

EVOLUTION OF FEDERAL OIL POLLUTION RESEARCH PLANNING

William T. Vocke, Senior Advisor

Oil Spill Preparedness Division

Bureau of Safety and Environmental Enforcement

45600 Woodland Road,

Sterling, Virginia 20166

Eric J. Miller, Acting Chief

Oil Spill Preparedness Division

Bureau of Safety and Environmental Enforcement

45600 Woodland Road,

Sterling, Virginia 20166

Dr. Candi Hudson, Chief Response Research Branch

Oil Spill Preparedness Division

Bureau of Safety and Environmental Enforcement

45600 Woodland Road,

Sterling, Virginia 20166

Scott Lundgren, Director

Office of Response and Restoration

National Oceanic and Atmospheric Administration

1305 East-West Highway

Silver Spring, Maryland 20910

Dr. Robyn N. Conmy

Oil Spill Research Area, Lead

USEPA CESER HSMMD WAIDB

26 West MLK Drive

Cincinnati, Ohio 45268

CAPT Kirsten R. Trego, Deputy Director

Emergency Management (CG-5RI)

United States Coast Guard

2703 Martin Luther King Ave, SE

Washington, DC 20593

Carol A. Baillie, ICCOPR Executive Director

Office of Marine Environmental Response (CG-MER-3)

U.S. Coast Guard, STOP 7516

2703 Martin Luther King Ave., SE

Washington, DC 20593

ABSTRACT

This paper describes the evolution of the Interagency Coordinating Committee on Oil Pollution Research (ICCOPR) Oil Pollution Research and Technology Plan (R&T Plan) to address changing oil pollution risks associated with advancements in the energy industry practices. The Oil Pollution Act of 1990 (OPA 90) Title VII required development of an R&T Plan to identify the resources needed for the government research programs. The 1992 R&T Plan and its 1997 revision marked a major advancement in how the United States (U.S.) planned its oil pollution research. The first two plans met the needs of their time but were outdated when the Deepwater Horizon oil spill in 2010 revealed a wide range of new research needed to address the risks associated with advancements in industry practices.

ICCOPR responded to the new challenges by revising the Charter and establishing a six-year R&T Plan revision cycle. In September 2015, ICCOPR released the FY 2015-2021 R&T Plan, which established a new baseline plan for current and future planning. This paper describes the structured review process used to analyze more than 900 research needs identified since OPA 90 was enacted. The paper explains the new research classification process that established four Classes, 25 Standing Research Areas (SRAs), and 150 priority research needs in the R&T Plan.

ICCOPR is working on the first revision in the new six-year planning cycle to cover the FY2022-2027 timeframe. The paper describes the factors being evaluated to update the list of

priority needs. These factors include how well current priorities have been addressed and new or emerging oil pollution risks. An update on the status of addressing the priorities will be presented, including the number of SRAs addressed by ICCOPR agencies and others.

INTRODUCTION

Federal oil pollution research planning has evolved from ad hoc coordination into a formal process structured to capture and prioritize the range of research needs. The Interagency Coordinating Committee on Oil Pollution Research (ICCOPR) is the organization responsible for establishing the federal government's priorities for oil pollution research since passage of the Oil Pollution Act of 1990 (OPA 90). ICCOPR is in the process of developing the fourth version of its Oil Pollution Research and Technology Plan (R&T Plan). This paper provides an overview of how federal oil pollution research planning has evolved from informal coordination to the current formal structured approach. It also describes the R&T Plan's key aspects and the process used to establish them.

INFORMAL OIL POLLUTION RESEARCH PLANNING

From the late 1960s until the *Exxon Valdez* oil spill in 1989, oil pollution research coordination was primarily on an ad hoc or informal basis, without an overarching federal vision. The 1970, the National Oil and Hazardous Materials Pollution Contingency Plan (NCP) included a provision for the National Interagency Committee for Control of Pollution by Oil and Hazardous Materials (NIC) to provide review and advice on research to improve responses to oil spills (CEQ, 1970). However, there was no coordinated federal research plan produced by the NIC to guide federal activities. The Ohmsett Interagency Technology Committee (OITC)

coordinated activities at the facility. The International Oil Spill Conference (IOSC) and other conferences and workshops provided some coordination but no formal organized planning.

By the late 1980s, oil pollution research was waning due to a belief that the research had reached a technological plateau and the absence of legislation or other driving force behind continued research. The Ohmsett facility was closed due to a lack of use. There was little research planning taking place.

INITIAL OIL POLLUTION RESEARCH PLANS

The 1989 Exxon Valdez oil spill marked a dramatic turning point in oil pollution research planning. Responders faced new challenges to a major spill in the subarctic environment. Federal agencies came together in workshops, working groups, and ad hoc committees to identify the new research and development needs and better coordinate their activities.

Simultaneously, Congress passed the Oil Pollution Act of 1990 (OPA 90) that established ICCOPR to identify and coordinate research needs. Title VII of the Act also mandated that ICCOPR develop an Oil Pollution R&T Plan. ICCOPR issued the first federal R&T Plan in 1992 (ICCOPR, 1992). At the same time, ICCOPR provided the Plan to the National Academies of Sciences Marine Board for review as required by OPA 90. The Marine Board recommended the plan be revised using a framework that addressed spill prevention, human factors, and the field testing/demonstration of developed response technologies (Marine Board, 1993). ICCOPR adopted the suggested improvements and published a revised R&T Plan in 1997 (ICCOPR, 1997). The 1997 R&T Plan was viewed as a five-year plan (ICCOPR, 2000).

Research coordination and planning was robust when the 1997 plan was released but gradually diminished over the next decade. In FY1997/98, ICCOPR was actively meeting about

three times a year and also meeting monthly with the National Response Team (NRT) Science and Technology (S&T) committee and the American Petroleum Institute twice a year (ICCOPR, 2000, 2003, 2005, 2007). However, by FY1999 the committee planned to reduce their meetings to “at least once a year” and in conjunction with oil pollution-related conferences when possible (ICCOPR, 2000). The focus on oil pollution research was further diminished as the Nation turned its attention to security and stopping terrorism following the September 11, 2001 attacks. ICCOPR began conducting its meetings in conjunction with the NRT S&T Committee rather than separate meetings. Research funding dropped from \$17.2 million in FY 2000 to \$10.3 million in FY 2009 (GAO, 2011). The 1997 R&T Plan had exceeded its planned five-year planning life and no longer served as a useful research planning tool.

NEW OIL POLLUTION RESEARCH PLAN SERIES

In late 2009, ICCOPR began a new research planning phase after the COSCO BUSAN oil spill and other spills highlighted the need for a greater focus on oil pollution research. The efforts included developing a schedule of formal committee meetings and reviewing the R&T Plan to determine if it was still valid (ICCOPR, 2009, 2012). Soon thereafter, the Deepwater Horizon oil spill and other spills, like the Exxon Valdez oil spill, revealed new oil pollution research challenges and confirmed the need for a new R&T Plan. The following sections discuss the ICCOPR efforts to reinvent the R&T Plan, the factors involved in developing the current baseline FY 2015-2021 plan, and the process to periodically update the plan to keep pace with evolving oil pollution risks.

REORGANIZING THE COMMITTEE

The U.S. Coast Guard (USCG), as the ICCOPR Chair, and the other members pulled together to enact several changes to address the challenges posed from the Deepwater Horizon oil spill. They developed a new Charter in 2013 that included two important changes. One change established the Vice Chair role to promote greater leadership status to three agencies with the largest research missions. The National Oceanic and Atmospheric Administration (NOAA), Bureau of Safety and Environmental Enforcement (BSEE), and the U.S. Environmental Protection Agency (EPA) now serve as Vice Chairs for two-year terms on a rotational basis that correspond with the time frame for a biennial report (ICCOPR, 2013). To date, each agency has served in the Vice Chair role at least once and the change has led to improved coordination.

The other change called for a new R&T Plan that would be reviewed and updated periodically to maintain relevance to oil spill research needs at the time. OPA 90 required development of the R&T Plan and the initial Marine Board review but did not require ICCOPR to subsequently reassess the R&T Plan's adequacy to meet evolving needs. Changes in industry exploration and production practices and locations in the intervening years warranted new priorities. The COSCO BUSAN oil spill, the Deepwater Horizon oil spill, and other spills added to the need for new priorities when they revealed new research needs and challenges that were either not envisioned or were a lower priority when the 1997 plan was issued. Regional interests and perspectives obtained by ICCOPR during three Public Meetings on the West, East, and Gulf Coasts in 2010 also identified the need for a new R&T Plan (ICCOPR, 2012).

ICCOPR adopted a six-year revision cycle to balance the time needed for research to produce improvements and the need to keep the plan current. The rationale was that it could take up to two years for agencies to develop research projects and obtain contract services and necessary permits to address new priorities. Additional time may be needed to account for the

government budgetary cycle. Research could take an additional two years based on the complexity of the studies and issues. Another year or two would be needed to reassess needs and revise the plan. Ultimately, a six-year period was selected to allow for the revised plans to be submitted with the appropriate ICCOPR biennial report to Congress (ICCOPR, 2013).

RESTARTING THE PLANNING PROCESS

ICCOPR organized a Steering Committee to lead development of the new baseline R&T Plan that would serve as the first in the new generation of plans. This Steering Committee included representatives from the USCG, NOAA, BSEE, EPA, and the Department of Energy (DOE). The Committee was tasked to establish the R&T Plan's scope and content, assess the status of the research needs, devise the approach to establish priorities in the plan, and present the priorities to the full ICCOPR for approval.

The Steering Committee obtained assistance in the revision process from the University of New Hampshire Coastal Response Research Center (CRRC) through their partnership with NOAA to assist with the revision process. The Center's independent expertise in oil spill issues combined with the University's survey expertise provided valuable assistance to the Steering Committee in culling data and organizing the material into a usable format.

REDESIGNING THE R&T PLAN

The 1992 and 1997 plans provided a good starting point for designing the new R&T Plan series. These plans established a framework for categorizing the research needs and setting priorities. ICCOPR conducted three workshops to reassess the structure and obtain input on the approach reestablishing the R&T Plan. As a result, ICCOPR redesigned the R&T Plan into two parts.

Part One, Oil Pollution Research, was designed to provide a comprehensive up-to-date description of current oil pollution risks and oil pollution research. It explains the need for oil pollution research, federal oil pollution research by ICCOPR and non-ICCOPR agencies, non-federal and international research, ICCOPR's research framework, and knowledge transfer and advancement opportunities.

Part Two, Establishing Research Priorities, presents detailed information on the state of oil pollution research, significant spill incidents, and the process used to establish the priorities. It presents the 150 priority research needs determined through the process described in this paper.

IDENTIFYING RESEARCH NEEDS

ICCOPR developed a research needs database beginning with any unresolved needs included in the 1992 and 1997 plans and supplemented with a literature review of source documents. A total of 61 documents and 26 internet sites were used to compile an initial list of more than 900 research needs. Example sources reviewed included: oil spill incident after action reports; the 1992 and 1997 R&T Plans; CRRC workshop reports; ICCOPR Public Meeting transcripts; interagency reports; and research solicitations and publications (ICCOPR, 2015). These were consolidated into 575 unique research needs after eliminating duplicates and combining similar needs. The database was organized into categories to facilitate comparisons to establish priorities.

CATEGORIZATION FRAMEWORK

The key to establishing the priority research needs is developing a framework that enables a comparison of related research needs to determine which are most critical. ICCOPR's

first two R&T Plans used slightly different ways to categorize the research needs. The 1992 version was organized into five sections, each dealing with a separate research and development area: Spill Prevention; Spill Response Planning and Management; Spill Response; Fate, Transport, and Effects of Oil; and Restoration and Rehabilitation. The 1997 plan identified 21 technology areas and organized them into four broad categories: Spill Prevention; Spill Response Planning, Training, and Management; Spill Countermeasures and Cleanup; and Fate, Transport and Effects, Monitoring and Restoration.

ICCOPR built upon the 1997 approach by adapting a taxonomic system to classify, discuss, and prioritize the large number of new oil pollution research needs identified to address the DWH lessons learned and trends in the oil industry. It is analogous to the taxonomic classification of organisms (i.e., Kingdom, Phylum, Class, Order, Family, Genus, and Species). ICCOPR's oil pollution research classification scheme consists of four levels – Classes, Standing Research Areas (SRAs), Research Needs, and Research Projects. The four broad research Classes at its highest level reflect how oil spill issues are addressed – Prevention, Preparedness, Response, and Injury Assessment and Restoration. Within these four Classes, ICCOPR identified 25 Standing Research Areas (SRAs) that represent the most common research themes encountered for oil spills at that time. ICCOPR recognized that the number of SRAs may change as industry or response practices change. Together, the Classes and SRAs provided a way to categorize the research needs so that similar needs can be compared during prioritization. An unconstrained number of Research Projects can address the Research Needs.

PRIORITIZATION PROCESS

The Steering Committee was tasked with evaluating the 575 research needs and developing a process to prioritizing them into a manageable list to be considered by the ICCOPR

membership (ICCOPR, 2014). First, the Research Needs were sorted into the proper SRA. However, many of the SRAs were complex and covered widely different aspects of the topic. This required using subcategories to ensure the range of issues for the SRA were adequately considered in the final priorities. For example, the Dispersant SRA included six subcategories to capture the different aspects of dispersant use and effects. The Steering Committee then decided to limit the priorities to three for each SRA or SRA subcategory.

In order to select the top three needs, the Steering Committee developed a set of questions to assess the needs. The questions looked at how important the need was to its Class, whether it was a standalone issue or part of a larger issue, the time needed to produce results, and where the need was in the lifespan of solving a research problem. (A question on cost was included but not used due to poor response rates.) Weighted values were assigned to these questions to help in the analysis. The survey questions also included opportunities to rank the needs within the SRA or SRA subcategory, identify missing needs, and identify impediments to solve the needs.

CRRC opted to use the UNH Survey Center to obtain a wider perspective on research needs. UNH sent surveys with 47 topics to 285 subject matter experts (SME) within and outside government. A total of 223 SMEs responded, including 38 from the private sector. All but three surveys had at least four responses. The Survey Center conducted a statistical analysis of the results and the CRRC facilitated a series of Steering Committee meetings to select the top three needs for each SRA or SRA subcategory.

Part Two, Establishing Research Priorities, of the R&T Plan describes the Classes, SRAs, and priority Research Needs established through this process. The Classes and their SRAs are:

Prevention Class

The Prevention Class includes research that supports the development of practices and technologies designed to predict, reduce, or eliminate the likelihood of discharges, or minimize the volume of oil discharges into the environment. Prevention is listed first because the success or failure of the prevention efforts has direct implications for the other three research Classes. ICCOPR identified Research Needs in eight SRAs that would help prevent oil spills or reduce their severity:

- *Human Error Factors* lists three priority Research Needs.
- *Offshore Facilities and Systems* lists three priority Research Needs.
- *Onshore Facilities and Systems* lists six priority Research Needs in two subcategories: Tank and Piping Inspection, Operations, Design, and Data; and Emerging Issues.
- *Waterways Management* lists three priority Research Needs.
- *Vessel Design* lists three priority Research Needs.
- *Drilling* lists six priority Research Needs in two subcategories: Deepwater Drilling and Technology; and Reservoir Characterization.
- *Rail & Truck Transportation* lists three priority Research Needs.
- *Pipeline Systems* lists six priority Research Needs in two subcategories: Materials; and Integrity.

Preparedness Class

The Preparedness Class includes research that supports the activities, programs, and systems developed prior to an oil spill to improve the planning, decision-making and management processes needed for responding to and recovering from oil spills. Spills are likely

to occur despite the best prevention efforts, so it is important to conduct research that provides response organizations with the information and strategies needed to mount an effective response.

- *Pre-spill Baseline Studies* lists nine priority Research Needs in three subcategories: Habitats and Species Baselines; Oceanographic and Geological Baselines; and Environmental Baseline Planning.
- *Response Management Systems* lists three priority Research Needs.

Response Class

The Response Class includes research that supports techniques and technologies that address the immediate and short-term oil spill effects spill and encompasses all activities involved in containing, cleaning up, treating, and disposing oil in order to: 1) maintain safety of human life; 2) stabilize a situation to preclude further damage; and, 3) minimize adverse environmental and socioeconomic effects. This diverse Class covers the wide range of response techniques that are employed to address oil spills captured in these 11 SRAs:

- *Structural Damage Assessment and Salvage* lists three priority Research Needs.
- *At Source Control and Containment* lists three priority Research Needs.
- *Chemical and Physical Behavior Modeling* lists 15 priority Research Needs in five subcategories: Arctic Behavior and Modeling; Oil Behavior Models; Transport Models; Oceanographic Models; and Emerging Crudes.
- *Oil Spill Detection and Surveillance* lists nine priority Research Needs in three subcategories: Remote Detection; Monitoring; and Submerged Oil Detection.
- *In- and On-water Containment and Recovery* lists six priority Research Needs in two

subcategories: Control and Recovery Technology; Recovery Operations and Testing.

- *Shore Containment and Recovery* lists three priority Research Needs.
- *Dispersants* lists 18 priority Research Needs in six subcategories: Cold Weather and Ice Conditions; Behavior; Impacts; Efficacy and Effectiveness; Fate; and Subsurface.
- *In-situ Burning* lists six priority needs in two subcategories: Effectiveness; and Planning and Technology.
- *Alternative Chemical Countermeasures* lists three priority Research Needs.
- *Oily and Oil Waste Disposal* lists three priority Research Needs.
- *Bioremediation* lists three priority Research Needs.

Injury Assessment and Restoration Class

The Injury Assessment and Restoration Class includes research that involves the collection and analysis of information to: 1) evaluate the nature and extent of environmental, human health, and socioeconomic injuries resulting from an incident; 2) determine the restoration actions needed to restore natural resources and their services to pre-spill conditions; and, 3) make the environment and public whole after interim losses. While Prevention and Preparedness occur before a spill, Injury Assessment & Restoration occur after the spill and may last for decades. Research under this Class provides valuable information to the other three Classes by identifying the effectiveness of the response techniques and strategies and revealing areas vulnerable to injury. The four SRAs and number of priority Research Needs are:

- *Environmental Impacts and Ecosystem Recovery* lists 18 priority Research Needs in six subcategories: Species Impacts; Toxicological and Sublethal Impacts; Submerged and Submerged Oil Impacts; Ecosystem and Habitat Impacts; Recovery; and Risk

Assessment and Impact Metrics.

- *Environmental Restoration Methods and Technologies* lists three priority Research Needs.
- *Human Safety and Health* lists six priority Research Needs in two subcategories: Safety; and Human Exposure.
- *Sociological and Economic Impacts* lists six priority Research Needs in two subcategories: Community and Economic Impacts; and Human Impacts.

REVIEW AND APPROVAL PROCESS

The Steering Committee presented the draft R&T Plan with a proposed priorities to the ICCOPR membership for review and final drafting. During this process, adjustments were made including revising some SRAs and priority needs. The draft was sent to membership for a 60-day review period followed by a 30-day second review round. Each agency was responsible for obtaining approval from the appropriate level within the organization for signing off on the R&T Plan. The FY 2015-2021 R&T Plan was approved on September 30, 2015.

The final plan identified 150 priority research needs within 25 SRAs and their subcategories as described above. As a result, users interested in a specific research area can identify the research topics that will best advance the state of knowledge in the topic. ICCOPR anticipates that the plan will help federal and nonfederal researchers better focus their research investments.

IMPLEMENTING THE FY 2015-2021 R&T PLAN

The ICCOPR agencies began implementing the concepts and priorities in the R&T Plan while it was under development. During the first four years since publication, the member

agencies have reported conducting or sponsoring research relevant to 24 of the 25 SRAs (ICCOPR, 2018, 2020). GAO reported federal expenditures exceeding \$67 million during the first two fiscal years after the plan was issued (GAO, 2019). GAO also noted that the R&T Plan is primarily aimed at federal agencies but can serve as a research planning guide for non-federal research organizations as well. ICCOPR is using the final two-years in the R&T Plan's time frame to continue addressing the priorities and reassess the status of the research needs.

FUTURE R&T PLANS

ICCOPR concept for future R&T Plans is to use the FY 2015-2021 version as a new baseline plan and build upon it every six years by adding new sections to show research advancements and make other adjustments to reflect changes in research needs to account for changes in oil industry practices. Part One, Oil Pollution Research, will be updated to reflect changes in research entities, spill events, and other conditions. Part Two, Establishing Research Priorities, will involve reexamining research needs and updating priorities.

The first step in updating Part Two is to assess how well the research community has addressed the priorities established in the baseline plan. ICCOPR Biennial Reports to Congress discuss member initiatives and will provide an indication of the research that focused on each SRA. But these reports only partially tell the story. Industry and academia also conduct extensive research that address research needs. These non-federal research advancements will be also be considered and factored into the plans.

ICCOPR is obtaining support to review progress toward addressing the priorities. This information will help establish a new baseline condition from which to establish priorities.

Likely steps include:

- Review reports on spills over the past six years to identify any new needs.
- Conduct outreach (correspondence, meetings, workshops, etc.) to obtain input on new and emerging issues to address in the plan.
- Determine if the current SRAs captures the range of needs and adjust as needed.
- Obtain input on research needs by SRA and SRA subcategories.

ICCOPR will be seeking input from the greater response community as it continues developing the FY 2022-2027 R&T Plan, scheduled for release by September 2021. Input is welcome on the content, research needs, progress in addressing the needs, and other issues.

CONCLUSIONS

ICCOPR's 1992 and 1997 R&T Plans moved the Nation's oil spill planning from an ad hoc basis into a formal coordinated approach. These R&T Plans provided the first framework for federal agencies to consider the range of oil spill research needs in their research planning processes. However, changes in oil industry practices over time, several oil spills, especially the Deepwater Horizon oil spill, revealed the need for an updated R&T Plan.

ICCOPR initiated organizational changes and established a six-year R&T Plan revision cycle. The first version in the series was published in September 2015 for FY2015-2021. That Plan adopted a categorization framework with four Classes and 25 Standing Research Areas that was used to compare research needs and identify 150 priority research needs. ICCOPR is currently updating the Plan with the FY2022-2017 R&T Plan.

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