Appendix H: Cost Estimation Methodology

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Cost Estimation Methodology

Introduction

Federal guidelines call for the Regional Plan to be "fiscally constrained." This means that the amount, timing, and eligibility of expected revenues are aligned with the cost to implement the projects and programs in the Regional Plan. This is especially important now, as global events like the COVID-19 pandemic, wars, and supply chain disruptions have had a profound impact on the cost to deliver projects. Construction costs for government projects increased as much as 33% between 2020 and 2024, imposing constraints on public investments. The cost estimates in the Regional Plan incorporate escalation rates over the life of the plan to reflect the anticipated cost to construct, operate, and maintain all of the elements of the plan.

This appendix summarizes our assumptions and how we worked with national experts, Caltrans, Metropolitan Transit System (MTS), North County Transit District (NCTD), and local jurisdictions to develop our cost estimates. The total estimated cost for the 2025 Regional Plan is $125.496 billion in 2024 dollars. Except as specified otherwise, costs in this appendix are in 2024 dollars.

Transportation Projects

Determining the overall cost to implement the Regional Plan required adding up the costs of hundreds of individual projects across a variety of types. These projects are in differing phases of development; various ways of estimating costs were used to make each estimate as accurate as it can be. For example, some advanced projects have already undergone environmental study and design. These project costs could be estimated with greater certainty and are included in the Regional Plan. Many other projects are more conceptual, so estimating costs requires assumptions and the use of standard unit costs. To develop these assumptions and unit costs, we studied similar projects delivered by peer agencies. With this approach, we applied average cost estimates to many projects that have not yet been studied in detail. SANDAG and other agencies will continue studying all of these projects and refine cost estimates throughout project development.

This appendix describes the main assumptions related to each project type. However, it is important to highlight that many of the projects are interrelated. Investing in every part of a multimodal transportation system ensures that each component will be successful.

Complete Corridors

Complete corridors projects take many forms, including the following types:

- Highway projects
    - Managed lanes
    - Connectors and access ramps
    - Interchange and arterial operational improvements
- Highway operations and maintenance
- Transportation technology
- Goods movement
- Rural corridor improvements

Highway Projects

SANDAG worked together with Caltrans to estimate the cost of highway projects. Cost estimates for conceptual projects, those that have not yet been studied in detail, were developed using a standard Caltrans template. This template uses a bottom-up approach, summing individual components to determine a per-mile average cost. Component costs are based on average historical unit costs for Caltrans District 11 projects (comprising both San Diego and Imperial counties) and escalated according to cost increases in recent years. The cost of improvements along general roadway sections is estimated based on the type (at grade, retained, on structure) and the scope (one lane, two lanes, etc.) of such improvements. These costs are broken down by mile for each type of roadway in a given project.

Per-mile cost analyses consider the following components:

- Earthwork
- Pavement structure
- Drainage
- Specialty items (guard rails, retaining walls, sound walls, etc.)
- Environmental (landscaping, irrigation, etc.)
- Traffic items
- Detours
- Roadway mobilization
- Supplemental work (value analysis, dispute resolution, etc.)
- Structures (bridges, overpasses, etc.)
- Right-of-way
- Support costs
- Contingency

The costs developed for each category of linear highway improvements are as follows:

- Managed lanes:
    - Converting general-purpose or high-occupancy vehicle lanes into managed lanes: $13 million per mile
    - Adding managed lanes within existing highway footprint: $48 million per mile

SANDAG estimated the costs for connector and ramp projects based on project-specific costs determined through planning and environmental studies. In cases where project-specific costs were not available, we applied average costs from previously completed projects. Average costs are identified as follows:

- Managed lanes and transit operational improvements: $85 million each

The plan contains several Interchange and arterial operational improvements projects intended to reduce conflicts, especially where multiple highways meet. Costs for these projects were developed through Comprehensive Multimodal Corridor Plans and project-specific studies, and the wide range of costs reflects their complexity and uniqueness.

- Interchange and arterial operational improvements: $78 million to $444 million each

Highway Operations and Maintenance

Maintaining our region's highway system and making sure it operates efficiently and safely every day is vital to personal mobility, the health of our regional economy, and meeting our state mandates for reducing greenhouse gas emissions. We receive funding from the State Highway Operation and Protection Program for highway operations and maintenance. The plan assumes all of the money available from this program is spent, so cost estimates are equal to revenue estimates.

- Highway operations and maintenance costs: $5.3 billion

Transportation Technology

Technology will allow for more efficient use of the transportation system and is critical for traffic management and emergency response. Based on our experience planning and implementing early transportation technology projects, as well as coordinating with peer agencies, we updated the unit costs and quantities of transportation technology elements that we plan to install on roadways throughout the San Diego region. These standard costs per mile were applied to each corridor and assumed to be implemented alongside other improvements such as managed lanes.

- Transportation technology costs: $4.4 billion

Goods Movement

The smooth transport of goods into and out of our region—and the delivery of goods to cities and communities within it—fuels our economy and contributes to a high standard of living. SANDAG developed goods movement projects and cost estimates from project-specific planning studies conducted by or in collaboration with partner agencies, including Caltrans, the Port of San Diego, and the San Diego County Regional Airport Authority. These goods movement projects focus on our region's roadways, railroads, seaports, airports, land ports of entry, and pipelines—as well as the technology to help the goods movement network function efficiently. Many goods movement projects share infrastructure and benefits with other parts of the transportation network. For example, some of the roadways used to move goods are targeted for improvements under the Complete Corridors initiative. Rail projects benefitting goods movement are targeted under transit. Also, the systems and software included in transportation system management projects benefit goods movement. Therefore, many of the costs for projects that support goods movement are reflected outside this section.

The goods movement project list also contains unconstrained projects, many of which we anticipate will be implemented by partner agencies. Neither the costs nor the revenues that would be used for unconstrained projects are included in the revenue constrained plan.

- Goods movement costs: $2.0 billion

Rural Projects

Improvement costs for rural travel corridors were based on costs developed for the 2021 Intraregional Tribal Transportation Study and amended 2021 Regional Plan and appropriately escalated.

- Rural corridor improvements costs: $2.9 billion

Reconnecting Communities

The costs for the Reconnecting Communities Program were determined based on anticipated revenue available for this purpose. We anticipate that the program will primarily be used to improve connections across highway infrastructure.

- Reconnecting Communities costs: $100 million
- Complete Corridors subtotal: $24.8 billion

Table H.1: Estimated Complete Corridors Costs (in millions of 2024 dollars)

Complete Corridors Category	FY 2025-2035	FY 2036-2050	Cost (millions of $2024)
Managed Lanes	$3,248	$1,573	$4,821
Managed Lane Connectors	$1,241	$2,840	$4,081
Interchange and Arterial Operational Improvements	$656	$220	$876
DARs and Transit Operational Improvement	$340	$0	$340
Transportation Technology	$2,615	$1,744	$4,359
Rural Corridor Improvements	$1,349	$1,560	$2,909
Highway Operations and Maintenance	$1,470	$3,854	$5,324
Goods Movement	$351	$1,625	$1,977
Reconnecting Communities	$0	$100	$100
Total	**$11,271**	**$13,517**	**$24,787**

Note: Totals may not add up due to rounding

Active Transportation

The active transportation network in the Regional Plan goes beyond biking and represents a significant increase in investment in safety and mobility for people who travel the region by foot, bike, scooter, transit, or other means outside of a car. The planned and prioritized projects reflect best available standards and guidelines by adhering to an average grid size of one-quarter mile to ensure the most important bicycle connections between regional centers, schools, residential, employment, and transit stops are provided with the appropriate network density for users. Projects are sited along at least one of the following: Regional Bike Plan corridors, Early Action Program, local jurisdiction plans, Comprehensive Multimodal Corridor Plans, Safety Focus Network, Systemic Safety Network, and existing bikeways.

While the Regional Plan maintains the adopted and approved networks listed above, the costs for each of the projects have been reassessed to reflect the level of investment to make the network comfortable for users of all ages and abilities. Current and historic SANDAG bikeway projects were used to provide a basis for cost because the level of investment is anticipated to be similar. We assume that a portion of the active transportation network will be constructed by local jurisdictions using funds allocated through the Local Streets and Roads program. As a result, 20% of the cost of non-Early Action Program projects are assumed to be funded through Local Streets and Roads improvements.

- Active transportation subtotal: $5.4 billion

Table H.2: Estimated Active Transportation Costs (in millions of 2024 dollars)

	FY 2025-2035	FY 2036-2050	Cost (millions of $2024)
Active Transportation	$1,079	$4,272	$5,351

Transit

Transit projects in the Regional Plan represent a variety of modes, including regional rail, light rail/Trolley, Rapid bus, and improvements to existing transit services.

Capital Cost Database

We used the Federal Transit Administration (FTA) Capital Cost Database to estimate costs for the proposed construction of regional rail, streetcar, and Rapid bus routes. This tool is used to develop order-of-magnitude cost estimates for conceptual transit projects, and cost models are adjusted to account for regional variances depending on the location of the project. The unit costs generated from the Capital Cost Database were compared with known actual project costs for the San Diego region, and they were adjusted to reflect the complexity of the project. Capital transit projects cost estimates cover construction (both station and segment per mile), right-of-way acquisition, and other non-construction "soft" costs such as environmental review, planning, and design.

The following are some examples of transit unit costs:

- Guideway and track elements (at grade, below grade, or above grade)
- Stations, stops, terminals, and intermodals
- Support/maintenance facilities, yards, shops, and administration buildings
- Sitework and special conditions
- Systems

Regional Rail

SANDAG manages numerous rail transit projects along the Los Angeles-San Diego-San Luis Obispo Rail Corridor (LOSSAN Corridor) and SPRINTER Corridor in coordination with NCTD. We used the cost estimates for projects along these corridors that were developed in project-specific studies.

Light Rail and Streetcar

Improvements to the region's light rail Trolley network include grade separations and double/triple-tracking to facilitate more frequent and reliable service. Cost estimates for these projects were based on assumptions developed for the 2021 Regional Plan and escalated appropriately.

New light rail projects were based on unit costs developed from the FTA Capital Cost Database and completed SANDAG capital projects. New streetcar projects were based on unit costs developed through the FTA Capital Cost Database.

Inline Stations

The 2025 Regional Plan includes multiple inline stations that will serve buses running in the median lanes of freeways. Costs for inline stations were estimated by considering project-specific costs from the existing SR 15 Mid-City Bus Rapid Transit Stations, resulting in an average cost per station that escalates to $45 million in 2024 dollars. Inline stations will be for transit use only, and the costs of inline stations are divided among the transit routes that will take advantage of the inline stations. For example, an inline station serving two transit routes added $22.5 million in capital costs to each route.

Rapids

Depending on the route, Rapid projects are located on a mix of arterial roads and freeways. In general, Arterial Rapids travel entirely on arterial roads, Mixed Rapids travel on a relatively even mix of arterial roads and freeways, and Freeway Rapids travel mostly on freeways. The standard costs for Arterial and Mixed Rapids were based on costs that were developed starting with the FTA Capital Cost Database and adjusted based on SANDAG's Next Gen Rapid Conceptual Planning Study unit costs. This results in a per-mile unit cost on arterial roads of $12.9 million, and this is split among routes that use the same road segments. Mixed Rapids and Freeway Rapids are anticipated to use managed lanes within freeways for portions of their routes, with those freeway portion per mile infrastructure costs included under Complete Corridors.

Transit Amenities

Amenities at transit stations can improve travel experience by allowing riders to check the arrival times of connecting services, use the restroom, or simply sit and wait in safe, shaded, landscaped areas. While new stations built as part of transit projects may include some of these amenities, many of the transit stations forecast to handle the greatest ridership through 2050 already exist. We assume that many of these stations will need investment to construct and maintain amenities beyond what currently exists. We considered reference projects in Seattle and Columbus to install and maintain restrooms and Wi-Fi, respectively, to determine appropriate assumptions that reflect local conditions and current year dollars for ongoing costs such as labor, equipment, supplies, maintenance, and subscription fees. Based on these projects, we determined that installing these amenities at all existing and planned light rail and regional rail stations in the plan would cost about $69 million in 2024 dollars through 2050. Estimated investments in amenities comprise 2% of all transit capital spending.

- Capital costs: $41.9 billion

Transit Vehicles

The number of transit vehicles needed to provide planned service levels was determined according to activity-based travel model outputs. Per-vehicle costs were estimated using recent purchase prices from MTS, NCTD, and other transit agencies and multiplied by the number of vehicles needed to obtain total transit vehicle costs.

- Vehicle costs: $4.3 billion

Transit operating costs were estimated based on the number of transit operating hours and the operating costs per hour for each mode of transit. The operating hours were estimated using outputs from the activity-based travel model, while operating costs were estimated using current data from MTS and NCTD. Operations costs also include specialized transportation services, totaling 5% of fixed-route operating costs. These services include Americans with Disabilities Act complementary paratransit provided by MTS and NCTD and other services made available to providers in the region through competitive programs.

- Operations costs: $23.7 billion

Fare subsidies that would reduce the cost of transit fares are also included in the plan. These subsidies, starting in year 2029, would reduce fares for either all riders or various groups like seniors, youth, and riders with low incomes.

- Fare subsidy costs: $2.4 billion
- Transit subtotal: $73.9 billion

Table H.3: Estimated Transit Costs (in millions of 2024 dollars)

Transit Category	FY 2025-2035	FY 2036-2050	Cost (millions of $2024)
Transit Capital	$14,966	$26,982	$41,948
Transit Vehicles	$1,058	$3,235	$4,293
Transit Operations	$6,907	$16,834	$23,741
Transit Fare Subsidies	$346	$2,092	$2,438
Microtransit Operations	$151	$449	$600
Transit Amenities	$247	$617	$863
Total	**$23,675**	**$50,209**	**$73,883**

Note: Totals may not add up due to rounding

Flexible Fleets

Flexible Fleets can include micromobility, ridehail, rideshare, carshare, neighborhood electric vehicles (NEVs), microtransit, and more. We assume that many of these services will be available, operating by charging fees to users and without public subsidy.

NEV and microtransit are assumed to require ongoing operational assistance from public agencies. The average operating costs for these services, including costs associated with purchasing or leasing vehicles, vehicle maintenance, and software licensing fees, were based on the on-call agreements that SANDAG negotiated with private operators for service in the San Diego region. We assumed operating characteristics for the NEV and microtransit service, including the number of estimated fleet vehicles in each service area, anticipated service hours, and service days. Related capital costs for infrastructure, storage space, and vehicles necessary to support NEVs and microtransit were built into the hourly cost of service and not listed separately.

- Flexible Fleet subtotal: $201 million

Table H.4: Estimated Flexible Fleets Costs (in millions of 2024 dollars)

	FY 2025-2035	FY 2036-2050	Cost (millions of $2024)
Flexible Fleets: NEV Operations	$55	$146	$201

Transportation System Management

Cost estimates for transportation system management components include data hub development, development of applications to support operations. The data hub provides a digital platform that can analyze transportation data in real time to make transportation more integrated, efficient, and responsive to people's immediate needs. Data hub and application development estimates include software and licensing, cloud storage, data warehousing, and acquiring third party data. Ongoing costs were estimated on an annual basis. Cost estimates also included major and minor system refreshes.

- Transportation System Management subtotal: $237 million

Table H.5: Estimated Transportation System Management Costs (in millions of 2024 dollars)

	FY 2025-2035	FY 2036-2050	Cost (millions of $2024)
Transportation System Management	$109	$128	$237

Local Streets and Roads

In addition to projects that serve the region, the Regional Plan assumes regional funding to support local projects. These projects are identified by local jurisdictions and cannot be identified specifically in the plan. However, we assume that the local jurisdictions spend all of the money available for this purpose. Therefore, cost estimates for local streets and roads projects would be equal to revenue estimates. As noted in the Complete Corridors section above, a portion of the active transportation improvements in the plan are anticipated to be implemented by local jurisdictions using local streets and roads funding. Therefore, those costs are subtracted from local streets and roads costs.

- Local streets and roads subtotal: $14.8 billion

Table H.6: Estimated Local Streets and Roads Costs (in millions of 2024 dollars)

	FY 2025-2035	FY 2036-2050	Cost (millions of $2024)
Local Streets and Roads	$6,616	$8,174	$14,789

Debt Service

To ensure that the San Diego region meets state and federal requirements, the 2025 Regional Plan has projects phased throughout the 25-year planning horizon. Financing projects based on anticipated future revenues enables SANDAG to deliver projects and benefits to the region more quickly than it could using only pay-as-you-go funding. As a result, the costs for servicing debt are included.

- Debt service subtotal: $2.6 billion

Table H.7: Estimated Debt Service Costs (in millions of 2024 dollars)

	FY 2025-2035	FY 2036-2050	Cost (millions of $2024)
Debt Service	$1,380	$1,216	$2,596

Policies and Programs

The policies and programs in the Regional Plan help us meet our requirements for air quality and reducing greenhouse gas emissions, in addition to other goals. These strategies maximize the benefits of the region's investments in transportation infrastructure. The cost estimates for Policies and Programs were based on historical program costs, outputs from off-model calculators, and funding eligibility. Agency implementation decisions will influence how much money is ultimately spent.

Vision Zero

Costs for this program are equal to anticipated revenues made available to SANDAG via the federal Safe Streets and Roads for All grant program or a similar program. Funds are anticipated to be used for a combination of capital and planning grants and community-based education programs.

Climate

This program has several components, including climate action plan monitoring and implementation and climate adaptation and resilience. Cost estimates reflect the anticipated funding that will be available to SANDAG and partner agencies for these purposes.

We also assume that some zero-emission charging infrastructure would be delivered and maintained through a public-private partnership model at transit centers or other important destinations. This would ensure availability of publicly accessible fast chargers and level 2 chargers at key locations across the region. Unit costs for this equipment, installation, and refreshes were developed using industry benchmarks.

Housing and Land Use

This category includes land use and housing programs that are made available to local jurisdictions. The cost is equal to the anticipated revenue available from the state and through TransNet.

Habitat

This program includes efforts toward achieving the regional habitat conservation vision described in **Appendix Q: Regional Habitat Conservation Vision**. The cost was determined by considering the revenues anticipated to be available from local, state, and federal sources. Additional resources to meet habitat conservation needs beyond the funding we expect to be available are included in the unconstrained network.

Transportation Demand Management (TDM)/Telework

This program includes e-bike incentives, commuter services, bike program lockers, vanpool program, marketing, outreach, and education. We assumed a level of investment consistent with previous plans.

Program Administration

Effectively managing so many anticipated programs will require additional resources. For the Regional Plan, we have separated out the anticipated administrative costs from each program and assumed cost efficiency for jointly administering multiple programs.

Table H.8 provides the breakdown of the program assumptions.

- Programs and Policies subtotal: $3.6 billion

Table H.8: Estimated Program Costs (in millions of 2024 dollars)

Supporting Policies and Programs	FY 2025-2035	FY 2036-2050	Cost (millions of $2024)
Housing and Land Use	$193	$256	$449
Climate	$293	$588	$882
Transportation Demand Management	$108	$147	$255
Vision Zero	$99	$158	$258
Fix it First	N/A*	N/A*	N/A*
Transportation Technology and Operational Improvements	N/A*	N/A*	N/A*
Pricing Strategies	N/A*	N/A*	N/A*
Digital Infrastructure	N/A*	N/A*	N/A*
Program Administration	$111	$156	$267
Habitat	$614	$886	$1,500
Health	N/A*	N/A*	N/A*
Total	**$1,418**	**$2,193**	**$3,611**

*Note: *The costs to implement these policies and programs are included in projects listed in **Appendix A: Transportation Projects, Programs, Policies, and Phasing** in Tables A.1 through A.6. Revenues that result from pricing strategies are described in **Appendix I: Funding and Revenues**.*

Cost Escalation

The 2025 Regional Plan includes many projects, programs, and policies to be delivered over a 25-year planning horizon. We spread project costs over multiple years to reflect typical development schedules, and we spread program and policy costs to match anticipated investment levels over time. The Plan reports costs in year-of-expenditure (YOE) dollars so that we understand how much each element will cost when we plan to deliver it. Comparing projected costs and revenues helps us determine an appropriate way of phasing our investments and is necessary to satisfy state and federal requirements for a fiscally constrained financial plan.

To get costs in YOE dollars, we accounted for how costs grow over time using a two-step process. In some cases, we developed cost estimates several years ago. As a result, the first step involved bringing costs developed in previous years to current year dollars ($2024). This first step used several widely accepted cost indices, depending on the project type and how recently cost estimates were developed. Indices included the Engineering News Record Los Angeles Construction Cost Index (ENR), the Producer Price Index for Government Construction (PPI), and the Consumer Price Index for San Diego (CPI). We also used the Caltrans-specific construction cost index for cost estimates developed by Caltrans on projects such as managed lanes, connectors, and Direct Access Ramps.

The second step of getting costs into YOE dollars required forecasts for how much costs will grow in future years. Depending on the cost components for each project, program, and policy, future cost growth is based on either ENR or CPI. For most construction projects, cost escalation is based on the 10-year "trimmed" average of annual cost increase reflected in ENR (that is, the average does not include the lowest and highest year of annual change because of the dramatic fluctuations experienced in years following the pandemic). For all other costs, we escalated costs based on the CPI that underpins our forecasted TransNet revenues and that was approved by the Board of Directors in February 2024.

Table H.9 and Table H.10 summarize the transportation expenditures included in the investment plan in both 2024 and escalated (YOE) dollars, respectively.

Table H.9: Major Estimated Expenditures by Mode (in millions of 2024 dollars)

Expenditure Category	FY 2025-2035	FY 2036-2050	Cost (millions of $2024)
Complete Corridors	$11,271	$13,517	$24,787
Active Transportation	$1,079	$4,272	$5,351
Transit	$23,675	$50,209	$73,883
Flexible Fleets	$55	$146	$201
Transportation System Management	$109	$128	$237
Supporting Policies and Programs	$1,418	$2,193	$3,611
Local Projects	$6,543	$8,287	$14,830
Debt Service	$1,380	$1,216	$2,596
Total	**$45,529**	**$79,967**	**$125,496**

Note: Totals may not add up due to rounding

Table H.10: Major Estimated Expenditures by Mode (in millions of escalated dollars)

Expenditure Category	FY 2025-2035	FY 2036-2050	Cost (millions of YOE$)
Complete Corridors	$14,156	$24,234	$38,390
Active Transportation	$1,473	$8,824	$10,297
Transit	$29,360	$83,846	$113,206
Flexible Fleets	$64	$226	$290
Transportation System Management	$120	$188	$308
Supporting Policies and Programs	$1,645	$3,401	$5,045
Local Projects	$7,544	$12,860	$20,404
Debt Service	$1,591	$1,888	$3,479
Total	**$55,953**	**$135,466**	**$191,419**

Note: Totals may not add up due to rounding