

## CHAPTER 2: VALUING GOVERNMENT SERVICES: QUASI-WILLINGNESS-TO-PAY

### Executive Summary

The benefit-cost model (BCM) for seismic rehabilitation of federal buildings presents few conceptual difficulties from an economic point of view. All of the costs of earthquake mitigation measures correspond to specific expenditures of federal dollars that represent purchases made at market prices. Many of the benefits of earthquake mitigation take the same form: any mitigation in damage to buildings and contents will reduce federal expenditures if and when an earthquake occurs, and the magnitude of these avoided expenditures can be used as the measure of benefits.

Two categories of benefits do not fit this straightforward paradigm: the deaths and injuries that might be avoided by earthquake mitigation measures, and the value of government services that might otherwise be interrupted by earthquake damage. Procedures for assigning economic value to avoiding deaths and injuries have been addressed in developing the BCM for private sector buildings; no new issues are raised in the federal case. However, avoiding interruptions in the output of government services represents a benefit with no similar component in the private sector model.

To account for these losses of government output, we need a simple procedure for assigning economic value to government services. The problem is that government services, almost by definition (in the U.S.), are those to which markets do not assign a value. Therefore private methods of analysis (and similar methods related to privatization and user fees) are either unavailable or unsuitable. Moreover, traditional methods of benefit-cost analysis tend to be overwhelmed by the problem, since so many different types of services are involved. Hedonic pricing and travel-cost methods would capture only a fraction of the value, at best, of government services. Survey methods are unreliable and expensive, and not easily adapted to the range of services in question.

We conclude that a simple procedure is best: the default assumption in the model is that if the government is paying \$5,000 a month to employ an individual in an office with a computer, then the loss of that individual's services—whatever they might be—for one month will cost the nation \$5,000. Sometimes this is called collective or politically-determined willingness to pay; we will call it quasi-willingness to pay (QWTP). If one were doing a benefit-cost analysis of a federal program from scratch, this method would be of little use because it would be circular. But for seismic rehabilitation it is superior to alternative techniques. A decision to rehabilitate a federal office building is not the appropriate occasion for a *de novo* reexamination of the

rationales and values underlying the federal programs it houses. Rather, the rehabilitation analysis should accept as a given the decision to provide a certain variety and level of services, and proceed from there to the question of how best to protect those services. Users of the BCM can provide a "continuity premium" to indicate the extra importance that certain functions might have in the immediate wake of an earthquake.

## 1. Introduction

Assigning economic values to non-market goods and services is usually the most challenging part of a benefit-cost analysis, either because there is little data from which to estimate values, or because it raises deeper conceptual problems like the treatment of intergenerational transfers, the validity of “existence” values, and other areas of theoretical controversy.

For the most part, the Benefit-Cost Model (BCM) for seismic rehabilitation of Federal buildings presents few such difficulties. All of the costs of earthquake mitigation measures are “pecuniary” costs on the federal budget. That is, we can identify specific expenditures of federal dollars that correspond to all of the economic costs, and these dollar flows can be taken as a complete quantitative measure of the underlying economic costs because they represent purchases of goods and services at market prices. Many of the benefits of earthquake mitigation take the same form: any mitigation in damage to buildings and contents will reduce federal expenditures if and when an earthquake occurs, and the magnitude of these avoided expenditures can be used as the measure of benefits.<sup>1</sup>

If all of the benefits took this form, then earthquake mitigation decisions could be modeled as pure internal government investments. Under OMB guidelines,<sup>2</sup> all of these budget flows would be converted to expected values (using the estimated probabilities of various outcomes), then summed to a net present value using a real discount rate equal to the federal cost of borrowing (about 4 percent), without having to apply any special multipliers to account for economic stimulation, for the excess burden of taxation, or for the shadow price of capital. (See Chapter 3 on discount rates and multipliers.)

Two categories of benefits do not fit this straightforward paradigm: the deaths and injuries that might be avoided by earthquake mitigation measures, and the value of government services that might otherwise be interrupted by earthquake damage.

Assigning economic value to deaths and injuries raises conceptual (or at least rhetorical) difficulties as well as practical ones, but these have been fully explored elsewhere.<sup>3</sup> Standard estimates of the value of life are incorporated into the BCM, and life-saving benefits are discounted at the same rate as other benefits in the model (4 percent). Although technically the value of life is measured in dollars of private consumption that are not strictly comparable to federal budget dollars (because of the

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<sup>1</sup> With a few possible exceptions (museum artifacts, for example), earthquake damage caused to buildings and their contents can be estimated by referring to market prices for repair or replacement.

<sup>2</sup> OMB, Circular A-94.

<sup>3</sup> See Chapter 4 of this volume for a review of the value-of-life literature.

excess burden of taxation), the BCM does not include an “excess-burden multiplier” to make them comparable. The standard BCM output includes a statement of net benefits both with and without the life-saving benefits,<sup>4</sup> so that the user may easily interpolate the influence of small changes in the value-of-life; additional sensitivity analyses can be run as needed. Using an excess burden multiplier in this context would only add confusion and would not improve the accuracy of the BCM.<sup>5</sup>

Interruptions and reductions in the output of government services also can produce real economic losses without any corresponding change in government outlays; and it is important to try to estimate these costs. In some cases it might be possible to observe indirect effects in the local economy, as businesses or individuals turn to substitutes for certain types of government services—Post Offices and Veterans' hospitals are federal facilities with obvious private substitutes. In many cases, however, the drop in government output will simply produce welfare losses among the public, with no easily observable economic manifestations. With broad public goods—such as federal research or national defense—the losses will not even be confined to the geographical area of the earthquake.

None of the benefit categories in the private-sector BCM is directly comparable to the reduced loss of government services. In modeling the decision process for private buildings, the primary point of view was that of the building owner/occupant. In the case of federal facilities, however, there is no useful distinction to make between private and social benefits. The federal government is a self-insuring entity owned by the public, so that the proper point of view for the benefit-cost analysis is that of the public as a whole. For example, while a commercial entity might care about profits but not consumer surplus, a public entity should try to take account of losses in consumer surplus.

Thus we need a manageable procedure for assigning an economic value to losses of output of government services from a building, which may house one federal agency—or a dozen. This is a simple question, yet any practicing economist will find it humbling. The problem is that government services, almost by definition, are those to which the market cannot assign a value, and the traditional methods of benefit-cost analysis for estimating values are overwhelmed by it. To explain why, this chapter reviews some of the standard methods available.

In the end, we conclude that a simple procedure is best: the default assumption in the BCM is that if the government is paying \$5,000 a month to employ an individual in an office with a computer, then the loss of that individual's services—whatever they might be—for one month will cost the nation \$5,000.

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<sup>4</sup> Note that the BCM includes a forecast of net benefits without the value of life *not* because there is any doubt about whether life-saving benefits should be counted, but to show the user what the source of benefits is and how they break down between on-budget and off-budget effects

<sup>5</sup> See Chapter 3 of this volume.

This approach recognizes that the level of output of government programs is decided not by the market, but by legislative and executive decisions--ultimately political decisions--about program funding levels, tax burdens, and budget deficits. If this process achieved economically efficient outcomes, then the value of each government program at the margin would be equal to its marginal cost. Since accurate information about the cost of government programs is more easily obtained than accurate information about the benefits, we could use cost as a proxy for economic value.<sup>6</sup>

Using price-paid as an indicator of value is a standard procedure for assigning values to private goods and services, and is usually referred to as the "willingness-to-pay" measure of consumer preferences. When governments (as opposed to individuals) are paying the bill, however, this term cannot be rigorously applied.<sup>7</sup> Instead, this method has sometimes been called "collective" willingness to pay, or "politically determined" willingness to pay. We will use the term quasi-willingness to pay (QWTP) in order to stress that it is related to the standard willingness-to-pay measure of value, but with some important differences.

The most important difference is that QWTP implicitly relies on the assumption that various government services are provided at economically efficient levels. While this assumption might fairly be called "heroic," it also is one of the main advantages of QWTP in the context of the BCM. Any alternative method for estimating the value of government services--one that implicitly assumed that the economically efficient mix of government services differed substantially from the actual mix of services--would likely achieve neither political acceptability nor economic credibility.

## II. Literature Review

### A. Private Decisions, Privatization, and User Fees

In searching for a method to assign value to government services, the obvious place to look for inspiration is the array of techniques used by the private sector to make decisions. Households and firms have been weighing benefits and costs for a long time—long before there were economists—and the problem of rehabilitating a federally owned building closely resembles the problem of rehabilitating a privately owned building. There are critical differences, however. One is information: households are

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<sup>6</sup> "Marginal" here refers to relatively small changes in the level of services. For example, there is no inconsistency in believing that the value to the nation of having a military capability is many times greater than what we pay for it, and at the same time that the value of any single military installation is about equal to what we pay for it--as long as we do not lose them all at once!

<sup>7</sup> There are technical reasons for this. For example, transitivity of preferences is taken as axiomatic for individual consumers, but has been shown to be impossible in the context of collective choice. So "revealed preference," "compensating variation," and the other standard tools of consumer welfare analysis cannot be strictly applied to government actions. Nor, of course, can the theory of the profit-maximizing firm be applied

presumed to know their own preferences, and firms are guided by market prices for both inputs and outputs. A government agency cannot be assumed to have any special insight into individual preferences, nor can it refer to market prices to determine the value of its output. Another major difference is that private decisionmakers face well-bounded problems; they need not worry about externalities, for example. A government agency must take a broader perspective and attempt to account for externalities and other messy complications.

In the past 15 years there has been a surge of interest in applying private management methods to the provision of government services, either through privatization of government-owned organizations, or through the use of user fees.<sup>8</sup> In the United States privatization and user fees were central features of President Reagan's domestic program, but far more research (and far more privatization) has been done in countries that initially had more socialized economies or more nationalized industries. Some early work was done in New Zealand and Great Britain; later several South American countries actively pursued privatization programs. With the rejection of communism in Eastern Europe,<sup>9</sup> the reunification of Germany, and the breakup of the Soviet Union, research on methods of privatization is stronger than ever.<sup>10</sup>

Unfortunately, the types of analysis used in privatization decisions are of little use in benefit-cost analysis. The government services that are most susceptible to privatization are those that supply essentially private goods. While a privatization analysis does assign a value to government services (and may estimate a demand curve), it is intended to find the conditions under which that service can be operated as a commercial enterprise. Such an analysis would not offer much insight into the value of most federal programs because it would tend to focus on private gains, rather than social benefits.

Even in the case of services for which a persuasive privatization analysis could be assembled, such as the Post Office or the Veterans' hospitals, the results would be controversial. The Postal Service is not subsidized, but it does enjoy a legal monopoly in first-class mail. One result is that there are more Post Offices than a fully private postal service would operate. Still, the Postal Service would be unlikely to concur in a conclusion that Post Offices should not be protected from earthquake damage because we have too many of them! Similarly, the Department of Veterans' Affairs could be expected to argue that the services it provides should not be evaluated from the perspective of potential profitability, because such an analysis would ignore larger social goals and commitments that justify the subsidies that its hospitals receive.

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<sup>8</sup> Hopkins, 1988.

<sup>9</sup> Note that the rise of communism and socialism in Europe was accompanied by the development of a large technical literature on methods of resource allocation in centrally planned economies. This literature is now almost unanimously regarded as worthless.

<sup>10</sup> The U.S. Agency for International Development is sponsoring a large program of technical assistance to the newly independent states, including teams of experts on privatization

The same comments apply with even greater force to the analysis of user fees, which have been adopted for many (and proposed for many more) Federal services. While user fees can help ensure that such services are used more efficiently (say, in the case of boaters who request Coast Guard rescue), they will not usually tell us at what level the program should be funded or what its total social value is. Typically user fees are proposed for programs that provide a mix of private and public goods, and are intended to ration the private component. Thus they will only reflect a portion of the total value associated with the program, and will only cover a fraction of its costs.

### **B. Public Decisions and the Development of Benefit-Cost Analysis**

The techniques of benefit-cost analysis focus largely on the problem of assigning value to public goods. Public goods are defined as those which are nonrivalrous (my consumption does not diminish what is available to you) and/or non-exclusive (if I buy some I cannot prevent you from enjoying it too). National defense is the classic example of a public good: however we decide to distribute the costs of defense, the benefits are inevitably shared. Markets cannot be relied on to elicit the right level of production of public goods, so governments (in theory) do. Not all public goods are provided by government: nature supplies clean air and scenic vistas; private charity supplies wilderness preserves and homeless shelters. Moreover, not everything that the government does can be easily explained as a public good. Nonetheless, the theory of public goods is the right place to look for guidance, because it deals with the general problem of how to assign economic value to goods and services that are not traded in a market.

Benefit-cost analysis is a twentieth-century development, and its origins are in the U.S. Department of Defense. Initially, it was applied to civil works of the Army Corps of Engineers. The River and Harbor Act of 1902 required the Corps to evaluate costs and benefits of water projects; the Flood Control Act of 1926 added the requirement that all projects proposed by the Corps must have positive net benefits. During World War II the United States and Great Britain developed a variety of mathematical methods for allocating scarce strategic materials and optimizing military operations. Program budgeting, linear programming, and other tools of "operations research" were developed and later incorporated into cost-effectiveness and benefit-cost analysis. The Defense Department continued to be a central focus for developing these methods, particularly in the Kennedy administration; President Johnson then initiated a campaign to export them to civilian agencies. In one guise or another benefit-cost analysis has been featured in proposed budget reforms ever since (although it still cannot be said that benefit-cost analysis is driving the Federal budget).

The growth of Federal regulatory agencies generated a whole new set of applications for benefit-cost analysis. President Nixon initiated a "Quality of Life Review" process that required an evaluation of regulatory costs and a review by the Executive Office of the President; every subsequent president has ordered some type of regulatory review

and balancing between benefits and costs.<sup>11</sup> Many recent advances in benefit-cost methodology have focused on evaluating regulations. While benefit-cost analysis still finds only limited statutory support in either budget programs or regulatory programs, it is generally accepted as best means of assessing the efficiency of government programs.

The latest refinements in benefit-cost analysis have been associated with its use in litigation. The Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (a.k.a. Superfund) called for federal regulations outlining methods of assigning value to natural resources that have sustained damage from spills of oil or hazardous substances.<sup>12</sup> In later amendments to CERCLA and in the Oil Pollution Act of 1990<sup>13</sup> Federal and state governments were authorized to bring civil suit for damages to natural resources. The resulting litigation has made valuation of public goods one of the most active areas of economic research today.

While the literature on benefit-cost analysis explores a variety of methods for assigning value to public goods, all of them are aimed at estimating the sum of individual willingness to pay to obtain a desired outcome.<sup>14</sup> This measure of value is comparable to the market prices that we use to value private goods and services, and it is straightforward in theory. In practice, however, it can be next to impossible to measure. Two basic approaches are used: one relies on revealed preferences--i.e., behavioral data; the other relies on expressed preferences, or survey data.

### C. Revealed Preference Methods

The theory of economic welfare builds on the preferences of individual consumers, as revealed by the decisions they make in the market place to buy—or not to buy—goods and services that are offered at various prices.<sup>15</sup> Since public goods are not traded in markets, no direct data on consumer preferences can be found there. The standard methods of benefit-cost analysis use indirect clues: by interpreting the behavior of consumers with respect to related private goods, it is possible to assign approximate values to public goods. Within this group, two well-developed quantitative techniques

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<sup>11</sup> President Clinton signed Executive Order No. 12866, *Regulatory Planning and Review*, on September 30, 1993. It maintains the requirement for benefit-cost analysis and affirms the principle that regulatory decisions should be guided by the results: "[A]gencies should select those approaches that maximize net benefits . . . , unless a statute requires another regulatory approach "

<sup>12</sup> Section 301(c). Responsibility for drafting regulations was delegated to the Department of the Interior by Executive Order

<sup>13</sup> Prompted by the Exxon *Valdez* oil spill. The Oil Pollution Control Act is administered by the Department of Commerce, which is developing its own regulations governing the estimation of damages.

<sup>14</sup> Rarely, willingness to *accept* compensation to *forego* the desired outcome is used instead. The difference should usually be small

<sup>15</sup> Samuelson, 1957, developed the revealed preference theory for market goods.

are available: hedonic methods and travel cost methods.

Hedonic methods attempt to find private goods whose market prices include a component attributable to the public good (or bad) being evaluated. Housing prices may tend to be depressed near the town dump, and may be elevated near a pristine lake. Econometric techniques can be used to sort out the many different factors that contribute to housing prices. Hedonic prices, for example, are used to estimate the market value of a closet in a new home—even though no separate market for closets can be observed. In exactly the same way, it is possible to extract from housing prices an estimate of the cost of the dump (in terms of its nuisance to near neighbors) or the value of the lakefront.

Standard estimates of the value of life are another example of hedonic methods. Econometric techniques were used to examine the determinants of wages in different jobs, with relative risk of accidental death as one of the independent variables. Since such studies consistently show that higher wages are associated with high-risk jobs, it is possible to extract the “price” that people place on their own safety.

Unfortunately, for the great majority of government services it would be impossible to find a suitable hedonic measure of value. While proximity to a National Park will certainly enhance nearby home values, it is unlikely that a typical federal office building would show much of an effect. If it did show an effect, the values extracted by this method could not account for more than a small fraction of the total value of the building's services, since access to these services is not strongly dependent on the location of the customer's residence.

The other well-developed revealed-preference technique is the travel-cost method. This is most often used to estimate the benefits of recreational opportunities, such as fishing or hiking; it resembles hedonic pricing in that it relies on spatial relationships. Instead of market prices, the travel cost method extracts willingness-to-pay estimates from the choices people make about how far to travel to enjoy a particular service. People will spend more time, as well as more money, to reach a more desirable fishing spot. By doing so, they reveal their preferences on a monetary scale—even though the fishing itself is free. As with hedonic pricing, this method would be applicable to only a small fraction of government services, and would likely measure only a fraction of the value of those.

#### **D. Expressed Preference or Survey Methods**

Dissatisfaction with the limitations of hedonic and travel-cost methods led the Environmental Protection Agency to sponsor a program of research in “contingent valuation” surveys. These resemble public opinion polls or market research surveys, but they are designed for the specific purpose of estimating individuals' willingness to pay for public goods. Respondents are confronted with a choice (one early study showed them photographs of the Grand Canyon with visibility impaired by varying levels of air pollution), and are asked how much they would be willing to pay for the

outcome they prefer. Estimates of value are aggregated across the relevant population (often the entire nation) to get a total value.

Contingent valuation surveys are classified as an expressed-preference method, because values are calculated from what people say, rather than inferred from what their behavior reveals. Advocates of expressed preference methods sometimes call them “direct” methods, because they are indeed less roundabout than the revealed preference methods described above. They have serious drawbacks, however, and for a while it seemed likely that this line of research would be abandoned. Contingent valuation surveys have experienced a strong revival, however, in the litigation authorized by CERCLA and the Oil Pollution Act of 1990. Both the Department of the Interior and the National Oceanographic and Atmospheric Administration have undertaken rulemakings to standardize valuation procedures for natural resource damages, and survey methods will play a prominent role in both of them.

There are serious philosophical disputes about the validity of expressed preference methods on a number of grounds. People who never use a good or service in any observable way may still express a large (and unverifiable) willingness to pay simply for the existence of, say, a pristine shoreline in Alaska. Such “non-use” values can skew resource allocation decisions, because there are so many non-users and no limit on what values they might express. Moreover, expressed preference methods do not conform to the usual scientific standards of verifiability. Given the large divergence between what people say in contingent valuation surveys, and what they actually do, it is still unclear whether the economics profession ultimately will accept survey data as a reliable indicator of value.

In any event, contingent valuation surveys require very careful design and execution, and large sample sizes. They tend to be far too expensive for most analytical purposes, and are popular only in the context of large civil lawsuits.

### **III. Quasi-Willingness-To-Pay**

#### **A. Relationship to Willingness-To-Pay Methods**

The overarching goal of a benefit-cost analysis is to estimate the changes in the well-being of individuals, where each person's welfare is measured according to his or her own preferences. Individual preferences are revealed by individual behavior—i.e., the decisions made in response to choices offered by the market. This is why market prices can be used as a gauge of individual values, and why individual willingness-to-pay is accepted as the conceptually correct measure of value in benefit-costs analysis, even when a real market is not present.

Firms do not have welfare, so no values can be ascribed directly to their behavior. But when markets are competitive, the economic theory of the firm provides a strong link between the choices a firm makes and the preferences of its customers, suppliers,

employees, and stockholders. In a benefit-cost analysis firms are generally assumed to be using factors of production efficiently and prices and quantities are assumed to be set by supply and demand.

In effect, the “quasi-willingness-to-pay” (QWTP) method adds one more heroic assumption: that government agencies are also allocating resources efficiently, so that their expenditures accurately reflect the underlying preferences of voters. This approach recognizes that the level of output of government programs is decided not by market processes but by legislative and executive budget decisions, ultimately controlled by electoral politics. If this process achieves economically efficient outcomes, the value of each program at the margin will be equal to its marginal cost. Thus for marginal changes in output, we can use the level of funding for a particular government function as a proxy for value. In simple cases, QWTP works as follows. If a government office experiences a 10 percent decline in productivity for one month, but no change in outlays, the lost output would be valued at 10 percent of the funding budgeted for that function.

On the surface, QWTP closely resembles conventional willingness to pay. Instead of trying to glean the preferences of individuals; QWTP looks instead at the preferences of the public collectively, as expressed through the democratic and administrative processes of government. Thus it is sometimes referred to as “collective” willingness to pay, or “politically determined” willingness to pay.

QWTP is not a formally developed procedure, because its scope of application is limited. It is sometimes used to rebut unreasonable damage assessments in natural resource cases. For example, a corporation accused of damaging a wetland may point out that the government bringing the civil suit has itself decided to develop wetlands, or has foregone opportunities to protect wetlands, and that those decisions imply a much lower value for wetlands than the lawsuit implies.

Often QWTP arguments are used inappropriately, as when an agency claims that if Congress has set a certain statutory goal—say, “preserving our heritage”—then attaining it must be worth, *ipso facto*, whatever the cost turns out to be. Used in this way, it is a rejection of benefit-cost analysis rather than an application of it.

One fruitful way to apply QWTP is to look for inconsistency across a number of programs with similar objectives. For example, in assessing various measures that were intended to achieve “energy independence” the Energy Department and its predecessor agencies used implicit values for saving a barrel of oil. While the method did not supply any independent indicator of what a barrel of oil was really worth, it did enable the Department to recognize when one conservation measure was putting an unrealistically high value on a barrel, or was out of line with other programs in terms of its cost-effectiveness

QWTP has sometimes been used to estimate the implicit value of life in various government safety programs. In this context, one author concludes:

If it could be assumed that governments act purposefully, rationally, and consistently, then the observed willingness to pay for increased longevity could be interpreted as a politically determined value of statistical life. The main problems with using data derived from the political process as the basis for assigning values are the strong assumption concerning the rationality and consistency of the political process, and the difficulty that even rational decisionmakers would have making consistent decisions in the face of substantial information gaps concerning the effects of various public policies on mortality.<sup>16</sup>

Even this may be an optimistic assessment, because “the strong assumption about rationality and consistency” may still not be enough to ensure a correspondence between government decisions and the values of individuals. It has to be acknowledged that there is no economic theory to demonstrate that governmental decision processes produce an efficient level of services.

Musgrave and Musgrave, after reviewing a variety of models of voting behavior, conclude that none is completely persuasive. While they recognize that the connection between individual preferences and fiscal decisionmaking is indirect, they do not dismiss it:

More likely than not, the public receives about the level of public services which it desires, and those who find this level deficient or excessive reflect departures from majority preferences rather than proof that the political process is itself grossly inadequate in giving expression to these preferences.<sup>17</sup>

In the context of the BCM, there are good reasons to use the level of funding as an indicator of the marginal value of Federal programs. It allows the user to take politically determined outcomes as a given. It does not require the modeler to develop an estimate of the value of Star Wars research, for example, independent of the decisions that the political process has arrived at. In this way, QWTP avoids fundamental inconsistencies between earthquake planning and the routine operations of the agency, and automatically keeps damage mitigation measures in proper proportion to all of the other competing priorities and resource constraints that each agency faces.

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<sup>16</sup> Freeman, 1979, pp. 172-3.

<sup>17</sup> Musgrave and Musgrave, 1976, pp. 118-119.

### The Department of Transportation Analysis

The Department of Transportation has used QWTP to estimate the value of transportation facilities that might be damaged by an earthquake.<sup>18</sup> In support of seismic safety standards for new buildings, DOT used illustrative values for an average “generic” building in a benefit-cost analysis. Three types of benefits were estimated: the “Benefit from saving the building,” the “Benefit from persons and property saved,” and the “Benefit from function preserved.”

To assign a value to the building’s function, “We start by assuming that the building is economically justified by the transportation function it facilitates.”<sup>19</sup> DOT then uses the cost of the building as a lower bound on the economic value of the services that flow from it<sup>20</sup>

Although the DOT analysis is only roughly sketched and does not evaluate any actual building, it is interesting to note the scale of the results that they get. The largest component of benefits from seismic protection is the benefit from persons and property saved, accounting for roughly 90 percent of total benefit. In contrast, the “benefit from function preserved” is less than 1 percent of the total benefit of seismic protection. This suggests that QWTP values need only be approximately correct. It is highly unlikely that they will be a major source of error in the overall benefit-cost analysis, given the large uncertainties that are unavoidably embedded in other components of the model.

### Advantages of Quasi-Willingness-to-Pay

There are two main advantages of the QWTP method. One is the relative ease of data collection. Revealed preference methods would require huge amounts of market research, and heroic manipulation of the resulting data, to produce estimates of estimating willingness to pay for even a few Federal services. Expressed preference methods would require the design and execution of complex consumer surveys, and the results would be of questionable reliability. In contrast, the data required by QWTP is already available. It is far easier to find out what we are paying to deliver a service than to find out what it is worth to those who receive it.

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<sup>18</sup> Nutter, Robert D. *Final Regulatory Evaluation for the Earthquake Rule Implementing E.O. 12699: Seismic Safety of Federal and Federally Assisted or Regulated New Building Construction*. Office of Regulatory Affairs, U S Department of Transportation: March 25, 1993.

<sup>19</sup> *ibid* . p. 11

<sup>20</sup> In the BCM, the value of one day’s worth of services from a building is taken as the cost of operating it for one day, including the salaries of the people inside. That is, for the duration of the disruption, we assume that the services of the employees will be lost along with the services of the building. In the DOT analysis, only the cost of the building itself is used, perhaps because they assume that employees who are not killed in an earthquake will find something useful to do.

The second advantage of QWTP is consistency with the existing allocation of resources within the Federal budget. If another method were to impute values to federal programs using an independent measure of value, some Federal facilities might be found to have zero or negative value. While such results might well be credible, the BCM is not the right place for them to be applied. Seismic rehabilitation decisions should accept as given the values implicit in politically determined resource allocations.

### **IV. Considerations in Applying a “Continuity Premium”**

The BCM allows the user to add a continuity premium to the QWTP estimate of the value of government services. This is an extra amount (per day-of-interrupted-services avoided) that the user feels would be reasonable to pay to maintain the flow of services from a particular site. The magnitude of this adjustment is left up to the user, but several things should be kept in mind when estimating a continuity premium.

#### **Identify the Size of the Disruption**

In some cases the damage to an individual building will cause a loss of services from multiple sites. This may be true when a facility is a node in a network: a transportation or communication hub, a mail-sorting center, or a command and control center. The question to ask in these cases is: In the event of quake damage, will the reduction in output from this facility effectively idle other, non-damaged facilities? While it might be possible to account for this effect by assigning a continuity premium to the critical facility, a better method is available. In estimating the value of lost services, the user should input cost figures that represent all of the capacity that is effectively disabled, rather than just the cost of the damaged node. (Of course, sites that do not experience direct earthquake damage should *not* be included when estimating benefits from structural, property, and life-safety protection.) This should capture all of the value of lost services.

#### **Post-Earthquake Demand Shifts**

An important assumption underlying the QWTP method is that the demand for any particular service is largely unaffected by an earthquake event. Obviously, there are many types of service for which that is untrue.<sup>21</sup> There will be a large increase in the demand for hospital services, communications services, police services, and possibly military services. In some cases—a tourist bureau, for example—demand may shrink after an earthquake, so that a negative value could be assigned to maintaining continuity of service. It may be difficult to assign a precise monetary value to services that will experience a large increase in demand. On the other hand, it is likely to be unnecessary, since the need to protect emergency facilities will generally be self-evident without the BCM.

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<sup>21</sup> Hurricane Andrew reminded us that anemometers tend to blow away just when everyone wants to know what they say

### Avoiding Double-Counting

One hazard of QWTP (and of any method of valuing government services) is that some benefits might be inadvertently double counted. The BCM will be estimating the additional costs that will be incurred to maintain services after an earthquake, as well as the value of the services that will be lost. It will be important to keep a clear distinction between these two, particularly when workload is shifted from one facility to another or from one time-frame to another. For example, few Social Security checks will be permanently lost, although many may be delayed. Processing those checks will shift either to other centers or to the future. In analyzing any particular facility the user will need to be aware of whether the workload is shifting, or disappearing altogether

There is a range of methods available for maintaining continuity of service: protecting the building, maintaining redundant facilities and off-site capacity, and using an aggressive response plan after an earthquake occurs to restore lost capacity. One of the functions of the BCM is to weigh the cost of structural rehabilitation against the benefit of avoiding post-earthquake relocation and other expenses. Adding a continuity premium puts a thumb on the scale in favor of prior structural rehabilitation. To be fair, a user who is adding a continuity premium to the QWTP value of a particular site should also be sure that the estimate of the duration of disruption is realistic. In general, government programs (such as emergency services) that one would expect to display a large continuity premium would in any event experience only very brief interruptions of service.

## Bibliography

Bentkover, Judith D., ed., *Evaluation of the State-of-the-Art in Benefits Assessment Methods for Public Policy Purposes*. (Washington: National Science Foundation, 1984)

Clinton, William J. Executive Order No. 12866, *Regulatory Planning and Review*, September 30, 1993

Desvousges, William H., and Venetia A. Skahen. *Type B Technical Information Document: Techniques to Measure Damages to Natural Resources*. Prepared by Research Triangle Institute for the Department of the Interior. (Washington: national Technical Information Service, Dept. of Commerce, 1987)

Desvousges, William H., V. Kerry Smith, and Matthew McGivney, *A Comparison of Alternative Approaches for Estimating Recreation and Related Benefits of Water Quality Improvement*, Environmental Benefits Analysis Series. (Washington: U.S. Environmental Protection Agency, 1983)

Federal Emergency Management Agency, *Loss-Reduction Provisions of a Federal Earthquake Insurance Program* (FEMA 200, September 1990).

Federal Emergency Management Agency, *A Benefit-Cost Model for the Seismic Rehabilitation of Buildings* (FEMA 228, April 1992). Volume 2: Supporting Documentation.

Freeman, A. Myrick, *The Benefits of Environmental Improvement*. (Washington: Resources for the Future, 1979)

Hanke, Steve H., "On the Feasibility of Benefit-Cost Analysis," *Public Policy*, Vol. 29 pp. 147-157, 1981

Hopkins, Thomas, ed., *Symposium on Federal User Fees*, Washington, DC, May 3, 1988. (Washington: Administrative Conference of the United States, 1988)

Kunreuther, Howard, and Lisa Bendixen, "Benefits Assessment for Regulatory Problems," in Bentkover, 1984.

Lenard, Thomas M., "Evaluating Natural Resource Damages Claims for Settlement or Litigation" *BNA Toxics Law Reporter*, Vol 6 pp 652-656.

Litan, Robert; Frederick Krimgold; Karen Clark; and Jayant Khadilkar, *Physical Damage and Human Loss: The Economic Impact of Earthquake Mitigation Measures*. (Boston: The Earthquake Project, National Committee on Property Insurance, 1992.)

Mishan, Edward J., *Cost-Benefit Analysis*. (New York: Praeger, 1976)

Mitchell, R.C. and R.T. Carson, *Using Surveys to Value Public Goods: The Contingent Valuation Method*. (Washington: Resources for the Future, 1989)

Musgrave, Richard A., and Peggy B. Musgrave, *Public Finance in Theory and Practice*. (New York: McGraw-Hill, Second Edition, 1976)

National Oceanographic and Atmospheric Administration, *Report of the NOAA Panel on Contingent Valuation*. 58 Federal Register 4601-4614, January 15, 1993.

Office of Management and Budget, Circular A-94, Revised (October 29, 1992): *Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs*.

Office of Management and Budget, "Regulatory Impact Analysis Guidance," Appendix V in *Regulatory Program of the United States Government*, April 1, 1991 – March 31, 1992.

Samuelson, Paul, *Foundations of Economic Analysis*. (Cambridge: Harvard, 1957)

Smith, V. Kerry, "A Conceptual Overview of the Foundations of Benefit-Cost Analysis," in Bentkover, 1984.