INTELLIGENCE THAT WORKS

Setting Research Priorities: Learning from the Economic Impacts of Environmental Incidents

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Introduction

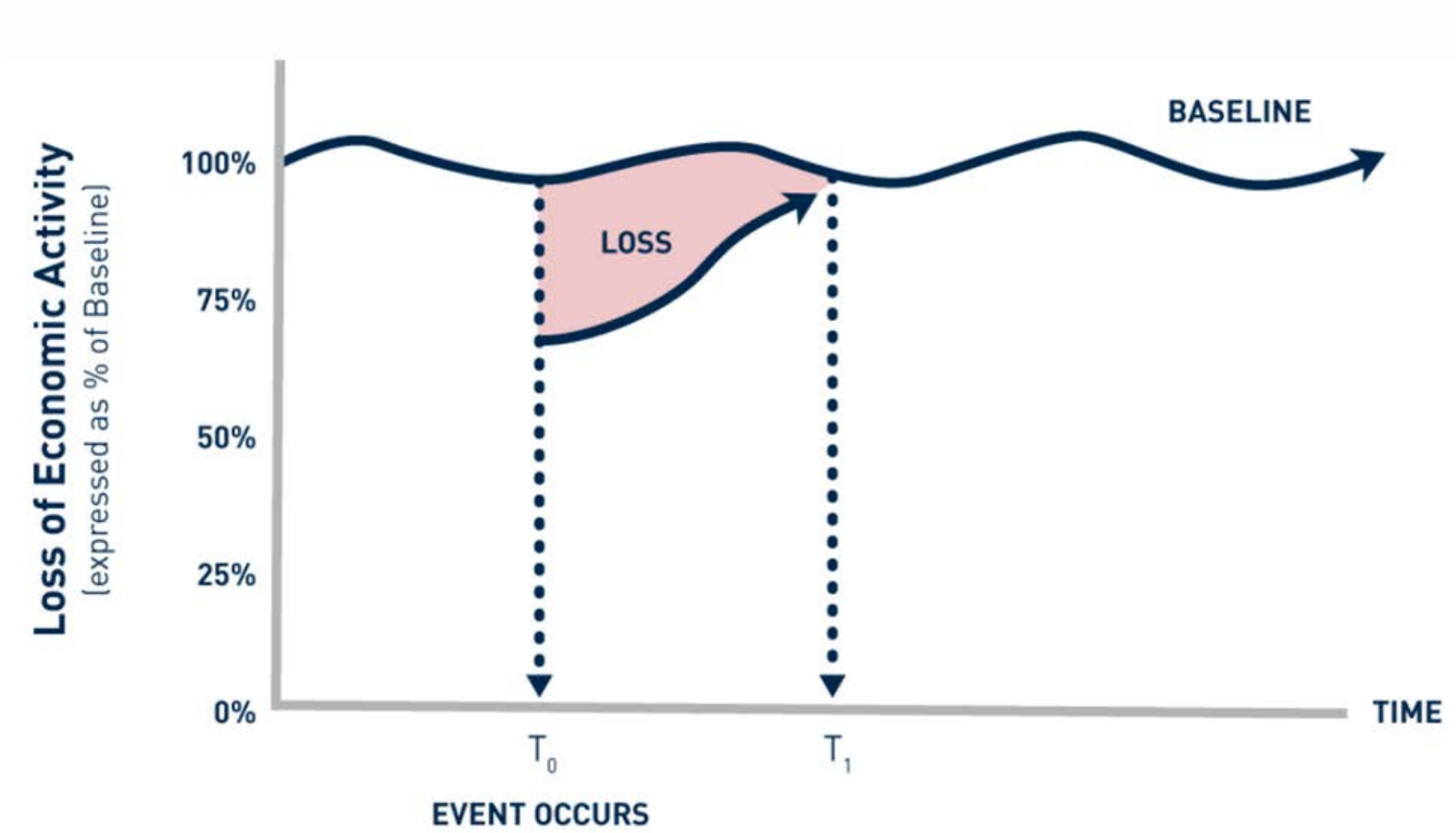
- Summary of my background
- Core damage concepts
- Damage-function approach
- Valuation of economic loss
  - Conventional scope
  - Social media and stigma

Note: The views and opinions expressed in this presentation are my own and do not necessarily reflect the opinions, position, or policy of Berkeley Research Group, LLC or its other employees and affiliates.

Core Damage Concepts

- Baseline
  - Historical and projected
- Incremental impact on assets and infrastructure caused by the release
- Loss of economic activity
  - Direct, indirect, and induced
- Restoration (attenuation, response, and compensatory)

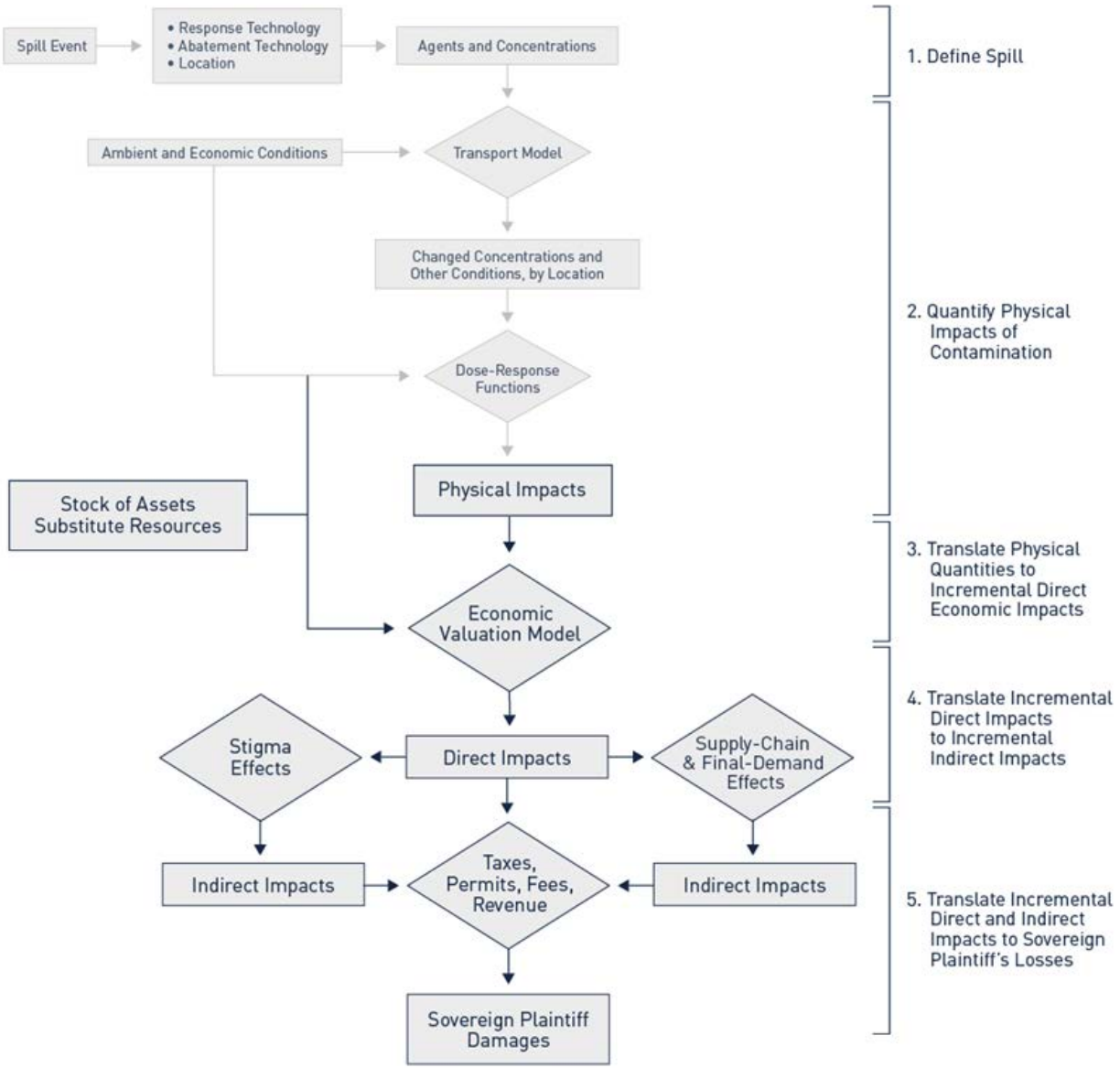
Economic Loss from Incident



Damage-Function Approach

- Evidenced-based methodology
- Focuses on causality and isolation of the incremental physical and economic effects
- Emphasizes:
  - Precise definition of the incident and release
  - Quantification of the immediate physical impacts, dispersion, dose-response, and changes to services or resource levels
  - Valuation of the direct, indirect, and induced economic impacts which can be social and psychological
  - Valuation of short- and long-term fiscal impacts

Impact-Pathway Damage Function Approach



Relationship between DFA and Economic Impacts

- Research identifies the following considerations for the financial shocks and economic losses from disaster events:
  - Economic impacts are derived from changes in the level of economic activity.
  - Direct impacts are first measured by the immediate value of physical destruction or impairment of capital and labor resources.
  - Smaller direct losses in local events are unlikely to produce measurable indirect losses.
  - Although direct capital and infrastructure losses can affect production and lead to indirect impacts, resource substitution reduces indirect impacts.
  - Economies with flexible and available production capacity are more resilient to the effects of disasters.
  - Economies with high levels of cross-regional connectivity are more resilient to the effects of disasters.
  - Disaster events with direct capital impacts less than $50 billion in value are not expected to exhibit measurable indirect losses in developed economies.

- Recent tax work examining the impacts on US state governments from natural disasters in the context of fiscal impacts finds no statistically significant effects on overall tax revenues generated in the jurisdiction. Why? Economic flexibility and response expenditures.

Valuation of Impacts from an Environmental Incident

- Measurement of incremental change in goods and services that are valued in use or create welfare through option, bequest, and existence values.
- Conditions that support reliable measures are rational, well-defined and stable preferences.
- Values can be *revealed* through economic choices or through *stated preferences* collected by survey/elicitation methods.
- Valuations are typically defined in monetary terms but need not be.
- Labor impacts often follow impacts to businesses, infrastructure, and property.

Economic Methods to Measure *Conventional* Sources of Changes in Value from Ecological Services

Benefit Category	Examples	Commonly Used Valuation Methods
Human Health Improvements		
Mortality risk reductions	Reduced risk of: Cancer fatality Acute fatality	Averting behaviors Hedonics Stated preference
Morbidity risk reductions	Reduced risk of: Cancer Asthma Nausea	Averting behaviors Cost of illness Hedonics Stated preference
Ecological Improvements		
Market products	Harvests or extraction of: Food Fuel Fiber Timber Fur and Leather	Production function
Recreation activities and aesthetics	Wildlife viewing Fishing Boating Swimming Hiking Scenic views	Production function Averting behaviors Hedonics Recreation demand Stated preference
Valued ecosystem functions	Climate moderation Flood moderation Groundwater recharge Sediment trapping Soil retention Nutrient cycling Pollination by wild species Biodiversity, genetic library Water filtration Soil fertilization Pest control	Production function Averting behaviors Stated preference
Non-use values	Relevant species populations, communities, or ecosystems	Stated preference
Other Benefits		
Aesthetic improvements	Visibility Taste Odor	Averting behaviors Hedonics Stated preference
Reduced materials damages	Reduced soiling Reduced corrosion	Averting behaviors Production / cost functions

Note: "Stated preference" refers to all valuation studies based on hypothetical choices, as distinguished from "revealed preference," which refers to valuation studies based on observations of actual choices.

Source: Reproduced from U.S. Environmental Protection Agency, National Center for Environmental Economics. Guidelines for Preparing Economic Analyses, December 17, 2010 (updated May 2014), p. 7-9, Table 7.1. (Similar to April 3, 2020, Update Review Copy, p. 7-3, Table 7.1).

Stigma Matters

lows the asbestos to enter the living areas of a structure. It is particularly dangerous when it is in "friable" condition. It is far less of a threat when it has been encapsulated.

al sites, as well as equipment used to transport radioactive material. Proximity of property to nuclear power plants and other nuclear facilities is likely to produce

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STANDARD ON THE VALUATION OF PROPERTIES AFFECTED BY ENVIRONMENTAL CONTAMINATION 2016

negative value effects. Aside from the obvious risks of nuclear accidents, additional risks are associated with decommissioning, waste disposal, and contaminated areas. To some extent, the problems are no different from those associated with proximity to conventional heavy industry. However, because radioactive waste often remains toxic for a very long time and tends to be more difficult to dispose of, a greater stigma may result. Finally, current radioactivity research indicates more risk from less exposure than was previously believed

with other substances or light to produce contaminants. The degree to which values are affected by air pollution depends on the economic cost to escape the pollution. For example, air pollution may occur equally throughout a major center. Because of distance to alternative work sites or other costs of doing business, it may be noncompetitive or undesirable to locate in less polluted locations. In this case, the effect of air pollution will be constant and already accounted for in the market. No additional adjustment will be necessary unless regula

Source: International Association of Assessing Officers (2016).

Stigma Matters for Research Priorities

Superfund responses at NPL sites can lead to two types of benefits. First, response actions can reduce actual exposure (or the likelihood of future exposure) to hazardous substances, which can lead to health benefits. Second, people living near NPL sites may have a better sense of well-being (i.e., "feel better") if the stigma associated with living near once-contaminated sites is eliminated through removal of any fear or uncertainty associated with potential health risks (Dale et al. 1999; Fischhoff 2001; Kasperson et al. 2001).[3]

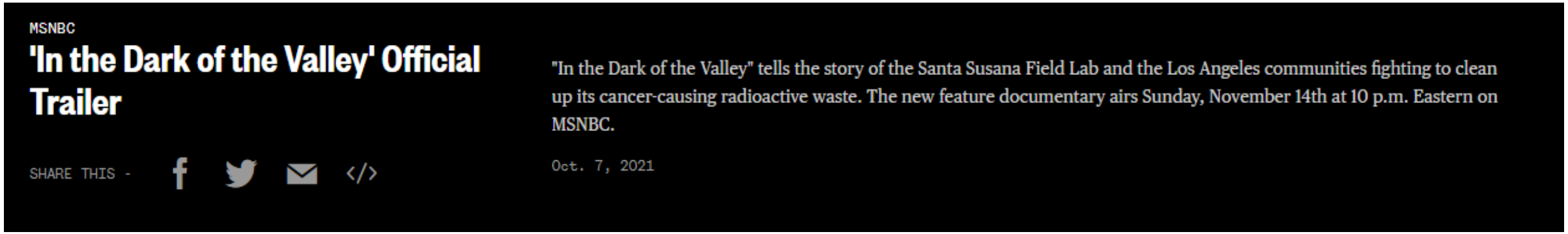
Specifically, stigma may cause declines in property values that result in shifts in the composition of a neighborhood, including a decreased ratio of homeowners to renters; a decrease in average income of residents; and a decrease in the overall status and political power of residents. This process would only be expected in areas where there was a long lag between when a site was first discovered and eventually cleaned up. An important aspect of stigma is that it may result from changes in a community that remain even after the health risks of contamination are eliminated, such as deterioration in housing stock (Fischhoff 2001; Gregory and Satterfield 2002). There is evidence that such long-term effects have occurred at NPL sites and may be especially problematic when remediation activities are delayed (McCluskey and Rausser 2003a; Messer et al. 2006). There is also evidence that NPL remediations themselves can cause stigma

Source: USEPA Office of Superfund Remediation and Technology Innovation (2009), Challenges in Applying Property Value Studies to Assess the Benefits of the Superfund Program

[3] In this context, stigma is attached to an area (or site) after it has been identified as contaminated and therefore dangerous, but stigma actually only occurs if an area that was once identified as acceptable gains a lasting reputation for being blemished or inferior.

Research is Needed to Address Unconventional Valuation

- Radiation sources include nature, technology, places, accidents, and intentional release.
- Stigma can affect places, products, technology, and industries.
- Changes in economic activity from stigma are indirect impacts with observable consequences, but prediction, measurement, and management of stigma are poorly understood.
- With social media, stigma can amplify the impacts from radiation contamination well beyond the original incident, “objective risks”, or the contaminated area.



Questions?

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