

# The Interview: On Environmental Portfolio Valuation, with

*Neil S. Shifrin and Terence E. Rodgers*

Future environmental portfolio costs can impact the success of real estate deals and business mergers so a robust cost estimation method can help the deal and serve as a management tool after a deal. Recently, the *Real Estate Finance Journal* spoke with Neil S. Shifrin and Terence E. Rodgers from Berkeley Research Group about a method to estimate future costs of environmental sites. Dr. Shifrin consults on a wide range of environmental engineering topics, including water quality, contaminant fate and transport, hazardous waste site cleanups, and environmental response cost liability/allocation. His experience extends back to the nation's first Superfund projects, such as Love Canal, and includes many complex contamination problems, such as PCBs in major receiving waters, dioxins in the Great Lakes, TCE in large aquifers beneath major cities, perchlorates, and CSO pollution of Boston Harbor. Dr. Rodgers has performed work for a variety of public and private corporations and state and federal agencies in 30 years of consulting. He has consulted on business issues including valuation, financial analysis, and management oversight within the construction, insurance, health care, consumer products, aerospace, and computer technology industries, among others.

## **REFJ: What is Environmental Portfolio Valuation (EPV)?**

**A:** EPV is a method to estimate the "cost to closure" of any number of environmental

projects/sites for which a company is responsible. The method is probabilistic, using Decision Tree analysis and Monte Carlo simulation, which means it addresses the many uncertainties always associated with environmental projects. The primary result of the analysis is a distribution of predicted costs derived from pertinent reasonable response alternatives allowing clients to select a single cost estimate according to their risk tolerance. EPV estimates both capital and operating costs, so it also provides a cash flow prediction and a Net Present Value (NPV) for a given discount rate.

## **REFJ: Why is EPV needed/important?**

**A:** There are at least four major reasons. First, environmental problems can on occasion break the bank and should have been deal-breakers. Some acquisitions have led to billion dollar environmental costs and even bankruptcy. It is thus important to screen for this risk. Second, Generally Accepted Accounting Principles (GAAP) do not require Environmental Reserves to list the total "cost to closure," so one might be fooled by a simple Balance Sheet review to account for environmental costs. Even if the environmental portfolio is not a financial disaster, a good estimate of its value, and of its nature (e.g., simple, time-consuming, bad publicity, etc.), is always useful for deal-pricing. Third, all environmental projects have some level of uncertainty, and EPV provides a transparent understanding of the level of risk related to

overvaluing or undervaluing future environmental costs. Finally, EPV identifies costs over time, which enables more accurate cash flow planning, perhaps for better financing, and also provides the buyer with a strategic tool for managing future costs and decisions after the deal.

**REFJ: There is always uncertainty in a deal, so why pay special attention to the environmental portion?**

**A:** Buyers are usually more knowledgeable about the business uncertainties in a purchase, such as industry trends, company performance, synergies, and competitive advantages associated with the business or its assets. These elements are generally drivers of the sale for the Buyer. However, Buyers are usually less knowledgeable about environmental issues, but such issues have the potential to create unexpected costs, cash flow jams, and distractions from the primary business. EPV fills that knowledge gap, and provides a framework for managing the environmental issues after the deal is made, so the buyer can focus on the main business at hand.

**REFJ: How is EPV different from other approaches?**

**A:** EPV is a data-rich, statistical approach focusing on both the future responses and their uncertainties, whereas other methods handle uncertainty indirectly. EPV makes uncertainty part of the decision-making process. Other methods are too simplified and don't provide direct information about uncertainty useful for making purchase and management decisions. In addition, by making uncertainty part of the analysis, EPV allows decision-makers to tune their decision to their risk tolerance.

**REFJ: There are other ways to estimate environmental costs, why is EPV superior?**

**A:** Primarily because it addresses uncertainty directly. The American Society of Testing and Materials (ASTM) International has a guidance manual on the various methods to estimate environmental costs (ASTM E2137). This manual lists as one option a statistical analysis of alternatives, which formed the basis of EPV. Notwithstanding its recommendation to use "Quoted Price" above all others, the approach represented by EPV is tops in ASTM's hierarchy of environmental valuation methods. Below it in the hierarchy is "Most Likely Value" and "Range of Values" (given equal weight), both of which are inferior to EPV. A "Most Likely Value" estimate masks uncertainty by offering a judgmental single path to closure when in reality, environmental clean-ups are most often multi-year, multi-activity projects and highly subject to change. The Most Likely Value approach buffers this uncertainty with the use of contingencies, which also are judgmental and not statistical. A variation of this approach is to develop a "Range of Values," which attempts to address the "Most Likely Value" single-path weakness by offering two paths, usually a "most-likely" and a worst-case. While this approach displays some uncertainty by showing a range, it presents three critical problems for decision-makers. First, it offers no information to select a "best" number. Second, the tempting, safe worst case number may unnecessarily overestimate costs. Third, the use of a compromise value, such as the midpoint, has no meaning because it still does not allow the decision-maker to know how much risk is associated with that value.

**REFJ: How does EPV work?**

**A:** EPV has four steps:

- 1) Initial assessment of available information followed by its evaluation (two phases);
- 2) Decision Tree analysis;
- 3) Statistical modeling of the Decision Tree alternatives; and
- 4) Strategic planning.

EPV uses a combination of available site-specific information, government databases, and proprietary BRG data sets to quantify multiple alternatives to closure along with their probabilities, costs, timing, and contingencies.

**REFJ: Why examine the available information in two phases?**

**A:** Because it could save money and it helps to understand the degree of risk. There are two milestones in the examination of available information: 1) Document Triage; and 2) identification of the information needed to create the Decision Tree. The types of information used for EPV include environmental study reports, internal documents such as budgets, agency correspondence, and response planning documents (often called Feasibility Studies and Records of Decision). Depending on a project's maturity or information availability, there is tremendous variation in availability and quality of this information and thus in the ability to predict appropriate responses to closure.

EPV's initial "Document Triage," is an expedited review of the type and detail of available information to determine how to go forward with the full evaluation and how much of the prediction will be based on factual in-

formation versus expert judgment. A poor information base might suggest an abbreviated review with more reliance on generalized estimates, whereas a rich information base might provide enough data to fully populate the Decision Tree analysis (described below) and bolster confidence in the cost distribution. It is vitally important for the client to understand the quality and quantity of information being used for future environmental cost estimates, and the Document Triage is designed to meet this need. The second step involves a detailed evaluation of the available information to identify the types, costs, and timing of response elements (*i.e.*, to gather the data necessary to populate the Decision Tree).

**REFJ: What is entailed in the Decision Tree analysis?**

**A:** The Decision Tree is a model representing pertinent alternative future events, their costs, timing, and the probabilities of their occurrence. It lays out the most reasonable, possible cleanup responses, sequentially over time (*i.e.*, one "branch" of the tree). It breaks down these responses into their elements, such as studies, soil responses, groundwater responses, etc.

Each response element is represented by a "box" on a branch of the Decision Tree, and those boxes are then assigned costs, timing, and probabilities. Cost information is derived from project information when possible, such as agency planning documents or from internal budgets. When no such cost information for a given box exists, EPV uses a proprietary Response Cost Database (RCD) to assign one. The RCD consists of capital and operating costs for about 200 common environmental responses (*e.g.*, caps, groundwater remedies, various types of studies, etc.) developed from several sources, includ-

ing actual remedy efforts, construction cost references, and US Environmental Protection Agency cost models. The timing of each response also gets assigned, including its start date and its duration. Finally, the probability of the response variation gets assigned. These probabilities are derived from project information, such as an agency letter indicating a preference for a certain remedy approach. To facilitate EPV's transparency, and to simplify future modifications when new information is available, two Decision Tree Support (DTS) tables are created while creating the Decision Tree—one referencing all cost information, and the other listing the rationale for each probability assigned.

**REFJ: How do you use this Decision Tree?**

**A:** The Decision Tree is then analyzed statistically using a simulation model called Monte Carlo analysis. Monte Carlo modeling was invented around 1940 by Stanislaw Ulam at Los Alamos National Laboratory and is a widely used statistical tool. It combines elements (boxes) across all branches of the Decision Tree in many combinations, often 100,000, to estimate the cost to closure of each combination, based on the probabilities, costs and durations assigned to each element. These 100,000 cost estimates result in a distribution of costs in terms of their probabilities. This cost distribution has a central tendency (e.g., the mean or Expected Value), a range (i.e., in terms of percentiles), and also includes the very high cost/low probability outcomes. Depending on a client's risk tolerance, the Expected Value is often the best estimate of cost after this analysis, but the shape of the cost distribution offers valuable information to veer from this selection and to examine a project more strategically, as described below.

**REFJ: How does EPV allow for strategic planning?**

**A:** The primary result of EPV is the predicted cost distribution (other results include a cash flow and NPV analysis)—a graphical display of the costs of all the combinations versus their likelihood. With this cost distribution, EPV is unique from other approaches because it provides information on the risk involved with future costs. For example, a narrow cost distribution indicates little risk in future cost. A wide or skewed distribution, indicating higher risks, suggests a need for further review and careful management of future costs as the project unfolds. EPV identifies the former as Static Valuations and the latter as Dynamic Valuations. The Expected Value of Static Valuations will usually be a sufficient cost estimate. Dynamic Valuation sites offer the greatest opportunity for both impacting a sale price and for creating future value by strategic management of those cleanup efforts. In terms of finalizing a deal, for example, a site/project flagged as Dynamic might be ripe for Buyer-Seller cost sharing, a carve-out, or retained liability with a potential insurance policy to collar risk. Post-acquisition, the strategic management of Dynamic Valuation sites could result in cost controls that extract further value from the acquisition. The fact that EPV facilitates this consideration is perhaps its greatest value proposition. EPV offers the potential for creativity within the deal, and its value continues when managing the portfolio after the deal.

**REFJ: What advantage does EPV offer a deal and the ability to get the most value out of the transaction?**

**A:** EPV can save the deal and it can save money later. It can save the deal by offering confidence that the environmental issues

have been well and transparently characterized, including solutions to the most difficult Dynamic Valuation sites. It can save money later by serving as a project management tool. It does this by being the action and cost baseline for comparison as the future environmental projects unfold. For example, if schedules slip or costs are higher than originally projected by EPV, the Decision Tree Support tables can be reviewed against actual experience perhaps to create corrective actions to impact events, contractors, or cost elements. Conversely, new information can easily be incorporated into an EPV “re-run” to make improved cost predictions and controls as the project unfolds and additional data become available.

### **REFJ: What qualifications are needed to perform EPV?**

**A:** Environmental and economics expertise is the basis of the EPV. The environmental expertise required is evident from the description above of how the Decision Tree is constructed. The better the environmental expertise and information used, including proprietary databases, the better the result. By combining this expertise with economic modeling, EPV enables the risk information to be used in a way conducive to understanding the value of the transaction prior to a sale and the most effective way to manage costs post-acquisition. Clients are best served when they have access to both environmental and economics expertise, particularly when they are used together.

### **REFJ: How long does it take to perform EPV/How can EPV be performed in the short window of time associated with the due diligence process?**

**A:** Because EPV is highly developed and

systematized, large portfolios can often be evaluated in similar timeframes as small portfolios by evaluating more sites/projects in parallel. As noted before, the level of effort and thus the time required depends on the amount, quality, and availability of information. It is understood that environmental issues are often considered late in the deal-making, after review for deal-breakers and after review for information accuracy. As with all assessments of environmental risks, it is advantageous to the client to provide as much time as possible for EPV.

### **REFJ: What does EPV cost?**

**A:** Several key factors could affect a cost estimate upwards or downwards. These include:

- Amount of available information
- Access to information
- Project stage
- Information quality
- The need for strategic review and recommendations
- Specific reporting requirements (customized to stakeholder needs such as for financing information)

There are generally economies of scale for larger portfolios, although it is not precisely scalable. Each portfolio will have its own characteristics that require more or less effort based on the complexity of the projects. Sometimes a portfolio of similar sites can be analyzed categorically, which can save money.

### **REFJ: Who needs an EPV?**

**A:** While it is clearly in the interest of a



Buyer to use EPV, just like it is for a buyer of a home to get a home inspection, it may also be in the interest of a Seller to commission an EPV. Given its objectivity, the same EPV might be shared by both Buyer and Seller with the advantage of eliminating controversy about environmental issues. Regardless of who sponsors it, some M&A attorneys think that an objective and transparent assessment, such as an EPV, can eliminate last-minute controversies in deal negotiations. An EPV would also be useful to Insurers or Lenders to give them a better understanding of their level of transaction risk. In addition to

real estate deals and Mergers & Acquisitions, EPV is also useful as a strategic management tool for environmental portfolio management. EPV can also provide information to establish Environmental Reserves on Balance Sheets.<sup>1</sup>

**REFJ: Thank you, gentlemen.**

**NOTES:**

<sup>1</sup>The following terms are trademarked but not yet registered by the Berkeley Research Group, LLC—Environmental Portfolio Valuation (EPV), Decision Tree Support (DTS), Dynamic Sites, Stable Sites, Response Cost Database (RCD) and Document Triage.