Economic Analysis at the Environmental Protection Agency

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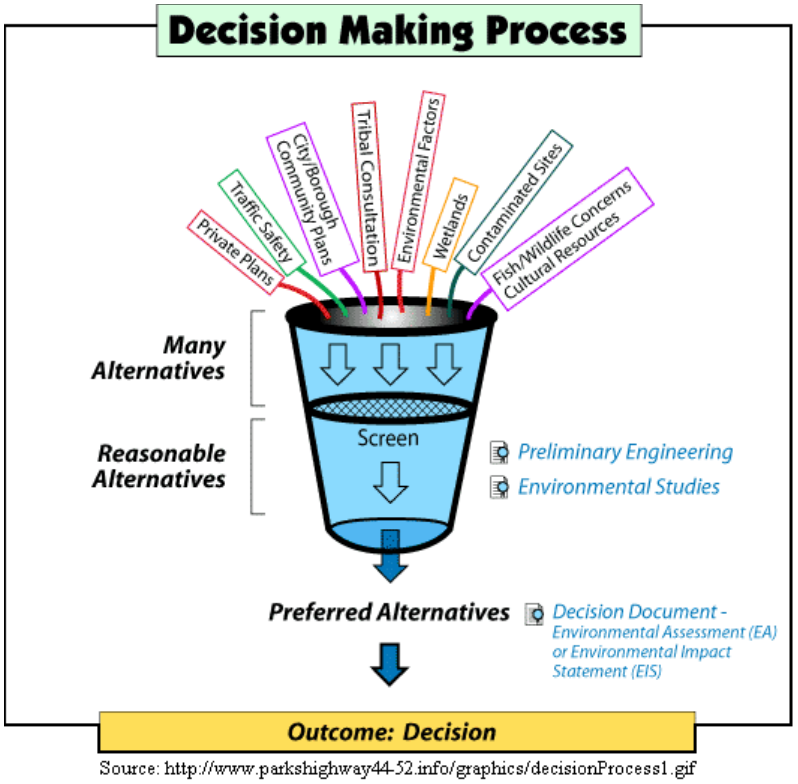
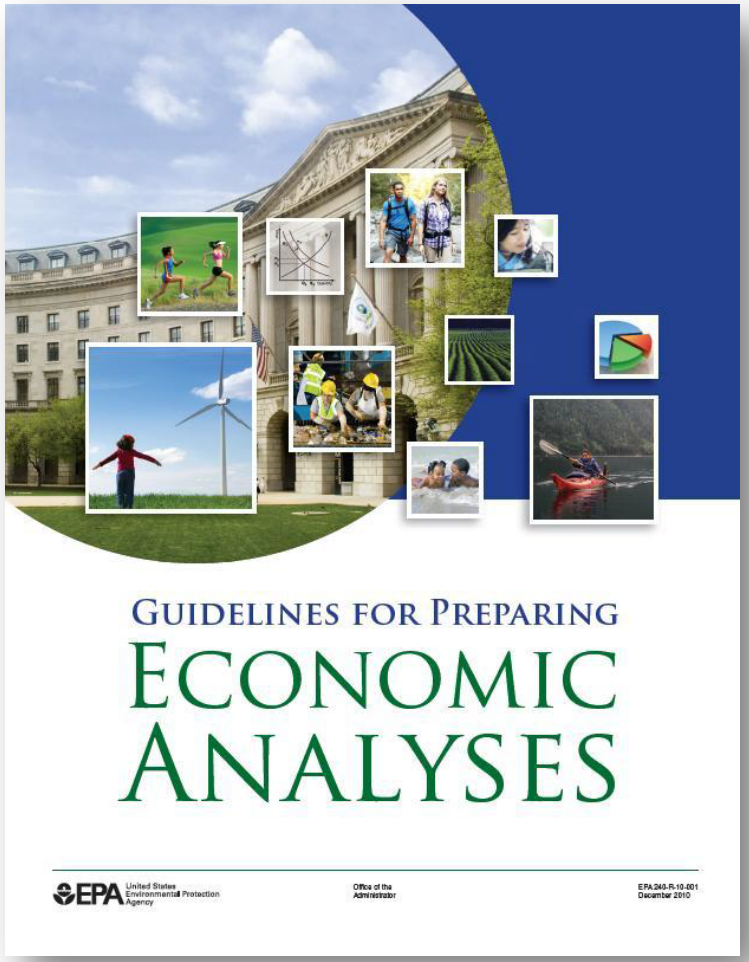
Economic Analysis is One Among Many Factors that Influences Policy Design at EPA

- Statutory instruction
- Institutional Feasibility
- Technical Feasibility
- Enforceability
- Ethics
  - Distributive Justice
  - Environmental Justice
- Sustainability
- Policy Calls
- Economic Impacts (Distributional effects)
- Benefits and Costs (Economic efficiency)



Source: http://www.parkshighway44-52.info/graphics/decisionProcess1.gif

EPA *Guidelines for Preparing Economic Analysis* (2010)



- Provides framework for economic analyses of environmental regulations and policies
- Summarizes theoretical work, empirical techniques, and data sources
- Main topics
  - Baseline specification
  - Discounting
  - Social costs
  - Social benefits
  - Economic impacts
  - Presentation of results
- Forthcoming additions
  - Environmental Justice
  - Update Mortality Risk Valuation
  - Measuring Employment Effects
- http://yosemite.epa.gov/ee/epa/eed.nsf/pages/Guidelines.html

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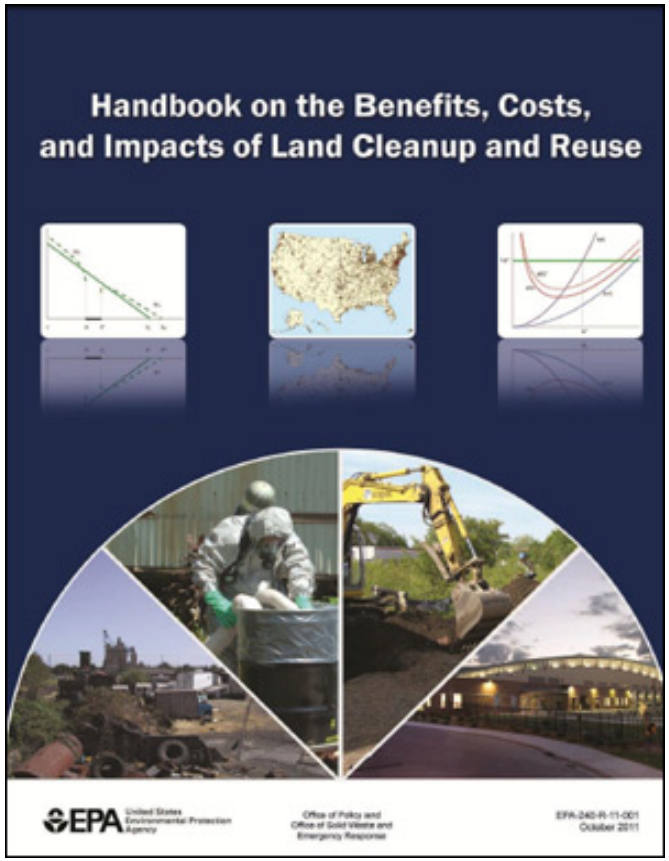
EPA *Handbook on the Benefits, Costs, and Impacts of Land Cleanup and Reuse* (2011)



- Summarizes the theoretical and empirical literature addressing benefit-cost and impact assessment **of the cleanup and reuse scenario** and provides recommendations when possible.
- Raises and clarifies important questions that remain in the literature.
- Main Topics
  - Cleanup programs
  - BCA vs. Impacts Analysis
  - Special considerations for land cleanup
  - Benefits estimation
  - Cost estimation
  - Impacts analysis
  - Research needs
- *http://yosemite.epa.gov/ee/epa/eed.nsf/pages/LandHandbook.html*

Social Benefits of Land Cleanup and Reuse

Table 6.1 - Potential Benefits of Land Cleanup (c) and Reuse (r) Activities

Benefit Category	Examples	Commonly Used Valuation Methods
Human Health Improvements		
Mortality	Reduced risk of: ▪ Cancer fatality (c) ▪ Acute fatality (c)	♦ Averting behaviors ♦ Property value models ♦ Stated preference
Morbidity	Reduced risk of: ▪ Cancer (c) ▪ Accident & injury (c) ▪ Lead poisoning (c) ▪ Birth defects (c)	♦ Averting behaviors ♦ Cost of illness ♦ Property value models ♦ Stated preference
Ecological Improvements		
Market products	▪ Improved fish harvests (c)	♦ Production/cost function
Recreation activities and aesthetics	▪ Enhanced hiking, boating, fishing (c)(r) ▪ Scenic views (c)(r)	♦ Production/cost function ♦ Averting behaviors ♦ Property value models ♦ Recreation demand ♦ Stated preference
Valued ecosystem functions	▪ Reduced surface water runoff (r) ▪ Increased soil permeability (r)	♦ Stated preference ♦ Production/cost function ♦ Averting behaviors
Nonuse values	▪ Restored or preserved species or ecosystems (c)(r)	♦ Stated preference

Social Benefits of Land Cleanup and Reuse (cont.)

Other Benefits		
Aesthetic improvements	▪ Improved neighborhood appearance (c)(r) ▪ Improved drinking water taste and odor (c)	♦ Averting behaviors ♦ Property value models ♦ Stated preference
Reduced materials damages	▪ Reduced corrosion and soiling (c)	♦ Averting behaviors ♦ Dual-profit function ♦ Production/cost function
Land productivity improvements	▪ Increased goods and services (c)(r) ▪ Increased labor productivity (c)(r)	♦ Production/cost function ♦ Property value models

Adapted from *EA Guidelines* (U.S. EPA 2010e).

Land Contamination and BCA

- Land contamination (or land clean up and reuse) is an important generator of benefits and must be addressed in benefit-cost analysis.
- On-site effects include the overlapping categories:
    - Health and ecological risks
    - Loss of land productivity
    - Costs of cleanup
- When assessing benefits of land clean-up, it is not sufficient to look at the enhanced value of land being cleaned.
  - Health and ecological risks extend beyond contaminated lands
  - Agglomeration Effects: Off-site effects on surrounding properties (e.g., homes, businesses, parks, etc.)
    - Built infrastructure around the land (roads, subways, schools etc. all become more productive.
    - Land clean up can greatly enhance values and productivity of surrounding lands
    - Efficiency effects such as productivity losses from lower concentration of development
      - Urban clean up leads to higher density development (preservations of “greenfields”)

Land Contamination and BCA

- Contamination, or its opposite – land cleanup, can lead to new equilibrium in a regional property market and regional development patterns
- EPA Land Cleanup Handbook highlights these emerging issues.
- Review panel thought these issues particularly important for the land scenario

Land Contamination and BCA

- Existing economics toolkit not sufficient to enable estimation of all of these land productivity effects

- However, “off-site” benefits are partially captured by a growing body of academic research. Two dominant approaches:
  - Property value studies
  - Stated preference studies

Property Value Studies

- Provide an aggregate estimate of benefits accruing to property owners near a contaminated site (does not capture other agglomeration effects)
- The property transaction data required to conduct the analysis are often available
- Benefit estimates are based on actual behavior but only reflect perspectives of nearby property owners (who might not perfectly understand risks)

Property Value Studies: Empirical Results

- Focus is on Superfund sites and residential properties
- Home values tend to decrease when site is declared a Superfund site, but result varies depending on site and neighborhood (e.g., Kohlhase, 1991; Michaels and Smith, 1990; Farber, 1998; Boyle and Kiel, 2001; Kiel and Williams, 2007).
- The extent of increase in surrounding property values upon cleanup of contamination also varies across sites (e.g., Kiel and Zabel, 2001; Dale et al., 1999; McCluskey and Rausser, 2003 ; Kiel and Williams, 2007).)
  - "May depend on the extent the public has confidence that site is clean. (e.g., Messer et al, 2006; Gregory and Scatterfield, 2002)
- Recent evidence - lowest decile within census-tract off-site property values within 3km of a Superfund site may increase by about 18% after cleanup, on average (Gamper-Rabindran, et al., 2011)

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Property Value Studies: Empirical Results (cont.)

- More recent property value studies have:
  - Targeted contaminated sites other than Superfund and identified significant property value effects
    - Underground storage tanks
      - Zabel and Guignet (2012) – find a 5% to 12% depreciation in surrounding home values when a relatively severe leak is discovered
      - Guignet (2012a) – finds an 11% depreciation at homes where private wells were tested for contamination from site
    - Brownfields
      - Haninger et al. (2012) find evidence of increases in nearby property values accompanying cleanup, ranging from 5% to 12.8%
  - Found that broad spatially aggregate analyses (e.g., at the census tract level) may not capture localized impacts (Gamper-Rabindran and Timmins, 2011)
  - Concluded that public information and awareness must be carefully controlled for (e.g., Gayer, Hamilton and Viscusi, 2002)
  - Found effects are location specific and depend on characteristics of the site and neighborhood (Kiel and Williams, 2007)

Stated Preference Studies

- Can assess all benefit categories, including nonuse and ecological benefits that might not be captured in property value analyses
- Can evaluate hypothetical policies or activities not yet implemented
- Can better account for information and perspectives of individuals
- Benefit estimates are based on *stated* behavior, (not actual market data).
- Expensive and time-consuming to conduct using approved protocols

Stated Preference Studies: Empirical Results

- Several surveys in the context of buying or selling a home
  - Estimate benefits of cleaning up or preventing contamination based on changes in respondents' stated bid on a home
  - Generally reinforce property value studies
  - Studies have found contamination leads to an 18 to 33% depreciation in stated off-site home values or bids (Jenkins-Smith et al., 2002; Guignet, 2012b; Simons and Winson-Geideman, 2005)
  - Similarly, Chattopadhyay et al. (2005) find that cleanup leads to a 16.6% appreciation in housing bids (for off-site homes)
    - Survey estimates suggest that full cleanup of a Superfund site in Illinois will increase property values a total of $535 million, which is similar to the $380 to $594 million estimated from a parallel property value study
- Alberini et al (2007) examined targeted changes in health risks from land contamination and cleanup in Italy
  - respondents selected among alternative public cleanup programs. Estimated a value of a statistical life saved of about $7.9 million

Conclusion

- Simply focusing on the avoided costs of cleanup ignores important benefit considerations.
- Does not account for regional “off-site” benefits of clean up or prevention
- Health, eco-system and land productivity can be affected for broader region
- Regional benefits (agglomeration effects) can be extremely large
- Recent progress in economics literature with property value and stated preference approaches
- Though evolving, the economics tool kit for measuring the full effects of land contamination is incomplete

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