

INFRASTRUCTURAL FUNDING ANALYTICS FOR THE UNITED STATES OF AMERICA: A FOCUS ON HIGHWAYS, MASS TRANSIT AND RAIL, AVIATION, WATER TRANSPORT, WATER RESOURCES AND UTILITIES

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Abstract: The US infrastructure has come under heavy scrutiny. The US Society of Engineers gave the state of U.S. infrastructure a D + in 2013 and estimates \$3.6 trillion in funding is needed by 2020 to ease infrastructure deficits.

This research paper tackles the perceived infrastructure failures with the data on Federal and private infrastructure spending through previous years.

Keywords: US infrastructure, US Society, U.S. infrastructure.

1. INTRODUCTION

I turn to some eventualities that might explain the deficit, such as changes in infrastructure wants and the quality of infrastructure funding. Below are some data based facts

- The total level of infrastructure funding by the public and private sectors has risen since 1956.
- The United States of America would have to raise public infrastructure funding by \$30 billion to get to the 2.6% standard portion of GDP for the period between 1956 and 2014.
- The United States would have to raise federal infrastructure funding by \$33.4 billion to get back to the 3.7% portion of federal spending for same period.
- Fixed capital per American worker has increased 50% between 1956 and 2015.
- As of 2014, the United States raised expenditure more on infrastructure operation and maintenance than new capital by \$54.5 billion, or 30%.

Figure 1: Real Infrastructure Spending by Federal vs. State & Local Governments (1956-2014)

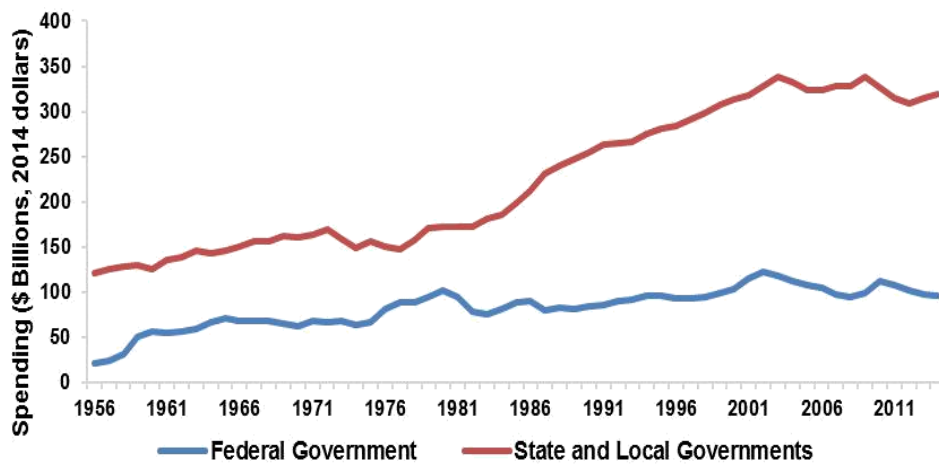
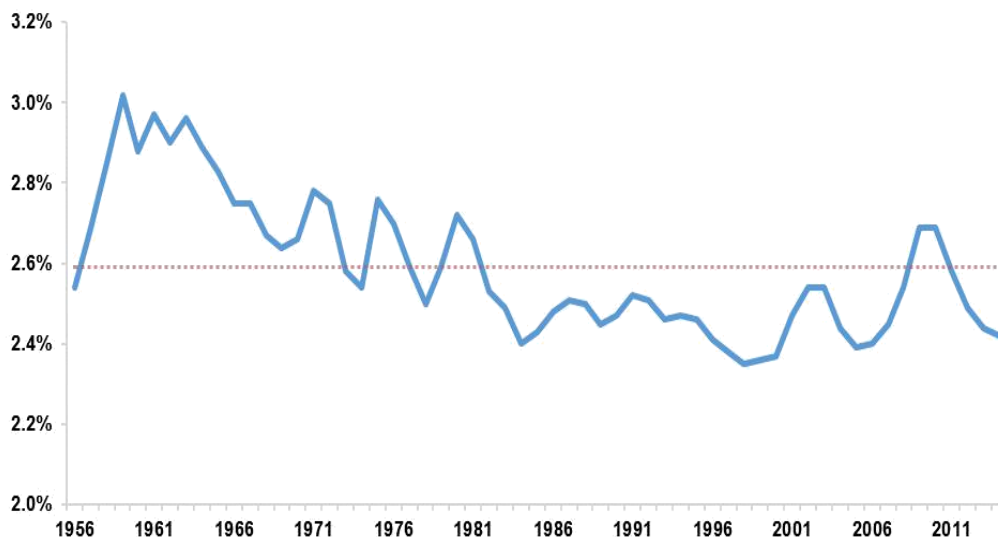


Figure 1 uses Congressional Budget office data from 1956 to 2014 to show the level of real (inflation-adjusted) Federal spending for transportation and water infrastructures. The data shows that total infrastructure spending has been on the rise over the past 60 years. Even though state and local government funding grew substantially, the government also raised its level of spending.

Figures 2. And 3. Use C.B.O data and present the transportation and water infrastructure spending as a part of GDP and federal funding, respectively.

Figure 2: Public Infrastructure Spending as a Share of Gross Domestic Product (1956-2014)



Between 1956 & 2014 in Figure 2, infrastructure funding as a share of GDP won't deviate greatly from the average of 2.6 % . , however, that the 2014 spending ratio is under the average, that the spending ratio has gone behind since 2011, and in the absence of the US Recovery and Reinvestment Act the share has been average for 35 years. The 2014 infrastructure funding share was 2.4 % and would need a surplus \$30 billion to get back to the 2.6 % average. This \$30 billion deficit

Figure 3: Infrastructure Spending as a Share of Federal Spending (1956-2014)

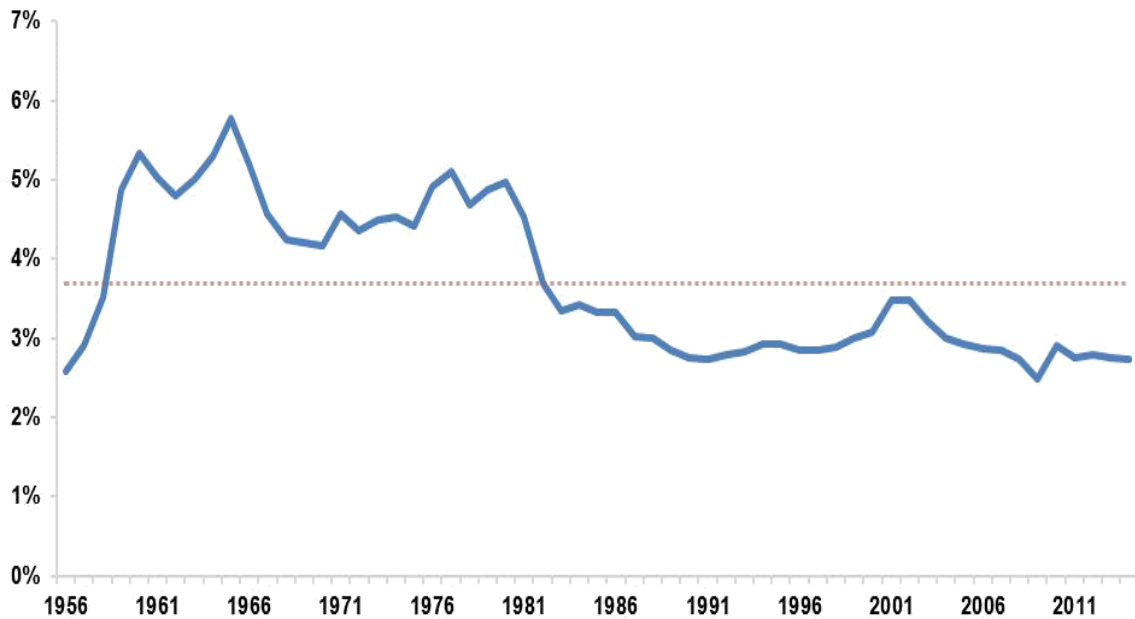
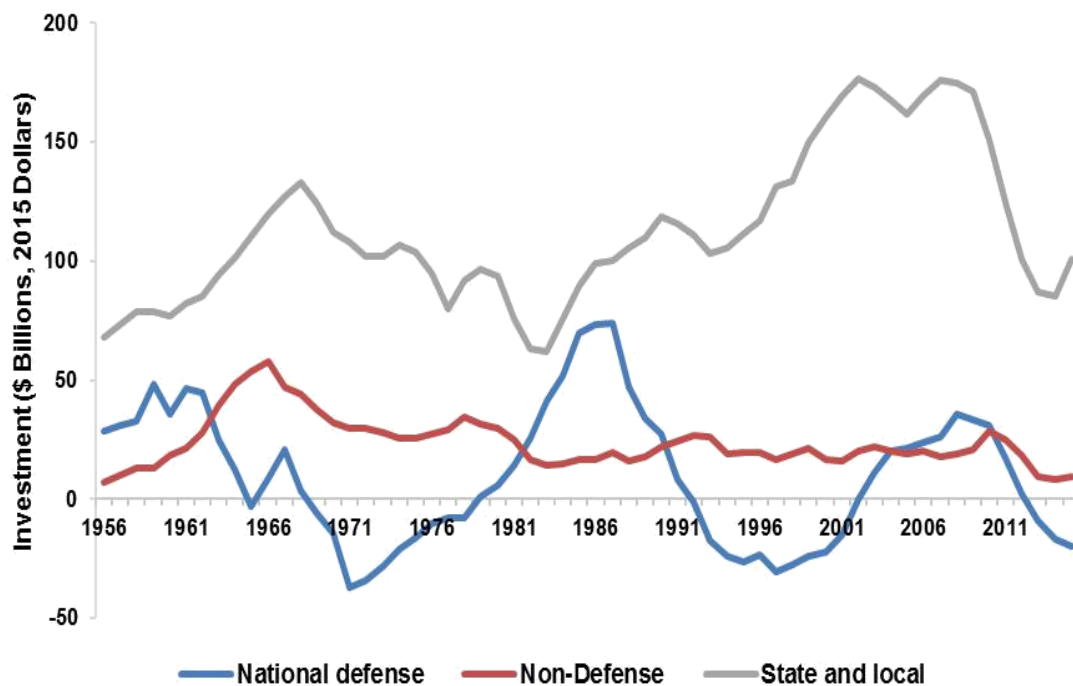


Fig 3. Shows the share of infrastructure spending in overall federal outlay, and shows a pattern similar to that in Fig 2. Which shows infrastructure spending dropped in importance as a focus of the government. The 2014 infrastructure portion of fed spending was 1% lower than the 3.7 percent average. To rise from 2.7 to the 3.7 % average, infrastructure spending would have to increase by \$33.4 billion.

Figure 4: Real Net Government Investment by Type (1956-2015)

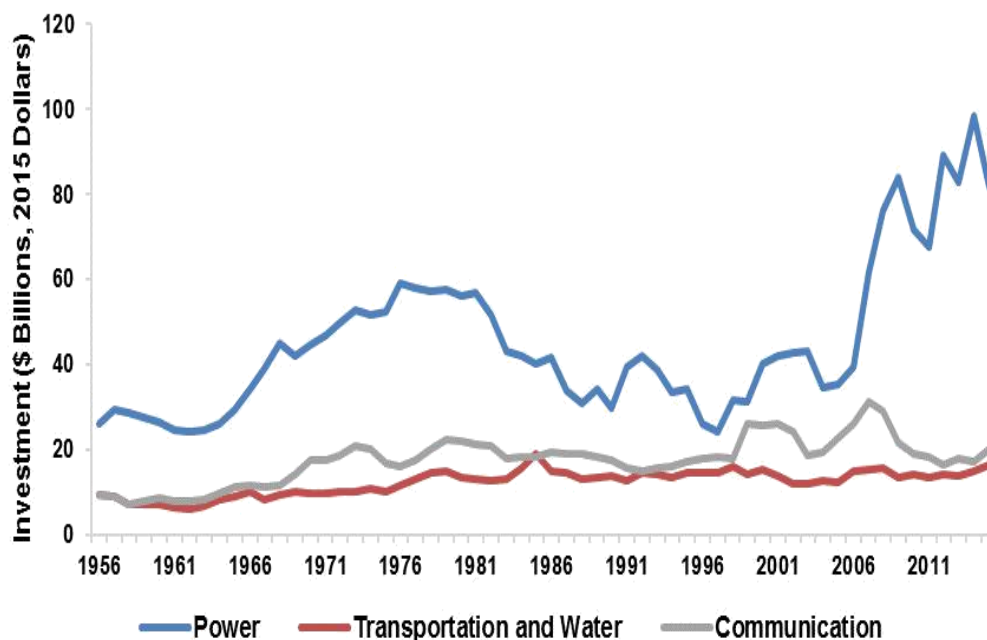


Another concept sequence is that the limited focus on infrastructure spending has allows the total amount of infrastructure capital to drop. Fig 4 examines at the net funding in infrastructure – that is investment net of depreciation of existing capital – Bureau of Economic Analysis inflation-adjusted stats. The real net investment data shows that government funding in non-defense undertakings have remained positive, with capital stock rising, for the past 60 yrs. The net non-defense funding from all areas of government came up to \$110 billion in 2015, which is up \$16 billion from 2014. Though the national, state and local governments experienced a reduction since 2009, those investments are still enough to relieve depreciation which shows that infrastructure capital grows.

2. PRIVATE SECTOR INFRASTRUCTURE VARIABLES

Focusing on public sector capital may actually negate the focus in infrastructure capital. Fig. 5 shows growing interest in private sector infrastructure participation by adopting inflation-adjusted BEA data from 1956 to 2014 to show the levels of private investment for the 3 available infrastructure sectors: transport and water, power, communication.

Figure 5: Real Private Investment in Infrastructure (1956-2015)



The stats show that the private sector invested heavily in power infrastructure over 60yrs. Since 1956, the private sector funding in power increased by \$55.8 billion, or 213%. Transport and water infrastructure experienced regular increase between 1956 and 2015 with \$6.9 billion in surplus spending, a 72% rise. The communication infrastructure funding showed little signs in growth since 1956, growing by \$10.7 billion. The height in 1999 & 2007 can be linked to the telecommunications act of 1996 and the expansion in mobile and wireless service.

These figs prove that infrastructure spending in both the public and private sectors have risen or remained constant. Despite these discoveries, the current state of U.S. infrastructure is in deplorable condition and raises the question, why is this level of funding not working

3. GROWING INFRASTRUCTURE NEEDS

An explanation to this is that more infrastructure funding is required today than in the previous years. This is hard to access because of the divided nature of infrastructure; it doesn't always get utilized as more reap from it. As the Utilization progresses, there is great gridlock on road and on many transportation system which may incur more infrastructure spending. Fig 6 uses inflation adjusted BEA and present employment data from the BLS to create inflation-adjusted fixed capital per American worker to look into this.

Figure 6: Real Fixed Capital per Worker (1956-2015)

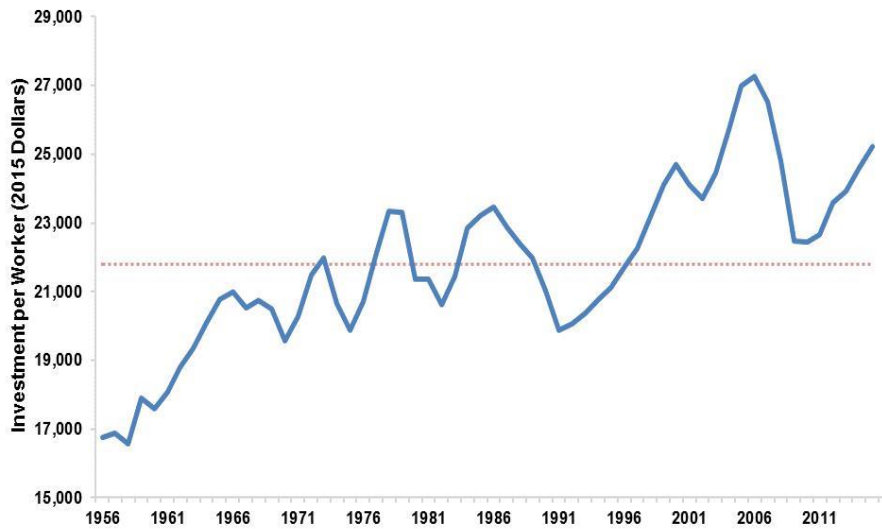


Fig. 6 reveals that the fixed capital /worker increased 50% from 1956 and 2015. There was a heavy decline caused by the great recession but America has frequently recovered from it. The 2015 net domestic investment / worker is about \$3400 more than the period's average of \$21,800. Fig. 6 shows that America would likely have improved infrastructure today if the infrastructure requirements had remained constant since 1956. This shows that stable or rising spending hasn't kept up with growing infrastructure needs.

Spending by Infrastructure Type

In a scenario where the top outlay stats mask moves in the makeup of infrastructure funding. To demonstrate how the disbursement of public infrastructure funding has changed, the following figures employ C.B.O statistics to analyze infrastructure spending into six divisions: highway, mass transport and railway, aviation, water transport, water resources, and water utility.

Figure 7: Share of Total Federal Infrastructure Spending by type of Infrastructure (1956-2014)

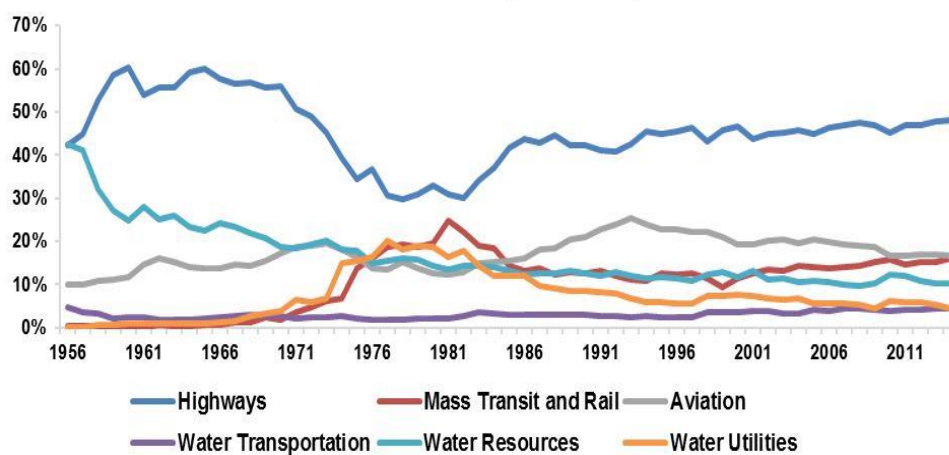


Fig.7 demonstrates highway spending has constantly gotten the highest federal funding between 1956 and 2014 and highways make up 48.1% of 2014 federal infrastructure funding. Water resources saw a huge drop of 32% between 1956 and 2014. Water resource funding gradually moved from buying new capital to regaining and operating existing capital. Between 1956 and 1970, mass transportation and railway was not a significant ratio of federal infrastructure funding but as of 2014 is responsible for 16.1% of the entire federal infrastructure funding.

Figure 8: Share of Total State and Local Infrastructure Spending by type of Infrastructure (1956-2014)

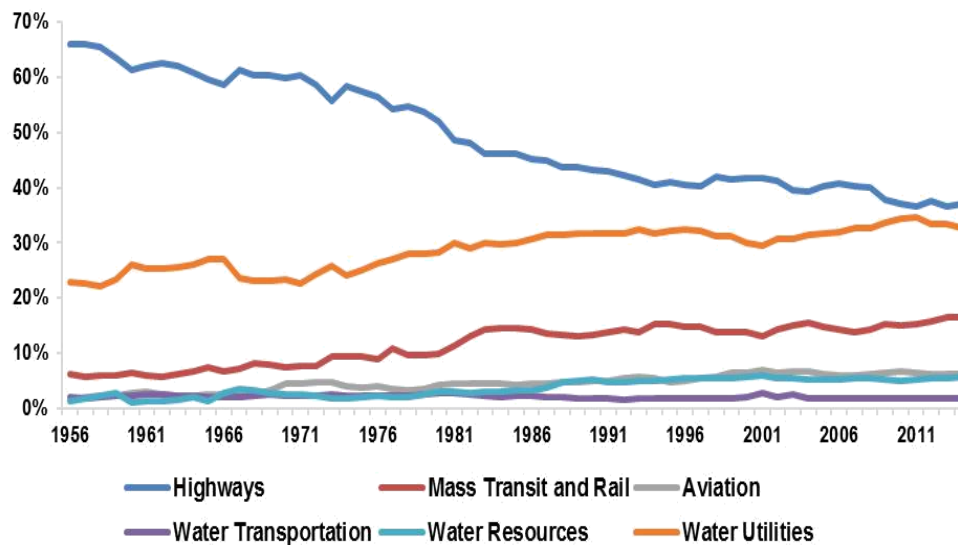


Fig 8 shows that state & local infrastructure funding disbursement has gone through huge changes. The Highway is now the major ratio but that lead has dropped since 1956. Water utilities with mass transport and railway witnessed increases in the share of total spending. Water utilities spending increased as greater importance was placed on improving water quality. Mass transit and rail funding increased with the help of federal subsidized laws with the Urban Mass Transportation Act of 1964.

Figure 9: 2014 Public Infrastructure Spending (\$ Billions)

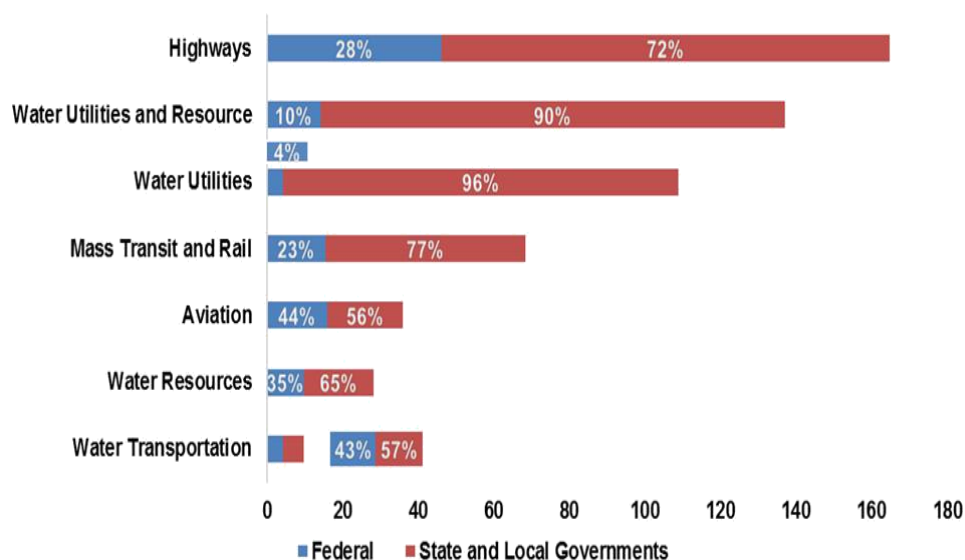


Fig. 9 demonstrates a 2014 view of the entire spending for each section of infrastructure by level of government using C.B.O statistics. Fig. 9 backs the trend of the previous figures—highways need the most resource and state and local governments make the biggest contribution. The chart also shows the small portion, 4%, of federal funding on water utility. Since the advantages and concerns of water utilities are peculiar to local regions, it isn't new that the majority of the responsibility rest on state and local government. Aviation and water transport, representing the nation's infrastructure benefits, are at a near level ratio.

These figs demonstrate that funding by infrastructure type has changed over the years. The following section goes into how the resources were spent, with details on how spending changes were formulated.

4. SPENDING CATEGORY

Spending on infrastructure can be apportioned as either capital spending or operation and maintenance spending. Capital spending is purchasing and modernizing new structures like roads, sewers and equipment.

Operation and maintenance consist of the cost of maintaining and up keep and also administration of public infrastructure such as air traffic control personnel. Associated education and research and enhancement devoted to infrastructure are also included in this category of spending.

Figure 10: Public Spending on Infrastructure

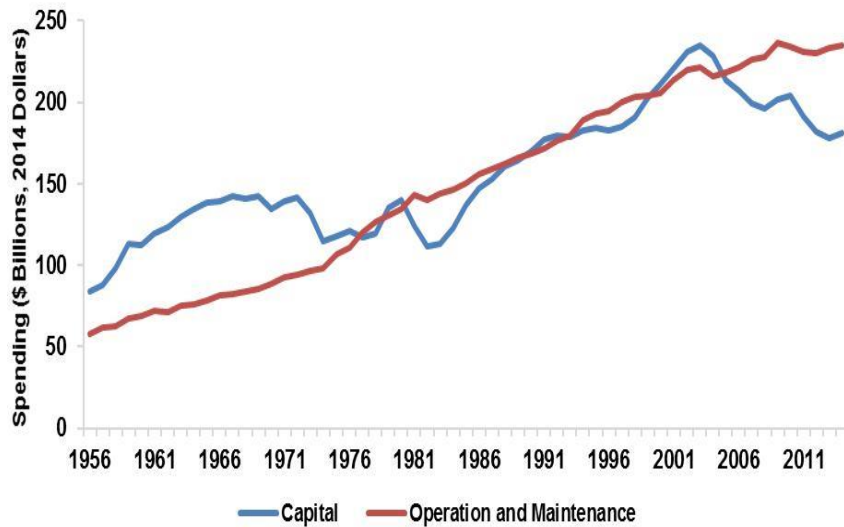


Fig. 10 uses the C.B.O statistics to show that the reason for spending has drastically switched over the yrs. In between 1956 and 1977, capital expenditures exceeded operation and maintenance spending by a huge ratio. But now that the infrastructure network has been reached, a bigger ratio of infrastructure funding is used on operation and maintenance. The battle began in 2005 and in 2014, operation and maintenance exceeds capital investments by \$54.5 billion, or 30% in spending.

Figure 11: 2014 Public Infrastructure Spending (\$ Billions)

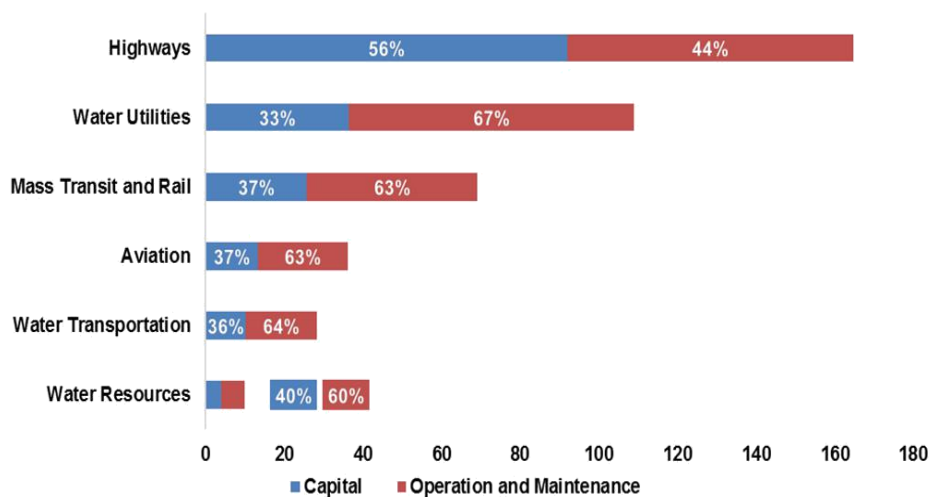


Fig. 11 examines the 2014 purpose of funding by infrastructure type using C.B.O statistics. Highway funding uses the biggest portion of capital spending at 56%, \$91.9 billion. The \$91.9 billion funding on highways is more than the capital spending for the 5 other types of infrastructures put together. Water utility need the biggest operation and maintenance to capital funding with spending of \$72.5 billion & \$36.4 billion, respectively

5. VALUE OF SPENDING

A reason why today's infrastructure funding is not seen to have kept up with past spending is that the quality of funding has dropped. It is very hard to gauge the level of funding without being able to access the demand for a certain type of infrastructure. If resources are being used on sections with minimal demand than the level of funding would be bad.

A potential instrument for assessing demand is final user fees. An example is that a toll point can measure the demand for a road. With that information, decisions can be taken to broaden the road if there is big demand, simply maintain the road if there is regular demand, or diminish funding on the road if there is no demand.

6. CONCLUSION

The declining state of America's infrastructure cannot easily be explained by spending cuts as total infrastructure funding levels are compared to old data. The best explanation is that public infrastructure needs have switched over time or that the value of funding the impact of spending on the practical enhancement of a working infrastructure—is worsening.

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