
Water



A Methodological Approach to an Economic Analysis of the Beneficial Outcomes of Water Quality Improvements from Sewage Treatment Plant Upgrading and Combined Sewer Overflow Controls

Environmental Benefits
Analysis Series

A Methodological Approach to an Economic Analysis of the
Beneficial Outcomes of Water Quality Improvements from
Sewage Treatment Plant Upgrading and Combined Sewer
Overflow Controls

Summary

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Summary of Findings and Recommendations

The purpose of this report is to demonstrate the feasibility and usefulness of an economic analysis of the beneficial outcomes of water quality improvements from implementing controls on multiple sources of pollution. This case study on Boston Harbor serves to (1) demonstrate the application of a variety of economic benefit estimation techniques and (2) to assess the reliability and limitations of each. It is intended as an example of how to perform benefit analysis. The pollution abatement considered in this report results from upgrading two sewage treatment plants (STPs) on Deer and Nut Islands and controlling combined sewer overflows (CSOs) in Dorchester Bay, the Neponset and Charles Rivers, Quincy Bay and the Inner Harbor.

I. Findings

A. Monetizable Benefits

1. Swimming benefits and all kinds of recreational benefits are the largest source of monetizable benefits. In the commercial fishing category, we could only estimate shellfishing benefits. Nonetheless, the recreational categories appear to be especially important for urbanized areas such as Boston Harbor, where local population density and demand for scarce nearby recreation rates are high.
2. Recreational fishing and boating benefits are substantial but are limited by the present and future availability of marinas and facilities, a constraint on increased participation not related to pollution control.
3. Intrinsic benefits include aesthetic benefits and benefits such as existence and option value, which are not necessarily related to direct use of the water resource. While difficult to accurately measure, these benefits can be substantial.
4. The geographic location of the pollution sources, in relation to the recreation sites, is an important factor in determining the type and level of benefits that would be generated by controlling the different point sources of pollution. Swimming and shellfishing benefits are the most sensitive to the geographic location of the pollution loadings.

B. Non-monetizable benefits

1. Commercial fishing benefits include shellfishing only. Although up to 2.6 million pounds of lobster and 28.4 million pounds of fish are landed annually in the port of Boston, benefits related to this activity were not calculated on account of the difficulty in assessing how these migratory species would be affected by the improved water quality.
2. Health benefits include only the reduction in risks of swimming in water contaminated with fecal coliforms and the consumption of shellfish similarly contaminated. The risks from the consumption of fish and lobster that have bioaccumulated toxics in their tissues could not be estimated given the lack of adequate data.
3. A potentially large category of benefits not captured in this economic analysis is ecological benefits (benefits related to preservation and restoration of the harbor and bay habitats). Since the volume of loadings from the STPs is over 30 times greater than that for the CSOs, the omission of the benefits that could result from the restoration of these highly productive habitats, is a serious limitation in the economic evaluation of controlling the two STPs' loadings.

C. CSO Benefits and Costs

1. This economic analysis clearly indicates that in addition to the legally required secondary treatment for the two STPs {or a federally approved ocean outfall in lieu of secondary treatment), the CSO problem must be addressed if full use restoration and health benefits are to be realized in Boston Harbor.
2. The CSO Planning Areas have the following benefits and costs:
 - a. The estimated annual use restoration and health benefits for Dorchester Bay, Neponset River, Constitution Beach (\$7.2 - \$11.1 million) clearly exceed the annualized costs (6.1 million).
 - b. The estimated annual use restoration and health benefits for controlling Quincy's storm sewers' effluent (\$5.4 - 9.2 million) most likely exceeds the annualized costs (\$.2 -\$6.0 million).
 - c. The estimated annual use restoration and intrinsic benefits for the Charles River Basin are

significant (\$3.2 - \$7.2 million) but are less than the annualized costs (\$10.4 million).

- d. The Inner Harbor CSO plan (without Constitution Beach) provides the least benefits (aesthetic and commercial use benefits from reduced odor and elimination of floatables, which were not monetizable) and the highest annualized costs (\$16.6 million). Furthermore, there exists uncertainty regarding the impacts, if any, that these discharges have on the other planning areas' uses.

D. STPs

The economic assessment of bringing the Deer and Nut Island STPs into compliance with the CWA (either upgrading to full secondary treatment or upgrading with an ocean outfall in lieu of secondary treatment) is limited due to an inability to quantify and monetize potentially significant beneficial impacts (ecological, health, and commercial fishing benefits) that could result from the implementation of such controls.

II. Recommendations

1. In addition to the legally required secondary treatment for the two STPs (or a federally approved ocean outfall in lieu of full secondary treatment), the CSO problem must be addressed if full use restoration and health benefits are to be realized in Boston Harbor.
2. In determining the funding priorities for CSO projects, decision-makers should include the consideration of net benefits as one criteria in evaluating and ranking project proposals. Since CSO controls provide heterogeneous beneficial impacts (swimming, boating, recreational, and commercial fishing, and health), net benefits analysis provides a useful tool for evaluating projects with different costs and different bundles of beneficial impacts. Such information would assist decision-makers in allocating scarce funds to those projects that would maximize use restoration and health benefits.

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Overflow Controls

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Office of Policy Analysis
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by

Meta Systems Inc
10 Holworthy Street
Cambridge, Massachusetts 02138

Preface

This report is submitted by Meta Systems Inc in fulfillment of EPA contract #68-01-6596 700-E. This report estimates the benefits and costs of upgrading two sewage treatment plants and of constructing combined sewer overflow controls in the Boston Harbor area.

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