



INFRASTRUCTURE

The Long-Term Cost of Short-Term Thinking in Infrastructure

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Infrastructure investment decisions often focus on upfront capital spending, but does this approach deliver the best long-term value for infrastructure owners? By focusing exclusively on initial costs, asset owners may unintentionally overlook a multi-billion-dollar opportunity hidden in plain sight—one with profound implications for capital productivity, borrowing costs, and long-term enterprise resilience.

When developing infrastructure assets—from airports and roads to power plants and data centers—owners should be aware that construction costs typically account for only a small part of overall costs. Expenses related to operations, maintenance, renewals, and eventual disposal often dwarf the initial cost and are essential to defining the asset’s long-term economics, or total cost of ownership (TCO). Yet owners commonly struggle to fully account for these life-cycle expenses. Budget pressures, political realities, and fragmented data across stakeholders can reinforce an unduly short-term focus.

In our extensive experience supporting infrastructure projects across industries, we have consistently observed that life-cycle cost reductions of 20% to 40% are possible when planners embed TCO best practices. Given that major infrastructure programs often range from \$5 billion to \$20 billion, capturing even the lower end of these savings represents billions of dollars in capital freed for redeployment across an owner’s wider portfolio, enhancing capital productivity and improving long-term financial performance. (See “The Bottom-Line Benefits of a Life-Cycle Approach to Infrastructure Costs.”) But the benefits aren’t just financial: integrating TCO best practices also results in more reliable assets, reduced risk exposure, greater resilience to unforeseen events, and significantly improved customer service.

— The Bottom-Line Benefits of a Life-Cycle Approach to Infrastructure

The financial benefits of adopting TCO into infrastructure projects are not theoretical. They are real and measurable, as seen in some of our recent work:

- A high-speed rail operator adopted a TCO approach to fleet procurement and reduced lifetime costs by approximately \$5 billion, strategically optimizing maintenance, energy consumption, and renewal schedules.
- A major engineering firm collaborated closely with its suppliers, employing a TCO lens to jointly reengineer key equipment specifications. The result: cost reductions of up to 20% through more intelligent design, optimized sourcing, and streamlined logistics.
- A global mining company developed a standardized TCO management framework across \$800 million worth of capital equipment procurement and realized \$100 million in annual savings through vendor consolidation, smarter procurement contracts, and improved asset management practices.

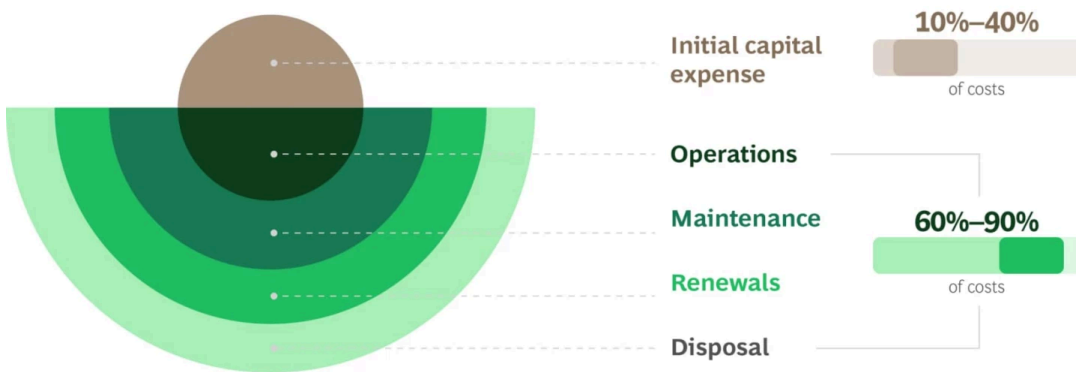
- Public infrastructure planners integrated utility corridors, joint planning, and combined maintenance activities, thereby reducing life-cycle costs by 18% to 33% through improved coordination and economies of scale.

In addition, emerging digital tools now enable infrastructure leaders to practically integrate existing life-cycle data and accurately forecast long-term costs. By leveraging these tools—within a comprehensive organizational management approach—decision makers gain clearer visibility into future spending, thereby reducing costly surprises, strengthening budget accuracy, and improving overall financial predictability and capital productivity.

Why Has the Industry Missed This Opportunity?

If the value of a life-cycle-focused approach is so substantial, why has the industry historically overlooked it? For decades, asset owners have narrowly defined infrastructure project success in terms of adherence to budgets and schedules, despite persistent challenges such as cost overruns and delays. Under pressure to deliver projects, owners naturally prioritize the most visible, measurable factor: upfront capital spending. Unfortunately, capital expenditures typically account for just 10% to 40% of an asset's lifetime costs; the other 60% to 90% of costs reside in long-term operations, maintenance, and other expenses. (See the exhibit.)

Initial Construction Costs Tend to Be a Relatively Small Part of Overall Lifetime Costs for an Infrastructure Asset



Source: BCG analysis.

Procurement practices reinforce this traditional mindset. Long-established tendering processes favor the lowest upfront bid, implicitly sidelining consideration of long-term operational costs. Political and organizational incentives further reinforce a short-term orientation: elected officials and executive leaders tend to focus on immediate deliverables rather than on less visible and less politically rewarding long-term performance metrics.

In this environment, infrastructure teams expend significant resources on navigating project delivery pressures—obtaining funding approvals, managing scope creep, and juggling stakeholder expectations—leaving them with limited attention or capacity to devote to developing strategies for long-term life-cycle management. This short-term orientation not only creates hidden liabilities but also undermines capital productivity and enterprise resilience across entire infrastructure portfolios.

Examples of the negative results of this short-term focus are visible across sectors:

- Airports, built with modest upfront budgets, face major deferred-maintenance crises as terminals and runways deteriorate sooner than anticipated.
- Utilities confront heightened reliability risks and increased maintenance burdens decades after construction of infrastructure components.
- Real estate developments become excessively expensive to operate due to inefficient systems and escalating energy costs.
- Data centers eventually incur significantly higher lifetime operating and energy expenses.
- Transportation assets such as roads, bridges, and railways age faster than expected as the visible effects of early compromises on construction quality emerge, requiring expensive renewal programs earlier than anticipated.

In short, the industry's fixation on near-term capital efficiency creates hidden liabilities and deferred challenges—precisely the conditions that TCO thinking is designed to avoid.

Factoring TCO into the Cost Calculus for Infrastructure Assets

Integrating TCO into the cost considerations for an infrastructure project entails embedding life-cycle thinking across each of the six phases of the asset's life.

Initial Planning. In the planning phase, teams should set a clear baseline for life-cycle costs. That effort should include establishing rough order-of-magnitude baseline cost estimates of direct and indirect expenses—not just construction, but also operations and maintenance, energy, financing, and disposal—reviewed and validated by technical and financial experts.

Design. During the design phase, teams evaluate design alternatives, weighing factors such as redundancy, modularity, maintainability, and ease of future replacement to assess their potential impact on reliability, costs, and overall asset lifespans.

A critical element in both the initial planning and design phases is cross-functional collaboration to understand the full life-cycle cost picture and use those insights to guide decision making. For example, having operations and maintenance teams review designs and provide feedback early on can ensure that projects meet practical operational requirements, leading to better decisions and lower long-term costs.

Procurement and Construction. In procurement and construction, infrastructure buyers assess life-cycle tradeoffs. In many cases, a TCO analysis can justify higher upfront investments if they will significantly extend the asset's lifespan, reduce downtime and unplanned maintenance, and improve the reliability of critical assets.

The three earliest stages of the process—planning, design, and procurement and construction—provide the greatest opportunities for positive impact. Choices made here set the trajectory for decades of operational efficiency and cost-effectiveness. Taking into account even imperfect or incomplete life-cycle data that is available at the outset can yield far better decisions than ignoring future costs altogether.

Asset Operations. Throughout the asset's operational phase, infrastructure owners base effective TCO management on proactive, data-driven maintenance strategies:

- Establishing clearly defined preventive maintenance schedules, tasks, and frequencies ensures optimal everyday performance.
- Building in realistic allowances for unplanned maintenance, informed by historical data or industry benchmarks, promotes accurate budgeting.
- Using digital tools such as building information management, digital twins, and AI-driven analytics can aid in properly predicting maintenance needs, optimizing asset performance, and proactively managing life-cycle expenses. These tools are essential enablers, and today's integrated systems can compile life-cycle data into unified sources of truth to inform planning.

Major Renewals and Overhauls. By leveraging life-cycle data and predictive analytics, teams can proactively schedule major asset renewals to optimize their timing and scope. This strategic approach reduces unexpected downtime and life-cycle costs, significantly improves asset reliability, and strengthens long-term financial resilience.

End-of-Life Disposal and Asset Renewal. At the end of an asset's life cycle, proactive renewal and disposal planning ensures efficiency, sustainability, and cost-effectiveness.

Crucially, TCO is designed not to replace established financial frameworks like net present value but to complement them. TCO enriches financial analyses, ensuring that future cash flow projections realistically account for long-term operating and maintenance costs and providing a comprehensive and accurate view of asset value across the asset's entire lifespan.

A Practical Roadmap for Infrastructure Leaders

To embed the approaches outlined above, infrastructure leaders need to develop organizational capabilities across four critical areas:

- **People.** Equip teams with training, clear responsibilities, and incentives to ensure that life-cycle cost considerations become core criteria in decision making across all levels of the organization.
- **Processes.** Institutionalize structured life-cycle reviews, formal gate-checks, and ongoing portfolio reassessments from initial planning through design, procurement, construction, and long-term operations. Most important, codify the cross-functional collaboration necessary to

develop a clear picture of TCO early on—for example, by including operations and maintenance teams in early decision making about planning and design.

- **Technology and Tools.** Deploy advanced analytics platforms—such as digital twins, predictive modeling, and AI-driven scenario planning—that empower decision makers to visualize and optimize long-term cost outcomes in real time.
- **Data.** Establish a single, integrated, digitized source of life-cycle cost data. This unified data repository enables asset owners to analyze scenarios, model future costs, and optimize assets on an ongoing basis across their entire life cycle.

In addition to these four components, TCO management requires a fundamental shift in mindset and decision making across several key areas that serve as a foundation for execution:

- **Long-Term Value.** Rather than seeking to minimize costs during procurement and contracting, owners can shift their focus to long-term value, leading to significant positive financial impact. This impact extends to improvements in credit ratings and financing costs for both public and private entities as they obtain a clearer view of their TCO and enhance their ability to manage it.
- **Cross-Functional Coordination.** Instead of depending on a single leader to make all decisions, teams with expertise across design, procurement, construction, and asset operations come together to optimize life-cycle costs.
- **Risk Management.** Armed with richer data and insights before construction starts, owners can proactively manage risks to long-term performance and resilience.
- **Portfolio-Level Management.** Taking a portfolio-level view enables owners to allocate capital strategically, directing resources toward projects that offer the highest life-cycle returns, optimizing risk exposure across multiple assets, and strengthening financial stewardship.

Together, these shifts in planning and management practices build the foundation for asset owners to integrate TCO into their culture and operations, ensuring that infrastructure decisions made today translate into sustained long-term value tomorrow.

Now Is the Time to Act

Every year that the industry delays switching to a TCO approach further entrenches inefficiencies, risk exposure, and higher life-cycle costs. Conversely, acting now to embed robust life-cycle

management practices, supported by digital data platforms, can fundamentally transform infrastructure management.

For infrastructure leaders, adopting a TCO mindset is therefore not just about enhancing long-term operations. It's about creating a strategic lever for improving capital productivity, strengthening financial resilience, and reducing long-term risk exposure across the entire infrastructure portfolio. For these reasons, it should be top of mind across the C-suite.

Infrastructure is built to serve generations. It's time that planning, construction, and management practices embody that same long-term vision.

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