Dispersants and Risk Communication

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Background

Risk communications is a research area of the social sciences which is closely associated with human dimensions and external communications. External communications, traditionally in the purview of public affairs, may have multiple purposes including influencing public beliefs, opinions, and judgments about the incident. Risk communications on the other hand:

- Includes actions, words, and other interactions that incorporate and respect the perceptions of the information recipients, intended to help people make more informed decisions about threats to their health and safety (Ropeik, 2008).
- Ropeik, D. 2008. Risk Communication: More Than Facts and Feelings. International Atomic Energy Commission Bulletin. 50-1:58-60.
- Is the interactive process of exchange of information and opinions among individuals, groups, and institutions concerning a risk or potential risk to human health or the environment. (National Research Council, 1989)National Research Council, Committee on Risk Perception and Communication. Improving Risk Communication. National Academy Press, Washington, DC. 1989.
- Means communication intended to supply lay people with the information they need to make informed, independent judgments about risks to health, safety and the environment. (Morgan et al 2001) Morgan, M.G., B. Fishoff, A. Bostrom and C.J. Atman. 2001. Risk Communication: A Mental Models Approach. Cambridge: Cambridge University Press.

There are many approaches toward risk communications. Some of them focus on improving the way external communications about risks are conducted, e.g., developing better messages, and some focus on the content of risk communications, that is, sharing technical information to support the assessment of the potential for risks. Better messages, engagement, and risk-based communications were needed during DWH.

Dispersants as an oil spill response tool have been studied for effectiveness and effects for over 40 years. Numerous studies conducted by academia, industry, and government agencies have provided important scientific information on dispersants and their effects on oil and the environment (Rowe et al., 2009; Khelifa et al., 2008; Lee, 2004). The general findings have been that dispersants have become less toxic and more effective since their original formulations. It is a generally accepted guideline that if the dispersant is compatible with the specific oil and there is sufficient water depth (10 meters or greater) and environmental conditions (water temperature and wave height) are right,

dispersants may have a positive effect on reducing shoreline oiling and increasing the biodegradation rate of the oil. The specific environmental trade-off analysis for any given situation needs to be weighed and appropriate actions taken. To provide some background, the extended quote below from a 1993 EPA document (Use of Chemical Dispersants for Marine Oil Spills), reveals the fact that practical considerations for dispersant use have historically been complex and contentious:

> During an oil spill, a confluence of competing interests must be balanced. The news media likely will be on the scene requesting statements on any action that is being taken to respond to a spill event. Various interested parties such as representatives of the vessel owner, the cargo owner, local fishing interests, businesses dependant on tourism, local/state/federal government agencies, environmental organizations, equipment vendors, and cleanup companies will appear on the scene and advocate their position to both the OSC and the press. Often the various groups approach spill response from a different base with different objectives. Decision making, management, and organization of a spill response are made more difficult by maintaining open communication with the various interest groups; but eventually the effort to maintain the interaction and develop it organizationally can result in a much more effective response. Management and organization of oil spill responses have been studied (Cohn et al, 1991; Noble, 1991), but there are no tested paradigms that account for the rapid action and public input required in a crisis situation.
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> With the multitude of problems that can arise in the U.S. legal environment and the strong antipathy toward the use of dispersants that has developed among some interested parties, the OSC should reflect carefully on dispersant use and be ready for criticism. Two considerations guide the decision-making process affecting an actual dispersant use situation:
>
> - There is a reasonable probability of measureable success (e.g., preventing oil from reaching a beach or breeding area).
>
> - Consensus agreement has been reached between potentially affected parties that dispersant application is worthy of being evaluated as a response.
>
> Measureable success, even if it is not complete, will vindicate the decision to use a dispersant. Although it may not be required, a consensus agreement will help to defuse critics who challenge a response that does not achieve success. Numerous other considerations will come into play in a response involving the prospect or the actual use of dispersants. It is beyond the scope of this document to attempt to identify all of the possibilities. The final decision will be based on the experience,

> understanding, and knowledge of the decision makers and their risk tolerance.

At the Deep Water Horizon (DWH) response there was some degree of measurable success, however, the consensus agreement in place prior to the spill was superseded by the magnitude of the spill and subsequent large amount of dispersants applied. The breakdown of consensus among government agencies contributed to public concern regarding the use of dispersants. For example, the state of Louisiana abstained in its vote for use of dispersants and the EPA began requiring additional topological testing and limitations on dispersants.

Consensus Environmental Risk Analysis

Since the late 1990s, through the Consensus Environmental Risk Analysis (CERA) process (Aurand, 1999), NOAA, the US Coast Guard and various stakeholders have worked with several USCG Sectors and Area Committees to evaluate various oil spill response options, identify specific biological resources at risk, seasonality, and through scenario-based gaming weigh the relative pros and cons of different response actions. The CERA approach was derived from EPA's Ecological Risk Assessment framework and guidelines (US EPA). These CERAs have involved local, state, and federal agencies that would participate in the decision-making process, as well as natural resource scientists and other stakeholders, e.g., NGOs and fisher representatives when available. This model has proved to be a valid and methodical way to assess and discuss trade-offs before an actual spill event.

A meeting convened by the CRRC entitled "Deepwater Horizon Dispersant Use Meeting," was attended by over 50 scientists, engineers and spill response practitioners from numerous organizations, including: U.S. Coast Guard (USCG), Mineral Management Service (MMS), National Oceanic and Atmosphere Administration (NOAA), industry, state government, and academia. The ultimate goals of this meeting were to: (1) Provide input to the affected Regional Response Teams (RRTs) on the use of dispersants going forward in the DWH incident; and (2) Identify possible new monitoring protocols in the event of continuing aerial and subsurface dispersant application (Coastal Response Research Center. 2010.)

Two of the conclusions from this report that are germane to this topic are:

> It was the consensus of this group that up to the time of the meeting, use of dispersants and the effects of dispersing oil into the water column had generally been less environmentally harmful than allowing the oil to migrate on the surface into the sensitive wetlands and near shore coastal habitats.
>
> For the DWH spill, the RRTs should provide for a continual re-evaluation of tradeoff options going forward. Because of the magnitude of the DWH spill and with the expectation of prolonged dispersant application, the RRTs should consider commissioning a Consensus Ecological Risk Assessment, or equivalent,

including use of existing temporal and spatial data on the resources at risk and using the most current environmental data.

These recommendations were not performed. Had they been enacted some additional degree of confidence regarding the use of dispersants may have been achieved for the general public.

The response to the DWH spill had limited success with regard to communications between various agencies, BP and the Coast Guard that reflected the CERA process. The need to develop specific risk communications for dispersants was raised by the Coast Guard in Houma, LA in late May, but by then the negative public perception regarding dispersants was well underway. Effective risk communication is a complex process where information and opinions are shared by risk management institutions with an involved public. Risk communication attempts to build consensus concerning accurate information through open and informed discourse (Fischoff et al. 1981).

Beginning in early June, Unified Command initiated community meetings in Louisiana provided an important opportunity for stakeholder engagement and dialogue. These meetings informed the development of risk communications and respond to stakeholder questions and concerns. Also, BP began developing risk communication messages from the JIC with input from dispersant and other technical specialists. However, risk communications as a specific function was new to the incident command system process and perceived primarily as targeted messaging. In this regard, there was no consensus agreement for public involvement and how to apply risk communication principles in communicating issues of risk and safety to the public.

What has not been as well studied is the way to convey this decision-making to the general public. There have been several studies conducted on spill risk communications (Tuler, et al. 2008; Tuler and Webler. 2008; Scholz, et al.1999). However, this line of research provides little information on how the decisions were made (ICS process), potential human impacts (low), fate of the oil (biodegradation), trade-offs (shoreline and surface vs. water column impacts), what dispersant are made of (formulations and other everyday products they are found in), etc. Most likely, this was due to the much smaller amounts used in the past and the very short time duration during which they were applied. Prior to DWH, agencies who made pre-authorization and incident-specific decisions about the use of dispersants apparently envisioned spills that resulted from vessels or pipelines, i.e., involving a release of oil over a short duration, e.g., on the order of hours to a few days. Blowouts had occurred in the past and therefore were within the US dispersant experience; nevertheless, no pre-authorization agreements contain explicit restriction of dispersants to a limited duration. Indeed, contingency plans have focused on “ecological issues” and human dimensions, e.g., economic, sociological and cultural risks, have received very limited attention (Webler and Lord. 2010). Given that a rather substantial body of research on the Exxon Valdez oil spill reveals severe and chronic impacts to human populations, more direct concern needs to focus on human dimensions (Picou et al. 2009; Picou. 2009). In particular, strategic risk communications regarding

the use of dispersants and their consequences for the ecology and human health should be addressed.

DWH Outreach Efforts

There were multiple efforts to inform the public about the necessity to use dispersants during the response to the DWH spill. The Public Affairs and Liaison Units in conjunction with the Environmental Unit (EU) prepared numerous press releases, public information brochures, posters, talking points, graphics, and statements. The objective of these activities were to inform the media and general public on the reasons dispersants were being used, the rationale behind the decisions, the efforts to monitor the applications, and the successes that were achieved.

From the vantage point of the command post, it appeared that the messages were being received in the fashion that they were intended. Early in the incident several people came from Alaska to talk with the fishing communities about their experiences during the *Exxon Valdez* spill, in the interest of helping Gulf communities prepare for what to expect. An important assumption was made prematurely that the two spills, and therefore the effects, were very similar and that the Gulf experience would closely parallel the Alaska experience. Some significant differences in the two spills were not acknowledged (e.g., locale, environment, oil, etc.). As a result of these interactions, some people in the community, including fishermen, developed negative sentiments toward dispersant applications or the addition of "chemicals." The Alaskan visitors to the Gulf spoke of people getting ill and fish dying. The Unified Command staff in the command post was not pro-active enough to get ahead of the negative stories being promulgated. The media took the sensationalism of the 20-year-old Exxon Valdez saga and retold them to larger audiences. Many examples of the ecological and social consequences of the *Exxon Valdez* spill were supported by peer reviewed journal articles and research funded by recognized agencies such as the National Science Foundation (Rice. 2009; Picou. 2009). However, combined with claims of health impacts, the resulting media accounts led to a confusing assortment of information that resulted in a "media scare" and increased anxiety for residents along the Gulf of Mexico.

In the command post, the perception was that the *in-situ* burning was going to be a larger concern to the public than dispersants. There was a history of dispersant use in the Gulf of Mexico. Burning was a new response technique for the public. Burning is very visible, with potential high human health impacts. Dispersants are fast acting and not easily seen once they moved into the water column. However, it turned out that the burning was viewed more as a "natural" way to remove the oil and the dispersants were seen as adding more chemical into the ocean. The "invisible" threat posed by chemical dispersants to both ecological and human communities increased public fears of new risks in a time of crisis.

There was a suggestion from the EU to bring in sociologist as consultants to focus on the human dimensions of this event. However, that effort was never funded. Human dimensions are not included in the "normal" range of spill management activities. The

human dimension aspects of spills are quite nebulous to natural scientists, spill managers, and legal advisors. A study to overcome this would require reaching consensus within the Unified Command and then identifying resources and assignments. This kind of activity, like risk communications, does not align readily with a "next operational period" IAP focus. There was a hope that the incident command could get ahead of the curve and identify which issues would be of highest concern to the local populations and develop methods to deal with them to minimize public fear. Nonetheless, this proposed strategy never materialized and clearly reveals an important lesson for future oil spills. The human dimension should be addressed with high priority and the accurate communication of agency objectives to minimize perceived risks to the public needs to be clearly articulated and implemented.

Since it was difficult to get the media to fully cover the dispersant issue in a fair and representative manner, the Unified Command in Louisiana began a series of local community meetings, which were held in each coastal parish throughout the summer of 2010. These were intended to facilitate improved communications by enabling one-on-one discussions with response specialists and interested members of the community. Members from the response who could directly address specific stakeholder questions staffed approximately 30 tables. The tables addressed a wide variety of topics including vessels of opportunity, safety, wildlife and dispersants. They were staffed by agencies including NOAA, EPA, and Louisiana Department of Environmental Quality. In this manner members of the public were able to meet the people responding and the responders met the people at the parish level. It was successful on a small scale, as each meeting could generally accommodate less than several hundred people.

Open house in Houma, LA. (Photo credit: Ed Levine, NOAA)

One item that became clear from talking to people at these sessions was that they had many misconceptions about dispersants (they did not degrade, they were more toxic than the oil, no one was monitoring the applications, they were being sprayed on people and close to shore, etc.). One statement that provided insight to their concern was "We'd rather deal with the devil we know, than the devil we don't." People in the Gulf are

familiar with oil, not dispersants. From conversations with those who visited the dispersant table, it was evident that many people also believed that any oil that was not black must be due to dispersants. Because this oil readily changed from black to brown to reddish-orange as it naturally weathered, people incorrectly assumed that all non-black oil was due to chemical dispersants. Since local fishermen were involved in the response as vessels of opportunity, their photos of the oil, comments, and incorrect assumptions spread quickly *via* social media throughout the Gulf. The fisherman's assumptions combined with social media from trusted community members and further reduced the effectiveness of risk communication efforts. Unresolved concerns about dispersants and their impact on seafood safety and human health persist over a year after the DWH leak was capped.

Risk Communications

The public understanding of risk is closely related to the role of science in characterizing and evaluating risk. A wide variety of risks are viewed as important, while others can be completely ignored. Risk communication is an important response during emergencies. Risk management institutions should include public concerns in the early stages of the response (Pidgeon, et al. 2010:136). The process by which risk, for example, the protection of human health during application of dispersants, is socially defined by science, reflects a complex process referred to as the "social amplification of risk" (Kaperson, et al. 2003). Flows of information are widely available to the public, which provide interpretations of this information involving messages from myriad sources. Among the most important of these sources are scientists, mass media, environmental groups, government agencies, opinion leaders and local authorities. These interpretations ultimately result in the public's assessment of the risk of their behaviors in terms of accepting, ignoring, tolerating or modifying the risk (Kaperson and Kaperson. 2005: 106). Scientific information flows are especially important for the management and communication of "risky" behavior. Nonetheless, public trust in the source of the information flows, sponsorship of scientific inquiry and the clarity of the methodology used by scientists are all important social interpretations that can lead to the acceptance or rejection of scientific opinions.

The negotiation and elaboration of what constitutes the public understanding of risk often occurs in the context of the mass media. It is apparent that the mass media is a prominent source of information regarding technology, science, and risk perceptions. A variety of media sources interpret scientific information, while also framing this information within an organizational context that may include moral and political implications. Therefore, the mass media has both direct and indirect effects on risk perceptions. Given the fact that scientists often provide caveats of uncertainty regarding their information, journalistic accounts often transform this uncertainty to what appears to be "absolute certainty" (Morgan, et al. 2001). Simply put: "The problem in many cases is that when it comes to news coverage the potentiality, uncertainty and ambiguity of risk have to be toned down. Either a risk is truly and surely dangerous or it is not news at all" (Arnoldi. 2009: 131).

The mass media may distort risk by either amplifying certain risks and/or ignoring others. Given that the mass media often poorly communicates the scientific complexity of risks, different media outlets may provide the public with interpretations that reflect their political interests. For example, publications and blogs from environmental organizations raised issues regarding the unknown chemical composition of dispersants, thereby increasing uncertainty regarding exposure risk and seafood consumption. On the other hand, government agencies will report the testing of seafood as comprehensive with their results reflecting a high degree of certainty. When covered by the media, this discourse of contradictory claims also becomes influential for public risk perceptions of the appropriateness and safety of dispersants. The complex scientific questions concerning differences between biota exposure to dispersants and the exposure of seafood to dispersed oil are never addressed adequately by the mass media. This fact often results in confusion and misunderstanding by the public of risks involved with dispersant use.

The perception of the safety of dispersant use involves a complex array of social factors. The public perception of risk involves: 1) how well the risk is understood; 2) how the risk is distributed across various groups; 3) the amount of personal control that can be exerted over risk; and 4) whether the risk is voluntary or involuntary (Morgan, et al. 2001). This information is delivered through a social framework with information flows from a variety of sources including technology, science, and the mass media. Trust, or lack of trust, in the sources of the information presented to the public is also critical for the acceptance or rejection of risk communications. For example, several random surveys of Gulf Coast residents clearly reveal a lack of trust in sources of risk information, including government, corporations and various agencies (Table 1). Research conducted while the DWH was releasing oil (Ulrich. 2011) and five months after the spill (Gill, Picou and Ritchie. 2011) suggest that except for information provided by the Coast Guard, Scientists, and NOAA, very little communication about the spill was viewed as trustworthy by residents of Louisiana, Alabama and Florida. Essentially, there was strong distrust in information provided by BP, the Federal Government, and websites /blogs. The fact that 2 out of 3 respondents did not trust any information released by government agencies, the media and environmental organizations reveals the social context of distrust that characterized risk communications associated with the DWH spill.

Table 1: Trust in Information About the DWH Provided by BP, Government Agencies and Other Sources

Percent of Respondents who Trust:		
Coast Guard	79%*	Scientists – 52%**
NOAA	46%	Environmental Orgs. – 37%
FDA	36%	Newspapers – 34%
Local Government	34%	Network T.V. – 26%
EPA	32%	BP – 18%
AL State Government	27%	Websites/Blogs – 12%
Federal Courts	23%	

MMS	22%
Federal Government	17%
BP	13%

*Source of data: Gill, Picou and Ritchie. 2011 **Source of data: Ulrich. 2011

This lack of trust in risk communications regarding efforts to inform the public as to why dispersant application was necessary for the DWH spill and the risk to human health and seafood posed by such use is related to public fears and concerns about dispersants. This fact reveals the importance of trust as it relates to perceptions of risk held by the public. For example, risk managers need to distinguish between "critical trust" and absolute "distrust" of the agency, scientific organization or corporation that is communicating information about the risk of controversy (Pidgeon, et al. 2010). Absolute distrust by people raises important concerns regarding the relationship between the public and the risk management institution. The fact that communications in the early stages of the DWH spill were inaccurate, i.e., amount of oil leaking kept changing and misinformation that BP refused to accept government directives regarding dispersant use, created a social context for public distrust of both the message and source of the message. Given this context, it would have been strategic for all agencies to conduct public meetings to assess public concerns regarding dispersants before providing risk statements on dispersant application and risk (Bier. 2001). Providing more information is often viewed by the public as "business as usual," resulting in more distrust.

An important issue for effective risk communication is the rebuilding of trust in the public after the threat to residents, tourists or seafood consumers has subsided. Indeed, the use of dispersants following the DWH spill caused health fears among residents and cleanup workers, while also raising concerns throughout the country regarding the safety of Gulf of Mexico seafood. The fact that the public viewed the impact of dispersants as "unknown" increased the perception of risk. When BP and NOAA officials visited primary schools in Louisiana and told children that the dispersants applied to the oil were as safe as laundry detergents, parents angrily responded in disbelief. Once again, by providing "more information" risk managers actually produced more distrust among the public concerning the risk of applying dispersants.

Trust

There are important antecedents to trust. First, trust in an institution requires a perception by the public of organizational competence. Second, a belief in the benevolence of the organization, which reflects a sincere concern of the public's perspective of the risk. Third, there needs to be a relationship of shared values between the public and the institution (Siegrist, et al. 2010). That is, if a corporation's values were profit at all cost, then residents who are worried about health issues would not be trusting. This reveals a disconnect between "shared values" (Savadori, et al. 2010). These elements combine to form the important precedent to trust often referred to as "confidence." Risk communication strategies must include confidence building messages as well as information.

Risk communication often focuses on the dissemination of "facts" to the stakeholders. However, increased knowledge, or the presentation of "facts" by experts is not correlated with increased trust or acceptance of a risk. Actually, when knowledge is limited or such claims contradictory, trust becomes very important for risk communication (Siegrist and Cuetkovich. 2000). When the public is highly knowledgeable about a hazard, they are less reliant on trust for the acceptance of risk. As noted by Siegrist and associates, "confidence is based on familiarity, experience and past performance. Social trust, in contrast, refers to the willingness to rely on others" (Siegrist et al. 2010: 268). When risk communication occurs in a context of no public confidence in the source of the information, there is a reaction of absolute distrust. Risk management institutions need to be knowledgeable about the fears, needs and values of their target audience before communication strategies are deployed (Siegrist et al. 2010: 282). Furthermore, risk communication programs should acknowledge "uncertainty" with a plan to reduce issues of concern. The involvement of representatives of environmental, local citizen and trusted intermediary organizations in the characterization of risk communication facts will also increase public confidence in the message. Indeed, it has been shown that risk communications that strongly argue that health symptoms are not physical, but social psychological in nature, result in a "blaming the victim" public perception. This, in turn, may lead to the rejection of the risk communication message (Wessely. 2000).

Risk communication is a complex process that must involve confidence and trust by the public in the risk management institution. Trust and confidence must be earned through the expression of "shared values" which require equal-status participatory communication strategies. Involvement of environmental groups, local citizen groups and trusted intermediary organizations in open discourse with the public is the first step for organizing effective risk communication concerning dispersant effects on health and seafood safety. Risk management institutions involved in oil spill response should be aware of their public image and attempt to project a positive concern for the public through their organizational culture and their transparent discourse with other stakeholders.

The Consensus Environmental Risk Analysis (CERA) process seeks to bring oil spill decision-makers and their advisors together in US Coast Guard Sectors to review potential response options for use during scenario-based oil spill incidents. Given that for the DWH spill this process was focused on species and habitats present during the scenario period, the consequences for public opinion or the effects on economic conditions was minimized. The future application of this process should identify the reasoning for using or not using different options and find effective strategies to disseminate information to the general public and other stakeholders outside the Unified Command system.

Lingering Issues

- Questions related to this topic that were resolved during DWH:
    - Is it possible to mount a coordinated large-scale dispersant operation?
    - Can you monitor dispersant effectiveness?

    - Was the public affairs unit prepared for communicating risks from dispersants to the public and other stakeholders?

- Knowledge gaps and questions that remained unresolved by DWH:
    - How much is too much?
    - What are the effects on sea life?
    - How long do dispersants remain in the environment?

- New questions that resulted from DWH relative to the topic:
    - How do you explain the issues involved in tradeoffs?
    - How do you build a trusting relationship after a disaster occurs?
    - What are some products that contain similar chemicals to dispersants that people can relate to?
    - How do you maintain, or rebuild, public confidence in seafood safety?

- R&D needed to resolve outstanding questions relative to topic:
    - How can you monitor for effect in a more real-time mode and translate the results to risk communications for public health and safety?
    - How can you build shared values during a spill response?
    - How do you plan for and recognized the human dimensions of oils spills?

Conclusions

The lessons learned from the DWH spill provide information across a broad array of concerns associated with large-scale oil spills. An effective, coordinated large-scale dispersant operation was mobilized following the DHW blowout. A monitoring system that detailed the effectiveness of both surface and subsurface applications was designed and applied throughout the spill area. Present research efforts are collecting scientific data on the impacts of dispersants on marine habitats and sea life. Questions regarding impacts and the degradation process of dispersants in the marine environment will also be addressed by these on-going scientific studies. At this time, the risks posed to the environment and human health by the dispersant applications in the Gulf of Mexico appears to be minimal. Nonetheless, public opinion continues to challenge such contentions.

The lessons from the DHW spill also identify new questions and research needs directly associated with risk communication issue that emerged over the spill timeline and continue to the present. First, risk management institutions should anticipate "media scares," the reporting of contradictory information and a general lack of accurate information for the scientific basis of procedural decisions made by the unified command system. The confusing context of the mass media, including social media sites, identifies a challenge for risk management institutions that involves broadening the participatory discourse of risk communications, building trust in information provided to the public and acknowledging the uncertainty of risks when appropriate. Risk management institutions need to be familiar with the economic, social and cultural characteristics of

communities impacted by oil spills. The importance of the human dimension for responding to oil spills became apparent in the months following the DHW incident.

The fact that some limited success in communications regarding dispersants and their use was achieved at small community meetings attests to the importance of understanding public concerns and fears prior to providing risk communication "facts" from the United Command. The participation of trusted intermediary organizations, such as Sea Grant, environmental organizations, public officials, etc., in these gatherings would also provide a mechanism to establish "shared values" between spill response organizations and residents of impacted communities. This process would result in positive trust building activities which enhance public acceptance of risk communication information.

There are also continuing problems regarding public perceptions of seafood safety, water quality, air quality and other ecological risks associated with the aftermath of the DWH release of over 200 million gallons of oil into the Gulf of Mexico. The human dimension of oil spills projects a number of economic, social, cultural and legal issues well into the future. Although the DWH spill is physically over, consequences for the human dimension will persist. Future basic research on risk perceptions regarding seafood safety and human health are needed and applied programs on the effective delivery of important risk information should be implemented at the community level. People continuously reflect on risk behaviors and risk perceptions do change over time. Because of this fact, efforts to build trust in risk management institutions through participatory discourse within local communities should be a high priority for fostering recovery. Given that social surveys show that the Coast Guard, reports from scientists and NOAA were the most trusted entities for the Gulf Coast residents identifies three important sources for sponsoring and implementing future risk communications about the lingering consequences of the DWH spill.

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