

Social disruption from oil spills and spill response: Characterizing effects, vulnerabilities, and the adequacy of existing data to inform decision-making.

Interim Report (summary of progress in Phase 1)

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Purpose

The purpose of this report is to summarize what we have learned about these two research objectives:

1. *Identify socially disruptive effects from oil spills and spill response activities.*
2. *Characterize the factors that shape the vulnerabilities of communities to stresses associated with oil spills and spill response activities.*

The report includes the following:

- A taxonomy of human impacts of oil spills that are relevant for spill response planning. These impacts are mined from the existing literature and gathered from fieldwork done in three case study locations and in Cordova, Alaska.
- A qualitative evaluation of how these impacts have been considered in oil spill response planning and management activities.
- Narrative descriptions of driving forces of vulnerability that shape the effects oil spill stressors have on communities. (These stresses refer to the spill itself, as well as preparation for a spill and clean-up activities). These factors are organized in a manner consistent with our understanding of vulnerability (i.e., exposure, sensitivity, response capacity).

Human impacts of oil spills and spill response

Our taxonomy of impacts is based on a review of the literature in the fields of social impact assessment (SIA), natural hazards management, and vulnerability studies. There are numerous other taxonomies that have been proposed and three of the most prominent are summarized in Table 1.

Vanclay (2002)	ICGPSIA (1994)	Gramling and Freudenberg (1992)
Environment	Population	Biophysical and health systems
Health and well-being	Individual and family	Psychological systems
Fears and aspirations		
Community	Community and institutional structures	Social systems
Way of life		
Political systems	Political and social resources	Political/legal systems
Personal and property rights	Community resources	Economic systems
Culture		Cultural systems

Our taxonomy builds mainly from the categories proposed by Gramling and Freudenberg, but differs in that we combine mental and physical health into one category and we add the category of “human uses of the environment” in order to get at impacts related to tourism, recreation, and other factors labeled as “way of life” by Vanclay. We call this database CIVIC: Classification of Impacts and Vulnerability-Influencing Components. Our structure of CIVIC is summarized in Table 2. It does an excellent job of accommodating the impacts relevant to oil spills and spill responses in a wide variety of communities. In the Table, there is no significance to the order of columns from right to left, each column hosts one type of impact.

The impacts listed in Table 2 are, for the main part, negative impacts. Of course, it is possible to describe any impact using neutral language, but we have decided that this would seem unnatural and confusing to most users. For most of the impacts we include, the consequences are negative. In the cases where the consequences can be positive, we have elected to use more neutral wording, for example:

- “change in income, revenue, or expense,” or
- “quality of everyday government functions.”

Table 2. Taxonomy of human impacts from oil spills					
Physical Health					
Acute	Chronic	Injuries	Trauma and depression	Anguish	
Social					
Change in relationships and interactions	Change in make-up of community	Change in behaviors	Stigmatization or labeling	Unfair treatment	Infrastructure and social services
Cultural					
Interruption of traditional activities	Violation, damage to or destruction of cultural, sacred, historical, archeological and natural resources				
Economic					
Disruption of "normal" economic activities	Change in income (revenue) and expenses	Lost livelihoods	Costs	Damage to tangible private property	
Experience and Use of the Natural and Built Environment					
Loss of recreation opportunity because of closures or presence of oil.	Impaired experience due to odors	Deterioration in non-market, non-consumptive aesthetic and moral value ascribed to a location.	Quality of community infrastructure	Quality and availability of housing	Access to natural environment and infrastructure
Governance					
Trust	Preparedness and capacity of response and planning.	Participation	Hearings and new legislation or regulation	Quality of everyday government functions.	

In keeping with the SIA literature, we define human impacts as: changes in condition or state of a social entity. And we define social entities as: having agency and the potential to interact with other social entities. CIVIC also includes a categorization of the social entities impacted, these are organized in Table 3. As with Table 2, there is no significance to the different columns from right to left, the layout is simply a more visually pleasing strategy to a bulleted list or outline.

Table 3. Taxonomy of social entities impacted from oil spills					
Individuals					
Cleanup workers	Residents	General Public	Fishermen		
Social					
Formal organizations	Households	Ethnic groups	Community	Tribal members	Subsistence
Economic					
Tourism industry	Commercial fishing	Other industry	Retail businesses	Oil sector	Economic sectors
Government					
Local	State	Federal	Tribe	Other	

Hypothetically, any one of the entities listed in Table 3 could experience any of the impacts in Table 2. Thus, it is possible to build a two-dimensional matrix, with types of impacts listed on one dimension and impacted entities along the other. In reality, not all impacts are experienced by all entities, so some of the cells remain blank, but this matrix organization helps to clarify who may be impacted and how. As noted above, for the most part we have elected to characterize impacts in a negative sense, except when those impacts often do also have a positive impact. Certainly, there are other entities that may be impacted by oil spills, but our taxonomy represents the major impacts and impacted parties that have been reported in the literature. Depending on the interests of those using the taxonomy, additional social entities can be added to reflect the specific entities that are relevant in area planning.

How human impacts are considered in planning

We began this project with an assumption that contingency plans do not provide systematic and comprehensive information to spill managers about human dimension impacts. To date, our research is confirming the validity of this assumption. However, this does not mean that area planning committees or contingency plans fail completely to identify human dimension impacts and strategies to mitigate them. Rather, we find that the efforts are *ad hoc*.

This preliminary conclusion is based on review of a small set of contingency plans, interviews in the Buzzards Bay, Long Island Sound, New Orleans, and Cordova case studies, and informal discussions with spill managers.

We are also finding the following patterns:

Spill managers are aware of and concerned about a number of human dimension impacts, but often focus on insights from recent experiences. Our case study interviews and informal discussions reveal that spill managers are well aware of the need to consider potential human dimension impacts from spills and spill response. Often, their concern is reflective of their recent experiences, rather than exploring the issue more thoroughly. For example, political fallout from the *Cosco Busan* spill has resulted in area committee members across the nation focusing a considerable amount of attention on public communications, perceptions of trust in government, and organizing/planning for volunteers. But it did not stimulate a thorough re-examination of how volunteers have been used, successfully or unsuccessfully, in other major oil spills across the country in the past decades. The *Bouchard-120* spill inspired attention to how coordination and integration of local responders and federal responders could be improved (thus, avoiding negative impacts such as decreased public trust in government and emergence of animosity among governmental entities). Similarly, Dept. of Homeland Security actions in the aftermath of the terrorist attacks of 9/11 have focused attention on specific areas. These include, for example, the National Security Presidential Directive 41 /Homeland Security Presidential Directive 13 (NSPD 41/HSPD 13), which, among other things, required plans to address maritime infrastructure recovery. This planning priority is reflected in formation of the Marine Transportation System Recovery Unit (MTRSU). The MTRSU is one instance of efforts to systematize input about economic impacts and vulnerabilities related to marine infrastructure into spill response.

Area planning committees and contingency plans do not address the full range of potential human dimension impacts from spills. Our review of existing literature on human dimensions of oil spills and spill response identifies many examples of human impacts that have resulted from spills or spill response. As stated above, we organized these impacts into a small set of major categories: individual health, social, economic,

cultural, human use of the environment, and political. We found that, when contingency plans do address human impacts, they focus heavily on economic impacts. Moreover, the impacts that are given attention do not appear to be identified through any sort of systematic assessment.

Prevention and mitigation strategies for human dimensions impacts often depend on pre-existing relationships rather than information in contingency plans. This was an interesting finding from our case studies. In New Orleans we learned, for example, that a recent spill occurred near to a community that was hosting a fishing rodeo. Spill managers knew this because of their embeddedness in the community and social relationships – not because the information was in a contingency plan or other document. The spill managers were unsure of the direction that oil might go, but they knew of the importance of the rodeo to the local community (socially and economically) and that under some conditions it might be impacted. Thus, they proactively contacted the local officials and organizers and began a conversation about what spill effects might be experienced and what could be done to mitigate those effects. According to the responders, this had the effect of solidifying trusting relationships between community political leaders and the federal and state agencies responsible for spill response.

Spill managers are trying new approaches to gathering information about human dimension impacts. For example, in Long Island Sound spill managers have initiated a series of meetings with local officials and business leaders about human dimension impacts from spills. These include the need to shut down ferry operations between Connecticut and Long Island, and the kinds of consequences that might occur (including how they vary across seasons). In addition, they have discussed the consequences of closing ports due to a spill, and how this can impact the distribution and availability of local supplies of gasoline and home heating fuel. This information is being used to think about exercise scenarios and spill response strategies that prevent or mitigate such impacts and vulnerabilities.

Driving forces of vulnerability

Vulnerability is a multi-dimensional, dynamic concept that links together three elements associated with the entity and the stressor. These are: *exposure*, *sensitivity*, and *response capacity*. Exposure involves an encounter with a stressor. Sensitivity and response capacity are properties of the social entity that is at the focus of consideration. Sensitivity is a property that determines how the entity is impacted from the exposure. Response capacity is ability to take actions to avoid, mitigate, or compensate for negative impacts. Vulnerability analysis highlights how stressors arise, how exposures and susceptibility to the threats are differentially distributed, and how people respond, adapt, or cope with the threats and their effects. In all of the analysis, efforts are made to think about these impacts and vulnerabilities in terms of coupled human-environment systems.

Exposure

Exposure is characterized with temporal and spatial extent, magnitude, duration and the types of social entities threatened. Table 4 briefly summarizes the characteristics of stressors that generate human impacts associated with an oil spill or a response to the spill.

Stressor	Qualities
Oil spill event	Type of oil
	Type of area impacted
	Spatial extent
	Time of year
	Duration
	Weather
Spill response	Number of workers
	Duration of activity
	Communication
	Involvement of volunteers
	Hiring local people
	Structure and organization of cleanup
	Response methods (e.g., use of dispersants, skimmers, steam cleaning)

Most of the items in Table 4 are self-explaining, but one in particular could bear elaboration. Under the stressor “spill response” we list a quality called “structure and organization of the cleanup.” This refers to the way in which the organizations involved

in the response -- state and federal agencies, Coast Guard, major stakeholders, and the responsible party – organize themselves and make decisions about the cleanup. For instance, if a key organization such as the Coast Guard is constantly rotating in new leadership every few days, this can itself be a type of stress that others are exposed to. Likewise, if the response leadership is geographically split and is not effectively communicating with each other, confusion can result.

Sensitivity

Sensitivity refers to the degree to which a social entity is likely to experience harm when exposed to a stressor. When we talk about sensitivity, we begin with the presumption that a social entity has been exposed. (Dodging or reducing exposure is dealt with in the next section.) It is helpful to distinguish among sensitivities that are more fixed and those that are dynamic or readily altered. The former are akin to being traits of social entities while the latter are akin to characteristics. Social entities have many traits and characteristics. In using these two words, we are making a distinction here that many psychologists make. Traits are usually seen as more fixed features of an individual's personality, while characteristics are qualities of a person that change. Whether any specific trait or characteristic is a sensitivity is determined by the type of stressor. For example, if a stressor is a toxin, then sensitivities will concern qualities of individual's health. People who are frail are more sensitive to additional toxic stresses than are individuals who are healthy. If the stressor is economic, then a whole different set of sensitivities will be relevant.

Table 5. Examples of sensitivities for economic stressors.		
	More fixed	More changeable
Individual	Risk-taking behavior	Training
Business	Debt burden	Number of employees
Community	Economic diversity	Enforcement of regulations

Fixed sensitivities are traits of an entity and past experiences that cannot be readily changed. They determine the entity's ability to absorb an insult without being impacted. Table 5 gives some examples of sensitivities associated with economic stressors for different kinds of social entities.

For example, a sensitivity of individuals that strongly influences how much harm they experience from an economic stressor is risk-taking behavior. Science has identified a gene associated with risk-taking behavior. This is a trait, a relatively fixed feature of an individual. It may be possible to modify it, but only over many years. People who embrace risk-taking expose themselves to greater amounts of possible harm due to an

economic stressor. Training, on the other hand, is not a trait. The level and content of someone's training is a characteristic. It is readily changeable. Training refers to the skills a person has mastered. For example, a crew person can be trained to cook, repair gear, and clean fish. When crew can perform multiple functions, their sensitivity to being put out of work is reduced.

Debt burden and number of employees are characteristics of businesses that affect how an economic stress impacts them. The former is more difficult to change quickly, which the latter can be rapidly changed. For communities, economic diversity is a slow-changing variable, while enforcement of regulations is something that can be changed very quickly.

The types of sensitivities can be further broken down into dimensions that are relevant to oil spill hazards. Table 6 lists five dimensions of sensitivities and gives some examples that are relevant for three types of social entities.

Dimensions	Individual	Business	Community
Physical	Age, health, reliance on subsistence fishing for nutrition, occupation	Type, location, transport routes, employment	Location, infrastructure, population, support services, housing
Economic	Debt burden, credit score, income	Resource dependency, access to markets, price and cost stability	Economic diversity, resource dependency, tax dependency, unemployment rate
Social	Kinship relations, knowledge of social services, social relations	Business reputation, stigma, perception of products	Social network, density, community cohesiveness, volunteer base, crime.
Governance	Influence, involvement	Legal expertise, influence, credibility, collaboration,	Trust, credibility, collaboration, leadership resources, experience with disaster response, communication channels.
Cultural	Risk perception, identity dependency on cultural resources	Cultural affiliation	Cultural conflict

Response capacities

Response actions are things that social entities may do when they anticipate or begin to experience impacts. Some of the words used in the literature for this are: prevention, coping, response, adjustment, and adaptation. We generally favor the term *response actions* to stand in for all these types of actions.

Not all entities can or will take all response actions. For this reason it is helpful to think about response capacities. It is also useful to think about response capacities, because enhancing response capacity is one way of reducing vulnerability to harm. Resilience is an important associated theme here. It is customary to define resilience as the ability of the system to return itself to the “normal” or stable state it was in before it encountered the stressor. Going further, it is also useful to distinguish between static resilience and dynamic resilience. The former relates to a simpler model, one where the system returns to a pre-condition state. Because social systems are always changing, this notion is of limited use. Dynamic resilience is meant to capture the idea that the system can “right itself” after the stress, but it may end up being in a different state. This state may be more preferable for some people, less preferable for others, but it is still considered a stable, functional state.

Response actions can be undertaken for several purposes. First, they can act directly to prevent the stressor itself. For example, regulations to require all tankers to be double-hulled are intended to reduce the probability of subsequent spills. Second, response actions can change behavior so as to interrupt the transmission of the stressor. For instance, fishers who are prevented from fishing in certain waters because of a spill, may change the gear on their boats so that they can fish for other species in other waters while their regular fishing grounds are closed. This is an adjustment to the process of fishing that continues to supply revenue during the disaster. Third, response actions may be intended change the sensitivities of social entities. For example, fishers might train their crew to do all the jobs on the boat so that, if the need arises to reduce crew size, the vessel can still function.

It is also helpful to distinguish among the parties taking the actions. Management response actions are explicitly intended to manage the hazard and reduce risk and harm. Response actions by individuals can be oriented to reducing their vulnerability, but may also be linked to secondary motives.

Conclusion

Drawing on existing literature, we have demonstrated how systematically thinking through the human dimensions of oils spill and vulnerability improves one's understanding of the dynamic aspects of the human-environment systems impacted by the spill and spill responses. Vulnerability information comprises stressors, intermediary processes, impacts, sensitivities, and response actions. The CIVIC taxonomy summarized in the Tables above is based primarily on existing reports of spills and spill responses. These are not intended to be checklists. They are intended to serve as a menu of possibilities that can be consulted in a study of a particular site to inform the investigations. They can also be used as a list of probes for interviews with stakeholders to better identify and anticipate their concerns.

In our literature review and in our case studies, we have found the following:

- Spill managers are aware of and concerned about a number of human dimension impacts, but often focus on insights from recent experiences.
- Area planning committees and contingency plans do not address the full range of potential human dimension impacts from spills.
- Prevention and mitigation strategies for human dimensions impacts often depend on pre-existing relationships rather than information in contingency plans.
- Spill managers are trying new approaches to gathering information about human dimension impacts.

A more systematic understanding of the factors that drive or shape vulnerability to spills and spill response activities will benefit contingency planning. For instance, quick access to current information on employment and housing availability may allow less disruptive clean-up responses. In the long-term, improved understanding of human impacts will contribute and enhance damage assessments. It will provide insight into the pathways by which negative and positive impacts emerge, who experiences them, and the long-term prospects for recovery. In addition, "lessons learned" from experiences with a particular spill may be more readily transferred to new spill events when the underlying context-dependent causal pathways that lead to socially disruptive effects are better understood.