



US Army Corps  
of Engineers

# Regional Sediment Management



# Primer



## RSM Overview

- ★ Regional sediment management (RSM) is a “system-based approach” that seeks to solve sediment-related problems by designing solutions that fit within the context of a regional strategy.
- ★ RSM is the integrated management of littoral, estuarine, and riverine sediments to achieve balanced and sustainable solutions to sediment-related needs. This approach provides opportunities to achieve greater effectiveness and efficiency.
- ★ RSM involves making local project decisions in the context of the sediment system and forecasting the long-range implications of management actions.
- ★ RSM recognizes sediment as a resource – sand and sediment processes are important components of coastal and riverine systems that are integral to economic and environmental vitality.
- ★ RSM engages many stakeholders. Many federal and non-federal sediment management activities may potentially have system-wide effects.
- ★ RSM recognizes that sediment management actions have potential economic and ecological implications beyond a given site, beyond originally intended effects, and over long time scales (decades or more).
- ★ RSM is a Corps-wide approach that is being implemented through coordinated activities using several Corps authorities.

# Sediment Management Actions

Sediment management actions are activities that affect the transport, erosion, removal, and deposition of sediment. Examples include:

- ★ Dredging and placement.
- ★ Building structures that divert or trap sediment.
- ★ Erosion protection methods or structures for riverbanks, shorelines, sea beds, and channel bottoms.
- ★ Sand and gravel mining for construction or other purposes.



Several Corps Districts are applying and adapting the RSM approach to programs, projects, and activities through the Corps' RSM National Demonstration Program. Other districts are adopting the RSM approach as a matter of good business practice. In 2004, the demonstration initiatives involve nine districts, three division offices, and 15 states (MS, AL, FL, GA, SC, NC, NJ, NY, MI, IN, CA, OR, WA, ID, TX). Corps offices participating in the RSM Demonstration Program include: Mobile, Jacksonville, Philadelphia, New York, Detroit, Los Angeles, Portland, Seattle, and Galveston Districts, along with the South Atlantic, South Pacific, and Northwestern Divisions. Additional information on these specific demonstration efforts can be found at <http://www.wes.army.mil/rsm/RSM-NDP/demos.html>.

The RSM strategies emerging within the demonstration initiatives share a number of common components. The strategies:

- ★ Identify a sediment budget for a given region—including sediment sources and sinks, and ongoing sediment management activities associated with Corps and other agency projects and activities, as well as natural processes.
- ★ Accommodate navigation channel maintenance material placement needs and strive to keep sand in the natural system. **Example: Mobile District, Perdido Pass—Improved understanding of the sediment budget and processes in the region helped identify and justify an alternative disposal area that helps keep sand in the system and available for down drift beaches and prevents dredged sand from reentering the channel.**
- ★ Link sediment availability with sand needs within the system based on suitable quantity, quality, and timing, in the context of regional strategies for sediment management. **Example: Northwestern Division is identifying potential sources of dredged material and sediment needs along riparian areas of Rock Creek to restore and protect ecological and cultural resources along eroding banks. Los Angeles District is examining sand availability and alternative placement costs of sand dredged from Ventura Harbor to several reaches at different distances from the harbor.**
- ★ Coordinate navigation channel maintenance with beach nourishment to share costs for construction equipment mobilization and demobilization, and to provide storage for sand as a resource. **Example: Jacksonville District—Matanzas and St. Augustine Inlets—coordinating the maintenance dredging and beach nourishment projects has saved approximately \$1M at these projects.**

- ★ Discuss alternative ways for keeping sand in the system, which may include bypassing or back-passing and using temporary storage such as *sediment traps*, *deposition basins*, and *inlet sediment sources* to facilitate sediment extraction and transfer. Explanations of these and other approaches are discussed in the Coastal Engineering Manual (EM 1110-2-1100, Chapter V-6, <http://www.wes.army.mil/export/home/http/htdocs/chlc/PartV-Chap6.pdf>, with examples provided in Section V-6-6).
- ★ Enhance coordination among Corps team members, other agencies, government representatives, and stakeholders. Examples are:
  - RSM National Demonstration Program Districts work to improve coordination among Corps planning, engineering, construction, program and project management, and operations activities related to sediment in a region. Because Corps activities are typically project funded, studies and activities may proceed with little coordination. RSM requires and fosters identifying commonality among studies, projects, and activities related by sediment in a region.
  - Two Divisions have formed Major Subordinate Command (MSC) RSM Project Delivery Teams (PDTs) to help advance the RSM approach beyond the demonstration efforts. The South Atlantic Division has established an RSM enterprise geographic information system (GIS) team. The North Atlantic Division has established an RSM PDT in the Division office that networks with RSM PDTs in its Districts.
  - The South Pacific Division is working with numerous agencies of the State of California, along with other agencies and stakeholders, to develop a California Coastal Sediment Master Plan to evaluate coastal sediment management needs on a regional, system-wide basis. The intent is to develop approaches to these issues that generate the greatest environmental and economic benefits.
- ★ Evolve through time to accommodate new opportunities, data and information, and lessons learned.



RSM practitioners have identified significant cost savings among other benefits. These benefits are related to navigation maintenance, beach nourishment, ecosystem restoration, as well as other needs and opportunities raised by sediment stakeholders in a region. Some benefits associated with RSM must be evaluated over larger spatial scales (across an entire region), instead of on a project-by-project basis, and as such may only be attained by using the RSM approach. For example:

- ★ Cost savings may be realized from reduced rehandling of material, extended dredging cycles, and combined equipment mobilization and demobilization for linked projects (e.g., dredging and shore protection). Costs may also be reduced by sharing information and reducing duplication of field data collection, or by reducing duplication in model and tool development.
- ★ Improved environmental conditions result from reintroduction of sediment into “sand starved” littoral systems. This reintroduction of littoral material can reduce the need for beach nourishment and contribute to restoring habitat for sea turtles and other animals.
- ★ Improved agency and institutional working relationships can facilitate the above benefits, along with producing opportunities for collaboratively leveraging financial and manpower resources in data collection and analysis, tool development, and project implementation. These relationships can reduce study costs and time, enhance support of environmental goals, and have the potential to streamline regulatory processes.
- ★ Shared regional scale data management systems, models, and other tools can improve project-level decisions and help achieve greater consistency in analytical results among studies and projects in a region.



To implement RSM:

- ★ Establish an RSM team. It is important to establish a working environment among stakeholders that supports coordination and collaboration among projects, programs, and functions involving or affecting sediment in a region, and that fosters “systems thinking.” Several Corps offices are establishing RSM teams to foster this coordination and collaboration. The RSM approach can be initiated and lead by any functional area, and should at least include project operations, maintenance and management, planning for new projects, engineering and design, construction, project management, coordinators for beneficial use of dredged material, and regulatory functions.
- ★ Seek management support. Endorsement of the RSM approach by District engineers and Division commanders, functional division chiefs, and other managers provides an important foundation for successful staff pursuit and implementation of an RSM approach. The contacts listed in “RSM Help and Support” below can provide assistance based on their experience and expertise.
- ★ Engage and involve other agencies that have a stake in managing sediment. Interagency working groups can be valuable forums for sharing data, tools, and experiences, and developing collaborative regional strategies. They can also foster leveraging of resources and programs, and provide avenues for building consensus on RSM plans and actions. For example, the Mobile District formed a multi-agency Technical Working Group to identify RSM needs and opportunities, as well as explore ways to leverage programs and resources and to exchange data and information.
- ★ Inform and engage other key stakeholders, including the public.



# Framework For Developing RSM Strategies

A conceptual framework composed of alternative actions, projects, or sediment management practices appropriate for a region for developing RSM strategies, along with management plans is outlined below. Working through this framework will be an iterative process. Information provided at each step advances the knowledge base for decisions and recommendations along the way. Stakeholder and public involvement may vary with each strategy and plan, but is integral to each part of the framework.

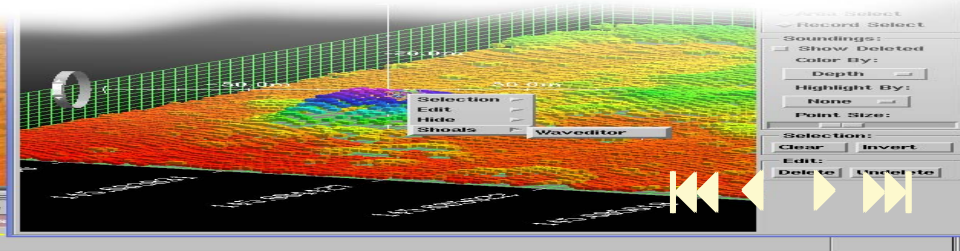
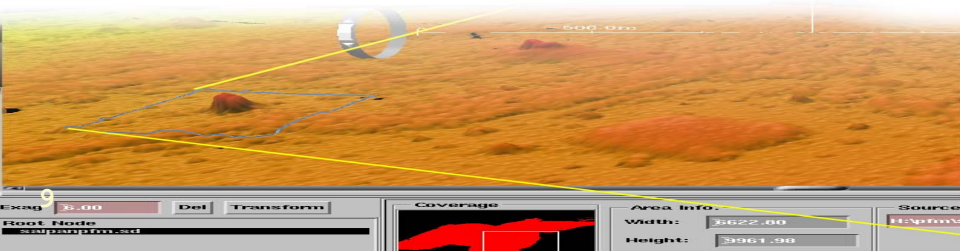
Step	Examples of Activities
<b>Specify Sediment-related Problems and Opportunities</b>	<ul style="list-style-type: none"> <li>★ <b>Identify the region.</b> While initially defining the region based on the sediment system, boundaries may be adjusted based on new understanding about processes or management objectives and issues.</li> <li>★ <b>Identify sediment concerns, needs.</b> Consider erosion, accretion, sediment demands, structures, activities, and other factors.</li> <li>★ <b>Identify opportunities and constraints.</b></li> <li>★ <b>Identify stakeholders involved in or with an interest in sediment management activities.</b> Public and private stakeholder interests could include several of the following: channel maintenance and other activities involving dredging, beach nourishment, habitat protection or restoration, sediment use regulation, bank erosion reduction, sedimentation, other.</li> </ul>
<b>Inventory and Forecast Conditions</b> <i>(continued)</i>	<ul style="list-style-type: none"> <li>★ <b>Identify available information that contributes to understanding the <i>historic, present, and future</i> sediment conditions, along with associated planning and management implications. Consider future sediment conditions under present management scenarios.</b> Regional databases can improve the understanding of the system context of sediment-related projects and management activities. Databases can take the form of a simple spreadsheet, or a geographic information system (GIS), providing: (1) central locations for existing and new data, corporate knowledge, measurements, engineering activities, and modeling; (2) means for sharing and leveraging information with stakeholders; and (3) analytical information to feed other tools (regional sediment budget, geomorphic or ecological process models, etc).</li> <li>★ <b>Develop a regional sediment budget reflecting total sediment transport pathways.</b> Whether conceptual or quantitative, these budgets identify sediment transport rates and pathways over specified time periods. Sediment budgets employ conservation of mass (or volume, or rate of volume change) and may begin as a conceptualization of existing knowledge and understanding. With more information (data, modeling results, and analysis), the regional sediment budget may be refined to</li> </ul>

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Step	Examples of Activities
<b>Inventory and Forecast Conditions</b> <i>(concluded)</i>	include different time periods, a range in conditions (e.g., “typical” vs. “storm”), and uncertainty. Depending on the region, it may be appropriate to include overland transport, sediment transport through streams and rivers to estuaries, and coastal transport. Also include natural features and projects and activities affecting sand movement within the region.
<b>Formulate Alternative RSM Plans</b>	<ul style="list-style-type: none"> <li>★ <b>Identify different ways of achieving the sediment management objectives identified for the region, taking care to avoid constraints, solve problems, and realize the opportunities.</b> Alternative plans can be composed of different combinations of management measures, such as changes in sand management practices, new or modified projects, new or modified regulations, coordination of various public and private activities, etc. Various numerical models may be utilized to estimate regional sediment transport, optimize alternative plans, and assess the cumulative impacts of multiple projects within the region.</li> </ul>
<b>Evaluate and Compare Alternative RSM Plans</b>	<ul style="list-style-type: none"> <li>★ <b>Describe and compare the “with” and “without” alternative future conditions. Consider conditions likely to result without changes to existing projects or practices, and those likely to result from new project or other management action implementation. Include important variables relevant to a given region to reveal desirable differences between the two futures.</b> Consider the magnitude, location, timing, and duration of the effects, and whether they are beneficial or adverse, good or bad, desirable or not. Also consider the completeness, effectiveness, efficiency, and acceptability of these effects. Consider the cost effectiveness and tradeoffs of outputs relative to different types of effects and preferences. Economic analysis assesses the costs and relative benefits of each alternative, and should consider life-cycle effects of alternatives.</li> </ul>
<b>Select and Implement an RSM Strategy</b>	<ul style="list-style-type: none"> <li>★ <b>Select and implement an RSM strategy through the coordinated and collaborative partnerships.</b> Assuming alternatives have been developed that are viewed as more beneficial than taking no additional action, select a <b>plan</b> that helps achieve the objectives in some meaningful way with respect to implementation costs, stakeholder preferences, opportunities that exist, regulatory requirement constraints, stakeholder capabilities and preferences, and funding. Changes can occur at any time in a project’s life cycle, and it may be necessary to account for new stakeholders, different environmental conditions, technological advances, or other unforeseen circumstances.</li> </ul>



Other sources of information include:

- ★ The Corps' RSM public website has more detail about RSM and points of contact for help and further information: <http://www.wes.army.mil/rsm>
- ★ A number of Corps authorities and policies endorse and support the RSM approach. See ERDC/RSM-TN-8 at <http://www.wes.army.mil/rsm/pubs/pdfs/rsm-tn-8.pdf>. The report, *Regional Sediment Management: Background and Overview of Initial Implementation* (IWR Report 02-PS-2), is available at [http://www.iwr.usace.army.mil/iwr/pdf/02ps2sed\\_man.pdf](http://www.iwr.usace.army.mil/iwr/pdf/02ps2sed_man.pdf)
- ★ Mobile District's Spatial Data Branch for GIS Internet access, data, services, etc.: <http://gis.sam.usace.army.mil/egis/egis.htm>; and Mobile District's support page for creating a GIS: [http://gis.sam.usace.army.mil/Support/Arc8\\_Workshop/index.htm](http://gis.sam.usace.army.mil/Support/Arc8_Workshop/index.htm)
- ★ ERDC/RSM-TN-2, June 2003, "Tools for Regional Sediment Management," <http://www.wes.army.mil/rsm/pubs/pdfs/rsm-tn-2.pdf>
- ★ ERDC/RSM-TN-13, May 2004, "Lessons Learned in Regional Sediment Management: The Mobile District Demonstration Program, Technical Program Implementation," <http://www.wes.army.mil/rsm/pubs/pdfs/rsm-tn-13.pdf>
- ★ Regional coastal survey data (useful to RSM) and topographic and hydrographic imagery will be collected and provided by the Joint Airborne Lidar Bathymetry Technical Center of Expertise to support physical and environmental regional monitoring: <http://shoals.sam.usace.army.mil/>

# Stakeholders and Public Involvement

While the technological and institutional aspects of RSM can be challenging, the need to inform and involve the public cannot be overlooked. Not only can the public catalyze support for RSM within local governments and other agencies, in some instances, activities on private land or by local citizens may play a key role in either advancing or impeding RSM. The public is represented through elected and appointed representatives, so information sharing both ways will be key to successful RSM implementation. To ensure successful implementation:

- ★ Inform and engage the public early enough to help shape the sediment management strategies, rather than as a last task.
- ★ Explain how local sediment issues are regional in nature and need to be addressed through a broader perspective.
- ★ Invite input on sediment-related needs and opportunities, as well as ideas about potential solutions or courses of action. Discuss regional implications of various choices, and the benefits of various alternatives or associated tradeoffs.
- ★ Provide information on beach and coastal, riverine, or estuarine processes since this information may be useful in helping citizens understand the sediment issues and opportunities in a region, and what they might expect from a proposed management action.
- ★ Explore what would help to develop a sense of ownership for the actions proposed in a regional strategy.
- ★ Identify whose support is needed to implement RSM in a particular region, and reach out to inform and involve those individuals and organizations.
- ★ Explore public involvement opportunities through partner agencies and stakeholder entities as they may have capabilities or procedures for obtaining responses to proposals and collecting information about public needs and concerns.

*RSM...for balanced, sustainable solutions*



<http://www.wes.army.mil/rsm>



<http://www.iwr.usace.army.mil/NSMS>

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