

ASSESSMENT OF INFRASTRUCTURE NEEDS TO 2010

NEW JERSEY STATE DEVELOPMENT AND REDEVELOPMENT PLAN

New Jersey State Planning Commission

June 12, **1992**

*This report is prepared as part of the State
Development and Redevelopment Plan in
accordance with the State Planning Act, and is
incorporated in the Plan by reference.*

ACKNOWLEDGEMENTS

This report was prepared by Douglas R. Porter under contract to Siemon, Larsen & Marsh, consultants to the New Jersey State Planning Commission.

The responses and reflections of the Policy and Research Committee of the New Jersey State Planning Commission, Herb Simmens, Committee Chairman, and the valuable contributions of public comments greatly assisted in framing and completing this assessment.

The report is based on analyses of state infrastructure assessments prepared by Hammer, Siler, George Associates in 1987 and by the New Jersey Office of State Planning in 1992, and draws from the state plan impact assessment prepared by the Center for Urban Policy Research in February, 1992 and April, 1992. Those analyses, in turn, depended on the extensive cooperation of many state departments and agencies.

Robert A. Kull, Assistant Director of the Office of State Planning, guided this effort, particularly in explaining data availability, projection models, and other aspects of present and prior assessments.

PREFACE

The New Jersey State Planning Act called for the State Planning Commission to

...prepare and adopt as part of the [State Development and Redevelopment] plan a long-term Infrastructure Needs Assessment, which shall provide information on present and prospective conditions, needs, and costs with regard to state, county, and municipal capital facilities....¹

This report responds to this requirement by presenting the findings of several research efforts that provided basic data and projections pertaining to long-term infrastructure needs. The assessment estimates potential infrastructure needs and costs with and without the adoption of the State Plan.

The projection of infrastructure conditions and prospective needs and costs to the year 2010 is intended to be adopted as part of the State Development and Redevelopment Plan. The assessment furnishes a benchmark of long-range needs for infrastructure improvements related to goals and policies in the State Plan. It also establishes a framework of data and methodology for more detailed and definitive estimates of short-term needs that will aid broad scale infrastructure investment policies and decisions in future years. In this way, **the Infrastructure Needs Assessment contributes to the development and refinement of policies for infrastructure investments and public investment priorities in the State Development and Redevelopment Plan.** These State Plan policies, in turn, may be applied in the evaluation of specific projects for infrastructure repair, maintenance, and improvement.

This assessment compiles and compares data and estimates from three primary sources:

- o the Assessment of Trend Infrastructure Needs to 2010 based on "Trend" conditions, prepared and published by the New Jersey Office of State Planning in January, 1992. In addition to summarizing data and estimates from that assessment, this report compiles and compares data and estimates from two other primary sources:
- o the Preliminary Infrastructure Needs Assessment carried out in connection with the Preliminary State Development and Redevelopment Plan by David Slater of Hammer, Siler, George Associates in 1987 (published as a Technical Reference Document by the New Jersey Office of State Planning, May 8, 1987);

¹ N.J.S.A. 52:18A-199b.

- o the Impact Assessment of the New Jersey Interim State Development and Redevelopment Plan, which presents analyses of both "Trend" and "Interim Plan" needs and costs for selected major components of infrastructure, prepared and published by the Rutgers University Center for Urban Policy Research.

This assessment draws from these sources to present the best available estimates and provide the most technically-proficient, long-range view of future needs and costs for infrastructure in New Jersey. In view of its comprehensive nature, the Office of State Planning "trend" assessment is used as the basic projection of needs. The other assessments, which deal with several major infrastructure systems, are used for comparative analyses of potential needs and costs. The reports all rely on extensive data obtained from many state agency and other sources. For some infrastructure systems, the assessments utilize complex, computer-assisted models to project future needs and costs. Detailed information about these models and data can be found in the referenced documents.

The existing base of information, however, is incomplete and hampers the capacity of even sophisticated models to deliver satisfactory results. For this reason, one purpose of this assessment is to structure a foundation and framework for continuing assessments of infrastructure needs. The assessment establishes a methodological approach and identifies the components of public and private infrastructure that should be included in future assessments. It also defines areas in which future expansions of data sources and improvements in models will allow more precise identification of existing infrastructure conditions and long-term needs. Future assessments will also benefit from additional information obtained from the Cross-acceptance process and subsequent local planning efforts.

The assessment is not intended, nor is it sufficiently detailed at this point, to instruct decisionmakers on determinations of short-term capital improvements at either state or local levels of government. To achieve this purpose, the database and methodologies must be further refined and expanded within the context of an infrastructure investment decision process similar to that described in the final section of this report. That process should incorporate continual updating of the assessment framework as well as determination of shorter-range multi-year and annual public capital investment programs.

This assessment, therefore, should be viewed both as a reasonable estimate of future needs at this time and as a point of departure for more comprehensive data collection and more effective projection methodology in future years. In any case, it will provide valuable information to assist the infrastructure investment decision process.

EXECUTIVE SUMMARY

The State Development and Redevelopment Plan provides a policy framework to guide actions at all levels of government toward a vision of a higher quality of life in New Jersey by 2010. Our success in achieving this vision will depend largely upon our ability to provide the infrastructure needed to promote sound economic growth, to maintain high economic productivity, and to protect the natural resources and environmental qualities of the state. To make sure that infrastructure is provided effectively and efficiently requires that we understand and plan for future needs for infrastructure. This assessment provides a first step toward such an understanding by estimating needs and costs of infrastructure under both Trend and Plan scenarios of future growth in New Jersey.

The components of infrastructure addressed in this assessment include facilities and land that are publicly owned or that serve the public. The assessment estimates future needs and costs based on three previous assessments: the Office of State Planning "Trend" Assessment; the earlier Preliminary Plan Assessment; and the Impact Assessment of trend and plan scenarios prepared by the Rutgers University Center for Urban Policy Research. The assessments evaluate infrastructure needs for projected population and employment to the year 2010, based on analyses of individual components of infrastructure, including backlog deficiencies, rehabilitation and replacement needs, and requirements to support new growth.

The most comprehensive assessment, prepared by the Office of State Planning and published in February, 1992, projects an overall requirement for \$116 billion in expenditures for capital improvements by 2010. This assessment of needs under existing, or "trend" conditions, independent of the provisions of the State Development and Redevelopment Plan, also projects potential revenues during this period at a level of \$96 billion, leaving a shortfall of \$20 billion to be made up from revenue sources yet to be determined. About two-thirds of all future costs are required to correct backlog deficiencies and rehabilitate existing infrastructure systems. Only about one-third of total costs will be generated by needs to support new growth. Comparisons of estimates by the four assessments for major systems--roads, transit, sewer and water, and schools--suggest that future development following the policy guidance of the State Development and Redevelopment Plan may well reduce total infrastructure needs, perhaps enough to require no additional revenue sources beyond those already in place.

The purpose of the assessment is to compile estimates of future needs for 17 components of infrastructure that provide a basic framework for development and redevelopment in New Jersey. The assessments were based on the best available data and projection methodologies. Many state agencies and other organizations contributed vital information and insights into future needs. As such, the assessment provides a long-range estimate of likely infrastructure

requirements, their expected costs, and the probable revenues that will be collected, based on present revenue streams, to fund them.

The assessment thus outlines an overall need for infrastructure development. Just as important, the assessment provides a conceptual and informational framework for continual reassessments and for shorter-term determinations of specific needs.

To be most useful to decisionmakers, however, the assessment requires broadening and deepening of the data sources and the methodological approaches. In some important areas, available data was not adequate to determine satisfactorily future needs and costs. Furthermore, the assessment of some major infrastructure systems, such as roads, water supply and public education, demonstrates the need for more intensive analysis of existing and future needs.

The final section in the assessment recommends an approach to infrastructure decisionmaking that may lead to reductions in future needs and better utilization of existing and future infrastructure systems.

TABLE OF CONTENTS

Acknowledgements	
Preface	
Executive Summary	
Introduction and Approach	
1	
Summary of Findings	9
Transportation and Commerce	15
Roads, Bridges, and Tunnels	
Public Transportation	
Freight, Aviation, and Other	
Energy	
Telecommunications	
Farmland Retention	
Health and Environment	27
Wastewater Disposal	
Water Supply	
Storm Water Management	
Shore Protection	
Public Recreation Open Space Lands	
Solid Waste Management	
Public Safety and Welfare	39
Public Education	
Higher Education	
Arts	
Revenue Analysis	45
The Infrastructure Investment Decision Process	49

INTRODUCTION AND APPROACH

The New Jersey State Planning Act recognizes the importance of infrastructure by linking infrastructure consideration and the State's capital budget to the State Development and Redevelopment Plan, and by making a comprehensive infrastructure needs assessment an integral part of the State Plan.

The State Development and Redevelopment Plan provides a policy framework to guide actions at all levels of government toward a vision of a higher quality of life in New Jersey by 2010. Our success in achieving this vision will depend largely upon our ability to provide the infrastructure needed to promote sound economic growth, to maintain high economic productivity and to protect the natural resources and environmental qualities of the State, all of which make living and working in New Jersey desirable and attractive. A first step in making sure that this infrastructure is provided effectively and efficiently is to obtain answers to several basic questions:

- o Where will past practices in providing infrastructure take us if extended into the future?
- o What will be our needs for infrastructure if we continue growing in the trends of locations and patterns that we have in the past?
- o What will be our infrastructure needs if we grow in more compact patterns, as the State Plan suggests?
- o How much will infrastructure cost under either of the above "scenarios"? o

What revenues might be available in the future to meet these costs?

This report provides some of the answers to these questions and lays the foundation for continued research and data development. It presents research findings based on current trends in infrastructure needs, costs, and revenues through the horizon year of the State Development and Redevelopment Plan (2010). The report also presents potential infrastructure costs, or potential savings in costs, associated with the implementation of a State Development and Redevelopment Plan. As presented in this report, infrastructure costs are not limited to state government responsibilities but include costs shared among all levels of government and the private sector.

The ultimate objective of this infrastructure-needs research is to answer these questions in ways that will allow governments at all levels to devise more effective, efficient and desirable growth and infrastructure policies ~ policies that will lead to the achievement of a higher quality of life at the least cost in terms of fiscal and natural resources. In this sense, therefore, assessment of infrastructure needs is only one component of a much larger program of the Office of State Planning to provide information necessary for public agencies at all levels to make sound, coordinated, public-investment and resource-allocation decisions that respond to the needs and goals of all' levels of government. This larger program is known as "The Resource Investment and Management System," or "TRIMS."

TRIMS is being developed to partially fulfill the statutory duties of the Office of State Planning to collect, analyze and apply data to strategic investment and to the related public-policy issues with which the State Planning Commission must deal. TRIMS relies on a cooperative, intergovernmental process for collecting and sharing data in a broad range of areas, including but not limited to: infrastructure needs and costs; local zoning changes and site plan approvals; building permits issued; and capital facility and natural resource system capacities. These data are analyzed through computer models, geographic information systems, and other technologies to assess both needs (e.g., land, housing, infrastructure) and impacts (e.g., of the State Plan, of alternative development patterns, of changes in infrastructure investment policy). The products of TRIMS will inform decisions that allocate financial and other resources.

Basic Approach to Needs Assessments

The components of the infrastructure needs assessment are infrastructure systems, needs, costs, and revenues:

Infrastructure means those capital facilities and land assets under public ownership, or operated or maintained for public benefit, that are necessary to support development and redevelopment and to protect the public health, safety, and welfare. Infrastructure systems include transportation, energy, telecommunications, farmland retention, water supply, wastewater disposal, storm water management, shore protection, open space and recreation, solid waste management, public health care, public education, higher education, arts, historic resources, public safety, justice, public administration, and public housing.

Need is the amount of infrastructure determined to be necessary to achieve and maintain desired levels of service and standards of quality, given estimates and projections of demand. Levels of service tend to be defined for capital facilities in terms of the relationship of demand to designed capacity. Standards of quality tend to be defined in terms of societal objectives, such as swimmable and fishable water quality and thresholds of cancer risk, although they are expressed in terms of tangible measurements achievable using current (though evolving) technologies.

Cost is determined using techniques appropriate for each infrastructure system which relate needs to estimates of costs for units and/or similar systems.

Revenue is estimated based on anticipated (authorized and appropriated) or projected revenue sources applicable to each infrastructure system. If available, analyses of fiscal capacity may be used to identify potential sources of revenue which may be used to finance estimated infrastructure costs.

Infrastructure Systems

The infrastructure included in this assessment process incorporates:

- o facilities and assets that are publicly owned or that serve the public;
- o systems of facilities and assets whose need is generated by and are necessary to support development and redevelopment in accordance with the State Development and Redevelopment Plan;
- o facilities and assets that may influence the form and/or the location of development and redevelopment;
- o capital facilities with a high fixed cost (over \$50,000) and a long service life (over 10 years); and
- o facilities and assets that are directly and substantially related to protecting public health, safety and welfare.

The Office of State Planning "trend" assessment includes more types of infrastructure than were analyzed in either the Preliminary Plan Assessment or the Rutgers University Center for Urban Policy Research Impact Assessment. For example, capital investments in open space, farmland acquisition and public utilities are not usually addressed in infrastructure studies. It does not include some facilities that should be incorporated in future assessments, such as libraries, recreation facilities, and public administration buildings.

On a statewide basis, each infrastructure system responds to a variety of needs. The sensitivity of these systems to locations and patterns of growth and development may vary for different components within each system. For the purposes of this assessment, infrastructure is categorized as follows:

Urban and Community Infrastructure provides site-specific services commonly associated with and supportive of urban densities (generally over 1,000 persons per square mile), and include, but are not limited to, public water supply, wastewater treatment, public transportation, and streets;

Statewide Infrastructure provides services to support development and redevelopment throughout the state or its subregions that are less sensitive to local sites and patterns of growth and development, and include freeways, airports, energy facilities, solid waste management, higher education facilities, and other systems not elsewhere classified; and

Land Assets provide for the preservation and public control of existing land resources that are sensitive to, and necessary' to support, growth and development in other locations, and include, but are not limited to, parks, open space, and farmland retention.

Estimating Needs and Costs

This report analyzes infrastructure systems in terms of currently available data, current growth trends (the "Trends" scenario), and conditions that may be established by the State Development and Redevelopment Plan (the "Plan" scenario). Projections of needs under the Trend scenario are drawn from three sources:

- o the Preliminary Plan Needs Assessment prepared by Hammer, Siler, George Associates in 1987 (henceforth referenced as the "Preliminary Plan Assessment");
- o the Office of State Planning Needs Assessment, a much more complete assessment, completed in February, 1992 (henceforth referenced as the "OSP Trend Assessment");
- o the Impact Assessment prepared by the Rutgers University Center for Urban Policy Research, completed in March, 1992 and supplemented in April, 1992 (henceforth referenced as the "CUPR Assessment").

Projections of needs under the Plan scenario are drawn from one source, Volume HI of the CUPR Assessment, (Research Findings: The Supplemental Assessment of AIPLAN of April, 1992) which was based on the most current information on vacant land and on the Planning Area boundaries and Centers designations of the Amended Interim State Development and Redevelopment Plan, but which projected needs for only selected major components of infrastructure.

Because the OSP Trend Assessment incorporates almost the complete range of infrastructure components, it is presented as the basic model for projected needs and costs. The other assessments are employed to provide a comparative analysis of needs and costs for selected-major infrastructure components. Where possible, the needs equation includes three different types of need: backlog, rehabilitation, and new growth. In some cases, each type of need is further calculated for local and statewide (regional) service delivery.

Needs and Costs Equations

In principle, the estimation of infrastructure needs takes the form:

$$\text{Need} = \text{Demand} \times \text{Standard}.$$

Demand is based on existing conditions and year 2010 growth projections. Standards are measures established by the jurisdiction responsible for that infrastructure component which consider both the condition of the infrastructure and its capacity.

In practice, calculations are far more complex. Demand varies according to expectations for growth-as well as individual preferences and behaviors. Standards vary according to a number of factors, such as site-specific conditions, the efficiency and availability of design responses to these conditions, and wide ranging public policy considerations. Standards are difficult to define with precision, particularly where there is a lack of detailed local information regarding infrastructure conditions and costs by which to develop or evaluate a standard. The determination of demand and service standards, therefore, is typically based on planning and engineering literature, professional judgment, and the experience of the researchers. In the planning context, however, this general method allows for assumptions regarding both demand and standards to be applied, tested, modified, and refined.

In turn, the estimation of costs takes the form:

$$\text{System Cost} = \text{Need} \times \text{Unit Cost}.$$

Again, an estimate for any system may represent the sum of costs calculated for a variety of components for a variety of conditions within the system.

The assessments apply these methodologies to determine needs and costs in various ways. In some instances, state agencies and the Center for Urban Policy Research have separately calculated needs and costs using "in-house" models (some based on federal agency models). In other cases, the Office of State Planning developed models, several of which were adapted by the Center for Urban Policy Research, that are grouped under the general heading of the Growth Simulation Model.

Four models, in particular, were developed and used by the Office of State Planning in its trend estimates:

- o The School Facilities Model component of the Growth Simulation Model estimates the cost of new school buildings (new capacity) for public elementary, middle, and high schools as may be required in response to population and at-place employment within each municipality.

- o The Wastewater Model component of the Growth Simulation Model estimates the capital costs associated with the construction of public wastewater collection and treatment facilities needed to service future population and employment within each municipality in accordance with Federal Clean Water Act requirements.
- o The State and Local Operating Budgets Projection Model component of the Growth Simulation Model estimates public operating expenditures, revenues, and balances for state and local (county and municipal) operating budgets based on municipal-level projections of population and employment.
- o The Roads Model component of the Growth Simulation Model projects capital costs for roads under various growth scenarios and planning policies based on existing correlations between population and road densities at the municipal level.

These models continue to provide a means of determining needs and costs for various population, employment, and other data inputs.

Growth Projections

The various assessments are based on calculations of overall needs, rather than on compilations of specific project proposals and costs. The needs are in turn based on a range of projected population and employment for the state and individual counties for the year 2010.

When the Office of State Planning developed estimates of trend infrastructure needs using its Growth Simulation Model, the baseline population and employment data were drawn from the 1990 United States Census of Population and from 1988 Current Employment Statistics of the United States Bureau of Labor Statistics. As current projections using these data were not available for the Office of State Planning assessment, the most recent population and employment projections were used. The 1989 New Jersey Department of Labor projections are based on 1980 Census data, with population controlled to the Department's 1987 preliminary population estimates. Employment projections for the 1989 New Jersey Department of Labor series are based on 1986 Current Employment Statistics.

The growth projections used by the Office of State Planning for its infrastructure needs assessment of the Trend scenario are shown in Table 1.

While demand for many infrastructure systems are more directly related to numbers of households, housing units, and non-residential space, projections for these parameters had not been commonly accepted at the time, the Office of State Planning conducted its assessment. Therefore, projections of residential and non-residential demand were calculated as an intermediate result of calculations of need for each infrastructure system based on established population and employment projections and associated per capita demand factors.

The CUPR Impact Assessment, which was initiated considerably later than the OSP assessment, used new population and employment projections for both Trend and Plan scenarios. These were carried out by using the CUPR Econometric Model, which incorporates a Land Capacity Model for allocating statewide projections to regions and municipalities.

The growth projections used by the Center for Urban Policy Research for its impact assessment are shown in Table 1. They are much lower than projections used by the Office of State Planning, due to the consideration of 1990 census data, only recently available, by the Center for Urban Policy Research. The considerable differences between the OSP and CUPR basic projections should be kept in mind when comparing the results of the assessments of infrastructure needs.

**Table 1. Population and Employment Projections
Used as Basis for OSP and CUPR Assessments**

	1990 Base	2010 Projections in OSP Assessment	2010 Projections in CUPR Assessment
State Population	7,730,188	8,996,600	8,250,260
State Employment	3,647,600	4,497,000	4,320,100

Scale of Service Delivery

Infrastructure needs are classified by their scale of service delivery using factors identified in the assessment for each infrastructure system. Infrastructure that may be categorized as statewide infrastructure, and certain land assets that possess characteristics of statewide infrastructure, are generally considered to be of a regional scale. Urban and community infrastructure and land assets sensitive to local patterns of growth and development are generally classified as local in scale.

Regional needs are calculated using data from regional, state and federal agencies and from counties that included infrastructure needs assessments in their Cross-acceptance comparison reports. Local needs are derived from municipal data in county Cross-acceptance reports or from other projections based on accepted standards and aggregated at the state level.

Backlog, Rehabilitation and New Growth Needs

Backlog need is defined as the need for correcting existing deficiencies to serve the existing population. - The deficiencies are related to system capacity and condition. Examples include improvements to bridges that do not meet federal structural safety codes and must

be repaired (condition), or a commuter rail line that has insufficient rolling stock to adequately serve the number of commuters on its lines (capacity).

Rehabilitation need is defined as the recurring, periodic need to improve and/or replace capital facilities to keep existing and anticipated infrastructure in service, at least through the year 2010. These are distinct from routine operations and maintenance costs. For example, the resurfacing of a road that may need to take place every 10 years would be considered a rehabilitation need, while street cleaning and patching would not.

New growth need is defined as the anticipated need for new infrastructure capacity to serve projected increases in population and employment resulting from new development and redevelopment between the date of the needs assessment and the horizon year (1990 - 2010). In practice, investments that upgrade existing infrastructure to satisfy new growth needs tend to satisfy rehabilitation needs as well, and may not be readily distinguished in this analysis.

General Assumptions and Conditions

- The following general assumptions and conditions are used in this assessment:
- o All costs for infrastructure systems are rounded to the nearest \$5 million;
 - o Costs for infrastructure systems do not include operations and routine maintenance;
 - o Cost calculations are in constant 1990 dollars, and do not account for inflation or debt service costs between 1990 and 2010;
 - o Planning, design and administration costs, which may average 20 percent for all infrastructure systems, are included in the costs of all systems unless otherwise indicated.

SUMMARY OF FINDINGS

Projected costs for infrastructure improvements required to support existing and new development in New Jersey from 1990 to 2010 will amount to \$116 billion, according to the Office of State Planning assessment of the Trends scenario. During that period, revenues projected by the OSP assessment will amount to \$96 billion, leaving an infrastructure funding shortfall of about \$20 billion, or an average of almost \$1 billion per year. The CUPR Impact Assessment comparison of selected infrastructure needs for Trend and Plan scenarios demonstrates that Plan infrastructure needs probably will be significantly lower than Trend needs, raising the prospect of erasing part of the projected shortfall if the State Development and Redevelopment Plan is adopted and implemented.

Table 2 summarizes the cost and revenue projections of the OSP Trend Assessment, which is the only comprehensive assessment available. The data and methodologies by which the estimates were made are considered the best available at this time. Much of the information was obtained from the state agencies responsible for financing major infrastructure systems.

Major Conclusions

The only comprehensive analysis and projection of infrastructure needs for New Jersey from 1990 to 2010 was prepared by the Office of State Planning as an estimate of needs under the Trend scenario. Other assessments focused on certain infrastructure systems to the exclusion of many important components of infrastructure. For that reason, the OSP assessment provides the best available estimate of future needs. The following conclusions can be drawn from the OSP assessment.

Backlog/Rehabilitation Needs Account for Major Costs

Exactly two-thirds of all projected infrastructure costs are attributable to needs for backlog and rehabilitation improvements in existing infrastructure systems. Only one-third of total costs are required to support growth in New Jersey's population and employment. Most backlog and rehabilitation costs are required to improve local infrastructure rather than regional/state infrastructure.

Transportation Accounts for More Than 40 Percent of Total Costs

More than 40 percent—\$49 billion of the total infrastructure needs is for roads, bridges, and tunnels. Nearly two-thirds of this amount is required to overcome existing deficiencies and to improve existing facilities.

**Table 2. Summary of Projected Trend Infrastructure
Costs and Revenues In New Jersey, 1990-2010**

(In millions of 1990 dollars)

	BACKLOG NEEDS	REHABILN EEDS	GROWTH NEEDS	TOTAL NEEDS
TOTAL PROJECTED TREND COSTS	\$9,490	\$67,510	\$38,710	\$115,710
Transportation and Commerce	790	44,635	27,810	72,270
Roads, Bridges and Tunnels	*	30,785	18,285	49,070
Public Transportation	*	4,605	2,150	6,755
Freight, Including Ports	*	1,980	655	2,635
Aviation, Including Air Freight	*	3,965	2,465	6,430
Other Transportation Facilities	*	150	115	265
Energy	350	3,130	1,080	4,560
Telecommunications	nav	nav	2,090	2,090
Farmland Retention	440	20	1,050	1,510
Health and Environment	8,440	8,780	5,410	22,630
Wastewater Disposal	1,395	2,595	4,000	7,990
Water Supply	700	2,300	450	3,450
Storm Water Management	1,640	nav	nav	1,640
Shore Protection	275	1,055	nav	1,330
Open Space and Recreation	2,150	1,115	435	3,700
Solid Waste Management	2,280	1,715	525	4,520
Public Safety and Welfare	260	14,095	5,410	19,765
Public Education	40	13,375	2,995	16,410
Higher Education	220	620	2,215	3,055
Arts	nav	100	200	300

Notes: Data' may not be available by type of need for all infrastructure systems. *
= Backlog Needs are included with Rehabilitation Needs. nav=
Not available.

Projected trend costs for the following infrastructure systems were not available: Recreation Facilities, Public Health Care, Historic Resources, Public Safety, Justice, Public Administration, and Public Housing.

Most Costs are for Local Infrastructure

Of the \$116 billion in total needs, \$63 billion (or 54 percent) will be needed for local infrastructure. Almost half of this amount is required for roads, bridges, and runnels serving local community needs.

Nearly Half of Projected Revenues Will Come from Existing State and Local Revenue Sources for Major Statewide Infrastructure Programs

Of the \$96 billion in total revenues projected under the Trend scenario, almost half will derive from present state and local revenue sources used for statewide infrastructure programs, almost one-third from local revenue sources presently used for local infrastructure, and about one-fifth from private sources.

Comparative Analysis of Findings from All Assessments

The OSP Trend Assessment, the CUPR Impact Assessment of Trend and Plan scenarios, and the Preliminary Plan Assessment all estimated needs and costs for five major components of New Jersey's infrastructure: roads, bridges, and tunnels; public transit, wastewater disposal, water supply, and public education. The following conclusions may be drawn from a comparison of results from these assessments.

Projected Costs for Roads, Bridges, and Tunnels Vary Widely Among Assessments

The various assessments estimate future costs for roads, bridges and tunnels at amounts from \$2,225 million (CUPR Plan Assessment) to \$49,070 million (the OSP Trend Assessment). The CUPR Trend Assessment estimates needs at \$2,924 million and the Preliminary Plan Assessment, updated by OSP, estimates needs at \$23,300 million.

The assessments used very different projection methodologies. The OSP Trend Assessment is based primarily on Department of Transportation estimates, which in turn depended on departmental projections of needs, in part prepared in consultation with local governments. CUPR assessments, based on land use density calculations, include no backlog and rehabilitation funding, which the OSP Trend Assessment estimates at over 60 percent of total costs. The Preliminary Plan Assessment was based on still other sources.

The assessment results demonstrate the need for a reconsideration and reconciliation of the assessments in future analyses, if only because transportation costs are a major proportion of all infrastructure needs for New Jersey to 2010.

Projected Transit Needs Indicate Little Difference Between Trend and Plan Scenarios

The OSP Trend Assessment estimated transit improvement costs at \$6,755 million for the state; the Preliminary Plan Assessment was somewhat higher, \$10,600 million. Although the CUPR assessments did not project costs, they indicated that the number of municipalities "with transit propensity" (related to development densities) would not change dramatically between Trend and Plan scenarios, although there may be some shifting in modes of transit, presumably because of the proportion of existing development compared to projected new growth.

Projected Costs for Wastewater Disposal are Quite Similar Among the Assessments

The assessments estimate costs for wastewater disposal infrastructure at \$6,300 million to \$7,990 million. Most of the difference can be explained by the higher population and employment projections used in the OSP Trend Assessment. The assessments were all based on similar projection methodologies. The estimate by the CUPR Plan Assessment indicates modest savings (approximately \$500 million) over the CUPR Trend Assessment.

The Assessments Project Generally Similar Costs of Water Supply

The OSP Trend Assessment estimates total water supply costs at \$3,450 million, compared to the CUPR Trend and Plan Assessments of \$634 million and \$549 million, respectively. The difference, however, can be explained by the exclusion in the CUPR assessments of backlog and rehabilitation costs, which the OSP Trend Assessment estimate at \$3,000 million. A problem remains in that the CUPR assessments do not include costs for non-residential water supply and are based on much lower population projections, which suggests that new growth costs may be considerably higher than the range of \$450 to \$634 million estimated by the assessments.

The Assessments Produce Varying Estimates of Public Education Costs

The OSP Trend Assessment estimates public education costs at \$16,410 million, while the CUPR Trend and Plan assessments project costs at \$5,296 and \$5,123 million, respectively. The CUPR assessments do not include backlog and rehabilitation needs, which the OSP Assessment estimates at \$13,415 million. Like the water supply estimates, the assessment projections for new growth are quite different. The CUPR Trend Assessment estimates \$5,296 million for educational facilities serving new growth, while the OSP Trend Assessment estimates only \$2,995 million, based on population projections almost twice as high as CUPR's. CUPR's Trend and Plan assessments are quite similar.

Implications of the Findings

The variances in projections of major infrastructure needs, and the lack of verifying assessments of many other types of infrastructure, underscores the need for ongoing improvement of data and methodologies. They also support the importance of the infrastructure decisionmaking process described in the final section, especially the analyses of potential cost reductions.

However, the "bottom line"¹ of this assessment suggests that state and local governments will be required to continue and even expand expenditures for infrastructure improvements to meet existing and future needs. At the same time, New Jersey governments need to put in place a recurring needs assessment process that constantly measures and updates infrastructure requirements in the light of current trends, standards, and policies.

TRANSPORTATION AND COMMERCE

Roads, Bridges and Tunnels

Summary of Needs

The OSP Trend Assessment estimated total public costs for local and state roadways at \$49,100 million. Most of the need, 60 percent, is for rehabilitation and backlog costs. By comparison, the CUPR projections reflect substantially lower costs because of lower population forecasts, exclusion of bridge and tunnel needs, and other methodological differences, which result in estimated needs of slightly less than \$3 billion. Perhaps the greatest value of the CUPR projections is to suggest relative differences between Trend and Plan scenarios which, using the same methodology, indicate that the State Plan may reduce road needs by 25 percent.

Description of Conditions

New Jersey is served by almost 34,000 miles of highways, toll roads, county roads, and local streets and more than 6,000 bridges. In 1990, 5.6 million New Jerseyans were licensed to drive the 5.6 million automobiles, trucks, and buses registered in the state. The 60 billion miles of vehicle travel throughout the state averaged two million miles of traffic per year for each mile of road, more than three times the national average.²

Assessment Methodologies

For the Trend scenario, needs for rehabilitation and backlog deficiencies on highways under state jurisdiction were estimated by New Jersey DOT, using a computer model called the Highway Performance Monitoring System (HPMS). The technique is also used by the Federal Highway Administration to develop estimates of national needs. Bridge improvements on state controlled highways were based on a recent bridge survey and current estimates of average repair costs. County and municipal roadway rehabilitation costs were developed based on estimates of the share of roads requiring reconstruction and resurfacing in 2015, (40 and 50 percent, respectively) and current estimates of the costs of reconstruction and repair. County bridge rehabilitation and backlog costs were calculated based on the costs of improving structural deficiencies, functional obsolescence, or normal maintenance and repairs, as appropriate. Estimates of long term capital investment needs were made originally by New Jersey DOT for some counties in the Bi-State Forum in 1990.

² Vehicle data from the U.S. Department of Transportation, Federal Highway Administration, "Highway Statistics: 1990," Washington, D.O, 1991.

Estimates for the remaining counties were developed using comparable methods, and combined along with 21 year projections of independent transportation authorities and commissions.

The costs of new state, county, and municipal roads needed to serve population growth were estimated using the OSP Growth Simulation Model, which assumes the current relationship between road supply and population density will hold in the future. It would assume, for example, that when a rural municipality reached the same population density as Lawrence Township, it would require the same density of roads. The relationship was applied at the county level for state roads, and at the municipal level for local roads, with an upper limit of 65 lane miles per square mile of municipality. Cost differentials reflect the higher costs of construction in built up areas.

The CUFR assessment methodology used a similar technique to project new state and local road needs.

Projected Needs and Costs

Needs and costs were estimated by combining the NJDOT projections of backlog and rehabilitation costs with the Office of State Planning estimates of new roads. The OSP Trend Assessment results are compared below to the Center for Urban Policy Research projections which do not include rehabilitation or backlog costs.

Table 3. Assessment of Road Infrastructure Costs

(In Millions of 1990 Dollars)

	Total Needs	Backlog and Rehabilitation	New Growth
OSP Trend Assessment	\$49,070	\$30,785	\$18,285
CUPR Trend Assessment	2,924	nav	2,924
Preliminary Plan Trend Assessment	23,300	nav	nav
CUPR Plan Assessment	2,225	nav	2,225

nav = Not available

Trend development will require an additional 5500 lane miles of local roads and 159 lane miles of state roads. Plan development will require addition of only 4074 LM of local roads and 128 LM of state roads. The differences represent 35 percent fewer lane miles of local roads and 25 percent fewer state road miles. The cost differences on state roads -22 percent-

are not as significant because the Plan alternative, which places more development in dense areas where construction costs are greater, will cost \$ 700 million less: \$567 million less local road costs and \$ 132 million savings for state roads. The cost reduction for local roads is estimated at 35 percent ~ approximately the same difference as the number of road miles.

It is important to note that backlog and rehabilitation costs projected by the OSP Trends Assessment amount to almost two-thirds of total projected costs. The large difference between the OSP Trend Assessment and the CUPR assessments is due in part to the CUPR exclusion of backlog and rehabilitation costs, and in part to use of different methodologies. The Preliminary Plan Assessment did not adequately project new growth needs or a complete representation of authority and commission needs. The CUPR assessments appear to support the argument that more compact development encouraged by the Plan scenario will provide infrastructure savings.

Recommendations

Future assessments should reconcile the differing methodologies and results of these assessments to reach a firmer conclusion regarding needs and costs.

Public Transportation

Summary of Needs

The OSP Trend Assessment projects total public costs for long term public transportation improvements at \$6.8 billion. CUPR assessments provide no cost estimates but project that under the Trend projection, 50 additional "municipalities would qualify for transit service, based on current standards. The Plan scenario would add 52 new municipalities to the list of those qualifying for transit service, with more of an orientation to local bus operations, rather than lower density commuter rail or express bus operations. Under the Plan scenario, a million new households would live in areas served by transit, a 50 percent increase over the Trend scenario.

Description of Conditions

New Jersey is served by extensive public transportation services including AMTRAK intercity rail, NJTransit local and commuter rail and bus, the Newark subway, the Port Authority Trans-Hudson (PATH) in the New York area, and SEPTA and PATCO rail service in Philadelphia. NJTransit alone, the fourth largest public transit agency in the U.S., carries 290,000 bus and rail riders daily. There are more than 130 private bus operators providing service in 19 counties, and NJTransit also leases buses to 132 private, subsidized, and contract carriers.

Assessment Methodologies

The New Jersey Department of Transportation estimated long term capital investment needs for northern and central New Jersey counties for the Bi-State Forum in 1990. Similar methods were used to develop estimates for other counties. NJ TRANSIT estimated its future rail rolling stock needs by applying its overhaul and replacement cycle plan to current inventories, using current cost estimates.

Other transportation agencies and commissions' needs were estimated by NJDOT based on business plans of each agency. One half of the needs of the capital plans for bi-state authorities and commissions were attributed to New Jersey. The needs of private carriers and public and private para-transit are not included.

In addition to the trend estimates of NJDOT, CUPR developed a Transit model based on net residential density. Municipalities were assigned to one of four "transit service propensity" categories based on population densities, using current and projected residential acreage and dwelling units. These categories include low and moderate frequency bus service, express bus, and commuter rail. The technique is intended to indicate a propensity for transit service rather than an explicit projection of need. Some municipalities may currently have more or less service than their density levels would seem to justify, but it is assumed that the technique will indicate general differences under a Trend or Plan scenario. The model, however, does not project costs, only general trends in service under different scenarios.

Projected Needs and Costs

Needs and costs were estimated by the NJDOT projections for rehabilitation costs and costs to serve new growth. All needs were assumed to be regional.

Table 4. Assessment of Public Transportation Costs

(In Millions of 1990 Dollars)

	Total Needs	Backlog and Rehabilitation	New Growth
OSP Trend Assessment	\$6,755	\$4,605	\$2,159

No costs were developed for the Plan scenario, but the CUPR Transit model allows a general comparison between trend and plan in terms of the number of municipalities which could justify different levels of transit service.

**Table 5. Municipalities with Transit Propensity
Trend and Plan Scenarios, 1990 and 2010**

	1990	2010 Trend	2010 Plan	Difference
Level of Transit Service				
Moderate -- 40 Buses/Day	84	88	97	9
Low -- 20 Buses/Day	208	216	213	-3
Express Bus	269	284	283	-1
Commuter Rail	247	270	267	-3

Source: CUPR Impact Assessment

Under current conditions, 516 municipalities have sufficient density to support express bus or commuter rail service, followed by 208 which should be able to support at least moderate bus service, and 84 which can justify frequent local buses. From 1990 to 2010, the TREND scenario shows that while more municipalities qualify for transit services, they tend toward low level services. Only four more communities can support frequent local bus service, and eight more can support moderate bus service. On the other hand, the Trend scenario shows support for express bus in 15 new communities, and 23 more with commuter rail.

The estimates for the Plan scenario show that the largest change among transit service levels continues to be those municipalities with a commuter rail density. In contrast to the Trend scenario, there are three fewer municipalities which fall into the commuter rail category, three fewer municipalities in the low frequency local bus category, and one fewer in the express bus category. However, in accordance of the intent of clustering growth, the Plan scenario adds nine more municipalities with frequent local bus service.

The household trends show a marked shift from the Trend projections. The growth in households among municipalities which qualify for transit service was over 1 million, in contrast to about two-thirds of that growth under the Trend projection. Not only is there a larger base of households exposed to transit, but 42 percent of them are located in municipalities served by local bus, compared to only 23 percent under the TREND scenario.

Using the CUPR Impact Assessment, analysis of the number of households in each category shows that the Trend favors development in low density communities. Household growth in municipalities which support the highest level of bus service is a mere 2 percent, while the number of households living at only commuter rail densities is projected at 14 percent. Household growth in municipalities which support express bus grows by 12 percent, compared to an increase of only 8 percent in communities that can qualify for at least low

frequency local bus service. Moreover, there are reductions in population in some of the most transit rich communities, notably the Northwest, where the Trend shows a loss of almost 65,000 households in the municipalities with local bus service, and an additional loss of 8,000 households in communities which could support express bus.

Recommendations

Given the significance of transit to the Plan scenario, improved estimates of future costs under Trend and Plan scenarios should be prepared in future analyses. Transit propensity should be translated into projected costs to serve those propensities and costs should reflect local and regional responsibilities for funding transit.

Freight, Aviation, and Other Transportation Facilities

Summary of Needs

The OSP Trend Assessment projects needs for freight, aviation, and other transportation facilities by 2010 at a total of \$9,310 million, of which freight needs are estimated at \$2,635 million, aviation needs at \$6,430 million, and other transportation needs at \$265 million. The Preliminary Plan Assessment was incomplete in these areas and the Impact Assessment does not include estimates for these infrastructure components.

Description of Conditions

New Jersey's seaports, highway system, rail system, airports, and related facilities provide essential support for its economy. Three major deepwater ports provide gateways for an extensive network of 1,330 miles of rail track, almost 34,000 miles of highways, roads, and streets, more than 6,000 bridges, and 574 airports, heliports, and other aeronautical facilities (including 54 public-use airports). Although many facilities are publicly-owned and maintained, a substantial number are controlled by private owners or quasi-public authorities such as the Port Authority of New York and New Jersey.

Assessment Methodologies

The New Jersey Department of Transportation prepared a comprehensive analysis of needs for state rail systems, port facilities, passenger and civil aviation facilities, and other facilities, and extrapolated five-year plans for authorities and commissions to project needs to 2010. Needs for private facilities were not estimated.

The Preliminary Plan assessment projected rail needs based on extrapolation of short-term needs identified in the 1985 State Rail Plan and projected airport needs for state-controlled

airports by extrapolation of five-year capital budgets. The current assessment provides a more comprehensive analysis of needs.

Projected Needs and Costs

The OSP Trend Assessment of freight, aviation, and other transportation infrastructure needs is summarized in the following table. All the needs are considered regional in scope.

Table 6. Assessment of Freight, Aviation, and Other Transportation Costs

(In millions of 1990 dollars)

	Total Needs	Backlog Needs	Rehabilitation	New Growth
Total Needs	\$9,310	*	\$6,095	\$3,235
Freight Needs	2,635	*	1,980	655
Aviation Needs	6,430	*	3,965	2,465
Other Needs	265	0	150	115

* Included in Rehabilitation

This assessment does not include local needs for facilities, which were not estimated. It also does not include needs for private facilities. The Preliminary Plan Assessment projected needs for state-controlled rail and airport facilities at \$100 million and \$300 million, respectively.

No assessment of needs under the Plan scenario was prepared. Any differences from the Trend assessment due to changes in growth patterns must be determined through more intensive analysis of siting, land, and building cost variables of individual facilities.

Recommendations

The assessment above is based in part on extrapolations of authority and commission five-year budgets. Given the importance of such entities in provision of port, rail, and air services, more complete projections of potential needs should be obtained. In addition, facility plans should be analyzed to determine possible implications of Plan policies for future needs and costs. Future assessments should consider local and private costs as well.

Energy

Summary of Needs

The OSP Trend Assessment estimated long-term electrical energy infrastructure needs to 2010 at \$3,500 million. Almost all power is generated by investor-owned, publicly-regulated utilities. No estimate of needs was prepared for other energy sources or for any needs under the Plan scenario.

Description of Conditions

New Jersey uses over 2,000 trillion BTU of fossil fuel and nuclear energy each year, all imported from other states and nations. In 1989, petroleum provided 50 percent of the state's energy, electricity 31 percent, and natural gas 19 percent. Almost half the energy produced is consumed by buildings, more than one quarter by transportation, and the remainder for industrial use.

Assessment Methodologies

A New Jersey Energy Master Plan Committee is preparing a plan for the production, distribution, and conservation of energy. Information on electric power from that plan was used in the OSP assessment. Estimates of future growth needs were drawn from the "Utility Expected" scenario based on a study by New Jersey electric utilities.

Projected Needs and Costs

The OSP Trend Assessment scenario estimated electric utility needs at \$4,560 million, of which \$350 million are backlog needs, \$3,130 million are for rehabilitation, and \$1,080 million to serve new growth. The estimate is for private costs only.

No estimates were prepared for the Plan scenario. Future assessments should examine whether electric power facility costs might be reduced by compact development.

Recommendation

Future planning for statewide energy use should address needs and costs other than those for electric power. It should also determine whether some future-costs, e.g. for co-generation, might be public costs rather than private.

Telecommunications

Summary of Needs

The OSP Trend Assessment estimated capital needs for long-term telecommunications infrastructure to 2010 of \$2,100 million. No estimate was prepared for the Plan scenario. Telecommunications infrastructure is provided almost entirely by investor-owned, publicly regulated utilities.

Assessment Methodologies

Estimates of needs were based on the New Jersey Telecommunications Infrastructure Study, commissioned by the New Jersey Board of Public Utilities, which included four scenarios ranging from existing trends to aggressive, accelerated of telecommunications technology. Cost estimates were limited to those above the baseline scenario and included no rehabilitation of existing facilities. All costs were considered to be regional in scope.

Projected Needs and Costs

The OSP Trend Assessment, based on the "aggressive" scenario of the Telecommunications Infrastructure Study, estimated needs for new growth at \$2,090 million.

No estimate was made of telecommunications needs under the Plan scenario. It appears unlikely that Plan encouragement of more compact growth would significantly alter needs.

Recommendations

Future assessments might include consideration of rehabilitation costs for telecommunications facilities, which at this point are accounted as part of operating and maintenance costs.

Farmland Retention

Summary of Needs

The OSP Trend Assessment estimated needs for farmland- retention based upon Plan policies to enhance the viability of agriculture. The assessment concluded that public capital needs for land acquisition and soil and water conservation facilities will require investment of \$1,500 million by 2010. No estimate was made for the Trend scenario.

Description of Conditions

New Jersey has about 870,000 acres of land in farms, producing cash receipts of \$660 million. Since 1950, land in farms has decreased at an average rate of two percent per year. Currently, a variety of public, private, and quasi-public organizations purchase land or development rights to preserve farmland.

Assessment Methodologies

Farmland retention needs and costs were determined by the OSP Trend Assessment using a series of assumptions concerning the amount, location, and cost of purchase of either development rights or fee simple rights to property. A key assumption was that about 300,000 acres should be retained through public capital investment to the year 2010, with additional purchases thereafter. All purchases were categorized as new growth needs except existing unfunded applications. It was assumed that 40 percent of total costs will be local in nature. Soil and water conservation needs were judged by the State Agriculture Development Committee to require a continuation of present expenditures of \$2.5 million every five years.

Projected Needs and Costs

No estimates were made by the OSP Trend Assessment or the Preliminary Plan assessment for farmland retention costs under the trend scenario. Costs would depend on monies made available and actually used for purchase of easements or fee simple property rights.

The OSP Trend Assessment estimated needs and costs under the Plan scenario as shown on the following table:

Table 7. Assessment of Farmland Retention Costs

(In millions of 1990 dollars)

	Total Needs	Backlog Needs	Rehabilitation	New Growth
Total Needs	\$1,510	440	20	\$1,050
Regional Needs	900	265	10	625
Local Needs	610	175	10	425

The OSP Trend Assessment also calculated costs if purchase of permanent easements in metropolitan, suburban, and fringe areas were reduced in favor of 20-year easements, resulting in a net decrease in costs of \$85 million.

Recommendation

Capital costs for farmland retention in either Trend or Plan scenarios probably will be supplemented by creative land use programs for farmland retention, such transfer of development rights programs and urban growth limits. The balance between compensatory and regulatory mechanisms would be subject to both state and local policy determinations, and therefore subject to change over time. The Plan assessment of costs indicated in Table 7 represents one formulation of that balance. Future assessments must consider current policies to determine capital needs.

HEALTH AND ENVIRONMENT

Wastewater Disposal

Summary of Needs

The OSP Trend Assessment estimated total public costs for wastewater disposal infrastructure at \$7,990 million. By comparison, other projections showed a range of \$6,300 million to \$6,790 million. The estimated cost under the Plan scenario is \$6,312 million, quite close to Trend costs estimated by CUPR. Accounting for differences in basic population projections, the estimates are similar.

Description of Conditions

Approximately 1.5 billion gallons of wastewater are discharged into New Jersey's water resources from 1,400 licensed treatment facilities each day. Domestic treatment systems account for 80 percent of these discharges. Systems are both publicly and privately owned. Currently, 89 sewage treatment plants and 23 sewage collection systems involving 183 municipalities in New Jersey may not connect new customers due to violations of water quality standards.

Assessment Methodologies

Estimates of wastewater disposal infrastructure needs were based on forecasts of population and jobs, estimates of wastewater flows from these sources, and estimates of costs for collection and treatment of estimated flows. Much of the information was compiled by the New Jersey Department of Environmental Protection and Energy for the 1990 update of the needs survey of the United States Environmental Protection Agency. These estimates were supplemented by the Office of State Planning Growth Simulation Model for new local interceptor and collector sewers. The Preliminary Plan Assessment was based on an earlier needs survey of the Department of Environmental Protection and Energy.

Both Trend and Plan assessments were determined by use of the OSP Growth Simulation Model, which included cost estimates and factors[^] The assessment methodology does not include needs and costs for private industrial treatment facilities, or individual on-site disposal systems.

Projected Needs and Costs

Needs and costs for wastewater disposal infrastructure were estimated for the trend scenario by three projections: the OSP Trend Assessment; the CUPR projection supplemented by OSP cost data; and the Preliminary Plan Assessment with costs updated by OSP. Needs and costs for wastewater disposal infrastructure under the Plan scenario were estimated by CUPR.

Table 8. Assessment of Waste Disposal Costs

(In millions of 1990 constant dollars)

	Total Costs	Backlog Needs	Rehabilitation	New Growth
OSP Trend Assessment	\$7,990	\$1,395	\$2,595	\$4,000
CUPR Trend Assessment	6,790	nav	nav	6,790
Preliminary Plan Trend Assessment	6,400	nav	nav	nav
CUPR Plan Assessment	6,313	nav	nav	6,313

nav = Not available

The difference between total costs estimated by OSP and CUPR can be explained almost entirely by the fact that the CUPR assessment is based on population and employment growth projections that are just over half of those used by OSP. The cost estimates, therefore, are quite similar with relation to growth in population and employment. Regarding the OSP Trend Assessment, it is noteworthy that almost half of all wastewater disposal costs arise from backlog and rehabilitation needs rather than new growth.

The CUPR assessment notes that Plan wastewater disposal costs could be reduced by shifting more residential development to areas with existing disposal capacity and by greater clustering of residential development to reduce collection costs.

Recommendation

The individual on-site disposal costs not included in this assessment likely would be lower under the Plan scenario than under the Trend scenario, because more development will be concentrated in areas served by public sewage collection and treatment systems. Future assessments should attempt to identify individual disposal costs under the two scenarios.

Water Supply

Summary of Needs

The OSP Trend Assessment estimates total public costs for water supply to be from \$634 million (for new residential development only) to \$3,450 million for all development, including backlog and rehabilitation. The latter costs account for 90 percent of total costs in the OSP Trends Assessment. The cost of water supply under the Plan scenario is estimated at \$549 million for new residential development only, about fifteen percent less than the CUPR Trend Assessment costs.

Description of Conditions

Water is supplied by more than 500 purveyors, both public and private, ranging from systems for individual subdivisions to huge metropolitan systems. More than half the total water supply is drawn from ground water. A combination of reservoirs, river intakes, and well systems is used.

Assessment Methodologies

For its Trend assessment, OSP used data supplied by the New Jersey Department of Environmental Protection and Energy which was based on estimates for the New Jersey Clean Water Bond Act. The CUPR assessments for Trend and Plan estimated new water demands for indoor residential use based on usage per capita, for outdoor residential use based on housing unit types, and for non-residential use based on usage per employee. Cost estimates were based on costs for water system hookups, varied by type of community and type of housing. No costs were estimated for non-residential needs or for backlog and rehabilitation needs.

None of the estimates included private and individual water supply needs and costs.

Projected Needs and Costs

Needs and costs for water supply under the Trends scenario were estimated by three projections: the OSP assessment projection shown; the CUPR projection; and the Preliminary Plan projection.

Table 9. Assessment of Water Supply Costs

(In millions of 1990 dollars)

	Total Costs	Backlog Needs	Rehabilitation	New Growth
OSP Trend Assessment	\$3,450	\$700	\$2,300	\$450
CUPR Trend Assessment	nav	nav	nav	634
Preliminary Plan Trend Assessment	2,480	nav	nav	NA
CUPR Plan Assessment	549	nav	nav	NA

nav = Not available

The differences in total costs between the three Trend assessments is largely explained by the exclusion of backlog and rehabilitation costs in the CUPR assessment. The CUPR assessment, however, also excluded costs for new non-residential water supply needs, which suggests that the "new growth" cost estimates are relatively far apart.

The CUPR assessment of water supply needs and costs under the Plan scenario concludes that new residential development would require about ten percent less than the Trend estimate. There is no estimate of non-residential needs nor for backlog and rehabilitation needs.

Recommendations

No comprehensive statewide analysis of water supply infrastructure needs in New Jersey currently exists. The results of the needs and cost estimates portrayed here indicate the need for more complete data on water supply needs. This current estimates underscore the usefulness of the Statewide Water Supply Master Plan currently being completed by the New Jersey Department of Environmental Protection and Energy, which should provide a more complete estimate of future needs. Even so, it may be noted that two-thirds of the total costs estimated in the OSP Trend Assessment are for maintaining and improving existing facilities.

The CUPR assessment observes that water infrastructure costs could be reduced further under the Plan scenario by clustering residential development and shifting it to areas where existing systems could serve new development. The assessment, however, does not include

costs for revamping existing water supply systems, which might be needed more if water consumers were concentrated nearer existing systems as called for by the Plan scenario.

Storm Water Management

Summary of Needs

Total public costs for capital investments in storm water management under the Trend scenario is \$1,640 million, according to the OSP Trend Assessment. No assessment of the Plan needs and costs for stormwater management was calculated.

Description of Conditions

Storm water is managed by flood plain management, flood control, and drainage control through construction of dams, channels, storm sewers, catch basins, and regulation of impervious surfaces and land uses. Dozens of national, state, and regional agencies are responsible for various aspects of storm water management.

Assessment Methodologies

Flood control needs were compiled from surveys of the New Jersey Department of Environmental Protection and Energy and from authorized expenditures for construction of federal flood control projects. No calculations were made for other storm water management needs. Needs associated with new development frequently are financed as part of development projects.

Projected Needs and Costs

Needs and costs for public storm water management under the trend scenario were estimated at \$1,640 million by the OSP Trend Assessment. The preliminary plan assessment, based on a survey of counties and municipalities, estimated total costs at \$59 million in 1982.

Storm water management needs and costs were not estimated for the Plan scenario. Based on Plan policies that would encourage somewhat higher densities and more clustered development patterns, the CUPR analysis of water pollution from storm water runoff estimates that runoff may be higher within developed areas but overall less land will be affected. Taken together with Plan policies, that protect stream valleys, flood plains, and other natural drainage ways, those findings suggest that it is probable that the Plan scenario will reduce needs for construction of storm water management facilities.

Recommendations

Data on projected needs and costs for storm water management facilities throughout the state are inadequate for a satisfactory assessment. Current data pertains primarily to major flood control projects and excludes other types of facilities and management systems. Thus the estimate of \$1.6 million under Trend conditions is almost certainly low. Further data will be required to determine more satisfactory estimates of needs and costs.

Shore Protection

Summary of Needs

The OSF Trend Assessment projects needs for long-term capital investments in coastal area protection at \$1,330 million all to maintain or rehabilitate existing shoreline. No estimate was made specifically for the Plan scenario, but capital needs and costs are likely to be very similar to the Trend estimates.

Description of Conditions

New Jersey's Atlantic Ocean shoreline is heavily developed for much of its length. Shoreline protection measures are intended to manage shore erosion and flooding to minimize harm to persons and property where applicable and to maintain existing natural shorelines.

Assessment Methodologies

Shore protection needs are outlined in the 1981 Shore Protection Master Plan compiled by the New Jersey Department of Environmental Protection and Energy in accordance with the federal and state coastal zone management program. The program emphasizes non-structural solutions for shoreline protection, including land acquisition for conservation and a "slow retreat" policy for of builtup shoreline areas that would involve incremented redevelopment and relocation of existing buildings. The master plan identifies priority projects based on measured benefits and costs.

The master plan assumes that new development will not significantly affect protection needs, primarily because much of the shoreline is already developed.

Projected Needs and Costs

Priority projects identified by the master plan will require investment of \$1,330 million, of which \$275 million will be required for backlog needs and \$1,055 for rehabilitation of existing protection measures. The master plan does not project costs for restoring property damage by major storms or for storm evacuation. The preliminary assessment was based on the same source.

No specific projection of needs and costs has been made under the Plan scenario. The Plan scenario should be little different from the Trend scenario in terms of investment in shoreline protection, although the Plan's environmental objectives might encourage a more rapid rate of acquisition for conservation and relocation of existing shoreline development. In this event, long-range costs due to storm damage might be reduced from the Trend scenario.

Recommendations

The accuracy of the cost estimate rests on the key assumptions in the Shore Protection Master Plan that shoreline conditions will be relatively unaffected by new development and that damage by major storms is not included in projected costs.

Regarding the first assumption, according to the Interim State Plan, "existing regulatory mechanisms and loopholes have allowed the incremental degradation of the coastal ecosystem."³ The state plan will encourage better management of the coastal ecosystem but much remains to be done to ensure that existing and new development will respect needs to protect the shoreline. Regarding the second assumption, major storm damage may well occur during the period to 2010 and, if existing developed shoreline areas continue to develop, potential damage will loom larger **over** time.

For those reasons, the cost estimate should be reconsidered and recalculated as more information becomes available about development trends in shoreline areas. In addition, estimates of potential storm damage might be prepared to indicate the magnitude of costs, public and private, that might be incurred from such an event.

Public Recreation Open Space Lands

Summary of Needs

The OSP Trend Assessment estimated needs for capital investments in open space land for public recreation at \$1,295 million. No estimates were prepared by the CUPR impact assessment or the Preliminary Plan Assessment.

Description of Conditions

Almost 1,300 square miles or 17 percent of the state's land is dedicated to permanently accessible open space for outdoor recreation. Almost 90 percent of this land is owned by

³ "Communities of Place: The Interim State Development and Redevelopment Plan for the State of New Jersey." (Trenton: The New Jersey State Planning Commission, July, 1991), p.86.

federal, state, and local agencies. The remainder is owned by private or quasi-public organizations.

Assessment Methodologies

For the Trend scenario, municipal and county needs for recreation land were projected based on standards of acres per 1,000 population contained in the Statewide Conservation and Outdoor Recreation Plan prepared in 1977 by the New Jersey Department of Environmental Protection and Energy. Regional needs for recreation land were projected based on guidelines for percentages of developed and developable areas; the guidelines were contained in the Outdoor Recreation Plan of New Jersey prepared in 1984 by the New Jersey Department of Environmental Protection and Energy. Costs of land were determined by the Office of State Planning for urban, suburban, rural, and federal/state acquisition and applied at the county level.

Backlog needs were determined by using the above standards applied to the amount of existing recreation lands in each jurisdiction. Rehabilitation needs were based on information from the New Jersey Department of Environmental Protection and Energy and from managers of county park systems.

The projection of regional needs was based on total land area and therefore includes some undevelopable land considered unsuitable for recreational open space.

No needs and costs have been estimated for the Plan scenario. In addition, the preliminary needs assessment did not identify needs for open space and recreation lands.

Projected Needs and Costs

The OSP Trend Assessment estimated the following costs for regional, local, and total needs:

Table 10. Projected Costs for Recreation Open Space

(In millions of 1990 dollars)

	Total Needs	Backlog Needs	Rehabilitation	New Growth
Total Costs	\$3,700	\$2,150	\$1,115	\$435
Regional Needs	1,295	705	590	0
Local Needs	2,405	1,445	525	435

No assessment has been made for the Plan scenario. Since needs and costs are based on either population or total land within jurisdictions, the land needs would not change. Costs, however, could change depending on the amount of projected land needs within various types of jurisdictions. If the Plan led to higher needs for recreation land within urban and suburban jurisdictions, which have higher land costs, total land costs would rise from the Trend total.

The Trend projection is based on standards for recreation land that clearly are not met by existing development, since the backlog is almost two-thirds of total identified needs. Detailed planning during and after the cross-acceptance process will determine whether the standards are appropriate or feasible in all jurisdictions.

It is apparent that the need for recreation land associated with new growth is quite small compared to total needs.

Recommendations

The projection of costs is based on assumptions of land costs in various types of jurisdictions that may not be accurate in specific instances and will be subject to change over time. To the extent that standards applied in urban and suburban areas will require major acquisition of land to meet backlog requirements, cost estimates may rise, especially if the Plan scenario encourages more development in those areas.

The guidelines for open space used to determine regional needs are intended to discount undevelopable land as unsuitable for open space needs. Given the amount of such land in scenic stream valleys, wetlands, and other "undevelopable" areas, many of which might be considered valuable as scenic or passive open space, these guidelines may be too stringent.

Solid Waste Management

Summary of Needs

The OSP Trend Assessment projected needs for solid waste management at \$4,500 million by 2010, substantially less than the preliminary plan assessment of \$7,700 million due to changes in policy assumptions regarding recycling and disposal techniques. No assessment has been made under the Plan scenario.

Description of Conditions

Currently, 14.1 million tons of solid waste are generated in New Jersey each year, of which 45 percent is recycled, 35 percent incinerated or dumped in landfills within the state, and

20 percent transported to other states. More than 400 solid waste landfills are due to be closed. Disposal is managed by 22 districts, including the 21 counties and the Hackensack Meadowlands. The Emergency Solid Waste Assessment Task Force Report of 1990 set a goal to recycle 60 percent of solid waste by 1995.

Assessment Methodology

Projections are based on population and current waste generation rates of ten pounds per person per day. The assessment assumes that regional recycling facilities will be established at a cost of \$30,000 per ton of daily design capacity and a five-year replacement cost of 40 percent of initial capital costs. Remaining waste disposal will be accomplished by high-technology processing and landfills for which capital and replacement costs were estimated. Backlog costs for both recycling and disposal were also calculated based on capacities of existing facilities. Costs for landfill closures were estimated in the draft Statewide Landfill Closure Plan.

Needs and Costs

The OSP Trend Assessment estimates the following capital costs for solid waste management for the Trend scenario:

Table 11. Assessment of Solid Waste Management Needs

(In millions of 1990 dollars)

	Total Needs	Backlog Needs	Rehabilitation	New Growth
Total Costs	\$4,520	\$2,280	\$1,715	\$ 525
Recycling Facilities	1,640	345	1,085	1,640
High Technology Disposal	935	110	630	195
Landfill Disposal	175	55	nav	120
Landfill Closure	1,770	1,170	nap	nap

nap = Not applicable
nav = Not available

The Preliminary Plan Assessment estimated solid waste management costs at \$7,700 million (updated to 1990 dollars). Much of the difference between the two estimates can be attributed to policy changes initiated by the Emergency Solid Waste Assessment Task Force that were intended to increase recycling and reduce total solid waste management costs.

No estimate has been made of solid waste management costs under the Plan scenario. It is likely that Plan cost estimates would be similar to Trend estimates, for two reasons. First, new growth accounts for a relatively small proportion of total costs for future management. Second, since the majority of needs are attributable to recycling and high technology disposal facilities and landfill closures, costs would not be significantly affected by geographic shifts in population and employment.

New growth will be responsible for only 12 percent of total capital needs for solid waste management to 2010. The assessment finds that most costs for solid waste management will be associated with establishing new management approaches that sharply reduce needs for landfill disposal. With that shift in policy, costs for landfill closures will be incurred as well. Thus the great majority of capital costs will be directed to improving the present system of solid waste disposal.

Recommendations

The cost estimate for solid waste management depends on successful implementation of an aggressive recycling program throughout New Jersey and effective siting and operation of high technology disposal facilities. Typically these programs are difficult and complex, and their may change from present estimates. These costs should be routinely reassessed as experience is gained.

This assessment assumes that solid waste management costs are public costs. It is possible that privatization of some types of facilities, such as recycling, would substantially reduce the need for nonreimbursed public capital outlays. As recycling becomes more common, and more uses are found for recycled materials, private firms may find profit in owning and operating recycling facilities, a possibility that should be retained as an option in future assessments of solid waste management costs.

PUBLIC SAFETY AND WELFARE

Public Education

Summary of Needs

The OSP Trend Assessment estimates total needs at \$16,410 million, of which 82 percent involves rehabilitation of existing schools. The CUPR and Preliminary Plan assessments do not include backlog and rehabilitation needs, but estimate considerably larger needs for new growth. The CUPR Plan assessment projects new growth needs at \$5,123 million.

Description of Conditions

The public education system in New Jersey consists of over 2,250 public school buildings used for education of kindergarten through high-school students, special education, and the state library system. The New Jersey estimates that 3,000 to 4,000 substandard spaces are used for classrooms.

Assessment Methodologies

For the Trend estimate, the Office of State Planning used several methodologies to determine regional and local projections for backlog, rehabilitation, and new growth needs. Backlog and rehabilitation needs were extrapolated from current five-year budgets for regional facilities and from five-year facilities plans submitted by school districts to the New Jersey Department of Education. New growth needs for regional facilities also were extrapolated from five-year budgets. For local new growth needs, however, it was assumed that five-year plans reflect recurring costs rather than new growth needs. For local new growth needs, therefore, the Office of State Planning projected needs by use of the OSP Growth Simulation Model, which estimates future student populations within districts, accounts for existing school capacities, determines capacity needs, and projects costs based on cost data supplied by the State Department of Education.

The Preliminary Plan Assessment projected needs based on projections of aggregate statewide student enrollment and the average cost of existing capital expenditures per student.

The Impact Assessment projected school facility needs for the-Trend and Plan scenarios through a method similar to OSP's Growth Simulation Model, by projecting public school

students, accounting for existing school capacities, determining capacity needs, and projecting construction and land costs differentiated by grade level and location, (p.234) The Impact Assessment did not separately estimate regional school costs nor identify backlog and rehabilitation costs.

Projected Needs and Costs

The following table summarizes the estimates of the three assessments made for the Trend scenario and the CUPR assessment of the Plan scenario.

Table 12. Assessments of School Facility Costs
(In millions of 1990 dollars)

	Total Costs	Backlog Costs	Rehabilitation	New Growth
OSP Trend Assessment: Total Needs	\$16,410	\$ 40	\$13,375	\$2,995
Regional Needs	60	40	15	5
Local Needs	16,350	nav	13,360	2,990
CUPR Trend Assessment	5,296	nav	nav	5,296
Preliminary Plan Trend Assessment	3,900	nav	nav	3,900
CUPR Plan Assessment	5,123	nav	nav	5,123

nav = Not available

The wide disparities between these projections stem from the major differences in methodologies used. The Preliminary Plan Assessment used statewide statistics that mask variances among individual school districts and may underestimate current capital costs. The CUPR Impact Assessment does not account for backlog and rehabilitation needs, which are by far the largest capital cost in the OSP Assessment But the CUPR assessment is based on population projections that are less than half those of the OSP assessment, yet yields new growth needs almost twice those of OSP.

The CUPR Impact Assessment estimates capital needs for school facilities at \$5,123 million. His close correspondence to Trend estimates is explained by the wide distribution of

available school capacity throughout the state, so that Plan clustering of new growth has relatively little effect on school needs.⁴

Recommendations

The results of projections of school capital needs clearly demonstrate that available data and projection methodologies do not provide a satisfactory comprehensive analysis of needs. Backlog and rehabilitation costs, because of their probable magnitude, require more definitive estimates than was possible with data from five-year school facility plans. The disparity between OSP and CUPR projections of new growth needs requires further study, since both projections were based on similar approaches.

A further question is the relationship between rehabilitation needs and existing school capacities that are projected to receive new growth. If much new growth is directed to schools requiring substantial improvements, then rehabilitation costs may be higher than those projected. Also it not clear whether interjurisdictional cooperation in use of existing school capacities would provide significant savings in capital needs.

These questions should be addressed in future assessments of capital needs.

Higher Education

Summary of Needs

The OSP Trend Assessment projects long-term needs for capital investments in public higher education at about \$3,100 million, mostly for state colleges and universities. Most of the need arises from new growth. No estimate was made for the Plan scenario.

Description of Conditions

The facilities of New Jerseys three public universities, nine public colleges, and 19 county colleges provide less than half the national standard of space per full-time student and many facilities suffer from obsolescence, overuse, and deferred maintenance. None of the 24 independent private institutions is included in this assessment.

⁴ For a fuller explanation of CUPR results for Trend and Plan scenarios, see p.248 in the "Impact Assessment," Volume n.

Assessment Methodologies

Office of State Planning estimates of needs were based on long-range master plans and facilities plans prepared by individual institutions. Some institutions had not prepared plans, however, and planning periods and data definitions in current plans did not correspond to state planning needs. Therefore, projections of backlog and rehabilitation needs were based on the capital renewal replacement category used by the New Jersey Department of Higher Education, projections of state and county colleges were based on averages obtained from submitted plans, and projections of needs to 2010 were extrapolated from shorter-term institutional estimates. State colleges and universities were classified as regional facilities.

Projected Needs and Costs

The estimates of costs for public higher education capital facilities to 2010 for the Trend scenario are shown in the following table.

Table 13. Assessment of Higher Education Costs

(In millions of 1990 dollars)

	Total Needs	Backlog Needs	Rehabilitation	New Growth
Total Needs	\$3,055	\$ 220	\$ 620	\$2,215
Regional Needs	2,765	220	575	1,970
Local Needs	290	nav	45	245

nav = Not available

Neither the CUPR Impact Assessment nor the Preliminary Plan Assessment included costs for higher education.

The CUPR Impact Assessment did not include an estimate of higher education costs under the Plan scenario. It is unlikely, however, that Plan costs would be significantly different from Trend costs unless it can be determined that capital needs vary by institutional and student locations within the state.

Recommendations

The Office of State Planning estimates were based on the best available data but much more complete information is needed to provide a satisfactory projection of needs. It is noteworthy, for example, that two-thirds of total costs are estimated to stem from new growth although current space per pupil and reports of structural conditions would suggest the need for major backlog and rehabilitation investments. OSP should work closely with the State Department of Education to encourage more complete planning by institutions of higher education.

The assessment also did not deal with private higher education institutions which provide many students with viable and sometimes preferable alternatives to public institutions.

Arts

Summary of Needs

Based on a 1987 study of performing arts facilities, long-term capital investment needs to 2010 approximate \$300 million.

Description of Conditions

Ten regional centers for the arts exist in New Jersey besides the performance facilities offered by colleges, universities, schools, and churches.

Assessment Methodologies

A 1987 study commissioned by the New Jersey Department of State examined current and future infrastructure needs for performing arts in the state.

Projected Needs and Costs

The study recommended construction of a new major center in Newark, and construction, upgrading, or renovation for seven existing regional centers. The new major center would cost about \$200 million and other improvements about \$100 million. No difference between Trend and Plan needs is anticipated.

Recommendations

The study examined statewide needs but did not address local needs. The age of the study suggests that both needs and costs may have changed. Future assessments should consider updating and expanding the examination of arts facilities.

REVENUE ANALYSIS

To determine net additional needs for funding infrastructure to 2010, the OSP Trend Assessment undertook a revenue analysis to project probable revenue streams over the next 20 years. Since the mid-1980s, state and local capital outlays have represented approximately ten percent of total general expenditures. Essentially, the assessment assumed that presently authorized funding would occur as planned and that future funding would continue at current levels to the year 2010. The estimate of future state revenues is summarized in Table 14 below.

In addition to projected state revenues, local jurisdictions (counties, municipalities, school districts, and special taxing districts) were projected to fund approximately \$1,500 million per year based on average capital outlays over the period 1985-1990, and private investment in infrastructure was assumed to continue at the estimated level of \$1,000 million per year.⁵

Total projected revenues for the Trend assessment, based on a continuation of present outlays, amounted to \$96.1 billion over the period 1990 to 2010, of which \$14.2 billion was authorized under existing major statewide infrastructure programs.

This level of revenues falls short of Trend needs by \$20 billion.

The fiscal analysis presented in the CUPR Impact Assessment does not identify projected revenues intended for capital outlays.

Existing Revenue Sources

Revenue sources tend to be highly specific to the various types of infrastructure. The following brief summary of funding sources for selected infrastructure types suggests the range of sources currently employed.

No systematic empirical data exists on actual developer investments in infrastructure, although it is almost certain that private contributions via exactions and impact fees have increased greatly in recent years. Fragmental evidence from various jurisdictions suggests that private investment may be as high as 25 percent of total investments in some areas.

**Table 14. Trend Assessment of Projected State Revenues
Allocated to Infrastructure Investment**

(In millions of 1990 dollars)

	TOTAL 1990 - 2010
TRANSPORTATION/COMMERCE	\$37,140
Roads, Bridges and Tunnels	23,950
Public Transportation	11,360
Freight	65
Aviation	20
Other Transportation	1,530
Energy	nav
Farmland Retention	215
HEALTH/ENVIRONMENT	5,510
Wastewater Disposal	1,935
Water Supply	nav
Storm Water Management	1,555
Shore Protection	375
Open Space and Recreation	560
Solid Waste Management	1,085
PUBLIC SAFETY AND WELFARE	925
Public Education (K - 12)	nav
Higher Education	925
Arts	0
PROJECTED PUBLIC REVENUE	43,575

nav = Not available

Transportation. State capital funds for transportation are provided through the Transportation Trust Fund, which collects revenues from the state motor fuel tax, motor vehicle registration fees, and payments from the turnpike, highway, and expressway authorities. A combination of debt and pay-as-you-go funding is used.

The fund has collected an average of \$330 million per year. Beginning in 1992, substantial revenues will be received through the Federal Intermodal Surface Transportation Act, which is authorized to provide \$5,470 million to the state for highway, bridge, and transit improvements over a six-year period.

Farmland Retention. Two \$50 million bond acts were passed in the 1980s to purchase development easements and fee simple rights for property. State policy is to provide 60 percent of funds needed for acquisition, with local funds making up the remainder.

Wastewater Disposal. Since 1972, more than \$2.6 billion in federal funds has been obligated for construction of wastewater treatment works in New Jersey. The state has implemented financing programs to provide grants and low-interest loans through the New Jersey Municipal Wastewater Assistance Program, which collects funds from the federal construction grants program for the Wastewater Treatment Fund and the Wastewater Treatment Trust Fund. Both funds were first capitalized by bond issues in 1985. Neither state or federal funding is available to finance capacity increases to accommodate new growth.

Storm Water Management. Federal and state funds are available for flood control projects but significant funding is not available for drainage control and flood plain management activities.

Shore Protection. Primary funding for maintenance and rehabilitation of shore protection infrastructure is from federal and state sources. Both state and federal funding are expected to decline.

Public Recreation Open Space. The 1989 New Jersey Green Acres Bond Act provided \$80 million for land acquisition and \$140 million for funding assistance to local governments through the New Jersey Green Trust. About 75 percent of local funding is in the form of loans to be repaid, adding \$310 million to the Trust fund. Some funding has also been obtained from the federal Urban Parks and Recreation Recovery Program and the Land and Water Conservation Fund.

Solid Waste Management. A variety of funding sources are used to finance solid waste facilities, including state bonds, waste generation taxes, and various disposal fees. Typically, bond issues to fund facilities are repaid through user fees.

Higher Education. The New Jersey Jobs, Education, and Competitiveness Bond Act of 1988 provided \$350 million for higher education capital facilities. Funds are also available from other bond issuances and from state appropriations.

Potential Sources of Revenue

In general, state and local governments have tended to rely less on property tax revenues and more on various types of user fees to fund capital improvements. Use-based financing attempts to apportion costs equitably among those who cause the need for, or directly benefit from, the services provided. Some financing techniques commonly employed in use-based financing are:

- o User fees, appropriate to types of facilities and services that serve identifiable customers whose use can be measured and priced. Direct fees include tolls, entrance fees, and water use fees.
- o Excise taxes are imposed on specific products, such as cigarettes and hotel rooms, to raise revenues for funding specific improvements. They may be placed in earmarked funds.
- o Impact fees are used to fund facilities for new growth, based on costs of facilities required to support development. They are dedicated to fund specific types of facilities.
- o Special taxing districts provide an organizational mechanism for raising revenues to fund facilities for a specific area. Typically districts issue bonds to raise capital funds, then repay debt through various types of taxes and fees paid by beneficiaries of the facilities.

It is likely that some combination of these types of revenue sources, plus continued use of general revenues raised through property, sales, and income taxes, will be tapped to fund future infrastructure needs in New Jersey.

THE INFRASTRUCTURE INVESTMENT DECISION PROCESS

The assessment of infrastructure needs to 2010 demonstrates that continuing and increasing investments *in* infrastructure will be required to support existing and future development under either the Trend or Plan scenarios. For the Plan scenario, infrastructure needs reflect and are interrelated with other policies and objectives of the State Development and Redevelopment Plan. During Plan implementation, however, specific investments should be determined within the context of a comprehensive decisionmaking process that examines potential timing and cost alternatives and incorporates effective investment management and financial practices.

The following types of analyses illustrate the range of concerns that should be considered in investment decisions.

Opportunities to Reduce Costs

One way to address needs is to find ways to lower demands and costs for facilities. The following possibilities are suggested for consideration.

Examine Timing and Phasing Alternatives

Infrastructure investments are intended to eliminate backlogs, rehabilitate and redevelop existing infrastructure systems as needed, and support future new growth. Some of these needs must be timed to forestall crises in service; many, however, may be scheduled within a general time period rather than in a specific year. In addition, some infrastructure improvements may be phased over time to reduce costs in any one time period. Such timing and phasing decisions may take advantage of economic ebbs and flows-i.e., by reducing expenditures in high-cost periods and increasing investments during economic lulls.

Control Demand for Services

Infrastructure needs are projected according to standards based on historic demands for services. Across the nation, those standards are being reexamined to determine measures, including non-structural solutions, that may reduce total requirements for infrastructure. Traffic demand management and water conservation programs are two examples of measures that increasingly are being adopted to decrease capacity demands on infrastructure systems. Such alternatives should be investigated before investment decisions are made to determine possible reductions in overall infrastructure needs.

Evaluate Standards

Infrastructure standards commonly are based on criteria other than absolute need. "Desirability factors" may inflate costs in ways that obscure the decisionmaking options of public officials. By explicitly correlating projected costs to a range of service levels, possible tradeoffs in service delivery may be evaluated. The National Council on Public Works Improvement recommends that needs assessments "offer choices among alternative capital spending and maintenance strategies, tied to service provided by the investments."⁶

Evaluate Consequences of Postponing or Reducing Investments

The potential costs of postponing investments or eliminating certain projects altogether should be evaluated in the light of current needs and financial- conditions. The cost of dis-investing in identified infrastructure needs may exceed the proposed investments, by adding to future maintenance and backlog costs and to service shortages. On the other hand, a current-year examination of needs and costs might determine that some projects might be put on hold without significant losses in capacity needs or service quality.

Improving Management Effectiveness

Coordinate Infrastructure Improvements

Unless infrastructure investments are coordinated among various systems and with development trends, funds will not be sufficient to provide for future needs. For example, investments in storm drainage, flood control, water supply, wastewater treatment, and shore protection are interrelated-investments in one system affect needs in others. The present emphasis on a more integrated approach to solid waste management, including source reduction, recycling, and disposal, illustrates the possibilities. The New Jersey Transportation Executive Council makes the case:

Indeed, the stakes are high enough and resources scarce enough that the state can no longer afford to have the various transportation agencies pursuing narrow, independent investment strategies. The state's collective investment must now form a larger, strategic, whole....⁷

⁶ National Council on Public Works Improvement, *The Nation's Public Works: Defining the Issues*. A Report to the President and the Congress. (Washington, D.G, September, 1986), p.20.

⁷ Transportation Executive Council, *The Decision-making Framework for Transportation in the 1990s*." (Trenton, New Jersey Department of Transportation, September 26, 1990), p3.

The National Council on Public Works Improvements supports this approach, observing that infrastructure needs assessments should become "catalysts in an ongoing state and local process where the goal is to produce consensus about a whole range of capital repair, maintenance, and new construction priorities."⁸

Recognize Life-Cycle Investment Requirements

A life-cycle approach essentially is an investment and management process that recognizes public facility and service costs for the entire lifetime of an infrastructure system, from initial identification of needs, planning, and financing through development and operation, maintenance, and replacement.

Build Institutional Capacity

State and local agencies frequently are not designed to efficiently manage multi-billion dollar infrastructure systems. Their capacity to plan for, invest in, and manage infrastructure should be broadened through such efforts as:

- o **Clarifying Jurisdictional Responsibilities.** Responsibilities for many infrastructure systems are fragmented among different agencies, thereby complicating effective management and probably increasing investment needs.
- o **Improving Management Information.** Inventories identifying the location, age, condition, use, and performance of existing and planned components of infrastructure systems should be established and maintained in a form readily accessible to decision makers. Linked to demographic and other projections, such inventories would support periodic reassessments of infrastructure needs.
- o **Coordinating Management Practices.** Capital investment, budgeting, and programming practices should be standardized "and coordinated among state and local agencies to reduce waste and improve interagency cooperation.
- o **Providing Continuous Oversight.** Investment decisions should be regularly monitored to determine their adherence to program goals, service and safety standards, and other operating requirements.

⁸ National Council on Public Works Improvement, p.17.

Strategic Financing

Develop Financing Strategies

Infrastructure is financed through a wide variety of financing mechanisms and revenue sources, some quite dependent on the specific type of infrastructure involved. These mechanisms and sources should be regularly reviewed to determine additional opportunities for generating constant revenue flows to underwrite anticipated investments. Financing strategies should determine appropriate balances between dedicated and general funds, debt and nondebt financing, and cost allocations among users, in addition to other concerns.

Coordinate State Capital Budgeting

The State Planning Act calls for increased coordination of infrastructure investments. The infrastructure needs assessment should form the basis for state capital planning and budgeting across all state agencies. This may require legislation to modify the accounting procedures of the Office of Management and Budget.

The Resource Investment and Management System

The management decision process for infrastructure investments in New Jersey will be assisted by a program newly established by the Office of State Planning called The Resource Investment and Management System (TRIMS). The program provides a new intergovernmental process to consider the needs of all levels of government in informing investment decisions for capital and administrative resources. TRIMS consists of three components:

- o Data Management Program. The program will supply a regularly-updated data base including information on such factors as existing and future population, employment, housing, and available developable land;
- o Infrastructure Needs Assessment. The assessment should be periodically reviewed and updated in light of current conditions. The data and methods used for determination of existing conditions and projections of future needs should be improved and expanded.
- o Monitoring and Evaluation Program. The program provides for regular assessments of economic, infrastructure, environmental, quality of life, and intergovernmental conditions as they relate to objectives of the State Development and Redevelopment Plan. The program will also include periodic analyses of resulting issues and recommended adjustments to the Plan and/or its implementation programs.

The process of compiling information and analyzing data for long-term, regular assessments is evolutionary in nature. The premises, assumptions, and projections incorporated in such assessments must be constantly updated and improved to shed light on critical changes and trends in New Jersey's future. To accomplish these objectives, the Resource Investment and Management System has been initiated