LINKING REGIONAL GOVERNANCE TO IMPACT ASSESSMENT: A CUMULATIVE IMPACTS FRAMEWORK FOR THE CALIFORNIA CURRENT ECOSYSTEM

TECHNICAL REPORT

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I. BACKGROUND: THE CALIFORNIA CURRENT LARGE MARINE ECOSYSTEM

The California Current Large Marine Ecosystem (CCLME) extends from British Columbia to just south of Baja California, encompassing an area of 2,224,665 square kilometers.[1] In the United States, the CCLME includes the state and federal waters off the coasts of California, Oregon, and Washington, which extend 200 miles offshore.

The CCLME is home to a great abundance and diversity of marine life. West Coast ocean and coastal environments include kelp forest, rocky shores, sandy beaches, open ocean, estuaries, and marsh habitat. These ecosystems support marine fish, invertebrates, marine birds and shorebirds, mammals, rare deep-sea corals, and numerous iconic marine species, from orcas and salmon in Puget Sound to the sea lion populations in Southern California. CCLME ecosystems also include abundant and diverse plankton and microbes at the base of the food web that help ensure the productivity of these waters.

Ocean and coastal areas on the West Coast maintain an expanding range of human uses and activities that are critical to the region's quality of life, economic viability, and the character of its communities.[2] For example, in California, economic activity directly related to the ocean accounted for $21.4 billion of the gross state product (GSP) in 2000, as compared to $6.5 billion of the GSP in Washington and $7.7 million of the GSP in Oregon.[3] These figures relate to economic activity occurring in six ocean economic sectors: 1) coastal construction, 2) offshore minerals, 3) living resources, 4) maritime transportation and ports, 5) ship and boat building and repair, and 6) coastal tourism and recreation (collectively, the "Ocean Economy"). In 2000, California's Ocean Economy further provided over 400,000 jobs, largely in the tourism and recreation sector, and over $11.4 billion in wages and salaries, underscoring the importance of ocean and coastal regions to the economic life of the state.[4]

For the present report, the Environmental Law Institute (ELI) interviewed thirty-two West Coast environmental practitioners to understand perceptions of human uses and activities that are occurring or are likely to occur in the West Coast marine environment in the near term, as well as potential threats to the CCLME. These are presented in Table 1.

[1] The Pew Charitable Trusts, *Sea Around Us Project*, *available at* .http://www.seaaroundus.org/lme/3.aspx
[2] The Office of the Governor, *Final Report of the Washington State Ocean Policy Work Group*, volume 1 at 20 (Dec. 31, 2006).
[3] The National Ocean Economics Program, *California's Ocean Eonomy, Report to the Resources Agency, State of California at* 1 (July 2005). When multipliers were added, California's Ocean Economy had a total market value of $42.9 billion, and accounted for approximately 700,000 jobs and $24 billion in wages and salaries.
[4] *Id*.

Table 1. Uses and Threats in the CCLME

Existing & Emerging Uses and Activities

- Aquaculture (coastal and offshore)
- Coastal fortification and beach fill
- Cruise ships and recreational boating
- Desalination
- Dredging
- Fishing, commercial and recreational
- Liquefied natural gas production
- Marine Protected Areas & Sanctuaries
- Ocean Transportation
- Ocean renewable energy
- Offshore sand and gravel mining
- Oil and gas drilling off California (traditional and methane hydrates)
- Recreation & tourism
- Research
- Restoration
- Shipping
- Sonar activities
- Military activities

Threats to the CCLME

- Pollution from atmospheric deposition
- Climate change impacts
- Degraded water quality
- Disease and hybridization
- Eutrophication
- Habitat modification
- Non-indigenous species
- Noise
- Nutrient pollution
- Overexploitation of resources/unsustainable fishing practices
- Plastics and trash
- Population growth and land-based development

Human activities in the CCLME include navigation, recreational and commercial fishing, and recreation and tourism. The West Coast supports some of the busiest ports in the world, including the Ports of Los Angeles and Long Beach,[5] and major ports in San Francisco, Seattle, Tacoma, and Portland. West Coast ports handle thousands of vessels annually, including cargo ships, cruise ships, and military vessels, and serve as gateways for international trade. The CCLME also supports valuable commercial and recreational fisheries for salmon, tuna, and other species, and provides a broad range of opportunities for research, beach recreation, scuba diving, recreational boating, whale watching, and other recreational, tourism, and academic pursuits.

Long-standing human activities compete or may compete with new and emerging ocean activities. For instance, offshore renewable energy development, including wave, tidal, and thermal energy development in both state and federal waters, is a foreseeable use of ocean space. In light of significant wave energy potential on the West Coast, the West Coast states have made it a priority to evaluate the impacts and benefits of renewable energy development.[6] Sand and gravel mining is another activity likely to grow in importance, in light of its potential role in sand renourishment projects that are likely to increase in frequency as sea level rises. In addition, aquaculture development in both state and federal waters is an emerging use in response to the growing demand for seafood production.

Although human activities in the ocean are critical to U.S. communities and economies, these activities are not conducted without costs. They directly, indirectly, and cumulatively impact CCLME resources,

[5] Port of Los Angeles, *available at* http://www.portoflosangeles.org; Port of Long Beach *available at* http://www.polb.com/about/facts.asp.

[6] Office of the Governors of Washington, Oregon & California, *West Coast Governors' Agreement on Ocean Health Action Plan* at 64-70 (2008), *available at* http://westcoastoceans.gov/docs/WCGA_ActionPlan_low-resolution.pdf.

leading to degraded water quality, hypoxia, resource depletion, and more (*see* Box 1). Further, human uses and activities can increase the vulnerability of West Coast resources and ecosystems to further degradation as a result of climate change.

Box 1. What are Cumulative Impacts?

Cumulative impacts result when the effects of human activities and uses accrue and affect resources and ecosystems. In the context of ecosystem-based management, the term "cumulative impacts" refers broadly to the net effect of all human activities across sectors and jurisdictions.

The typical legal definition of the term is narrower, and generally refers to "significant" impacts that result when the impacts of a proposed project or action, which on their own may not be significant, combine with those from a subset of other projects or actions within a defined geographic area.

A 2009 quantitative assessment of human use and cumulative impacts in the CCLME by Halpern et al. revealed that cumulative impacts are, in fact, ubiquitous in the CCLME. [7] According to the study, the highest impacts in marine waters occur near highly populated coastal areas, and on the continental shelves off Oregon and Washington. In addition, the study revealed that most CCLME areas are affected by multiple threats (e.g. ocean acidification, atmospheric deposition, organic pollution), although climate change presented the primary threat to coastal ecosystems in the CCLME. These results provide a baseline of cumulative impacts in the CCLME, and can help guide priorities and strategies for ongoing CCLME management.

[7] Benjamin S. Halpern et al. *Mapping Cumulative Human Impacts to California Current Marine Ecosystems*, CONSERVATION LETTERS 2: 138-148 (2009).

II. CONCEPTUAL FRAMEWORK FOR MINIMIZING CUMULATIVE IMPACTS TO THE CALIFORNIA CURRENT LARGE MARINE ECOSYSTEM

The purpose of this report is to advance the goal of minimizing cumulative human impacts to the California Current Large Marine Ecosystem. We present three key ways to achieve this goal: (1) integrating ongoing regional governance efforts with project- or action-specific environmental impact assessment and decision-making; (2) improving cumulative impact analysis within environmental impact assessment; and (3) utilizing best available science and technology to inform the environmental impact assessment process. The focus of this report and many of the examples used are specific to the West Coast. However, the concepts presented here are broadly applicable, and may be useful for other U.S. regions and potentially beyond the United States.

In this chapter, we introduce the first of our recommended approaches for minimizing cumulative impacts and suggest a conceptual framework for integrating regional ocean governance with project- or action-specific environmental impact assessment. Chapter III explores the existing cross-cutting laws, agreements, and policies that address cumulative impacts in the CCLME. Chapter IV considers concrete opportunities to link regional ocean governance with environmental impact assessment. Chapter V explores approaches that could strengthen the way cumulative impacts are addressed in practice during environmental impact assessment processes. Finally, Chapter VI examines the science and technology needs to support an integrated ocean governance framework.

A. Overview

Loss of coastal habitat, decline of living resources, expansion of dead zones, and contaminated beaches are just some of the conditions that demonstrate the failure of U.S. federal, regional, and state governance to appropriately minimize human impacts to ocean and coastal environments. As West Coast populations expand, the ocean is used in new ways, and pressure on resources increases, it is imperative to develop appropriate ocean governance systems that minimize cumulative human impacts.

Cumulative human impacts in the CCLME can be best addressed using a governance system that considers and manages the effects of human use and activity at both regional and local scales. The West Coast Governors Agreement, California Ocean Protection Council, Oregon Territorial Seas Plan, and Puget Sound Partnership provide an important start to regional governance for the CCLME. Recent efforts to implement marine planning at the federal and state levels also offer significant opportunities to address regional cumulative impacts in West Coast waters.

To be most effective, existing and emerging regional approaches in the CCLME should be integrated and aligned with one another, as well as with state and local decision-making and implementation activities, to ensure governance is cohesive and effective. This report focuses on integrating regional approaches with decision-making under environmental impact assessment laws applicable to the West Coast: the National Environmental Policy Act (NEPA), Washington State Environmental Policy Act (SEPA), and California Environmental Quality Act (CEQA). Each of these laws is designed to evaluate the direct,

indirect, and cumulative impacts of proposed activities on resources, ecosystems, and communities. In addition, these laws provide a useful focus for tackling the challenges posed by cumulative impacts at the project level, because they are:

- **forward-looking** and encompass the goal of sustainable development;
- the **first regulatory hurdle** in the development pathway for many projects;
- the point at which **analysis of cumulative impacts** occurs on a project level;
- in some cases, the driver for **mitigation requirements** to reduce significant impacts;
- the primary mechanism available to assess potential **ecosystem impacts** and conduct **baseline environmental analyses**;
- **cross-cutting** in analysis, but linked to sector-specific decision-making; and
- **existing processes** with large amounts of federal, state, and private **funding** used to implement them.

The recommendations in this report are specifically directed to, on the one hand, policy makers, state and federal agencies, and entities engaged in ecosystem-based management (EBM) and marine planning on the West Coast; and on the other hand, managers and practitioners conducting environmental impact assessments. In particular, these recommendations build on the belief that well-designed regional ocean governance can provide baseline information and set ecosystem health objectives that can then inform project-level assessment and decision-making, and potentially ease the regulatory burden placed on ocean users. At the same time, environmental impact assessment can directly support and inform regional governance by: contributing to the growing body of ecosystem information; creating a record of ocean impacts; and aligning project-level decisions with regional ocean plans to ensure that projects and actions support regional and state objectives.

B. Conceptual Framework for Integrating Regional Ocean Governance and Environmental Impact Assessment

Figure 1. Integrating regional ocean governance with NEPA analysis and decision-making.

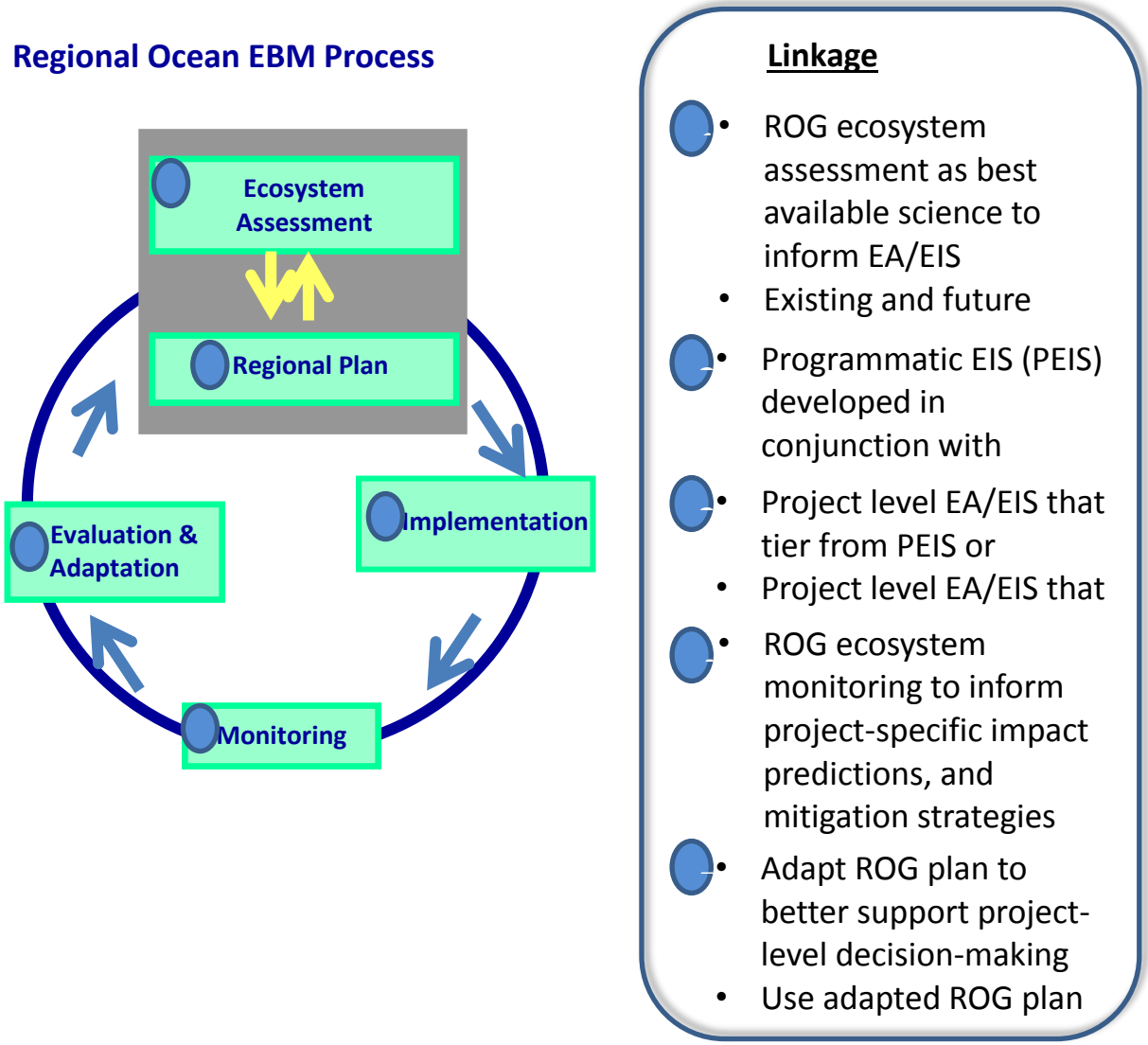

Figure 1 shows how a model regional ocean governance system, such as those proposed for marine planning, can be implemented through integration with the existing law and policy framework, including environmental impact assessment.

As shown in Figure 1, the model regional ocean governance system described in this report is an iterative process with five related steps: (1) ecosystem assessment; (2) regional vision and plan; (3) implementation; (4) monitoring; and (5) evaluation and adaptation. As envisioned here, regional ocean governance provides the foundation for the ocean management system, since all other aspects of ocean management and decision-making can be supported or informed by this larger structure. Regional ocean governance sets concrete goals and measurable objectives based on a broad understanding of ecosystem health, threats, and priorities that are then used to inform the regulatory process and other activities. Regional ocean governance can address large-scale regional or ecosystem-wide issues

appropriate for a comprehensive regional response, which in turn can guide on-the-ground decision-making at various levels (local, state, and regional).

To create a truly integrated system of regional governance, and not simply a regional layer on top of an existing sector-based system, implementation activities ideally should build from, align with, and inform regional ocean management. Although regional plans can be implemented using a variety of mechanisms (e.g., permitting, research, education, and enforcement), for the reasons discussed above, this report specifically focuses on the relationship between regional ocean planning and environmental impact assessment processes (*see* Fig. 1).

Box 2. A Note About Ecosystem Assessment Versus Environmental Impact Assessment

To differentiate the region-wide, cross-sectoral process from the project-specific decisions that occur under NEPA, SEPA, or CEQA, this report refers to **"ecosystem assessment"** as a science-based evaluation of the status and trends of coastal and marine ecosystems that is used to assess ecosystem health and support ecosystem-based approaches to management, including marine planning. Currently, ecosystem assessments are not legally mandated; however, West Coast non-binding agreements call for ecosystem assessments, and federal agencies are assisting with them.

This report uses the term **"environmental impact assessment"** to refer to the legally mandated impact assessment that accompanies project- or action-level decisions in accordance with federal and state statutes, including NEPA, SEPA, and CEQA.

C. Linking Regional Ocean Governance and Environmental Impact Assessment

There are many opportunities to link regional ocean governance with project-level environmental assessment processes to better manage cumulative impacts. Each step of the model regional governance cycle described in this report can support and influence the environmental impact assessment process (and vice versa). The five steps of the model regional ocean governance system are:

(1) **Ecosystem Assessment—**An ecosystem assessment assembles and synthesizes data and information related to ecosystem condition, use, and impacts in order to guide management decisions and alternatives. Increasingly, ecosystem assessments have a mapped component to help people understand the spatial aspects of ecosystem structure and function. In addition to informing decision-makers about the general parameters and health of ecosystems, ecosystem assessments provide baseline data from which to measure subsequent change. To have an effective regional planning process and ultimately reduce cumulative impacts, an ecosystem assessment should form the scientific basis for regional ocean planning and implementation.

(2) **Regional Vision and Plan**—Key elements of regional ocean governance are a vision for achieving a healthy and resilient ecosystem, and an implementation plan for achieving that vision. Although regional plans and programs can exist in the absence of a legal mandate, a

legal directive can help ensure that a plan is developed and implemented. To be most effective, plans should include express consideration of cumulative impacts.

(3) **Implementation**— Plans can be implemented through regulation (impact assessment, permitting, and enforcement) and other mechanisms such as research, preservation, education, and outreach. These ongoing processes, which operate under their own statutory mandates, ideally would be aligned with the goals of the regional plan.

(4) **Monitoring**—Regional monitoring programs generally include two elements: (i) monitoring compliance with the regional plan; and (ii) monitoring the status and condition of resources and the ecosystem to assess progress towards achieving regional objectives and goals. The first is significantly easier to enforce, but the second has greater relevance to regional ocean governance since it produces the information needed for evaluation and adaptive management.

(5) **Evaluation and Adaptation**—The final step, before the process repeats, is evaluating the results of the monitoring to determine whether the regional plan's environmental objectives are being met. If not, the plan must be amended to have a better effect in practice.

These five model steps are consistent with the growing scientific and policy literature related to ocean governance and the approach that emerging programs in ocean and coastal governance are taking, including the recommended national marine planning framework.[8]

Further, the environmental impact assessment process described in this report also is envisioned as an adaptive management process that should be informed by, and support, the broader regional ocean governance system. As advanced by the NEPA Task Force to the Council on Environmental Quality (CEQ), the steps of an adaptive environmental impact assessment process[9] are:

(1) **Prediction**—Environmental impact assessment laws often require managers and practitioners to consider significant direct, indirect, and cumulative impacts of proposed projects or actions before permits and approvals are issued. Predicting cumulative impacts typically requires an assessment of the direct and indirect effects of a proposed project in light of the effects of past, present, and foreseeable future activities within a defined geographic area. The magnitude and significance of these impacts are measured against an environmental baseline and compared to assumed sustainability thresholds.

(2) **Avoidance or Mitigation**—A project proponent should, and sometimes is required to, minimize and offset the impacts of the proposed activity when it is feasible to do so. Effective mitigation can reduce the cumulative impacts of new activities.

(3) **Project/Action Implementation**—Implementation of a project or action is project-specific and is not further covered here.

[8] *See* Interagency Ocean Policy Task Force, *Final Recommendations of the Interagency Ocean Policy Task Force*, White House at 2 (July 19, 2010); Ex. Order No. 13,547 (July 19, 2010), 75 Fed. Reg. 43,023 (July 22, 2010).
[9] NEPA Task Force Report to the Council on Environmental Quality: *Modernizing NEPA Implementation* (2003) (hereinafter "NEPA Task Force Report"). The use of an *adaptive* environmental impact assessment cycle has clear advantages in dynamic systems, where scientific uncertainty abounds and prediction is difficult at best.

(4) **Monitoring**—As with the regional governance framework, monitoring for purposes of environmental impact assessment typically focuses on: (i) monitoring compliance with the plans for mitigation and/or activity implementation (i.e., determining if the actions are taken as proposed); and (ii) monitoring the status and condition of the environment to reveal whether the mitigation and/or activity implementation is having the intended impact. The first is significantly easier to enforce, but the second is more important to the adaptive management process since it signals whether the goals are being met.

(5) **Evaluation and Adaptation**—Again like the regional governance framework, the final step, before the process repeats, is evaluating the results of the monitoring to determine whether the mitigation effort and/or activity itself is having the intended environmental impact. If not, then the plan for the activity and/or mitigation should be amended to have the proper effect in practice, specifically the management of cumulative impacts.

Regional ecosystem assessments and plans could supply valuable baseline data and information to predict the direct, indirect, and cumulative impacts of specific proposed projects or actions, ideally improving the accuracy of those predictions. Improved baseline information also could reveal gaps in existing information, highlighting where further analysis, focused monitoring, mitigation, and the precautionary approach are most needed for a particular project. Information collected at each stage of regional planning and management could support and influence an assessment of the significance and magnitude of impacts of a proposed project. In addition, monitoring at an ecosystem scale could frame and supplement project-specific monitoring plans by identifying issues of particular concern, gaps in existing monitoring, and the broader impacts of more localized events. Project-level decision-making could adopt regional objectives as a basis for decision-making.

Further, information from project-level environmental impact assessments can support and influence other activities undertaken to implement regional ocean management. Approaches for linking regional ocean governance and project-level decision-making are further described in Chapter IV.

III. CROSS-CUTTING LAWS AND AGREEMENTS THAT ADDRESS CUMULATIVE IMPACTS

A. Overview

This chapter describes existing West Coast laws and policies that can support linking regional governance with project-level environmental impact assessment. It specifically notes the elements in these laws and policies that address cumulative impacts. Table 2 provides a brief overview of the laws and agreements discussed in this section. Many of these provisions and the resulting programs are revisited in later sections of the report.

Table 2. West Coast Laws and Agreements that Address Cumulative Impacts

Federal, Regional, and State Ocean Governance Frameworks	
National Ocean Policy and West Coast Marine Planning	• In accordance with Executive Order 13547 and part of the national marine planning process, the West Coast will undertake regional marine planning in accordance with the National Ocean Council's criteria and guidance.
West Coast Governors' Alliance	• The West Coast Governors' Agreement provides a coordinated, collaborative cross-jurisdictional mechanism for addressing regional ocean issues of mutual importance, addressing scientific and technological needs for regional management, and maximizing financial resources.
National Marine Sanctuaries	• National marine sanctuaries are plan-based management systems. The CCLME includes five national marine sanctuaries: Channel Islands, Cordell Banks, Greater Farallones, Monterey Bay, and Olympic Coast. Together, this encompasses 12,672 square miles of the CCLME. West Coast sanctuary management uses monitoring programs to assess effectiveness and to support adaptive strategies as necessary. Management also includes impact reduction actions.
Coastal Zone Management	• The Coastal Zone Management Act encourages states to prepare and implement coastal zone management plans to manage their coastal zones. Federal activities affecting the coastal zone must be consistent with approved state coastal management programs.
California	• California Coastal Management Program • California Ocean Protection Council • California Marine Life Protection Act
Washington	• Washington Coastal Zone Program • Puget Sound Partnership • SSB 6350, Marine Spatial Planning Law
Oregon	• Oregon Coastal Program • Oregon Territorial Sea Plan
Federal and State Environmental Impact Assessment Laws	
National Environmental Policy Act	**An environmental impact assessment law that applies to major federal agency actions.** • NEPA requires determination of whether the proposed activity will significantly affect the environment; if so, an Environmental Impact Statement (EIS) is required.

Table 2. West Coast Laws and Agreements that Address Cumulative Impacts	
	• The EIS must identify the range of actions, alternatives, and impacts necessary for an accurate assessment, including cumulative actions and impacts (as defined by CEQ regulations). • Baseline understanding of the ecosystem is required in the environmental impact statement. • No plan is developed as a result of environmental impact assessment; however, programmatic EIS and "tiering" could be used to link project-level decisions to regional planning. • Mitigation may be used to prevent a finding of significant impact and avoid an EIS requirement, but mitigation is not required even if significant impacts are expected. • An adaptive approach is recommended when mitigation is used but is not required.[10]
California Environmental Quality Act	**An environmental impact assessment and mitigation law that applies to state and local agency actions.** • An Environmental Impact Report (EIR) is required when a project will have significant environmental effects. This assessment must consider significant effects, including effects that are "individually limited but cumulatively considerable," as determined when considering past projects, current project, and probable future projects. • Prohibits approval of a project "if there are feasible alternatives or feasible mitigation measures available which would substantially lessen the significant environmental effects of such projects." • Programmatic EIR and tiering may be used to link project-specific impact assessment to regional planning.
State Environmental Policy Act (Washington)	**An environmental impact assessment law that applies to state and local agency actions.** • An Environmental Impact Statement is required when an action will have significant environmental impacts, including cumulative impacts. • Agencies can require mitigation for impacts using substantive SEPA authority; these measures must be included in permits and other agency approvals to become mandatory and enforceable. • The Growth Management Act promotes integration of SEPA review and comprehensive planning. • Programmatic EIS and tiering may be used to link project-specific impact assessment to regional planning.[11]
Oregon	**No state environmental impact assessment law.**

B. West Coast Regional and State Ocean Governance Frameworks

A number of laws and policies authorize or encourage agencies and departments to plan and manage human activities and resources in West Coast waters. These laws and policies can help address cumulative impacts at regional and statewide scales, and can support on-the-ground activities to prevent and minimize cumulative impacts. This section briefly describes the key laws and policies that can advance regional efforts to minimize cumulative impacts. State coastal zone management and planning programs in Washington, Oregon, and California also use various approaches to minimize human impacts on resources and ecosystems on smaller geographic scales. These laws and policies are presented briefly here, and discussed in more detail in Appendix 1.

[10] NEPA Task Force Report, *supra*, note 9.
[11] *See e.g.*, WASH. ADMIN. CODE 197-11-443.

1. National Ocean Policy and Marine Planning

The National Ocean Policy provides an important opportunity to improve regional efforts to minimize cumulative impacts to the CCLME while allowing sustainable development.[12] According to Executive Order No. 13547 (Ocean Policy EO), it is now the national policy to "protect, maintain, and restore the health and biological diversity of ocean, coastal, and Great Lakes ecosystems and resources."[13] To achieve this national policy, President Obama established a new National Ocean Council and mandated all federal agencies to:

- implement the National Ocean Policy, Stewardship Principles, and National Priority Objectives;
- participate in the marine planning process; and
- comply with certified coastal and marine spatial plans

"…to the fullest extent consistent with applicable law."[14] This includes following the detailed final recommendations adopted by the precursor Interagency Ocean Policy Task Force, which the Ocean Policy EO incorporates by reference.[15]

One of the nine stewardship principles established in the final recommendations provides that "[p]olicies, programs, and activities of the United States should be managed and conducted in a manner that seeks to prevent or minimize adverse environmental impacts to the ocean, our coasts, and the Great Lakes ecosystems and resources, *including cumulative impacts*, and to ensure and improve their integrity."[16] Federal agencies are required to consider the new national policy and stewardship principles in their actions and decision-making affecting the oceans and coasts.

Further, the Ocean Policy EO and final recommendations provide for a new overarching marine planning framework that incorporates, as key elements, the principles of ecosystem-based management, adaptive management, and precaution. A major rationale for marine planning is that:

> It would allow for the *reduction of cumulative impacts* from human uses on marine ecosystems, provide greater certainty for the public and private sector in planning new investments, and reduce conflicts among uses and between using and preserving the environment to sustain critical ecological, economic, recreational, and cultural services for this and future generations.[17]

The marine planning process would "objectively and transparently guide and balance allocation decisions" for marine resources.[18]

[12] Interagency Ocean Policy Task Force, *supra*, note 9 at 4; Ex. Order 13547 (July 19, 2010), 75 Fed. Reg. 43,023 (July 22, 2010).
[13] Ex. Order 13547 § 2.
[14] Id. § 6.
[15] Id. § 1.
[16] Interagency Ocean Policy Task Force, *supra*, note 9 at 15-16 (emphasis added).
[17] *Id.* at 32-33 (emphasis added).
[18] *Id.* at CITE.

If implemented, this marine planning process would provide an important mechanism to proactively manage human use and activity to minimize cumulative ocean impacts at the regional level, including on the West Coast, which has been identified as one of nine regions for marine planning purposes.

The marine planning process will include each of the five elements of the model regional ocean governance framework shown in Figure 1.[19] An "essential element" of regional planning would be a regional ecosystem assessment that comprehensively describes "the existing and predicted future conditions, uses, and characteristics of" the CCLME.[20] This ecosystem assessment would provide the scientific basis for developing a certified marine plan, with which federal agencies are required to comply.[21] The marine plan should proactively address cumulative impacts by identifying and planning current and future uses of ocean and coastal areas "in order to reduce conflicts among uses, reduce environmental impacts, facilitate compatible uses, and preserve critical ecosystem services…."[22] The plans will be developed and implemented in accordance with existing authorities, and monitored, evaluated, and adapted as needed.[23] Ideally, the process would also support and inform project-level permitting and decision-making, restoration, preservation, and other concrete implementation activities.

Those tasked with developing marine planning have been asked to build upon existing regional governance bodies, data management approaches, and planning efforts. While the marine planning framework clearly allows for sustainable development while minimizing cumulative impacts, there is no clear guidance on how to accomplish such an objective beyond laying out general elements of marine planning. This report begins to tackle the challenge by conceptualizing how the existing West Coast law and policy framework can be utilized. The regional and state ocean planning bodies described below could provide information, processes, and resources upon which to build marine planning in the CCLME region. It will also be necessary to align new and existing regional processes with sector-based management approaches to ensure plans are appropriately implemented.

2. Regional and State Bodies Engaged in Ocean Planning and Management

The **West Coast Governors' Agreement on Ocean Health** (Agreement) provides an important start to regional ocean governance in the CCLME. The Agreement is a non-binding memorandum that establishes a cross-jurisdictional collaboration between the three West Coast states for addressing shared issues associated with seven priority action areas, such as clean waters and beaches, healthy ocean and coastal habitat, and effective EBM.[24] The Agreement further seeks to enhance "existing governance, management, and planning structures to address issues of mutual significance," and to coordinate "management strategies and approaches for those shared coastal and marine resources of mutual significance."[25] The Agreement is implemented through the West Coast Governors' Agreement on Ocean Health Action Plan (Action Plan).[26]

[19] *Id*. at 51-53.
[20] *Id*. at 59.
[21] Ex. Order 13547 (July 19, 2010), 75 Fed. Reg. 43,023 (July 22, 2010).
[22] Interagency Ocean Policy Task Force, *supra* note 9 at 41.
[23] *Id*. at 47.
[24] West Coast Governors' Agreement on Ocean Health (Sept 18, 2006), *available at* http://westcoastoceans.gov/docs/WCOceanAgreementp6.pdf.
[25] *Id*. at 2.
[26] Office of the Governors of Washington, Oregon & California, *supra*, note 9.

The Agreement and Action Plan provide an important collaborative framework that can facilitate regional planning and governance and help reduce cumulative impacts. For example, the Action Plan identifies and prioritizes ocean health issues of regional significance, identifies actions to improve ecosystem health and to prevent or minimize ecosystem impacts, and facilitates mechanisms to address scientific, technical, and financial needs for regional ocean management. The three states have produced eight final work plans to accomplish particular actions presented in the Action Plan. The West Coast Governors Agreement also is intended to help advance regional policy positions and objectives to strengthen ocean governance.

As a result of this collaboration, the three states have produced a shared vision, plan, implementation strategy, and various monitoring expectations (e.g., monitoring the presence of algal blooms, hypoxia, and invasive species). The Action Plan is not an attempt at management planning, and so is not based on an ecosystem assessment. It also is not directly linked to the regulatory framework and is not legally enforceable. Instead, the Action Plan calls for specific measurable actions that, if implemented, will improve the way resources and uses are considered and managed. For example, the Action Plan calls for the development of integrated ecosystem assessments (IEA)[27] that presumably will inform future regional ocean governance. Although the Agreement does not explicitly address monitoring, evaluation, and adaptation of the Action Plan, given the eighteen-month timeline for completion of most of the Action Plan's activities and the various expectations for monitoring, it is reasonable to assume that next steps under the Agreement will be adaptive.

The West Coast Governors' Agreement has particular relevance as a framework that may facilitate efforts by these states to engage with federally mandated regional planning bodies as they develop and implement West Coast marine plans. The states could use this process to advance regional priorities and provide input on issues and concerns of shared significance, as well as tools and approaches that should be considered or used in the planning process. They also could use their resources or the products and technical information they have developed from IEA development or though focused monitoring programs to facilitate marine planning design and implementation. The Agreement partners also could identify and undertake specific actions to support and advance rational marine planning on the West Coast.

Other collaborations and planning bodies of significance to regional ocean governance include the California Ocean Protection Council and Puget Sound Partnership. These single-state and sub-state approaches each focus on balancing the needs of development and resource use with sustainability and conservation. They also inform and support coast-wide planning and management efforts.

Created in 2004, the **California Ocean Protection Council** coordinates state activities related to ocean resource conservation and protection. The Council was created by the California Ocean Protection Act to provide a forward-looking coordinated and integrated management approach, rather than a system to correct past impacts. The Act designates the Secretary of the Resources Agency, Secretary for Environmental Protection, and Chair of the State Lands Commission as Council members. It also delineates the responsibilities of the Council, including its coordinating role, and roles in creating policies and recommending changes to state and federal laws and policies.

[27] For greater discussion of IEAs, see *infra* notes 258-259and accompanying text.

The Council has produced a Strategic Action Plan[28] that includes goals, objectives, and measurable actions to improve ocean and coastal resource protection. Like the West Coast Governor's Agreement Action Plan, the California Plan is not an attempt at comprehensive management planning and not based on an ecosystem assessment. Instead, the Plan calls for specific outputs and outcomes to improve management and governance. For example, the Strategic Action Plan calls for increased and improved monitoring, observation, and mapping to strengthen baseline understanding of the state's ocean and coastal environment. It also calls for actions to improve ocean and coastal water quality, strengthen governance, maintain and restore habitat, and respond to the effects of climate change. The Strategic Action Plan includes a two-page vision statement that identifies "what success might look like:" its vision of management is ecosystem-based, relies on the precautionary principle, and is adaptive. Marine planning is a cross-cutting tool that could help achieve the objectives enumerated in the Strategic Action Plan.

The need to better manage human use impacts is emphasized in the California Ocean Protection Act and the Strategic Plan.[29] The Act declares the state's policy that all public agencies shall "consider the impact of activities on land that may adversely affect the health of the coastal and ocean environment" when making decisions affecting land and water resources,[30] and encourages an ecosystem-based management approach. The Act further declares that the state's policy is "to incorporate ecosystem perspectives into the management of coastal and ocean resources, using sound science, with a priority of protecting, conserving, and restoring coastal and ocean ecosystems, rather than managing a single species or single resource basis."[31] This approach supports integrating consideration of cumulative impacts into decision-making processes; however, there are no explicit mechanisms mandating that project-level decisions follow the Ocean Protection Act and Plan. That said, the Council is tasked with making recommendations for legislative changes, which could include recommending development of an ocean management system that links large-scale ecosystem analysis and planning to project-level decision-making.

Recent additions to the Act will require the Council to take specific actions to implement EBM in California waters, including marine planning. Specifically, the Act provides that, subject to funding, the Council must "support state agencies' sharing and use of scientific and geospatial information for coastal- and ocean-relevant decisionmaking, including marine spatial planning"[32] by taking particular actions. Specifically, the Council must evaluate agency needs with regard to their abilities to collect, use, manage, and share information and tools relevant to ocean and coastal EBM. The Council must also "increase the amount of baseline scientific and geospatial information that is available to public agencies in a publicly accessible, electronic, and geospatial format" related to "[t]he cumulative effects of human caused and natural sources of stress," the value of ecosystem services, and other aspects of ocean and coastal environments.[33] If implemented, these actions could facilitate regional ocean governance by enhancing the scientific basis for management and improving access to data and information that could be used for regional or project-level decision-making.

[28] The California Ocean Protection Council, *A Vision for Our Ocean and Coast, Five-Year Strategic Plan* (2006).
[29] *See, e.g.*, the California Ocean Protection Council, *supra*, note 28 at 12.
[30] CAL. PUB. RES. CODE § 35510(b)(2).
[31] *Id*. § 35510(b)(3).
[32] CAL. PUB. RES. CODE § 35615(a) (as amended through January 2011).
[33] *Id*. (emphasis added).

Finally, the **Puget Sound Partnership** provides an important example of sub-regional ocean governance. The Puget Sound is the second largest estuary in the United States, and is connected to the Pacific Ocean through the Strait of Juan de Fuca. The health of the Sound has been compromised by over a century of human use and activity both on- and off-shore. In order to restore the Sound, the Washington legislature established the Puget Sound Partnership in 2007 and charged the agency with implementing an Action Agenda to achieve a healthy Puget Sound by 2020.[34] The Partnership does not have regulatory authority or authority over other regulatory programs. Instead, the law creates a Partnership tasked with developing and guiding implementation of the action agenda, allocating funds, producing progress reports, setting priorities and benchmarks, and adopting accountability measures.[35] The Partnership is composed of a Leadership Council, an Ecosystem Coordination Board to advise the Council, and a Science Panel.

The Partnership's work includes planning, baseline assessment, monitoring, restoration, and adaptive management. At least in part, this work is directed towards avoiding or reducing human impacts to the Sound, including cumulative impacts to ecosystem processes, structures, and functions. The Partnership's Action Agenda sets forth near-term priority objectives and action items to meet ecosystem goals. The Partnership has identified a suite of 20 ecosystem indicators, and targets and benchmarks to allow it to monitor trends over time and evaluate progress towards restoring the Sound by 2020. In addition, the Partnership is developing a "coordinated regional ecosystem monitoring program," and also is working with NOAA to develop an Integrated Ecosystem Assessment to allow it to evaluate management options in the Puget Sound.

Adaptive management is an important component of the Action Agenda, and will allow the Partnership to refine indicators, benchmarks, targets, and management options in response to an improved understanding of the ecosystem, new information, or changing conditions. In addition to the Partnership's work in Puget Sound, other entities are conducting planning and management activities in other limited geographic areas—most notably, the Lower Columbia River Estuary Partnership's development of the Columbia River Estuary Management Plan under the National Estuary Program.[36]

While the Partnership did evaluate potential environmental impacts in accordance with state law, it found that the Action Agenda does not have a probable significant adverse impact; therefore no EIS was required.[37] Therefore, there is no ongoing mechanism linking environmental impact assessment with regional planning.

While each of these mechanisms make an important contribution to regional ocean management, they are not comprehensive and do not address all the steps of the model regional governance framework. For example, the Puget Sound Partnership addresses restoration issues, but does not link to regulation and permitting. Similarly, the West Coast Governors and California Ocean Protection Council are collaborative entities, but are not intended to engage in state- or region-wide assessment or management planning. Instead, many of the plans, assessments, and management strategies are developed on a sector- or issue-specific basis under state laws and policies (described below).

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[34] Puget Sound Partnership, *Action Agenda* (Dec. 1, 2008), updated May 2009.
[35] ESSB 5372 § 5(a).
[36] Lower Columbia River Estuary Partnership, *Management Plan*, *available at* http://www.lcrep.org/management-plan-1.
[37] Notice of State Environmental Policy Act, Determination of Nonsignificance (DNS) (2008), *available at* http://www.psp.wa.gov/downloads/DRAFT_ACTION_AGENDA_2008/DNS.pdf.

3. Cross-Cutting Federal and State Laws, Programs, and Policies

Federal and state laws, policies, and programs—including the National Marine Sanctuaries Act, the Coastal Zone Management Act, Washington's marine spatial planning law and land-use planning laws, Oregon's coastal program and Territorial Seas Plan, and California's Marine Life Protection Act and Coastal Act—are existing mechanisms that play a role in ocean management. Some of the laws have specific mechanisms to address cumulative impacts, as noted below.

As marine planning gets underway on the West Coast, these laws and programs should play an important role in design and implementation. Even in the absence of marine planning, these laws, policies, and programs could, and to some extent already do, provide a cross-cutting vehicle for linking regional ocean governance to project-level decision making. These programs are introduced here, but they are also used as examples throughout the report.

i. Federal Approaches: National Marine Sanctuaries Act and the Coastal Zone Management Act

The **National Marine Sanctuaries Act (NMSA)** is the basis for national marine sanctuary development. It authorizes the Secretary of Commerce to designate as a sanctuary "any discrete area of the marine environment" that is of "special national significance" and is otherwise inadequately protected under existing authority.[38] The West Coast has the following national marine sanctuaries: Olympic Coast, Cordell Bank, Greater Farallones, Monterey Bay, and Channel Islands, which together cover 12,672 square miles.

While limited in scope, each sanctuary is managed using ecosystem assessment, vision and plan, implementation, monitoring, and evaluation and adaptation, and could serve to inform or support region-wide ocean governance. The management plan identifies goals, objectives, responsibilities, and strategies for managing resources; implementation regulations; and an evaluation of the advantages of cooperative federal and state management, if applicable.[39] Research, monitoring, and adaptive management may be used to establish baseline information, to evaluate progress towards achieving management goals, and to take corrective action as needed.

The overarching framework for state coastal management is the federal **Coastal Zone Management Act (CZMA)**.[40] Many experts view the CZMA, along with state coastal zone and land-use planning laws and programs, as central to implementing regional ocean governance approaches, including marine planning. The West Coast states have jurisdiction over their public shorelands and coastal waters within three miles from shore,[41] and administer various policies and programs to manage them. The CZMA encourages state participation in its voluntary program in two ways. First, it provides cost-sharing grants to coastal states to develop and implement coastal management programs.[42] Second, coastal states with

[38] 16 U.S.C. § 1433. NMSA is part of the Marine Protection, Research, and Sanctuaries Act that also includes the Ocean Dumping Act.
[39] 16 U.S.C. § 1434(a)(2)(C).
[40] *See* 16 U.S.C. §§ 1451-52.
[41] *See* Submerged Lands Act, 43 USC § 1312. Texas and the west coast of Florida have established claims out to nine nautical miles.
[42] *Id.* §§ 1452(1), 1453(12), 1454, 1455(a), 1455a(b), 1455b(f), 1456(c)-(d).

approved programs can engage in federal consistency review, which gives states the authority to monitor proposed federal actions and ensure they are consistent with the enforceable policies of the state's program.[43]

The CZMA does not contain specific requirements, and thus does not directly mandate consideration of cumulative impacts or require environmental impact assessment. It does, however, authorize enhancement grants to help states address cumulative impacts within their coastal zones.[44] Further, the Act's broad policies of coastal protection and development suggest a need for coordinated efforts across sectors and agencies. In addition, several required elements of coastal management programs could involve cumulative impacts assessment—such as the requirement that each program include guidelines on use priorities in particular areas, a planning process for beach and public area access and protection, and a planning process for energy facilities in or affecting the coastal zone.[45]

Each of the West Coast states implements a coastal zone program pursuant to the CZMA. Yet there is substantial variation in the programs and policies that each state uses to manage coastal areas within its jurisdiction. The specific elements of each West Coast state's coastal zone management program, and potential opportunities for considering and addressing cumulative impacts, are briefly described in the section that follows.

ii. Washington Approaches: Puget Sound Partnership, Marine Spatial Planning, and Coastal Zone Management

Washington manages marine areas using a variety of laws and planning frameworks, including the Shoreline Management Act, Ocean Resources Management Act, Aquatic Lands Act, and SSB 6350—the new marine spatial planning law. These laws provide planning authority to the state and local governments, tribes, and other entities to manage resources or uses to advance specific interests. This section highlights some of the major laws and entities with authority over marine management activities in Washington, and describes specific elements of each that may be used to facilitate the linkage between regional ocean governance and project-level impact analysis.

In addition to the approach developed in Puget Sound (discussed above), the Washington legislature has recently taken steps to initiate marine spatial planning for all of Washington's marine waters. **Substitute Senate Bill 6350**, enacted in 2010, creates a marine interagency team that will recommend a framework for conducting marine spatial planning in Washington and integrating marine spatial planning into existing management plans, including that of the Partnership.[46] The interagency team must recommend goals and objectives after evaluating the existing goals and objectives in marine management plans already developed for discrete Washington marine or estuarine regions, and must summarize how the recommended goals and objectives harmonize with those adopted by California and Oregon and with relevant national frameworks.[47]

[43] *See id.* §§ 1454, 1455(c)-(d), 1456(c)-(d).
[44] *Id.* § 1456b(b).
[45] *Id.* § 1455(d)(2).
[46] SSB 6350 § 3(1) and 4(1).
[47] SSB 6350 § 4(2).

The interagency team also must develop recommendations on how Washington can achieve a unified approach to data management and sharing to support marine spatial planning.[48] Subject to available funding, state agencies are authorized to include marine spatial planning data and planning elements into existing marine management plans and ongoing planning, and the Partnership *must* integrate marine spatial planning and information into its action agenda.[49] In addition, and also subject to funding, the interagency team must coordinate development of a marine spatial plan for Washington's marine waters that includes baseline assessment, planning, monitoring, and adaptive management elements, and that is developed and created to foster sustainable use without significant adverse impacts.[50] This marine spatial planning process provides an opportunity to integrate regional ocean governance with environmental impact assessment.

Washington also manages ocean and coastal development and promotes compatible uses in marine environments through four primary statutes that comprise Washington's federally-approved coastal management program: the **Shoreline Management Act (SMA)**,[51] **Ocean Resources Management Act (ORMA)**,[52] **Aquatic Lands Act (ALA)**,[53] and **Growth Management Act (GMA)**.[54] The SMA, ALA, and GMA and associated regulations each contain elements of regional management, including ecosystem assessment, planning, implementation mechanisms (e.g., permitting), and monitoring; but they are generally narrowly focused and not comprehensive. Plans developed under these three laws must be updated regularly, which could help promote an adaptive approach.

The SMA is the cornerstone of Washington's Coastal Management Program, and seeks to prevent piecemeal development of shorelines. Under the SMA, cities and counties develop a shoreline master program (SMP) to regulate shoreline development, which includes both a shoreline plan and regulations delineating development and activity standards in the shoreline region.[55] Local governments also issue permits, administer the regulatory program, and make recommendations to the Washington State Department of Ecology (Ecology) about federal consistency review decisions.[56] Ecology reviews and approves SMPs, provides technical oversight, and reviews certain permit decisions.

Although the SMA does not address cumulative impacts, the SMA Guidelines, as recently amended, require SMPs to do so to advance the goal of achieving "no net loss" of shoreline ecological functions. Specifically, the Guidelines provide that SMPs:

> shall evaluate and consider cumulative impacts of reasonably foreseeable future development on shoreline ecological functions and other shoreline functions fostered by the policy goals of the act. To ensure no net loss of ecological functions and protection of other shoreline functions and/or uses, master programs shall contain policies, programs, and regulations that address adverse cumulative impacts and fairly

[48] *Id*.
[49] SSB 6350 §§ 5(1),(2).
[50] SSB 6350 § 6.
[51] WASH. REV. CODE § 90.58 *et seq*.
[52] WASH. REV. CODE §§ 43.143 *et seq*.
[53] WASH. REV. CODE §§ 79.02 *et seq*.
[54] WASH. REV. CODE §§ 36.70a *et seq*.
[55] WASH. REV. CODE §§ 90.58.010-90.58.930. Shorelines are defined to include all waters of the state and their associated shorelands, with some small freshwater body exceptions.
[56] WASH. REV. CODE § 90.58.050; WASH. ADMIN. CODE § 173-27-060.

> allocate the burden of addressing cumulative impacts among development opportunities.[57]

In addition, the Guidelines require local governments to consider cumulative impacts that may be caused and avoided by proposed SMP policies and regulations, consistent with the relevant guiding principle.[58] Such assessments must address the current circumstances, foreseeable development, and beneficial impacts of regulatory regimes, in conjunction with the effect of unregulated and exempt activities.[59] Finally, the need to consider cumulative impacts is noted as a general principle applicable to all shoreline modifications,[60] and is a permissible basis for conditional use permit requirements.[61]

The **Ocean Resources Management Act** recognizes both the value of coastal resources and conflicting demands on them, and asserts the state's primary jurisdiction over coastal waters between the mean high tide mark and the three-mile ocean boundary, as well as the state's interest in how resources are managed in the federal Exclusive Economic Zone.[62] Overseen by Ecology, ORMA grants preference to uses that do not adversely impact renewable resources, with the exception of commercial fishing and recreational activities.[63] It also prohibits oil and gas development, exploration, and production in Washington's outer coast waters.[64]

While neither ORMA nor the subsequent guidelines developed by Ecology directly mention cumulative impacts, they are focused on the assessment and consideration of environmental, social, and economic impacts generally. For any use or activity that requires a local, state, or federal permit and will adversely impact renewable resources, the applicant must demonstrate, among other things, that long-term significant adverse impacts are unlikely; that reasonable avoidance and minimization efforts have been taken for environmental, social, and economic impacts; and that compensation is provided to mitigate adverse impacts to coastal resources.[65] These considerations of impacts and mitigation requirements suggest research into cumulative impacts and inclusion of that information in management decisions. Moreover, the guidelines applicable to all general ocean uses incorporate the cumulative impact assessment requirements of SEPA.[66]

The **Aquatic Lands Act** governs all submerged lands up to mean high tide from three miles offshore to the edge of navigability upstream.[67] The Department of Natural Resources (WDNR) Aquatic Resources Program manages this resource as a public trust. The ALA does not explicitly address cumulative impacts, but WDNR has promulgated management rules that at a minimum suggest a comprehensive planning approach under the ALA. Most notably, WDNR must undertake multiple-use management, defined as "a management philosophy that seeks to insure that several uses or activities can occur at

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[57] WASH. ADMIN. CODE § 173-26-186(8)(d); *see also* Shoreline Master Program Handbook, *Cumulative impacts analysis*, Ch. 17, (May 2010).
[58] *Id.* § 173-26-201(3)(d)(iii).
[59] If the local government properly used a comprehensive, interdisciplinary approach to develop its policies or regulations, it will not be liable for failing to address cumulative effects that fell outside it. *Id.*
[60] WASH. ADMIN. CODE § 173-26-231(2)(d).
[61] *Id.* § 173-26-241(b)(i).
[62] WASH. REV. CODE § 43.143.020(2).
[63] *Id*. §§ 43.143.010(2), (5).
[64] *Id*. § 43.143.010(2).
[65] *Id*. § 43.143.030.
[66] WASH. ADMIN. CODE § 173-26-360(7)(e).
[67] WASH. REV. CODE §§ 79.105.001-79.105.904.

the same place at the same time. The mechanism involves identification of the primary use of the land with provisions such as performance standards to permit compatible secondary uses to occur."[68]

Finally, the **Growth Management Act** facilitates coordinated land use and planning, and provides common state planning goals. The GMA is overseen by the Washington Department of Community, Trade, and Economic Development.[69] The Act calls for cities and counties to develop comprehensive twenty-year growth plans, which should be reviewed every seven years and updated if necessary.[70] In addition to assessment, planning, and implementation elements, the GMA contains an adaptive approach that requires regular plan updates. Cumulative impacts are mentioned briefly as part of the comprehensive plan review process—any proposed amendments must be considered concurrently so their cumulative effects may be evaluated.[71]

According to the Act, environmental planning pilot projects "should be designed and scoped to consider cumulative impacts resulting from plan decisions, plan impacts on environmental quality, impacts on adjacent jurisdictions, and similar factors in sufficient depth to simplify the analysis of subsequent specific projects being carried out."[72] Also, the Act incorporates the goals and policies of the Shoreline Management Act, which includes cumulative impacts provisions. Areas within the shoreline designated as critical under the GMA are governed by the applicable SMP rather than the local comprehensive plan.[73]

The intersection of the SMA, ORMA, ALA, and GMA is not always clear. Generally, SMA provides programmatic requirements and guidelines for all shoreline counties, while ORMA provides an additive layer for managing uses of and activities involving outer coast resources. ALA separately controls the leasing of state-owned aquatic lands. GMA applies programmatic growth management principles throughout the state, creating overlapping jurisdiction between it and SMA. The interplay between these two programs is still being determined, under the expectation that the two should complement rather than supersede each other.

Regional ocean management could build upon these laws. The Puget Sound Action Agenda, shoreline plans, management plans for state-owned aquatic lands, and other conservation and management plans developed could incorporate additional measures or actions to minimize cumulative impacts and integrate EBM and comprehensive planning principles and approaches. As regional marine plans develop, these plans and programs also could require managers to consider certified marine plans in environmental permitting and decision-making.

[68] WASH. ADMIN. CODE § 332-30-107(1), 332-30-106(40).
[69] WASH. REV. CODE § 36.70.010.
[70] WASH. REV. CODE § 36.70A.130(4).
[71] *Id.* § 36.70A.130(2)(b).
[72] *Id.* § 36.70A.385(1). The pilot projects "should be designed and scoped to consider cumulative impacts resulting from plan decisions, plan impacts on environmental quality, impacts on adjacent jurisdictions, and similar factors in sufficient depth to simplify the analysis of subsequent specific projects being carried out."
[73] *Id.* § 36.70A.480(1), (3), (5).

iii. California Approaches: Marine Life Protection Act, Ocean Protection Council, and Coastal Zone Management

The California Marine Life Protection Act, California Ocean Protection Council, and Coastal Zone Management Program provide collaborative mechanisms and sector-specific, on-going management and planning that create an important foundation for regional ocean governance, including marine planning. In the long term, California's Coastal Management Program could support the model regional ocean governance framework described in this report by using regional ecosystem assessments and plans as the basis for state coastal zone management planning and management.

The **California Marine Life Protection Act (MLPA)** authorizes development of a network of Marine Protected Areas (MPAs) along the California coast.[74] While comprehensive in geography, its scope is limited to the management of recreational and commercial fisheries and the establishment of marine protected areas. Despite this constraint, it has a full suite of adaptive management elements: the planning and implementation process involves planning, ecosystem assessment, monitoring, research, enforcement, and adaptive management.

The MLPA requires the state to consider baseline environmental information, reevaluate and redesign existing MPAs, and consider new areas that could support a networked system. The California Marine Life Protection Act Initiative, a public-private partnership that includes the California Department of Fish and Game and the California Resources Agency, is leading the efforts to develop this MPA network. The state created a master plan framework to guide the planning process in five California regions: the North Coast, South Coast, North Central Coast, Central Coast, and San Francisco Bay.[75] Science and technical information developed to redesign these MPAs – including baseline information developed during the environmental assessment processes – could be used to increase understanding of regional ocean processes and to support regional ocean governance.

In addition, the **California Coastal Management Program**, established by the California Coastal Act, manages coastal zone development and promotes compatible uses.[76] It applies to land and water areas within California from Oregon to the Mexican border, "extending inland generally 1,000 yards from the mean high tide line of the sea" and seaward out to the three-mile state/federal ocean boundary.[77] Under the Coastal Act, almost all development within the coastal zone requires a permit from the California Coastal Commission.[78] For example, changes in access to water, new coastal zone construction, and major vegetation removal activities require a California Coastal Commission permit. The Commission delegates much of its permitting authority to local governments with certified Local Coastal Programs (LCPs).[79]

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[74] Marine Life Protection Act, Fish & Game Code §§ 2850-2863 (2004).
[75] California Department of Fish & Game, Marine Life Protection Act Initiative, *available at* http://www.dfg.ca.gov/mlpa/.
[76] CAL. PUB. RES. CODE §§ 30000 *et seq*.
[77] CAL. PUB. RES. CODE § 30103.
[78] The San Francisco Bay Conservation and Development Commission oversees the San Francisco Bay.
[79] *Id.* § 30519(a). The Commission retains primary permitting authority over tidelands, submerged lands, other public trust lands, and ports and universities, as well as appellate review authority for development permits within 300 feet of the mean high tide line. *Id.* § 30519(b).

The Act's legislative findings declare that the Commission should seek technical advice and recommendations from the scientific and academic communities with regard to decision-making involving, among other things, the cumulative impact of coastal zone developments.[80] The Coastal Act definition of "cumulatively" or "cumulative effects" provides that "the incremental effects of an individual project shall be reviewed in connection with the effects of past projects, the effects of current projects, and the effects of probable future projects."[81]

The Coastal Act further states that new development should be sited where, among other things, it will not have significant adverse impacts either individually or cumulatively.[82] However, the majority of the other provisions addressing cumulative effects are provisions that allow the Commission to categorically exempt parties from permit requirements. The Commission can exempt certain uses or activities from development controls and approval standards if they are not expected to result in significant cumulative effects. The Commission also can establish an automatic exemption for categories of development determined to have no potential to cause individually or cumulatively significant adverse impacts on coastal resources or public access.[83]

For example, the Commission can designate areas where single-family residences do not require development permits if there is no potential for them to have individually or cumulatively significant adverse effects on public access or scenic, environmentally sensitive, or agricultural resources;[84] urban areas can be excluded from permit requirements if development will not have significant adverse cumulative impacts on coastal resources or public access.[85]

iv. Oregon Approaches: Coastal Zone Management and Oregon Ocean Resources Management Act

The legal foundation for the **Oregon Coastal Management Program**[86] is the Oregon Land Use Planning Act, which requires Oregon's cities and counties to enact comprehensive plans.[87] The Act also mandated the establishment of statewide goals and guidelines to use during comprehensive plan development, adoption, and amendment.[88] Most of the 19 Statewide Planning Goals contain both mandatory provisions and non-binding implementation guidelines, and have played a critical role in Oregon land-use planning and development.[89]

Of the four Planning Goals that concern coastal resources, two address the importance of considering cumulative impacts. Goal 16 relates to protection of the environmental, social, and economic values of estuarine resources. Local and state agencies must develop comprehensive plans for estuarine

[80] *Id.* § 30006.5.
[81] *Id.* § 30105.5.
[82] *Id.* § 30250(a).
[83] *Id.* § 30610.
[84] *Id.* § 30610.1.
[85] *Id.* § 30610.5.
[86] NOAA, Ocean and Coastal Management in Oregon, http://coastalmanagement.noaa.gov/mystate/or.html.
[87] OR. REV. STAT. §§ 197.005 *et seq.*
[88] *Id.* §§ 197.075, 107.175, 197.225, 197.230.
[89] *See* Oregon's Statewide Planning Goals & Guidelines, Goal 2: Land Use Planning, OAR 660-015-0000(2) (stating that the guidelines "are suggested directions that would aid local governments in activating the mandated goals. They are intended to be instructive, directional and positive, not limiting local government to a single course of action when some other course would achieve the same result.").

resources, which must "[c]onsider and describe . . . the potential cumulative impacts of the alterations and development activities envisioned. Such a description may be general but shall be based on the best available information and projections."[90] Under Goal 19, which mandates conservation of marine resources and ecological functions, cumulative impacts assessments are optional. The Goal states that flexibility in management is required "to account for variable conditions in the marine environment, the changeable status of resources, and individual and cumulative effects of uses."[91]

In 1991, the **Oregon Ocean Resources Management Act** established an Ocean Resources Management Program, which consists of the relevant portions of the Oregon CMP, an Ocean Policy Advisory Council, and a Territorial Sea Plan (TSP). The TSP implements Goal 19 (ocean resources) by establishing mandatory decision-making procedures for proposed uses and activities (other than fishing), which detail the types of project information and projected impacts that must be considered during the proposal process.[92] Part V of the TSP, developed in 2009 to govern renewable energy activities, explicitly requires the applicant to provide a written evaluation of the reasonably foreseeable adverse impacts of the proposed renewable energy project. The applicant must

> [e]valuate the cumulative effects of a project, including the shoreland component, in conjunction with effects of any prior phases of the project, past projects, other current projects, and probable future projects. The evaluation should analyze the biological, ecological, physical, and socioeconomic effects of the renewable energy facility development and of other renewable energy facility projects along the Oregon coast, while also taking into account the effects of existing and future human activities and the regional effects of global climate change.[93]

Citing the federal NEPA definition of cumulative impacts, the Plan details specific factors that the applicant should consider in the cumulative effects evaluation. The scope of the cumulative effects assessment may be set by a Joint Agency Review Team, according to its guidelines.[94]

C. West Coast Environmental Impact Assessment Framework

1. Overview

The federal National Environmental Policy Act, California Environmental Quality Act, and Washington's State Environmental Policy Act are the environmental impact assessment laws applicable to the CCLME.[95] These laws require federal and state agencies to consider the environmental consequences of proposed actions or projects, evaluate possible alternatives, and disclose information to the public, before issuing final permits or other agency approvals. NEPA applies to actions that are proposed,

[90] Oregon's Statewide Planning Goals & Guidelines, Goal 16: Estuarine Resources, OAR 660-015-0010(1).
[91] Oregon's Statewide Planning Goals & Guidelines, Goal 19: Ocean Resources, OAR 660-015-0010(4).
[92] Oregon Territorial Sea Plan (I)(B)(2)(e), (II) (1994).
[93] Oregon Territorial Sea Plan (V)(B)(4)(e)(4)(A) (2009) (citation omitted).
[94] *Id.* (4)(B).
[95] For purposes of this report, and to distinguish this type of impact assessment from the ecosystem assessment associated with regional ocean governance, we will use "environmental impact assessment" to refer to project-level assessments, except when discussing the use of environmental impact assessment at the regional or programmatic scale.

funded, or permitted by the federal government, while SEPA and CEQA involve state projects or actions. Oregon lacks such a "little NEPA," as the EIA process is subsumed by the statewide planning process.

NEPA, SEPA, and CEQA provide a number of opportunities to interact with the regional ocean governance framework and minimize impacts. These laws also can play an important role in identifying and mitigating significant project-level impacts, thus strengthening the integrity of the regional ocean governance system. Further, they allow for a "tiered" assessment approach that could directly link regional planning with project-level assessment and decision-making (see Box 3 below).

2. National Environmental Policy Act

NEPA requires federal agencies to consider the potential environmental impacts of a proposed federal (or federally-approved) action, and to evaluate feasible alternatives. This is done through preparation of an Environmental Assessment (EA), which determines whether the proposed action will significantly affect the environment and thus whether a fuller Environmental Impact Statement (EIS) is necessary.[96] NEPA review may be required for programmatic decisions, such as the adoption of a new national program or formal plan, or more focused project-level actions (see Box 3).[97]

Box 3. Tiered NEPA Analyses

A "tiered" NEPA approach is one way that federal agencies can link regional coastal and marine spatial planning with their obligations to conduct project-level environmental impact assessments under NEPA. NEPA allows federal agencies to prepare programmatic environmental impact statements (PEIS) to assess the impacts of and alternatives to broad federal programs and policies. Site-specific or action-specific environmental impact assessments follow from the PEIS in a process known as "tiering." The CEQ regulations define tiering as follows:

> Tiering refers to the coverage of general matters in broader environmental impact statements (such as national program or policy statements) with subsequent narrower statements or environmental analyses (such as regional or basinwide program statements or ultimately site-specific statements) incorporating by reference the general discussions and concentrating solely on the issues specific to the statement subsequently prepared. Tiering is appropriate when the sequence of statements or analysis is:
>
> (a) From a program, plan, or policy environmental impact statement to a program, plan, or policy statement or analysis of lesser scope or to a site-specific statement or analysis.
> (b) From an environmental impact statement on a specific action at an early stage (such as need and site selection) to a supplement (which is preferred) or a subsequent statement or analysis at a later stage (such as environmental mitigation). Tiering in such cases is appropriate when it

[96] 42 U.S.C. § 4332.
[97] 40 C.F.R. § 1508.18.

> helps the lead agency to focus on the issues which are ripe for decision and exclude from consideration issues already decided or not yet ripe.[98]

Thus, a tiered approach allows decision-makers to move analytically from broad and often cumulative impacts to focused site-specific or action-specific impacts in a tiered fashion.[99]

The comprehensive cross-sector planning embodied by the marine planning process is the type of coordinated program that NEPA PEIS and tiering is meant to facilitate. Developing an EIS at an early stage of the marine planning process could result in more comprehensive analyses, as well as efficiency gains, when NEPA review of project-level actions tiers from the broader EIS. One approach would be to complete an EIS for the national marine planning program, as well as an EIS for each regional marine plan. These EIS processes would consider area-wide or program-wide cumulative environmental impacts and the mitigation measures that might effectively constrain them. A project- or action-level environmental impact assessment would then focus "on those issues and mitigation measures specifically relevant to the narrower action but not analyzed in sufficient detail in the [broader programmatic] document."[100]

If an agency determines that a proposed action will have a significant effect on the environment, NEPA requires it to detail the expected impacts, alternatives, negative environmental effects that cannot be avoided, and the relationship between short-term uses and long-term sustainability.[101] The first step is to "scope" the range of actions, alternatives, and impacts necessary for an accurate assessment. This includes connected, cumulative, and similar actions; reasonable alternatives; and direct, indirect, and cumulative impacts.[102]

The Council on Environmental Quality regulations define "direct effects" as effects "which are caused by the action and occur at the same time and place."[103] "Indirect effects" are effects "which are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable."[104] Finally, a "cumulative impact" is:

> the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.[105]

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[98] NEPA Task Force Report, *supra*, note 9 at 39.
[99] For a general discussion of programmatic EIS and tiering, *see* Beth C. Bryant, *NEPA Compliance in Fisheries Management: the Programmatic Supplemental Environmental Impact Statement on Alaskan Groundfish Fisheries and Implications from NEPA Reform*, 30 HARV. ENVTL. L. REV. 441 (2006).
[100] Department of the Interior, Bureau of Land Management, NEPA Handbook H-1790-1 at 27 (2008), *available at* http://www.blm.gov/pgdata/etc/medialib/blm/wo/Information_Resources_Management/policy/blm_handbook.Par.24487.File.dat/h1790-1-2008-1.pdf.
[101] 42 U.S.C. § 4332(c).
[102] 40 C.F.R. § 1508.25.
[103] 40 C.F.R. § 1508.8(a).
[104] 40 C.F.R. § 1508.8(b).
[105] 40 C.F.R. § 1508.7.

The Council on Environmental Quality Handbook, *Considering Cumulative Effects Under the National Environmental Policy Act*, further explains that cumulative impacts include both additive effects of single or multiple actions and interactive effects. "Interactive effects may be either countervailing—where the net adverse cumulative effect is less than the sum of the individual effects—or synergistic—where the net adverse cumulative effect is greater than the sum of the individual effects."[106]

The CEQ Handbook further explains that cumulative impacts may be attributed to "spatial (geographic) and temporal (time) crowding of environmental perturbations. The effects of human activities will accumulate when a second perturbation occurs at a site before the ecosystem can fully rebound from the effects of the first perturbation."[107] The U.S. Court of Appeals for the Ninth Circuit, whose decisions are binding in federal courts on the West Coast, has interpreted the required inclusion of cumulative impacts during the scoping analysis to mandate consideration of the cumulative impacts of the proposed action in the EIS itself.[108]

3. California Environmental Quality Act

In California, CEQA applies to proposed state actions, including private actions permitted or licensed by the state.[109] The law's basic structure—and its cumulative impacts requirement—parallels NEPA's.[110] According to the CEQA guidelines, an Environmental Impact Report (EIR) must include a cumulative impacts analysis when the incremental effect of the project is "cumulatively considerable." The lead agency determines whether an incremental effect is cumulatively considerable, and must provide a brief explanation if it finds that it is not.[111] If the combined cumulative impact of the project in conjunction with other past, present, and likely future projects is not considerable, the EIR must briefly explain why it is not, and provide supporting facts and analysis.[112]

The EIR must also list the past, present, and likely future projects with cumulative effects (or, for a general plan or similar document, a summary of projections for regional conditions); provide an overview of expected environmental effects, where to find supporting information, and analysis of their cumulative impacts; and assess the reasonable and feasible options for mitigating or avoiding contributing to cumulative impacts.[113] As with NEPA, tiering is allowed from broad programmatic documents to focused action-level EIRs.[114]

An important difference between NEPA and CEQA is that, where NEPA is purely procedural, CEQA substantively prohibits the approval of a project "if there are feasible alternatives or feasible mitigation measures available which would substantially lessen the significant environmental effects of such

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[106] Council on Environmental Quality, *Considering Cumulative Effects Under the National Environmental Policy Act* at 9 (1997), *available at* http://ceq.hss.doe.gov/nepa/ccenepa/ccenepa.htm [hereinafter "CEQ Handbook"].
[107] *Id*. at 7.
[108] *Kern v. US Bureau of Land Mgmt*., 284 F.3d 1062, 1076 (9th Cir. 2002).
[109] *See* CAL. PUB. RES. CODE §§ 21000-21001.
[110] *See City of Carmel-by-the Sea v. U.S. Dep't of Transportation*, 123 F.3d 1142, 1165 (9th Cir. 1997) ("The California Environmental Quality Act's cumulative impacts requirements closely mirror the federal standards.").
[111] CAL. CODE REGS. tit. 14, § 15120(a).
[112] CAL. CODE REGS. tit. 14, § 15120(a).
[113] CAL. CODE REGS. tit. 14, § 15120(b).
[114] CAL. CODE REGS. tit. 14, § 15152.

projects."[115] "Significant effects" include when "[t]he possible effects of a project are individually limited but cumulatively considerable….mean[ing] that the incremental effects of an individual project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probably future projects."[116]

4. Washington State Environmental Policy Act

Similarly to NEPA and CEQA, Washington's SEPA requires agencies to prepare an EIS for major state "actions significantly affecting the quality of the environment."[117] The scope of environmental review for a proposed activity must encompass the range of actions, alternatives, and impacts necessary for an accurate analysis.[118] Impacts to be considered in this scoping process may include those that are direct, indirect, and cumulative.[119] Although SEPA regulations do not define the term "cumulative impacts," SEPA was modeled on NEPA, and NEPA decisions may be used to interpret SEPA issues.[120]

SEPA requires decision-makers to consider the probable cumulative impacts in an EIS, but not impacts that are remote or "speculative."[121] The Washington Supreme Court has stated that:

> "[i]mplicit in [SEPA] is the requirement that the decision makers consider more than what might be the narrow, limited impact of the immediate pending action. The agency cannot close its eyes to the ultimate probable environmental consequences of its current action…[but] it is impractical if not impossible to identify and evaluate every remote and speculative consequence of an action."[122]

SEPA further mandates that the location of considered impacts not be limited to the agency's boundaries, regardless of whether the agency is a local or state government.[123]

The Washington State Department of Ecology provides examples of situations requiring a cumulative impact analysis. For example, decision-makers should consider cumulative impacts where "[i]ncreased runoff and contaminants from development would be added to the volumes and levels of contamination from similar developments surrounding the wetland."[124] In addition, cumulative impacts should be considered for a proposal that will emit greenhouse gases, and decision-makers should evaluate how the proposal will contribute to climate impacts and how those impacts may be mitigated.[125] SEPA substantive authority allows decision-makers to condition or deny proposals based on information in the EIS and the agency's adopted SEPA policies. Accordingly, the agency could place conditions on the

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[115] CAL. PUB. RES. CODE § 21002.
[116] CAL. PUB. RES. CODE § 21083(b)(2).
[117] RCW 43.21C.030.
[118] *Id.* § 197-11-792.
[119] *Id.*
[120] WASH. REV. CODE § 43.21C.010–914; WASH. ADMIN. CODE § 197-11-010–990.
[121] WASH. REV. CODE 197-11-060(4).
[122] *Cheney v. City of Mountlake Terrace*, 87 Wash.2d 338, 344 (1976).
[123] WASH. ADMIN. CODE § 197-11-060(4)(b).
[124] Washington State Department of Ecology, State Environmental Policy Act Handbook, Pub. No. 98-114 at 56 (Sept. 1998), updated in 2003.
[125] Washington State Department of Ecology, Guidance: SEPA and GHG Emissions, *available at* http://www.ecy.wa.gov/climatechange/sepa_impacts.htm.

project to mitigate adverse cumulative impacts, or could deny a proposal if significant cumulative impacts cannot reasonably be mitigated.[126]

Box 4. More About Environmental Impact Assessment Requirements in the CCLME

While this report focuses on three general environmental impact assessment laws in the CCLME, there are additional sector- or issue-specific legal provisions that are important for environmental impact assessment and, in some cases, mitigation. These additional provisions also could be harmonized and integrated with a regional governance framework in a fashion similar to the model framework described in this report.

Among national laws, the Outer Continental Shelf Lands Act (OCSLA) and the Federal Power Act require predictions of the impact of an activity on the environment. The integrated license application process under the Federal Power Act requires the development of Exhibit E, which must include a list of cumulatively affected resources; a description of how those resources are cumulatively affected; and a discussion of past, present, and future actions, and their effects on resources based on the new license term. The Act also requires that all licenses for hydrokinetic facilities include conditions for mitigation of the impacts to fish and wildlife and their habitats from the development, operation, and management of the proposed project.

OCSLA requires a study of an oil and gas lease area prior to its sale in order to assess and manage environmental impacts on the human, marine, and coastal environments. OCSLA also requires the development of an exploration plan that includes information regarding onsite flora and fauna, in particular endangered species and critical habitats, as well as onshore and offshore environmentally sensitive areas.

Under the Endangered Species Act (ESA), federal agencies must confer with the Secretary of the Interior or of Commerce, depending on the species at issue, regarding any agency action that likely will jeopardize the continued existence of any threatened or endangered species or adversely modify critical habitat. The Secretary must then draft and issue an opinion as to whether and how the agency action affects the species or critical habitat at issue, including a summary of the information on which the opinion is based and suggestions as to reasonable and prudent alternatives that would avoid jeopardizing the species or adversely modifying critical habitat. Under the ESA, a "take" of an endangered or threatened species may not be permitted unless, among other things, the applicant will minimize and mitigate the impacts of the take to the maximum extent practicable, will ensure that adequate funding for the plan is provided, and the take will not significantly reduce the likelihood of the survival and recovery of the species.

D. Gaps in the Existing Framework

The existing legal requirements and regional structures identified above (and described in greater detail in Appendix A) contribute parts to a basic foundation for addressing cumulative impacts in the CCLME. However, the majority of the overarching laws and policies are broad mandates or non-binding

[126] Washington State Department of Ecology, *supra*, note 124 at 45.

agreements that call for consideration of cumulative impacts, but are unsupported by targeted requirements to gather the information or conduct the monitoring necessary to establish and achieve ecosystem goals. Conversely, concrete provisions that require assessing and/or minimizing cumulative impacts are typically limited by sector, site, or species. Other statutory and regulatory requirements, both at the state and federal level, establish systems and tools to facilitate comprehensive planning—but these too need to be linked to regional planning and decision-making that seek to minimize cumulative impacts.

This section identifies some of the most significant gaps in the capacity of the existing CCLME management framework to effectively assess, consider, and address cumulative impacts.

At the region-wide scale, the West Coast Governor's Agreement on Ocean Health is one existing cross-sectoral approach to addressing ocean and coastal issues. Its provisions encourage regional cross-jurisdictional planning and ecosystem-based management, but the Agreement and resulting Action Plan are non-binding. In addition, the federally mandated marine planning process may provide opportunities to strengthen this regional ocean governance framework. However, it is still unclear how the new marine planning process will address cumulative impacts and link to the existing Agreement.

At the state level, Washington, Oregon, and California have disconnected systems of managing ocean resources, with different strengths and limitations found in the legal frameworks of each state. They all have coastal management programs that: (1) provide broad, cross-sectoral management authority in the coastal zone through a variety of laws and policies; and (2) contain cross-sectoral management systems that are regulatory in nature. All three states have some comprehensive ocean planning programs—California Ocean Protection Council, Oregon Territorial Sea Plan, Washington's Puget Sound Partnership and marine spatial planning law. However, with the exception of Oregon, these planning mechanisms are not linked to the regulatory systems.

While coastal management programs are intended to address coastal resources in their entirety, few contain specific requirements to consider cumulative impacts at the individual project level. For example, the California Coastal Act lists consideration of cumulative impacts as a legislative finding, but does not contain concrete mechanisms for requiring assessment of the cumulative impacts of specific projects. Further, although Washington's multiple coastal zone management laws—which include the Shoreline Management Act, Aquatic Lands Act, Ocean Resources Management Act, and Growth Management Act—suggest a comprehensive management approach and provide an example of integrating and coordinating related efforts, cumulative impacts are mentioned and addressed only in very limited contexts. A significant exception is the SMA's requirement that Lakeshore Management Plans evaluate cumulative impacts of future development on shoreline ecological functions to ensure no net loss, and related guidelines for conducting a cumulative impacts analysis in the Shoreline Master Program Handbook.[127]

Oregon's coastal management plan does directly address cumulative impacts, although still at a general level: the "estuarine resources" statewide planning goal requires that comprehensive plans consider cumulative impacts, the "marine resources" statewide planning goal encourages cumulative impacts analysis, and the Territorial Sea Plan requires evaluation of reasonably foreseeable cumulative impacts in relation to proposed offshore renewable energy activities. None of the programs require ongoing monitoring and evaluation of cumulative impacts on a local, statewide, or regional basis.

[127] Washington State Department of Ecology, *Shoreline Master Program Handbook*, Ch. 17 (May 2010).

Environmental impact assessment on the West Coast occurs at the federal level through NEPA and at the state level through SEPA and CEQA. One notable omission is the lack of a "little NEPA" in Oregon. NEPA and the state-law equivalents provide an avenue for analyzing cumulative impacts. Beyond the requirements to assess cumulative impacts, however, there is significant variation as to whether (and what) action must be taken to address them. Of the three laws, CEQA requires applicants to undertake feasible measures for mitigating significant impacts. SEPA allows agencies to condition or deny a proposal due to a likely significant adverse impact.[128] Under NEPA, agencies must only analyze and report the predicted impacts.

Significantly, NEPA, SEPA, and CEQA do *not* contain monitoring requirements to determine whether mitigation measures (when required) are actually implemented. They also do not require monitoring to determine whether actual environmental impacts result from project implementation. In addition, SEPA is the only one of the three that has been at least partially integrated with other comprehensive planning processes—i.e., the Growth Management Act.[129]

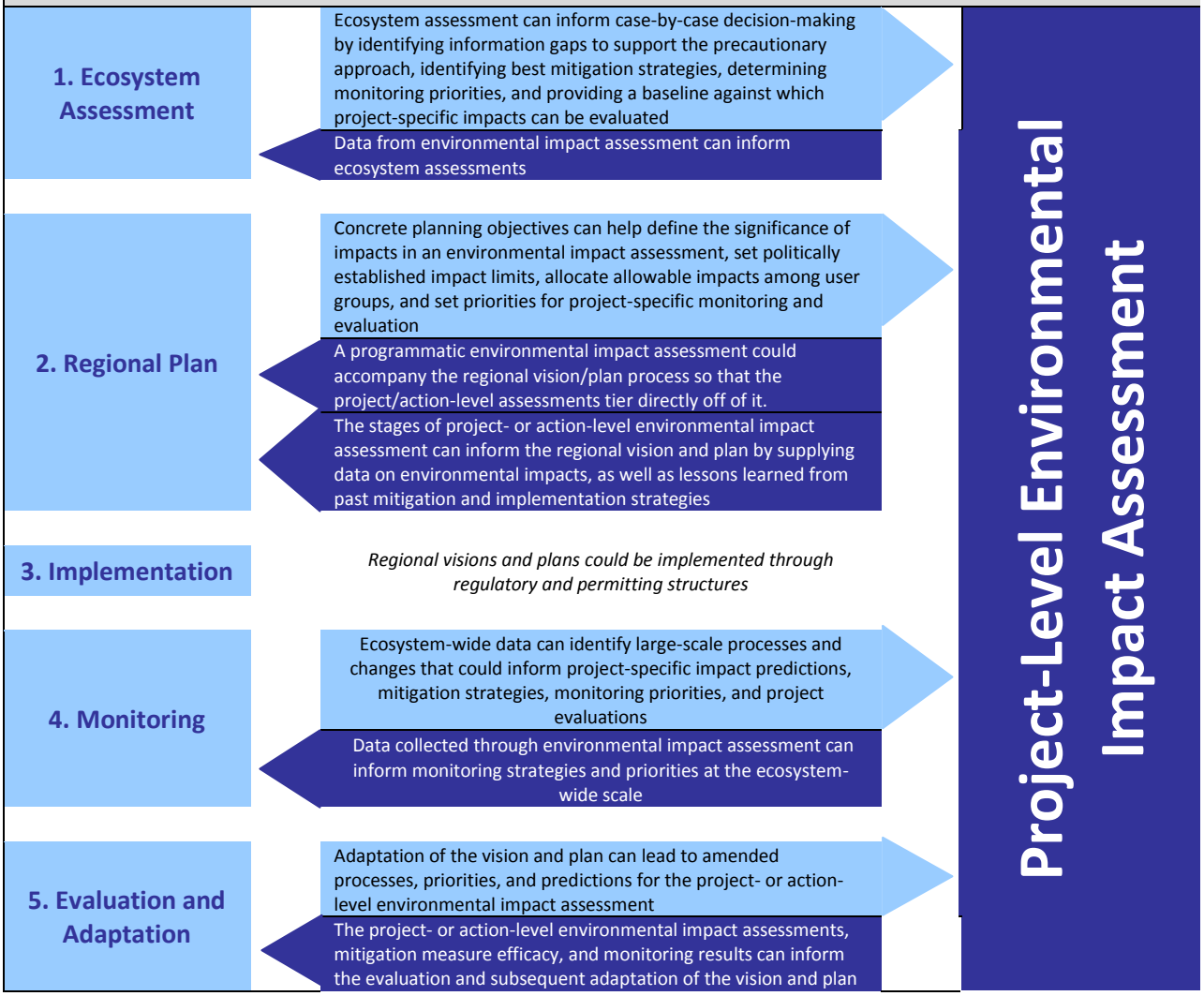
[128] WASH. ADMIN. CODE § 197-11-660; Department of Ecology, State Environmental Policy Act (SEPA), *at* http://www.ecy.wa.gov/programs/sea/sepa/faq.htm.
[129] See *infra* Box 7 (notes 154-156 and accompanying text).

IV. OPPORTUNITIES TO CONNECT REGIONAL OCEAN GOVERNANCE WITH ENVIRONMENTAL IMPACT ASSESSMENT AND PERMITTING

A. Overview

Managers have multiple opportunities to integrate regional ocean governance and project-specific decision-making. Integrating these frameworks can ensure that the best available information is used in decision-making, advance regional goals and objectives, and more effectively minimize cumulative impacts. This section considers approaches to make these important linkages, as summarized in Figure 2.

Figure 2. Linkages between Ocean Governance and Environmental Impact Assessment



B. Linking Ecosystem Assessment and Environmental Impact Assessment

A number of ecosystem assessments have been developed for various West Coast regions, and assessments are also underway, but not completed, for the entire CCLME. In addition to these region-wide efforts, NEPA, SEPA, and CEQA require agencies to conduct an environmental impact assessment for proposed projects or actions that will have significant impacts on the environment. These impact assessments must include a description of the affected resources and ecosystems that will serve as a baseline for evaluating predicted impacts. Environmental impact assessments can result in significant cost, involve an enormous amount of scientific analysis, and result in hundreds if not thousands of pages of analysis and prediction.

While project-level environmental impact assessments vary greatly in content and quality, the scientific, economic, and social data and information generated by these processes likely have utility beyond the specific projects in question. Unfortunately, the existing approach to environmental impact assessment remains project-specific and fragmented, so that resulting assessments at best only inform the immediate project and not the broader management community, and at worst are an afterthought to the decision-making process.

Regional ecosystem assessments and project-level impact assessments could be integrated to increase understanding of ecosystem processes and project impacts, better predict potential cumulative impacts, and support and inform management and decision-making at both the regional and project-specific levels. By integrating information developed at the regional and project scales, managers and practitioners will have a stronger understanding of potential cumulative impacts, and will be better positioned to minimize potential harms.

Regional ecosystem assessments generally encompass large geographic areas and can provide an important context for project-specific studies. Information generated by a regional ecosystem assessment can identify information gaps to support the precautionary approach, identify appropriate mitigation and mitigation priorities, and provide key baseline information for project-level assessments, including, for example:

- The distribution and location of rare, sensitive, valuable, and unique habitat;
- The distribution, location, and significance of key resources;
- The distribution, location, value, and significance of ecosystem services;
- Important ecosystem patterns, processes, and linkages;
- The connectivity between habitat and trends in key resources;
- The location of areas that provide significant recreation, public access, conservation, and cultural benefits;
- The type, density, and distribution of current and reasonably foreseeable future ocean uses and activities;
- A record of the type, density, and distribution of past uses of ocean space;
- The likely impact of human use and activity on resources and ecosystem components.

By using regional ecosystem information as a platform for project-level impact assessment, project managers could improve process efficiency and minimize the time and expense required to collect information from scratch. They could also improve the quality of environmental impact assessments by

providing ecosystem information that may be difficult and resource-intensive to collect for smaller-scale assessments. For example, a regional ecosystem assessment could indicate the distribution and significance of resources and habitat and the interconnections between various ecosystem components.

Not only can regional ecosystem assessment inform environmental impact assessments, but also the reverse is true: project-specific assessments can supply information at a level of detail that an ecosystem assessment often cannot, and can provide focused information related to the actual impacts of projects and actions within geographic regions. This may be particularly valuable during iterative ecosystem assessments once a plan is in place.

Linking regional and project-level assessments on the West Coast would require improved methods for sharing, managing and storing data and information, and potentially new mandates for considering information gathered at other scales (see Chapter VI). To be most effective, information from the CCLME should be stored in a common, central database that would be available to the public, managers, and practitioners. The information also would be scalable and searchable by geographic area to inform cumulative impact analyses for proposed projects and sound mitigation and adaptation strategies. Information in the database could be gathered using standardized protocols, and periodically updated to ensure the information is comprehensive and represents best available science.[130]

The following example demonstrates the potential utility of using regional ecosystem assessments to inform project-specific assessment and decision-making.

Box 5. Lessons from Massachusetts – Using an Ecosystem Assessment as a Platform for Permitting and Decision-Making

In 2009, Massachusetts prepared a *Baseline Assessment of the Massachusetts Ocean Management Planning Area* to support marine spatial planning in Massachusetts' waters. The Baseline Assessment constitutes the information base for the Massachusetts Ocean Management Plan.[131] After the state Secretary of Energy and Environmental Affairs adopted the Plan, "all certificates, licenses, permits and approvals for any proposed structures, uses or activities in areas subject to the ocean management plan" were required to be consistent with the Plan to the maximum extent practicable.[132] This requirement encompasses approvals made under the Massachusetts Environmental Policy Act (MEPA).[133]

The Baseline Assessment and supporting work group documents provide the scientific context for the state's efforts to manage conflicts and compatibilities between present and future human uses and between human uses and the environment. The Baseline Assessment assembles and synthesizes best available science on present conditions, characteristics, and human uses within the marine planning area.[134] It identifies key ecosystem components and maps the distribution, density, and abundance of "special, sensitive or unique [SSU] estuarine and marine life and habitats."[135] It also maps significant

[130] *See infra* Chapter VI for more about technical considerations.
[131] MASS. GEN. LAW ch 21A § 4C (2008) (Massachusetts Oceans Act).
[132] MASS. GEN. LAW ch 21A § 4C (2008).
[133] 301 C.M.R. § 11.07(6)(g).
[134] *See generally* Commonwealth of Massachusetts, Ocean Management Plan, vol. 2 (2008).
[135] MASS. GEN. LAW ch 21A § 4C (2008).

human uses within and adjacent to the management area, including renewable energy development, and identifies specific areas suitable for wind energy development. Further, it identifies important pressures and threats (e.g., water pollution) and principal drivers of ecosystem change. The Baseline Assessment incorporates an adaptive management element, and must be updated every five years.

Notably, the Baseline Assessment includes many of the same elements that are required in the description of the "existing environment" under MEPA, and therefore may be used to provide current baseline information against which the magnitude and significance of impacts of proposed projects or actions are evaluated. The Assessment provides important baseline information related to existing uses, recognizing them as significant interests that should be considered in evaluating significant cumulative impacts under MEPA. Further, special, sensitive, or unique resource data and maps provide "clear baseline information that will allow proponents, agency staff, and the public to focus on areas of greatest potential environmental significance."[136] Information in the Baseline Assessment is meant to direct and focus scoping for cumulative impacts "on aspects of a given project of greatest potential environmental significance"[137] and appropriate alternative actions.

Because it will be updated every five years, the Baseline Assessment will likely improve the quality of cumulative impacts analysis, by revealing significant data gaps, trends, patterns, and issues that may be missed during smaller-scale assessments and by providing a consistent information base for proposed projects and actions. In the context of marine planning in the CCLME, an ecosystem assessment could identify and map SSU resources and other resources of regional or sub-regional importance. In addition, the assessment could identify and map existing and future uses and activities, including areas that could be designated for renewable energy development and other foreseeable uses. On the flip side, project-level assessments could provide a record of impacts and focused data and information that could be integrated into the regional assessment during periodic updates.

C. Linking Regional Planning and Environmental Impact Assessment

Project-level decision-making also could be aligned with regional ocean plans to ensure that projects and actions support regional and state ocean governance objectives. This could be accomplished by: (1) integrating regional planning goals and objectives into project-level environmental impact assessments; (2) integrating regional plans and project-level impact assessments through a tiered approach; and (3) linking regional plans and project-level assessments with regulation and permitting.

1. Integrate Planning Goals and Objectives into Project-Level Environmental Impact Assessment

Ecosystem goals and objectives are important elements of regional planning that commonly articulate the desired future state of resources or the ecosystem. The best goals and objectives are ones that are concrete and measurable. Managers can measure progress toward achieving concrete goals and measurable objectives using a range of indicators, and they can use this information to adapt regional objectives, plans, and implementation strategies as needed.

Regional goals and objectives can inform and support project-specific impact assessment by:

[136] Commonwealth of Massachusetts, Ocean Management Plan, vol. 1 at 2-8 (2008).
[137] *Id*.

- Providing information related to regional and state priorities that can be used to identify potential cumulative impact issues;
- Serving as politically established limits to environmental impact, which could signal the point at which impacts become "significant" and have reached unacceptable levels;
- Supporting the agency's decision related to mitigation, monitoring, and adaptive management.

Box 6. A hypothetical example: harmful algal blooms

Assume that nutrient loading from land-based sources were leading to harmful algal blooms in the CCLME. A regional plan might have a goal of eliminating such human-caused blooms, with a measurable objective of limiting nutrient discharges to a specific amount. The plan could also indicate priority activities that should be allowed to continue discharging at some rate. Such a plan could inform project-level environmental impact assessment in several ways. First, the goal to eliminate harmful algal blooms would be an indication to agencies that activities leading to nutrient loading may alone or in combination significantly impact the environment. Second, the agency conducting the analysis would have an indication of the target level above which the cumulative nutrient loads would be excessive, and therefore "significant." Finally, this knowledge could lead project proponents or agencies to develop appropriate mitigation measures or conditional permits to avoid exacerbating the nutrient problem.

To best support project-level decision-making, regional goals and objectives should be clear, concrete, quantitative, science-based, and measurable. Clear and quantitative objectives have greater utility for assessing whether management strategies are achieving the desired effect. If quantitative objectives are not available, qualitative objectives should be measurable. Activities should not individually or cumulatively exceed set objectives and, to ensure that end, a significant measure of safety should be included to minimize risk.

Both qualitative and quantitative goals and objectives have been developed for many of the existing West Coast ocean and coastal management frameworks, including the West Coast Governors Agreement, Puget Sound Action Agenda, and California Ocean Protection Council's Strategic Plan. For example, Table 3 highlights sustainability goals and objectives directed at preserving, improving, or restoring ecosystems and their functions in legislation and policy documents related to the CCLME. These existing goals and objectives could be used to inform project-level environmental impact assessments, particularly those that establish quantitative or measurable goals and standards.

Table 3. Examples of Goals and Objectives to Protect Ecosystem Resources and Function

Source	***Goal or Objective***
Marine Planning	"Protect, maintain, and restore the Nation's ocean, coastal, and Great Lakes resources and ensure resilient ecosystems and their ability to provide sustained delivery of ecosystem services."[138]
West Coast Governor's	(1) Identify key West Coast habitats to protect and restore them, and establish

[138] Interagency Ocean Policy Task Force, *supra*, note 8 at 48 (National Goal of CMSP No. 2).

Table 3. Examples of Goals and Objectives to Protect Ecosystem Resources and Function	
Agreement Action Plan	measures to ensure that habitat protection is effective; (2) restore estuarine habitats and functions "to achieve a net increase in habitat and their function by at least 10% over the next 10 years;"[139] and (3) eradicate invasive *Spartina* cordgrass coast-wide.
Washington State	Shoreline Management Act: Achieve a standard of no net loss of ecological functions by appropriately regulating development, conducting restoration and mitigating impacts, and improving practices affecting shorelines.[140] SSB 6350: "[P]rotect special, sensitive or unique estuarine and marine life and habitats, including important spawning, rearing, and migration areas for finfish, marine mammals, and productive shellfish habitats."[141] Puget Sound Partnership Goals to achieve by 2020: (1) healthy and sustaining native species populations, and a robust food web; and (2) "A healthy Puget Sound where freshwater, estuary, nearshore, marine, and upland habitats are protected, restored, and sustained."[142] Measurable outcomes are set forth in the Action Agenda, and include ensuring that "Non-native species do not significantly reduce native species' viability or impair food web function;" and that habitats "sustain diverse species and are formed by natural processes and human stewardship so that ecosystem functions are sustained."[143]
California	Coastal Act: "Protect, maintain, and where feasible, enhance and restore the overall quality of the coastal zone environment and its natural and artificial resources."[144] California Marine Life Protection Act: (1) "To protect the natural diversity and abundance of marine life, and the structure, function, and integrity of marine ecosystems;" (2) "To help sustain, conserve, and protect marine life populations, including those of economic value, and rebuild those that are depleted."[145]
Oregon	Statewide Planning Goal 16, Estuarine Resources: "To recognize and protect the unique environmental, economic, and social values of each estuary and associated wetlands;" and "To protect, maintain, where appropriate develop, and where appropriate restore the long-term environmental, economic, and social values, diversity and benefits of Oregon's estuaries."[146]

[139] Office of the Governors of Washington, Oregon & California, *supra*, note 6 at 50-51. Because there are no tools available to measure ecological function easily, measurable indicators (e.g., area of native vegetation) that are related to specific functions are generally used to evaluate changes in ecological function over time.
[140] WASH. ADMIN. CODE § 173-26-176(3)(c) (citing RCW 90.58.020).
[141] SSB 6350 § 1(3)(j). This is not a goal or objective of marine planning, but is one of thirteen policies announced by this legislation to guide state and local governments exercising jurisdiction over proposed uses and activities in Washington waters. An interagency team is charged with developing specific goals and objectives for marine planning in Washington.
[142] Puget Sound Partnership, *Action Agenda*, at 10 (Dec. 1, 2008), updated May 2009.
[143] *Id*. at 15.
[144] PUB. RES. CODE § 30015.5(a).
[145] Cal. Fish & Game Code § 2853(b) (Goals for Redesign of MPA System).
[146] Oregon's Statewide Planning Goals & Guidelines, *Goal 16: Estuarine Resources*, OAR 660-015-0010(1).

Table 3. Examples of Goals and Objectives to Protect Ecosystem Resources and Function	
	Statewide Planning Goal 17, Coastal Shorelands: "To conserve, protect, where appropriate, develop and where appropriate restore the resources and benefits of all coastal shorelands, recognizing their value for protection and maintenance of water quality, fish and wildlife habitat, water-dependent uses, economic resources and recreation and aesthetics. The management of these shoreland areas shall be compatible with the characteristics of the adjacent coastal waters."[147] Statewide Planning Goal 19, Ocean Resources: "To conserve marine resources and ecological functions for the purpose of providing long-term ecological, economic, and social value and benefits to future generations."[148]

The goals and objectives in existing West Coast laws and plans generally were developed on a state-by-state basis. Moving forward, such goals and objectives may need to be harmonized with those developed for regional or coast-wide ocean management. This is the approach taken by Washington in SSB 6350, which provides that state with authority to conduct marine spatial planning in the state's marine waters, and to augment existing ocean and estuarine management plans with marine spatial planning components.[149]

SSB 6350 does not define sustainability goals and objectives for Washington's ocean and estuarine environments. Instead, the law creates a marine interagency team, and gives the team until December 2010 to provide the state legislature with an assessment that: (1) summarizes the existing goals and objectives for a set of defined ocean and coastal management plans; (2) includes "recommended goals and objectives for marine spatial planning that integrate with existing policies and regulations . . ."; and (3) summarizes how these goals and objectives differ from those developed by other states for the California Current LME, and with those presented in the National Ocean Policy and Final Recommendations.[150] This mandate helps to ensure that the goals and objectives for marine spatial planning in Washington waters will be consistent and compatible with the goals and objectives contained in existing state planning and coast-wide marine spatial planning efforts.

Box 7. Washington Shoreline Management Act—Integrating a Sustainability Goal with Planning and Project Permitting

The Washington Shoreline Management Act (SMA) provides an important model for integrating a regulatory sustainability goal into planning and project-level implementation. The SMA creates a substantive "no net loss" standard that agencies are required to apply when determining whether projects will be permitted. It thus goes one step further than our model framework of linking planning to impact analysis, by linking planning directly to permitting.

[147] Oregon's Statewide Planning Goals & Guidelines, *Goal 17: Coastal Shorelands*, OAR 660-015-0010(2), amended 08/05/99.
[148] Oregon's Statewide Planning Goals & Guidelines, *Goal 19: Ocean Resources*, OAR 660-015-0010(4).
[149] S.S.B. 6350, State of Washington, 61st Legislature, 2010 Regular Session (2010).
[150] *Id*. § 4.

The SMA is the centerpiece of Washington's coastal zone management program, and seeks to prevent piecemeal development of shorelines. The SMA includes a broad policy goal for protecting, restoring and preserving shoreline natural resources and ecology.[151] Drawing from statutory language in the SMA, the SMA Guidelines also establish an explicit, new regulatory requirement to protect and restore "the ecological functions of shoreline natural resources."[152]

The no-net-loss standard is implemented at the planning level, and shoreline permits must be approved in compliance with the plan. At the planning level, SMA regulations direct that:

> (b) Local master programs (which include comprehensive shoreline plans) shall include policies and regulations designed to achieve no net loss of those ecological functions.
>
> (i) Local master programs shall include regulations and mitigation standards ensuring that each permitted development will not cause a net loss of ecological functions of the shoreline . . .
>
> (ii) Local master programs shall include regulations ensuring that exempt development in the aggregate will not cause a net loss of ecological functions of the shoreline.[153]

SMA guidelines further require local master programs to "evaluate and consider cumulative impacts of reasonably foreseeable future development on shoreline ecological functions and other shoreline functions fostered by the policy goals of the act. To ensure no net loss of ecological functions and protection of other shoreline functions and/or uses, master programs shall contain policies, programs, and regulations that address adverse cumulative impacts and fairly allocate the burden of addressing cumulative impacts among development opportunities."[154]

The Shoreline Master Program (SMP) Handbook provides a list of practices that can be used to achieve no net loss, including protection, restoration, and regulation. The SMP Handbook also provides a list of potential indicators that may be used to measure net loss and track the status of ecosystem functions. Further, the SMP Handbook includes a chapter on evaluating cumulative impacts on shoreline ecological functions (e.g., habitat, hydrology, water quality) to demonstrate no net loss.[155]

Not only are no-net-loss principles (first avoiding, then minimizing and compensating for ecological impacts) applied in shoreline plans and policies but also these principles are applied as individual shoreline project applications are reviewed and approved, conditioned, or denied (e.g., during plan implementation and permitting).[156] This helps account for impacts and development types that are not accounted for in the master program. In addition, where mitigation is required, the SEPA guidelines

[151] WASH. REV. CODE 90.58.020.
[152] WASH. ADMIN. CODE § 173-26-176(3)(c) (citing RCW 90.58.020).
[153] WASH. ADMIN. CODE § 173-26-186(8)(b).
[154] WASH. ADMIN. CODE § 173-26-186(8)(d).
[155] Washington State Department of Ecology, *Shoreline Master Program Handbook*, Ch. 4 at 17 *available at* http://www.ecy.wa.gov/programs/sea/shorelines/smp/handbook/index.html.
[156] *Id*. at Ch. 4 at 5.

require avoidance of new adverse impacts and, when avoidance is not possible, mitigation sequencing may be used to minimize impacts.[157] By prioritizing avoidance, the SMA makes it more difficult merely to compensate for adverse impacts of human use and activity.

Because the no-net-loss standard is relatively new, the effectiveness of incorporating it into planning and implementation is not yet known. However, at least in theory, the new requirements are a significant step towards a more comprehensive and robust approach to managing impacts on ecological functions in Washington.

Box 8. West Coast Governors Agreement Action Plan – Develop Clear and Measurable Objectives

In May 2008, California, Oregon, and Washington released an Action Plan to guide implementation of the West Coast Governors Agreement on Ocean Health. The Action Plan establishes seven action priorities to protect West Coast ocean and coastal ecosystems and economies. One of the seven priority areas is to protect and restore ocean and coastal habitats to advance a vision where: "Estuarine, marine, and coastal habitats are ecologically healthy and allow for public enjoyment and sustainable use."[158] This vision is supported by three goals: (1) identify key West Coast habitats for protection and restoration; (2) restore the habitats and function of West Coast estuaries; and (3) eradicate the invasive *Spartina* cordgrass coast-wide.[159]

Each of these three goals is connected to action objectives. For example, one objective is to "[d]ocument, describe, and map marine and estuarine ecological communities throughout West Coast waters, characterize existing human uses of those area, and establish measures to ensure effective habitat protection."[160] Another is to "[r]estore estuarine habitats, including coastal wetlands, to achieve a net increase in habitat and their function by at least 10% over the next 10 years."

Although the Action Plan does not directly link coast-wide visions, goals, and objectives with project-level implementation, the specificity of the objectives could assist decision-makers in making project-level decisions by supporting or suggesting project conditions, necessary mitigation, or focused monitoring. For example, if the goal of achieving a 10% net increase in habitat and function is taken into account, the agency could require a project proponent to mitigate environmental impacts on habitat connectivity, habitat value as spawning habitat, or vegetation coverage. This policy goal could also lead the agency to prioritize cumulative impacts on those resources and functions when those impacts are scoped during the environmental review process.

2. Link Regional Planning and Project-Level Impact Assessment by Using a Tiered Approach

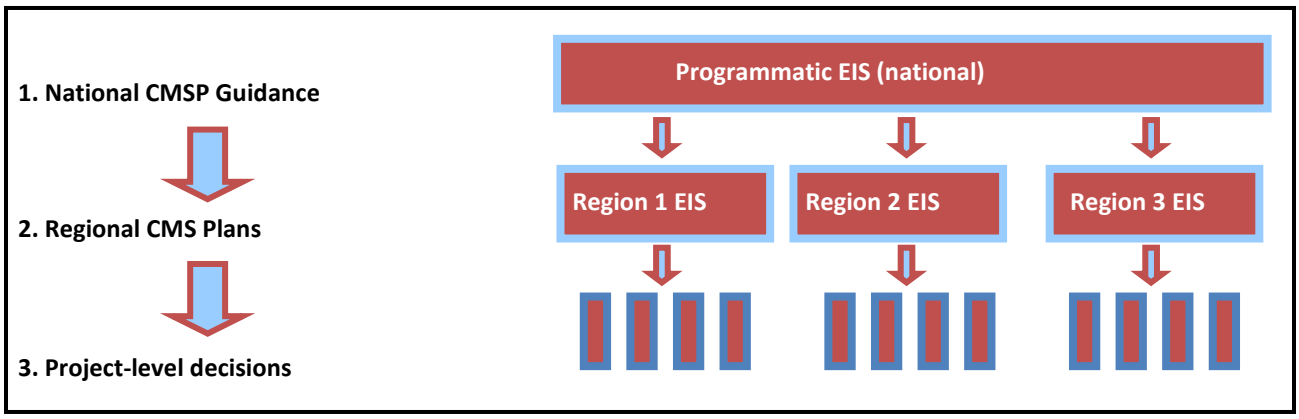
Regional planning could link more directly with the environmental impact assessment process through development of a programmatic environmental impact assessment that would serve as the basis for project-level assessment. This process, known as tiering, can enable a more comprehensive

[157] WASH. ADMIN. CODE § 173-26-201(2).
[158] Office of the Governors of Washington, Oregon & California, *supra*, note 6 at 60-61.
[159] *Id*. at 44.
[160] *Id*. at 49.

environmental impact assessment system, and could streamline management. In tiering, an agency prepares a programmatic environmental impact assessment for a broad program or plan. When project-level assessments are required, the agency prepares project-level impact assessment that builds off of the programmatic assessment, covering project-specific environmental matters not addressed in the broader plan.

Specifically, tiering could provide a mechanism to link coastal and marine spatial plans with project-level implementation. For marine planning, the tiering process could include the following steps: (1) developing an EIS for the national marine planning program; (2) developing an EIS for each regional plan; and (3) developing an EIS for individual projects or actions, as necessary. Figure 3 provides a schematic showing how environmental impact assessment could be integrated with the marine planning process.

Figure 3. Conceptual Diagram Integrating NEPA and coastal and marine spatial planning (CMSP)



With a tiered approach, a national-level impact assessment could evaluate area-wide or program-wide cumulative impacts for the marine planning program as a whole, and mitigation measures that could effectively constrain them. This in turn could guide the scoping of regional marine plans, which would evaluate environmental impacts and mitigation relevant to the narrower geographic scale. A more limited review could then occur for project or action-level environmental impact assessments, providing a potential savings of time and cost to project proponents and agencies.

Not only is the tiered approach potentially beneficial, it could be required with the development of the marine planning process called for by President Obama in E.O. 13547. If a regional coastal and marine spatial plan constitutes a major federal action that significantly affects "the quality of the human environment," NEPA requires the development of an environmental impact statement for it.[161] Although evaluating these legal issues is beyond the scope of this report, the Interagency Ocean Policy Task Force's Final Recommendations indicate that regional planning bodies will be preparing an environmental impact assessment for the regional marine spatial plans they develop.[162]

[161] 42 U.S.C. § 4332(2)(C).
[162] Interagency Ocean Policy Task Force, *supra*, note 8 at 57-58.

Box 9. Washington GMA and SEPA—A Model Approach to Integrating Planning-Level and Project-Level Environmental Impact Assessment

The interaction between the Washington Growth Management Act and the State Environmental Policy Act provides a useful model for how comprehensive marine planning might link to two levels of the environmental impact assessment process.

Recognizing the difficulty of addressing cumulative impacts on a project-by-project basis, SEPA promotes the integration of SEPA documents with those of the state's Growth Management Act.[163] Under the GMA, local governments adopt comprehensive land-use plans, policies, and regulations to manage land use, resources, and growth within their jurisdictions. An environmental impact assessment is then prepared for the comprehensive plan that considers the impacts of past, present, and future actions, and identifies mitigation for the entire subject area, rather than on a project-by-project basis. "This allows cumulative impacts to be identified and addressed, and provides a more consistent framework for the review, conditioning, or denial of future projects."[164]

Because an EIS is prepared for the comprehensive plan, the environmental impact assessment process for specific projects or actions is greatly simplified. Project-level assessment generally involves ascertaining whether project-specific proposals are consistent with the comprehensive plan and other legal requirements, and evaluating likely impacts of the proposal that were not addressed in the prior environmental impact assessment process. In this sense, it serves as a gap-filling device, because planning under GMA ostensibly will have already considered and mitigated many impacts, including the cumulative impacts of development.

3. Link Regional Plans with Regulation and Permitting

Regional plans may be implemented more effectively, and better address cumulative impacts, if they are integrated with project-level permitting under existing regulatory processes. Regional plans should be designed with regulation and permitting in mind so that decision-makers have the information that they need to make permitting decisions consistent with regional goals and objectives.

Compliance with regional plans should be required through legislative amendments or new legislation that explicitly requires consideration of regional management visions and plans during permitting and decision-making. The benefit of such an approach is that it makes consideration of an ocean management plan mandatory and enforceable, and provides greater certainty that planning visions and goals will not be jeopardized due to lack of implementation.

Regional plans also may be implemented through less formal mechanisms, like memoranda of understanding or letters of agreement. For example, federal and/or state government entities could agree to adhere to regional plans and goals "to the extent possible," and could memorialize that commitment in a memorandum of understanding. Existing sector-specific and environmental laws would be used as the legal and regulatory basis for implementation. The benefit of such an approach is

[163] *Id.* § 197-11-235.
[164] Washington State Department of Ecology, *State Environmental Policy Act Handbook*, PUB. NO. 98-114 at 75 (Sept. 1998), updated in 2003.

that it avoids the time, resources, and political support that new legislation or legislative amendments require. Potential drawbacks to this approach include issues with compliance and enforcement, and challenges in achieving uniform implementation of plans and goals among numerous agencies and jurisdictions.

Box 10. Lessons from Massachusetts – Integrating the Massachusetts Ocean Management Plan and Environmental Review Under MEPA

The Massachusetts Oceans Act, enacted in May 2008, is the nation's first comprehensive ocean planning law.[165] The Oceans Act directs the state's Secretary of Energy and Environmental Affairs to develop an Ocean Management Plan to promote proper stewardship of Massachusetts state waters. The Plan identifies and establishes goals, siting priorities, and performance standards for development within state marine waters. The Plan is explicitly linked to the regulatory framework, since under the Oceans Act: "all certificates, licenses, permits and approvals for any proposed structures, uses or activities in areas subject to the ocean management plan shall be consistent, to the maximum extent practicable, with the plan."[166]

The Ocean Plan establishes three categories of management areas within marine waters subject to Massachusetts' jurisdiction: 1) Prohibited Area, 2) Renewable Energy Area, and 3) Multi-Use Area.[167] In the Prohibited Area, certain uses, activities, and facilities simply are banned.[168] In the Renewable Energy Area, commercial- and community-scale offshore wind development is allowed and encouraged, as are other renewable energy facilities. Further, the Plan designates two areas that are "presumptively suitable" for commercial-scale wind energy development, based on environmental screening.[169] In the Multi-Use Area, all uses, activities, and facilities are allowed. Instead of using spatial designations, the Plan establishes siting and performance standards to determine whether uses are allowed in specific locations.[170]

Managers and practitioners need to consider the Plan in developing an Environmental Impact Report under MEPA for uses and activities that have potentially significant impacts. During MEPA review, for projects represented on ocean use maps contained in the Plan, the Secretary must presume that areas outside "special, sensitive, or unique" (SSU) locations constitute a less environmentally damaging practicable alternative than development within the SSU area. Accordingly, a project proponent must select a location outside the SSU areas for siting and development, or may rebut the presumption by demonstrating that no less damaging practicable alternative exists, that the project will not significantly alter the resource, or that SSU area maps in the Plan are not accurate.

The practical effect of the siting standard is that it "modifies the MEPA standard of 'avoid, minimize, or mitigate damage to the environment to the maximum extent practicable'" with a rebuttable

[165] The Oceans Act of 2008, Ch. 114 of the Acts of 2008.
[166] *Id*. at section 2.
[167] Commonwealth of Massachusetts, *Massachusetts Ocean Management Plan*, volume 1, Dec. 2009, 2-1.
[168] *Id*.
[169] *Id*. at, 2-1 to 2-3.
[170] *Id*. at 2-3 to 2-9.

presumption that less damaging practicable alternatives to locating a project within a SSU area do exist.[171] Further, even if no less damaging practicable alternative exists, a project proponent still must "demonstrate that the public benefits associated with the proposed project clearly outweigh the public detriments to SSU resources."[172] Following MEPA review, and during permitting, a project proponent also would need to demonstrate that they have "taken all practicable steps to avoid damage to the SSU resource interests and values [through the project's construction and operation design] and that there would be no significant alteration of the SSU resource values or interests."[173]

Box 11. Oregon Territorial Sea Plan—Linking Planning for Renewable Energy Development with On-the-Ground Actions

In 1994, Oregon developed a Territorial Sea Plan to manage resources and human uses in the state's ocean and near-shore environments. Oregon amended the Plan in 2009 to include a law and policy framework for renewable energy development and other uses in the Oregon territorial sea.

Part Five of the Territorial Sea Plan establishes a process and requirements for state and federal decisions related to ocean energy facility siting in Oregon's territorial sea. The purpose of Part Five is to "protect areas important to renewable marine resources (i.e. living marine organisms), ecosystem integrity, marine habitat and areas important to fisheries from the potential adverse effects of renewable energy facility siting, development, operation, and decommissioning and to identify the appropriate locations for that development which minimize the potential adverse impacts to existing ocean resource users and coastal communities."[174]

The Plan addresses potential impacts from renewable energy development in two ways: (1) it identifies areas as appropriate for renewable energy development within the territorial sea; and (2) it establishes mandatory mitigation policies and requirements that federal and state agencies must follow in their decision-making. Specifically, the Territorial Sea Plan designates areas as suitable for renewable energy development based upon a comprehensive assessment of resources and ocean uses in the management area. In addition, facilities proposed for development within these designated areas must be located so as to avoid, minimize, or mitigate adverse impacts from facility development.[175] In making decisions related to facility siting, development, operation, and decommissioning, federal and state agencies must require that such actions avoid, minimize, and rectify or mitigate impacts, and restore areas following facility decommissioning and removal, within the territorial sea.[176]

[171] *Id*. at 2-8.
[172] *Id*. at 2-6 and 2-7.
[173] *Id*. at 2-7.
[174] Oregon Territorial Sea Plan, Part 5, *Use of the Territorial Sea for the Development of Renewable Energy Facilities or Other Related Structures, Equipment or Facilities* at 1 (2009).
[175] *Id*. at 3.
[176] *Id*. at 2.

D. Linking Regional Ecosystem Monitoring and Environmental Impact Assessment

Consistent monitoring is vital to an adaptive ocean governance system, because the information is necessary to identify cumulative impacts as they occur and how the plan or implementation strategy needs to change as a result. For maximum effectiveness, monitoring should occur at both the regional and project levels, and should involve gathering information to: (1) evaluate the condition and state of the environment; and (2) track performance of a regional plan or the success of project-specific implementation. Further, monitoring at both levels should be coordinated so the information gathered at each level supplements that provided by the other.

A regional environmental monitoring program, ideally for the entire California Current LME, could identify large-scale changes and thus is best suited to revealing cumulative impacts. It could evaluate ecosystem health using indicators and benchmarks to evaluate change from established baselines. This information can benefit regional plans, but also can benefit project-specific impact predictions, mitigation and adaptive strategies, monitoring priorities, and project evaluations. Similarly, project-specific environmental assessments and accompanying monitoring data can supplement regional information with focused detail about the ecology of specific areas and sources of stress.

In addition to monitoring the state of the environment, monitoring should track implementation. Regional monitoring programs can create accountability for meeting regional plan goals and objectives. At the project level, implementation monitoring can ensure that specific actions and mitigation are carried out as intended. Understanding how implementation has occurred in practice is important when determining the causes of environmental outcomes. Ecological degradation may be caused by poor implementation rather than a failure of the plan, in which case the implementation must be fixed. Similarly, success may have resulted from intentionally or unintentionally deviating from the plan, which is important to know if the strategy can be replicated elsewhere. If cumulative impacts that occurred during the implementation phase exceed acceptable levels, managers may consider adapting plans or implementation strategies to achieve a desired ecosystem state.

Box 12. Florida Keys National Marine Sanctuary—Ecosystem Monitoring Integration Program

A useful example of a regional monitoring program is the Florida Keys Ecosystem Monitoring Integration Project. NOAA and the Florida Fish and Wildlife Conservation Commission's Florida Marine Research Institute are jointly implementing this Project in South Florida, Florida Bay, and the Florida Keys.[177] The Project fulfills NOAA's responsibility under the Florida Keys National Marine Sanctuary and Protection Act[178] to "establish a long-term ecological monitoring program and database, including methods to disseminate information on the management of the coral reef ecosystem[]" within the Florida Keys National Marine Sanctuary (FKNMS).

Impacts within the FKNMS have resulted in the degradation of marine living resources, including coral reefs. Yet, impacts to resources are not well quantified or understood. A goal of the ecosystem

[177] *See* Florida Keys National Marine Sanctuary, *Research and Monitoring*, *available at* http://floridakeys.noaa.gov/research_monitoring.
[178] Pub. L. 101-605, Sec. 7(a)(5) (H.R. 5909) (The Florida Keys National Marine Sanctuary and Protection Act).

monitoring, therefore, is to develop a baseline of data and information on resources and ecosystem components in the area so that effective management strategies may be implemented. Outputs of the Project are expected to include a coordinated monitoring framework to measure ecosystem change in the South Florida coastal ecosystem, and a baseline evaluation of resources and ecosystem components. These may be used to identify and address information gaps to improve ecosystem understanding. Baseline information and long-term monitoring results also will help measure and evaluate progress toward achieving management goals and objectives. This information could be used to make necessary adjustments in management strategies within the sanctuary.

E. Linking Regional Evaluation and Adaptation with Environmental Impact Assessment

A regional ocean governance system should include an element of adaptive management so that management goals, plans, and strategies can appropriately respond to changing conditions, new information, and unanticipated results. Regional planners can integrate new or changing scientific information into regional plans as new information becomes available, including information concerning ecosystem trends, linkages, status, or condition. This information can provide an "early warning" of cumulative impacts, and highlight the need for improved management strategies. Adaptive strategies could include revised regional goals and objectives, or a need to prohibit or limit certain types of development in areas containing rare or sensitive habitat to protect key species.

Adaptation of regional plans can also lead to amended processes, priorities, and predictions at the project level. Managers should consider new regional scientific information and understanding in developing baseline assessments for evaluating cumulative impacts at the project or action level. For example, regional plans may be updated to identify new areas that are particularly susceptible to human impact, and this information could be considered in evaluating the significance of impacts during focused environmental impact assessment processes. Further, amendments to a regional plan could help managers identify and prioritize the mitigation needed for specific projects or actions.

Box 13. ReCAP – Assessing Cumulative Impacts at a Regional Scale along California's Coast

In the early 1990s, two factors combined to spur the California Coastal Commission's creation of the Regional Cumulative Assessment Project (ReCAP). First, the Commission was looking to decrease the resources required to conduct periodic reviews of Local Coastal Programs (LCPs).[179] Second, the 1990 amendments to the federal Coastal Zone Management Act made cumulative impacts a priority, and two years later, the Commission received a CZMA Section 309 enhancement grant. The result was a multi-year strategy to improve management of, among other things, cumulative and secondary impacts in the state's coastal zone. ReCAP, an effort to evaluate the regional implementation of the state's Coastal Management Program and LCP effectiveness in addressing cumulative impacts, was the central component of the strategy.

[179] Under the California Coastal Act, every certified LCP must be reviewed "from time to time" (but at least every five years) to determine whether the local government is effectively implementing it and whether the plan conforms to overarching Coastal Act policies. CAL. PUB. RES. DIV. 20 § 30519.5.

ReCAP focused on assessing the cumulative impacts of development on key coastal resources, identifying the major contributing factors, reviewing the implementation of key LCP and Coastal Act policies, and making recommendations on how to address them. To do this, the Commission had to develop performance measures and criteria, which resulted in production of a guidance manual for conducting periodic reviews.[180] The agency first developed a matrix of questions to assess physical impacts to coastal resources and what caused them, prioritizing the questions and identifying appropriate assessment methods. For each issue identified, the Commission determined whether policies existed to address it, whether those policies and implementation standards were adequate, and how the policies had been applied. The outputs were a range of recommendations to address each problem identified, with various implementation strategies incorporated into one-year work plans.

Two regional assessments were completed, a pilot project in the Monterey Bay region and a second project covering the area between the Santa Monica Mountains and Malibu. The Commission encountered several obstacles. Its data was limited to a single source, the potentially biased information contained in Commission-authorized permits. The data was also stored in hard-copy files that took time to convert to a more easily accessible electronic format. Finally, it proved time-intensive to track the recommendations that ultimately were adopted into LCPs. Nonetheless, the preliminary projects yielded both LCP-specific and programmatic benefits, such as identifying expiring offers-to-dedicate, motivating the agency to focus more resources on the impacts of shoreline protection, improving the Commission's information management processes, and initiating a public access database. But due to the resource-intensive nature of these efforts, the Commission ultimately reverted to the individual LCP review model.[181]

F. Additional Challenge: Funding

Effectively managing cumulative impacts at the regional and project-specific levels depends on adequate funding. For regional ocean management, sufficient funds are necessary to collect, analyze, and synthesize the data and information required to produce a sound scientific context for EBM. Funds are also needed for consistent monitoring, and to update and expand data inventories and assessments as new information becomes available. Further, if knowledge gained during the assessment process is to be used during project-level assessments, funds are needed to manage information so that it is accessible to industry, managers, practitioners, and the public. At the project level, appropriate funding is required to prepare baseline evaluations and to conduct required mitigation, monitoring, and adaptive management activities over the short and long term.

Financing for regional or project-level management may involve a range of sources, from governmental appropriation to private support. Alternative financing mechanisms that link regional management with ocean use and activity can also be explored (see, e.g., Box 14, 15, 16). In light of significant state and federal budget constraints, financial considerations will play an important role in the success of West

[180] CALIFORNIA COASTAL COMMISSION, PROCEDURAL GUIDANCE MANUAL: CONDUCTING REGIONAL PERIODIC REVIEWS (1997).
[181] Discussion with California Coastal Commission staff (Jan. 7, 2009) (notes on file with author).

Coast ocean management. If appropriate funding is not available, monitoring, evaluation, and adaptive management programs may not achieve their potential (see, e.g., Box 12 ReCAP Program).

Box 14. Department of the Army Regulations—Require Project Proponents to Demonstrate Availability of Funds for Mitigation, Monitoring, and Adaptation

The Department of the Army regulations implementing NEPA require project proponents to demonstrate the availability of sufficient funds to carry out required mitigation and monitoring. These regulations provide that mitigation measures selected for implementation and identified in a FONSI or a ROD "shall become a line item in the proponent's budget or other funding document, if appropriate, or included in the legal document implementing the action (for example, contracts, leases, or grants)."[182] Further, "Any mitigation measures selected by the proponent will be clearly outlined in the NEPA decision document, will be budgeted and funded (or funding arranged) by the proponent, and will be identified, with the appropriate fund code, in the EPR (AR 2001)."[183] If required mitigation is not appropriately funded and implemented, adverse environmental effects could reasonably be expected to result, and could negatively affect the performance of regional ocean management plans and strategies.

Box 15. User Fee System Established Under Massachusetts Oceans Act

The Massachusetts Oceans Act of 2008 (Act) establishes a "user pays" financing mechanism to ensure long-term, reliable funding for marine spatial planning activities. The Act establishes authority for marine spatial planning in waters within Massachusetts' jurisdiction. It also creates an Ocean Resources and Waterways Trust Fund that will include funds from: (1) appropriations and funds authorized by the general court and designated to be credited to the trust fund; (2) appropriations or grants made to the fund; and (3) ocean development mitigation fees collected under section 18 of chapter 132A of the General Laws of 2006, as amended. The user fee system provides a clear link between regional management and environmental permitting, where resource users help finance regional ocean conservation, restoration, and management.

The mitigation fee system requires any entity or individual receiving a permit or license for conducting ocean uses and activities to pay an ocean development mitigation fee in accordance with the Oceans Act. The legislation excludes from the mitigation fee requirement permits or licenses issued for commercial and recreational fishing.

The trust fund directs money credited to the account toward various activities, including regional management activities and project-specific impact mitigation. According to the statute:

> The priority for use of funds derived from compensation or mitigation for ocean development projects shall be to restore or enhance marine habitat and resources impacted by the project for which the compensation or mitigation shall have been received. The funds derived from compensation or mitigation related to public

[182] 32 C.F.R. § 651.15(b).
[183] *Id*.

navigational impacts shall be dedicated to public navigational improvements; provided, however, that any funds for the enhancement of fisheries resources shall be directed to conduct fisheries restoration and management programs.[184]

Other amounts credited to the fund will be used by Massachusetts as revenue for "environmental enhancement, restoration and management of ocean resources,"[185] including marine spatial planning activities and baseline assessment development.[186] Any money remaining in the fund at the end of the year are to be made available in the subsequent fiscal year.[187]
The user pays system is designed to provide a long-term and reliable source of funding for marine spatial planning in Massachusetts waters.

Box 16. Federal, Private, and Non-State Funds to Implement Marine Spatial Planning in Washington

In anticipation of the federal directive for marine spatial planning in the California Current LME, Washington State enacted a 2010 marine spatial planning law that provides authority for marine spatial planning and management in Washington ocean waters, as well as the Puget Sound and Columbia River estuaries.[188] The law specifically: (1) provides certain state agencies with authority to integrate marine spatial planning elements into existing plans and ongoing planning; and (2) creates a marine interagency team and provides the team with authority to develop a comprehensive marine spatial plan for state waters.[189] The law stipulates that an ecosystem assessment must be included in the marine management plan that is developed.

The legislation anticipates that federal resources and support will be available to participate in the marine spatial planning framework as described in the national Task Force recommendations.[190] As such, it prohibits the interagency team from conducting marine management planning or developing the ecosystem assessment until "federal, private, or other nonstate funding" is secured for these activities, in addition to any matching state funds that are required.[191] State agencies are also prohibited from integrating marine spatial planning elements into existing plans and ongoing planning until federal, private or other non-state funding is secured.[192]

The law identifies multiple non-state revenue sources that may be used for marine spatial planning, and creates a marine resources stewardship trust account that will include funds from: (1) investment income derived from trust fund monies; (2) grants, gifts, or donations to the state designated for marine management activities; and (3) appropriations made to the account.[193] Trust account monies "may only

[184] MASS. GEN. LAW ch 10 § 35HH (2008).
[185] MASS. GEN. LAW ch 10 § 35HH (2008).
[186] MASS. GEN. LAW ch 21A § 4C (2008).
[187] MASS. GEN. LAW ch 10 § 35HH (2008).
[188] S.S.B. 6350, State of Washington, 61st Legislature, 2010 Regular Session (2010) (Marine Waters Planning and Management Act).
[189] *Id*. at 5 & 6.
[190] *Id*. at Sec. 1(g).
[191] *Id*. at Sec. 3(2).
[192] *Id*. at Sec. 6(4).
[193] S.S.B. 6350, State of Washington, 61st Legislature, 2010 Regular Session, Sec. 10 (2010).

be used for the purposes of marine management planning, marine spatial planning, research, monitoring, implementation of the marine management plan, and for the restoration or enhancement of marine habitat or resources."[194]

[194] *Id*. at Sec. 10.

V. MINIMIZING CUMULATIVE IMPACTS – STRENGTHENING ENVIRONMENTAL IMPACT ASSESSMENTS USING EXISTING TOOLS AND APPROACHES

A. Overview

Cumulative impacts will be best addressed though an ocean governance system that includes a strong regional planning and management component, as well as robust methods for considering and managing cumulative impacts during environmental permitting and project-level decision-making. Regional ocean management and project-specific decision-making should be appropriately integrated, aligned, and coordinated to manage cumulative impacts and ensure the long-term sustainability of West Coast ocean and coastal ecosystems.

The National Environmental Policy Act, Washington State Environmental Policy Act, and California Environmental Quality Act are national and West Coast environmental impact assessment laws that could be integrated with regional ocean governance to better address cumulative impacts. Each of these laws requires agencies to consider the cumulative impacts of proposed projects in combination with past, present, and reasonably foreseeable future projects or actions within a defined geographic area. Although agencies are not required to minimize cumulative impacts under these laws, agencies can strengthen the tools and approaches they use to evaluate cumulative impacts, and can use regional planning as a platform for their decisions and actions.

As currently practiced, assessing cumulative impacts during environmental impact assessment has proven challenging. Challenges stem, in part, from the inherent uncertainty in making before-the-fact predictions regarding the likely direct, indirect, and cumulative effects of proposed projects or actions on resources and ecosystems, not to mention synergistic or additive effects. In addition, information gaps, insufficient scientific data and agency guidance, and technological limitations hinder one's ability to make robust cumulative impact predictions.

This chapter discusses tools and approaches for strengthening cumulative impact predictions, mitigation, and monitoring, and recommends using adaptive management for most major actions. It specifically adopts the five-step "Predict, Mitigate, Monitor, Evaluate, Adapt" model for environmental impact assessment, as advanced by the CEQ's NEPA Task Force.[195]

[195] NEPA Task Force, Report to the Council on Environmental Quality: *Modernizing NEPA Implementation*, 44-56 (2003).

B. Improving Predictions

Adequately predicting the cumulative impacts of proposed projects or actions requires a substantial amount of information concerning the characteristics of the environment; past, present, and foreseeable future uses; and the collective effect of impacts from a range of projects and actions. Scientific understanding of ecosystem processes and the impacts of human activities on those systems is, and may always be, imperfect; but managers and practitioners should ensure that the best available information is used for decision-making through a range of collaborative, science-driven, and ecosystem- and plan-based approaches. Precautionary and adaptive measures also should be used to account for scientific uncertainty in predicting cumulative impacts.

1. Adequately Scope Cumulative Impact Issues

The quality of cumulative impact analysis depends upon effective scoping. CEQ regulations define scoping as "an early and open process for determining the scope of issues to be addressed and for identifying the significant issues related to a proposed action."[196] Scoping has similar meaning under CEQA and SEPA.[197] During scoping, managers and practitioners collect information to determine the current state of the ecosystem and predict the consequences of an added stressor on that ecosystem. Scoping helps managers improve the efficiency of environmental impact assessment by prioritizing key issues and eliminating insignificant issues from further consideration.[198]

In order to adequately scope cumulative impacts, managers should consider:

(1) Whether the resource [or ecosystem] is especially vulnerable to incremental effects;
(2) Whether the proposed action is one of several similar actions in the same geographic area;
(3) Whether other activities in the area have similar effects on the resource [or ecosystem];
(4) Whether these effects have been historically significant for this resource [or ecosystem]; and
(5) Whether other assessments in the area have identified a cumulative effects concern.[199]

The Council on Environmental Quality discusses these considerations, as well as the steps and principles for effective scoping, in *Considering Cumulative Effects Under the National Environmental Policy Act*.[200] The scope of cumulative impact analyses also should be broad enough to consider cumulative effects that may undermine the ability of ecosystems to accommodate additional change while maintaining the

[196] 40 C.F.R. § 1501.7. Agencies may conduct scoping through a variety of mechanisms, including planning meetings, public hearings, requests for public comment, discussion papers, and other mechanisms. *See, e.g.*, NOAA Admin. Order 216-6 § 4.01w (1999).
[197] WASH. ADMIN. CODE 197-11-793 ("[S]coping means determining the range of proposed actions, alternatives, and impacts to be discussed in an EIS…Scoping is used to encourage cooperation and early resolution of potential conflicts, to improve decisions, and to reduce paperwork and delay."); CAL. CODE REGS. tit. 14, § 15083 (CEQA does not explicitly define scoping, but states that early consultation with stakeholders may be called scoping).
[198] 40 C.F.R. § 1501.7; CAL. CODE REGS. tit. 14, § 15083; WASH. ADMIN. CODE 197-11-793.
[199] Environmental Protection Agency Handbook, *Consideration of Cumulative Impacts in EPA Review of NEPA Documents*, EPA 315-R-99-002 at 5 (May 1999) [hereinafter "EPA Handbook"]; *see also* CEQ Handbook, *supra*, note 95 at 13 (Table 2-1); Larry W. Canter, *Addressing Cumulative Effects within Impact Study Documents*, presented at the 20th Annual Meeting of the International Association for Impact Assessment, Hong Kong, June 19-23 at 4 (2000).
[200] CEQ Handbook, *supra*, note 106 at 11-21.

full suite of ecosystem services (see below). Regional ocean governance entities, management plans, and ecosystem assessments should inform the scope and issues addressed in project-level assessments.

From a practical perspective, agencies cannot exhaustively scope environmental impact assessments in all instances. Instead, the rigor of the scoping process may appropriately reflect the nature, scale, and anticipated effects of a proposed action. Actions with potentially serious, widespread, or long-lasting effects on ecosystems, resources, and human communities should, and typically do, receive closer scrutiny than actions that are expected to leave a relatively small footprint. Rigorous scoping also may be particularly desirable where a proposed action's cumulative impacts are unknown or difficult to determine.

For example, it may be appropriate to more rigorously scope an environmental impact assessment for an emerging ocean use, such as renewable energy development, than an action with anticipated impacts that are relatively well-known and well-defined. Managers should, however, consider in all cases whether cumulative impacts are likely to be an issue, and should document the rationale behind any decision to conduct a particularly limited – or more robust – analysis.

2. Consider Cumulative Impacts through Ecosystem Services Lens

Managers and practitioners should consider potential cumulative impacts through an ecosystem services lens and evaluate the ability of ecosystems to accommodate additional change in light of that information. Ocean and coastal ecosystem services include a range of cultural, regulating, provisioning, and supporting services that benefit human communities (*see* Table 3).[201] For example, "[e]cosystems such as mangroves, seagrasses, and mudflats provide key regulating services through *shoreline stabilization*, *protection from floods and soil erosion*, *processing pollutants*, and *stabilizing land* in the face of changing sea levels by trapping sediments and buffering land from storms."[202] Other ocean and coastal ecosystems, including beaches, kelp beds, and rocky reefs, also provide a range of benefits such as tourism support, recreation, research and education.

[201] *See* United Nations Environment Programme (UNEP), MARINE AND COASTAL ECOSYSTEMS AND HUMAN WELL-BEING, A SYNTHESIS REPORT BASED ON THE FINDINGS OF THE MILLENIUM ECOSYSTEM ASSESSMENT at 10 (2005), *available at* http://www.millenniumassessment.org/en/Article.aspx?id=76.
[202] UNEP, *supra,* note 201 at 10.

By assessing the impact of a proposed action on the full array of ecosystem services, functions, and values, "cumulative impacts could be more fully assessed."[203] Thus, rather than describing impacts to salt marshes simply in terms of acreage lost or impacts to specific marsh species, an environmental impact assessment document could take a broad view of the salt marsh ecosystem and describe the impact to habitat values and function, such as its storm buffering capacity, ability to improve water quality, and value in food web cycles and as nursery habitat. With ecosystem services view of cumulative impacts, managers and practitioners also will be better positioned to design effective mitigation and adaptive strategies.

In light of current and emerging efforts to identify, map, and value important ecosystem services on the West Coast, managers and practitioners have substantial opportunities to consider and integrate ecosystem service information into decision-making.[204] Important resources include:

- **Natural Capital Project**—tools to map, model, and value ecosystem services; science-policy interface tools;
- **InVEST 2.0**—models and software tools developed by the Natural Capital Project for measuring ecosystem services;[205]
- **National Ocean Economic Study**—non-market value estimates and valuation studies;[206]
- **EBM Tools Network**—hyperlinks to ecosystem service tools and approaches, case studies, and readings;
- **The Communication Partnership for Science and the Sea (COMPASS)**—hyperlinks to new tools and a framework for describing and measuring ecosystem services.[207]

Further, under the Interagency Ocean Policy Task Force recommendations, regional planning bodies are to assess, analyze, and value "[i]mportant ecosystem services in the planning area and their vulnerability or resilience to the effects of human uses, natural hazards, and global climate change" as they develop ecosystem assessments for marine plans.[208] Information on key ecosystem services and values developed for marine plans applicable to the CCLME could help to identify and evaluate services potentially impacted by proposed projects or actions.

Box 17. Mapping Ecosystem Services in Puget Sound

Puget Sound provides provisioning services, including food from salmon and crab, and regulating services, such as flood and storm protection and shoreline stabilization. It also provides other key services, such as water for drinking, transportation, and hydroelectric power generation, as well as cultural and ethical values.[209] These and other ecosystem goods and services in Puget Sound are

[203] EPA Handbook, *supra*, note 199 at 6.
[204] *See e.g.,*Natural Capital Project, *About the Natural Capital Project*, *available at* http://www.naturalcapitalproject.org/about.html; the Communication Partnership for Science and the Sea, *Ecosystem Services*, *available at* http://www.compassonline.org/science/ecoservices.
[205] http://inves.ecoinformatics.org.
[206] http://www.oceaneconomics.org/.
[207] http://www.compassonline.org/science/ecoservices.
[208] Interagency Ocean Policy Task Force, *supra*, note 8 at 57 & 66.
[209] Puget Sound Partnership, *Ecosystem Services*, *available at* http://www.psp.wa.gov/aa_ecosystem.php.

summarized in a World Resources Institute (WRI) report, *Identifying Important Ecosystem Goods & Services in Puget Sound*.[210]

Recognizing the importance of these and other ecosystem services to Sound communities, the Puget Sound Partnership, together with The Nature Conservancy, NOAA Fisheries' Northwest Fisheries Science Center, and WRI, are mapping, modeling, and valuing ecosystem services throughout Puget Sound.[211] The project is expected to help focus regional goals and objectives, and target priority efforts for Sound management. For example, a solid understanding of important ecosystem goods and services could help the Partnership refine ecosystem goals and indicators, as well as its overall vision of a "healthy" Puget Sound.[212] In addition, once completed, spatial information concerning the distribution, quantity, and value of ecosystem services, maps and other resources developed for the project could inform project-specific cumulative impact assessments in the region.

3. Provide Meaningful Analysis of Past Projects and Actions

ELI's interviews with environmental practitioners highlighted a need to improve the way past projects and actions are considered in cumulative impacts analysis, thus ensuring environmental impacts do not continue to accumulate. As explained in an EPA Handbook:

> Knowing whether the resource is healthy, declining, near collapse, or completely devastated is necessary for determining the significance of any added impacts due to the proposed project. The NEPA document should consider how past activities have historically affected and will continue to detrimentally affect the resources of concern. How far back in time to consider depends on how long the resources have been affected. Trends analysis, or how the resource condition has changed over time, is the most useful tool for looking at the accumulated effect of past actions.[213]

In practice, however, while past actions typically are discussed in environmental impact assessment documents, this discussion "is seldom used to fully assess how the system has changed from previous conditions."[214]

Cumulative impact analyses could be strengthened by fully and analytically considering the effect of past actions.[215] NEPA, SEPA, and CEQA require managers and practitioners to consider the incremental effect of a proposed project or action in light of other past (and present and future) actions in a given area within an environmental impact assessment. To evaluate past actions, practitioners may use a "list approach," where the impacts of discrete past actions are evaluated individually in assessing cumulative effects. Alternatively, NEPA case law suggests that managers may aggregate the effect of past actions,

[210] World Resources Institute, *Identifying Important Goods & Services in Puget Sound* (Sept. 2008), *available at* http://www.psp.wa.gov/aa_ecosystem.php (under link for "Ecosystem Services Analysis – Report").
[211] Puget Sound Partnership, *supra*, note 209.
[212] World Resources Institute, *supra*, note 210.
[213] EPA Handbook, *supra*, note 199 at 12. Although EPA developed these statements with respect to NEPA assessments, they are also applicable to CEQA and SEPA.
[214] *Id*.
[215] *See id*.

which avoids the need to consider effects of discrete events.[216] Where the aggregate approach is used, however, practitioners still must supply meaningful information about past actions in environmental impact analysis documents, and managers must consider that information in decision-making.[217]

Existing and emerging tools can assist practitioners in evaluating and assessing the impact of past actions in cumulative impact assessments. The CEQ Handbook identifies useful tools and approaches, including trends analysis, overlay mapping and GIS.[218] In addition, efforts to map cumulative impacts in the California Current LME, led by Benjamin Halpern (2009), could provide managers with an understanding of whether a cumulative impact problem already exists or not.[219]

Over the long term, the marine planning process also should provide a record of past uses and activities and associated impacts in a geographic region. Further, new approaches, such as the development of a GIS-based database of permitting records, could facilitate evaluation of the impact of a proposed action in light of the impact of past actions in West Coast waters. These technological options are discussed further in Chapter VI.

Box 18. Analytically Considering the Impacts of Past Actions in Evaluating Cumulative Impacts: The Columbia River Channel Improvement Project

The Final Supplemental Environmental Impact Statement[220] (Final SEIS) for the Columbia River Channel Improvement Project illustrates a recent effort to analytically evaluate cumulative impacts in a setting affected by over 100 years of industrialized activity. The Final SEIS provides a relatively comprehensive picture of historic activities and their resource and ecosystem impacts. It also identifies mitigation, monitoring, and adaptive management processes necessary to minimize the potential for significant cumulative effects.

The Project involved dredging and deepening about 100 miles of the Columbia River in order to improve shipping navigation and port access, disposing of dredged material at offshore sites.[221] The U.S. Army Corps of Engineers' Final SEIS discusses the impacts of the proposed action and alternatives to deep-draft navigation and disposal actions, and includes a detailed account of the history of channel development over 100 years of industrialization.

[216] *See League of Wilderness Defenders – Blue Mountains Biodiversity Project v. U.S. Forest Serv.*, 549 F.3d 1211, 1217-18 (9th Cir. 2008); *accord Ecology Ctr. v. Castaneda*, 574 F.3d 652, 666 (9th Cir. 2009) (permitting consideration of past actions in the aggregate under NEPA).
[217] *See id*.
[218] CEQ Handbook, *supra*, note 106 at Chapter 5.
[219] Benjamin S. Halpern et al., *supra*, note 7.
[220] U.S. Army Corps of Engineers, *Columbia River Channel Improvement Project Final Supplemental Integrated Feasibility Report and Environmental Impact Statement* (Jan. 2003) *available at* http://www.nwp.usace.army.mil/issues/crcip/docs/final/vol1/vol1.pdf; the Final Integrated Feasibility Report and Environmental Statement is available by request from the U.S. Army Corps of Engineers. These documents are collectively referred to as the "Final SEIS".
[221] U.S. Army Corps of Engineers, *Columbia River Channel Improvement Project Final Integrated Feasibility Report and Environmental Impact Statement* (August 1999); *see also* Background on Columbia River Channel Improvement Reconsultation Project, SEI website, *available at* http://www.sei.org/columbia/background_project.html (accessed Jan. 14, 2009).

The Final SEIS departs from many environmental impact assessment documents that discuss but do not consider past impacts analytically in the cumulative impact analysis. According to the Final SEIS: "The project's absence of significant impacts, and the benefits provided by the ecosystem restoration features, provides the starting point; the question is whether that conclusion must be altered at all when the project's impacts are added to the impacts of the other actions."[222]

The Final SEIS concludes that historic activities have resulted in significant deterioration and impacts on most of the resources considered; however, unlike past impacts, present and reasonably foreseeable future actions are unlikely to continue the trajectory toward degradation. This outcome is predicted because the present stringent regulatory environment forces current projects to avoid, minimize, and mitigate adverse effects. Further, the Final SEIS concludes that, although historic activities have resulted in adverse impacts on many resources, the project is not likely to combine with impacts of past, present, or other reasonably foreseeable projects to result in significant cumulative effects, because few significant impacts result from the project itself and in light of the project's mitigation and environmental restoration features.

4. Adequately Consider Foreseeable Future Projects and Actions

In addition to the impacts of past actions, an environmental impact assessment must consider the impact of reasonably foreseeable future projects or actions together with the impacts of a proposed project. Such an evaluation requires agencies to identify future actions and forecast the likely impacts of those actions before they occur. The identification of future actions is often limited to "probable" or "reasonably foreseeable" future projects associated with specific proposals, to avoid including "speculative" projects or actions within the analysis. Even limited in this way, it is often difficult and resource-intensive to assemble information about future impacts from dispersed sources. Project proponents may be reluctant to share information concerning likely future projects where a specific proposal has not been made, or where projects or actions may change during permitting or licensing. It also can be challenging to identify the impacts of projects that are not yet constructed or operating.

Improved approaches are needed to consistently and reliably identify reasonably foreseeable future projects within discrete geographic areas. This could include the development of a GIS-based system for tracking and analyzing permits across multiple jurisdictions and sectors. In addition, regulatory targets established during regional ocean planning could be used to project reasonably foreseeable future actions within a region.

5. Consider Ecologically Relevant Scales

Practitioners must identify appropriate spatial and temporal boundaries for analyzing the cumulative impacts of proposed projects. Existing law and agency guidance explicitly recognize that appropriate scales for cumulative impact analyses may be greater than boundaries used for other project-specific assessments.[223] This is because impacts resulting from a proposed action, in combination with other past, present, and future actions, may impose demands on marine resources, ecosystems, and human

[222] Final SEIS at 6-93 (2003).
[223] *See, e.g.,* CEQ Handbook, *supra*, note 106 at 12.

communities over broader spatial and temporal scales than the demands imposed by impacts solely attributable to the proposed project.

In evaluating cumulative impacts of ocean projects or actions, it is important to define **spatial scales** that account for the fluid, dynamic nature of the ecosystem and the inter-connections between ecosystem components. It is also important to define **temporal scales** broad enough to accommodate potentially non-linear responses of resources and ecosystems to added stressors.

In defining spatial scales, natural boundaries rather than jurisdictional, political, or project boundaries should be used to evaluate cumulative effects.[224] Spatial scales should be informed by, but not limited to, area-based designations, including those that would occur under a marine spatial plan. For example, if an activity is proposed in a marine protected area or sanctuary, it is important to consider impacts within that area in accordance with the goals and objectives of the area, but the analysis should not necessarily be limited to the designated area since significant impacts can occur beyond its boundaries.

Ocean eco-regions may be particularly relevant in analyzing cumulative effects, since ocean environments are fluid and rarely have discrete boundaries for analysis. The U.S. portion of the California Current LME consists of three eco-regions, each with distinct physical and biological attributes.[225] These three eco-regions define a "first-order" demarcation of habitat into large marine provinces for purposes of analyzing cumulative impacts on ecosystems or resources. According to U.S. GLOBEC (1992), the eco-regions are: (1) Southern British Columbia to Cape Blanco in Southern Oregon; (2) Cape Blanco to Point Conception, California; and (3) Southern California and Baja.

[224] *See, generally*, CEQ Handbook, *supra*, note 106 at Ch. 3.

[225] U.S. GLOBEC, *Global Ocean Ecosystems Dynamics and Climate Change, Eastern Boundary Current Program, Report on Climate Change and the California Current Ecosystem* 7 (1992), *available at* http://globec.oce.orst.edu/reports/ebcccs/ebcccs.contents.html; Mark D. Spalding et al., *Marine Ecoregions of the World: a bioregionalization of coast and shelf areas*, BIOSCIENCE 57(7): 573-583 (2007).

Table 4. West Coast Regions and Eco-Regions[226]	
Spatial Scale	***Location***
Marine Region	❖ California Current Large Marine Ecosystem
Eco-Region	❖ Puget Trough/Georgia Basin ❖ British Columbia (Cape Flattery) to Cape Blanco (Southern Oregon) ❖ Cape Blanco to Point Conception ❖ Point Conception to Northern Baja, Mexico
Features	❖ Columbia River Plume
West Coast NEP Estuaries	❖ Puget Sound ❖ Lower Columbia River ❖ Tillamook Bay ❖ San Francisco Estuary ❖ Morro Bay ❖ Santa Monica Bay

Eco-regional scales may be particularly useful when analyzing: (1) the cumulative effects of a proposed action on the affected ecosystem (or eco-region) itself; (2) the cumulative effects of a proposed action on affected resources or ecosystem components where regional processes are necessary to sustain those resources or processes; or (3) the effects of actions with widespread anticipated environmental effects. An extended spatial—and temporal—scope of analysis also may be necessary when the full impact of a proposed action is uncertain. Thus, a proposal for an offshore wave energy project may require a broad geographic scope in light of uncertain effects of such projects on marine ecosystems and resources.

Eco-regional scales, however, will be too broad for assessing the impacts of some actions. Managers will need to tailor the scale of analyses to the activity and the affected resource(s) and ecosystem(s). In such a case, there may need to be a two-step analysis that considers two different geographic scales. First, it may be appropriate to evaluate cumulative impacts on a local scale, focusing on features including habitat types, depth, or ocean zones. Second, managers could evaluate the state of the larger ecosystem, accounting for the sensitivity, rarity, and vulnerability of affected habitats and resources. Living resources might move from one habitat to another during different life stages, requiring an evaluation of the broader ecosystem. Also, understanding the state of regional habitats (e.g., sea grass beds) will help managers determine if additional impacts on a single habitat will result in significant impact to the ecosystem.

Box 19. Hawaii Range Complex EIS/OEIS—Establishing Broad Spatial Boundaries for Potentially Affected Resources

The U.S. Department of the Navy's 2008 Final Environmental Impact Statement/Overseas Environmental Impact Statement (EIS/OEIS) for the Hawaii Range Complex provides one example of an environmental impact assessment that uses broad eco-regional spatial scales to evaluate cumulative impacts. The EIS/OEIS evaluates the cumulative effect of mid-frequency active and high frequency active sonar use

[226] *Id.*, *see also* U.S. EPA, *National Estuary Program*, *available at* http://water.epa.gov/type/oceb/nep/index.cfm.

and related training, research, development, test and evaluation activities, exercises, and facilities on affected resources.[227]

The EIS/OEIS identifies the total geographic boundary for analysis as a sum of individual boundaries for different resources, including air quality, migratory wildlife, terrestrial resources, marine resources, and others.[228] The geographic boundary used to assess cumulative impacts on wide-ranging or migratory wildlife is the range of the affected populations, given the potential for impacts of the proposed action to combine with impacts of other actions located throughout the populations' ranges. The geographic boundary used for all other marine resources is the ocean ecosystem of the central North Pacific Ocean.[229] The EIS/OEIS then identifies and briefly describes all past, present, and planned projects in the geographic boundary with the potential to interact with the proposed project.[230] This list includes 152 projects,[231] and was followed by detailed explanations of the effects of other broad activities such as commercial fishing, anthropogenic contributors to ocean noise, and coastal development.[232] The cumulative impact analysis concludes with a section that applies the above information to each proposed project alternative, one resource at a time.[233]

6. Use a Precautionary Approach in Addressing Cumulative Impacts

The Interagency Ocean Policy Task Force's Final Recommendations explicitly call for the use of "a precautionary approach as reflected in the Rio Declaration of 1992" in ocean and coastal management and decision-making. [234] Principle 15 of the Rio Declaration states:

> [w]here there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.[235]

Managers and practitioners should use a precautionary approach in addressing cumulative impacts to account for scientific and management uncertainty. The precautionary approach will serve to prevent an ecosystem from reaching a threshold beyond which its ecosystem functioning cannot return to its previous state. In general, a heightened need for precaution arises in the context of uncertainty related to affected resources or ecosystems or the effectiveness of management approaches, degraded or data-poor environments, or where systems are experiencing a large number of disturbances. Stewardship measures are also needed when decisions affect sensitive, unique, important, or vulnerable resources with a strong influence on ecosystem functioning (*see* Table 5).

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[227] U.S. Dep't of the Navy, *Hawaii Range Complex: Final Environmental Impact Statement/Overseas Environmental Impact Statement* at 5-2 (2008).
[228] *Id*.
[229] *Id*.
[230] *Id*. at 5-3.
[231] *See id*. at 5-4 to 5-18.
[232] *Id*. at 5-18 to 5-29.
[233] *Id*. at 5-30 to 5-50.
[234] Interagency Ocean Policy Task Force, *supra*, note 9 at 16.
[235] Rio Declaration, Principle 15, *available at* http://www.unep.org/Documents.multilingual/Default.asp?DocumentID=78&ArticleID=1163; Interagency Ocean Policy Task Force, *supra*, note 8 at 16.

Table 5. Potential Precautionary Measures and Approaches	
Formulation	***Source***
Precautionary measures should be taken "when an activity raises threats of harm to human health or the environment."	Wingspread Statement on the Precautionary Principle (1998)
Levels of precaution should be proportional to the level of scientific uncertainty such that the less that is known about a system, the more precautionary management decisions should be.	U.S. Commission on Ocean Policy (2006)
"Precautionary measures should be taken to" protect krill and other species at the base of the food web	West Coast Governors Agreement (2008)
Puget Sound management should "reflect a balanced precautionary and adaptive approach." In particular, "[a]ctions and decisions about the use of resources should err on the side of caution to avoid irreversible ecological consequences."	Puget Sound Partnership Action Agenda (2008)[236]
"Increased levels of precaution are prudent as ecosystems are pushed further from pre-existing states."	COMPASS (2005)[237]
Precaution is needed to manage for general resilience if a system is impacted by a large number of disturbances, particularly if those are interacting in a synergistic or unpredictable fashion.	H. Leslie & A.P. Kinzig (2009)[238]

In the environmental impact assessment context, Tickner and Geiser (2004) suggest using the following precautionary measures to avoid unexpected or undesirable impacts:

- Prepare an EIS or EIR for a project or action that *could* result in significant impacts, even though the scale or scope of those impacts is uncertain;
- Adopt mitigation goals to achieve, on balance, greater positive than negative impacts;
- Build precaution into thresholds used in predicting cumulative impacts;
- Evaluate a worst-case scenario where scientific information related to impacts is incomplete or uncertain; and
- Consider alternatives to proposed actions as a means of implementing precaution, stimulating innovation, and reducing risk.[239]

Managers and practitioners specifically should apply existing impact limits backed by a precautionary approach. Sector-specific impact limits applicable to the marine environment include maximum sustainable yield and optimum yield used in fisheries management, optimum sustainable population level used to manage marine mammals, and water quality standards and criteria. These legal and regulatory limits indicate the point at which a resource, ecosystem, or community cannot accommodate additional stress. In light of significant gaps in understanding ecosystem resilience to additional stress,

[236] Puget Sound Partnership, *supra*, note 34 at 32.
[237] Scientific Consensus Statement on Marine Ecosystem-Based Management (2005), *available at* http://www.compassonline.org/sites/all/files/document_files/EBM_Consensus_Statement_v12.pdf.
[238] Heather M. Leslie & Ann P. Kinzig, *Resilience Science*, in ECOSYSTEM-BASED MANAGEMENT FOR THE OCEANS, (K.McLeod & H.Leslie eds. 2009).
[239] *See, e.g.,* Joel A. Tickner & Ken Geiser, *The Precautionary Principle Stimulus for Solutions- and Alternatives-based Environmental Policy*, ENVTL IMP ASSESS REV 24: 801-824 (2004).

impact limits should be applied in combination with a precautionary approach to minimize the risk that a proposed project or action will result in significant adverse effects, and to avoid unwanted ecosystem change.

Box 20. Establish Thresholds Allowing an Ample Margin for Scientific and Management Uncertainty

Established thresholds should allow an ample margin for management and scientific uncertainty. By allowing a margin of safety, there is less risk that human impacts will exceed sustainable limits. Total maximum daily loads (TMDLs), developed under the Clean Water Act, provide one example of how to establish a margin of safety.[240]

The process leading to creation of a TMDL begins with state water quality assessments: if a water body or segment does not meet a water quality standard for a designated use, it is deemed to be impaired.[241] If a water segment is impaired by a pollutant[242] and not otherwise exempted, a TMDL must be developed to address the pollutant.[243] A TMDL allocates permissible pollutant loading among types of contributors, up until the point that the water segment would risk falling out of compliance with water quality standards.

Vital to TMDL creation is accurate calculation of the loading capacity—the maximum amount of a pollutant that a water body can receive from all contributing sources—in addition to background conditions, without violating water quality standards.[244] This total load is divided among three categories, a wasteload allocation, a load allocation, and a margin of safety. A wasteload allocation is "[t]he portion of a receiving water's loading capacity that is allocated to one of its existing or future point sources of pollution."[245] The wasteload allocation for a specific pollutant is divided among the contributing point sources that are regulated under NPDES permits. A load allocation is "[t]he portion of a receiving water's loading capacity that is attributed either to one of its existing or future nonpoint sources of pollution or to natural background sources."[246] The combination of load and wasteload allocations must be below the loading capacity to account for "any lack of knowledge concerning the relationship between effluent limitations and water quality."[247] In practice, the margin of safety increases with less-developed predictive models.

[240] This example was originally developed for ELI's publication, *Ocean and Coastal Ecosystem-Based Management: Implementation Handbook*, at 97-98 (2009).
[241] 33 U.S.C. §1313(d)(1)(A) (2000).
[242] The term "pollutant" is defined in the Clean Water Act as "dredged spoil, solid waste, incinerator residue, sewage, garbage, sewage sludge, munitions, chemical wastes, biological materials, radioactive materials, heat, wrecked or discarded equipment, rock, sand, cellar dirt and industrial, municipal, and agricultural waste discharged into water." §1362(6).
[243] § 1313(d)(1)(C).
[244] 40 C.F.R. § 130.2(f).
[245] 40 C.F.R. § 130.2(h).
[246] 40 C.F.R. § 130.2(g).
[247] 33 U.S.C. §1313(d)(1)(A) (2000).

7. Collect New Information and Fill Information Gaps

A major challenge in analyzing cumulative impacts is the lack of complete scientific information necessary to fully understand ecosystem function and processes and the effect of additional stressors. Relevant information may be limited or difficult to acquire due to a lack of adequate collaboration among agencies or across jurisdictions, or the lack of centralized and accessible repositories. Time lags in project approval also can make it difficult to determine the stage of project planning or approval associated with other marine sector projects, which can prevent managers from considering relevant projects in cumulative impacts assessments.

In light of significant information gaps, legal requirements concerning scientific uncertainty are "highly relevant" (Table 6).[248] Managers and practitioners should obtain information necessary to predict cumulative impacts to the extent permitted under applicable law. Monitoring also can be used to determine the actual impacts of proposed projects or actions and the outcome of any required mitigation. Additionally, monitoring data can provide baseline information and can help fill information gaps.

Table 6. Provisions for Acquiring Information Under NEPA and SEPA*	
NEPA 40 CFR § 1502.22	"Agencies must acquire information if the information is needed to make "a reasoned choice among alternatives and the overall cost of obtaining it are not exorbitant." If the overall cost of the information is exorbitant or the means to acquire the information are not known, an agency must: (a) state that the information is incomplete or unavailable in the EIS; (b) explain the relevance of the information in the EIS; (c) summarize existing scientific information that is relevant to the analysis of the proposed action's impacts; and (d) evaluate the impacts based upon generally accepted theoretical or research approaches.
SEPA WAC 197-41-080	Agencies must acquire information if the information is needed to make "a reasoned choice among alternatives…and the costs of obtaining it are not exorbitant." If the overall cost of the information is exorbitant or the means to acquire the information are speculative or not known, an agency can proceed without vital information after weighing "the need for the action with the severity of possible adverse impacts which would occur if the agency were to proceed in the face of uncertainty. If the agency proceeds, it shall generally indicate in the appropriate environmental documents its worst case analysis and the likelihood of occurrence, to the extent that this information can reasonably be developed."
*CEQA guidelines do not specify procedures for acquiring information. However, in forecasting impacts under CEQA, agencies must use "best efforts to find out and disclose all that it reasonably can," which could be read to impose a "reasonable inquiry" requirement on obtaining relevant information.	

8. Use Existing and Emerging Datasets and Tools

The availability and organization of the data needed to inform cumulative impacts decisions is improving, and with continued refinement, decision-making based upon quantitative—rather than largely qualitative—cumulative impacts assessments are a foreseeable possibility. There are currently a number of resources and tools that can be used to help practitioners identify appropriate baseline

[248] Janis Searles Jones & Steve Ganey, *Building the Legal and Institutional Framework*, in ECOSYSTEM-BASED MANAGEMENT FOR THE OCEANS (K. McLeod & H. Leslie eds. 2009) at 172-173.

information and spatial and temporal scales for analyses, and ultimately better predict cumulative impacts.

Long-Term Monitoring Data Sets

Long-term monitoring data sets can provide critical information for baseline assessments and monitoring, and can augment understanding of ocean and coastal conditions over longer time scales (*see* Table 7).

Table 7. Long-Term Monitoring Data Sets

Existing Monitoring Data – Data Sources

Washington

- IOOS: Integrated Ocean Observing System[249]
- NANOOS: Northwest Association of Networked Ocean Observing Systems[250]
- Puget Sound Assessment and Monitoring Program[251]
- Environmental Monitoring & Assessment Program (EPA)[252]
- National Assessments Database
- State agencies, local planning agencies

Oregon

- IOOS: Integrated Ocean Observing System
- NANOOS: Northwest Association of Networked Ocean Observing Systems
- Environmental Monitoring & Assessment Program (EPA)
- National Assessments Database
- State agencies, local planning agencies

California

- CalCOFI
- IOOS: Integrated Ocean Observing System
- CeNCOOS: Central & Northern California Ocean Observing System[253]
- NANOOS: Northwest Association of Networked Ocean Observing Systems
- SCOOS: Southern California Coastal Ocean Observing System[254]
- Environmental Monitoring & Assessment Program (EPA)
- National Assessments Database
- Southern California Coastal Water Research Project[255]
- San Francisco Estuary Institute Regional Monitoring Program[256]
- State agencies, local planning agencies

The Integrated Ocean Observing System Regional Associations are an important source of long-term data sets of physical, chemical, and biological properties in the CCLME. Some of the data are available on a real-time basis, which may be an effective way to detect rapid changes. For example, at the Scripps

[249] http://ioos.gov/program/.
[250] http://www.nanoos.org/nanoos_manual/nanoos_manual.php.
[251] http://www.psp.wa.gov/psamp.php.
[252] http://www.epa.gov/emap/html/data/index.html.
[253] http://www.cencoos.org/.
[254] http://www.sccoos.org/.
[255] http://www.sccwrp.org/view.php?id=33.
[256] http://www.sfei.org/rmp/.

Pier in Southern California, one of the data collection sites for the Southern California Coastal Ocean Observing System (SCOOS), data are collected on chlorophyll, pressure, salinity, and temperature. Moorings in Southern California provide additional information on currents, winds, and dissolved oxygen. These data sets could be used in combination with targeted information concerning specific resources and information on the cumulative effects of human activities to provide managers with a more comprehensive view of baseline environmental conditions within a defined geographic area. In addition to baseline information, SCOOS and other sites can provide data to help inform adaptive management strategies.

Box 21. SLOSEA – Science to Facilitate Ecosystem-Based Management

The San Luis Obispo Science and Ecosystem Alliance (SLOSEA) is a collaborative effort by scientists, resource managers, and stakeholders to study marine resources and ecosystems on California's Central Coast, and to link science to resource management and policy decisions. SLOSEA focuses on key issues affecting California's Central Coast, and conducts research and monitoring related to water quality, invasive species, human access to the coast, climate change, fish populations, and the social and economic value of coastal resources.

In the Morro Bay estuary, SLOSEA works with local regulators and resource managers to address water quality issues in the region.[257] SLOSEA is addressing water quality issues by: (1) establishing a Morro Bay water quality observatory to collect information that informs models and predictions about the movement of pollutants in the estuary; (2) researching the impact of specific pollutants on resources; (3) engaging with state-wide monitoring programs; and (4) providing data and recommendations to other stakeholders to address the causes of pollutants. "Live" water quality data and monthly data archives are available on SLOSEA's website. The water quality data can be used to inform local projects and actions and adaptive decision-making. The data has the potential to close information gaps concerning the impact of pollutants on resources, which can help managers better understand the impacts of proposed actions.

Emerging Resources

New efforts to map benthic habitat, to study the cumulative impact of human activities within the California Current ecosystem, and to create new pilot Integrated Ecosystem Assessments for the California Current and Puget Sound may also provide compelling information about the status of the environment where proposed actions are planned.

Integrated Ecosystem Assessment. An Integrated Ecosystem Assessment (IEA) "is a formal synthesis and quantitative analysis of information on relevant natural and socioeconomic factors, in relation to specified ecosystem management objectives," and "an organizing framework for designing and evaluating ecosystem-scale approaches to management."[258] IEAs use a broad range of quantitative data and information, as well as ecosystem modeling, to assess the condition of relevant natural resources

[257] San Luis Obispo Science and Ecosystem Alliance, *Water Quality*, *available at* http://www.slosea.com/initiatives/wq/wquality.php.

[258] Mary Ruckelshaus et al., *Puget Sound, Washington USA*, in ECOSYSTEM-BASED MANAGEMENT FOR THE OCEANS, (K.McLeod & H.Leslie eds. 2009).

and the threats they face in a given ecosystem. IEAs also evaluate various management options against ecosystem goals. They have the potential to provide an effective, transparent means of characterizing the status of ecosystem components and addressing ocean and coastal management issues. Significantly, IEAs can predict the response of ecosystems and biological resources to new pressures, and can also predict how biological communities may respond to pressures, rather than assessing how they affect single species.

The National Oceanic and Atmospheric Administration (NOAA) is currently developing an Integrated Ecosystem Assessment for the entire CCLME, and is working with the Puget Sound Partnership on a separate IEA for Puget Sound. In addition, the West Coast Governors Agreement on Ocean Health is considering three regional IEA (R-IEA) pilot projects in the state waters of Coastal Oregon, Northern California, and Central California, in addition to the Puget Sound IEA already underway. If developed, these R-IEAs could contribute to and complement development of a larger California Current IEA.

Following their development, "regularly updated and high quality integrated ecosystem assessments have the potential to streamline processes under laws requiring environmental impact review, such as the California Environmental Quality Act and Washington's State Environmental Policy Act, if these integrated assessments are used as a basis for environmental impact statements."[259] IEAs will provide resource managers, stakeholders, and others with an effective and transparent assessment of ecosystem components, and may show where data gaps exist.

Further, under current plans, stakeholders and the public will have access to IEA data, which would encompass a broad range of economic, social, and natural resource scientific data and information relevant to specific management interests. These data and information could be assembled for proposed projects or actions, and used to develop baseline assessments for use in environmental review processes. IEAs also could help identify time trends, interactions, and projections of future ecosystem states, thereby reducing the time and expenditure frequently required for assembling and integrating data for project-level assessments.

Sea Floor/Habitat Maps. Comprehensive seafloor and habitat maps are or will be available from a variety of sources. These maps will allow practitioners to view the distribution of marine habitat and substrates in defined geographic areas. As such, they may provide critical baseline information for predicting ecosystem change, and also may facilitate the identification of appropriate geographic boundaries for cumulative impact assessments.

For example, the USGS California Seafloor Mapping Program is developing a comprehensive coastal/marine geologic and habitat base map for California waters.[260] The Program is using high-resolution sonar data to reveal habitat types, bathymetry, and seafloor substrate in detail. The statewide mapping effort will help provide an ecosystem context for management, and may assist in boundary selection in cumulative impact assessments. The Active Tectonics and Seafloor Mapping Lab at Oregon State University's College of Oceanic and Atmospheric Sciences is developing benthic habitat data for Washington and Oregon. Surficial maps are available for these state waters, and efforts are

[259] Joint Ocean Commission Initiative, *One Coast, One Future, Securing the Health of West Coast Ecosystems and Economies*, at 29 (January 2009).
[260] *See* California Seafloor Mapping Program, *available at* http://walrus.wr.usgs.gov/mapping/csmp/index.html

underway to map these regions more comprehensively with modern acoustic methods.[261] In the West Coast Governors Agreement, the three states further indicated their commitment to: (1) completing sea floor maps; (2) coordinating interstate data collection and sharing; and (3) encouraging federal agencies to make mapping data and resources available.[262]

Mapping Cumulative Impacts. An effort led by Benjamin S. Halpern and funded by the National Center for Ecological Analysis and Synthesis may provide managers with models of the cumulative impact of human activities, and the relative effect of different activities, within the California Current ecosystem. Halpern et al. (2009)[263] developed spatial data for 19 intertidal and subtidal ecosystems (habitat) within the California Current LME, and mapped cumulative human impacts on those ecosystems. The ecosystems evaluated included beach, kelp forest, salt marshes, rocky reef, canyon, seamount and pelagic environments. In order to map cumulative impacts, they looked at the context provided by ecosystem maps, the presence and intensity of particular stressors, and the vulnerabilities that result in ecosystems as a result of these stressors. A vulnerability weight allows different stressors to be compared, and the calculated cumulative impact score was ground-truthed with the in situ ocean degradation data to ensure accuracy. The cumulative impact is built into the ecosystem's vulnerability score, and these scores become meaningful within a relative context.

These maps provide baseline information about the distribution of various ecosystems within the California Current system, as well as the impact of human activities within those ecosystems. This method therefore provides a quantitative mechanism for evaluating multiple human impacts on marine ecosystems that can be used by managers to get a baseline understanding of whether a cumulative effect problem exists. The model may also help guide selection of appropriate geographic boundaries to analyze cumulative effects of proposed actions in light of other past, present, and future actions.

C. Strengthening Mitigation

Mitigation is a critical step in managing cumulative impacts, as it provides a means to avoid, minimize, rectify, reduce, or compensate for significant impacts of proposed projects or actions.[264] Although CEQA *requires* proponents to undertake "feasible" measures to mitigate significant impacts, mitigation is not mandated under NEPA or SEPA. Regardless, agencies have significant opportunities under all three laws to identify mitigation measures and activities during environmental impact assessment and to promote effective mitigation.[265]

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[261] *See* mapping products and other seafloor and habitat information for Washington and Oregon state waters at http://geohab.coas.oregonstate.edu/.

[262] Office of the Governors of Washington, Oregon & California, *supra*, note 6 at 81-89.

[263] Halpern et al., *supra* note 7.

[264] 40 C.F.R. § 1508.20; WASH. ADMIN. CODE 197-11-768(6) (the definition of mitigation under SEPA further includes taking corrective action).

[265] This section addresses legal, regulatory, and governance approaches, and other considerations, to avoid and mitigate the cumulative impacts of human activity. Although monitoring is considered separately in the section that follows, mitigation should be coupled with monitoring in all cases where mitigation is used, to ensure that required mitigation measures have their desired outcome. Further, if mitigation serves as the basis of a mitigated Finding of No Significant Impact (FONSI) or mitigated non-significance determination, it is particularly imperative to ensure that the mitigation is implemented and that mitigation measures have their predicted effect, in order to determine whether an EIS or EIR is warranted and to minimize the risk of environmental damage.

1. Strengthen Regulatory Requirements for Mitigation

Agency practices and procedures vary in the degree to which they promote effective mitigation. In general, a stronger regulatory approach could yield more effective mitigation planning and implementation and help minimize cumulative impacts. Agencies should assess existing regulatory requirements to ensure they promote successful mitigation outcomes. In particular, agencies should consider whether new regulations, regulatory amendments, or guidance are required to address the needs for: (1) a clear statement of mitigation commitments in environmental impact assessment documents; (2) monitoring to assess mitigation implementation; (3) monitoring to assess mitigation effectiveness; (4) a mechanism to respond to monitoring results and to take corrective action as needed; and (5) a mechanism to enforce mitigation requirements.

Box 22. Department of the Army NEPA Regulations

The CEQ highlighted the Department of the Army's NEPA regulations as a relatively comprehensive mitigation approach that could be followed by other agencies to strengthen NEPA mitigation programs and procedures.[266] The Army regulations, which apply to NEPA review of Army actions, emphasize the need to consider mitigation throughout the environmental impact assessment process, to explicitly identify required mitigation in the NEPA decision document, and to monitor mitigation measures and activities.[267] The regulations also contain specific provisions addressing budgeting and funding of mitigation activities, and assign the burden of responding to public inquiries concerning the status of mitigation to the project proponent.[268] If mitigation that serves as the basis for a FONSI is not accomplished, the proponent is required to "publish an NOI [Notice of Intent] and prepare an EIS."[269] This requirement is significant, because it provides a legal mechanism to ensure that an EIS will be prepared in the event that mitigation that serves as the basis for a FONSI is not implemented or is not effective.

2. Avoid Impacts Where Feasible

ELI's interviews with practitioners highlighted the need to avoid impacts before they occur as the preferred strategy for mitigating cumulative impacts.[270] Avoiding adverse impacts of proposed projects or actions is a more effective means of mitigation than minimizing impacts or compensating for impacts after they occur. Measures to avoid impacts also can be cheaper to implement, and have fewer social and political costs than other mitigation approaches, such as compensatory mitigation. In order to minimize unnecessary environmental damage, increased effort should be directed at exploring all options for avoiding adverse impacts, beginning early in the decision-making process.

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[266] Council on Environmental Quality, *Appropriate Use of Mitigation and Monitoring and Clarifying the Appropriate Use of Mitigated Findings of No Signficant Impact,* MEMORANDUM FOR HEADS OF FEDERAL DEPARTMENTS, Appendix at 17-20 (January 14, 2011).
[267] 32 C.F.R. § 651.15.
[268] 32 C.F.R. § 651.15(b).
[269] 32 C.F.R. § 651.15(c).
[270] In specific contexts (e.g. to achieve "no net loss" to wetlands), regulators are required, in a process known as "mitigation sequencing," to preferentially avoid impacts before they minimize unavoidable impacts or compensate for those impacts.

Box 23. Adopt Guidance or Regulations That Prioritize Avoiding Impacts

Section 404 of the CWA may be the best example, in theory (if not in practice), of required mitigation. A 1990 memorandum of agreement between the Corps of Engineers and the U.S. EPA established the goal of no overall net loss of wetland values or functions, which requires wetlands impacts that are unavoidable to be offset by the restoration or creation of wetlands.[271] Following this objective, the guidelines also establish a sequence of preferred responses to potential wetland impacts: avoid, minimize, and only then compensate.[272] Agencies could borrow from this example and adopt a sequence of preferred mitigation that prioritizes impact avoidance over other mitigation strategies for ocean projects and actions.

Washington's Shoreline Management Act takes a no-net-loss approach. The SMA regulations impose a standard of no net loss of ecological functions that must be integrated into local shoreline master programs, including comprehensive shoreline plans and policies. The no-net-loss standard may be achieved through regulation, restoration, and mitigation. Achieving no net loss specifically requires the use of mitigation sequencing, which means that efforts must first be made to avoid adverse impacts before proceeding with other mitigation strategies. By prioritizing avoidance, the SMA, like the no net loss standard in the CWA wetlands guidelines, makes it more difficult merely to compensate for adverse impacts of human use and activity.

Avoidance measures could include eliminating alternatives from further study where they will result in unacceptable adverse impacts, or modifying the project scope, scale, or location to protect resources and the environment. Actions that will result in irreversible impacts or impacts to rare, sensitive, unique, threatened, or endangered habitat or species, and ecosystems providing critical ecosystem services, should be avoided.

Box 24. Columbia River Channel Improvement Project—Avoid Impacts and Restore Habitat

The 2003 Final SEIS for the Columbia River Channel Improvement Project illustrates an approach to avoiding impacts to the marine environment associated with the ocean disposal of river material.[273] According to the 1999 Final IFR/EIS for the Project, approximately 37 million cubic yards of river material would have been disposed in an ocean disposal site located in Washington waters. The 2003 revisions to the channel improvement project instead called for use of the river material that would have been disposed at the ocean disposal site to construct two connecting channels in the Columbia River, providing juvenile salmon access to embayment rearing habitat. By using the river material for the construction of ecosystem restoration features, the Corps avoided impacts at the ocean disposal site for at least 20 years.

[271] Memorandum of Agreement between the Environmental Protection Agency and the Department of the Army Concerning the Determination of Mitigation Under Clean Water Act Section 404(b)(1) Guidelines 2 (Feb. 6, 1990).
[272] *Id*.
[273] 32 C.F.R. § 651.15.
[273] *See* Sustainable Ecosystems Insitute, *Lower Columbia and Willamette Rivers Channel Deepening Project*, *available at* http://www.sei.org/columbia/background_project.html.

3. Develop a Clear Mitigation Plan and Articulate Mitigation Goals

Environmental impact assessment documents should contain a clear description of the mitigation to be performed and should clearly articulate mitigation goals. Such documents should also describe the technologies and methods to be used and the length of time for which mitigation will be performed. A clear articulation of required mitigation is necessary to allow stakeholders to understand, track, and monitor mitigation commitments most effectively. Mitigation measures used as the basis of a mitigated FONSI or mitigated determination of non-significance also must be clearly identified and described to facilitate transparency and accountability.[274]

Further, environmental impact assessment documents should clearly articulate mitigation goals to provide a standard against which success is measured. Mitigation goals should clearly specify "whether they are intended to reduce impacts to a particular level, as in a mitigated FONSI, or adopted to achieve an environmentally preferable outcome."[275] Mitigation goals may be based on legal requirements, or may be defined based on regional plans, expert opinion, or as a result of participatory stakeholder processes. The overall objective of mitigation, at minimum, should seek to obtain a net balance between the positive and negative impacts of a project or action (e.g., no net loss of value or function), and any mitigation implemented should be consistent with regional plans and goals. Where possible, mitigation protocols should include benchmarks or performance standards to allow practitioners to assess whether mitigation objectives are achieved, and contingency plans in the event that standards are not achieved.[276]

Box 25. Cape Wind Project—Mitigation

Mitigation plans contained in the Minerals Management Service's[277] Final Environmental Impact Statement for the Cape Wind Project provide a useful recent approach to mitigating the impacts of a major, controversial ocean energy project. The proposed project is a 130-turbine wind energy project to be developed in federal waters off Nantucket Sound. It is the first utility-scale wind project that will be located in East Coast waters, and its mitigation plan will likely inform mitigation strategies for other wind energy projects in both federal and state waters. Elements of the mitigation and monitoring approach may also guide strategies for a variety of other major offshore projects and actions.

Mitigation for the project is primarily described in a chapter and two appendices of the FEIS. The Mitigation and Monitoring section:

- articulates the mitigation measures required by regulatory agencies and committed to by the applicant, including mitigation required by state and federal regulatory agencies (MMS, USCG, FWS, NOAA, the Massachusetts Energy Facility Siting Board), and under the state MEPA process;

- expressly states that all mitigation and monitoring measures and actions described in the

[274] CEQ Mitigation Guidance, *supra*, note 266 at 6-9.
[275] *Id*. at 2.
[276] *Id*.
[277] The Bureau of Ocean Energy Management, Regulation and Enforcement replaced the MMS in 2010.

FEIS would be "required conditions of approval for MMS' authorization of the project";

- describes the monitoring actions that the applicant is to undertake during the life of the project, and states that required monitoring actions will be included in the Record of Decision (ROD);
- provides that all monitoring reports will be made available to the public; and
- summarizes a mitigation and monitoring framework that could serve as a foundation for adaptive management.

Specific mitigation measures to minimize impacts to aesthetic ecosystem services include using off-white turbines to decrease the visual impact from shore, installing fewer turbines to reduce the project footprint, and installing turbines in a specific layout to result in a smaller visual impact. It is expected that required mitigation will be addressed in the ROD, and additional measures may also be contained in the commercial lease or other Project documents.

The FEIS goes beyond most other environmental impact assessments in setting forth a plan for mitigating and monitoring certain key impacts, and incorporates elements of adaptive management. For example, the "Avian and Bat Monitoring Plan for the Cape Wind Proposed Offshore Wind Facility" describes methods and requirements for collecting data, evaluating impacts to avifauna and bats in Nantucket Sound, and assessing the effectiveness of specific mitigation measures.[278] This Plan specifically requires monitoring to assess the effectiveness of anti-perching mitigation requirements that MMS will require the project proponent to implement as part of any approved lease. Pre-construction, the Plan calls for the use of still or video cameras to monitor the presence of avifauna and the effectiveness of the perch deterrents. The Plan also requires the proponent to conduct three years of post-construction monitoring to assess perch deterrent effectiveness. Monitoring reports will be available to the public.

Importantly, the Plan establishes a reporting system to make effective and timely use of monitoring results, so adjustments to future monitoring, methodology, or mitigation requirements can be made as needed.[279] Pre-construction monitoring results would be used to inform changes to the methods used for post-construction anti-perching mitigation. Post-construction monitoring results would also be used to drive further mitigation changes if, for example, perch deterrents are less effective than predicted. Although the FEIS does not explicitly define an adaptive management protocol, this mitigation and monitoring framework is an adaptive approach that could serve as a model.

Finally, with regard to potential navigation impacts, the FEIS specifies that mitigation measures may be adapted and adjusted to accommodate new information. Appendix M of the FEIS discusses potential mitigation measures to address potential risks to navigation safety posed by wind turbine effects on marine radars. The FEIS recognizes that, with respect to navigation impacts, "an adaptive management approach needs to be followed, since there are user groups that may still need to be included in mitigation discussions, and until the proposed action is constructed and proposed mitigation

[278] Minerals Management Service, Cape Wind Final Environmental Impact Statement, (January 2009), available at http://www.boemre.gov/offshore/RenewableEnergy/CapeWindFEIS.htm [hereinafter, "Cape Wind FEIS"]. The Plan is included in Appendix N.

[279] Cape Wind FEIS, *supra*, note 278, Appendix N, p. 2.

implemented, effectiveness cannot be fully assessed. If proposed mitigation is found to be inadequate or insufficient, the USGS [would] retain[] the ability to seek revised and additional mitigation measures to ensure that navigation safety is acceptable."[280]

Because the Cape Wind Project is the first utility-scale offshore wind energy project in the United States, the mitigation strategies developed for the project will likely inform mitigation strategies for other renewable energy projects. The project also has the potential to inform mitigation approaches taken for other major offshore activities, particularly in the context of scientific uncertainty. Of key interest will be the effectiveness of adaptive management approaches to mitigating project impacts, the transparency of the mitigation process and results, and the extent to which comprehensive mitigation is incorporated into the commercial lease and other agency approvals and further developed in mitigation and adaptive management protocols for the project.

4. When Using Compensatory Mitigation, Give Preference to On-Site Mitigation

Where mitigation is directed at compensating for unavoidable environmental impacts, preference generally should be given to on-site mitigation. In some cases, however, on-site compensatory mitigation may result in reduced environmental benefits compared to mitigation off-site. For example, a nearby off-site location might contribute more to ecosystem services, values, and habitat function than similar on-site mitigation. Where offsite mitigation is used, it should address losses to habitat, biodiversity, and ecosystem services with replacements of at least equal value or function.

5. Adopt Mitigation Commitments in the ROD or Other Decision Document

Just because mitigation activities and measures are identified in an environmental impact assessment document does not make the measures enforceable. *Required* mitigation should be adopted in the agency's Record of Decision under NEPA or the state decision document. Required mitigation measures also should be included as enforceable conditions of permits, licenses, and other legal devices, and agency approvals.

D. Monitoring and Adaptive Management

Monitoring and adaptive management can significantly enhance efforts to address cumulative impacts on marine resources and ecosystems. Monitoring can provide important information about the effects project activities and mitigation measures are having in practice, and can help assess whether projects or actions are implemented in a way consistent with regional plans. Monitoring results can be used to inform adaptive management strategies to better address cumulative impacts in response to new information, changing conditions, and unexpected impacts of projects or actions.

Moreover, as more information is gathered about the environmental impacts of projects or the status of CCLME resources, monitoring data can suggest improvements to similar projects that could reduce significant cumulative impacts over the long term. Monitoring and adaptive management are playing an increasing role in ocean and coastal decision-making and approvals—particularly for new and emerging uses where the impacts of human use and activities are poorly understood.

[280] Cape Wind FEIS, *supra*, note 278, section 9-17.

1. Employ an Iterative Adaptive Management Approach

Although "adapt[ing]" serves as the final step in the "Predict, Mitigate, Implement, Monitor, and Adapt" framework,[281] an adaptive approach should be iterative, informing decisions at all levels of the environmental impact assessment process.[282] An iterative adaptive management approach allows practitioners and managers to predict, mitigate, monitor, and evaluate project impacts and to adapt decision-making in light of new information, changed conditions, or unexpected results.

Managers might include a range of alternative mitigation measures in an environmental impact assessment, and provide for "upward or downward adjustments in the scale and intensity of mitigation efforts, to be triggered in response to information produced by follow-up monitoring."[283] This could allow application of more responsive mitigation measures and reduced environmental harm. An adaptive approach also could help managers adjust mitigation measures that themselves result in unanticipated impacts, without incurring undue costs.[284] Further, lessons learned through project implementation could be used to implement mid-course corrections to address unforeseen impacts without requiring a new or supplemental NEPA review.[285] Lessons learned can also inform project implementation at the relicensing stage, particularly for new and emerging ocean uses such as the scaling-up of a pilot project.

Box 26. Reedsport OPT Wave Park—Adaptive Management for a Wave Energy Project

The adaptive management strategy designed for the Reedsport OPT Wave Park is the best recent example of an iterative adaptive management plan developed for a West Coast ocean project. It highlights the importance of public participation, a well-designed monitoring protocol, and an explicitly adaptive approach to addressing unanticipated impacts. It also provides a model that will be used to inform the development of other adaptive management strategies, particularly for wave energy projects off the Oregon Coast and elsewhere in West Coast waters, as well as for other marine projects and activities.

The proposed wave park will be the first commercial wave energy park located in West Coast waters, 2.5 miles off the coast of Gardiner, Oregon. Development of the proposed wave park will be phased, commencing with installation of a single buoy. The second phase of the project will involve installation of nine additional buoys. Full project development is expected to result in an approximately 200-buoy array. A submarine power transmission cable will run from the project to shore, where it will connect to the electric grid.

In October 2006, Oregon Governor Kulongoski designated the proposed wave park an "Oregon Solutions" project. Oregon Solutions is a program of the National Policy Consensus Center at Portland

[281] NEPA Task Force Report, *supra*, note 9 at 45.
[282] *Id.* at 48.
[283] Bradley C. Karkkainen, *Whither NEPA?* Colloquium on New Approaches to Environmental Review sponsored by the New York University ENVTL LAW J (April 10, 2003).
[284] *Id.* at 47.
[285] *Id.* at 45.

State University, which is focused on achieving agreements among diverse stakeholders and promoting sustainable solutions to "community-based problems."[286] The Oregon Solutions process has guided the project proponent, Reedsport OPT Wave Park LLC, and other stakeholders including agencies and non-profit groups, in developing a collaborative, coordinated licensing process for the project and in facilitating stakeholder involvement in the process. In 2010, the parties concluded the state-sponsored process and finalized a settlement agreement, which includes an adaptive management strategy.[287] This settlement agreement is expected to help expedite and streamline the FERC licensing process.

The adaptive management strategy for the wave park will help manage environmental impacts during Project construction and operation.[288] The strategy includes the following key elements:

- an iterative adaptive management strategy;
- use of study and monitoring plans;
- data and information evaluation and reporting requirements;
- defined triggers to stimulate decision-making related to the need for Project changes and adjustments; and
- stakeholder participation requirements.

Under the adaptive management plan, a Coordinating Committee, four Implementation Committees, and a Licensing Compliance Coordinator will participate in the adaptive management process and will help ensure that project impacts are appropriately addressed. The Coordinating Committee will be composed of a representative from each party to the Settlement Agreement, and will address all issues raised under it. Implementation Committees will oversee studies and other activities (Aquatics and Water Quality, Recreation and Public Safety, Crabbing and Fishing, and Terrestrial and Cultural Resources impacts) described in appendices to the settlement. Finally, a Licensing Compliance Coordinator designated by OPT will coordinate the various committees, and will oversee the Company's compliance with the requirements of its FERC license and the settlement agreement.

The settlement agreement requires the Company to undertake long-term studies and monitoring in order to identify environmental or socioeconomic impacts of the project. The Company must also synthesize and analyze the data collected and study results. Implementation Committees will further consider and interpret study and monitoring results, and will determine whether any "screening criteria" are met. If the criteria are met, the relevant Committee will consider whether changes to study designs, construction methods or operations, or other changes in project management are warranted. The adaptive management strategy outlines a framework for adopting an "avoidance, minimization or mitigation plan" to address necessary Project changes and adjustments. The strategy also outlines an approach for addressing adverse project effects that require immediate response. Importantly, because development of the project will occur in stages, the monitoring program during the first and second phases will allow the Company to assess impacts prior to further build-out.

Finally, data and information collected during implementation of the strategy may be made available to the public, developers, and other stakeholders. These data accordingly may be used to inform the development of other wave energy projects in Oregon and other West Coast waters.

[286] *See* Oregon Solutions website, *available at* http://www.orsolutions.org.
[287] Settlement Agreement among Reedsport OPT Wave Park, LLC et al. (July 28, 2010), FERC No. 12713 ("Reedsport OPT Wave Park Settlement Agreement").
[288] The Project consists of the 10-buoy array, and not full build-out.

Box 27. Joint Management Plan Review – Cordell Bank, Greater Farallones, and Monterey Bay National Marine Sanctuaries

At five-year intervals, the National Marine Sanctuaries Act (NMSA) requires NOAA to assess marine sanctuary goals and evaluate progress toward management plan implementation, paying particular attention to site-specific management measures.[289] NMSA additionally stipulates that changes to a sanctuary's designation require an EIS analysis.[290] By calling for regular evaluation and adjustment of site-specific management goals and methods to reflect lessons learned, national marine sanctuary management incorporates an ecosystem-specific, adaptive management framework into the environmental impact assessment process.

National marine sanctuary designation and review necessitates an extensive scoping process, engaging a wide range of stakeholders. Broad stakeholder involvement ensures collaboration and better informs the objectives and performance benchmarks guiding monitoring parameters and evaluation.[291] In the first review of the jointly managed Cordell Bank, Greater Farallones, and Monterey Bay National Marine Sanctuaries, the 2008 FEIS addresses concerns raised in the scoping process, such as wastewater discharge or seabed protection, by instituting measures that include new or modified regulations and monitoring protocols.[292] The FEIS additionally points to funding and expansion of monitoring measures, like the SIMoN integrated ecosystem monitoring program, as a means to bolster understanding of ecosystem processes and allow for continued integration of emerging information into management objectives and practices.[293]

2. Use Adaptive Management for Tiered or Phased Projects and Actions

An adaptive management approach may be particularly amenable to situations where project development is tiered or phased, or where there will be sequential environmental impact assessment. Tiered or phased projects or actions may be particularly conducive to an adaptive management approach, as there is ample opportunity to incorporate lessons learned into mitigation measures and project management approaches prior to further build-out.

Box 28. FERC Process for Issuing Hydrokinetic Licenses

The Federal Energy Regulatory Commission's process for issuing conditioned licenses for hydrokinetic projects provides an example of a system that supports an adaptive management approach. FERC issues

[289] 16 U.S.C. § 1434(e).
[290] Cordell Bank, Gulf of the Farallones, and Monterey Bay Sanctuaries: Final Environmental Impact Statement (Sept. 2008), at ES-5, *available at* http://sanctuaries.noaa.gov/jointplan/feis/091608feis_jmpr.pdf; *see also* 16 U.S.C. § 1434(e).
[291] NEPA Task Force Report, *supra*, note 9 at 51.
[292] Cordell Bank, Gulf of the Farallones, and Monterey Bay Sanctuaries: Final Environmental Impact Statement (Sept. 2008), *available at* http://sanctuaries.noaa.gov/jointplan/feis/091608feis_jmpr.pdf.
[293] *Id.*, Appendix A-3, Summary Scoping Document: Report to Sanctuary Advisory Councils (February 2002), Table 2 Analysis of Cross-Cutting Issues, at 463-464.

pilot project licenses with five-year terms, ensuring proper evaluation of project impacts and adjustment of project implementation before permanent (thirty-year) license approval.[294] FERC's hydrokinetic licensing process also requires some evaluation and modification over the course of the pilot project phase, calling for "project alteration or shutdown in the event that there is an unacceptable level of environmental effect."[295] This tiered licensing system may be particularly amenable to an adaptive management approach, as it offers many opportunities to inform later stages of project development.

FERC guidance on hydrokinetic project criteria further specifies that applications should include a proposed plan for post-license monitoring to determine actual project impacts; performance measures; and methods for project modification, shutdown, or removal in the event of environmental harm.[296] Project applications should additionally demonstrate adequate consultation of potentially interested parties.[297]

3. Require Monitoring for Most Major Actions

Monitoring is a critical component of adaptive management, and should be required to the fullest extent permitted under existing laws for most major actions.[298] Monitoring can ensure that:

- predicted environmental impacts actually occur;
- mitigation measures are actually implemented;
- mitigation measures are successful in achieving desired outcomes;
- unanticipated adverse impacts do not occur;
- impacts that do occur do not cause selected indicators to approach critical levels; and
- environmental standards are met.[299]

Information from monitoring efforts also can help to: (1) inform baseline assessments; (2) enhance the accuracy of predictions; (3) assist in identifying environmental indicators; (4) help to control the location, timing, and levels of impacts; (5) advance understanding of ecosystem function and inter-linkages; and (6) improve the development of mitigation and adaptive management strategies so that impacts are maintained at acceptable levels.[300]

Monitoring is permitted under existing law; however, post-implementation monitoring currently does not appear to be widely or effectively used in practice. Studies indicate there may be an overall lack of follow-up inspection to confirm that implementation of mitigation measures has occurred, as well as a lack of reporting with regard to the actual outcome of mitigation efforts.[301] This is a problem because, if

[294] Policy Statement on Conditioned Licenses for Hydrokinetic Projects, 121 FERC ¶ 61,221(November 30, 2007), at 3, *available at* http://www.ferc.gov/eventcalendar/Files/20071130153255-PL08-1-000.pdf.
[295] *Id.*
[296] Licensing Hydrokinetic Pilot Projects (April 2008) at 14, *available at* http://www.oceanrenewable.com/wp-content/uploads/2009/04/white_paper.pdf.
[297] *Id.*
[298] *See* Larry W. Canter, *The Role of Environmental Monitoring in Responsible Project Management*, ENVTL PROF 15: 76-87 (1993).
[299] These factors are drawn, in part, from: Canter (1993). *Id.*
[300] *Id*. *See* Carissa Schively Slotterback, *Evaluating the Implementation of Environmental Review Mitigation in Local Planning and Development Processes*, ENVTL IMPACT ASSESS REV 28: 546-561 (2008).
[301] Canter supra note 298; *Id.*

the actual impacts are far worse (or better) than expected, the evaluation will not have the desired predictive effect. In addition, without monitoring or a systematic way of tracking monitoring results, agencies cannot benefit from environmental information that could inform and improve later decisions.

Monitoring is particularly critical where impacts are not well understood or in the context of scientific uncertainty, as is the case for many new and emerging uses. Monitoring, combined with adaptive management, should be appropriately integrated into environmental review processes for offshore ocean energy projects to allow agencies to adjust decisions in the face of unanticipated effects, and could improve decision-making related to project location, scale, and effects.

4. Develop an Effective Monitoring Strategy

To be of use, an adaptive management strategy will need to employ an effective monitoring approach in order to provide timely feedback about project decisions and to inform further project development. An effective monitoring system or plan for evaluating cumulative impacts may require:

- "The ability to establish clear monitoring objectives;
- The existence of a baseline or the ability to develop a baseline for the resources being monitored;
- The ability to see the effects within an appropriate timeframe after the action is taken;
- The technical capabilities of the procedures and equipment used to identify and measure changes in the affected resources and the ability to analyze the changes; and
- The resources needed to perform the monitoring and respond to the results."[302]

Agencies also should consider their capacity for quality assurance of monitoring data, and stakeholder commitment to monitoring efforts.[303] A rigorous data management strategy also is required to ensure the data collected is aggregated and interpreted to inform decision-making, and to ensure that meaningful information is available to relevant stakeholders. Agencies also should pre-develop response strategies, or exit strategies, in the event monitoring indicates the presence of unacceptable adverse impacts. Specific monitoring approaches should be tailored to the particular qualities of the proposed action and mitigation, as well as to the location, timing, and scale of anticipated impacts.

5. Incorporate Monitoring and Adaptive Management into Leases, Permits, and Other Agency Approvals

Monitoring and adaptive management requirements should be incorporated explicitly as conditions attached to leases, permits, and other agency approvals, and these conditions should be enforced. The Department of the Army regulations expressly incorporate this requirement with regard to mitigation, stating: "The mitigation shall become a line item in the proponent's budget or other funding document, if appropriate, or included in the legal document implementing the action (for example, contracts, leases, or grants)."[304] Similarly, requirements for monitoring and adaptive management should be

[302] NEPA Task Force Report, *supra,* note 9at 50.
[303] *See* Puget Sound Assessment and Monitoring Program, *Keys to a successful monitoring program: lessons learned by the Puget Sound Assessment and Monitoring Program*, (2008); and NEPA Task Force Report, *supra*, note 9 at 46-47.
[304] 32 C.F.R. § 651.15(b).

explicitly included in leases, grants, and other agency approvals to ensure that monitoring and adaptive management measures are carried out.

6. Ensure Available Funding

Funding to implement monitoring and adaptive management is critical to the success of these approaches. Practitioners and managers should determine the cost necessary to implement proposed monitoring and adaptive management actions. Funds to carry out these measures should be incorporated into the project budget, and practitioners and managers should "ensure that funding needs for monitoring as well as for any adaptive measures are considered and reflected in the decision documents."[305] Unless funds to carry out mitigation, monitoring, and adaptive management are "actually budgeted and manpower assigned," such measures "do[] not exist."[306] Decision-makers will also need to consider how to balance the need for specific monitoring and adaptive management measures while retaining the economic viability of a project or action.

[305] NEPA Task Force Report, *supra*, note 9 at 48.
[306] 32 C.F.R. § 651.15(d).

VI. MINIMIZING CUMULATIVE IMPACTS— NEEDS FOR BEST AVAILABLE SCIENCE AND TECHNOLOGY

A. Overview

A large amount of scientific data and information is needed to understand the cumulative impacts of human use and activity at regional and local levels and to support effective management decisions. As Katherine Andrews states, cumulative impact analyses are data-intensive and complicated because:

> Not only do regulators need information about natural resources of the receiving environment, they need to know everything that *is* occurring and everything that *will* reasonably occur in the affected environment and how that all works together to affect the environment. If the data are lacking, the regulators have to make decisions based on assumptions or educated guesses.[307]

Understanding the cumulative impacts of human use and activities in ocean and near-shore environments can be particularly challenging in light of the dynamic nature of those ecosystems and the substantial interconnectivity between ecosystem components.

In order to develop a strong scientific basis for analyzing cumulative impacts at all levels of ocean governance, managers and practitioners need to fill data gaps and use robust tools and approaches. This chapter provides recommendations for how science can better inform cumulative impacts analysis and decision-making. To achieve this, we:

- analyze how science currently is used in the cumulative impacts analysis and decision-making process;
- identify and discuss the limitations of current approaches; and
- discuss scientific and technological needs and approaches that can strengthen the cumulative impact analyses conducted under existing law and support an integrated ocean governance framework.

Our recommendations are based on our research on scientific requirements of cumulative impacts evaluation, and draw from ELI's interviews with a range of West Coast resource managers, planners, policy advisors, academic and government scientists and scholars, private practice and environmental consulting experts, non-profit researchers, and law and policy experts.

[307] Katherine Andrews, *Governing the Exclusive Economic Zone: The Ocean Commons, Cumulative Impacts and Potential Strategies for Improved Governance* at 23 (2008) (emphasis in original).

B. How Science is Used in Cumulative Impact Analysis and Decision-Making

Cumulative impacts should be considered and addressed in project-level permitting and decision-making and in regional ocean governance approaches, including coastal and marine spatial planning. This section discusses the ways in which science is used to consider cumulative impacts at the project or action level during environmental impact assessment processes on the West Coast. We also consider how science informs cumulative impact analyses during regional planning processes, and provide case studies to illustrate the opportunities for and challenges to conducting meaningful cumulative impact analyses and related decision-making.

1. Project- or Action-Level Cumulative Impact Analysis

On the West Coast, cumulative impacts are considered for major ocean projects and actions under NEPA, SEPA, and CEQA. Cumulative impact analyses under these laws are science-based, data-intensive, and, frequently, complicated undertakings. As described by the CEQ, cumulative impact analyses include eleven basic steps:

1. "Identify the significant cumulative effects issues associated with the proposed action and define assessment goals.
2. Establish the geographic scope for the analysis.
3. Establish the time frame for the analysis.
4. Identify other actions affecting the resources, ecosystems, and human communities of concern.
5. Characterize the resources, ecosystems, and human communities identified in scoping in terms of their response to change and capacity to withstand stresses.
6. Characterize the stresses affecting these resources, ecosystems, and human communities and their relation to regulatory thresholds.
7. Define a baseline condition for the resources, ecosystems, and human communities [against which the magnitude and significance of impacts will be measured].
8. Identify the important cause-and-effect relationships between human activities and resources, ecosystems, and human communities.
9. Determine the magnitude and significance of cumulative impacts.
10. Modify or add alternatives to avoid, minimize, or mitigate significant cumulative effects.
11. Monitor the cumulative effects of the selected alternative and adapt management."[308]

A substantial amount of scientific data and information is needed to support most, if not all, of these steps.

The U.S. Navy's 2008 Hawaii Range Complex Environmental Impact Statement/Overseas Environmental Impact Statement (EIS/OEIS) provides a useful example of the type and quantity of scientific information

[308] CEQ Handbook, *supra*, note 106 at 10 (Table 1-5).

and approaches needed to understand the cumulative impacts of a major ocean action.[309] This EIS/OEIS evaluates impacts, including cumulative impacts, of the Navy's proposal to "support and conduct current, emerging, and future training and research, development, test, and evaluation (RDT&E) activities in the Hawaii Range Complex"—which includes the use of mid- and high-frequency active sonar (MFA and HFA sonar) off the Hawaiian Islands.

The Navy's five-volume Final EIS/OEIS addresses expected cumulative impacts of the project in the Hawaii Range Complex region, including potential impacts to air quality, airspace, marine biological resources, terrestrial biological resources, migratory wildlife, cultural resources, hazardous materials and wastes, noise, socioeconomics, and water resources.[310] The Final EIS/OEIS evaluates the geographic area that would be affected by the proposed project; the impacts expected in that area from the proposed project; other past, present, and reasonably foreseeable future projects that have affected or are expected to affect the area; the effects or expected effects of these other actions; and the total impact expected if individual effects accumulate.

The EIS/OEIS identifies the geographic area affected by the proposed project and defines geographic boundaries for analysis on a resource-by-resource basis. The geographic boundary used to assess cumulative impacts on wide-ranging or migratory wildlife, for example, was the range of the affected populations, given the potential for impacts of the proposed action to combine with impacts of other actions located throughout the populations' ranges. The geographic boundary used for all other marine resources was the ocean ecosystem of the central North Pacific Ocean.[311]

Within the defined geographic boundaries, the EIS/OEIS presents best available science concerning the affected environment and the anticipated impacts of the Navy's action. With regard to marine mammals, the EIS/OEIS describes the range, abundance, distribution, behavior, and acoustic ability of twenty-seven marine mammal species potentially affected by the project, including whales and dolphins. It discusses natural and human-induced risks to marine mammals, including disease, commercial fishing, coastal development, ship strikes, commercial shipping, whale watching, and commercial and military sonar, that could combine with the proposed action to result in cumulative impacts. In addition, the EIS/OEIS identifies over 150 past, present, or reasonably foreseeable projects or actions that have had or may have impacts in the same area, and qualitatively describes the potential impacts of these other actions.

In light of the controversial nature of sonar use in ocean environments, the EIS/OEIS devotes substantial attention to the potential impact of MFA and HFA sonar use on marine mammals. In addition to summarizing and discussing available information, the EIS/OEIS highlights key information gaps, including those pertaining to: (1) the effect of MFA sonar on marine mammals;[312] (2) the effect of ship strikes on marine mammals and the quantity and type of mammal involved;[313] (3) the impact of coastal

[309] In 2007, the Navy prepared a Draft EIS/OEIS for the proposed Hawaii Range Complex project and circulated the document for public comment. EIS/OEIS, ES-5. Following preparation of the Draft EIS/OEIS, the Navy, in coordination with the National Marine Fisheries Service, re-analyzed the effect of mid-frequency active sonar on marine mammals. The re-analysis, and discovery of new information, resulted in a Supplement to the Draft EIS/OEIS, which was circulated for public comment in 2008. The results of environmental analyses in the Supplement to the Draft EIS/OEIS are incorporated in the Final EIS/OEIS.
[310] EIS/OEIS, 5-3.
[311] *Id*.
[312] *Id*. at ES-6.
[313] *Id*. at 5-20.

development on whales;[314] (4) "how, or at what levels and in what combinations, environmental contaminants may affect cetaceans" and their role in cumulative impacts;[315] and (5) the specific impacts of natural occurrences (storms, algal blooms, hypoxia, earthquakes, prey species variability, and other disturbances) on marine mammals, and their role in cumulative impacts.[316] These gaps are not filled during the environmental review process; rather, decision-making proceeded in the face of scientific uncertainty.

A January 2010 letter from Under Secretary of Commerce Jane Lubchenco to the Council on Environmental Quality highlighted the types of research needed to improve the way sonar use impacts are addressed during permitting and decision-making.[317] Specifically, the letter calls for a comprehensive sound budget for the ocean that could be used to develop "comprehensive baselines with which to measure cumulative sound impacts." It also calls for improved population estimates and fine-scale density estimates of whales in sensitive or otherwise important areas, and workshops to better understand marine mammal "hot spots." If developed, a comprehensive sound budget could be used to identify and quantify noise from various sources and to spatially map the relative contributions of various sectors to ocean noise within a region. This information could help evaluate the impact of noise on resources for use in regional planning or project-level environmental assessments. For purposes of environmental review, this information could help identify areas where an incremental change in ocean sound could significantly impact the environment.

2. Addressing Cumulative Impacts during Regional Planning

Cumulative impacts also should be addressed proactively at the regional level through ocean planning and management. Regional cumulative impact analyses can promote broad-scale understanding of the net effects of ocean use and activity, taking into account the inter-connectivity between resources, and between resources and the environment. Managing cumulative impacts for regional ocean management requires spatial information about multiple species and human uses across jurisdictions and management sectors; the types, distribution, and value of ecosystem services; and information regarding ecosystem stressors and threats, among other information types. To effectively manage these impacts, managers are then called upon to make proactive tradeoffs among potentially competing ocean uses within and among ocean use sectors.

The Massachusetts ocean planning process provides one example of the types of scientific information involved in ocean management planning and the challenges to effectively addressing cumulative impacts at the regional level. Massachusetts promulgated the *Massachusetts Comprehensive Ocean Management Plan* in 2009 to strengthen stewardship of ocean waters and resources under state jurisdiction. The scientific basis for the Plan is the *Baseline Assessment of the Massachusetts Ocean Planning Area*. The Baseline Assessment assembles and synthesizes best available science on present conditions, characteristics, and human uses within the marine planning area.[318] It identifies key ecosystem components and maps the distribution, density, and abundance of "special, sensitive or

[314] *Id*. at 5-28.
[315] *Id*. at 5-28.
[316] *Id*. at 5-30.
[317] Letter from Under Secretary of Commerce for Oceans and Atmosphere to CEQ Chair Nancy Sutley, dated January 19, 2010, *available at* http://www.nmfs.noaa.gov/pr/pdfs/permits/lubchenco_letter.pdf.
[318] *See generally* Commonwealth of Massachusetts, *Massachusetts Ocean Management Plan*, vol. 2 (2009).

unique [SSU] estuarine and marine life and habitats."[319] It also maps significant human uses within and adjacent to the management area, including renewable energy development, and identifies specific areas suitable for wind energy development. Further, it identifies important pressures and threats (e.g., water pollution) and principal drivers of ecosystem change. The Baseline Assessment incorporates an adaptive management element and must be updated every five years.

A key issue in developing the Plan was handling data variability. Specifically, the Baseline Assessment observes that: "Within the ocean management planning area . . . , available data varies spatially, temporally, and in terms of depth, precision, and accuracy for most subjects…In the future, one of the important ocean management activities will be addressing data variability and filling data gaps, particularly for priority issue and management concerns."[320] Because of the ambitious schedule established by the Oceans Act, Massachusetts did not collect new data or develop new monitoring programs to develop the Plan, but relied instead on existing data. Information gaps and data variability will likely be addressed as the Plan evolves.

In conjunction with Plan development, Massachusetts prepared a *Science Framework* to address the scientific research and data acquisition needed to support continued evolution of the Plan. The Science Framework highlights the need to:

1. "Further develop the approach to identifying special, sensitive, or unique estuarine or marine life and habitats by incorporating new and enhanced data resulting from targeted scientific research into habitat classification, ecological assessment models, and/or similar efforts;
2. Obtain/augment human use data for use in compatibility analysis, tradeoffs analysis, ecosystem services evaluation, or other aspects of ocean planning that require spatial information regarding human uses;
3. Increase the understanding of climate change effects on marine and coastal systems and the resulting implications and considerations for management actions;
4. Identify the impacts of anthropogenic stressors on coastal/marine ecosystems, with particular attention to cumulative impacts;
5. Develop an indicator framework (supported by appropriately temporally and spatially scaled monitoring) to assess and improve the effectiveness of management measures and enable status and trends analysis;
6. Enhance data availability for appropriate use in management by supporting: quality assurance/quality control during research, development of research plans at appropriate temporal and spatial scales, and the data delivery protocols that maximize utility for managers and others; and
7. Inform managers and the public of scientific findings and provide for appropriate translation/dissemination vehicles."[321]

[319] MASS. GEN. LAW ch 21A § 4C (2008).
[320] Commonwealth of Massachusetts, *Massachusetts Ocean Management Plan*, *Baseline Assessment*, vol. 2 (2009) at BA 1-2.
[321] Commonwealth of Massachusetts, *Massachusetts Ocean Management Plan*, *Science Framework*, vol. 2 (2009) at SF-4.

These regional research priorities are focused on strengthening EBM and managing cumulative impacts in Massachusetts' waters. However, regional information that is developed and integrated into Massachusetts' ocean planning also could support and inform environmental permitting and decision-making under MEPA.

At present, Massachusetts is working with partners to address the research and data needs and actions identified in the Science Framework. One partner is the Massachusetts Ocean Partnership (MOP), an organization that works to advance stakeholder-informed ocean management in Massachusetts and beyond.[322] MOP is privately funded by the Moore Foundation, and contributes expertise and resources to advance the Science Framework priorities. MOP projects and programs include a cumulative impacts/vulnerability assessment to help "implement and advance a framework for assessing impacts associated with multiple uses," ecosystem services tradeoff modeling and visualization tools, a catalogue of EBM science and planning tools, and a set of indicator initiatives that will help measure the effectiveness of the Plan and demonstrate the status and trends of key ecosystem services.[323]

C. Science and Technology Needs for Strengthening Cumulative Impact Analysis and Decision-Making

This section discusses science needs and approaches to overcome challenges in analyzing cumulative impacts and support effective ocean management.

1. Address Data and Information Gaps

Cumulative impact analyses must be supported by robust scientific information to ensure that ocean activities and uses allow the continued delivery of critical ecosystem services. Decision-makers should rely on the "best available information," but it is also clear that key information gaps exist and should be filled, and ecosystem models and other tools developed to properly evaluate and manage cumulative impacts and support effective management.

There are numerous data needs and information gaps that, if filled, could improve the ability of managers and practitioners to more effectively consider and manage cumulative impacts. These include specific information needs tailored to individual projects or actions, and information needed to support regional approaches to management. This section presents four key research needs to support an ocean governance system that effectively considers cumulative impacts at regional and project-levels:

(1) develop baseline information related to key species, habitats, and human activities;
(2) identify key ecosystem services and values;
(3) understand interconnections between and among activities, resources, and ecosystems; and
(4) develop methods and approaches for integrating climate-change information into decision-making.

These examples are not intended to constitute a complete list of the research needed to perform effective analyses, but rather to highlight important gaps in our understanding. Further, we note that

[322] Massachusetts Ocean Partnership, *About MOP*, *available at* http://massoceanpartnership.org/about/mission.
[323] Massachusetts Ocean Partnership, *Tools to Inform Decision Making*, *available at* http://massoceanpartnership.org/science-stakeholders/overview/tools-to-inform-decision-making/

Similar regional and state-specific research priorities are considered in several other reports, including Sea Grant's West Coast Regional Marine Research and Information Needs (2009), California Ocean and Coastal Information, Research, and Outreach Strategy (2005); and Ocean Protection Council Program Priorities 2009 through 2010;[324] although, the priorities in these reports do not explicitly or exclusively focus on cumulative impacts.

Although some data gaps may be filled using regulatory authority under NEPA, SEPA, and CEQA (*see* Table 7 above), during the development of CMS Plans, or through existing public-private partnerships, it is clear that additional funding, partnerships, and capacity are necessary to meet key data and information needs.[325]

Science Need: Develop Baseline Information Related to Key Species, Habitats, and Human Activities

A key challenge in analyzing cumulative impacts is that managers and practitioners frequently lack even basic data and information concerning key species, habitats, and human activities. This information is required to support baseline assessments for measuring the magnitude and significance of regional or project/action-level cumulative impacts. It is an essential aspect of effective science-based decision-making.

Science is needed to identify and characterize key species, habitats, functions, ecosystem processes, and ocean uses to inform and support robust baseline assessments. ELI's interviews specifically identified the following information needs that should be addressed to develop a strong scientific platform for decision-making:

- understand the abundance, distribution, dynamics, and inter-linkages between and among important species and ecosystem functions;
- improve understanding of species, ecosystems, and processes, particularly in Oregon;
- understand the impacts from fishing in Oregon;
- understand how new activities will impact ecosystems;
- understand the impacts, causes, and dynamics of hypoxic events and other ocean stressors;
- understand the impacts of runoff from agriculture and urban areas;
- understand how pollutants in the ocean combine to cause impacts;
- develop fine scale data to facilitate use of models for decision-making at local scales; and
- develop information about how different activities interact to affect ecosystems.

In collecting new information, researchers should prioritize and address information gaps concerning *important* species, ecosystem components, and processes, particularly those that are vulnerable, sensitive, unique, or important. This may include developing spatial data and mapping tools to identify significant human activities in the CCLME that may contribute to cumulative impacts. California has

[324] Ocean Protection Council, Ocean Program Priorities for 2009 through 2010 & California Ocean and Coastal Information, Research and Outreach Strategy (IRO) (2005), *available at* http://www.opc.ca.gov/council-documents/.

[325] Managers and practitioners have substantial opportunities to collect new information vital to project-level decision-making consistent with NEPA, SEPA, and CEQA regulatory requirements (see Table 7, *supra*). In addition, data gaps may be filled during regional planning processes, such as during the development of comprehensive CMS Plans or by establishing public-private partnerships.

already begun work in this direction for state and federal waters off California, but similar information could be developed for other CCLME areas.[326]

Specific needs for developing and improving baseline assessments should be identified in a CCLME research plan that is periodically updated and communicated to entities engaged in managing ocean resources and ecosystems. Policy makers specifically should consider key information gaps, tools, and needs identified during the development of the Integrated Ecosystem Assessment (IEA) for the CCLME, which could advance regional and project-level decision-making in developing regional research priorities. They may also consider data and information needs identified in existing assessment programs (e.g., five-year biological assessments performed by the Port of Long Beach and Port of Los Angeles), or opportunities for expanding these programs into other regions.

Box 29. The California Ocean Uses Atlas—Filling Gaps in Baseline Understanding

The California Ocean Uses Atlas Project is a public-private partnership between NOAA's Marine Protected Areas Center and the non-profit Marine Conservation Biology Institute. With funding from the Gordon and Betty Moore Foundation and the Resources Legacy Fund Foundation, the Project fills a key information gap for management by "mapping, for the first time, the full range of significant human uses of the ocean in state and federal waters off the coast of California."[327] The thirty significant human uses mapped include non-consumptive uses, various types of commercial and recreational fishing, and industrial/military uses.[328] The products from this Project include regional and state-wide maps displaying the location and extent of individual, sector-based, or all-sector uses, GIS geodatabases, case studies, and an online mapping tool. The maps provide important baseline information that can be used in cumulative impact analyses. Expansion of the Project or the development of compatible projects in Oregon and Washington could inform planning and decision-making in those areas as well.

Science Need: Identify Key Ecosystem Services and Values

A key goal of EBM is to minimize cumulative impacts while maximizing delivery of important ecosystem services. Lester et al. (2010) identifies the following key services in the CCLME: "fisheries (commercial, recreational and subsistence), aquaculture, shoreline protection and other regulating services, supporting services such as spawning and nursery habitat for fishery species, energy (wind, wave and

[326] National Marine Protected Areas Center, *The California Ocean Uses Atlas*, *Data & Analysis*, *available at* http://www.mpa.gov/dataanalysis/atlas/.
[327] National Marine Protected Areas Center, *The California Ocean Uses Atlas*, *Data & Analysis*, *available at* www.map.gov/dataanalysis/atlas/.
[328] The types of uses are: beach use, motorized boating, paddling, sailing, SCUBA/snorkeling, surface water sports, swimming, tidepooling, Tribal/Native American spiritual uses, wildlife viewing at sea, commercial dive fishing, commercial fishing with benthic fixed gear, commercial fishing with benthic mobile gear, commercial kelp and algae harvest, commercial pelagic fishing, hunting for marine animals other than fish or invertebrates, recreational kayak fishing, recreational and commercial fishing from shore, recreational dive fishing, recreational fishing from boats (benthic species), recreational fishing from boats (pelagic species), shore-based recreational harvest, aquaculture, cruise ships, mining and mineral extraction, military operations, offshore alternative energy, offshore oil and gas, shipping, and underwater cables. National Marine Protected Areas Center, California Ocean Uses Atlas: List of Uses, available at www.mpa.gov/dataanalysis/atlas.

tidal), recreation, tourism, cultural significance, and aesthetic value."[329] Managers and practitioners need information, tools, and approaches to draw ecosystem service information into environmental decision-making at regional and local scales.[330]

In order to incorporate ecosystem services into regional planning and project-level decision-making, managers and practitioners require comprehensive information related to precise types, quantities, and spatial distribution of key ecosystem services and values in CCLME areas. They also require information on how activities can affect delivery of ecosystem services and approaches for monitoring to ensure that impacts to key services do not result in significant loss of the services people want and need. Effectively addressing cumulative impacts may also require approaches for prioritizing services, mapping tools to evaluate multiple ecosystem services, approaches for developing social, economic, and ecological metrics and assigning value to key ecosystem services, and protocols for integrating this information into regional and project-level analyses.

Box 30. Natural Capital Project—Developing Tools to Evaluate Ecosystem Services

The Natural Capital Project is a partnership among the Woods Institute for the Environment at Stanford University, The Nature Conservancy, the University of Minnesota's Institute on the Environment, and the World Wildlife Fund. The Natural Capital Project is developing tools and approaches to map ecosystem services and quantify their values, and to incorporate this information into environmental management and decision-making.[331] Available tools include a suite of science-policy interface tools, like InVEST (Integrated Valuation of Ecosystem Services and Tradeoffs). InVEST is a publicly available method to model and map the distribution, delivery, and value of ecosystem services that can be applied in various policy and planning contexts, including marine spatial planning. With this tool, users can evaluate the economic value of resources and activities, as well as biophysical costs and benefits.

Science Need: Understand Interconnections Between and Among Activities, Resources, and Ecosystems

Ocean and coastal ecosystems are highly dynamic and complex. Cumulative impacts only can be understood fully by considering the complex linkages between species, activities, ecosystem components, processes, and functions in the CCLME. However, there is presently significant scientific uncertainty concerning the interactions between and among multiple species, and between species and the environment. There is also substantial uncertainty about the ways in which various activities might interact to affect ecosystems and ecosystem components. Science is needed to better understand the inter-connections between species and ecosystems (including connections between oceans and land) to

[329] Sarah E. Lester et al. *Science in support of ecosystem-based management for the US West Coast and beyond*, BIOL. CONS. 143: 576-587.
[330] Heather Tallis et al., *New metrics for managing and sustaining the earth's bounty*, MAR. POL. (2011) (in press) (defining tools to quantify, measure, track and evaluate ecosystem services and values to support marine planning).
[331] Natural Capital Project, *About The Natural Capital Project*, *available at* http://www.naturalcapitalproject.org/about.html; *see also* Environmental Law Institute, *Ocean and Coastal Ecosystem-Based Management: Implementation Handbook*, 116-17 (2009).

support impact predictions, and monitoring and adaptive strategies, and to strengthen basic understanding of ecosystem health.[332]

Box 31. Ecosystem-Based Management Tools Network—Understanding Ecosystem Linkages

The Ecosystem-Based Management Tools Network is a public database of existing tools that can help implement EBM approaches. The EBM Tools Network has assembled a suite of resources for understanding ecological linkages between and among species, habitats, and other ecosystem components. These tools can: (1) identify available conceptual models for specific ecosystems; (2) identify key ecological linkages that should be considered in decision-making; and (3) evaluate policy and management options that better account for ecological linkages. They include models (e.g., Coastal Transects Analysis Model), approaches (e.g., marine spatial planning tools), and other resources to help consider and understand ecological linkages in the marine environment. One of the approaches highlighted on the website is NOAA's Integrated Ecosystem Assessments (IEAs) tool.[333] The site also identifies relevant scientific research, including a Special Issue on Marine Population Connectivity, issued by Oceanography in 2007.

Science Need: Identify the Thresholds at Which Ecosystem Resilience is Affected

If possible, practitioners and managers should analyze cumulative impacts in relation to quantitative ecosystem thresholds that define the point at which ecosystem resilience is affected. It is known that "[e]cosystems can recover from many kinds of disturbance, but are not infinitely resilient. There is often a threshold beyond which an altered ecosystem may not return to its previous state."[334] For example, at some level of nutrient input, ecosystems like Hood Canal can experience a rapid regime shift from oxic to hypoxic conditions—an example of non-linear ecosystem change. Hypoxic ecosystems also show resistance to returning to prior conditions.[335] Identifying appropriate ecosystem indicators and thresholds would help avoid shifts to undesirable ecosystem states.

With regard to the marine environment, agencies generally suffer from a lack of adequate knowledge or direction about resource and ecosystem thresholds or carrying capacities. "Without a clear idea of what magnitude of change is unacceptable, agency decision-makers find it difficult to conclude whether they should modify their decisions in response to these problems or do additional assessments of the effects

[332] MRAG Americas, Inc. et al., *Draft Science Tools to Implement EBM in MA* (2009) offers some tools and models that may help planners understand inter-linkages between ecosystem components in the ocean environment.
[333] Phillip S. Levin et al., *Integrated Ecosystem Assessments*, NOAA TECHNICAL MEMORANDUM NMFS-NWFSC-92 (2008). In brief, an IEA is a formal synthesis and quantitative analysis of information on relevant natural and socioeconomic factors relative to specified ecosystem management goals."The IEA process follows a Driver→Pressure→State→Impact→Response framework. Specially, it considers: (1) drivers of ecosystem change; (2) pressures on the ecosystem caused by those drivers; (3) the state of the ecosystem as a result of those pressures; (4) the impact of the state of the ecosystem; and (5) the management response. For example, a driver of ecosystem change could be agricultural runoff, resulting in coastal nutrient inputs (the pressure) and areas of hypoxia (the state).
[334] Scientific Consensus Statement, *supra* note 237.
[335] Daniel J. Conley et al., *Ecosystem thresholds with hypoxia*, HYDROBIOLOGIA 629: 21-29 (2009).

of their actions."[336] Research could identify thresholds at which ecosystem function is affected in the marine environment. New impact limits should include an ample precautionary margin to address scientific and management uncertainty and avoid surpassing the threshold level in practice. In the absence of ecosystem thresholds, managers should rely on sector-specific and possibly ecosystem impact limits, combined with the precautionary approach.

Science Need: Develop Methods and Approaches for Integrating Climate-Change Information into Cumulative Impacts Analysis and Decision-Making

Climate change is perhaps the most pressing issue facing U.S. ocean and coastal environments. The impacts of climate change on these ecosystems include ocean acidification, sea level rise, and impacts on coastal communities, jobs, and economies. Climate-change impacts may combine with human-use impacts and other stressors to result in cumulative effects on ocean and coastal resources, communities, and economies. These impacts must be considered in environmental impact assessments in many jurisdictions.[337]

Research is needed to strengthen our understanding of the near- and long-term impacts of climate change on oceans and coasts. ELI's interviews with ocean and coastal practitioners specifically revealed a need for information concerning the types and magnitude of climate change impacts at regional and local scales. They also highlighted a need for robust models, forecasts, and tools to understand how and to what extent climate change impacts will interact with human use and activity to result in cumulative effects.

Numerous entities have emphasized the need for improved scientific understanding of climate change impacts on ocean ecosystems. A 2010 Sea Grant report itemizes specific research needs, including the need to: (1) estimate current and anticipated future changes in ocean circulation; (2) understand the drivers and impacts of ocean acidification; (3) understand how "climate change will impact social and ecological systems, and which mitigation, adaptation, and response strategies will be successful;"[338] and (4) understand the relationship between physical oceanographic conditions and ocean ecological conditions, and their interactions (both present and future).[339] The Partnership for Interdisciplinary Studies of Coastal Oceans,[340] the National Center for Ecological Analysis and Synthesis,[341] and others, also are conducting research to identify how climate change will impact oceans and coasts, and support policy decisions.

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[336] Lance N. McCold, *Reducing global, regional, and cumulative impacts with the National Environmental Policy Act*, ENVTL PROF 13: 107-113, 107 (1991).

[337] *See, e.g.*, *Center for Biological Diversity v. Nat'l Highway Traffic Safety Admin.*, 538 F.3d 1172 (Ninth Circuit 2007); Matthew P. Reinhart, *The National Environmental Policy Act: what constitutes an adequate cumulative environmental impacts analysis and should it require an evaluation of greenhouse gas emissions?* 17 U. BALT. J. ENVTL. L. 145 (2010).

[338] Sea Grant, *West Coast Regional Marine Research and Information Needs*, at 50 (2010).

[339] *See generally*, *id*.

[340] The Partnership for Interdisciplinary Studies of Coastal Oceans *available at* http://www.piscoweb.org/topics/climate-change.

[341] The National Center for Ecological Analysis and Synthesis, *Ecological Effects of Climate Change*, *available at* http://www.nceas.ucsb.edu/ecology/climate.

Box 32. The Partnership for Interdisciplinary Studies of Coastal Oceans—A Model Approach for Addressing Climate Change Information Needs

The Partnership for Interdisciplinary Studies of Coastal Oceans (PISCO) is a research and monitoring program led by a consortium of marine scientists from four West Coast academic institutions. The program is focused on strengthening ecosystem science on the U.S. West Coast and sharing scientific knowledge with managers and policy makers so that it can inform science-based ocean and coastal decision-making. PISCO's climate-change research specifically focuses on understanding the ecosystem impacts and causes of ocean acidification and hypoxia in the CCLME, and answering management and policy questions. Notably, with regard to ocean acidification, PISCO has developed a "Consortium Approach," designed to match science with the information needs of managers and regulators, which has five basic elements: (1) conducting continuous ecosystem monitoring and scientific research to understand how the ecosystem responds to acidification; (2) managing data in standardized ways and making it accessible; (3) conducting outreach to make science usable; (4) training future ocean leaders; and (5) coordinating and integrating efforts. This type of collaborative, coordinated science-to-policy system could serve as a model system for answering other important climate change and scientific research questions.

2. Strengthen Approaches for Accessing, Managing, Synthesizing, and Communicating Data and Information

In addition to strong science and information, managers and practitioners require robust tools, approaches and strategies for sharing, managing, synthesizing, and communicating data and information to interested parties in order to effectively address cumulative impacts. At present, data and information relevant to CCLME management is collected, stored, and managed by multiple institutions, management sectors, and jurisdictions. By strengthening access to data and science, managers and practitioners can have a more complete understanding of the environmental consequences of their decisions. In addition, improved access to data decrease the cost and time required to develop cumulative impact assessments, and avoid duplicating the efforts of government agencies and others.[342]

This section presents several options for strengthening the science, technology, and institutional capacity for cumulative impact analysis and decision-making.

Science Need: Cost-Effective Tools and Approaches for Sharing and Managing Data and Information
Cumulative impacts will be more effectively managed if various sectors and levels of governance (regional, state, local) make decisions based on shared information. Federal, state, and local managers need information about activities and uses regulated by multiple management sectors and jurisdictions, and the impact or anticipated impact of those uses. At present, a significant amount of ecological, social, and economic data is available to inform management decisions, but it is housed in dispersed sources, including at federal, state, and local agencies and departments, in scientific literature, and at academic institutions. As a result, managers and practitioners spend substantial time and resources identifying,

[342] Katherine Andrews, *supra*, note 307 at 34 (Citing C. Ehler & F. Douvere, Visions for a Sea Change: Report of the First International Workshop on Marine Spatial Planning, Intergovernmental Oceanographic Commission and Man and the Biosphere Programme, IOC Manual and Guides 46, ICAM Dossier 3, Paris: UNESCO (2007) at 27).

collecting, and synthesizing data and information to support regional initiatives and project-level assessments, in a process that could be described as inefficient at best.

Managers and practitioners require new or improved tools and approaches to connect strong science and information to the decision-making system effectively. This includes protocols, tools, and approaches to:

- store information related to the status or resources and ecosystems, and past, present, and future uses and activities electronically so that it can be effectively used in decision-making;
- timely share information developed for regional and project-level environmental assessments;
- timely analyze and share regional and project-level monitoring data so that it can efficiently feed into management and decision-making; and
- share lessons learned in adaptive management.

By timely connecting dispersed data and information to the decision-making system, managers will be better poised to understand the status and condition of resources and ecosystems and to evaluate management success.

Box 33. California's Marine Protected Area Monitoring Network

California launched the Marine Protected Area (MPA) Monitoring Enterprise in 2007 to "lead the development and implementation of impartial, scientifically rigorous and cost-effective MPA monitoring."[343] The Monitoring Enterprise: (1) plans MPA monitoring; (2) implements monitoring; (3) analyzes monitoring data; and (4) reports on monitoring results. Importantly, the MPA Monitoring Enterprise does not collect MPA monitoring data itself. Rather, the Monitoring Enterprise leads the implementation of data collection through its partnerships with federal and California agencies, researchers, and others. The Monitoring Enterprise makes MPA monitoring data available to managers and decision-makers to support MPA management decisions via on online monitoring hub.

Science Need: A Common, Central Information System that Integrates Information for Regional and Project-Level Decision-Making

A key need for a CCLME ocean governance system is a common, central information system that can link regional and project-level assessments and decision-making. Such a system could serve as an integral part of an improved system for storing, sharing, and managing ocean and coastal data and information. To be most effective, such a system would need to be combined with tools and incentives to facilitate the transfer of information from all levels of ocean governance (regional, state, local) and relevant management sectors.

Information in this system ideally would inform, and be informed by, regional and project level ecosystem and baseline assessments and monitoring results in the CCLME. To be most useful, this

[343] Marine Protected Area Monitoring Enterprise, *About Us*, *available at* http://monitoringenterprise.org/about.php.

system should be accessible to practitioners, agency staff, and the public for use in regional planning and project-level decision-making. Funding and institutional investment will be required to develop an effective information system that can meet regional and project-specific needs.

Developing this system would require effective mechanisms for transferring relevant information from dispersed sources and protocols, and approaches for standardizing relevant data (*see* below). Data and information in this system should be updated continuously to ensure the best available science is used in assessing cumulative impacts and managing human use and activity.

At the national level, the Interagency Ocean Policy Task Force already has emphasized the need for a national integrated information system, stating that it is a priority objective of the United States to:

> Strengthen and integrate Federal and non-Federal ocean observing systems, sensors, data collection platforms, data management, and mapping capabilities into a national system, and integrate that system into international observation efforts.[344]

According to the Task Force, progress towards achieving this priority objective should strengthen "our ability to obtain and use science and information, and to facilitate transparency and access to critical data and information for "science-based management across authorities and governance structures…."[345]

Box 34. Digital Coast – A Central Repository of Tools and Information

NOAA Coastal Services Center leads the Digital Coast effort with extensive input from its partners, including the Coastal States Organization and the National Association of Counties. The Digital Coast is focused on centralizing useful tools and information. It is intended to serve as a repository of data, tools, and training for coastal decision-makers.[346] Coastal data that can be accessed through this portal include benthic, elevation, hydrography, land cover, marine boundaries, imagery, and socioeconomics. One of its main features is the Legislative Atlas, which maps the limits and boundaries of federal and state area-based laws on GIS maps.[347] The datasets and models housed at this site are derived primarily from NOAA sources, but the site also includes datasets and tools developed by the U.S. Army Corps of Engineers, U.S. Geological Service, Oregon State University, and other partners.

[344] Interagency Ocean Policy Task Force, *supra*, note 8 at 6.
[345] Interagency Ocean Policy Task Force, *supra*, note 8 at 29.
[346] Environmental Law Institute, *Ocean and Coastal Ecosystem-Based Management: Implementation Handbook*, at 59 (2009); NOAA, Coastal Services Center, *Digital Coast Details*, *available at* http://www.csc.noaa.gov/digitalcoast/about.html.
[347] Environmental Law Institute, *Ocean and Coastal Ecosystem-Based Management: Implementation Handbook*, at 59 (2009); M. Freeman, *NOAA's GIS-Enabled Web Site helps Resource Managers Navigate Legislation*, ARCWATCH (Dec. 2007), *available at* http://www.esri.com/news/arcwatch/1207/noaa.html.

Box 35. Lessons from Massachusetts – Development of a Central Database to Support State Ocean Planning

The Massachusetts Ocean Resource Information System (MORIS) is one example of an information system developed to support comprehensive ocean planning. MORIS is a web-based mapping tool created by the state of Massachusetts and partners. With this tool, "[u]sers can interactively view various data layers, create and share maps, and download the data for use in a Geographic Information System (GIS)."[348] The available datasets include those related to: ocean use, bathymetry, fisheries, biological resources, and habitat distribution and abundance. Although MORIS specifically houses data used to develop and update the Massachusetts Comprehensive Ocean Management Plan, it can also be used to support project-level environmental permitting and assessments.

Science Need: Standardized Methods and Approaches for Information Collection and Storage

A key challenge in adequately analyzing cumulative impacts is synthesizing and reconciling data and information collected using different methods and approaches. As the Massachusetts experience with comprehensive ocean planning illustrates (discussed *supra*), protocols for collecting scientific data and information can be highly variable, and the data and information collected can also vary tremendously in precision and accuracy. This presents significant challenges to synthesizing or making sense of relevant information in developing environmental assessments or analyzing impacts.

In general, there is a need to reconcile "inconsistent standards, physical infrastructure, research platforms, organizations, and data management, to identify critical gaps, ensure high quality data, and provide information necessary to inform management, including mechanisms to transition research results into information products and tools for management."[349] Standardized protocols and methods for data collection and storage may help synthesize ecosystem data and information from dispersed sources, and integrate new data collected during environmental monitoring and adaptive management. Standardized data collection and reporting approaches also may facilitate regional and project-specific environmental impact assessments, and should reduce the time and expense of preparing and interpreting information.

[348] Massachusetts Office of Coastal Zone Management, Massachusetts Ocean Resource Information System, *available at* http://www.mass.gov/czm/.
[349] Interagency Ocean Policy Task Force, *supra*, note 8.

Box 36. The Southern California Coastal Water Quality Research Project

The Southern California Coastal Water Quality Research Project (SCCWRP) is a regional government agency that brings together multiple federal, state, and local agencies to conduct coastal environmental research in Southern California. The scientific focus of the SCCWRP includes Southern California Bight ecology, integrated coastal management, watershed management, and sediment quality criteria.

In 1990, the National Research Council (NRC) issued a report finding that dischargers largely carried out water quality monitoring.[350] The NRC report also revealed that the monitoring methods used by dischargers were inconsistent, with different indicators and field and laboratory methods, and incompatible data formats, making it impossible to synthesize the data to analyze the water quality across the Southern California Bight.[351] In response, the SCCWRP coordinated marine monitoring in Southern California through standardized methods and coordinated data collection.[352] Its first collaborative assessment in 1994 included twelve local, state, and federal agencies and focused on fish and sediment quality.[353] Its second collaborative assessment in 1998 included sixty-two organizations, and the assessment was expanded to include bays, harbors, port areas, and nearby Mexican waters. It also added a microbiology component.[354] Today fourteen agencies and organizations participate in SCCWRP, including the most recent addition, the California Ocean Protection Council.[355] To achieve standardization, SCCWRP developed methods manuals, which now articulate procedures for monitoring facilities; conducted training exercises; and developed quality assurance protocols involving field audits and blind sample analysis.[356]

Science Need: Strong Tools and Approaches for Analyzing, Synthesizing, and Communication Data and Information

Researchers, managers, and practitioners often find themselves "drowning in data while gasping for knowledge of how ecosystems respond to human activities."[357] Although it is necessary to have sufficient data for ocean management, it is equally important to ensure that data and information are adequately synthesized, integrated, and communicated to support effective regional or project-level management.

[350] B.B. Bernstein & S.B. Weisberg, *Southern California's Marine Monitoring System Ten Years After the National Research Council Evaluation*, 81 ENVTL MONITORING & ASSESS 3 (2003); *see also* Environmental Law Institute, *Ocean and Coastal Ecosystem-Based Management: Implementation Handbook* (2009).
[351] *Id*. at 3-4.
[352] For a history of the Southern California Coastal Water Quality Research Project, *see* A.J. Mearns, M.J. Allen & M.D. Moore, *The Southern California Coastal Water Quality Research Project – 30 Years of Environmental Research in the Southern California Bight*, *in* SCCWRP 1999 ANNUAL REPORT, *available at* ftp://ftp.sccwrp.org/pub/download/DOCUMENTS/AnnualReports/1999AnnualReport/01_ar01.pdf.
[353] *Id*. at 20.
[354] Bernstein & Weisberg, *supra*, note 26 at 4.
[355] Southern California Coastal Water Research Project, *About SCCWRP – History*, *available at* http://www.sccwrp.org/view.php?id=456.
[356] *Id*. at 5.
[357] Phillip S. Levin et al., *Integrated Ecosystem Assessments: Developing the Scientific Basis for Ecosystem-Based Management of the Ocean*, PLOS BIOL. 7(1): e14 (2009).

Managers and practitioners require new or improved technologies and capacity for characterizing and analyzing the ecosystem data, including data mapping tools, modeling approaches, or methods for integrating data and information assembled from dispersed sources or time periods. Such technologies might include a Web-based information system for assembling monitoring data from dispersed sources and tools for packaging information for use by managers, practitioners, and others. It might also include development of integrated ecosystem assessments using existing data to indicate the overall health and sustainability of an ecosystem.

In addition, effective communication practices and approaches are also needed to ensure managers and practitioners are aware of new or existing intellectual resources (e.g., models, tools, decision-making frameworks, data). Specifically, "Products and tools with user-friendly interfaces such as interactive maps and searchable Web-served databases should be available in understandable, jargon-free language to facilitate science-based ocean and coastal decision-making. To make these tools more useful for management-critical needs, they should be developed with, and regularly evaluated by, those who will use them."[358] In addition, a system of review should be in place so that feedback on the utility or limitations of tools can be considered or addressed, and to prevent outdated approaches from becoming entrenched. As tools are evolve, it is important to ensure that agencies are making updates and using appropriate tools, and to address issues related to a lack of resources, institutional will, or capacity to use important resources.

Several programs have already been developed to make West Coast ocean and coastal information more accessible to managers, scientists, and decision-makers. These programs include: Ecosystem-Based Management Tools Network (EBM Tools), Digital Coast, and Partnership for Interdisciplinary Studies of Coastal Oceans (PISCO).

Box 37. The Multipurpose Marine Cadastre—Strengthening Data Management

The Multi-Purpose Marine Cadastre is one example of a useful data management system. This system relies on data and information from federal and state sources, and can provide geospatial baseline information, or fill data gaps, for regional planning and environmental permitting processes.[359] Users can select a specific ocean area and view the applicable jurisdictional boundaries, geology and seafloor data, marine habitat and biodiversity, restricted areas, laws, critical habitat locations, and other key features. In addition to providing baseline information, the Cadastre may assist practitioners in defining action alternatives that will result in less significant cumulative impacts during environmental impact assessments. Practitioners require a GIS data visualization application to view downloaded spatial data.

[358] Sea Grant, *supra*, note 338 at 18 (2009).
[359] NOAA, Coastal Services Center, Digital Coast Details, *available at* http://www.csc.noaa.gov/digitalcoast/tools/index.html.

Box 38. Synthesizing Existing Information to Evaluate Cumulative Human Impacts

In 2009, Benjamin S. Halpern, with support from the National Center for Ecological Analysis and Synthesis and Gordon and Betty Moore Foundation, developed a quantitative assessment of cumulative human impacts in the CCLME. The research team compiled data on twenty-five anthropogenic drivers that encompassed the effects of climate change, fishing, and pollution. Data was not available for stressors such as disease, altered freshwater input, hypoxic zones, or sea level rise.[360] The drivers were then impact-weighted according to standardized quantitative estimates of the varying effects each of the activities would have in nineteen different marine ecosystems. The authors produced a one-square-kilometer resolution map that accounts for both the extent and relative contribution of different human activities to cumulative impacts.

The datasets and mapping tool developed for this project are freely available to assist decision-making. The cumulative impacts map provides insight into areas suitable for focused mitigation, restoration, or preservation and can provide a baseline against which to compare future ocean conditions. The map also can provide information related to the spatial overlap of impacts across the CCLME. The datasets are particularly useful for assessing impacts at the regional level and, with higher resolution data, they could also be useful for some local-scale decisions and actions.

Science Need: A GIS-Based System to Monitor and Track All Projects and Map Predicted and Actual Impacts of Projects

Ocean projects and activities subject to NEPA, SEPA, and CEQA EIS or EIR requirements require consultants and agency staff to review, amass, and evaluate vast amounts of ecological, social, and economic data and information from dispersed sources. Relevant information is synthesized in an environmental impact statement or report and other permitting records, but that information generally becomes obsolete once the review process is complete.

To streamline this process, and avoid redundant efforts in collecting information, ocean projects and activities subject to EIS or EIR requirements could be characterized in a comprehensive West Coast Geographic Information System (GIS). A GIS-based system could provide managers and practitioners with spatial information on all projects and actions in the CCLME, which could be displayed and tracked on regional or sub-regional maps. This system could strengthen and support the development of regional ecosystem assessments by identifying concentrations and types of existing or planned human use and other baseline information. It could also strengthen cumulative impact assessments for proposed projects by identifying past and present uses within a specified area, and providing spatial information on the predicted and actual impacts of these projects for to be used analytically in environmental review processes. It could also inform baselines, performance standards, and the

[360] Benjamin S. Halpern et al., *supra*, note 7. The twenty-five drivers were: beach access, coastal engineering, ocean deposition, inorganic pollution, invasive species, light pollution, nutrient runoff, ocean engineering, organic pollution, fish farming, ocean-based pollution, power plants, ocean acidification, sediment runoff increase, sediment runoff decrease, shipping, sea surface temperature change, coastal waste, UV, demersal destructive fishing, demersal non-destructive high-bycatch fishing, demersal non-destructive low-bycatch fishing, pelagic high bycatch fishing, pelagic low-bycatch fishing, and recreational fishing.

identification of environmental trends, relevant during project-level permitting, thereby reducing the cost to industry and governments of collecting this information *de novo*.

Further, a GIS-based system could help track monitoring commitments and results within an area, and could determine the success of mitigation measures. This information could be used to identify appropriate mitigation strategies for proposed projects, including potential locations and successful means of compensatory mitigation. In addition to cost, the primary downside to developing a GIS-based system is the greater complexity involved in developing this type of tool as opposed to more commonly used databases.

Box 39. ReCAP—Calling for a GIS-Database for Evaluating Regional Cumulative Impacts

The California Coastal Commission completed two Regional Cumulative Impact Assessment Program (ReCAP) assessments that evaluated Local Coastal Program (LCP) effectiveness in addressing cumulative impacts.[361] These were: (1) a pilot project in Monterey Bay region; and (2) a project covering the area between the Santa Monica mountains and Malibu.[362] In conducting these assessments, the Commission identified a number of technological and financial obstacles to effectively analyzing regional cumulative impacts. These obstacles included incompatible computer and database structures across agencies in the region and data ownership issues.

Significantly, the Commission learned that agency approaches to data management and storage are not conducive to effectively managing cumulative impacts. Much of the data relevant to assessing cumulative impacts existed only in hard-copy permit applications in dispersed agencies, institutional memory, or from outside experts, which precluded analysts from quickly and easily accessing relevant data and information.[363] In addition, data and information often was filed away with permit applications, and therefore could not easily be retrieved or used in determining the cumulative impact of projects in a region. Further, where data was stored electronically, agencies often used different computers and data storage approaches making it difficult to share data and information. The practical result of these issues was that neither the Commission nor local governments could, for example, "provide a running total of how many acres of wetlands were disturbed this year or how many square feet of beach was covered by rip-rap revetments this year. That kind of information needs to be easily available to permit analysts when the next wetland or rip rap proposal comes in, otherwise cumulative impacts are too difficult to include in permit review."[364]

To more effectively manage cumulative impacts, the Commission identified the need to make "'big-picture', contextual information available to permit analysts as they review individual permits so that each project could be reviewed in light of its contribution to cumulative impacts on coastal resources." The Commission recommended developing a GIS-based system to analyze the spatial relationship of permitted projects. Specifically, the GIS should provide permit analysts with spatial information about

[361]The ReCAP program is described in further detail in Box 12; *see also* California Coastal Commission website, *available at* http://www.coastal.ca.gov/recap/rctop.html.
[362] *Id*.
[363] California Coastal Commission, *ReCAP Pilot Project Findings and Recommendations: Monterey Bay Region*, chapter 6, *available at* http://www.coastal.ca.gov/recap/content2.html.
[364] *Id*.

project impacts on resources, the location of past, present, and future development, and facilitate cumulative impact assessments.[365]

3. The Future: Effectively Address Cumulative Impacts under a New Ocean Governance Framework

Science for Marine Spatial Planning

A strategic approach to marine development and conservation through coastal and marine spatial planning will simplify the process of predicting and minimizing the cumulative impacts within and across ocean use sectors sectors. Marine spatial plans identify suitable locations within which to conduct certain activities and focus growth in areas where it will have the least negative impact. In addition, holistic and strategic planning and management can limit harmful overlap of use and activity and avoid case-by-case permitting and development, which can result in cumulative effects.

The Obama Administration has recently initiated a process to begin comprehensive and marine spatial planning in federal and state ocean waters.[366] All federal agencies will be required to comply with certified coastal and marine spatial plans, including plans developed for the CCLME, "to the fullest extent consistent with applicable law."[367]

Developing and implementing marine planning in the CCLME, as called for by the Administration, will require a substantial amount of scientific data and information. The Administration has identified critical science and information needed to implement marine planning. For example, in National Priority Objective No. 3, the Administration highlights the need for science to "continually inform and improve management and policy decisions and the capacity to respond to change and challenges." To further this objective, science gaps will need to be filled, including those related to: (1) watershed processes and linkages between land and sea; (2) ocean ecosystem dynamics; (3) current and emerging human use; and (4) ocean conditions and trends.[368] In the final National Priority Objective, the Administration further calls for stronger, integrated "Federal and non-Federal ocean observing systems, sensors, data collection platforms, data management, and mapping capabilities" that are integrated into a national system and with international efforts.[369] Science needs for marine planning will be further identified and developed as the newly formed National Ocean Council prepares strategic action plans to implement the National Priority Objectives.

Other science needs to implement marine planning are highlighted in this document, including scientific information to identify, evaluate, map and assess ecosystem services, and to understand ecosystem resilience. In addition, science-based targets for permitting within ocean use sectors below identified thresholds could be developed to account for scientific and management uncertainty. The *Science Framework* developed in conjunction with comprehensive ocean planning in Massachusetts waters may help identify needs, gaps, and approaches relevant to marine planning in the CCLME.

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[365] *Id*.
[366] Executive Order No. 13547, *Stewardship of the Ocean, Our Coasts, and the Great Lakes* (July 19, 2010) § 2. Additional background on the federal policy can be found in Chapter III of this report.
[367] *Id.* § 6.
[368] *Id*. at 33.
[369] *Id*. at 28.

Science for Adaptive Management

Regional ocean governance, including coastal and marine spatial planning, and project- or action-level environmental impact assessments, should include adaptive management as a key element in order to better address and manage cumulative impacts. Adaptive management allows managers routinely to evaluate and adapt EBM plans and local decision-making as knowledge, conditions, and circumstances change. With an adaptive approach, data gaps can be filled and information can be consistently collected, analyzed, and integrated to support "better informed and improved future decisions."[370]

Robust science is the foundation of effective adaptive management. At the regional scale, scientific data and information is collected via monitoring to ensure compliance with regional plans, and to evaluate the status and condition of resources and the ecosystem to assess progress towards achieving regional goals and objectives. Based on the results of monitoring, management plans and actions can be modified or amended to respond to new information or environmental conditions.

Adaptive management is also gaining traction as an important component of environmental impact assessment processes, particularly for new or emerging uses and activities where a high degree of scientific uncertainty remains. In this context, monitoring is used to determine the status and condition of resources and the ecosystem to inform scientific understanding of the receiving environment. It is also used to evaluate whether projects or actions are having their anticipated impacts and, if not, to design mitigation or adaptive strategies to prevent unintended consequences.

Science is needed to help managers efficiently translate monitoring results into management actions within relevant timeframes. This includes the need for: (1) well developed and defined monitoring programs and plans; (2) environmental indicators to evaluate environmental status and condition; (3) new thresholds that can signify when impacts have reached unacceptable levels; (4) protocols and approaches for timely translating monitoring data and information into effective mitigation strategies; (5) science to assist managers in developing appropriate mitigation strategies for maximizing ecosystem services; and (6) protocols and approaches for integrating adaptive regional governance approaches with project-level decision-making and for sharing lessons learned.

Specifically, linking project-level data and information with a regional EBM approach will require improved methods for sharing, managing, and storing data and information, and potentially new mandates for considering information gathered at the project-level. Ideally, this information would be stored in a common, central database that is available to the public, managers, and practitioners. The information also would be scalable and searchable by geographic area to inform evolution of the EBM plan.

[370] *Id*. at 2.