioral science leadership, capacity, and focused expertise and efforts are critical to achieve progress in this vision area.</p>	<p>Major findings of the NASEM report include research on the weather enterprise system, factors influencing risk assessments and responses, and messaging. These topics are addressed in the objectives under key question 1.4</p> <p>Addressed in Guiding Principles "Partnerships".</p>
Vision Area 2	SAB	<p>NOAA should explicitly include in its strategic plan the development of local, national and international partnerships and engagement strategies to assure that research efforts are strategic and synergistic with those of other agencies as well as communities and nations.</p> <p>Specific research topics under each heading appear to give little emphasis to sustainability and the role of coastal and marine ecosystems. It is impossible to understand the "sustainable use of ocean and coastal resources" without an understanding of ecosystem functions and interactions (including an understanding of interactions between humans and natural ecosystems). There are a few topics that address ecosystem outcomes (e.g., combined effects of environmental changes on species and ecosystems; model, monitor, and forecast events that degrade coastal habitats; evaluate impacts and economic tradeoffs of ocean acidification, sea level rise, and harmful algal blooms). However, for the most part, research to understand aquatic ecosystems is given minimal emphasis</p>	<p>See intro paragraph for vision area 2. Also, the summary of vision area section, Vision area 2 "NOAA needs to undertake basic R&amp;D such as exploring uncharted areas of the ocean, developing the knowledge, tools and technologies to understand, protect and restore healthy coastal and marine ecosystems..." Key question 2.2 bullet 4 reads "Develop environmental indicators that facilitate increased ecosystem understanding and sustainable coastal development and recreational fishing.</p>
Vision Area 2	SAB	<p>There seems to be a disconnect between topic headings that imply research on issues such as sustainability and healthy ecosystems, and a lack of specific and wellarticulated research topics in these areas. Similarly, Section 1 (addressing sustainable aquaculture) does not appear to include topics covering ecosystem impacts and interactions (except to the extent covered by disease transfers and space-conflicts).</p> <p>Notably absent is any reference to ecosystem "services" (whether using that language or other terminology).</p>	<p>Added text to key question 2.3 first objective: "Develop models, manuals, and new technologies to better determine ocean spaces suitable for aquaculture, protect natural ecosystems, and minimize space-use conflicts. Objective 3: Conduct studies on fish genetics and applied genomics, disease, and hatchery feed stocks for enhancing aquaculture and understanding the impacts of aquaculture on the natural environment.</p> <p>Intro paragraph text changed "Coastal, ocean and Great Lakes resources are vital to the coastal communities that depend on them for ecosystem services (e.g. food, energy production, storm mitigation, recreation, and economic prosperity). Declines in the ecosystems that provide these services directly impact human health and well-being. Already mentioned in 2.1 lead paragraph.</p> <p>Intro paragraph text changed "Sea level rise, ocean acidification, and warming, challenge the resilience of coastal communities, change habitats....."</p>
Vision Area 2	SAB	<p>The section understandably has a discussion of ecosystems (and a traditional juxtaposition of ecosystems and ecosystem protection vs extraction/use/development). While this is relevant, it overlooks a focus on ecosystems AS infrastructure and as linked to economic outcomes, coastal resilience, etc.</p> <p>In each of the vision areas, recognize explicitly that NOAA long-term research on the state of the oceans, atmosphere, and their interactions provides critical baseline information for understanding impacts and shorter-term developments.</p>	
Vision Area 2	SAB	<p>Clarify "environmental phenomena", timescales for the phenomena of interest, and using "funnel approach" (from global to local) to ensure that the processes/linkages and interactions across space and time are captured.</p> <p>Move the focus beyond precipitation and temperature only</p>	
Vision Area 1	SAB		
Vision Area 2	2.3 SAB	<p>Address new genomics tools to allow aquaculture to accelerate selective breeding efforts by utilizing marker assisted selective breeding...</p>	<p>Modified objective in key question 1.2 to read "Identify causes for observed regional and seasonal differences in U.S. trends (e.g. temperature, precipitation, visibility, wind, clouds) across latitude, longitude, altitude, and topography to improve predictions and projections, especially for extreme events. "</p> <p>Added selective breeding to bullet 3</p>
Vision Area 2	2.3 SAB	<p>Address selective breeding efforts for shellfish as best hope of resolving disease impacts on aquaculture...</p>	<p>Added selective breeding to bullet 3</p>
Vision Area 2	2.3 SAB	<p>Address planning tools that enable decadal scale planning of coastal/estuarine conditions and how space-use conflicts will be influenced by climate/SLR</p>	<p>Modified objective in key question 2.3 to read, "Develop decision support processes for aquaculture permitting that incorporate scientific results and consideration of future conditions into the decision making process."</p>
Vision Area 2	2.3 SAB		

		If satellite images could be of sufficient resolution to identify that tracks of small boats in crowded waterways it might be possible to determine where recreational and commercial boats actually do traffic and where they don't, making arguments about multiple use conflicts fact based instead of subjective		This recommendation may fit within the objective in key question 2.6 that reads "Advance coastal and offshore surveying and mapping technologies, tools, and methodologies to ensure safe navigation, support maritime commerce, discover archaeological and heritage sites, identify marine hotspots and spawning aggregation sites, and expand scientific understanding of the seafloor for economic activities, such as resource extraction siting" as well as the objective in key question 2.3 that reads "Develop models, manuals, and new technologies to better determine ocean spaces suitable for aquaculture, protect natural ecosystems, and minimize space-use conflicts."
Vision Area 2	2.3 SAB	This doesn't seem like a high priority – or it may need further explanation. What is needed are models that enable the interactions between development, and different fishing pressures to be better understood and to allow simulation of the effects. Should the role of MPAs be explicitly included here?		The objective under key question 2.3 has been expanded to read "Develop models, manuals, and new technologies to better determine ocean spaces suitable for aquaculture, <b>protect natural ecosystems</b> , and minimize space-use conflicts."
Vision Area 2	2.3 SAB	For each of these, an example area (or two) of potential application is needed. Also, which are studies/knowledge development, which are tools and which are technologies?		The objectives under key question 2.2 include potential applications (e.g., "to optimize sustainable commercial harvest and recreational opportunities while conserving protected species") and include whether knowledge, technology, tools, etc. are being developed
Vision Area 2	2.2 SAB	Address "Improved needs assessment and market analyses" and "Indicators for ecosystem sustainability"		The objective "Develop next-generation fisheries and protected species stock assessments that incorporate the effects of environmental and climate change on stock dynamics, and <b>socioeconomic drivers of fisher behavior and fishing communities along with</b> habitat-quality models to optimize sustainable commercial harvest and recreational opportunities while conserving protected species" addresses needs assessments and socioeconomic drivers. The objective "Develop environmental indicators that facilitate <b>increased ecosystem understanding and</b> sustainable coastal development and recreational fishing" addresses indicators for ecosystem sustainability.
Vision Area 2	2.2 SAB	This is an important research question for NOAA. However, the sub-bullets that define this topic do not appear to articulate research that addresses "healthy and diverse ecosystems" directly, but rather speak to (1) Nextgeneration species stock assessments, (2) Illegal, unreported, and unregulated fishing, (3) Bycatch, and (4) Indicators for coastal development and recreational fishing. All of these influence ecosystems in various ways, but there appears to be little emphasis given to research involving ecosystems themselves (unless this is somehow captured under "indicators for coastal development...").		The objective "Develop environmental indicators that facilitate <b>increased ecosystem understanding and</b> sustainable coastal development and recreational fishing" addresses fisheries ecosystem research
Vision Area 2	2.2 SAB	Bullet 5: Do you mean what are the costs and benefits? And the distribution of those costs/benefits – who pays? Who gains?		Costs and benefits are no longer in this objective. The Research Balance guiding principle states "R&D activities are investments in the future; therefore, tradeoffs must be assessed among competing investment options in terms of focus, benefits, costs, and risks."
Vision Area 2	2.2 SAB	Address ecosystem modeling here		The objective "Develop analytical models and tools to understand and quantify impacts of environmental change in large marine ecosystems and species of interest, including protected species" in key question 1.1 addresses ecosystem modeling
Vision Area 2	2.1 SAB	Scale up restoration techniques: Unclear what is meant by this. It might mean improved planning tools to enable the derivation of greater system benefit from multiple smaller investments. That would be a useful addition.		Added text to objective in key question 2.1 to read "Improve and scale-up existing and innovative restoration techniques (e.g. <b>coral propagaton and planting on damaged reefs</b> ) for coastal and marine ecosystems."
Vision Area 2	2.1 SAB	. Address effects of improved training and professional development.		Training and professional development is mentioned in the "Workforce Excellence" portion of the "Guiding Principles for R&D" section in the introduction
Vision Area 2	2.5 SAB	Oil spill response technologies - This seems out of place here and would be better in knowledge tools and technologies above.		The objective "Support domestic and international R&D focused on innovative oil spill and other incident response technologies and procedures, particularly those suitable for the Arctic environment" is relevant to key question 2.5 as it relates to safety improvement of increased marine vessel traffic
Vision Area 2	2.5 SAB	Model, monitor, and forecast events that degrade coastal habitats: This has to be more than just events. We need to model, monitor and predict (maybe not forecast) the effects of different activities. Reframe this to focus on both chronic and acute stresses – and enable seeing one in the context of the other. Storm damage vs SLR? Also suggest adding behavior		Modified objective in key question 2.4 to read "Improve capabilities for modeling, monitoring, and <b>predict chronic and acute stressors</b> that degrade coastal habitats and resources (e.g. hypoxia), or pose human health risks (e.g. harmful algal blooms, pathogens, and rip currents)."
Vision Area 2	2.4 SAB	Evaluate impacts and economic tradeoffs of ocean acidification, sea level rise, and harmful algal blooms: Clarify economic tradeoffs: Does this mean economic consequences? Who is suffering those consequences?		Economic tradeoffs are no longer mentioned in this objective, which now reads "Understand the processes and impacts of temperature, ocean acidification, sea level rise, and harmful algal blooms on marine organisms, ecosystems, and coastal communities."
Vision Area 2	2.3 SAB	Growers could benefit from advances in labor saving devices – engineering solutions are needed to lessen the reliance on back-breaking, repetitive manual labor NOAA could develop a competition to incentivize the development of approaches to shellfish farming that utilize areas with less conflicts such as deep-water sites on some of the larger estuaries, or moderate depth sites in some of the larger estuaries like Delaware Bay. These sites will require larger vessels and work platforms that can survive heavy seas and gear that can stand up to storms		Modified objective in key question 2.3 to read "Develop and improve <b>technologies (e.g., marine aquaculture feeds, automated systems) to reduce costs and labor.</b> "
Vision Area 2	2.3 SAB	Continue to worry about the increasing frequency and intensity of HAB blooms of <i>Cochlodinium</i> which, while non-toxic to humans, are causing mortalities of shellfish and probably fish and crustaceans from the mid-Atlantic to southern New England. This species deserves greater attention.		This activity falls under the larger objective "Develop models, manuals, and new technologies to better determine ocean spaces suitable for aquaculture, protect natural ecosystems, and minimize space-use conflicts" in key question 2.3
Vision Area 2	2.4 SAB			<i>Margalefidinium</i> (previously <i>Cochlodinium</i> ) is now mentioned specifically in the HABs research highlight for key question 2.4. Harmful algal blooms are included in key question 2.4 objectives "Understand the processes and impacts of temperature, ocean acidification, sea level rise, and harmful algal blooms on marine organisms, ecosystems, and coastal communities" and "Improve capabilities for modeling, monitoring, and predict chronic and acute stressors that degrade coastal habitats and resources (e.g. hypoxia), or pose human health risks (e.g. harmful algal blooms, pathogens, and rip currents)".

		In each of the priority areas use of deep learning, AI, machine learning, big data, cloud computing terms are included. While this isn't a very descriptive document, it is somewhat surprising that open source software (OSS) is not highlighted as a priority, especially since all of these computing advances rely so heavily on open source libraries and many of the active researchers work within an open source framework. It seems that OSS should be mentioned alongside these high-level priorities for NOAA. It seems like this would also respond to OMB m-16-21. Developing the capabilities for these new types of analysis and model development could be more easily enabled through code efficiencies developed through OSS algorithms for data processing, essentially developing OSS enterprise solutions. Using AI, DL, DNN, ML, etc. all require large training datasets and accurate uncertainty estimates. The development of open matchup datasets for satellite and in situ / model data is a critical first step that I don't see mentioned. ESA has already funded a number of these through their CCI program, it would be useful (and collaborative) for NOAA to contribute to this effort for the NOAA satellites, which would also move NOAA closer to advancing some of the advanced computing the NOAA is prioritizing.	OSS is one component of the objective "Pursue a unified modeling approach to apply a common framework for interoperability across disciplines with support from the external research community."
Vision Area 3	3.3 SAB	Social Sciences: The NOAA R & D plan outline identifies three important vision areas for future research. They identify a number of weather and climate science initiatives, but particularly under vision areas number one and number two, the outlined research agenda does not clearly articulate a significant role for social science in bridging the gap between scientists and potential forecast and warning users. Reviewer recognizes that this is only brief outline and perhaps the issues raised below were thought to be implied, but it would be useful in the next version to make the vision clearer. Bringing in more complementary social science and coproduction activities with decision makers that obviously is integrated throughout the research process offers important opportunities for NOAA to address concerns about public safety and economic impacts. Doing this is not simply a matter of more communication or evaluation on the back end; it is understanding decision frameworks, decision calendars (how much lead time do various decisions need for forecasts to be useable and useful), what is the relative significance of various types of uncertainty (whether that be social, economic, regulatory, or forecast related) in determining what makes information useful and usable. Using social science to refine a project at the beginning can bring efficiencies to the total path of product design and version development.	Social science has been added to Vision Area 1 through the addition of key question 1.4 (and subsequent objectives) which reads "How can NOAA enhance communications, products, and services to enable informed decision-making?". Social science has been added to Vision Area 2 through the addition of key question 2.7 (and subsequent objectives) which reads "How can NOAA utilize and improve socioeconomic information to enhance the sustainability of ecosystem services, public engagement practices, and economic benefits?". To recognize the importance of integrating R&D across fields, including the social sciences, text has been added to the Summary of Vision Areas and Key Questions section of the introduction that states "NOAA has matured as an agency, past focus on R&D within a single discipline toward increasing integration between multiple disciplines (e.g. biological, physical, economic, social, behavioral sciences), with increased partnerships that research pressing topics to address the needs of the diverse communities NOAA serves."
Vision Area 3	3.4 SAB	Address mechanism(s) by which stakeholder input is solicited and incorporated. This could involve existing frameworks such as State Climate Offices, Regional Climate Centers, Sea Grants, Extension Services OR creating new ones.	Stakeholder input is achieved through partnerships. This is addressed in the Partnership section of the introduction. The first objective under key question 3.1 also addresses the external research community.
Vision Area 3	3.1 SAB	All forms of data, platforms and analysis should be considered.	
Vision Area 3	3.2 SAB	Emphasize acquisition/sharing of private sector data networks, especially for model initialization. This would dovetail with remarks by NOAA acting Administrator for model changes (SAB meeting Feb 2019).	The objectives written under key question 3.2 address all current and future observing systems and data, considering all of the available platforms and analyses. Objective added to key question 3.1: "Explore the use of acquisition and sharing of private sector data networks to improve model initialization."
Vision Area 3	3.2 SAB	Missing is better use of commercial products	Objective in key question 3.1 amended: Evaluate the current business model for observational data and technical capabilities for alternatives (including the use of commercial products) for optimizing NOAA's current and future observing systems, aiming to enhance understanding, accuracy, characterization, and monitoring (including ecosystem state and processes), while minimizing costs.
Vision Area 3	3.2 SAB	Embed social science throughout in relevant research areas so it can work in concert with other research, i.e., better forecasts and how to communicate them, understanding indigenous fishing needs and pressures	Social science has been added to Vision Area 1 through the addition of key question 1.4 (and subsequent objectives) which reads "How can NOAA enhance communications, products, and services to enable informed decision-making?". Social science has been added to Vision Area 2 through the addition of key question 2.7 (and subsequent objectives) which reads "How can NOAA utilize and improve socioeconomic information to enhance the sustainability of ecosystem services, public engagement practices, and economic benefits?".
Vision Area 3	3.4 SAB	Does Q3 refer to NOAA only or linkages to the private sector as well?	While NOAA may work with the private sector, this question is focused on NOAA's use of big data.
Vision Area 3	3.3 SAB	Address issue of next generation transdisciplinary experts: what strategies exist in creating a new type of researcher? Implies a focus on having social science evaluate work once it is done rather than having social science and social science collaborations with decision-makers inform how to shape a research project from the beginning to meet needs. Bringing those insights into the beginning of a project formulation increases efficiencies by producing a product with the first version that is more closely aligned with stakeholder needs and less in need of revision. Would be useful to expand on the phrase "methodology for reaching target audiences" so that the needs and intent are more fully and clearly articulated.	Workforce excellence is addressed in the Introduction of the plan.
Vision Area 3	3.4 SAB	Specify type of social science (psychology, sociology, anthropology, economics etc.) to better address the needs and gaps raised in the previous sub-questions	Added text to paragraph under key question 3.4 to read "Integrating social, behavioral, and economic sciences throughout the lifespan of R&D activities is crucial to meeting the needs of NOAA stakeholders and improving the capacity of the public and other decision makers to make scientifically informed choices." And the objective in key question 3.4 expands on the phrase "methodology for reaching target audiences" to read "Develop and apply research methodologies to assess targeted audiences and engage stakeholder groups at the community level to improve NOAA's capacity to efficiently and effectively inform decision-making."
Vision Area 3	3.4 SAB	Address two-way communication with stakeholder when addressing methodology for reaching targeted audiences	The objectives under key questions 3.4 list the specific type of social science discipline that is addressed.
Vision Area 3	3.4 SAB	Integrated climate and ecosystem data with economic and human dimension data: Address the modeling aspect – data modeling, not just data	Two way communication falls under the larger objective "Develop and apply research methodologies to assess targeted audiences and engage stakeholder groups at the community level to improve NOAA's capacity to efficiently and effectively inform decision-making."
Vision Area 3	3.4 SAB		This is addressed in the key question: "Develop methods to integrate climate and ecological data with economic and human-dimension data into coupled models and decision support tools to improve understanding of how people respond to environmental change."