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MARKET INTELLIGENCE

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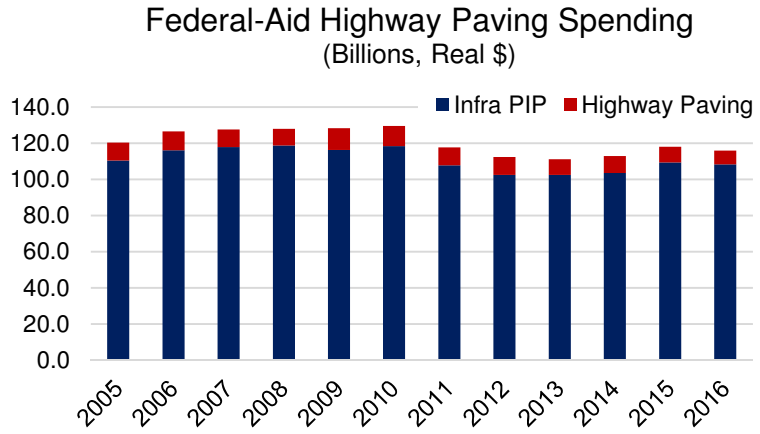
Trump Infrastructure: Potential Taxpayer Savings from the Use of Life Cycle Cost Analysis (LCCA)

Overview

Incorporating a life cycle cost analysis (LCCA) provision into the Trump infrastructure bill can save taxpayers and state DOTs billions of dollars. Take spending on highway pavements for example (LCCA) evaluates the cost of a pavement over its full lifetime, thereby helping transportation planners and designers make more accurate cost decisions when spending taxpayer dollars on infrastructure. While initial construction cost considerations are important, future maintenance or repair costs can equal more than 50 percent of the total cost of a project[1].

Using historical information from Oman Systems Inc. data, which measures state highway paving activity, and LCCA software from the Federal Highway Administration (FHWA), PCA Market Intelligence was able to estimate the savings associated with using LCCA on federal-aid highways. It was estimated that using LCCA for pavements alone can save an average ***$91 million for every $1 billion spent, or 9.1 percent***, when comparing equivalent concrete and asphalt pavement alternatives. Had these savings been applied to FAST Act paving projects, it could have saved taxpayers an estimated $2.4 billion. This translates to almost 1,000 additional lane miles, or the equivalent of paving a two-lane highway from Washington, D.C. to Boston.



If similar results could be achieved in other infrastructure programs contained in the $1 trillion Trump plan, then the potential taxpayer savings could be substantial. Assume for illustrative purposes that LCCA saves 9.1 percent in all other programs as well as paving, then taxpayer savings could exceed $90 billion over the life of these projects[2] with a $1 trillion plan. Some suggest the Trump plan will exceed $1 trillion, perhaps reaching as high as $1.5 trillion. Under this high scenario, the potential taxpayer savings from this illustrative example could exceed $135 billion. Clearly there are caveats to these estimates including

[1] https://cshub.mit.edu/pavementslifecycle-infosheet
[2] Assumes all infrastructure projects have similar life lengths as the roadways used in this analysis (40 years).

the actual size of the infrastructure spending program, its composition among construction projects, the durability and price of competing materials, and the existence of LCCA already in use at the state level.

Methodology Used to Estimate Paving Savings Using LCCA

The term "infrastructure" can mean many different things. For this analysis, infrastructure spending refers to PCA's estimated total public put-in-place construction spending (PIP), less military and public buildings. There is little doubt that the savings associated with LCCA will differ among construction projects. The potential LCCA analysis for concrete versus steel bridges, for example, could yield considerably different savings to taxpayers than the 9.1% reflected in the analysis of pavements.

Many states currently have LCCA policies in place, differing in methodology and use, which could vary in the impact of a federally mandated policy. This analysis represents a general look into the potential savings realized by applying LCCA to current federal-level paving assumptions. It was applied only to interstates, freeways, and arterial roads. Local streets and collectors were not included; however, LCCA could offer savings there as well.

The American paving market is very large. As of 2015, the FHWA measured the size of the paved roadway network at over 6.2 million lane miles. Of this, approximately 11 percent of these lane miles are federal-aid highways, or just over 700,000 lane miles.

PCA used FHWA's RealCost program to estimate life cycle costs for federal-aid highways. Four types of roads were analyzed representing a wide range of traffic volumes. Over a 40-year lifespan, LCCA for these types of roads showed a weighted average savings of 9.1 percent when concrete was the chosen pavement material. Oman Systems, Inc.'s state DOT data provided the average unit costs for the inputs, while FHWA highway statistics were used for the four traffic volume examples as well as the weights for calculating the average savings across the four examples[3]. Concrete life-cycle savings increased with higher traffic volumes and decreased with lower traffic volumes.

1-mile Section of Fed-Aid highway (2 lane miles)

Traffic	Road Type	LCCA - Concrete	LCCA - Asphalt	Total Savings
High Volume	Urban Interstate	$5,280,601	$6,091,477	13.3%
Medium Volume	Rural Interstate	$4,915,767	$5,482,805	10.3%
Medium Volume	Urban Arterial	$4,550,933	$4,869,789	6.5%
Low Volume	Rural Arterial	$4,186,100	$4,256,772	1.7%
			Weighted AVG (FHWA lane miles)	**9.1%**

Sources: RealCost (FHWA), Oman Systems, Inc., PCA

PCA views these as conservative estimates for several reasons.

The choice of discount rate plays a big role in estimating future maintenance costs. The cost estimates above represent a default 5% rate for ***both*** paving materials – meaning equally discounted future values for maintenance events. If this analysis used the current OMB 30+ year discount rate of 0.6% for both, weighted average ***life-cycle cost savings grow to nearly 15%*** when concrete is the material of choice on federal-aid highways[4].

In reality, inflation rates vary significantly between construction materials, with concrete historically matching close to the general rate of inflation and asphalt moving more variably than the general rate.

[3] FHWA Highway Statistics 2016, tables HM-37 and HM-60.
[4] https://www.federalregister.gov/documents/2018/02/08/2018-02520/discount-rates-for-cost-effectiveness-analysis-of-federal-programs

Using the same discount rate for both could therefore be underestimating the savings associated with using concrete on federal-aid highways.

A true equivalent design between competing materials is always up for debate. PCA believes the thickness differences used in this analysis are conservative[5]. Similarly, while this analysis uses 40 years as the timeline, concrete roads tend to last longer, suggesting a 50-year timeline could produce even more savings[6].

Finally, while LCCA showed an average savings of 9.1 percent, average savings are even larger for higher traffic roads. If the infrastructure plan focuses more on urban, more frequently traveled roads, this average rate would be weighted higher and thus the savings could be even larger.

Summary

The usage of LCCA analysis can yield significant taxpayer savings. As demonstrated above, applying this 9.1% savings expected from incorporating LCCA to paving activity to all infrastructure programs in the $1 trillion Trump initiative yields more than $90 billion in taxpayer savings. Whether LCCA usage will yield $90 billion in taxpayer savings is not the intent of this analysis. Recent infrastructure programs that did not incorporate LCCA missed out on significant taxpayer savings.

The FAST Act sent $226.3 billion to federal-aid highways beginning in FY 2016. It is estimated that approximately $26.4 billion of this amount would go to pavements.[7] If the above savings rate of 9.1% from LCCA, had been included in the FAST Act, than it could have saved taxpayers an estimated $2.4 billion. This means an additional 1,000 lane miles of highway could have been paved, enough for a two-lane highway from Washington, D.C. to Boston.

[5] high volume – 12" concrete pavement, 16" asphalt pavement; med volume a – 10" concrete, 14" asphalt; med volume b – 8" concrete, 12" asphalt; low volume – 6" concrete, 10" asphalt; 6" aggregate base used for all four.
[6] In this particular example a 50-year analysis would include an additional maintenance need for the asphalt road in year 48, whereas the next maintenance need for a concrete alternative would take place in year 52 or later.
[7] Holding constant the ratio of real Oman spending for highways to real Highways & Streets put-in-place (PIP) construction spending.