Cost-Benefit Handbook:

A Guide for New York State's Regulatory Agencies

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January 1996

Dear State Regulating Agencies:

New York Governor George E. Pataki, in his 1995 State of the State Message, explained:

> This government not only spends too much and taxes too much, it regulates too much. The tangle of red tape that binds the lives of New Yorkers has simply grown too costly and too intrusive. We must free people from redundant, excessive, and overbearing regulation....The regulatory burden on our people must be lifted....It is time to cut regulation and encourage achievement and success.[i]

Since taking office, the Governor has imposed a nine-month moratorium on the adoption of new regulations, directed all agencies to identify existing regulations that could be reformed or repealed, asked me to serve as his Director of Regulatory Reform, and has empowered my office to coordinate these efforts as we review the more than 53,000 pages of state regulations. Recently, Governor Pataki also issued Executive Order #20 (signed November 30, 1995), putting in place a rigorous process and set of standards for state regulations.

Early in his service, the Governor announced a 16-point health-care reform package that will streamline reporting requirements, shorten permit time frames, and grant hospitals and nursing homes greater administrative flexibility, all the while continuing to ensure top-level patient care. Similarly, the Governor announced the reform or repeal of more than 200 social-service regulations, including a rule that required day-care centers to provide lunches even when a child brings a lunch prepared by his or her own parents. Just this month, the Governor also announced the repeal or reform of two-thirds of the State Insurance Department=s regulations.

Sparked by the ongoing regulatory review efforts of our office, many other major reform announcements are expected in the coming months and years. But just as important as these reform initiatives is the change in the overall approach to rulemaking in New York, requiring among other things the conduct of cost-benefit analysis -- the subject of this "how-to" manual. This analysis is an important tool in the Governor's effort to make the state's rulemaking process more rational and less burdensome to individuals, businesses, and governmental entities subject to regulation while maintaining

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[i] Governor George E. Pataki, *Annual State of the State Message*, January 4, 1995, 12-13, 5.

appropriate health, safety, and environmental standards.

Interestingly, New York=s State Administrative Procedure Act (SAPA) already requires the costs and benefits of a proposed regulation to be weighed as part of the rulemaking process. Although this statutory provision dates back to 1983, this little-noticed and much-ignored requirement was not enforced by the prior administration, which had a far different philosophy about government regulation.

Similarly, the state Department of Environmental Conservation has been required by statute since 1981 to "formulate guides for measuring presently unquantified environmental values and relationships so they may be given appropriate consideration along with social, economic, and technical considerations in decisionmaking."[ii] This mandate also was ignored by the prior administration, despite substantial progress in the academic field on developing methods for quantifying environmental benefits.

Illustrative of the new direction embraced by the Pataki Administration, New York already has begun demanding cost-benefit analysis in major regulatory decisions. A good example of this is offered by the intensive review and ultimate abandonment of an agency proposal to adopt sweeping revisions to the state's building code to address the alleged risk of earthquakes in New York. When the agency proposed these changes, the accompanying regulatory impact statement failed to provide any cost estimates and the only scientific evidence of the risk of earthquakes that was provided was a 1989 newspaper article on the liklihood of earthquakes in the Eastern United States -- an article that, by the way, indicated that the scientific evidence was too premature to serve as the foundation for policy decisions.

When told that a more rigorous explanation of costs and benefits was needed, the agency provided a listing of earthquakes in New York that dated back to 1534, the earliest date for such records. (For historical perspective, this is the year that Henry VIII broke from the Catholic Church and installed himself as the head of the Church of England, and only two years before he beheaded the second of his six wives. In other words, it was a long time ago.) Interestingly, the state agency provided Richter values for these long-ago earthquakes even though Charles Richter, the inventor of the Richter scale was not even born until 1900 and did not invent the Richter scale until 1935.

[ii] New York State Environmental Conservation Law, Section 3-0301 (q). *New York Laws of 1981*, chap. 156.

Richter himself thought that the attempt to ascribe Richter values retroactively was highly suspect. Moreover, the proposing state agency provided no evidence that any of the earthquakes that did occur resulted in any loss of life, personal injury, or property damage.

The agency ultimately provided estimates that showed that increased costs of construction and renovation could approach four percent per project -- a substantial number considering that the risk of serious earthquakes in New York remains unproven. In fact, New York has never had a major earthquake (defined by the National Center for Earthquake Engineering Research in Buffalo as 6.0 or higher on the Richter scale).

Put another way, the proposed earthquake Aprotection≅ regulation was a solution in search of a problem.

* * * * *

This cost-benefit handbook is the outgrowth of a conversation I had with State Senator Mary Lou Rath, chairwoman of the Senate Administrative Regulations Review Commission from January 19, 1994 to December 31, 1995, on how to help state agencies comply in good faith with the newly enforced cost-benefit requirements of the State Administrative Procedure Act. The report provides an overview of the key elements of a comprehensive cost-benefit analysis.

This manual is intended to give regulators a feel for the range of issues they should contemplate and assess as part of a comprehensive cost-benefit analysis. It is not a "guidance document" (as some agencies use that phrase) or a prescription of exactly how every cost-benefit analysis must be performed. We expect agencies to use their best judgment and common sense. This handbook should help agencies exercise this judgment in an informed way.

As noted, SAPA already requires an assessment of the costs and benefits of all proposed rulemakings (except for emergency rules or the repeal of obsolete or invalid rules). This routine assessment is less rigorous than will be required when a regulation imposes a major impact on the economy, and thus GORR opts to require a formal cost-benefit analysis or risk assessment pursuant to its responsibilities under Executive Order #20. As a general rule of thumb, GORR does not expect to request a comprehensive cost-benefit analysis for rulemakings that do not go beyond the minimum of federal mandates (whether a federal statute, regulation, or grant condition),[iii] the minimum of state statutory requirements, minor rules (e.g., minor Public

Service Commission ratemakings), emergency rules, or the repeal of obsolete or invalid rules.[iv]

This handbook closely approximates what will be expected for comprehensive cost-benefit analyses. For technical analysis procedures, readers are referred to in the several comprehensive resource documents in footnotes throughout the manual and in the several appendices to this report. While this level of sophistication may not be necessary or justified for every proposed rulemaking, generally speaking the greater the impact of a regulation on individuals, businesses, or governmental entities and the state's overall economy, the more important it becomes to fully document the need for the exercise of government regulatory power. As the Governor's regulatory gatekeeper, GORR=s intensity in its review of proposed agency regulations will reflect the relative significance of the regulations= potential or actual impacts.

Pursuant to Executive Order #20, GORR also may suggest an outside peer review of the cost-benefit analysis that an agency has prepared as justification for its proposed rulemaking. This peer review may look at the entire study, or simply focus on the risk-assessment component of the study if the regulation is a response to a perceived health, safety, or environmental risk. Of course, agencies are free to confer at any time with GORR staff or outside experts before proposing any new regulations.

As we embark on this new process, agency regulators and others should understand, as Dr. Jeryl Mumpower of the University at Albany has noted, that cost-benefit and risk assessment Ado not represent radical, new innovations.≅ Cost-benefit and risk assessment have been used at the federal level under Presidents Ford, Carter, Reagan, Bush, and Clinton.[v] For example, President Bill Clinton's executive order on this topic provides: AEach agency shall assess both the costs and the benefits of the intended regulation and, recognizing that some costs and benefits are difficult to quantify, propose or adopt a regulation only upon a reasoned determination that the benefits of the intended regulation justify its costs.≅[vi] And, in New York State, applying

cost-benefit analysis to proposed regulations was recommended as early as April 1982 by a non-partisan blue-ribbon panel assembled by the New York State Bar Association.[vii]

Subjecting a regulatory cost-benefit study to an outside peer review also has broad support. In comments on a draft version of this handbook, the Assembly Democrat Majority staff of the Administrative Regulations Review Commission recommended: "Just as the credibility of any agency's risk assessment is strengthened by an outside peer review, so is the credibility of a cost-benefit analysis."[viii]

This diverse and bipartisan support for cost-benefit analysis, risk assessment, and peer review should be kept in mind as we move forward.

* * * * *

The primary researcher for this handbook was Ron Miller. Mr. Miller has 30 years experience as a career economist, 23 years at the State Department of Environmental Conservation and now is a private consulting economist. Overall project supervision was provided by Tom Carroll, Deputy Director of GORR.

Mr. Miller was aided by an inter-agency work group that included, in alphabetical order: Wes Bartlett (Office of Parks, Recreation, and Historic Preservation); Jeff Boyce (GORR); Ed Castorina (Department of State); Jim Colquhoun (Department of Environmental Conservation); Jim Dunne (Office of Real Property Services); Melanie DuPuis (Department of Economic Development); Jim Held (Department of Economic Development); John Iannotti (Department of Environmental Conservation); Gary McVoy (Department of Transportation); Regina Morse (Department of Labor); Nick Paradiso (GORR); Carl Pechman (Department of Public Service); Bob Reinhardt (Office of Parks, Recreation, and Historic Preservation); and, Bill Stasiuk (Department of Health) and Mary Werner (Department of Environmental Conservation. The input of each contributor was valuable and has resulted in the development of this handbook.

Further insights were provided by participants (more than 700 individuals) and expert speakers at three forums hosted or co-hosted by the GORR on June 14, 1995, September 7, 1995, and November 14, 1995. The expert speakers included:
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Michael Gadola, Director, Michigan Office of Regulatory Reform

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Robert Hahn, Resident Scholar, American Enterprise Institute for Public Policy

John Hird, Associate Professor of Political Science, University of Massachusetts at Amherst

Terry Krukemyer, Economist, Arizona Governor=s Regulatory Review Council

Lester Lave, Higgins Professor of Economics and Finance, Carnegie Mellon University

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Dozens of individuals and organizations also commented (orally or in writing) on an earlier draft of this manual including:

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Lee Wasserman, Executive Director, Environmental Advocates (since resigned to enter a Democratic primary for U.S. Congress)
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Marina Woolcock, Director, Local Government Committee, New York State Senate

Michael Zagata, Commissioner, State Department of Environmental Conservation

Extensive revisions to an earlier draft of this handbook were made in response to comments GORR received from these many diverse sources.

* * * * *

It is our hope that this manual, and the efforts of the new Administration and the Governor=s Office of Regulatory Reform, will help ensure the development of sound regulatory behavior by government agencies. We envision the day when all state regulations will be cost-effective, based on factual data, and upon a rational assessment of competing risks.

Sincerely,

Robert L. King
Director

I. BASIC QUESTIONS ABOUT PROPOSED REGULATIONS AND ALTERNATIVE ACTIONS

The New York State Administrative Procedures Act (SAPA) requires agencies to prepare a Regulatory Impact Statement (RIS), complete with a cost-benefit assessment, when considering the adoption of a new or revised regulation. Before undertaking what could be a major and highly technical task, however, state regulators should first consider several fundamental questions. These include:

- Is there clear statutory authority for the proposed regulation?[1]
- Were alternatives to regulatory action fully considered and weighed?[2] Such alternatives could include: doing nothing; private or nonprofit solutions; voluntary agreements with affected parties; public education; local government or federal action; and, nonregulatory state actions.
- Could more or better enforcement of existing laws and regulations achieve the desired goal?
- Is the problem the regulation seeks to address an isolated case or of sufficiently broad concern to justify a state regulation?
- Is the proposed regulation simply a response to the Acrisis *du jour,*≅ which may subside on its own, or is it designed to address a persistent, lasting public concern?

Answering these questions at the initial stages of the development of state regulations will help agencies develop smarter regulations.

If an agency addresses these threshold questions satisfactorily and if a decision is made to formally advance a proposed rule, the answers to these questions and a full discussion of the alternatives considered must be included in the required RIS.

A second set of fundamental questions then should be asked by agency regulators. Among these are the following, which also would be included in the RIS:

- Is the proposed regulation appropriately tailored to the specific problem it seeks to address?
- Does the proposed regulation provide maximum flexibility to the regulated parties?[3]
- Are compliance costs, including paperwork requirements,[4] minimized to the extent possible?[5]
- Does the proposed rule tap market-based incentives and performance standards, where appropriate, rather than using a command-and-control approach?[6]
- Does the proposed regulation impose requirements stricter than the federal government? [7] If so, are these differences explained fully, and is appropriate justification provided?

Of course, if an agency decides to formally advance a proposed rule, all other current requirements of SAPA and other applicable statutes, rules, and judicial edicts also must be met.

In some instances, federal or state statutory mandates or judicial edicts will preclude enacting the most reasonable option for action. In such cases, state agencies should make every effort to identify and pursue the most reasonable regulatory option available to them. In every case, however, any proposed regulations should attempt to maximize net benefits to the extent possible given statutory and judicial constraints.

II. COSTS OF PROPOSED REGULATIONS AND ALTERNATIVE ACTIONS

The challenge of accurately estimating the costs of proposed regulations varies greatly by the program area being regulated and the type of regulatory action being recommended. The more far reaching a regulation, the greater the need for a comprehensive determination of costs. This chapter details vital components of a thorough cost estimate.

KEY ELEMENTS OF COST ESTIMATE

There are some fundamental functions that agencies must perform to ensure a good cost analysis. These actions include:

1. estimate who is directly covered and affected by the proposed regulation and any alternative actions considered;

2. describe the types of direct compliance costs to be incurred by affected parties because of the regulation;

3. estimate expected typical average compliance costs, and, if appropriate, a high and low range of direct compliance costs for entities to be regulated;

4. present the total direct compliance costs for all affected entities in New York State;

5. estimate all indirect costs imposed on regulated parties by the proposed regulation;[8] and,

6. estimate and present the cost to state and local agencies of developing, implementing, monitoring, and enforcing the proposed regulation.

WHO IS AFFECTED?

The first important step in cost assessment is the accurate determination of who is affected by proposed regulations.

1. Information on the number of and types of entities directly subjected to proposed regulations and alternative actions considered should be presented, perhaps grouped as follows:
   a. total, all business entities;
   b. total, small business entities;[9]
   c. total, non-profit organizations;
   d. total, households and/or number of people; and,
   e. total, state government and all other governmental jurisdictions.[10]

2. Within the above major groups, important subgroups subjected to the regulations also should be identified. For businesses, the Standard Industrial Classification (SIC) system could be used, unless other classifications or identifiers are more applicable or appropriate. Within the government category, distinctions should be made for municipalities, and special districts.

3. The following geographic distribution in New York of the number of entities subject to the proposed regulation could be provided where appropriate.
   a. Statewide
   b. New York City
   c. Long Island
   d. Upstate (remainder of state)

   Additional geographic detailing by county, departmental region, or regulated market may be used to show any special concentrations of parties affected by the proposed regulations.

4. All information and reference sources used by an agency to develop its selection of affected entities should be fully disclosed, thoroughly documented, and accurately dated.

DESCRIPTION AND ESTIMATES OF REGULATORY COSTS

After the number and types of affected parties are determined, the types and amount of costs imposed on those parties by the proposed regulations should be determined. These costs could be portrayed in the analysis as follows:

1. Incremental regulatory compliance costs should be identified and grouped into the following major categories, as applicable:
   a. capital costs (list separately land, structures and equipment);
   b. ongoing operational costs (include separately labor, materials, energy costs and purchased services);
   c. ongoing transaction costs, which reflect the time and value to do paperwork and other administrative compliance by entities subject to the regulations; and
   d. any start-up compliance costs, which may not be captured in any of the above categories.

2. Expected average compliance costs for applicable capital and other major cost items for typical regulated entities should be identified. Ranges of total compliance costs to be faced by regulated entities should be listed when it is inappropriate to typify the affected parties, such as when large, medium, and small businesses each may face different compliance costs. In these cases, expected average costs should be identified for each appropriate subgroup of the affected population.

3. Incremental administrative costs to the implementing agencies and other agencies that have regulatory and enforcement oversight should be identified.

4. Compliance costs should be totaled based upon a "typical" average cost or expected range of compliance costs (or any other acceptable methodology) and the number of entities affected by the regulations. Aggregate compliance costs should be developed for the major types of costs (i.e., capital, operational) as well as a schedule for when these costs are expected to be incurred. If appropriate, this data also should be totaled by geographic regions, as well.

Extensive use of published and unpublished technical sources, government experts, the regulated community, and academic and private sector sources is strongly recommended to help develop accurate estimates of compliance costs. If agency estimates of compliance costs substantially differ from estimates provided by regulated parties, such differences should be disclosed.

OTHER COSTS TO CONSIDER

Other costs to consider include: the ability of regulated parties to pay for the compliance costs associated with the proposed regulations; cash-flow and other financial problems that could be inflicted upon regulated entities as a result of the proposed regulations; marketplace effects, including limited entry and decreases in competitiveness; and effects the implementation of the regulation would have on employment, the price of goods and services, and consumer choices. Not all of these factors (e.g., ability to pay) would necessarily be included in an overall tabulation of costs and benefits, but these should be noted nonetheless.

Ability to Finance Compliance Costs

Once the magnitude of capital costs that will be imposed by the proposed regulation is determined, an analysis should be performed of the capabilities of regulated entities to either internally or externally finance these capital costs. Estimates of the number, percentage, and type of entities that are likely to have difficulties in financing the capital compliance costs should be identified. In preparing estimates of compliance costs, the

agency should indicate whether the adaptive capabilities of the regulated parties may lead to lower-than-expected costs.

Financial Hardship

The nature and severity of any financial difficulties beyond those estimated for the financing of capital costs also should be assessed. These difficulties can include such problems as restricted cash flows as a result of the proposed regulation, or adverse effects on profit margins. For businesses that operate on narrow profit margins, limited cash flow, or other restrictions (such as seasonally-sensitive finances), sweeping regulatory impositions may impose drastic financial hardships.

Competitiveness of Enterprises and Sectors

An assessment should be conducted to determine if proposed regulations will adversely affect the costs and quality currently experienced in the production and distribution of products, goods, and services by either private enterprises or government entities. Similarly, any adverse effects on markets, customers, or recipients of government services also must be determined. The nature and severity of such effects need to be stated clearly in the impact analysis. Particular attention should be given to assessing adverse competitive effects relative to comparable enterprises in other states. Finally, any adverse effects on the advancement of technological innovations should be estimated.

Barriers to Entry and Expansion

Effects of the proposed regulations on the ability of new enterprises to start-up or on existing ones to expand should be analyzed. Such barriers include, but are not limited to, additional licensing or educational requirements, new mandatory permits or regulatory procedures, and increased documentation or reporting requirements. The impact and costs of time delays caused by the proposed regulation should be discussed, as well.

Employment Effects

An assessment of adverse effects on jobs within the affected regulated entities should be performed. Adverse employment effects can result from, among other things: (1) production and operational changes required by the regulations; (2) any requirement that increases the cost of doing business in general or labor costs in particular; and, (3) the close-down of businesses as a result of the company=s inability to financially (or otherwise) comply with the proposed regulations.

Any potential job loss should be stated explicitly and prominently in an agency=s regulatory cost analysis.

Consumer Choice and Prices

An analysis of the effects that the regulations will have on consumer products, goods, or services available in New York should be completed. Additionally, any increases in the price to consumers in any good, product, or service as a result of the imposition of the proposed regulation should be presented.

INDIRECT ECONOMIC AND DISTRIBUTIONAL EFFECTS

Cost effects of regulations are not just restricted to the economic sector being regulated. Other industries, individuals, and markets often are affected indirectly by state regulatory action. Therefore:

1. Any negative effects on other economic sectors in New York as a result of implementation of the proposed regulations should be assessed. (Positive effects would be listed as benefits, not costs. See also discussion of opportunity costs and transfers that follows under general guidelines.) Agency analysts should be aware that some of the economic sectors that can be affected indirectly -- and sometimes seriously -- may include suppliers and customers of regulated entities, and people receiving or paying for government services.

2. If the proposed regulation may have sweeping economy-wide direct or indirect effects -- such as when a proposed regulation may affect the price of gasoline -- a quantitative analysis of some sort should be completed to reflect this economy-wide cost.

3. Any special population groups -- including businesses, households, and public sectors -- that would be affected by the proposed regulation also should be identified, with appropriate quantification of costs provided.
Indirect effects are often difficult to predict with precision. Any uncertainty should be acknowledged and noted. In some cases, only qualitative estimates may be possible.

GENERAL GUIDELINES

In summary, agencies should follow the set of guidelines below when undertaking this exercise in order to develop a thorough and accurate cost analysis:

1. Cost estimates should be stated in terms of incremental or marginal annual costs over the period covered by the proposed regulation, representing the changes in costs compared to the *status quo*. Future costs not directly attributable to the enactment of the proposed regulation, and related costs incurred by the affected party prior to the enactment of the regulation, should

be excluded from the analysis.

2. Any "opportunity costs," such as loss of time and benefits foregone, should be described and estimated where significant. Also, significant transfer costs or payments need to be described. These are gains or losses to some that are offset by gains or losses to others. They represent no net social benefit or cost.

3. Ranges of high and low costs imposed on regulated entities by the proposed regulation, in addition to the expected costs, should be presented if there is uncertainty, if information sources used in the development of cost estimates cite significant differences in cost estimates, or if there is substantial difference in how the regulation affects subgroups of the affected population.

4. Incremental costs that are known but which, in a agency=s determination, cannot be accurately or quantitatively calculated, should be explained. An example of such costs are those imposed by a regulation that may slow the rate of technological innovation.

5. Final cost estimates should be presented in constant dollars, and the base year should be as close to the calendar year of the analysis as possible. Documentation on the conversion of any current dollar information to constant dollars also should be provided.

6. Total costs incurred by state agencies due to the development, implementation, and enforcement of the proposed regulation also should be calculated and presented as an annual cost of the regulation. Estimates of fringe benefits and General State Charges should be included.

7. As required by SAPA, an analysis of the proposed regulation=s impact on small business should be presented.

8. Agencies should consider any effect that changing the deadline for mandatory compliance with the proposed regulation and altering the level of stringency of the regulation may have on costs incurred by affected parties. Other cost-lessening options include grandfathering, staged implementation, and payment of compensation.

9. Other regulatory flexibility factors also should be incorporated into the cost analysis, including the effects of using market-oriented solutions and performance standards as compared to design or operational standards.[11]

10. Assumptions made by agencies and research sources used by agencies should

be clearly cited and thoroughly documented. The existence of differing cost estimates that an agency chooses not to use in its analysis also should be noted.

III. BENEFITS OF PROPOSED REGULATIONS

Government economic and social regulations are designed with the intention of providing some sort of benefit. For example, some regulations try to ensure greater levels of public health or safety. Others are created to protect the land, water, and air from pollution and other undesired uses. Still other regulations exist to strengthen consumer rights. Whatever the case, it is important for agencies to clearly define and measure -- and for the public to accurately understand -- the benefits of proposed government regulations.

TYPES OF BENEFITS

Many of the benefits from government regulation generally can be grouped into one of the following major categories: (1) public health and safety; (2) occupational health and safety; or (3) environmental protection and natural resource management. Other often-seen benefit categories include: economic and operational efficiency, consumer protection and benefits, and personal rights.

BASIS AND QUANTIFICATION OF BENEFITS

When proposed regulatory actions affect public or occupational health, safety, or environmental protection, agencies should incorporate a formal risk assessment as part of their benefit analysis. Even in instances where the regulatory change is judged to be relatively small, and therefore an agency determines that a quantitative risk assessment is impractical, the agency must provide sufficient evidence that the proposed regulatory actions

will successfully address significant problems that cannot be adequately addressed otherwise.

Risk assessments should include data within the following general benefit categories, when appropriate:

- human health and safety (mortality, chronic morbidity, acute morbidity);
- other impacts on humans (recreational uses of ecological systems; amenities, including non-use values; visibility; noise; etc.);
- market-related economic productivity of ecological systems (for example, commercial agriculture, forestry, or fishing activities);
- ecological stability and biodiversity (such as wetlands guidelines; species protections; etc.);
- economic productivity (administrative flexibility; reductions in paperwork; etc.); and,
- protection of public and private capital infrastructure (land; equipment; structures; etc.).

Because of their complexity and traditionally controversial nature, methods to quantify health and environmental benefits are discussed in greater detail in the following chapter of this manual. However, all benefit analyses should contain certain key components, which are listed below.

KEY COMPONENTS OF BENEFIT ANALYSIS

1. As part of their regulatory analyses, agencies should describe and quantify the expected *incremental* benefits that would result from implementation of proposed regulations. If the regulations have distinguishable components, each element's expected benefits also should be separately tabulated. The benefit analysis also should include data on the incremental benefits that would likely occur for alternative regulatory strategies and other options that have been evaluated but not selected for adoption. These incremental benefits are both the quantifiable and non-quantifiable benefits in such areas as health,

safety, environmental protection, consumer protection, economic efficiency, and quality of life that are expected to result from the effects of the regulations as compared to the *status quo* or taking no action.

2. Agencies should document the scientific, technical, and physical basis cited for the incremental benefits that are expected to accrue to affected parties because of the enactment of the regulation.

3. A range of incremental benefits estimates that include high and low values should be presented, particularly if there are uncertainties, differences in technical sources consulted by the agency, or substantially different impacts of the proposed regulation on various subgroups of the affected population. Documentation of studies or analyses describing these differences should be summarized clearly and referenced thoroughly. Agencies= own assessments of these differences also should be included as part of this analysis.

4. Thorough documentation and analysis describing the recipients of any expected direct or indirect benefits should be provided in the benefits discussion. To the greatest extent possible, this data should include the number and type of entities expected to benefit from the regulation, categorized appropriately.

5. Uncertainties concerning the timing, probabilities, and range of benefits should be carefully identified and disclosed.

IV. MEASURING HEALTH AND ENVIRONMENTAL BENEFITS

Quantifying the public health, occupational health and the environmental benefits of proposed regulations is highly complex, involving a number of assumptions and estimations as well as analyses of data from highly technical studies. Because of this complexity and the uncertainties in predictive models, the analyses of benefits are controversial.

Typically, the purpose of proposed public health and environmental regulations is to reduce or eliminate risks, either to human health or to the quality of the environment. The first step in regulatory action in these areas, therefore, should be to assess qualitatively (1) whether a risk exists, and (2) if so, is the risk acceptable. If an unacceptable risk exists, state agencies should analyze how and by what amount the proposed regulations will reduce this risk. State agencies also have the obligation to indicate whether the risk is already being, or could be addressed, by private action, by existing statutes, or by existing federal or local regulations.

RISK ASSESSMENT

A risk assessment is a systematic approach to organizing and analyzing scientific knowledge and other information. It identifies possible adverse human health or environmental effects which may occur because of exposure to an agent (chemical, microbiological, physical hazard, etc.) or an activity (skiing, climbing a ladder, etc.). It also

estimates the likelihood of the effect occurring under specified conditions.[12]

Before regulatory action is taken, a state agency must establish, using a scientifically valid risk assessment, that by regulating a substance or activity an unacceptable health, safety or environmental risk can be reduced or eliminated. Unfounded intuition or anecdotal accounts do not provide sufficient analysis. A full risk assessment is not needed for every regulatory action. A simple screening-level risk assessment can identify minor risks. More stringent and detailed analyses will be expected for proposed regulations that impose significant costs on affected parties.

An agency=s risk assessment should reference and rely on scientifically valid, peer-reviewed data and methodologies. If other data or methodologies of similar reliability and quality exist, an agency may choose to use such sources in addition to peer-reviewed data, but should justify doing so.

Often, the credibility of a risk assessment that underlies an agency=s proposed regulation will be strengthened if it is subject to outside peer review by eminent experts in the relevant field. This is not always possible for every regulation, however, often because of cost and timeliness reasons, but such peer review should be pursued for any proposed regulation that would have a major impact on individuals, businesses, or the economy in general.[13]

To make sure that a clear link is established between the proposed regulation and the identified risk, agencies proposing regulations should ensure that the risk assessment provides:

1. an explanation of how the proposed regulations address the identified risk;

2. an estimate of any increased risks that might result from the proposed regulation; and

3. a review of the existing safeguards that are in place and an explanation of what gaps, if any, the proposed regulation will fill.

A risk assessment generally has four steps: hazard identification, dose-response assessment, exposure assessment, and risk characterization.

1. Hazard Identification**:** The determination of whether a particular substance (e.g. chemical, microbiological or physical hazard, etc.) or a particular activity (skiing, climbing a ladder, etc.) is or is not causally linked to particular health, safety, environmental or ecological effects.

The hazard identification portion of a risk assessment identifies the specific effects (e.g. disease, injury, death, etc.) that may be caused by exposure of people or the environment to a particular substance or activity. It identifies the conditions (e.g., route of exposure, amount of exposure, type of habitat, working conditions) under which the effects might occur.

Hazard identification is a qualitative description but should be as specific as possible, depending on factors such as the kind and quality of available data on humans, laboratory animals, or the environment, the availability of ancillary information (e.g., similarity to other chemicals, viruses or physical hazards) from other studies and the weight of the evidence from all of these data sources.

Hazard identification in the environmental area, for example, could include the following information: nature of effect, conditions under which it will occur, how long it could occur, who or what could be affected, how it could change the use of a resource and

whether it is reversible.

2. Dose-Response Assessment: The determination of the quantitative relationship between the exposure to a particular substance or activity and the incidence or severity of the effect.

In many instances, the severity of an effect or the number of people (or plants, animals, etc.) affected varies by dose. Many substances (for example, aspirin, salt, or water) are perfectly safe if used as directed in small or moderate doses, but lethal in high doses.

Events, in addition to substances, also can have a dose-response relationship. For example, earthquakes of moderate intensity present no problem, but can cause much damage and many deaths at higher intensities.

Providing information on how responses change as the amount of exposure to a substance or activity changes is crucial to determining the benefits of the proposed regulation.[14]

3. Exposure Assessment: Determination of the amount, duration and frequency of actual or hypothetical exposure of people, organisms, or the environment to a substance or an activity that can affect health, the environment, or the ecosystem.

Exposure assessment involves specifying the populations that are or may be exposed to a substance or activity, identifying the ways each of these populations may be exposed, and estimating the magnitude, duration and frequency of exposure. The populations that may be exposed and all of the factors may vary under different regulatory options. Specifying the population at risk may include: the number of people (or animals, etc.), their age, sex, and

racial distribution, socio-economic status and health status. The ways people can be exposed include skin contact, inhalation or ingestion of a substance, having a medical x-ray, climbing a ladder and many other activities. The environment can be exposed to greenhouse gases, vehicle emissions, etc.

For example, in assessing the exposure of a person to a chemical in air, quantitative information or estimates are needed on the amount (concentration) of the chemical in the air, the person=s inhalation rate, how long the exposure lasts, and how frequently it is repeated. The exposure assessment is sometimes based on hypotheses or estimates about possible activities. It is essential to provide an explanation of and rationale for all assumptions, uncertainties, and data bases used in the assessment, for existing conditions and under each proposed regulatory option.

In addition to human exposure, agencies may need to assess exposure for risk involving the following: surface water (quality, quantity, sediment, drainage patterns and flow, etc.); groundwater (quality, quantity, etc.); air (quality, acid rain, ozone depletion, etc.); plants, vegetation and crops (threatened, endangered, or rare species, individual species, distribution and diversity, productivity, etc.); fish and wildlife (threatened, endangered or rare species, individual organisms, population, etc.); habitat; lands and forests; and, ecosystem functions.

4. Risk Characterization: The description of the nature and often the magnitude of the health, safety, or environmental risk, including attendant uncertainties.

Risk characterization combines information from hazard identification, dose-response

assessment, and exposure assessment. It describes what is likely to happen to people and the environment.

Equally important as the prior three steps in risk assessment is the agency=s presentation to the public of the nature and magnitude of the risk that the agency seeks to mitigate. Presenting complicated data and scientific research is not easy. The challenge to the agency is to do so in a way that is more illuminating than demagogic.[15]

At a minimum, the risk characterization should contrast the level of the health, safety, or environmental risk that would occur given baseline conditions with the level of risk that would occur under alternative regulatory options. If the risks vary by population, geography, or other risk factors, these should be explained fully. The risk characterization also should place the risk the agency seeks to mitigate in the context of what is generally considered as unacceptable risk.

The risk characterization also should place the risk the agency seeks to mitigate in the context of other risks that the agency addresses. Information also should be provided on the everyday risks that the average person might confront (e.g., driving a car, being struck by lightning, dietary effects, etc.)[16]

It is especially important to include a description of uncertainties in the overall process when characterizing risk. As pointed out in the 1994 NRC report, *Science and Judgement in Risk Assessment:*

> The very heart of risk assessment is the responsibility to use whatever information is at hand or can be generated to produce a number, a range, a probability distribution -- whatever expresses best the present state of knowledge about the effects of some hazard in some specified setting. Simply to ignore the uncertainty in any process is almost sure to leave critical parts of the process incompletely examined, and hence to increase the probability of

generating a risk estimate that is incorrect, incomplete or misleading.[17]

The uncertainties in risk assessment derive from uncertainties in three of the four component steps: hazard identification, dose-response assessment, and exposure assessment. Uncertainties in hazard identification can arise from a lack of information about the hazards associated with a new chemical or activity, from inconsistent or conflicting results of toxicological or epidemiological studies, and from differences in the types of studies that are conducted. For example, if human data on exposure to a chemical are not available, it may be necessary to rely on animal experiments, or even on knowledge of the effects of similar chemicals. There are also specific uncertainties in establishing dose-response relationships for a chemical or activity. Scientists can disagree on the classification of histological changes or of tumors in animal cancer bioassays and on the appropriate mathematical model to extrapolate from effects on animals at high doses to effects on humans at low doses. These types of disagreements do not necessarily dictate that nothing be done, but such disagreements should be fully disclosed and discussed.

Exposure assessment, too, often requires use of assumption and mathematical models which introduce uncertainty in the estimate of human exposure to a chemical or other hazard. Examples are the number of people who will be exposed to a chemical, or how much of a non-food substance a toddler will put in her mouth.

In many cases, a useful way to represent the combined effect of all of these uncertainties on the characterization of risk is to express the various parameters in terms of ranges of probable values, rather than as definite numerical values.[18]

The 1994 NRC report on risk assessment concludes that the need to confront

uncertainty in risk assessment has changed little since the 1982 NRC report which concluded: AThe dominant analytic difficulty...is pervasive uncertainty...there is often great uncertainty in estimates of the types, probability, and magnitude of health effects associated with a chemical agent, of the economic effects of a proposed regulatory action, and of the extent of current and possible future human exposures.≅[19] Uncertainty doesn=t mean that risk assessments shouldn=t be prepared, only that we need to understand the limitations of certain data. This uncertainty also underscores the need for full disclosure of underlying assumptions and data.

RISK MANAGEMENT

Risk Management is the process of integrating the results of risk assessment with other information to make decisions about the need for, method of, and extent of risk reduction.

Risk assessment provides information about one of several factors that must be considered in deciding whether regulatory action is warranted. Policy considerations derived largely from statutory requirements dictate the extent to which risk information is used in decision-making and the extent to which other factors -- such as technical feasibility, cost, and offsetting benefits -- play a role. [20] In the risk management process, the agency weighs the risks, benefits, costs, technical feasibility, social acceptance and statutory requirements pertaining to the proposed action and decides the best option.

The two steps -- risk assessment and risk management -- should not be confused. *Just because a problem has been identified and documented should not necessarily lead to*

the conclusion that a proposed regulation is the correct solution. To make sure there is a clear link between the proposed regulation and the identified risk, agencies proposing regulations should provide the following:

! a discussion of alternative approaches to reducing the environmental or health risk, and an explanation of why the recommended regulation was chosen and why the agency views it as the best option available; and

! documentation that the regulation is appropriately tailored to respond to the identified risk and does not amount to either an insufficient step or overkill.

OTHER ENVIRONMENTAL AND HEALTH BENEFITS

Most major environmental and health laws are intended to address specific risks. Among these are, for example, these federal laws:

-- Clean Air Act;
-- Clean Water Act;
-- Resource Conservation and Recovery Act (RCRA);
-- Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA);
-- Safe Drinking Water Act;
-- Insecticide, Fungicide, and Rodenticide Act;
-- Toxic Substances Control Act;
-- Endangered Species Act;
-- Emergency Reporting and Community Right-to-Know Act; and
-- Occupational Safety and Health Act (OSHA).

However, in some cases, agencies may propose regulations in the health and environmental areas that do *not* have mitigation of risk as its primary purpose. For example,

a regulation could set aside land as a nature park or for recreational uses. In such a case, the regulation may be proposed even in the absence of any foreseeable risk of air pollution, water or soil contamination, threat to endangered species, harm to wildlife, or other environmental concerns. Benefits that could be pursued -- even in the absence of risk -- might include active or passive recreation such as fishing, wildlife observation, visual amenities, biodiversity, preservation of unique ecosystems, and ecological diversity.

In such cases, risk assessment may not be appropriate. Nonetheless, claimed benefits still should be articulated. There are numerous ways to capture these benefits quantitatively, although this often is a complex undertaking.

In the words of A. Myrick Freeman III, the author of the definitive textbook on quantifying environmental benefits:

> Some people may be distrustful of economists= efforts to extend economic measurements to such things as human health and safety, ecology, and aesthetics, and to reduce as many variables as possible to commensurate monetary measures. Some skepticism about the economist=s penchant for monetary measurement is no doubt healthy, but it should not be overdone. It is *not* correct to say that there are some things like human health and safety or the preservation of endangered species that cannot be valued in terms of dollars....The real world often creates situations where trade-offs between such things as deaths avoided and some other things of value cannot be avoided. The questions really are how the problem of making choices about such trade-offs is to be approached and what information can be gathered to help in the problem of choice.[21]

Direct and indirect methods for valuing environmental benefits include: competitive market price, simulated markets, travel cost, hedonic wage and property values, avoidance expenditures, referendum voting, bidding games, willingness-to-pay questions, contingent ranking, contingent activity, and contingent referendum.[22] (See Appendix A: AGlossary≅ for further explanation of these terms.)

For those benefits for which monetary value estimates cannot be provided, however,

qualitative estimates should be offered. In such cases, the balancing of costs and benefits necessarily becomes more subjective. Agencies proposing new regulations that will result in subjectively-measured benefits should take extra care to allow the general public, affected parties, and policymakers to review and comment on the agency's assumptions. In these instances, it is particularly important to note whether other interested parties arrive at the same conclusion as the agency, given the array of itemized costs and benefits, including those that could not be quantified.

V. COMPARING REGULATIONS= COSTS AND BENEFITS

The final steps in cost-benefit analysis are the following: (1) summarize and compare the aggregate costs in relationship to the overall benefits of the proposed regulations and the alternatives considered; (2) evaluate the overall impacts of the regulations; and (3) discuss issues that are outside the traditional bounds of criteria underlying cost-benefit analysis, but which have a bearing on the merits of the proposed regulations.

This final component of the analysis should be designed to provide policymakers and reviewers with concise quantitative and qualitative information to support decisionmaking regarding the overall merits, both pros and cons, of the proposed regulations and alternative actions.

SUMMARIZING AGGREGATE COSTS

Aggregate costs of proposed regulations should be presented as follows:

1. Total constant dollar costs estimated for implementing the proposed regulations and any alternatives should be shown on an annualized basis in chart or tabular formats. A summary of the major cost elements also should be presented in concise narrative. If cost ranges have been developed, they should be included along with important geographic dimensions of these costs.

2. Any costs elements that have not been quantified, but which are significant, should be clearly stated and discussed. Where costs cannot be precisely annualized, time frames of when such costs will be incurred should be indicated.

SUMMARIZING AGGREGATE BENEFITS

The benefits identified and estimated to be achieved should be presented as follows:

1. Quantified and totaled benefits should be presented in chart or tabular form on an annualized basis. Where developed, ranges of benefits should be shown. Significant geographic and demographic dimensions also should be included. Whatever supporting narrative is necessary should be as concise as possible.

2. Non-quantified benefits also should be listed by category, in a chart if possible, with geographic and demographic impacts included.

3. Benefit categories should be separately identified in terms of: (a) public health and safety; (b) occupational health and safety; (c) environmental and natural resource protection; and (d) any other appropriate categories.

DISCOUNTING

Future costs and future benefits should be discounted to their present values. The method used for such discounting should be explained thoroughly, and the same discounting method should be applied consistently to both costs and benefits.

EVALUATING THE OVERALL REGULATORY IMPACTS

The quantitative and qualitative aggregate statewide costs in relationship to overall benefits should be presented in appropriate chart and narrative form. The narrative should include a statement of findings regarding the *net* benefits of the regulations.

Agencies also should provide separate net benefit calculations for each major element of the regulation, or for the attainment of different benefit levels. The need for this kind of detail is obvious if one considers the real case retold by U.S. Supreme Court Justice Steven Breyer, an appointee of President Clinton, in his book entitled *Breaking the Vicious Circle: Toward Effective Risk Regulation*:

> The first [example] comes from a case in my own court, *United States v. Ottati & Goss,* arising out of a ten-year effort to force cleanup of a toxic waste dump in southern New Hampshire. The site was mostly cleaned up. All but one of the private parties had settled. The remaining private party litigated the costs of cleaning up the last little bit, a cost of about $9.3 million to remove a small amount of highly diluted PCBs and Avolatile organic compounds≅ (benzene and gasoline components) by incinerating the dirt. How much extra safety did this $9.3 million buy? The forty-thousand-page record of this ten-year effort indicated (and all the parties seemed to agree) that, without the extra expenditure, the waste dump was clean enough for children playing on the site to eat small amounts of dirt daily for 70 days each year without significant harm. Burning the soil would have made it clean enough for the children to eat small amounts daily for 245 days per year without significant harm. But there were no dirt-eating children likely to appear there, for future building seemed unlikely. The parties also agreed that at least half of the volatile organic chemicals would likely evaporate by the year 2000. To spend $9.3 million to protect non-existing dirt-eating children is what I mean by the problem of Athe last ten percent.≅[23]

From the Breyer example, it is easy to understand why an agency proposing new regulations should not simply calculate the net benefits of an overall regulation, but also should give some consideration to individual aspects of the regulation that impose incremental costs that exceed the incremental associated benefits (Breyer=s Alast 10 percent≅). The agency should use cost-benefit to help it answer the question: AWhere do we stop?≅ To this end, agencies should make separate cost-benefit calculations for discrete components of the proposed regulation as well as identifying the incremental costs and benefits of different levels of regulation. These steps will better enable the agency to identify the weaknesses in a proposed regulation from a cost-benefit perspective.

An agency also should compare and disclose the relative costs and benefits of each of the major regulatory options it considered.

COST EFFECTIVENESS AND COST-UTILITY ANALYSIS

Cost effectiveness analysis (CEA) and cost-utility analysis (CUA) are typically used in situations where it is either difficult, impractical, or inexpedient to Amonetize≅ the benefits of alternative programs or regulations. Examples include: improvements in the quality of life of individuals or a population, a better environment, or reduced probability of death. These benefits are referred to as Aeffectiveness measures.≅ With both CEA and CUA costs are measured in monetary terms. The approaches are often employed when comparing alternative programs or regulations for achieving a particular goal.

Cost effectiveness analysis employs a ratio analysis approach for ranking alternative programs or regulations. If C_i refers to the cost of the ith regulation and E_i refers to the effectiveness of the ith regulation, then there are two ratios that can be formed from a set of alternative regulations: $CE_i = C_i/E_i$ and $EC_i = E_i/C_i$. Using the CE_i ranking, regulations with the lowest ratio are the most effective. (The Aaverage cost per unit of effectiveness≅ is at a minimum.) Using the EC_i ranking, regulations with the highest ratio are the most effective. (The Aaverage effectiveness per unit of cost≅ is at a maximum.)

There may be additional constraints imposed on a decision maker when implementing a policy. For example, there may be an explicit effectiveness goal, E_i, that is desired. The problem may then become a simple cost minimization subject to the constraint that effectiveness meet or exceed the effectiveness goal. Alternatively, a cost constraint may be imposed externally, C_i , that dictates the maximum allowable cost for a policy. The problem is then one of maximizing the effectiveness measure subject to the cost of the program not exceeding C_i.

Cost utility analysis is employed if analysts are interested in two or more of these effectiveness measures. For example, the Department of Health might place value on both increasing life expectancy and quality of life. Different programs or regulations could have different expected impacts on these two effectiveness measures and require an evaluation of the Autility≅ of different combinations of these two effectiveness measures.

FULL DISCLOSURE OF DATA SOURCES, ASSUMPTIONS, & LIMITATIONS

Finally, to enable the public and policymakers to assess the quality of an agency's cost-benefit analysis and the conclusions the agency reached, the agency should "fully disclose important assumptions and major points of uncertainty."[24]

In attempting to fully disclose such assumptions and points of uncertainty, agencies should be mindful of several existing requirements of the State Administrative Procedure Act. In setting forth what must be included in the Regulatory Impact Statement for a proposed rule, the State Administrative Procedure Act provides: "Where one or more scientific or statistical studies, reports or analyses has served as the basis for the rule, the statement shall contain a citation to each such study, report or analysis and shall indicate how it was used to determine the necessity for or the benefits to be derived from the rule." As well, SAPA requires disclosure of "the information, including the source or sources of such information, and methodology upon which the cost analysis is based" and, where

complete estimates are not possible, "its best estimate, which shall indicate the information and methodology upon which such best estimate is based and the reason or reasons why a complete cost statement cannot be provided."[25]

Such full disclosure will add to the quality and thoroughness of public comment on

the proposed regulations, and will help provide the firmest foundation upon which policymakers can enact the most appropriate public policies.

Finally, agencies may want to subject their entire cost-benefit analysis to outside peer review, instead of just the risk assessment portion. This step would substantially increase the credibility and reliability of the agency=s presentation.

APPENDIX A: GLOSSARY

Administrative Costs

All agency personnel and non-personnel costs associated with implementing a regulation, including technical, legal, and management oversight and enforcement. These costs should include all involved agencies at the state and local levels, where applicable. Indirect costs should be included, but estimated separately from direct costs.

Affected Parties

All entities that are directly subject to the proposed regulation and who, therefore, are likely to incur compliance costs and all parties who will receive direct benefits (economic, social, environmental, etc.) as a result of the regulation being implemented.

Assumption

A statement accepted or supposed true without proof or demonstration. For example, if data are unavailable to complete a step in a cost-benefit or risk assessment, they may have to be estimated or assumed to complete the analysis. In some situations, formal policy guidelines may direct the use of preferred assumptions.

Average Direct Compliance Costs / Range of Direct Compliance Costs

The costs incurred by establishments as a direct result of complying with the regulation. Average direct compliance costs refers to the arithmetic mean of costs that firms incur due to a specific regulation. If necessary, the mean may be estimated and the fact that is was estimated should be stated clearly in the analysis. The range of costs reflects various levels of costs that different establishments may incur due to the regulation. Cost analyses should illustrate how the regulation will affect different regulated entities, and often regulations do not impose the same compliance burdens on all entities because of economic, technical or regulatory reasons. For example, production processes or work place conditions often differ among regulated entities, making it more expensive for some to comply and less expensive for others. Therefore, it is important to illustrate the distribution of compliance costs. High and low cost values should be presented when significant numbers of establishments have high compliance costs or low compliance costs. The differential between these figures is the cost range.

Benefit Analysis

The research and analysis used to estimate the added societal gains expected from a regulation. Benefit analysis generally requires the melding of scientific, technical, and economic research and analysis to develop quantifiable as well as non-quantifiable measures and descriptions for public health, occupational safety, environmental improvements, or other benefits. (Also, see AIncremental benefits≅).

Biodiversity

The variety of life on earth arising from the genetic diversity among individuals of a given species, the diversity of existing species, and the diversity of biological communities and ecosystems which include diverse aggregations of populations of individuals species.

Capital Costs

Expenditure on goods such as equipment, buildings, and other physical assets to meet regulatory compliance requirements.

Compliance Costs

All costs associated with a regulated entity following all the proposed elements of regulations. Compliance costs can include start-up and ongoing costs and fees for permits or licenses, installation of pollution abatement equipment, purchase of safety materials for employees, and the added cost of electricity from operating a pollution control device, for example.

Constant Dollars *(Real dollar value)*

Dollar values which remove the effect of inflation from statistical data reported for different years. To obtain constant dollar data a base year is selected and all other dollar data for years before and after that base year are adjusted by a price index or deflator. The consumer price index (CPI) is the most commonly used constant dollar deflator. There are other indexes that may be more appropriate to the subject matter, however, such as an index for construction costs of purchasing equipment. The U.S. Labor Department publishes the most widely used price indices for all goods categories.

Cost Analysis

The research and analysis used to estimate the coverage and compliance costs of a regulation for affected parties. This analysis should include estimates of the administrative costs to agencies with regulatory oversight. Cost analyses usually involve engineering data and analysis as well as economic and financial analysis.

Cost-Benefit (C/B) Analysis

A conceptual framework which is designed to compare a policy=s incremental and total costs to its incremental and total benefits. C/B analysis considers all gains (benefits) and losses (costs) regardless of to whom they accrue. Traditionally, C/B analysis has attempted to quantify and put monetary values on the costs and benefits to arrive at a net-benefit figure, which could be positive or negative. Good C/B analyses must be based upon sound science, technical research and analysis.

***Cost Effectiveness Analysis (CEA*)**

An approach for comparing alternative programs or regulations when the benefits are difficult or impossible to translate into dollar terms. The benefits are referred to as Aeffectiveness measures.≅ Costs are measured in monetary terms. CEA employs a ratio analysis approach, for ranking alternative programs or regulations.

Cost-Utility Analysis (CUA)

An approach for comparing alternative programs or regulations when the benefits are difficult or impossible to translate into dollar terms. CUA is employed if analysts are interested in two or more dimensions or measures of benefits, for example, increasing life expectancy and quality of life.

Discounting

A process by which benefits or costs realized in future periods are converted to their present value (also, see APresent value≅). Discounting adjusts for the time value of money (i.e., a dollar one possesses now is worth more than a dollar that one will receive in two years, since it could have been invested and earned interest in the intervening period). Discounting also incorporates assumptions about future inflation effects.

Distributional Effects

Distributional effects are the identification of how a regulation affects both the regulated parties and those who may receive some benefits of the regulation. For example, a regulation may unevenly distribute costs and benefits among individuals, groups or enterprises. When analyzing regulatory impacts, it is important to identify significant distributional effects that may occur due to the proposed regulation. These effects, however, should not be included in the calculations of a regulation=s net benefits.

Dose-Response Assessment

Determination of the quantitative relationship between exposure to a particular substance or activity and the incidence or severity of an effect. Dose-response assessment evaluates the conditions under which the effect might occur and considers factors that influence relationships, such as intensity and pattern of exposure and age and lifestyle variables that could affect susceptibility. Such assessments also can involve extrapolation of high-dose responses to low-dose responses and from animal responses to human responses. The development of this relationship may involve the use of mathematical models.

Environmental Benefits and Costs

There are a number of accepted empirical research methods and techniques for valuating environmental improvements or environmental damages. They can be classified into four categories: (1) direct observed; (2) indirect observed; (3) direct hypothetical; and, (4) indirect hypothetical. The following are brief explanations and

examples of these methodologies. Most but not all, are drawn upon the work of A. Myrick Freeman, III.

(1) Direct Observed

Competitive market price: The price paid for a product, good, or service by a consumer from a vendor that reflects the going market price. For example, the prices paid for commercial fish harvests, timbered and/or agriculture crops that would be subject to environmental regulations or natural resource management programs.

Simulated market: An artificially created market that helps determine what individuals are willing to pay for particular goods. An example would be auctioning of a limited supply of hunting permits.

(2) Indirect Observed

Travel cost: A technique that has been widely used for many years to estimate the value that people attach to outdoor recreation visits to sites and areas for hunting, fishing, boating, hiking, picnics, etc. The generally accepted methodology is to use the out-of-pocket money cost and time cost of a visit as an implicit price of the visit. An appropriate economic model can be used to analyze how visitation rights vary across groups facing different implicit prices and to calculate individuals= consumer surplus or willingness to pay over and above the actual cost of visits.

Hedonic pricing models: The method entails collecting large amounts of sample data and using statistical techniques (such as a regression analysis) to measure how one variable affects another variable. For example, a hedonic pricing model could help determine how changes in air quality effect property values. This method can also be used to estimate how workers value occupational and safety health risks by the premium wage rates they seek compared with Asafer≅ jobs.

Averting behavior/Avoidance expenditures: Averting behavior is the action taken by an individual to avoid an unpleasantry. A value can be placed on this behavior by estimating the extra cost or time incurred due to this action. This can be done by collecting information on how much people are willing to spend to avoid environmental health problems or adverse situations. An example would be researching how many people suffering from asthma buy air conditioners or purifiers to reduce their exposure to air pollution.

Referendum voting: The technique of offering a fixed price for a fixed amount of an environmental good or amenity and seeing whether the response is a Ayes≅ or Ano≅ to the offer. This technique has limited applications.

(3) Direct Hypothetical

Hypothetical Referendum Study: A direct valuation technique where people are asked if they are willing to pay for an environmental, recreational, or cultural improvement at a specific quoted price. This term is also referred to as Abidding games.≅

Willingness to pay: An alternative form of the bidding approach, where people are asked an open ended question about the value they would place on an environmental benefit.

(4) Indirect Hypothetical

Contingent Valuation methods: Three variations of this technique include: (1) contingent ranking, (2) contingent activity, (3) contingent referendum. With contingent ranking, people are asked to rank environmental conditions in order of preference. Contingent activity asks people how they would change the level of a particular activity in response to changes in environmental conditions. A contingent referendum asks people to respond with a yes or no to whether they would be willing to pay a specific price for a certain improvement in the environment.

(5) Transferring Benefit Estimates:

A less complicated approach to valuing environmental benefits or costs, this technique uses information from existing studies. There is, for example, an extensive amount of literature on monetary values associated with outdoor recreational activities based on travel cost models. More recently, contingent valuation and hedonic pricing studies have provided monetary values associated with protection of public health and the environment. For a thorough discussion of this method see, *Project and Policy Appraisal Integrating Economics and Environment*, (Organization for Economic Cooperation and Coordination, 1994), ATransferring Benefit Estimates≅, Chapter 10.

Exposure

Contact with a substance by swallowing, breathing, direct contact (such as through the skin, eyes or mucous membranes) or intravenous injection. Exposure may be either short term (acute) or long term (chronic).

Exposure Assessment

Exposure assessment is the determination of the amount, duration, and frequency of an actual or hypothetical exposure of people, organisms, or the environment to a substance or an activity that can affect health, the environment, or the ecosystem. Exposure assessments specify the population that might be exposed, identifies the routes through which exposure can occur, and estimates the magnitude, duration, and timing of the doses that people might receive as a result of their exposure.

Exposure Pathway

The process by which an individual is exposed to contaminants or disease organisms that originate from a specified source. An exposure pathway consists of the following five elements: source of contamination, environmental media and transport mechanisms, point of exposure, route of exposure, and receptor opulation.

Externalities

When one entity=s actions impose uncompensated benefits or costs on another without a voluntary market trade, the effects are known as externalities. An example of an externality would be a chemical plant that discharges effluents into a stream which adversely effects recreational fishing. This would result in a negative externality suffered by the fisherman. Also an example of a positive externality would be a bee-keeper who benefits neighboring farmers by incidentally supplying pollination services for their crops. Environmental externalities largely occur because of a lack of property rights for many public goods, such as clean air and clean water.

Hazard Identification

The determination of whether a particular substance (e.g. chemical, microbiological, or physical element) or particular activity (skiing, climbing a ladder, etc.) is or is not causally linked to particular health, safety, environmental or ecological effects. Hazard identification is a qualitative description based on factors such as kind and quality of data on humans or laboratory animals, the availability of information from other studies (e.g., similarity to other chemicals, viruses or physical hazards) and the weight of the evidence from all of these data sources.

Incremental Benefits

The added gains or improvements expected from a regulatory policy (see ABenefits Analysis≅).

Incremental Costs

The extra or additional costs imposed as a result of a regulatory policy. The term incremental is interchangeable with "marginal." If compliance requirements have

different levels or degrees of achieving certain targets, then incremental costs can be associated with each level of compliance from the current state.

Indirect Benefits

Secondary gains or improvements from a regulation that are not directly intended as benefits. For example, if an air pollution regulation concerned with motor vehicles results in not only reduced pollutant emissions, but energy savings on gasoline consumption as well, the latter would be an indirect benefit. Conversely, added gasoline consumption resulting from a regulation should be treated as an indirect cost. Indirect benefits need to be substantiated and explained, since some indirect benefits often may be included in the direct benefit estimates.

Indirect Costs

Costs that cannot be easily segregated or linked to compliance costs. For example, some proportion of a firm=s administrative expenses are related to compliance costs. It is difficult, however, to determine what proportion of these costs are a result of complying with a specific regulation. Direct compliance costs should be estimated to the full extent possible.

Marginal Annual Costs

The extra or additional regulatory compliance costs for a regulated entity, translated into a yearly cost or charge.

Market-Based Incentives

Reliance upon pricing mechanisms such as user charges, fees, subsidies, and other innovative means that rely on market prices and costs to affect the behavior of regulated or non-regulated entities. A well-known example is the public trading of sulfur dioxide credits allowed under the 1990 Federal Clean Air Act. Often contrasted with traditional Acommand and control≅ regulations.

Monetary Valuation Estimates

The dollar values estimated through various research and analytical methods for public or occupational health benefits or environmental improvements associated with regulations in these areas.

Monte Carlo Analysis

A statistical technique which uses random numbers to determine whether a set of data values is random. A Monte Carlo analysis simulates situations where elements of risk are affected by variations in the value of a variable to determine which of these variations have the greatest influence on the various elements of risk. This technique also can be used for comparing alternatives involving elements of risk or alternative economic decisions.

Morbidity Rate

The number of illnesses or cases of disease in a population in relation to the total population.

Net Benefit/Cost Calculations

The difference between the quantified costs and benefits of a proposed regulation.

Non-Pecuniary Costs or Benefits

Costs or benefits that are not measured in monetary or dollar terms. An example of a non-pecuniary cost would be a decrease in the Afairness≅ of the tax code. Pecuniary Costs or Benefits are measured or easily measurable in monetary or dollar terms.

Non-Quantifiable Benefits

Gains or improvements expected from a regulation for which numerical values cannot be assigned. Because of the nature of certain benefits or the lack of an adequate base of information, occasionally descriptions of expected benefits rather than quantification should be presented.

Ongoing Operational Costs

Labor, materials, energy, services, or other annual operating expenses that are associated with meeting regulatory compliance requirements. Direct or indirect costs, if applicable, should be included in operational costs. One-time start-up costs should be excluded from ongoing annual operational cost estimates. Capital investments, including annual amortization costs, should be excluded from operational costs.

Operating Expenses

See AOngoing operational costs.≅

Opportunity Cost

The opportunity cost of an action is the value of the foregone alternative action. Where resources available to meet wants are limited, opportunity costs are always present.

Outcome

A term used in risk assessment that refers to an effect or consequence such as disease, illness, injury, birth defect, organ damage, death, etc.

Pecuniary Costs or Benefits

Costs or benefits that are measured or easily measurable in monetary or dollar terms. Non-Pecuniary Costs or Benefits are not measured in monetary or dollar terms. An example of a non-pecuniary cost would be a decrease in the Afairness≅ of the tax code.

Peer Review

A process whereby scientific and technical research and analysis is subject to outside review and comments by individuals or a panel qualified to review and comment upon the material. Many scientific and technical journals conduct peer reviews before studies are published. Governmental agencies involved in scientific and technical missions and programs also often use peer reviews to guide research agendas, evaluate research proposals and studies, and evaluate proposed health-based environment standards.

Performance Standards

The requirement for certain results or outcomes. Usually used to describe results-based regulations, performance standards shy away from prescribing practices or specifications, and do not stipulate the type of technology or other requirements to be used when complying with the regulations.

Present Value

The discounted worth of a future stream of costs or benefits (see ADiscounting≅).

Public Good

A commodity or service which if supplied to one person can be made available to others at no extra cost. A public good is thus said to exhibit Anon-rival consumption≅; one person=s consumption of the good does not reduce its availability to anyone else. It may be contrasted with a private good where one person=s consumption precludes the consumption of the same unit by another person.

Qualitative Estimates

See ANon-quantifiable benefits.≅

Range of Direct Compliance Costs

See AAverage direct compliance costs.≅

Real Dollar Value

See AConstant dollars.≅

Regulatory Impact Statement (RIS)

Required by SAPA ∋202-a, the regulatory impact statement (RIS) is an analysis wherein an agency explains its developmental process for the rule, as well as the impact of the rule on affected parties. Among the topics required to be addressed are the following: the statutory authority for the rule, the necessity for and benefits of the rule, the costs of the rule to regulated persons and governmental entities, legal requirements duplicated by the rule, alternatives to the rule, and whether the rule exceeds federal standards and, if so, why the rule exceeds such standards.

Risk

The possibility of an adverse outcome and the likelihood and probablility of its occurrence.

Risk Assessment

A systematic approach to organizing and analyzing data, scientific knowledge, and other information to identify possible adverse human health or environmental effects which may occur because of exposure to an agent (chemical, microbiological, or physical substance) or an activity (skiing, climbing a ladder, etc.). It also estimates the likelihood of the effect occurring under specified conditions. A risk assessment generally has four steps: hazard identification, dose-response assessment, exposure assessment, and risk characterization.

Risk Characterization

The description of the nature and the magnitude of the health, safety, or environmental risk, including attendant uncertainties. Often, comparisons will be made to everyday risk occurrences (death from a car accident, being struck by lightening, etc.) to help characterize the risk and make it more understandable to the general public.

Risk Factor

Anything that increases the likelihood of disease, injury, illness, death, etc.

Risk Management

The process of integrating the results of a risk assessment (see above) with other information to make decisions about the need for, method of, and extent of risk reduction. Policy considerations and statutory requirements can dictate the extent to which risk information is used in decision-making and the extent to which other factors -- such as technical feasibility, cost, and offsetting benefits -- play a role.

Small Business

The State Administrative Procedure Act (SAPA) defines a small business as a firm or enterprise that is independently owned and operated and that has under 100 employees.

Standard Industrial Classification (SIC)

A numerical classification of all industries, including businesses, government establishments and non-profit organizations, according to their principal products or services at a specific location. The SIC classification can range from one to four digits, with a larger number of digits indicating a more specialized classification. For example, all manufacturing is at the one-digit level, while all establishments that are in the printing and publishing business are classified as SIC 27. All commercial printing establishments are classified as SIC 275 and commercial offset printing is SIC 2752. Economic statistics on various sectors of the economy produced by the U.S.

government, New York State agencies, and other sources all use the SIC system. The State Department of Economic Development and State
Library have the latest SIC Manual which describes all classification categories.

Start-up Compliance Costs

Initial costs of regulated parties associated with responding to a revised or new regulation. This may include hiring a consulting, or law firm, to help a regulated entity obtain a permit to show they comply with a regulation. It could also include
the time value of a firm=s management or technical staff involvement with the consultants. Start-up costs are not recurring and should be distinguished from continuing operational costs or investments required for capital equipment.

State Administrative Procedure Act (SAPA)

The statute which establishes uniform procedures that State agencies must follow in order to adopt rules. These requirements include publication and public participation requirements, as well as the preparation of a regulatory impact statement. SAPA also establishes procedures for the administration of adjudicatory proceedings by State agencies, including notification and record-keeping requirements. The requirements for an analysis of a rule=s costs, benefits, and overall affects on regulated parties by proposed rules is based in SAPA.

Transaction Costs

The real resources, including time, that go into complying with a specific regulation. A common example is the time it takes for a company to fill out all the paperwork associated with a regulation. Lost productivity as a result of waiting for government approval of a permit application is also a transaction cost to the regulated party.

APPENDIX B: DATA SOURCES FOR COST-BENEFIT ANALYSIS

When possible, cost-benefit analyses should use official data, estimates, and projections. When official data are not used, analyses should explain why official data were not representative of the regulatory target group and why the data chosen to be used provide a better measurement. Listed below are several helpful sources of data that can be used in the development of cost-benefit analyses. These sources -- plus those studies cited in an accompanying bibliography -- provide a fairly comprehensive research foundation for agency regulators.

Where to Start

Always begin by reviewing general information sources before assuming that the answers to questions will require significant amounts of research. A good general source of information is the *Statistical Abstract of the United States* and the *City and County Data Book* which are published by the U.S. Bureau of the Census and available in any library reference section. An excellent reference source of business and industry data is *Business Information Sources*, by Lorna M. Daniells, which describes available sources of business information in great detail. Finally, the *New York State Statistical Yearbook*, published by the Rockefeller Institute, contains a variety of state and sub-state data ranging from general information to government programs and operations.

Another good starting point is the New York State Data Center, located in the Department of Economic Development, which can provide official state estimates of demographic forecasts and projections. The New York State Data Center also can help you obtain information from the sources mentioned in this supplement. The Center=s phone number is (518) 474-1141.

Also, the state Department of Labor's ES-202 file can be used for official employment and establishment data (see description below). Estimates provided by the Bureau of Economic Analysis, located within the U.S. Commerce Department, and the Bureau of Labor Statistics, located within the U.S. Department of Labor, can be used to forecast industry employment levels and other economic activity. The Bureau of Economic Analysis= phone number is (202) 606-9900. The Bureau of Labor Statistics= phone number is (202) 606-7828.

New York State Data

ES-202:

This state data base contains information on all establishments which pay unemployment insurance for at least one employee. It does not include information on self-employed workers, firms with uncovered workers, or work in some nonprofit organizations. This database contains information on the number of establishments, total employment, total payroll, and average wages per employee

by 4-digit SIC code. Information is obtained on a quarterly basis and one-third of all SIC codes are verified and updated annually. Businesses with more than one facility are classified as multi-unit establishments. The database reports data by establishment and not by firm, however, making firm-level analysis difficult. The ES 202 database does not distinguish between full-time and part-time employees.

The ES-202 file does contain individual establishment-level data; however, this data is subject to confidentiality restrictions. State-level "aggregated" data, by SIC code, is not subject to such restrictions. The New York State Department of Labor (DOL) aggregates data at the State or county level. If more specific information is needed, special requests may be made to DOL. Because this database only covers establishments which pay unemployment insurance, small "mom and pop" businesses without employees will not be represented. [Information on the ES-202 file can be obtained by calling the Department of Labor=s Division of Research and Statistics. This Division=s phone number is (518) 457-6369.]

Local Government Data Bank:

This is a large data set maintained by the State Comptroller=s Office, the Department of Audit and Control, Bureau of Municipal Research and Statistics. It contains information on revenues, expenditures, and indebtedness of all types of local government units by local fiscal year. Summary data also are available from the *Comptroller's Special Report on Municipal* Affairs, published annually. [The Bureau has past and present copies of these reports on file. It is located on the 10th Floor of the Alfred E. Smith Office Building in Albany. For assistance, call (518) 474-3687.]

Agency-Specific Data:

A number of state and federal agencies collect information on firms which fall under their regulatory purview. For example, the New York State Department of State, which manages many state licensing programs, has lists of firms and practitioners that have licenses to operate in the state, such as real estate firms, private investigators, barbers and cosmetologists. Individual agencies should be contacted for such firm-specific data.

State and Federal Tax Data:

IRS and state tax data is subject to confidentiality restrictions. However, some aggregated data sometimes is available. Both the New York State Department of Tax and Finance and the Internal Revenue Service have aggregated data on corporate tax returns by SIC-code. This includes information on sales tax that can be used to roughly estimate average revenue. It is important to know that, in some industry categories, tax information is not comprehensive because some industries pay the majority of tax under one section of the tax law while others pay under different sections of the tax law. Also, information is collected by individual payee, and it is not always possible to determine what an industry has paid on purchases as opposed to sales.

Federal Data

[*For assistance locating or using any of the listed federal data source=s call the New York State*

Library and ask to speak with the Census Specialist. The phone number is (518) 474-5355. The Library is a Federal Depository and has access to all Federal documents and reports. Besides these sources, individuals seeking information concerning risk assessment should consult the APublic Health Assessment Guidance Manual.≅ This manual, produced by the U.S. Agency for Toxic Substances and Disease Registry, lists data sources that will help individuals who are studying risks to public health.]

Census of Population:

This database provides detailed characteristics for the population and housing units in states, counties, cities, and towns, giving data by age, sex, race, education, occupation, etc. Occasionally, the Bureau of Census also publishes separate special reports on particular population issues.

Census of Manufacturers:

This database covers all manufacturing establishments, by state. While information is generally available at the SIC code level, SIC codes with few establishments are generally subject to confidentiality restrictions, more so than the state=s ES-202 file. The Census of Manufacturers, particularly the AIndustry Series,≅ provides more information about the size and structure of the industry in general, sometimes at the state level, than the ES-202. The Industry Series can also provide information on value of shipments, production costs, and other industry information not available on the ES-202 file.

Annual Survey of Manufacturers:

The Bureau of the Census publishes these data in the years between each manufacturing census, based on a sample survey. It is, however, less detailed than the Census of Manufacturers.

Current Industrial Reports:

The Census Bureau publishes this continuing series of over 100 monthly, quarterly, and annual reports, containing detailed statistics on about 5,000 manufactured products that account for 40 percent of all U.S. manufactured output. Production, shipments, and inventories for specific products or industries is provided to the 7-digit SIC number. There are no similar data available, however, at the state level.

Pollution Abatement and Control Expenditures:

This data is published by the U.S. Department of Commerce, Bureau of the Census. It gives details on pollution control capital and operating expenditures for manufacturing industries at the national and state level.

Census of Retail Trade:

This database provides information by state, SMSA, and non-metropolitan areas for over 100 different types of retail enterprises. It includes data on employment, wages, and receipts.

Census of Service Industries:

This database covers many business and consumer service industries such as engineering firms, hotels, recreation services, and health services. Statistics are presented by geographic area and by industry.

Census of Agriculture:

This database provides detailed statistics on farms, farming, ranching, and related agricultural activities at the national, state, and county level. The data are collected only every 5 years, however, and it takes a number of years for the data collected to become available. Therefore, the data tend to be somewhat dated by the time they become available.

Other Federal Data Sources:

The U.S. Bureau of Census also conducts many other surveys of specific industry sectors. These include: transportation, construction, wholesale trade, financial insurance, real estate, minerals, and oil and gas mining, for example. All of theses censuses, as well as those discussed above, are conducted every five years. The most recent surveys were conducted in 1992. Detailed information on these reports and other data from the Census Bureau can be found in the *Census Catalog & Guide*, which is published annually.

Other Data

[*For assistance obtaining information from the following databases call the New York Data Center at (518) 474-1141. The Center is able to provide information from many of these sources to state agencies free of charge. The Center may charge a fee for certain data it receives from these sources, however. The Center also has access to additional construction activity and firm level information that may not be included in the noted databases.*]

Dun & Bradstreet:

This database tends to deal with firm-level data and should not be used at the SIC aggregated level. D&B defines "firm" and "establishment" in ways different from the Department of Labor and the Census Bureau, making it difficult to compare and link information from these data bases. D&B tends to focus more on the financial data of a firm, with a focus on long-term financial viability.

FW Dodge:

This database provides construction industry statistics. These data represent actual construction activity better than other databases which rely on permits granted, such as the U.S. Census Bureau=s data. Since this database represents only construction based on contracts, however, it misses smaller construction data captured by permit-based reports.

Industry Association Data:

Industry associations often collect data concerning their members. This information

can be very useful, but should be used with caution due to the fact that industry associations generally represent only the larger firms in an industry. Industry information on costs from these sources should be cross-checked with other sources. *National Trade and Professional Associations of the United States* may be helpful in identifying pertinent trade associations to contact for information. [This reference book is located in the New York State Library. For assistance, call the reference desk at (518) 474-5355.]

APPENDIX C: EXAMPLE SUMMARIES OF COST-BENEFIT ANALYSIS STUDIES

The following cost-benefit analyses were done for regulations or proposals concerned with public health, environmental protection or occupational health.

U.S. Environmental Protection Agency, *Costs and Benefits of Reducing Lead in Gasoline, Final Regulatory Impact Analysis* (Washington, D.C.: 1985).

This study is an analysis of EPA=s proposed rule to reduce lead in gasoline. Lead, which has been historically added to gasoline to boost octane has been proven to adversely affect children=s health and learning capability and also cause problems with blood in adults. EPA concluded that the primary costs would result from phasing out lead in gasoline at refineries. EPA estimated that these costs would be $3.6 billion between 1985 and 1992. The anticipated health benefits and better fuel economy were estimated to be $50 billion over this same period. The benefit estimates combined an extensive review of medical studies and statistical analyses of the health effects of lead and medical treatments associated with those effects. It also placed values on lost wages and increased special education needs for children. Finally, the study provides a detailed discussion of the costs and benefits of alternatives to the proposed regulation.

U.S. Environmental Protection Agency, *Regulatory Impact Analysis of Proposed Effluent Limitations Guidelines and Standards for the Metal Products and Machinery Industry (Phase 1)* (Washington, D.C.: 1995).

This study is an analysis of the proposed rule to apply standards for the discharge of waste-water effluents from plants in seven industrial sectors. In the study, EPA estimated that approximately 10,600 facilities nationwide would be subject to this regulation. EPA estimated that their total annual cost to comply with this regulation would be $200 million. Benefits identified by EPA included improved quality of freshwater, estuarine and marine ecosystems, reduced risk to human health resulting from contaminated fish, and reduced costs for sewage sludge use and disposal. EPA estimated that the annual benefits of this regulation that could be quantified ranged between $86 to $209 million. It also provided a discussion of those benefits it concluded could not be quantified. EPA quantified the reduction in cancer mortality from reduced exposure and placed a value on Astatistical lives≅ saved by using a summary of the literature on Awillingness to pay≅ (see glossary) to avoid cancer risks.

Occupational Safety and Health Administration, *Protecting Workers in Confined Spaces—Summary of the Final Regulatory Impact Analysis* (Washington, D.C.: 1993).

This study analyzes the costs and benefits of promulgating regulations to reduce the amount of injuries that result from employees working in confined spaces. OSHA estimated that 240,000 establishments employing over 12 million individuals would be affected by such regulations. It estimated that the annual compliance costs would be $202 million and that requirements for atmospheric testing alone would cost the regulated industries $47 million

annually. OSHA stated that the benefits to the regulation would include reduced fatalities, and fewer lost workdays. Although OSHA did not provide monetary figures for these benefits, it concluded that the regulation would annually reduce fatalities by 54 and lost work-days by 5,041. The benefits were based upon the assumption that 85% of the existing baseline conditions would be avoided. No formal risk reduction models were used.

Occupational Safety and Health Administration, *Controlling Worker Exposure to the Chemical MDA—Regulatory Impact Analysis and Regulatory Flexibility Analysis* (Washington, D.C.: 1992)

This study analyzes the costs and benefits of reducing workers exposure to MDA, a chemical used in various manufacturing and construction related activities. The majority of the regulated industry=s compliance costs would result from providing safety provisions, such as on-site showers and protective clothing. The manufacturing industry=s costs were estimated to be $10 million annually and the construction industry=s costs were estimated to be $355,000 annually. OSHA used a model for a quantitative assessment of cancer death risks. Based on the model, EPA calculated a range of 2.3 to 23 cancer deaths per year averted. For the construction industry, well under 1 death per year would be averted. Other health effects such as liver disease and dermatitis could not be quantitatively modeled.

WMA Inc., *Regulatory Impact Analysis -- National Primary Drinking Water Regulations — Sulfate* (prepared for the U.S. Environmental Protection Agency) (Alexandria, VA: August 31, 1994.)

This analysis estimates the costs and benefits of regulating sulfates in drinking water. EPA presented four alternatives that could be adopted by public and private water supply systems. It estimated that the compliance costs could range from a high of $147 million annually, to a low of $15 million annually, depending on the chosen alternative. The primary benefit of this regulation would be a reduction in cases of diarrhea suffered by infants and adults who drink water with high levels of sulfate. EPA placed a monetary value of between $3,608 and $3,828 per averted case of hospitalization resulting from infant diarrhea. The out-patient costs for either infants or adults were estimated to be between $218 and $273 dollars per case averted. These figures were based on costs for typical cases, but EPA did not develop quantitative assessments of the overall risks of diarrhea that would be prevented by regulation.

APPENDIX D: SELECTED BIBLIOGRAPHY

To aid the user of this guidebook, this bibliography groups together sources that further explain the concepts discussed in this manual. While there are numerous additional sources and materials that exist on the subject of cost-benefit analysis, those listed here should be useful to state agency personnel conducting cost-benefit analyses and risk assessments. For assistance locating source copies, contact the New York State Library at 518-474-5355.

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