



Leading on Climate through a “For the People” Infrastructure Package

Policy and Investment Priorities of the National Wildlife Federation

Discussion Draft, May 2019

**Congress can pass bold, targeted infrastructure investments
that achieve at least a 30 percent total reduction in U.S.
greenhouse gas emissions below a 2016 baseline.**

Investment in our nation’s infrastructure is long overdue. Aging roads, bridges, and railways pose safety risks; inefficient buildings and industrial processes are wasting energy; many rural areas still lack effective internet access; the transportation sector overly relies on polluting fuel sources; out-of-date water systems are ill-equipped to meet public health standards; and the U.S. electric grid is largely unable to handle modern energy needs. Each issue requires concerted policy attention. In addition, degraded natural resources are leaving infrastructure, local communities, and the economy more vulnerable to extreme weather and the effects of climate change, with disproportionate impact on those least able to absorb added financial and health risks.

The Intergovernmental Panel on Climate Change and the U.S. National Climate Assessment warn that climate change is not a distant threat — but one that has arrived and is afflicting communities through worsened hurricanes, megafires, flooding, heat waves, and other increasingly common severe weather events. They conclude, and reiterate, that we must strive to limit warming to 1.5 degrees Celsius over the pre-industrial era to avoid the worst impacts of climate change. This requires that global greenhouse gases be reduced and captured at a rate equaling net zero emissions by mid-century.

The 116th Congress has an important and meaningful opportunity to address our changing climate and to invest in our nation’s energy, industrial, transportation, water, and natural infrastructure systems alike to increase community safety and resilience, protect and recover wildlife, boost local economies and family-sustaining jobs, and reduce greenhouse gas emissions in a technology-inclusive way. These investments will benefit every

community in America and are a fiscally responsible insurance policy against costly extreme weather and climate effects. And, they provide a down payment on the low-carbon economy of the future.

Effectively addressing our infrastructure crisis requires maintaining the full suite of protections provided by the nation’s environmental laws, including the National Environmental Policy Act, Clean Water Act, Clean Air Act, Endangered Species Act, Safe Drinking Water Act, and more. Lasting, broad support for infrastructure investments requires improving equitable access to benefits, and ensuring the health and safety of the most vulnerable people and the environment.

The National Wildlife Federation emphasizes three major opportunities to improve resilience and reduce emissions significantly through an infrastructure policy: 1) Boost natural infrastructure and carbon sinks; 2) Build a clean grid; and 3) Adopt smart transportation plans. **These together can achieve more than a 30 percent total reduction in greenhouse gases below a 2016 baseline.**¹

We urge Congress to avoid picking winners and losers, and to consider all methods that can safely and responsibly help meet climate goals and the needs of the most vulnerable people and wildlife. Therefore, we recommend two primary technology-neutral funding mechanisms to drive innovation and adoption of low- or zero-carbon technologies in the energy and industrial sectors, a revolving loan fund to support resilience investments, and additional policy priorities to meet climate, wildlife, economic, and employment goals through natural infrastructure and smart transportation. The National Wildlife Federation’s infrastructure priorities include:

1. Create Resilient Communities and Ecosystems through Natural Infrastructure:

- a. Establish a **Resilient Communities Revolving Loan Fund and Grant Program** to provide low- to zero-interest loans for communities to invest in projects and programs that improve disaster preparedness and long-term resiliency, with an emphasis on use of natural defenses to achieve those goals; and
- b. Adopt policies and invest to:
 - i. Improve coastal resilience;
 - ii. Promote healthy waters;
 - iii. Enhance forest restoration, reforestation, and climate-smart management;
 - iv. Protect and restore wildlife habitat;
 - v. Improve drought resilience;
 - vi. Upgrade Tribal infrastructure;
 - vii. Build agricultural resilience and soil health; and
 - viii. Accelerate parks and public lands maintenance and land conservation.

¹ Estimates of greenhouse gas benefits derive from published literature on the policy options presented in each section. Millions of metric tons (MMT) of carbon dioxide emissions are given, unless otherwise indicated. Reductions are achieved by 2025, 2030, 2040, or 2050, depending on the type of investment. Dates are cited wherever possible.

2. Build a Clean and Resilient Grid:

- a. Establish a **Technology Neutral Tax Credit** to reduce emissions from electricity generation;
- b. Establish an **Energy Efficiency Revolving Loan Fund** to dramatically reduce energy consumption in residential and commercial buildings and industry; and
- c. Adopt policies to:
 - i. Spur development of point-source carbon capture and direct air capture;
 - ii. Curb methane emissions;
 - iii. Boost grid resilience;
 - iv. Increase installation of utility-scale battery storage; and
 - v. Invest in interregional transmission.

3. Deploy Smart Transportation Infrastructure:

- a. Adopt policies to:
 - i. Maintain fuel efficiency improvements;
 - ii. Electrify the sector;
 - iii. Invest in smart growth planning;
 - iv. Expand mass transit infrastructure;
 - v. Advance clean vehicles;
 - vi. Expand production of truly low-carbon, sustainable biofuels; and
 - vii. Establish a national freight investment program.

4. Create Family-Sustaining Jobs and a Highly Trained Workforce:

- a. Adopt policies to:
 - i. Protect workers;
 - ii. Benefit local communities and prioritize disadvantaged communities; and
 - iii. Enhance energy and green infrastructure and conservation workforce education and training.

1. CREATE RESILIENT COMMUNITIES AND ECOSYSTEMS THROUGH NATURAL INFRASTRUCTURE

Safeguarding human and wildlife communities — as well as America’s investment in the built environment — from increasingly damaging climate effects necessitates an expansive view of infrastructure to include key natural resources and processes. Healthy natural systems, such as wetlands, floodplains, dunes, and forests, are better able to buffer the impact of storms, drought, and sea-level rise than ecologically degraded areas, and can often buffer dry periods or self-repair after storm or flood damage. Natural infrastructure is cost-effective compared to hard infrastructure, and can provide benefits for fish and wildlife habitat, water quality, and recreation opportunities.²

Natural infrastructure consists of natural or nature-based systems that provide essential services and benefits to society, such as flood protection, water purification, and carbon storage. Such systems can be natural ecosystems, like forests, floodplains, beaches, and grasslands, or they can be engineered systems that use natural materials and are designed to emulate the functioning of natural ecosystems.

Climate resilience is defined as the ability of a system (either natural or human) to withstand, adapt to, or recover from the accelerating impacts of climate change, such as sea-level rise,³ flooding, drought, megafires,⁴ and more severe hurricanes.⁵

In addition, restoring and maintaining robust natural systems provides a significant opportunity to sequester carbon while providing quality jobs, often in rural areas. Therefore, the National Wildlife Federation recommends inclusion of a robust resilience and natural infrastructure title in any infrastructure package to improve climate resilience for people, wildlife, and natural resources, providing an insurance policy for the investments made throughout the bill, and also enhance carbon sinks. We suggest a combination of investments including a revolving loan fund and grant program, totaling **\$275 billion**. While we acknowledge that this represents a significant and bold investment, we believe it is appropriate given the scale of the challenges we face.

A Resilient Communities Revolving Loan Fund and Grant Program. Per a recent report from the National Institute of Building Sciences, every \$1 invested in mitigation upfront saves society an average of \$6 in future disaster costs.⁶ Financial losses in 2017 from natural disasters including

² U.S. National Climate Assessment 2014. Coastal Zone Development and Ecosystems. <https://nca2014.globalchange.gov/report/regions/coasts>

³ National Wildlife Federation (NWF) 2016. Changing Tides: How Sea-Level Rise Harms Wildlife and Recreation Economies along the U.S. Eastern Seaboard. <https://www.nwf.org/changing-tides>

⁴ NWF 2017. Megafires: The Growing Risk to America’s Forests, Communities, and Wildlife. <https://www.nwf.org/megafires-report>

⁵ NWF 2018. Unnatural Disasters: Climate Change and the Mounting Threats to People and Wildlife. <https://nwf.maps.arcgis.com/apps/Cascade/index.html?appid=9d24acf0f70d49999fea768ea9b86dcd>

⁶ National Institute of Building Sciences 2018. New Report on the Value of Mitigation. <https://www.nibs.org/news/381874/National-Institute-of-Building-Sciences-Issues-New-Report-on-the-Value-of-Mitigation.htm>

hurricanes and wildfires in the U.S. exceeded \$300 billion, setting a new record. Over the decade prior to the historic 2017 disasters, the federal government incurred direct costs of more than \$350 billion because of extreme weather and fire events.⁷ Currently, most mitigation dollars are funneled post-disaster through the Federal Emergency Management Agency's (FEMA) hazard mitigation grant programs and the Housing and Urban Development Department's (HUD) Community Development Block Grant Programs. While proactive, pre-disaster investment in these existing programs must increase, communities need other tools to strengthen their resilience in the face of climate change impacts, which include increasingly severe storm and wildfire events.

Revolving loan funds are a popular tool to provide communities with additional financial flexibility, and have been used successfully to encourage highly leveraged investments in clean water and drinking water infrastructure. There is growing interest at the state and national level in designing revolving loan funds for other objectives, including community resilience. To help municipalities increase and improve long-term resilience as populations expand and climate change impacts become more severe, the National Wildlife Federation recommends a Resilient Communities Revolving Loan Fund. This fund could provide low- to zero-interest loans for communities to invest in projects and programs that improve disaster preparedness and long-term resiliency in the face of increasingly severe storms, flooding, drought, wildfires, and other natural hazards, with an emphasis on use of natural infrastructure to achieve those goals.⁸ To support efforts in lower-income communities, the RLF should be administered alongside a grant program with aligned goals, or should include a mechanism to ensure access to the program for communities that otherwise would not have the resources available to participate. The National Wildlife Federation recommends an initial federal investment of **\$60 billion over 5 years**, where loan repayments replenish the fund for additional projects over time.⁹

Policy Recommendations. While the revolving loan fund and grant program will provide communities with a critical tool to prepare for disasters, the National Wildlife Federation recommends significant additional direct investment in specific strategies that improve resilience while capturing carbon. Such investments should include:

- *Improve Coastal Resilience.* Recommended investment: **\$50 billion.** Our coasts possess significant economic and natural resource assets, and yet are increasingly vulnerable to sea-level rise, storm surge, flooding, and other climate change-related effects. Unequal access to social and economic safety nets leaves some residents particularly vulnerable to disaster and dislocation. According to the U.S. National Climate Assessment, more than 50

⁷ U.S. Government Accountability Office 2017. Information on Potential Economic Effects Could Help Guide Federal Efforts to Reduce Fiscal Exposure. <https://www.gao.gov/products/GAO-17-720>

⁸ Similar to a proposal in the [Senate Democrats Jobs and Infrastructure Plan for American Workers](#).

⁹ A \$60 billion recommended investment is derived from total disaster damages from 2008-2017 (pre-2017 hurricane season), divided by a factor of 6 per the National Institute of Building Sciences mitigation spending-to-savings ratio of 6:1. <https://www.nibs.org/news/381874/National-Institute-of-Building-Sciences-Issues-New-Report-on-the-Value-of-Mitigation.htm>

percent of the country's population now lives in densely populated coastal areas.¹⁰ Residents and tourists together place strain on already stressed natural systems, which are further imperiled by a changing climate, putting people, economic activity, and infrastructure at risk.

Infrastructure in U.S. coastal areas tends to be older, water-dependent, and adjacent to heavily populated inland areas. Often, structures are built to inadequate standards that do not recognize changing climatic conditions (e.g., the frequency of major flooding events, or the increasing risk of storm surge). At the same time, it is hard to imagine infrastructure more vital to preservation of life than the network of coastal roads and highways needed to evacuate residents during an emergency.

Building resilience along our coastlines involves improving the ability of natural and built systems to withstand and adapt to change. Recommendations for potential coastal infrastructure investments and policy improvements that would increase overall resilience include:

- *Increase investments in pre-disaster mitigation programs.* Historically, the vast majority of mitigation dollars have flowed to communities *after* disaster strikes, often through FEMA and HUD grant programs. While this support is critical to help communities get back on their feet, an increased investment in proactive mitigation is an efficient and cost-effective way to decrease future damages. Per provisions in the 2018 Disaster Recovery Reform Act, FEMA now has the authority to set aside an amount equivalent to 6 percent of the estimated aggregate total of other FEMA disaster grants for pre-disaster mitigation assistance. This set-aside authority is optional, but should be made mandatory and the percentage increased, to ensure adequate investment in resilience pre-disaster. Congress must also prioritize direct mitigation investments in historically disadvantaged and/or economically vulnerable communities.
- *Reauthorize and reform the NFIP.* After a string of short-term extensions, Congress must fully reauthorize and modernize the National Flood Insurance Program. Needed reforms include resources to increase accuracy of flood risk maps, and additional mitigation investments to reduce overall risk, including through community-wide nature-based mitigation approaches. Such improvements would both decrease at-risk infrastructure, and help to inform smarter infrastructure investments moving forward.
- *Reestablish Federal Flood Protection Standards that apply to all federal infrastructure spending.* Ensure that all federal dollars expended to support the construction of public buildings, facilities, and other infrastructure account for the future impacts of climate change and associated risks in their design and

¹⁰ U.S. National Climate Assessment 2014. Coastal Zone Development and Ecosystems.
<https://nca2014.globalchange.gov/report/regions/coasts>

construction, and avoid investments in floodplains and coastal areas vulnerable to sea level rise.

- *Significantly increase funding for competitive grant programs such as the National Coastal Resilience Fund.* Such programs can encourage innovation and create a low-risk opportunity for communities to increase their comfort level with new risk reduction techniques or types of projects. The National Coastal Resilience Fund is a competitive grant program administered by the National Fish and Wildlife Foundation in partnership with the National Oceanic and Atmospheric Administration (NOAA), to restore, increase, and strengthen natural infrastructure to protect coastal communities from storm and flood hazards.
- **Promote Healthy Waters.** Recommended investment: **\$50 billion.** Many of our outdated drinking water, stormwater, and wastewater systems were not designed to withstand the impacts of climate change, including sea level rise, drought, floods, and storms. Unfortunately, the needs are monumental. The National Association of Clean Water Agencies estimates the cost of re-engineering our existing water systems to adequately address threats due to climate change may require an additional \$448 to \$944 billion by 2050.¹¹ The EPA has estimated that the U.S. needs to invest roughly \$660 billion in our nation’s drinking water, wastewater, and stormwater infrastructure over the next 20 years to meet environmental and public health requirements.¹² A more recent study by the U.S. Water Alliance shows that the U.S. needs to invest an estimated \$82 billion annually in water infrastructure — both natural and traditional — to fix aging pipes and water treatment plants. This investment could create \$220 billion in annual economic activity and result in 1.3 million jobs annually.¹³ Any infrastructure package should include a significant increase in resources to address these known water infrastructure needs.

To build more resilient communities and systems, we must also work to restore iconic water ecosystems across our country, which will simultaneously create local jobs, increase tourism, expand hunting and fishing opportunities, safeguard our drinking water, provide wildlife habitat, and bolster our outdoor economy.

Recommendations to promote healthy waters include:

¹¹ National Association of Clean Water Agencies and Association of Metropolitan Water Agencies. 2009. Confronting Climate Change: An Early Analysis of Water and Wastewater Adaptation Costs. <https://www2.nacwa.org/images/stories/public/2009-10-28ccreport.pdf>

¹² EPA 2017. EPA Launches New Program With \$1 Billion in Loans Available for Water Infrastructure Projects. <https://archive.epa.gov/epa/newsreleases/epa-launches-new-program-1-billion-loans-available-water-infrastructure-projects.html>

¹³ The Value of Water Campaign 2017. The Economic Benefits of Investing in Water Infrastructure. http://thevalueofwater.org/sites/default/files/Economic%20Impact%20of%20Investing%20in%20Water%20Infrastructure_VOW_FINAL_pages.pdf

- *Increase federal investment in water infrastructure*, including existing sources of financing like the Clean Water and Drinking Water State Revolving Funds, which provide essential funding to reduce pollution and ensure safe drinking water and healthy rivers and streams, and developing new and innovative funding sources. Congress should roughly triple appropriations to the Clean Water State Revolving Fund (from \$1.7 billion in FY18 to \$6 billion annually) and the Drinking Water State Revolving Fund (from \$1.95 billion in 2020 to \$6 billion) and maintain this level of funding into the future. This funding should require and incentivize the use of natural and green infrastructure solutions, like permeable pavements, vegetated roadside swales, and rain gardens, through a 20 percent set-aside CWSRF funds for the Green Project Reserve. Investing in water infrastructure protects water quality and creates quality job opportunities for America’s workers. Funding should include sustained investments to fix deficient drinking water, stormwater, and wastewater infrastructure, and not come at the expense of reduced funding for other environmental programs.¹⁴
- Invest in planning and construction of *ecosystem restoration projects* to allow wildlife to thrive. Many iconic ecosystems around the nation, including but not limited to the Everglades, Mississippi River Delta, Great Lakes, and the Chesapeake Bay, San Francisco Bay, Puget Sound, Lake Champlain, Rio Grande, and Columbia River have associated restoration plans that should be better resourced to expedite recovery. These special places are nationally-significant hubs of tourism, and many support and protect other critical industries including fisheries, shipping, and energy production. Restoration implementation also supports a \$25 billion "restoration economy" that directly employs 126,000 people and supports 95,000 other jobs, mostly in small businesses.
- *Enhance Forest Restoration, Reforestation, and Climate-Smart Management.*
Recommended investment: **\$50 billion.**

America’s forests are an extremely valuable natural resource. In 2016, forests sequestered 670 MMT of CO₂ equivalent,¹⁵ and they have the potential to double, or even triple this indispensable service. While forests are not typically considered “infrastructure,” they are worth including in any infrastructure proposal. Healthy, resilient forests can act as an

¹⁴ Relevant legislation for increasing SRFs from the 116th and 115th Congress: Water Quality Protection and Job Creation Act of 2019 (H.R. 1497), Water Resources Development Act (S. 3021), Water Infrastructure Trust Fund Act of 2017 (H.R. 1647), Clean Safe Reliable Water Infrastructure Act (S. 1137), Clean Water through Green Infrastructure Act (H.R. 6944), Water Infrastructure Resiliency and Sustainability Act (H.R. 5596), Leading Infrastructure for Tomorrow’s (LIFT) America Act (H.R. 2479). Relevant legislation prioritizing green infrastructure set aside from the 116th and 115th Congress: Water Infrastructure Sustainability and Efficiency Act or WISE Act (H.R. 2458), Consolidated Appropriations Act of 2018 (H.R. 1625/P.L. 115-141), Water and Energy Sustainability Through Technology Act (H.R. 3275), Clean Water Through Green Infrastructure Act (H.R. 6944)/Innovative Stormwater Act of 2017 (S. 1695), and Water Infrastructure Resiliency and Sustainability Act of 2018 (H.R. 5596).

¹⁵ EPA 2018. Inventory of U.S. Greenhouse Gas Emissions and Sinks 1990-2016.
https://www.epa.gov/sites/production/files/2018-01/documents/2018_complete_report.pdf

insurance policy against climate-driven damages, safeguarding our built environment and human life from hazardous storms, floods, and fast-spreading megafires. Plus, up-front investment in forest health has the potential to provide invaluable carbon mitigation benefits in a warming world. Policy recommendations include:

- *Improved forest management and enhanced restoration* can increase carbon storage in existing forests by **560-1,590 MMT annually by 2050**,¹⁶ for an annual investment of at least \$1 billion. Investments include:
 - *End the practice of fire borrowing and ensure an adequate budget for firefighting on Federal lands.* Funding is essential to supporting resources needed to properly manage and respond to wildfires. The Federal government should provide sufficient funding for federal agencies to respond to wildfires, recognizing the growing average annual cost of firefighting, increase funding for proactive restoration and fire risk reduction programs, and ensure that this funding is not taken from existing conservation programs. Recent passage of a “fire funding fix” will help end use of conservation funds to fight fires, but now greatly increased resources are needed to restore and improve the health and resilience of our national forests.
 - Building on the existing Forest Inventory and Analysis Program, fund the design of an *advanced forest carbon monitoring system* within the U.S. Forest Service to monitor carbon enhancing activities, conduct statistical sampling of stored carbon in select projects, and estimate ecosystem carbon storage averages that include use of remote sensing data. (Recommended funding: \$5 million.)¹⁷
 - Increasing funding for *integrated forest restoration* such as through the recently reauthorized USDA Collaborative Forest Landscape Restoration Program (CFLRP), and ensure broader applicability for qualifying lands. (Recommended funding: \$150 million).¹⁸
 - Increasing funding for *inter-agency initiatives* like the Joint Chiefs’ Landscape Restoration Partnership, which improves the health of forests

¹⁶ McGlynn, E. and A. Chitkara 2018. Negative Emissions and Land-Based Carbon Sequestration: Implications for Climate and Energy Scenarios. Rocky Mountain Institute. https://www.rmi.org/wp-content/uploads/2018/11/RMI_Negative_Emissions_Scenarios_Report_2018.pdf

¹⁷ National Academies of Sciences, Engineering, and Medicine. 2018. Negative Emissions Technologies and Reliable Sequestration. <https://www.nap.edu/catalog/25259/negative-emissions-technologies-and-reliable-sequestration-a-research-agenda>

¹⁸ U.S. Forest Service 2012. Collaborative Forest Landscape Restoration Program Overview. <https://www.fs.fed.us/restoration/CFLRP/overview.shtml>

where public forests and grasslands connect to privately owned lands. (Recommended funding: \$100 million.)¹⁹

- Ensuring that federal expenditures of national forest restoration funds (e.g., CFLRP, Good Neighbor, Stewardship Contracting, etc.) are *climate-informed* and compliant with core environmental safeguards.
- Promoting expanded federal/state/private collaboration through the U.S. Forest Service’s new *Shared Stewardship platform* and ensuring that implementation of forestry priorities and risk management achieves carbon and ecological benefits.²⁰
- *Expand forested areas in the right places (potential carbon sequestration of 960-1,290 MMT annually by 2050).*²¹ Almost 400 years ago, the estimated area of U.S. forest land was 1,023 million acres, or about 46 percent of the total land area. Since 1630, about 256 million acres of forest land have been converted to other uses — mainly agricultural.²² Some of the most significant opportunities to sequester carbon in nature lie in reforesting strategic parts of this land. These opportunities should be prioritized in areas of historical forest cover or degraded land. For example, in California, the latest Forest Inventory and Analysis Program report states that there are 582,000 acres of potential forest land in the state that are not stocked with trees and are potentially candidates for reforestation.²³
 - As a starting place, Congress should invest in an updated national assessment of forest resources that also identifies the areas of greatest potential for reforestation that would have minimal conflicts with food production and wildlife conservation.
- *Restore Abandoned Mine Lands (AMLs).* Expedite the use of existing funds in the Abandoned Mine Land Fund to reclaim abandoned coal mines and stimulate

¹⁹ U.S. Forest Service and USDA’s Natural Resources Conservation Service 2018.

<https://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/newsroom/features/?cid=stelprdb1244394>

²⁰ USDA 2018. USDA Forest Service Announces New Strategy for Improving Forest Conditions.

<https://www.fs.fed.us/news/releases/usda-forest-service-announces-new-strategy-improving-forest-conditions>

²¹ McGlynn, E. and A. Chitkara 2018. Negative Emissions and Land-Based Carbon Sequestration: Implications for Climate and Energy Scenarios. Rocky Mountain Institute. https://www.rmi.org/wp-content/uploads/2018/11/RMI_Negative_Emissions_Scenarios_Report_2018.pdf. Note: NWF does not include these estimates in our total potential for forest carbon sequestration, as there is disagreement in the literature about the social and economic feasibility of afforestation and reforestation on a large scale in the United States.

²² U.S. Forest Service 2012. U.S. Forest Resource Facts and Historical Trends.

https://www.fia.fs.fed.us/library/brochures/docs/2012/ForestFacts_1952-2012_English.pdf

²³ El Dorado County Resource Conservation District (RCD) 2018. Reforestation Needs Assessment.

http://bofdata.fire.ca.gov/board_business/binder_materials/2018/september_2018_meeting/management_committee/mgmt_2_a_e_drcd_reforestation_needs_assessment.pdf

economic development on the reclaimed land.²⁴ In addition, Congress should support the Appalachian Regional Commission, the Department of Commerce’s Assistance to Coal Communities program within the Economic Development Administration, and the Department of Interior’s AML Pilot program, in order to maximize coordination of economic and reclamation reinvestments with opportunities in coal communities facing economic transition. (Recommended funding: \$1.5 billion.)

- *Reauthorize the Forest Service’s Legacy Roads and Trails (LRT) program* to direct work towards urgently needed road decommissioning, road and trail repair and maintenance, and removal of fish passage barriers. The program emphasizes areas where Forest Service roads may be contributing to water quality problems in streams and water bodies that support threatened, endangered, and sensitive species or community water sources. (Recommended funding: \$100 million).²⁵

- *Planting urban trees* lifts property values, has the potential to provide tens of thousands of new American jobs,²⁶ increases carbon sequestration, and reduces energy use in nearby buildings. Total tree carbon storage in U.S. urban areas (in 2005) was estimated at 643 million metric tons, with annual carbon sequestration estimated at 25.6 million tons.²⁷ Urban trees also can reduce carbon pollution generated by cities by reducing energy demand when planted near buildings, therefore cutting electricity-related emissions. Congress should:
 - Increase dedicated funding for the U.S. Forest Service *Urban & Community Forestry Program*, which delivers grants and best practices information to state partners on maintaining, restoring, and improving community forests. (Recommended funding: \$50 million.)²⁸

- *Protect and Restore Wildlife Habitat.* Recommended investment: **\$30 billion.** America harbors a remarkable array of wildlife, yet up to one-third of U.S. species are at increased risk of extinction. Habitat loss and degradation, invasive species, disease, and pollution all pose threats to our wildlife — threats that are being amplified by a rapidly changing climate. The below opportunities demonstrate how smart investment in conservation and infrastructure can help reverse America’s wildlife crisis while also supporting healthy ecosystems and the booming outdoor economy, worth \$887 billion.

²⁴ Relevant Legislation from the 116th Congress: RECLAIM Act (S. 1232, H.R. 2156); 115th Congress: RECLAIM Act (S.728, H.R. 1731).

²⁵ U.S. Forest Service 2012. https://www.fs.fed.us/restoration/Legacy_Roads_and_Trails/overview.shtml

²⁶ U.S. Forest Service. Urban & Community Forestry Program. https://www.fs.fed.us/ucf/supporting_docs/UCF-Brief-Jan2018.pdf

²⁷ U.S. Forest Service 2013. Carbon Sequestration by Urban Trees Valued in the Billions of Dollars Annually. https://www.fs.fed.us/research/highlights/highlights_display.php?in_high_id=472

²⁸ National Urban and Community Forestry Federal Advisory Council. Ten-Year Urban Forestry Action Plan: 2016-2016. https://urbanforestplan.org/wp-content/uploads/2015/11/ActionPlanFundingNeeds_11_17_15.pdf

- Invest in state-level *wildlife habitat restoration projects* through implementation of already adopted State Wildlife Action Plans and funded through the Wildlife Conservation and Restoration Account of Pittman-Robertson. (Relevant legislation: Recovering America’s Wildlife Act.²⁹)
- *Build wildlife crossings and other infrastructure to reduce vehicle collisions and protect people and wildlife.* Invest in wildlife crossings (bridges and improved culverts), protective fencing, and other mitigation efforts. (Relevant legislation includes the Wildlife Corridors Conservation Act.³⁰)
- *Remove outdated infrastructure* to improve habitat and public safety. Invest in the identification, study, and removal of dams, locks, and other instream structures that no longer serve their intended purpose and harm wildlife habitat and recreational opportunities. Many such structures are not properly maintained, and present a hazard to surrounding communities during flood or storm events. For example, outdated dams can be the primary obstacle to recovery of imperiled fish and other vulnerable species that depend on healthy waterways.
- ***Improve Drought Resilience.*** Recommended investment: **\$5 billion.** Climate change is increasing the risk of severe drought in the United States. Drought threatens livestock and crops, and increases the risk of megafires. The cost of one severe drought in 2012 was over \$30 billion in damages, mostly due to agricultural impacts. It is critical that the United States address this threat through investment in the front lines of defense against future disaster — natural infrastructure. Protecting and restoring watersheds help create more resilient communities and ecosystems in a changing world, and help protect the \$992 billion food and agriculture industry.³¹
 - Expand and provide additional funding for the U.S. Bureau of Reclamation’s WaterSMART Drought Response Program, with a focus on cross-jurisdictional planning and implementation projects that *enhance natural water storage*.
 - Revive the National Drought Resilience Partnership to align federal drought policies across government and help communities *manage the impact of drought* by linking information such as monitoring, forecasts, and early warnings with long-term resilience strategies. Specifically provide incentives to replicate innovative (and ongoing) pilot projects that embrace natural water storage such as the Montana Demonstration Project.

²⁹ From the 115th Congress: Recovering America’s Wildlife Act (S.3223, H.R. 4647). See: National Wildlife Federation. Recovering America’s Wildlife Act. <https://www.nwf.org/Our-Work/Wildlife-Conservation/Policy/Recovering-Americas-Wildlife-Act>

³⁰ From the 115th Congress: Wildlife Corridors Conservation Act (S.3715, H.R. 7232).

³¹ AgWeb 2017. Food & Ag Industry Contributes \$992 Billion to U.S. Economy. <https://www.agweb.com/mobile/article/food--ag-industry-contributes-992-billion-to-us-economy-naa-ben-potter/>

- Provide funding to implement the 2018 Farm Bill’s *Water Source Protection Program and Watershed Condition Framework*, both of which support collaborative science-based landscape restoration and for improving watershed resilience and improved water quality. More than half of the drinking water in the western United States originates as snow on National Forest lands, so activities aimed at protecting and restoring watershed health have a direct benefit for downstream water users as well as fish and wildlife.
- **Upgrade Tribal Infrastructure.** Recommended investment: **\$15 billion.** Native American communities have endured decades of underinvestment in infrastructure, and many also face worsening economic conditions and cultural dislocation as a result of climate change. A growing body of literature illustrates that Indian Tribes are disproportionately impacted by climate change, while resources to address these threats fall far short of the need. This is especially clear when it comes to infrastructure needs, particularly in regard to water quality and sustainable use, reliable and efficient energy, and emergency and disaster preparedness.³² Recommendations include:
 - Ensure Indian Country has *access to clean, affordable, and reliable electricity*. Currently, 14.2 percent of Tribal households lack access to basic electricity services.³³
 - Establish an *energy efficiency grant program* to retrofit existing reservation buildings or to cover costs of new buildings.
 - Ensure Indian Country has access to *clean, reliable water supplies*. While 1 percent of the U.S. general population lacks access to safe water supplies, 9 percent of Indian homes lack such access.³⁴
 - Provide increased investment in *water infrastructure improvements*, including clearing maintenance backlogs for dilapidated irrigation systems, and adoption of conservation methods such as canal lining and more efficient watering systems. Recent studies indicate that there is upwards of \$700 million in deferred maintenance in Bureau of Indian Affairs irrigation projects alone, a problem that impedes economic and employment opportunities in tribal communities.

³² Fourth National Climate Assessment. 2018. Volume II: Impacts, Risks, and Adaptation in the United States. Summary Findings: 7. Indigenous Peoples. <https://nca2018.globalchange.gov/>

³³ WilmerHale 2018. Infrastructure Series: Tribes and Infrastructure. <https://www.wilmerhale.com/en/insights/client-alerts/2018-04-26-infrastructure-series-tribes-and-infrastructure>

³⁴ *Ibid.*

- Double funding for the Bureau of Indian Affairs' *Tribal Resilience Program* and dedicate a portion of funds to help offset costs of relocation brought on by climate change, or to build infrastructure needed for emergency management and evacuation in relation to climate-fueled disasters.
- **Build Agriculture Resilience & Soil Health.**³⁵ Recommended investment: **\$5 billion.** Adding carbon to our nation's soils can help us adapt to climate change, as well as benefit our wildlife, water supplies, and rural economies. Farms with healthy soils are more profitable, more sustainable, and have higher yields in adverse weather—the kind of weather we can expect more of as our climate changes. Sequestering carbon in cropland and grazing land can be achieved through a wide variety of activities, including cover crops, crop rotation, residue management, rotational grazing, biochar use, and planting field borders and other areas with perennial grasses and other native plants³⁶ (**potential carbon sequestration of 170-270 MMT annually by 2050**³⁷). Policy options include:
 - Fund a *national on-farm soil carbon monitoring system* within the U.S. Department of Agriculture's National Resources Inventory. This would be an experimental network for improving soil carbon processes and studying soil carbon dynamics at depth, and a data-model platform for predicting and quantifying agricultural soil carbon removal and storage. (Recommended funding: \$5 million.)³⁸
 - *Infuse Farm Bill conservation programs with significant additional funding* to protect more private forests, grasslands, and wetlands so they can continue to store carbon and provide storm and flood resiliency. Conservation easement programs require up-front payments to provide indefinite conservation value.³⁹
- **Accelerate Parks/Public Lands Maintenance & Land Conservation.** Recommended investment: **\$10 billion.** Americans share ownership of approximately 600 million acres of land and water in the United States. These public lands include federal designations like national parks, forests, wildlife refuges, and monuments, as well as state and local areas owned by the public.⁴⁰

³⁵ Environmental Law Institute 2018. Legal Pathways to Deep Decarbonization in the United States: Summary and Key Recommendations. https://www.eli.org/sites/default/files/docs/books/deep_decarb_summary_booklet_online.pdf, pp. 75-78.

³⁶ California Environmental Protection Agency, et al 2019. California 2030 Natural and Working Lands Climate Change Implementation Plan (Draft). <https://arb.ca.gov/cc/natandworkinglands/draft-nwl-ip-1.7.19.pdf>

³⁷ McGlynn, E. and A. Chitkara 2018. Negative Emissions and Land-Based Carbon Sequestration: Implications for Climate and Energy Scenarios. Rocky Mountain Institute. https://www.rmi.org/wp-content/uploads/2018/11/RMI_Negative_Emissions_Scenarios_Report_2018.pdf

³⁸ National Academies of Sciences, Engineering, and Medicine. 2018. Negative Emissions Technologies and Reliable Sequestration. <https://www.nap.edu/catalog/25259/negative-emissions-technologies-and-reliable-sequestration-a-research-agenda>

³⁹ Food and Agriculture Organization of the United Nations (FAO) 2010. Challenges and opportunities for carbon sequestration in grassland systems. http://www.fao.org/fileadmin/templates/agphome/documents/climate/AGPC_grassland_webversion_19.pdf

⁴⁰ Relevant legislation: National Park Service Legacy Act (H.R. 2584); National Park Service Critical Maintenance and Revitalization Conservation Fund (Sec 5101 of S 1460), Outdoor Recreation Legacy Partnership Grant Program Act (H.R. 2943), Veterans Conservation Corps Act (H.R. 4363).

These lands are an example of the natural infrastructure that supports wildlife, clean water, and the outdoor recreation industry. The following opportunities represent examples of critical investments:

- Mandate adequate funding for the *Land and Water Conservation Fund* to address backlogged federal conservation needs that provide valuable natural infrastructure and ecosystem services, as well as economic and recreational opportunity.
- *Establish a National Park Service maintenance fund* to reduce the maintenance backlog by allocating from existing revenues.
- Create a guaranteed funding source for projects that *expand outdoor recreational opportunities in cities* across the country, particularly in underserved areas.
- Connect veterans with employment opportunities in *public lands maintenance*.

2. BUILD A CLEAN AND RESILIENT GRID

The United States has an outdated electrical grid that is in need of significant upgrades. The “grid” includes systems for generation, transmission, and distribution (end use). There is significant opportunity within each of these categories to invest in cleaner, more resilient infrastructure that ensures affordable and reliable energy, and creates family sustaining jobs. *A Technology Neutral Tax Credit would target emissions at their source and an Energy Efficiency State Revolving Fund would reduce demand for electricity. This two-pronged strategy will help cut emissions from the grid, and incentivize much needed upgrades that strengthen the economy and save customers money.* The National Wildlife Federation recommends measures worth an investment of approximately **\$75 billion**.

A Technology Neutral Tax Credit to Reduce Emissions. The National Wildlife Federation recommends that Congress dedicate **\$25 billion** to a state-differentiated Technology-Neutral Tax Credit to spur research, development, demonstration, and deployment of diverse, environmentally-responsible, low- and no-carbon power generation technologies across the country. Modeling repeatedly shows that meeting climate stabilization targets cannot be achieved without an array of solutions. While market demand for cleaner energy is driving significant change, more concerted attention from Congress is necessary to speed the transition and to broaden options for our low-carbon future. Plus, smart policy is needed to bring greater clean energy investment, employment, and environmental benefits to more parts of the country currently being left behind. Congress has a role to play in spurring those technologies that get the greatest climate benefits, while also ensuring they are developed responsibly and without negative effect on the environment, wildlife, or health.

The National Wildlife Federation recommends that the credit be scaled to the relative carbon-reducing benefit of a technology, when compared to conventional natural gas-fired generation without carbon capture, and that full carbon lifecycle accounting be assessed (such as including land use changes associated with bioenergy crop production). Further, NWF recommends weighting the tax credit to drive greater clean energy investment to the states with the most carbon intensive electric sectors, to accelerate delivery of benefits to the residents and local economies needing investment most. *Additional details available upon request.*

An Energy Efficiency State Revolving Fund to Reduce Energy Demand in Buildings and Industry. Energy efficiency investments create more jobs per dollar invested than traditional energy supply investments,⁴¹ and result in significant consumer and carbon savings. Yet, the full potential of energy efficient products and processes is not realized due to insufficient adoption. At the core of any infrastructure bill, The National Wildlife Federation recommends creating an Energy Efficiency State Revolving Fund (SRF) at the Department of Energy that incentivizes energy efficiency installations in commercial and residential buildings, power generation, and industrial settings. According to the Department of Energy, existing or planned state energy codes for residential and commercial buildings alone are projected to reduce carbon dioxide emissions by an amount equivalent to removing 94 million cars from the road by 2030. Industrial sector efficiency improvements can cut greenhouse gas emissions by 2030 equivalent to 88 million cars.⁴² With an initial federal investment of **\$25 billion**, the Energy Efficiency SRF would fund projects that:

- *Improve energy efficiency in residential buildings (potential reduction of 235 MMT annually by 2030)*⁴³ by supporting home upgrades of heating/cooling systems; use of energy efficient lighting, appliances, electronics, and water heaters; and increasing assistance for low-income home weatherization;
- *Improve energy efficiency in commercial buildings (potential reduction of 209 MMT annually by 2030)*⁴⁴ by supporting installation and upgrades of building control technologies; supporting installation of geothermal water heating systems and more efficient lighting; and increasing funding for the Federal Energy Management Program to invest in energy efficiency measures for all federal buildings and permanent military installations; and

⁴¹ United States Agency for International Development 2018. Economic and Employment Impacts of Energy Efficiency. <https://www.usaid.gov/energy/efficiency/economic-impacts>

⁴² U.S. Department of Energy. U.S. Energy Efficiency Potential Maps. <https://www.energy.gov/eere/slsc/us-energy-efficiency-potential-maps>. Note: Converted and added DOE projections of MWh and MW savings for energy efficiency and combined heat and power to carbon dioxide emissions, using EPA's Greenhouse Gas Equivalencies Calculator.

⁴³ Pacific Northwest National Laboratory 2016. Impacts of Model Building Energy Codes. Table ES.1.

https://www.energycodes.gov/sites/default/files/documents/Impacts_of_Model_Building_Energy_Codes.pdf. Note: Estimate includes only those states that have adopted or are planning to adopt a model code, and is an underestimate of energy and carbon savings from energy efficiency measures nationally.

⁴⁴ *Ibid.*

- *Improve energy efficiency in industrial processes (potential reduction of 413 MMT annually by 2030)*⁴⁵ by supporting end-use efficiency, industrial demand response, and industrial combined heat and power. According to the American Council for an Energy Efficient Economy, combined heat and power systems can operate at efficiency levels as high as 80 percent (compared to 45 percent for conventional heat and power generation). Many existing industrial boilers can be re-powered with advanced technologies that replace fuel burners and add additional electricity generation capacity while cutting emissions. Overall, increasing use of energy efficient technologies and practices can reduce industrial energy consumption by 15-32% by 2025.⁴⁶ Additional technologies can include advanced electric motor systems, high efficiency boilers, mechanical insulation, energy-efficient lamps and lighting controls, and sensors and controls that improve process performance.⁴⁷

Recognizing that low-income residential consumers will have less access to EE SRF loans than larger commercial, industrial, or military/university/school/hospital (MUSH) consumers, the National Wildlife Federation recommends an increase in the annual appropriations for the Weatherization Assistance Program from \$257 million⁴⁸ to **\$1 billion**.

Policy Recommendations: While the Technology-Neutral Tax Credit and Energy Efficiency State Revolving Fund should spur significant infrastructure investments in low-carbon technologies and processes, the National Wildlife Federation recommends an additional **\$25 billion** in initial direct investments in low- and zero-carbon projects in the energy and industrial sectors, with the understanding that additional significant investment will be needed over time in some of these areas. These should include:

- *Spur development of point-source carbon capture, direct air capture, and markets for captured carbon:* Carbon capture, utilization, and storage (CCUS) can not only significantly decrease the amount of GHGs entering the atmosphere, but it can also offer a source of usable carbon for other purposes while supporting high-quality jobs. CCUS technologies can capture more than 90 percent of carbon dioxide (CO₂) emissions from power plants and industrial facilities⁴⁹ and most modeling assumes heavy use of CCUS to achieve climate goals. Still, additional research and development will be needed to bring costs down and realize that potential. Opportunities to deploy CCUS in the industrial sector are plentiful and more cost-effective than in the power sector. Direct air capture has unlimited potential to directly remove carbon dioxide from the air, though costs remain high. The National Academies of Science recommend a National Direct Air

⁴⁵ U.S. Department of Energy. U.S. Energy Efficiency Potential Maps. <https://www.energy.gov/eere/slsc/us-energy-efficiency-potential-maps>. See note 40.

⁴⁶ U.S. Department of Energy 2015. Barriers to Industrial Energy Efficiency. https://www.energy.gov/sites/prod/files/2015/06/f23/EXEC-2014-005846_6%20Report_signed_0.pdf

⁴⁷ American Council for an Energy-Efficient Economy 2016. Combined Heat and Power (CHP). <https://aceee.org/topics/combined-heat-and-power-chp>

⁴⁸ <https://www.energy.gov/sites/prod/files/2018/12/f58/WPN-19-2-allocations.pdf>

⁴⁹ Center for Climate and Energy Solutions. Carbon Capture. <https://www.c2es.org/content/carbon-capture/>

Capture Test Center to pilot test direct air capture systems.⁵⁰ Utilization of captured carbon for industrial purposes, construction, commercial products, and fuels presents exciting options for closing the loop on emitted carbon, though incentives are slim without a price signal that turns carbon into a marketable commodity. Additional research, development, demonstration, and deployment is needed in each of these areas.

- ***Cut methane emissions (potential reduction of 35 MMT of carbon dioxide equivalent emissions (CO₂E) annually by 2025):*** Methane is a climate super-pollutant with 80 times the climate-altering potential in the near-term. The oil and gas sector is the single largest source of methane pollution in the U.S., where a portion of emissions is emitted accidentally through leaks in infrastructure.⁵¹ Meanwhile, agricultural sources together account for more than one-third of U.S. methane emissions.
 - Natural gas infrastructure: A prudent infrastructure policy would go beyond existing voluntary programs such as Natural Gas STAR to: require operators of existing, new, and modified oil and gas facilities to find and repair leaks; capture natural gas from the completion of hydraulically fractured oil and gas wells; and limit emissions from new and modified pneumatic pumps and several types of equipment used at natural gas transmission compressor stations, including compressors and pneumatic controllers. These requirements could cost-effectively reduce **15 MMT⁵² of annual CO₂E emissions by 2025.**⁵³ Another option is to create a state revolving loan fund for natural gas distribution pipeline repair and replacement to provide additional tools to states and utilities to address old, leaking distribution pipeline infrastructure.
 - Agriculture emissions: Livestock are also major sources of methane emissions in the U.S. Congress can play a significant role in incentivizing the use of anaerobic digesters, impermeable covers, and flaring technologies at agricultural sites. If these practices were to be adopted on just 10 percent of dairy cattle and swine operations, emissions could be reduced by **20 MMT⁵⁴ of CO₂E annually by 2025.**
- ***Boost grid resilience:*** Flooding, high winds and extreme heat each present risks to grid integrity. Congress should support adoption of smart grid technologies and related software that enhance demand response to reduce peak energy consumption, such as through the installation of smart meters in homes and businesses in conjunction with

⁵⁰ National Academies of Sciences, Engineering, and Medicine. 2018. Negative Emissions Technologies and Reliable Sequestration. <https://www.nap.edu/catalog/25259/negative-emissions-technologies-and-reliable-sequestration-a-research-agenda>

⁵¹ Note: Estimates vary greatly on emissions leakage from oil and gas infrastructure. Detecting or monitoring leaks is not currently required by federal law, though is in some states.

⁵² Estimate based on U.S. Department of Interior. 2016. Fact Sheet Methane and Waste Prevention Rule. https://www.doi.gov/sites/doi.gov/files/uploads/methane_waste_prevention_rule_factsheet.pdf & Environmental Protection Agency 2016. <https://www.epa.gov/sites/production/files/2016-09/documents/nsps-overview-fs.pdf>

⁵³ Pipeline Revolving Fund and Job Creation Act (S. 1209), Pipeline Modernization and Consumer Protection Act (S. 1208)

⁵⁴ U.S. Department of Agriculture. 2016. USDA Building Blocks for Climate Smart Agriculture and Forestry. <https://www.usda.gov/sites/default/files/documents/building-blocks-implementation-plan-progress-report.pdf>

customer information platforms.⁵⁵ Smart meters will help integrate private solar and electric vehicle charging stations into the grid, and will enable automatic outage detection and service restoration. Smart grid technologies installed throughout much of the U.S. electrical grid could decrease annual energy use and utility sector carbon emissions by at least 12 percent by 2030 (**442 million metric tons annually by 2030**).⁵⁶ Also, Congress should support distributed energy resources, which can include generation, storage, efficiency, and demand response. And, Congress should help fund solutions such as restoring natural coastal protections, relocating key assets, undergrounding power lines, expanding tree-trimming programs, and improved transmission line materials such as high-temperature, low-sag conductors.

- *Increase installation of utility-scale battery storage:* The global energy storage market has the potential to attract over \$620 billion in investment over the next 22 years,⁵⁷ and the United States could be a world leader in this market.⁵⁸ Utility-scale lithium-ion battery storage systems are expected to decrease in cost by 52 percent between 2018 and 2030.
 - Currently, energy storage technologies are only eligible for the investment tax credit as part of hybrid projects, under specific and relatively limited circumstances. Clarifying energy storage’s full eligibility for the ITC would accelerate energy storage deployment, improve power system reliability and resilience, and optimize the nation’s renewable energy resources.
 - The Department of Energy should also be allocated significantly more resources for energy storage program research, development, and deployment, given the potential of advanced batteries to speed the transition to a clean, resilient grid. The Department should also improve program coordination and maximize dissemination of research findings.⁵⁹

- *Invest in interregional transmission:* Better long-range planning for a strong transmission system will yield net customer savings as well as allow for more cost-efficient low-carbon energy delivery.⁶⁰ A recent study by the Eastern Interconnection States Planning Council and others projected a \$50-110 billion interregional transmission need over the next 20 years. Congress should direct FERC to establish robust and timely interregional planning processes among regional transmission organizations and independent systems

⁵⁵ Relevant legislation: Leading Infrastructure for Tomorrow’s (LIFT) America Act (H.R. 2479).

⁵⁶ U.S. Department of Energy. 2010. The Smart Grid: An Estimation of the Energy and CO2 Benefits. https://energyenvironment.pnnl.gov/news/pdf/PNNL-19112_Revision_1_Final.pdf

⁵⁷ Bloomberg New Energy Finance 2018. Energy Storage is a \$620 Billion Investment Opportunity to 2040. <https://about.bnef.com/blog/energy-storage-620-billion-investment-opportunity-2040/>

⁵⁸ Relevant legislation: Energy Storage Tax Incentive and Deployment Act of 2019 (S.1142, H. 2096).

⁵⁹ Electricity Advisory Committee 2016. 2016 Storage Plan Assessment: Recommendations for the U.S. Department of Energy. <https://www.energy.gov/sites/prod/files/2017/06/f34/2016%20EAC%20Storage%20Plan%20Assessment%20Recommendations%20for%20the%20U%20S%20Department%20of%20Energy%20%28September%202016%29.pdf>

⁶⁰ WIRES 2016. Well-Planned Electric Transmission Saves Customer Costs: Improved Transmission Planning is Key to the Transition to a Carbon Constrained Future. <https://www.eesi.org/files/WIRES-Report-Well-Planned-Electric-Transmission-Saves-Customer-Costs.pdf>

operators, including relieving congestion and providing clean energy access to markets, with the goal of making more low-carbon energy available to consumers.

3. DEPLOY SMART TRANSPORTATION INFRASTRUCTURE:

In 2016, transportation accounted for the largest portion of total greenhouse gas emissions. There is tremendous potential to reduce this large source of emissions through investments in infrastructure. These recommendations for **Smart Transportation** outline strategies to help the United States catapult low-carbon vehicles and transit alternatives into more widespread use in an equitable way and reduce emissions, with an initial investment of **\$40 billion**.

- *Maintain fuel efficiency improvements:* Require the National Highway Traffic Safety Administration and U.S. EPA to maintain or tighten the 2022 to 2025 model year standards for passenger cars and trucks finalized in 2012 (**potential reduction of 600 MMT annually by 2040**).⁶¹ Also, maintain 2016 emissions requirements for heavy duty glider vehicles, glider engines, and glider kits (truck bodies produced without a new engine, transmission, or rear axle). The 2016 standards for new on-road medium- and heavy-duty vehicles and engines would reduce emissions by **270 MMT annually**.⁶²
- *Electrify the sector (potential reduction of 430-550 MMT annually by 2050).*⁶³ Ultimately, large segments of the transportation sector should become electrified to adequately reduce the sector's contribution to climate change and wean America off of foreign oil. The below policies highlight examples of the types of actions needed to electrify the sector, though they do not represent the entirety of potential greenhouse gas reductions through electrification:
 - *Extend the federal Qualified Plug-In Electric Vehicle (PEV) tax credit* by 10 years and remove the per manufacturer sales limit;
 - *Establish a grant program* for the installation of electric vehicle charging infrastructure and hydrogen fueling infrastructure along the National Highway System;
 - *Reinstate the Alternative Fuel Infrastructure Tax Credit* (26 U.S. Code 30C and 38) through FY30 for electricity to support more residential and commercial

⁶¹ Union of Concerned Scientists 2016. Fuel Economy Standards and the Mid-term Review (2016).

<https://www.ucsusa.org/clean-vehicles/fuel-efficiency/national-program-mid-term-review#.XGHZIIVKjIU>

⁶² Government Publishing Office 2016, p. 73480. Greenhouse Gas Emissions and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles — Phase 2. <https://www.govinfo.gov/content/pkg/FR-2016-10-25/pdf/2016-21203.pdf>

⁶³ Electric Power Research Institute 2015. Environmental Assessment of a Full Electric Transportation Portfolio: Executive Summary. <https://www.epri.com/#/pages/product/3002006881/?lang=en-US>

charging installations, and increase the credit for public installations along interstate highways;

- Expand and increase block grant programs and incentives to states and localities to *electrify mass transit systems and public school buses and to purchase public electric vehicle fleets*,⁶⁴ such as through the Better Utilizing Investments to Leverage Development, or BUILD Transportation Discretionary Grant program,⁶⁵ the Congestion Mitigation and Air Quality (CMAQ) program, and the Clean Diesel program dedicated School Bus Rebate program;⁶⁶ and
- *Accelerate research and development for advanced batteries* by establishing a grants program to be administered by the Vehicle Technologies Office (VTO) under the Advanced Battery Development, System Analysis, and Testing activity of the Batteries, Charging, and Electric Vehicles program.
- *Invest in smart growth planning* by increasing funding for Environmental Protection Agency Smart Growth Grants. Improved and highly utilized mass transit, higher-density and mixed-use development, and walkable and bikeable neighborhoods can reduce the usage of passenger vehicles and concentrate development to avoid greater sprawl. An analysis by the Department of Energy finds that these changes to the built environment alone could reduce GHG emissions from urban light duty vehicles by as much as 12 to 18 percent by 2050, or 7-10 percent of overall U.S. transportation emissions (**potential reduction of 125-178 MMT annually by 2050**).⁶⁷
- *Expand mass transit infrastructure* for urban areas. Smart investment in public transportation can reduce CO₂ emissions by **37 MMT** annually.⁶⁸ The U.S. Department of Transportation estimates there is a \$90 billion backlog of repair projects facing the nation's public transportation systems, and additional investments are needed to move more rapidly towards zero- and low-carbon modes of public transportation.
 - Increase funding for the Federal Transit Administration's Capital Investment Grants (CIG) Program to support *accelerated transit investments*, such as metro, light rail, and buses.

⁶⁴ Relevant legislation: Community Health and Clean Transit Act (S. 3720).

⁶⁵ Relevant Legislation: Transportation Infrastructure for Job Creation Act (H.R. 1428).

⁶⁶ Center for Climate and Energy Solutions 2017. Transitioning to Electrification: Funding Sources.

<https://www.e2es.org/site/assets/uploads/2017/11/transitioning-electrification-funding-resources-1.pdf> See also: EV Smart Fleets. 2017. Capturing the Federal EV Tax Credit for Public Fleets. <https://www.georgetownclimate.org/files/report/Capturing-the-Federal-EV-Tax-Credit-for-Public-Fleets%20-%20Case%20Study.pdf>

⁶⁷ U.S. Department of Energy 2013. Effects of the Built Environment on Transportation: Energy Use, Greenhouse Gas Emissions, and Other Factors. <https://www.nrel.gov/docs/fy13osti/55634.pdf>

⁶⁸ American Public Transportation Association 2018. Failure to Restore and Modernize U.S. Public Transit Results in a Loss of \$340 Billion in Business Revenue, According to APTA Study. <https://www.apta.com/mediacenter/pressreleases/2018/Pages/Modernize-Public-Transportation.aspx>

- Double annual federal FAST Act (49 U.S.C. Section 5312) funding through FY30 for *innovative public transportation research and development*. Section 5312 allocates \$28 million in annual funding through FY20 from the Highway Trust Fund, with an additional \$20 million authorized for congressional appropriations from the General Fund;⁶⁹ and
- Double annual federal FAST Act (49 U.S.C. Section 5339(c)) set-asides to states and localities through FY30 for the deployment of *no- and low-emission buses* through the Bus Discretionary Program.⁷⁰
- *Advance clean vehicles* by extending the Fuel Cell Motor Vehicle Tax Credit for another ten years, and increase funding for the Department of Energy’s Fuel Cell Technologies Office.
- *Expand production of truly low-carbon, sustainable biofuels*. First generation biofuels made from corn and soy have negligible, if any, climate benefits, yet they have crowded out more expensive alternatives that can have dramatic emission reductions relative to gasoline and diesel, with a potential annual reduction of **67 MMT of carbon dioxide**.⁷¹ Provide loans, loan guarantees, and tax credits for facilities that produce fuels with lower GHG emissions profiles than corn or soy ethanol and that meet sustainability requirements relating to habitat conversion and water use.

4. CREATE FAMILY-SUSTAINING JOBS AND A HIGHLY TRAINED WORKFORCE

It is critical that America invest in infrastructure to boost our economy and create millions of jobs, while also reducing pollution and combating climate change. BlueGreen Alliance research has found that investing an estimated \$2.2 trillion in America’s infrastructure in strategies such as those outlined in this document has the potential to support or create an additional 14.5 million job-years⁷² across the U.S. economy, add a cumulative \$1.66 trillion to gross domestic

⁶⁹ U.S. Department of Transportation, Federal Transit Administration. Fact Sheet: Public Transportation Innovation, Section 5312.

[https://www.transit.dot.gov/sites/fta.dot.gov/files/docs/5312_Public_Transportation_Innovation_\(Research\)_Fact_Sheet.pdf](https://www.transit.dot.gov/sites/fta.dot.gov/files/docs/5312_Public_Transportation_Innovation_(Research)_Fact_Sheet.pdf)

⁷⁰ Federal Transit Administration. Low or No Emission Vehicle Program -- 5339(c).

<https://www.transit.dot.gov/funding/grants/lowno>

⁷¹ Cellulosic fuels by law must reduce emissions by at least 60% compared to gasoline. Corn ethanol GHG emissions are roughly equal to gasoline. The [transportation sector](#) is responsible for 1,854.04 MMT of carbon dioxide emissions; [light duty vehicles](#) emit 60% of that pollution, or 1,112.42 MMT. Corn ethanol -- making up roughly 10% of the current gasoline mix -- would be responsible for approximately 111.24 MMT of carbon pollution. Cellulosic fuels would reduce those emissions by at least 66.75 MMT. (This excludes trucks, ships, and aviation.)

⁷² Note: A "job year" is one job performed for one year. Two "job years" would be counted for that same job performed for an additional year.

product over 10 years, and reduce greenhouse gas pollution, versus a business as-usual approach.⁷³

These forward-thinking investments will reduce air and water pollution and bolster the ecosystems that wildlife and the \$887 billion outdoor economy depend on. Repairing America's infrastructure systems is also a critical opportunity to increase economic opportunities for workers, build up the American manufacturing sector, support local jobs, and improve public health, while safeguarding communities and reducing our climate vulnerability.

To ensure we maximize the benefits of our infrastructure investments for communities, the environment, and workers, **any infrastructure package must invest in job creation and workforce development in a just and equitable way:**

- Ensure all projects built with public resources are subject to Buy America standards that maximize the return to taxpayers and enforce Davis-Bacon provisions that ensure workers are paid prevailing wages.
- Increase economic opportunities for people of color, low-income communities, and disadvantaged workers through job training, and prioritize use of the most efficient, resilient, and cleanest materials and products with the lowest carbon and toxicity footprints.
- Enhance workforce education and job training by improving existing federal programs like Pell grants, Perkins Act and Career and Technical Education, STEM, and Federal Work Study programs to better incorporate infrastructure job preparation.
- Pass the Rebuild America's Schools Act with added language connecting building rehabilitation to education through green school education programs that support project-based learning.⁷⁴

Lead Authors: Shannon Heyck-Williams and Lauren Anderson

Contributors: Sarah Bates, Kevin Coyle, Laura Daniel Davis, David DeGennaro, David Dreher, Patrick Fitzgerald, Aviva Glaser, Mike Leahy, Jim Lyon, Collin O'Mara, Jessie Ritter, Melissa Samet, Bruce Stein, Abby Tinsley, Garrit Voggesser, and Glenn Watkins

For more information, please visit www.nwf.org.

⁷³ Bluegreen Alliance 2017. <https://www.bluegreenalliance.org/the-latest/infrastructure-improvements-could-create-14-5-million-job-years-increase-gdp-by-1-66-trillion-reduce-emissions-over-next-decade/>

⁷⁴ See the Rebuild America's Schools Act of 2019, H.R. 865 / S. 266.