

Cross-Sectoral Economic Impact Analysis of Climate Change in New York State

Appendix C: Impacts on Revenues and Expenditures of the State Government of New York

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New York State Energy Research
and Development Authority

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Cross-Sectoral Economic Impact Analysis of Climate Change in New York State

Appendix C: Impacts on Revenues & Expenditures of the State Government of New York

Final Report

Sectoral

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Notice

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Acronyms and Abbreviations

CHIPS	Consolidated Local Street and Highway Improvement Program
Climate Act	Climate Leadership and Community Protection Act
DPS	New York State Department of Public Service
FIMP	Fire Island to Montauk Point
FY	fiscal year
GCM	global climate model
GDP	gross domestic product
GHG	greenhouse gas
LCOE	levelized cost of energy
NY	New York
ORDA	Olympic Regional Development Authority
SLR	sea-level rise
SSP	Shared Socioeconomic Pathway
USD	U.S. dollars

C1 Introduction

To complement the various sector-specific analyses of climate change impacts presented in this report, this appendix examines the corresponding fiscal impacts to New York State (NYS) under different climate change scenarios. This type of fiscal impact analysis is less well developed in the climate impacts literature (see, e.g., Gilmore and St. Claire 2017 and Gilmore et al. 2022) and as such is not included in the main economic analysis but instead presented in this appendix. Analyses such as this, however, are of increasing interest as state and local governments begin to examine the fiscal implications of climate change impacts. For example, the 2022 Massachusetts Climate Change Assessment identified “reduction in state and municipal revenues” as the top priority impact within the Governance sector (Commonwealth of Massachusetts 2022).¹

As noted in the introduction to this report, this analysis is intended to provide insights about the potential direction and magnitude of climate change impacts. None of the estimates presented here should be interpreted as definitive predictions of future impacts at a particular place or time, nor should they be assumed to be official calculations by New York State. Instead, the intention is to produce preliminary estimates of future effects using the best available data and methods, which can then be revisited and updated over time as science and modeling capabilities continue to advance.

New York State’s fiscal health depends both on revenues collected by the State and expenditures made by the State to provide public services. Historically, U.S. states have not demarcated climate expenditures, which has hindered identification of climate-related budget risks (Gilmore et al. 2017). To shed light on these risks in the New York State context, this analysis of the fiscal impacts related to climate change considers potential changes to both revenues and expenditures related to many of the climate hazards characterized in this report.

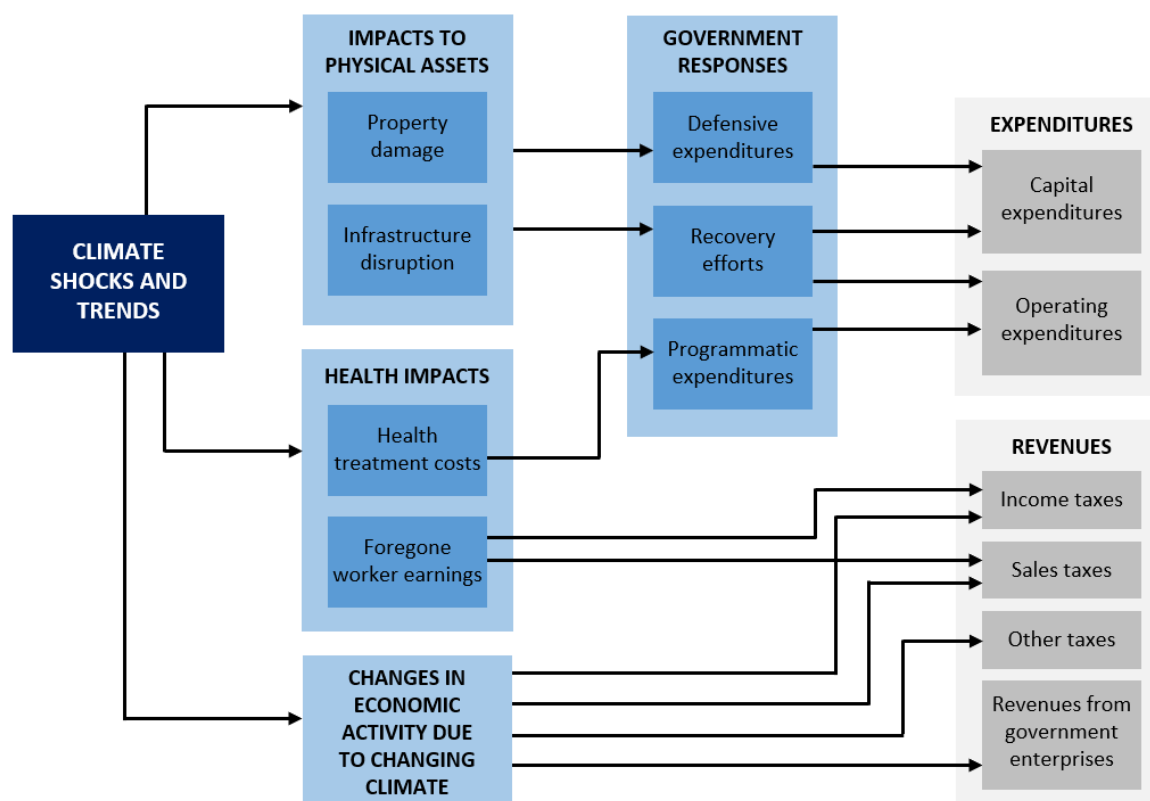
The pathways through which climate change may affect the State’s revenues and expenditures are varied and complex. As shown in Figure C-1, the exposure of physical assets to climate hazards can result in both increased operating expenditures and increased capital spending by State agencies; the former often relates to recovery efforts and the latter to both recovery efforts and—in the context of proactive action—investments in adaptation strategies to reduce the likelihood of impacts and the magnitude of

¹ See in particular Volume 1, pages ES16 and ES17.

such impacts when they occur (Gilmore et al. 2022). Climate stressors may also affect the level of activity in specific sectors of the economy, affecting various sources of government revenue. Additionally, climate-related health impacts can influence both State expenditures and revenues. Government-funded health programs may face rising healthcare costs due to climate effects, while resulting health issues can also reduce workforce participation and productivity.

While expenditures associated with climate effects are likely to strain the budget resources of New York State and other states, public investment in adaptation may ultimately improve the State’s fiscal health. Developing research in this area suggests that adaptation expenditures may reduce climate-related disaster-relief expenditures and indirectly prevent reductions in the gross domestic product (GDP) associated with major storm events and other climate-related stressors, thereby preventing or minimizing reductions in tax revenues (Bachner et al. 2019).

Figure C-1. Climate Change Fiscal Impact Pathways Examined



The analysis presented in this appendix considers climate-related changes in four specific revenue streams for New York State (see Figure C-1): income taxes (both personal and corporate), sales taxes, other taxes (e.g., the general tariff surcharge for electricity delivery), and revenues for government-owned enterprises. For all four revenue streams, this analysis captures direct impacts that arise from the effects of climate change on specific sectors, as well as spillover effects to the broader economy. As an example, direct revenue losses associated with personal income taxes would result from adverse health effects that reduce time at work and taxable wages. These reduced wages from climate-related health effects also result in spillover income tax losses, as the wages lost would not be spent in the NYS economy to support the taxable wages of other workers.

For expenditures, this analysis focuses on any spending by NYS agencies to address climate impacts examined in each of the sectoral analyses in the broader analysis. However, not all sectoral impacts are expected to result in expenditures by NYS agencies.

This analysis was restricted to impacts within New York State, excluding any broader national impacts that indirectly affect NYS revenues or expenditures. Also, although changes in property tax revenues are a local fiscal impact rather than an impact to the State, this analysis includes a qualitative description of the ways in which climate change may affect property tax revenues within the context of relevant sectors.

The sectoral analyses discussed in previous chapters provide estimates of climate change costs, using different measures of impacts as relevant to a given sector. While many of these impacts affect expenditures or revenue for New York State (or other levels of government), many do not. In addition, the analyses for some sectors are qualitative and do not lend themselves to analysis of fiscal impacts. Figure C-1 identifies each sector, specifies the outputs generated for each, and classifies the corresponding type of fiscal impacts captured in this analysis, if any. For the sectors listed in Table C-1, estimated fiscal impacts (where analyzed) include specific expenditure and/or revenue-related impacts for each sector.

Table C-1. Fiscal Impacts by Sector

Results from Chapter 4, Ecosystem Services Sector, were not addressed in the fiscal impact analysis because fully quantified economic impact analyses for that sector are unavailable.

Sector	Impact	Primary Outputs of Impact Analysis	Included in Fiscal Impacts Analysis	Fiscal Impacts Assessed	Fiscal Impacts Assessed and Connection between Sectoral Outputs and Fiscal Impacts
Agriculture	Dairy production	• Lost milk production • Lost dairy revenues	No	N/A	Fiscal impacts are not assessed. Reduced dairy production and the associated loss of income represent important climate-related risks. However, due to federal subsidies to the agricultural sector, changes in farm income and the corresponding income tax impacts are highly uncertain.
	Crop production (corn, soy, etc.)	• Percent changes in crop yields • Changes in revenues from crops	No	N/A	Fiscal impacts are not assessed. Reduced crop production and the associated loss of income represent important climate-related risks. However, due to federal subsidies to the agricultural sector, changes in farm income and the corresponding income tax impacts are highly uncertain.
Buildings	Coastal properties	• Costs of defensive infrastructure construction and beach nourishment • Changes in average annual losses to property owners from storm surge flooding • Losses to property owners from the need to abandon properties due to SLR • Costs to property owners due to elevation construction	Yes	Expenditures	• State expenditures on defensive infrastructure and beach nourishment, to the extent that NYS is expected to finance the construction of such infrastructure. • Fiscal impacts for property losses are not quantitatively assessed because these costs will be borne by property owners. However, these effects are qualitatively addressed.
	Inland flooding	• Annual flood damages	Yes	Expenditures	NYS expenditures for disaster relief to flood victims.

Table C-1. (continued)

Sector	Impact	Primary Outputs of Impact Analysis	Included in Fiscal Impacts Analysis	Fiscal Impacts Assessed	Fiscal Impacts Assessed and Connection between Sectoral Outputs and Fiscal Impacts
Energy	Electricity transmission & distribution	• Damage to transmission and distribution infrastructure	No	N/A	Fiscal impacts are not assessed. Costs estimated in the sectoral analysis will be borne by ratepayers.
	Energy demand and supply	• Changes in electricity delivered to NY customers	Yes	Revenues	• Because electricity supply and delivery sales are taxed in NYS, a change in state revenues is expected. • Change in power sector output will also affect corporate income taxes paid by the industry and total wages paid to industry workers, which will affect personal income tax revenues. • The change in power sector output has spillover effects to other sectors, affecting corporate income taxes, sales taxes, and personal income taxes related to those sectors (and their workers).
Human Health and Safety	Extreme temperature	• Effects on mortality • Effects on morbidity	Yes	Expenditures, Revenues	• Expenditures: Spending by NYS health programs to treat program-eligible individuals suffering from the effects of extreme heat. • Revenues: Reduced personal income tax collections due to lost work time and wages related to morbidity impacts. Also, reduced wages result in less consumer spending and lower sales tax collections. • Fiscal impacts related to mortality effects are not captured. The extreme-temperature analysis does not generate estimates of cumulative population change over time, which are necessary to accurately capture fiscal impacts related to mortality.

Table C-1. (continued)

Sector	Impact	Primary Outputs of Impact Analysis	Included in Fiscal Impacts Analysis	Fiscal Impacts Assessed	Fiscal Impacts Assessed and Connection between Sectoral Outputs and Fiscal Impacts
Human Health and Safety (continued)	Air quality	• Effects on mortality • Effects on morbidity	Yes	Expenditures, Revenues	• Expenditures: Spending by NYS health programs to treat program-eligible individuals who experience morbidities due to degradation of air quality. • Revenues: Reduced personal income tax collections due to lost work time and wages related to morbidity impacts. Also, reduced wages result in less consumer spending and lower sales tax collections. • Fiscal impacts due to mortality effects are not captured. The air quality analysis does not generate estimates of cumulative population change over time, which are necessary to accurately capture fiscal impacts related to mortality.
	Aeroallergens	• Effects on morbidity	Yes	Expenditures, Revenues	• Expenditures: Spending by NYS health programs to treat program-eligible individuals who experience morbidities from changes in aeroallergen exposure. • Revenues: Reduced personal income tax collections due to lost work time and wages related to morbidity impacts. Also, reduced wages result in less consumer spending and lower sales tax collections.
	Vector-borne disease	• Incidence and cost of increased Lyme disease cases • Lost worktime from increased Lyme disease cases	Yes	Expenditures, Revenues	• Expenditures: Spending by NYS health programs to treat program-eligible individuals for Lyme disease. • Revenues: Reduced personal income tax collections due to lost work time and wages related to Lyme disease. Also, reduced wages result in less consumer spending and lower sales tax collections.
	Mental health	• Effects on mortality related to suicides	No	N/A	• Fiscal impacts due to effects on mortality are not assessed. The mental health analysis does not generate estimates of cumulative population change over time, which are necessary to accurately capture fiscal impacts relate to mortality.

Table C-1. (continued)

Sector	Impact	Primary Outputs of Impact Analysis	Included in Fiscal Impacts Analysis	Fiscal Impacts Assessed	Fiscal Impacts Assessed and Connection between Sectoral Outputs and Fiscal Impacts
Society and Economy	Labor	- Hours of labor lost per high-risk worker - Lost wages per year per high-risk worker	Yes	Revenues	Reduced personal income taxes due to reduced wage income. Reduced wages also lead to decreased consumer spending and reduced sales tax revenues.
	Winter recreation	- Change in NYS annual ski season length - Change in NYS annual skiable terrain - Changes in revenue associated with NYS lift ticket sales	Yes	Revenues	- Reduced lift ticket sales will have revenue implications for NYS since the State owns several ski areas. - Estimated change in revenues related to lift ticket sales will have implications for corporate income tax revenues collected by the State. The change in lift ticket sales, however, will not affect sales tax revenues because lift ticket sales are not subject to NYS sales tax. See Tax Bulletin ST-8 (NYS Department of Taxation and Finance 2022). - The reduction in ski industry activity, as measured by reduced lift ticket sales, has spillover effects to other sectors, affecting corporate income taxes, sales taxes, and personal income taxes related to those sectors (and their workers).
	Recreational fishing	- Changes in welfare associated with freshwater fishing trips - Changes in shoreline fishing trips and associated welfare	No	N/A	Fiscal impacts are not assessed. The change in welfare for recreational anglers is not a taxable measure, unlike income or consumption.
	Other outdoor recreation	- Percent changes in recreation participation for all outdoor recreation and a limited set of individual activities - Welfare gains and losses associated with changes in participation	No	N/A	Fiscal impacts are not assessed. The change in welfare for recreation participants is not a taxable measure, unlike income or consumption.

Table C-1. (continued)

Sector	Impact	Primary Outputs of Impact Analysis	Included in Fiscal Impacts Analysis	Fiscal Impacts Assessed	Fiscal Impacts Assessed and Connection between Sectoral Outputs and Fiscal Impacts
Transportation	Roads (temperature & precipitation)	• Maintenance cost impacts and increased capital costs (i.e., more costly asphalt binders) to make roads more resilient. • Delay costs from road damage	Yes	Expenditures	• Road maintenance and construction expenditures, to the extent that the state is expected to contribute to additional road maintenance and construction costs. • Fiscal impacts are not estimated for delays.
	Rail	Maintenance costs and increased capital costs for sensor/signal systems to make rail more resilient. Delay costs due to orders to reduce train speed	No	N/A	Fiscal impacts are not assessed. Most of the rail network is privately owned. In addition, a large share of costs is likely to be borne by passengers and cargo owners.
	Coastal roads (high-tide flooding)	• Costs to government road maintenance entities to elevate and improve roads • Delay costs to road users	No	N/A	• Many of the costs incurred due to traffic delays are realized by private individuals rather than government agencies. • Fiscal impacts due to delays are not assessed.
Water Resources	Water quality	• Willingness to pay to avoid water quality degradation • Lost consumer surplus due to recreational closures resulting from harmful algal blooms	No	N/A	Fiscal impacts are not assessed. The change in welfare is not a taxable measure, unlike income or consumption.

Table C-1. (continued)

Sector	Impact	Primary Outputs of Impact Analysis	Included in Fiscal Impacts Analysis	Fiscal Impacts Assessed	Fiscal Impacts Assessed and Connection between Sectoral Outputs and Fiscal Impacts
Water Resources (continued)	Water supply	Welfare changes from water shortages	No	N/A	Fiscal impacts are not assessed. Welfare changes associated with water shortages are not taxable.
	Urban drainage	Capital costs to increase the urban drainage system capacity due to more severe rainstorm events	Yes	Expenditures	Expenditures for expansion of the urban drainage system capacity, to the extent that the State is expected to contribute to investment in capacity expansion.

C2 State Fiscal Effects by Impact

The following sections detail the methods and results for the assessed fiscal impacts across sectors described in Table C-1. In general, the identified methods rely on data inputs from the climate impacts identified across sectors in the analyses discussed previously in this report (the sectoral analyses), used in conjunction with additional research and analysis to identify how these climate-related impacts translate to fiscal impacts to New York State. In the case of increased expenditures modeled under the sectoral analyses, the estimation of fiscal impacts involves identifying the share of expenditures likely to be borne by the State. In the case of impacts to revenues, the estimation of fiscal impacts involves identifying the relevant tax rates for outputs from the sectoral analyses and calculating impacts accordingly. Each of the following sections discusses the fiscal impacts estimation method relevant to the given sectoral analysis, as well as an overview of results across the available scenarios. In addition, many of the sectoral analyses presented in prior chapters assess costs under reactive response and/or proactive adaptation scenarios. Where such a distinction is made in the sectoral analyses, this analysis of fiscal impacts focuses on costs under the reactive response scenario, as this represents the most likely scenario for most sectors. The one exception is the coastal sector, where fiscal impacts were assessed under the proactive adaptation scenario.

C2.1 Buildings Sector

Climate impacts related to NYS buildings sector will result in state-level fiscal effects related to coastal protection and damage from inland flooding events. For both of these categories, fiscal impacts will be due to changes in NYS expenditures.

C2.1.1 Proactive Adaptation versus Reactive Response: Coastal

As noted in the main text, this methodology makes use of the proactive adaptation scenario investments assessed in Chapter 3, Buildings Sector, as a key input in the estimation of anticipated NYS expenditures. Chapter 3 also assesses new investments under a reactive scenario, which are overall lower than estimates in the proactive scenario. With reactive investments as the key input, the expected NYS expenditures contribution would be significantly lower than those in Table C-3, ranging from \$0.1 million–\$2.1 million (2030s, Shared Socioeconomic Pathway [SSP]2-4.5) to \$3.1–\$58.5.

C2.1.2 Coastal Defensive Measures: State Expenditures

In response to the increased risk of property damage from sea-level rise (SLR) and storm surge, state, local, and federal governments, along with private property owners, are likely to invest in defensive measures to protect coastal properties. These measures may include drainage structures, seawalls, levees, revetments, beach and dune renourishment, elevation of coastal homes, and slope stabilization. To assess the potential fiscal implications of these investments for New York State, this analysis estimates the extent to which the NYS government is likely to shoulder these costs.

For the purposes of this analysis, costs incurred by the State were considered for both hardening of coastal property (e.g., seawalls and levees) and beach nourishment. It is assumed that the costs of hardening New York State's coastline will be incurred by government agencies at the federal, state, and local levels, and that beach nourishment costs will be incurred by government agencies as well as owners of private beaches.² According to Pogue and Lee (1999), 41% of NYS beaches are publicly owned. Based on this figure, we assume that 41% of beach nourishment costs will be borne by the public sector and the remaining 59% will be incurred by private property owners.

To distribute the costs expected to be borne by different levels of government, this analysis examines the costs associated with four Coastal Storm Risk Reduction Projects currently underway or completed in New York State, for which data on the distribution of costs were readily available. Some of these projects were designed as three-way partnerships between federal, state, and local governments, with each entity bearing a different share of the cost depending on the project. Using cost share data from the four defensive infrastructure projects identified in Table C-2, it was estimated that the New York State government contributed a weighted average of 5.6% of the total funding for these projects.³ It was assumed this percentage would also apply to investments in coastal hardening and the publicly funded portion of beach nourishment costs.

² While the U.S. Army Corps of Engineers (the Corps) plays a large role in beach nourishment in coastal areas, state and local governments also play a major role, with local governments passing those costs through to coastal property owners, rather than spreading the costs across an entire community. At the local level, many coastal communities use differential property tax rates to fund beach nourishment. Thus, while local governments may implement beach nourishment projects, many communities pass the costs through to coastal property owners. See Mullin et al. (2019).

³ For additional context, if the simple average of the percentages (shown in Table C-2 for each project) was used rather than the weighted average, the percent funded by the State would be 14.9% instead of 5.6%.

Table C-2. Coastal Fiscal Analysis Data Sources

Source: New York State Department of Environmental Conservation (N.d.), USACE (2023).

Project	Project Cost	Percentage of Costs Incurred by NYS Agencies
South Shore Staten Island Coastal Storm Risk Management Project	\$615,000,000	24.5%
Fire Island to Montauk Point (FIMP)	\$1,700,000,000	0%
Rockaway Beach, Queens, NY, Coastal Storm Risk Management Project	\$627,000,000	0%
Montauk Point Lighthouse Coastal Storm Risk Management Project	\$44,000,000	35%

Given the small sample of projects used to derive this expenditure share, this analysis presents a range, with the calculated 5.6% share of total contributions by the State as a lower bound. The upper bound is considered to be 100% of public-sector costs (i.e., all hardening costs and beach nourishment costs for publicly owned beaches) borne by New York State. Table C-3 applies these lower and upper bound factors to the beach nourishment and protection costs from the sectoral analysis to estimate NYS expenditures on defensive coastal infrastructure under each climate scenario for the 2030s, 2050s, and 2080s time periods, under the proactive adaptation scenario.

The coastal impacts sectoral analysis presented in Chapter 7, Society and Economy Sector, also assesses damage to coastal properties as the effects of climate change increase. This could have implications for local property tax collections, as homeowners see potential reductions in the value of coastal properties in the face of increased risk to property or difficulties with insurance. In New York State, only localities levy property taxes. Accordingly, this impact will only affect municipal tax revenues and is unlikely to influence NYS finances.

Table C-3. Expected Changes in Annual New York State Expenditures on Defensive Infrastructure

Reported in millions of 2021 USD.

Category	Near Century (2030s)		Midcentury (2050s)		Late Century (2080s)	
	SSP2-4.5	SSP5-8.5	SSP2-4.5	SSP5-8.5	SSP2-4.5	SSP5-8.5
Lower-Bound Estimates	\$0.8	\$1.0	\$1.2	\$1.9	\$4.6	\$8.1
Upper-Bound Estimates	\$11.6	\$13.3	\$9.8	\$17.1	\$35.1	\$62.0

C2.1.3 Inland Flooding: State Expenditures

This analysis estimates spending by NYS agencies to provide disaster relief to flood victims under different climate scenarios. As presented in the corresponding sectoral analysis, annual flood damages are expected to increase as climate change intensifies. As these annual damages increase, so will New York State's expenditures to provide aid.

New York State's recent flood relief expenditures from the Capital Program and Financing Plans for fiscal year (FY) 2015–2022 were used to estimate the share of historical damages covered by State funding. Four line items were identified as most relevant to flood relief expenditures during this period, and the expenditure values for each were used to derive an average annual expenditure amount. Based on this annual average and the estimate of historical annual damages from inland flooding presented in Chapter 7, Society and Economy Sector, the proportion of total damages likely to be covered by the State was estimated. Finally, this percentage was applied to the expected annual damages estimated for each climate scenario. Table C-4 describes the data sources in greater detail.

Of the line items included in Table C-4, the Greater Catskill Flood Remediation Program and the Lake Ontario Flood Relief Grant were identified as directly related to inland flooding. However, it is unclear whether the Annual Flood Damage/Rehab and Annual Flood Recovery line items pertain only to inland flooding or if some of the funds were also allocated for rehabilitation and recovery from coastal flooding. Due to this uncertainty, the percentage of damages covered by the State was estimated as a range, with the low end assuming that half of these appropriations were for inland flooding rehabilitation and recovery, and the high end assuming that all of these appropriations are for inland flooding. Based on this approach, the percentage of annual flood damage covered by New York State is estimated to range from 6.1% to 7.8%. By applying these percentages to the flooding damages presented in Chapter 7, Society and Economy Sector, the incremental annual increase in State expenditures on inland flooding was estimated, as summarized in Table C-5, by climate scenario and era.

Table C-4. Inland Flooding Fiscal Analysis Data Sources

Data	Description	Source
Annual Flood Damage/Rehab Appropriations	Different value every year. Analysis uses the average of \$656,000 from FY 2015–2022.	NYS Capital Program and Financing Plan (FY 2015–2022)
Annual Flood Recovery Appropriations	\$15,000,000 is appropriated annually beginning FY 2018.	New York State Capital Program and Financing Plan (FY 2018–2022)
Greater Catskill Flood Remediation Program	Disbursed \$4,900,000 between FY 2015 and 2019. Analysis uses the average annual disbursement of approximately \$1,000,000.	New York State Capital Program and Financing Plan (FY 2015–2019)
Lake Ontario Flood Relief Grant	\$40,000,000 disbursed through a grant in FY 2019.	New York State Capital Program and Financing Plan (FY 2019)
Historical Annual Damages	Statewide annual inland flooding damages for calendar years 1981–2010. The average value is approximately \$465 million.	Inland Flooding Sectoral Analysis in Chapter 7

Table C-5. Expected Changes in Annual New York State Expenditures on Inland Flood Relief

Reported in millions of 2021 USD.

Estimate Level	Near Century (2030s)		Midcentury (2050s)		Late Century (2080s)	
	SSP2-4.5	SSP5-8.5	SSP2-4.5	SSP5-8.5	SSP2-4.5	SSP5-8.5
Lower-Bound Estimates	\$37.6	\$36.1	\$38.4	\$44.2	\$46.2	\$56.0
Upper-Bound Estimates	\$48.0	\$46.1	\$49.0	\$56.4	\$59.0	\$71.5

C2.2 Energy Sector

Fiscal impacts of climate change in the energy sector will be related to changes in State revenues due to changes in electricity use and prices.

C2.2.1 Electricity Sector: State Revenues

As the climate continues to change, the operation of New York State’s electricity system and patterns of electricity demand across the State will evolve. These changes will affect loads served by electric utilities across New York State as well as the price of electricity, both of which will affect electric utilities’ sales revenues. Because the State charges various fees and taxes on electricity sales revenues, changes in electricity sales will have implications for the revenues collected by the State.

This analysis examines these changes in State revenues. Sample utility bills, information in the New York State tax code, and correspondence with staff at the NYS Department of Public Service (DPS) were used to identify the specific revenue streams affected by changes in electricity sales. While certain taxes on electricity supply and delivery will change based on electricity sales, others are set to collect a specific amount and are adjusted periodically to account for any over- or under-collection. Because the reconciliation process would lead to no changes in revenues associated with the latter category, this analysis focuses only on the former. Based on this scope, this analysis considers changes in New York State revenues related to two specific charges on electricity sales:

1. The General Tariff Surcharge (2.0% of sales revenues related to delivery only, not generation)
2. The NYS General Assessment (0.33% of all total sales revenues, inclusive of generation charges)

To estimate change in utility revenues subject to these charges, retail electricity prices (i.e., inclusive of generation, transmission, and distribution) were calculated for each scenario. Because the electricity system modeling described in Chapter 6, Human Health and Safety Sector, estimates the levelized cost of energy (LCOE) rather than retail electricity prices, estimates of retail prices were derived based on the price forecast in the Annual Energy Outlook 2023 (EIA 2023). This forecast allocates prices among generation, transmission, and distribution, and the change in the LCOE for each scenario, which excludes distribution and most transmission costs. These data were also used to estimate a delivery price (rather than the full retail price) for each scenario and year.

Using these prices and the total load for each scenario, total revenues and delivery revenues were estimated for each climate scenario and year. Changes in total revenue and delivery revenue were calculated as the difference between total (or delivery) revenue under a specific climate change scenario and those under the baseline scenario. The change in revenues for each combination of climate scenario, era, and infrastructure scenario was calculated by applying the General Assessment rate to the change in total revenues and the General Tariff Surcharge rate to delivery revenues. As described in Chapter 6, Human Health and Safety, the reference infrastructure scenario reflects policies that are already in place, such as New York State's Clean Energy Standard, and the decarbonization scenario reflects changes in New York State's electricity system to meet the greenhouse gas (GHG) reduction targets set in the Climate Leadership and Community Protection Act (Climate Act). In addition, the moderate climate scenario used for the electricity sector analysis reflects projections from a single GCM for SSP2-4.5, and the severe scenario reflects one GCM's projections for SSP5-8.5 presents the estimated revenue impact to New York State by climate scenario, year, and infrastructure scenario. Table C-6 shows that climate change is expected to lead to increased revenues for New York State under the reference

infrastructure scenario, across both climate scenarios and all time periods. This reflects an increase in electricity system loads under the reference scenario due to increased demand for cooling. Although energy demand for space heating is expected to decline under both climate scenarios, a large portion of space heating is met by natural gas and fuel oil under the reference infrastructure scenario. In contrast, Table C-6 shows a mix of increased and decreased revenues for New York State under the decarbonization infrastructure scenario. Similar to the reference infrastructure scenario, these changes reflect projected changes in load relative to the mild climate scenario described in Chapter 5, Energy Sector. Under the moderate climate change scenario/decarbonization infrastructure scenario, load is projected to increase during the 2030s era but subsequently decline through the rest of the century. Under the severe climate change scenario/decarbonization infrastructure scenario, load is projected to decline somewhat during the 2030s era and then increase through the rest of the century due to increased demand for cooling.

Table C-6. Expected Changes in Annual New York State Revenues Associated with Climate Change

As described in Chapter 5, Energy Sector, the moderate scenario reflects projections from one GCM for SSP2-4.5, and the severe scenario reflects one GCM's projections for SSP5-8.5. The results presented in this table reflect the difference between the climate scenarios shown and the mild climate scenario summarized in Chapter 5. Reported in millions of 2021 USD.

Infrastructure Scenario	Near Century (2030s)		Midcentury (2050s)		Late Century (2080s)	
	SSP2-4.5	SSP5-8.5	SSP2-4.5	SSP5-8.5	SSP2-4.5	SSP5-8.5
Reference Infrastructure Scenario	\$6.5	\$9.6	\$14.4	\$30.8	\$21.2	\$82.3
Decarbonization Infrastructure Scenario	\$1.0	(\$1.1)	(\$4.1)	(\$13.0)	(\$6.9)	\$1.8

C2.3 Human Health and Safety Sector

The fiscal impacts of climate change on the human health and safety sector will affect State government revenues and expenditures.

C2.3.1 Public Health Sector: State Expenditures and Revenues

Health impacts related to climate change, as described in Chapter 9, Water Resources Sector, will affect expenditures by NYS agencies and the revenues collected by the State. State health programs, including

Medicaid, will face increased costs to treat participants impacted by climate-related health issues. Because many of these health effects lead to time away from work and changes in worker income, they also lead to changes in income tax revenues and sales tax revenues collected by New York State.

For healthcare expenditures incurred by the State, this analysis focuses on expenditures to treat vector-borne diseases, new childhood asthma cases resulting from poor air quality, illness related to aeroallergens, and health impairments from extreme temperature. The share of the NYS population covered by State-funded programs was examined to determine the fiscal impact of these maladies. This included assessing costs for Medicaid enrollees and for uninsured individuals whose healthcare expenses are ultimately covered by the State.

For each health effect, the analysis considers how impacts vary across different age groups and how the State covers costs associated with each group. For example, because Medicare, which is a federal program, covers a large share of costs for those aged 65 and older, New York State would likely cover a smaller portion of the costs for this age group than for other age groups. Drawing on information from Table C-7 shows the distribution of cases across three age groups for each health effect: children, non-elderly adults, and the elderly. While definitions of these groups vary slightly across health effects, this analysis defines children as individuals from birth to age 18, adults as those aged 19 to 64, and elderly adults as those aged 65 and older.

Table C-7. Distribution of Health Impacts across Age Groups

Sources: For West Nile virus, CDC (2021); for Lyme disease, CDC (2017); for vibriosis, Bell and Bott (2021); for heat-related respiratory hospital admissions, Lin et al. (2012); and for aeroallergen-associated asthma outcomes, Neumann et al. (2018).

Health Effect	Distribution of Health Impacts across Age Groups	
Respiratory hospital admissions (related to extreme heat) ^a	Children	-7.1%
	Adults	47.1%
	Elderly	60%
Childhood asthma (related to air quality)	Children	100%
	Adults	0%
	Elderly	0%
West Nile virus	Children	4%
	Adults	62.5%
	Elderly	33.5%
Lyme disease	Children	28.1%
	Adults	55.6%
	Elderly	16.3%
Vibriosis	Children	0%
	Adults	50%
	Elderly	50%
Aeroallergens	Children	57%
	Adults	—
	Elderly	43%

^a The negative percentage shown for children for respiratory hospital admissions indicates that the incidence of this health effect is expected to decline for this age group. This result is consistent with the finding in the underlying Lin et al. (2012) study that a decline in hospital admissions is associated with heat exposure for this age group (see Table 2 of that study for details).

To determine the share of medical costs that New York State would shoulder for each age group, the analysis relied on 2017 data published by the Kaiser Family Foundation (2021) on the distribution of New York State's population across insurance types by age group. Based on federal–state cost sharing for the Medicaid program, 50% of costs for those covered by Medicaid are assumed to be borne by the State. For expenses associated with the uninsured, it was assumed that New York State would bear 29.5% of the costs. This figure reflects the State's share of total state and local healthcare spending in New York State in 2017, excluding Medicaid.^{4, 5}

Table C-8 presents the estimated portion of healthcare costs covered by New York State for each age group.

⁴ Data for 2017 were used to be consistent with the insurance coverage information obtained from the Kaiser Family Foundation (2021).

⁵ State healthcare spending data for 2017 obtained from NYS Division of the Budget (2017), and local healthcare spending data for 2017 obtained from U.S. Census Bureau (2017).

Table C-8. Percentage of Healthcare Costs Borne by New York State, by Age Group

Age Group	Percent of Healthcare Costs Covered by NYS
Children (birth to 18)	22.3%
Adults (19 to 64)	14.2%
Elderly (65+)	1.7%

Based on the approach outlined above, Table C-9 presents the incremental increase in healthcare expenditures borne by New York State by climate scenario and era. Across all health effects examined, these costs are expected to increase by approximately \$20 million annually during the 2030s era and \$36 million to \$56 million during the 2080s era.

Table C-9. Expected Changes in Annual Healthcare Expenditures Incurred by New York State Due to Climate Change

Reported in millions of 2021 USD.

Health Effects	Near Century (2030s)		Midcentury (2050s)		Late Century (2080s)	
	SSP2-4.5	SSP5-8.5	SSP2-4.5	SSP5-8.5	SSP2-4.5	SSP5-8.5
Respiratory hospital admissions	\$1.0	\$1.0	\$1.6	\$2.1	\$2.4	\$4.5
Childhood asthma	\$13.7	\$14.0	\$17.5	\$18.7	\$20.6	\$27.1
West Nile virus	\$0.1	\$0.2	\$0.2	\$0.3	\$0.3	\$0.4
Lyme disease	\$5.9	\$6.4	\$9.6	\$13.8	\$14.5	\$27.1
Vibriosis	\$0.2	\$0.2	\$0.2	\$0.2	\$0.2	\$0.3
Aeroallergens	\$0.1	\$0.1	\$0.1	\$0.1	\$0.1	\$0.2
Total	\$20.9	\$21.8	\$29.2	\$35.2	\$38.2	\$59.6

In addition to the healthcare expenditure impacts presented earlier, the health impacts of climate change may also affect NYS revenues, due to reduced income taxes and sales taxes paid by affected populations. The estimated health impacts presented in Chapter 9, Water Resources Sector, reflect the average foregone earnings associated with each health effect. To estimate the corresponding reductions in income and sales tax revenues, the effective income and sales tax rates presented in Table C-11 are applied to income losses. Note that these losses represent the present value of all present and future earnings losses associated with the change in incidence for each health effect. For some health effects, earnings impacts are realized over a period of multiple years. Estimates of NYS revenue impacts for a given year, and therefore, reflect revenue losses realized that year as well as in future years. While this may overstate

revenue impacts for the State, the estimated change in revenue for a given year does not reflect changes in incidence from prior years. For example, the revenue impact for 2050 does not reflect new cases of childhood asthma in 2040 resulting from climate change. This would suggest potential underestimation of revenue impacts in 2040.

Table C-10 presents the estimated change in NYS revenue collections due to health effects associated with climate change. As shown in the table, revenues are expected to decline across both climate scenarios and all time periods, with revenue losses of \$11 million–\$12 million annually during the 2030s and \$20 million–\$32 million annually during the 2080s.

Table C-10. Annual Changes in Annual New York State Income and Sales Tax Revenues Due to Health Effects Associated with Climate Change

Reported in millions of 2021 USD.

Health Effects	Near Century (2030s)		Midcentury (2050s)		Late Century (2080s)	
	SSP2-4.5	SSP5-8.5	SSP2-4.5	SSP5-8.5	SSP2-4.5	SSP5-8.5
Childhood asthma	(\$7.2)	(\$7.4)	(\$9.3)	(\$9.9)	(\$10.9)	(\$14.3)
West Nile virus	(\$0.05)	(\$0.1)	(\$0.1)	(\$0.1)	(\$0.2)	(\$0.3)
Lyme disease	(\$4.2)	(\$4.5)	(\$6.7)	(\$9.6)	(\$10.1)	(\$19.0)
Vibriosis	(\$0.2)	(\$0.2)	(\$0.2)	(\$0.3)	(\$0.4)	(\$0.6)
Aeroallergens	(\$0.0)	(\$0.0)	(\$0.0)	(\$0.0)	(\$0.0)	(\$0.0)
Total	(\$11.7)	(\$12.2)	(\$16.5)	(\$20.2)	(\$22.0)	(\$34.7)

C2.4 Society and Economy Sector

The estimated fiscal impacts on New York State’s society and economy sector include revenue impacts associated with heat-related effects for labor, as well as revenue impacts related to reductions in winter recreation activity.

C2.4.1 Labor: State Revenues

The labor force analysis presented in Chapter 7, Society and Economy Sector, assesses the impact of heat on the amount of time devoted to work among people who work outside or in indoor environments without air conditioning. As work hours from this segment of the labor force decrease due to climate change, particularly increased heat exposure, income earned by these individuals will also decline. This reduction in income would also lead to reductions in state income and sales tax collections.

As an initial step in estimating these reductions in tax revenues, the effective income tax rate and effective sales tax rate was estimated for New York State using data from the New York State Financial Plan for FY 2022–2023 (NYS Division of the Budget 2023a). The effective income tax rate was calculated as estimated personal income tax collections, as specified in the 2022–2023 Financial Plan, divided by total personal income. Because this approach examines income taxes and income in aggregate, it accounts for New York State’s graduated income tax, providing the average (effective) tax rate. The effective sales tax rate was estimated as sales tax collections divided by personal income. In using aggregate data, this approach accounts for:

1. The share of income spent on goods and services subject to consumption and use taxes
2. The fraction of income saved rather than spent

This approach also limits the calculated sales tax rate to taxes collected by the State. Sales taxes paid by consumers in New York State also include local and/or county sales taxes, which are excluded from this analysis. Table C-11 presents the data sources used in more detail and the resulting income and sales tax rates for New York State.

Table C-11. Labor Fiscal Analysis Data Sources

Data	Values	Source
Total projected 2022 personal income	\$1,519 billion	New York State Financial Plan (FY 2022–2023)
Total projected 2022 personal income tax revenues	\$68 billion	New York State Financial Plan (FY 2022–2023)
Total projected 2022 consumption/ use taxes	\$19 billion	New York State Financial Plan (FY 2022–2023)
Effective personal income tax rate	4.5%	Calculated
Effective consumption/use tax rate	1.3%	Calculated
Annual labor force income losses (2030s)	\$157 M (SSP2-4.5) \$175 M (SSP5-8.5)	Analyzed in Chapter 7, Society and Economy
Annual labor force income losses (2050s)	\$369 M (SSP2-4.5) \$555 M (SSP5-8.5)	Analyzed in Chapter 7, Society and Economy
Annual labor force income losses (2080s)	\$776 M (SSP2-4.5) \$2105 M (SSP5-8.5)	Analyzed in Chapter 7, Society and Economy

As detailed in Table C-12, the calculated effective personal income tax rate is 4.5%, based on estimated values for FY 2022–2023. Similarly, the effective consumption and use tax rate is 1.3% (as a share of total personal income). To estimate the income and sales tax losses associated with reduced work time for laborers in weather-exposed industries, effective tax rates are applied to the labor force income losses

presented in Chapter 7, Society and Economy Sector. The estimated annual revenue losses, by climate scenario and era, are shown in Table C-12. These losses are between \$10 million and \$11 million per year in the 2030s but grow to \$48 million to \$131 million per year by the end of the century.

Table C-12. Expected Changes in Annual New York State Revenue Due to Lost Work Time Associated with Increased Outdoor Heat Exposure

Reported in millions of 2021 USD.

NYS Revenue Changes	Near Century (2030s)		Midcentury (2050s)		Late Century (2080s)	
	SSP2-4.5	SSP5-8.5	SSP2-4.5	SSP5-8.5	SSP2-4.5	SSP5-8.5
NYS Income Tax Revenue Losses	(\$7.1)	(\$7.9)	(\$16.5)	(\$24.9)	(\$34.8)	(\$94.4)
NYS Sales Tax Revenue Losses	(\$2.0)	(\$2.2)	(\$4.7)	(\$7.0)	(\$9.8)	(\$26.7)
Total Revenue Change	(\$9.1)	(\$10.1)	(\$21.2)	(\$31.9)	(\$44.7)	(\$121.1)

C2.4.2 Winter Recreation: State Revenue

Rising temperatures and decreasing snowfall associated with climate change are likely to shorten ski seasons in the future, which could reduce visitor volume and lift ticket sales. To the extent this occurs at State-owned ski resorts (e.g., Whiteface, Gore Mountain, and Belleayre), these changes in winter recreation will lead to reductions in revenue for the State. This analysis estimates the reduction in revenues from lift ticket sales at these State-owned ski areas based on:

1. Estimates of statewide reductions in lift ticket sales revenues presented earlier in this report
2. State-owned ski areas' share of total statewide ski resort visits.

To determine the number of visitors attending State-owned ski resorts, data from the Olympic Regional Development Authority (ORDA) Economic Value Report for FY 2016–2017 (ORDA n.d.) were assessed. Data obtained from the Ski Areas of New York Economic Value Analysis for the 2016–2017 season (RCC Associates n.d.) were then compared to the total number of visitors attending all ski resorts across the State (RCC Associates n.d.). Based on this analysis, 18.1% of total winter ski resort visitors attended State-owned resorts during the 2016–2017 season. Applying this percentage to the reduction in downhill skiing lift ticket sales presented in Chapter 7, Society and Economy Sector (rising to 75% and 95% statewide in the late century under SSP2-4.5 and SSP5-8.5, respectively), yields the estimated revenue losses presented in Table C-13 by climate scenario and era.

Table C-13. Expected Changes in Annual New York State Revenue from Winter Recreation Visits

The 2016–2017 season was the most recent for which data were available on total ski resort visits statewide and visits to State-owned ski areas. Reported in millions of 2021 USD.

Impacts	Near Century (2030s)		Midcentury (2050s)		Late Century (2080s)	
	SSP2-4.5	SSP5-8.5	SSP2-4.5	SSP5-8.5	SSP2-4.5	SSP5-8.5
Revenue changes for NYS-owned ski areas	(\$27.4)	(\$27.6)	(\$37.8)	(\$46.2)	(\$45.4)	(\$57.2)

C2.5 Transportation Sector

The fiscal impacts of climate change on New York State’s transportation sector will include expenditure impacts related to construction and maintenance of the State’s road network.

C2.5 1 Roads: State Expenditures

As noted in the main text, this methodology makes use of the reactive response scenario investments as assessed in Chapter 8, Transportation Sector, as a key input in the estimation of anticipated NYS expenditures. Chapter 8 also assesses new investments under a proactive adaptation scenario, which are overall lower than estimates in the reactive scenario. With proactive investments as the key input, the expected New York State expenditures contribution would be significantly lower than those in Table C-15, ranging from \$42.7–\$46.6 million (2030s, SSP2-4.5) to \$21.1 million–\$24.7 million (2080s, SSP2-8.5), compared to the reactive scenario estimates that appear in the table.

The costs of maintaining and constructing roads in New York State will increase as the climate changes due to factors such as higher summer temperatures, increased precipitation, and changes in freeze–thaw patterns. Building on the assessment of these costs presented in Chapter 8, Transportation Sector, the analysis presented here estimates the extent to which these costs are borne by New York State (as opposed to local governments or the federal government). These costs are estimated as the sum of:

1. Climate change costs for roads owned by New York State
2. The State-funded portion of climate change costs for roads owned by local governments

The costs for both State-owned and locally owned roads are derived from cost modeling that supports the roads analysis presented in Chapter 8, Transportation Sector. Therefore, a critical component of the analysis presented in this section is determining the share of costs for local roads that is ultimately borne by the State.

Data on State funding for local road projects from New York State’s FY 2020 Capital Program and Financing Plan, along with data on local government expenditures on NYS roads from the U.S. Census Bureau’s 2020 Annual Survey of State and Local Government Finances, are applied to estimate the State’s share of costs for local roads. Table C-15 identifies two line items in the Capital Program and Financing Plan with combined funding of \$678 million for local road projects. In addition, according to the U.S. Census Bureau data, local governments spent approximately \$6.08 billion on NYS roads in 2020. Based on these two figures, the State was estimated to cover approximately 9.5% of climate change-related costs for locally owned roads. One important uncertainty regarding the data for the line items labeled CHIPS and Marchiselli local highway and bridge programs in Table C-14 is how much of it represents State funding for bridges rather than roads. To address this uncertainty, a low-end estimate of 5.6% was calculated, assuming that half of the Consolidated Local Street and Highway Improvement Program (CHIPS) and Marchiselli funding is allocated to roads.

Table C-14. Roads Fiscal Analysis Data Sources

Sources: NYS Division of Budget (2023b), U.S. Census Bureau (2020).

Data	Description	Amount (Millions of 2021 USD)
CHIPS and Marchiselli Local Highway and Bridge Programs	State funding for highway and bridge projects, maintenance, and repair	\$478
PAVE NY Local Highway Aid Program	State funding for highway maintenance and repair	\$100
Local Government Expenditures—Highways	Funding for highways spent by local governments	\$6,078

To estimate total costs borne by the State for each climate scenario and time period, upper- and lower-bound percentages were applied to cost estimates for locally owned roads. These values were added to the costs for State-owned roads. Focusing on the reactive response scenario, Table C-15 presents these costs for each climate scenario and period.

Table C-15. Expected Changes in Annual New York State Expenditures on Roads Due to Climate Change, Reactive Scenario

Reported in millions of 2021 USD.

Category	Near Century (2030s)		Midcentury (2050s)		Late Century (2080s)	
	SSP2-4.5	SSP5-8.5	SSP2-4.5	SSP5-8.5	SSP2-4.5	SSP5-8.5
Lower-Bound Estimates	\$182.8	\$201.8	\$372.6	\$507.2	\$509.4	\$1,038.1
Upper-Bound Estimates	\$190.3	\$210.3	\$392.6	\$535.9	\$538.5	\$1,101.7

C2.6 Water Resources Sector

Fiscal impacts of climate change in the water resources energy sector will be related to changes in State expenditures associated with necessary upgrades to urban drainage systems, to accommodate an increased severity of extreme precipitation events and prevent severe flooding in urban areas.

C2.6.1 Urban Drainage: State Expenditures

As climate change intensifies, increasingly severe rainstorm events are likely to overwhelm the capacity of existing urban drainage systems across New York State. The urban drainage analysis in Chapter 7, Society and Economy Sector, estimated costs of expanding the capacity of these systems in the 50 largest cities in New York State to manage the additional runoff volumes. For each climate scenario, the analysis considered potential costs associated with changes in three frequency-duration rainfall events: the 10-year, 24-hour storm; the 25-year, 24-hour storm; and the 50-year, 24-hour storm. This section estimates the extent to which New York State is likely to incur costs associated with expanded urban drainage capacity.

Ideally, historical data on State and local funds used for urban drainage system investments would be relied upon to approximate the share of total urban drainage expenditures borne by New York State. However, such data are not readily available. In the absence of these data, expenditures on water supply utility infrastructure serve as a proxy for urban drainage system spending. According to data from the Census Bureau’s 2020 Annual Survey of State and Local Government Finances, expenditures by New York State on water supply infrastructure in 2020 were approximately \$77.9 million, whereas the corresponding figure for the State government and local governments combined was \$3.3 billion (U.S. Census Bureau 2020). Based on these figures, it was estimated that approximately 2.3% of new investments in urban drainage will be borne by New York State. The cost estimates assessed in Chapter 7 range from \$240 million–\$464 million (2030s) and \$340 million–\$719 million (2080s) for 10-year

storms, to \$409 million–\$750 million (2030s) and \$367 million–\$1,055 million (2080s) for 50-year storms. Table C-16 summarizes the share of these costs expected to be borne by New York State by climate scenario, era, and frequency-duration event.

Table C-16. Expected Changes in Annual New York State Expenditures on Urban Drainage Systems

Reported in millions of 2021 USD.

Frequency-Duration Storm Event	Near Century (2030s)		Midcentury (2050s)		Late Century (2080s)	
	SSP2-4.5	SSP5-8.5	SSP2-4.5	SSP5-8.5	SSP2-4.5	SSP5-8.5
10-year, 24-hour storm	\$7.5	\$7.1	\$7.6	\$9.4	\$10.0	\$12.9
25-year, 24-hour storm	\$10.5	\$10.0	\$10.8	\$13.0	\$13.7	\$17.1
50-year, 24-hour storm	\$12.7	\$12.1	\$13.1	\$15.6	\$16.4	\$20.1

C2.7 Spillover Effects: State Revenues

Some direct impacts to the sectors considered in this analysis have additional downstream economic and associated fiscal impacts. These “spillover effects” fall into two categories:

1. **Reduced tax revenues from reductions in worker spending due to productivity losses:** These “induced” tax effects are those associated with reductions in consumption following losses in labor productivity. As consumption decreases, so do downstream collections of personal income tax, sales tax, and corporate profit tax associated with avoided consumption. These impacts are specific to worker productivity losses in the health and labor sectors, as detailed in the sections above. These impacts are incremental to the revenue impacts discussed in those sections, as they are relevant to the downstream impacts of the reductions in labor income, as opposed to the lost income itself. As an example of this effect due to health-related reductions in income associated with climate change, consumer purchases from NYS businesses may decline. This may lead to reductions in income for workers at these businesses, which would reduce income tax and sales tax collections for New York State.

Changes in tax revenues due to impacts on industry output: These output-related tax impacts represent a broader set of economic impacts related to direct changes in industry output for the winter recreation and electricity sectors. Changes in sales and output for both of these sectors have direct, indirect, and induced economic effects. The direct effects include changes in corporate income taxes collected from both industries and changes in personal income tax and sales tax collections associated with changes in worker income in these industries. Indirect impacts will result from changes in output for industries that provide inputs to the winter recreation and electricity sectors. If output for the winter recreation and electricity sectors declines, purchases from industries that serve as suppliers for these industries will also decline, which will affect State revenue related to corporate income taxes, personal income taxes, and

sales taxes for these upstream businesses and their workers. The induced effects associated with output changes in these industries would be conceptually similar to those described above for health effects. When changes in output within these industries impact the disposable income of their workers, it influences how much those workers spend at local businesses. This, in turn, affects the incomes of employees in those businesses and the taxes paid by both the businesses and their workers to the State. Depending on whether output for the winter recreation or electricity sector increases or decreases, the impacts described above could be positive or negative. As described in prior chapters, winter recreation is expected to decline, but electricity output may increase or decrease, depending on the climate scenario and era examined.

Data from the IMPLAN regional input-output model were used to calculate the impacts described above; these data contain sector-specific tax impact multipliers across direct, indirect, and induced economic effects. Tax multipliers were used in conjunction with the relevant changes in labor productivity and output across sectors to determine the associated New York State tax revenue impacts. For the electricity sector, IMPLAN contains multipliers specific to various components of electricity supply and delivery. A weighted average was created to represent a set of tax multipliers, reflecting the mix of transmission and delivery along with the changing proportions of electricity supply sources over time, as modeled in the electricity sector analysis. The resulting tax multipliers vary temporally and account for variations in the effective tax rates and labor intensity of individual components of the power sector (e.g., wind generation, fossil-fuel generation, and distribution). For reductions in winter recreation output, a single static set of tax multipliers was used.

Table C-17 presents estimates of the spillover revenue effects based on the approach outlined above. As indicated in the table, the spillover revenue effects related to the winter recreation, health, and labor productivity sectors are all negative (i.e., revenue losses). However, for the electricity sector, the shift in revenues varies by infrastructure scenario, climate scenario, and era. Under the reference infrastructure scenario, spillover revenue impacts are positive across years and climate scenarios. Under the decarbonization scenario, however, the direction of spillover revenue effects varies by climate scenario and year. The Overall spillover effect across all sectors is largely dominated by effects estimated for the electricity sector, with revenue gains expected under the reference infrastructure scenario and revenue losses expected under the decarbonization scenario.

Table C-17. Spillover Effects: Expected Annual Revenue Shifts Due to Changes in Output

Reported in millions of 2021 USD.

Sector	Near Century (2030s)		Midcentury (2050s)		Late Century (2080s)	
	SSP2-4.5	SSP5-8.5	SSP2-4.5	SSP5-8.5	SSP2-4.5	SSP5-8.5
Winter recreation	(\$9.0)	(\$9.0)	(\$12.4)	(\$15.1)	(\$14.9)	(\$18.7)
Labor productivity	(\$2.8)	(\$3.1)	(\$6.6)	(\$9.9)	(\$13.9)	(\$37.7)
Electricity sector	—	—	—	—	—	—
Reference infrastructure scenario	\$28.3	\$48.2	\$57.7	\$136.2	\$74.2	\$319.1
Decarbonization infrastructure scenario	\$2.9	(\$3.1)	(\$23.0)	(\$53.8)	(\$54.1)	\$11.5
Health	(\$3.6)	(\$3.8)	(\$5.1)	(\$6.3)	(\$6.8)	(\$10.8)
TOTAL						
Total with reference scenario for the electricity sector	\$12.8	\$32.2	\$33.6	\$104.9	\$38.6	\$251.9
Total with decarbonization scenario for the electricity sector	(\$12.5)	(\$19.1)	(\$47.0)	(\$85.1)	(\$89.7)	(\$55.7)

C3 State Fiscal Results Summary

Table C-18 summarizes the various expenditure and revenue effects detailed in the previous sections. The table presents expenditure and revenue effects separately for each sector, climate scenario, and era. Overall, the results show that climate change is expected to adversely affect New York State’s fiscal position, with a net deficit increase of \$300 million–\$400 million annually during the 2030s and a net deficit increase of \$800 million–\$2 billion annually during the 2080s. These effects are largely driven by costs projected to be incurred by New York State to maintain State-owned roads (and local roads maintained with State funds) as the climate changes. The results in the table also show that increased revenues from electricity sales under the electric sector’s reference infrastructure scenario would prevent the projected deficit impact from being even larger.

Figures C-2 and C-3 present these expenditure and revenue results in aggregate, along with the overall net fiscal cost to New York State.

Table C-18. Fiscal Impacts Summary: Annual Changes in Expenditures and Revenues

Reported in millions of 2021 USD. Positive values are increases in expenditures.

Impact	Near Century (2030s)		Midcentury (2050s)		Late Century (2080s)	
	SSP2-4.5	SSP5-8.5	SSP2-4.5	SSP5-8.5	SSP2-4.5	SSP5-8.5
Inland flooding	\$37.6–\$48	\$36.1–\$46.1	\$38.4–\$49	\$44.2–\$56.4	\$46.2–\$59	\$56–\$71.5
Urban drainage, 10-year storm	\$7.5	\$7.1	\$7.6	\$9.4	\$10.0	\$12.9
Urban drainage, 25-year storm	\$10.5	\$10.0	\$10.8	\$13.0	\$13.7	\$17.1
Urban drainage, 50-year storm	\$12.7	\$12.1	\$13.1	\$15.6	\$16.4	\$20.1
Coastal, proactive adaptation	\$0.8–\$11.6	\$1–\$13.3	\$1.2–\$9.8	\$1.9–\$17.1	\$4.6–\$35.1	\$8.1–\$62
Roads, reactive response	\$182.8–\$190.3	\$201.8–\$210.3	\$372.6–\$392.6	\$507.2–\$535.9	\$509.4–\$538.5	\$1038.1–\$1,101.7
Public health ^a	\$20.9	\$21.8	\$29.2	\$35.2	\$38.2	\$59.6
Subtotal: Expenditure impacts^b	\$252.7–\$281.3	\$270.7–\$301.4	\$452.1–\$491.4	\$601.5–\$657.6	\$612.1–\$684.4	\$1,178.9–\$1,311.9

^a Summed across impacts

^b An expenditure subtotal reflects expenditure figures for the 25-year storm for urban drainage.

Table C-19. Fiscal Impacts Summary: Annual Changes in Revenues

Reported in millions of 2021 USD. Negative values are reductions in revenue.

Impact	Near Century (2030s)		Midcentury (2050s)		Late Century (2080s)	
	SSP2-4.5	SSP5-8.5	SSP2-4.5	SSP5-8.5	SSP2-4.5	SSP5-8.5
Labor	(\$10.0)	(\$11.1)	(\$23.1)	(\$34.5)	(\$48.4)	(\$130.8)
Electricity, ^a Reference Infrastructure	\$6.5	\$9.6	\$14.4	\$30.8	\$21.2	\$82.3
Electricity, ^a Decarbonization Infrastructure	\$1.0	(\$1.1)	(\$4.1)	(\$13.0)	(\$6.9)	\$1.8
Public health ^b	(\$11.7)	(\$12.2)	(\$16.5)	(\$20.2)	(\$22.0)	(\$34.7)
Winter recreation	(\$27.4)	(\$27.6)	(\$37.8)	(\$46.2)	(\$45.4)	(\$57.2)
Spillover effect, ^b Reference case for electric	\$28.3	\$48.2	\$57.7	\$136.2	\$74.2	\$319.1
Spillover effect, ^b Decarbonization case for electric	\$2.9	(\$3.1)	(\$23.0)	(\$53.8)	(\$54.1)	\$11.5
Subtotal: Revenue impacts (reference case for electric)	(\$14.4)	\$6.9	(\$5.2)	\$66.0	(\$20.4)	\$178.7
Subtotal: Revenue impacts (decarbonization case for electric)	(\$45.1)	(\$55.1)	(\$104.4)	(\$167.8)	(\$176.8)	(\$209.4)

^a For the electric sector, estimates presented here for SSP2-4.5 reflect the moderate climate scenario relative to the mild (baseline) scenario, and estimates for SSP5-8.5 represent impacts under the severe climate scenario relative to the mild scenario.

^b Summed across impacts.

Table C-20. Fiscal Impacts Summary: Combined Annual Changes in Expenditures and Revenues

Reported in millions of 2021 USD. Negative values are net reductions in fiscal position.

Impact	Near Century (2030s)		Midcentury (2050s)		Late Century (2080s)	
	SSP2-4.5	SSP5-8.5	SSP2-4.5	SSP5-8.5	SSP2-4.5	SSP5-8.5
Net change in NYS fiscal position	(\$267.1)– (\$326.5)	(\$263.8)– (\$356.6)	(\$457.3)– (\$595.7)	(\$535.5)– (\$825.4)	(\$632.5)– (\$861.3)	(\$1,000.2)– (\$1,521.4)

Figure C-2. Expenditures, Revenues, and Net Fiscal Impacts of Climate Change to New York State, SSP2-4.5

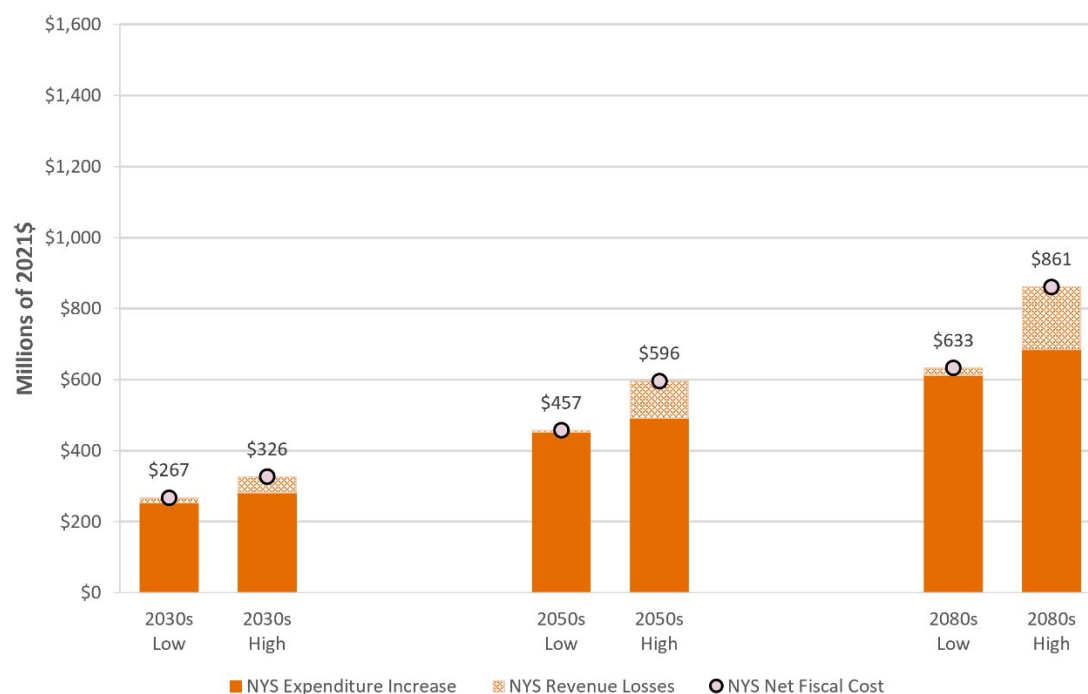
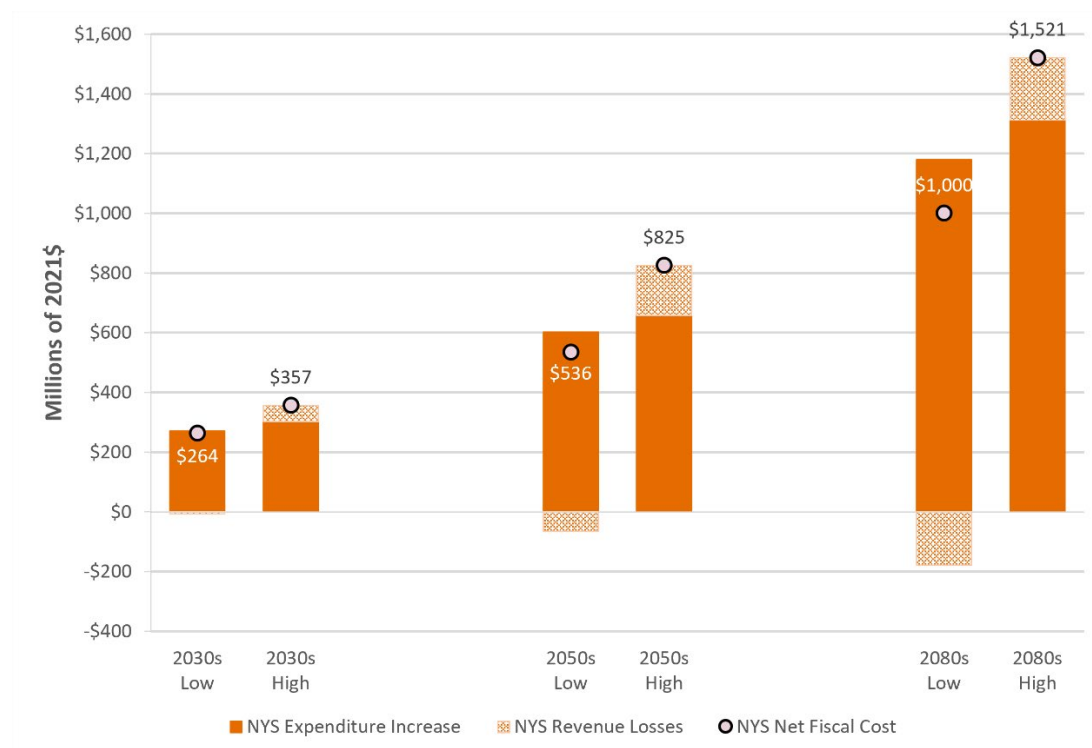


Figure C-3. Expenditures, Revenues, and Net Fiscal Impacts of Climate Change to New York State, SSP5-8.5



C4 Discussion of Local Government Fiscal Effects

In addition to State government revenues and expenditures, it is possible to also examine the fiscal impacts of climate change on local government revenues and expenditures for three sectors: roads, urban drainage, and coastal defensive measures. Based on information on the share of public cost shares born by State versus local governments, these sectors have the largest potential impacts on local governments.

C4.1 Roads

In New York State, road expenditures by local governments are funded in part by contributions from the State government. This analysis of State impacts determined that the State government contributes 5.6%–9.5% of local roads expenditures. The remainder of local road expenditures—90.5%–94.4% of the total—is funded directly by the local governments themselves.

These lower and upper bound percentages were applied to the estimated costs for locally managed roads from the sectoral analysis, which comprise slightly more than half of the total estimated costs for all roads in New York State, focusing on the reactive scenario. The anticipated additional annual costs borne by New York State local governments for roads under different climate scenarios range from approximately \$172 million–\$1,529 million per year.

C4.2 Urban Drainage

As with the analysis of State impacts, the share of future urban drainage expenditures borne by local governments is likely to be proportional to the share reflected in existing spending patterns. For this sector, the share can be estimated using data from the Census Bureau's 2020 Annual Survey of State and Local Government Finances on water supply infrastructure. Local government expenditures on water supply infrastructure in 2020 were around \$3,244 million, while total expenditures on water supply infrastructure by both State and local governments amounted to approximately \$3,322 million. From these data, 97.7% of total urban drainage expenditures are borne by local governments.

Using this percentage for urban drainage infrastructure, using costs estimated by the sectoral analysis, costs specific to New York State local governments for urban drainage infrastructure may range from \$294.1 million to \$837.8 million per year, depending on the time period, climate scenario, and storm type.

C4.3 Coastal Defensive Measures

To estimate local government expenditures on coastal defensive infrastructure, future expenditures could reasonably be estimated to follow current spending patterns. The analysis considers both protection and beach nourishment costs and uses data on costs associated with four Coastal Storm Risk Reduction Projects in New York State. These data indicate that local governments bear between 2.2% and 100% of costs for protection and between 2.2% and 41% of costs for beach nourishment. Using the lower and upper bound percentages of the protection and beach-nourishment costs from the sectoral analysis, and under the reactive scenario, the costs borne by NYS local governments for coastal defensive infrastructure could range from \$0.3 million–\$62 million per year.

Although not quantified in this analysis, damages to coastal properties from climate impacts like SLR could also have implications for local property tax revenues, as permanently flooded property is removed from the property tax base (Shi and Varuzzo 2020). A study of this revenue impact was conducted for Massachusetts, and unfortunately, no parallel study has yet been conducted for New York State. In

addition, as properties become more frequently or permanently flooded, they may lose more or all of their market value (Atreya and Ferreira 2015). Recent studies on a nationwide scale indicate that homes exposed to SLR sell for 7% less than unexposed properties (Bernstein et al. 2019). Since NYS localities levy property taxes, this impact will likely affect local government tax revenues as climate change intensifies. Based on boundary elevation data, it is estimated that 12.7 square miles of land in New York State (containing approximately 1,725 buildings) will be affected by SLR by 2050 (Climate Central 2022).

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