



CENTER FOR HOMELAND  
DEFENSE AND SECURITY  
NAVAL POSTGRADUATE SCHOOL



# HSx: CHALLENGES IN INFRASTRUCTURE FUNDING



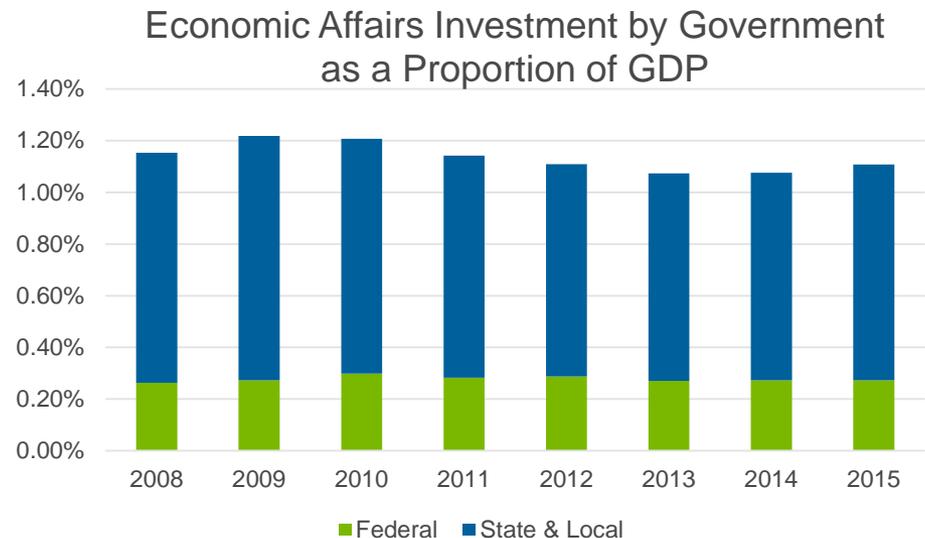
June 2017

# CONTEXT

- Critical infrastructure offers direct and indirect benefits to businesses and the population. Despite benefitting all it can be challenging to win approval for funding infrastructure projects.
- All three levels of government and private sector owners and operators are responsible for funding infrastructure creation, maintenance and improvement.
  - Building and improving critical infrastructure are generally captured in capital budgets.
  - Routine maintenance for existing critical infrastructure is generally captured in the operational budget.
- Failure to make needed investments in infrastructure, whether routine maintenance investments or ensuring capacity meets current demand, can result in serious consequences.

# CONTEXT

- Infrastructure funding has been shrinking as a percentage of GDP
  - Investment has declined from 2.3% of GDP in 1980 to less than 1.5% of GDP in 2014.
  - The recession of 2009 caused a significant drop in government funding in infrastructure investment resulting from the depressed labor market where only a 0.5% increase in employment has occurred over a 5 year period.
- Stagnant economic growth and a hesitance to increase user fees have lowered debt capacity further impeding infrastructure investment.



Data Source: U.S. Dep't of Commerce, Bureau of Economic Analysis  
Accessed May 2017

# CONTEXT

- Increased fiscal pressures at all levels have led to lower commitments to infrastructure and more reliance on debt financing, higher debt ratios and reduced debt coverage.
  - Infrastructure spending is at a 30 year low, Federal funding has fallen by 50% versus 20% at the state and local level.
  - States are seeking innovative solutions to funding shortfalls caused by fiscal stresses.
  - Municipal governments are recovering from the recession but may be decades from having positive cash flows to support infrastructure.
- The American Society of Civil Engineers (ASCE) estimates that an investment of \$2T over the next eight years is required to bring infrastructure up to an above average state. Infrastructure sectors of particular concern are transportation, water and waste water and energy due to their cross cutting nature in the U.S. Economy. Over the next decade:
  - Water and Wastewater have a projected funding shortfall of \$105B.
  - Surface Transportation mode have a projected funding shortfall of \$1.1T.
  - Energy Sector has a projected funding shortfall of \$65B.

# A CHALLENGING PERSPECTIVE

- Despite the previous context, some researchers argue that the infrastructure funding gap does not exist.
- The supply side of private capital has resources to cover the financing gap and the gap is in the number of investable infrastructure projects.
- The money exists in:
  - Managed funds - \$43T in the U.S.
  - Municipal bonds - \$3.7T
  - Pension funds
- The primary obstacles to applying the private funding to infrastructure projects are:
  - Uncertainty of revenue streams
  - Establishing guarantees
  - Political risk
  - Correct types of capital
  - Question of emerging and greenfield markets
- How funds are allocated to maintenance or expansion based on their sources (public versus private) may offer improvements on generating the revenues to support private investments.

# CASE STUDY: STATE FINANCING AND THE HIGHWAY TRUST FUND FAILS TO SUPPORT ROAD AND BRIDGE RENEWALS

- In 2007, the I-35W bridge across the Mississippi River in Minneapolis-St. Paul collapsed killing 13 people and injuring another 150.
- In addition to the \$130M repair cost, the net economic impact to Minnesota over a two year period was \$60M.
- Almost two decades of inspection had identified structural deficiencies on the bridge.
- ***Despite the inspection results, repairs were not initiated due to a lack of funds not a lack of knowledge.***

Graphic Source: *U.S. finds bridge plates deficient in collapse probe*, Reuters,  
<http://www.reuters.com/article/us-usa-bridge-collapse-idUSN1553543220080115>, Web 17Mar 2017



# CASE STUDY: MICHIGAN MUNICIPAL WATER SYSTEM FAILURES FROM ECONOMIC DISTRESS

- Municipal funding distress in Detroit and Flint, Michigan, led to the cities being under Emergency Management.
- In Detroit, de-industrialization and disinvestment led to decreased city revenues and services accelerating the funding shortfalls to support the water system.
  - Falling per capita incomes, urban flight, and flat production costs led to 40,000 annual water shutoffs for unpaid bills.
  - Residents were paying up to 21% of their income for water and sewer services.
  - Broken and vandalized water pipes at vacant properties resulted in the production of significant quantities of non-revenue water.
  - In Flint, the city chose to replace the Detroit Water supply with a newly constructed supply line in an attempt to stem rising costs.
  - An interim water supply was needed and the Flint River was selected
  - The city failed to introduce corrosion control treatment into the water supply, resulting in lead leaching from the system with associated health impacts on residents.
  - A State of Emergency was declared in Flint and residents were supplied with bottled water until the corrosion issues can be resolved.

# CASE STUDY: WMATA MAINTENANCE LAGS DUE TO FISCAL STRESSES AND GOVERNING STRUCTURE

- The Washington Metropolitan Area Transit Authority (WMATA) operates the transit system that serves more than 200,000 riders per day in the District of Columbia, Maryland, and Virginia.
- WMATA is a \$3B/year operation that lacks a dedicated funding stream from the governing bodies in the area it serves.
  - WMATA is forced to solicit funds from the district and neighboring states where it operates to cover annual operating costs.
  - Economic stresses on those jurisdictions and varying priorities and constraints make funding the transit system difficult during declining or stagnant national economic conditions.
- Lack of funding for and focus on preventative maintenance paralyzing the system. The result has been preventable derailments and days long partial or complete shutdowns.
- The resulting lack of confidence in the system has caused a decrease in ridership, further exacerbating the funding issues.

# POLITICAL IMPLICATION: VARYING LEVELS OF GOVERNMENT PARTICIPATION ARE NEEDED

- Infrastructure construction and upgrade financing is derived from all layers of government and private sector, each using a range of funding approaches, including: tax revenue (grants, local expenditures, and bonds) and user fees (tolls, fees, and service charges).
  - Grants: Financial awards given by federal, state, and local governments to an eligible recipient for a major project that benefits specific parts of the population or the community as a whole.
  - Bonds: A debt investment in which investors loan money to an entity (corporate or governmental) for a fixed period at a variable or fixed rate.
  - User Fees: Payments made to the owner or operator of a facility or service. User fees may be structured as a fixed rate connection fee and/or a service charge based on usage level.
- Coordination and integration of the various funding mechanisms and approaches is needed to succeed in reversing current shortfalls in infrastructure funding due to economic stagnation and fiscal distress at all levels of government.
- Governments at all levels will need to prioritize infrastructure investments in a coordinated approach.

# ECONOMIC IMPLICATION: SHORTFALLS MAY BENEFIT FROM PARTNERSHIPS WITH THE PRIVATE SECTOR

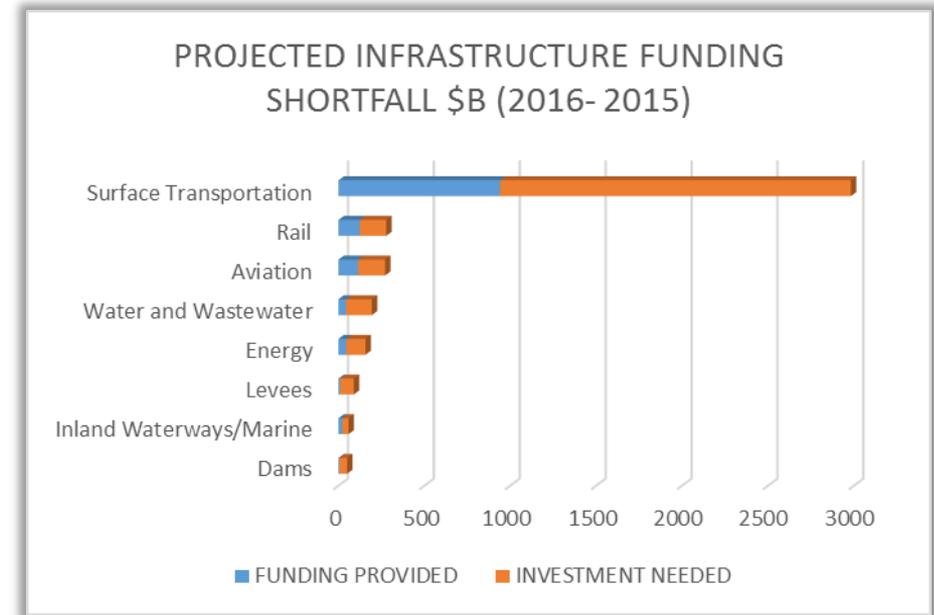
- Public Private Partnerships (P3s) are relatively new sources of infrastructure funding.
- In P3s, private investors fund an infrastructure project for a return on their investment while bearing a portion of the risk and responsibility.
- Private partners form a project company to manage all or part of the design construction, financing, operations and/or maintenance of the infrastructure
- Governments receive private sector capital management and technical expertise.
- An effective P3 requires governments to:
  - Understand and communicate priority infrastructure projects
  - Minimize or eliminate administrative or parochial interests that delay or stop projects
  - Identify and manage project risks
- P3s hold the potential to attract in excess of \$200B to infrastructure projects over the next decade.

# ENVIRONMENT IMPLICATION: INFRASTRUCTURE PROJECTS MUST ACCOUNT FOR SHORT AND LONG TERM RISKS

- Government entities often defer the risks associated with a long-term infrastructure projects due to the uncertainty of those risks. The result is short-term understood risks are mitigated while long-term risks grow unchecked.
- The risk associated with infrastructure projects are often attributable to:
  - Construction
  - Land Acquisition
  - Permitting
  - Financing
  - Political
  - Usage/demand
  - Operations and Maintenance
  - Taxation
- To better inform their investment of limited infrastructure funding, compete for Federal funding, and to attract new private sector interest, governments must quantify, and where possible, mitigate these risks.

# SOCIAL IMPLICATION: SHORTFALLS IMPACT INFRASTRUCTURE SECTORS AND AMERICAN FAMILIES

- Based on the ASCE Infrastructure Scorecard, Surface Transportation, Rail, Aviation, Water and Wastewater, and Energy are the infrastructure types with the greatest funding shortfalls over the next decade.
- While the overall grade for the nation's infrastructure remained a "D", nearly half of the sectors showed improvement.
- The \$2.2T funding shortfall can result in:
  - \$3.9 trillion in losses to the U.S. GDP by 2025
  - \$7 trillion in lost business sales by 2025
  - 2.5 million lost American jobs in 2025.
- American families will lose upwards of \$3,400 in disposable income each year due to underfunded infrastructure maintenance and improvements.



GRAPHIC SOURCE DATA: Failure to Act: Closing the Infrastructure Investment Gap for America's Economic Future, American Society of Civil Engineers, 2016

# CURRENT APPROACHES TO INFRASTRUCTURE FINANCING - FEDERAL

- Federal funding approaches include:
  - Highway Trust Fund (HTF) – Under the Federal Aid Highway Program, the Highway Trust Fund finances 80% of Interstate and non-Interstate project costs, with the State covering the remainder. The per gallon fuel tax that funds the HTF has not been increased since 1993 leaving a continuing shortage.
  - Drinking Water State Revolving Fund (DSRF) – As part of several amendments to the Safe Drinking Water Act of 1996 (SDWA), the DSRF provides 80% of capital costs for projects to help water systems and States achieve the objectives of the SDWA based on the most recent Drinking Water Infrastructure Needs Survey and Assessment.
  - Clean Water State Revolving Fund (CWSRF) – Established by the 1987 amendments to the Clean Water Act, CWSRF provides loans to support high priority water quality projects.

# CURRENT APPROACHES TO INFRASTRUCTURE FINANCING –STATES

- State Funding approaches include:
  - State Revolving Loan Funds – States match allocated Federal funding and make loans to cities for water and wastewater projects.
  - State Infrastructure Banks – Separate from the State Revolving Loan Funds, Infrastructure Banks provide grants and loans for infrastructure projects. Each state bank is unique in its resources and requirements. Twenty-two states have infrastructure banks.
  - Public Private Partnerships – Thirteen States have authorized the use of P3s for all types of infrastructure. P3s bring private funding into infrastructure project financing, operations and maintenance and require specific terms on return on investment (ROI).

# CURRENT APPROACHES TO INFRASTRUCTURE FINANCING - MUNICIPALITIES

- Municipal funding approaches include:
  - Bond issues – Debt securities issued by a state, municipality, county, or special purpose district to finance capital expenditures, that are exempt from federal tax, and are generally exempt from state taxes. Bond issues have been declining over the last decade leaving infrastructure under-improved.
  - Special Sales Taxes – In 29 states, cities have the ability to levy special sales taxes (<2%) on purchased goods and services to fund particular projects. In 18 states, voter approval is required for the levy. Voters often resist these taxes leaving the cities looking to other sources of funding.
  - Special Fuel Taxes – Levied as a cents per gallon of fuel fee, cities use these taxes to fund local road projects. Of the 16 states that allow fuel taxes, voter approval is required in 8 states. Fuel taxes are subject to consumer avoidance and increased vehicle fuel efficiency.

# EMERGING APPROACHES TO INFRASTRUCTURE FINANCING - FEDERAL

Multiple initiatives and approaches have been undertaken since the 2009 recession to reinvigorate investment in infrastructure to offset shortfalls from the economic stagnation Federal initiatives include:

- Transportation Infrastructure Finance and Innovation Act (TIFIA) - Provides flexible long-term financing to transportation projects that generate dedicated revenue such as tolls or fares. The low cost financing often is used to attract a P3 to a transportation project. Financing is available to state and local governments transit agencies, railroads, and private entities.
- Railroad Rehabilitation and Improvement Financing (RRIF) Program – Provides direct loans or loan guarantees to support acquiring, improving, rehabilitating or developing a wide range of rail facilities. RRIF requires the borrower to cover the cost of the credit subsidy, making its use viable in a limited range of projects.
- National Infrastructure Bank – A funding concept in development, a national infrastructure bank may be viable due to the diversity of infrastructure supported, national scope of eligible projects, the signaled commitment of the Federal government, the availability of technical assistance, and the establishment of a national market of infrastructure projects.

# EMERGING APPROACHES TO INFRASTRUCTURE FINANCING – STATE AND LOCAL

State and local governments are also using emerging vehicles and approaches to directly fund projects and/or attract private sector investment including:

- Direct Pay Bonds – Aimed at attracting banks, insurance companies, public pension funds, and foreign investors, the interest on these taxable bonds issued by state and local governments are subsidized by the federal government. The primary consumers of these bonds are not subject to U.S. income tax.
- Private Activity Bonds (PAB) – As a major component of P3s, PABs are tax-exempt bonds issued by state or local governments on behalf of private developers. The PABS can be used for transportation, water/wastewater, health, and education projects, with 95% of the proceeds going to those projects. State and federal caps on the total value have limited applications of PABs. PABS have successfully been used in coordination with TIFIA financing.

# EMERGING APPROACHES TO INFRASTRUCTURE FINANCING – STATE AND LOCAL

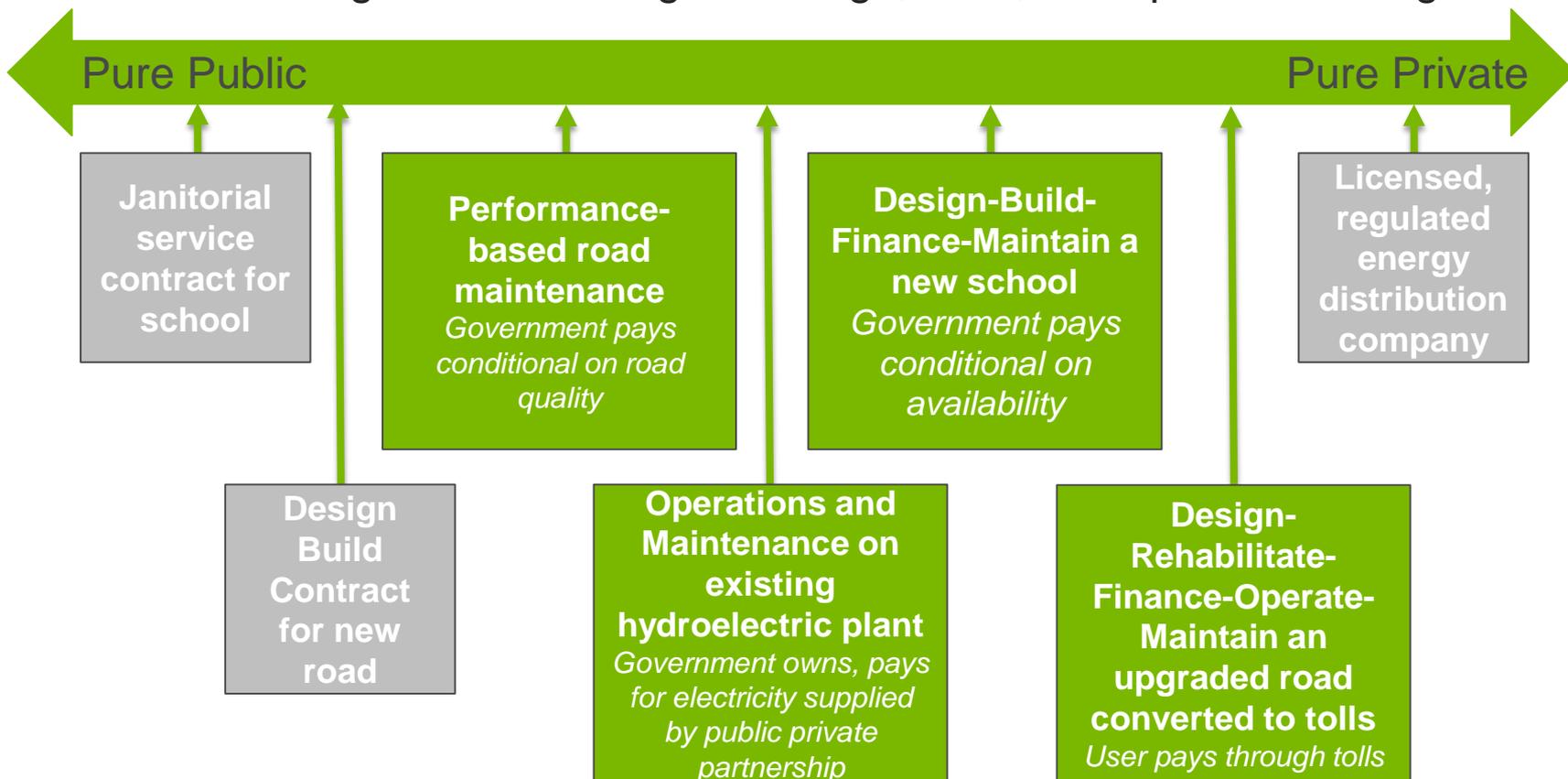
- Credit Enhancement – Used to attract investors to take on project debt to reduce risks. Credit enhancements may be loan guarantees, loss reserves to avoid shortfalls in revenue streams, or public sponsor debt guarantees.
- Crowdfunding – Usually associated with smaller infrastructure projects, crowdfunding leverages an online platform to generate funding from individual investors. Resulting mini or micro bonds are underwritten by municipalities and dedicated to specific local projects. Denver and Memphis have had success crowdfunding bike lanes, while Kansas City had difficulties attracting crowd funds for a street car project.
- Socially responsible investing – Using Green Bonds or Social and Environmental Bonds, governments seek to attract investors to projects with significant social, climate, or environmental benefits. Standards for these bonds are evolving to meet interest from investors. Sustainable investing has tripled over the last decade.

# EMERGING APPROACHES TO INFRASTRUCTURE FINANCING – IMPROVED PUBLIC-PRIVATE PARTNERSHIPS (P3s)

- P3s are evolving to incorporate a wide range of emerging financing mechanisms at all project levels, across multiple infrastructure sectors.
- Public and private entities are tailoring these agreements to:
  - Combine and share resources, risks and revenues
  - Provide higher efficiency in project planning and execution
  - Provide better access to capital
  - Improve and streamline regulatory compliance
- P3s are being adopted by state and local governments and are the basis for recently proposed infrastructure initiatives by President Trump, in addition to tax credits.

# EMERGING APPROACHES TO INFRASTRUCTURE FINANCING – IMPROVED PUBLIC-PRIVATE PARTNERSHIPS (P3s)

- P3s are evolving to cover a range of design, build, and operation configurations.



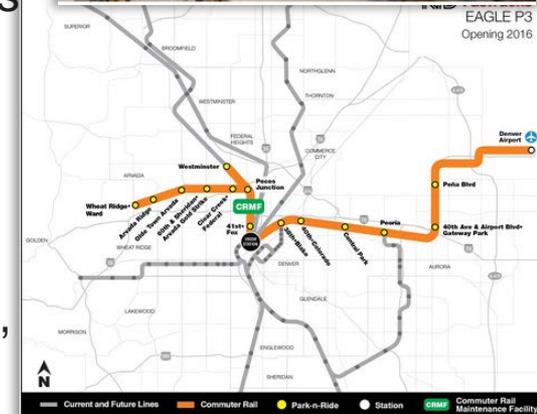
 P3

 Other private sector involvement in infrastructure

GRAPHIC SOURCE: Expanding our Nation's Infrastructure through Innovative Financing, U.S. Department of Treasury, September 2014, [https://www.treasury.gov/resource-center/economic-policy/Documents/3\\_Expanding%20our%20Nation%27s%20Infrastructure%20through%20Innovative%20Financing.pdf](https://www.treasury.gov/resource-center/economic-policy/Documents/3_Expanding%20our%20Nation%27s%20Infrastructure%20through%20Innovative%20Financing.pdf)

# IMPROVED PUBLIC-PRIVATE PARTNERSHIPS - COLORADO FASTRACKS EAGLE PROJECT

- The Denver, Colorado FasTracks Eagle Project exemplifies the integrated approach to infrastructure financing.
- The FasTracks Eagle project is a \$2.2 billion public-private partnership to construct two new commuter rail lines.
- The project incorporated several DOT funding mechanisms
  - FTA New Starts grants
  - PABs
  - TIFIA loan
  - Federal, State, and local resources
  - Private investment
- The project uses a “design-build-finance-operate-maintain” contract with a 34-year concession.
- The city keeps ownership of the assets, sets fares and fare policies, and keeps project revenues.
- The city then makes payments to the private investor and operator based on performance metrics.



GRAPHICS SOURCE: Eagle P3 Project, 2016 Fact Sheet  
[http://www.rtd-fastracks.com/media/uploads/ep3/EP3\\_Fact\\_Sheet\\_2016\\_FINAL.pdf](http://www.rtd-fastracks.com/media/uploads/ep3/EP3_Fact_Sheet_2016_FINAL.pdf)

# RESOURCES

- The following resources provide further information on this topic:
  - *Failure to Act, Closing the Infrastructure Investment Gap for America's Economic Future*, American Society of Engineers, 2017
  - *Expanding Our Nation's Infrastructure Through Innovative Financing*, U.S. Department of Treasury, Office of Economic Policy, 2014
  - *New and Emerging Capital Providers for Infrastructure Funding*, Project #4617, Water Research Foundation, 2016
  - *State and Local Governments' Fiscal Outlook, 2016 Outlook*, GAO-17-213SP, U.S. Government Accountability Office, 2016
  - *Inside 5 Tools Cities Can Use to Pay for Infrastructure*, Jen Kinney, May 19, 2016, Next City, <https://nextcity.org/daily/entry/5-funding-tools-cities-pay-infrastructure-projects>, accessed 17March 2017
- Additional research materials and information sources regarding this topic can be found in the associated *Literary & Scholastic Resource List*.

# Literary and Scholastic Resources – Challenges in Infrastructure Funding

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**Date of information:** 23 March 2017

**Overview:** While not exhaustive, the following resources provide a roadmap to understanding trends that have led to underfunding of infrastructure maintenance, potential impacts to the nation’s critical infrastructure systems, and current and emerging approaches and methods to funding infrastructure now and into the future. These resources provide a baseline understanding of key issues related to the complex problem of infrastructure funding, and may be updated as new data becomes available.

**Module Resource Lists to Cross-Reference:** Aging and Failing Infrastructure, Asymmetric Population Growth

## Organizations:

- **American Society of Civil Engineers:** Publishes the Report Card for America’s Infrastructure, which is widely referenced in discussions of the condition of infrastructure assets and systems. The latest Infrastructure Report Cards and subreports can be accessed at <http://www.infrastructurereportcard.org/>, Web, 23 Mar 2017.
- **National League of Cities:** Researches and publishes position papers on traditional and creative solutions to resolve infrastructure issues. Topics include bridges, power, roads, security, utilities and water systems. More information and access to the topical papers is available at <http://www.nlc.org/topics/infrastructure/>, Web, 23 Mar 2017.
- **U.S. Government Accountability Office:** Models state and local government sustainability on an annual basis. These simulations reveal long-term trends that burden these levels of government and make projections on their balances over the next 50 years. Current and past models and key reports are available at [https://www.gao.gov/fiscal\\_outlook/state\\_local\\_fiscal\\_model/overview#t=1](https://www.gao.gov/fiscal_outlook/state_local_fiscal_model/overview#t=1), Web, 23 Mar 2017.
- **Bipartisan Policy Center:** Assesses policy issues including infrastructure and seeks to combine the best ideas to promote health, security, and opportunity for Americans. BPC publishes issue papers promoting policy decisions on issues of importance on a national basis and identifies other sources for addressing these issues. BPC’s infrastructure issue papers are available at <https://bipartisanpolicy.org/topics/infrastructure/>, Web, 23 Mar 2017.

## Recent Publications:

- **2017 Infrastructure Report Card:** Published by the American Society of Civil Engineers, this report, issued every four years, assesses the current condition of infrastructure across the country. Additional reports include sector-specific or region-specific analysis, as well as economic impacts. Reports and roll-ups can be found at <https://www.infrastructurereportcard.org/>, Web, 23 Mar 2017.



- State and Local Governments' Fiscal Outlook, 2016 Outlook: Prepared by the U.S. Government Accountability Office, the report presents results of simulations of long-term fiscal trends in the state and local government sector and chronicles the long-term fiscal pressures facing state and local governments
  - *Citation*: U.S. Government Accountability Office, State and Local Governments' Fiscal Outlook: 2016 Outlook, GAO-17-213SP: 8 Dec 8 2016, full text at <https://www.gao.gov/assets/690/681506.pdf>, Web, 23 Mar 2017.
- More Money Won't Fix U.S. Infrastructure If We Don't Change How It's Spent: In a different perspective paper, StreetsblogUSA, presents a view that sufficient funds exist to finance infrastructure and advocates assessing how the financing is spent can improve the overall funding outlook.
  - *Citation*: Full text at <http://usa.streetsblog.org/2015/02/05/more-money-wont-fix-u-s-infrastructure-if-we-dont-change-how-its-spent/>, Web, 23 Mar 2017.
- Making the most of a wealth of infrastructure finance: In a position paper, McKinsey & Company advocates for a different model that focuses on the way infrastructure projects are structured and prioritized as a means to infuse private financing more broadly into the funding landscape. *Citation*: Full text at <http://www.mckinsey.com/industries/capital-projects-and-infrastructure/our-insights/making-the-most-of-a-wealth-of-infrastructure-finance>, Web, 23 Mar 2017.

#### **Other Resources:**

- Expanding our Nation's Infrastructure through Innovative Financing: U.S. Department of Treasury, Office of Economic Policy: An overview of underinvestment in infrastructure and approaches to solving the funding shortfalls.
  - *Citation*: Department of Treasury, Resource Center, Economic Policy. Link to pdf can be found at [https://www.treasury.gov/resource-center/economic-policy/Documents/3\\_Expanding%20our%20Nation%27s%20Infrastructure%20through%20Innovative%20Financing.pdf](https://www.treasury.gov/resource-center/economic-policy/Documents/3_Expanding%20our%20Nation%27s%20Infrastructure%20through%20Innovative%20Financing.pdf), Web, 23 Mar 2017.
- Funding Municipal Infrastructure: Integrating Project Finance and Crowdfunding: Published by Stanford University, Global Project Center under support from the National Science Foundation, this document discusses causes of current fiscal issues at municipalities and the integration of crowdfunding with small municipal projects.
  - *Citation*: Full text at <https://gpc.stanford.edu/publications/funding-municipal-infrastructure-integrating-project-finance-and-crowdfunding>, Web, 23 Mar 2017.
- Fixing America's Surface Transportation Act, or "FAST Act": Signed in 2015 to provide long-term funding for planning and investment in surface transportation.
  - *Citation*: Information at <https://www.fhwa.dot.gov/fastact/>, full text at <https://www.fhwa.dot.gov/fastact/legislation.cfm>, Web, 23 Mar 2017.
- The Short and Long term Impact of Infrastructure Investments on Employment and Economic Activity: Prepared by the Economic Policy Institute, the briefing paper details the role of infrastructure in the economy and provides three scenarios to illustrate how financing impacts the economy.
  - *Citation*: Full text at <http://www.epi.org/files/2014/impact-of-infrastructure-investments.pdf>, Web, 23 Mar 2017.



- Answering the Infrastructure Finance FAQs: Presented by the Bipartisan Policy center, the article provides definitions for many of the fundamental financing terms and a primer on their application.
  - *Citation*: Information at Bipartisan Policy Center, Infrastructure, <https://bipartisanpolicy.org/topics/infrastructure/>, full text at <https://bipartisanpolicy.org/blog/infrastructure-finance-faqs/>, Web, 23 Mar 2017.
  
- What Would an Infrastructure Bank Really Do?: The position paper prepared by Brookings Institute addresses the potential benefits of establishing a National Infrastructure Bank.
  - *Citation*: Full text at <https://www.brookings.edu/blog/up-front/2012/07/16/what-would-an-infrastructure-bank-really-do/>, Web, 23 Mar 2017.