THIRD WAY

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Parting the Red (Tape) Sea: Delivering Infrastructure Projects on Time and on Budget is Key to Hitting Climate Goals

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Topline

Getting to zero carbon in the United States will require a major, national investment in new energy, transportation, and building infrastructure, as well as in rebuilding our existing, decaying infrastructure. The U.S. used to do this very well – delivering ambitious public works projects on time and on budget. Those days, however, are currently far in the rearview mirror. To reach our climate goals, we're going to need to get back to building big things at their original price tag and getting them done on schedule. To accomplish this, Third Way identified seven roadblocks plaguing U.S. infrastructure projects with overruns and delays. While these roadblocks are not easily dismantled, we identified eight steps policymakers can take to begin to address these problems.

Introduction

The threat of global climate change, coupled with deferred investment in infrastructure that some estimate to exceed $4 trillion in need, will require massive investments in new energy and transportation infrastructure in the coming years. [1] This means building high speed rail to connect cities, new sources of electricity that do not emit carbon, high voltage transmission lines to connect windy and sunny parts of the country with places with high electricity demand, electric vehicle charging infrastructure, new hydrogen and ammonia production, storage and transportation and infrastructure to capture, transport and store carbon dioxide. The U.S. used to manage massive infrastructure investments in short time frames. [2] But recently, public and private megaprojects have struggled woefully to be completed on time and on budget. [3]

There is not "one weird trick" to solving the consistent issues that drive delays and cost overruns. These issues include psychological and structural issues that encourage overly optimistic assumptions, beginning projects before plans are finalized, incentive structures that encourage delays, and a lack of effective project oversight. Our research has identified at least seven often-overlapping factors that drive up the cost and delays in infrastructure projects. These include an optimism bias by all involved in planning and approving the project at the outset, incentives for underbidding the true cost of projects, misaligned consequences for delays and project cost overruns, financing costs associated with delays, regulatory delays caused by policy misalignment, projects that are started without completed designs, the lack of partnerships with labor, and litigation between partners.

In 2012, Third Way published a short paper on ways to complete infrastructure projects on time and on budget. [4] Those findings build on a long line of academic papers, government investigations, and private sector studies. As we anticipate the buildout that addressing climate change requires – and for all of the big infrastructure that the U.S. needs to repair or build – it would be smart to take steps now to reduce the risk of out of control costs and long delays. This

should include implementing rigorous project management, tracking firms' ability to complete projects on-time and on-budget to determine their eligibility for future bidding, increased focus on forecasting, and an eyes-open approach to public-private partnerships (P3s).

Given the consistency of these problems across projects, identifying and implementing a set of best practices can help reduce – and potentially – eliminate them.

Root Causes of Cost Overruns and Delays

While there is no single driver of cost overruns and delays, the literature points to a number of consistent issues in large scale project management. These include psychological issues like optimism bias and incentives for under-bidding. They also include contracting and management issues that include the status of the design when projects begin, consequences for change orders, and labor and subcontractor relationships. In the face of cost overruns and delays, California dramatically scaled back plans for the first high speed rail project in the United States. [5] [6] Public transit projects in New York City have faced massive delays and exponential cost overruns. [7] A nuclear power project in South Carolina was abandoned after $9 billion had been spent. [8] The result is fewer resources available for future projects, delays that make it more difficult for us to meet our goals, and well-earned public skepticism of the institutions we will need to develop and build the high-speed rail, public transit projects, power generation, transmission, and other infrastructure we will need to solve climate change. The investment needed to meet this challenge will be large. We simply can't afford to waste money or time.

1. " Optimism Bias" Causes Delays and Overruns Before Projects Even Begin

Planners tend to consistently be over optimistic about costs and timeframe, and consistently underestimate challenges and hurdles in completing a project. As a result, many projects are doomed to run over budget with significant delays before the ceremonial groundbreaking even occurs. Daniel Kahneman won the Nobel Prize for economics in 2002 for his work in behavioral economics, part of which focused on biases present as decision makers think about risk. He warned against exactly this "optimism bias," or "the systematic tendency to be overly optimistic" about outcomes in forecasting in this work. [9] Unfortunately, his findings have not been sufficiently integrated into planning of infrastructure, particularly at the outset of projects and in evaluation of proposals.

This is a significant issue on cost overruns. Projects that start with unrealistic cost and timeline targets will not meet them. The cycle of not meeting time and budget goals erodes public confidence, makes it difficult for policymakers to properly budget and plan for other projects, and creates a culture where time and budget overruns are accepted.

2. Governments and Contractors are Incentivized to Underbid and Overpromise

While optimism bias is an unconscious act, there are also incentives in many megaprojects for policymakers, contractors, and advocates to consciously underestimate costs. This includes procurement structures that heavily favor lowest cost bids, do not adequately shift risk to firms providing low cost bids, and accept cost overruns are inevitable. Former San Francisco Mayor Willie Brown makes this point clear in discussing a $300 million cost overrun for the San Francisco Transbay Terminal. Brown noted "[w]e always knew the initial estimate was way under the real cost," and added "[i]f people knew the real cost from the start, nothing would ever be approved." [10]

3. Delays Cause Cost Increases Due to Cost of Capital for Construction

There is a high correlation between delays and cost overruns, largely due to financing costs. [11] Construction financing tends to be expensive – because construction financing is pre-revenue, there is an increased risk to lenders. Delays also increase labor costs. One study found that a one-year delay on transportation projects results in a 4.64% increase in costs. [12] For big projects, this is significant. A one-year delay in London's $26 billion cross rail project was estimated to be "$1.2 billion extra, or $3.3 million per day." [13]

4. Lack of Public Policy Alignment Causes Regulatory Delays

Government, like any large entity, often has competing priorities. We want our governments to encourage economic growth and job creation but also protect our safety, water quality, and enhance our quality of life. Procurement officials for mass transit authority may be charged with keeping costs low, while designers and planners for the same agency may be charged with increasing ridership and creating an aesthetically pleasing station. Environmental regulators often have every incentive to delay or require additional designs for a clean energy project and no incentive to minimize delays or to make reasonable compromises to control costs. Regulators are often limited in their ability to work in partnership with other agencies and those designing and building projects. Getting buy-in from regulators for big picture policy goals is critical.

5. Projects Started with Incomplete Designs Result in Delays

One of the most consistent problems cited as a cause of cost overruns and delays is the pressure to start a project before the final design has been completed. A groundbreaking report written by Kirsty Gogan and Eric Ingersoll for the Energy Technologies Institute on the cost of nuclear power projects found that the "degree of design completion when construction began was one of the most important drivers of total capital cost." [14] Failure to have a complete design, approved by relevant regulators, can lead to the need to

undue previous work and a focus on finishing plans rather than managing the execution of the project. A complete design allows for customers, policymakers, engineers, and regulators to make key decisions before ground has been broken and concrete has been poured.

6. Multiple Scope and Design Changes Result in Significant Delays and Cost Overruns

Big projects often involve multiple decision makers, contractors, policymakers, regulators, financers, and customers. Those decision makers have differing roles and responsibilities, as well as the authority to impact budget and schedule decisions without any responsibility for time or cost overruns. The combined effect of many small change orders, design modifications, and other decisions often add up to significant delays and additional costs.

Having a plan that is repeatedly changed results in an outcome similar to starting a plan with an incomplete design. Once the "go decision" is made, every architectural, engineering, and regulatory change order causes a delay, and every delay increases the cost of a project. Changes can be demanded by politicians looking to increase the benefits of a project to his or her constituents, by contractors looking to correct errors or expand the scope, or by regulators requiring changes after a plan is approved. [15]

7. Litigation Delays

Some projects, like the Cheniere LNG terminal, are managed and executed by one contractor serving one corporate client. But others involve multiple primary contractors, hundreds of subcontractors, and multiple client companies or agencies paying for the project.

The Alaskan Way Viaduct Replacement Program in Seattle, for instance, requires coordination among five different government agencies from the federal, state, and municipal levels. [16] The Washington State Department of Transportation describes the ambitious project as 32 separate

sub-projects, including tunnel boring and viaduct demolition, each with its own lead contractor and subcontractors. [17] The tunnel construction alone utilized 113 subcontractors from 2011-2019. While the tunnel opened to traffic in February 2019, the project experienced years of delays as various construction problems mounted and is the subject of ongoing lawsuits between the state and lead contractor. [18]

With hundreds of parties involved, disputes arise. And in the United States, disputes lead to litigation, which can cause further cost and time overruns.

Recommendations for Policymakers

The root causes of skyrocketing infrastructure costs and endless delays in completing projects are solvable. There are examples of multi-billion projects, including many in the energy sector that do come in on time and on budget. Cheniere, for example, built the first set of natural gas liquefaction facilities in the United States for tens of billions of dollars on time and on budget. [19] Wind and solar developers have demonstrated a respectable track record of delivering power generation projects on time and on budget. [20] It will require a commitment from policymakers and project managers, however, to take the necessary steps to implement needed changes across the government. Ultimately, we must get to a point where the focus is on setting achievable budgets and timelines, and structuring project management with a focus towards completing projects on time and on budget. This includes rigorous project management, rewarding firms for performance, learning from others, and maximizing the benefits from public-private partnerships.

1. Rigorous Performance Management of Projects

Managing multibillion construction projects is a complicated task, and in fact, a profession unto itself. But in many cases, those directly responsible for overseeing the development of large projects have limited or little experience in megaprojects. These include government agency heads or CEOs of companies with experience in other areas. There is tremendous value in employing management professionals with specific expertise to ensure best practices, check for optimism bias, and focus on reducing delays and mitigating cost increases.

Governments should develop professional megaproject management capabilities, use analytics to learn from the past, institute rigorous best practice requirements, and make these resources available to other agencies contracting to build major projects. For example, the Program Management Improvement Accountability Act of 2016 (PMIAA) created the Program Management Policy Council (PMPC), which is comprised of OMB and agency officials. According to the GSA, "the council drives improvements in program performance and efficiency by developing capacity, facilitating cross-agency learning, improving cooperation, and sharing best practices identified by agencies and the private sector." [21] In conjunction with OMB, engineering, procurement, and construction firms should develop and share best practices to ensure that projects are more precisely forecasted.

2. Monitoring and Tracking Individual Firms Ability to Complete Projects on Time and on Budget

If we're serious about meeting our climate and energy goals, we'll need many new projects, with many firms bidding for contracts to build the infrastructure. Federal government agencies, as well as state and local governments, should work together to track the ability of these firms to complete projects in a timely manner and on budget. The ability to gain future work will incentivize individual firms to reduce costs, avoid delays, and resist the temptation to increase their short-term profits at the expense of a project's budget and

timeline. Some suggest a "pre-qualification" system that reward good past performance. [22]

The latest OMB guidance on PMIAA implementation, issued in June of 2018, suggests publicizing contractor effectiveness ratings using industry specific performance evaluation criteria. [23] As federal agencies continue to strengthen project management practices, it may be worth revisiting whether they require third party auditors to effectively measure and communicate these ratings.

3. Increased Focus on Precise Forecasting Focused on Learning from Others

We know that optimism bias (as well as public bias towards underestimating cost) exists, we know that it is persistent, and we have thousands of data points that show where and how these increases occur. This must be used to improve the way we forecast the cost of projects. In addition, independent auditors can be used at the front end of project submission to review proposals, test assumptions, and increase the accuracy of forecasts. This approach has been used in Norway on transportation projects to reduce overruns. We will never meet budgets or timelines if those budgets and timelines are not realistic. [24]

4. Providing Economic Incentives to Avoid Incomplete Plans and Change Orders

As noted, two important drivers of overruns are starting a project without a complete design and the aggregation of change orders. Often, change orders are ordered by those who are not required to absorb the associated costs. An engineer may see an elegant way to solve a perceived construction problem but will not be accountable for the delays caused by ordering the change. This applies to changes made by contractors, engineers, regulators, and policymakers.

Project managers should start with a complete design and provide strong disincentives to change any aspect of a final

plan. This can include providing economic costs for those requiring changes that result in cost increases and delays, dramatically limiting the number of individuals and subcontractors who can order a change order, and requiring an analysis of delays and associated costs before a change order can be approved.

5. Aligning All of Government on Policy Priorities

Regulatory agencies within governments tend to be siloed, and agencies are often held to account for meeting narrow policy goals, rather than contributing to larger policy objectives. Many environmental regulations around permitting new infrastructure, for example, do not require climate change impact assessments. High level leaders need to harmonize the need for regulatory protections with overall policy goals relating to issues like climate change.

The Obama Administration, for example, established a "Rapid Response Team for Transmission" consisting of representatives from various federal agencies, including agencies that would regulate the construction of new transmission lines in the United States. [25] Such efforts must ensure equity for disadvantaged communities, the appropriate level of authority and buy-in from regulatory agencies, and must allow for key questions to be quickly elevated and resolved by decision makers who can balance these competing priorities.

The Program Management Policy Council, created under the PMIAA and comprising OMB and agency officials, provides such a platform for agencies to identify and promote shared goals.

6. Rigorous Management of Public Private Partnerships (P3s)

Many of the problems associated with publicly managed projects (incentives for design change orders, lack of megaproject management experience, changing priorities) can be mitigated through the use of private sector firms to

manage public infrastructure projects. But so-called public-private partnerships are not in and of themselves a panacea. [26] They must focus on reducing the overall cost of the project, ensuring that the project is completed on time, meeting equity, environmental and labor goals, and benefiting the public. Private sector firms can expect to earn a profit, but that profit must come from improved efficiency and must involve an associated shift in risk to the private sector entity.

Currently, P3s are primarily used for transportation projects, and many do not have access to tax exempt bond financing. [27] Bipartisan legislation in the Senate and House would allow state and local governments to use private activity bonds to finance the construction and repair of public buildings. [28] Using this legislation as a template, Congress can add climate-related infrastructure to the list of eligible projects to expand financing opportunities for P3s.

7. Contract Oversight to Reduce Litigation

Project disputes that result in litigation slow progress, insert unnecessary costs, and reduce trust among the teams working to complete a project. Contracting parties can take steps early in the process, and throughout construction, to reduce litigation. These include identifying potential risks early, strong project management, binding arbitration and mediation, dispute resolution within the contract management structure, and aligning economic incentives to reduce the likelihood of disputes. [29]

According to the International Federation of Consulting Engineers, Dispute Adjudication Boards (DABs) are an increasingly popular dispute resolution mechanism for capital projects. [30] Singapore, for instance, recently launched the Singapore Infrastructure Dispute Management Protocol to mediate disputes for large infrastructure projects. [31] From the outset of a project, contracting parties agree to allow a team of independent engineering professionals (or a DAB) to render dispute resolution decisions as needed. This

preemptive approach allows parties to resolve disputes more quickly, which can potentially save significant time and money. The use of DABs is more popular in the U.S. than in any other country, and the government could encourage or even require the use of DABs for public works projects. [32]

8. Partnership with Labor

Labor costs tend to be higher in the developed world, but labor costs are not a primary driver of cost and time overruns. Firms have a strong incentive to retain well-trained workers and maintain good relations with its workforce. When used effectively, Project Labor Agreements (PLAs) can help manage labor costs and prevent strikes and lockouts. [33] [34] Strikes, lockouts, and contract disputes can be extremely disruptive to projects, and working at the front end to avoid these conflicts can help ensure that projects are completed on time and on budget.

First used in the New Deal public works projects, PLAs continue to play a role in large private and public construction projects such as Dominion Energy's Cove Point LNG Export Terminal and LAX Airport. [35] Opponents of these labor agreements argue that they increase construction costs by restricting the pool of bidders, and Kentucky recently became the 25 [th] state to prohibit state and local government agencies from requiring PLAs for public works projects. [36] However, the law does not prohibit voluntary PLAs, so states still have the authority to invest in projects with high labor standards.

Conclusion

Solving the climate challenge will require significant investment in energy and transportation projects. In order to maintain the public trust and to allow public resources to be used as efficiently as possible, it will be important to ensure that infrastructure projects can be completed on time and on budget. This will require an understanding of project cost

drivers, rigorous project management, rewarding firms that perform, increasing the effectiveness of forecasts, and confronting the opportunities and challenges of public-private partnerships.

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