



State of the Region: Infrastructure Report

2015



METROPOLITAN WASHINGTON
Council of Governments



About the Metropolitan Washington Council of Governments

The Metropolitan Washington Council of Governments (COG) is an independent, nonprofit association that brings area leaders together to address major regional issues in the District of Columbia, suburban Maryland, and Northern Virginia. COG's membership is comprised of 300 elected officials from 22 local governments, the Maryland and Virginia state legislatures, and U.S Congress.

Region Forward is COG's vision. It's a commitment by COG and its member governments, who together seek to create a more accessible, sustainable, prosperous, and livable National Capital Region. COG's mission is to advance *Region Forward* by being a discussion forum, expert resource, and catalyst for action.

Published: January 14th, 2015

A Letter from Chairman Mendelson



The **2015 State of the Region: Infrastructure Report** provides an in-depth look at both the infrastructure systems at the heart of the metropolitan Washington region, and their funding needs. These roads, bridges, transit systems and airports; water, sewer and energy utilities; communication systems; and public buildings are critical to our region's health, safety, economy and quality of life.

Infrastructure is usually under-appreciated until something goes wrong. We want transportation to run smoothly, electricity and natural gas to turn on when we flip the switch, water to flow when we turn on the tap, clear communications in an emergency, and first-class public buildings. However, maintenance and replacement costs in critical sectors have been deferred as leaders have been faced with competing priorities, and the need for investing in new systems to support growth and maintaining a state of good repair totals in the billions.

For 2014, I proposed that the COG Board of Directors focus on this critical issue, and since January, we have held discussions with experts from across the infrastructure provider spectrum. We heard from state, regional and local transportation departments and authorities about the needed investments in roads, bridges and transit, and from the heads of the region's three commercial airports who spoke to balancing growth and making investments to support current and future demand. Water officials reviewed long term plans for assuring the safety and supply of our region's drinking water, how wastewater and stormwater infrastructure have produced significant environmental improvements and outlined further investments, particularly in stormwater management, needed to restore local waterways and the Chesapeake Bay. Leaders from the region's largest energy utilities addressed plans for replacing and upgrading natural gas pipes and electric power lines as well as using new technologies to improve efficiency. These and other discussions in our series have been enlightening and—taken together—paint a detailed picture of the current capacity, gaps, and funding needs of our region's infrastructure.

I commend COG staff for drawing on its regional connections and applying its expertise across subject areas to produce this first-of-its-kind report. Now, our challenge is to put this valuable information to good use as each of our jurisdictions, authorities and other infrastructure owners and regulators set budgets and consider projects. Let's work together to identify policy, advocacy, and outreach actions that will address these needs.

The region's infrastructure connects us in so many ways. Let's pledge a renewed commitment to its maintenance, repair, and strategic expansion in order to shape stronger communities and realize our Region Forward vision for a prosperous, accessible, livable, and sustainable future.

Phil Mendelson
Chairman, Board of Directors, Metropolitan Washington Council of Governments
Chairman, Council of the District of Columbia



Project Team

- ▶ **Stuart Freudberg**
Project Manager
- ▶ **Monica Beyrouiti**
Principal Author
- ▶ **Stephen Walz**
Principal Author
- ▶ Chuck Bean
- ▶ Steve Bieber
- ▶ George Danilovics
- ▶ Paul Desjardin
- ▶ Robert Griffiths
- ▶ Steve Kania
- ▶ Jeff King
- ▶ Matt Kroneberger
- ▶ Isabel Ricker
- ▶ Richard Roisman
- ▶ Jeanne Saddler
- ▶ Tanya Spano
- ▶ Kanti Srikanth

Special Thanks

- ▶ AquaLaw PLC
- ▶ Baltimore Washington International Thurgood Marshall Airport
- ▶ District Department of Transportation
- ▶ District of Columbia Water and Sewer Authority
- ▶ Dominion
- ▶ Fairfax County
- ▶ Federal Communications Commission
- ▶ Maryland State Highway Administration
- ▶ Metropolitan Washington Airports Authority
- ▶ National Regulatory Research Institute
- ▶ National Association of Clean Water Agencies
- ▶ North Central Texas Council of Governments
- ▶ Pepco
- ▶ Prince George's County
- ▶ Urban Land Institute
- ▶ Virginia Department of Transportation
- ▶ Virginia Department of Transportation
- ▶ Washington Aqueduct
- ▶ Washington Metropolitan Area Transit Authority
- ▶ WGL Holdings, Inc.

Table of Contents

Letter from Chairman Mendelson	3
Executive Summary	6
Findings	7
Recommendations	8
Introduction and Overview of 2014 Infrastructure Initiative	9
Infrastructure Sectors	12
Transportation	13
<i>Current Infrastructure Funding Gap: \$24.5 billion</i>	
Water	23
<i>Infrastructure Funding Gap: \$20 billion</i>	
Energy	30
<i>Infrastructure Funding Gap: \$5 billion</i>	
Public Buildings	35
<i>Infrastructure Funding Gap: \$8.5 billion</i>	
Public Safety Communications	37
<i>Infrastructure Funding Gap: Study for Regional NG9-1-1 in process, cost estimates available in late 2015</i>	
Conclusions & Recommendations	40



METROPOLITAN WASHINGTON

Council of Governments

Executive Summary

The metropolitan Washington region's leaders have recognized the fundamental role infrastructure plays in the ability to maintain and improve the region. However, despite regional recognition of the importance of maintaining our infrastructure, infrastructure investment is often a challenge for many organizations. Officials at the federal, state, and local level must balance an enormous number of funding needs, and sufficient funds often are not available for infrastructure needs.

To raise awareness about the importance of adequate infrastructure funding, the COG Board of Directors established Regional Infrastructure as a priority focus for

2014. This report synthesizes information considered by the Board of Directors throughout the year and explains the current status and future needs to address the region's infrastructure systems.

The COG Board of Directors focused on five critical infrastructure sectors—transportation, water, energy, local public buildings, and public safety communications. These infrastructure systems were selected as they are lifeline infrastructure systems that are regional in scope, are owned and controlled locally or regionally, or are significantly affected by government regulation.

Executive Summary

Findings

This report found that the Region has been making considerable investment in maintaining and expanding critical infrastructure. These investments are being made by local, state and federal governments, local and regional authorities, energy, telecommunication, water and wastewater utilities, and private businesses. A variety of sources are used to pay for infrastructure

investments, including tax collections, utility rates, and user fees paid for services such as on toll roads.

Despite these investments, and in light of the continued growth in the region, with more than 1.6 million new residents expected by 2040 (an increase of nearly 33%), billions of dollars in additional funding is needed to maintain our critical infrastructure. Comparing and comprehensively

quantifying the needs across the region and its major infrastructure sectors requires accounting for the different planning horizons and financing assumptions made by each infrastructure provider. Accepting that there is no standard time frame for analysis, this report conservatively estimates a funding gap of **\$58 billion** in the next 15 years.

The ability to expand and sustain the metropolitan Washington region is directly connected to the health and sustainability of the Region's infrastructure. This report highlights the need to bring infrastructure development, operations and maintenance needs to the forefront of governmental priorities. Local, state, and federal officials need to work with regional partners to secure funds and implement solutions to provide for these critical needs.

15 Year Infrastructure Funding Gaps*

Infrastructure Sector	Funding Gap	Time Frame
Transportation—Public Transportation	\$16 billion	10 years
Transportation—Roads	\$7.5 billion	15 years
Transportation—Bridges	\$1 billion	10 years
Water—Storm Water	\$10 billion	10 years
Water—Drinking & Waste Water	\$10 billion	10 years
Energy—Electric	\$4.4 billion	3 years
Energy—Gas	\$650 million	5 years
Public Buildings	\$8.5 billion	6 years
Public Safety Communications	Study for Regional NG9-1-1 in process, cost estimates available in late 2015	
Total:	\$58 billion	

*The above funding gaps are based on conservative estimates. Additional funding gaps over the next 15 years are still being quantified.

Executive Summary

Recommendations

To achieve a vibrant future for the Region, the following recommendations are made to preserve, invest in and enhance the region's systems of critical infrastructure. Taken together, these recommendations represent a commitment to support COG's *Region Forward* vision for a prosperous, accessible, livable and sustainable Region.

Five recommendations have been identified to reinforce the critical importance of the investment in the region's infrastructure. These include creation of an infrastructure partnership to formalize regional focus, public education, sharing best practices, highly innovative financing, and advocacy.

1. **Regional infrastructure exchange:** Establish a regional or mid-Atlantic infrastructure exchange in the form of an organization or council tasked with a continued focus on infrastructure needs within local governments. This group of

regional partners would prioritize infrastructure costs, funding needs and mechanisms, and continue to periodically assess the state of infrastructure in the region.

2. **Public education campaign:** Increase public awareness of the infrastructure needs in the region and the costs of implementing these needs. Local leaders, policy makers and the general public need to gain a better understanding of the large funding gaps currently existing and realize the necessity of making infrastructure a priority when allocating limited resources and funds.
3. **Continued sharing of best practices:** Coordinate with regional entities and with experts across the United States to increase the exchange of best practices and models for maintaining the current infrastructure and adequately financing the necessary infrastructure as the region continues to grow.

4. **Workshop series on unique funding mechanisms:** Facilitate a series of workshops focused on developing ideas for financing essential infrastructure projects. Experts should be brought together to brainstorm out-of-the-box funding mechanisms for infrastructure projects related to transportation, wastewater, drinking water, energy, communications and public buildings innovative and creative ideas can be identified to accomplish specific funding needs on a project by project basis.
5. **Advocacy:** Insure that the COG Board of Directors' legislative priorities and policy positions support essential investments, creation of partnerships, and champion the actions required to close the funding gaps identified in this report.

The COG staff will track and report on the status of implementation at least once a year.

Introduction and Overview

of MWCOG's 2014 Infrastructure Initiative

Infrastructure can be defined as the basic physical and organizational structure needed for the operation of a society or enterprise. It includes the facilities and related services that support a society, such as roads, bridges, tunnels, rail lines, airports, water supply, sewers, electrical grids, telecommunications, public buildings and facilities, and other similar systems. Infrastructure is necessary to provide the commodities and services essential to enable, sustain, or enhance societal living conditions.

The term infrastructure comes from the French language, where it means subgrade or the native material underneath a constructed pavement or

railway. English use started in the late 1920s as a term to describe the installations that form the basis for an operation or system. Current use of the term to describe the physical infrastructure of our communities came into use in the 1970s.

Infrastructure plays a vital role in the success of our region. As our population continues to grow, new infrastructure and upgrades to current infrastructure is necessary to accommodate the increased demand.

Numerous organizations have characterized the challenged state of our nation's infrastructure. For

example, in the 2013 Report Card For America's Infrastructure, the American Society of Civil Engineers (ASCE) rated the United States overall infrastructure a D+. According to ASCE's report, solid waste (B-) is currently the strongest ranked category of infrastructure in the U.S. Inland waterways and levees were the lowest rated (D-). Other national scores included aviation (D), bridges (C+), drinking water (D), energy (D+), public parks and recreation (C-), rail (C+), roads (D), schools (D), solid waste (B-), transit (D), and wastewater (D).

The National Association of Manufacturers released a report

outlining the importance of robust infrastructure and that maintaining the status quo will not be sufficient to turn around the nations failing grades on infrastructure. The report cited economic analysis by the University of Maryland showing that long-term increases in public infrastructure investments nationally from all public and private sector sources over the next 15 years would yield almost 1.3 million jobs and boost GDP by 1.3% by 2020 and 2.9% by 2030.

For the metropolitan Washington region, infrastructure is the foundation for a livable and workable metropolitan area. While the current

infrastructure is providing for our region today, new infrastructure will need to be established, in addition to maintaining the current infrastructure, as the metropolitan Washington region continues to grow. Local, state, and federal governments, as well as public utilities and private businesses, will need to dedicate the time and funds to provide for the robust infrastructure needed to propel the region into the future.

Investment in infrastructure will provide multiple benefits to the metropolitan Washington region. For example, infrastructure plays a critical role in helping the region meet the Metropolitan Washington Council of Governments' (COG) Region Forward vision for a more accessible, sustainable, prosperous, and livable metropolitan Washington.

In order to increase the collective knowledge and awareness of infrastructure in the metropolitan Washington region, the COG Board of Directors identified regional infrastructure as a key element of its 2014 Work Plan. Throughout the year staff has highlighted the critical importance of investment in our region's infrastructure. The Board received presentations from regional and national infrastructure experts and examined the issues with each critical infrastructure sector. The dialogues led to the proposed policy initiatives, guidance and direction included in this report.

The infrastructure topics focused on COG's core competency areas—transportation, water, energy, local public buildings and public safety communications. These were selected as they are lifeline

Infrastructure Components of The Metropolitan Washington Region



infrastructure systems that are regional in scope, are owned and controlled locally or regionally, or are significantly affected by government regulation. They are critical to our region's health, safety, economy, and quality of life.

This report highlights each infrastructure system and sub-types and includes information on what defines and distinguishes our region's infrastructure, who owns and manages it, what it costs to maintain, what the future needs will be; how it is currently paid for; and the future financing/funding needs and options. In addition to explaining the current condition and capacity of the region's infrastructure, the report also addresses the gaps and needs, regulations, concerns, assets, and future challenges to maintaining and developing each infrastructure system.

The report assesses the funding gap between what is needed to build, operate and maintain infrastructure systems to meet the metropolitan Washington region's needs and the funds that have currently been earmarked for these systems. This report conservatively estimates a 15 year funding gap of \$58 billion.

What does this report mean by a funding gap? This is comparable to unbudgeted expenses a couple may face into the future. Assume the couple is paying \$1,500 per month, or \$18,000 per year for a home mortgage and \$300 per month, or \$3,600 per year, for utility and regular maintenance costs. These would total to \$216,000 in budgeted costs over 10 years. However, they could have to pay to replace their heating and cooling system and a hot water heater, put on a new roof, paint the house, and other

similar work that could cost \$20,000. Additionally, if they were to have a child, their annual costs would increase \$250 per month or \$3,000 per year. These would total to a \$50,000 funding gap, or nearly one-quarter more than budgeted, over the next 10 years.

This report calculated the funding gap for the region's infrastructure as follows:

- ▶ **Transportation:** Local, regional and state agencies have identified, in the region's Constrained Long Range Plan, \$79 billion in system preservation projects and operations for which funding is reasonably available. However, there are additional investments needed. It is estimated that the region will need \$7.5 billion over the next 15 years for road resurfacing and rehabilitation, and \$1 billion over the next 10 years to rehabilitate and reconstruct bridges. WMATA estimates that it will need \$1 billion annually, or \$10 billion over the next 10 years, to maintain and replace assets on a regular life cycle basis, and \$6 billion through 2025 for the Metro 2025 initiative. This totals to a \$24.5 billion gap for transportation.
- ▶ **Water:** Local governments, water and wastewater utilities, and regional authorities have been making significant investments in upgrades to their central treatment plants and systems. However, the region's drinking water utilities will need to make over \$1 billion per year in capital investments to replace aging pipe, valves, and distribution and gathering pipe infrastructure and continue upgrades to central treatment plants. Local

governments will need to invest at least \$10 billion in stormwater management infrastructure. These investments will need to be recovered through future utility rates, stormwater fees and other revenue. They total to a minimum of \$20 billion.

- ▶ **Energy:** The electric and natural gas utilities serving the region have invested billions of dollars in upgrades to electric and natural gas transmission and distribution systems as well as in new electric generation plants and energy efficiency and demand control measures. These investments will need to continue into the future. For example, Pepco is planning to invest \$3 billion in the next four years to improve electric system reliability in the District and Maryland suburbs. Dominion is planning \$1.4 billion in infrastructure investments just in Northern Virginia. Washington Gas is planning to invest \$650 million in system upgrades over the next 5 years. These investments will need to be recovered through future utility rates. They total to \$5 billion.
- ▶ **Public Buildings:** Local governments operate and maintain over 3,600 schools, public safety, libraries, offices, and other public buildings. Localities must rehabilitate old buildings and build new buildings to meet the needs of the region's growing population. They are planning over 500 public building projects to be funded through future taxes and other revenue totaling to \$8.5 billion over the next six years.

Infrastructure Sectors



Transportation

Current Infrastructure Funding Gap: **\$24.5 billion**

Background

Transportation infrastructure provides for the movement of people and goods and is critical to the growth and sustainability of our region. Transportation often receives the most attention compared to other forms of infrastructure due to its visibility and prominence in the day-to-day lives of both residents and visitors. Providing this effectively throughout the region is vital to ensure economic competitiveness, public safety, and quality of life.

The primary categories of transportation infrastructure in the region include roads and bridges, public transportation, and aviation. The region also is served by and transected by freight railroads and a limited amount of water-borne transportation. All of these parts are interconnected and must work to meet our region's needs for transportation needs.

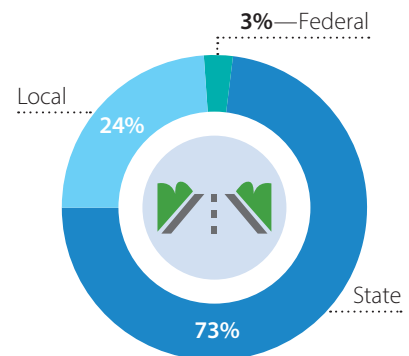
Roads and Bridges

Work on road and bridge infrastructure includes the planning, design, construction, and

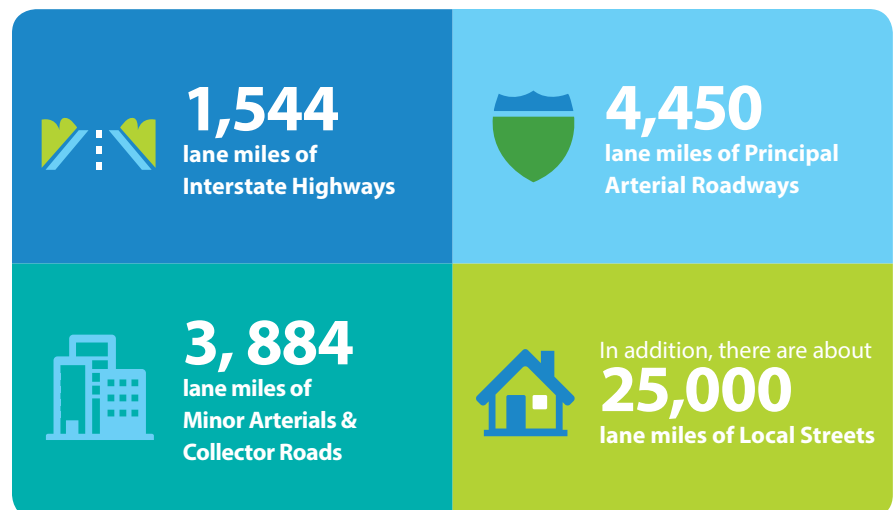
maintenance of streets, sidewalks, bridges, tunnels, bicycle lanes, streetlights, signals, street trees, and alleys. This work is the responsibility of the District Department of Transportation, the Federal Highway Administration, Maryland State Highway Administration, National Park Services, Virginia Department of Transportation, regional authorities and local governments.

Eight out of ten daily trips in the region are by automobile and truck, totaling 120 million vehicle miles

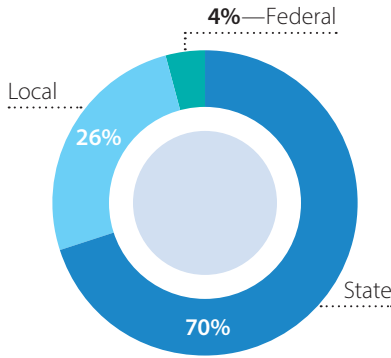
Highway Ownership



Highway Inventory

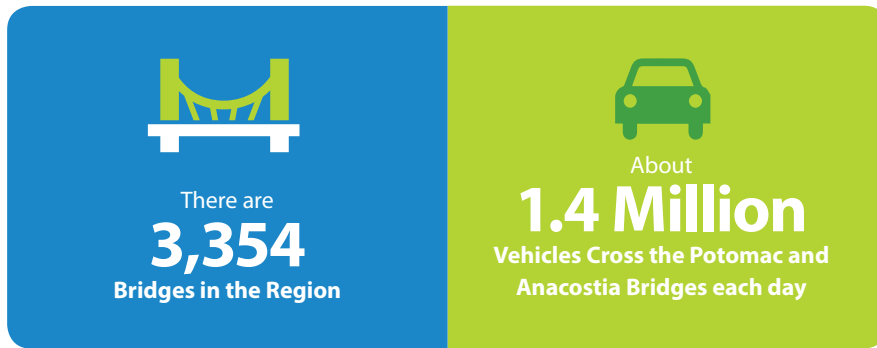


Bridge Ownership

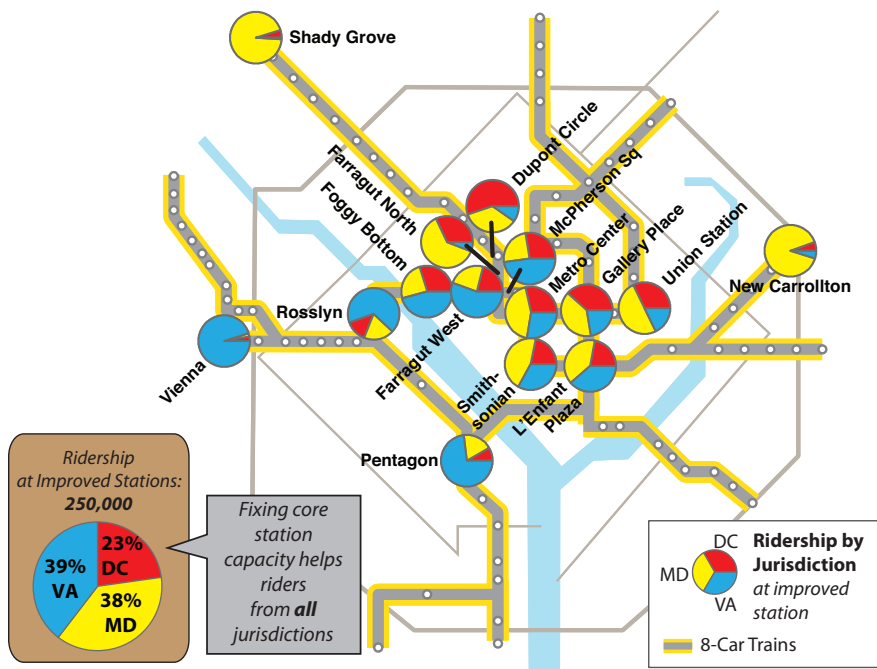


traveled (VMT) per day. Heavy and medium trucks account for about eight percent of this daily VMT. About 78 percent of daily highway travel is on roads with Good or Acceptable Ride Quality. Therefore, 22 percent of daily highway travel is on roads that need to be improved. There are 3,354 bridges in the region with approximately 1.4 million vehicles crossing the 15 major Potomac and Anacostia bridges each day.

Bridge Infrastructure



Momentum Regional Ridership Composition



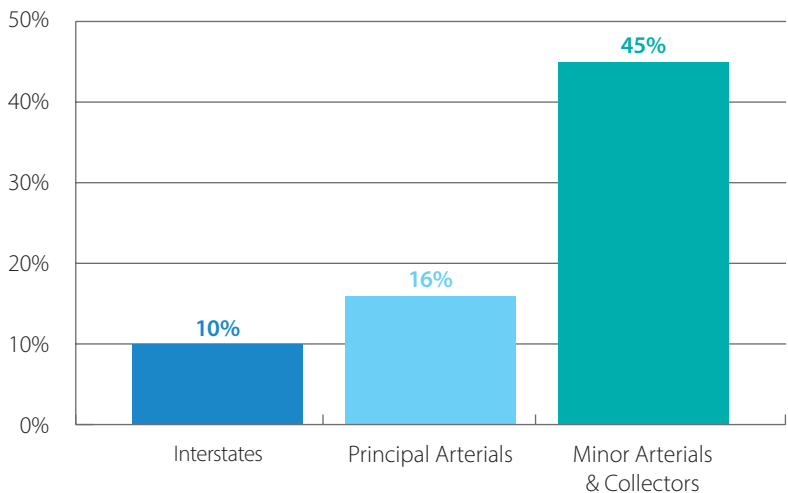
Transit

The main form of public transportation in the region is the Metro. The Washington Metropolitan Area Transit Authority (WMATA or Metro) was created by an interstate compact in 1967 to plan, develop, build, finance, and operate a balanced regional transportation system in the national capital area. Metro's rail and bus lines account for 85 percent of the public transportation in the region. The other 15 percent is comprised of the Virginia Railway Express (VRE), the Maryland Area Regional Commuter (MARC), and additional bus systems. Today, Metrorail serves 91 stations and has 117 miles of track and Metrobus operates a fleet of 1,500 buses. Metrorail and Metrobus serve a population of 5 million within a 1,500-square mile footprint. In 2013 customers made approximately 209 million rail trips and 136 million bus trips.

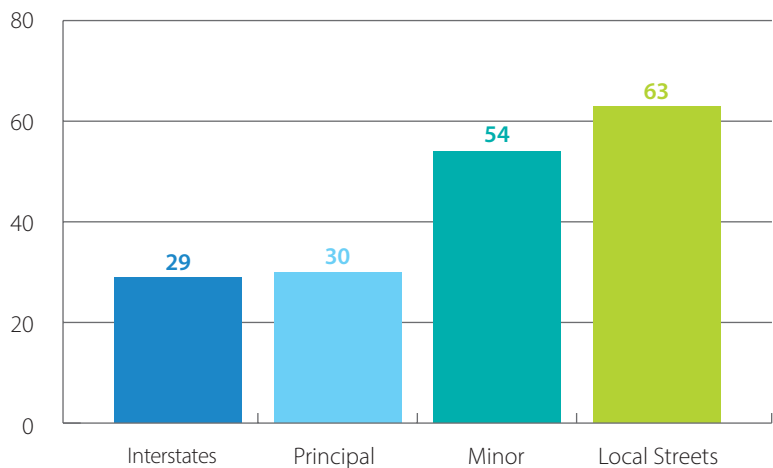
Air Travel

There are three commercial service airports serving the metropolitan Washington region: Baltimore-Washington International Thurgood Marshall Airport (BWI) located in Anne Arundel County, Maryland, Ronald Reagan Washington National Airport (DCA) located in Arlington County, Virginia, and Washington Dulles International Airport (IAD) located in Loudoun and Fairfax counties, Virginia. In 2013, BWI, DCA, and IAD were all in the top 25 busiest airports in the United States based on data from the Federal Aviation Administration (FAA). The three airports as a single regional system serve both air passengers and air cargo. It has been long-standing

Percent of Lane Miles with Deficient Pavement (Ride Quality)



Number of Structurally Deficient Bridges



regional policy to seek balance within that system. Continuing this balance will promote economic growth and regional sustainability.

Connectivity between airports and roads and transit is essential to keeping our region competitive. The airport mode of access chart shows the types of transportation used to access each airport as reported in the 2013 Washington-Baltimore Regional Air Passenger Survey.

The most recent FAA forecasts predict continued growth at all three regional airports. Despite DCA’s federal government regulatory limits on flight operations and their existing conditions approaching the physical capacity limits of the airport, DCA continues to experience high growth. The implementation of weekend MARC service to BWI and the opening of the Metrorail Silver Line towards IAD will improve access to both of these airports and assist in accommodating the anticipated future growth. Directing future traffic to spread regionally to BWI and IAD is in the best interest on the region as a whole and will allow for increased economic growth.

Highway Pavement Conditions




Only about **78%** of daily highway travel is on roads with “Good” or “Acceptable” Ride Quality

Bridge Conditions



176 bridges or about 5% of all bridges in the Region have been rated as “Structurally Deficient”

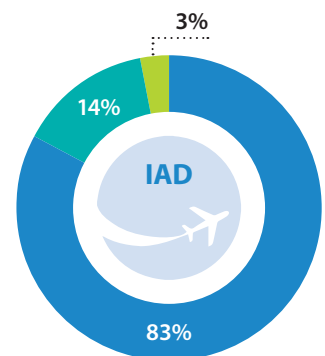
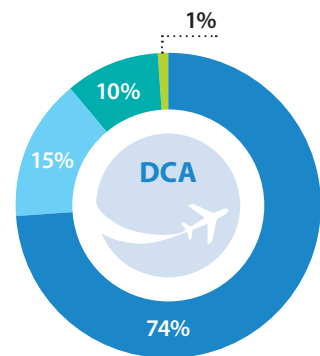
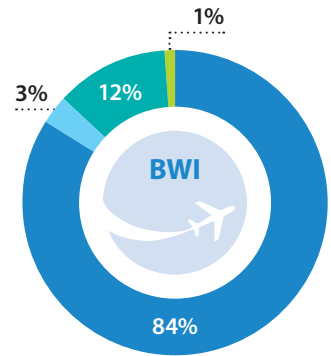


Nationally, about **11%** of all bridges are rated as “Structurally Deficient”

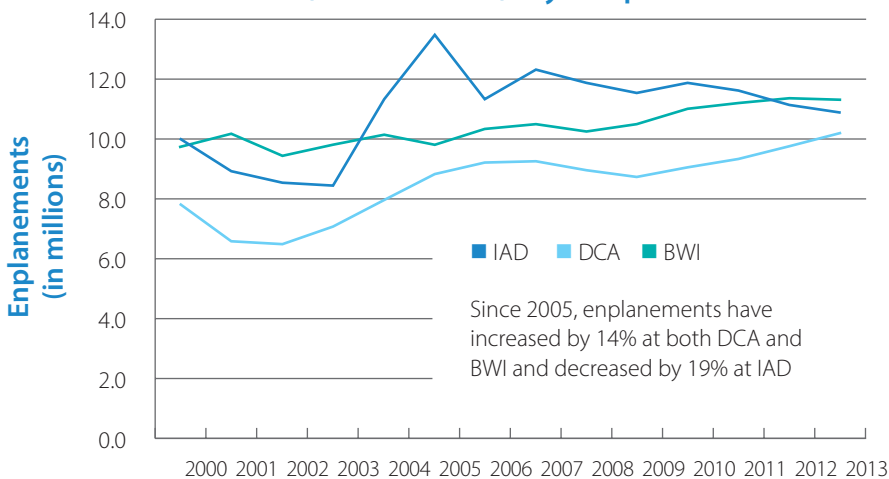
Map of COG/TPB Air System Planning Region with location of three airports



Locally Originating Airport Trip Mode of Access (2013 Survey)



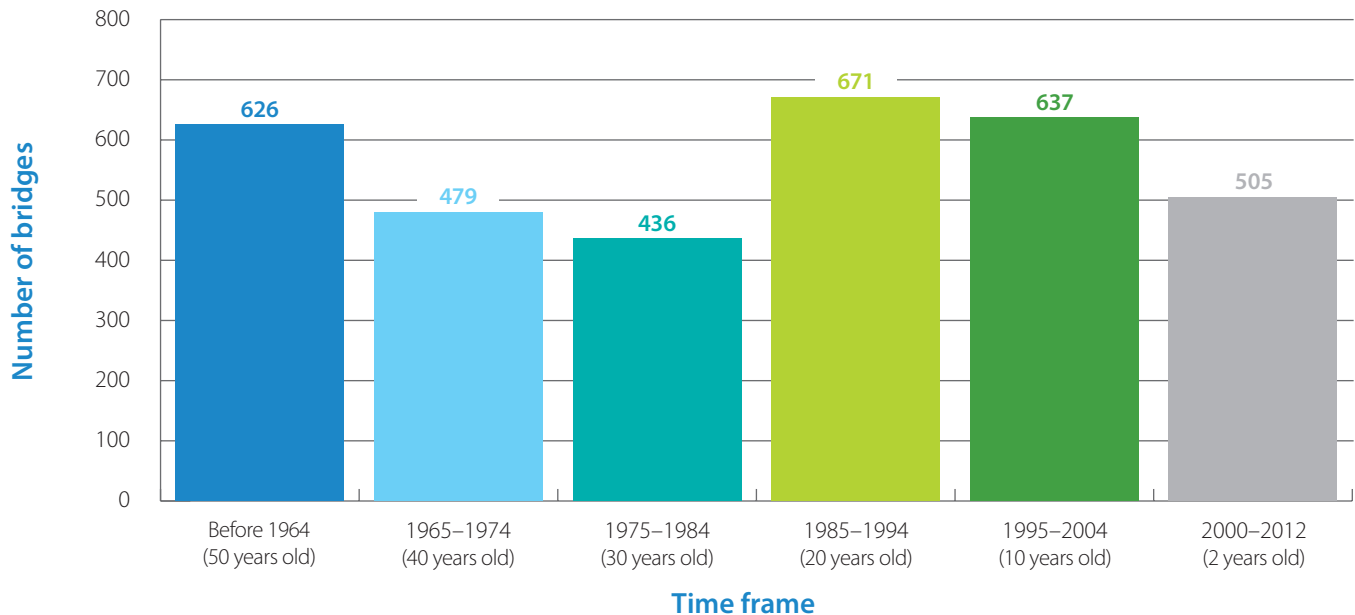
Regional Air Passenger Enplanements Trend (2000–2013) by Airport



- Private Car / Rental Car / Taxi
- Metrobus / MTA Bus / Other
- Airport Bus / Van / Limo + Hotel / Motel Bus
- Metrobus / MTA Bus / Other

Age of Bridges in Region

Bridge construction by time period



Future Gaps and Needs

The metropolitan Washington region has a large population of residents and visitors commuting in and around the region every day. There are approximately 17 million trips per day, of which 100,000 are “through trips”; 3.5 million are commuters, and 8 million are “local commerce trips”. “Local commerce trips” include work-related business, shopping, and personal business such as banking and healthcare. Tourist trips vary throughout the year depending on the season and scheduling of special events. This creates constant wear on the roads, bridges, rail lines, and airports. Given this high volume use of the roads and bridges in the region, funding regular maintenance and repairs is vital to maintaining acceptable and useable conditions and maintaining a sustainable transportation infrastructure system.

Roads and Bridges

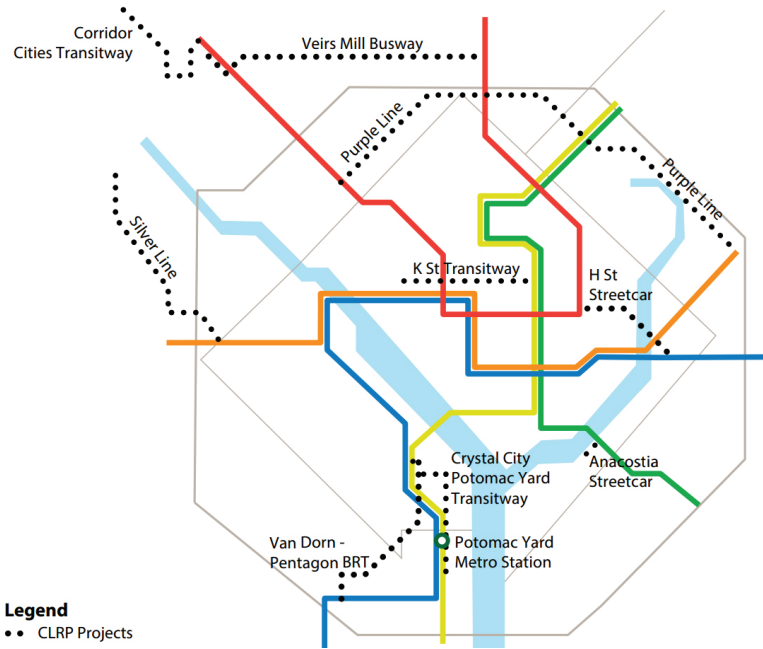
In order to maintain an acceptable level of “Ride Quality” on the region’s highways, each lane mile of roadway needs to be resurfaced at least once approximately every 15 years, and a major structural rehabilitation of the roadway is required about every 30 years. High volume roads with significant truck traffic require more frequent resurfacing and structural rehabilitation, about every 10 years.

The average life span of a bridge structure is 50 years. The Age of Bridges in the Region chart shows that in the next ten years the region will need to replace or reconstruct 626 bridges of the region’s 3,354 bridges. For the past five years about 63 bridges have been constructed or reconstructed per year. The region will need to maintain this pace over the next ten years. The average cost of a bridge reconstruction varies widely based on the type and

Re:focus Partners Reinvest Initiative in Hoboken, NJ

The REinvest Initiative is a public-private program to initiate private investment partnerships with municipal governments across the country in an effort to create more resilient and sustainable infrastructure systems. Eight cities across the United States were selected to participate in the program. Hoboken is reinvesting to reduce urbanized flooding. The city is building an underground parking garage and stormwater detention that will also assist with flood control in times of need. This unique solution is an example of combining resources to achieve common goals.

Metro Integration Projects



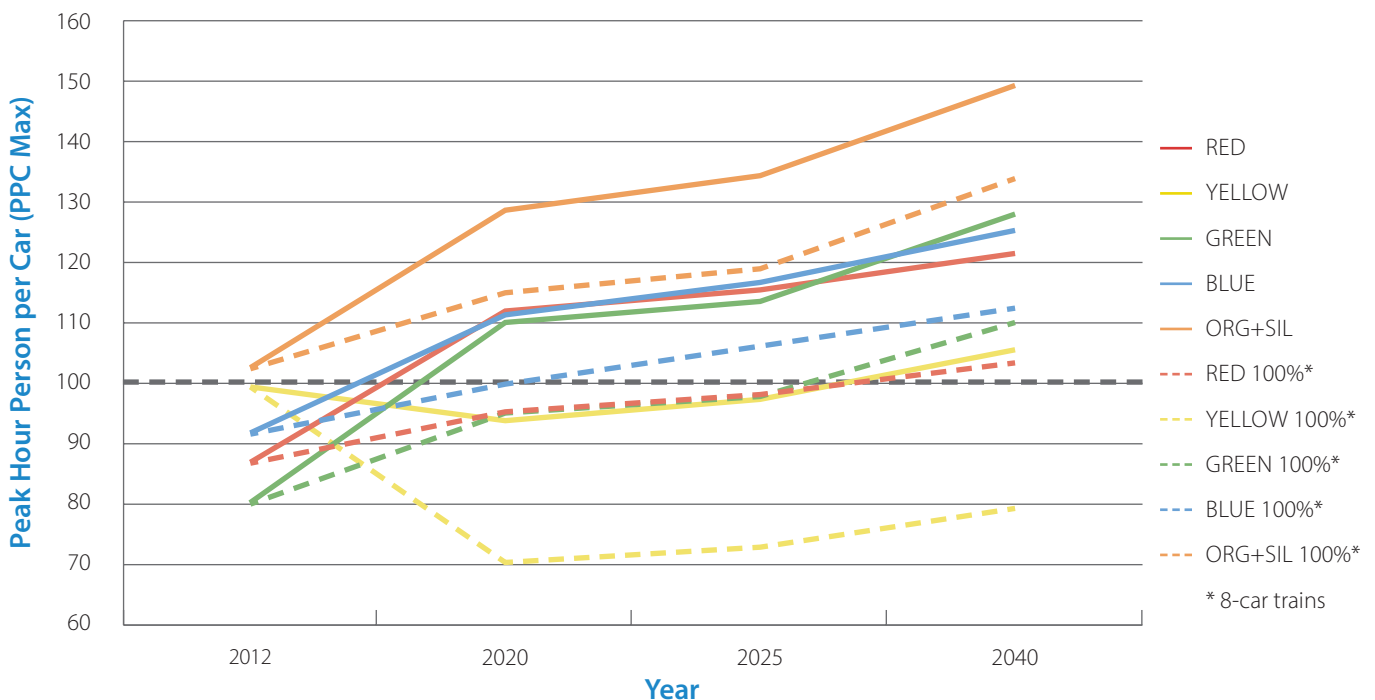
length of the structure, ranging from less than \$1 million for small short-length bridge structures to several hundred millions of dollars for major bridges on interstate freeways.

Currently 176 bridges, about five percent of the bridges in the region, have been rated structurally deficient by the state and District transportation departments. While this is below the national average of 11 percent, many of these bridges are essential to the connectivity of regional travel. Therefore it is important to maintain and structurally improve our bridges to ensure continued reliability in the future.

Transit

At the age of 47 years, Metrorail is in need of many repairs and routine maintenance is essential to keeping

Metrorail crowding with and without 8-car Trains



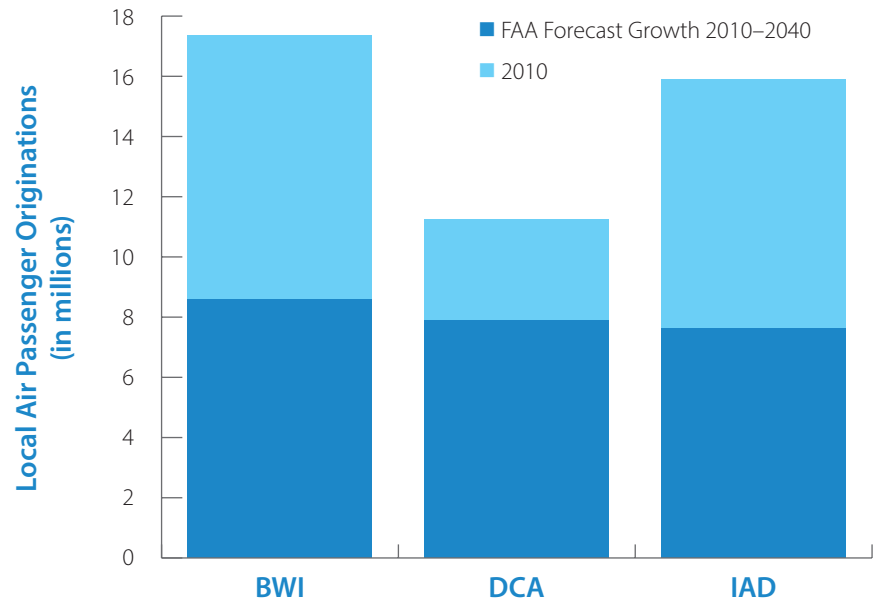
the system operating properly and on-time. The *MetroForward* improvement program outlines a series of maintenance improvements currently in progress throughout the region. However, identified and secured funding to continue up-keep in the future is essential to the functionality of the region's public transportation infrastructure. Underfunding Metro repairs and upkeep will produce more delays, service disruptions and crowded conditions.

During peak ridership times, many of the Metrorail lines are already at full capacity. As the region continues to grow and expand, six-car trains will be unable to serve the population. Based on this limited capacity to serve more riders, transportation planners must stop counting additional Metro ridership in transportation plans as of 2020. Metro needs to complete its upgrade from six-car trains to eight-car trains to account for the growing system traffic. Providing adequate capacity on the Metrorail system is integral to the success of the region's investments and supporting continued growth in the region's activity centers.

Costs and Funding

The long term investments planned for the metropolitan Washington region's road, bridge and transit infrastructure are totaled in the Constrained Long Range Plan (CLRP) for the region. The 2014 CLRP includes \$39 billion in system preservation projects by 2040. System preservation includes safety and resurfacing projects,

Historic and Forecast Growth in Local Air Passenger Originations*



*Excludes connecting passengers and ground access trips originating outside the air systems region

Source: FAA TAF (2013) COG/TPB Ground Access Forecast Update

Pennsylvania Rapid Bridge Replacement Program

In 2012 the Pennsylvania Department of Transportation established the P3 Transportation Partnership Board with the mission of reviewing and approving potential Public-Private Transportation Projects for procurement. The Rapid Bridge Replacement Program has been approved by the state and is one of their main projects out for procurement in 2014. The Rapid Bridge Replacement Program will procure a private contractor to accelerate the replacement of

approximately 600 structurally deficient bridges in Pennsylvania. Hiring a private company to repair the bridges will allow the state to complete the project exponentially faster while minimizing impact on the public. The length of the project contract will include three to four years of construction, and 25 years of maintenance responsibility for each bridge. Estimated costs per bridge are approximately \$2.1 million. Design and construction for this project will begin in early 2015.

The NextGen aircraft navigation system coming to the region's airports

The Washington region is the first in the nation to have three NextGen aviation systems running side by side. This advanced aircraft navigation system allows more efficient use of the airports by allowing more accurate takeoff and landing paths and procedures. The system improves point to point flight paths and reduces spacing between aircraft take-offs. NextGen uses satellite-based and digital technologies to better connect all segments of air travel to improve the safety and overall experience for both travelers and the impacted environment. When deployed nationwide, the NextGen system will annually reduce fuel used by aircrafts by over 2.5 million gallons.

and smaller area-wide preventative maintenance resurfacing projects. There is an additional \$40 billion in projects by 2040 for operations. This translates annually into state and local transportation budgets.

Roads and Bridges

Maryland, Virginia, and the District of Columbia each have millions of dollars of priority road and bridge projects to improve traffic conditions in the region. For example, the MD 97/Randolph Road Interchange construction in Maryland is valued at \$40 million and the I-395 Seminary Road HOV Ramp and NB Auxiliary Lane in Virginia is valued at \$60 million.

The Maryland State Highway Administration fiscal year 2014 system preservation budget is approximately \$90 million. The Virginia Department of Transportation plans to spend approximately \$390 million on pavement construction and maintenance statewide in FY2015 and approximately \$24 million each year for bridge maintenance.

Looking at costs another way, the current unit cost for road resurfacing is approximately \$125,000 per 12' lane for secondary roads, \$175,000 per lane mile for primary arterial roads, and approximately \$240,000 per lane mile for interstate and other freeways. Structural rehabilitation costs are considerably more and depend on a number of design factors, but average about \$750,000 per lane mile for arterial roads and \$1 million per lane mile for interstate roads.

Applying these average costs to the region's highway inventory, it is estimated the region will need to spend more than **\$7.5 billion over the next 15 years** on roadway resurfacing and rehabilitation. Lower volume local streets require pavement resurfacing much less frequently than highways, but the costs of resurfacing these streets are in addition to the total above and fall primarily on local governments.

It is also estimated that the region will need to spend more than **\$1 billion dollars in the next 10 years** to rehabilitate and/or reconstruct bridges that will be reaching the end of their typical 50-year life span. For example, major bridges across the Potomac and Anacostia Rivers including the Key

Bridge, Theodore Roosevelt Bridge, Memorial Bridge and the South Capitol St Bridge will need to be reconstructed. In total, the region is expected to spend \$100 billion on highways and bridges over the next 25 years.

Transit

Turning to transit, WMATA launched *MetroForward* in 2011, a \$5-billion program to deal with deferred maintenance of the Metrorail and Metrobus system. This six-year effort has already delivered improvements in safety and reliability, including escalator rehabilitation, station repairs, and hundreds of replaced or rehabilitated buses. Although *MetroForward* will make great strides in rebuilding the system, the funding agreement for the program will end in 2020. At the same time, new maintenance challenges will continue to emerge. For example, Phases I and II of the Silver Line in July 2014 are increasing the size of the rail system by 25 percent, requiring an increase in capital maintenance. Over the coming decade, WMATA estimates that the system will need more than **\$1 billion annually** just to maintain and replace assets on a regular life-cycle basis to continue the current level of service.

In addition to this annual maintenance price tag WMATA has identified a number of capacity improvements to the core of the Metro system in *Metro 2025*, a component of its new Momentum strategic plan. *Metro2025* includes 7 key initiatives to improve the rail and bus lines that will cost approximately **\$6 billion through 2025**. Improvements include more 8-car trains, power

improvements, and maintenance facilities to operate all 8-car trains during rush hours. Planned station improvements will increase flow through major stations with more escalators, stairs, and mezzanine space added at transfer stations to accommodate more riders. More buses, bus-only lanes along major corridors, and additional limited-stop and express service are also in the strategic plan. Although the necessary capacity improvements have been outlined, funding has not been identified or secured. Without funding to make these improvements the public transportation infrastructure will not be able to keep up with the growing demand.

Air Travel

Collectively, the region's three airports have invested hundreds of billions of dollars in their infrastructure and are investing hundreds of millions annually in renovations, expansion, and maintenance. As commercial service airports, this form of transportation and regional infrastructure funding operates differently than the surface network.

DCA, and IAD are owned and operated by the Metropolitan Washington Airports Authority. BWI is owned and operated by the Maryland Aviation Administration. These airports are funded through user fees charged to airlines for takeoff and landing rights at each airport, supplemented with federal, state, and local funding sources. However, user fees can be subject to market sensitivities and can create imbalances in the system. For example, IAD is charging higher fees than DCA and BWI, in part to pay its high debt service payments

for infrastructure investments such as AirTrain and the Metrorail Silver Line. While IAD is paying these costs, they contribute to the growth of the regional airport system as a whole.

Findings

This report of transportation infrastructure in the region found that:

- ▶ State and local governments have made significant new investments in maintenance of the system.
- ▶ Population and business growth and ongoing maintenance needs will continue to strain the transportation system. New road improvements will be needed to reduce congestion. New transit investments will be needed to ensure that capacity will meet demand. The region has not identified sufficient sources of funds to meet these needs.
- ▶ The region's three commercial passenger airports act as a system to meet the region's needs. Growth needs to be targeted to IAD and BWI due to the limited capacity for growth at DCA and the need to support infrastructure investments being made at IAD and BWI.

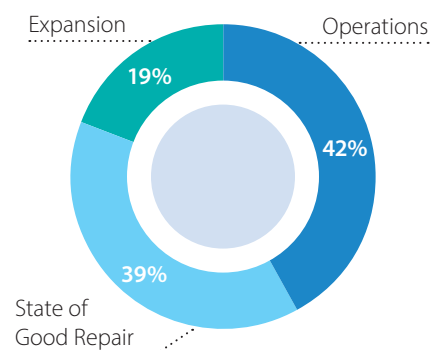
Considerations Moving Forward

As the population living and commuting in the region continues to increase, our transportation infrastructure will become closer and closer to reaching capacity. Without regular maintenance, improvements, and expansion, the infrastructure will not be able to adequately serve a growing population and economy. Securing dedicated funding to maintain and expand

Expenditures on Highway and Bridge Infrastructure



Estimated 2015–2040 Highway & Bridge Expenditures



the transportation infrastructure is imperative to provide for future growth of the region.

Obtaining adequate funding to both grow and maintain our transportation infrastructure is not without its challenges. For example, it is estimated that about half of highway and bridge funding will need to go towards maintaining the region's highway and bridge infrastructure and a quarter will need to go towards maintenance and operations. This leaves only a remaining quarter of anticipated highway and bridge funding available to go towards expanding roads and bridges to support the region's growing population and visitors.

Obtaining additional funding now for preventive maintenance on roads and bridges in the short-term can significantly reduce long term maintenance costs. Preventative pavement maintenance practices including crack sealing, chip seals, slurry surfacing and hot mix asphalt

(HMA) thin overlays can extend pavement life, reduce replacement costs, and more quickly bolster current ride quality. Experience shows that spending \$1 on pavement preservation before serious deterioration occurs can eliminate or delay spending \$6 to \$10 on future rehabilitation or reconstruction costs. The Virginia Department of Transportation recommends that at least 20 percent of annual roadway paving budgets be dedicated to performing proactive preventive maintenance activities. The region has increased funding for preventative maintenance through its recent state transportation funding packages, these efforts must be maintained to cost-effectively manage our road system into the future.

Momentum is Metro's strategic plan to maintain a state of good repair and provide for growth in the region. *Metro 2025* lays out plans for improvements over the next ten years. Although the *Metro 2025* plan

is in place, funding has yet to be identified. With allocated funding from *Metro Forward* ending in 2020, the lack of secured funds to continue maintenance and improvements is a huge issue for public transportation in the region. Identifying funding to both maintain a state of good repair and expansion is imperative to the infrastructure of the region.

The region needs to continue to seek balance between BWI, DCA, and IAD to continue growing and expanding its aviation infrastructure. Directing air passenger and air cargo growth to where infrastructure investment has been made and capacity exists for future flight operations, namely, at BWI and IAD, is crucial to maintaining a balanced regional air system. Improving roads and bridges, and public transportation connections to the three airports also is essential to improve accessibility and synergy of our transportation system as a whole.





Water

Current Infrastructure Funding Gap: **\$20 billion**

Background

Water infrastructure fulfills a fundamental need and provides essential services to the metropolitan Washington region. Water is critical to the health and safety of the region's overall environment and economy. As a key ingredient to sustaining life, it is an indispensable resource. The broad goal of water infrastructure is to provide our homes and businesses with healthy, reliable, and affordable

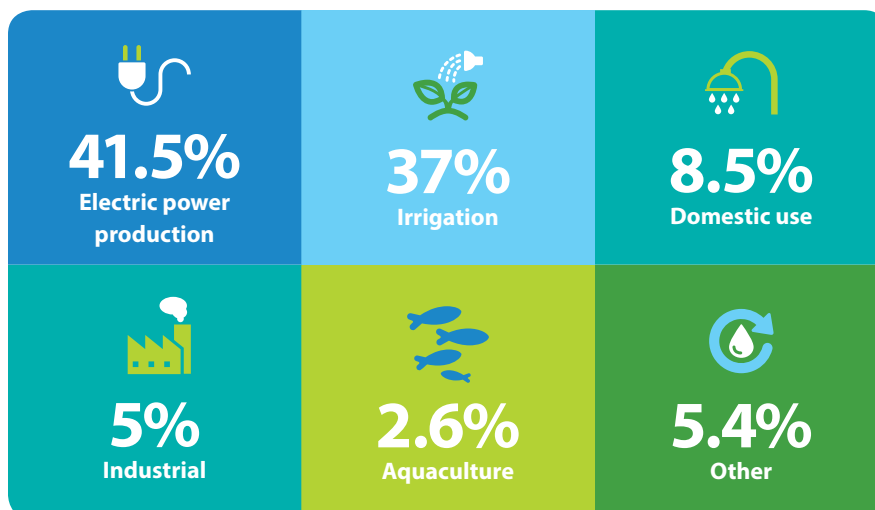
water, fire protection, sanitation, irrigation and other uses, and to minimize flooding and pollution from stormwater. Water infrastructure also plays a key role in protecting the public health and restoring the quality of our rivers, streams, and lakes.

The age of water infrastructure varies greatly throughout the region. While many of the region's water and wastewater treatment plants have recently made significant

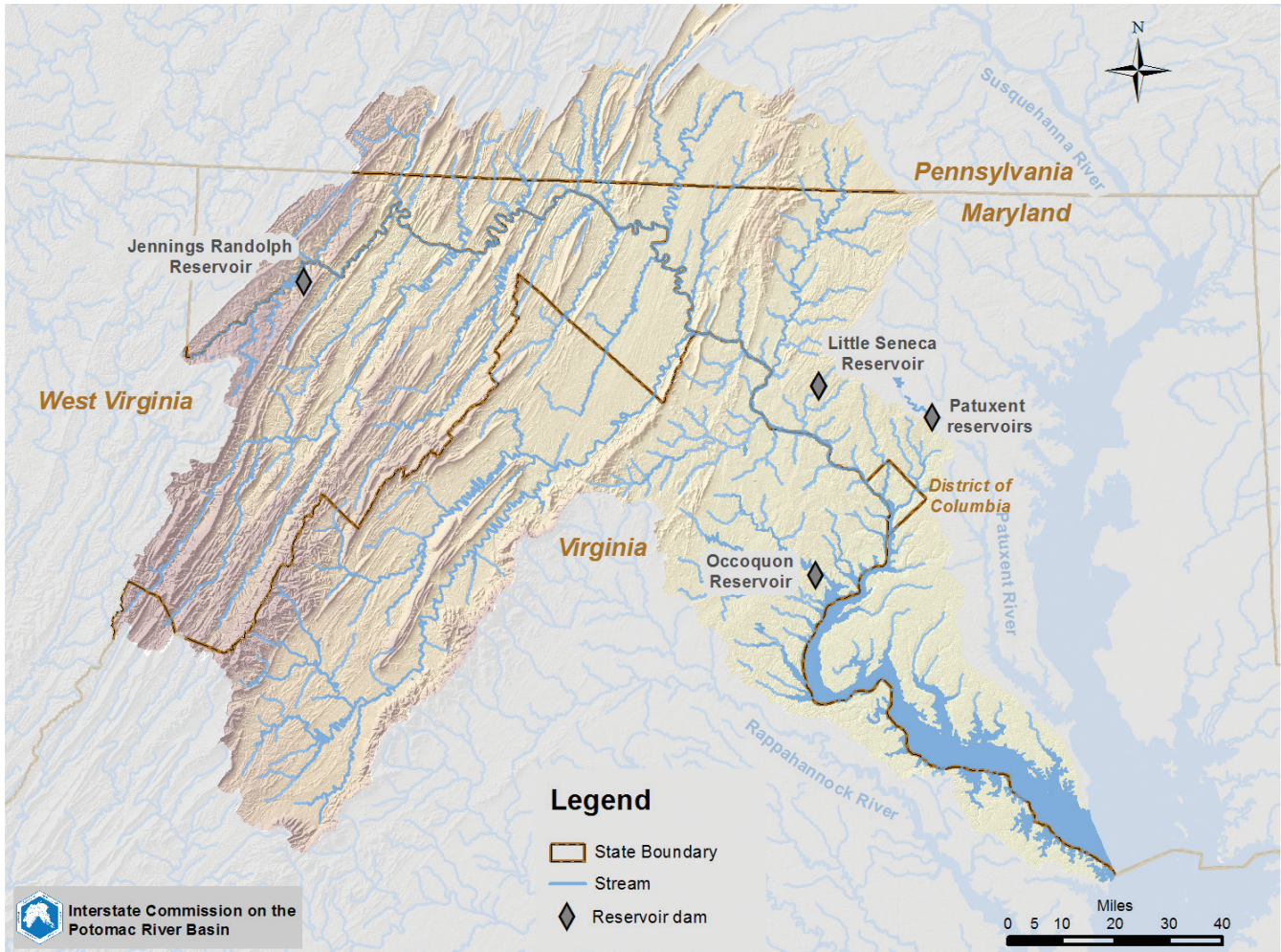
investments in upgrades and expansions, large portions of water and wastewater pipes in the ground are 50–80 years old. Some of DC Water's pipes date back to Civil War times. Our water system as a whole needs on-going maintenance and in some cases strategic replacement at an accelerated rate.

There are three main types of critical water infrastructure: drinking water, wastewater, and stormwater. The majority of the region's drinking water comes from the free-flowing Potomac River where there is an active regional source water protection partnership focused on protecting the region's water supply given ongoing agriculture and growth in the basin. Most of the region's wastewater is treated to meet very stringent permits to protect the Potomac estuary and Chesapeake Bay; since it is discharged into the tidal Potomac, it does not impact the region's drinking water supply. Stormwater runoff affects the entire region and it is now being actively managed to reduce pollution to local streams, the

The uses of freshwater withdrawals in the United States include:



Potomac River Basin CO-OP Utilities Current Reservoir Sites



Anacostia and Potomac Rivers and the Bay. Overall management of this set of complex systems is critical to the health of the region.

Drinking Water

Drinking water infrastructure includes surface water intakes, wells, reservoirs, water treatment plants, water storage tanks, pump stations, 14,500 miles of water distribution lines (large mains and smaller distribution lines), control valves, 114,000 fire hydrants, as well as water connections and meters.

This infrastructure is owned and operated by the region's 28 water utilities, serves more than 5.3 million people and has over one million metered accounts across the region.

Three water utilities, the Washington Aqueduct, the Washington Suburban Sanitary Commission (WSSC), and Fairfax Water are the primary wholesale suppliers of the region's drinking water. They work together on water supply management through the Cooperative Water

Supply Operations on the Potomac (Co-Op). These Co-Op providers produce an average of approximately 370 million gallons of drinking water per day, with the capacity to produce 600 million gallons per day during times of peak demand.

The region's water utilities use surface water as their primary source of drinking water. The Potomac River provides approximately 78 percent of the surface water withdrawals for about 4.5 million people. The

Drinking Water Treatment Plant Service Areas

COG Region

Legend

◆ Water Treatment Plants

Drinking Water Suppliers and Distributors

■ City of Bowie Dept. of Public Works

■ City of Manassas DU

■ City of Manassas Park DPW

■ Rockville

Loudoun County Town Systems

1. Town of Lovettsville

2. Town of Hillsboro

3. Town of Purcellville

4. Town of Round Hill

5. Town of Hamilton

6. Town of Middleburg

7. Town of Leesburg

Frederick County Utilities and Solid Waste

■ City of Frederick

Frederick County Town Systems

1. City of Brunswick

2. Fort Detrick

3. Town of Middletown

4. Town of Mt. Airy

5. Town of Myersville

6. Town of Thurmont

■ Fairfax Water

■ Loudoun County Water

■ Prince William County Service Authority

■ Virginia-American Water Company

■ Virginia-American Water Company—Alexandria

■ Vienna DPW

Washington Aqueduct U.S. Army Corps of Engineers (COE)

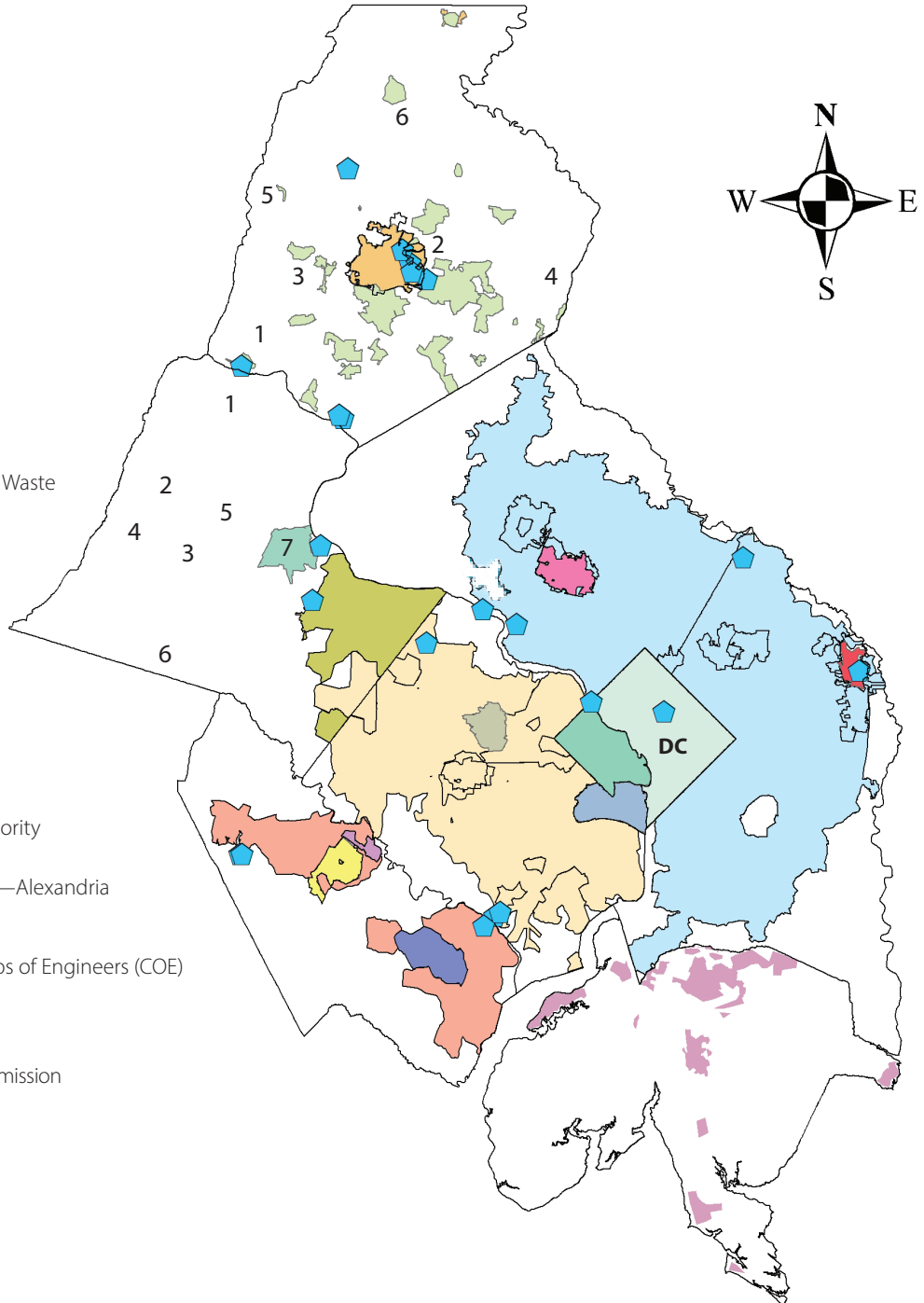
■ Arlington DPW

■ District of Columbia

■ Washington Suburban Sanitary Commission

■ Charles PWS

□ Areas served by private systems



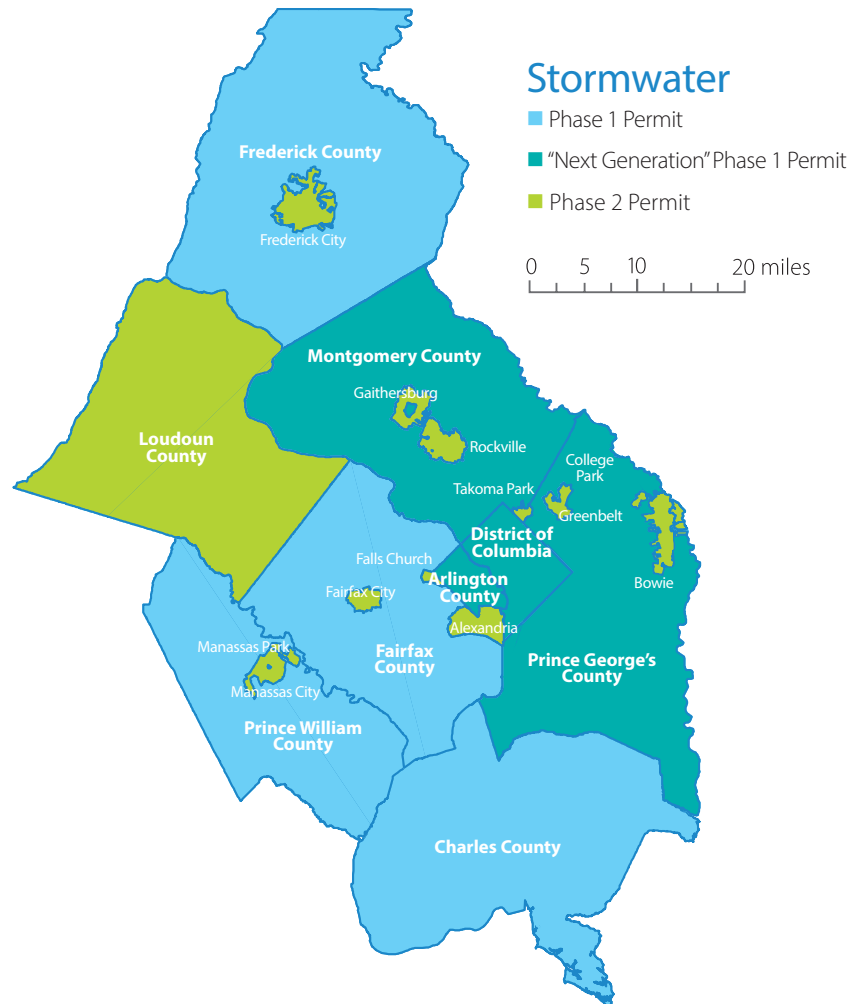
remaining 22 percent is drawn from the Occoquan Reservoir in Virginia, and the Patuxent River in Maryland. The region uses three reservoirs for daily use (Potomac and two Patuxent reservoirs) and two backup reservoirs for use during droughts.

Water security is vital to ensure the stability and sustainability of water infrastructure in the region. Source water assessments address a broad array of possible threats to the water supply. The region's drinking water is also monitored by each utility and through a collaborative Regional Drinking Water Monitoring Network to detect water quality problems.

Wastewater Treatment

The metropolitan Washington region is home to some of the largest and most advanced wastewater treatment plants in the country. The main function of wastewater infrastructure is to treat household and commercial sewage to return it safely to the environment meeting health and environmental standards. Approximately 90 percent of the region's population is served by wastewater treatment plants and 10 percent is served by on-site septic and community systems.

Wastewater treatment is provided primarily through 16 local governments, authorities, and privately owned wastewater utilities which collectively own approximately 16,000 miles of pipes, pumping stations and other facilities that feed 24 wastewater treatment plants. These plants can treat up to 777 million gallons of wastewater per day. In 2013, the average amount of wastewater treated in the region was 544 million gallons per day.



Stormwater Treatment

The original purpose of stormwater infrastructure was to move rainfall off roads and prevent flooding. Today, stormwater infrastructure also addresses the goals of improving water quality in local streams, the Potomac River, and the Chesapeake Bay. There are 22 local government stormwater management programs in the Metropolitan Washington Region. Each of these local stormwater management programs must meet federal Clean Water Act requirements, plus any related state regulatory requirements. A stormwater structure can include "soft" structures such as ponds or wetlands, or structures

built to work with existing or "hard" drainage structures, such as pipes and concrete channels.

In order to maintain a healthy water system, the water infrastructure in our region is highly regulated. Meeting regulatory requirements requires our utilities to make large investments in infrastructure and limits their ability to invest in non-regulatory driven system improvements. The U.S. Environmental Protection Agency (EPA), Maryland Department of the Environment (MDE), and Virginia Department of Environmental Quality (VA-DEQ) all regulate

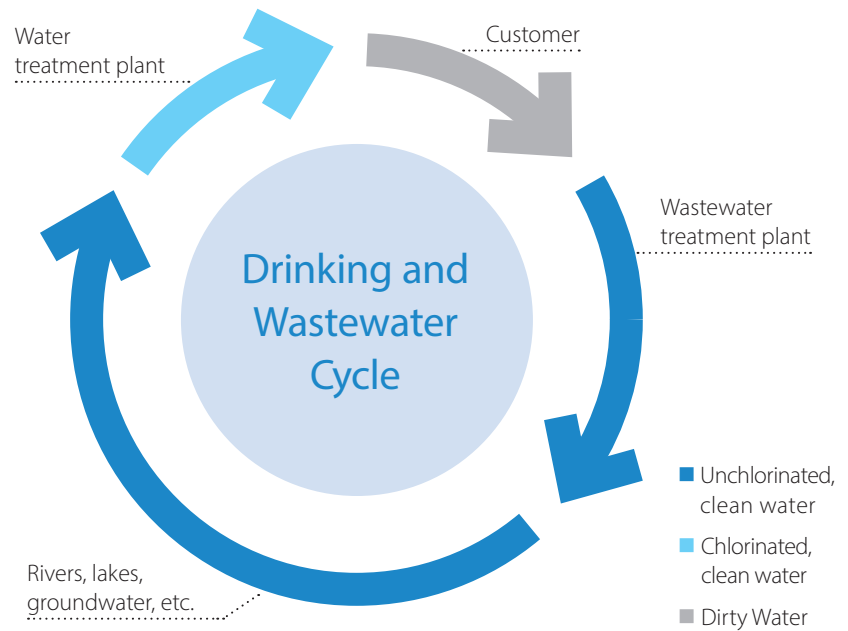
different areas of water infrastructure. Local governments are responsible for implementing and complying with the regulations put in place by these authorities.

Gaps and Needs

Since water infrastructure is often out of sight and out of mind, maintaining the systems, as well as communicating its true value and costs, can be a challenge.

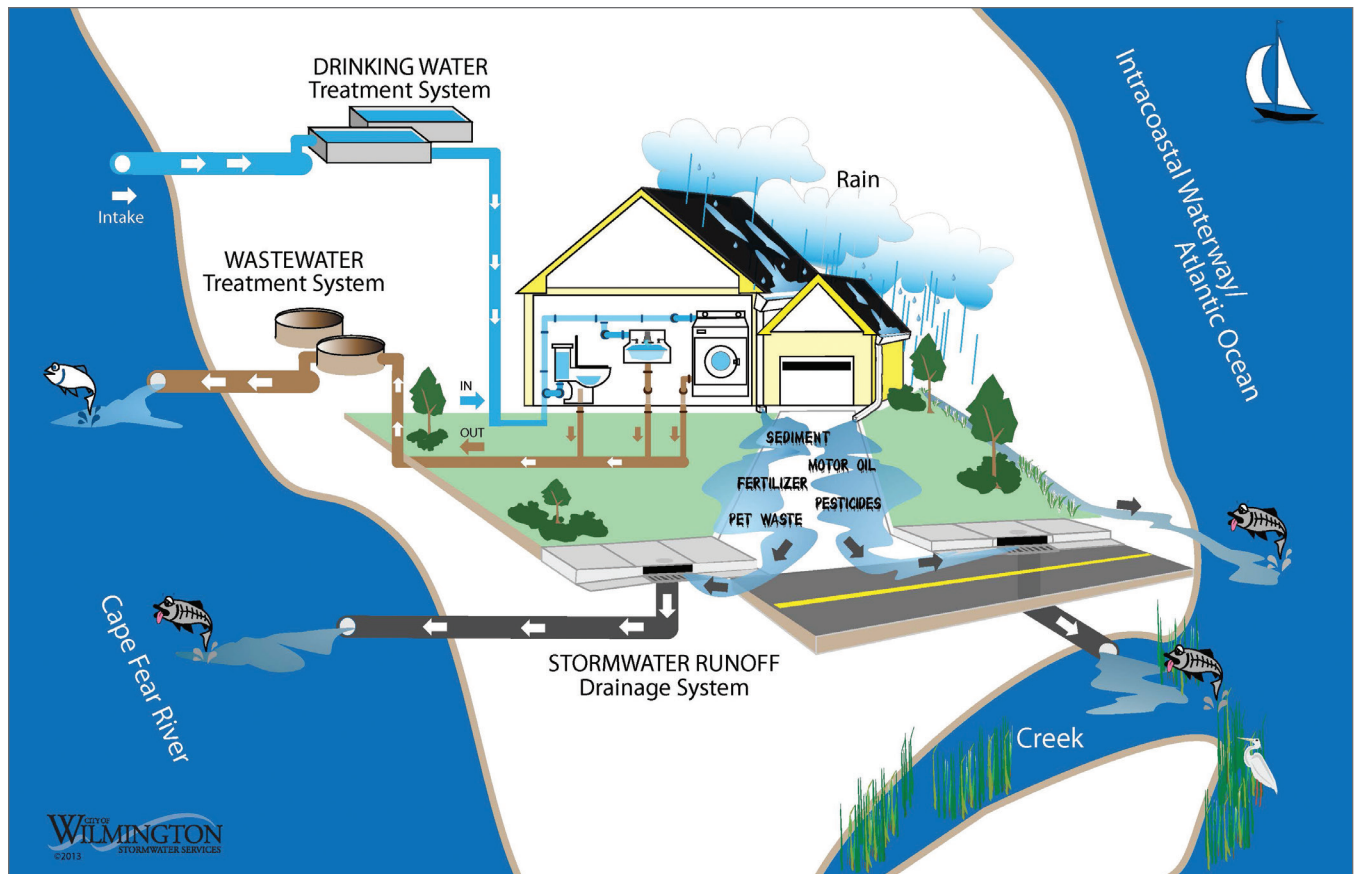
Drinking Water

Due to the age of the region's water infrastructure—for example one water main in the District of Columbia that failed in 2010 was installed the year the light bulb was invented—the biggest need involves system maintenance and replacement, particularly of aging



Source: <http://water.me.vccs.edu/courses/ENV110/lesson12.htm>

Water System



Source: <http://www.wilmingtonnc.gov/Portals/0/documents/Public%20Services/Stormwater/Education/WaterSystemsGraphicFINAL.jpg>

Prince George's County's Public/Private Approach to ESD/LID Retrofits

In order to meet Watershed Implementation Plan requirements and advance Environmental Site Design and Low Impact Development (ESD/LID) implementation in Maryland, Prince George's County is contracting out for the retrofits in a way that will ultimately drive costs down. Funds from the County's Water Quality Protection Charge are used to leverage private funds through a public private limited liability company (LLC). This approach has also been successfully applied to public infrastructure projects, energy plants and recycling programs. Using this public private partnership transfers financial risk to the private sector while leveraging local government resources through private matching funds.

pipes and valves. DC Water averages 400 to 500 water main breaks a year. Additionally, the problem with old pipes breaking is exacerbated by cold weather. For example, WSSC experienced nearly 600 main and feeder breaks in January 2014 during the cold, but less than 50 in June 2014 when it was warm.

The three largest drinking water suppliers produce an average of 370 million gallons of water per day. They need to be able to deliver, at peak, almost 600 million gallons per day. Based on existing capacity, the region's drinking water treatment

plants should be able to meet peak demands until 2030. Active planning is underway to address future needs.

Wastewater

Similar to the gaps faced by our drinking water infrastructure, many wastewater utilities have old sewer pipes in the ground. The District of Columbia and the City of Alexandria additionally have combined sewer and stormwater systems that can be overwhelmed during rain storms. These old sewer pipes are put under extra pressure and can break during large rain storms causing polluted sewage to flow into the region's waterways.

Stormwater

New stormwater infrastructure must fit into existing communities, often making it costly and difficult to implement. Funding for new stormwater infrastructure is vital to continue to meet water quality standards. New rate structures and alternative revenue sources are needed to close the gap between existing revenues and funds needed maintain and upgrade the infrastructure.

Costs and Funding

Since water infrastructure is expensive to build and maintain, long-term planning and investments are essential for water infrastructure sustainability.

Drinking and Wastewater

Our drinking water infrastructure is made up of billions of dollars of capital assets that require large annual investments to operate and preserve. However, the average amount of water used per capita has been decreasing since about 1985. This has led to lower revenues from volumetric charges while the utilities continue to be faced with increasing costs.

The region's drinking water utilities are currently making approximately \$1.5 billion per year in capital investments. Operation and maintenance budgets total approximately \$1.3 billion per year.

The metropolitan Washington region's wastewater system operators made \$1.3 billion in capital investments in 2013 and expended \$950 million in operating costs. The majority of capital costs have been made to meet nutrient discharge limits at central plants. In the future, costs will shift to maintaining and upgrading other parts of the systems such as old collection pipes and other processes. Investments of at least **\$1 billion** per year will need to continue to be made into the future to replace aging pipe, valve and other distribution and gathering system infrastructure and complete upgrades to central treatment plants.

Stormwater

There is currently an estimated need to invest **\$10-\$15 billion in stormwater management infrastructure** to meet regulatory compliance requirements in the region over the next 10 to 20 years. Fairfax County estimates that it will need 18,000 stormwater structures (6,000 are currently in place) to meet stormwater management requirements. Prince George's County estimates it will need close to 40,000 structures to meet its stormwater management needs.

Today, 21 of COG's 22 jurisdictions have either their own dedicated stormwater taxes or fee programs or are subject to the tax and fee programs of other jurisdictions. The tax and fee programs cover residential property owners and the majority of commercial and multi-

family properties. The average cost is about \$90 per household per year. Revenue will need to grow in future years as the need for and cost of stormwater management infrastructure construction, operation and maintenance continues to grow.

Findings

This study of water infrastructure in the region found that:

- ▶ Water and wastewater utilities have made substantial investments to upgrade central plants to meet regulatory standards and improve water quality. Meeting regulatory requirements has required our utilities to make large investments in infrastructure and has limited their ability to invest in non-regulatory driven system improvements.
- ▶ Our water and wastewater utilities face future challenges replacing aging pipes and valves to improve the reliability of service.
- ▶ Implementing stormwater controls will require installation of large numbers of facilities on public and private land, and will require development of new processes to ensure the facilities are properly maintained over time.

Considerations Moving Forward

Whether it's safe drinking water at the tap in homes or businesses, clean water coming out of a wastewater treatment plant or runoff being treated by stormwater practices, healthy water infrastructure means healthy communities. Our region's water supply capacity is expected to meet the peak demands of the region until at least 2030, and our wastewater capacity is expected to be sufficient

to meet our region's needs beyond the year 2040. However, planning for maintenance and repairs of this aging infrastructure is vital to expansion and growth of the region.

The region also needs to diversify its water supply by better interconnecting the main water supply and distribution systems, identifying additional primary and backup source water supplies, and maintaining the extensive underground water distribution systems. For example, WSSC has recently evaluated water valves in its distribution system and found that over half of its valves on large, high-volume water transmission mains do not function properly due to severe corrosion.

The main challenges facing wastewater utilities are completing required upgrades to wastewater treatment plants to meet the water discharge permit limits and replacing the old pipes in the wastewater collection/sewer systems.

Stormwater challenges include preventing stream channel erosion, removing pollutants (e.g., excess nutrients, oil, chemicals and sediment) from runoff, and protecting the Chesapeake Bay. Stormwater systems must fit into existing communities, on both public and private land. This will require development of new processes to implement and maintain these disbursed facilities.

The water sector expects to lose 30–50 percent of its experienced workforce within the next ten years (2010, Water Research Foundation). The American Water Works Association, the Water Environment Fund and other water associations have initiated a "Work

for Water" campaign. Current efforts are focused on recruiting veterans to the water sector. Furthermore, the region will need additional workers to install and maintain stormwater management and other green infrastructure. This will require workers to be trained with new skills to be available when needed to fill the jobs.

Addressing the region's needs for stormwater management will require investments in new and innovative technologies, practices and ongoing maintenance. This will include expanded use of low impact development (LID) and green infrastructure. It will require significant investment by the private sector as it develops and redevelops property, and new financial tools such as public private partnerships.

One way the region can leverage funding and costs of its water systems is through better coordination among other sectors and enterprises. For example, coordinating among infrastructure sectors when pipes are being replaced or roads are being resurfaced, and doing as much as possible at one time, can reduce overall costs of maintenance and upgrades. While both the extent and cost of the upgrades in water infrastructure to meet future regulatory requirements and customer demand is uncertain, it is clear that local governments and utilities will have to do a lot more in terms of both capital projects and annual operations and maintenance programs to meet future needs. Making water infrastructure a priority in future budgets is vital to replacing our water infrastructure and addressing rate structures for future costs.



Energy

Current Infrastructure Funding Gap: **\$5 billion**

Background

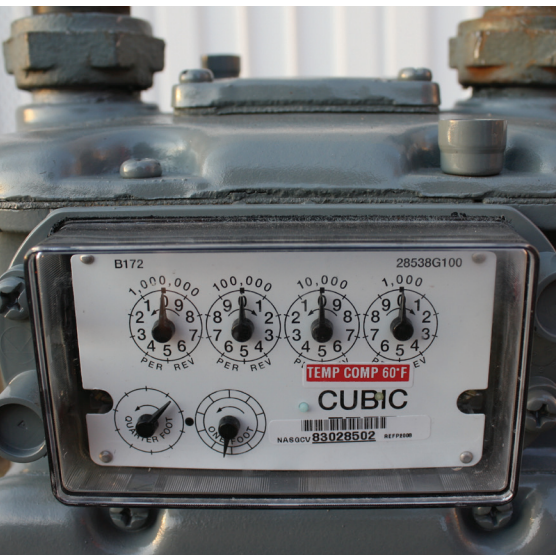
A reliable and sustainable energy supply is crucial to the safety, livability and economic vitality of the region. Energy infrastructure includes electric, natural gas and petroleum supply and distribution systems. Since energy is needed 24 hours a day, seven days a week it is vital to keep this form of infrastructure maintained and accessible.

Electricity

There are seven electricity providers serving customers in the metropolitan Washington region. Pepco, Dominion, Baltimore Gas & Electric and Potomac Edison are investor-owned utilities, while the two electricity cooperatives, Southern Maryland Electric Cooperative (SMECO) and Northern Virginia Electric Cooperative (NOVEC), are owned by their

customers. Manassas Electric is a municipal utility, owned and operated by the City of Manassas. Pepco and Dominion are the largest utilities each supplying approximately 40 percent of the region's electricity.

Two-thirds of the electricity our region uses is generated outside of our borders and transported across the PJM Interconnection (PJM).



The region's electricity infrastructure consists of:



75,000
miles of **distribution line**. This is lower voltage line delivering power to local end-users.



1,974,506
total **electric meters** (customers)

470
substations

260,000
transformers

60,547.7
million kWh of **electricity** delivered/
consumed in 2013

PJM, sometimes called the largest machine in the world, manages the high-voltage transmission and generation system from Virginia north to New Jersey and west to Chicago. The other third of our electricity is supplied by three coal, three natural gas, four oil, three waste to energy, six landfill gas generating plants, and 27 megawatts (MW) of solar installations located in the region. Three new natural gas plants are under development.

Natural Gas

The region's natural gas infrastructure is owned and operated by three natural gas providers: Washington Gas, Columbia Gas and Baltimore Gas & Electric. Washington Gas serves approximately 95 percent of the region's natural gas customer base. Natural Gas is distributed to customers through 15,000 miles of distribution pipelines.

Petroleum

Our region primarily relies on two petroleum pipelines, Colonial and Plantation, to deliver billions of gallons per year of liquid fuels for transportation and other uses. The fuel is distributed through eight

primary distribution terminals in the Washington and Baltimore areas.

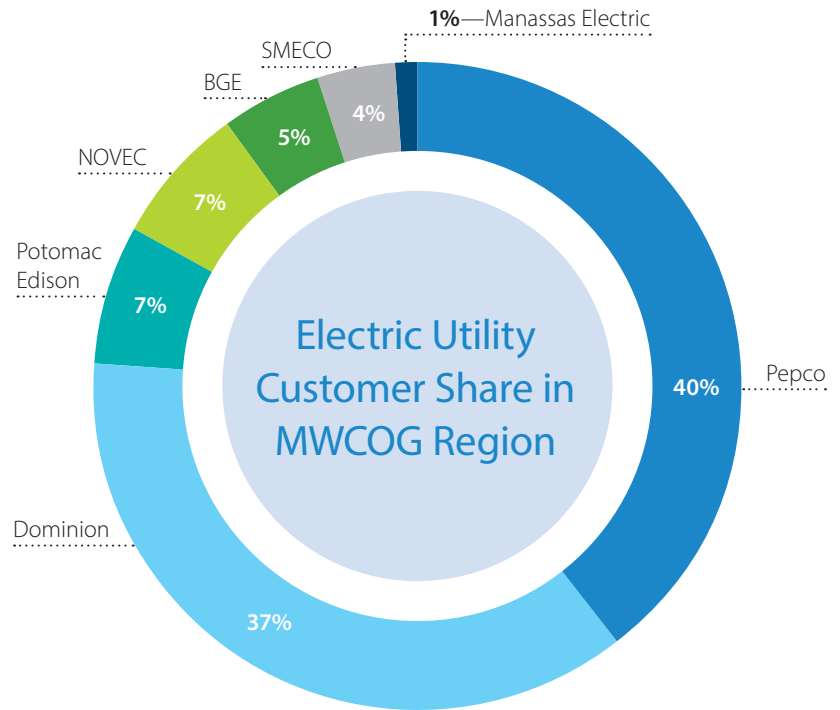
Gaps and Needs

While the current energy infrastructure in the region is sufficient to meet existing needs, utilities and other stakeholders will need to invest in system upgrades and expansion, including replacing aging infrastructure,

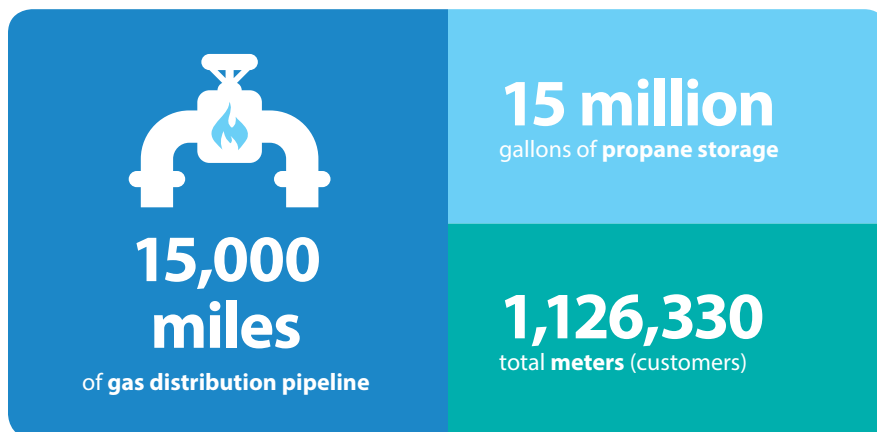
to serve growth in the region, meet requirements for reliability, comply with new environmental regulations, and address changing business models.

Electric utilities will need to upgrade their transmission and distribution systems, including making a significant investment in placing electric distribution lines underground. Natural gas utilities will need to continue to upgrade their pipeline systems to reduce leakage and extend natural gas services to new areas. Other new infrastructure will be needed to accommodate policy and technology changes such as moves towards distributed generation of electricity.

Investments in a range of new energy technology to support growth, improve resiliency, and reduce emissions are essential for our region. These investments will take place in the context of more stringent environmental requirements including



The region's natural gas infrastructure consists of approximately:





DC and Montgomery County large-scale procurement of solar PV on government buildings

In 2010, COG partnered with the US EPA Green Power Partnership program to pursue a municipal solar PV collaborative procurement across the metropolitan Washington region. Through a grant under EPA's Clean Energy Collaborative Procurement Initiative, COG member jurisdictions received financial and technical feasibility assessments performed by Optony, Inc., a research and consulting firm focused on solar technology. From 2011-2012, over 277 municipal facilities across the region were evaluated for solar potential. Full feasibility assessments were performed for 143 sites. The project identified the potential for 70 megawatts (MW) of onsite, distributed solar PV projects, distributed across the region. To date, the effort has led

to procurement efforts exceeding 15MW in the region, and more local agencies are planning to move forward soon. In the spring of 2014, the DC Department of General Services issued a solicitation for more than 10 MW of solar PV capacity at 49 sites across the city. Also in 2014, Montgomery County Department of General Services launched a broad solar procurement for its facilities, the first phase of which will result in solar installations at approximately 17 sites. The County aims to have 6 MW of installed solar capacity by the end of 2016. Several other COG member jurisdictions, particularly in Maryland, have expressed interest in riding or bridging Montgomery County's contract to facilitate solar procurements for their municipal facilities.

PV= Photovoltaic

new federal ozone health standards and requirements to reduce carbon dioxide and other greenhouse gases from fossil-fuel based power production. New regulations have also been proposed that will require reductions in carbon dioxide emissions from power plants.

Utilities, governments and other stakeholders in the region are aware of the pressing concerns, but greater attention will be required in order to build the infrastructure required to ensure the region's continued growth and prosperity in line with the Region Forward goals.

Electricity

With two-thirds of the region's electricity imported over long-distance transmission lines and many of these transmission lines nearing the end of their useful life, significant investment will be required to upgrade or replace these lines. This will require action by policy makers to enable cost recovery.

New sources of electric generation will be needed to provide reliable, cost-efficient electric supply as the region grows. This will require a combination of locally sourced power and improvement of electric transmission lines to import power into the region.

New federal regulations addressing greenhouse gases and criteria pollutants may impact facilities that generate electricity for the region's power grid. Pressure is mounting on power plants that rely on coal as their primary source of fuel. New investments will be required to build new natural gas or other power plants, new pipeline infrastructure serving any new natural gas-fired plants. Additionally, more effort is needed to expand investment in energy efficiency and demand

control and support expansion of distributed generation from sources such as solar to mitigate load growth and lessen the need for future infrastructure expansions.

Disruptions of electric supply are too common in many parts of the region, particularly during heavy storms. Recent extreme weather events such as the Derecho, and Hurricane Sandy caused extended, widespread outages. Other disruption concerns include physical and cyber-attacks. These risks compound existing grid reliability issues due to aging infrastructure and highlight the need for distributed energy resources.

Utilities are working to improve system reliability and resilience to such events, primarily through investments to harden electric infrastructure, including undergrounding electric lines. Energy users are investing in increased emergency generation to keep critical infrastructure operating during blackouts.

Natural Gas

Natural gas supplies are increasingly seen as a critical part of economic growth. This is leading to new pipelines being planned and expansion of natural gas delivery infrastructure into new areas.

While there has been a jump in shale gas production, seasonal shortages can still be a problem. Limited natural gas supplies in 2014 caused suppliers to curtail interruptible class customers, including several area hospitals. Improved communication and coordination with suppliers in advance of curtailment situations may be required, and new pipeline infrastructure may be necessary to ensure reliable delivery to critical

infrastructure. These and other improvements will need to be funded by ratepayers, governments, and utilities.

Costs and Funding

The most prominent challenge facing the energy sector in the region is financing planned system upgrades and expansion while maintaining low rates and high reliability. Upgrading the system is necessary, and obtaining approval for the investments is vital to the continuation of reliable service.

Electricity

The metropolitan Washington region's seven electric utilities own approximately \$10.2 billion in assets located in the region. This electric infrastructure will need expansion to meet growing demand from business and residential growth and to improve system reliability.

In response, Pepco is planning **\$3 billion infrastructure investments**

Planned Investments in Infrastructure Upgrades—COG Region 2014–2018

Pepco	\$3 billion
Dominion Virginia Power	\$1.4 billion
NOVEC	\$150 million
SMECO	\$85 million
Potomac Edison	\$4.4 million

from 2014 to 2018, to improve reliability and service to the District of Columbia and suburban Maryland. Dominion is planning **\$1.4 billion infrastructure investments** to improve reliability and service in Northern Virginia. These costs will have to be recovered from ratepayers through their monthly bills.

Natural Gas

The region's three natural gas utilities own approximately \$4.5 billion in physical assets within the region's footprint. This infrastructure requires



Arlington Initiative to Rethink Energy (AIRE)

The Arlington Initiative to Rethink Energy (AIRE) is a program established by Arlington County to encourage the community to use energy wisely. AIRE supports residents, businesses and the government through outreach programs focused on making smart decisions about energy use and individual actions that improve and sustain the county. A Community Energy Plan guides their sustainability efforts through outreach programs and improvement projects. Programs include both energy efficiency improvements to Arlington County government facilities and public programs such as the Arlington Green Games, Green Home Choice, and the Green Building Program.

constant upgrades and maintenance to ensure the systems can continue to safely deliver natural gas to the utilities' customers.

In our region, Washington Gas has received authority for accelerated pipeline replacement in Maryland and Virginia to enable cost recovery of the investments needed to replace and upgrade aging underground natural gas pipelines. Overall, they have proposed **\$650 million worth of system upgrades over the next five years.**

Findings

This report of energy infrastructure in the region found that:

- ▶ The region's energy utilities have been making ongoing

investments to upgrade aging equipment and improve reliability. These investments will need to continue into the future and will result in new expenses to be paid for by ratepayers.

- ▶ Access to third party private capital can lead to higher levels of investments in our energy infrastructure. While traditional bond finance remains an important tool for project finance, power purchase agreements and leasing arrangements can secure third party capital to help fund project development as well.
- ▶ State and local governments can adopt policies such as advanced energy codes to help offset the demand placed on energy infrastructure from future growth. Local governments can lead energy efficiency efforts at the grassroots level and through leading by example.

Considerations Moving Forward

Federal, state, and local governments each have a strong role to play in managing energy resources and infrastructure in the region. The U.S. Department of Energy and other federal agencies provide funding to assist with grid modernization, solar energy, and building efficiency retrofits. Matching funds can leverage significant investment for new infrastructure, for instance, the deployment of smart meters in the District of Columbia was jointly funded by the District government, ratepayers, and the federal government. State energy offices support localities and the region through various programs (Smart Energy Communities, Game Changers Program) which has led to deployment of new energy solutions,

including electric vehicle infrastructure and solar energy with battery storage.

Local governments can lead energy efforts at the grassroots level and through leading by example. Community efforts can also help spur demand and lower prices, for example solarize efforts at the neighborhood level can result in costs savings of up to 20–30 percent.

The need to better manage electric use and growing use of electric vehicles, renewable energy, and distributed generation has encouraged many utilities in the region to implement smart grid improvements to electric distribution. Electric utilities are investing in advanced metering infrastructure (AMI) or “smart meters” and “smart switches” to help facilitate this development. Residents, businesses, and governments are investing in building efficiency retrofits, high efficiency LED lighting, and on-site solar PV, and are considering novel approaches such as advanced microgrids and combined heat and power/district energy systems.

These investments will be critical for local jurisdictions to meet their climate and energy goals, in addition to meeting growing customer demand. On-going coordination of plans and investments are important to enable this effort to be successful on a regional basis.

Working together to standardize energy programs and to provide for measurement and verification of project performance can reduce program risk. Governments can help reduce energy efficiency project costs through creating loan loss reserves or performance guarantees to serve as credit enhancements.



Public Buildings Infrastructure

Current Infrastructure Funding Gap: **\$8.5 billion**

Background

Public Buildings Infrastructure plays a large role in the operation of government functions and services throughout the region. Public buildings are defined as structures owned and operated by a government entity. Without maintaining these public buildings, the ability of government to continue to serve the residents in and visitors to the metropolitan Washington region will be adversely affected. Local public buildings include public schools, libraries, public safety facilities such as police stations and fire stations, city halls, recreation centers, and any other building owned by a locality. The age of public buildings in the region varies widely from hundreds of years old, to brand new. Regular maintenance and repairs are vital to maintaining the infrastructure over a long period of time.

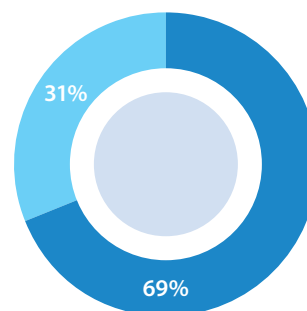
There are over 3,600 public buildings in the region totaling over 150 million square feet of publically owned space. In addition to the publically owned local government buildings, there are also approximately 8 million square

feet of publically leased space by local governments. Approximately 1,100 or 31 percent of the public buildings in the region are schools. There are over 300 public safety facilities, and 150 libraries spread across the region. The local governments in our region have also become a leader in green buildings. A green building is any structure that is built, renovated, or operated in an environmentally-friendly fashion using standards typically focused on site design, water efficiency, energy efficiency, materials, or indoor environmental quality.

Gaps and Needs

Schools and public safety buildings such as police stations, 9-1-1 call centers, and fire stations are the most important forms of public buildings infrastructure. They all play an essential role in our society and serving the existing residents in the region. Local governments will continue to face needs for public buildings, especially schools, public safety facilities, and social services/human services centers. Maintaining these facilities directly corresponds to the region's capacity for sustainability and growth.

Local Public Buildings and Schools In Metropolitan Washington



■ Public Buildings ■ Schools

SOURCE: MWCOG Survey of Local Governments, October 2014



After a public facility is built, regular maintenance and repairs need to be budgeted for on an annual basis. As our region continues to grow the capacity of our public buildings needs to expand. Keeping facilities in good operating condition will help increase the longevity of our current building infrastructure. Adaptive reuse or re-purposing of existing space is also an option, as are leasing of space devoted to specific needs. In most jurisdictions, local governments create a six year Capital Improvement Plan (CIP) for new construction or significant renovations to existing space. These CIP's outline

Uniform Standard Specifications and Details for Public Works Construction

The Maricopa Association of Governments serving the metropolitan Phoenix area of Arizona published the Uniform Standard Specifications and Details for Public Works Construction in 2012. This publication was created to provide uniform rules for governing public works construction throughout the region. This standardized set of provisions incorporates the modern materials and construction techniques to provide clear standards that reduce issues and save money by reducing construction costs. A permanent Specifications and Details Committee was also established to periodically study and recommend updates to the Specifications and Details to reflect the changing technology of the construction industry and the region.

the projects and funding necessary to sustain the local public building infrastructure in that locality.

Costs and Funding

Allocating annual funds for maintenance, renovations, and upgrades is vital to maintaining this form of infrastructure. Combined the region spends approximately \$800 million a year on operating and maintenance costs on locally-owned government buildings. Funding sources for these annual costs need to continue to be identified and secured in order to insure buildings effectively function as designed.

Over the next six years there are more than 500 local public building infrastructure projects planned in the metropolitan Washington region. 75 percent of the planned projects will be renovations to existing local government buildings. The other 25 percent will be new construction throughout the region. **In total the projects are estimated to cost approximately \$8.5 billion.** Funding sources will need to be identified and secured for improvement and expansion projects after 2020.

Findings

This report of the local public buildings infrastructure in the region found that:

- ▶ There are over 3,600 public buildings with a total of over 150 million square feet of publically owned space. Combined the region spends approximately \$800 million a year on operating and maintenance costs for local government buildings.
- ▶ There are over 500 local public buildings infrastructure projects estimated to cost approximately

\$8.5 billion included in local capital investment plans over the next six years.

- ▶ Funding sources will need to be identified and secured for improvement and expansion projects after 2020 in order to keep up with the anticipated growth in the region.

Considerations Moving Forward

There are many challenges in maintaining existing public buildings and planning for future facilities. Technology considerations include changing developments for construction materials and integrating 'smart building' technology for operations and security needs. Other considerations include complying with locally-established energy-efficiency standards and goals, and required ongoing maintenance and improvements to HVAC and other major mechanical systems. Flexible or 'universal' design to address mobility and accessibility challenges is also an important concern. Officials should also recognize the co-benefits of funding building improvements. For example, improvements to increase the efficiency of energy using systems often extend the life of the systems and reduce the need for future investment. Officials will need to incorporate these advancements into their maintenance, renovations, and construction plans for all public buildings in the region. Ongoing planning and dedicated funding is needed to properly maintain local public buildings and sustain the infrastructure to provide for the expanding region.



Public Safety Communications

Current Infrastructure Funding Gap: **Study for Regional NextGen 911 in process, cost estimates available in late 2015**

Background

The National Capital Region's Interoperable Communications Infrastructure (NCR ICI) is based on the tenet that the region is committed to a common vision of working together towards a safe and secure metropolitan Washington region. This infrastructure uses a shared, jurisdiction-managed internet protocol (IP) based network transport infrastructure, data exchange engine. Nearly a dozen shared applications and cyber security systems tie the local emergency operations centers to support law enforcement and emergency response. Oversight of the system is provided through the COG Chief Information Officers Committee. Policy guidance is provided through the COG Homeland Security Executive Committee, including the local government Chief Administrative Officers.

The network forming the backbone of the NCR ICI is the NCRnet, a region-wide physical interoperable

network providing controlled access among the region's 911 centers, Public Safety Answering Points (PSAPs) and allied organizations. It does not share bandwidth with the regular internet, and is scalable in order to add new users and sites.

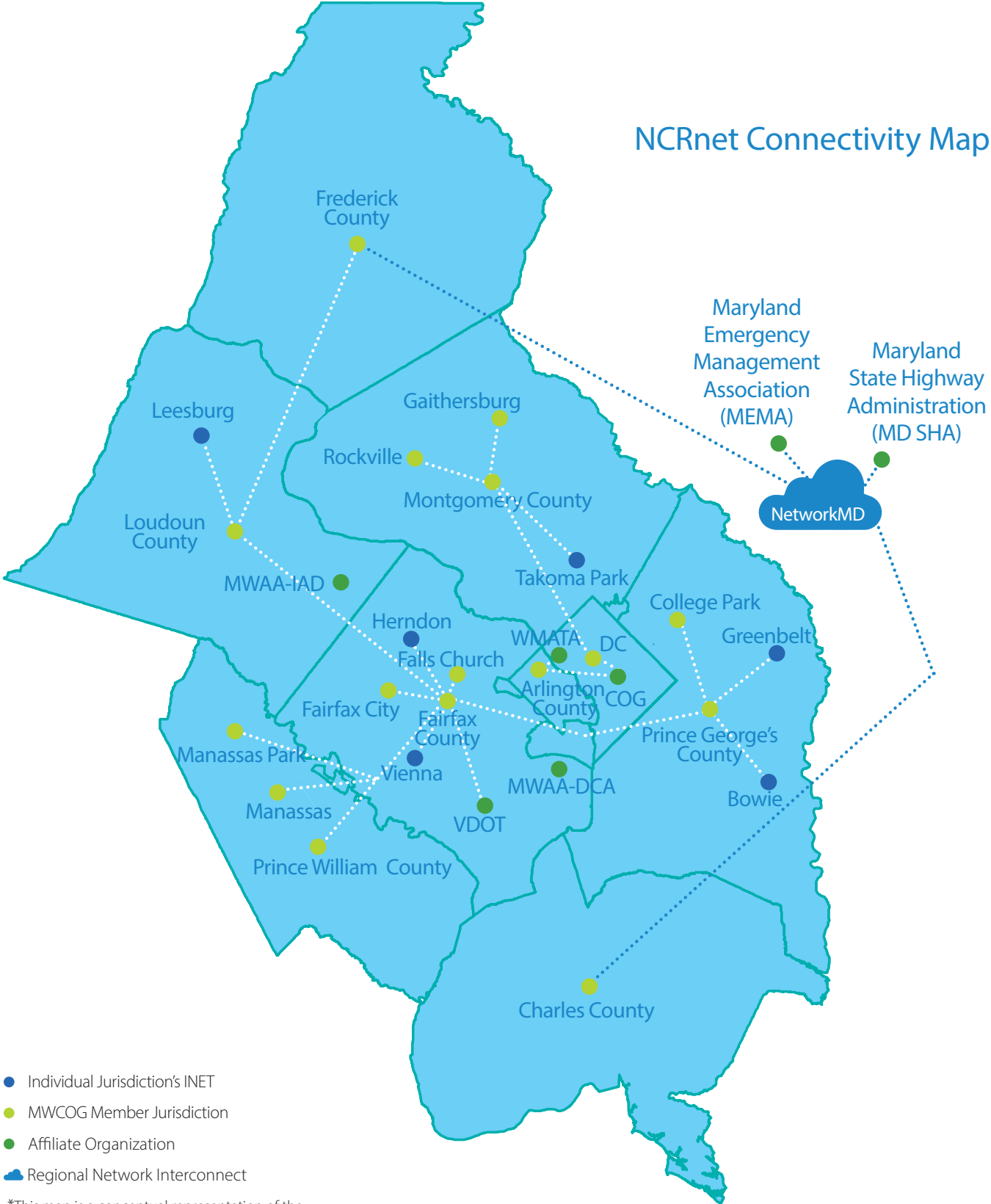
Local 911 centers linked through the NCRnet provide a secure, locally controlled environment to receive 911 calls through common

telecommunication carriers. They include computer aided dispatch (CAD) software and geospatial information systems (GIS) to identify the sources of and direct response to emergency calls. The centers use voice radio systems to communicate with first responders.

The region has invested over \$100 million in regional homeland security funds and considerable state and local



NCRnet Connectivity Map



- Individual Jurisdiction's INET
- MWCOG Member Jurisdiction
- Affiliate Organization
- ☁ Regional Network Interconnect

*This map is a conceptual representation of the NCRnet connectivity system and is not geographically correct.

funds to upgrade emergency voice communications, data sharing and video sharing infrastructure. To provide a more coordinated approach to future investments, the region completed the National Capital Region Strategic Voice Communications Plan and Radio Capabilities Assessment during the summer of 2014. The Plan builds off of the region's voice interoperability for first responders to provide options on how the region can provide enhanced interoperability and additional capabilities throughout the region.

Gaps and Need

The metropolitan Washington region's emergency response communication infrastructure uses old technology based on service provided through traditional telecommunication carriers. The existing system is based on the Verizon 911 Call Routing Network. This needs to be replaced and upgraded with a new Emergency Services Internet Protocol Network (ESInet) that will direct calls to proper 911 centers using GIS data in place of the phone number data-base system used today. This is also needed to respond to the increasing percentage of 911 calls from mobile callers and IP networks.

The region will need to move to what is called the "NextGen 911" technologies. These will enhance 911 center operations with voice, data, texting, web and visual information. One of the first requirements will be to implement text-to-911. NextGen 911 also can incorporate use of social media, enhanced mobile technologies such as Wireless Emergency Alert (WEA) and Emergency Alert Systems (EAS), Integrated Public Alert and Warning Systems (PAWS), and integration of intelligent medical devices, sensors, telematics, etc. It will also add redundancy and diversity to be less at risk of a failure from critical support systems failing such as from the 2012 Derecho.

As with all modern infrastructure systems, NextGen 911 systems will need to carefully address cybersecurity. One strength of the current technology is that it does not rely as heavily on automated computer systems and is therefore less at risk of cyber-attacks than modern digital systems. The National Institute for Standards and Technology (NIST) has developed a cyber security framework for these systems.

Costs and Funding

The metropolitan Washington region has already made considerable investments in upgrading its public safety emergency communication infrastructure. However, moving to the NextGen systems will require substantial new investments. The COG 911 Center Managers Committee is in the process of performing an assessment of the region's 911 centers and developing a NextGen 911 implementation strategy.

This will require substantial federal, state and local support, but the majority of the costs will fall on local governments. The full extent of funding needs has not yet identified, but will need to be paid for through use of local funding and allocation of 911 fees on phone bills. Local governments need to begin planning for this large financial undertaking and future funding gap to update the public safety communications infrastructure system in the region. There will be opportunities for savings through region-wide cooperative purchasing and shared services as NextGen 911 is implemented.

Findings

This report of public safety communication infrastructure in the region found that:

- ▶ The region has invested over \$100 million in to upgrade its

public safety communications infrastructure.

- ▶ The region's emergency response communication infrastructure uses old technology based on service provided through traditional telecommunication carriers and needs to be updated to use NextGen 911 technologies. A study is currently being conducted to consider implementation options and elements and quantify cost estimates and necessary funding sources to install the new infrastructure system.

Considerations Moving Forward

At the national level, the Federal Communications Commission (FCC) issued rules for the First Responder Network Authority (FirstNet) and requires that individual states opt-in or opt-out. The FirstNet goal is to provide a nation-wide broadband network primarily for public safety use. The FirstNet provides a similar technical architecture to the NCR ICI. Maryland became the first state to begin the FirstNet consultation process in July 2014. Maryland's consultation process and stakeholder education and outreach will continue into 2015.

The COG 911 Center Managers Committee is currently conducting a study for Regional NextGen 911. The study is considering design elements, implementation options, and costs of implementing NextGen 911 systems across the region. Cost estimates and future funding needs should be available in late 2015.

Conclusions & Recommendations

Conclusions

The ability to expand and sustain the metropolitan Washington region is directly connected to the health and sustainability of the region's infrastructure. This report summarizes a year long, in-depth look into the region's infrastructure system by the COG Board of Directors. Infrastructure experts helped define the current state of the region's infrastructure and estimated a **\$58 billion** funding gap over the next 15 years. The areas studied were: transportation, water, energy, local public buildings, and public safety communications, are all interconnected in the regional infrastructure system. Each of these components is equally essential to maintaining a livable community.

Our infrastructure system needs to be maintained to sustain the current population and updated to account for future growth. This report emphasizes the importance of bringing infrastructure maintenance and needs to the forefront of government, public agency and private sector infrastructure providers. There are billions of dollars of funding gaps in the infrastructure system that need to be prioritized by leaders and the region. This demand requires dedicated support, both financially and politically for infrastructure provisions. Local, state, and federal officials need to work with regional partners to explore mechanisms to secure funds and implement solutions to provide for the increasing system demand and current funding deficit.

Recommendations

To achieve a vibrant future for the Region, the following recommendations are made to preserve, invest in and enhance the region's systems of critical infrastructure. Taken together, these recommendations represent a commitment to support COG's *Region Forward* vision for a prosperous, accessible, livable and sustainable Region.

Five recommendations have been identified to reinforce the critical importance of the investment in the region's infrastructure. These include creation of an infrastructure partnership to formalize regional focus, public education, sharing best practices, highly innovative financing, and advocacy.

1. **Regional infrastructure exchange:** Establish a regional or mid-Atlantic infrastructure exchange in the form of an organization or council tasked with a continued focus on infrastructure needs within local governments. This group of regional partners would prioritize infrastructure costs, funding needs and mechanisms, and continue to periodically assess the state of infrastructure in the region.
2. **Public education campaign:** Increase public awareness of the infrastructure needs in the region and the costs of implementing these needs. Local leaders, policy makers and the general public need to gain a better understanding of the large funding gaps currently

existing and realize the necessity of making infrastructure a priority when allocating limited resources and funds.

3. **Continued sharing of best practices:** Coordinate with regional entities and with experts across the United States to increase the exchange of best practices and models for maintaining the current infrastructure and adequately financing the necessary infrastructure as the region continues to grow.
4. **Workshop series on unique funding mechanisms:** Facilitate a series of workshops focused on developing ideas for financing essential infrastructure projects. Experts should be brought together to brainstorm out-of-the-box funding mechanisms for infrastructure projects related to transportation, wastewater, drinking water, energy, communications and public buildings innovative and creative ideas can be identified to accomplish specific funding needs on a project by project basis.
5. **Advocacy:** Insure that the COG Board of Directors' legislative priorities and policy positions support essential investments, creation of partnerships, and championing the actions required to close the funding gaps identified in this report.

The COG staff will track and report on the status of implementation at least once a year.

Photo Credit

Cover

- ▶ **Key Bridge**
Kevin Harber
- ▶ **911 Call Center**
Fairfax County
- ▶ **7000 Series Car**
Matt Johnson
- ▶ **Dulles**
Joe Ravi (CC-BY-SA 3.0)
- ▶ **Pylon**
Ian Muttoo
- ▶ **WSSC Solar**
Jeff King
- ▶ **BIOSWALE**
District Department
of the Environment

Page 2

- ▶ **Key Bridge**
Kevin Harber
- ▶ **WSSC Solar**
Jeff King
- ▶ **Dulles**
Joe Ravi (CC-BY-SA 3.0)

Page 3

- ▶ **Pylon**
Ian Muttoo

Page 22

- ▶ **7000 Series Car**
Matt Johnson

Page 30

- ▶ **Gas Meter**
Nic Stage

Page 32

- ▶ **Petroleum Tank Farm**
USDA

Page 33

- ▶ **Pylon**
Ian Muttoo

Page 35

- ▶ **Oakton Library**
Fairfax County
Public Library

Page 37

- ▶ **Firetruck**
Elvert Barnes

State of the Region: Infrastructure Report



METROPOLITAN WASHINGTON
Council of Governments