2050

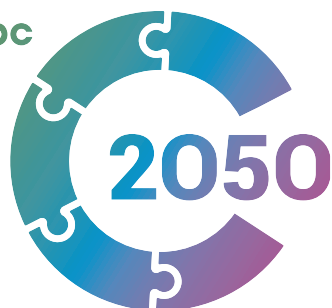## Connections 2050
PLAN for GREATER PHILADELPHIA
Policy Manual

Adopted September 2021

DELAWARE VALLEY dvrpc REGIONAL PLANNING COMMISSION

PA

NJ

New York City

Bucks

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Trenton

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Chester

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Delaware

Camden

Burlington

Gloucester

Wilmington

MD

Baltimore

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THE DELAWARE VALLEY REGIONAL PLANNING COMMISSION (DVRPC) is the federally designated Metropolitan Planning Organization (MPO) for the nine-county Greater Philadelphia region. **DVRPC IS CHARGED WITH DEVELOPING A LONG-RANGE TRANSPORTATION PLAN THAT GETS UPDATED EVERY FOUR YEARS.** See the *Connections 2050 Process and Analysis Manual* for more information on the Plan's development, outreach, analysis, and financial plan details.

dvrpc

2050

TRANSPORTATION Connects Us

GROCERY SHOPPING

FAMILY &FRIENDS

SCHOOL

PARKS & OPEN SPACE

DINING

ENTERTAINMENT

WORK

DOCTOR

SHOPPING
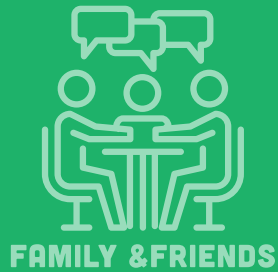
INTRODUCTION

2050 looms as a milestone year, when a number of major regional, national, and global goals hope to be achieved. These goals include a regional Vision Zero target of no deaths or serious injuries from transportation, net zero carbon emissions in the United States, and United Nations' goals of building truly sustainable societies and no one exposed to unhealthy levels of fine particulate matter ($PM_{2.5}$).

There are substantial challenges facing Greater Philadelphia today, before even considering the extensive progress needed to achieve the above goals. Many of these challenges have come to the fore as the *Connections 2050* Plan was developed during an unprecedented period with a global pandemic; Black Lives Matter social justice protests; and events like wildfires in California and Australia, and a deep freeze from winter storm Uri in Texas, that clearly show planet Earth is in a climate emergency.

An MPO's long-range plan must contain a vision for the orderly growth and development of the region and a fiscally constrained financial plan for how the region intends to invest reasonably anticipated transportation revenue. Although DVRPC is charged primarily with planning for transportation infrastructure, the Plan is broader than that in recognition that transportation is both affected by and affects other areas, including land use and communities, the economy, and the environment.

Several efforts inform the Plan's development through a review of current conditions, consideration of trends and forces shaping the region, and public outreach.

➲ The *Tracking Progress* regional indicator website measures how the region is performing relative to the Plan's goals and identifies regional strengths and weaknesses.

➲ Scenario planning considers how uncertainties associated with key forces shaping the region—such as digital technologies, rising inequality, and climate change—could play out in different ways. This range of plausible futures is used to help identify key strategies that can better achieve the vision.

➲ The vision was developed with broad input from regional planning partners, stakeholder groups, and residents through public visioning workshops, community conversations, meetings with DVRPC's committees, and a survey.

➲ A series of public and stakeholder strategy workshops informed the recommendations to achieve the vision.

The VISION for 2050

The *Connections 2050* Plan is built on principles of equity, sustainability, and resiliency, which are applied to its four focus areas: the environment, communities, multimodal transportation, and the economy.

Plan PRINCIPLES

The following sections provide background information about the Plan's overarching principles.

EQUITY

The Plan advances Title VI of the Civil Rights Act and Environmental Justice (EJ) principles. Title VI of the Civil Rights Act states that "no person in the United States, shall, on the grounds of race, color, or national origin be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving federal financial assistance." EJ is defined by the federal government as, "identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations in the United States."

The Black Lives Matter protests highlighted the continued importance for every sector to meaningfully implement equity-based and anti-racism policies. The Plan aims to remove barriers and protect civil rights for the most vulnerable people, reduce poverty, increase economic mobility, and support racially and socioeconomically integrated communities. The January 6, 2021, attack on the federal Capitol building and challenges to election results showed the fragility of our democratic system. In response, the Plan renews commitment to public outreach and participatory planning to hear more voices in the development of communities that we live in, and to increase everyone's access to the transportation infrastructure needed for all of our daily activities.

SUSTAINABILITY

The long-term sustainability of human civilization requires rapid and significant global reduction in greenhouse gas (GHG) emissions. GHGs trap heat in the atmosphere, causing climate change. The main source of regional GHG emissions is the burning of fossil fuels (primarily gasoline, natural gas, and heating oil) to move our cars, trucks, and buses; provide heat for industrial operations; and to generate the electricity used to heat, cool, and light our buildings and power our electric equipment. Other sources of GHG emissions include methane from agriculture and natural gas system leakages, oil refining, some industrial processes, and clearing land for buildings and roads. The planet will continue to warm with increasing atmospheric GHG levels. The amount and rate of climate change that will take place over the remainder of this century and into the next depends on the success or failure of global efforts to reduce GHG emissions. Lower emissions ensure less severe long-term impacts, while higher emissions will lead to an increasingly untenable future. The Plan calls for reduction of GHG

emissions to a net zero level by 2050 through renewable energy, energy management, the electrification of buildings and vehicles, and improving transit and non-motorized travel options.

RESILIENCY

Even the most concerted global action to reduce emissions will have little impact on the climate change that will take place over the course of the coming decades due to the emissions that have already occurred, which means the region will need to become more resilient. The climate the region experiences today will shift, exposing the region and its residents to new dangers and heightened risks. Greater Philadelphia can expect increased episodes of extreme heat, more freeze-thaw cycles, fewer but more intense precipitation events, and sea level rise in the coming decades. These changes are likely to amplify coastal, river and stream, and other inland flooding; harm coastal and inland ecosystems; disrupt fishing and farming; and increase human health risks. Responding to these changes may require difficult actions to harden our communities and their infrastructure systems or move them out of harm's way.

Plan FOCUS AREAS

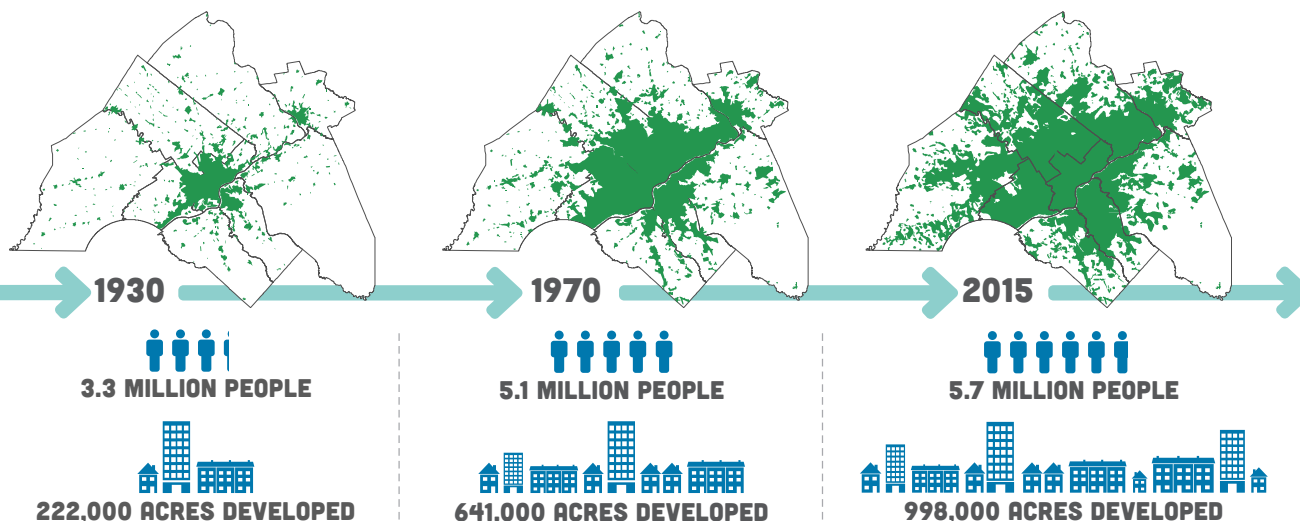The following provides background information on the focus areas, and a summary of what is in the Plan.

The ENVIRONMENT

Greater Philadelphia has shown a major commitment to protecting the environment by being a national leader in land preservation, with more than 633,400 acres permanently protected. Despite this, 357,000 acres were developed between 1970 and 2015, an average of 22 acres each day over this 45-year period. The ongoing disappearance of open space negatively impacts air and water quality, the agricultural economy, wildlife habitat, outdoor recreation opportunities, and the region's character and quality of life.

The region does not meet federal National Ambient Air Quality Standards (NAAQS) for ground-level ozone and has only recently attained the standard for $PM_{2.5}$. Ozone forms when nitrogen oxides (NO_x) and volatile organic compounds (VOCs) combine in the presence of sunlight. NO_x emissions are mostly associated with power generation and transportation, while VOCs can come from a number of petroleum-based chemicals. $PM_{2.5}$ pollution is made of tiny drops of liquid or particles that come from a variety of sources, such as diesel engines, power generation, or forest fires. Ground-level ozone and $PM_{2.5}$ pollution are linked to a range of health problems— including breathing disorders, heart disease, and even premature death—that are especially problematic for the elderly, the very young, and people with cardiovascular diseases. DVRPC is federally required to conduct an air quality conformity analysis

EXTENT OF REGIONAL DEVELOPMENT 1930–2015

1930

3.3 MILLION PEOPLE

222,000 ACRES DEVELOPED

1970

5.1 MILLION PEOPLE

641,000 ACRES DEVELOPED

2015

5.7 MILLION PEOPLE

998,000 ACRES DEVELOPED

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to ensure the Plan's investments are consistent with the Clean Air Act of 1990 and its subsequent amendments and state implementation plans for achieving the NAAQS. The continued protection and enhancement of natural amenities, air and water quality, open space, and farmland is a regional priority.

COMMUNITIES

The region's population is expected to grow by 440,000 people, or 7.6 percent, and employment by 445,000 jobs, or 14.6 percent (half of this growth accounts for the return of jobs lost during the pandemic), between 2020 and 2050.

This growth can be sustainably accommodated by building walkable communities and investing in more than 135 Plan Centers, in smaller Centers as identified in county and local plans, or as infill and redevelopment in the region's existing developed areas (see Land Use Vision map on page 37). Centers are the cornerstone of *Connections 2050*. They are neighborhoods, districts, or downtowns that serve as focal points in the regional landscape and reinforce a sense of community for local residents. Centers provide a framework for efficient provision of water, sewer, and transportation infrastructure. Concentrating growth in and around Centers can preserve open space; reduce strains on our natural resources; and create inclusive, healthy, and walkable communities that offer a better quality of life for all residents.

MULTIMODAL TRANSPORTATION

The Plan adopts the Vision Zero planning philosophy, which aims to end fatal and serious injury crashes by protecting all roadway users through equitable engineering, education, and enforcement, while prioritizing speed control. Vision Zero recognizes that traffic deaths are not accidents; they are preventable incidents that can be systematically mitigated to eliminate the risk of a life-altering event on our regional roadway network. DVRPC facilitates coordination among county and municipal partners, state departments of transportation (DOTs), and the Federal Highway Administration (FHWA) to bring data-driven safety improvements to both local and state roads. The region's data-driven *Transportation Safety Analysis and Plan* (TSAP) focuses on key regional emphasis areas for reducing roadway crashes, injuries, and fatalities. It is a living document that guides effective collaboration and coordination among safety professionals and stakeholders to address various road-user issues, including: intersection safety, impaired driving, roadway departure crashes, and pedestrian and bicyclist safety.

Protecting people from traffic crashes while using alternative modes is critical. Walking, biking, and transit provide healthy and environmentally friendly transportation accessible to a wide range of users for a variety of trip purposes.

These modes are ideal for a Centers-based development pattern; offer safer travel options and other health benefits; and can reduce congestion, GHG emissions, and air pollution. One effort that embodies the push to promote alternative modes is the 800-mile multiuse 'Circuit Trails' network. Today, 355 miles of this network are complete, with an additional 82 miles in design or under construction. When fully constructed, the Circuit Trails will connect urban, suburban, and rural communities with dedicated rights-of-ways separated from vehicular traffic.

The Plan also encourages deploying emerging technologies that can provide safety and mobility benefits. Transportation networking companies; bike, e-bike, and e-scooter sharing; and highly automated vehicles (HAVs) all offer new ways of getting around and suggest a larger role for the private market in transportation services. Transportation systems management and operations (TSMO) applies multimodal, cross-jurisdictional services and projects to improve transportation network operations, security, safety, and reliability. DVRPC's *TSMO Plan* recommends viewing transportation as an integrated network, using technology and innovation to support TSMO strategies, obtain accurate real-time network conditions, and promote cooperation among regional transportation and emergency management partners to proactively manage planned and unplanned events and to provide timely and accurate travel information to customers so they can make informed mobility decisions.

The **ECONOMY**

Until about 50 years ago, manufacturing had long dominated the economy of both the city and the suburbs, accounting for almost 60 percent of the region's jobs. As traditional heavy manufacturing employment declined with globalization, the region's economy has transitioned to more knowledge-based and digital industries. However, these jobs require a different set of skills than many workers in the region have. *Connections 2050* reiterates the goals and strategies embodied in *Growing Greater Philadelphia*, accepted by the U.S. Economic Development Administration as the regional Comprehensive Economic Development Strategy (CEDS). The regional CEDS was created and is maintained under the direction of a committee of state, county, city, and regional economic development and planning professionals. Through the regional CEDS process, DVRPC is actively engaged in regional efforts to accelerate the transition to a more environmentally friendly economy, enhance workforce skills, and support inclusive growth.

Although the Plan focuses on creating more walkable, bikeable, and transit-oriented communities, there will still need to be more investment in roads and highways that accommodate higher-speed vehicle movement to increase access to high-quality job opportunities, reduce congestion and commute time, and facilitate trade and connections to the national and global economy. The Plan stresses the importance of context-sensitive approaches, where transportation facilities respond to their surrounding land uses, in the design and construction of facilities in these corridors.

Strategies to **ACHIEVE** the **VISION**

Strategies to achieve the vision include policies, projects, actions, decision making and other processes, education and outreach, and collaboration and partnerships. Fifteen high-level key strategies were identified from the feedback in the strategy workshops. These strategies aim to be consistent with the Plan's overarching principles and are aligned with the Plan's four focus areas, along with a set based on regional planning practices.

TRANSPORTATION Investments

The financial plan for investing in transportation infrastructure is developed to support the vision by:

- ➲ forecasting reasonably anticipated revenue;

- ➲ assessing an aspirational vision for transportation infrastructure across project categories: preservation for existing road and transit facilities and assets, operational improvements for existing facilities, expanding and improving bike and pedestrian infrastructure, expanding road and transit networks to address new growth, and other investment needs;

- ➲ allocating reasonably anticipated revenue to project categories based on Plan policy and goals to ensure fiscal constraint;

⮱ evaluating and selecting Major Regional Projects (MRPs) within project categories; and

⮱ identifying local options to close the funding gap.

The financial plan is developed in close coordination with two federally required DVRPC programs: the Transportation Improvement Program (TIP) and the Congestion Management Process (CMP). The TIP is the regionally agreed-upon list of priority multimodal transportation projects over a four-year period that intend to use federal funds, along with all non-federally funded projects that are regionally significant for air quality conformity, with estimated costs and purposes. MRPs are large-scale projects with significant regional travel impacts. The Plan lists only the MRPs that can advance within current funding. The TIP contains hundreds of additional projects that are consistent with and a part of the Plan.

The CMP's guiding principle is that transportation investments should support the Plan's land use goals and policies. It identifies and prioritizes the region's congested corridors and multimodal design and technology strategies to mitigate congestion. Regulations require projects that add single-occupancy vehicle capacity to be consistent with the CMP in order to be eligible for federal funding. These projects must include supplemental strategies to get the most long-term value. The CMP defines procedures for all federally funded major capacity-adding road projects, whether in congested corridors or not. Additionally, the CMP provides information about the performance of the regional transportation system and identifies inexpensive strategies appropriate almost everywhere to minimize congestion and enhance the mobility of people and goods.

TAKING ACTION

Ultimately the Plan is about transportation infrastructure. Infrastructure underpins our society and our economy and makes much of what we do possible. In order for the transportation network to continue to serve the region's residents and its economy, we must find the means to invest to modernize and improve the condition of our infrastructure, and we must coordinate across public and private sectors to make the necessary safety, information, multimodal, and reliability improvements needed for the digital age. At the same time, climate change and shifting ideologies around equity are joining with the Digital Revolution to drive change and reshape the region's economy, along with its environment, land use and communities, and the transportation network. DVRPC and its partners look forward to being a part of the dialogue and doing our part in making all these areas more equitable, sustainable, and resilient.

A major focus going forward will be to incorporate the Plan's strategies into projects and investments undertaken throughout the nine-county region and to ensure that decision making is consistent with the Plan's vision and goals. Many of the strategy recommendations contained within the Plan are for the region, and go beyond what DVRPC and its planning partners can do on their own. As a result, it is critical to continue to coordinate and build partnerships across the public and private sectors, as well as take individual actions to help implement the Plan. ▸

Current
CONDITIONS & TRENDS

To better understand what type of future we want, it helps to have a good idea of where we are as a region in the present day. The *Connections 2050* Plan uses quantitative indicators to comprehend where we are now and to track progress in achieving the vision and goals. The Plan's visioning outreach identified key regional values and concerns. The Plan was developed during a turbulent period due to the Coronavirus Disease 2019 (Covid-19) pandemic and Black Lives Matter protests, which are greatly shaping current conditions and trends, as well as the values and concerns that were expressed during the outreach. This section further explores each of these topics.
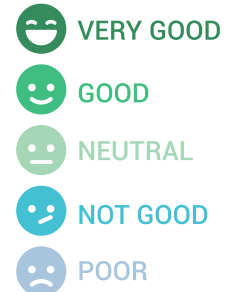
TRACKING PROGRESS Indicators

DVRPC utilizes meaningful, reliable, and easy-to-replicate data to track progress toward achieving the Plan's goals. Indicator data is compiled and presented in an interactive dashboard on the *Tracking Progress* website.[1] This data is used to better understand where the region is during a given time period, identify successful programs, align DVRPC's planning and implementation activities, and inform regional strategies.

[1]*www.dvrpc.org/TrackingProgress*

The region's most positive trends in *Tracking Progress* are in bridge conditions, air quality, GHG emission reductions, housing activity, innovation, job growth, land consumption, and population growth. *Tracking Progress* identifies concerning regional trends around income disparities, pavement conditions, exported goods, roadway safety, and water quality. The Plan has adopted a regional Vision Zero goal to improve roadway safety, has elevated equity as an overarching Plan principle, and continues to focus on achieving a state-of-good repair (SGR) for transportation infrastructure and expanding access to opportunity. ▶

TRACKING PROGRESS DASHBOARD

Bridge Conditions
−54% deficient deck area
2003 to 2018

Air Quality
−109 unhealthy days / year
2009 to 2018

Educational Attainment
+8.6% people >24 with a high-school diploma
2000 to 2017

Greenhouse Gases
−21% emissions
2005 to 2015

Housing Activity
+30% permits in preferred development areas
1999 to 2018

Innovation
+29% patent approvals
1998 to 2017

Job Growth
+6% jobs
2001 to 2017

Land Consumption
-62% in annual acres developed
1990-2005 to the 2005-2015 period

Population Growth
+6.5% people
2000 to 2018

Commute Mode
−1.5% driving alone to work
2006 to 2017

Congestion
+2.3% regional highway reliability
2011 to 2018

Global Connectivity
0% change in PHL international destinations
2009 to 2019

Housing Affordability
−4.2% cost-burdened households
2005 to 2017

Miles Driven
+0.6% annually per person
2000 to 2017

Racial & Ethnic Disparities
−6.8% income gap between people of color and white
2000 to 2017

Sex Disparities
−30% income gap between males and females
2000 to 2017

Transit Conditions
+14% revenue fleet age
2000 to 2017

Transit Ridership
−1.1% trips per person
2000 to 2017

Exported Goods
−8.9% in value
2012 to 2018

Roadway Safety
+2.5% fatalities and severe injuries
2015 to 2017

Water Quality
−8.7% water supporting aquatic life
2006 to 2014

Income Disparities
+25% gap between high and low household income
2006 to 2017

Pavement Conditions
+5.3% segment miles in poor condition
2010 to 2017

VERY GOOD
GOOD
NEUTRAL
NOT GOOD
POOR

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As part of identifying the regional vision, public outreach for developing the *Connections 2050* Plan asked participants to share what they value most about the region and what their concerns about the future are. The values and concerns heard in this dialogue reinforce the Plan's vision, principles, goals, and focus areas.

REGIONAL VALUES

Different aspects of quality of life and built environment, such as affordability, walkable and bikeable communities, vibrant neighborhoods, feeling of community, and sense of place

Cultural amenities, entertainment venues, and history and historic sites

Proximity to other places, access to mountains, beaches, and easily getting around the region and easy to get to places outside the region

Multimodal transportation network, especially bike/pedestrian infrastructure, and transit service

Diverse population, communities, and landscapes

Green and open spaces, and parks and recreation

The region's economy, including the education and medical sectors, and access to opportunity

and **CONCERNS**

Environmental degradation, including air and water pollution, litter, and loss of tree canopy; and the impacts of climate change

Aging infrastructure and lack of transportation funding

Inequality, and inequitable development patterns, including lack of transit access for lower-income and Black and Brown neighborhoods

Sprawling development patterns contributing to automobile reliance and loss of open space, green space, farmland, and natural areas

Rising cost of living, including increasing costs of housing

Traffic congestion

Regional economic decline over the last several decades and recovery from the pandemic recession in the near term

Access to education, jobs, and training; and lack of school funding

Viability of transit

Quality of life, including public health, communities and neighborhoods, and crime and personal safety

Government, leadership, civics, political will, and taxes

Transportation safety, including lack of safe bicycle facilities

COVID-19

Covid-19 is a deadly, highly-infectious disease unlike anything the modern world has seen. The Covid-19 virus is primarily transmitted person to person through respiratory droplets that form through breathing, talking, sneezing, or coughing.[2]

The pandemic has had a heavy human toll, with disproportionate impacts to Black, Latinx, and older adult populations. Although older individuals have elevated risks due to compromised immune systems, the legacy of racism, exclusion, and environmental factors—urban heat islands, air and water pollution—along with economic, health, and social disparities in Black, Indigenous, and People of Color (BIPOC) communities are all being laid bare by Covid-19. There has also been a disturbing and unacceptable rise in racist attacks on Asian Americans during the pandemic, with more than 2,500 incidents reported, with countless more unreported, across the United States between March and September 2020.[3]

Surges in Covid-19 cases have overwhelmed hospitals and caused postponement of other needed health services. The pandemic has also reduced focus on the opioid epidemic. Long-term health concerns for Covid-19 survivors are still not well understood. The good news is that multiple vaccines have been authorized for distribution, giving hope of building herd immunity to the virus in the near term, although fears and misinformation have slowed their distribution and prolonged the pandemic.

Spring 2020 lockdowns led to significant declines in vehicle miles traveled (VMT) and transit ridership, while regional trail use surged. After the lockdowns were lifted, VMT rebounded more quickly than transit ridership, although it still declined nationally by 13 percent in 2020 compared to 2019. Covid-19 has shown how quickly urban areas can adapt to change, such as closing roads to vehicles to increase recreational space in dense neighborhoods, and repurposing parking spaces to expand outdoor dining areas for restaurants. These changes have not been welcomed by everyone, particularly essential workers whose ability to get to work or deliver goods was made more difficult.

Many analysts speculate that post-pandemic there will be more working from home, and some degree of transition away from transit and shared mobility toward personal vehicles. Once the pandemic is over, there is a major opportunity to reset travel patterns and behaviors—by continuing to give street space to parklets, eating areas, and bike and pedestrian uses—and use recovery investments to create a more equitable, resilient, and sustainable society.

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[2]COVID-19 Employer Information for Bus Transit," Centers for Disease Control, Updated August 5, 2020, www.cdc.gov/coronavirus/2019-ncov/community/organizations/bus-transit-operator.html (accessed August 28, 2020).

[3]Zijia Eleanor Song and Jennifer Vázquez, "Study Shows Rise of Hate Crimes, Violence Against Asian Americans During the Pandemic," NBC New York, February 11, 2021, www.nbcnewyork.com/news/local/crime-and-courts/study-shows-rise-of-hate-crimes-violence-against-asian-americans-in-nyc-during-covid/2883215/.

BLACK LIVES MATTER Protests

Following the high-profile killings of Breonna Taylor, Ahmaud Arbery, and George Floyd in the summer of 2020, the United States and the Greater Philadelphia region erupted into protests demanding racial and social justice. These protests were largely supported by Black Lives Matter, an organization that has sought to combat and counter acts of violence against Black communities since 2013.

Transportation is not innocent in the systematic racism that has oppressed and disenfranchised BIPOC communities. In many areas, Interstates and highways were aligned in a manner that cut off Black neighborhoods from the wider community; transit systems were segregated through the 1950s; and aggressive police presence and harmful policies like "stop and frisk" made public transit dangerous for Black and Brown communities to use. To this day, BIPOC people continue to feel unwelcome in certain public spaces; studies show taxis avoid picking up and dropping off in BIPOC neighborhoods; and there is often a lack of meaningful community engagement when planning transportation projects in low-income and marginalized communities. It is clear that the transportation sector has a long way to go to make up for past transgressions and current shortcomings if it is going to equitably serve everyone.

Ending racism and building an equitable society requires giving voice to disadvantaged Black, Brown, Latinx, and other marginalized communities. Black Lives Matter advocates urge undertaking difficult dialogue about the causes of community disinvestment, structural racism, environmental injustice, and unequal wealth distribution. Even then, conversations about radical changes to transportation infrastructure should incorporate infrastructure basics in BIPOC communities to mitigate the disparities caused by racist legacies. Such measures include installing green infrastructure and ensuring appropriate drainage, reducing urban heat island disparities, improving air quality, upgrading underground utilities, creating accessible curbs and crossings, and installing adequate amenities and shade by adding bus shelters and tree canopy. Truly transformative transportation projects must be developed through a collaborative process that incorporates the experiences of disenfranchised people.

Alternate SCENARIOS & FORECASTS

A good long-range plan considers how key trends and forces may shape the region in the future. Scenario planning envisions a range of plausible futures that can be used to inform the Plan's vision, test the effectiveness of potential strategies, and guide decision making. As part of developing the long-range plan, DVRPC is required to adopt an official forecast of population and employment through the Plan's horizon year to guide its planning activities.

DISPATCHES from ALTERNATE FUTURES

DVRPC and the Futures Working Group (FWG) collaborated on a scenario planning effort[4] to understand how different forces and decisions we collectively make today could shape the future. The resulting scenarios are extreme, but plausible, futures built around an axis of uncertainty based on three driving forces shaping Greater Philadelphia:

Rising Inequality is the result of increasing wealth concentration, along with a shrinking middle class, including more inequality between regions as "superstar" regions extract wealth from less successful areas in the digital economy.

Climate Change is expected to increase the region's precipitation levels through more intense storms, although with fewer precipitation events; sea level rise causing more coastal and nuisance flooding; rising temperatures with more variability; and more freeze-thaw cycles.

The Digital Revolution began with the emergence of computers, digital data storage, and the internet, which have collectively shifted how humans communicate; changed the primary function of the economy from product manufacturing to information; and enabled software, automation, robotics, and outsourcing to replace low-skill jobs with high-skill ones.

Each scenario's story is told through a series of news articles from the future set around key topic areas of land use, transportation funding, transportation technology, the environment, the economy, equity, and demographics. ▶

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[4] www.adobe.ly/3pzz0KX.

TECHNOLOGY

	Incremental Change	**Transformative Change**

Vertical axis: CLIMATE CHANGE & EQUITY

Political Will/Collective Action

PEOPLE POWER
Grassroots democracy gives citizens more input into the development of their communities and the economy, while readily available technologies are deployed to fight climate change.

INCLUSIVE TECH
A collaborative, networked, open source economy of abundance emerges from societal efforts to make technological advances more sustainable and equitable.

2020s

People Power (Incremental):
- Antitrust Suit Brought against Amazon
- Aging Population Straining Universal Healthcare Programs
- Federal Officials Investigate Truck Platoon-Related Crash on PA Turnpike

- Climate Refugees Compound Crisis on Southern Border
- Congress Narrowly Passes Transportation Legislation, Shifts Funding Mechanism to VMT Fees
- Following Fatal Passive Hacking Crash, Autodrive is the Latest Self-Driving Car Company to Shut Down Operations

Inclusive Tech (Transformative):
- End of the Road for Brick-and-Mortar Retail?
- Major Legislation Gives Hope against Climate Change
- Robotic "Road Butlers" Coming to Crash-Prone North Philly

- Ready or Not, the Automated Vehicle Race Arrives in Philly Area
- Digital Lives Not so Democratic after All
- Eco-Suburban Housing Markets Are Heating up but Are They Sustainable?

2030s

- Extreme Weather Tipping Point for Decentralized Energy
- Supreme Court Invalidates Single-Family Zoning
- Transit Renaissance Continues as New SEPTA Regional Rail Line Opens

- Hedge Funds Become World's Largest Landlord
- Gig Economy All That's Left?
- Calls for Seed Banks to Be Opened to Curb Big Ag Impacts

- Payment for Personal Data Adds to Welfare State
- Push for Programmable Roads as Carbon Tax Dwindles
- Opinion: It's Time to Admit the Office Market Isn't Coming Back

- The Impacts of Congestion Pricing One Decade In
- Ubiquitous Cryptocurrency Undermining the U.S. Dollar
- American Bumblebee Officially Extinct

2040s

- 2040 Census: Greater Philadelphia Still Growing Slowly
- Community Organization Gives People Power

- 2040 Census: Greater Philadelphia Population Declines Amid Undercount, Hurricane, and Pandemic Concerns
- Expectations Remain Delayed as Climate Solutions Remain Out of Reach

- 2040 Census: Greater Philadelphia Growth Still Driven by Foreign Immigration
- Open Source, Inclusive Tech Allowing Everyone to Design Their Community

- 2040 Census: Greater Philadelphia Growth Shifts to the Suburbs
- Best of the Underground Press in 2041:
- *Not Just an Internet Thing: Sorting Also Happening in our Communities*
- *It's a Bird, It's a Plane, It's a...Flying Taxi?*
- *Algorithms and Big Data Put Technology in the Driver's Seat*
- *Little Progress in Slowing Climate Change, Despite Technological Advances*

Market Forces/Individual Responsibility

DELAYED EXPECTATIONS
Climate change, sharp political swings, ongoing civil discord, and a slowdown in innovation lead to a lack of direction and economic stagnation.
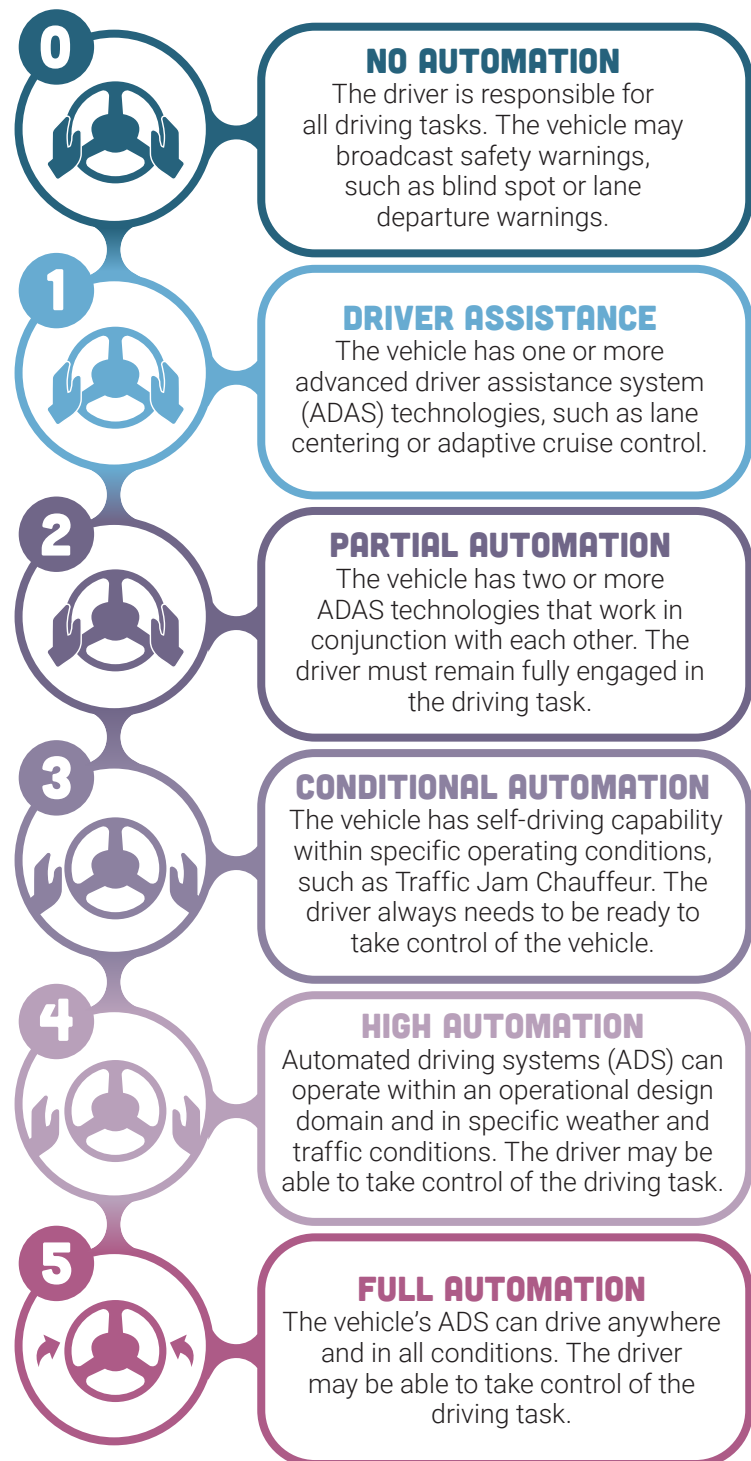
TECH IN THE DRIVER'S SEAT
Markets drive economic growth through Big Data, algorithms, and innovation.

Preparing for
EMERGING TRANSPORTATION TECHNOLOGIES

Preparing Greater Philadelphia for Highly Automated Vehicles[5] utilizes the Dispatches scenarios to consider how HAVs could be deployed in the region. Automated vehicles (AVs) use on-board hardware and software to assist drivers or perform driving tasks. The Society of Automotive Engineers has identified different levels of vehicle automation. This is important, because most people often think immediately of the highest level of self-driving capability, although there will likely be a long transition period between current AV capabilities and full self-driving technology deployment. There will also likely be a long transition period before HAVs comprise the majority of the vehicle fleet. While Level 4 HAVs are beginning to appear on roads in the United States and around the world, Level 5 HAVs may still be decades away.

[5]www.dvrpc.org/Products/20013/.

0 NO AUTOMATION
The driver is responsible for all driving tasks. The vehicle may broadcast safety warnings, such as blind spot or lane departure warnings.

1 DRIVER ASSISTANCE
The vehicle has one or more advanced driver assistance system (ADAS) technologies, such as lane centering or adaptive cruise control.

2 PARTIAL AUTOMATION
The vehicle has two or more ADAS technologies that work in conjunction with each other. The driver must remain fully engaged in the driving task.

3 CONDITIONAL AUTOMATION
The vehicle has self-driving capability within specific operating conditions, such as Traffic Jam Chauffeur. The driver always needs to be ready to take control of the vehicle.

4 HIGH AUTOMATION
Automated driving systems (ADS) can operate within an operational design domain and in specific weather and traffic conditions. The driver may be able to take control of the driving task.

5 FULL AUTOMATION
The vehicle's ADS can drive anywhere and in all conditions. The driver may be able to take control of the driving task.

TECHNOLOGY

	Incremental Change	Transformative Change
Political Will/ Collective Action	**PEOPLE POWER** Grassroots democracy gives citizens more input into the development of their communities and the economy, while readily available technologies are deployed to fight climate change.	**INCLUSIVE TECH** A collaborative, networked, open source economy of abundance emerges from societal efforts to make technological advances more sustainable and equitable.

CLIMATE CHANGE & EQUITY

Transportation Vision	Focus on expanding bike, pedestrian, and transit systems.	No compelling vision for the future emerges, and the system muddles along without significant changes even as infrastructure conditions deteriorate.	Create a non-profit, integrated, multimodal mobility-as-a-service (MaaS) network.	A private-market-administered, HAV-based MaaS network emerges.
HAV Deployment	Automated middle-mile goods movement takes off. Slow-moving automated shuttles expand transit service in suburban areas and integrate with existing transit networks. They also improve high-definition mapping for when Level 4 HAVs are deployed.	Although ADAS technologies become ubiquitous in the vehicle fleet, crashes and fatalities remain stubbornly high as warnings get tuned out.	Federal innovation policy is geared to increasing the sustainability, equity, and safety of new technology leading to a wide variety of HAVs hitting the road, with little resemblance to conventional human-driven cars.	Level 4 HAVs operate within an operational design domain (ODD) focused on limited-access facilities and suburban arterials, promoting a new round of suburban sprawl.
HAV Deployment Outcomes	The slow rollout of HAVs allows for more trial and error, time to build public acceptance, development of public-private partnerships, and lets the industry address safety concerns in order to create a better final product.	Without HAV deployment, the status quo vehicle ownership model remains in place. There are only limited improvements to safety and access to opportunity.	These different modes and vehicle types are incorporated into a public and non-profit-managed, open source MaaS network. Thanks to a focus on Vision Zero, safety culture has taken root across society, spreading well beyond the transportation sector.	MaaS company subscriptions limit integration with other transportation options. Although ODDs expand over time, Level 5 capabilities are not achieved by 2050. As gridlock worsens, HAVs begin to be disrupted by aerial passenger drones.

Market Forces/ Individual Responsibility	**DELAYED EXPECTATIONS** Climate change, sharp political swings, ongoing civil discord, and a slowdown in innovation lead to a lack of direction and economic stagnation.	**TECH IN THE DRIVER'S SEAT** Markets drive economic growth through Big Data, algorithms, and innovation.

NETWORKING TRANSPORTATION

Beyond HAVs, there are a number of transportation technologies converging to shape the future of transportation.

Connected vehicles (CVs) use licensed wireless and cellular networks, satellites, the internet, and telematics to enable real-time communications between cars, trucks, buses, motorcycles, bicyclists, pedestrians, and infrastructure to enhance safety.

Electric vehicles (EVs), also called Plug-in Electric Vehicles (PEVs), are powered by an electric motor using electrical energy stored in batteries that are recharged by plugging into the electric grid. EVs include plug-in hybrid electric vehicles (PHEVs)—which have a supplementary internal combustion engine—and battery electric vehicles (BEVs), also known as all-electric vehicles (AEVs).

Shared mobility providers offer service through digital networks, which are typically accessed through a smartphone app that uses real-time data to match supply and demand. Different types of shared mobility include bikesharing, including electric bicycle (e-bike) options, electric-scooter (e-scooter), carsharing, courier networking services (offering on-demand delivery of goods, groceries, and take-out food), and transportation network companies (TNCs).

Digital communications technologies offer real-time information and communications through a variety of digital devices and automated data collection systems, which are critical to enabling shared mobility. They also support travel routing and navigation tools and apps, such as Google Maps, INRIX, Waze, and Southeastern Pennsylvania Transportation Authority (SEPTA) and New Jersey Transit (NJ TRANSIT) apps. These tools can optimize trips based on travel time, cost, available modal options, and identify the quickest and most direct route. They can route people and vehicles away from congested facilities and onto less congested ones, reducing travel time and gridlock. However, these routes sometimes inappropriately go through residential neighborhoods.

Digital technologies enable transportation agencies to manage road and transit networks in real time. A variety of other applications can gain new efficiencies through dynamic carpooling, freight apps that allow small trucking carriers to transact directly with shippers, multimodal apps and MaaS aggregators that provide multimodal real-time travel and cost information, parking apps that provide space availability, person-to-person rentals, taxi apps that operate within the taxi medallion framework, and easier payment options for all the above.

The combination of these new and emerging modes and digital technologies offer an opportunity to integrate them all together into a MaaS network. MaaS could change the current transportation model from vehicle ownership to individual rides and monthly subscriptions as the main way to pay for mobility. Each trip is made using the best available mode, using real-time travel information found through an app that simplifies payment across service providers.

Level 4 HAVs may be used as shared mobility robotaxis within defined ODDs, and automated shuttles could be either hailed on demand or operate fixed route service within MaaS services, if they are able to operate without a safety driver. Level 5 HAVs could greatly strengthen the potential for MaaS, but their capabilities may generate strong consumer interest in owning their own HAVs.

Ultimately, these technologies will be beneficial only if deployed in a manner that is consistent with the Plan's vision and goals. That is, they should improve safety, reduce dependence on vehicles and vehicle ownership, increase the efficiency—including the energy efficiency—of the transportation network, improve first- and last-mile transit connections, and expand everyone's access to opportunity.

MaaS OPERATOR

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POPULATION and EMPLOYMENT FORECASTS

The pandemic has impacted existing regional trends around an aging population and slowing birth rates, while international immigration, long the primary source of regional population growth, has declined significantly. Change in domestic movement in or out of the region is less certain.

Given these trends, the region is projected to see moderate levels of population growth in the coming decades, with a forecasted increase of 7.6 percent, or 440,000, more people from 2020 to 2050. The highest absolute growth is forecast to be in Chester and Montgomery counties, and the highest growth rates in Chester and Gloucester counties. Many of the new households formed in the future will likely have just a single person or a couple without children living in them. Around 20 percent of the population is projected to be over 65 in 2050, compared to 13 percent in 2020. Empty nesters looking to downsize and benefit from more communal living have been increasingly willing to rent.

The region experienced strong employment growth in the 2010s before the pandemic led to record weekly unemployment claims, peaking at nearly seven million in early April 2020. At that time, the nation's unemployment rate hit 14.7 percent after being just 3.5 percent in February 2020. Although many experts initially forecast a long recession, high household savings levels—as consumers have been social distancing and less able to spend money—and a fast rising stock market suggest a potential strong post-pandemic economic recovery. Even so, it is not clear whether the economic recovery will equitably benefit all income groups.

The region's employment is forecast to increase by 14.6 percent, or 445,000, jobs from 2020 to 2050. More than half of the forecasted jobs growth accounts for a rebound from low employment levels during the pandemic, with steady growth after the recovery. The sectors that grow post-pandemic are likely to be different from what existed pre-Covid. Increasing e-commerce during the pandemic has spurred demand for light industrial warehouse space, with an estimated 92 million square feet currently proposed or under development in the region.

Future growth across the region will ultimately be the result of larger trends and forces, public policies ranging from local zoning to federal programs, and individual decisions. With limited revenue available to improve transportation infrastructure, the Plan will focus investments on projects that best meet the needs of the region.

2020 → 2050

14.6% EMPLOYMENT
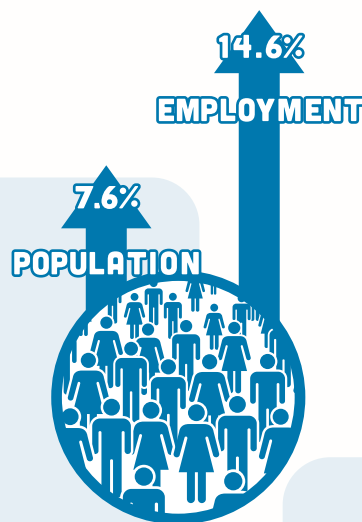
7.6% POPULATION

Projected **FUTURE DEVELOPMENT** Locations and **FORECASTED CHANGE** in **POPULATION** and **EMPLOYMENT** by County **2020–2050**

BUCKS
5.1%

MERCER
7.7%
13.0%

MONTGOMERY
12.3%
13.4%
8.9%

CHESTER
23.5%
25.4%

DELAWARE
3.6%
12.3%

PHILADELPHIA
7.0%
18.0%

BURLINGTON
6.9%
11.6%

CAMDEN
2.3%

GLOUCESTER
12.5%
12.0%
29.9%
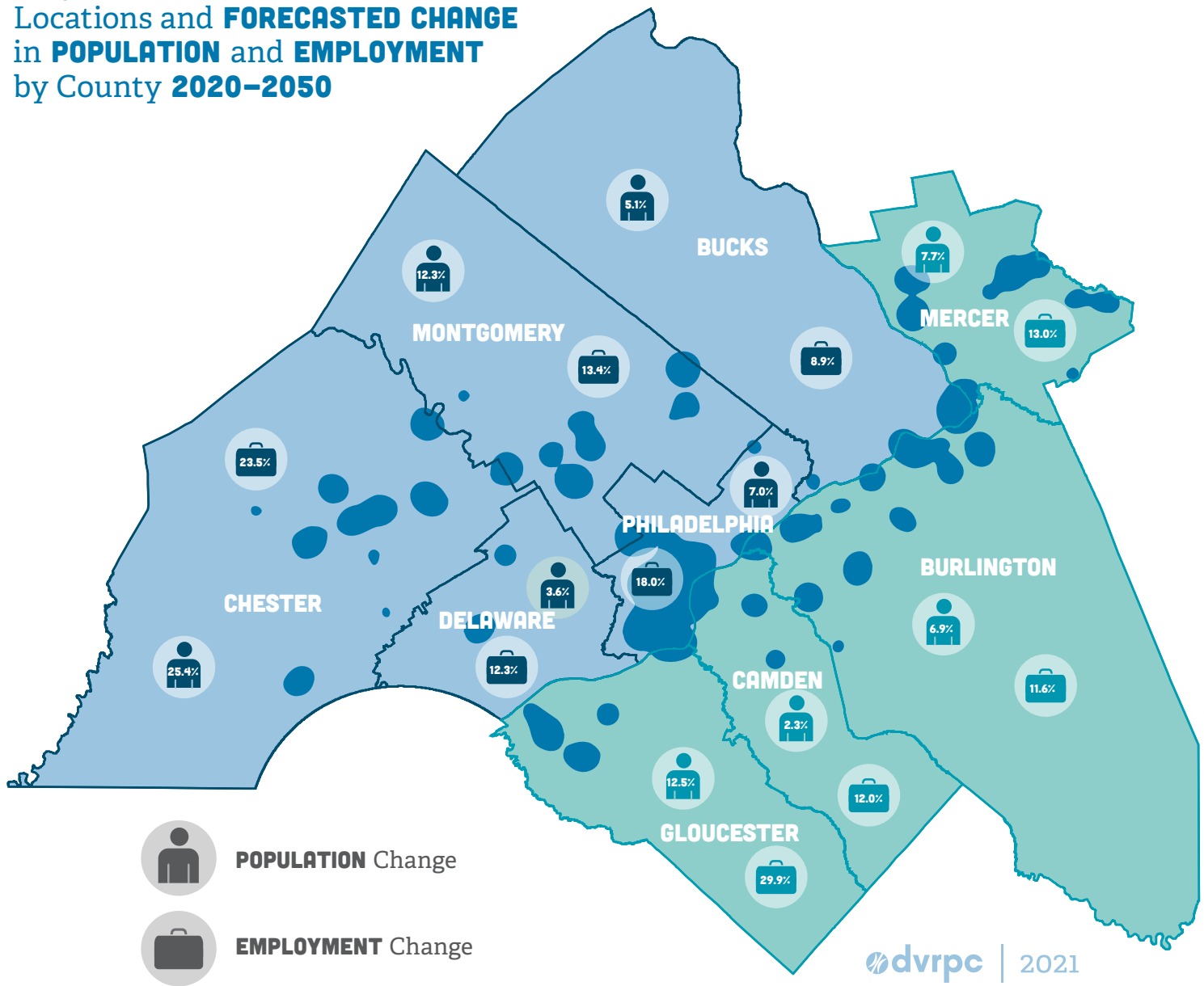
POPULATION Change

EMPLOYMENT Change

AREA WITH PROJECTED HIGH-LEVEL of **DEVELOPMENT ACTIVITY**

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Areas projecting high levels of future development were identified through residential and commercial development pipeline data for all nine counties, which informed the population and employment forecasts.

VISIONING—What We Heard

"Extensive car-free corridors and downtowns, [and] dramatically increased spending on street trees and parks; so none of these things will be rare; thus hopefully limiting risks of gentrification…"

"A welcoming community where people from a variety of backgrounds and with a variety of belief systems can live in harmony with mutual respect in an environmentally and economically sustainable way."

"Legalization of multi-family housing in all areas of the region."

"Black women have [the] same quality access to jobs, housing, healthcare, and education as white men."

"We build on our strengths — diversity, quality of life, a great place to live and visit, pharma, higher ed, technology … , good place for all ages, affordability, attracting new companies and many more small vibrant businesses representing the diversity of our region."

"Seamless automated private and public transport to provide access from anywhere to anywhere, to both reduce GHG emissions and to improve access to jobs and work for people in underserved neighborhoods."

"More economic growth and opportunity for all residents,

"An economy that has a goal of making society better, not individuals wealthier."

"To be the region looked upon by the nation as the definitive leader in social change, technological transition, urban and suburban environmental quality."

greater investment in transit and open space,

fewer structural incentives favoring auto-centricity / sprawl."

All quotes on this page come directly from participants in the Plan's visioning outreach.

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VISION for 2050

At the heart of a long-range plan is a broadly shared vision for where we collectively want the region to be in 30 years, which is generated through wide and far-reaching public input. The *Connections 2050* vision is: An **EQUITABLE, RESILIENT**, and **SUSTAINABLE** Greater Philadelphia region that:

Preserves and restores the natural **ENVIRONMENT**.

Develops inclusive, healthy, and walkable **COMMUNITIES**.

Maintains a safe, multimodal **TRANSPORTATION NETWORK** that serves everyone.

Grows an innovative and connected **ECONOMY** with broadly shared prosperity.

The Plan's focus areas are the environment, land use and community, transportation, and the economy. These are the most prominent topical themes in the 2050 visioning outreach. Each one is also highly relevant to DVRPC's work and mission. Equity, resilience, and sustainability are Plan principles, the most prominent policy-oriented themes from the 2050 visioning outreach and the lenses through which the Plan's focus areas are viewed.

The Greater Philadelphia region is committed to...

EQUITY is the just and fair structuring of society where everyone can participate, prosper, and reach their full potential, including extensive, restorative, and accessible civic dialogue and engagement that gives everyone a meaningful voice in public decision-making processes, with a particular focus on communities that have historically been marginalized and disenfranchised.

RESILIENCY includes planning in advance so as to minimize the vulnerability of people and infrastructure to hazards and emerging threats such as extreme weather, pandemics, recessions, and other shocks to economic, environmental, transportation, and land use systems; and the ability to manage and recover quickly from these threats and hazards when they do happen.

SUSTAINABILITY is the ability to meet present needs without compromising the ability of future generations to meet their needs, particularly in making policy and investment decisions that stand the test of time by incorporating environmental, economic, and social considerations.

Develops inclusive, healthy, and walkable COMMUNITIES.

Preserves and restores the natural ENVIRONMENT.

Grows an innovative and connected **ECONOMY** with broadly shared prosperity.

Maintains a safe, multimodal **TRANSPORTATION NETWORK** that serves everyone.

This regional **VISION IS INTENTIONALLY BROAD AND EXTENDS OUTSIDE DVRPC'S TRADITIONAL SCOPE** and programs. **ACHIEVING THE VISION WILL REQUIRE** substantial **INDIVIDUAL AND COLLECTIVE ACTIONS, AND EFFORTS** that go well **BEYOND THE STATUS QUO** and will need to reach past what DVRPC and its planning partners can do on their own. The following section highlights the goals for each of the Plan's focus areas and how they relate back to the principles. Although each individual goal is only listed once, they are often applicable to more than one focus area. The next section identifies key strategy recommendations for achieving the vision and goals.

PRESERVE and RESTORE the NATURAL ENVIRONMENT

Parks, natural areas, and farmland improve air and water quality; reduce stormwater runoff; enhance health and well-being; provide wildlife habitat and biodiversity; boost property value; and increase access to healthy, locally produced food. Within the built environment, studies have shown many benefits to people when they are surrounded by trees and vegetation in their communities and the buildings where they spend their time. These include reduced stress and blood pressure, increased cognitive function, mental stamina and focus that improves worker productivity and learning outcomes, lowered crime rates, and better moods.[6]

GOALS:

Permanently **PROTECT** one million acres of **OPEN SPACE** by the year 2040, focusing on the region's critical greenspace network and conservation focus areas.

Attain **NET-ZERO GHG EMISSIONS** by the year 2050 and prepare communities for the impacts of climate change.

Improve **AIR AND WATER QUALITY**.

Increase **LOCAL FOOD PRODUCTION**, distribution, and access.

Bring nature and **ECOLOGICAL** functions back into developed **COMMUNITIES** to enhance livability and well-being, reduce flooding risks, and mitigate the heat island effect.

An **EQUITABLE ENVIRONMENT** provides clean water, clean air, and a healthy ecosystem for current and future generations, along with easy access to parks, recreation, and open space—with a focus on improving access for communities most lacking in natural amenities.

[6] Terrapin Bright Green, The Economics of Biophilia: Why Designing with Nature in Mind Makes Economic Sense (New York: Terrapin Bright Green, 2012), www.terrapinbrightgreen.com/wp-content/uploads/2012/06/The-Economics-of-Biophilia_Terrapin-Bright-Green-2012e.pdf.

A **RESILIENT ENVIRONMENT** is prepared for new risks from extreme heat, more freeze-thaw cycles, more intense precipitation events, and rising sea levels. Resiliency efforts do not place undue burdens on historically marginalized and disenfranchised communities.

A **SUSTAINABLE ENVIRONMENT** reduces GHG emissions and maintains a healthy level of GHGs in the atmosphere over time. Sustainability initiatives do not place undue burdens on historically marginalized and disenfranchised communities.

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DEVELOP INCLUSIVE, HEALTHY, and WALKABLE COMMUNITIES

Connections 2050 envisions developing new and supporting existing places that are affordable and inclusive, providing multimodal and active transportation, and having safe and easy access to parks and open space. These are communities where walking, biking, and transit can help meet daily activity and fitness recommendations, which provides health benefits and improves social cohesion. They are places where affordable housing is available to all families across the income spectrum. Housing is a central issue for equity, key to public health—as it provides a place to access basic needs and familial and social interactions—and critical to making the regional economy an attractive location.

GOALS:

Preserve existing and build more accessible and **AFFORDABLE HOUSING**, reducing how much of a household's income is spent on combined housing and transportation costs.

Foster racially and socioeconomically **INTEGRATED NEIGHBORHOODS**, and **ADVANCE EJ** for all the region's inhabitants.

Invest in COMMUNITY SCHOOLS AND AMENITIES, such as parks, trails, sidewalks, bicycle lanes, pedestrian plazas, and open space.

Focus growth in mixed-use, **WALKABLE PLAN CENTERS** across the region, and promote vibrant main streets and downtowns and live/work opportunities.

Preserve **HISTORIC AND CULTURAL RESOURCES**.

EQUITABLE COMMUNITIES are affordable, socioeconomically integrated, safe, accessible, and built for all ages, from eight to eighty. They offer easy access to parks, grocery stores, transit, and jobs; and accommodate growth without displacing the existing population.

RESILIENT COMMUNITIES are places with strong social, physical, and economic resources that help residents weather adversity, return quickly to normal life and avoid adverse impacts from extreme weather events, economic downturns, and other disruptions.

SUSTAINABLE COMMUNITIES use Centers-based development patterns to make efficient use of infrastructure and enable growth with less consumption of energy, land, and other resources.

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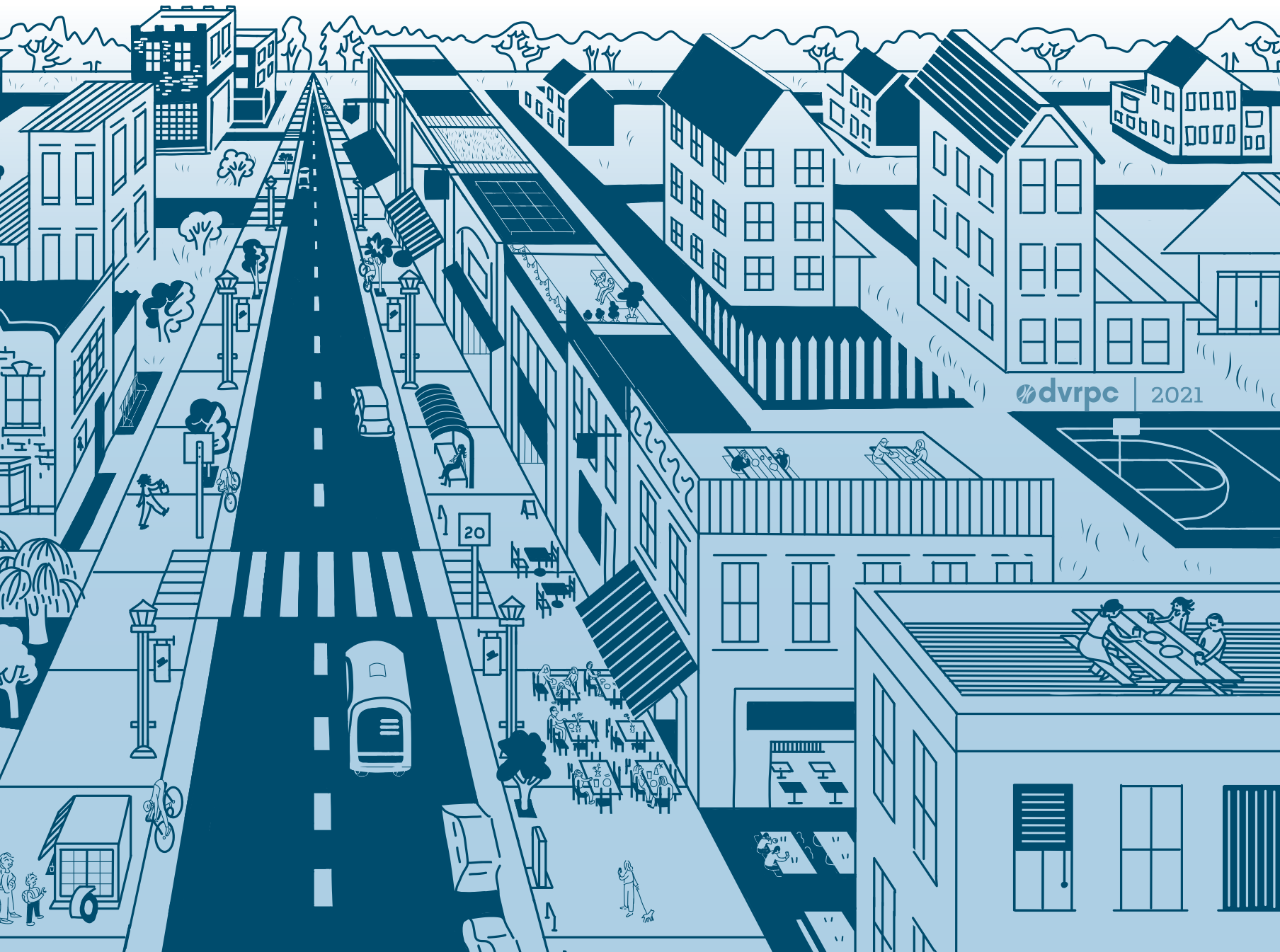
Maintain a **SAFE, MULTIMODAL TRANSPORTATION NETWORK** that Serves **EVERYONE**

Greater Philadelphia has an enviable transportation network with major highways, an extensive transit system, expansive walking and biking facilities, and an international airport. However, many aging transportation facilities will need to be reconstructed and modernized in the coming decades. Additional investment is needed to deploy emerging technologies. The region's transportation agencies will need to do more with constrained funding and find ways to generate new revenue.

GOALS:

Rebuild and **MODERNIZE** the region's **TRANSPORTATION ASSETS** to achieve and maintain an SGR, including full Americans with Disabilities Act (ADA) accessibility.

ACHIEVE VISION ZERO—no fatalities or serious injuries from traffic crashes by 2050.

Integrate existing and emerging transportation modes into an accessible, **MULTIMODAL MaaS NETWORK**, which collects real-time data, and uses it to plan and pay for travel using the best option available. Transit, walking, and biking—including the Circuit Trails system—are integral components of this network.

Increase **MOBILITY AND RELIABILITY**, while reducing congestion and VMT.

Strengthen transportation network **SECURITY AND CYBERSECURITY**.

EQUITABLE TRANSPORTATION NETWORKS increase everyone's safety and access to affordable transportation, along with the jobs, services, and opportunity that come with it. They prioritize communities that have been historically marginalized and individuals who are the most vulnerable.

RESILIENT TRANSPORTATION NETWORKS provide real-time data to both individuals and operators in order to enhance efficiency and pinpoint problems before they become disruptive; provide travel options; and harden or move infrastructure at risk from climate change to maintain operations over the long run.

SUSTAINABLE TRANSPORTATION NETWORKS reduce auto dependence to optimize the safe movement of people and goods in space- and energy-efficient ways—particularly walking, biking, and transit—and use renewable and alternative fuels and clean technologies to reduce emissions.

MOBILITY HUB

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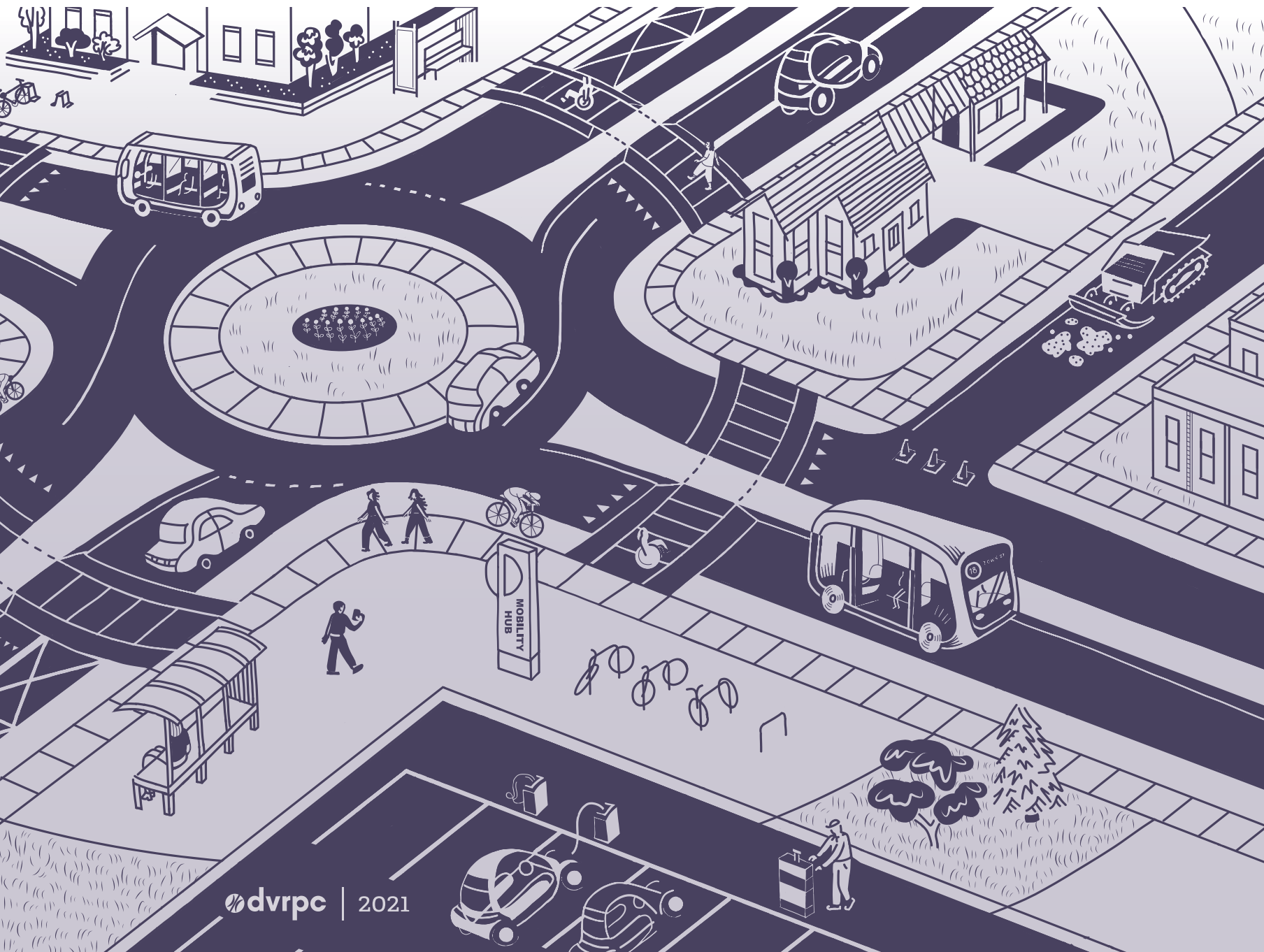
GROW an INNOVATIVE and Connected ECONOMY with Broadly SHARED PROSPERITY

Greater Philadelphia is home to major educational, healthcare, and non-profit institutions that can incubate new technologies and business startups. The region is well positioned in the Northeast corridor, with more than 100 million people living within 500 miles. However, the region's economy faces challenges from climate change, rising inequality, and the Digital Revolution, which creates both opportunities and uncertainty about the future of work and the economy.

GOALS:

Foster a HIGH-SKILLED WORKFORCE, expand entrepreneurialism, innovation, new business formation and growth, and support key economic sectors.

Expand the CIRCULAR[7] AND SHARING ECONOMIES[8], cooperatives and worker-owned firms, and support independent contractors.

Assist with the post-pandemic recovery and growth of SMALL BUSINESSES and local business districts.

Improve GLOBAL CONNECTIONS—facilitate goods movement, aviation, and multimodal intercity connections; and expand internet access.

REDUCE POVERTY and the wealth gap, and improve school quality for all residents.

[7]The circular economy continually reuses resources to eliminate waste.

[8]The sharing economy allocates resources on demand between organizations and individuals through the internet.

EQUITABLE ECONOMIES expand economic mobility by providing all students access to good schools, attracting and creating more good-paying jobs, and increasing access to capital for everyone. They place additional focus on expanding opportunity in communities that have been historically marginalized and denied access to good jobs.

RESILIENT ECONOMIES have the ability to withstand economic shocks, recover quickly from them when they do happen, or avoid them altogether.

SUSTAINABLE ECONOMIES are energy efficient, generate clean energy, and reduce the need to consume energy, which saves money, protects the environment, and provides other benefits—such as less need to drive or more comfort in well-insulated buildings.
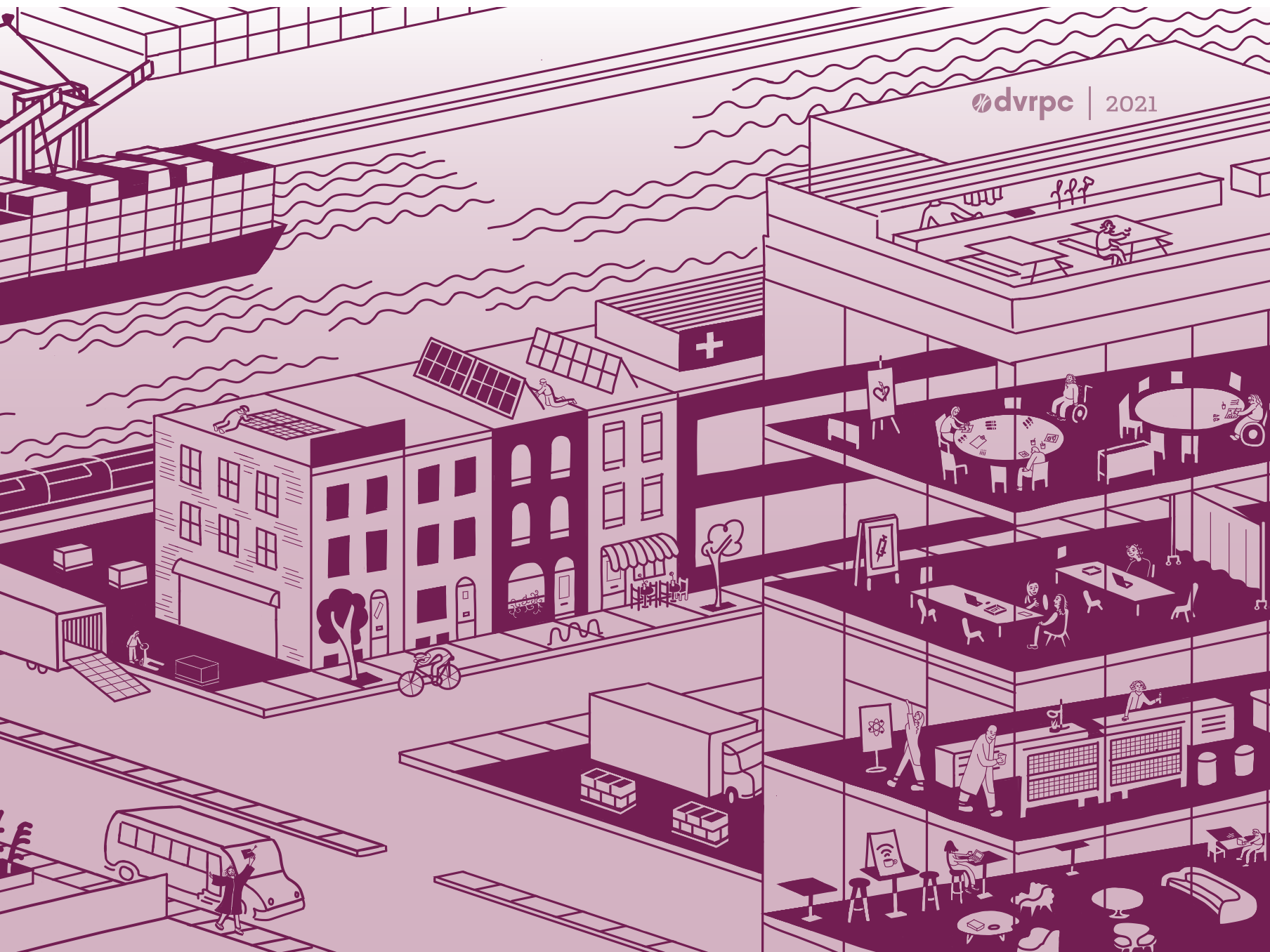
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Strategies to
ACHIEVE THE VISION

Recommended strategies were informed by a series of public "strategy workshops" and align with the Plan's equity, sustainability, and resiliency principles. These strategies recognize the need for a more equitable society and inclusive decision making so that actions taken to combat climate change reduce existing inequities. They support each of the Plan's focus areas—the environment, communities, transportation, and the economy—with a fifth set of strategies developed under a regional planning rubric. Regional planning strategies use the *Dispatches* scenarios to consider contingent actions across a range of futures, and ensure decision making supports the Plan's principles, vision, and goals.

The table on the following page ties together the strategies with the Plan's overarching principles, focus areas, and goals contained in the vision. These strategies are intended to shape the hundreds of projects in the TIP, especially the pipeline of future projects as they move into it. Implementing these strategies will also require building partnerships and other collaborative efforts across a wide range of public and private actors—including federal, state, and local governments, transit agencies, social services providers, real estate developers, major employers, funders,

and individual citizens. Although none of the strategies are specific to public health, nearly all of them can positively benefit individual health and well-being, from protecting open space, to greening communities, to a more active transportation network, and improved education and access to economic opportunity. The strategies are numbered for organizational purposes, and this is not intended to indicate any sort of prioritization. Under nearly each key strategy is a checklist of more specific strategy recommendations. ▶

Key **STRATEGIES** Related to **PLAN PRINCIPLES, FOCUS AREAS,** and **GOALS**

⇅ EQUITY ⚒ RESILIENCY ↻ SUSTAINABILITY

Strategies **ENVIRONMENT** Goals

1 PRESERVE OPEN SPACE and **FOCUS GROWTH** in **CENTERS**

2 REDUCE GHG EMISSIONS and **IMPROVE AIR QUALITY**

3 EXPAND NATURE in the Built Environment, **IMPROVE WATER QUALITY,** and **ADAPT TO CLIMATE CHANGE**

Strategies **COMMUNITIES** Goals

4 UPLIFT EVERY VOICE to **BUILD INCLUSIVE COMMUNITIES** that **DEVELOP WITHOUT DISPLACEMENT**

5 DESIGN NEW and **CELEBRATE HISTORIC** High-Quality, **WALKABLE NEIGHBORHOODS**

6 INCREASE the **SUPPLY** and **VARIETY** of **AFFORDABLE HOUSING** Options and **SUPPORT** an **AGING POPULATION**

Strategies **TRANSPORTATION** Goals

7 MAINTAIN Existing **TRANSPORTATION INFRASTRUCTURE** and **FACILITATE** the **EQUITABLE DEPLOYMENT** of **NEW MODES** and **TECHNOLOGIES**

8 SAFELY ACCOMMODATE TRANSIT, WALKING, and **BIKING,** and **TRANSPORTATION NETWORK USERS** of **ALL ABILITIES**

9 PROMOTE EQUITABLE ACCESS to **OPPORTUNITY**

Strategies **ECONOMY** Goals

10 BOLSTER CONNECTIONS to the **GLOBAL ECONOMY** and **ACCESS** to **COMMUNICATIONS TECHNOLOGIES**

11 EXPAND KEY ECONOMIC SECTORS

12 SUPPORT SMALL BUSINESSES, ENTREPRENEURSHIP, and **LIFELONG LEARNING**

Strategies **REGIONAL PLANNING** All Goals

13 ADAPT to a **RANGE** of **PLAUSIBLE FUTURES**

14 DECISION MAKING that **SUPPORTS** the **REGIONAL VISION**

15 TAKE MUNICIPAL and **INDIVIDUAL ACTIONS**

1 PRESERVE OPEN SPACE and FOCUS GROWTH in CENTERS

Forests, farmland, and other natural areas are indispensable to our region and its residents. However, these lands have been rapidly and steadily declining for the past 70 years. To combat these trends, the region must continue to both protect open space and pursue a Centers-based development strategy. Centers are our region's existing and emerging walkable, higher density, mixed-use communities. Focusing growth in existing Centers, or building new Centers, will reduce development pressure on open space lands; bring households and jobs closer together; save money on infrastructure provision; and make walking, biking, and transit more feasible.
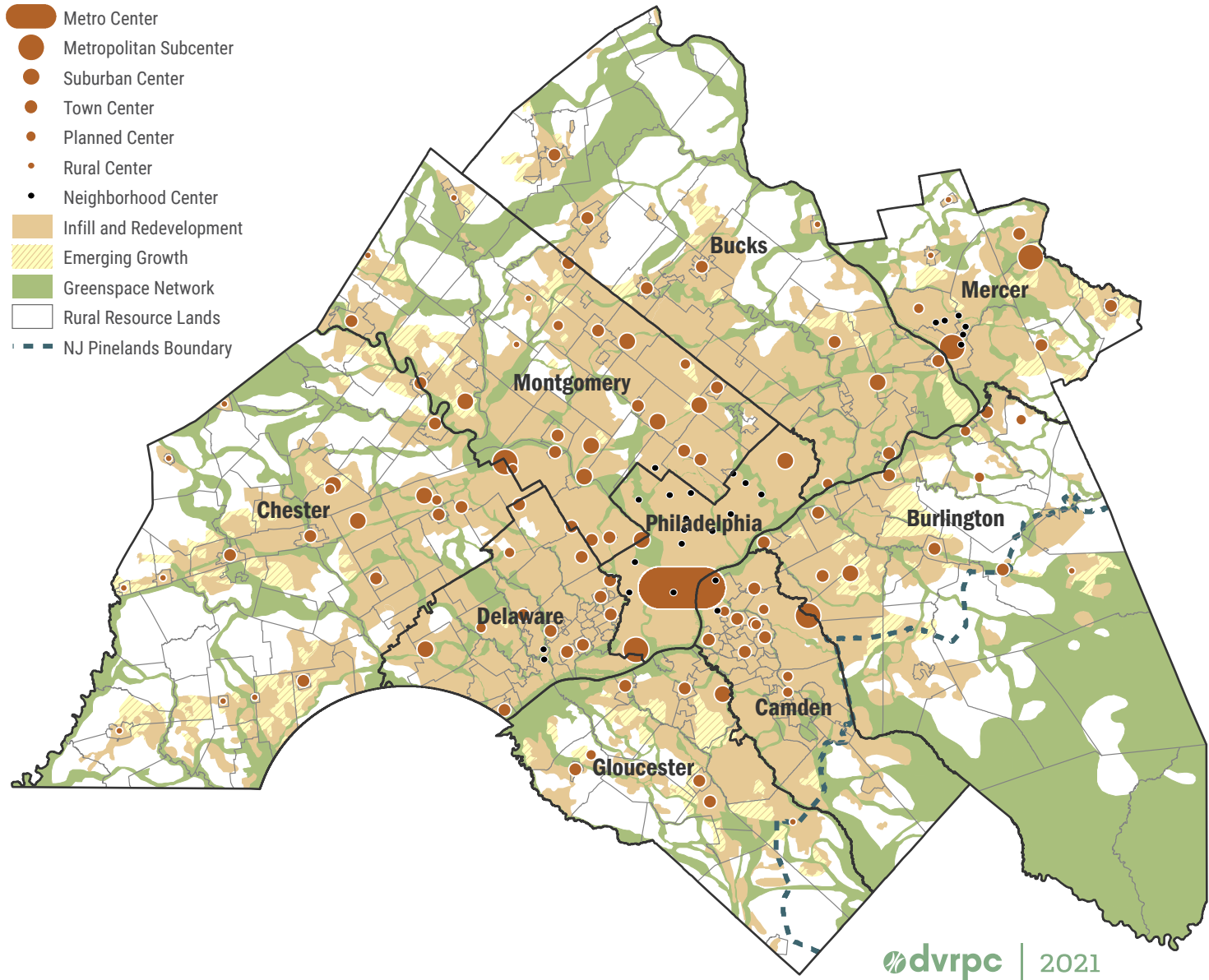
The *Connections 2050* Land Use Vision map illustrates this "two-pronged" approach to growth management at the regional scale. This map divides the region into: Infill and Redevelopment areas, Emerging Growth areas, Rural Resource Lands, and the Greenspace Network, which are in turn overlaid by more than 135 Centers. This vision aims to create a healthy, accessible, and sustainable environment, where key natural resource areas and agricultural lands are protected, open space is provided in an interconnected and distributed network, and most growth naturally gravitates toward Centers due to the economic and cultural advantages; mobility options; high quality of life; and inclusive opportunities they provide. More investment is needed at all levels of government to meet the region's goal of one million acres of protected open space by 2040.

Checklist:

- [ ] Preserve and protect undeveloped lands through acquisitions and conservation easements.

- [ ] Protect open space during the development process through transfer of development rights (TDR) programs and conservation design techniques.

- [ ] Enact and implement local open space funding programs.

- [ ] Promote infill and redevelopment in Plan Centers and other locations with multimodal transportation access by allowing for increased density in zoning codes, or through density bonuses, inclusionary zoning, or community land trusts.

- [ ] Update municipal zoning and subdivision and land development ordinances, and consider financial incentives to require or encourage transit-oriented development (TOD) and traditional neighborhood design.

- [ ] Integrate parks and high-quality public spaces into existing and emerging Centers.

REGIONAL LAND USE VISION

Metro Center
Metropolitan Subcenter
Suburban Center
Town Center
Planned Center
Rural Center
Neighborhood Center
Infill and Redevelopment
Emerging Growth
Greenspace Network
Rural Resource Lands
NJ Pinelands Boundary

Bucks

Mercer

Montgomery

Chester

Philadelphia

Burlington

Delaware

Camden

Gloucester

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PENNSYLVANIA CENTERS

COUNTY	METROPOLITAN SUBCENTERS	SUBURBAN CENTERS	TOWN CENTERS	RURAL CENTERS	PLANNED CENTERS	NEIGHBORHOOD CENTERS
BUCKS	N/A	Oxford Valley	Bristol Borough, Chalfont, Doylestown Borough, Morrisville, Newtown Borough, Perkasie/Sellersville, Quakertown, Telford/Souderton	New Hope	Waterside	N/A
CHESTER	King of Prussia/Valley Forge	Exton, Great Valley, Uwchlan	Coatesville, Downingtown, Kennett Square, Malvern, Paoli, Phoenixville, Spring City/Royersford, West Chester	Atglen, Avondale, Elverson, Honeybrook, Oxford, Parkesburg, West Grove	Eagleview, Uptown Worthington	N/A
DELAWARE	International Airport/Navy Yard/Sports Complex	Concordville	Darby, Havertown, Lansdowne, Marcus Hook, Media, Prospect Park/Norwood, Ridley Park, Wayne, Swarthmore, 69th Street	N/A	Ellis Preserve, Pond's Edge/Franklin Station	Chester City: Chester Central Business District, University Crossing
MONTGOMERY	King of Prussia/Valley Forge	City Avenue, Fort Washington, Montgomeryville, Plymouth Meeting, Willow Grove/Horsham, Route 422/Collegeville	Ambler, Ardmore, Bridgeport, Bryn Mawr, Conshohocken/Spring Mill, Glenside/Keswick, Hatboro, Jenkintown, Lansdale, Narberth, Norristown, Pottstown, Spring City/Royersford, Telford/Souderton	Tri-Borough, Boyertown/Gilbertsville, Harleysville, Skippack Village	Kulpsville, Village at Valley Forge, Willow Grove Naval Air Station	N/A
PHILADELPHIA	International Airport/Navy Yard/Sports Complex	City Avenue, Far Northeast	N/A	N/A	N/A	Broad & Passyunk, Woodland Avenue, 52nd & Market, Broad & Cecil B. Moore/Temple, Broad & Lehigh/Amtrak, Broad & Erie, Kensington/Richmond, Roxborough/Manayunk, Germantown, Chestnut Hill/Mt. Airy, Broad & Olney, Frankford, Cottman & the Boulevard, Fox Chase/Lawncrest, Mayfair/Holmesburg

NEW JERSEY CENTERS

COUNTY	METROPOLITAN SUBCENTERS	SUBURBAN CENTERS	TOWN CENTERS	RURAL CENTERS	PLANNED CENTERS	NEIGHBORHOOD CENTERS
BURLINGTON	Cherry Hill/ Mount Laurel/ Marlton	Mount Laurel	Bordentown, Burlington City, Mount Holly, Palmyra, Pemberton Borough, Riverside, Village of Moorestown	Brown Mills	Columbus, Bordentown Waterfront Community, Old York Village	N/A
CAMDEN	Cherry Hill/ Mount Laurel/ Marlton	N/A	Collingswood, Gloucester City, Haddonfield, Haddon Heights, Merchantville, Westmont	N/A	Voorhees/ Lindenwold, The Town Center at Haddon, Haddon Avenue Transit Village, Towne Place at Garden State Park	Camden City: Fairview, Parkside
GLOUCESTER	N/A	Deptford	Glassboro, Paulsboro, Pitman, Swedesboro, Woodbury	Williamstown	Woolwich Town Center	N/A
MERCER	Trenton, Route 1 Corridor	N/A	Hightstown, Princeton, Washington Town Center	Pennington, Hopewell Borough	Ewing Town Center	Trenton: Broad Street/ Chestnut Park, Chambersburg, Wilbur, Top Road, Pennington Village, West End

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2 REDUCE GHG EMISSIONS and IMPROVE AIR QUALITY

Achieving a goal of zero net GHG emissions in the region by 2050 is challenging for an economy that is highly dependent on fossil fuels for energy. The region's primary air quality concerns are ground-level ozone and $PM_{2.5}$, which often come from the same sources as GHGs, so many actions that address climate change also reduce air pollution.

Obtaining zero net GHGs will require a commitment across society, government, and economic sectors to convert from fossil fuels to low- to no-carbon energy sources, along with substantial advances in technologies that produce and use energy. The two basic strategies are: (1) use less energy through efficiency and conservation, and (2) use low- or no-carbon sources of energy, rather than fossil fuels. A regional electricity supply transformed to zero carbon energy has the potential to be more resilient and less susceptible to fossil fuel supply disruption. Important non-energy-related GHG reduction strategies include maintaining and enhancing forests, urban trees and plants, and soils. Beyond storing carbon, these strategies improve water quality, provide shade to counter extreme heat, slow flooding, and accommodate wildlife habitat.

Cars, trucks, buses, and other mobile transportation sources emit up to 50 percent of regional NO_x emissions, which contribute to both ozone and $PM_{2.5}$ pollution. More EVs, transit, and walking and biking can help to reduce this pollution. Commercial and residential energy generation and heating account for an additional 25 percent of NO_x emissions. Retrofitting buildings to be more energy efficient reduces emissions, makes those buildings more comfortable, and creates local jobs.

Regional land use, housing, and business development patterns

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also shape energy use, GHG emissions, and air pollution. Municipalities with walkable, mixed-use neighborhoods, good transit infrastructure, and smaller houses generally use less energy, and produce fewer GHG emissions and air pollution per person.

Checklist:

☐ Electrify transportation, including municipal fleets, transit buses, school buses, and medium- and heavy-duty vehicles.

☐ Encourage energy efficiency in government facilities, such as using light-emitting diodes (LEDs) for all lighting, as well as electrifying equipment currently using fossil fuels.

☐ Support carbon pricing to provide a financial incentive to reduce emissions.

☐ Apply demand management to increase electric grid efficiency, and support improvements to transmission and distribution systems needed to allow for the increased demand for electricity brought on by electrification.

☐ Support the development of renewable energy sources through supportive renewable energy ordinances and power purchase agreements for solar-photovoltaic-, wind-, and hydroelectric-generated electricity.

☐ Decrease motor vehicle emissions through projects and policies that reduce trips; provide for transit, walking, and biking travel options and efficient goods movement; reduce traffic congestion; and support cleaner fuels and emissions standards.

☐ Provide air quality forecasts to the public and encourage voluntary measures to reduce emissions, particularly on days when pollution is forecast to violate air quality standards.

☐ Work with regional partners to reduce air pollution impacts on at-risk populations.

☐ Work with refineries, port facilities, pipeline operators, and freight railroads to promote safety, clean air, and "freight-as-a-good neighbor" initiatives within facility host communities, on National Highway System connector roads, and at key highway-railroad grade crossings and railroad bridges.

3 EXPAND NATURE in the Built Environment, IMPROVE WATER QUALITY, and ADAPT TO CLIMATE CHANGE

Improving water quality and responding to the impacts of climate change are distinct, yet interrelated challenges. Regional water quality is impaired largely due to problems associated with stormwater runoff. In built-up areas, water flows off impervious surfaces, washing pollution into rivers and streams. In addition, the increased volume and velocity of runoff leads to erosion and sedimentation, further degrading water quality. Climate change is expected to bring more intense precipitation and severe storms, exacerbating these water quality issues. At the same time, increased episodes of extreme heat brought on by climate change will introduce new stressors for communities and infrastructure, particularly in densely developed areas that are most impacted by the urban heat island effect.

Key approaches for improving water quality and managing increased stormwater runoff include protection of large-scale natural areas and smaller-scale strategic greening techniques in built up areas. In natural areas, such as forests, most rainfall soaks into the ground, thereby eliminating stormwater runoff at its source. In urban and suburban settings where stormwater runoff cannot be avoided, urban greening techniques like naturalized retention basins, vegetated riparian buffers, street trees, and Green Stormwater Infrastructure (GSI) systems—which includes rain gardens, green roofs, tree

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trenches, stormwater planters and vegetated bioswales—can capture and soak stormwater directly into the ground.

These same techniques also help to ameliorate the impacts of extreme heat. Large forests have a natural cooling effect on the landscape, while street trees, GSI, green roofs, and other types of greening techniques in the built environment all act to ameliorate the worst impacts of the urban heat island effect and mitigate increases in urban air pollution associated with higher heat.

Although nature-based techniques are central to climate change adaptation efforts, other approaches like cooling centers; passive building techniques; raising and hardening infrastructure; preparing to respond to extreme weather disasters; and other adaptive practices in fields like energy, agriculture, and public health will be needed. In the longer term, some neighborhoods and infrastructure will need to be moved out of harm's way from inland or coastal flooding.

Checklist:

☐ Protect and restore naturally functioning streams and floodplains through riparian buffers, daylighting buried streams, re-establishing warm season meadows in place of manicured lawns, restoring stream channels, buy-out of flood-prone properties, and related techniques.

☐ Enact and enforce local ordinances— such as maximum impervious coverage and parking standards—to protect water quality and control stormwater.

☐ Promote GSI in the development and redevelopment of streets and parcels, and establish stormwater utilities/authorities to fund GSI.

☐ Promote the planting and maintenance of street trees, and incorporation of other natural elements, particularly in areas with pedestrian traffic.

☐ Use climate projections, not historical precedents, to plan, maintain, and construct housing, commercial and industrial buildings, bridges, drainage structures, catenary, and rails.

☐ Continue to evaluate critical transportation and community assets that are vulnerable to climate change, and take steps to minimize risk.

☐ Develop and implement strategies to prevent and mitigate extreme heat, including increasing shade, targeted assistance programs, warning systems, and cooling centers to protect community members.

☐ Update floodplain ordinances and building codes and practices to make structures more resilient to unpredictable extreme weather events, including flooding and high winds.

UPLIFT EVERY VOICE to BUILD INCLUSIVE COMMUNITIES that DEVELOP WITHOUT DISPLACEMENT

Inclusive communities respect all residents, ensure everyone has full access to resources, promote equal treatment and opportunity for all, work to mitigate and repair past discriminations, engage residents in decision making, value diversity, and respond quickly to discrimination and other incidents. Two of the biggest keys to forming inclusive communities is to make sure that everyone has access to safe and healthy housing (see strategy #6), and to create forums where dialogue can be shared between different groups, bringing them together as equals.

Public engagement allows stakeholders and residents to learn about issues facing their communities and participate in the creation of plans and projects that will shape their future. Institutional support and leadership is critical to advancing dialogue, finding shared values and building relationships, providing open access to data and information, promoting transparency and equity, mitigating and correcting past harms, and serving as a convener and coordinator for collective action.

There is growing concern that low-income individuals can be priced out of their community as rising interest for development continues. Redevelopment in the region's Centers is a specific Plan goal that generally has positive outcomes, but structural and institutional safeguards are needed to ensure more equitable housing, health, educational, and economic outcomes for low- and moderate-income individuals and families. At the same time, many other neighborhoods continue to struggle with vacancy, lack of opportunity, and disinvestment. Regardless of where they live, the vast majority of people want access to jobs, good schools for their kids, and healthier and more vibrant neighborhoods. Individuals should have influence over the decision making process that affects their community, benefit from improvements, have access to resources and services that improve quality of life and fulfill basic needs, have choices about where they live and work, and should not be involuntarily displaced from their preferred neighborhood.

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Identify and Implement Antiracist Policies

The antiracist movement promotes equal opportunities for all people, while providing actions to counter racial prejudice, systemic racism, and the oppression of specific racial groups. Urbanists, planners, and transportation professionals can bring anti-racist practice into their work. Although urbanists are advocating for cities that are for everyone and open streets for people of all ages, abilities, and backgrounds, across the country Black and Brown people have been harassed and killed in public spaces while they are running, biking, walking, playing, or driving their cars. Planners must acknowledge and respond to marginalized communities' concerns by better understanding how institutions in our communities produce or sustain racial inequity.

In order to advance anti-racist policies, we must understand the outcomes of all types of policies: Does a policy help to bring more diverse voices into the decision-making process? Does it expand the ability to participate in democratic processes? Does it shrink the wealth gap? Does it expand access to opportunity for marginalized and disenfranchised communities? Does it deconcentrate poverty? Does it help all people reach their full potential? Policies and processes that do the opposite of any of these things should be re-evaluated or discontinued while seeking other more equitable approaches.

Checklist:

☐ Identify and support anti-racist policies, including taking public health approaches to policing, and improving education, access to jobs, and health investments in historically underserved communities.

☐ Provide more information to the public about how government works and how to get more involved in it and expand K-12 civic education curriculum.

☐ Support efforts to make it easier to vote, so that all citizens can participate in our democracy.

☐ Extend assistance programs and revise zoning and tax policies so that neighborhoods with high demand for housing can grow and densify without displacing existing residents.

☐ Provide American Sign Language and foreign language translation and interpretation at all public meetings.

☐ Empower neighborhood groups and residents to form community organizations that guide decision making and policy development for their communities.

5 DESIGN NEW and CELEBRATE HISTORIC High-Quality, WALKABLE NEIGHBORHOODS

Well-designed communities promote the health and well-being of their residents and contribute to the economic and environmental sustainability of the region. Community design principles that inform the character of streets, public space, and individual buildings can be used to maintain and enhance existing neighborhoods and guide the development of new communities in Greater Philadelphia.

Some of the most important community design principles include mixing residential and commercial uses, maximizing walkability, orienting buildings toward streets, preserving and reusing historic buildings, and managing parking. In addition, integrating public facilities into a community's fabric can increase civic engagement and social cohesion. Locating green and open space, schools, and municipal offices where they are accessible by a variety of transportation modes can also reduce sprawl and create more opportunities for

SOME BEST PRACTICES IN COMMUNITY DESIGN[9]
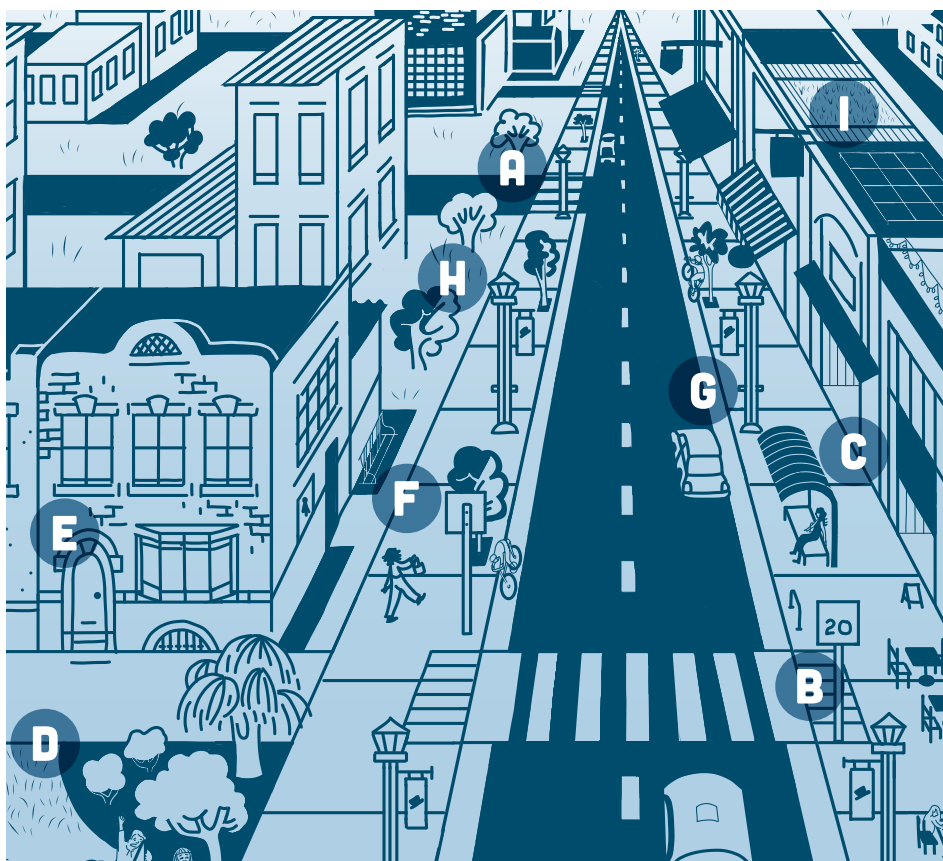
A Connect each street to at least two others, creating continuous networks.

B Design local streets for a maximum vehicle speed of 20 mph.

C Have two or more major land uses on every block.

D Buildings should face public space and form a continuous building line.

E Active facades at the street level.

F Provide space in front of buildings for plants and/or street trees.

G Cover no more than 30% of building setbacks with parking.

H Use existing trees, landscape, and natural features to determine site layout and character.

I Design to reduce, re-use, and recycle natural and energy resources.

[9]Source: Elizabeth Winkel, "Decoding Design," *Well Designed and Built*, February 15, 2012 www.welldesignedandbuilt.com/2012/02/15/decoding-design-matthew-carmona-ucl-about-delivering-public-realm/ (accessed September 15, 2014).

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walking or biking to schools, libraries, and parks.

Greater Philadelphia has a wealth of historic resources, including historic landmarks, sites, and districts on the national register of historic places; nationally and state-recognized historic landscapes and cultural heritage areas; sites protected through local historic designations; and countless other historic buildings and cultural resources

that lack any formal designation. These assets should be identified, protected, preserved and/or restored to maintain our region's unique identity and sense of place. Without protections and investment, many of these assets are threatened with disrepair and/or demolition. Local regulations should be predictable and allow for preservation of unique community features while facilitating appropriate growth and change.

Checklist:

☐ Develop parking standards based on supply and demand, reduce parking minimums, and better manage existing parking resources to allow more room for bicycle and pedestrian spaces and services.

☐ Seek adaptive reuse for existing underutilized buildings and design new buildings with potential for adaptive reuse in mind.

☐ Use streetscaping, public art, creative placemaking strategies, and a mix of programming to animate public spaces, parks, transportation facilities, and business districts for diverse audiences.

☐ Identify, document, and formally protect historic sites, buildings, and structures that contribute to community identity and character, and document

opportunities for transportation project mitigations.

☐ Involve local partners, advocates, and the public in creating a long-term strategic vision to develop more parks in underserved areas and prioritize capital investments and maintenance in existing parks.

☐ Strengthen the role of neighborhood schools as community and social centers by partnering with government agencies, healthcare providers, and non-profits to provide support services—such as health clinics, employment support, food pantries, English language learning opportunities, and/or financial literacy programs—tailored to community needs.

☐ Use local land banks, code enforcement, and other means to fight blight, decay, and abandonment.

6 INCREASE the SUPPLY and VARIETY of AFFORDABLE HOUSING Options and SUPPORT an AGING POPULATION

Everyone needs access to affordable housing, which provides shelter, safety, privacy, and health and well-being. People of color and those who are low income are disproportionately burdened by housing costs and threats of displacement, making housing attainability a central equity issue for our region. The region must find ways to ensure all households can meet their needs—including accessible units for people with disabilities and maintaining the greatest possible independence for the region's growing senior population. Many seniors want to age in place where they have forged ties to the community. Age-friendly places enable older adults to engage in social, economic, and civic life, lessening the need for long-term institutional care.

Lack of affordable housing can cause low-income households to sacrifice basic needs like healthy food, medical care, or transportation, and harms the local economy when employers have a hard time attracting and retaining a qualified workforce. The region's Core Cities are rowhouse cities, offering a range of adaptable, energy-efficient, medium-density homeownership opportunities. Missing-middle housing includes a variety of smaller-unit, medium-density building types—duplexes, triplexes, fourplexes, courtyard buildings, and live-work units—that are compatible in scale and form with detached single-family homes, and can increase housing affordability, make neighborhoods more walkable, and support local businesses.

Checklist:

☐ Incentivize and update zoning to allow for more new affordable alternative housing, such as missing-middle housing, co-housing, accessory dwelling units (ADUs), and shared housing.

☐ Preserve existing dedicated affordable housing, enact home maintenance programs, help households access and afford private-market homes, and protect against poor housing conditions and displacement.

☐ Make communities more age-friendly through age-friendly business programs, universal design standards, and ridesharing partnerships for seniors without smartphones; and by adding sidewalks, bus shelters, benches, access to public restrooms, connected streets, and places to sit and rest.

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7

MAINTAIN Existing TRANSPORTATION INFRASTRUCTURE and FACILITATE the EQUITABLE DEPLOYMENT of NEW MODES and TECHNOLOGIES

Reconstructing and modernizing transportation facilities is a top priority, and provides an opportunity to incorporate technology and connectivity between infrastructure, vehicles, and the internet. Embedded sensors can provide real-time travel data and infrastructure condition data—which can help to better time repairs. TSMO can improve travel time reliability for people and goods movement; provide more transportation options and traveler information; and enhance multimodal transportation safety, security, and traffic incident management (TIM). As more infrastructure and vehicle components are digitized and connected together, cybersecurity will become an integral part of transportation security planning.

Checklist:

☐ Prioritize projects that maintain and modernize the existing transportation network.

☐ Form an Advanced Mobility Partnership to prepare for CVs, HAVs, and MaaS and work with state DOTs on plans for safe HAV testing and deployment.

☐ Apply Integrated Corridor Management techniques to proactively manage and operate traffic across modes and jurisdictions.

☐ Provide real-time travel information across modes and enhance regional multimodal trip planning tools.

☐ Implement advanced integrated traffic signal and transit management systems.

☐ Ensure first responders and public safety agencies have the necessary technologies to share interoperable voice, data, and video during an emergency.

☐ Use TIM to: improve interagency communication and coordination; improve incident detection and verification; quickly and safely respond to and clear traffic incidents; reduce the number of overall major, secondary, and work-zone-related traffic incidents; and reduce crashes at signalized intersections.

☐ Coordinate and cooperate with federal, state, local, and other agencies involved in regional resiliency and transportation security planning; and apply up-to-date cybersecurity strategies to protect transportation infrastructure and personal privacy.

# 8 SAFELY ACCOMMODATE TRANSIT, WALKING, and BIKING, and TRANSPORTATION NETWORK USERS of ALL ABILITIES

Achieving a more walkable, bikeable, and transit-friendly region requires an emphasis on, and investment in, supportive infrastructure and engineering solutions; more focused safety enforcement; and the provision of educational programs for cyclists, pedestrians, and drivers. Both states are FHWA Pedestrian and Bicyclist Safety Focus States, so a regional priority is to identify Highway Safety Improvement Program (HSIP) eligible pedestrian and bicyclist safety projects. DVRPC works with the region's transit agencies to coordinate improvements to transit network operations, expansion, access, and TOD.

The forthcoming *Transportation Safety Analysis and Plan* (TSAP) builds on the Vision Zero philosophy through a Safe System Approach, which identifies all the stakeholders that play a role in ensuring crashes do not lead to death or serious injury: users, network designers and managers, as well as vehicle manufacturers and others. The *TSAP* is coordinated with the Pennsylvania and New Jersey Strategic Highway Safety Plans, which seek to maximize federal HSIP funds for infrastructure improvements that advance substantive safety goals. The *TSAP* also promotes appropriate enforcement to improve safety, including building knowledge for applicable legislative initiatives, supporting relevant professional development for law enforcement staff, and increased use of technology like automated enforcement for red light running and speeding, as well as in-vehicle technologies.

There is a major opportunity to work with the private sector to create a MaaS network that increases travel options and reduces reliance on vehicle ownership. Successfully bringing about such a network will require a supportive policy environment that ensures it serves everyone. Transportation hubs are accessible to safe bicycle
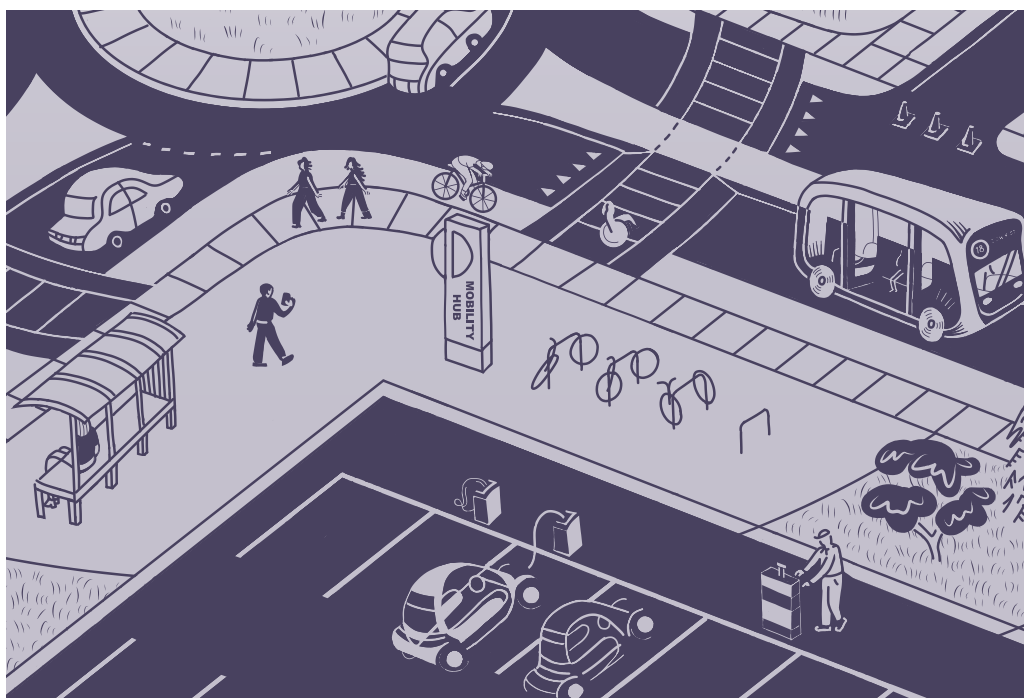
and pedestrian facilities that provide seamless connections between modes by combining a transit station with carsharing, bikesharing, and TNC and taxi pick-up and drop-off areas.

As shared mobility becomes more commonplace, curb management and pick-up/drop-off areas will become critical for accessing destinations, including at transit stations.
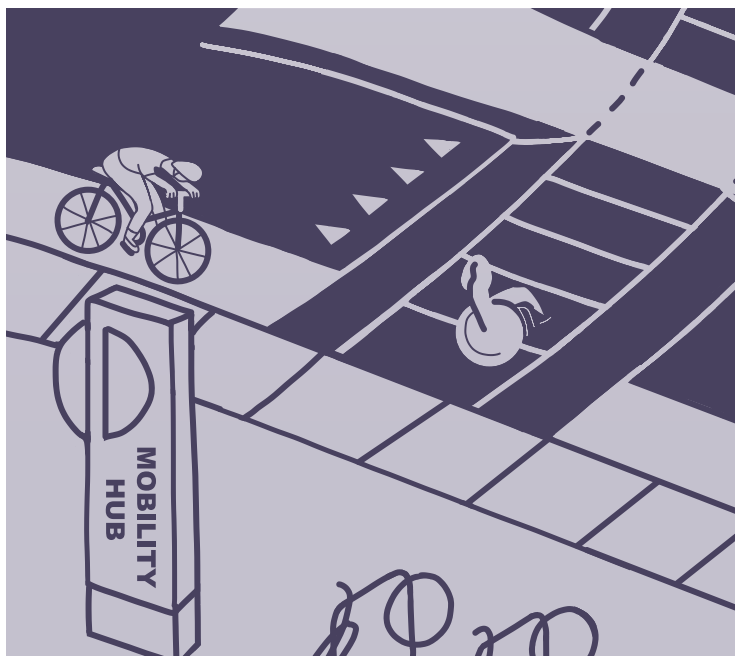
Checklist:

☐ Make transit more attractive, visible, and easy to use; increase service frequency and pursue transit-first strategies—transit signal priority, off-board fare payment, and dedicated bus lanes—in high-ridership locations; and integrate private shared mobility services with transit.

☐ Offer flexible transit service that can adapt to changing travel demand following the pandemic, including more service between suburban areas and throughout the day.

☐ Improve accessibility, adopt a Safe Routes to School program, and consider active transportation options in connecting parks and schools to the community.

☐ Provide safe facilities for walking and bicycling—including connected sidewalks, Complete Streets, pedestrian-only zones, protected bike lanes, bike/ped bridges and tunnels, public restrooms, and places to sit or rest—for people of all ages and abilities, and space for goods delivery.

☐ License private shared mobility services to operate only if they: serve everyone, share data, integrate with transit and other transportation providers, follow curb regulations, and meet safety standards. Periodically renew licenses only if these requirements are being met.

☐ Design all projects with system safety principles, and use traffic calming, reduced travel lane widths, roundabouts, road diets, lower speed limits, automated traffic enforcement, and FWHA's proven safety countermeasures to improve safety and operations, slow traffic, and enhance bikeability and walkability.

☐ Maintain a regional crash database and a web-based crash mapping application for use in identifying high-crash locations and to develop local road priority safety networks similar to Philadelphia's Vision Zero high-injury network.

☐ Use government procurement to advance safety and green vehicle technologies, such as electric powertrains, lane keeping, and front-end collision avoidance, which is also effective for pedestrians.

9 PROMOTE EQUITABLE ACCESS to OPPORTUNITY

The region's transportation network should link places where people live and work and be navigable with comfort, safety, and dignity by users of all ages and abilities. Vulnerable individuals—who are low income, senior, or have physical or mental disabilities—are more acutely affected by infrequent transit service and gaps in infrastructure, such as poor sidewalk connectivity, inaccessible transit stops or vehicles, and disconnected land use planning. Vulnerable populations are more likely to be transit dependent and have unique transportation needs for reaching essential services, including places of employment, grocery stores, schools, medical facilities, recreation and open space areas, senior centers, and centers for the developmentally disabled.

MOBILITY HUB

Checklist

☐ Comply with ADA and Title VI regulations and guidelines.

☐ Prioritize physical accessibility, information, and safety improvements in: transportation hubs and activity centers that serve significant numbers of vulnerable populations; communities with concentrations of disabled and/or senior populations; and essential service locations, such as hospitals, medical facilities, and senior centers.

☐ Explore ways to expand transit pass access to vulnerable communities, such as free full-week passes for public school students, discounted passes for low-income customers, and providing free or affordable transfers.

☐ Improve vulnerable populations' access to broadband and online travel information, including outreach and communications to populations with Limited English Proficiency.

☐ Prioritize convenience and affordability of fixed-route and paratransit lifeline services and connections to essential services, employment, and last-mile connections.

☐ Work with shared mobility companies, taxis, and transit agencies to enhance service in low-income and EJ communities, and provide increased accessible-vehicle service.

10

BOLSTER CONNECTIONS to the GLOBAL ECONOMY and ACCESS to COMMUNICATIONS TECHNOLOGIES

Economically successful regions have strong connections to the nation and world. With an acceleration of e-commerce, investments are needed in ports and multimodal infrastructure to enhance goods movement through regional and global supply chains, provide local employment opportunities, and support key regional economic sectors. Broadband access, and the capacity to utilize it and related technologies, is now a basic requirement for participation in the economy. Broadband deployment, accessibility, and capacity-building efforts must be carried out broadly and equitably.

The region can increase its desirability by investing in arts, cultural, and recreational amenities; supporting entrepreneurs and innovative thinkers; improving environmental quality; maintaining the supply of affordable housing; expanding public infrastructure; and support ongoing efforts to make Philadelphia a world-class city and region that is an international destination for businesses, talent, visitors, and immigrants.

Checklist:

- ☐ Expand capacity and improve international connections—particularly to Asian and Latin American markets—at Philadelphia International Airport (PHL).

- ☐ Support the implementation of the Federal Railroad Administration's Northeast Corridor Future plan and enhance intercity bus connections.

- ☐ Enhance access to critical international gateways, including landside improvements at maritime ports and highway connections at PHL.

- ☐ Incorporate freight and goods movement in transportation planning with a focus on improving safety and efficiency for all system users.

- ☐ Prepare a freight plan to identify and prioritize key infrastructure investments, raise awareness of issues related to changing consumer and industrial development trends, and identify strategies to better manage growth in freight activity.

- ☐ Form a Digital Technologies Commission to monitor how digital technologies evolve, develop local plans and adopt policies for accessible broadband, wifi, and 5G cellular infrastructure deployment, and serve as the official entity for public engagement.

- ☐ Promote and expand programs to enroll people in low-income broadband plans, and increase outreach and education around digital literacy.

11 EXPAND KEY ECONOMIC SECTORS

The region has a large and diverse economy that is anchored by a number of key economic sectors. Health services, professional and business services, financial activities, and IT have emerged as principal drivers of the information economy. There are concentrations of cutting-edge biotechnology, higher education, aerospace defense, and creative industries, along with a burgeoning tech startups and alternative and clean energy industry—which is poised for growth as the world responds to climate change. Tourism is increasingly important, given Greater Philadelphia's role in the nation's founding and development, the only United States World Heritage City, and variety of recreational and cultural opportunities. Other key sectors include energy conservation, specialty and precision manufacturing, performing arts, and food production and distribution. Transferring innovative discoveries from the region's numerous academic and research institutions to industry partners and commercializing new technologies are important drivers of continued economic growth.

Checklist:

☐ Expand research and development, new technology commercialization, access to capital, and work with academic institutions, business incubators, venture capitalists, and others to attract or create new companies while simultaneously supporting and expanding existing companies.

☐ Identify and protect key industrial zones, particularly those with multimodal access.

☐ Continue to promote and secure more attractive wage and business taxes, licensing, and permitting to encourage the attraction, retention, and expansion of businesses in the region.

☐ Enhance coordination between all food system stakeholders—from private and public sectors, and including sustainable agriculture advocates, hunger relief organizations, farmland preservation coordinators, and economic development agencies—to collaborate on planning activities, supportive land use ordinances, incentive programs, and other food system improvements.

☐ Incorporate urban agriculture into economic development policies and funding programs.

12 SUPPORT SMALL BUSINESSES, ENTREPRENEURSHIP, and LIFELONG LEARNING

The past 25 years point to the steady growth of a freelancer economy, where large companies contract out many tasks, and employees are more likely to consult or do temporary work. Strengthened by the internet, this trend suggests a future with fewer traditional 9 to 5 jobs where individuals will need to be more entrepreneurial.

In an era of rapid technological change, workers need to continually upgrade their skills. Pathways into specific careers can be created through partnerships between industry and schools that offer specialized training. Small employers need to be connected with workforce training programs. Educational attainment levels can be raised by leveraging higher education resources to increase elementary and secondary school students' motivation and performance, especially in the region's Core Cities and urban areas. Policies should also ensure everyone has equal access to land and capital.

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Checklist:

☐ Create one-stop shops for startups and mentorships between established and emerging business leaders.

☐ Increase the number of cooperatives and worker-owned businesses.

☐ Assess available real estate for business development and expansion, such as incubator, accelerator, and co-working space.

☐ Identify resource linkages between companies, university research centers, and industry associations.

☐ Promote local hiring and work with employers to incentivize diverse hiring practices.

☐ Assist minorities, immigrants, veterans and other new entrepreneurs with technical assistance, specialized training, and English as a second language as needed to expand opportunities and create a more inclusive economy.

☐ Develop portable health and life insurance, retirement, worker disability, vacation, and training benefits programs.

☐ Work with political leaders and community stakeholders to ensure all school districts receive adequate financial support.

ADAPT to a RANGE of PLAUSIBLE FUTURES

13

The scenario planning exercise conducted by DVRPC and the FWG considered different ways the future could unfold, and then identified adaptive responses to different futures. Adaptive strategies can respond to specific challenges of an imagined future, but may be ineffective, unnecessary, or even counterproductive in other futures. Other adaptive strategies may become critical in some scenarios, but could still be seen as beneficial in other

futures. Adaptive strategies aim to make the *Connections 2050* Plan more resilient. The *Dispatches* scenarios focus on climate change, rising inequality, and technology, and also increase the Plan's consideration of equity, resiliency, and sustainability. Signposts can help to identify which future scenario may be unfolding through the challenges that arise, which can help to indicate which adaptive strategies should be employed. See *Dispatches from Alternate Futures* and *Preparing Greater Philadelphia for Highly Automated Vehicles* for additional signposts for each scenario.

FOCUS AREA		DELAYED EXPECTATIONS	PEOPLE POWER	TECHNOLOGY in the DRIVER'S SEAT	INCLUSIVE TECH
ENVIRONMENT	**CHALLENGES**	Climate change advances faster than current forecasts, and a major hurricane hits the Delaware Valley.	Innovations intended to reduce GHGs do not become market ready as initially anticipated.	Increasing waste streams, particularly e-waste.	Development is increasingly decentralized and more mobile.
	ADAPTIVE STRATEGIES	Limit development in floodplains; undertake proactive retreats from low-lying areas; focus affordable housing development in high-and-dry areas, consider more aggressive anti-flooding treatments, such as China's Sponge City concept or Copenhagen's cloudburst boulevards and floodable parks.	Reduce GHGs with readily available technologies: tax credits for building and vehicle electrification; green building standards and energy efficiency; increased investment in transit, walking, and biking; solar and wind microgrids; land preservation; conservation tillage.	Enact Zero Waste policies, provide resources for self-repair of electronic and digital devices, and build the circular economy so that materials and resources can constantly be reused.	Increase the regional goal for preserved open space and agricultural lands.
COMMUNITIES	**CHALLENGES**	Housing is increasingly owned and commodified by large, global economic firms, decreasing homeownership rates.	Single-family-only zoning is invalidated.	The increasing presence of digital screens and facial recognition technologies are decreasing the appeal of urban areas and reducing social cohesion.	Commercial office and retail space never recover from the Covid-19 pandemic.

FOCUS AREA		DELAYED EXPECTATIONS	PEOPLE POWER	TECHNOLOGY in the DRIVER'S SEAT	INCLUSIVE TECH
COMMUNITIES	ADAPTIVE STRATEGIES	Consider expanding the supply of nonprofit or publicly owned and subsidized housing stock for low- and middle-income households.	Allow ADUs and missing-middle housing in more zoning districts, and allow the subdivision of single-family homes into multiple units.	Ensure citizens are involved in Smart City initiatives and prioritize privacy and social cohesion in high-tech Smart City approaches.	Rezone to enable reuse of vacant space for other purposes, such as maker workspaces, entertainment, or mixed-income housing; identify potential tax implications and ways to fill any resulting revenue gaps.
TRANSPORTATION	CHALLENGES	Continued shortfall in infrastructure funding and shorter infrastructure lifespans due to climate change.	A push for more sustainable transportation has led to "travel austerity."	Private-market companies increasingly own and operate transportation infrastructure, run monopolistic shared mobility services, and intrusively collect rider data.	A wide variety of vehicles with varying levels of automation and operating speed are competing for limited road space and creating safety issues.
	ADAPTIVE STRATEGIES	Prioritize assets and create plans to decommission assets that cannot be supported in the long term, particularly those most at risk from climate change; find low-cost ways to develop climate-safe and sustainable infrastructure.	Expand transit and multiuse trails, and provide discounted passes and credits for riders.	Maintain public stewardship over transportation assets; balance data collection and privacy.	Promote stronger multimunicipal planning and regional approaches; build flexible transportation infrastructure, with more space dedicated to transit, walking, and biking; Increase resources dedicated to HAV preparations.
ECONOMY	CHALLENGES	Slow economic growth leads to rising inequality as the wealthiest capture more of the national income, and many jobs shift to the gig economy.	There are fears the federal government is overly directing economic activity, crowding out the private market and stunting innovation and entrepreneurship.	Algorithms are increasingly directing much social and economic activity, while a combination of digital technologies is displacing high-paying jobs.	There is a growing abundance of low-cost goods and services, even as technology is displacing jobs.
	ADAPTIVE STRATEGIES	Support efforts to make additional investments in infrastructure, increase worker rights, and use tax policy to more equitably distribute income.	Expand support for small businesses, entrepreneurship, and efforts to commercialize new innovations.	Use binary economics to more equitably distribute capital ownership, and consider providing universal basic incomes; ensure algorithms and predictive mathematical models do not perpetuate inherent biases in financial, employment, electoral, healthcare, educational, insurance, justice, and other systems.	Support the creation of community jobs programs, and devise strategies to reuse or upcycle materials in order to reduce waste flows.

DECISION MAKING that SUPPORTS the REGIONAL VISION

The *Connections 2050* Plan uses indicators to gauge progress toward regional goals, scenarios to consider alternative futures, and project evaluation criteria and performance-based planning and programming (PBPP) to track transportation network performance and link investments to long-range plan goals. PBPP increases transparency and accountability to better connect investments to outcomes and support decision making based on the Plan's vision.
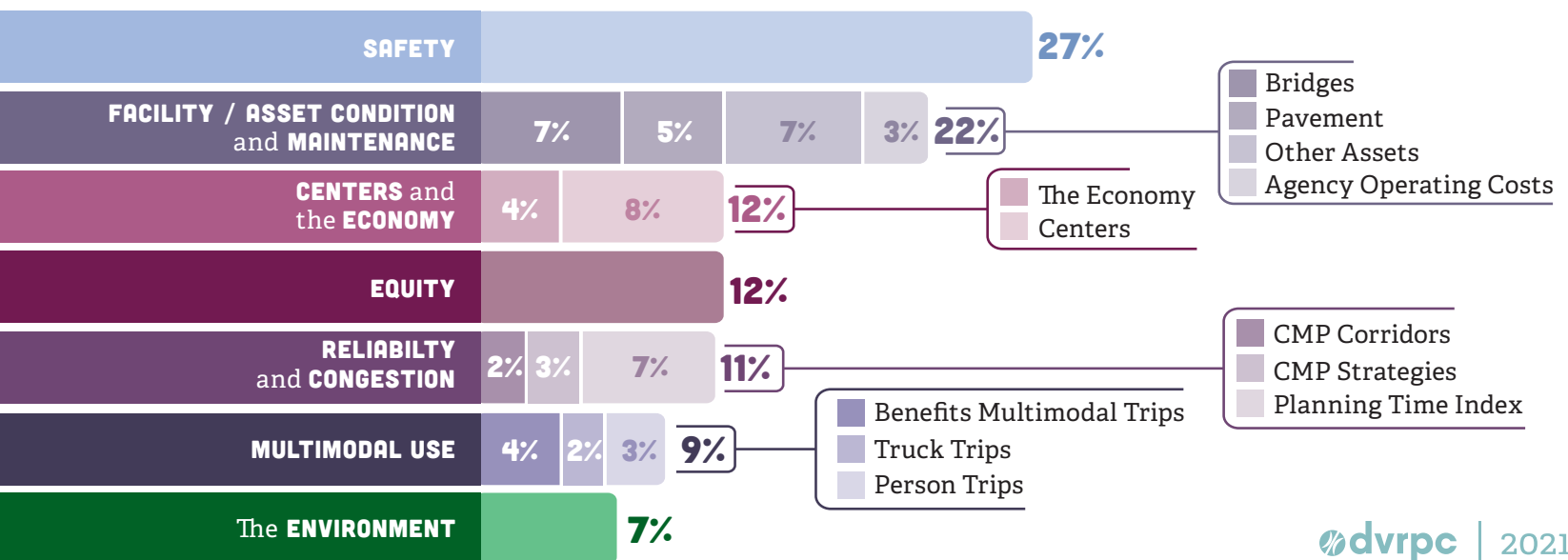
DVRPC's multimodal TIP-LRP Project Benefit Evaluation Criteria aims to analyze all types of projects. It screens new road and fixed guideway transit projects to ensure they are primarily located in the Land Use Vision's (see page 37) "Existing Infill or Redevelopment" or "Emerging Growth areas"; and new roadways for consistency with the region's CMP. Those that pass the screening are analyzed with the following criteria:

Safety projects implement FHWA-proven safety countermeasures or other strategies with specific crash reduction factors, address DOT-identified high-crash locations or crashes in communities of concern, or help meet safety performance measures identified by a public transportation agency safety plan.

Facility/Asset Condition and Maintenance projects projects bring a facility or asset into an SGR, extend the useful life of a facility or asset, or provide reduced operating/maintenance costs.

TIP–LRP Project Benefit Evaluation CRITERIA WEIGHTING

Criteria					Total
SAFETY					**27%**
FACILITY / ASSET CONDITION and MAINTENANCE	7%	5%	7%	3%	**22%**
CENTERS and the ECONOMY	4%	8%			**12%**
EQUITY					**12%**
RELIABILTY and CONGESTION	2%	3%	7%		**11%**
MULTIMODAL USE	4%	2%	3%		**9%**
The ENVIRONMENT					**7%**

Facility / Asset Condition and Maintenance:
- Bridges
- Pavement
- Other Assets
- Agency Operating Costs

Centers and the Economy:
- The Economy
- Centers

Reliability and Congestion:
- CMP Corridors
- CMP Strategies
- Planning Time Index

Multimodal Use:
- Benefits Multimodal Trips
- Truck Trips
- Person Trips

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Centers and the Economy projects are located within a quarter-mile of a Plan or Freight Center, connect two or more Centers, or are located in an above-average density area; are located in a municipality that meets United States Economic Development Administration funding eligibility requirements; are within a half-mile of a major regional visitor attraction; or are part of an economic development project.

Equity evaluates how the project serves under-represented and marginalized communities and other population groups with additional transportation needs based on location in census tracts with high Indicators of Potential Disadvantage.

Reliability and Congestion projects are located in a CMP congested corridor, implement a strategy appropriate for that corridor, are on a road with a high planning time index (PTI), or are on a transit route with low on-time performance.

Multimodal Use considers the total number of people and daily trucks using the facility or asset; and the project's overall benefit to multimodal trip making.

Environmental projects deliver high air quality benefits or incorporate environmentally friendly design principles.

Although GHGs are not able to be measured directly for evaluation, projects that enhance safety, reduce congestion, invest in Centers, expand multimodal options, and improve air quality will all help to lower emissions.

Checklist:

☐ Utilize a PBPP approach to select projects for capital programming based on performance metrics; scenario planning; strategic long-range planning goals; lifecycle investment analyses; system performance and condition data; and consideration of social, environmental, and financial impacts.

☐ Explore opportunities to co-locate energy, communications, and other infrastructure within transportation corridors.

☐ Preserve existing rail and road right-of-way for future transportation uses.

☐ Limit roadway new capacity to appropriate areas, as identified in the CMP, and focus construction of new capacity on missing links, priority bottlenecks, and economic development.

☐ Seek opportunities to expand access and reconnect neighborhoods that have been separated from the broader community by the construction of transportation facilities projects.

☐ Work with state and local governments to determine data needs, and build local government data management and processing capacity.

15 TAKE MUNICIPAL and INDIVIDUAL ACTIONS

The region's 350 municipalities have home-rule authority to influence land use; provide public services; protect natural and historic resources; and, ultimately, create the places where we live, work, and play. They play a critical role in developing inclusive, healthy, and walkable communities; supporting broadly shared economic growth; providing multimodal transportation and helping to achieve Vision Zero; reducing GHG emissions and adapting to climate change; and protecting the region's natural resources. DVRPC provides various forms of technical assistance to help local governments address current challenges and prepare for the future. The Municipal Implementation Toolbox serves as a guide for municipalities and provides resources, case studies, and model ordinances that can be used to implement the *Connections 2050* Plan within their own jurisdictions. Municipalities should additionally seek opportunities for shared services, multimunicipal planning efforts, local outreach and community-led solutions, and regional cooperation.

FINANCE HOUSING DOWNTOWN FUTURE CLIMATE SAFETY ENERGY AGRICULTURE PARKING TRANSIT REGIONAL REVITALIZE AFFORDABILITY PEOPLE ACTIVE MUNICIPAL IMPLEMENTATION TOOLBOX HEALTH GREEN AGING JOBS FLOOD TRAFFIC EDUCATION PRESERVE BUSINESS

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In addition to municipal actions, there are many **SIMPLE STEPS** that **EVERYONE** in the region **CAN TAKE TO** help **MAKE THE PLAN** a **REALITY.**

Reduce Waste; Compost; Recycle	Insulate and Seal Your Home	Avoid Idling	Use LED Lights	Buy Local Produce and Eat Less Meat
Plant Native Trees and Plants	Visit / Shop in a Center	Clean Up in Your Community	Support Mixed-use Development	Enjoy Local Parks and Trails
Be Involved in Your Community	Use Renewable Energy	Support Local Businesses	Start a Walking School Bus	Depave / Use Pervious Pavements
Practice Anti-racism and Support Equity	Take Transit; Walk; or Bike	Travel Off-peak and Combine Trips	Organize Play / Open Streets	Consider a Hybrid or Electric Vehicle

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TRANSPORTATION INVESTMENTS

Connections 2050 outlines a strategy for how Greater Philadelphia can make capital investments in transportation infrastructure to help achieve the Plan's vision in the coming decades. The 2050 vision is to achieve and maintain a state-of-good repair (SGR) for all existing transportation infrastructure; achieve a Vision Zero goal of no fatalities or serious injuries from transportation; and integrate modes while increasing biking, walking, and transit to expand options in getting around.

The financial plan contains both an aspirational "vision plan" for investing in transportation infrastructure and a "fiscally constrained plan" for what can be afforded given the reasonably anticipated revenue forecast. The vision plan contains an in-depth needs assessment that uses asset management systems to determine what is required to achieve and maintain an SGR for existing infrastructure, improving bike and pedestrian infrastructure, making physical and technological improvements to enhance safety and operations in the transportation network, and limited investment in new facilities. The total estimated cost of the vision plan is $152.4 billion. However, the Plan estimates that there will only be $67.3 billion in total

federal, state, and local funding, and borrowing from 2022 to 2050 to pay for the vision[11]. Roadway and transit revenues come to the region as separate budgets, with very limited ability to transfer between them. Federal regulations require all financial plan revenues and project costs be presented in year-of-expenditure (YOE) dollars, which account for the impact of inflation over time. *Connections 2050* forecasts a 3 percent annual inflation rate over the life of the Plan.

Available revenues are allocated to different project categories: system preservation, bike and pedestrian projects, operational improvements, system expansion,

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[11]*This revenue projection does not account for any additional funding from the Infrastructure Investment and Jobs Act (IIJA) signed into law on November 15, 2021, shortly after the Plan was adopted. This bill increases total federal roadway funding over the next five years by 55 percent and transit funding by 77 percent, though much of this new funding will be advanced through a variety of new competitive funding programs and some of it is dependent on future Congressional appropriations. Actual additional funding to the region is still to be determined.*

Regional **TRANSPORTATION VISION COMPARED** to Available **FUNDING**

Legend:
- PA Roads
- PA Transit
- NJ Roads
- NJ Transit

WHAT WE CAN AFFORD
- $23.5
- $24.4
- $14.3
- $5.2
- **$67.3 B** Available Funding

WHAT WE NEED
- $64.1
- $53.5
- $18.4
- $16.5
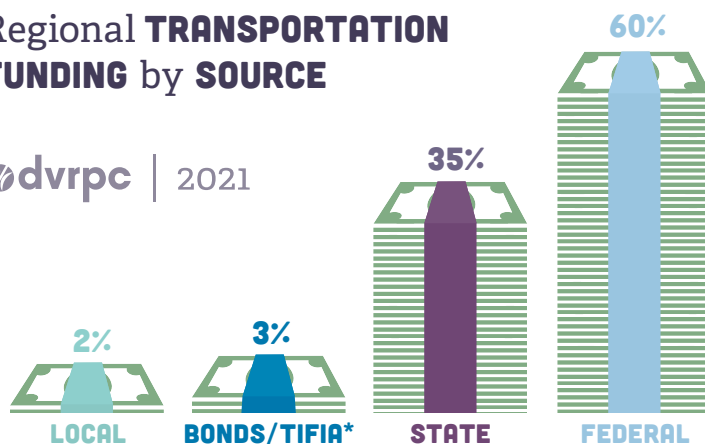- **$152.4 B** Transportation Vision
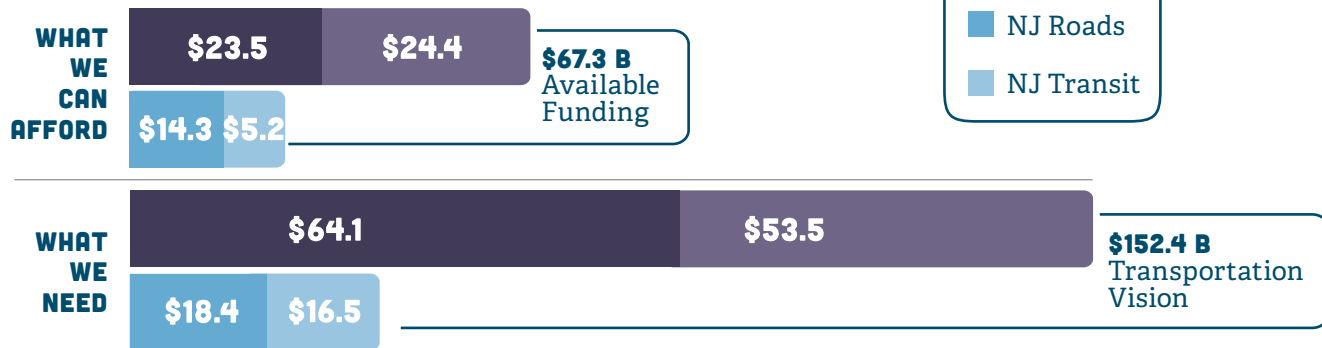
All figures in billions of YOE dollars

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and other. Funding within each category is allocated to both major regional projects (MRPs), which are listed in the Plan, and to buckets that will fund hundreds of smaller-scale projects as they are programmed in current and future TIPs. The following pages show how the Plan will allocate the $67.3 billion in revenue across different roadway and transit project categories and MRPs that can be afforded

within this budget. A percentage of total roadway and transit funding for the Pennsylvania and New Jersey subregions is allocated to each project category based on the Plan's vision and goals, policy, and comparative need. *Connections 2050* increases funding allocated to stand-alone bike and pedestrian projects, while continuing to focus on SGR with nearly three-quarters of available revenue programmed for road and transit preservation projects. In addition, nearly all road projects in the TIP have some bike or pedestrian improvements that are not accounted for in this stand-alone category. For more information about each MRP, see the interactive MRP web map,[12] which also includes a list of aspirational projects the region would pursue with additional revenue. The Funded MRP map includes toll authority and other agencies' "externally funded projects," which do not use federal transportation funds but must be accounted for in DVRPC's air quality conformity analysis. ▶
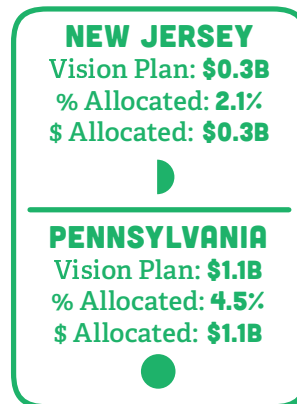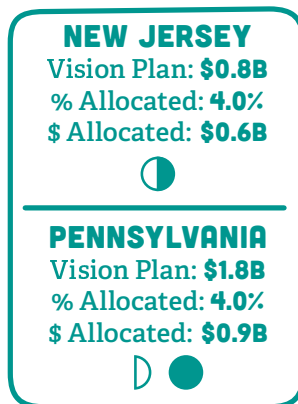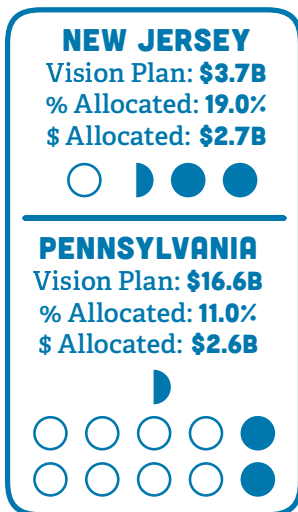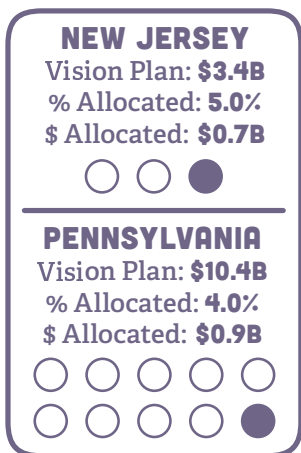
Regional **TRANSPORTATION FUNDING** by **SOURCE**

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- **2%** LOCAL
- **3%** BONDS/TIFIA*
- **35%** STATE
- **60%** FEDERAL

*Transportation Infrastructure Finance and Innovation Act

[12]www.dvrpc.org/webmaps/mrp2050.

Summary of **TRANSPORTATION INFRASTRUCTURE VISION PLAN,** Reasonably **ANTICIPATED REVENUE,** and **TARGET ALLOCATION**

NEW JERSEY
Vision Plan: **$10.1B**
% Allocated: **69.9%**
$ Allocated: **$10.0B**

PENNSYLVANIA
Vision Plan: **$34.2B**
% Allocated: **76.5%**
$ Allocated: **$18.0B**
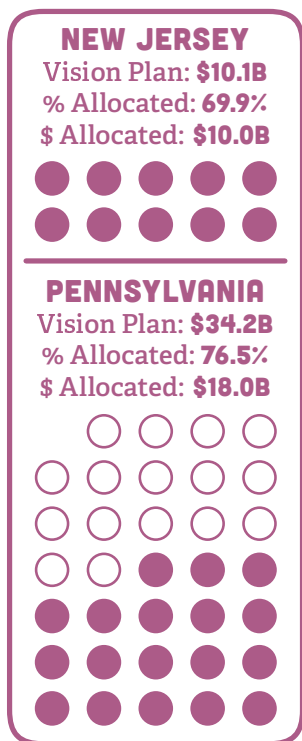
Roadway SYSTEM PRESERVATION
Minor repairs, repaving or rehabilitation, and major reconstruction of existing roads and bridges.

NEW JERSEY
Vision Plan: **$3.4B**
% Allocated: **5.0%**
$ Allocated: **$0.7B**

PENNSYLVANIA
Vision Plan: **$10.4B**
% Allocated: **4.0%**
$ Allocated: **$0.9B**

Roadway BIKE AND PEDESTRIAN
Sidewalks, bike lanes, and multiuse trails, reflecting the region's desire to build more bikeable and walkable communities.

NEW JERSEY
Vision Plan: **$3.7B**
% Allocated: **19.0%**
$ Allocated: **$2.7B**

PENNSYLVANIA
Vision Plan: **$16.6B**
% Allocated: **11.0%**
$ Allocated: **$2.6B**

Roadway OPERATIONAL IMPROVEMENTS
Physical improvements and technologies that enhance the efficiency of the existing transportation network.

NEW JERSEY
Vision Plan: **$0.8B**
% Allocated: **4.0%**
$ Allocated: **$0.6B**

PENNSYLVANIA
Vision Plan: **$1.8B**
% Allocated: **4.0%**
$ Allocated: **$0.9B**

Roadway SYSTEM EXPANSION
New or widened roads, new interchanges, flex lanes or part-time shoulder use focusing on eliminating congestion bottlenecks and supporting land use goals.

NEW JERSEY
Vision Plan: **$0.3B**
% Allocated: **2.1%**
$ Allocated: **$0.3B**

PENNSYLVANIA
Vision Plan: **$1.1B**
% Allocated: **4.5%**
$ Allocated: **$1.1B**

Roadway OTHER
Includes planning and design, environmental mitigation, debt service, and other items, such as equipment maintenance and storage facilities.

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FUNDED = $1 Billion YOE
UNFUNDED = $1 Billion YOE

NEW JERSEY
Vision Plan: **$8.2B**
% Allocated: **73.3%**
$ Allocated: **$3.8B**

PENNSYLVANIA
Vision Plan: **$32.6B**
% Allocated: **63.5%**
$ Allocated: **$15.4B**

NEW JERSEY
Vision Plan: **$0.4B**
% Allocated: **4.0%**
$ Allocated: **$0.2B**

PENNSYLVANIA
Vision Plan: **$5.5**
% Allocated: **6.5%**
$ Allocated: **$1.6B**

NEW JERSEY
Vision Plan: **$6.8B**
% Allocated: **1.0%**
$ Allocated: **$0.1B**

PENNSYLVANIA
Vision Plan: **$10.5B**
% Allocated: **11.5%**
$ Allocated: **$2.8B**

NEW JERSEY
Vision Plan: **$1.1B**
% Allocated: **21.8%**
$ Allocated: **$1.1B**

PENNSYLVANIA
Vision Plan: **$4.8B**
% Allocated: **18.5%**
$ Allocated: **$4.5B**

Transit **SYSTEM PRESERVATION**
Includes rails and ties, catenary, bridges, stations, vehicle maintenance and replacement, and vehicle storage facilities.

Transit **OPERATIONAL IMPROVEMENTS**
Includes real-time information systems, signal preemption, fare modernization, and double tracking and sidings.

Transit **SYSTEM EXPANSION**
Includes new and extended transit lines, and new stations on existing lines.

Transit **OTHER**
Includes safety, security, rail track lease agreements, debt service, environmental mitigation, equipment, and planning and design.

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FUNDED MAJOR REGIONAL PROJECTS:

Legend:
- ROADWAY PRESERVATION
- TRANSIT PRESERVATION
- BIKE AND PEDESTRIAN
- ROADWAY OPERATIONAL IMPROVEMENT
- TRANSIT OPERATIONAL IMPROVEMENT
- ROADWAY EXPANSION
- TRANSIT EXPANSION
- ROADWAY OTHER
- TRANSIT OTHER
- EXTERNALLY FUNDED ROADWAY
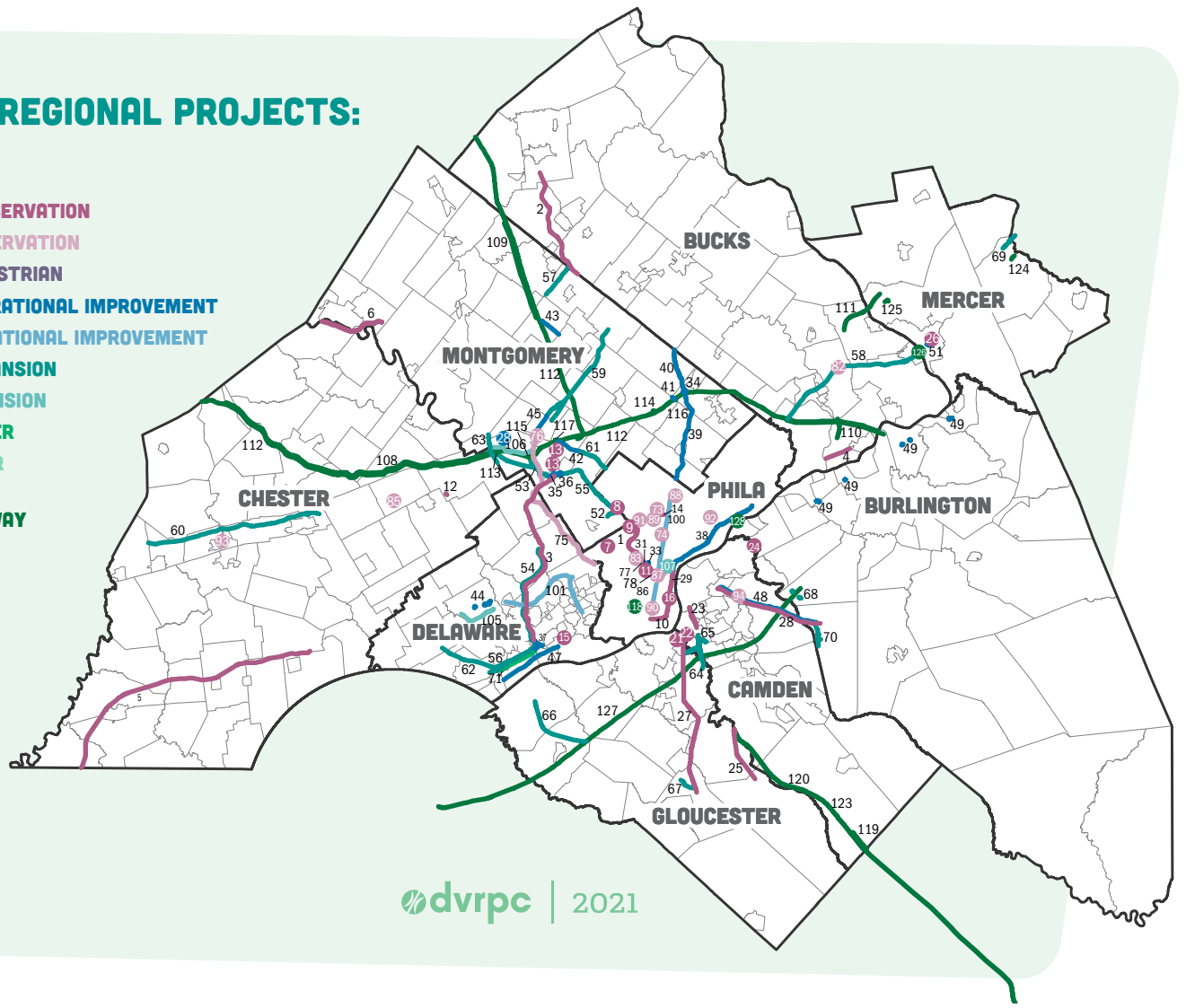
Unmapped Projects
30 46 50 72 79 80
81 84 95 96 97 98
99 102 103 104 121 122

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ROADWAY PRESERVATION

1. I-76 Resurfacing
2. PA 309 Sellersville Bypass Resurfacing
3. I-476 Resurfacing
4. State Road Resurfacing
5. US 1 Reconstruction
6. US 422 Reconstruction
7. 59th Street Bridge over Amtrak
8. Belmont Avenue Bridge over Schuylkill
9. Falls Road Bridge Preservation
10. I-95 Reconstruction in South Philadelphia
11. Market Street Bridge over Schuylkill River and CSX

12. Darby Road Extension
13. Ridge Pike over Norfolk Southern and PA Turnpike
14. US 1 Bridge over Wayne Junction
15. Wanamaker Avenue Bridge over Darby Creek
16. Swanson Street Reconstruction
17. I-95 Bridge over Neshaminy Creek
18. I-476 Bridge over Balligomingo Road
19. I-95 Girard Point River Crossing
20. I-95 Bridge over Bartram Avenue / Conrail
21. US 130 Bridge over Big Timber Creek
22. Route 47 Bridge over Big Timber Creek
23. I-76/I-676 Bridges and Pavement

24. Route 73 Bridge over Route 130
25. Route 42 Resurfacing
26. Lincoln Avenue/Chambers Street Bridge over Amtrak and Assunpink Creek
27. Route 47 Resurfacing and ADA
28. NJ 70 Reconstruction

BIKE AND PEDESTRIAN

29. Penn's Landing Access and Community Improvement
30. The Circuit Trail Network*

ROADWAY OPERATIONAL IMPROVEMENTS

31. 30th Street Station Vehicle Circulation
32. District Traffic Management Center

33. Eakins Oval Circulation

34. I-276 at PA 611 Willow Grove

35. I-476 and I-76 Ramp Modifications

36. I-76 at PA 23 Matsonford Road

37. I-95 and I-476 Interchange

38. I-95 Reconstruction - North Philadelphia

39. PA 611 Intelligent Transportation System (ITS)

40. PA 611-Easton Road

41. Welsh Road Bridge Reconstruction and Intersection Improvements

42. Ridge Pike Reconstruction

43. Sumneytown Pike Corridor Improvements

44. US 1 Interchange Improvements at PA 352 & 452

45. US 202 Reconstruction and Center Turn Lane

46. Vision Zero Safety Improvements*

47. Second Street/Industrial Highway Complete Street

48. NJ 70 Corridor Improvements

49. US 130 Corridor Improvements

50. Trenton City Traffic Signal Upgrades

51. Trenton Station Area Access

ROADWAY SYSTEM EXPANSION

52. Belmont Avenue at I-76 Interchange

53. Henderson Road and South Gulph Road Widening

54. I-476 Active Traffic Management

55. I-76 Integrated Corridor Management

56. I-95/US 322/Highland Avenue Interchange

57. PA 309 Connector Road (Phase 2)

58. US 1 Reconstruction and Widening

59. US 202 Reconstruction and Widening

60. US 30 Coatesville-Downingtown Bypass

61. Ridge Pike Reconstruction and Widening

62. US 322 Reconstruction and Widening

63. US 422 Mainline Widening

64. I-295 at I-76/NJ 42 Missing Moves

65. I-295 Direct Connect

66. US 322 Widening

67. US 322 Bypass

68. NJ 73 Grade-Separated Interchanges

69. US 1 Widening

70. NJ 73 at Evesham Road

ROADWAY OTHER

71. Chester City and Township Sound Walls

TRANSIT SYSTEM PRESERVATION

72. Bus and Trolley Communications System

73. Chestnut Hill East Line Bridges

74. Chestnut Hill West Line Bridges

75. Norristown High Speed Line Tracks

76. Norristown High Speed Line Bridges

77. Regional Rail Catenary

78. Regional Rail Mainline Bridges

79. Regional Rail from 30th Street to Phil Interlocking

80. Trolley Track and Right-of-Way

81. Substation Replacements (multiple)

82. Woodbourne and Cresheim Valley Substations

83. Zoo Interlockings

84. SEPTA Transit Vehicle Replacements (Multilevel Cars, Silverliner VIs, Market Frankford Line, Broad Street Line, Norristown High-Speed Line, Buses)

85. Frazer Shop and Yard

86. Center City Concourse Improvements

87. City Hall and 15th Street Stations

88. Fern Rock Station Modifications

89. Midvale Bus Garage Roof

90. Broad Street Line Ventilation at NRG Station

91. Regional Rail Station Enhancements

92. Transit Station Enhancements

93. Amtrak Keystone Corridor Stations

94. Atlantic City (AC) Line Stations

95. NJ TRANSIT Vehicle Replacements (AC Line Locomotives and Commuter Rail, River Line, NE Corridor Line)

96. Port Authority Transit Corporation (PATCO) Vehicle Replacement

97. PATCO Bridges Rehabilitation

98. PATCO Station Platform Rehabilitation

TRANSIT OPERATIONAL IMPROVEMENTS

99. SEPTA Trolley Modernization

100. Broad Street Line Signals

101. Media/Sharon Hill Lines Positive Train Control

102. Norristown Regional Rail Track

103. SEPTA Audio Visual Public Address System

104. SEPTA Key

TRANSIT SYSTEM EXPANSION

105. Elwyn Line Extension

106. King of Prussia (KOP) Rail

107. Franklin Square Station
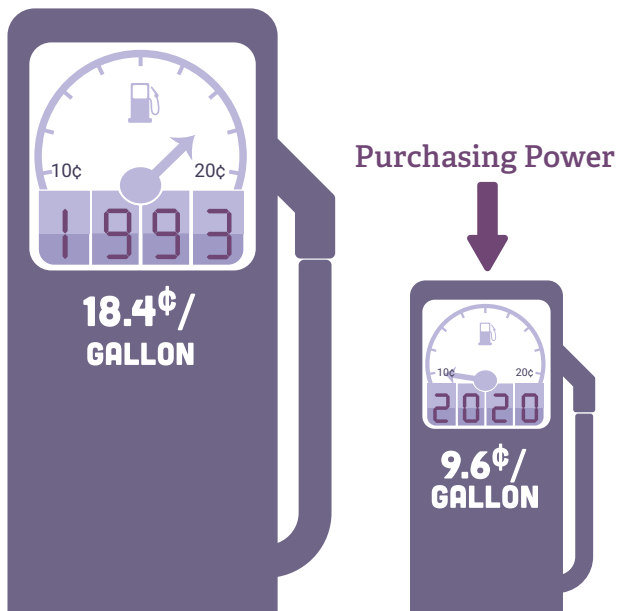
EXTERNALLY FUNDED ROADWAY

108. PA Turnpike Reconstruction and Widening

109. PA Turnpike Northeast Extension Reconstruction and Widening

110. I-95 and PA Turnpike Interchange

111. I-295 Scudder Falls Bridge Replacement

112. PA Turnpike All Electronic Tolling

113. I-276/I-76 Valley Forge Interchange

114. I-276 at Virginia Drive Full Movements

115. I-276 at Henderson Road Interchange

116. I-276 at Welsh Road Interchange

117. I-276 at Lafayette Street/Ridge Avenue

118. South Philadelphia Refinery Redevelopment

119. AC Expressway Widening

120. AC Expressway Electronic Tolling and ITS Upgrades

121. South Jersey Transportation Authority Facility Improvements

122. AC Expressway Bridges

123. AC Expressway Resurfacing

124. Vaughn Drive Connector

125. West Trenton Bypass

126. Delaware River Joint Toll Bridge Commission All Electronic Tolling

127. NJ Turnpike Widening

128. Tacony-Palmyra Bridge Rehabilitation

Project is partially funded.

FILLING the FUNDING GAP

Additional funding is needed at the federal, state, and local levels if the region wants to realize the transportation vision set forth in this Plan. The primary source of the region's transportation funding—taxes on gasoline and petroleum products—have been declining due to more fuel-efficient and alternative-fuel vehicles, and decreased VMT as a result of the pandemic, after more than a decade of flat driving

rates following the 2007 recession. Inflation since the last federal gas tax increase in 1993 has eaten away nearly 50 percent of its purchasing power. DVRPC will continue to facilitate dialogue around replacements for federal and state gas taxes that are consistent with the Plan's vision and goals.

Given the region's limited transportation funding, DVRPC and its planning partners will work to reduce investment needs through project right-sizing and application of cost-saving technologies. Right-sizing seeks efficiencies by resolving transportation problems with more affordable, context-sensitive solutions that are supported by surrounding communities and are implementable in a reasonable timeframe. Right-sizing means the DOT will consider reduced-scale alternatives like TSMO before developing more costly alternatives, such as new or widened roadways. If the problem is safety, and not congestion, then the DOT will consider focused solutions to improve safety without increasing capacity—although safety must be the focus of all projects.

The Greater Philadelphia region is very dependent on federal and state funding, and provides very little transportation funding from local

The EFFECT of INFLATION on the FEDERAL GAS TAX

18.4¢/GALLON

Purchasing Power

2020

9.6¢/GALLON

Source: Producer Price Index, Construction Materials Index, 1993–2020

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sources—particularly for transit capital projects—as compared with peer regions. Local sources are anticipated to contribute just 2 percent of the region's funds. Regions with more local funding are better able to build and maintain infrastructure, and have more flexibility to build partnerships and experiment with new technologies to grow their economies. As federal and state partners consider alternatives and means to increase transportation funding, local leaders must also look for mechanisms to supplement those federal and state funds to provide local and regionally generated funding to support local and regional priorities.

Potential **FUNDING OPTIONS** for **REPLACING** the **GAS TAX**

MILEAGE-BASED USER FEES

Drivers are charged by the mile for travel on a defined roadway network.

CARBON TAX

Assessed based on the carbon content emitted by the burning of fossil fuels.

TOLL EXISTING HIGHWAYS

A user fee on designated limited access roads and bridges.

VEHICLE REGISTRATION FEES

An annual assessment on vehicle ownership.

TRADABLE DRIVING CREDITS

Each person receives an allotment of miles each year; those who drive less can sell them to those who drive more.

COMMERCIAL PROPERTY VMT FEE

Connects land use and transportation by applying a location-based fee to commercial real estate based on the annual vehicle miles they generate.

PARKING PRICING

Ensures available on-street parking through demand-based pricing, while making off-street spaces a less expensive alternative and reducing traffic.

CONGESTION PRICING

Sets variable tolls to manage demand for using a facility or entering a specific zone, using revenue generated to provide more transportation options.

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Aspirational **TWEETS** & **NEWS HEADLINES** for **GREATER PHILADELPHIA** in the Year **2050**

Greater Philly wins 'triple crown' 1. [R]anked most equitable region in nation. 2. Most entrepreneurial 3. Most livable.

Cooperation across [the] Greater Philadelphia Region leads to: increasing equity in educational outcomes, reduced income inequality, and soaring levels of homeownership.

In the past 30 years, Black, Brown and white residents all turned to green as region addresses racial bias to seek a better future and minimize impacts of climate change.

Regional goal of 100% disability accessible sidewalks, crosswalks, and transit has been met.

Philadelphia has yet again reported zero fatalities on its roadways as a result of [a] huge shift to walking, biking, and transit as a part of the region's strong commitment to safety and climate change.

Greater Philadelphia achieves a net zero carbon footprint.

Philadelphia metro residents are happy, healthy, fully employed, highly educated and lead fulfilling lives in a clean environment.

All quotes on this page come directly from participants in the Plan's visioning outreach.

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TAKING ACTION

Connections 2050 was developed with input from a broad array of regional stakeholders and the public, and builds consensus with a wide range of planning partners representing a diverse region with needs that vary across geographic boundaries. It is intended to provide a path forward for a more equitable, resilient, and sustainable future. The Plan focuses on transportation infrastructure. Infrastructure underpins our society and our economy, and delivers many of the things we value. Transportation provides us access to jobs, education, visits with friends and family, nature, open space, and recreational activities, routine and emergency healthcare, and numerous other opportunities.

Improving transportation in the digital age requires strengthening coordination efforts, increasing reliability, implementing safety improvements, providing information about transportation options, and developing flexible services that improve access to essential services and job opportunities. The financial plan aims to achieve the vision by prioritizing the repair of existing infrastructure and making safety improvements; enhancing transit, walking, and biking options; and limited investment in roadway expansion. To fully achieve the vision, the region must find ways to increase investment in maintaining and improving transportation infrastructure. Transportation investments often have a much wider benefit than initially expected. For example, ADA curb cut requirements have made walking accessible for a variety of users, such as children in strollers or on bicycles; individuals using crutches, canes, or walkers; and travelers with wheeled suitcases. Vision Zero safety investments are likely to similarly yield a wider range of benefits, such as encouraging more multimodal transportation, enhancing community, reducing noise and air pollution, and decreasing GHG emissions.

Transportation does not exist in a vacuum—it both affects and is impacted by land use and community design, the economy, and the environment. Centers-based development patterns can reduce the need to travel long distances and make walking, biking and transit more feasible. This can reduce GHG emissions and stimulate the daily in-person encounters

that make life more enjoyable, help to transfer skills and knowledge, and promote innovation. Climate change presents major risks to life on Earth. Combating the worst outcomes from climate change and adapting to the levels of change that have already been baked in will require a level of mobilization at a local, regional, national, and international level unlike anything ever seen in history. It will require a massive decarbonization of energy, transportation, and economic systems, and hardening communities and infrastructure or moving them out of harm's way. These investments could reduce existing inequities, but could worsen inequality without a focus on creating more equitable policies and economic outcomes.

In addition to climate change, a range of digital technologies—such as artificial intelligence, robotics, 3D printing, the Internet of Things, and others—are causing deep uncertainty around the future of work and production, trade and goods movement, and the nature of the economy. At the same time, shifting ideologies are calling for the creation of a fairer, more equitable economy with increased access to opportunity for communities that have historically been marginalized. DVRPC and its partners look forward to being a part of the ongoing dialogue and continuing to do our part to help reshape the economy, the transportation network, communities, and the environment to be more equitable, sustainable, and resilient.

MOVING FORWARD

Implementation requires making policy, investment, project development, and everyday decisions that are consistent with the Plan's vision and goals. Many implementation activities occur through DVRPC's Annual Work Program; the TIP; and actions taken by planning partners, member governments, stakeholder agencies, and individuals. The Commission provides an array of services to the region's municipalities, such as the Municipal Implementation Toolbox, the Transportation and Community Development Initiative (TCDI), the regional streetlight procurement program, the regional circuit rider for energy efficiency in local government operations, Equity Through Access, and the regional trails program.

Achieving the vision requires building partnerships and the dedicated efforts and cooperation of many actors across the public and private sectors—including federal, state, and local governments; DOTs and transit agencies; social services providers; real estate developers; major employers; non-profits and funders; and individual citizens. The region must also strengthen collaboration within the Northeast and Mid-Atlantic megaregions, which we benefit from being connected to. The Circuit Trails embody the power of building regional partnerships, in this case between private foundations, county governments, state agencies, and the Pennsylvania and New Jersey DOTs. The formal nonprofit body representing this partnership, the Circuit Trails Coalition, has a goal of completing 500

miles of trails by 2025 and completing the buildout of the full network by 2040. As a part of the coalition, DVRPC supports these goals and is investing to make them happen. When fully constructed, the Circuit Trails will be a model for metropolitan trail networks.

DVRPC will continue to serve as a convener and facilitator to bring a wide range of groups together to help to better understand the region's infrastructure gaps. DVRPC hosts a range of committees consisting of representatives from the public and various professional fields, including the Public Participation Task Force, Regional Technical Committee, Delaware Valley Goods Movement Task Force, Regional Aviation Committee, Transportation Operations Task Force, Central Jersey Transportation Forum, Regional Community and Economic Development Forum, Regional Safety Task Force, Information Resources Exchange Group, Air Quality Partnership, Coastal Zone Management Program, Greater Philadelphia Futures Group, and Healthy Communities Task Force, along with the Commission's Board.

The *Connections 2050* Plan contains a bold aspirational vision for investment in transportation infrastructure to improve safety, expand bike and pedestrian facilities, and enhance transit service. The Plan aims to set the regional agenda and shape the pipeline of projects coming into the TIP. Planning is an ongoing process, and much more work is needed to obtain this vision. Some examples of the work that is needed include a better understanding of what will need to be done to harden or move infrastructure out of harm's way; finding ways to more quickly reduce GHG emissions throughout the infrastructure lifespan—including

construction, operations, maintenance, and eventual rehabilitation or decommissioning—as well as changing design standards, undertaking educational outreach, and equitable enforcement actions needed to achieve Vision Zero; bringing more diverse voices into the decision-making process to ensure more equitable investments; and preparing for, and understanding, the potential applications, benefits, and risks of digital technologies and emerging transportation technologies. On top of that, more funding will be needed. The Plan is updated every four years, and each update is an opportunity to take stock of changing priorities for the vision, and assess strategies and investments needed to obtain it.

As the region implements *Connections 2050*, it will be important to determine whether the goals contained in the Plan are being met. The *Tracking Progress* indicators assess how well we are doing, and identify where further planning is most needed. DVRPC will also evaluate the Plan's effectiveness in guiding decision making, which will further inform the next update cycle.

Your help is needed to advance the principles and goals in *Connections 2050*. Join us in shaping our region's future by participating in public meetings, reviewing our website and publications, submitting comments on our plans and programs, or taking action on any of the individual strategies noted in strategy #15 on page 61. ∎

Acronyms

AC Atlantic City

ADA Americans with Disabilities Act

ADAS Avanced Driver Assistance System

ADS Automated Driving System

ADU Accessory Dwelling Unit

AEV All-Electric Vehicle

AV Automated Vehicle

BEV Battery Electric Vehicle

BIPOC Black, Indigenous, and People of Color

CEDS Comprehensive Economic Development Strategy

CMP Congestion Management Process

Covid-19 Coronavirus Disease 2019

CV Connected Vehicle

DOT Department of Transportation

DVRPC Delaware Valley Regional Planning Commission

E-Bike Electric Bicycle

E-Scooter Electric Scooter

EJ Environmental Justice

EV Electric Vehicle

FHWA Federal Highway Administration

FRA Federal Railroad Administration

FWG Futures Working Group (of DVRPC)

GHG Greenhouse Gas

GSI Green Stormwater Infrastructure

HAV Highly Automated Vehicle

HSIP Highway Safety Improvement Program

ITS Intelligent Transportation Systems

LED Light-Emitting Diode

MaaS Mobility as a Service

MPO Metropolitan Planning Organization

MRP Major Regional Project (in the Plan)

NAAQS National Ambient Air Quality Standards

NJ Transit New Jersey Transit

NO$_x$ Nitrogen Oxide

ODD Operational Design Domain (for HAVs)

PATCO Port Authority Transit Corporation

PBPP Performance-Based Planning and Programing

PEV Plug-in Electric Vehicle

PHEV Plug-in Hybrid Electric Vehicle

PHL Philadelphia International Airport

PM$_{2.5}$ Fine Particulate Matter

PTI Planning Time Index

SEPTA Southeastern Pennsylvania Transportation Authority

SGR State-of-Good Repair

TDR Transfer-of-Development Rights

TIM Traffic Incident Management

TIP Transportation Improvement Program

TNC Transportation Network Company

TOD Transit-Oriented Development

TSAP Transportation Safety Analysis and Plan (of DVRPC)

TSMO Transportation Systems Management and Operations

VMT Vehicle Miles Traveled

VOC Volatile Organic Compound

YOE Year of Expenditure

THE DELAWARE VALLEY REGIONAL PLANNING COMMISSION is the federally designated Metropolitan Planning Organization for the Greater Philadelphia region, established by an Interstate Compact between the Commonwealth of Pennsylvania and the State of New Jersey. Members include Bucks, Chester, Delaware, Montgomery, and Philadelphia counties, plus the City of Chester, in Pennsylvania; and Burlington, Camden, Gloucester, and Mercer counties, plus the cities of Camden and Trenton, in New Jersey.

DVRPC serves strictly as an advisory agency. Any planning or design concepts as prepared by DVRPC are conceptual and may require engineering design and feasibility analysis. Actual authority for carrying out any planning proposals rest solely with the governing bodies of the states, local governments or authorities that have the primary responsibility to own, manage or maintain any transportation facility.

DVRPC's vision for the Greater Philadelphia region is a prosperous, innovative, equitable, resilient, and sustainable region that increases mobility choices by investing in a safe and modern transportation system; that protects and preserves our natural resources while creating healthy communities; and that fosters greater opportunities for all.

DVRPC's mission is to achieve this vision by convening the widest array of partners to inform and facilitate data-driven decision making. We are engaged across the region and strive to be leaders and innovators, exploring new ideas and creating best practices.