NOAA Response to SAB Review

A Presentation to the
NOAA Science Advisory Board

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August 30, 2022

Agenda

- Motivation and Purpose
- Timeline and Status
- SAB Feedback and NOAA Resolution
- Looking Forward

Motivation and Purpose

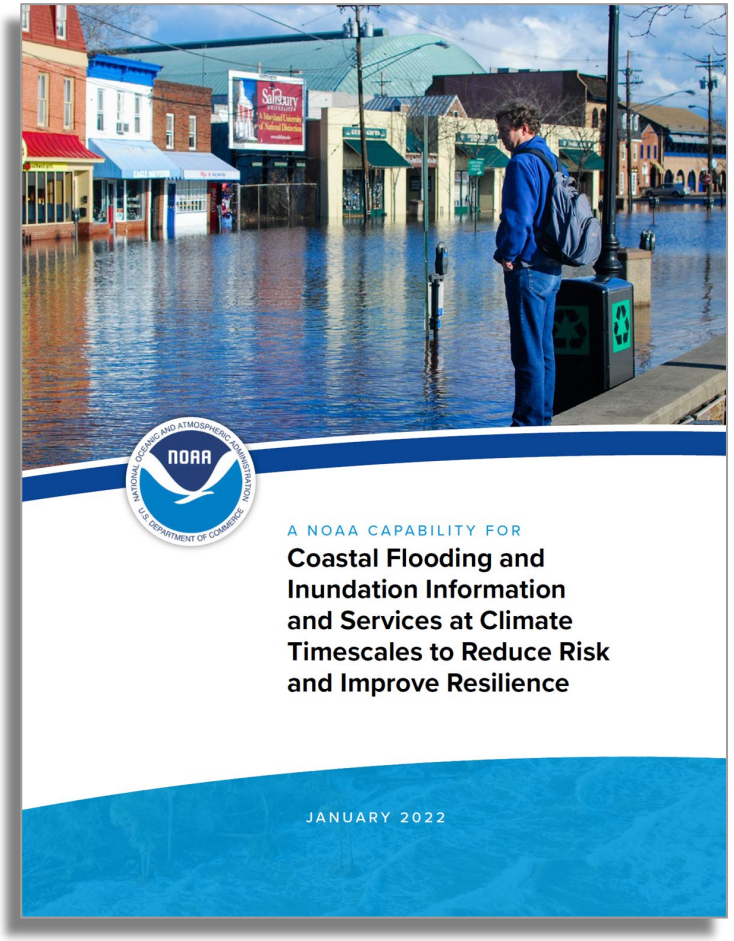
https://www.nytimes.com/2019/11/24/us/florida-keys-flooding-king-tide.html

Motivation and Purpose

To conclude NOAA's response to the SAB's review of

A NOAA Capability for Coastal Flooding and Inundation Information and Services at Climate Timescales to Reduce Risk and Improve Resilience

White Paper has been finalized and review response memo sent to SAB/CWG



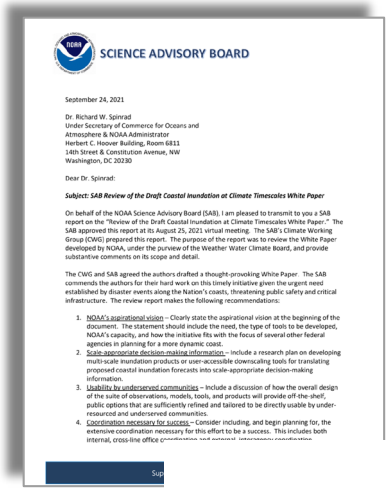
Timeline and Status

- **April 2020: NOAA Climate Team champions drafting of White Paper**
- May 2020: SAB Climate Working Group (CWG) briefed and updated on progress
- **Apr 2021: Draft White Paper completed**
- May 2021: Draft shared with SAB CWG for comment
- **Sept 2021: SAB/CWG recommendations report transmitted to NOAA**
- Oct-Dec 2021: SAB/CWG and internal NOAA comments reviewed and adjudicated
- **Jan 2022: Final Draft White Paper completed**
- Oct 2021/Jan 2022/Mar 2022: Status briefings to WWCB
- **April 2022: WWCB endorsed the vision outlined in the White Paper**
- June 2022: NOAA Climate Team reviews draft NOAA Response to SAB Review
- July 2022: Receive WWCB approval of NOAA response to SAB
- **Aug 2022: Briefing and transmittal to SAB on NOAA response to review comments**

SAB Feedback and NOAA Resolution

From SAB/CWG Review Report:

"... White Paper does a fantastic job of describing the vision for NOAA's capability to produce and provide authoritative data, products, and services that quantify and communicate the risk of coastal flooding and inundation for the U.S. and its territories at subseasonal-to-centennial timescales."



SCIENCE ADVISORY BOARD

September 24, 2021

Dr. Richard W. Spinrad
Under Secretary of Commerce for Oceans and Atmosphere & NOAA Administrator
Herbert C. Hoover Building, Room 6811
14th Street & Constitution Avenue, NW
Washington, DC 20230

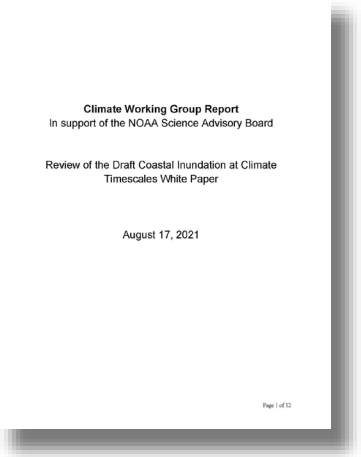
Dear Dr. Spinrad:

Subject: SAB Review of the Draft Coastal Inundation at Climate Timescales White Paper

On behalf of the NOAA Science Advisory Board (SAB), I am pleased to transmit to you a SAB report on the "Review of the Draft Coastal Inundation at Climate Timescales White Paper." The SAB approved this report at its August 25, 2021 virtual meeting. The SAB's Climate Working Group (CWG) prepared this report. The purpose of the report was to review the White Paper developed by NOAA, under the purview of the Weather Water Climate Board, and provide substantive comments on its scope and detail.

The CWG and SAB agreed the authors drafted a thought-provoking White Paper. The SAB commends the authors for their hard work on this timely initiative given the urgent need established by disaster events along the Nation's coasts, threatening public safety and critical infrastructure. The review report makes the following recommendations:

1. NOAA's aspirational vision – Clearly state the aspirational vision at the beginning of the document. The statement should include the need, the type of tools to be developed, NOAA's capacity, and how the initiative fits with the focus of several other federal agencies in planning for a more dynamic coast.
2. Scale-appropriate decision-making information – Include a research plan on developing multi-scale inundation products or user-accessible downscaling tools for translating proposed coastal inundation forecasts into scale-appropriate decision-making information.
3. Usability by underserved communities – Include a discussion of how the overall design of the suite of observations, models, tools, and products will provide off-the-shelf, public options that are sufficiently refined and tailored to be directly usable by under-resourced and underserved communities.
4. Coordination necessary for success – Consider including, and begin planning for, the extensive coordination necessary for this effort to be a success. This includes both internal, cross-line office



Climate Working Group Report
In support of the NOAA Science Advisory Board

Review of the Draft Coastal Inundation at Climate Timescales White Paper

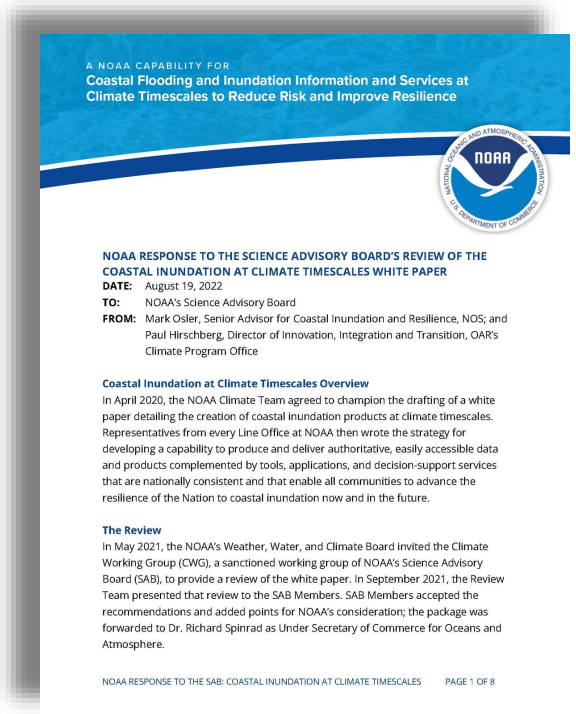
August 17, 2021

While 18 specific comments were received, the SAB highlighted four primary recommendations regarding:

- NOAA's aspirational vision
- Scale-appropriate decision-making information
- Usability by underserved communities
- Coordination necessary for success

SAB Feedback and NOAA Resolution

A point-by-point response to the SAB/CWG recommendations are detailed in the memo (here)



A NOAA CAPABILITY FOR

Coastal Flooding and Inundation Information and Services at Climate Timescales to Reduce Risk and Improve Resilience

NOAA RESPONSE TO THE SCIENCE ADVISORY BOARD'S REVIEW OF THE COASTAL INUNDATION AT CLIMATE TIMESCALES WHITE PAPER

DATE: August 19, 2022
TO: NOAA's Science Advisory Board
FROM: Mark Osler, Senior Advisor for Coastal Inundation and Resilience, NOS; and Paul Hirschberg, Director of Innovation, Integration and Transition, OAR's Climate Program Office

Coastal Inundation at Climate Timescales Overview

In April 2020, the NOAA Climate Team agreed to champion the drafting of a white paper detailing the creation of coastal inundation products at climate timescales. Representatives from every Line Office at NOAA then wrote the strategy for developing a capability to produce and deliver authoritative, easily accessible data and products complemented by tools, applications, and decision-support services that are nationally consistent and that enable all communities to advance the resilience of the Nation to coastal inundation now and in the future.

The Review

In May 2021, the NOAA's Weather, Water, and Climate Board invited the Climate Working Group (CWG), a sanctioned working group of NOAA's Science Advisory Board (SAB), to provide a review of the white paper. In September 2021, the Review Team presented that review to the SAB Members. SAB Members accepted the recommendations and added points for NOAA's consideration; the package was forwarded to Dr. Richard Spinrad as Under Secretary of Commerce for Oceans and Atmosphere.

NOAA RESPONSE TO THE SAB: COASTAL INUNDATION AT CLIMATE TIMESCALES PAGE 1 OF 8

SAB Feedback and NOAA Resolution

SAB/CWG Recommendation #1

NOAA's Aspirational Vision

Clearly state the aspirational vision at the beginning of the document. This statement should include the need, the type of tools to be developed, NOAA's capacity, and how the initiative fits with the focus of several other federal agencies in planning for a more dynamic coast.

NOAA's Response - Agree, updated text includes:

- Work with Federal and other partners to provide a national foundation of regional and local climate timescale coastal inundation information and services
- Provide off-the-shelf, publicly accessible information that is sufficiently refined to be directly relevant to place-based decision making
- Enable a private-sector marketplace of value-added information
- Decision-support services offered equitably to all U.S. coastal states and territories through creation of, and support for, communities of practice and extension networks that increase local capacity.

SAB Feedback and NOAA Resolution

SAB/CWG Recommendation #2

Scale-appropriate Decision-making Information
Include a research plan on developing multi-scale inundation products or user-accessible downscaling tools for translating proposed coastal inundation forecasts into scale-appropriate decision-making information.

NOAA's Response - Agree, updated text includes:
Information will be produced on a scale that is relevant to local decision making, which could include down to the parcel level in those cases where the following three criteria are met: (a) there exists a demonstrated user need, (b) NOAA believes there is sufficient scientific skill that allows for communication of information at this scale, and (c) information is able to be delivered at this scale on a national basis.

SAB Feedback and NOAA Resolution

SAB/CWG Recommendation #3

Usability by Underserved Communities
Include a discussion of how the overall design of the suite of observations, models, tools, and products will provide off-the-shelf, public options that are sufficiently refined and tailored to be directly usable by under-resourced and underserved communities.

NOAA's Response - Agree, updated text includes:
Beyond improvements to data access, the service delivery components of this proposed capability will ensure that all users, especially socially and economically vulnerable populations, have access to training to support their understanding and application of this information. This enhanced understanding will empower users to apply this information to their decision making and engage within the ongoing co-development process.

SAB Feedback and NOAA Resolution

SAB/CWG Recommendation #4

Coordination Necessary for Success
Consider including, and begin planning for, the extensive coordination that will be necessary for this effort to be a success. This will include both internal, cross-line office coordination and external, interagency coordination.

NOAA's Response - Agree, updated text includes:
Convene Federal Collaboration and Pursue Partnerships focused on advancing a whole-of-government approach to coordinate coastal inundation research and service delivery, using existing interagency fora and connections between Federal and non-Federal partners, including local governments, NGOs, private-sector enterprises, and academic institutions.

Looking Forward

White paper has been shared externally

https://cpo.noaa.gov/Initiatives/Climate-Risk-Areas-Initiative/Coastal-Inundation-Capability-Framework

Federal collaboration/alignment taking shape via White House NCTF Coastal Resilience Interagency Working Group

Bipartisan Infrastructure Law jumpstarts NOAA's progress on 2 of the 12 action steps from the White Paper

Continued focus on NOAA implementation plan and attracting/aligning resources

Thank You!

Review and insight from the Science Advisory Board was extremely helpful and has (a) made the White Paper a stronger document, and (b) galvanized the NOAA community working on this topic.

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Backup Slides

Detailed Outcomes from Whitepaper

5- and 10-Year Milestones

Baseline Climatologies

DATA & PRODUCTS

DATA & PRODUCTS TIMESCALES

Baseline Climatologies

Current Status	5 Years	10 Years
Mean and extreme still water level and freshwater (river flow, rainfall) at in situ point observations, via some numerical models and remotely-sensed via satellite altimetry with limited ties to coastal inundation. Mean lake levels in the Great Lakes. Climatologies of waves and water levels are generally at different locations and are different products.	National 2-dimensional (2D) gridded 40-year climatology of still and dynamic still ('still' + wave setup) water levels at 1 kilometer resolution along the coastline and Great Lakes.	National 2D gridded climatology and associated probabilities of integrated total water level (TWL: coupled 'still' water, wave setup, and freshwater input) means and extremes at 100m resolution.

5- and 10-Year Milestones

Trends and Monitoring

DATA & PRODUCTS

DATA & PRODUCTS TIMESCALES

Trends and Monitoring

Current Status	5 Years	10 Years
Real-time and historical sea level and coastal flood information at select water level gauge locations and satellite altimetry. This includes: Long-term sea level change or changes in Great Lake levels and associated inundation (high tide flooding/extremes) assessed at in situ point observations; Land motion assessed via point GNSS observations; Regional and global SLR assessed via in situ observations and satellite altimetry; and minor flood frequency for the previous calendar year at in situ point observations.	National coverage of basic coastal flood monitoring to include reporting of the magnitude and frequency of means and extremes of in situ and remote sensed sea level.	National coverage of enhanced coastal flood monitoring to include reporting of the magnitude and frequency of components and processes affecting relative TWL (e.g., waves, rainfall, rivers) and vertical land motion (VLM) utilizing in situ and remote sensed observations.

5- and 10-Year Milestones

Monitoring Patterns and Processes

DATA & PRODUCTS

DATA & PRODUCTS TIMESCALES

Monitoring Patterns and Processes

Current Status	5 Years	10 Years
No real time attribution or analysis of coastal inundation is provided. Some monthly tracking of Great Lake levels are monitored and assessed with precipitation. Analysis of patterns and assessing processes occurs offline and often on an annual basis.	Identification and quantification of primary modes of variability of still and dynamic water levels at in situ gauge locations. Seasonal attribution of processes leading to coastal inundation in the contest of large-scale atmospheric, oceanic and lake modes of variability.	Identification and quantification of primary modes of variability of total water levels at in situ gauge locations and gridded modeled output. Near real-time attribution of processes leading to coastal inundation in the context of large-scale atmospheric, oceanic and lake modes of variability.

5- and 10-Year Milestones

National Sub-Seasonal Integrated Water Predictions

DATA & PRODUCTS

DATA & PRODUCTS TIMESCALES

National Sub-seasonal Integrated Water Predictions

Current Status

National 10-day and monthly hydrologic water outlooks, currently not fully coupled with coastal models. Weekly-to-monthly projections of Great Lake levels. Regional outlooks of likely high tide flood days relying on tides and climatologies at in situ gauges (High Tide Bulletin).

5 Years

2D coastal hydrodynamic models and machine learning/statistical methods are used to predict subseasonal magnitude and frequency of still water coastal inundation. Models are connected to seasonal riverine predictions, including land surface runoff at watershed scale resolutions, to provide sub-seasonal outlooks of coastal inundation.

10 Years

2D coastal hydrodynamic models utilize hydrologic boundary conditions to predict sub-seasonal integrated total water at 1km resolution. National coverage of sub-seasonal probabilistic coastal inundation includes information on flood magnitude and frequency.

5- and 10-Year Milestones

National Sub-Seasonal to Seasonal Outlooks

DATA & PRODUCTS

DATA & PRODUCTS TIMESCALES

National Sub-seasonal to Seasonal Outlooks

Current Status	5 Years	10 Years
Regional outlooks of likely flood days updated seasonally (High Tide Bulletin, Great Lake levels) and annual (Annual High Tide Flooding Outlook) at in situ gauges. Limited model-based monthly forecasts for some regions.	An integrated monthly-to-annual outlook of the probabilities of coastal inundation, including the likely days and frequency of still water coastal inundation at gauge locations.	An integrated monthly-to-annual outlook of the probabilities of coastal inundation, including the likely days and frequency of TWL coastal inundation at 100m resolution.

5- and 10-Year Milestones

National Decadal to Century Projections/ Scenarios

DATA & PRODUCTS

DATA & PRODUCTS TIMESCALES

National Decadal to Century Projections/Scenarios

Current Status

National 1 degree gridded and tide gauge specific sea level rise projections (ocean and vertical land motion component separate). NOAA (2017)/ NCA4 global sea level rise scenarios including 1-degree gridded estimates of still water (tide gauge measured) probabilities.

5 Years

National gridded projections of mean and extreme sea level probabilities, or lake level variability, at 500m resolution along the coast line and Great Lakes out to 2100. Projections will consider changes in relative and global mean sea level or lake level including InSAR measurements of land subsidence but include only climatological variability.

10 Years

National gridded projections of total water level probabilities at 500m resolution along the coast line and Great Lakes out to 2150. Projections will consider changes in relative and global mean sea level or lake level including InSAR measurements of land subsidence, as well as future changes in extremes, morphology, and the joint probability from river flows and waves.

5- and 10-Year Milestones

National Coastal Change Outlooks

DATA & PRODUCTS

DATA & PRODUCTS TIMESCALES

National Coastal Change Outlooks

Current Status

Limited to weather scale or event scale coastal change forecasts are disseminated through disparate cross-agency applications.

5 Years

An operational weekly-to-monthly probabilistic coastal change outlook at 1km resolution along a subsection of national ocean and Great Lakes coastlines.

10 Years

An operational weekly-to-annual probabilistic coastal change outlook at 1 km resolution along a majority of national ocean and Great Lakes coastlines.

5- and 10-Year Milestones

Integrated, Centralized, and Operational Infrastructure

INFORMATION ACCESS & APPLICATION

INFORMATION ACCESS & APPLICATIONS TIMESCALES

Integrated, Centralized and Operational Infrastructure

Current Status

Coastal inundation information is disseminated disparately across different NOAA Line Offices and Program Offices. Some offices have centralized access points within their websites, but these are limited in tools and scope.

5 Years

Existing coastal inundation applications will include an integrated web-based framework and a prototype dissemination interface with necessary backend infrastructure.

10 Years

A “one stop” centralized dissemination infrastructure for coastal inundation information. The infrastructure will include a web-based framework with outlooks and applications to provide users and partners baseline data and decision-support information, thus enabling value-added information and services.

5- and 10-Year Milestones

Accessible, Discoverable, and Useful Data and Information Services

INFORMATION ACCESS & APPLICATION

INFORMATION ACCESS & APPLICATIONS TIMESCALES

Accessible, Discoverable and Useful Data and Information Services

Current Status

Coastal inundation data is inconsistently available through different services and formats. Some data is available through API or GIS services, while others are only available through CSVs, data reports, or are locally stored and not generally accessible.

5 Years

NOAA Big Data Program to include coastal inundation data services. Identify all existing sources of climate coastal inundation data and develop a uniform and consistent data services framework to enable access to both internal and external data users.

10 Years

A coastal inundation on climate timescales community of practice of industry and government partners, regularly convened to assess the application of future flood and risk data to their industry and services. Evaluation and measurement of the use of our coastal inundation tools and information.

5- and 10-Year Milestones

Next Generation Coastal Inundation Tools and Training

DECISION SUPPORT

DECISION SUPPORT TIMESCALES

Next Generation Coastal Inundation Tools and Training

Current Status	5 Years	10 Years
Coastal inundation at climate timescales data and products have not been consistently packaged and/or integrated into existing decision support tools, applications, and training.	A user-needs assessment of the next-generation assemblage of coastal inundation data services, applications, tools, and training to support the sector based decision-making needed from the new data and products capabilities.	A next-generation assemblage of coastal inundation applications, tools, and training informed by new predictions, outlooks and projections at climate timescales to support sector based decision-making.

5- and 10-Year Milestones

Regional Capacity Building

DECISION SUPPORT

DECISION SUPPORT TIMESCALES

Regional Capacity Building

Current Status	5 Years	10 Years
Coastal constituents struggle to know where and how to engage with NOAA related to their technical questions and risks associated with regional and local coastal inundation at climate timescales.	Community-based adaptation specialists and extension agent networks are trained on availability and delivery of NOAA coastal inundation tools, products, and services.	A trusted 'boots on the ground' network of experts that provides reliable, technical, and science-based information regarding coastal inundation at climate timescales to address local needs, while also transferring research and data service needs back to improve the existing services.