2023 EARTH OBSERVATION ASSESSMENT REPORT: CLIMATE ANNEXES

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About the Subcommittee on the United States Group on Earth Observations

The United States Group on Earth Observations (USGEO) is chartered as a Subcommittee of the NSTC Committee on Environment. The Subcommittee's purpose is to plan, assess, and coordinate Federal Earth observations, research, and activities; foster improved Earth system data management and interoperability; identify high-priority user needs for Earth observations data; and engage international stakeholders by formulating the United States' position for, and coordinating U.S. participation in, the intergovernmental Group on Earth Observations (GEO).

About this Document

In the area of climate, societal benefits accrue from Earth observation measurements that can inform both short- and long-term decisions made by policymakers, urban planners, disaster managers, research scientists, as well as watershed, natural resource, and land managers. Earth observation measurements of renewable resources and ecosystem condition also support evidence-based decision-making by commodity markets, communities, and all levels of government. These annexes to the Climate Report provide additional insights into the impact an Earth observation input has on parts of the societal benefit area (SBA) *value tree* (e.g., by SBA, SBA sub-area, and key product, service, and outcome [KPSO]). USGEO is making readily available, either through this report or through the online visualization services (https://usgeo.gov/eoa), those elements that are most valuable for agency and public analysis.

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Annex A: Climate Descriptions

In Climate, societal benefits accrue from Earth observation measurements that can inform both short- and long-term decisions made by farmers, ranchers, foresters, research scientists, as well as watershed, natural resource, and land managers. Land management decisions are complicated by dynamic and ongoing sources of disturbance, such as diseases, pests, climate extremes, as well as climate change and the conversion of natural land to other uses. Earth observation measurements of renewable resources and ecosystem condition also support evidence-based decision-making within commodity markets, communities, and all levels of government. Accurate and timely (e.g., low latency) information derived from Earth-observing systems can help enhance food supplies, advance the productivity of renewable resources, improve ecosystem condition, and maximize our resilience to disasters and disturbance events. Measurements in this societal benefit area (SBA) improve the ability of farmers and foresters to meet the needs for human food, animal feed, fiber, biofuels, and forest products; support production decisions; and advance forecasting and risk analysis. Measurements in this SBA lead to reduced damages and inform risk from human and natural sources of disturbance including climate change, such as ecosystem degradation, wildfire, drought, flood, and storm events, as well as pests and invasive species. Research and improved data in this SBA can contribute to early warning systems for crop yield shortfalls and pest outbreaks; quantify the potential impact of climate change on the supply of renewable Agricultural & Forestry products; improve data to support the management of and response to disturbance and disaster events; and limit ecosystem degradation associated with agricultural, forestry, and grazing practices.

Within the Climate SBA, four sub-areas were identified representing the major thematic components, each with between three and seven key objectives. To assess the relative contribution of each Earth observation input to the provision of societal benefit, SBA teams consisting of federal subject matter experts assigned *weights* to each of the sub-areas and key objectives based on input from subject matter experts within the interagency. The total weight of all sub-areas under an SBA sum to 100% as do the total weights of every key objective under a particular sub-area, and these weights are shown in brackets in the descriptions below.

The Earth's Climate System and the Changes Occurring in It [35%]

Improving our understanding of the climate system requires fundamental research activities that probe critical processes, interactions with other aspects of the Earth system, and any significant forcings and feedbacks taking place due to natural and anthropogenic influences.

Observations at the climate system level provide us data to improve modeling of the changes occurring primarily due to human activities. Continuity of measurements is critical for addressing the KOs in this area and ensuring the fundamental understanding underpinning international treaties remains valid in a changing climate.

The Atmosphere: Understand and model atmospheric circulation variability and change, and the role of the atmosphere in climate change [15%]

The atmosphere plays a unique role in the climate system due to its volatility, rapid transport of heat, moisture, aerosols, and chemical species, and its influence on Earth's radiation balance through cloud and water vapor feedbacks. Recent advances in EO systems have helped improve our understanding of these processes and interactions, but challenges remain in accurately representing atmospheric dynamics and addressing uncertainties in climate sensitivity. This KO focuses on improved understanding of the dynamic properties and physical processes within the Earth's atmosphere. Additionally, it seeks to understand the feedback mechanisms between the atmosphere and the climate system, including water vapor and cloud feedbacks that influence climate sensitivity.

EO systems play a critical role in meeting this KO by providing comprehensive and continuous data on various aspects of the atmosphere. EO systems deliver essential measurements of temperature, water vapor, wind, pressure, precipitation, and atmospheric constituents. This will require data, gathered from a combination of ground-based, airborne, and satellite instruments, as well as reanalysis models to advance our understanding of the atmosphere and its role in climate change. High-resolution observations in space and time are necessary to capture localized and episodic phenomena like precipitation. While the traditional radiosonde network has provided valuable data, satellite observations have become indispensable for global coverage and understanding of essential climate variables (ECVs). Continuous efforts must be made to maintain and enhance global atmospheric observing systems, improve the accuracy of atmospheric observations, ensure adequate observational coverage in underserved areas, and advance the modeling of the small but critical and compounding changes that occur over decades.

This KO is critical to Federal agencies' missions as it addresses the urgent need to enhance our understanding of the Earth's atmosphere, which plays an important foundational role in monitoring, modeling, and predicting changes occurring in the climate system. Achieving this objective through prudent investments in the most salient EO systems leads to more accurate climate models, forecasts of extreme weather events, and a deeper understanding of the economic and environmental impacts of long-term climate change. Furthermore, knowledge of atmospheric circulation variability and change can contribute to our understanding of how human-induced changes, such as increasing greenhouse gas emissions and aerosol distributions, affect the atmosphere and climate system. Ultimately this allows policymakers to make improved decisions about Federal agency investments to facilitate better climate change mitigation, adaptation, and disaster preparedness.

The Ocean: Understand and model ocean variability and change, including the ocean's physical, biogeochemical, and dynamical conditions, and the role of oceans in climate change [30%]

Ocean waters cover 70% of the Earth's surface, and the ocean's influence extends to seasonal, interannual, and decadal variability of the climate system. The ocean has greater capacity than the atmosphere and land to store heat and carbon. It holds most of the water in the global hydrological cycle, providing through evaporation the vital water that falls over land as rain and snow. Prolonged drought is influenced by persistent patterns of ocean surface temperature and consequent influences on evaporation and atmospheric circulation patterns. Coupled atmosphere-ocean regimes such as ENSO change seasonal weather and storm patterns around the world. The transport of heat from the tropics toward the poles is a major factor in determining the surface temperature of many nations; transport along and under ice shelves may determine how rapidly they separate from land and buttress glaciers, and, in turn, affect sea level, whose rise is one of the more significant societal concerns about climate change. Moreover, due to its storage and transport of heat, the ocean is a possible origin of rapid climate change, through alteration of its deep circulation.

EO systems are essential in providing accurate and comprehensive data on various aspects of the ocean. Observations of ocean color, sea surface temperature, and air-sea exchanges of heat, moisture, and momentum are necessary for understanding oceanic and atmospheric interactions. Autonomous CO2 sampling instruments on ships and moored buoys, as well as satellite-based measurements, are essential for monitoring biogeochemical changes and the ocean's role in carbon sequestration. Paleo-oceanographic reconstructions from sediment cores offer valuable long-term records of ocean parameters to serve as baselines against current changes. Sea level measurements, sea ice observations, and data on the regional sources and sinks of carbon are also crucial for understanding the global carbon cycle and its role in climate change. Furthermore, international partnerships and ongoing ocean carbon inventories are vital to support the implementation of effective climate policies, climate mitigation efforts such as marine carbon dioxide removal, and forecasts.

This KO is an essential component of Federal agencies' missions to assist vulnerable communities and manage or protect marine resources and ecosystems in response to the impacts of climate change. Understanding ocean variability and change provides significant societal benefits, such as more accurate climate predictions, better management of fisheries, and informed decision-making for coastal communities facing sea-level rise. Furthermore, studying the ocean's biogeochemical cycle fills gaps in our understanding of the overall climate sensitivity of the Earth to greenhouse gas emissions, while also facilitating improved projections for use in the development of adaptation strategies for affected marine ecosystems and the communities that depend on them.

The Cryosphere: Understand and model the Earth's cryospheric systems, including the sensitivity, feedbacks, and dominant processes controlling system variability, evolution and change, and the role of cryospheric systems in climate change [20%]

This KO is centered on understanding and modeling the Earth's cryospheric systems, which include frozen components such as sea ice, glaciers, ice sheets, and permafrost. The focus is on the sensitivity, feedbacks, and dominant processes controlling system variability, evolution, and change, as well as the role of cryospheric systems in climate change. In addition, many communities depend on the water resources or other ecosystem services associated with the cryosphere, underscoring the societal benefits that come with improved monitoring and prediction capabilities. Cryospheric systems are experiencing notable alterations due to climate change, such as thinning arctic sea ice, loss of Greenland ice sheet mass, destabilization of West Antarctic ice shelves, shrinking mountain glaciers, and deepening permafrost thaw layers. However, the processes controlling these changes remain poorly understood and represented in models.

Fortunately, technologies are rapidly evolving to enable additional observations in coastal regions, biogeochemical cycle variables, and primary productivity. Observations of sea ice extent, concentration, and thickness are essential for assessing climate change indicators, global albedo processes, and impacts on polar ecosystems. Land ice system models are just beginning to be coupled into climate models, and challenges include adequately coupling the systems, initializing the ice conditions, and testing the models. Paleoclimate perspectives, such as paleo-sea reconstructions from sediment cores, serve as baselines for understanding modern changes in cryospheric systems. Observations of permafrost warming and effects on carbon release are also critical for enhancing our understanding of the processes involved and improving the representation of these processes in climate models.

Understanding the dynamics of cryospheric systems is essential for predicting sea level rise, ocean freshening, and alterations in global albedo, which can have profound impacts on coastal communities and ecosystems. Moreover, changes in the cryosphere can influence energy resources, transportation accessibility, and the release of stored ancient carbon, affecting global carbon balance and navigation in affected regions. Developing a better understanding of these systems will inform policy decisions and adaptation strategies to mitigate the impacts of the changing environment, preserve vulnerable ecosystems, manage resources in polar regions, and contribute to navigation and infrastructure planning in permafrost-affected areas.

The Land Surface: Understand and model land surface variability and change with respect to the primary influences on the climate system and climate change [5%]

The land surface is where we live, and it has unique characteristics in how it reflects heat, light, and other radiation. Topography greatly influences local to regional climates in both the simple effects of elevation such as adiabatic cooling, and more complex effects such as rain shadowing and wind abatement. Albedo and other surface characteristics directly influence climate, and human induced changes in these—such as urban heat islands, regional agricultural practices, and reforestation effects—are well known examples.

Land surface products may be the most mature and widely used of our global remote sensing systems. Remote sensing products in particular are extremely useful because they provide a global (or very large regional) view of critical variables, such as temperature and differentials in it, over brief timescales. Although they are widely ground-truthed, remote sensing products ultimately provide coverage in areas where ground survey may be impossible or lacking. This allows comprehensive models that can calculate global climate variable effects with minimum possible bias.

This KO is essential to the missions of almost all Federal agencies, as they manage resources on land or manage resources elsewhere but have large footprints on land, all of which will have to account for the effects of climate and how they influence it. Topography, terrestrial ecosystems, and land use all can greatly influence local to regional climates in both the simple effects of elevation such as adiabatic cooling, and more complex effects such as urban heat islands.

Climate Sensitivity and Climate Feedbacks: Understand and model feedbacks across the Earth's climate system, including changes in cloud cover, atmospheric water vapor, ocean circulation, and Arctic amplification (accelerated warming in the Arctic), and improve understanding of climate system sensitivity to external forcings including from human and natural sources [25%]

Climate sensitivity refers to the equilibrium response of the Earth's temperature to changes in radiative forcing, while climate feedbacks are processes that either amplify or dampen this response. This KO aims to improve the comprehension and modeling of the climate system's sensitivity to external forcings, originating from both human and natural sources, and the feedbacks across the Earth's climate system. These models include assessment of current teleconnections (ENSO, Arctic Oscillation [AO], North Atlantic Oscillation [NAO], Indian Ocean Dipole [IOD], Pacific Decadal Oscillation [PDO], Atlantic Multidecadal Oscillation [AMO]) for correlation with future atmospheric and drought conditions on sub-seasonal to seasonal time scales, the base state, variability, and climate change of small-scale modes of circulation, and all relevant Earth system models such as those participating in Coupled Model Intercomparison Project (CMIP). Understanding all the variability, feedback mechanisms, and climate sensitivities is challenging, as they involve complex interactions between various Earth system components, which includes changes in cloud cover, atmospheric water vapor, ocean circulation, and Arctic amplification (accelerated warming in the Arctic).

These feedbacks and modes of variability can exhibit significant regional diversity; however, the current climate models demonstrate much less robustness in accurately representing regional signals than capturing broad patterns. As decision-makers and the public seek reliable information to determine strategies to address human-caused warming of the planet and reduce the severity of related impacts, addressing the knowledge gaps in climate sensitivity and feedbacks becomes increasingly urgent.

Addressing this KO can contribute to the credibility and utility of Federal agencies' climate services, supporting more informed decisions on water and energy policies, community vulnerability assessments, and adaptation and mitigation strategies (e.g., reducing greenhouse gas emissions).

Past Climate: Improve understanding and quantification of past climate states and extremes, including abrupt changes in climate [5%]

This KO focuses on the use of paleoclimate records, such as corals, ice cores, pollen core studies, and tree rings. These records help to uncover insights about historical climate states; abrupt changes; the role of the carbon cycle, the temperature, and hydrological responses to climate forcings; the El Niño-Southern Oscillation (ENSO) and its sensitivity to forcing variations; and hydroclimate regimes of multi-decadal length. Furthermore, understanding the historical range of conditions provides valuable context to establish a baseline for estimating possible extremes, reversals, and threshold behavior under human-caused warming of the planet.

Achieving this KO relies on the integration of various types of EO data. For example, lake ice melt dates serve as effective signals for monitoring regional climate warming trends, and pollen core studies help uncover inland historic climate trends. Assimilation of the more recent historical data into high-resolution climate simulations also provides valuable information about changes in circulation and the frequency of large storms during recent centuries.

The quantification of uncertainty of sensitivities to climate forcings is essential for developing an enhanced and fundamental understanding of the temperature and hydrological responses that are associated with given amounts of human-caused greenhouse gases and aerosols. A better understanding of past climate states helps us anticipate and prepare for future climate change, ensuring more effective adaptation and mitigation strategies. For example, crucial information on hydroclimate regimes can inform regional water management practices and assist decision-makers to assess the potential risks associated with climate change.

Human and Natural Influences on the Climate System [5%]

To slow, stop, or reverse climate change, directly addressing its drivers will be necessary. The primary drivers of recent warming in the climate system are human emissions of well-mixed and long-lived greenhouse gases such as CO2, nitrous oxide (N2O), chlorofluorocarbons, and methane (CH4). The sources of these greenhouse gases include fossil fuel combustion (for industrial processes, power generation, and transportation), agriculture and deforestation, and natural processes that occur in response to these changes and associated planetary warming. Currently, about half of the CO2 emitted by fossil fuel combustion is removed from the atmosphere by the ocean and terrestrial systems, but there is uncertainty about the continuing strength of these carbon sinks in the future. This results in a first-order uncertainty in climate prediction (i.e., on par with cloud and water vapor feedbacks). In addition, anthropogenic emissions of aerosols can have a cooling effect on the climate by reducing the flux of solar radiation through the atmosphere. These emissions are more localized and have a short lifetime in the atmosphere. This complicates our understanding of how climate is responding to increases in radiative forcing, since the long-term warming effects of CO2 have been partially and temporarily masked by the cooling effects of the shorter-lived species. Globally, the concentrations of these aerosols are decreasing, which could enhance the warming effect of greenhouse gas emissions.

Understanding the sources, sinks, and impacts of these and other human or natural climate forcers such as aerosols is critical for the efforts to slow or reverse human-caused climate change. This information allows for better design of less impactful technologies, more effective emission management, and more effective adaptation and mitigation policies.

Understand climate system forcings and improve their estimation [45%]

This KO concerns fundamental research to understand the sensitivity of the climate system to natural or human perturbations (or forcings). Changes to the climate system are largely based on changes in atmospheric concentrations of greenhouse gases, which warm the climate, and aerosols, which primarily cool the climate. Greenhouse gas and aerosol concentrations in the atmosphere are derived from natural and anthropogenic sources. The sensitivity of the climate system will depend on several factors, such as the radiative properties of the respective molecules or particles, their overall concentration, the average duration of a forcing constituent once in the atmosphere (also known as the atmospheric lifetime), and the level of dispersion throughout the atmosphere. All these factors require accurate measurements and observations for reliable estimations that can be used to predict climate system responses. These processes are also included in climate models, as these models simulate the full behavior of the climate system.

EO systems will be critical to advancing this KO, particularly with respect to estimation of the level and strength of climate system forcings. For example, greenhouse gas concentrations are observed and monitored at many locations above Earth's surface using towers, aircraft, and ships. There are also first-generation exploratory efforts to capture greenhouse gas distributions using satellite remote sensing. Fluxes between atmosphere and ocean or land are measured as well. Observations of greenhouse gases need to be continued and expanded to better understand the processes of CO2 removal from the atmosphere. This will allow for better representation of (potentially strong) positive feedbacks between the terrestrial and oceanic carbon cycles and climate in Earth system models. Short-lived greenhouse gases include ozone and methane, which has a complex mix of natural and anthropogenic sources. But CO2 emissions are of primary concern for climate because of their very long atmospheric lifetime. Aerosols primarily cool climate, with some absorption by dark carbonaceous particles and dust contributing to warming. Aerosols also brighten clouds and extend their lifetimes, which adds to the clouds' cooling effects. Aerosols come from natural sources (desert dust, sea-sprays, volcanic eruptions and degassing, and terrestrial emissions), as well as from biomass burning and fossil fuel combustion. Aerosols are removed from the atmosphere by precipitation scavenging, dry deposition, and gravitational settling, and their lifetimes are short (e.g., days to weeks in the troposphere). Because of their diverse sources and short lifetimes, the distributions and climate impacts of aerosols vary widely by time and region. The sources, sinks, concentrations, and chemical processes involving these short- and long-lived atmospheric species need to be measured and included as critical drivers in models that simulate climate, both for the relatively short period during which the model output can be compared against instrumental data, and for the past millennium, during which forcings such as volcanic and solar activity can be compared against paleoclimate reconstructions that are resolved annually and sub-annually.

This KO is an important component of Federal agencies' missions to assist the Nation in meeting its commitments on anthropogenic climate change and to adapt to a warming planet. Understanding and estimating climate system forcings provides significant societal benefits by allowing for more accurate estimation of the sensitivity of the climate system to these forcings and better prediction of climate system responses that will affect society.

Assess, attribute, and project changes to sources and sinks of natural and anthropogenic atmospheric radiative forcing agents and pollution constituents [10%]

Both anthropogenic agents originating from human activities and natural agents stemming from processes like volcanic eruptions or solar activity have significant influence on the climate system. These agents and constituents, such as greenhouse gases and aerosols, can alter the Earth's energy balance by absorbing, emitting, or reflecting radiation. Understanding the impact of the sources, sinks, concentrations, and chemical processes of these agents and their impacts on the climate system is a complex and challenging task due to the diverse nature of these agents and constituents, their varying spatial and temporal scales, the complex interplay between different climate drivers, and the intricate interactions between them and the Earth's climate system.

There are a variety of ways to examine how various drivers, including natural and anthropogenic greenhouse gases and short-lived climate forcers, contribute to climate change. Climate models have been used to study the impact of various forcing factors (such as CO2). Much more useful than understanding the effects of a given species is to simulate and understand the effects of a given source, where each source typically emits a complex mixture of species—but this is difficult to validate. Uncertainty in the model processes also limits the usefulness of models for attributing impacts to sources. Robust detection and attribution research makes use of statistical methods involving both models and observations to connect specific impacts to sources. This can be challenging particularly for effects that are isolated in space or time, such as for extreme events or for regional climate signals.

The main limiting factor is usually sufficient spatial and temporal availability of measurements of both drivers and impacts. A second critical limit is the ability to discriminate the chemical composition of aerosols because different compositions can impose different impacts. For example, attribution of climate change to short-lived species is uncertain in part because of limited observations of the species, but also because they vary both spatially and temporally. Extensive measurements are essential to advance this research and make it useful to society. Various metrics intermediate between cause and effect are often used to provide estimates of the climate impact of individual factors, with applications both in science and policy. Radiative forcing (RF) is one of the most widely used metrics, and most other metrics are based on RF. RF is the net change in the energy balance of the Earth system due to some imposed perturbation. It is usually expressed in watts per square meter averaged over a particular period of time and quantifies the energy imbalance that occurs when the imposed change takes place. Though usually difficult to observe, estimates of RF provide a simple quantitative basis for comparing some aspects of the potential climate response to different imposed agents, especially global mean temperature, and, hence, is widely used in the scientific community. Forcing is often presented as the value due to changes between two particular times, such as pre-industrial to present-day.

Improved understanding of radiative forcing (RF) agents reduces uncertainties in climate modeling. The enhanced capability to forecast climate variability and change leads to more targeted and effective policies for emission reduction and better planning and preparedness for extreme weather events.

Monitor atmospheric greenhouse gas concentrations [15%]

This KO aims to systematically detect and measure the levels of greenhouse gases, such as carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), chlorofluorocarbons, and short-lived species like carbonaceous aerosols, sulfate and ozone in the Earth's atmosphere. Greenhouse gases trap heat from the Sun in the atmosphere, which leads to global warming and other harmful effects.

This task presents unique challenges, as greenhouse gases are emitted and transported around the world and vary across regions and time. The needs for measurements can be diverse at different altitudes with various interactions among atmospheric components. The complexity of the Earth's atmosphere, coupled with the need for high-quality, long-term datasets to discern trends, further emphasizes the importance of advanced observation techniques. Except for the anthropogenic sources of greenhouse gases, it is also vital to account for natural variability, such as seasonal fluctuations in vegetation and oceanic processes that affect the carbon cycle. Recent advances in EO technologies, such as the launch of the National Aeronautics and Space Administration's (NASA) Orbiting Carbon Observatory-3 (OCO-3) and Europe's Sentinel-5P satellite, have improved our ability to monitor greenhouse gas concentrations and better understand their sources and sinks. Additionally, advances in data assimilation techniques have allowed for more accurate and reliable estimates of greenhouse gas fluxes between the atmosphere and land and ocean surfaces.

The monitoring of these concentrations is essential for understanding, modeling, and forecasting climate variability and change, providing foundational information for policymakers, businesses, and individuals to reduce greenhouse gas emissions and mitigate climate change. By monitoring greenhouse gas concentrations, governments can also track the effectiveness of climate policies, identify emission hotspots, and assess the impact of climate change on natural resources, ecosystems, and human health.

Effectively validate greenhouse gas emissions inventories through enhanced cooperation with organizations such as the Global Climate Observing System and the Committee on Earth Observing Satellites [5%]

Greenhouse gas emissions inventories account for GHG emissions from various activities, such as burning fossil fuels and deforestation, which contribute to climate change. By validating greenhouse gas emissions inventories, we can ensure that the information collected is accurate, reliable, and globally comparable. This is achieved by strengthening collaboration with key organizations, such as the Global Climate Observing System (GCOS), which is an international program that ensures the provision of continuous, reliable, and high-quality climate observations—and the Committee on Earth Observing Satellites (CEOS), which coordinates civil space-borne observations of Earth to maximize societal benefit and ensure efficient use of resources.

The collaboration involves sharing of best practices, harmonizing data from diverse sources, establishment of robust validation processes, and overcoming limitations in current monitoring capabilities. This fosters more consensus among diverse organizations, recognizing the importance of collaborative efforts to tackle climate change effectively.

Monitor or predict the effects of potential climate intervention strategies [25%]

Monitoring and predicting the effects of climate intervention strategies, including solar radiation modification (SRM) and other geoengineering strategies, is of societal interest because of their potential unintended consequences and unknown risks. Therefore, research in this area is essential to ensure that the benefits of any interventions outweigh the risks and potential negative impacts on the environment and society.

The success of this KO relies heavily on EO systems to provide high-quality data on various environmental parameters, including atmospheric and surface radiation measurements, cloud and aerosol properties, and ocean heat content, to understand the changes in the Earth's climate system. The requirements for EO data need to be more accurate, reliable, and validated to ensure that the SRM models are robust.

Monitoring and predicting the effects of any past and potential climate intervention strategies may be important to some Federal agencies whose missions involve developing effective policy responses to mitigate the impacts of climate change. Meeting this KO allows policymakers to allocate resources more efficiently and equitably across different social groups and regions. By investing in measures that are likely to have the most significant positive impact while minimizing potential risks, societies can maximize the benefits of climate action. Other societal benefits include supporting the promotion of social justice, reducing disparities, and ensuring that vulnerable populations are not disproportionately affected by climate change or intervention strategies.

Climate Change Effects on Human and Environmental Systems [35%]

Understanding climate change effects on human and environmental systems provides essential information for adaptation and mitigation decisions across the country. Climate changes—including changes in temperature, precipitation, sea level, and extreme weather events—impact natural and human systems, human health, infrastructure, ecosystems, and economies. Modeling and predicting these impacts are challenging due to the complex and interconnected nature of these systems, which requires a multidisciplinary approach and the integration of different types of data.

Observed changes in climate extremes reflect the influence of anthropogenic climate change that can lead to increases in natural climate variability. There is evidence from observations gathered since 1950 of change in some extremes that include extended heat waves and droughts, more severe flooding, and stronger storms. Confidence in observed changes in extremes depends on the quality and quantity of data and the availability of studies analyzing these data, which vary across regions and for different extremes. Assigning "low confidence" in observed changes in a specific extreme on regional or global scales neither implies nor excludes the possibility of changes in this extreme. Extreme events are rare, which means there are limited data available to make assessments regarding changes in their frequency or intensity. The rarer the event, the more difficult it is to identify long-term changes. Global-scale trends in a specific extreme may be either more reliable (e.g., for temperature extremes) or less reliable (e.g., for droughts) than some regional-scale trends, depending on the geographical uniformity of the trends in the specific extreme.

Observations are needed to build capacity to better identify and deliver climate information that supports informed adaptation and mitigation policy through a sustained assessment process, including national and international science assessments, problem-focused assessments, and needs assessments. The value of assessment is in its unique ability to bridge the research and the services components of a societally relevant science enterprise. Assessment implies a process of engagement and research to produce a suite of products that are timely, relevant, and credible. The assessment process includes identification and refinement of needs within key sectors through engagement with local and regional stakeholders. During this engagement, the regional context and the knowledge of regions and locations produces new insight and understanding of vulnerabilities that inform science priorities and communications. The shared learning between experts and practitioners engaged in the assessment process helps create a community of practice that drives our science and our services in complementary directions that are relevant to stakeholders.

Problem-focused climate science assessments are often time-sensitive. They address specific climate-sensitive issues; are done in response to significant changes in environmental conditions; and support policy, planning, and decision-making at local to regional levels. Problem-focused climate science assessments may be applied at local scales, and often use national and international climate science assessments as a starting point, but such assessments generally require additional analyses, reprocessing, interpretation, and information to focus more tightly on a specific problem or place. Examples include: (1)

the rapid evaluation of recent local changes and trends in extreme climate events, especially their impacts; (2) the analysis of whether these changes and trends portend future impacts, especially as related to specific aspects of an area's infrastructure, ecosystems, or economics; and (3) the review of whether current adaptation or mitigation efforts are meeting intended goals. This kind of assessment can lead to the development of easy-to-use decision support tools and the timely flow of data and information to support such tools.

Federal agencies play a crucial role in developing policies and programs on adaptation and mitigation based on impact assessments. Appropriate assessment also requires consensus and efforts among diverse organizations to advance observation systems and modeling to support more effective policies and programs across the Nation.

Understand, assess, predict, and project the impacts of climate change, including extreme events, on water resources [25%]

Effects of climate change on water resources involve climate change influences on water quality and quantity, as well as how extreme weather events like droughts, floods, and storms affect water availability and usage. This objective recognizes that water is a vital resource that has tremendous implications for human health, agriculture, energy production, and industrial processes. The challenges associated with this KO include the complexity of water systems and the need to accurately model how water resources will change over time including water use, availability, and quality—and how future land use and socioeconomic and climate change impact water resources.

EO systems, including satellites, airborne sensors, and ground-based measurements, provide information on water cycle dynamics, precipitation patterns, soil moisture, surface water, snow and ice cover, and groundwater storage. Data on vegetation, land use, and land cover also provide information on water use, evapotranspiration, and water availability information that require integrated land-water modeling to account for complex interactions driven by natural and anthropogenic processes.

Understanding, monitoring, assessing, predicting, and projecting the impacts of climate change on water resources provides critical information for making informed decisions about water resource management. Federal and local agencies rely on this knowledge to develop strategies to mitigate drought impacts and adapt to more frequent extreme events in the future and to ensure water security and quality for communities and industries. These strategies are essential to ensure and enhance food security, public health, and public safety for the future.

Understand, assess, predict, and project the impacts of climate change, including extreme events, on the built environment, including urban systems, energy systems, and transportation systems [10%]

Climatic changes and extreme events such as extreme heat, severe storms, wildland fires, flooding, drought, and sea level rise pose threats to a wide variety of sectors, including the built environment (e.g., roads and buildings), water resources, agriculture, forests, wildlife habitat, outdoor recreation, and human health. In particular, the built environment is at risk, including roads and buildings, which can suffer long-term damage from climate change—and energy systems, which are critical to climate change adaptation yet vulnerable to extreme events.

The requirements for data and information vary from sector to sector, and engagement with individual sectors is needed to understand what information is needed and how much uncertainty is tolerable. At the same time, there are some commonalities in requirements across sectors, and identifying how best to leverage these will be important to effectively meet growing needs. Projections of future water, wind, and solar resource availability; storm frequency; temperature exceedance frequency and severity; and sea level change rate are among the most important information for various sectors. For example, remote sensing data can be used to monitor land use changes, vegetation cover, and soil moisture, which can help predict the occurrence of droughts and floods. Satellite data can also be used to monitor sea level rise, which is critical for understanding the potential impacts on coastal infrastructure. EO data can also be used to identify areas where infrastructure investments, such as building seawalls or updating stormwater management systems, may be necessary to reduce the risks associated with climate change.

Knowledge about the historical and potential impacts of climate change on various sectors will support Federal agencies and communities to develop more effective policies and programs to reduce disruptions in the supply chain, minimize losses to businesses, and improve the resilience of communities. Ultimately, adaptation and mitigation activities will help to reduce the impact of natural disasters on communities, protect infrastructure, reduce energy consumption, and improve public health in the long run.

Understand, assess, predict, and project the impacts of climate change, including extreme events, on human-driven changes to land cover and land use [5%]

Climatic changes and extreme events such as extreme heat, severe storms, wildland fires, flooding, and drought may bring significant impact on land cover changes and land use. This KO has the aim of understanding and predicting the direct and indirect consequences of climate change on the physical characteristics of the Earth's surface, including vegetation, water, and human-made structures, as well as people's interaction with and utilization of these natural resources.

The EO system, including powerful computational models, provides vital data on land surface characteristics, such as temperature, water, and surface imaging, that helps to monitor and analyze the changes in land cover and land use over time, as well as the effects of those changes on the land and human-driven changes to the land and the built environment. For example, forest fragmentation and growth (or declines in growth) can be measured using ranging techniques such as LiDAR (e.g., ICESat-2 and GEDI) and Synthetic Aperture Radar (e.g., Sentinel-1 and the upcoming NISAR mission). Urban green cover, fire extent, wetland extent, and the agricultural landscape and its mix with urban activities are measured by a large variety of instruments at various wavelengths. The ECOSTRESS instrument on the International Space Station (ISS) can measure evapotranspiration, the process by which water is transferred from the land to the atmosphere through evaporation from soil and transpiration from plants. Changes in evapotranspiration can indicate shifts in water availability and usage, which are influenced by climate change. Hurricanes and their effects can be observed over time with numerous weather satellites and ground systems, and models such as FPHLM and HAZUS can incorporate the data and predict losses. In three dimensions, temperature and water effects as well as numerous biogeochemical fluxes are paramount and are remotely sensed and modeled as well.

Understand, assess, predict, and project the impacts of climate change, including extreme events, on terrestrial ecosystems and agroforestry systems [5%]

Climatic changes and extreme events such as extreme heat, severe storms, wildland fires, flooding, and drought can significantly impact terrestrial ecosystems and agroforestry systems. The scope of this objective encompasses various ecological and agricultural systems, including forests, grasslands, deserts, crop fields, and livestock habitats. Accomplishing this objective poses unique challenges due to the complexity of the interactions between different components of the Earth system.

A growing body of observation indicates that natural systems are changing and are impacted due to a warming planet and associated climate extremes. Ecosystem changes include shifts in species and animal and insect populations due to changing temperatures and precipitation. Cryospheric changes that affect associated ecosystems are strongly evident, with diminished mountain glaciers, loss of ice sheet mass from Greenland and Antarctica, and thaw of permafrost. With climate warming, hot extremes will become more common, and the atmosphere will be more conducive to more extreme precipitation events. As a result, ecosystems and agricultural systems that are sensitive to these extremes will be more likely to be negatively impacted. Similarly, species and agricultural systems that are better adapted to extended periods of heat will have an advantage.

EO systems provide observations of various environmental parameters such as temperature, precipitation, water vapor, soil moisture, and vegetation cover, which is vital for monitoring and analyzing changes in terrestrial ecosystems and agroforestry systems. Accurate and high-resolution data are needed to develop decision support tools that can be used by policymakers, farmers, etc., to ensure the health and sustainability of ecosystems, the services they provide, and the Nation's food supply.

Understand, assess, predict, and project the impacts of climate change, including extreme events, on coastal and marine resources and ecosystems [35%]

Climatic changes and extreme events such as extreme heat, severe storms, sea level rise, and hurricanes may bring significant impact to coastal and marine resources and ecosystems. Climate change is leading to warmer and more acidic ocean conditions, which impact ocean ecosystems (e.g., coral reef bleaching). Climate changes and extremes that have particularly profound, sometimes catastrophic impacts on vulnerable regions include storms such as hurricanes and tornadoes, droughts and floods, sea level rise and coastal storm surge, and extended high temperatures.

The success of this KO relies heavily on EO systems. EO data can help track the impacts of climate change on coastal and marine ecosystems by measuring various parameters such as sea surface temperature, ocean color, ocean acidity, sea level, coastal erosion, and changes in marine habitats. EO data also allow for identifying and assessing areas that are particularly vulnerable to climate impacts, such as coastal communities at risk of sea level rise or coral reefs threatened by ocean warming and acidification. By combining observational data with climate models, scientists can simulate how factors like sea level rise, ocean temperature, and extreme weather events will affect the coastal and marine ecosystems over time.

This KO is essential for Federal agency missions in coastal zone management and marine spatial planning. Coastal and marine ecosystems support millions of people worldwide through fisheries, tourism, and other economic activities. By assessing the impacts of climate change on these vulnerable ecosystems, societies can develop sustainable management practices and alternative livelihood options to safeguard the well-being of coastal communities dependent on these resources. Predictions and projections also help policymakers and stakeholders make informed decisions about mitigation measures and adaptation strategies to protect infrastructure, homes, and livelihoods of the coastal communities and reduce the risk of damage and loss from extreme events.

Understand, assess, predict, and project the impacts of climate change, including extreme events, on the air quality and human health [10%]

It is critical to have accessible EO for health surveillance, monitoring, and forecasting across disciplines. EO have been used for monitoring vector borne diseases across the world, understanding heat impacts, providing heat forecasts, and monitoring air quality.

EO data are often not in an accessible format for health researchers, nor are they included in the initial framing of a given tool or data collection. Data should be provided in a format and spatial-temporal scale often used in the health sector to ensure that socioeconomic and health surveillance data can be incorporated. EO data should also be downscaled to be used in local regions, which will be of most use to public health officials and environmental justice communities. There is also a need for new sensor technology to improve EO (high resolution, high accuracy, low-cost sensors); novel data collection processing and sharing pathways via the use of novel computing technologies; artificial intelligence (AI) and machine learning algorithms; unique data sharing platforms/interfaces that promote use of EO data by diverse stakeholder groups (e.g., commercial entities, state and local governments); and decision support tools that take into consideration Earth monitoring data with the end goal of empowering communities and individuals. This is a step beyond a data dashboard and includes technology like digital twins and other interactive interfaces that utilize modeling, simulation, and AI.

Climate justice on local, national, and global levels addresses historic injustices and systemic discrimination that created disproportionate climate change impacts on historically underserved populations. These populations include Black, Indigenous, and people of color, sexual and gender minorities, geographically isolated groups, low-wealth communities, rural communities, citizenship status, those with disabilities, children, those who are elderly, and more. These populations often do not have equitable access to, for example, health care services, disaster infrastructure, and green spaces. To address climate injustice, local communities need to be empowered to determine how support is provided and used and tools need to be co-created. Indigenous data sovereignty, open data principles, and health equity should also be framed into data collection and tools. These local and regional mitigation and adaptation strategies to combat direct and indirect human health effects related to a changing climate can be informed by EO in conjunction with community engagement, outreach, and inclusion.

Climate change is one of the most important public health issues in the United States, and for the U.S. Government to maintain leadership and coordination in its research and response, it will be necessary to foster transdisciplinary and multisectoral approaches to integrating EO data with health data to mitigate the health impacts of climate change. The U.S. Global Change Research Program's Climate Change and Human Health Working Group (CCHHG) is an interagency working group consisting of 14 Federal agencies. Their charge is to be the entry point for coordination across the U.S. Government on climate and health issues. Many members of this group work at the intersection of EO and human health or are leaders in similar groups such as the GeoHealth Community of Practice, World Health Organization-World Meteorological Organization Joint Climate Health Programme, and the Global Heat and Health Information Network. Natural hazards, impacts, and prediction tools are used by Federal and sub-national decision-makers, community groups, and researchers. The National Integrated Drought Information System was authorized by Congress in 2006 to coordinate and integrate drought research and establish a national drought early warning system. This tool provides indicators of drought, drought forecast, risk assessment, timely information on drought conditions, and a framework for education and public awareness. Air quality is highly important to track, especially in relation to heat, which can have compounding effects, particularly for communities that are historically underserved. NASA's HAQAST (Health and Air Quality Applied Sciences Team) is a collaborative community of researchers that partner with public health and air quality organizations to combine NASA data for public benefit. Community tools, climate reports, and assessments can be used by the public for education, outreach, informing decision-makers, and creating local solutions. The Department of Health and Human Services' Office of Climate and Health Equity has a monthly Climate and Health Outlook that provides timely regional information on drought, extreme heat, hurricane, wildland fire, Lyme disease, and pollen with information on specific vulnerabilities.

Understand, assess, predict, and project the impacts of climate change, including extreme events, on Tribes and Indigenous Peoples [10%]

Climatic changes and extreme events such as extreme heat, severe storms, wildland fires, flooding, drought, and sea level rise may bring significant impact to Tribes and Indigenous Peoples. Potential for disasters could result from the climate extremes themselves and from the exposure and vulnerability of human and natural systems. Tribal and Indigenous communities are often disproportionately impacted by climate change due to their more direct reliance on natural resources for their livelihoods, cultural practices, and spiritual beliefs. These communities also face unique challenges, such as limited resources and infrastructure, that make it challenging to adapt to the impacts of climate change.

Indigenous communities in coastal areas, such as the Inupiat and Yup'ik peoples living in Alaska, rely on the ocean for subsistence hunting and fishing. EO systems provide valuable data on sea level rise, coastal erosion, changes in sea ice extent, and permafrost thaw, helping these communities assess the impacts of climate change on their coastal habitats and plan adaptation measures. In California, Indigenous communities like the Karuk Tribe have partnered with scientists to analyze satellite data to assess wildfire risks and develop strategies for managing fire-prone landscapes using traditional ecological knowledge. By integrating traditional knowledge with scientific expertise and technological tools, these communities can develop informed strategies for adaptation, resilience, and sustainable development in a changing climate.

This KO is essential for Federal agency missions in promoting social justice and protecting cultural resources. Understanding the impacts of climate change on Indigenous Peoples' traditional livelihoods, such as hunting, fishing, and agriculture, helps inform Indigenous-led adaptation strategies to maintain sustainable resource management and economic resilience. By assessing the impacts of climate change on Indigenous lands and cultural heritage, societies can support Indigenous communities adapt their cultural practices and rituals to changing environmental conditions while preserving Indigenous knowledge and maintaining their cultural identities. Predicting and projecting climate change impacts also informs policies and programs that address systemic inequalities of disproportionate impacts of climate change on vulnerable Indigenous communities, ensures Indigenous rights and sovereignty, and promotes social justice and equity.

Facilitating Societal Responses to Climate Vulnerability and Change [25%]

Societies' responses to climate variability and change cover a diverse range of strategies from adaption to the impacts and mitigation to direct action to stem the loss of biodiversity. Responses are inherently social actions. However, the Federal Government has a responsibility to support the development of effective strategies and policies to adapt to and mitigate the impacts of climate change.

An understanding of the social context and consequences is essential to ensure environmental justice and equity. Many solutions are potentially transformative with large-scale technological and societal changes, and decision-makers will need to exhibit and communicate their understanding of the consequences of their actions. Understanding the costs, benefits, and risks of effective climate change adaption and mitigation strategies and providing information stewardship and data management at scales from global to local will empower the most impacted communities to prepare and effectively respond.

Evaluate the costs, benefits, risks, and effectiveness of climate change mitigation, including strategies to reduce anthropogenic greenhouse gas emissions or influence greenhouse gas sources, sinks, and concentrations [5%]

This KO focuses on understanding various mitigation strategies, ranging from high-technology solutions like renewable energies and energy-efficient equipment to changes in management practices and consumer behavior, to reduce anthropogenic greenhouse gas emissions or influence greenhouse gas sources, sinks, and concentrations. Additionally, protecting and enhancing natural carbon sinks like forests, wetlands, and oceans through green agriculture, aquaculture, and silviculture is an integral part of mitigation efforts. The unique challenges encompass evaluating the trade-offs, effectiveness, potential unintended consequences of climate intervention strategies, and managing the complexities of a multifaceted approach towards climate change mitigation.

Achieving this KO relies heavily on not only EO systems data, but also various modeling tools, including Earth system models, integrated assessment models, and impacts-adaptation-vulnerability models. These models help to estimate mitigation costs, expected benefits, and societal impacts in both the short and long term. Combining these tools in appropriate ways is a growing area of research that can optimize societal strategies for addressing climate change. Incorporating observations to drive and test these models is critical for understanding the feasibility and effectiveness of climate intervention approaches. As the science matures, it will be important to assess which observations and data are most critical for addressing the most pressing societal concerns related to climate change, ensuring that mitigation strategies are informed by the best available information.

Climate change mitigation efforts contribute to moving towards a low-carbon society, which can help minimize the adverse impacts of projected climate variability and change. A comprehensive approach to mitigation can address current climate hazards, poverty, unequal access to resources, food insecurity, and other factors that exacerbate vulnerability to climate change. Furthermore, evaluating mitigation options helps to ensure that resources are allocated effectively, leading to more sustainable economic growth and improved quality of life for citizens.

Evaluate the costs, benefits, risks, and effectiveness of climate change adaptation strategies and investments [5%]

This KO aims to evaluate the different adaptation strategies and investments that are being developed to address the impacts of climate change, including rising sea levels, extreme weather events, and changing precipitation patterns. This assessment also takes into account the costs and benefits of these strategies, as well as their associated risks and effectiveness. The scope of this objective is broad and multidisciplinary, encompassing economic, social, environmental, and infrastructural aspects.

Climate change adaptation refers to the adjustments and modifications that societies and ecosystems make to better cope with the adverse effects of climate change, such as sea level rise, increasing temperatures, and extreme weather events. Some climate change impacts on human and environmental systems can be addressed through preventive action. Thinking ahead about the impacts of climate change on these sectors is essential for communities to reduce risks and lower the long-term costs of damage resulting from climate change. Built, natural, and human systems already have some experience with wide fluctuations in weather events and climate conditions (e.g., flooding and heat waves), and most of these systems are equipped to deal with fluctuations within a certain range as, for example, are illustrated by flood zone maps. This is characterized as a system's "adaptive capacity." Nature has evolved to tolerate expected fluctuations based on historical patterns. Human systems are engineered to tolerate specific expected conditions. As climate change continues, systems and sectors can be stressed beyond their current adaptive capacities. Identifying where systems reach these breaking points is critical for identifying a community's vulnerability to climate change.

Planned anticipatory adaptation has the potential to reduce vulnerability and realize opportunities associated with climate change, regardless of autonomous adaptation. Adaptation facilitated by public agencies is an important part of societal response to climate change. Implementation of adaptation policies, programs, and measures should have immediate and future benefits.

Adaptations to current climate and climate-related risks (e.g., recurring droughts, storms, floods, wildfires, and other extremes) generally are consistent with adaptation to changing and changed climatic conditions. Adaptation measures are likely to be implemented only if they are consistent with or integrated with decisions or programs that address non-climatic stresses. Vulnerabilities associated with climate change are rarely experienced independently of non-climatic conditions. Impacts of climatic stimuli are felt via economic or social stresses, and adaptations to climate (by individuals, communities, and governments) are evaluated and undertaken in light of these conditions.

The costs of adaptation often are marginal to other management or development costs. To be effective, climate change adaptation must consider non-climatic stresses and be consistent with existing policy criteria, development objectives, and management structures. The key features of climate change for vulnerability and adaptation are related to variability and extremes, not only changed average conditions. Societies and economies have been making adaptations to climate for centuries. Most sectors, regions, and communities are reasonably adaptable to changes in average conditions, particularly if the changes are gradual. But losses from climatic variations at extremes are substantial and, in some sectors, increasing. These losses indicate that autonomous adaptation has not been sufficient to offset damage associated with temporal variations in climatic conditions. Communities, therefore, are more vulnerable and less adaptable to changes in the frequency or magnitude of conditions, especially extremes, which are inherent in climate change. The degree to which future adaptations are successful in offsetting adverse impacts of climate change will be determined by success in adapting to climate change, variability, and extremes.

The data from EO systems are used to monitor the effectiveness of different adaptation strategies and investments and to identify areas where additional action is needed. Evaluating the costs and benefits of different adaptation strategies is an essential component of Federal agencies' missions, since this ensures that resources are used efficiently, and investments are made in the most effective strategies.

Provide data needed to support national, regional and local impact assessments and the identification of highly vulnerable systems, regions, and populations [30%]

The impacts of climate change on various regions and populations depend upon the intersection of climate with local exposure and vulnerability. Exposure and vulnerability are dynamic and varying across temporal and spatial scales, and they depend on economic, social, geographic, demographic, cultural, institutional, governance, and environmental factors. Individuals and communities are differentially exposed and vulnerable based on inequalities expressed through levels of wealth and education, available infrastructure and information, disability, and health status—as well as gender, age, class, and other social and cultural characteristics. Climate changes and extremes that have particularly profound, sometimes catastrophic impacts on vulnerable regions include storms such as hurricanes and tornados, droughts and floods, sea level rise and coastal storm surge, and extended high temperatures.

Climate justice on local, national, and global levels would seek to protect at-risk populations that are disproportionately affected by climate change. The social context for this is on underserved and vulnerable geographies and populations both globally and nationally, as these groups are particularly susceptible to climate change because of the geography of the area and the vulnerabilities of the inhabiting populations. Negative human health effects on variable and vulnerable populations due to changing climate are concerning, as health threats are not expected to produce parallel effects among all individuals. Vulnerable communities are least able to respond and adapt to climate change. These include minority communities, Indigenous people, geographically isolated groups, and those who are socioeconomically disadvantaged and already experiencing poor environmental quality. Local and regional mitigation and adaptation strategies are needed for citizens and leaders to combat direct and indirect human health effects related to a changing climate.

Collectively, EO systems tend to focus on industrialized parts of the planet. Often, they could be deployed more broadly or strategically to gather data on areas for which information is relatively sparse and where it could greatly benefit more of the populations that are most at risk from climate change. In addition to human populations, certain natural systems are particularly vulnerable to climate change. Examples include ecosystems and species that have evolved under certain climate conditions and are unable to evolve or migrate fast enough to adapt to climate change, such as coral reef bleaching.

Meeting this KO is crucial for Federal agencies' missions, as it enables policymakers to make informed decisions on funding and resources. Furthermore, providing data in an accessible way to support national, regional, and local impact assessments is essential for ensuring that adaptation measures are tailored to the specific needs of different regions and communities.

Provide communication services, stakeholder engagement, user education, and support tools to assist decision-making related to climate change adaptation efforts [10%]

Climatic changes such as extreme heat, severe storms, flooding, drought, and sea level rise pose real threats to the human-engineered and natural environments of the United States and world. Stakeholder engagement is also a crucial component of this objective to ensure that diverse perspectives and needs are considered in decision-making processes.

Observations and modeling suggest that documented changes, especially in recent decades, have been driven in large part by human influences on the climate system. But regardless of the causes of climate change, or ongoing policy deliberations about the solutions, communities must begin preparing for the expected changes and adapting to those that are already occurring. A fundamental starting point for identifying vulnerabilities and developing adaptation action plans is to understand the most likely changes in local climate based on current trends and projections of temperature, precipitation, and storm patterns. Understanding these changes will help society begin to identify the specific risks that climate change poses to its community and consider how best to prepare for such change. Understanding existing and projected changes in the climate system is a fundamental starting point for local communities to develop plans and take actions to address how those changes impact their residents, resources, and infrastructure.

For example, the restoration of wetlands has great potential for improving carbon sequestration. Additionally, large infrastructure projects such as dams, power plants, and water supply from distant areas can have planning horizons of a decade or more with life expectancies of 30 to 50 years, and projected climatic changes must now be included in the planning stages of these projects. Engagement of public and private entities requires the preparation of climate data and information into formats that are at the appropriate temporal and spatial scale. These data should also be useful and understandable to non-scientists; information and education on the uncertainties as well as the expected risks are critical. Information will need to be presented on easy-to-navigate websites, in written materials, and through personal engagement between scientists and stakeholders.

This objective poses unique challenges, as it requires effective communication and engagement with stakeholders with different levels of expertise and understanding of the climate system. EO data and tools need to be developed to meet different needs while maintaining accuracy.

Meeting this objective will lead to various societal benefits, including reduced vulnerability to climate change impacts, increased resilience of ecosystems and communities, and improved economic stability. Additionally, this objective can promote awareness and education about climate change and its impacts, leading to increased public engagement and support for climate action.

Empower communities, in particular marginalized and traditionally underserved groups, to strengthen their adaptive capacity, increase resilience, and to prepare for and mitigate climate change impacts [15%]

Marginalized and traditionally underserved groups include low-income communities, Indigenous peoples, people of color, and people with disabilities. This objective recognizes that these groups are often disproportionately affected by climate change due to social, economic, and political factors that limit their access to resources, opportunities, and decision-making processes. The scope of this KO is to provide these communities with the necessary tools, resources, and support to adapt to climate change impacts and increase their resilience. To do this, we not only need better and more customized communication systems, but also data products that are more appropriate to the task. Higher level products that interpret EO in a way that integrates well with the specific decision-making systems in use in these communities are essential. Lower latency products can also save lives, but they need to be deployed in a way that they can be easily used.

Compared to other KOs, this objective emphasizes the importance of addressing social equity and justice concerns related to climate change adaptation. It requires a participatory approach that involves collaboration with these communities to co-create solutions that meet their needs and priorities. Nevertheless, EO systems provide fundamental data for community-based planning development. For example, the Environmental Protection Agency's EJSCREEN tool integrates satellite imagery, demographic data, and environmental indicators to assess environmental and health risks in communities across the United States. This environmental justice mapping tool informs equitable allocations of resources and targeted interventions to address environmental justice concerns and disparities in marginalized communities. EO data also provide real-time information on extreme weather events, natural disasters, and infrastructure damage, which enables communities to assess risks, develop evacuation plans, and coordinate emergency response actions. For example, during Hurricane Harvey in 2017, satellite imagery from NASA and other agencies helped emergency responders and local authorities monitor flood extents, assess damages, and prioritize rescue and recovery efforts in affected communities, including marginalized neighborhoods and low-income areas.

Provide data management and information stewardship in service of climate change adaptation efforts [10%]

This objective involves archiving, effectively documenting and delivering data on climate dynamics, extremes, and change to understand and describe impacts, vulnerability, and risk. It also involves building and maintaining the advanced cyberinfrastructure necessary to enable and support decision-making processes for mitigation and adaptation planning. As the volume of EO data continues to grow, greatly expanded management and stewardship are necessary to meet the challenge of curating and harnessing these dynamic and extensive climate data.

Global collaboration in data management is essential for maximizing accessibility, transparency, reliability, and usability of climate data and information; information stewardship ensures the data and information are reproducible and compatible with other products or systems. For example, archiving of National Oceanic and Atmospheric Administration (NOAA) data and information according to Federal Government standards allows for reproducibility and certification of data authenticity to meet the needs of climate data users for transparency. This capability, such as through the NOAA NCEI Common Access system, allows users to conduct investigations into transportation accidents, to build rate cases for energy costs, and to settle legal disputes. Furthermore, interagency collaboration boosts the resilience of data infrastructure by avoiding duplication of efforts, promoting synergies, and minimizing the vulnerability of data to loss or corruption.

Enable the U.S. to collaborate with national and international partners and provide leadership on the global stage to address climate change [20%]

This KO involves ensuring the United States continues working with (and helping lead) domestic and international partners to develop and implement EO policies, programs, and technologies that monitor our environment and enable effective climate change action. By fostering collaboration between the climate research community and decision-makers, from the local, State, Tribal, national, and international levels, the U.S. EO enterprise can inform adaptation strategies that protect infrastructure, communities, and ecosystems from climate change impacts. Transboundary activities that rely on collaborative EO products and services include efforts to monitor and report greenhouse gas emissions, increase the resilience of communities and ecosystems to climate impacts, monitor ocean health, and promote sustainable development.

The United States has a history as a reliable and responsible international partner when undertaking technically complex EO. The success of this KO relies heavily on the willingness to tackle the climate crisis with technology and comprehensive EO and monitoring with the continued leadership to promote policies ensuring full and open access to environmental data around the world.

This KO is critical to Federal agencies' missions largely because climate and environment data are crucial for decision-making, including for monitoring weather and climate variability, real-time agricultural activity, land use and land cover mapping, and water availability. As environmental observables are inherently transboundary, the U.S. Government's international obligations related to EO are predominantly intergovernmental in nature and are rooted in agreements related to intergovernmental organizations including the World Meteorological Organization (WMO) and the Group on Earth observations (GEO).

The Key Products, Services, and Outcomes (KPSOs) categorized under this KO of the Climate SBA Value Tree structure exemplify the many ways in which the United States continues to lead on the global stage in addressing climate change with a science-led, evidence-based, sensor- and satellite-enabled collaborative approach.

Support the environmental stewardship activities of Tribes and Indigenous Peoples and their capacity to mitigate climate change impacts [5%]

This KO recognizes the unique relationship and responsibilities of Tribes and Indigenous Peoples to their ancestral lands, natural resources, and the environment. This objective also recognizes the need to respect and incorporate the cultural values and traditional ecological knowledge of Tribes and Indigenous Peoples while also meeting the scientific and technical standards required for environmental protection and climate change mitigation.

Federal agencies, such as USGS, NASA and NOAA, have initiated programs aiming to build partnerships with Indigenous communities to address climate change impacts using Earth system science and data analytics. These programs support projects that integrate traditional ecological knowledge with EO data to enhance community resilience and management of forest health, water resources, and wildlife habitats in the face of climate change.

Abbreviations and Acronyms

AI	Artificial Intelligence
AMO	Atlantic Multidecadal Oscillation
AO	Arctic Oscillation
CEOS	Committee on Earth Observing Satellites
CCHHG	Climate Change And Human Health Working Group
CMIP	Coupled Model Intercomparison Project
EO	Earth Observations
ENSO	El Niño-Southern Oscillation
GCOS	Global Climate Observing System
GEO	Group on Earth Observations
GHG	Greenhouse Gas
IOD	Indian Ocean Dipole
Lidar	Light Detection And Ranging
NAO	North Atlantic Oscillation
NASA	National Aeronautics and Space Administration
NOAA	National Oceanic and Atmospheric Administration
PDO	Pacific Decadal Oscillation
RADAR	Radio Detection and Ranging
RF	Radiative Forcing
SBA	Societal Benefit Area
SRM	Solar Radiation Modification
TEK	Traditional Ecological Knowledge
UAS	Uncrewed Aircraft Systems
USDA	U.S. Department of Agriculture
USGS	U.S. Geological Survey
WMO	World Meteorological Organization

Annex B: Climate Summary Table

The ranking in this table reflects the observing systems that the Federal community is currently relying on and does not include new/upcoming systems that may have value in the future for the Climate SBA. The ranking is determined by the number of Climate KPSOs impacted. The ranking of an Earth Observation Input only applies in the context of the Climate SBA. Any given Earth Observation Input may be ranked either higher or lower for other SBAs and for the Earth observation enterprise as a whole.

Key	Satellite/Satellite Data *In Situ* Data Airborne Data Ships Field Work Elevation Data Other Reference Data **Earth Observation Inputs**	Number of Climate KPSOs Impacted (509 Total)	% Impact on Climate
1	GOS Basic Surface Synoptic Network	278 (0.88%)	0.88%
2	Aqua Moderate Resolution Imaging Spectroradiometer (MODIS)	271 (2.43%)	2.43%
3	Voluntary Observing Ship	271 (0.63%)	0.63%
4	Automated Weather Observing System (AWOS)	270 (1.03%)	1.03%
5	Terra Moderate Resolution Imaging Spectroradiometer (MODIS)	265 (1.9%)	1.90%
6	Automated Surface Observing System (ASOS)	261 (0.53%)	0.53%
7	JPSS Polar Constellation Visible Infrared Imaging Radiometer Suite	259 (2.07%)	2.07%
8	SNOwpack TELemetry (SNOTEL)	257 (0.92%)	0.92%
9	Global Drifter Program	255 (1.04%)	1.04%
10	Interagency Remote Automated Weather Stations (RAWS)	252 (0.34%)	0.34%
11	NWS Cooperative Observer Program (COOP)	250 (1.4%)	1.40%
12	Geostationary Operational Environmental Satellite - R Series (GOES-R) Advanced Baseline Imager	249 (1.57%)	1.57%
13	Coastal Weather Buoys (CWB)	248 (0.72%)	0.72%
14	Polar-orbiting Operational Environmental Satellite Series (POES) Advanced Very High Resolution Radiometer	246 (1.37%)	1.37%
15	Community Collaborative Rain, Hail and Snow Network (CoCoRaHS)	233 (0.54%)	0.54%
16	MetOp Advanced Very High Resolution Radiometer [EUMETSAT]	231 (0.79%)	0.79%
17	Upper-air Rawinsonde Network	231 (0.47%)	0.47%
18	Global Change Observation Mission 1st-Water (GCOM-W1) Advanced Microwave Scanning Radiometer-2 [JAXA]	229 (0.78%)	0.78%
19	Defense Meteorological Satellite Program (DMSP) Special Sensor Microwave Imager Sounder	227 (1.27%)	1.27%
20	MetOp Advanced Scatterometer [EUMETSAT]	226 (0.34%)	0.34%
21	Coastal-Marine Automated Network (C-MAN)	224 (0.38%)	0.38%
22	Himawari Advanced Himawari Imager [JMA]	222 (0.46%)	0.46%
23	Global Argo Profiling Floats	220 (1.36%)	1.36%
24	Meteorological Data Collection and Reporting System (MDCRS)	220 (0.23%)	0.23%
25	U.S. Climate Reference Network (USCRN)	219 (1.35%)	1.35%
26	Polar-orbiting Operational Environmental Satellite Series (POES) Advanced Microwave Sounding Unit A	218 (0.34%)	0.34%
27	Aircraft Meteorological DAta Relay (AMDAR)	218 (0.22%)	0.22%
28	MetOp Advanced Microwave Sounding Unit A [EUMETSAT]	215 (0.26%)	0.26%
29	MetOp Infrared Atmospheric Sounding Interferometer [EUMETSAT]	213 (0.25%)	0.25%

Key	Satellite/Satellite Data *In Situ* Data Airborne Data Ships Field Work Elevation Data Other Reference Data **Earth Observation Inputs**	Number of Climate KPSOs Impacted (509 Total)	% Impact on Climate
30	Meteosat Second Generation [EUMETSAT]	212 (0.44%)	0.44%
31	GOS Upper Air Network	208 (0.21%)	0.21%
32	Next Generation Weather Radar (NEXRAD) Base Products	207 (0.09%)	0.09%
33	JPSS Polar Constellation Advanced Technology Microwave Sounder	206 (0.23%)	0.23%
34	JPSS Polar Constellation Cross-track Infrared Sounder	205 (0.3%)	0.30%
35	Tropical Atmospheric Ocean Buoy Array (TAO) Ocean Profile	204 (0.78%)	0.78%
36	Next Generation Weather Radar (NEXRAD) Velocity Derived Products	204 (0.16%)	0.16%
37	COSMIC-2 Tri-GNSS Radio Occultation System	195 (0.11%)	0.11%
38	Prediction and Research Moored Array in the Atlantic (PIRATA) Ocean Profile	194 (0.58%)	0.58%
39	Research Moored Array for African-Asian-Australian Monsoon Analysis (RAMA) Ocean Profile	194 (0.51%)	0.51%
40	Next Generation Weather Radar (NEXRAD) Precipitation Estimation Products	192 (0.08%)	0.08%
41	MetOp Microwave Humidity Sounder [EUMETSAT]	190 (0.14%)	0.14%
42	Polar-orbiting Operational Environmental Satellite Series (POES) Microwave Humidity Sounder	190 (0.11%)	0.11%
43	Next Generation Weather Radar (NEXRAD) Reflectivity Derived Products	190 (0.09%)	0.09%
44	Aqua Atmospheric Infrared Sounder	187 (0.16%)	0.16%
45	Polar-orbiting Operational Environmental Satellite Series (POES) High Resolution Infrared Sounder	180 (0.18%)	0.18%
46	NASA Global Precipitation Measurement Mission (GPM) Microwave Imager	176 (0.39%)	0.39%
47	Aqua Advanced Microwave Scanning Radiometer	174 (0.14%)	0.14%
48	Aircraft Report (AIREP)	173 (0.04%)	0.04%
49	Cooperative Agency Profilers	172 (0.11%)	0.11%
50	MetOp Global navigation satellite system Receiver for Atmospheric Sounding [EUMETSAT]	172 (0.06%)	0.06%
51	MetOp High Resolution Infrared Sounder [EUMETSAT]	170 (0.12%)	0.12%
52	AURA Ozone Monitoring Instrument	169 (0.29%)	0.29%
53	Next Generation Weather Radar (NEXRAD) Dual-Pol Derived Products	168 (0.05%)	0.05%
54	Hydrometeorological Automated Data System (HADS)	167 (0.11%)	0.11%
55	Radarsat Series Synthetic Aperture Radar [CSA]	164 (0.59%)	0.59%
56	National Water Level Observation Network (NWLON)	157 (1.43%)	1.43%
57	NOAA Aircraft G-IV Dropsondes	157 (0.04%)	0.04%
58	Gravity Recovery and Climate Experiment (GRACE) Follow-On Triple G (GPS, Galileo, GLONASS)	156 (0.13%)	0.13%
59	Spatial - Global Land Survey Topography (University of Maryland)	154 (0.18%)	0.18%
60	Commercial GNSSRO	153 (0.03%)	0.03%
61	Sentinel-1 Synthetic Aperture Radar C-Band [ESA]	150 (0.69%)	0.69%
62	5-Minute Refresh	150 (0.11%)	0.11%
63	Pilot Report for Aviation Weather Phenomena (PIREP)	149 (0.03%)	0.03%
64	Pilot Balloon (PIBAL)	149 (0.03%)	0.03%
65	GCOS Reference Upper Air Network (GRUAN)	148 (0.17%)	0.17%
66	Global Positioning System (GPS) Integrated Precipitable Water Sensor	143 (0.1%)	0.10%
67	Various Mesonets	138 (0.13%)	0.13%

Key:

- Satellite/Satellite Data
- *In Situ* Data
- Airborne Data
- Ships
- Field Work
- Elevation Data
- Other Reference Data

Key	Earth Observation Inputs	Number of Climate KPSOs Impacted (509 Total)	% Impact on Climate
68	Ronald H. Brown Ocean Profiles	134 (0.49%)	0.49%
69	Okeanos Explorer Ocean Profiles	134 (0.38%)	0.38%
70	10km OSISAF Global Daily Sea Ice Concentration Reprocessing Data	130 (0.17%)	0.17%
71	NWS Cooperative Observer Program (COOP) - Precipitation	130 (0.08%)	0.08%
72	IOOS Regional Ocean Observing System	128 (0.29%)	0.29%
73	Canadian Doppler Radar	126 (0.05%)	0.05%
74	Digital Elevation Models Output - Shuttle Radar Topography Mission (USGS)	123 (1.22%)	1.22%
75	Jason Ocean Surface Topography Mission (2, 3 & CS) [NASA, EUMETSAT]	123 (0.67%)	0.67%
76	International Arctic Buoy Programme	122 (0.38%)	0.38%
77	Polar-orbiting Operational Environmental Satellite Series (POES) Solar Backscatter Ultraviolet Spectral Radiometer	120 (0.07%)	0.07%
78	Aqua Advanced Microwave Sounding Unit	120 (0.06%)	0.06%
79	Supplementary Aviation Weather Reporting Station (SAWRS)	119 (0.33%)	0.33%
80	Sentinel-6 GNSS-RO [ESA]	119 (0.04%)	0.04%
81	Animal Borne Tagging and Bar Coding system	114 (0.3%)	0.30%
82	Soil Climate Analysis Network (SCAN)	114 (0.05%)	0.05%
83	U.S. Air Force Hurricane Hunters Dropsondes	113 (0.03%)	0.03%
84	Commercial Airborne Lidar	111 (1.99%)	1.99%
85	JPSS Polar Constellation Visible Infrared Imaging Radiometer Suite Day-Night Band	111 (0.23%)	0.23%
86	TerraSAR-X GPS-RO [DLR]	107 (0.06%)	0.06%
87	Gravity Recovery and Climate Experiment (GRACE) Follow-On High Accuracy Inter-satellite Ranging System	103 (0.26%)	0.26%
88	JPSS Polar Constellation OMPS Nadir Mapper	103 (0.07%)	0.07%
89	Landsat Operational Land Imager (OLI)	101 (3.45%)	3.45%
90	NOAA Aircraft KingAir Snow Survey	101 (0.06%)	0.06%
91	JPSS Polar Constellation OMPS Limb Profiler	99 (0.05%)	0.05%
92	JPSS Polar Constellation OMPS Nadir Profiler	99 (0.05%)	0.05%
93	Oceansat-2/3 Scatterometer [ISRO]	97 (0.01%)	0.01%
94	NWS Cooperative Observer Program (COOP) - Temperature	94 (0.07%)	0.07%
95	CDMP 19th Century Forts and Voluntary Observers Database	91 (0.11%)	0.11%
96	Oscar Dyson Ocean Profiles	90 (0.04%)	0.04%
97	Parameter-Elevation Regressions on Independent Slopes Model	90 (0.04%)	0.04%
98	Remote Video Monitoring	90 (0.04%)	0.04%
99	Gordon Gunter Ocean Profiles	90 (0.04%)	0.04%
100	Global Positioning System (GPS)	87 (0.5%)	0.50%
101	NOAA Aircraft JetProp Snow Survey Snow Water Equivalent	87 (0.04%)	0.04%
102	CryoSat-2 SAR Interferometer Radar Altimeter [ESA]	85 (0.04%)	0.04%
103	Tropical Atmospheric Ocean Buoy Array (TAO) Surface Atmosphere	84 (0.03%)	0.03%
104	Fairweather Ocean Profiles	84 (0.03%)	0.03%
105	NOAA Aircraft Otter Snow Survey Snow Water Equivalent	83 (0.01%)	0.01%
106	NOAA Aircraft P-3 (Dropsondes)	82 (0.02%)	0.02%
107	Landsat Thermal Infrared Sensor (TIRS)	81 (1.58%)	1.58%

Key		Number of Climate KPSOs Impacted (509 Total)	% Impact on Climate
	Satellite/Satellite Data		
	In Situ Data		
	Airborne Data		
	Ships		
	Field Work		
	Elevation Data		
	Other Reference Data		
	Earth Observation Inputs		
108	Satellite with ARgos and ALtiKa (SARAL) Altimeter Ka Band [CNES]	81 (0.09%)	0.09%
109	International Doppler Radars	81 (0.02%)	0.02%
110	Climate Variability and Predictability	77 (0.2%)	0.20%
111	Canadian Surface Weather Network	75 (0.25%)	0.25%
112	Global Land Survey Digital Elevation Model (GLSDEM)	74 (0.89%)	0.89%
113	Prediction and Research Moored Array in the Atlantic (PIRATA) Surface Atmosphere	74 (0.09%)	0.09%
114	USGS Rain Gauge Network	73 (0.07%)	0.07%
115	Airborne Synthetic Aperture Radar (SAR)/Interferometric SAR (IfSAR)	72 (0.33%)	0.33%
116	Historical Observing Metadata Repository (HOMR)	71 (0.29%)	0.29%
117	Global Sea Level Observing System (GLOSS)	70 (0.3%)	0.30%
118	European Climate Assessment and Dataset	70 (0.21%)	0.21%
119	Global Hourly - Integrated Surface Database (ISD)	70 (0.21%)	0.21%
120	Global Ships of Opportunity for the XBT Network	70 (0.2%)	0.20%
121	Coriolis WindSat Archive	70 (0.08%)	0.08%
122	Research Moored Array for African-Asian-Australian Monsoon Analysis (RAMA) Surface Atmosphere	70 (0.02%)	0.02%
123	Sentinel-2 Multi-Spectral Imager [ESA]	69 (0.7%)	0.70%
124	WorldView 2 Commercial Earth Observation Satellite	69 (0.34%)	0.34%
125	WorldView 3 Commercial Earth Observation Satellite	69 (0.18%)	0.18%
126	Surface Radiation Budget Network (SURFRAD)	69 (0.11%)	0.11%
127	National Glider Network	69 (0.1%)	0.10%
128	Canadian Digital Elevation Model	68 (0.25%)	0.25%
129	Bell M. Shimada Ocean Profiles	68 (0.02%)	0.02%
130	Nancy Foster Ocean Profiles	68 (0.02%)	0.02%
131	Global Ocean Ship-based Hydrographic Investigations Program Ocean Profile	66 (0.17%)	0.17%
132	Greenland Ice Mapping Project (GIMP) DEM	64 (0.12%)	0.12%
133	Norwegian Polar Institute (NPI) Elevation Data	64 (0.12%)	0.12%
134	Sweden, Norway, and Finland National (SNF) Elevation Data	64 (0.12%)	0.12%
135	Radarsat Antarctic Mapping Project (RAMP) DEM	64 (0.12%)	0.12%
136	China Meteorological Administration data	64 (0.11%)	0.11%
137	All-Russia Research Institute of Hydrometeorological Information Data	64 (0.11%)	0.11%
138	Landsat archives	63 (0.39%)	0.39%
139	MOM Research Activity, Code Stack, and Collaborations: GFDL	62 (0.48%)	0.48%
140	University-National Oceanographic Laboratory System (UNOLS) Research	62 (0.13%)	0.13%
141	Global Ocean Ship-based Hydrographic Investigations Program Hydrographic Analysis	62 (0.05%)	0.05%
142	Global Climate Model DEM	60 (0.27%)	0.27%
143	Global Stratospheric/Tropospheric Ozone Network	60 (0.22%)	0.22%
144	Polar-orbiting Operational Environmental Satellite Series (POES) Advanced Microwave Sounding Unit B	60 (0.08%)	0.08%
145	University-National Oceanographic Laboratory System (UNOLS) Ocean Profile	60 (0.07%)	0.07%
146	International Collection	60 (0.07%)	0.07%

Key	Satellite/Satellite Data *In Situ* Data Airborne Data Ships Field Work Elevation Data Other Reference Data	Number of Climate KPSOs Impacted (509 Total)	% Impact on Climate
	Earth Observation Inputs		
147	Belarus surface observing network	60 (0.05%)	0.05%
148	Daily Climate Summaries: Australian Bureau of Meteorology	60 (0.05%)	0.05%
149	Ukraine surface observing network	60 (0.05%)	0.05%
150	Uzbekistan surface observing network	60 (0.05%)	0.05%
151	National Agriculture Imagery Program (NAIP)	59 (0.87%)	0.87%
152	Soil Moisture Active-Passive (SMAP)	59 (0.39%)	0.39%
153	Global Surface Radiation Baseline Network	59 (0.03%)	0.03%
154	National Lightning Data Network (NLDN)	59 (0.02%)	0.02%
155	Various Mesonets - Boundary Layer	59 (0.02%)	0.02%
156	Field Work - Visual Surveys/Lab Samples Collection	58 (0.2%)	0.20%
157	NOAA Aircraft P-3 Expendable Bathythermograph	58 (0.02%)	0.02%
158	Western Boundary Time Series and South Atlantic Meridional Overturning Circulation (WCRP/SAMOC)	57 (0.04%)	0.04%
159	State & Local Buoy Network	57 (0.01%)	0.01%
160	State & Local Streamgage Networks River	55 (0.02%)	0.02%
161	Chartered Vessels Research	54 (0.1%)	0.10%
162	OAR ROV AUV & Gliders	53 (0.07%)	0.07%
163	In-situ Aerosol System	53 (0.03%)	0.03%
164	Atlantic Hurricane Database Reanalysis Project (AOML)	52 (0.5%)	0.50%
165	National Hydrography Dataset (NHD) Data	52 (0.3%)	0.30%

Annex C: Climate Full Results Table

The ranking in this table reflects the observing systems that the federal community is currently relying on and does not include new/upcoming systems that may have value in the future for the Climate SBA. The ranking is determined by the weights in Annex A, which were developed by federal subject matter experts. The ranking of an Earth Observation Input only applies in the context of the Climate SBA. Any given Earth Observation Input may be ranked either higher or lower for other SBAs and for the Earth observation enterprise as a whole.

Key: 99th Percentile; 95th Percentile; 90th Percentile; 75th Percentile; 50th Percentile; Below 50th Percentile; Blank Cells Indicate Input Does Not Contribute to Area

Key	Earth Observation Inputs	SBA: Climate [CL]	Sub-area: The Earth's climate system and the changes occurring in it (CL-1)	Sub-area: Human and natural influences on the climate system (CL-2)	Sub-area: Climate change effects on human and environmental systems (CL-3)	Sub-area: Facilitating societal responses to climate variability and change (CL-4)
1	Landsat Operational Land Imager (OLI)	3.45%	1.83%	3.74%	3.39%	5.87%
2	Aqua Moderate Resolution Imaging Spectroradiometer (MODIS)	2.43%	2.48%	3.04%	2.18%	2.58%
3	JPSS Polar Constellation Visible Infrared Imaging Radiometer Suite	2.07%	3.61%	1.57%	1.37%	0.92%
4	Commercial Airborne Lidar	1.99%	0.59%	2.47%	2.82%	2.76%
5	Terra Moderate Resolution Imaging Spectroradiometer (MODIS)	1.90%	1.37%	2.83%	2.02%	2.31%
6	Landsat Thermal Infrared Sensor (TIRS)	1.58%	0.54%	1.74%	1.51%	3.19%
7	Geostationary Operational Environmental Satellite - R Series (GOES-R) Advanced Baseline Imager	1.57%	2.17%	1.16%	1.21%	1.29%
8	National Water Level Observation Network (NWLON)	1.43%	1.14%	0.05%	0.68%	3.17%
9	NWS Cooperative Observer Program (COOP)	1.40%	2.08%	0.52%	0.85%	1.34%
10	Polar-orbiting Operational Environmental Satellite Series (POES) Advanced Very High Resolution Radiometer	1.37%	2.02%	0.72%	1.08%	0.96%
11	Global Argo Profiling Floats	1.36%	1.72%	1.28%	1.25%	1.01%
12	U.S. Climate Reference Network (USCRN)	1.35%	1.06%	0.29%	2.26%	0.67%
13	Defense Meteorological Satellite Program (DMSP) Special Sensor Microwave Imager Sounder	1.27%	1.66%	0.73%	1.45%	0.56%
14	Database: Digital Elevation Models Output - Shuttle Radar Topography Mission (USGS)	1.22%	0.58%	1.27%	1.25%	2.08%
15	Global Drifter Program	1.04%	1.68%	1.07%	0.50%	0.85%
16	Automated Weather Observing System (AWOS)	1.03%	1.38%	0.14%	0.39%	1.60%
17	Traditional Ecological Knowledge (TEK)	0.99%			1.57%	1.80%
18	USGS Streamgages	0.92%	<0.01%	0.03%	1.96%	0.96%
19	SNOwpack TELemetry (SNOTEL)	0.92%	1.15%	0.38%	0.56%	1.19%
20	Database: Global Land Survey Digital Elevation Model (GLSDEM)	0.89%	0.49%	1.12%	0.95%	1.33%
21	GOS Basic Surface Synoptic Network	0.88%	1.09%	0.48%	0.74%	0.86%
22	National Agriculture Imagery Program (NAIP)	0.87%	0.31%	1.95%	1.38%	0.75%

Key		SBA	Sub-area			
	99th Percentile 95th Percentile 90th Percentile 75th Percentile 50th Percentile Below 50th Percentile Blank Cells Indicate Input Does Not Contribute to Area					
	Earth Observation Inputs	Climate [CL]	The Earth's climate system and the changes occurring in it (CL-1)	Human and natural influences on the climate system (CL-2)	Climate change effects on human and environmental systems (CL-3)	Facilitating societal responses to climate variability and change (CL-4)
23	Database: NOAA Monthly U.S. Climate Divisional Database	0.86%	0.90%		0.63%	1.29%
24	Sediment Cores	0.80%	1.55%	2.50%		0.49%
25	MetOp Advanced Very High Resolution Radiometer [EUMETSAT]	0.79%	1.55%	0.44%	0.30%	0.42%
26	Tropical Atmospheric Ocean Buoy Array (TAO) Ocean Profile	0.78%	0.95%	0.69%	0.67%	0.70%
27	Global Change Observation Mission 1st-Water (GCOM-W1) Advanced Microwave Scanning Radiometer-2 [JAXA]	0.78%	1.78%	0.07%	0.21%	0.25%
28	Coastal Weather Buoys (CWB)	0.72%	0.83%	0.49%	0.64%	0.71%
29	Sentinel-2 Multi-Spectral Imager [ESA]	0.70%	0.18%	0.42%	0.79%	1.40%
30	Sentinel-1 Synthetic Aperture Radar C-Band [ESA]	0.69%	0.66%	0.18%	0.49%	1.10%
31	Jason Ocean Surface Topography Mission (2, 3 & CS) [NASA, EUMETSAT]	0.67%	0.61%	0.17%	0.79%	0.68%
32	Voluntary Observing Ship	0.63%	0.88%	0.52%	0.54%	0.42%
33	Database: Hydrologic Unit Codes (HUC)	0.60%	<0.01%	0.19%	1.61%	0.11%
34	Radarsat Series Synthetic Aperture Radar [CSA]	0.59%	1.12%	0.12%	0.06%	0.65%
35	Prediction and Research Moored Array in the Atlantic (PIRATA) Ocean Profile	0.58%	0.87%	0.52%	0.40%	0.42%
36	Community Collaborative Rain, Hail and Snow Network (CoCoRaHS)	0.54%	0.80%	0.13%	0.42%	0.39%
37	Automated Surface Observing System (ASOS)	0.53%	0.76%	0.12%	0.22%	0.72%
38	Research Moored Array for African-Asian-Australian Monsoon Analysis (RAMA) Ocean Profile	0.51%	0.69%	0.53%	0.39%	0.43%
39	Global Positioning System (GPS)	0.50%	0.15%	0.99%	0.54%	0.87%
40	Database: Atlantic Hurricane Database Reanalysis Project (AOML)	0.50%	0.37%	0.28%	0.71%	0.44%
41	Ronald H. Brown Ocean Profiles	0.49%	0.99%	0.62%	0.18%	0.17%
42	MOM Research Activity, Code Stack, and Collaborations: GFDL	0.48%	0.78%	0.23%	0.34%	0.29%
43	Field Work - Water Testing	0.48%			0.96%	0.60%
44	Database: Legacy Paleoclimatology	0.47%	1.26%			0.07%
45	Upper-air Rawinsonde Network	0.47%	0.66%	0.27%	0.36%	0.38%
46	Himawari Advanced Himawari Imager [JMA]	0.46%	0.80%	0.27%	0.21%	0.34%
47	Database: Sea Level Rise Technical Report	0.45%	0.10%		0.26%	1.32%
48	Meteosat Second Generation [EUMETSAT]	0.44%	0.73%	0.30%	0.25%	0.30%
49	GLERL Observing Capabilities Ships	0.41%	<0.01%		1.17%	
50	Database: SPARC Reanalysis Intercomparison Project (S-RIP)	0.40%	0.73%	1.37%	0.02%	0.28%
51	Soil Moisture Active-Passive (SMAP)	0.39%	0.12%	0.11%	0.59%	0.57%
52	Stranding Reporting Network	0.39%	0.01%		0.94%	0.25%

Key

99th Percentile
95th Percentile
90th Percentile
75th Percentile
50th Percentile
Below 50th Percentile
Blank Cells Indicate Input Does Not Contribute to Area

Key	Earth Observation Inputs	SBA: Climate [CL]	Sub-area: The Earth's climate system and the changes occurring in it (CL-1)	Sub-area: Human and natural influences on the climate system (CL-2)	Sub-area: Climate change effects on human and environmental systems (CL-3)	Sub-area: Facilitating societal responses to climate variability and change (CL-4)
53	NASA Global Precipitation Measurement Mission (GPM) Dual-frequency Precipitation Radar	0.39%	0.14%	0.40%	0.53%	0.56%
54	Database: Landsat archives	0.39%	0.24%	0.70%	0.19%	0.84%
55	NASA Global Precipitation Measurement Mission (GPM) Microwave Imager	0.39%	0.29%	0.10%	0.31%	0.70%
56	Database: Papers - Journals, Scientific Articles/Reports (External)	0.39%	0.93%	0.05%	0.08%	0.10%
57	Database: Coupled Model Intercomparison Project Phase 6 (CMIP6)	0.39%		2.09%	0.52%	0.43%
58	GLERL Observing Capabilities Small Boats	0.39%	0.03%		1.08%	0.01%
59	Database: MACAv2-METDATA	0.39%			0.94%	0.25%
60	Okeanos Explorer Ocean Profiles	0.38%	0.77%	0.49%	0.15%	0.13%
61	Coastal-Marine Automated Network (C-MAN)	0.38%	0.58%	0.30%	0.21%	0.34%
62	Database: STATSGO Database	0.38%	<0.01%	0.23%	1.01%	0.07%
63	International Arctic Buoy Programme	0.38%	0.74%	0.03%	0.06%	0.35%
64	Database: Census of Agriculture Data	0.35%	<0.01%	4.93%	0.22%	0.16%
65	ISS Orbiting Carbon Observatory-3 (OCO-3)	0.35%	0.09%	2.95%		0.71%
66	MetOp Advanced Scatterometer [EUMETSAT]	0.34%	0.55%	0.20%	0.20%	0.28%
67	WorldView 2 Commercial Earth Observation Satellite	0.34%	0.02%	0.13%	0.64%	0.44%
68	Polar-orbiting Operational Environmental Satellite Series (POES) Advanced Microwave Sounding Unit A	0.34%	0.56%	0.15%	0.21%	0.23%
69	NOAA NOS Bathymetry Data	0.34%	0.21%		0.33%	0.61%
70	Interagency Remote Automated Weather Stations (RAWS)	0.34%	0.46%	0.41%	0.30%	0.19%
71	Airborne Synthetic Aperture Radar (SAR)/Interferometric SAR (IfSAR)	0.33%	0.24%	0.53%	0.39%	0.37%
72	Supplementary Aviation Weather Reporting Station (SAWRS)	0.33%	0.57%	0.04%	0.11%	0.36%
73	Database: NASA Power	0.33%			0.16%	1.12%
74	Ice, Cloud, and Land Elevation Satellite 2 (ICESAT) Advanced Topographic Laser Altimeter System	0.33%	0.85%	0.12%	<0.01%	0.06%
75	Document: Mandates: NMFS	0.32%			0.62%	0.44%
76	Database: Coupled Model Intercomparison Project Phase 5 (CMIP5)	0.32%	<0.01%	0.03%	0.72%	0.27%
77	Commercial Airborne Lidar Point Cloud	0.32%	0.23%	<0.01%	0.48%	0.27%
78	Database: Modern-Era Retrospective analysis for Research and Applications	0.31%	0.27%	0.12%	0.41%	0.27%
79	Field Work - Biomarker Identification	0.31%	0.37%	3.71%		
80	Field Work - Carbon Dating	0.31%	0.37%	3.71%		
81	Field Work - Element Evaluation	0.31%	0.37%	3.71%		
82	Field Work - Petrographic Microscope Analysis	0.31%	0.37%	3.71%		

Key	Earth Observation Inputs	SBA: Climate [CL]	Sub-area: The Earth's climate system and the changes occurring in it (CL-1)	Sub-area: Human and natural influences on the climate system (CL-2)	Sub-area: Climate change effects on human and environmental systems (CL-3)	Sub-area: Facilitating societal responses to climate variability and change (CL-4)
	99th Percentile					
	95th Percentile					
	90th Percentile					
	75th Percentile					
	50th Percentile					
	Below 50th Percentile					
	Blank Cells Indicate Input Does Not Contribute to Area					
83	Field Work - Pollen Sample Collection	0.31%	0.37%	3.71%		
84	Field Work - Strata Characterization	0.31%	0.37%	3.71%		
85	Global Sea Level Observing System (GLOSS)	0.30%	0.19%	0.10%	0.06%	0.87%
86	Animal Borne Tagging and Bar Coding system	0.30%	0.36%	0.21%	0.30%	0.24%
87	JPSS Polar Constellation Cross-track Infrared Sounder	0.30%	0.43%	0.75%	0.21%	0.16%
88	USACE Joint Airborne Lidar Bathymetry Technical Center of Expertise (JALBTCX)	0.30%	0.15%	0.01%	0.31%	0.56%
89	Database: National Hydrography Dataset (NHD) Data	0.30%	0.02%	0.28%	0.69%	0.16%
90	Database: Tropical Rainfall Measuring Mission (TRMM) satellite - Clouds and the Earth's Radiant Energy System (CERES)	0.30%	0.12%	0.55%	0.44%	0.31%
91	Database: Historical Observing Metadata Repository (HOMR)	0.29%	0.48%	<0.01%	0.12%	0.32%
92	Orbiting Carbon Observatory-2 (OCO-2)	0.29%	0.09%	2.73%	<0.01%	0.53%
93	IOOS Regional Ocean Observing System	0.29%	0.48%	0.10%	0.21%	0.17%
94	AURA Ozone Monitoring Instrument	0.29%	0.40%	0.28%	0.26%	0.18%
95	Database: National Emissions Inventory (NEI)(EPA)	0.29%	0.02%	0.03%	0.57%	0.35%
96	Database: Sea Ice Data 1850-1978	0.29%	0.80%			
97	Uncrewed Aerial System	0.29%	0.05%	0.32%	0.29%	0.61%
98	Field Work - Visual Inspections	0.28%	0.03%	1.26%	0.53%	0.13%
99	Ameriflux	0.28%	0.05%	0.64%	0.56%	0.16%
100	Information Management System: Visualization (OCM)	0.28%	0.09%		0.34%	0.54%
101	University-National Oceanographic Laboratory System (UNOLS) Ecosystem Survey	0.28%	0.53%	1.72%	0.02%	0.01%
102	Database: Global Climate Model DEM	0.27%	0.10%	0.22%	0.33%	0.45%
103	National Estuarine Research Reserve (NERR) System-Wide Monitoring Program	0.27%	0.05%	<0.01%	0.66%	0.10%
104	Database: Defense Meteorological Satellite Program Special Sensor Microwave Imager	0.27%	0.74%	0.01%	<0.01%	<0.01%
105	Database: Surface Ocean Carbon dioxide ATlas: PMEL and University of Bergen	0.27%	0.47%	1.97%		0.01%
106	Database: Historical Aerial Imagery Data	0.26%			0.59%	0.24%
107	MetOp Advanced Microwave Sounding Unit A [EUMETSAT]	0.26%	0.40%	0.13%	0.17%	0.21%
108	Database: Land Cover Institute - Land Cover (USGS)	0.26%	0.03%	1.27%	0.20%	0.47%
109	Global Greenhouse Gas Reference Network (GGGRN) Surface Trace Gas	0.26%	0.17%	2.79%	0.01%	0.24%
110	Gravity Recovery and Climate Experiment (GRACE) Follow-On High Accuracy Inter-satellite Ranging System	0.26%	0.38%	0.03%	0.24%	0.15%

Key		SBA	Sub-area			
	99th Percentile 95th Percentile 90th Percentile 75th Percentile 50th Percentile Below 50th Percentile Blank Cells Indicate Input Does Not Contribute to Area					
	Earth Observation Inputs	Climate [CL]	The Earth's climate system and the changes occurring in it (CL-1)	Human and natural influences on the climate system (CL-2)	Climate change effects on human and environmental systems (CL-3)	Facilitating societal responses to climate variability and change (CL-4)
111	Global Ocean Carbon Network	0.25%	0.39%	0.49%	0.12%	0.21%
112	Information Management System: Web Services (OCM)	0.25%	0.07%		0.29%	0.51%
113	Information Management System: Geographic Information Systems (OCM)	0.25%	0.07%		0.29%	0.51%
114	Canadian Surface Weather Network	0.25%	0.53%	<0.01%	0.12%	0.08%
115	Hydrographic Surveying	0.25%	0.67%		0.01%	0.03%
116	Database: U.S. Census Topologically Integrated Geographic Encoding and Referencing (TIGER) system - Boundaries	0.25%			0.61%	0.17%
117	Database: Canadian Digital Elevation Model	0.25%	0.14%	0.33%	0.27%	0.37%
118	MetOp Infrared Atmospheric Sounding Interferometer [EUMETSAT]	0.25%	0.43%	0.14%	0.15%	0.12%
119	Gulf of Mexico Marine Assessment Program for Protected Species (GoMMAPPS): BOEM	0.24%	0.01%		0.67%	0.01%
120	Field Work - Visual Surveys	0.24%	<0.01%	<0.01%	0.59%	0.13%
121	Atlantic Marine Assessment Program for Protected Species (AMAPPS): NEFSC	0.24%	0.01%		0.67%	0.01%
122	Ronald H. Brown Research	0.24%	0.11%	0.07%	0.44%	0.17%
123	Database: U.S. Census Data	0.23%	<0.01%	2.70%	0.24%	0.09%
124	Hawaiian Islands Cetacean and Ecosystem Assessment Survey (HICEAS): PIFSC	0.23%	0.01%		0.66%	<0.01%
125	Atmospheric Baseline Observations Surface Trace Gas	0.23%	0.16%	1.96%	0.03%	0.27%
126	JPSS Polar Constellation Advanced Technology Microwave Sounder	0.23%	0.35%	0.16%	0.18%	0.14%
127	Database: U.S. Census Data - Urban Extent	0.23%			0.10%	0.79%
128	Meteorological Data Collection and Reporting System (MDCRS)	0.23%	0.34%	0.15%	0.19%	0.14%
129	JPSS Polar Constellation Visible Infrared Imaging Radiometer Suite Day-Night Band	0.23%	0.43%	0.06%	0.04%	0.24%
130	Aircraft Meteorological DAta Relay (AMDAR)	0.22%	0.33%	0.15%	0.19%	0.14%
131	Database: ASTER Global Emissivity Database (GED)	0.22%	0.01%	0.08%	0.25%	0.52%
132	Global Stratospheric/Tropospheric Ozone Network	0.22%	0.30%	0.36%	0.02%	0.35%
133	Database: Google Earth Engine (GEE)	0.21%	0.05%	<0.01%	0.38%	0.26%
134	Database: European Climate Assessment and Dataset	0.21%	0.42%	<0.01%	0.12%	0.07%
135	Database: Global Hourly - Integrated Surface Database (ISD)	0.21%	0.41%	<0.01%	0.12%	0.07%
136	GOS Upper Air Network	0.21%	0.37%	0.07%	0.10%	0.14%
137	Global Ships of Opportunity for the XBT Network	0.20%	0.18%	0.17%	0.21%	0.22%
138	Climate Variability and Predictability	0.20%	0.28%	0.57%	0.08%	0.17%

Key

- 99th Percentile
- 95th Percentile
- 90th Percentile
- 75th Percentile
- 50th Percentile
- Below 50th Percentile
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		SBA	Sub-area			
Key	**Earth Observation Inputs**	Climate [CL]	The Earth's climate system and the changes occurring in it (CL-1)	Human and natural influences on the climate system (CL-2)	Climate change effects on human and environmental systems (CL-3)	Facilitating societal responses to climate variability and change (CL-4)
139	JPSS Polar Constellation Clouds & Earth Radiant Energy System	0.20%	0.38%	1.18%	0.01%	<0.01%
140	InSAR Data (University-owned)	0.20%			0.13%	0.62%
141	Field Work - Visual Surveys/Lab Samples Collection	0.20%	0.01%	0.53%	0.29%	0.26%
142	Database: Spatial - Bathymetry (State, Local)	0.20%	0.54%	<0.01%	<0.01%	<0.01%
143	Database: Social Vulnerability Index: CDC	0.19%	<0.01%		0.53%	0.04%
144	Okeanos Explorer Research	0.19%	0.10%	0.07%	0.34%	0.14%
145	Database: Sea Ice and Snow Cover Extent: NCEI	0.19%	0.03%	0.05%	<0.01%	0.73%
146	State & Local Air Monitoring Stations (SLAMS)	0.19%	0.08%	0.03%	0.44%	0.04%
147	Database: FAO Crop Production Data	0.19%		0.22%	0.24%	0.38%
148	National Observer Program (NOP)	0.19%	0.02%	<0.01%	0.35%	0.24%
149	Database: State-level Field Boundary Datasets [CA, OR, WA, ID, UT, NV]	0.19%	0.05%	<0.01%	0.40%	0.13%
150	Small Boats - Protected Species	0.18%	0.01%		0.35%	0.25%
151	Polar-orbiting Operational Environmental Satellite Series (POES) High Resolution Infrared Sounder	0.18%	0.36%	0.10%	0.09%	0.07%
152	Effects of Sea Level Rise (ESLR) Competitive Grants	0.18%			0.53%	
153	Commercial Airborne Imagery	0.18%	<0.01%	0.16%	0.50%	<0.01%
154	Total Carbon Column Observing Network (TCCON)	0.18%	0.06%	1.86%		0.28%
155	Database: SeaWiFS	0.18%	0.36%	0.01%	0.14%	<0.01%
156	Database: Spatial - Global Land Survey Topography (University of Maryland)	0.18%	0.25%	0.12%	0.16%	0.11%
157	Database: Google Earth	0.18%	0.01%	0.40%	0.17%	0.39%
158	WorldView 3 Commercial Earth Observation Satellite	0.18%	0.05%	0.13%	0.15%	0.40%
159	Database: U.S. Census Topologically Integrated Geographic Encoding and Referencing (TIGER) system	0.18%	<0.01%	1.28%	0.13%	0.28%
160	NOAA Aircraft Otter (Protected Species)	0.17%	0.01%		0.30%	0.27%
161	ISS Global Ecosystem Dynamics Investigation (GEDI) Lidar	0.17%	0.19%	0.48%	0.11%	0.18%
162	Fish Surveys	0.17%	0.02%		0.36%	0.15%
163	Global Ocean Ship-based Hydrographic Investigations Program Ocean Profile	0.17%	0.32%	0.59%	0.03%	0.06%
164	Sentinel-3 Ocean and Land Color Instrument [ESA]	0.17%	0.20%	0.09%	<0.01%	0.38%
165	Database: 10km OSISAF Global Daily Sea Ice Concentration Reprocessing Data	0.17%	0.21%	0.07%	0.13%	0.18%
166	Small Boats - Recreational Fisheries	0.17%	0.31%	1.21%		
167	Database: GAP Protected Area Database (PAD-US) Data	0.17%	<0.01%	0.38%	0.33%	0.14%
168	GCOS Reference Upper Air Network (GRUAN)	0.17%	0.23%	0.14%	0.15%	0.11%
169	Database: GOES System Historical Database	0.17%	0.44%	<0.01%	0.02%	0.01%
170	Database: ICESat Altimetry	0.17%	0.42%	0.03%	0.02%	0.03%

Key
99th Percentile
95th Percentile
90th Percentile
75th Percentile
50th Percentile
Below 50th Percentile
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Key	Earth Observation Inputs	SBA: Climate [CL]	Sub-area: The Earth's climate system and the changes occurring in it (CL-1)	Sub-area: Human and natural influences on the climate system (CL-2)	Sub-area: Climate change effects on human and environmental systems (CL-3)	Sub-area: Facilitating societal responses to climate variability and change (CL-4)
171	Database: DOE Energy Information Administration (EIA) Annual Energy Outlook	0.16%			0.33%	0.21%
172	Fisheries Science Center Observing and Lab Equipment	0.16%	<0.01%		0.17%	0.42%
173	Next Generation Weather Radar (NEXRAD) Velocity Derived Products	0.16%	0.25%	0.08%	0.13%	0.09%
174	Aqua Atmospheric Infrared Sounder	0.16%	0.24%	0.31%	0.06%	0.15%
175	University-National Oceanographic Laboratory System (UNOLS) Sediment Cores	0.16%	0.18%			0.38%
176	Database: National Hydrography Dataset Plus (NHD-Plus)	0.16%	<0.01%	0.01%	0.38%	0.09%
177	Database: SoilGrids 2.0	0.16%	0.09%	0.53%	0.14%	0.21%
178	Database: CDC National Syndromic Surveillance Program (NSSP)	0.16%			0.45%	
179	Database: Historic Maps (NOS T-Sheets)	0.16%	0.12%		0.24%	0.13%
180	NOAA Aircraft KingAir Coastal Mapping Topography	0.16%	0.11%	0.01%	0.27%	0.09%
181	Aqua Cloud's and the Earth's Radiant Energy System	0.15%	0.24%	1.29%	0.01%	0.01%
182	Terra Cloud and Earth Radiant Energy System	0.15%	0.24%	1.29%	0.01%	0.01%
183	NCore (National Core Network)	0.15%	0.06%	0.03%	0.35%	0.03%
184	NASA Aerosol Robotic Network (AERONET)	0.15%	0.18%	1.76%	<0.01%	<0.01%
185	Fisheries Science Center Observing and Lab Capabilities SWFSC	0.15%	<0.01%		0.18%	0.35%
186	Database: Global Snow Lab, Rutgers University	0.15%				0.60%
187	Database: Harmonized global maps of above and belowground biomass carbon density in the year 2010	0.15%		0.18%	0.19%	0.30%
188	Database: History Database of the Global Environment	0.15%		0.18%	0.19%	0.30%
189	Database: SAGE 175 crop harvested area and yield data, circa 2000	0.15%		0.18%	0.19%	0.30%
190	NCEI Bathymetric Data	0.14%	<0.01%		0.09%	0.45%
191	Aqua Advanced Microwave Scanning Radiometer	0.14%	0.25%	0.16%	0.07%	0.08%
192	USGS Streamgage Network River	0.14%	0.13%	0.26%	0.02%	0.30%
193	Database: Ag Conservation Practice Type and Acreage Data	0.14%	<0.01%	0.12%	0.38%	<0.01%
194	Database: Direct Reports from Farmers (Crop Reports, 578s)	0.14%	<0.01%	0.12%	0.38%	<0.01%
195	MetOp Microwave Humidity Sounder [EUMETSAT]	0.14%	0.19%	0.09%	0.14%	0.07%
196	Ecological Process Data	0.14%			0.39%	
197	Terra Multi-angle Imaging Spectroradiometer	0.14%	0.18%	<0.01%	0.09%	0.16%
198	Database: Wind Integration National Dataset (WIND)	0.13%			0.27%	0.17%

Key	Earth Observation Inputs	SBA: Climate [CL]	Sub-area: The Earth's climate system and the changes occurring in it (CL-1)	Human and natural influences on the climate system (CL-2)	Climate change effects on human and environmental systems (CL-3)	Facilitating societal responses to climate variability and change (CL-4)
	99th Percentile					
	95th Percentile					
	90th Percentile					
	75th Percentile					
	50th Percentile					
	Below 50th Percentile					
	Blank Cells Indicate Input Does Not Contribute to Area					
199	Physical Oceanographic Real-Time System (PORTS) Surface Atmosphere	0.13%	0.09%		0.18%	0.16%
200	Various Mesonets	0.13%	0.07%	<0.01%	0.16%	0.22%
201	National GroundWater Monitoring Network (NGWMN)	0.13%	<0.01%	<0.01%	0.37%	<0.01%
202	California Statewide Groundwater Elevation Monitoring (CASGEM)	0.13%			0.37%	
203	Database: National Conservation Easement Database	0.13%	<0.01%	0.11%	0.35%	<0.01%
204	Database: BLM Surface Management Agency Layer	0.13%	<0.01%	0.11%	0.35%	<0.01%
205	Gravity Recovery and Climate Experiment (GRACE) Follow-On Triple G (GPS, Galileo, GLONASS)	0.13%	0.22%	0.03%	0.10%	0.04%
206	University-National Oceanographic Laboratory System (UNOLS) Research	0.13%	0.23%	0.15%	0.01%	0.13%
207	Database: Coastal Change Hazards Portal (CCHP) Coastal Vulnerability Index	0.13%	0.03%		0.24%	0.13%
208	Database: Greenland Ice Mapping Project (GIMP) DEM	0.12%	0.08%	0.16%	0.13%	0.18%
209	Database: Norwegian Polar Institute (NPI) Elevation Data	0.12%	0.08%	0.16%	0.13%	0.18%
210	Database: Sweden, Norway, and Finland National (SNF) Elevation Data	0.12%	0.08%	0.16%	0.13%	0.18%
211	Database: Radarsat Antarctic Mapping Project (RAMP) DEM	0.12%	0.08%	0.16%	0.13%	0.18%
212	Database: USGS Global 30 Arc-Second Elevation (GTOPO30)	0.12%	0.15%	0.03%	0.12%	0.11%
213	MetOp High Resolution Infrared Sounder [EUMETSAT]	0.12%	0.21%	0.07%	0.08%	0.05%
214	Earth Radiation Budget Assessment Projects: CSL	0.12%	0.13%			0.30%
215	Sea Level Change Analyses: GFDL	0.12%	0.13%			0.30%
216	Synthesis of Reports: GFDL	0.12%	0.13%			0.30%
217	AWI RV Polarstern icebreaker (Germany)	0.12%	0.33%			
218	Database: USDA FSA Form 578 Database	0.12%	0.02%	0.28%	0.18%	0.16%
219	Database: Copernicus Marine Environment Monitoring Service (CMEMS)	0.12%	<0.01%	<0.01%	0.23%	0.16%
220	Atmospheric Radiation Measurement (ARM) Surface Atmosphere	0.12%	0.21%	0.09%	0.04%	0.08%
221	NWS HeatRisk tool	0.12%			0.34%	
222	NOAA NCCOS Coastal Time Series Sponsored Research	0.11%	0.31%			
223	Northern Gulf of Alaska (NGA) Long Term Ecological Research (LTER) Sponsored Research: Seward	0.11%	0.31%			

Key

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224	Database: Shuttle Radar Topography Mission (SRTM)	0.11%	0.01%	0.06%	0.17%	0.19%
225	Cooperative Agency Profilers	0.11%	0.17%	0.06%	0.10%	0.06%
226	University of Bristol LISFLOOD-FP Hydrodynamic Model	0.11%			0.12%	0.28%
227	Polar-orbiting Operational Environmental Satellite Series (POES) Microwave Humidity Sounder	0.11%	0.16%	0.09%	0.09%	0.07%
228	Database: Green Data Oasis (LLNL)	0.11%			0.18%	0.20%
229	COSMIC-2 Tri-GNSS Radio Occultation System	0.11%	0.17%	0.07%	0.09%	0.06%
230	Field Work - Cosmogenic Exposure Dating	0.11%	0.31%			
231	Database: Spatial - Soil Classification (USDA)	0.11%	0.09%	<0.01%	0.02%	0.29%
232	Field Work - Glacier Stakes, Snow Depth and Density Measurements	0.11%	0.28%		0.03%	
233	Hydrometeorological Automated Data System (HADS)	0.11%	0.16%	0.05%	0.08%	0.09%
234	Database: CDMP 19th Century Forts and Voluntary Observers Database	0.11%	0.21%	0.01%	0.06%	0.04%
235	5-Minute Refresh	0.11%	0.09%	0.06%	0.15%	0.09%
236	Surface Radiation Budget Network (SURFRAD)	0.11%	0.22%	0.17%	0.03%	0.03%
237	Wind Profiling SODAR Surface Atmosphere	0.11%			0.18%	0.18%
238	State & Local Fish Surveys	0.11%	0.04%		0.17%	0.13%
239	China Meteorological Administration data	0.11%	0.21%	<0.01%	0.06%	0.04%
240	All-Russia Research Institute of Hydrometeorological Information Data	0.11%	0.21%	<0.01%	0.06%	0.04%
241	Database: Aquarius/Satélite de Aplicaciones Científicas-D	0.11%	0.02%		0.28%	
242	Field Work - Ground Truthing	0.11%	<0.01%		0.06%	0.34%
243	Physical only climate models GFDL	0.10%	0.29%			
244	Data assimilation research for initilaizing Climate prediction GFDL	0.10%	0.29%			
245	Research Activity: Development and use of physical parameterizations GFDL	0.10%	0.29%			
246	Global Soil Wetness Project: WCRP	0.10%	<0.01%	0.40%	0.07%	0.24%
247	IceBridge Multichannel Coherent Radar Depth Sounder (MCoRDS) L2 Ice Thickness	0.10%	0.29%			
248	Global Positioning System (GPS) Integrated Precipitable Water Sensor	0.10%	0.16%	0.03%	0.08%	0.06%
249	IOOS High-Frequency Radars	0.10%	0.25%	<0.01%	0.02%	0.02%
250	Atmospheric Radiation Measurement (ARM) Atmospheric Profile	0.10%	0.21%	<0.01%	0.04%	0.04%
251	AURA Microwave Limb Sounder	0.10%	0.07%	0.12%	0.19%	0.02%
252	National Glider Network	0.10%	0.22%	0.15%	0.02%	0.02%

Key		SBA	Sub-area			
	99th Percentile					
	95th Percentile					
	90th Percentile					
	75th Percentile					
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	Earth Observation Inputs	Climate [CL]	The Earth's climate system and the changes occurring in it (CL-1)	Human and natural influences on the climate system (CL-2)	Climate change effects on human and environmental systems (CL-3)	Facilitating societal responses to climate variability and change (CL-4)
253	Database: NOAA Science On a Sphere	0.10%				0.40%
254	Nanosats Planet	0.10%		0.08%	0.25%	0.03%
255	Document: World Meteorological Organization (WMO) Solid Precipitation Measurement Intercomparison	0.10%	<0.01%	0.40%	0.07%	0.23%
256	Database: Spatial - Flood Zone Mapping (FEMA)	0.10%	<0.01%		0.28%	<0.01%
257	Chartered Vessels Research	0.10%	0.13%	0.15%	0.03%	0.14%
258	National Cooperative Soil Survey (NCSS)	0.10%			0.19%	0.12%
259	Database: NCDC Paleoclimatology Datasets	0.10%	0.07%	0.72%		0.15%
260	Satellite with ARgos and ALtiKa (SARAL) Altimeter Ka Band [CNES]	0.09%	0.14%	0.07%	0.11%	0.02%
261	Next Generation Weather Radar (NEXRAD) Base Products	0.09%	0.13%	0.05%	0.06%	0.10%
262	Database: Coastwatch SST, Ocean Color, Wind, Salinity, Sea Level	0.09%	0.03%		0.16%	0.12%
263	Global Ocean Reference Stations	0.09%	0.03%	<0.01%	0.03%	0.30%
264	Database: USACE National Inventory of Dams (NID)	0.09%	<0.01%	<0.01%	0.25%	0.02%
265	Prediction and Research Moored Array in the Atlantic (PIRATA) Surface Atmosphere	0.09%	0.25%	0.01%	0.01%	<0.01%
266	Database: World Data Service for Paleoclimatology: Archive Enhancement Activities	0.09%	0.26%			
267	Database: Historic Streamgage Network (USGS, USACE, NWS, State, Local)	0.09%	0.18%		0.06%	0.01%
268	Next Generation Weather Radar (NEXRAD) Reflectivity Derived Products	0.09%	0.14%	0.01%	0.05%	0.10%
269	Database: Nimbus Scanning Multi-channel Microwave Radiometer (SMMR)	0.09%	0.25%		<0.01%	<0.01%
270	Climate Hazards Group InfraRed Precipitation with Station data (CHIRPS)	0.09%			0.16%	0.14%
271	Database: NOAA Climate.gov Global Climate Dashboard	0.09%				0.37%
272	Hydrographic Surveying Small Boats	0.09%	0.06%		0.17%	0.03%
273	Database: Maurer 12km Climate Forcings Data	0.09%			0.26%	
274	NASA Aircraft DC8 Aerosols Research	0.09%	0.01%	1.80%	<0.01%	<0.01%
275	Database: USGS National Water Information System	0.09%	<0.01%		0.26%	<0.01%
276	Database: Socio-Economic - Population Data (DoC/U.S. Census)	0.09%	0.06%	0.02%	0.15%	0.06%
277	Goddard Earth Observing System (GEOS)-Chem	0.09%			0.26%	
278	Database: Oklahoma Water Resources Board Future Use Data	0.09%			0.25%	
279	Database: State-level Water Rights Data	0.09%			0.25%	

Key	Earth Observation Inputs	SBA: Climate [CL]	Sub-area: The Earth's climate system and the changes occurring in it (CL-1)	Sub-area: Human and natural influences on the climate system (CL-2)	Sub-area: Climate change effects on human and environmental systems (CL-3)	Sub-area: Facilitating societal responses to climate variability and change (CL-4)
	99th Percentile; 95th Percentile; 90th Percentile; 75th Percentile; 50th Percentile; Below 50th Percentile; Blank Cells Indicate Input Does Not Contribute to Area					
280	Database: General Bathymetric Chart of the Oceans (GEBCO)	0.09%	0.24%	0.01%	<0.01%	<0.01%
281	Database: Eulerian Level Set Model of FIRE spread Model (ELMFIRE)	0.09%			0.13%	0.17%
282	USGS Small Uncrewed Aircraft Systems (sUAS)	0.08%			0.24%	
283	Database: Citizen Science UHI Maps	0.08%			0.24%	
284	NWS Cooperative Observer Program (COOP) - Precipitation	0.08%	0.13%	0.05%	0.06%	0.06%
285	Database: Historical Settlement Data Compilation for the United States (HISDAC-US)	0.08%		1.35%	0.04%	0.03%
286	Database: Carbon Budget Model of the Canadian Forest Sector (CBM-CFS3)	0.08%	0.06%	0.44%		0.16%
287	Digital Towed Underwater Camera Systems	0.08%			0.15%	0.13%
288	Clean Air Status and Trends Network (CASTNET)	0.08%	0.09%	0.01%	0.14%	0.01%
289	Polar-orbiting Operational Environmental Satellite Series (POES) Advanced Microwave Sounding Unit B	0.08%	0.13%	0.01%	0.04%	0.09%
290	Soil Moisture and Ocean Salinity Mission (SMOS) Microwave Imaging Radiometer using Aperture Synthesis [ESA]	0.08%	0.11%	0.06%	0.06%	0.08%
291	Database: Historical Airborne Imagery	0.08%	0.06%	0.01%	0.12%	0.07%
292	Continuously Operating Reference Stations (CORS) Total Electron Content Data	0.08%	0.03%	0.22%	0.03%	0.21%
293	Database: Spatial - Marine Geology (Academic, International)	0.08%	0.22%			
294	Commercial Fisheries Dependent Data Survey	0.08%	0.01%		0.16%	0.09%
295	Database: Commercial Roads Databases(NavTeq)	0.08%	<0.01%	0.11%	0.04%	0.24%
296	Global Ocean Ship-based Hydrographic Investigations Program Water Quality and Harmful Algal Bloom	0.08%	<0.01%		0.02%	0.29%
297	Database: Outgoing Longwave Radiation Daily Climate Data Record: NCEI	0.08%	0.22%			
298	Database: African Rainfall Climatology, version2 (ARC2): CPC	0.08%			0.22%	
299	Database: Coriolis WindSat Archive	0.08%	0.10%	0.08%	0.07%	0.05%
300	Database: Joint Typhoon Warning Center Best Track: Navy	0.08%	0.13%	<0.01%	0.04%	0.07%
301	Next Generation Weather Radar (NEXRAD) Precipitation Estimation Products	0.08%	0.10%	0.01%	0.05%	0.10%
302	Database: NREL Annual Technology Baseline	0.07%			0.15%	0.09%
303	Database: Coral Reef Ecosystem Integrated Observing System/National Coral Reef Monitoring Plan	0.07%	0.01%		0.16%	0.07%

Key

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Key	Earth Observation Inputs	SBA: Climate [CL]	Sub-area: The Earth's climate system and the changes occurring in it (CL-1)	Sub-area: Human and natural influences on the climate system (CL-2)	Sub-area: Climate change effects on human and environmental systems (CL-3)	Sub-area: Facilitating societal responses to climate variability and change (CL-4)
304	Database: DOE Grid Modernization Laboratory Consortium	0.07%			0.22%	
305	JPSS Polar Constellation OMPS Nadir Mapper	0.07%	0.03%	0.52%	0.07%	0.06%
306	NOAA Open Data Dissemination (NODD) Mesonets	0.07%			0.21%	
307	Field Work - Stake Measurements	0.07%	0.21%			
308	Belgium Modèle Atmosphérique Régional (MAR)	0.07%	0.21%			
309	California Dept of Water Resources (CaDWR) Atmospheric River Observatories (ARO)	0.07%	0.20%			
310	California Dept of Water Resources (CaDWR) Soil Moisture Stations	0.07%	0.20%			
311	California Dept of Water Resources (CaDWR) Snow-Level Radars	0.07%	0.20%			
312	Database: Airborne Snow Radar + Airborne Accumulation Radar	0.07%	0.20%			
313	University-National Oceanographic Laboratory System (UNOLS) Ocean Profile	0.07%	0.16%	0.13%	0.01%	0.02%
314	National Weather Service Doppler Radar	0.07%			0.21%	
315	Polar-orbiting Operational Environmental Satellite Series (POES) Solar Backscatter Ultraviolet Spectral Radiometer	0.07%	0.10%	0.05%	0.08%	0.04%
316	Wind Profiling SODAR Atmospheric Profile	0.07%			0.12%	0.12%
317	Interagency Monitoring of Protected Visual Environments (IMPROVE)	0.07%	0.04%	0.02%	0.14%	0.03%
318	Field Work - Ground Surveys, Field Measurements	0.07%	<0.01%	0.91%	0.07%	0.02%
319	USGS Rain Gauge Network	0.07%	0.05%	<0.01%	0.02%	0.20%
320	In Situ Landslide Instruments/Crackmeters	0.07%				0.29%
321	In Situ Monitoring for Landslides	0.07%				0.29%
322	Marine and Estuarine Goal Setting for South Florida	0.07%			0.06%	0.20%
323	OAR ROV AUV & Gliders	0.07%	0.14%	0.02%	0.03%	0.03%
324	Database: State Geologic Survey Maps	0.07%	<0.01%	0.30%	0.14%	0.03%
325	Database: State/Local Parcel Data	0.07%	<0.01%	0.81%	0.07%	0.03%
326	Commercial Fisheries Dependent Data Surveys State Fish Ticket	0.07%	0.01%		0.18%	0.03%
327	NWS Cooperative Observer Program (COOP) - Temperature	0.07%	0.07%	0.01%	0.09%	0.06%
328	Database: Wetland Losses in the United States (USFWS report) - 1780-1980	0.07%		1.12%	0.03%	0.02%
329	Database: High Plains Regional Climate Center real-time surface data	0.07%	0.11%	<0.01%	0.05%	0.04%
330	Field Work - Permafrost Gas Diffusion Experiments	0.07%	0.19%			
331	Advanced Land Observing Satellite-2 (ALOS-2) Phased Array L-band SAR [JAXA]	0.07%	0.14%	<0.01%	0.02%	0.05%

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332	Northwest Bottom Trawl Survey	0.07%	<0.01%	<0.01%	0.13%	0.09%
333	Database: NASA Land Mask/Surface Type	0.07%	<0.01%	<0.01%	0.18%	0.02%
334	Alaska Bottom Trawl Survey - Aleutians	0.07%	<0.01%	<0.01%	0.13%	0.09%
335	Alaska Bottom Trawl Survey - Gulf of Alaska	0.07%	<0.01%	<0.01%	0.13%	0.09%
336	NASA Uninhabited Aerial Vehicle SAR (UAVSAR)	0.07%	0.13%	0.06%	0.02%	0.05%
337	Database: National Climate Assessment (NCA) Teaching Resources (CLEAN)	0.07%				0.28%
338	Terra Advanced Spaceborne Thermal Emission and Reflection Radiometer	0.07%	<0.01%	0.03%	0.03%	0.22%
339	USGS Lidar	0.07%	<0.01%	<0.01%	0.09%	0.15%
340	Global Greenhouse Gas Reference Network (GGGRN) Upper Air Trace Gas	0.07%	0.07%	0.71%	0.02%	<0.01%
341	Database: International Collection	0.07%	0.15%	<0.01%	0.01%	0.03%
342	MetOp Global navigation satellite system Receiver for Atmospheric Sounding [EUMETSAT]	0.06%	0.10%	0.05%	0.05%	0.03%
343	Database: Local Constructed Analogs (LOCA) Statistically Downscaled CMIP5 Data	0.06%			0.19%	
344	Database: Neotoma Paleoecology Database	0.06%	0.05%	0.48%		0.10%
345	Photochemical Assessment Monitoring Stations (PAMS)	0.06%	0.03%	0.01%	0.14%	0.01%
346	TerraSAR-X GPS-RO [DLR]	0.06%	0.08%	0.09%	0.08%	0.02%
347	3D Coral Imagery	0.06%	0.18%			
348	Database: MIRCA2000 Global Monthly Crop Irrigated and Rainfed Harvested Crop Areas	0.06%		0.09%	0.08%	0.13%
349	Database: FAO/UNESCO Soil Map of the World	0.06%		0.09%	0.08%	0.13%
350	Marine Recreational Information Program	0.06%	0.01%		0.14%	0.05%
351	Database: Atmospheric Abundance - Ozone Depleting	0.06%	0.01%	0.28%		0.19%
352	Aqua Advanced Microwave Sounding Unit	0.06%	0.10%	0.02%	0.06%	0.02%
353	NOAA Tide Gauges	0.06%	0.02%		0.05%	0.16%
354	USGS Surface Lidar Topography	0.06%	0.07%	0.01%	0.10%	0.01%
355	USGS Inner-shelf Vessels Benthic Habitat	0.06%	0.04%		0.08%	0.08%
356	Database: World Inventory of Soil Emission Potentials (WISE)	0.06%			0.05%	0.18%
357	Database: Infrastructure Data from Digital Coast (OCM)	0.06%	0.04%		0.08%	0.08%
358	Spotter/Skywarn Volunteer Program Weather Reports	0.06%	0.02%	<0.01%	0.07%	0.11%
359	Database: USGS Topographic Maps	0.06%	<0.01%	0.49%	0.10%	0.02%
360	Cloud-Aerosol Lidar and Infrared Pathfinder Satellite Observations Cloud-Aerosol Lidar with Orthogonal Polarization	0.06%	0.05%	0.85%	<0.01%	0.01%
361	NOAA Aircraft KingAir Snow Survey	0.06%	0.13%	<0.01%	0.03%	0.02%

Key

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Key	Earth Observation Inputs	SBA	Sub-area			
		Climate [CL]	The Earth's climate system and the changes occurring in it (CL-1)	Human and natural influences on the climate system (CL-2)	Climate change effects on human and environmental systems (CL-3)	Facilitating societal responses to climate variability and change (CL-4)
362	Ecosystems & Fisheries-Oceanography Coordinated Investigations (EcoFOCI)	0.06%	0.15%	<0.01%	0.02%	0.01%
363	Geophysical Field Surveys	0.06%			0.10%	0.11%
364	Reservoir Operations Data	0.06%	0.03%	<0.01%	0.12%	0.04%
365	Northeast Bottom Trawl Survey	0.06%	<0.01%	<0.01%	0.12%	0.08%
366	Halocarbons & Other Atmospheric Trace Species (HATS) Surface Trace Gas	0.06%	0.02%	0.38%	0.04%	0.09%
367	Database: IPCC Assessment Reports	0.06%	0.08%	0.21%	0.01%	0.08%
368	NASA Icebridge	0.06%	0.17%			
369	Bottomfish Fishery-Independent Survey in Hawaii (BFISH) - Cooperative Research Fishing Surveys	0.06%		<0.01%	0.12%	0.08%
370	Database: 2011-2020 Real Time Mesoscale Analysis (RTMA) dataset	0.06%			0.09%	0.12%
371	Database: NREL Pumped Storage HydroPower Resource Assessment	0.06%			0.12%	0.08%
372	NMFS ROV AUV & Gliders	0.06%	0.05%	0.06%	0.03%	0.12%
373	Protected Resource Surveys Ships	0.06%	<0.01%		0.11%	0.08%
374	Database: APEX SyncroSIM ST-Sim	0.06%	<0.01%	0.02%	0.02%	0.20%
375	GLERL Observing Capabilities Divers	0.06%			0.17%	
376	Database: Bing Building Footprint Maps Database	0.06%	<0.01%	0.02%	0.01%	0.22%
377	Gordon Gunter Research	0.06%	0.10%	0.07%	0.04%	0.03%
378	Alaska Bottom Trawl Survey - Bering Sea	0.06%	<0.01%	<0.01%	0.11%	0.08%
379	Field Work - River Discharge Measurements	0.06%			0.17%	
380	Database: Seabird Catalog - Historical (USFWS)	0.06%	0.10%	0.01%	0.05%	0.02%
381	Database: Glacier Monitoring (WGMS)	0.06%	0.04%	0.05%	0.04%	0.11%
382	Harmonized Emissions Component	0.06%			0.16%	
383	Fairweather Research	0.06%	0.10%	0.07%	0.03%	0.03%
384	Database: USGS Structures Database: Critical Facilities	0.06%	<0.01%		0.16%	<0.01%
385	Database: Esri Business Analyst data (2019)	0.06%	<0.01%		0.16%	<0.01%
386	Saildrone	0.06%	0.12%	<0.01%	<0.01%	0.04%
387	Database: Watershed Boundary Dataset (WBD)	0.06%			0.12%	0.06%
388	Database: Coupled Model Intercomparison Project (CMIP) Archives	0.06%			0.06%	0.14%
389	Greenhouse Gas Chambers (CO2/CH4 flux measurements)	0.05%		1.15%		
390	NEON Airborne Observation Platform (AOP) Airborne Lidar	0.05%	<0.01%	0.22%	<0.01%	0.18%
391	Database: National Gap Analysis Program - Species (USGS)	0.05%			0.16%	<0.01%
392	Database: Climate and Economic Justice Screening Tool	0.05%			0.16%	

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	99th Percentile					
	95th Percentile					
	90th Percentile					
	75th Percentile					
	50th Percentile					
	Below 50th Percentile					
	Blank Cells Indicate Input Does Not Contribute to Area					
393	Database: Biomass Assessment SAR Field Campaigns: AfriSAR, INDREX-2, BioSAR/2/3, TropiSAR	0.05%		0.22%		0.18%
394	ARM Mobile Facility #2 (AMF2) (DoE)	0.05%	0.15%			
395	Belarus surface observing network	0.05%	0.11%	<0.01%	0.03%	0.02%
396	Database: Daily Climate Summaries: Australian Bureau of Meteorology	0.05%	0.11%	<0.01%	0.03%	0.02%
397	Ukraine surface observing network	0.05%	0.11%	<0.01%	0.03%	0.02%
398	Uzbekistan surface observing network	0.05%	0.11%	<0.01%	0.03%	0.02%
399	Ice, Cloud and land Elevation Satellite-2 - Spacecraft	0.05%	0.11%	0.25%		0.01%
400	Database: Topography, Soils, Vegetation Types	0.05%	0.10%	<0.01%	0.05%	<0.01%
401	NOAA Aircraft Otter Aerosols Research	0.05%	0.06%	0.04%	<0.01%	0.12%
402	Database: European Remote-Sensing Satellite (ERS-1,2) Database	0.05%	0.15%	<0.01%	<0.01%	<0.01%
403	Habitat Assessment	0.05%	0.01%		0.10%	0.06%
404	Database: State/Local Water Use Data	0.05%			0.13%	0.02%
405	Program Funding Competitive Grants, Air Quality studies: Atmospheric Chemistry, Carbon Cycle and Climate (AC4)	0.05%	<0.01%	1.03%	<0.01%	<0.01%
406	Citizen Reporting - Phenology	0.05%	0.08%		0.07%	
407	Database: Commercial Landings Data (NMFS)	0.05%	<0.01%	0.02%	0.12%	0.03%
408	NOAA Streamgages	0.05%			0.10%	0.06%
409	Documents: Montreal Protocol and its Amendments	0.05%	0.01%	0.22%		0.15%
410	NOAA Aircraft Otter Trace Gas Research	0.05%	0.06%	0.08%	<0.01%	0.10%
411	Database: Integrated Reporting of Wildland-Fire Information (IRWIN)	0.05%	<0.01%	0.01%	0.04%	0.14%
412	Database: MERIS Historical Data	0.05%	0.14%			
413	Global Ocean Ship-based Hydrographic Investigations Program Hydrographic Analysis	0.05%	0.06%	0.02%	0.04%	0.06%
414	Commercial Fisheries Dependent Data Surveys Biological Samples	0.05%	<0.01%		0.13%	0.02%
415	NOAA Aircraft Otter (Coastal Mapping)	0.05%	0.07%	0.01%	0.06%	0.02%
416	Marine Biological Observers	0.05%	0.09%		0.03%	0.02%
417	Canadian Doppler Radar	0.05%	0.07%	0.04%	0.04%	0.03%
418	Database: Snow Pack Monitoring (CSAS)	0.05%				0.20%
419	Database: USGS Land Cover Trends (2002)	0.05%		0.79%	0.02%	0.01%
420	JPSS Polar Constellation OMPS Limb Profiler	0.05%	0.03%	0.01%	0.07%	0.06%
421	JPSS Polar Constellation OMPS Nadir Profiler	0.05%	0.03%	0.01%	0.07%	0.06%
422	Database: Quick Fire Emission Dataset	0.05%			0.14%	
423	Gulf of Mexico SEAMAP Bottom Trawl Survey	0.05%	<0.01%	<0.01%	0.09%	0.07%
424	Database: DOE Energy Information Administration (EIA) Consumptive Use Data	0.05%	<0.01%	0.21%	0.08%	0.04%

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	99th Percentile 95th Percentile 90th Percentile 75th Percentile 50th Percentile Below 50th Percentile Blank Cells Indicate Input Does Not Contribute to Area	SBA	Sub-area			
425	South Atlantic SEAMAP Bottom Trawl Survey	0.05%	<0.01%	<0.01%	0.09%	0.07%
426	AOML/NOAA Florida Current Cable (AOML/NOAA)	0.05%	0.13%			
427	Database: World Weather Records (WWR)	0.05%	0.01%	<0.01%	<0.01%	0.17%
428	Planet Dove	0.05%	0.06%	0.02%	0.02%	0.07%
429	Database: Passive Acoustic Data (SanctSound)	0.05%	0.13%			
430	Database: Community Emissions Data System - proxy	0.05%	<0.01%	0.12%	0.12%	<0.01%
431	Next Generation Weather Radar (NEXRAD) Dual-Pol Derived Products	0.05%	0.05%	0.01%	0.03%	0.07%
432	Database: Air Quality System (AQS)	0.05%	0.13%	<0.01%		<0.01%
433	Sentinel-6 Poseidon-4 Dual-Frequency SAR [ESA]	0.05%	0.01%	0.11%	0.06%	0.07%
434	Gordon Gunter Protected Species Surveys	0.05%	0.01%	<0.01%	0.08%	0.06%
435	Soil Climate Analysis Network (SCAN)	0.05%	0.07%	0.03%	0.04%	0.02%
436	Commercial Fisheries Dependent Data Surveys Log Books	0.05%	<0.01%		0.10%	0.04%
437	State/Local Rain Gauge Network	0.05%	<0.01%	<0.01%	<0.01%	0.19%
438	Database: Multivariate Adaptive Constructed Analogs (MACA) Downscaled CMIP5 Data	0.05%			0.13%	
439	USGS Mobile Surge Sensors	0.05%	0.05%	<0.01%	0.05%	0.04%
440	Fisheries Science Center Observing and Lab Capabilities SEFSC	0.04%	<0.01%		0.13%	<0.01%
441	Database: NLDAS-2 Forcings Dataset	0.04%		<0.01%	0.02%	0.15%
442	Database: HydroSource	0.04%			0.09%	0.06%
443	Database: Guidance in Teaching About Climate and Energy (CLEAN)	0.04%				0.18%
444	Database: Climate and Energy Educational Resource Collection (CLEAN)	0.04%				0.18%
445	Database: Spatial - Hydrologic Flow Lines (USGS)	0.04%				0.18%
446	Database: Polar-orbiting Operational Environmental Satellite Series Microwave Sounding Unit	0.04%	0.11%	0.05%	<0.01%	0.01%
447	Information Management System: Advanced Hydrological Prediction Service (AHPS)	0.04%	0.01%	0.06%	0.10%	0.01%
448	Sentinel-3 Synthetic Aperture Radar Altimeter [ESA]	0.04%	<0.01%	0.11%	0.10%	<0.01%
449	Ice-Tethered Profiler System	0.04%	0.12%			
450	State & Local Water Quality Monitoring	0.04%	0.01%		0.11%	0.01%
451	Database: latest global geophysical parameter lifetimes to develop new ODS scenarios	0.04%	0.01%	0.19%		0.13%
452	Database: Spatial - Bathymetry (USACE)	0.04%	0.10%	<0.01%	0.02%	<0.01%
453	Database: WORLDCLIM Temp Climate Data	0.04%	0.01%	<0.01%	0.10%	0.02%
454	High Spectral Resolution Lidar	0.04%	0.03%	0.64%		
455	Cloud-Aerosol Transport System	0.04%	0.03%	0.64%		

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	99th Percentile					
	95th Percentile					
	90th Percentile					
	75th Percentile					
	50th Percentile					
	Below 50th Percentile					
	Blank Cells Indicate Input Does Not Contribute to Area					
456	CryoSat-2 SAR Interferometer Radar Altimeter [ESA]	0.04%	0.07%	0.04%	0.04%	0.02%
457	Database: NCDC Paleoceanography Datasets	0.04%	0.05%			0.10%
458	Sentinel-6 GNSS-RO [ESA]	0.04%	0.05%	0.14%	0.03%	0.03%
459	RadarSat Constellation Mission	0.04%	0.12%	<0.01%	<0.01%	<0.01%
460	University-National Oceanographic Laboratory System (UNOLS) Protected Species Survey	0.04%	<0.01%		0.06%	0.08%
461	NOAA Aircraft G-IV Dropsondes	0.04%	0.05%	0.01%	0.05%	0.02%
462	Database: Homeland Security Information Network (HSIN) Land Ownership Data	0.04%		0.67%	0.02%	0.01%
463	Database: University of Idaho Vegetation Transition Database	0.04%	<0.01%	0.02%	0.02%	0.13%
464	Aircraft Report (AIREP)	0.04%	0.07%	0.02%	0.03%	0.03%
465	Database: National Geologic Map	0.04%	<0.01%	0.08%	0.09%	0.03%
466	Database: Atmospheric Abundance - Key Climate Gases	0.04%	0.01%	0.18%		0.12%
467	Single-beam Bathymetry	0.04%	0.01%		0.04%	0.10%
468	Database: Global Energy and Water cycle Exchanges Project (GEWEX)	0.04%	0.05%	0.44%		
469	Antarctic Observing Network (AON) Drifting Ice Buoys	0.04%	0.11%	<0.01%	<0.01%	<0.01%
470	Database: Kruitwagen Photovoltaic Solar Energy Inventory	0.04%	<0.01%	0.01%	0.06%	0.08%
471	Database: OpenStreetsMap	0.04%	0.05%	<0.01%	<0.01%	0.09%
472	Database: NASA Airborne Topo Mapper (ATM) Archive	0.04%	0.10%		0.01%	0.01%
473	USGS Geomagnetic Observatories Mobile Marine	0.04%	0.11%		<0.01%	
474	Documents: Scenario Development Activity	0.04%	0.01%	0.18%		0.12%
475	Oscar Dyson Ocean Profiles	0.04%	0.08%	0.05%	0.02%	0.01%
476	CSL Atmospheric Emissions Field Campaigns (e.g., AEROMMA, SUNVEx, LISTOS, SENEX)	0.04%	0.04%	0.20%		0.07%
477	Bathymetric Lidar	0.04%	<0.01%		0.02%	0.13%
478	Database: Spatial - Bathymetry (International)	0.04%	0.11%		<0.01%	<0.01%
479	Western Boundary Time Series and South Atlantic Meridional Overturning Circulation (WCRP/SAMOC)	0.04%	0.02%	0.03%	0.04%	0.06%
480	Fisheries Science Center Observing and Lab Capabilities PIFSC	0.04%			0.11%	<0.01%
481	Database: Parameter-Elevation Regressions on Independent Slopes Model	0.04%	0.02%	0.06%	0.04%	0.06%
482	Remote Video Monitoring	0.04%	0.03%	<0.01%	0.07%	0.02%
483	Database: Passive Acoustic Data (ADEON)	0.04%	0.11%			

Key

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484	Gordon Gunter Ecosystem Surveys	0.04%	0.01%	<0.01%	0.09%	0.02%
485	Database: University of Minnesota National Lacustrine Core Repository	0.04%	0.11%			
486	NOAA Aircraft JetProp Snow Survey Snow Water Equivalent	0.04%	0.03%	<0.01%	0.04%	0.05%
487	Sub-bottom Profilers	0.04%	0.10%			
488	Gordon Gunter Ocean Profiles	0.04%	0.07%	0.05%	0.02%	0.01%
489	Ocean Acoustic Monitoring System Passive	0.04%	0.03%		0.07%	<0.01%
490	Downlooking RGB Photography	0.04%	0.07%	0.24%		
491	Intelsat Commercial Ku-band satellites	0.04%	0.10%			
492	Field Work - Ice Cores and Temperature Sensors	0.04%	0.10%			
493	GPS (handheld)	0.04%	0.10%			
494	Protected Species: Publication of Data Assimilation and Synthesis Tools	0.04%				0.15%
495	Database: Open Altimeter Database (ADB)	0.04%	0.03%	<0.01%	0.04%	0.05%
496	Database: Radar Altimeter Database (RADS)	0.04%	0.03%	<0.01%	0.04%	0.05%
497	USGS Terrestrial Lidar (T-Lidar)	0.04%	<0.01%		0.02%	0.12%
498	Oregon II Fish Surveys	0.04%	<0.01%	<0.01%	0.08%	0.03%
499	Oscar Dyson Fish Surveys	0.04%	<0.01%	<0.01%	0.08%	0.03%
500	Database: NCEI Archive Management System (AMS) SUMD	0.04%	0.05%			0.07%
501	Ground-based Lidar Systems (upward pointed)	0.04%			0.02%	0.11%
502	Okeanos Explorer Water Quality and Harmful Algal Bloom	0.04%	0.01%	<0.01%	0.08%	0.02%
503	Cooperative Observer Program (COOP) Streamgage Network River	0.04%	0.03%	0.02%	0.02%	0.07%
504	Coral Reef Ecosystem Integrated Observing System/National Coral Reef Monitoring Plan Autonomous Reef Monitoring Structures	0.04%	<0.01%		0.07%	0.04%
505	Database: MERRA Aerosol Dataset: NASA	0.04%	0.01%	0.01%	0.06%	0.05%
506	Database: LANDFIRE Existing Vegetation Cover 2016 Remap	0.04%	<0.01%	0.02%	0.02%	0.12%
507	Database: FAO Harmonized World Soil Database v1.2	0.04%				0.14%
508	Database: Sonar/Active Acoustic Data (Rolling Deck to Repository)	0.03%	0.10%			
509	Database: Historical FIA Forest Inventory Data	0.03%	<0.01%	0.42%	0.03%	0.01%
510	Database: DOE Billion Ton Update	0.03%		0.56%	0.02%	0.01%
511	Tropical Atmospheric Ocean Buoy Array (TAO) Surface Atmosphere	0.03%	0.07%	0.01%	0.01%	0.03%
512	Database: Historical Documents (Newspapers, Federal Records, Industry Records, etc.)	0.03%	0.10%			

Key		SBA	Sub-area			
	99th Percentile 95th Percentile 90th Percentile 75th Percentile 50th Percentile Below 50th Percentile Blank Cells Indicate Input Does Not Contribute to Area					
	Earth Observation Inputs	Climate [CL]	The Earth's climate system and the changes occurring in it (CL-1)	Human and natural influences on the climate system (CL-2)	Climate change effects on human and environmental systems (CL-3)	Facilitating societal responses to climate variability and change (CL-4)
513	Bell M. Shimada Fish Surveys	0.03%	<0.01%	<0.01%	0.07%	0.03%
514	Database: NOAA Digital Coast Lidar	0.03%	0.05%	<0.01%	<0.01%	0.07%
515	Glacier Weather Stations	0.03%	0.09%		0.01%	
516	Database: Emissions Database for Global Atmospheric Research (EC-JRC)	0.03%	0.02%	0.28%		0.06%
517	Database: State and Local Imagery: Low tide	0.03%	0.05%	<0.01%	<0.01%	0.07%
518	Oscar Elton Sette Protected Species Surveys	0.03%	<0.01%	<0.01%	0.06%	0.05%
519	AOML Gliders	0.03%	0.08%	0.04%	0.01%	
520	Nancy Foster Water Quality and Harmful Algal Bloom	0.03%	<0.01%	<0.01%	0.08%	0.02%
521	Pisces Fish Surveys	0.03%	<0.01%	<0.01%	0.07%	0.03%
522	Database: Real Time International GNSS Service	0.03%	<0.01%	<0.01%	0.10%	<0.01%
523	Field Work - Water, Soil, Species Collection	0.03%			0.10%	
524	Database: Passive Acoustic Data (BOEM)	0.03%	0.09%			
525	Database: Shoreline Data (USGS)	0.03%	0.08%	0.01%	<0.01%	0.01%
526	Fairweather Ocean Profiles	0.03%	0.06%	0.04%	0.01%	0.01%
527	WorldView 1 Commercial Earth Observation Satellite	0.03%	0.01%	0.03%	0.07%	0.01%
528	Gravity for the Redefinition of the American Vertical Datum (GravD) Marine	0.03%	0.09%	<0.01%	<0.01%	<0.01%
529	TanDEM-X Synthetic Aperture Radar [DLR]	0.03%	0.06%	<0.01%	0.03%	<0.01%
530	Database: International CO2 Measurements	0.03%	0.05%	0.18%	0.02%	
531	Ocean Acidification Gliders	0.03%	0.06%	0.06%	0.02%	0.01%
532	Database: Our World In Data CO2 and Greenhouse Gas Emissions database	0.03%		0.21%	0.01%	0.08%
533	Spotter/Skywarn Volunteer Program Surface Atmosphere	0.03%	<0.01%	<0.01%	<0.01%	0.13%
534	Nancy Foster Habitat Surveys	0.03%	0.02%	<0.01%	0.03%	0.06%
535	Database: Topographic Data (External)	0.03%	0.08%	0.01%	<0.01%	<0.01%
536	Commercial GNSSRO	0.03%	0.05%	0.02%	0.02%	0.02%
537	Database: EPA Level III Ecoregions Map	0.03%	<0.01%	<0.01%	0.08%	0.01%
538	Henry B. Bigelow Fish Surveys	0.03%	<0.01%	<0.01%	0.07%	0.03%
539	NEON Airborne Observation Platform (AOP) Imaging Spectrometer	0.03%	<0.01%	<0.01%	0.05%	0.05%
540	Weather Bureau Army Navy (WBAN) Weather Data	0.03%	0.01%	0.05%	0.07%	0.01%
541	Global Surface Radiation Baseline Network	0.03%	0.02%	0.17%	0.02%	0.03%
542	Japan Meteorological Agency Forecast Services	0.03%	0.03%	<0.01%	0.05%	<0.01%
543	Database: Input Datasets for Model Intercomparison Projects	0.03%	0.08%	<0.01%		
544	NANOOS and PMEL Environmental Sample Processor (ESP) mooring	0.03%	0.08%			
545	Database: PNW HAB bulletin (UWashington)	0.03%	0.08%			
546	NANOOS Cha'ba mooring	0.03%	0.08%			

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547	NANOOS NEMO subsurface profiler	0.03%	0.08%			
548	In-situ Aerosol System	0.03%	0.01%	0.12%	0.01%	0.07%
549	Documents: Deliberate climate intervention alternatives for scenario planning	0.03%	0.01%	0.13%		0.09%
550	Documents: Prior WMO Ozone Assessments	0.03%	0.01%	0.13%		0.09%
551	Database: Joint Altimetry Satellite Oceanography Network - 2 Poseidon 3	0.03%	<0.01%		0.09%	<0.01%
552	Cloud Physics Lidar	0.03%	0.02%	0.44%		
553	Flux Towers	0.03%	0.08%	<0.01%	<0.01%	<0.01%
554	Compact Total Irradiance Monitor (CTIM)	0.03%	0.07%	0.09%		
555	ISS Total and Spectral Solar Irradiance Sensor (TSIS)	0.03%	0.07%	0.09%		
556	Solar Radiation and Climate Experiment (SORCE) / TIM	0.03%	0.07%	0.09%		
557	TSI Calibration Transfer Experiement (TCTE) / TIM	0.03%	0.07%	0.09%		
558	Tropospheric Emissions: Monitoring of Pollution	0.03%	0.01%	0.28%	<0.01%	0.05%
559	Database: Scenario Climate Metrics: e.g., global warming potentials (GWPs), combined global temperature change potential (CGTP), and radiative forcing (RF).	0.03%	0.01%	0.13%		0.09%
560	Microwave Imagery, Vertical Polarization, GPM(GMI) Sensor Data Records (SDR)	0.03%	0.04%		<0.01%	0.06%
561	Landsat-8 OLI Panchromatic	0.03%	0.08%			
562	Physical Oceanographic Real-Time System (PORTS) Sea Level	0.03%	0.06%	<0.01%	0.01%	0.01%
563	Oregon II Ecosystem Surveys	0.03%	<0.01%	<0.01%	0.07%	0.02%
564	Database: NOAA Center for Operational Oceanographic Products and Services NOAA Tides and Currents	0.03%	0.08%		<0.01%	<0.01%
565	U.S. Air Force Hurricane Hunters Dropsondes	0.03%	0.04%	0.02%	0.03%	0.01%
566	Citizen Reporting	0.03%			0.08%	
567	Microwave Imagery, Horizontal Polarization, GPM(GMI) Sensor Data Records (SDR)	0.03%	0.04%		<0.01%	0.06%
568	Database: GHGI (EPA)	0.03%	<0.01%	0.24%	0.01%	0.05%
569	Database: EPA GHG Reporting Program	0.03%	<0.01%	0.24%	0.01%	0.05%
570	Airborne Lidar (Federal/State/County owned)	0.03%			0.02%	0.09%
571	Database: Unsponsored Bathymetric Data	0.03%	0.08%		<0.01%	<0.01%
572	NOAA Ships thermosalinograph (TSG)	0.03%	0.04%			0.05%
573	Pilot Report for Aviation Weather Phenomena (PIREP)	0.03%	0.04%	0.01%	0.02%	0.02%
574	Database: Xbeach Model	0.03%	0.01%		0.05%	0.03%
575	Database: Database of Reservoir Construction Dates	0.03%		0.45%	0.01%	0.01%
576	Pilot Balloon (PIBAL)	0.03%	0.04%	0.02%	0.02%	0.02%

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577	NOS ROV AUV & Gliders	0.03%	0.05%	0.06%	0.01%	0.01%
578	Pisces Ecosystem Surveys	0.03%	<0.01%	<0.01%	0.06%	0.02%
579	Database: Navy-NOAA Joint Ice Center Analog maps of ice concentration estimates Data 1979-present	0.03%	0.07%			
580	Database: SSMI/S, SMMR, AMSR Microwave Sensor Data	0.03%	0.07%			
581	Database: U.S. Census Topologically Integrated Geographic Encoding and Referencing (TIGER) system - Roads	0.03%			0.02%	0.08%
582	GeoEye1 Commercial High-Resolution Satellite Imagery	0.03%	<0.01%	0.02%	0.07%	<0.01%
583	Oscar Elton Sette Ecosystem Surveys	0.03%	<0.01%	<0.01%	0.06%	0.01%
584	Sea Ice Concentrations from Nimbus-7 SMMR	0.03%			0.04%	0.05%
585	Kuroshio Extension Observatory Moorings	0.03%	0.07%			
586	Ocean Station Papa Mooring: PMEL	0.03%	0.07%			
587	Soil Moisture Sensors	0.03%	<0.01%	<0.01%	0.07%	<0.01%
588	National Ecological Observatory Network (NEON)	0.03%	0.04%		0.03%	
589	Ocean Acoustic Monitoring System	0.03%	0.02%		0.04%	0.01%
590	Antarctic UV Network	0.03%	<0.01%	0.02%	<0.01%	0.10%
591	Database: Historical Gravity Recovery and Climate Experiment Data	0.03%	0.07%			
592	Database: Spatial - Nautical Charts Archive (OCS, NGS)	0.03%	0.06%	<0.01%	0.01%	0.01%
593	Field Work - Salinity Sampling, Tidal Observations	0.03%	0.01%	0.04%	0.03%	0.03%
594	Planet SuperDove	0.03%	0.06%	<0.01%	0.01%	<0.01%
595	Database: The Climate Literacy Framework (USGCRP)	0.03%				0.10%
596	Database: The Energy Literacy Framework (DOE)	0.03%				0.10%
597	Urban Testbed: NIST	0.03%	0.02%	0.13%		0.04%
598	Database: Physical Oceanography Distributed Active Archive Center, Altimetry: NASA	0.02%			0.07%	
599	Field Work - Campaigns including Aircraft	0.02%	0.07%			
600	Database: Model of Emissions of Gases and Aerosols from Nature (MEGAN-MACC)	0.02%	<0.01%	<0.01%	0.07%	
601	NIFC Incident Management Situation Report (IMSR)	0.02%	0.07%			
602	Global Greenhouse Gas Reference Network (Aircraft Trace Gas)	0.02%	0.07%			
603	Everglades National Park Hydrologic Monitoring Stations	0.02%	0.04%	0.18%		
604	Database: Passive Acoustic Data (LISTEN_GoMex)	0.02%	0.07%			
605	Environment Canada (EC) Weather Network	0.02%	0.01%	0.04%	0.05%	0.01%
606	Database: Historical Water Usage - 2020 Study	0.02%			0.07%	

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607	GLERL Observing Capabilities Moored Thermistors	0.02%	0.04%		0.01%	0.03%
608	In Situ Water Loggers	0.02%	0.07%			
609	Multi-beam Bathymetry	0.02%	0.03%		0.02%	0.03%
610	Database: Ocean Biogeographic Information System (OBIS) - Spatial Ecological Analysis of Megavertebrate Populations (Duke University)	0.02%	0.01%		0.06%	<0.01%
611	Shoreline Mapping Airborne Charter High Res Imagery	0.02%	0.03%	<0.01%	<0.01%	0.05%
612	Database: USFS Land Ownership/Land Use	0.02%	<0.01%	0.02%	0.06%	<0.01%
613	SNOLITE (Snow Telemetry and Snow Telemetry Lite)	0.02%	0.07%			
614	Geostationary Operational Environmental Satellite - R Series (GOES-R) Geostationary Lightning Mapper	0.02%	0.03%	<0.01%	0.01%	0.04%
615	NOAA Aircraft P-3 Trace Gas Research	0.02%	0.02%	0.09%	<0.01%	0.05%
616	Database: Climate Prediction Center Thermal Infrared Dataset	0.02%	0.02%		0.04%	0.01%
617	Fish Surveys Small Boats (NOAA funded)	0.02%	<0.01%		<0.01%	0.09%
618	Database: Historical USGS Streamgage Data	0.02%	0.07%			
619	Database: Copernicus Global Land Cover Dataset	0.02%		0.15%	0.05%	
620	Database: California Cooperative Oceanic Fisheries Investigations (CalCOFI): California	0.02%	0.02%	<0.01%	0.03%	0.02%
621	Henry B. Bigelow Protected Species Surveys	0.02%	<0.01%	<0.01%	0.04%	0.04%
622	Database: RapidEye Archive	0.02%			0.06%	0.01%
623	Oscar Elton Sette Fish Surveys	0.02%	<0.01%	<0.01%	0.05%	0.02%
624	Database: Global Time Series, NCEI	0.02%				0.09%
625	National Lightning Data Network (NLDN)	0.02%	0.03%	0.01%	0.01%	0.03%
626	Space Geodesy Product: NASA	0.02%			0.07%	
627	Field Work - Species Data Collection	0.02%			0.06%	0.01%
628	Database: Environmental Monitors on Lobster Traps and Large Trawlers (The Gulf of Maine Lobster Foundation)	0.02%	0.06%			
629	Shoreline Mapping Airborne Chartered Lidar Hydrography	0.02%	0.06%	0.01%	<0.01%	0.01%
630	Database: Internal Reduced Complexity Models (LTA Model, SBSP)	0.02%	0.06%			
631	National Marine Sanctuary System-Wide Monitoring (SWiM) Program: Small Boats	0.02%	<0.01%		0.05%	0.02%
632	Nancy Foster Ecosystem Surveys	0.02%	<0.01%	<0.01%	0.05%	0.01%
633	Arctic Observing Network (AON) Hydrophone Moorings	0.02%	0.06%			
634	Database: State/Local Land Use Maps	0.02%	0.03%	<0.01%	<0.01%	0.04%
635	USACE Streamgage Network	0.02%	0.01%	<0.01%	<0.01%	0.08%

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	Earth Observation Inputs	Climate [CL]	The Earth's climate system and the changes occurring in it (CL-1)	Human and natural influences on the climate system (CL-2)	Climate change effects on human and environmental systems (CL-3)	Facilitating societal responses to climate variability and change (CL-4)
636	Database: Wetland Potential Index (WPI)	0.02%	0.02%	0.15%	0.01%	0.02%
637	Reuben Lasker Protected Species Surveys	0.02%	<0.01%	<0.01%	0.04%	0.03%
638	University of Alaska Fairbanks Airborne Lidar	0.02%				0.09%
639	Stratospheric Aerosol Injection Modeling CSL ERB Research Funding	0.02%	0.06%	0.01%		<0.01%
640	Stratospheric Aerosol Loading Response Modeling CSL ERB Research Funding	0.02%	0.06%	0.01%		<0.01%
641	Stratospheric Aerosol Observations CSL ERB Research Funding	0.02%	0.06%	0.01%		<0.01%
642	Stratospheric Solar Radiation Management Materials CSL ERB Research Funding	0.02%	0.06%	0.01%		<0.01%
643	State & Local Streamgage Networks River	0.02%	0.01%	0.01%	0.01%	0.07%
644	Database: Hadley Centre/Climatic Research Unit Temperature (HadCRUT) global temperature dataset: Hadley Centre	0.02%	0.06%	0.01%		
645	Database: SPC Severe Weather Database Files	0.02%	0.01%	0.37%		
646	Henry B. Bigelow Water Quality and Harmful Algal Bloom	0.02%	<0.01%	<0.01%	0.05%	0.01%
647	Database: Dust deposition from University of Miami dust network	0.02%	0.06%			
648	Database: Merged Total Ozone Column Product: NASA	0.02%	0.06%			
649	Multispectral Imaging, Detection, and Active Reflectance (MiDAR)	0.02%				0.09%
650	Sentinel-3 Sea and Land Surface Temperature Radiometer [ESA]	0.02%	0.03%	0.13%	0.01%	0.01%
651	Database: Global Multi-Resolution Terrain Elevation Data 2010 (EROS)	0.02%	<0.01%	0.03%	0.03%	0.04%
652	Database: Homeland Infrastructure Foundation-Level Data (HIFLD)	0.02%			0.01%	0.08%
653	Snow Courses	0.02%	<0.01%	0.03%	0.05%	0.01%
654	Ecosystem Surveys	0.02%	<0.01%		0.06%	<0.01%
655	Arctic Observing Network (AON)	0.02%	<0.01%	0.15%	<0.01%	0.05%
656	Database: Historical Wildland Fire Interagency Geospatial Services (WFIGS) Data	0.02%				0.09%
657	Database: Global Land Cover Classification	0.02%	<0.01%		0.04%	0.02%
658	U.S. Air Force Hurricane Hunters Stepped Frequency Microwave Radiometer	0.02%	0.01%	<0.01%	0.05%	<0.01%
659	TerraSAR-X Synthetic Aperture Radar [DLR]	0.02%	0.06%	<0.01%	<0.01%	<0.01%
660	Caribbean Coastal Ocean Observing System (CARICOOS)	0.02%	0.01%		0.04%	0.02%
661	Database: Quikscat SeaWinds Scatterometer Archive	0.02%	0.03%	<0.01%	<0.01%	0.03%

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	Earth Observation Inputs	Climate [CL]	The Earth's climate system and the changes occurring in it (CL-1)	Human and natural influences on the climate system (CL-2)	Climate change effects on human and environmental systems (CL-3)	Facilitating societal responses to climate variability and change (CL-4)
662	Database: Max Planck Institute Earth System Model (MPI-ESM1.2)	0.02%			0.06%	
663	Terminal Doppler Weather Radar (TDWR) Wind	0.02%	0.01%	<0.01%	<0.01%	0.07%
664	Mexico Weather Network	0.02%	0.01%	0.03%	0.05%	0.01%
665	Database: VIIRS Land Cover Product	0.02%	<0.01%		0.04%	0.04%
666	Cooperative Observer Program (COOP) Streamgage Network Surface Atmosphere	0.02%	0.02%	0.02%	0.02%	0.02%
667	DOE Aerosol Time of Flight Mass Spectrometer (ATOFMS)	0.02%	0.02%	0.02%	0.02%	0.02%
668	Database: USGS Experimental Advance Airborne Research Lidar (EAARL)	0.02%	<0.01%		0.03%	0.03%
669	NOAA’s Adaptation Sciences (AdSci) research program grants: CPO	0.02%	0.01%			0.07%
670	Database: French Research Institute for Exploitation of the Sea	0.02%	0.03%			0.04%
671	Database: ArcGIS Imagery	0.02%	<0.01%	0.23%	0.02%	0.01%
672	Database: Spatial - Marine Geology (USGS)	0.02%	0.06%		<0.01%	<0.01%
673	Planetscope	0.02%				0.08%
674	Bell M. Shimada Ocean Profiles	0.02%	0.04%	0.03%	0.01%	0.01%
675	Nancy Foster Ocean Profiles	0.02%	0.04%	0.03%	0.01%	0.01%
676	Database: FracFocus	0.02%			0.06%	
677	Database: OneMine Global Mining and Minerals Library	0.02%			0.06%	
678	Database: NatureServe Ecological Systems Datasets	0.02%	<0.01%	<0.01%	<0.01%	0.08%
679	Database: WHOI Moisture Heat Flux	0.02%	0.01%	0.07%	0.02%	0.03%
680	Database: FWS Land Ownership/Land Use	0.02%	<0.01%	0.02%	0.05%	<0.01%
681	Database: NPS Land Ownership/Land Use	0.02%	<0.01%	0.02%	0.05%	<0.01%
682	Database: NCAR Community Climate System Model 4.0	0.02%			0.06%	
683	Global Atmosphere Watch (GAW) Green House Gases	0.02%		0.15%		0.05%
684	Database: EPA Safe Drinking Water Information System (SDWIS) Data	0.02%			0.05%	<0.01%
685	Fisheries Science Center Observing and Lab Capabilities UAS_Srvy/Surveillanc	0.02%	<0.01%		0.05%	0.01%
686	CSD Observing Capabilities	0.02%	0.01%	0.04%		0.05%
687	Various Mesonets - Boundary Layer	0.02%	0.02%	<0.01%	0.02%	0.03%
688	Economic and Socio-cultural Data Surveys Recreational Fish Catch Southeast Fisheries Science Center	0.02%	<0.01%		0.04%	0.03%
689	Airborne High-Resolution Visible Imagery	0.02%	<0.01%	0.10%	0.03%	0.02%

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	Earth Observation Inputs	SBA: Climate [CL]	Sub-area: The Earth's climate system and the changes occurring in it (CL-1)	Sub-area: Human and natural influences on the climate system (CL-2)	Sub-area: Climate change effects on human and environmental systems (CL-3)	Sub-area: Facilitating societal responses to climate variability and change (CL-4)
690	Database: U.S. Documented Unplugged Orphaned Oil and Gas Well Dataset	0.02%		0.40%		
691	Field Work - Methane Emission Testing	0.02%		0.40%		
692	Cyclone Global Navigation Satellite System (CYGNSS) Delay Doppler Mapping Instrument	0.02%	0.03%	0.05%	<0.01%	0.02%
693	USACE Hydrographic Surveys Geospatial Analysis	0.02%	0.01%	<0.01%	0.02%	0.04%
694	Database: NCDC Extreme Events Database	0.02%		<0.01%	0.04%	0.02%
695	Emergency Manager Dispatch & 911	0.02%	0.01%	<0.01%	0.04%	<0.01%
696	Database: Unusual Mortality Events (NMFS/OPR)	0.02%	<0.01%		0.05%	<0.01%
697	Database: Sonar/Active Acoustic External	0.02%	0.05%			
698	Database: U.S. Drought Monitor data tables	0.02%		<0.01%	0.04%	0.03%
699	Database: Coastal Data Information Program (UCSD/Scripps)	0.02%	0.05%	<0.01%	<0.01%	<0.01%
700	Database: Ecosystem Monitoring formerly known as MARMAP (EcoMon): NMFS	0.02%	<0.01%	<0.01%	0.04%	0.03%
701	National Marine Sanctuary System-Wide Monitoring (SWiM) Program: Divers	0.02%			0.04%	0.01%
702	National Marine Sanctuary System-Wide Monitoring (SWiM) Program: In-situ Mobile Platforms	0.02%			0.04%	0.01%
703	NOAA National Geodetic Survey (NGS) Coastal Mapping Program Airborne Lidar	0.02%	<0.01%	<0.01%	0.04%	0.02%
704	Database: Hawaii Ocean Time Series (HOT)	0.02%	0.01%		0.04%	0.01%
705	Economic and Socio-cultural Data Surveys Ocean Recreational Fish Catch Southwest Fisheries Science Center	0.02%	<0.01%		0.04%	0.03%
706	Database: ArcMap Surface Toolset	0.02%	<0.01%	0.01%	<0.01%	0.07%
707	Database: LANDFIRE Fuel Rules Database	0.02%		<0.01%	0.03%	0.04%
708	Database: LANDFIRE Total Fuels Change Tool (LFTFC)	0.02%		<0.01%	0.03%	0.04%
709	Economic and Socio-cultural Data Surveys Ocean Recreational Fish Catch Pacific Islands Fisheries Science Center	0.02%			0.04%	0.02%
710	Contract Ships (unspecified)	0.02%			0.03%	0.03%
711	DOI Survey Vessels	0.02%			0.03%	0.03%
712	Database: Emissions - Global Emissions InitiAtive (IGBP)	0.02%	0.01%	0.02%		0.06%
713	Database: FAA Airport Diagrams	0.02%	<0.01%	0.21%	0.02%	0.01%
714	Database: Avenza Maps	0.02%	<0.01%	0.21%	0.02%	0.01%
715	Database: MAPBOX Building Footprints Data	0.02%			0.02%	0.04%
716	Sidescan Sonar	0.02%	0.04%		<0.01%	0.01%
717	Database: LANDFIRE Existing Vegetation Type (EVT) 2016 Remap	0.02%	<0.01%	0.03%	0.01%	0.05%

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718	Surface Ozone	0.02%	0.01%	0.19%	0.01%	0.01%
719	National Marine Sanctuary System-Wide Monitoring (SWiM) Program: Animal Borne Sensors	0.02%			0.04%	0.01%
720	Database: LANDFIRE 40 Fire Behavior Fuel Models 2016 Remap	0.02%		<0.01%	0.03%	0.03%
721	NOAA Aircraft P-3 Tail Doppler Radar	0.02%	0.01%	<0.01%	0.04%	<0.01%
722	Western Regional Climate Center (WRCC) Mesonet	0.02%	<0.01%	0.03%	0.04%	0.01%
723	International Doppler Radars	0.02%	0.03%	<0.01%	0.01%	0.01%
724	Extensometers	0.02%				0.07%
725	Geophones	0.02%				0.07%
726	Laser Distance Meters	0.02%				0.07%
727	Terrestrial Laser Scanning (TLS)	0.02%				0.07%
728	Research Moored Array for African-Asian-Australian Monsoon Analysis (RAMA) Surface Atmosphere	0.02%	0.04%	0.01%	<0.01%	<0.01%
729	Energy Exascale Earth System Model Diagnostics	0.02%	0.05%	<0.01%		
730	International Space Station Optical Camera	0.02%			0.01%	0.05%
731	Document: Coral Reef Jurisdictional Status Reports NOS	0.02%	0.05%			
732	Database: Severe Tornado Watch: Storm Prediction Center	0.02%	0.01%	0.28%	<0.01%	<0.01%
733	MOtor Vehicle Emission Simulator Model	0.02%		0.36%		
734	Database: National Fire Emissions Inventory	0.02%		0.36%		
735	Economic and Socio-cultural Data Surveys River Recreational Fish Catch Southwest Fisheries Science Center	0.02%	<0.01%		0.03%	0.02%
736	Database: Paleoclimate Modeling Intercomparison Project 4 (PMIP4)	0.02%	0.05%			
737	Database: Historical Census Data	0.02%	0.05%			
738	Database: NOAA EV2 Historical Climate Records	0.02%	0.05%			
739	Canadian Moored Buoy Network	0.02%	0.05%	<0.01%	<0.01%	<0.01%
740	NASA Land, Vegetation and Ice Sensor (LVIS)	0.02%	0.04%	0.05%		
741	Database: POES Microwave (NCDC)	0.02%	0.02%	<0.01%	0.01%	0.02%
742	Dockside monitoring	0.02%			0.03%	0.02%
743	Recreational Fisheries Sampling Telephone Interviews	0.02%			0.03%	0.02%
744	U. of Texas Institute of Geophysics (UTIG) LiDAR	0.02%	0.05%			
745	NOAA Aircraft P-3 Expendable Bathythermograph	0.02%	0.02%	0.01%	0.02%	<0.01%
746	NOAA Aircraft P-3 (Dropsondes)	0.02%	0.02%	<0.01%	0.02%	0.01%
747	ImageCat and GEO-CAN (Global Earth Observation-Catastrophe Assessment Network) Risk to Critical Infrastructure	0.02%			0.01%	0.05%

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	99th Percentile					
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	Below 50th Percentile					
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748	Jet Propulsion Lab MODIS/ASTER airborne simulator (MASTER)	0.02%			0.01%	0.05%
749	Henry B. Bigelow Ecosystem Surveys	0.02%	<0.01%	<0.01%	0.04%	0.01%
750	Database: Dynamic Public Water Supply Service Area Dataset (WSA)	0.02%			0.05%	
751	Vaisala Global Lightning Dataset 360 (GLD360)	0.02%	0.04%	<0.01%	0.01%	0.01%
752	Database: Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER) Global Digital Elevation Model (GDEM)	0.02%	<0.01%	0.04%	0.02%	0.03%
753	Database: Pacific/ North American teleconnection pattern (PNA): CPC	0.02%				0.07%
754	Deep-ocean Assessment and Reporting of Tsunamis (DART)	0.02%	0.05%	<0.01%	<0.01%	<0.01%
755	Oscar Dyson Research	0.02%	<0.01%	<0.01%	0.03%	0.01%
756	Environmental Protection Agency Water Quality Samples	0.02%	<0.01%		0.05%	
757	Database: FAOSTAT Wood Products Data	0.02%		0.06%	0.04%	
758	Justice40 Grants	0.02%				0.07%
759	Database: Livneh hydrometeorological dataset	0.02%				0.07%
760	FEMA National Risk Index	0.02%				0.07%
761	Database: Aquatic Barrier Prioritization	0.02%			0.05%	
762	Database: Community and Regional Planning	0.02%			0.05%	
763	Database: Community Rating System Explorer	0.02%			0.05%	
764	Database: Coastline Change: Future Scenarios	0.02%			0.05%	
765	Database: Coastline Change: Historical Data	0.02%			0.05%	
766	Database: Economics of Coastal Adaptation	0.02%			0.05%	
767	Database: Economics of Nature-Based Adaptation	0.02%			0.05%	
768	Database: Ecosystem Effects of Sea Level Change	0.02%			0.05%	
769	Database: Flood and Sea Level Rise	0.02%			0.05%	
770	Database: Future Habitat	0.02%			0.05%	
771	Database: Living Shoreline Explorer	0.02%			0.05%	
772	Database: Marsh Explorer	0.02%			0.05%	
773	Database: Natural Defense Projects	0.02%			0.05%	
774	Database: Resilient Coastal Cities Explorer	0.02%			0.05%	
775	Database: Restoration Explorer	0.02%			0.05%	
776	Database: Risk Explorer	0.02%			0.05%	
777	Database: VIIRS Geolocation Parameters (VNP03)	0.02%	0.01%			0.04%
778	Database: Famine Early Warning Systems Network (FEWS NET) Land Data Assimilation System (FLDAS)	0.02%	0.03%	0.05%	<0.01%	0.01%
779	Database: GIMMS Leaf Area Index	0.02%	0.03%	0.05%	<0.01%	0.01%

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780	Database: Global Land Evaporation Amsterdam Model (GLEAM): Soil Moisture	0.02%	0.03%	0.05%	<0.01%	0.01%
781	Database: Rapid Climate Change-Meridional Overturning Circulation and Heatflux (RAPID-MOCHA) Array	0.02%	0.03%	0.05%	<0.01%	0.01%
782	Database: CSIRO Marine and Atmosphere Research (CMAR): Sea Level and Ocean Heat Products	0.02%	0.03%	0.05%	<0.01%	0.01%
783	Database: Speleothem Isotope Synthesis and Analysis (SISALv2)	0.02%	0.03%	0.05%	<0.01%	0.01%
784	Database: In-Situ Glacier Subsurface Sensor Datasets Archive	0.02%	0.04%			
785	Real-Time Coastal Observation Network (RECON)	0.02%	0.03%	<0.01%	<0.01%	0.01%
786	Database: National Incident Feature Service (NIFS)	0.02%	<0.01%	0.01%	0.03%	0.02%
787	Database: LANDFIRE Existing Vegetation Height 2016 Remap	0.02%	<0.01%	0.01%	0.01%	0.04%
788	Database: Group for High Resolution Sea Surface Temperature (GHRSST) Level 4 sea surface temperature analysis produced as a retrospective dataset: JPL PODAAC	0.02%	0.04%			
789	Atmospheric Baseline Observations Surface Aerosol	0.02%	<0.01%	0.06%	<0.01%	0.05%
790	Brewer Spectrophotometer UV and Ozone Network	0.02%	<0.01%	0.02%	<0.01%	0.06%
791	Halocarbons & Other Atmospheric Trace Species (HATS) Upper Air Trace Gas	0.02%	<0.01%	0.03%	0.04%	<0.01%
792	Leveling Network on the North American Continent	0.02%	0.02%		0.02%	0.01%
793	Mean Sea Level at Pointe-au-Père tide station	0.02%	0.02%		0.02%	0.01%
794	Database: LANDFIRE Internal Disturbance Detection Process	0.02%	<0.01%	0.01%	0.02%	0.04%
795	Database: NCEP ADP Global Surface Observational Weather Data	0.02%	<0.01%	0.01%	0.04%	<0.01%
796	Database: ORNL 9505 Climate Change Impact Assessment Report Data for Hydropower	0.01%			0.03%	0.02%
797	Economic and Socio-cultural Data Surveys Fish Community Pacific Islands Fisheries Science Center	0.01%			0.03%	0.01%
798	Bottom Trawl Surveys	0.01%	<0.01%		0.04%	<0.01%
799	Database: hydrochlorofluorocarbons (HCFCs) current bank estimates	0.01%	<0.01%	0.07%		0.04%
800	Reuben Lasker Fish Surveys	0.01%	<0.01%	<0.01%	0.03%	0.01%
801	Oil and Gas Estimation Tool	0.01%		0.31%		
802	InSAR Data (unspecified sources)	0.01%				0.06%
803	Database: Sink Hole Layer	0.01%			0.04%	
804	Database: NCEP ADP Global Upper Air Observational Weather Data	0.01%	<0.01%	<0.01%	0.04%	<0.01%
805	High Capability Radar Sounder (HiCARS)	0.01%	0.04%			

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806	Bell M. Shimada Protected Species Surveys	0.01%	<0.01%	<0.01%	0.02%	0.02%
807	Database: Museum Databases/Specimen Data	0.01%			0.04%	
808	Database: Beaches and Sand Layer (USDA)	0.01%	0.04%			
809	Database: Geology Layer (USGS)	0.01%	0.04%			
810	Fish and Shellfish Impact Assessment Research	0.01%	0.04%			
811	Database: Flood Hazard Zones (FEMA)	0.01%	0.04%			
812	Arctic Observing Network (AON) International Arctic Systems for Observing the Atmosphere (IASOA)	0.01%	0.01%	0.08%		0.03%
813	Field Work - Soil Sample Collection	0.01%	0.01%	0.15%	0.01%	
814	Database: TOPEX/Poseidon	0.01%	<0.01%	<0.01%	0.04%	<0.01%
815	Database: Hawaii Statewide Agricultural Baseline Project	0.01%	<0.01%	0.02%	0.01%	0.04%
816	Database: USGS Microsoft Building Footprints	0.01%	<0.01%	0.02%	0.01%	0.04%
817	Database: 2015 North American Land Change Monitoring System (NALCMS) Land Cover	0.01%	<0.01%	0.02%	0.01%	0.04%
818	Oceansat-2/3 Scatterometer [ISRO]	0.01%	0.02%	0.01%	0.01%	0.01%
819	Advanced Terrestrial Simulator (ATS) Code: ORNL	0.01%		0.29%		
820	Database: Standardized Precipitation Index (SPI)	0.01%	0.03%		<0.01%	<0.01%
821	Database: LANDFIRE Historical Disturbance	0.01%	<0.01%	0.01%	<0.01%	0.05%
822	Centre for Environmental Data Analysis (CEDA) Chemistry Research Models	0.01%	<0.01%	0.06%		0.04%
823	Uncrewed Aerial System (UAS) Greenhouse Gas Sensors	0.01%	0.04%			
824	Defense Meteorological Satellite Program (DMSP) Special Sensor Magnetometer	0.01%	<0.01%		0.04%	
825	NOAA ESRL Aerosol Monitoring Stations	0.01%			0.04%	
826	NASA Advanced Global Atmospheric Gases Experiment (AGAGE)	0.01%			0.04%	
827	World Resources Institute’s (WRI’s) Climate Analysis Indicators Tool (CAIT)	0.01%			0.04%	
828	Database: National Audubon Data	0.01%			0.04%	
829	Database: Cooperative Institute for Climate and Satellites (CICS) data	0.01%			0.04%	
830	Database: Geospatial Attributes of Gages for Evaluating Streamflow, version II (GAGES II) Database	0.01%			0.04%	
831	Database: NDFD Apparent Temperature	0.01%			0.04%	
832	Database: National Allergy Bureau Pollen Data	0.01%			0.04%	
833	ENACT/ENSEMBLES version 4 (EN4)	0.01%			0.04%	
834	Database: USACE Lidar	0.01%				0.06%
835	Ice Mass Balance Buoys (IMB): Dartmouth College	0.01%	0.04%			

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836	Borehole Cores	0.01%	0.01%			0.05%
837	Position Buoys (Oregon State University)	0.01%	0.04%			
838	Airborne Lidar (USGS owned)	0.01%			0.01%	0.04%
839	Database: World Ocean Circulation Experiment, 1990-2002 (NODC)	0.01%	<0.01%		0.02%	0.02%
840	Database: National Assessment of Hurricane-Induced Coastal Erosion Hazards - Dune Height Data (Doran et al., 2020)	0.01%	<0.01%		0.02%	0.01%
841	Database: European Marine Observation and Data Network	0.01%	0.03%	0.04%	0.01%	
842	Database: Global Ocean Surface Underway data: SEANOE	0.01%	0.03%	0.04%	0.01%	
843	Database: International Council for the Exploration of the Sea	0.01%	0.03%	0.04%	0.01%	
844	Database: Integrated Marine Observing System	0.01%	0.03%	0.04%	0.01%	
845	Database: Pangaea Ocean Dataset	0.01%	0.03%	0.04%	0.01%	
846	Database: SeaDataNet	0.01%	0.03%	0.04%	0.01%	
847	The European Global Ocean Observing System Regional Operational Oceanographic System	0.01%	0.03%	0.04%	0.01%	
848	Database: Landsat-based Irrigation Dataset (LandID)	0.01%			0.03%	<0.01%
849	Database: Subsurface Tile Drainage Extent	0.01%			0.04%	
850	Database: Global Lakes and Wetlands Database	0.01%	<0.01%		0.03%	0.01%
851	NOAA Aircraft P-3 Stepped Frequency Microwave Radiometer	0.01%	0.01%	<0.01%	0.03%	<0.01%
852	Database: Glacier Monitoring: Glacier Change Bulletin (WGMS)	0.01%				0.05%
853	Database: ArcWorld dataset (ESRI 1992)	0.01%	<0.01%		0.03%	0.01%
854	Database: Digital Chart of the World (ESRI 1993)	0.01%	<0.01%		0.03%	0.01%
855	U.S. Historical Climatology Network (USHCN)	0.01%	0.03%	<0.01%	<0.01%	0.01%
856	Economic and Socio-cultural Data Surveys Harvesters Northwest Fisheries Science Center	0.01%	<0.01%		0.03%	0.01%
857	Database: Emissions - Carbon Dioxide Information Analysis Center (ORNL/DoE)	0.01%	0.01%	0.17%		
858	Database: International Surface Observations	0.01%	0.03%	<0.01%	<0.01%	<0.01%
859	Natural Resource Management Community Reporting (Fed, State, Local Gov't)	0.01%	0.02%		0.02%	
860	Communication, Ocean and Meteorological Satellite (COMS) Geostationary Ocean Color Imager (GOCI): ROK	0.01%	0.03%	0.01%		
861	Database: First Street Foundation (FSF) Adaption and Infrastructure Internal Database	0.01%			0.02%	0.03%
862	Database: Synthetic Hurricane Tracks Dataset	0.01%			0.02%	0.03%

Key		SBA	Sub-area			
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	Below 50th Percentile					
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	Earth Observation Inputs	Climate [CL]	The Earth's climate system and the changes occurring in it (CL-1)	Human and natural influences on the climate system (CL-2)	Climate change effects on human and environmental systems (CL-3)	Facilitating societal responses to climate variability and change (CL-4)
863	Database: Stream Flow (USGS)	0.01%	<0.01%	<0.01%	0.01%	0.04%
864	Nonattainment Areas and Designations	0.01%	0.04%			
865	Database: Japan Agency for Marine-Earth Science and Technology (JAMSTEC)	0.01%	0.03%			
866	Database: UK Climate Research Unit (CRU) Climate Data	0.01%		0.16%		0.02%
867	Shoreline Mapping NOS	0.01%	0.03%	<0.01%	<0.01%	0.01%
868	University-National Oceanographic Laboratory System (UNOLS) Water Quality and Harmful Algal Bloom	0.01%	0.01%		0.03%	0.01%
869	Database: Global Volcanism Program (Smithsonian Institution)	0.01%	0.03%			
870	Database: Mexico National Meteorological Service (SMN) surface observations	0.01%	0.03%			
871	Fisheries Science Center Observing and Lab Capabilities AFSC	0.01%	0.01%		0.03%	<0.01%
872	ECCO-IcES Model Codestack	0.01%	0.03%			
873	USACE Hydrographic Surveys Hydrographic Analysis	0.01%	<0.01%	<0.01%	0.01%	0.03%
874	Wagon Wheel Nonpoint Emissions Tool	0.01%		0.25%		
875	MOtor Vehicle Emission Simulator NONROAD Model	0.01%		0.25%		
876	Database: Biogenic Emission Sources	0.01%		0.25%		
877	Database: Commercial Marine Vessels	0.01%		0.25%		
878	Communication and Outreach Activity	0.01%	0.03%			
879	State & Local Lidar	0.01%	<0.01%		0.02%	0.02%
880	Interferometric Bathymetry	0.01%	<0.01%		0.02%	0.02%
881	Tropical Atmospheric Ocean Buoy Array Ocean Surface Currents	0.01%	0.02%			0.02%
882	Pleiades Commercial High-Resolution Satellite Imagery	0.01%	<0.01%	<0.01%	0.01%	0.03%
883	Database: Farm Operator Surveys	0.01%		0.03%	0.03%	
884	Database: Internal USGS Custom Vdep Tool	0.01%				0.05%
885	Database: OnX Hunt - Hunting GPS Maps	0.01%	<0.01%	0.14%	0.01%	<0.01%
886	Database: National Land Cover Dataset (NLCD) Alaska	0.01%	<0.01%	0.02%	0.01%	0.03%
887	Database: USFS Wildfire Risk to Communities	0.01%	<0.01%	0.02%	0.01%	0.03%
888	Database: California Statewide Crop Mapping	0.01%	<0.01%	0.02%	0.01%	0.03%
889	NCAR Community Climate System Model 4/Community Earth System Model 2	0.01%	0.01%		0.03%	<0.01%
890	Database: Global Fire Emissions Database, Version 4.1	0.01%	0.01%	0.18%		

Key

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Key	Earth Observation Inputs	SBA: Climate [CL]	Sub-area: The Earth's climate system and the changes occurring in it (CL-1)	Sub-area: Human and natural influences on the climate system (CL-2)	Sub-area: Climate change effects on human and environmental systems (CL-3)	Sub-area: Facilitating societal responses to climate variability and change (CL-4)
891	Database: Interagency Fire Perimeter Historical Data	0.01%				0.05%
892	State Reservoir Data	0.01%			0.03%	
893	Database: CPC Historical El Nino / La Nina episodes: CPC	0.01%	<0.01%		0.02%	0.02%
894	Database: gridded National Soil Survey Geographic Database (gNATSGO)	0.01%	<0.01%	<0.01%	0.02%	0.02%
895	Western Boundary Time Series Pressure Inverted Echo Sounder	0.01%	0.03%			
896	Air-Launched Autonomous Micro Observer (ALAMO)	0.01%	0.03%	0.02%	<0.01%	<0.01%
897	NADP National Trends Network (NTN)	0.01%	0.02%	<0.01%	0.01%	0.01%
898	GLERL Observing Capabilities Wave Sensors	0.01%	0.03%			
899	Database: Climate Indices (NCAR)	0.01%	0.03%			
900	Northwest Environmental Mooring (UWashington)	0.01%	0.03%			
901	Database: NCEI Storm Events	0.01%	0.03%			
902	Database: MODIS Geolocation Parameters (MOD03)	0.01%	0.02%	<0.01%	<0.01%	0.01%
903	Geo Korea Multipurpose Satellite-2B Geostationary Environment Monitoring Spectrometer [KARI]	0.01%	0.01%			0.04%
904	Citizens Weather Observer Program	0.01%	0.02%	<0.01%	<0.01%	<0.01%
905	Database: European Space Agency Product (ESA OC-CCI)	0.01%	<0.01%	<0.01%	0.02%	0.01%
906	NOAA Aircraft Otter Snow Survey Snow Water Equivalent	0.01%	0.01%	<0.01%	0.01%	0.02%
907	Database: Past Global Changes (PAGES) Datasets	0.01%	0.01%			0.03%
908	Database: NOAA Hydrometeorological Design Studies Center (HDSC) Precipitation	0.01%	<0.01%	0.01%	0.02%	<0.01%
909	Database: USDA National Forest Type Dataset	0.01%	0.01%	0.06%		0.02%
910	Agrimet (USBR, Pac NW Agricultural Sfc Weather Network)	0.01%	<0.01%	0.01%	0.01%	0.02%
911	Database: Estimated use of water in the United States in 2015, Dieter et al.	0.01%			0.03%	0.01%
912	Database: World Data Service for Paleoclimatology	0.01%	0.03%			
913	Database: Historical Land-Cover Change and Land-Use Conversions Global Dataset: NCEI	0.01%	0.03%	<0.01%		<0.01%
914	Database: EPA Wadeable Streams Assessment	0.01%			0.03%	
915	Database: NFCMS Forest Carbon Stocks and Fluxes, Conterminous USA, 1990-2010 [Williams et al.]	0.01%	0.01%	0.05%		0.02%
916	Arctic Observing Network (AON) Ice Drilling	0.01%		0.08%		0.03%
917	Database: WORLDCLIM Precip Climate Data	0.01%	0.01%	<0.01%	<0.01%	0.02%
918	Stratospheric Water Vapor Profiles	0.01%	0.01%	0.10%	<0.01%	0.01%
919	Database: Climate Database Modernization Program (CDMP)	0.01%	<0.01%	0.02%	0.01%	0.02%

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	95th Percentile					
	90th Percentile					
	75th Percentile					
	50th Percentile					
	Below 50th Percentile					
	Blank Cells Indicate Input Does Not Contribute to Area					
920	Database: Quality Controlled Local Climatological Data	0.01%	<0.01%	0.02%	0.01%	0.02%
921	Database: SouthEast Monitoring & Assessment Program (SEAMAP): NMFS	0.01%	<0.01%	<0.01%	0.02%	0.01%
922	University of Washington (UW) Applied Physics Lab Research Sensors	0.01%	0.03%			
923	Database: Fisheries and Oceans Canada (DFO) Line P Cruises: Canada	0.01%	0.03%			
924	Database: National Estuarine Research Reserve System - Habitat Boundaries (OCM)	0.01%	0.02%		0.01%	<0.01%
925	Documents: Shared Socioeconomic Pathway (SSP) scenarios	0.01%	<0.01%	0.04%		0.03%
926	Database: WORLDCLIM Aridity Index	0.01%	0.01%	<0.01%	<0.01%	0.02%
927	Field Work - Field Moisture Sampling	0.01%		0.19%	<0.01%	<0.01%
928	State/Local Streamgages	0.01%	<0.01%	<0.01%	0.02%	0.01%
929	Henry B. Bigelow Coral Field Surveys	0.01%	<0.01%		0.02%	0.01%
930	Terminal Doppler Weather Radar (TDWR) Reflectivity	0.01%	0.02%	<0.01%	<0.01%	<0.01%
931	Database: Google Earth Engine (GEE) Climate Engine	0.01%			0.03%	
932	NOAA National Data Buoy Center (NDBC) Buoy Network	0.01%	<0.01%	0.01%	0.02%	<0.01%
933	Database: Global Carbon Project	0.01%				0.04%
934	Gravity for the Redefinition of the American Vertical Datum (GravD) Terrestrial	0.01%	0.01%	<0.01%	0.01%	0.01%
935	Field Work - Sample Collection	0.01%			0.03%	<0.01%
936	Database: State/Local Well File/Permit Information	0.01%			0.03%	
937	USBR Water Flow Data	0.01%			0.03%	
938	Database: Integrated Taxonomic Information System (ITIS) Data	0.01%			0.03%	
939	Database: Ocean Acidification: NCEI	0.01%	<0.01%		0.02%	0.01%
940	Database: AMO (Atlantic Multidecadal Oscillation) Index: PSL	0.01%	<0.01%		0.02%	0.01%
941	Database: Cottonwood Lake Study Area (CLSA) Annual Average Water-table Heights	0.01%			0.03%	
942	Database: Cottonwood Lake Study Area (CLSA) Pond Elevation and Groundwater Depth	0.01%			0.03%	
943	Database: FWS Spring Pond Count Data	0.01%			0.03%	
944	Database: USGS Water-Elevation Data (Devils Lake)	0.01%			0.03%	
945	Hydroclimatic Data Network (HCDN) - streamflow data	0.01%			0.03%	
946	Database: Waterfowl Breeding Population and Habitat Survey	0.01%			0.03%	

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947	Database: Environmental System Science Data Infrastructure for a Virtual Ecosystem (ESS-DIVE)	0.01%		0.19%		
948	Database: Short-Term Shoreline Erosion Rate Data (Himmelstoss et al., 2010, 2018)	0.01%	<0.01%		0.02%	0.01%
949	Database: Global Historical Climatology Network-Monthly version 2 (GHCN-M) Precipitation	0.01%			0.03%	
950	Database: North Dakota Climate Division 5 Meterological Dataset	0.01%			0.03%	
951	Database: State Natural Heritage Databases	0.01%		<0.01%	0.02%	<0.01%
952	Nancy Foster Coral Field Surveys	0.01%	<0.01%		0.02%	0.01%
953	Database: GPS Attenuation Calibration (NGS)	0.01%	0.01%	<0.01%	0.01%	0.01%
954	Bell M. Shimada Research	0.01%	<0.01%	<0.01%	0.02%	0.01%
955	Database: Spatial - Offshore Platforms and Pipelines Infrastructure (BOEM)	0.01%	0.01%		0.01%	0.01%
956	DOE Mobile Aerosol Time of Flight Mass Spectrometer (MATOFMS)	0.01%	0.01%	0.01%	0.01%	0.01%
957	Canadian Streamgage Network	0.01%	0.02%	<0.01%	<0.01%	<0.01%
958	GMD Observing Capabilities Trace Gases	0.01%	0.01%			0.02%
959	Rapid-AMOC Array: UK Natural Environment Research Council (NERC)	0.01%	0.01%			0.02%
960	Database: Spatial - Marine Geology (BOEM)	0.01%	0.02%			
961	Database: North Atlantic Oscillation: NCEI	0.01%	<0.01%		0.02%	0.01%
962	Database: National Wildland Fire Coordinating Group (NWCG) Units	0.01%	<0.01%	<0.01%	<0.01%	0.03%
963	Database: USGS Storm Overwash Probability Data (Doran et al., 2020)	0.01%	<0.01%		0.02%	0.01%
964	USGS In Situ Water Level Sensors	0.01%	0.02%		<0.01%	<0.01%
965	Crowdsource Media	0.01%	0.01%	<0.01%	0.01%	0.01%
966	Database: Hemispheric Transport of Air Pollution (HTAP)	0.01%	<0.01%	<0.01%	0.02%	
967	Evapotranspiration Data Collection	0.01%			0.02%	
968	Marine Optical Buoy (MOBY)	0.01%	0.01%	0.07%	<0.01%	<0.01%
969	Database: Centers for Disease Control and Prevention (CDC) Social Vulnerability Index	0.01%			0.02%	
970	UAF Airborne Scanning Lidar	0.01%	0.02%			
971	Database: GAP Land Cover/Ecological Systems Dataset	0.01%			0.02%	<0.01%
972	Database: NOAA U.S. Daily Weather Map Series	0.01%	0.02%			
973	North Dakota Agricultural Weather Network (NDAWN)	0.01%	<0.01%	0.01%	0.02%	<0.01%
974	Nebraska Mesonet (NEMESO)	0.01%	<0.01%	0.01%	0.02%	<0.01%
975	Database: Gridded EPA CH4 emissions inventory	0.01%	0.01%	0.08%		0.01%

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976	Database: Gulf Stream Index (GSI): WHOI	0.01%			0.02%	0.01%
977	Database: Jason-1	0.01%	0.01%		0.01%	
978	Bell M. Shimada Habitat Surveys	0.01%	<0.01%	<0.01%	0.01%	0.02%
979	Database: Severe Weather and Hydro Application Development NSSL	0.01%	0.01%	<0.01%	0.01%	0.01%
980	Mauna Loa Observatory	0.01%				0.03%
981	Nancy Foster Research	0.01%	<0.01%	<0.01%	0.02%	0.01%
982	Database: Advanced Weather Interactive Processing System - Points of Interest (NWS-WFO)	0.01%				0.03%
983	Nancy Foster Protected Species Surveys	0.01%	<0.01%	<0.01%	0.01%	0.01%
984	NOAA Aircraft G-IVTail Doppler Radar	0.01%	0.01%	<0.01%	0.01%	<0.01%
985	Oil and Gas Point Location Data	0.01%	<0.01%	0.01%	<0.01%	0.02%
986	Local Weather Stations	0.01%	0.02%			
987	Database: USACE Climatological Wave Power Data (Aretxabaleta et al., 2022)	0.01%	<0.01%		0.01%	0.01%
988	U.S. Air Force Hurricane Hunters Flight Level	0.01%	<0.01%		0.02%	
989	California Irrigation Management Information System (CIMIS)	0.01%	<0.01%	0.01%	0.02%	<0.01%
990	Database: WACS2 2014 PMEL	0.01%	0.02%			
991	Buoy-based Surface Weather Data	0.01%	0.01%		0.01%	0.01%
992	NASA Airborne Snow Observatory	0.01%			0.01%	0.02%
993	CropManage App	0.01%			0.01%	0.02%
994	Commercial Airborne High-resolution Visible Imagery	0.01%	<0.01%	0.01%	0.01%	0.01%
995	Database: USGS Ecologically Relevant Geophysical (ERGo) Landforms Data	0.01%			0.02%	
996	Database: National Solar Radiation Database (NSRDB)	0.01%	<0.01%	<0.01%	0.02%	<0.01%
997	NOAA/INL Mesoscale Meteorological Network	0.01%	0.01%	0.07%	<0.01%	<0.01%
998	Database: WFIGS Working Polygons	0.01%	<0.01%	<0.01%	<0.01%	0.03%
999	Database: NIFS Event Polygons	0.01%	<0.01%	<0.01%	<0.01%	0.03%
1000	University-National Oceanographic Laboratory System (UNOLS) Habitat Survey	0.01%	<0.01%	<0.01%	<0.01%	0.03%
1001	Conductivity, Temperature, Depth (CTDs)	0.01%		0.05%	0.01%	0.01%
1002	Database: Maps of surface and Top of Atmosphere Radiation from CERES project EBAF CDR Terra Edition 4.0: NASA	0.01%	0.02%			
1003	Database: CO2 observations: ESRL/GML	0.01%	0.02%			
1004	Atmospheric Baseline Observations Upper Air Aerosol	0.01%	0.01%	0.11%	<0.01%	<0.01%
1005	Database: Ocean Carbon and Acidification Data System (OCADS): NCEI	0.01%	0.02%			

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1006	Database: Global Forest Age Map [Bernard et al.]	0.01%	0.01%	0.04%		0.01%
1007	Database: Landsat-based Irrigation (LandID) 1997-2017	0.01%	<0.01%	0.01%	<0.01%	0.02%
1008	Mercury Deposition Network (MDN)	0.01%	0.01%	<0.01%	<0.01%	0.01%
1009	Marine Recreational Information Program Fish Tagging	0.01%	<0.01%		0.01%	0.01%
1010	Arctic-Boreal Vulnerability Experiment (ABoVE) Program: NASA	0.01%		0.15%		
1011	Next-Generation Ecosystem Experiments (NGEE) Arctic study sites, Meteorology Stations, and Soil Sensor	0.01%		0.15%		
1012	Database: Open-source Data Inventory for Anthropogenic CO2	0.01%	<0.01%	0.11%		
1013	Database: CA - LandIQ Specialty Crops (2019)	0.01%	<0.01%	0.02%	0.01%	0.01%
1014	Database: NRCS National Commodity Crop Productivity Index (NCCPI) [MI only]	0.01%	<0.01%	0.02%	0.01%	0.01%
1015	Database: FL - NASS Citrus Data Layer (2022)	0.01%	<0.01%	0.02%	0.01%	0.01%
1016	Database: WA - Washington State Dept of Agriculture Crop Data (2022)	0.01%	<0.01%	0.02%	0.01%	0.01%
1017	Meteosat Visible Infrared Imager	0.01%	0.02%	<0.01%	<0.01%	<0.01%
1018	Minnesota Climatology Working Group Gauge Network	0.01%	<0.01%	0.01%	0.02%	<0.01%
1019	North Dakota State Water Commission (NDSWC) Gauge Network	0.01%	<0.01%	0.01%	0.02%	<0.01%
1020	Nevada Division of Water Resources (NVDWR) Gauge Network	0.01%	<0.01%	0.01%	0.02%	<0.01%
1021	South Florida Water Management District (SFWMD) Gauge Network	0.01%	<0.01%	0.01%	0.02%	<0.01%
1022	Long-Term Precipitation Storage Gage Stations	0.01%	<0.01%	0.01%	0.02%	<0.01%
1023	Gordon Gunter Fish Surveys	0.01%	<0.01%	<0.01%	0.01%	0.01%
1024	Database: Environmental Conservation Online System (ECOS) Critical Habitat Mapper	0.01%		<0.01%	<0.01%	0.03%
1025	Database: Community Emissions Data System (CEDS)	0.01%	0.01%	0.03%		0.01%
1026	Thomas Jefferson Habitat Surveys	0.01%	<0.01%	<0.01%	0.01%	0.01%
1027	Database: NOAA Atlas 14 precipitation frequency estimates	0.01%	<0.01%	0.01%	0.01%	0.01%
1028	Document: Microbial carbon and energy processes: Scripps	0.01%	0.02%			
1029	Document: Zooplankton role in the carbon cycle: WHOI	0.01%	0.02%			
1030	Autonomous Ocean Flux Buoys (AOFB): Naval Postgraduate School	0.01%	0.02%			

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1031	Database: Sea ice macro- and micro-nutrient concentrations	0.01%	0.02%			
1032	Database: Be-7 tracer measurements in atmosphere, ice, and ocean (FIU/FSU/Ugeorgia) [NSF Project, Kadko et al.]	0.01%	0.02%			
1033	small unmanned aerial systems (sUAS) (PSL)	0.01%	0.02%			
1034	Ultra-Wideband Microwaveradiometer(UWBRAD): NSF	0.01%	0.02%			
1035	Database: Earth Science Project Office (NASA)	0.01%	<0.01%			0.02%
1036	Ultra Wide-Band Snow Radar: Center for Remote Sensing of Ice Sheets (CReSIS)	0.01%	0.02%			
1037	Database: Poland Plankton Sorting and Identification Center	0.01%	0.01%	<0.01%	<0.01%	<0.01%
1038	Database: Laboratory for Atmospheric and Space Physics (LASP) Interactive Solar Irradiance Data Center (LISIRD), University of Colorado-Boulder	0.01%				0.03%
1039	Database: Solar Irradiance Climate Data Record NCEI	0.01%				0.03%
1040	Solar Dynamics Observatory (SDO) Atmospheric Imaging Assembly	0.01%				0.03%
1041	Chemical Speciation Network (CSN)	0.01%	0.02%		<0.01%	<0.01%
1042	Database: Projected Sea Level Rise Rate Data (Sweet et al., 2017)	0.01%	<0.01%		0.01%	0.01%
1043	USGS Chris Konrad Flow Measurements Data	0.01%			0.02%	
1044	Database: Estimates of Road Salt Application across the Conterminous U.S.	0.01%			0.02%	
1045	Cloudsat Cloud Profiling Radar	0.01%	0.01%	0.01%	<0.01%	0.01%
1046	In-Service Aircraft for a Global Observing System	0.01%	0.01%	0.04%	<0.01%	0.01%
1047	Database: LANDFIRE polygons (Federal, State and Local)	0.01%	<0.01%	<0.01%	<0.01%	0.02%
1048	Database: USFS Vegetation Treatment Data	0.01%	<0.01%	<0.01%	<0.01%	0.02%
1049	Manual Snow Depth Measurements	0.01%	0.01%		<0.01%	0.01%
1050	Database: Global Ocean Heat and Salt Content: Seasonal, Yearly, and Pentadal Fields: NCEI	0.01%	<0.01%			0.02%
1051	Moored Buoys with CO2 Sensors	0.01%	0.02%			
1052	Cyclone Global Navigation Satellite System (CYGNSS)	0.01%	<0.01%		<0.01%	0.02%
1053	NOAA Bathymetric and Acoustic Backscatter Data	0.01%	<0.01%		<0.01%	0.02%
1054	USGS Tide Gages	0.01%	<0.01%	<0.01%	0.01%	0.01%
1055	USGS Streamgage Network Surface Atmosphere	0.01%	0.01%	<0.01%	<0.01%	<0.01%
1056	Fairweather Ecosystem Surveys	0.01%	<0.01%	<0.01%	0.01%	<0.01%
1057	Oscar Dyson Ecosystem Surveys	0.01%	<0.01%	<0.01%	0.01%	<0.01%

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Key	Earth Observation Inputs	SBA: Climate [CL]	Sub-area: The Earth's climate system and the changes occurring in it (CL-1)	Sub-area: Human and natural influences on the climate system (CL-2)	Sub-area: Climate change effects on human and environmental systems (CL-3)	Sub-area: Facilitating societal responses to climate variability and change (CL-4)
1058	Acoustic Survey: AFSC	0.01%			0.01%	0.01%
1059	Acoustic Trawl Survey: SWFSC	0.01%			0.01%	0.01%
1060	Florida Fish and Wildlife Research Institute Hook and Line Repetitive Time Drop Survey	0.01%			0.01%	0.01%
1061	Florida Fish and Wildlife Research Institute Video survey	0.01%			0.01%	0.01%
1062	Longline Survey: AFSC	0.01%			0.01%	0.01%
1063	Longline Survey: GOM	0.01%			0.01%	0.01%
1064	Southwest Bottom Trawl Survey	0.01%			0.01%	0.01%
1065	NMFS Panama City Video Survey	0.01%			0.01%	0.01%
1066	SEAMAP Reef fish Video Survey	0.01%			0.01%	0.01%
1067	Southeast Fisheries Independent Survey (SEFIS)	0.01%			0.01%	0.01%
1068	Database: USFS Visitor Map	0.01%	<0.01%	0.07%	0.01%	<0.01%
1069	Economic and Socio-cultural Data Surveys Fish Community Northwest Fisheries Science Center	0.01%	<0.01%		0.01%	0.01%
1070	Database: USFS Motor Vehicle Use Maps (MVUM)	0.01%	<0.01%	0.07%	0.01%	<0.01%
1071	Database: AARI (Arctic and Antarctic Research Institute). 2007. Sea ice charts of the Russian Arctic in gridded format, 1933-2006	0.01%	0.02%			
1072	Database: Arctic Climate System Study 1850-1986	0.01%	0.02%			
1073	Database: Danish Meteorological Institute (DMI) and NSIDC. 2012. Arctic Sea Ice Charts from the Danish Meteorological Institute, 1893 - 1956	0.01%	0.02%			
1074	Database: The Dehn Collection of Arctic Sea Ice Charts, 1953-1986.	0.01%	0.02%			
1075	Database: Kelly Sea Ice Extent Grids 1901-1956	0.01%	0.02%			
1076	Database: Temporal extension of Kelly data 1957-1971	0.01%	0.02%			
1077	Database: Pan-Arctic SIBT 1850 Sea Ice Dataset	0.01%	0.02%			
1078	Database: Pan-Arctic digital database of Arctic sea ice concentrations 1954-2013	0.01%	0.02%			
1079	Database: Sea ice maps for Alaska and Greenland sectors into yearbooks, Naval Oceanographic Office 1953-1971	0.01%	0.02%			
1080	Database: Information derived by Walsh (1978) from analyses done by the Japan Meteorological Agency (JMA) 1970-2007	0.01%	0.02%			
1081	Database: Walsh and Johnson/Navy-NOAA Joint Ice Center 1953-1977 & Navy-NOAA Joint Ice Center Climatology 1972-1994	0.01%	0.02%			
1082	Buoy-based Water Level Data	0.01%	<0.01%		0.01%	0.01%
1083	Meteosat Third Generation [EUMETSAT]	0.01%			0.01%	0.01%
1084	Database: Unedited Local Climatological Data	0.01%	<0.01%	0.01%	0.01%	0.01%

Key

- 99th Percentile
- 95th Percentile
- 90th Percentile
- 75th Percentile
- 50th Percentile
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		SBA	Sub-area			
	Earth Observation Inputs	Climate [CL]	The Earth's climate system and the changes occurring in it (CL-1)	Human and natural influences on the climate system (CL-2)	Climate change effects on human and environmental systems (CL-3)	Facilitating societal responses to climate variability and change (CL-4)
1085	Near-Road Monitoring Network	0.01%	0.02%			
1086	National Air Toxics Trends Stations (NATTS)	0.01%	0.02%			
1087	Information Management System: HydroSHEDS	0.01%	<0.01%	<0.01%	0.02%	<0.01%
1088	Database: Methods for Estimating Water Consumption for Thermoelectric Power Plants in the United States, 2013, Dieh et al	0.01%			0.01%	<0.01%
1089	Database: Thermoelectric-power Withdrawals, Cooling-system Information, and Net power Generation (from facilities, state premitting, or regulatory agencies)	0.01%			0.01%	<0.01%
1090	Database: US Energy Information Administration Thermoelectric Water Withdrawals	0.01%			0.01%	<0.01%
1091	Database: Internal USFS S-Class ArcPro Tool	0.01%				0.02%
1092	Database: Coastal Ocean Data Analysis Product in North America (CODAP-NA): NCEI	0.01%	0.02%			
1093	Database: Nature Conservancy S-Class Assignment Spreadsheet	0.01%				0.02%
1094	State & Local Buoy Network	0.01%	0.01%	<0.01%	<0.01%	<0.01%
1095	Database: Salt Water Intrusion USGS	0.01%				0.02%
1096	Database: Sea Level Center, University of Hawaii	0.01%				0.02%
1097	Database: Tide Gauges Data NCEI	0.01%				0.02%
1098	Database: Monthly North Atlantic Oscillation, Columbia	0.01%				0.02%
1099	University-National Oceanographic Laboratory System (UNOLS) Advancing Technology	0.01%	<0.01%		<0.01%	0.02%
1100	Field Work - Fish Sampling	0.01%			0.02%	
1101	WorldView (1-3) Commercial Earth Observation Satellite	0.01%	<0.01%	<0.01%	0.02%	<0.01%
1102	Pisces Coral Field Surveys	0.01%	<0.01%		0.01%	<0.01%
1103	Database: InFORM Fire Occurrence Data Record (FODR)	0.01%	<0.01%	<0.01%	<0.01%	0.02%
1104	Terrestrial Lidar (T-Lidar)	0.01%	0.02%			
1105	Database: Multi-Error-Removed Improved-Terrain (MERIT) Hydro River Network Data	0.01%			0.02%	
1106	Database: Reservoir Locations(ie; state, local, USACE, GRanD,etc)	0.01%			0.02%	
1107	Ronald H. Brown Surface Atmosphere	0.01%	0.02%			
1108	Autonomous Underwater Vehicle (AUV)/Remotely Operated Underwater Vehicle (ROUV)	0.01%		0.12%		
1109	Rainier Geospatial Analysis	0.01%	0.01%	<0.01%	<0.01%	<0.01%
1110	Western Boundary Time Series and South Atlantic Meridional Overturning Circulation Florida Current Profilers	0.01%	<0.01%	<0.01%	0.01%	0.01%

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1111	Autonomous Underwater Gliders: National Oceanography Centre UK	0.01%	0.02%			
1112	RAPID-WATCH moorings: British Oceanographic Data Centre (BODC)	0.01%	0.02%			
1113	California Data Exchange Center (CDEC) Mesonet	0.01%	<0.01%	0.01%	0.01%	<0.01%
1114	State & Local Protected Resource Surveys	0.01%	<0.01%		0.02%	<0.01%
1115	Database: Global Flood Awareness System: European Commission	0.01%			<0.01%	0.02%
1116	National Status and Trends Program (NSTP)	0.01%	<0.01%		0.01%	0.01%
1117	Database: Ocean Heat Content, Salt Content, and Sea Level Anomalies: NCEI	0.01%				0.02%
1118	Database: State Harmful Algal Blooms Toxin Reports	0.01%				0.02%
1119	Database: Natural Resources Defense Council Harmful Algal Blooms Reports	0.01%				0.02%
1120	Oscar Elton Sette Coral Field Surveys	0.01%	<0.01%		0.01%	<0.01%
1121	Database: State Health Department Recreational Advisories	0.01%				0.02%
1122	Economic and Socio-cultural Data Surveys Fish Community Alaska Fisheries Science Center	0.01%	0.01%		0.01%	<0.01%
1123	Autonomous Surface Vehicle CO2 (ASVCO2)	0.01%	0.02%			
1124	Biogeochemical ARGO	0.01%	0.02%			
1125	Database: EPA Emissions & Generation Resource Integrated Database (eGRID)	0.01%		0.01%	0.01%	<0.01%
1126	Thomas Jefferson Geospatial Analysis	0.01%	0.01%	<0.01%	<0.01%	<0.01%
1127	Database: IMPLAN Economic Impact Modeling Data (NMFS/OST)	0.01%	<0.01%		0.01%	<0.01%
1128	Acoustic Trawl Surveys	0.01%	<0.01%		0.01%	0.01%
1129	Surface Trawl Surveys	0.01%	<0.01%		0.01%	0.01%
1130	Washington State University AgWeatherNet	0.01%	<0.01%	0.01%	0.01%	<0.01%
1131	Lower Colorado River Authority Network (LCRA)	0.01%	<0.01%	0.01%	0.01%	<0.01%
1132	U.S. Air Force Hurricane Hunters	0.01%	0.01%	<0.01%	0.01%	<0.01%
1133	Greenhouse gas observations from the Northeast Corridor tower network	0.01%	0.01%	0.07%		<0.01%
1134	Sentinel-5 Precursor TROPOMI [ESA]	0.01%	0.01%	<0.01%	<0.01%	<0.01%
1135	Database: Whaling ship logbooks 1850-1914	0.01%	0.01%			
1136	Cavity Ring-down Spectrometer	0.01%		0.11%		
1137	Database: University of Hawaii Sea Level Center data	0.01%	<0.01%		0.01%	0.01%
1138	Database: OceanWatch SST Products	0.01%	<0.01%		0.01%	0.01%
1139	Database: NOAA Fisheries Office of Sustainable Fisheries Status of U.S. Fisheries	0.01%	<0.01%		0.01%	0.01%
1140	Database: Historical NASA Ozone Data (NIMBUS-7 TOMS, Meteor3)	0.01%	0.01%	<0.01%		

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1141	Protected Resource Surveys Aircraft (NOAA funded)	0.01%	<0.01%		0.01%	<0.01%
1142	Oregon II Habitat Surveys	0.01%	<0.01%	<0.01%	<0.01%	0.01%
1143	Database: Near-Surface Permeability	0.01%			0.01%	
1144	Colorado Agricultural Meteorological Network (COAGMET)	0.01%	<0.01%	0.01%	0.01%	<0.01%
1145	NOAA Aircraft P-3 Flight Level	0.01%	<0.01%		0.01%	
1146	Database: 3D Hydrography Program (3DHP)	0.01%	<0.01%	0.01%	0.01%	0.01%
1147	Oscar Dyson Protected Species Surveys	0.01%	<0.01%	<0.01%	0.01%	0.01%
1148	Fish Surveys Aircraft	0.01%	<0.01%		<0.01%	0.02%
1149	Southern Hemisphere ADditional OZonesondes	0.01%	0.01%	0.04%	<0.01%	0.01%
1150	Database: NEFSC Diet Data shiny app	0.01%			0.01%	0.01%
1151	Database: NOAA Resource Ecology and Ecosystem Modeling (REEM) food habits	0.01%			0.01%	0.01%