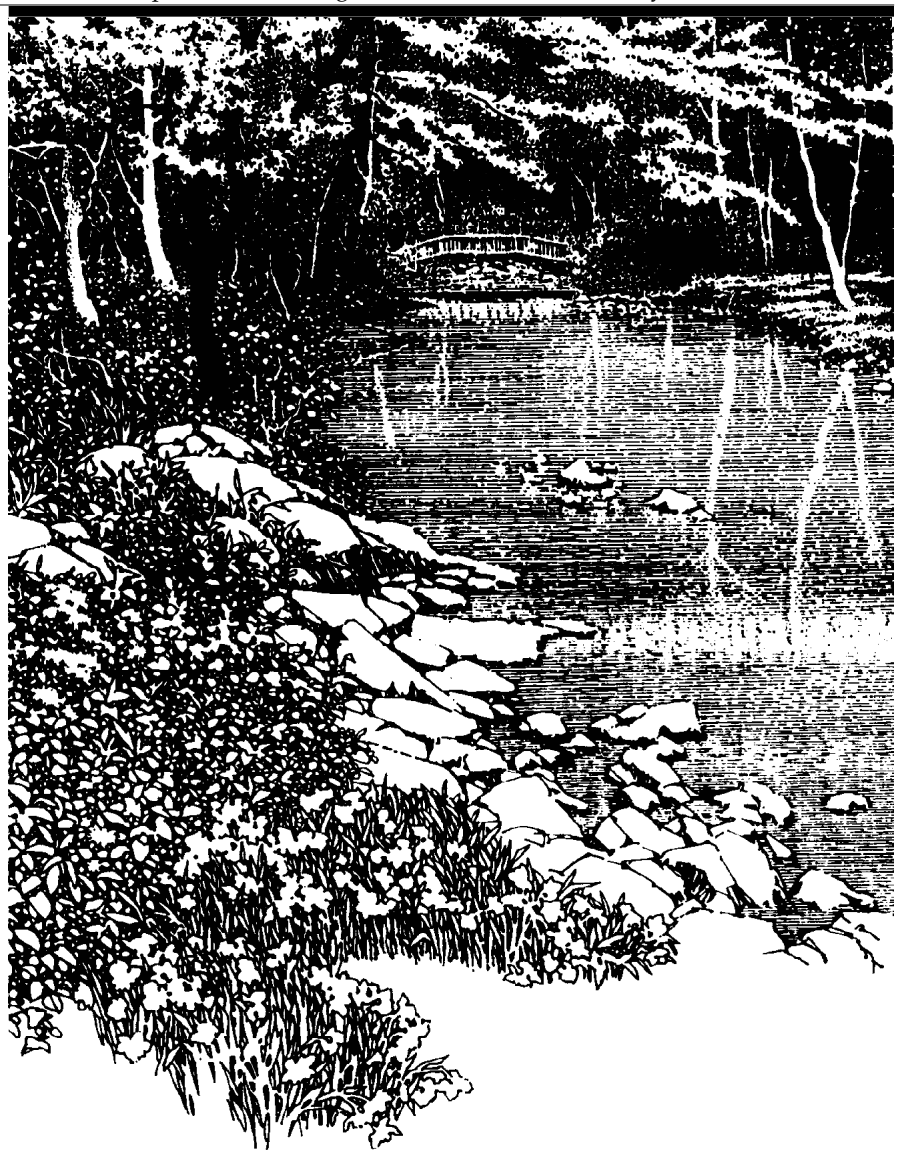
# Public Cost Reduction



## Contents

Conservation of greenways, rivers, and trails may result in reduced costs to local governments and other public agencies. By conserving a greenway corridor rather than permitting intensive development, local agencies may reduce costs for public services such as sewers, roads, and school facilities. Establishing a greenway in an area prone to hazards, such as flooding, may decrease costs for potential damages. Greenways and associated vegetation can also help control water, air and noise pollution by natural means, resulting in potential decreased pollution control costs. Greenways and trails may promote physical fitness, leading to decreased public health care costs.

**Public Service Requirements**

The choices between retaining undeveloped lands as open space or allowing residential development must be considered. How this choice effects public expenditures and the tax base is often the subject of debate. Expansion of the tax base is not always beneficial in the long term. Expansion almost always results in increased public service requirements. In many situations, the cost of providing these services to residential development is much higher than the revenues to local governments resulting from the expanded tax base. A list of development costs could include:

Transportation and Utility costs
- ❏ Roads
- ❏ Public and private utilities
- ❏ Sanitary sewage
- ❏ Water
- ❏ Natural Gas
- ❏ Electricity
- ❏ Storm sewage

Facility and Service Costs
- ❏ Open space, recreation, and libraries
- ❏ Schools
- ❏ Health care
- ❏ Police and fire protection
- ❏ Mail delivery
- ❏ Solid waste collection and disposal

■ Urban sprawl is costing a bundle according to a team of economists at Rutgers University in New Jersey. Potential capital costs attributable to sprawl development patterns in the state of New Jersey were cited at $1.3 billion over 20 years for roads, water,

sewer and school facilities. Additional operating and maintenance costs of development reached $400 million annually. Capitalized at current borrowing rates, these numbers translate to a $7-8 billion cost for sprawl over the twenty years from 1992 to 2012 (Kasowski, 1992).

■ After researching the economic benefits of open space, the planning department in Duchess County, New York found that farms and other types of open land can actually subsidize local government by generating more in property taxes than the demand for services. Residential lands required $1.12 to $1.36 for every tax dollar contributed, while agricultural lands required only $0.21 to $0.48 for every dollar contributed as reported by the Cornell Cooperative Extension of Duchess County (Sayer, 1994).

■ According to an American Farmland Trust (1986) study of Loudoun County, VA, "over a wide range of development densities . . . the ongoing public costs of new residential development will exceed the (public) revenues from such development." Of those units analyzed, annual revenues per thousand dwellings were between $2.7 million and $2.9 million, while costs averaged between $3.5 and $5.0 million. The annual net deficit per thousand units ranged from $0.6 million to $2.3 million (1986 dollars). The greatest predicted shortfall was for the lowest-density units, termed by the Trust as "rural sprawl." The least shortfall was for medium density development. For all densities, school expenses were the largest proportion of total costs (American Farmland Trust, 1986).

■ In the City of Boulder, Colorado, the 1988 public cost for maintaining non-open space, such as developed acres, was estimated to be over $2,500 per acre, and could be as high as $3,200 per acre when utilities, flood control, transportation, and subsidiary governmental entities' costs are included. The cost for maintaining open space in the City was only $75 per acre, or less than three percent the cost of non- open space (Crain, 1988).

■ In Culpeper County, Virginia, the average new residential unit can be expected to produce a deficit in the County budget of $1,242

(1988 dollars) (Larson and Vance, 1988). According to these authors, this study addresses the widespread but erroneous perception that residential growth, in expanding the tax base, somehow contributes to local fiscal health. Although residential development results in increased revenues from the real estate tax and other sources, it simultaneously increases demand for public service expenditures and generates the need for expanded public facilities.

A companion study concluded that for every dollar of tax revenue collected from residential land uses in Culpeper County in 1987, $1.25 was spent on county services. For every dollar collected from industrial/commercial or farm/forest/open space lands, only $0.19 was spent on services (Vance and Larson, 1988).

**Hazard Mitigation**

Use of geologically or environmentally sensitive areas for open space or recreation purposes can reduce potential property damage costs and loss of life. Hazards which can be mitigated through conservation of open space include flooding, slope instability, structural fire damage, and earthquake losses. Many of the available examples focus on flood control.

■ Potential multi-million dollar claims for landslide damages were avoided in Richmond, California, because property originally proposed for residential development was purchased for natural parkland instead. In 1980, a major development was proposed on hillside land which was prone to instability. The local community objected to the development, arguing in part that the area was prone to instability and not suitable for development. The project was denied and the land, purchased by the Trust for Public Land, was eventually transferred to the East Bay Regional Parks District for inclusion in the Wildcat Canyon Regional Park. After major storms in 1982 and 1983, landslides occured on this property, which would have destroyed development had it been allowed. The state of California subsequently passed legislation granting land-slide immunity to public agencies who maintain land in a natural

condition. This legislation may help encourage park districts to acquire property which may be prone to landslides (Kent, 1990).

■ The Minnesota Department of Natural Resources computed the average cost to replace an acre-foot of flood water storage to be $300. In other words, if development eliminates one acre of wetland that naturally stores a twelve inch depth of water during a storm, it would cost the public $300 to replace the water storage. The cost to replace 5,000 acres of wetlands lost annually in Minnesota would be $1.5 million (Floodplain Management Association, 1994).

■ Leaders in Johnson County, Kansas, expected to spend $120 million on stormwater control projects. Instead, voters passed a $600,000 levy to develop a county-wide streamway park system. Development of a greenways network along streambeds will address some of the County's flooding problems, as well as provide a valuablerecreation resource.

The Federal Flood Insurance Program subsidizes the cost of procuring flood insurance. Under the program, a structure repeatedly damaged by floods can receive damage payments each time. It is often argued that in the long run, it would be cheaper for the public to acquire repeatedly damaged structures than to continue to provide funds to repair or rebuild structures in flood-prone locations.

■ In 1958, Gilbert White estimated that for every six dollars in potential damages reduced each year by new flood protection measures, at least five dollars in additional damages resulted from development in floodplains. Steve Hanke calculated the same ratio of dollars spent in flood control to dollars of damage in 1972. Flooding accounted for larger annual property losses than any other single geophysical hazard (Riley).

■ Baltimore County, Maryland, acquired 100 homes in several 100-year floodplains and resold them to people willing to relocate the structures to higher ground. At a cost of $27 million, the County will have cleared the100-year flood plain in eight of its most critical

watersheds, with local money saving $85 million in storm damage assistance costs over the next five years (Caputo, 1979).

**Pollution Control**

Researchers have found that natural properties of plants and trees help mitigate water, air, and noise pollution. Greenways which help conserve such plants and trees provide a valuable contribution toward pollution control. These natural abilities are described below. Pollution can also be decreased by establishing trails and greenways which encourage people to walk or bicycle rather than drive automobiles.

Establishment of a greenway along a river or stream helps maintain water quality because riparian vegetation helps filter out pollutants. Riparian vegetation serves as an effective buffer between a stream and adjacent agricultural area. The retention capabilities of this vegetation prevents many agricultural chemicals from polluting the stream. A study of an agricultural watershed and riparian forest in Maryland (Peterjohn and Correll, 1984, as cited in Risser, 1987) found that if the riparian forest were removed, there would have been twice as much nitrate nitrogen lost to the stream.

Man-made wetlands are making their way into the spotlight because of their ability to improve the quality of polluted water from sources such as municipal wastewater, stormwater and agricultural runoff and acid mine drainage. Wetlands are formed in chambers which the water passes through as the pollutants are filtered by various biological processes. The water leaving the wetland will be cleaner and higher quality than it was before treatment (Oertel, 1990).

■ The wetlands of Congaree Bottomland Hardwood Swamp in South Carolina provide valuable water quality functions such as sediment, toxicant and excess nutrient removal. The least cost substitute for the water quality services provided would be a water treatment plant costing $5 million (Floodplain Management Association, 1994).

Riparian habitat within a greenway may also serve to keep water temperatures cool by shading the stream and thereby improve conditions for fisheries. Restoration of Boulder Creek in Colorado illustrates how a stream restoration

project can not only reduce costs for pollution control, but also provide opportunities for fisheries.

■ Boulder, Colorado, reduced potential wastewater treatment costs significantly by deciding to restore Boulder Creek rather than construct a nitrification tower. Discharge effluent at the wastewater treatment plant met water quality standards, however, further downstream, ammonia concentrations exceeded the allowable level. Downstream the creek had been previously channelized and degraded. Through revegetation, terracing, construction of aeration structures, and other improvements, the stream was restored. The natural functions of the stream would then cool and reaerate the water to convert the ammonia. Restoration of Boulder Creek would also improve wildife habitat, particularly fisheries. (John Barnett, Greenways Coordinator, City of Boulder, 1990).

Greenways can also help reduce other adverse impacts of urbanization. Drastic alterations of a ground surface, such as compaction or paving can reduce the infiltration capacity of a surface, which can cause a serious reduction in groundwater recharge and an increase in runoff.

Greenways help reduce the impacts of noise in two ways. First, greenways serve to maintain distance between the noise source and receiver. Secondly, greenways can include planting barriers, such as tree belts and grassy areas that have the natural ability to absorb, deflect, and refract sound. The effectiveness of plants in controlling noise varies, depending upon the characteristics of the sound, the type, height, density and location of the planting, and climatic factors (Robinette, 1972). Although solid sound attenuation walls may still be necessary to mitigate noise impacts, the distance buffer of greenways and the natural ability of plants should not be overlooked. Greenways as buffers may also have a visual and psychological advantage over masonry walls.

■ A forestry study found that sound reductions attributed to wide belts of tall, dense trees often reached 10 decibels, and soft surfaces such as grass or plowed ground adjacent to a tree belt, reduced noise levels by 8 to 12 decibels (National Park Service, 1983).

Greenways also help control air pollution because plants are natural air cleaners. Plants cleanse the air through the process of photosynthesis, which removes carbon dioxide from the air and returns oxygen. Specifically, plants control air pollution through oxygenation and dilution. Oxygenation refers to the introduction of excess oxygen into the atmosphere. The ability of plants to introduce excess oxygen into oxygen-deficient air serves to readjust the balance. A wide greenbelt along a highway could readjust the air balance in the area. Plants also act as cleansers by absorbing pollutants directly into their leaves and assimilating them (Robinette, 1972). Vegetation can absorb ozone, sulfur dioxide, carbon monoxide, and airborne particles of heavy metals.

■ In 1991, trees in the City of Chicago, Illinois (11 percent tree cover) removed an estimated 17 tons of carbon monoxide, 93 tons of sulfur dioxide, 98 tons of nitrogen dioxide and 210 tons of ozone. The value of this pollution removal was estimated at $1 million annually (Nowak, 1994).

■ Recent studies indicate that a single rural tree can intercept up to 50 pounds of particulates per year. In one study, it was determined that planting half a million trees in Tucson, Arizona would reduce airborne particulates by 6,500 tons per year. The annual value of this pollution control measure was estimated to exceed $1.5 million annually (McPherson, 1991).

■ Reductions in pollutant concentrations downwind from parks has been recorded. In one study, reductions in particulate concentration of 19 percent were recorded in Ohio conifer stands. (Schmid, 1975, and Dochinger, 1975, as cited in National Park Service, 1983).

■ Trees in greenways also provide ambient temperature mediation and help reduce heating and cooling costs. Trees reduce winter heating costs by 40 percent in some cases; and summer shading might provide even greater benefits. A single, isolated tree, generously supplied with water can transpire energy equivalent to five average room air conditioners running 20 hours per day. The species of tree, available moisture, and available soil volume affect the quantity of water evapotranspired per tree (Newsweek, 1979 and Federed, 1971).

### Health Care Costs

Active use of a river, trail, or greenway by community residents can help improve their physical fitness and health. Studies have shown that exercise can reduce health care costs. These costs savings may be shared by public health services, employers, and individuals.

■ For every mile a person walks or runs, they will save society 24 cents per mile in medical and other costs. These figures are the results of a theoretical model developed by the Rand Corporation (Men's Fitness Magazine, 1992).

■ Recreation activities involving exercise reduce health care costs. People who exercise regularly have 14 percent lower claims against their medical insurance, spend 30 percent fewer days in the hospital, and have 41 percent fewer claims greater than $5,000. These figures were taken from a Corporate Wellness Study for the city of San Jose, Department of Recreation, in 1988. In 1991 the average American family paid nearly 12 per cent of average family income for health care, according to a Families USA Foundation study. By the year 2000, the study predicts families will be paying over 16 per cent of their income for health care. (U.S. News and World Report, December 23, 1991.

■ Exercise derived from recreational activities lessens health related problems and subsequent health care costs. Every year, premature deaths cost American companies an estimated 132 million lost work days at a price tag of $25 billion. Finding and training replacements costs industry more than $700 million each year. In addition, American businesses lose an estimated $3 billion every year because of employee health problems (National Park Service, 1983).

### How to Use These Rationales in Your Community

**Calculate itemized costs for development.** Table 8-1 has been adapted from the 1986 American Farmland Trust study of Loudoun County, Virginia. In this study, major annual public costs and revenues were projected for communities of varied densities. Table 8-1 shows the net public finance shortfall for

medium density development (2.7 units per acre) is almost $670 per unit.

Loudoun County, Virginia, is a rapidly growing area, with a present population of 66,500 and an annual budget of $85 million. Although it is one of Virginia's best farming communities, Loudoun County is within the Washington D.C. metropolitan area, and development pressure is high. If your community is similar to Loudoun County, you may be able to apply these conclusions to your community. Otherwise, the table illustrates the categories of public costs and revenues that can be used in determining the public cost/revenue relationship for your community.

**Calculate average costs for development**. If time or staff is not available to carry out itemized calculations, you may choose the method used in the city of Boulder case. In that case, city staff estimated the 1988 average cost per acre for both open space and non-open space acreage within the city limits. The open space operational budget was divided by the number of acres in open space and the general fund operating budget was divided by the number of acres in non-open space use. The result was a comparison of public costs between these two land uses.

**Apply the Fitch Formula to understand the costs of development.** According to Lyle Fitch, former chief administrator to the City of New York, there are some cases where it is financially advantageous to acquire land to preclude its residential development. This point occurs when the municipal cost of servicing

**Fitch Formula**

$$la = \frac{Cs - (Lat + Lfi)}{t}$$

Where,

| | |
|---|---|
| la | is the point at which the municipal costs of servicing development equaled generated tax revenues |
| Cs | represents the costs of providing public services to the development |
| La | is any decrease in the assessment resulting from the acquisition |
| t | represents the tax rate |
| Lf | is the cost of acquisition |
| i | is the interest rate on borrowed money |

a proposed development is equal or greater than the tax revenues projected to be generated by development (Caputo, 1979). His formula to calculate this point is as follows:

**Calculate local expenditures for flood mitigation**. If property owners have filed claims for flood damages, total those claims, and the processing and legal fees associated with them. For each flood event, find out the magnitude of the event (e.g. 50-year flood, 75-year flood, etc.) and how many properties were damaged. Forecast the potential losses and claims of a 100-year flood. Compare these costs with the expenditures made for flood control measures to determine whether building in the flood plain is cost-effective.

Talk to the staff of your local Flood Control District to acquire background information on flood control history, policies, and compensation in your area. They may refer you to the Federal Emergency Management Agency for information on the flood insurance program in your area and for maps of the 100-year flood plain. Your local district office of the Army Corps of Engineers is probably involved in flood control studies and hazard analysis in your area, and can be a valuable source of information.

**Table 8-1**

**Housing Unit Public Cost and Revenue Projections for Loudoun County, Virginia**

(Medium Density Housing)

| Public Costs | Amount | Public Revenues | Amount |
|---|---|---|---|
| Public school capital costs | $ 243 | Real property taxes | $ 846 |
| Public school operating/instructional | 2,256 | Personal property taxes | 240 |
| Public school transportation costs | 67 | Other local taxes | 276 |
| Public road maintenance costs | 38 | Other local revenue | 162 |
| Water and sewer operation costs | 260 | Revenue from state | 984 |
| Law enforcement costs | 165 | Federal payments and grants | 54 |
| Fire/rescue service costs | 58 | Water and sewer revenues | 260 |
| Health and welfare costs | 295 | Road maintenance/repair | 37 |
| Government administrative costs | 147 | | |
| **Total Average Annual Costs (per housing unit)** | **$ 3,528** | **Total Average Annual Revenues (per housing unit)** | **$ 2,859** |

**Net Loss per Medium-Density Dwelling = $ 669**

*Source: American Farmland Trust, 1986*

**Compare future storm damage costs to relocation costs.** As was done by Baltimore County, Maryland, calculate the cost involved in purchasing flood prone structures, and reselling them to persons willing to relocate to non-flood prone lands. Compare this amount to forecasted flood damage costs and present this information to decision-makers.

### Sources of Information

***Practitioner's Guide to Fiscal Impact Analysis.*** This 1980 text by Burchell and Listokin contains overviews of several methods for projecting direct public costs and revenues associated with new development. Though a somewhat technical volume, it provides a good introduction to fiscal impact analysis. It also includes summary tables which provide figures for your calculations. This text should be available through your city, county, or university library.

***The Use of Economic Analysis in Valuing Natural Resource Damages.*** This 1984 text from the Environmental Law Institute is aimed at illustrating economic methods to assess damages from toxic substances. It describes many economic assessment methods in generic terms.

### Considerations in Using These Rationales

**Keep all aspects of a situation in perspective.** Public fiscal impacts are only one consideration in land use planning. Other considerations include adequate and affordable housing stock, ability to attract commercial investment, and local economic conditions.

**Determine developer contributions to public service requirements.** Many developers, as part of their proposals, or as conditions for development, construct public service facilities (sewer, stormwater systems, etc.), or contribute to service funds. Often, however, these contributions will not cover the entire public costs of development. Make certain to incorporate developer contributions into your figures. Be sure to calculate long-term service costs, not just facility costs.

**Update dollar values.** If you use dollar values from studies completed in different years, make sure you convert those values to a common year (preferably the current year) before using them in calculations. See Appendices A and B.

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