

NOAA R&D Plan Outline

- Executive Summary – One-pager style overview of the R&D plan
- Introduction
 - Purpose – The importance of strategic planning for NOAA’s R&D enterprise
 - Mission and vision – The role the scientific enterprise plays in furthering NOAA’s mission and vision
 - Scope – Definitions of research and development and descriptions of NOAA’s intramural and extramural R&D activities
 - Enabling elements for R&D – Scientific integrity, partnerships, an educated workforce, a robust infrastructure, and operational support are essential for effective R&D
 - Motivation – Describes the driving documents behind the creation of the plan
 - Structure – The plan is focused on 3 vision areas, each with key questions that contain objectives and selected topics of research
- Vision areas, key questions, and objectives
 - Vision area 1: Reducing societal impacts from severe weather and other environmental phenomena
 - ***How can forecasts and warnings for severe weather and other environmental phenomena be improved?***
 - Community-based modeling moving to a Unified Forecast System (UFS) approach, with coupling infrastructure jointly developed with NCAR
 - Sub-seasonal and seasonal forecasts
 - Cone of uncertainty
 - Tsunami forecasting
 - In-house and external observations
 - Minute-to-month water resource information
 - ***What is the state of global climate and how is it affecting local weather, posing increased environmental hazards, and affecting water availability?***
 - Natural and radiative forcing
 - Regional and seasonal temperature and precipitation differences
 - Impacts of changing climate
 - Changes in the Arctic
 - Water quality for prediction and decision support
 - Additional long-term risks
 - ***How can space weather products and services be improved?***
 - Streamline research to operations
 - Develop space weather products
 - Transition coupled modeling system to operations
 - Risk communication
 - Vision area 2: Sustainable use of ocean and coastal resources

- ***How can the growth of sustainable aquaculture in the United States be accelerated?***
 - Marine aquaculture feeds
 - Applied genomics
 - Disease and disease transfers
 - Space-use conflicts
- ***How can healthy and diverse ecosystems be sustained while meeting the needs of indigenous, recreational, and commercial fishermen?***
 - Next-generation species stock assessments
 - Illegal, unreported, and unregulated fishing
 - Bycatch
 - Indicators for coastal development and recreational fishing
- ***How can knowledge, tools, and technologies be leveraged to better understand, protect, and restore ecosystems?***
 - Emerging technologies for augmenting capacity
 - Biomass and mortality measurement uncertainty
 - Metagenomics and machine learning technologies
 - Combined effects of environmental changes on species and ecosystems
 - Scale-up restoration techniques
- ***How can efficiencies be maximized and safety improved under increasing maritime traffic and larger vessel sizes?***
 - Improved models for major U.S. ports
 - Arctic positioning and navigation
 - Oil spill response technologies
 - Ocean and ice observation and forecasting capabilities
 - Evaluate economic tradeoffs
- ***What exists in the unexplored areas of the ocean?***
 - Surveying and mapping technologies
 - High resolution mapping of deep ocean
 - Undersea exploration
- ***How can the conservation of coastal and marine resources, habitats, and amenities be balanced with growth in tourism and recreation?***
 - Model, monitor, and forecast events that degrade coastal habitats
 - Environmental sensors and monitoring platforms
 - Restoration and adaptation methods and manuals
 - Evaluate impacts and economic tradeoffs of ocean acidification, sea level rise, and harmful algal blooms
- Vision area 3: A robust and effective research, development, and transition enterprise

NOAA R&D Plan Outline

- ***How can modeling be integrated and improved with respect to skill, efficiency, and adaptability for service to stakeholders?***
 - Coupled atmosphere, ocean, land, and ice models
 - Operational model and forecasts uncertainty
 - Downscaling modeling techniques
 - Hydrodynamic, biogeochemical, and ecosystem models
- ***How can earth observations and their associated platforms be optimized to meet NOAA's needs?***
 - Data evaluations
 - Innovative sensors, platforms, and data processing
 - Integrating ocean observations into forecasts
 - Real-time data sharing
- ***How can Big Data and information technology be utilized to form new lines of business and economic growth?***
 - Cloud computing platforms
 - Interoperability of large datasets
 - Data access, archiving technology, and dissemination
 - Data mining and analyzing large datasets
 - Machine learning and artificial intelligence
- ***How can it be ensured that decisions about NOAA's investments are informed by credible social science research?***
 - Effectiveness of public responses to NOAA products and services
 - Confidence, specificity, and impacts of products
 - Methodology for reaching targeted audiences
 - Integrated climate and ecosystem data with economic and human dimensions data
- ***How can the transition of research to operations and other uses (R2X) and operations to research (O2R) be optimized?***
 - Transition plans
 - Performance metrics
 - Annual operating plans
- Evaluation – Importance of evaluation for determining program success and existing mechanisms NOAA will leverage to track the progress of R&D plan objectives. In addition to accessing progress to plan, evaluation provides comprehension of the scope and character of the NOAA R&D Enterprise.
- Appendices
 - List of plans and mandates to inform the R&D Plan