Chapter 14: The Class Action Model: Is It Working? Justice for the Lonely Pollutee

by Robert A. Simons, Robert Shields, and Jesse D. Saginor

I. Introduction

Given the inconsistency demonstrated in Chapter 13 between the legal and academic perspectives on property toxic tort litigation outcomes, Chapter 14 addresses the ability of smaller environmental damage cases, including those without health claims, to obtain access to a legal mechanism to help them resolve their environmental property disputes. What is missing is justice for smaller groups of potential plaintiffs, or for the individual pollutee. This chapter evaluates how the existing system works for plaintiffs outside a class action framework, commenting on passage of time, expenses to mount a case, and legal fees. We suspect that many potential cases do not get filed because the potential outcome economics for the law firms are insufficient. This is a form of market failure for the plaintiffs. This is especially true now with the recent passage of the Class Action Fairness Act. We are hoping to provide some alternative resources to provide justice or movement in that direction, such as some data that could be used as a starting point in dispute resolution. We demonstrate that a derivative of the statistical models from Chapter 5 can be used to formulate a predictive regression model that is capable of roughly estimating losses to residential property in many common yet different pollution situations. This model is capable of estimating the loss outcomes for generic environmental property situations, within a loss band of 10 percentage points, about 80% of the time. Since the methodology and data requirements to correctly apply this model is out of reach of the typical practitioner, a boiled-down and user-friendly version, called the BIG MATRIX, is provided just inside the back cover. The data requirements for the BIG MATRIX are reasonable. The results are suitable for scoping out the particulars of a case, before consideration of site particulars such as actual environmental contamination, etc.

However, the BIG MATRIX as described here, to be presented by a non-expert, does not have formal scientific validity. Nevertheless, it can serve as a starting point for estimating losses to property values in most, but not all, situations. It is intended as a negotiation tool to try to settle cases out of court, and as a way for lawyers contemplating litigating a case to evaluate potential case outcomes, from the perspective of the peer-reviewed literature. The caveats and limitations, including some from the defense side of the case, are set forth.

II. Class Action Fairness Act

In February 2005, the U.S. Congress passed and President George W. Bush signed into law the Class Action Fairness Act. The Act has broad implications for toxic tort litigation. It will force a majority of such suits into federal court, the preferred forum for most defendants. Although the Act contains a number of provisions referred to as the Consumer Class Action Bill of Rights, those sections probably have little impact on toxic tort cases or environmental property damages actions. Instead the "Bill of Rights" is focused on settlements of consumer class actions involving products. The principal impact of the Act on toxic cases relates to expanded federal diversity jurisdiction.

The first major change involves the extent of diversity of citizenship as a basis for federal jurisdiction. Federal courts have jurisdiction if the claim arises under federal law or there is diversity of citizenship and the amount in controversy is sufficient. Most toxic cases, particularly property damage claims, are based on state law and not federal law. Consequently, the only basis for federal jurisdiction normally is diversity of citizenship. The general diversity of citizenship requirement is that there must be complete diversity of citizenship, that is, all of the defendants must be citizens of different states than all of the plaintiffs. If one defendant is from the same state as one plaintiff, there is not, under the historic general rule, federal jurisdiction based on diversity of citizenship.

The Class Action Fairness Act changes the requirement from complete diversity of citizenship to "minimal" diversity. Section 4 of the Act provides that federal district courts have original jurisdiction over any class action in which there are 100 class members, the aggregate amount in controversy exceeds $5 million, and any member of a plaintiff class is a citizen of a different state from any defendant. The practical effect of the change to "minimal" diversity is that federal district courts will have original jurisdiction over almost all large toxic tort class actions.

A home state exception, also known as the Feinstein Amendment, was added to the Act shortly before its passage. It provides that if two-thirds or more of the class members are from the defendants' home state, the case would not be subject to federal jurisdiction. On the other hand, if less than one-third of the class members were citizens of the defendants' home state, the case is subject to federal jurisdiction. For the middle, between one-third and two-thirds, federal jurisdiction exists but the federal court could "in the interest of justice" decline to exercise that jurisdiction. The defendants' home state is defined as either the state of incorporation or principal place of business for a corporation.

The Class Action Fairness Act also changes the rules regarding removal of a case to federal court from a state court. The general removal section, 28 U.S.C §1446, provides that the defendants may remove a case from state court to federal court only if there is original federal jurisdiction, all of the defendants consent, one of the defendants is not a citizen of the state where the action is pending, and in any event a case cannot be removed more than a year after filing. The Act, as noted above, expands the basis for original federal jurisdiction. It also removes most of the limitations to removal. The one-year rule will no longer apply to class actions. Defendants may remove a class action without the consent of all of the defendants. And perhaps most significantly, the fact that a defendant is a citizen of the state where the action is brought in state court does not prevent removal. The latter rule change flies in the face of the historic justification for removal of a case from state court to federal court: removal was allowed so that an out-of-state defendant would not be prejudiced by being in a local court. The converse reasoning was that there was no need for federal jurisdiction, and therefore removal, if the defendant was also a citizen of the state where the local court was located since there should be no prejudice against a local defendant.

The Act also applies to "mass actions" which are not brought as class actions. Section 4 of the Act includes a provision expanding federal jurisdiction over mass actions, even if they are not class actions. Any civil action in which 100 or more named parties seek to try their claims together will be treated as a class action for jurisdictional purposes with certain exceptions. A federal court would only have jurisdiction over the plaintiffs whose claims meet the current individual amount in controversy requirement, currently $75,000. Those who sought smaller recoveries would be remanded to state court. More importantly, a mass action would not be removable under the Class Action Fairness Act if all of the claims arise out of an event or occurrence in the state where the suit is brought and all of the injuries were incurred in that state. In that event, the traditional rules, including complete diversity of citizenship, apparently would apply. Thus, a property damage action in which several hundred claims have been joined but not brought as a class action, arising out of a toxic spill in the state where the suit was brought and all of the injuries occurred, could not be removed to federal court based on the rule changes of the Act. For such cases, if there is at least one local defendant and therefore no complete diversity, the historic prohibition against removal remains in effect. Even with this "local event and injury" exception, most mass toxic tort cases will end up in federal court, whether or not they seek class action treatment.

III. Economics of Case Selection Revisited

As indicated in Chapters 10 and 13, the existing legal system appears to provide justice in the form of financial and other compensation for many types of toxic tort property claims. However, the consistency of these legal outcomes is quite variable. For class action or larger mass action lawsuits, justice can be achieved, but it takes a long time. For example, the expenses to mount a modest sized, e.g., 200 plaintiffs, mass or class action case would be between $0.5 to 1.5 million. It would not be unusual for a network of attorneys, instead of just one firm, to spread the risk by sharing the expenses. There has to be an economic nexus for the lawyers, related to the property claims upside, related health claims from the litigation, potential for punitive damage awards, and opportunity cost. The decision to take a case is made on the basis of how busy the lawyers are as well as their reasonable expectations for the case. Usually the attorney fees in such cases are contingent on the outcome; that is, the fee is a percentage of the amount recovered. If there is no recovery, no fee is owed. The client, however, may be required to be responsible for expenses. Property damages are usually just a part of the claims asserted against the defendants. The other claims typically include personal injury claims for specific disease and medical monitoring. However, there are cases that are too small to attract lawyers because the potential payout in terms of legal fees would not justify the time and opportunity cost.

Environmental and toxic tort litigation is expensive, whether there is a class, multiple individually joined claimants, or a single plaintiff asserting only a property damage claim. Toxic contamination cases are expensive because expert testimony is required to prove the required elements of the claim, and it is not unusual, even in an individual case, for several experts to be necessary. They also require an attorney to invest a substantial amount of time and resources. A few examples will illustrate this point.

Assume that the potential case arises out of the contamination of groundwater underneath a residential property adjacent to a gasoline service station as a result of leaking underground storage tanks (LUSTs). There is no doubt that the presence of the contamination reduces the value of the property. Proving the nature and extent of the contamination, that it originated from the adjacent service station, that the tanks at the station leaked, that the owner or operator of the station was negligent, and the cost of remediation all requires expert testimony, and probably several different experts—a tank tightness expert, an environmental engineer, a hydrogeologist, and a chemist. In addition, an economist or other property damage expert also will be necessary. The cost of proving the case will exceed the value of the property damage by severalfold. And that is not even considering attorneys fees. If an attorney is hired on an hourly basis the fees for litigating such a case also would exceed substantially the potential recovery. Because the potential recovery is limited, it is unlikely that an attorney would consider taking the case on a contingent basis. The investment of time and resources simply would not be justified based on the potential recovery.

Even if the case is expanded to include a personal injury claim, it is unlikely that the cost does not exceed the potential recovery, absent a catastrophic injury. Assume that the residential property obtained drinking water from a contaminated well and the family living on the property asserted various non-catastrophic injuries such as gastrointestinal complaints. The personal injury claims add to the value of the overall claims but they also add expense. Additional expert witnesses testifying about exposure, causation, and the nature and extent of the personal injuries are now required. In fact, the cost of the additional experts probably exceeds the added value of the personal injury claims. Of course, if the personal injury claim is a catastrophic injury such as leukemia allegedly caused by exposure to benzene, a volatile component of gasoline, the individual claim may become economically viable. Absent such catastrophic injuries, traditional toxic litigation simply is not economically viable unless there are numerous claims joined in one action, either as a class action or pursuant to the legal rules regarding joinder of individual claims.

There may be rare circumstances where the consolidation of a few claims may create the unusual situation where it is in the interests of all parties to reach an early resolution. Where the basis for the claim is reasonably obvious and does not require extensive expert testimony, and both causation and the nature and extent of injury are clear, an early resolution may be possible. For example, assume a nuisance case from the discharge of toxic chemicals into a stream upgradient from a lake surrounded by residential properties in which the chemicals flow into the lake and create an obvious odor and prevent the use of the lake for recreational uses such as swimming and fishing. The basis for liability and the nature and extent of the injury may be so obvious that numerous expert witnesses are unnecessary, yet the potential recovery is significant enough that it may be in the interests of both the plaintiffs and the defendant to settle the claims early and avoid the expense of the litigation. A settlement will occur under these circumstances only if the defendant is convinced that the plaintiffs are willing to proceed and the potential recovery minimally is sufficient to justify the prosecution of the claim, and has the potential for a substantial jury verdict. The classic model for toxic litigation, however, is the joinder of numerous claims or the use of a class action such that even a relatively modest recovery per claimant is large enough in total to justify the great expense of these kinds of cases.

Given the expense of proving environmental contamination property damage claims, attorneys fees on a traditional fee-for-services basis, and the related problem of finding an attorney to handle a smaller claim on a contingent-fee basis, the obvious question is: can an individual plaintiff property owner effectively get relief from the judicial system? The answer is probably not. Even modest sized groups of claimants are unlikely to be able to pursue their claims in court, if their property values are fairly low (say under $75,000 per property), because the expenses could well exceed the recovery, or at least the net recovery may not justify the risks. The reality is that because of the expense of such litigation, justice often remains elusive for the lonely pollutee.

If the judicial system cannot provide justice, is there some alternative, such as arbitration or mediation? Arbitration primarily is a mechanism used to provide an expedited (and less-expensive) resolution of commercial disputes. Traditionally, the alternative dispute device of arbitration was used when a contractual provision required that any dispute between the parties to the contract had to be resolved by arbitration instead of resorting to the judicial system. The problem is that a claim for property damage from environmental contamination rarely is the result of or related to a contractual relationship where there is an arbitration clause. In the absence of a contractual arbitration provision, arbitration is only available when the parties agree to submit the dispute to arbitration. A defendant who recognizes that the claimant does not have the ability to pursue the claim through the judicial system because of the expense of litigation is not going to be interested in agreeing to arbitration because it is not in its interest to make it economically viable for the injured property owner to pursue his claim. Consequently, arbitration is not likely to be an available alternative.

Similarly, mediation is not normally a reasonable alternative to litigation. Mediation usually is an alternative used late in the litigation process in an attempt to reach a settlement and avoid a jury trial. Typically, it is one of the last steps in litigation, after the expiration of the expensive, time-consuming, and extensive discovery and pretrial procedures that are part of modern litigation. Mediation does not solve the problem of the lonely pollutee being unable economically to pursue the claim in the judicial system because mediation typically would not occur until the virtual end of the litigation process. This does not mean that there are not circumstances when mediation occurs early in the process, but it is unlikely to occur in the absence of equal bargaining power and equal ability to pursue expensive litigation.The more realistic alternative is to make the cost of proving a claim in court less expensive. One possibility of reducing the expense of litigation is to create a mechanism for obtaining expert testimony on the reduction of property value that does not require expensive special studies but uses some general information on property damage that can be applied to an individual claim and give a reasonably fair estimate of the value of the loss. The rest of this chapter addresses such an approach.

IV. Predictive Regression

Having established a need for a low-cost way to estimate the value of potential environmental property case outcomes, we introduce predictive regression as a good way to estimate these losses to property values. The prediction is based on a large array of data inputs, specifically those indicated in Chapter 5. Predictive regression has been used in the peer-reviewed literature to estimate property value losses, and for other similar purposes. For example, several articles in the peer-reviewed literature have used predictive regression. Robert Simons used predictive regression to examine the possible effect of a pipeline rupture on property values.[1] Simons, William Bowen, and Arthur Sementelli used predictive regression to analyze the affect on price from LUSTS on commercial and residential properties.[2] In their study of pipeline sludge, Simons, Kimberly Winson-Geideman, and Brian A. Mikelbank also used predictive regression.[3] Other articles such as those written by: John Clapp[4]; John Loomis, Vicki Rameker, and Andy Seidl[5]; and Okmyung Bin[6] have also used predictive regression in other real estate applications.

The peer-reviewed, academic literature generally sets the bar at a 15% error rate, signifying that predicted results not within 15% of the actual value are considered to be not valid or significant. If a large percentage of predicted values fall outside of the 15% error rate, then the model may be considered too unstable and inaccurate to be used as a predictive tool for estimating damages. Note that a model variation rate of 15%, and a range of 15 percentage points (that we use in this chapter) are different. The latter is less precise than the former. However, the variation rate of the predictive model is known. Further, as more observations are added to the model in the future, the error rate may drop.

The meta-analysis models presented in Chapter 5 provide the foundation for the construction of the predictive model. When the parameter estimates of all three models were analyzed, the outlier model (which had fewer observations, but had outlier observations removed) had the largest number of significant variables and the lowest constant (unexplained variables) term. Table 5-3 from Chapter 5 shows this model. The outlier model was the model without outliers, defined as observations located more than 10 miles away from the source of contamination, where the price affect was positive in relation to the source of contamination, had an unusually high mortgage

1. Robert A. Simons, *The Effects of Oil Pipeline Ruptures on Non-Contaminated Easement-Holding Property*, APPRAISAL J., July 1999, at 255-63.

2. Robert A. Simons et al., *The Price and Liquidity Effects of UST Leaks From Gas Stations on Adjacent Contaminated Property*, APPRAISAL J., Apr. 1999, at 186-94.

3. Robert A Simons et al., *The Effects of an Oil Pipeline Rupture on Single-Family House Prices*, APPRAISAL J., Oct. 2001, at 410-18.

4. John Clapp, *A Semiparametric Method for Estimating Local House Price Indices*, 32 REAL EST. ECON. 127-60 (2004).

5. John Loomis et al., *A Hedonic Model of Public Market Transactions for Open Space Protection*, 47 J. ENVTL. PLAN. & MGMT. 83-96 (2004).

6. Okmyung Bin, *A Prediction Comparison of Housing Sales Prices by Parametric Versus Semiparametric Regressions*, 13 J. HOUS. ECONS. 68-84 (2004).

rate over 15%, and properties with unimpaired values above $500,000. A comparison of the parameter estimates across all three models is included in Appendix 14-A of this chapter. The outlier model included 29 observations for air pollution, 23 observations for groundwater contamination, 32 observations for linear sources such as high voltage overhead transmission lines (HVOTLs) and railroads, 20 observations for nuclear or manufacturing sources, 66 observations for Superfund sites and landfills, and 14 observations for urban disamenities. Using these 184 observations from the model without the outliers, the independent variables were input into the software package statistical package for the social sciences (SPSS) to calculate the predicted percentage loss of each observation based on the independent variables. This step was necessary to determine the reliability of using the actual data from the observations for prediction purposes. We reported the accuracy of the predictions for this model.

Once this step was completed, the parameter estimates were next applied to the full data set of 228 observations to further examine their predictive reliability. Finally, the parameter estimates were applied to the results from a peer-reviewed article that was not included in the original data set. Error rates are set forth.

V. Tests of Predictive Reliability Using the Outlier-Free Model

Applying the outlier parameter estimates to analyze prediction accuracy using the observations from the outlier model is similar to fitting a glove on a hand. The hand in this case would be the actual values of the observations included in the outlier model. Since these same observations are also used for the predicting values, the results should be satisfactory for the vast majority of the observations, acting as a glove that comfortably fits on the hand. If the model is accurate, the hand is universal, with the glove comfortably fitting any hand, and with no more than 10-15 percentage points of "wiggle" room. When the glove is put on the outlier data (those excluded from the first model), results reflect a good fit, but not as good as the original model. This is expected, because this larger data set represents a different "hand," including some data points with unusually long or short "fingers," meaning the glove does not fit as well. This means that a larger portion of the observations will have a higher error rate. If the scientific threshold for validity in this case is having predicted values (of loss) within 15 percentage points of the actual values, the smaller model with outlier observations excluded performs adequately: 58% of the predictions are within 5% of the actual loss amount found in the peer-reviewed literature, and 84% are within 10 percentage points, and 95% of the predicted values fall within 15 percentage points of the actual values from the outlier data. This is shown on Table 14-1.

Figures 14-1 and 14-2 show the same information as Table 14-1, but in graphic form. Figure 14-2 plots the actual values against the predicted val-

Table 14-1: Predicted Values Compared to Actual Values						
	Observations	% Within 5%	5%-10%	10%-15%	% Within 15%	% > 15%
Air	29	45%	34%	14%	93%	7%
Groundwater	23	61%	22%	9%	91%	9%
Linear	32	56%	28%	9%	94%	6%
Nuclear/Manufacturing	20	65%	20%	10%	95%	5%
Superfund/Landfill	66	56%	27%	12%	95%	5%
Urban Disamenity	14	86%	7%	7%	100%	0%
Total	184	107	47	20	174	10
% of Total		58%	26%	11%	95%	5%

ues results with an R^2 (explanatory power) of .807, indicating that 80.7% of the variability of the results can be predicted by the model. The predicted value is the line, and each dot is an actual observation. The difference between each dot and the fitted line is the prediction error. This figure is at the same level of detail as Table 14-1: all 184 observations are combined. Figure 14-1 demonstrates the error occurrences for the six different types of contamination (groundwater, air, etc.), showing both overprediction and underprediction, by type of contamination. Each vertical bar is an observation. The number of observations for each category and maximum value of overpredicted or underpredicted values are shown.

Figure 14-1: Error in Percent between Actual and Predicted Loss in Value by Type of Contamination

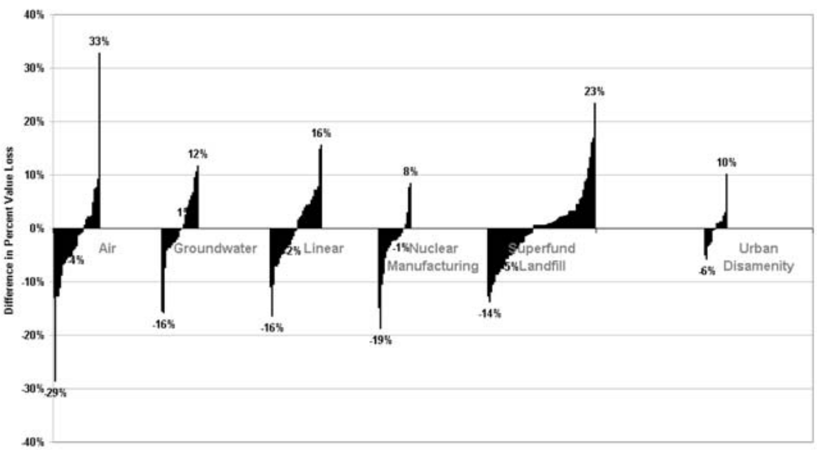
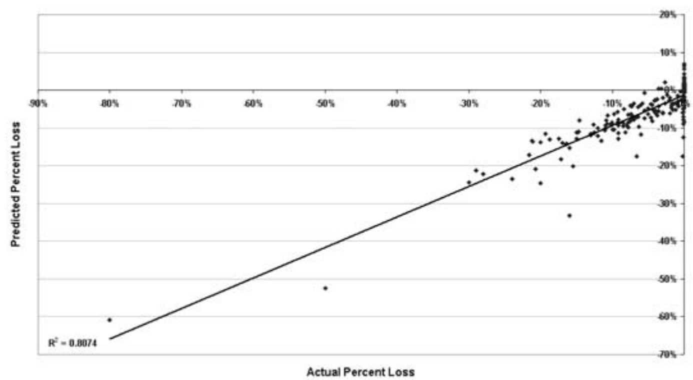


Figure 14-2: Actual vs. Predicted ValueLoss Using Observations within Outlier Dataset



Figures 14-3 to 14-8 show the actual value loss versus predicted value loss by type of contamination, thus extending the little bar charts in Figure 14-1 with the same technique demonstrated for all observations in Figure 14-2. Plotting the actual versus predicted values by each type of contamination has varied results. The range of R^2 values varies between .48 for groundwater contamination to .94 for air pollution. The difference between the two is the error rate for each observation. Using the number of observations by contamination type and the respective R^2, a weighted R^2 of .81 is calculated. Additionally, while air pollution had the widest range in terms of percentage difference, no single category of contamination skews the results substantially, which is to be expected given that this model uses the data set without the outliers.

Figure 14-3: Actual vs. Predicted Value Loss for Air Pollution

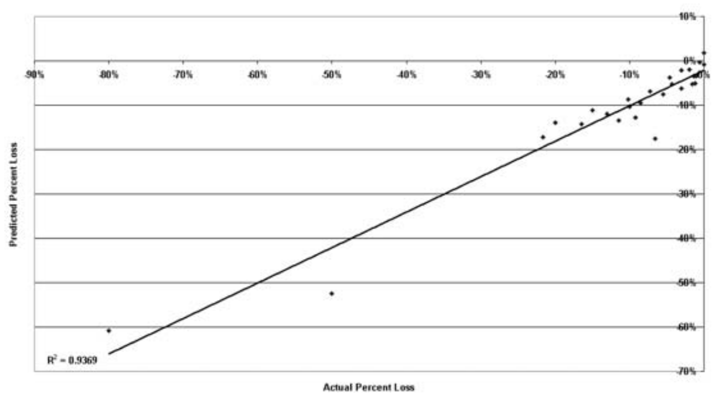


Figure 14-4: Actual vs. Predicted Value Loss for Groundwater Contamination

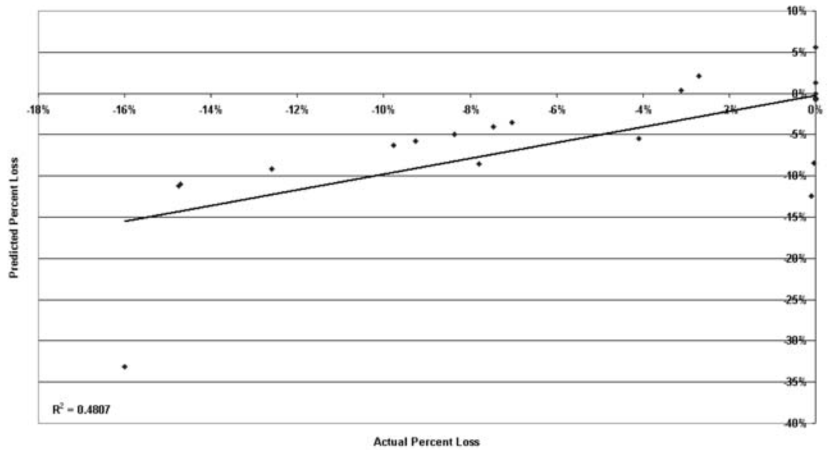


Figure 14-5: Actual vs. Predicted Value Loss for Linear Sources of Contamination

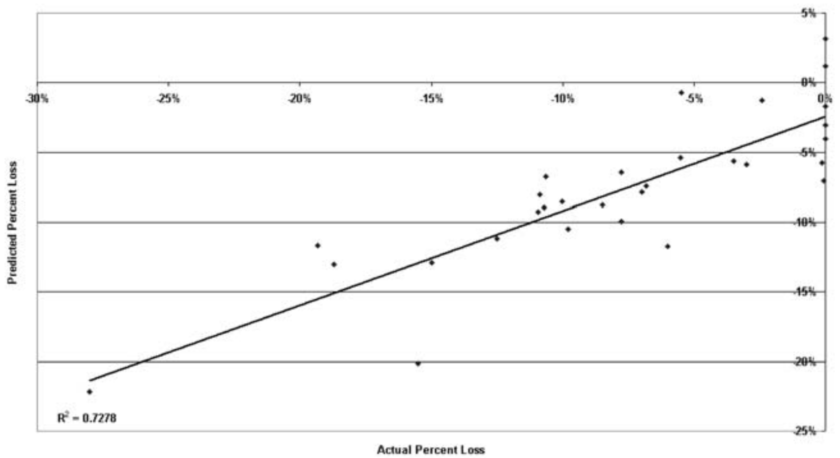


Figure 14-6: Actual vs. Predicted Value Loss for Nuclear and Manufacturing-related Contamination

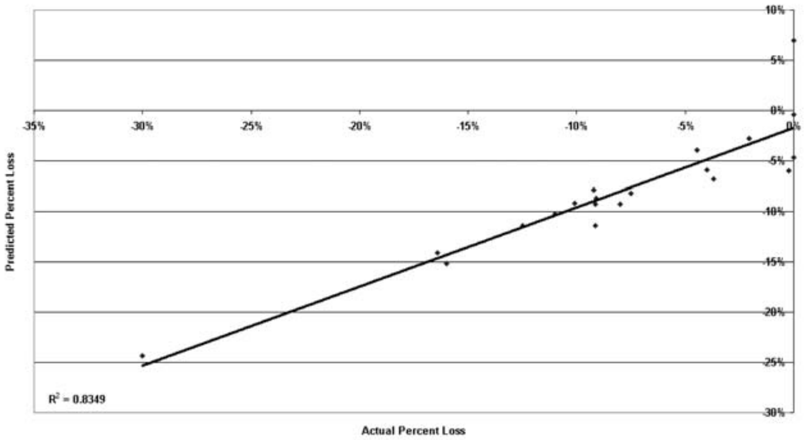


Figure 14-7: Actual vs. Predicted Value Loss for Superfund and Landfill Observations

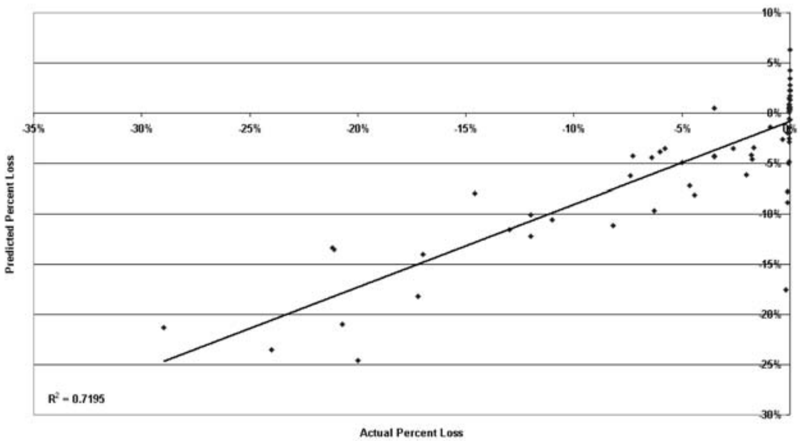
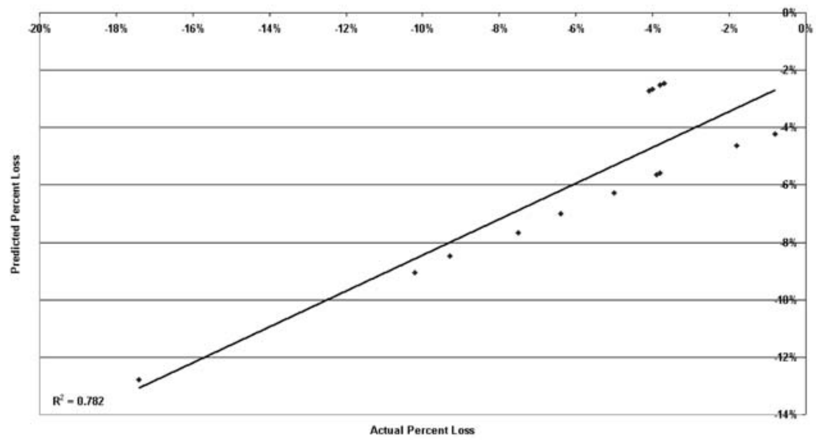


Figure 14-8: Actual vs. Predicted Value Loss for Urban Disamenities



VI. Applying the Outlier-Free Model to New Data

How accurate is the model when applied to the results reported in a peer-reviewed article which are not part of any data set previously included in the model? Simons and Winson-Geideman used contingent valuation (CV) surveys to determine market perceptions of contamination from LUSTs by residential property buyers.[7] This is considered a groundwater contamination problem. Utilizing contingent valuation analysis, 1,115 total telephone interviews were conducted across eight states, of which seven provide useable data for this part of the analysis. The average loss for bidders in the top one-half of the market ranged from a discount of 25 to 33% with an average of 31%. Bidders in the top one-quarter of the market had discounts of 11 to 24% with an average of 19%.[8]

Using the bidding discount results for each state, predicted values were calculated based on the parameter estimates from the outlier-free model for

7. Robert A. Simons & Kimberly Winson-Geideman, *Determining Market Perceptions on Contamination of Residential Property Buyers Using Contingent Valuation Surveys*, J. Real Est. Res., Apr./June 2005, at 193-220.

8. See Chapter 7 for a discussion of marginal bidding theory for CV analysis. The top one-half and top one-quarter is a function of how many contaminated properties are on the market, and what portion of potential buyers would offer a bid for a contaminated property, given full information about the contamination.

bidders in the top one-half and top one-quarter of the market to test the accuracy of the predictive model. The predicted losses were all within 10% of the actual values from the study. A total of 14 observations were thus generated from this study.

Table 14-2: Predictive Model Applied to CV Data

Top One-Quarter	Actual	Predicted	Difference
Kentucky	-22.0%	-21.3%	-0.7%
Pennsylvania	-18.0%	-24.6%	6.6%
Ohio	-21.0%	-22.5%	1.5%
Alabama	-11.0%	-20.8%	9.8%
Illinois	-24.0%	-31.4%	7.4%
South Carolina	-19.0%	-27.0%	8.0%
Texas	-21.0%	-21.8%	0.8%
Average	**-19.4%**	**-24.2%**	**4.8%**
Top One-Half	Actual	Predicted	Difference
Kentucky	-31.0%	-21.2%	-9.8%
Pennsylvania	-25.0%	-23.6%	-1.4%
Ohio	-32.0%	-22.4%	-9.6%
Alabama	-27.0%	-21.0%	-6.0%
Illinois	-32.0%	-29.8%	-2.2%
South Carolina	-33.0%	-27.1%	-5.9%
Texas	-29.0%	-20.7%	-8.3%
Average	**-29.9%**	**-23.7%**	**-6.2%**

For the top one-quarter of bidders the difference in value between the actual value and predicted value ranged from a low of 0.7% for Kentucky to a high of 9.8% for Alabama. All but one of these bids was underpredicted. For bidders in the top one-half of the buyer's side of the market, the difference in predicted and actual values ranged from 1.4% in Pennsylvania to 9.8% in Kentucky, and all of these loss predictions were on the high side. Overall, the average difference between the actual and predicted values was 4.8% for the top one-quarter bidders and 6.2% for the top one-half bidders, and over one-third of the predictions were within 5 percentage points. None of the 14 individual predictions exceeded 10 percentage points from the actual observation. This is a highly satisfactory fit.

VII. Applying the Predictive Model to a Larger Data Set

These predictive model results based on the outlier-free model are next applied to the full data set of 228 observations (but not the 14 new data points described above), using the outlier-free parameter estimates. As expected, the overall accuracy declines due to the inclusion of the outliers into the predictive model. Of the 44 additional observations included in the full model, just over one-third (15 observations) of the predicted values fell outside 15 percentage points of the actual loss values. On the bright side, however, the same proportion were accurately predicted within 5 percentage points, indicating that some observations that are deemed to be outliers can still be accurately predicted by the model. Overall, pooling all 228 observations, the prediction accuracy dropped from 58% within 5 percentage points to 54% for the full data set, and from 95% within 15 percentage points to 89%.

Overall, pooling the full model and the 14 new additional LUST observations, 193 (80%) of the observations were within 10 percentage points of their predicted values, and 217 of the 242 observations tested (90%) were within 15 percentage points of their predicted values. Table 14-3 gives summary outcomes for all three data sets.

Table 14-3: Predicted Values Compared to Actual Values for the Outlier-free, Full and Full + CV Datasets

	Within 5%	5%-10%	10%-15%	**Within 15%**	> 15%
Outlier-free model (N = 184)	107 58%	47 26%	20 11%	**174** **95%**	10 5%
Full model (N = 228)	122 54%	57 25%	24 11%	**203** **89%**	25 11%
Full model + CV results (N=242)	127 52%	66 27%	24 10%	**217** **90%**	25 10%

This part of the chapter has addressed the efficiency and accuracy of a predictive regression model. The purpose was to analyze how accurately the parameter estimates from the outlier model could predict property damages of known observations both within and outside the original outlier-free model. The predictive model was then applied to a peer-reviewed journal article to determine its accuracy. All of these results pertain to the peer-reviewed literature. We conclude that the model can predict property damage losses for residential property within 10 percentage points 80% of the time, and within 15 percentage points 90% of the time. The model can serve as a corroborative primary source for estimating property damages. However, the data requirement needed for this exercise is too onerous for the legal or lay practitioner. The next section addresses how to apply a generic, simplified version of the model to residential property losses where the losses are unknown, but where a bare minimum of facts about the case can be provided. This is the BIG MATRIX, which can be found in the inside back cover.

VIII. The BIG MATRIX

So, given that there is a body of literature available and a meta-analysis predictive regression model with known error bands, and there are also potential property damages cases that need to be evaluated, this chapter can be a resource for parties interested to know the approximate value of any losses to real property potentially related to environmental issues. This methodology provides a rough measure of losses, based loosely on predictive regression, but having more simple data input requirements. It is a do-it-yourself loss calculator, a lookup table of losses, based on a matrix of plusses and minuses for various factors known to affect property value. This section introduces this model.

The above section set forth the strengths and weaknesses of the predictive regression application. Although the model's error rates are known, the model's performance as currently specified falls below the generally accepted threshold of scientific validity. In other words, even though 80% of the observations had error rates within 10 percentage points, and 90% were within 15 percentage points, this error band is considered too broad for precise measurement of losses. However, it is useful for preliminary negotiation, scoping out of potential property losses, and settlement within a band of potential property losses, if both parties are in agreement about settling the case. It may also be used as a corroborative primary technique.

IX. Limitations of the BIG MATRIX

The BIG MATRIX is not accurate enough, by itself, to replace an expert report. It does not include important particulars of the case, such as presence or absence or extent of contamination, knowledge of the parties, disclosure, known health claims associated with the contamination, temporary or permanent nature of contamination, etc. The BIG MATRIX provides estimates of property damages based on the peer-reviewed literature, which does not necessarily correspond to eventual court outcomes, which have been shown in Chapter 13 to vary widely. Further, the BIG MATRIX can only be applied to cases that are similar to and "within" the range of cases included in the literature review. For example, the BIG MATRIX would NOT APPLY to the following types of cases:

- Commercial property;
- Raw land;
- Multi-family properties with more than two to four units;
- Asbestos;
- Toxic mold;
- "Company towns" devastated by a single polluter that left the area;
- Very expensive houses; and/or
- Other situations where property markets are rapidly accelerating or collapsing.

If you try to apply the BIG MATRIX to the above situations, the results would have almost no validity, and any error rates cannot be determined. Because the BIG MATRIX data set is based on published studies, it only addresses permanent losses to property that sold. Thus, the results may understate overall losses because it doesn't address other parts of the real estate bundle of rights, such as delayed sale, inability to obtain financing, or loss of use or enjoyment over time, e.g., temporary losses. The BIG MATRIX cannot predict losses for new situations not covered above, or extreme losses.

X. Application of the BIG MATRIX to Specific Property

Once eligibility for the use of the BIG MATRIX has been established, the curious pollutee or counsel needs to get and have handy the following data about the affected property:

1. Type of contamination (may include multiple types);
2. Distance from the source of contamination;
3. U.S. state and access to the map of economic regions in Chapter 5;
4. Classification of the market area where the property is located (urban, suburban, rural, or a mix of areas);
5. If a No Further Action (NFA) Letter has been issued;
6. If the contamination was a sudden, e.g., explosion, or ongoing gradual event;
7. If the subject property is involved in litigation;
8. Unimpaired value of the unit (market value before consideration of contamination issues); and
9. If the polluting source has closed down (regardless of any NFA).

If multiple properties are in play, the process can be repeated for each property, or a class of properties, to arrive at the overall value of potential losses for the property part of the case. The right-hand column of Appendix

14-A has a list of the factor weights for each of the above categories, and how they can be applied. The factors are developed for easy use by practitioners, and are based on the outlier-free predictive model parameter estimates.

Once you have the data collected, go through the analysis set forth on Table 14-4 to generate the expected loss amount (if any) for your property. Follow the step-by-step instructions for the color-coded categories. If the factor applies, use the appropriate positive or negative percent associated with that factor. If not, the net effect on property loss is zero. When you sum the losses, you have your answer. The result is the midpoint of an error band. Eighty percent of the cases using the more elaborate form of this model had their predicted values within 10 percentage points of their actual loss figure, while 90% were within 15 percentage points.

A. Example 1

A LUST causes groundwater pollution in a suburban Midwest city. The pollution is ongoing despite some remediation because no NFA has been issued and the source of pollution has not closed. There is no litigation at the present time. The median value of homes in the area is $120,000.

Consulting the BIG MATRIX tables, an estimate in the percentage loss in value can be calculated. The base discount for groundwater is -13%. Since the home is adjacent to the source of contamination, there is a reduction in loss. The site is in the Industrial Midwest, which adds a discount of -9%, and no adjustment because it is in a suburban location. The contamination is ongoing, so no adjustment is made to account for either a sudden effect or an NFA. From the table, there is an adjustment of 1.4% for every $10,000 in median home value below $160,000. An adjustment of 5.6% (reducing the loss) is derived from the median home value of $120,000, which is $40,000 less than $160,000. The source of contamination is still operating. The total loss in value is calculated by adding -13% (groundwater contamination), -9% (Industrial Midwest), and 5.6% (1.4% for each $10,000 under $160,000) to get a total loss of -16.4% for this example.

B. Example 2

A house is located 200 feet away from an HVOTL in suburban southern California. The house is worth $250,000. There is no pending litigation.

The base discount for linear sources of nuisance from the BIG MATRIX is 4%. Overhead transmission lines are an ongoing source of contamination, so no adjustments are made for an NFA, sudden, or source closing. The home's location 200 feet away from the power lines equals a 2% positive adjustment (1% for each 100 feet away from the source). It is in a suburban part (0% adjustment) of southern California (2%). The home is $90,000 above the median value of $160,000, requiring an adjustment of -12.6% (-1.4% because it is above $160,000 multiplied by 9 because it is $90,000 above). The total loss in value is -12.6%.

C. Example 3

Both air and water pollution from a Superfund site affect a house one-quarter a mile away with a value of $60,000 in a poor, rural area in the South. The home is part of a class action lawsuit against the site.

There are three sources or types of contamination involved in calculating the base discount of 35%: air (-13%), water (-13%), and the Superfund site (-9%). However, choose only two (the highest two are fine) of these to avoid overstating the effects. There is no distance adjustment because the house is located within a mile of the site. The home is located in the South (-7%) and in a rural area (-10%). There is also litigation (-6%) as the home is part of a class action lawsuit. The home is worth $60,000, which is $100,000 less than the median value of $160,000, requiring a positive adjustment of 14%. The total loss in value is -35% (-13% for air -13% for water (do not count -9% for Superfund) -7% for South -10% for rural -6% for litigation + 14% for being $100,000 under the median value).

D. Example 4

There is a house worth $300,000 on a river in the rural Mineral Extraction region of the United States. An explosion occurs at a site adjacent to the river, polluting the water. The problem is corrected and a future explosion is unlikely. Despite the unlikelihood of a repeat occurrence, litigation is filed.

The explosion leads to water pollution, a base discount of -13%. This house is located on the riverfront, so no distance adjustments are necessary. The home's Mineral Extraction location requires an adjustment of +2% as well as a discount of -10% because it is in a rural area. The explosion was sudden (+6%), an NFA was issued (+11%), and is highly unlikely to happen again (+13%). The problem has been remedied, but litigation is filed anyway (-6%). There is a cap on discounts in home value that has a maximum cap at -14% and applies to homes with a value above $260,000. Due to the relatively high value of this home, the discount cap of -14% applies. The total percent loss in value for this example is 11%.

XI. Conclusion

This chapter has set forth the dilemma of a portion of worthy cases that cannot readily obtain justice for environmental damage property claims. A predictive model with a known error rate has been built to estimate property damage losses. A generic and user-friendly version of this model has been developed that allows potentially injured parties to generically estimate their losses, prior to consideration of particulars of the case.

It is hoped that the model may enable some claimants, who otherwise would not be able to pursue their claims because of the expense of proving their damages, to reduce somewhat the expense of litigation so that they are not as a practical matter barred from obtaining justice. For example, a local real estate appraisal expert might be able to rely on the model and data to express an opinion about lost value without the necessity of undertaking a specific study. Unfortunately, the model cannot deal with all of the other expenses of litigation or make obtaining competent and effective counsel more possible. However, to the extent that it has some effect on the expense of proving the claim, it may allow some additional injured property owners to pursue their claims.

From the defense perspective, there are floodgate issues on mediating or settling cases. They may require the plaintiff to agree not to discuss or publicize the case, and thereby not setting a precedent. Still, use of the BIG MATRIX is a sensible approach, but without motivation or legal pressure, it is hard to imagine many defendants acting on a claim that is not filed.

Appendix 14-A: Parameter Estimates of All Three Models

	Model			
Variable	Five Observations Maximum	Full	Outlier	BIG MATRIX Factor
(Constant)	***23.8%***	15.2%	-4.3%	None
Real 2003$ value	***0.0%***	***0.0%***	***0.0%***	**See note 1**
Northeast	7.1%	6.3%	-4.1%	-4.0%
Industrial Midwest	***-7.8%***	***-7.4%***	***-8.7%***	**-9.0%**
South	-7.0%	***-13.3%***	***-7.4%***	**-7.0%**
Farmland	2.5%	-1.9%	***-10.1%***	-10.0%
Mineral Extraction	5.7%	7.8%	2.1%	**2.0%**
Southern California	0.7%	0.0%	2.3%	**2.0%**
Northern California	5.9%	***12.8%***	4.1%	**4.0%**
USA	-8.5%	***14.4%***	0.7%	None
Sudden	6.9%	6.1%	***6.4%***	**6.0%**
NFA post-remediation	***29.4%***	***38.5%***	11.5%	**11.0%**
Log of distance	0.4%	***0.6%***	***0.6%***	**See note 2**
Nuclear/manufacturing	***-11.1%***	***-16.4%***	***-9.7%***	**-14.0%**
Superfund/landfill	-0.8%	1.0%	-4.8%	-9.0%
Groundwater	-8.6%	***-10.5%***	***-8.5%***	**-13.0%**
Air/concentrated animal feeding operation	***-8.6%***	***-12.2%***	***-9.1%***	**-13.0%**
Urban disamenity	-6.2%	-7.6%	-4.3%	**-8.0%**
Litigation dummy	-2.6%	***-5.7%***	***-6.1%***	**-6.0%**
Announcement of bad thing	-1.1%	-0.9%	1.2%	None
Announcement of closing	***32.2%***	***33.2%***	***12.8%***	**13.0%**
Suburban	***-9.6%***	-5.4%	0.1%	None
Rural	0.0%	7.0%	***-10.2%***	-10.0%
Mix	0.8%	-0.8%	-1.3%	-1.0%
2000 unemployment rate	0.5%	***1.2%***	0.4%	None
30-year mortgage rate	-0.1%	0.2%	***1.4%***	None
Log of sample size	-2.1%	0.8%	-0.3%	None
Case	***-32.9%***	***-28.9%***	***-11.6%***	**None**
Survey	***-10.2%***	***-6.7%***	***-6.3%***	**None**
Other	0.8%	1.3%	***8.3%***	None
Linear hazard	Ref cat[3]	Ref cat	Ref cat	-4.0%
Mid-Atlantic region	Ref cat	Ref cat	Ref cat	-0.0%
Urban location	Ref cat	Ref cat	Ref cat	-0.0%

For the three models, bold-italic type indicates that the variable was significant at the 85% level of confidence.
[1] For homes with a median value under $160,000, add 1.4% per $10,000 under, no more than 10%. For homes with a median value over $160,000, subtract 1.4% per $10,000 over up to 15%.
[2] Distance varies based on the source and type of contamination. Add 1% per 100 feet away from linear sources, add 2.3% for each mile away from nuclear and manufacturing facilities, add 2.7% for each mile away from a Superfund site or landfill, 0% Jesse please check this for air and/or groundwater contamination depending on whether home is on or off plume, and add 2% for each 100 feet away from an urban disamenity.
[3] Ref cat indicates reference category for main model.