



SFMTA

Infrastructure Lifecycle Management

Balancing capital and operating resources to achieve State of Good Repair

The Goal of Lifecycle Management

SFMTA delivers services through the procurement, maintenance, and operation of a range of transportation infrastructure, such as vehicles, track, facilities, signs, and signals. Ensuring our varied infrastructure performs as expected throughout its useful life requires balancing capital and operating investments. Upfront capital investments are needed to build or procure infrastructure and ongoing operating investments are needed to maintain infrastructure for the entirety of its useful life. Making timely and strategic investment decisions depends on understanding the desired level of performance, estimated useful life, asset condition, operating cost, risk of failure, and replacement cost of a given piece of infrastructure.

Relationship between Operating and Capital Investments

Capital resources enable the agency to build new infrastructure or replace existing infrastructure at the end of its lifecycle.

Operating resources are the people and materials that ensure infrastructure is operating and maintained at a specified level of performance.

Capital and operating resources have an interdependent relationship and each impact the effectiveness of our transportation infrastructure.

Investments in our infrastructure are not an either/or choice between capital and operating resources, but a choice informed by the specific needs of the SFMTA. It's a balance between both types of investment.

FOR CONSIDERATION:

As the SFMTA commits to building projects, it is important that the SFMTA Board consider the whole lifecycle costs associated with new infrastructure and not just the one-time capital project costs.

This means adequate resources for the ongoing staffing and maintenance resources over the estimated useful life of new projects.

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Infrastructure Lifecycle

- Capital and operating resources are utilized at different times over the lifecycle of an asset.
- Investment decisions should be made based on agency strategic goals and comprehensive data; improved data collection is key to making the correct choices at each stage of the lifecycle
- Different staff are involved at different stages of the asset lifecycle. Almost everyone in the Agency plays a role in the asset lifecycle.
- Choices made across lifecycle depend on the needs of the agency, performance of the asset, and resource availability



Planning: The start of the lifecycle determines if there is a need for the infrastructure. Once a need is identified, planning includes basic design, coordination of operation and maintenance requirements, and long-term financial planning.

Acquisition: In this phase, the infrastructure is procured, installed, built and/or delivered. Keeping this phase on time and on budget is critical, otherwise there will be a negative impact on the rest of the lifecycle.

Operation and Maintenance: In this phase, the infrastructure is in use providing service to the public. To ensure the highest level of services throughout the lifecycle requires regular maintenance, scheduled capital upgrades, and continuous condition tracking. This is the longest phase of the lifecycle and often the most labor and resource intensive.

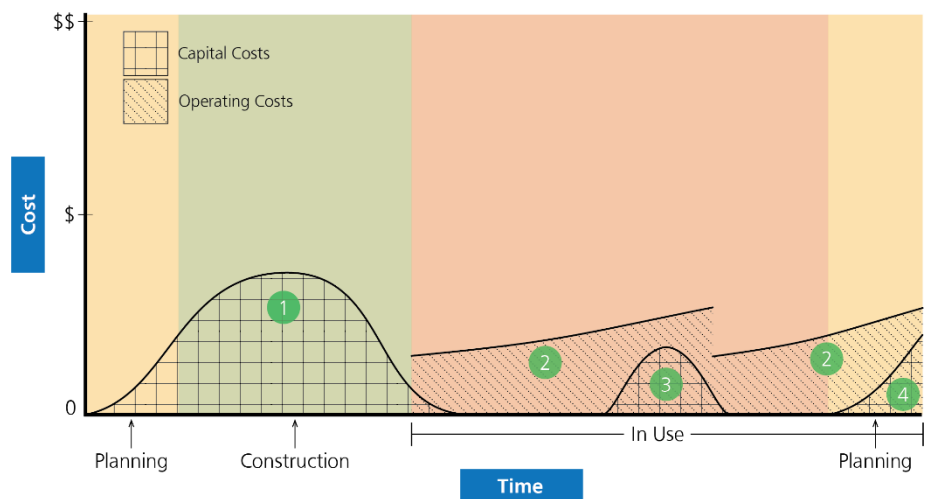
Disposal: This final phase comes at the end of the infrastructure's useful life. It should be scheduled but can also occur when maintenance and operations costs become too high.

Visualizing the Benefits of Lifecycle Management

- Utilizing proper lifecycle management extends assets' useful lives and avoids reactive maintenance. These practices can significantly reduce operating and capital costs in the long-term, keeping resources available for other services and projects.
- Lifecycle planning avoids peaks and valleys of unexpected breakdowns and unpredictable emergency replacements. Smooth operating and capital costs make financial forecasting predictable and consistent. This allows for more effective financial planning and efficient use of future funding resources.
- Proper lifecycle management minimizes service outages and maintains safe, continuous use for the public. This builds trust and goodwill and encourages the use of transit, biking, and walking as modes of transportation, aligning with the SFMTA and city's values.
- Full lifecycle management includes procuring replacement assets before the end of the useful life of the existing asset. This keeps all assets in a state of good repair and avoids emergency replacements allowing time to properly plan for the lifecycle of the replacement asset.

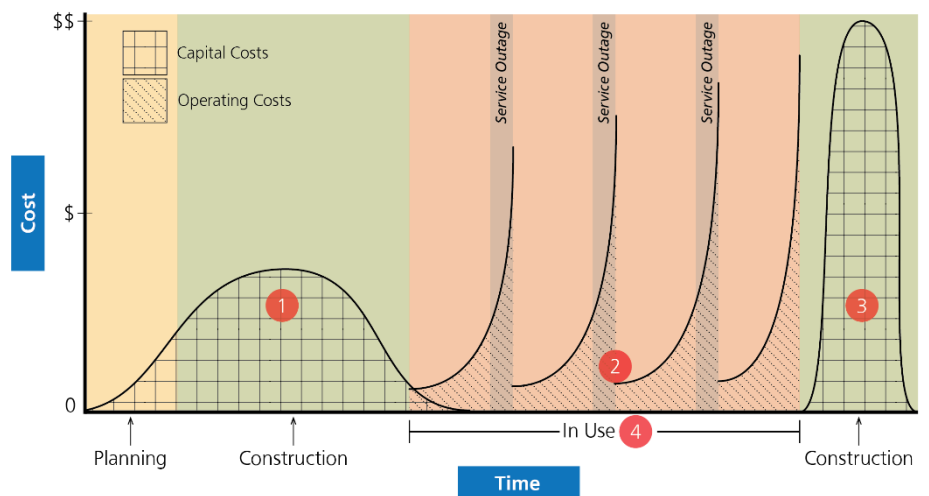
- 1 Total capital costs incurred through planning, acquisition and construction of the asset.
- 2 Preventative operating and maintenance costs (O&M). Costs steadily increase over time as assets age and are in good use.
- 3 Capital repair or rehabilitation cost. Ensures asset meet its anticipated useful life, in some cases extend it. Reduces O&M costs by fixing common wear and tear issues.
- 4 Asset retirement and replacement costs

Operating with a Lifecycle Management Approach



- 1 Total capital costs incurred through planning, acquisition and construction of the asset
- 2 Reactive operating and maintenance costs (O&M). Underinvestment in preventative maintenance at the on set, result in costly response to failure and outages.
- 3 No planned capital repair or rehabilitation mean the asset is only reinvested in when it becomes too expensive to operate or breaks down completely.
- 4 Despite additional O&M spending, the asset will not stay in use as long. Shortening the asset's useful life incurs capital costs more frequently and depletes available capital funds more quickly.

Operating without a Lifecycle Management Approach

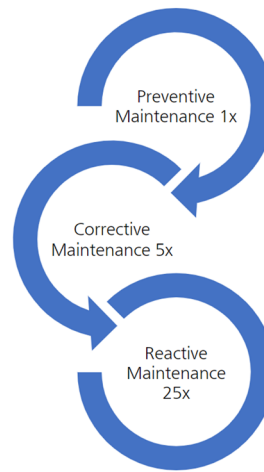


Stop Playing Catchup – A Costly Cycle

Far too often, the SFMTA is forced to play catchup, responding to an infrastructure failure after it has occurred. In the Asset Management world, playing catchup is known as reactive maintenance. Reactive maintenance is costly because it redirects staff efforts away from their daily duties, necessitates expedited procurement of materials and contractors, and creates unplanned service disruptions. These costs negatively impact riders in the near-term by interrupting their trips and in the long-term by unnecessarily taxing resources.

Implementing Asset Management practices will shift our agency from a reactive to a proactive approach to maintenance. Proactive or preventative maintenance reduces the risk of infrastructure failure through frequent inspections. The resulting data empowers staff to plan and budget for repairs and procurements, to communicate service disruptions in advance, and to plan service substitutions that minimize impacts to our riders. While preventative maintenance requires higher operating investments, it is a more efficient approach in the long-term.

Reactive to Preventative Modes



Preventative Maintenance (regularly scheduled inspections and minor maintenance activities) costs less than **Corrective Maintenance** (repairs to defects or failures of minor components) and significantly less than **Reactive Maintenance** (responding after something has already failed or broken).

Moving from a reactive to preventative mode of operating requires increasing operating investments, but the agency benefits from reduced risk of failure, ability to plan service around planned maintenance, and predictable costs.

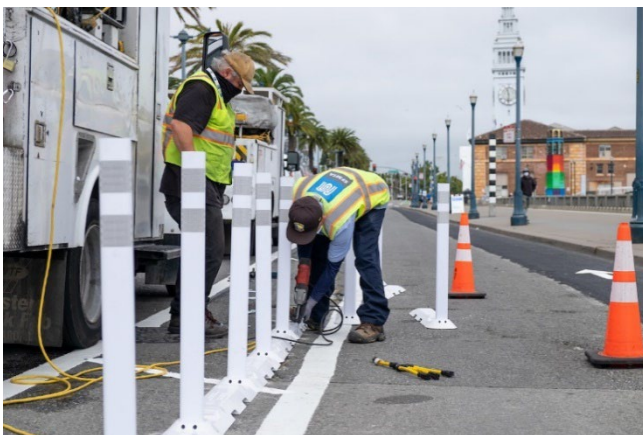
Supporting Vision Zero with Lifecycle Management

The Vision Zero Strategy calls for a full build-out of the High Injury Network by 2024. This build-out includes capital investments for upgrading existing street infrastructure and adding new improvements. Planning for the long-term operating costs of maintaining the built-out infrastructure is vital to the success of the Vision Zero strategy.

Signs, street markings, signals, posts and bollards sustain damage from several sources, including the elements and vandalism, limiting their effectiveness in keeping pedestrians and cyclists safe. This lifesaving infrastructure wears quickly and requires regular inspection and replacement. To meet our Vision Zero goals, SFMTA staff must plan operating costs and staffing levels proportional to the increased street infrastructure called for in the Vision Zero strategy.

Supporting Transit Service with Lifecycle Management

By focusing on key elements of the subway infrastructure, conducting up-to-date assessments of condition, and sequencing infrastructure replacement and maintenance cycles, the SFMTA can prioritize the upgrade work necessary to meet the needs of San Francisco while minimizing impacts to customer experience. This shift to planned and preventative replacement cycles reduce the risk of critical failures in the future and allows the SFMTA to supplement service around planned work and provide advance notice to our customers. This also smooths out the capital and operating resources required to maintain the system in a state of good repair.



Key Takeaways

- The nature of transportation planning requires thinking two to three budget cycles ahead.
- Operating costs represent **65-80% of total lifecycle costs**.
- Ongoing operating resources must be enough to cover new infrastructure projects.
- **Preventative maintenance costs 25 times less** than responding to emergencies when infrastructure fails.
- Clearly established levels of service or performance targets are required before determining what investments are needed for the SFMTA's transportation infrastructure.

When approving new capital infrastructure projects, decision makers must consider:

- the ongoing operating costs of new infrastructure
- staffing levels required to maintain and operate new infrastructure
- the expected infrastructure performance
- Asset mid and end of life plan.

Staffing and Organization management is key to maintaining institutional knowledge and organizational resiliency. These resources are not easily replaced or substituted through one-time efforts.

