

Economic Impacts, Benefits and Costs of Completing the ADHS

Ryan Brumfield & Dan Hodge

FHWA Webinar

December 13, 2017



Speakers



**Stefan Natzke, Team Leader,
FHWA National Systems
and Economic Development**



**Ryan Brumfield,
Senior Transportation Advisor
Appalachian Regional
Commission (ARC)**



**Everett Matias,
Senior Transportation
Engineer
FHWA Office of Program
Administration**



**Dan Hodge,
Principal,
Hodge Economic Consulting**

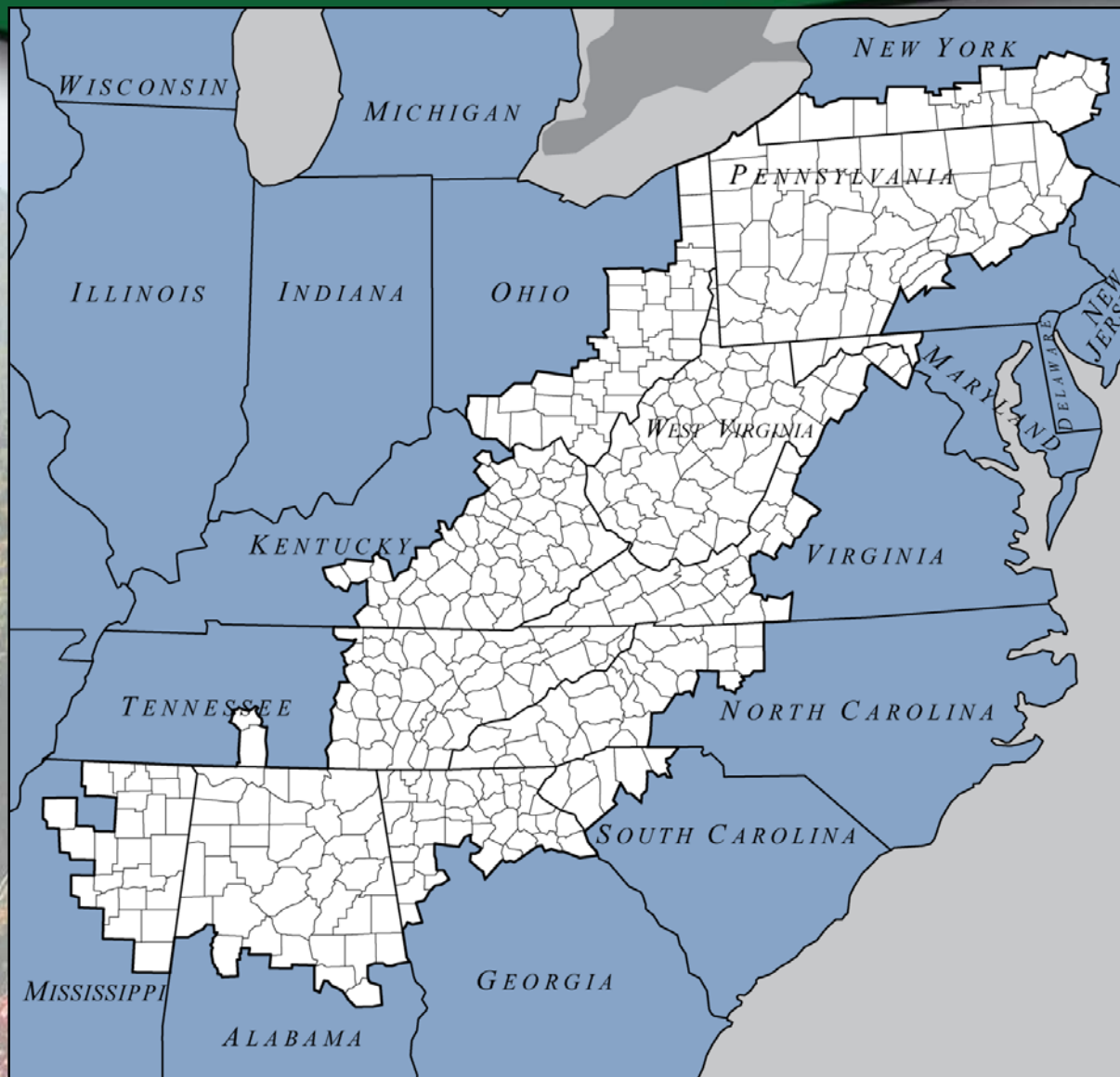
ADHS Economic Study – Today's Presentation

- Appalachian Regional Commission (ARC) and Appalachian Development Highway System (ADHS) Context
- Back-casting to estimate transport and economic impacts of ADHS system through 2015
- Forecasting of economic impacts, benefits, and costs of ADHS system completion
- Analysis of major ADHS corridors and impacts of accelerated completion

About the Appalachian Regional Commission (ARC)

- ARC is an economic development agency of the federal government and 13 state governments focusing on the Appalachian Region
- In 1965, Congress established the ARC to address the profound economic and social problems that made Appalachia a “region apart” from the rest of the nation
- The Appalachian Regional Development Act established a mandate to focus resources on reducing the socioeconomic gap between Appalachia and the nation

Appalachian Region



- Follows the spine of Appalachian Mountains from southern NY to northeastern MS
- Mountainous terrain, isolation, historical underinvestment
- 13 States, 420 counties
- 205,000 sq. miles
- Disproportionately rural
- Region of economic contrasts
- Tremendous assets:
 - Natural (forests, water, agriculture)
 - Cultural (arts, heritage),
 - Structural (leaders and institutions)

ARC – Vision, Mission, and Strategic Goals

Vision: *Appalachia is a region of great opportunity that will achieve socioeconomic parity with the nation*

Mission: *Innovate, partner, and invest to build community capacity and strengthen economic growth in Appalachia*

Strategic Goals:

1. Economic Opportunities
2. Ready Workforce
3. Critical Infrastructure
4. Natural and Cultural Assets
5. Leadership and Community Capacity

High-Poverty Counties in the Appalachian Region

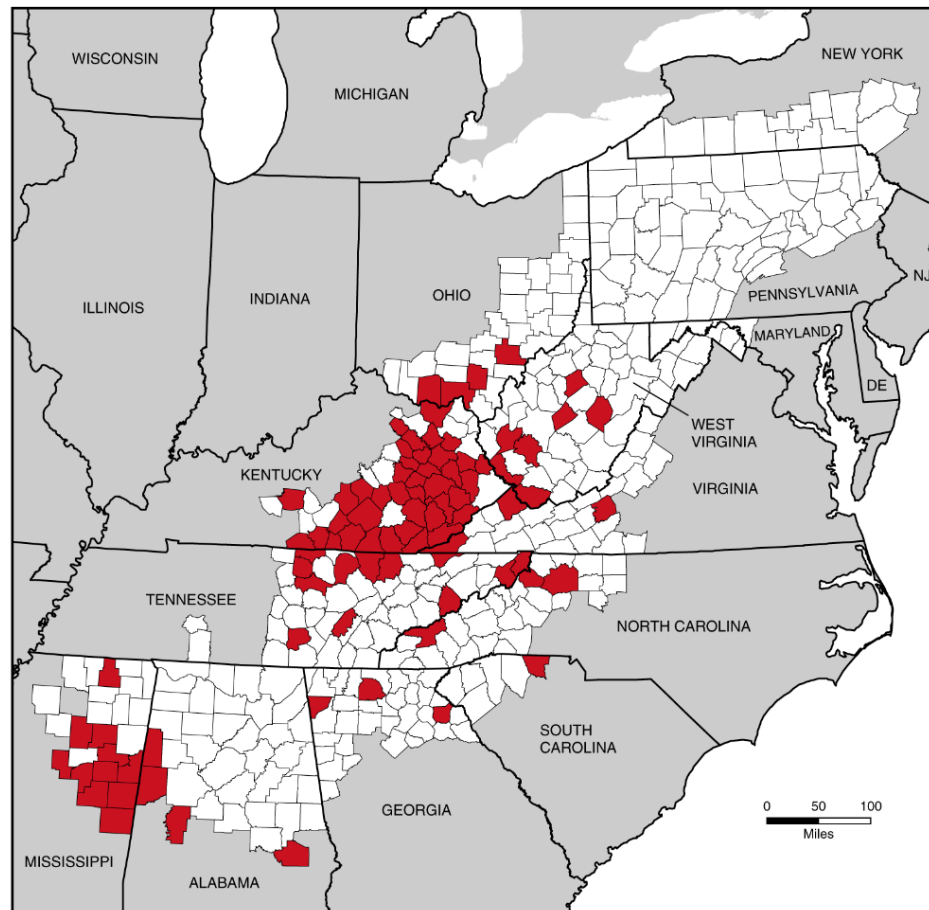
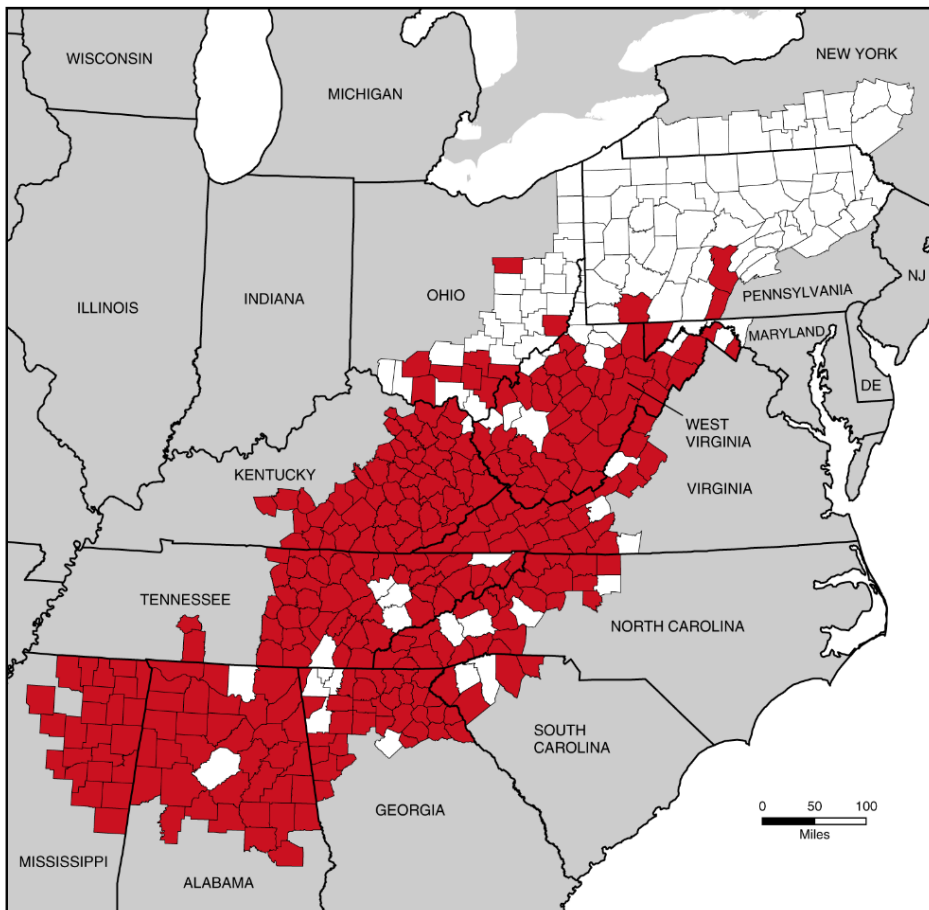
(Counties with Poverty Rates At Least 1.5 Times the U.S. Average)

1960

295 High-Poverty Counties

2011–2015

87 High-Poverty Counties



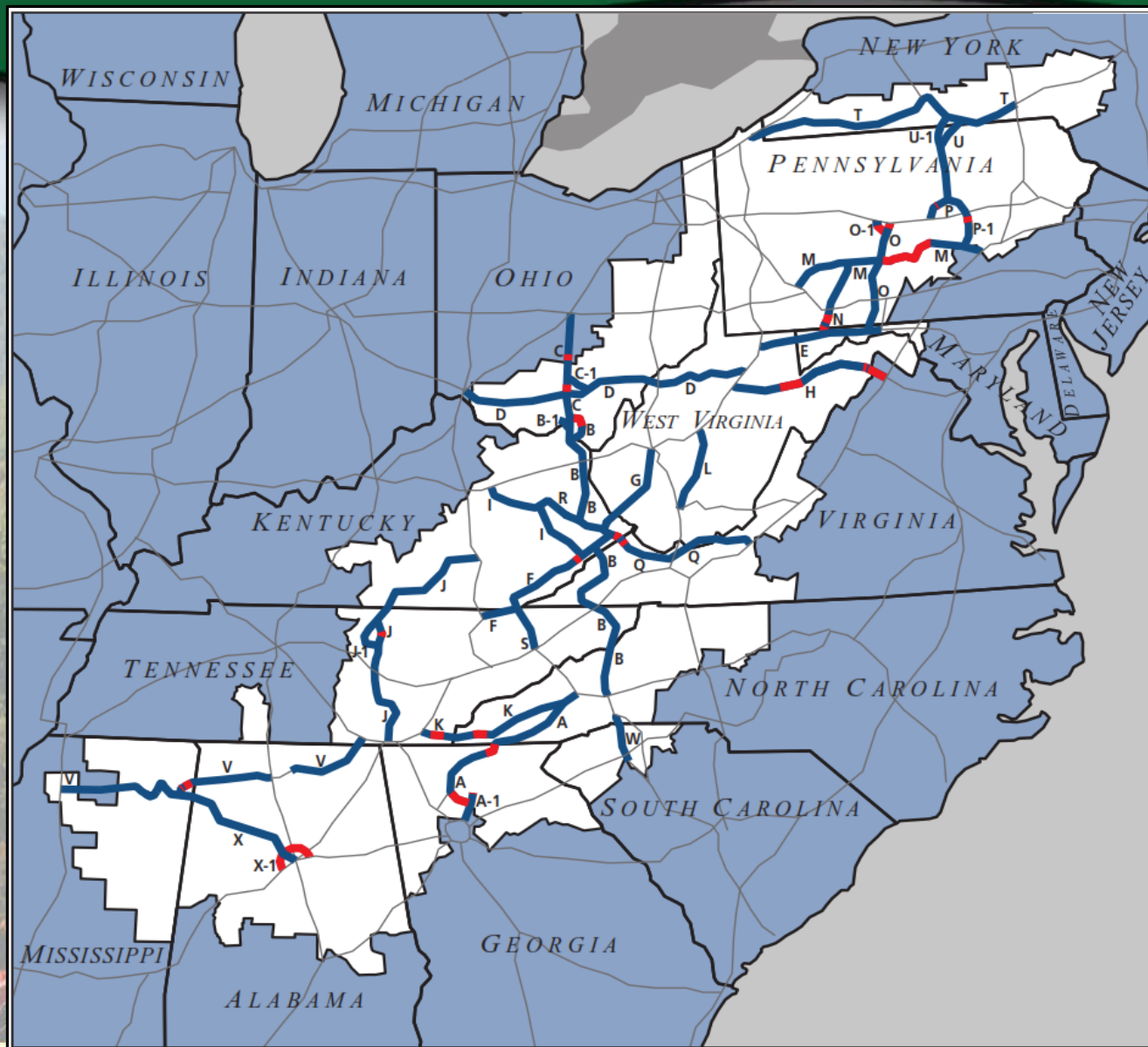
Data Source: Office of Economic Opportunity data from U.S. Dept. of Agriculture, Economic Research Service, 1960

Data Source: U.S. Census Bureau, American Community Survey, 5-Year Estimates, 2011–2015

Appalachian Development Highway System (ADHS)

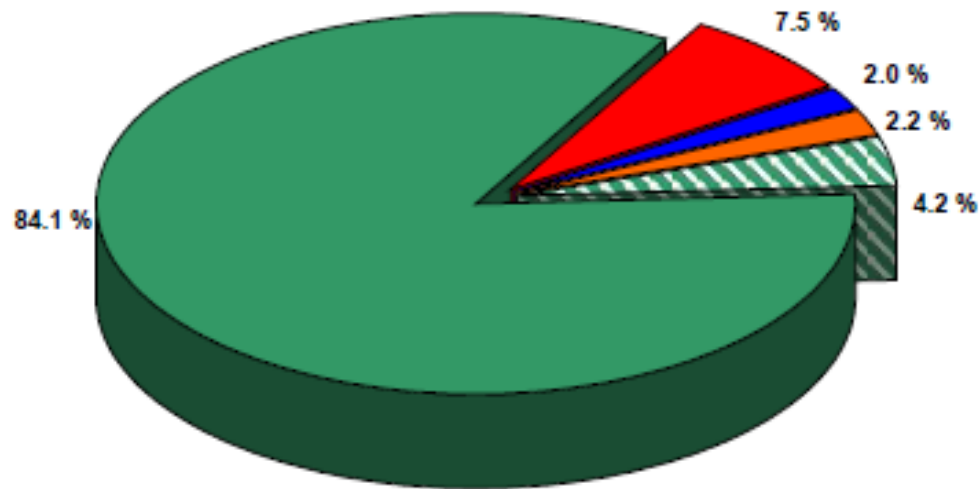
- Established by Congress in 1965
- System of corridors totaling 3,090 miles within the 13 Appalachian states
- Designed to generate economic development in previously isolated areas, connect Appalachia to the interstate system, and provide access to regional, national and global markets
- Between 1965 and 1999, funds were provided through annual appropriations
- TEA-21 and SAFETEA-LU provided annual authorizations of between \$450 Million and \$520 Million through FY 2012
- MAP-21 and the FAST Act did not provide specific authorization of funds for ADHS but did increase eligible share to 100% for remaining ADHS funds

ADHS Today and Corridors to Complete



ADHS Status of Completion as of 9/30/2017

Appalachian Development Highway System Status of Completion as of 9/30/2017 3090.1 Eligible Miles

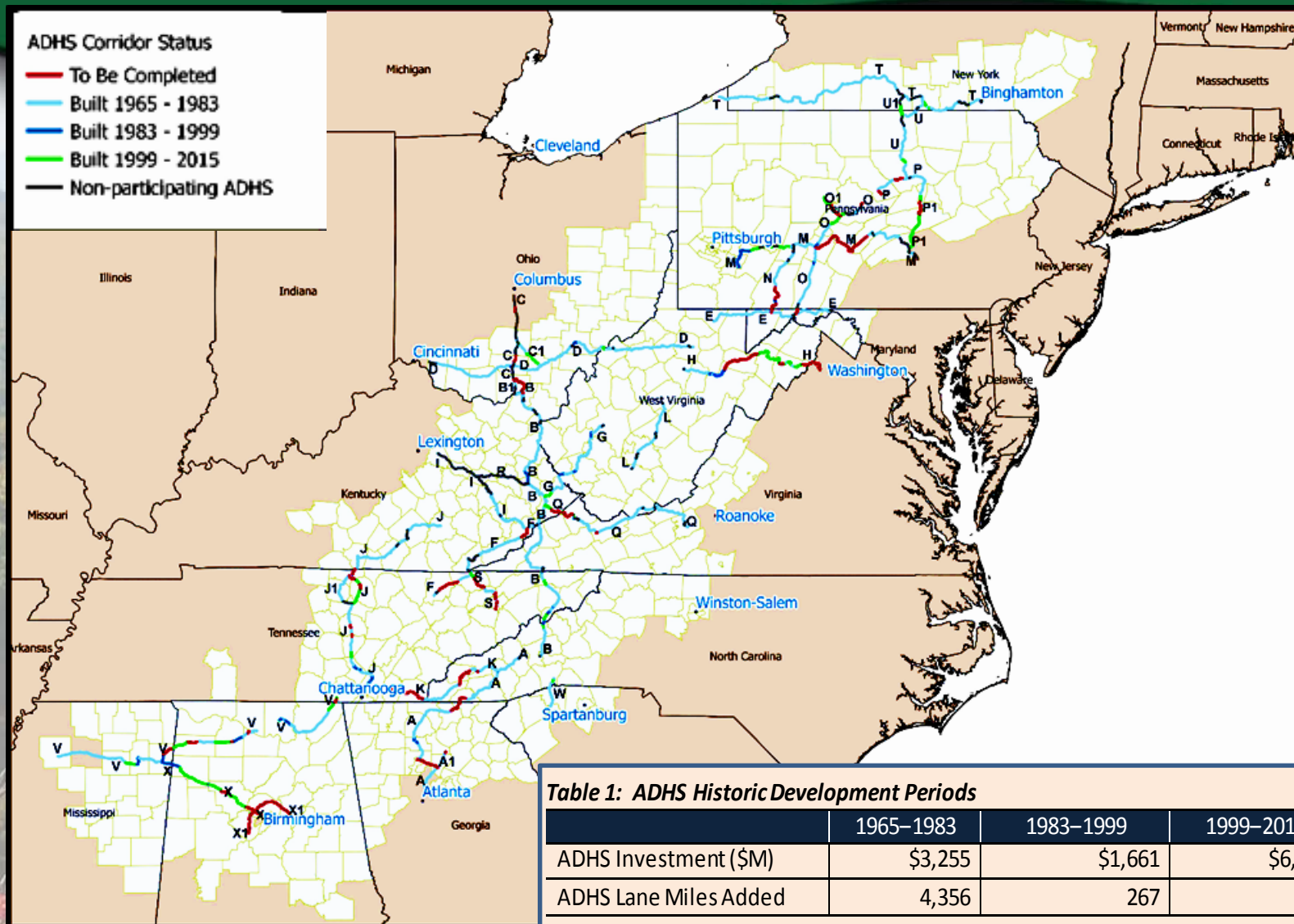


- Location
- Design/Right-of-Way
- Construction
- Open--Stage Construction Work Remaining
- Open--All Eligible Work Complete

Study Objectives and Key Impact Concepts

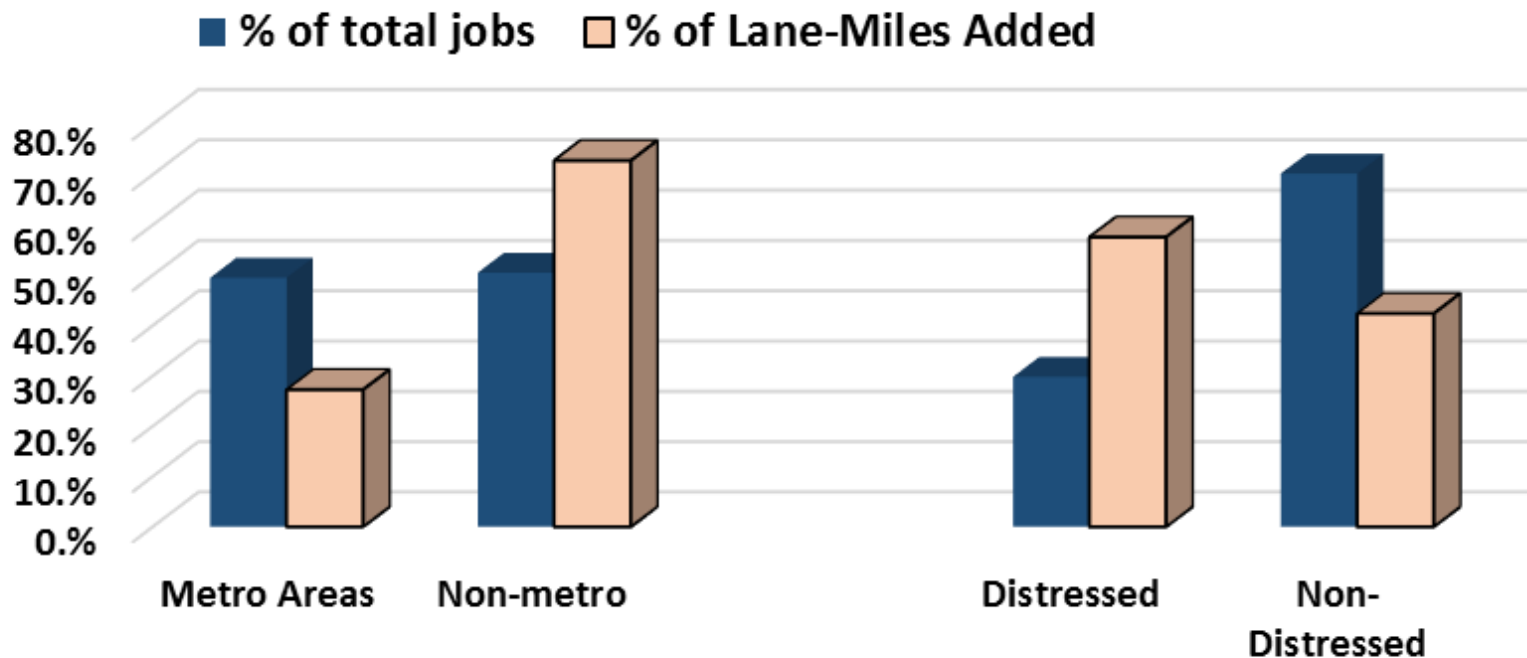
- **Back-cast:** What have been the transportation and economic impacts of ADHS investment so far (1965-2015)?
- **Forecast:** What are the economic impacts, benefits, costs and ROI of completing the ADHS (2016-2045)?
- **Travel Impact:** Modeling highway network with vs. without ADHS segments in place, to assess:
 - *Travel Efficiency Performance* (travel times, distances, costs) and
 - *Travel Accessibility* (labor market, same-day delivery market, intermodal terminal connectivity)
- **\$ Value** of Travel Time & Cost Savings
- **Economic development:** forecasting model calculates effects on job growth, GDP and wages

Back-casting – ADHS Projects 1965-2015



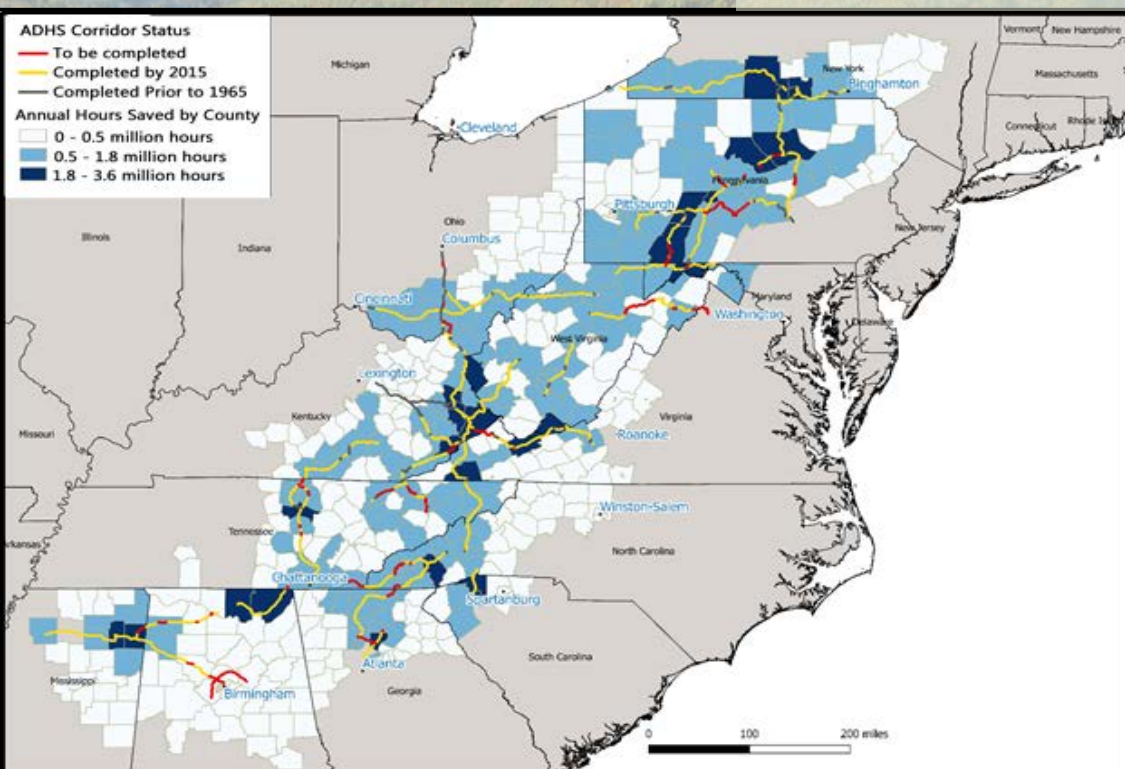
ADHS Investments Concentrated in Non-Metro and Distressed Areas

Percent of All ADHS Lane-Miles and All Employment Located in Various Classes of Counties



Travel Efficiency Benefits to 2015

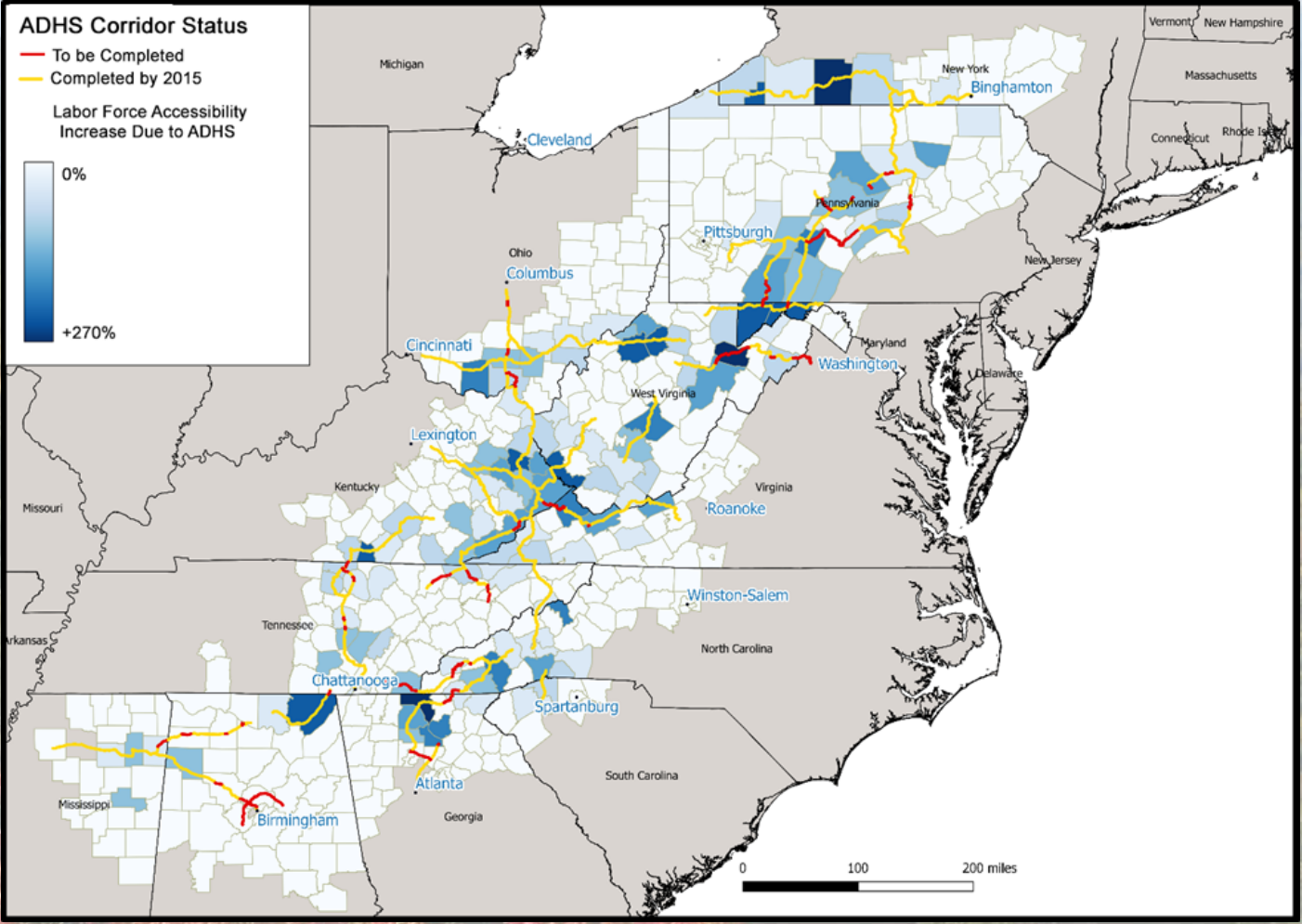
For all projects completed →	As of 2015
Total VHT Time Savings in 2015 (millions)	231.0
Car and Light Trucks	199.5
Freight Trucks	31.5
Total Reliability Time Savings in 2015 (millions)	129.1
Car and Light Trucks	111.5
Freight Trucks	17.6
Total Hours Saved (Reliability and VHT)	360.1



Travel time and reliability improvement by location of occurrence

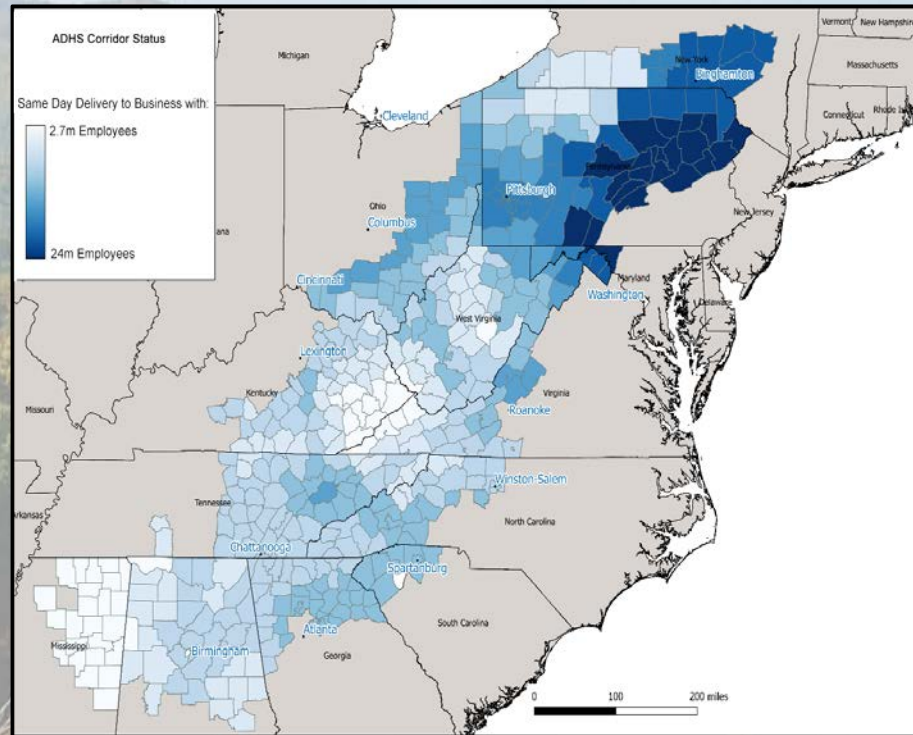
Labor Market Access Benefits to Date

% Increases in Workforce Access in 2015 from 1965-2015 ADHS Investment

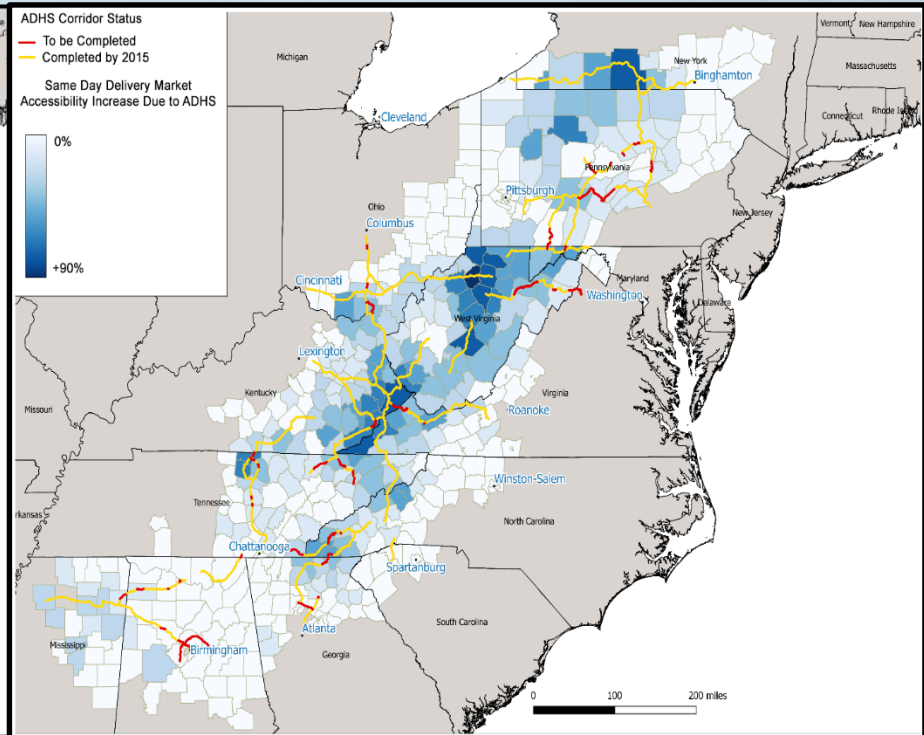


Same-Day Delivery Market Access to Date

Size of Same-Day Market Accessible from Appalachian Counties as of 1965

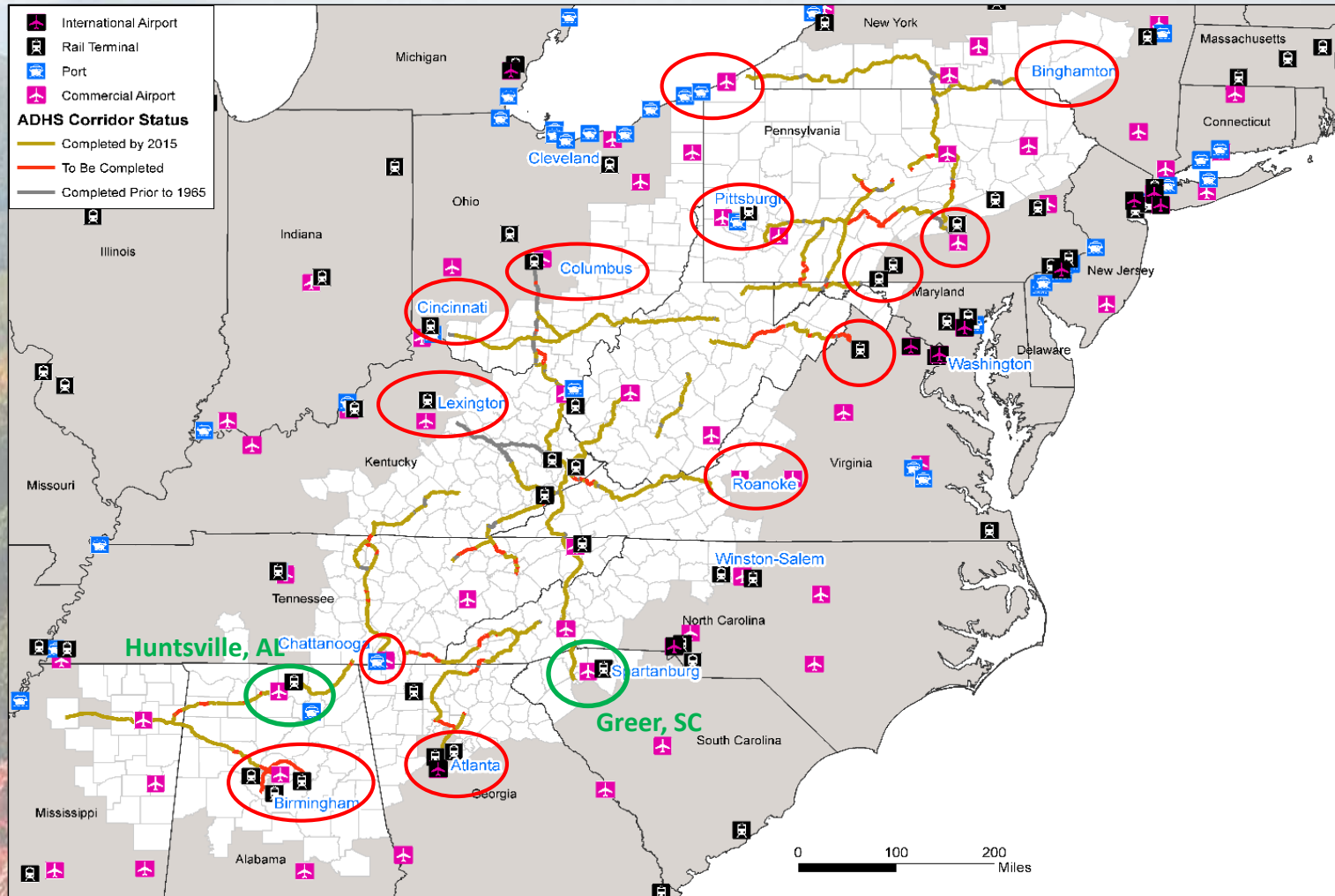


Percent Increase in Same-Day Market from Past ADHS Improvements (1965-2015)



Connecting to Intermodal Terminals in (and just beyond) Appalachia

ADHS Ties Appalachia to Air & Rail intermodal terminals



Examples of Appalachia Intermodal Facilities

Corridor V: Huntsville Intermodal Center (AL)

Connects Huntsville Airport, inter-modal rail + truck distribution centers via Corridor V to I-65 (Nashville and Birmingham)



Corridor W: Greer, SC Inland Port

Connects Spartanburg/Greenville (BMW, Michelin) via shuttle train to Charleston Port. Corridor W truck access to Tennessee (John Deere, Eastman Chemical).

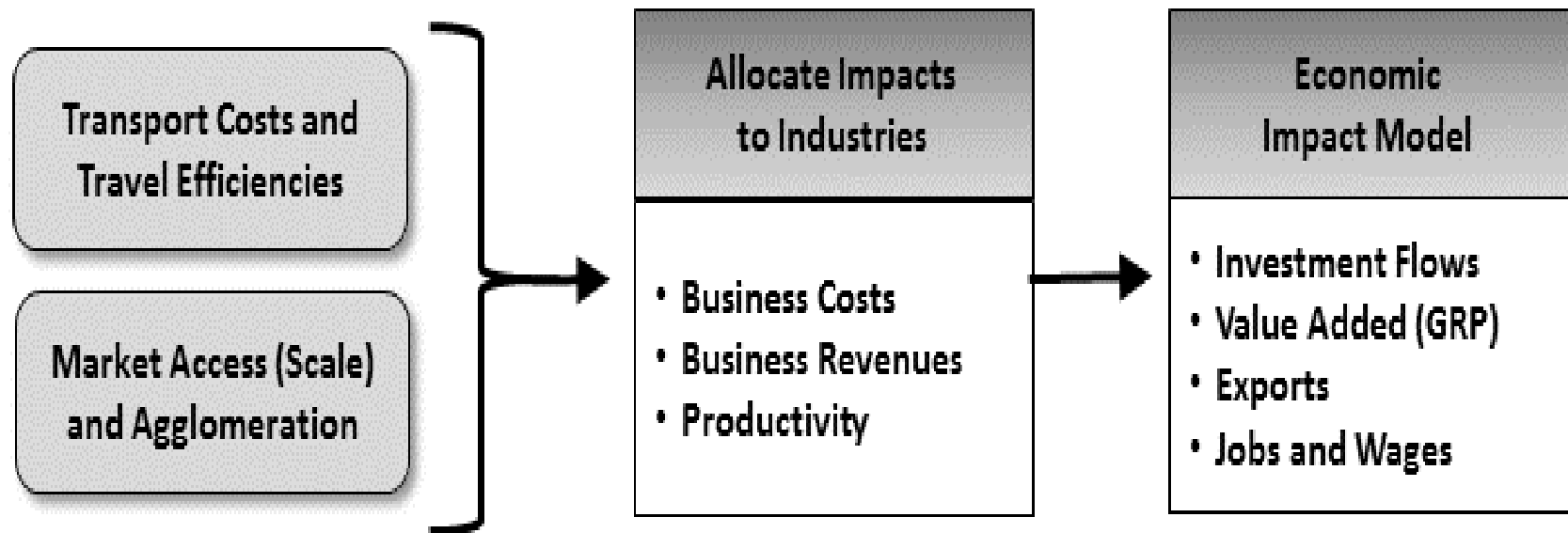


\$ Value of Travel Benefits as of 2015

Table 4: Value of Travel Efficiency Savings from Completed Projects as of 2015 (\$ millions/yr.)

Category of Value	Freight Truck	Car + Lt. Truck	Total
Vehicle Operating Cost Savings	\$930	\$2,473	\$3,403
Business Travel Time Cost Savings	\$1,431	\$2,261	\$3,692
Shipper/ Logistics Cost Savings	\$555	\$0	\$555
Personal Travel Time Savings	\$0	\$3,059	\$3,059
Total	\$2,916	\$7,793	\$10,709

Economic Impact Modeling of ADHS Investments

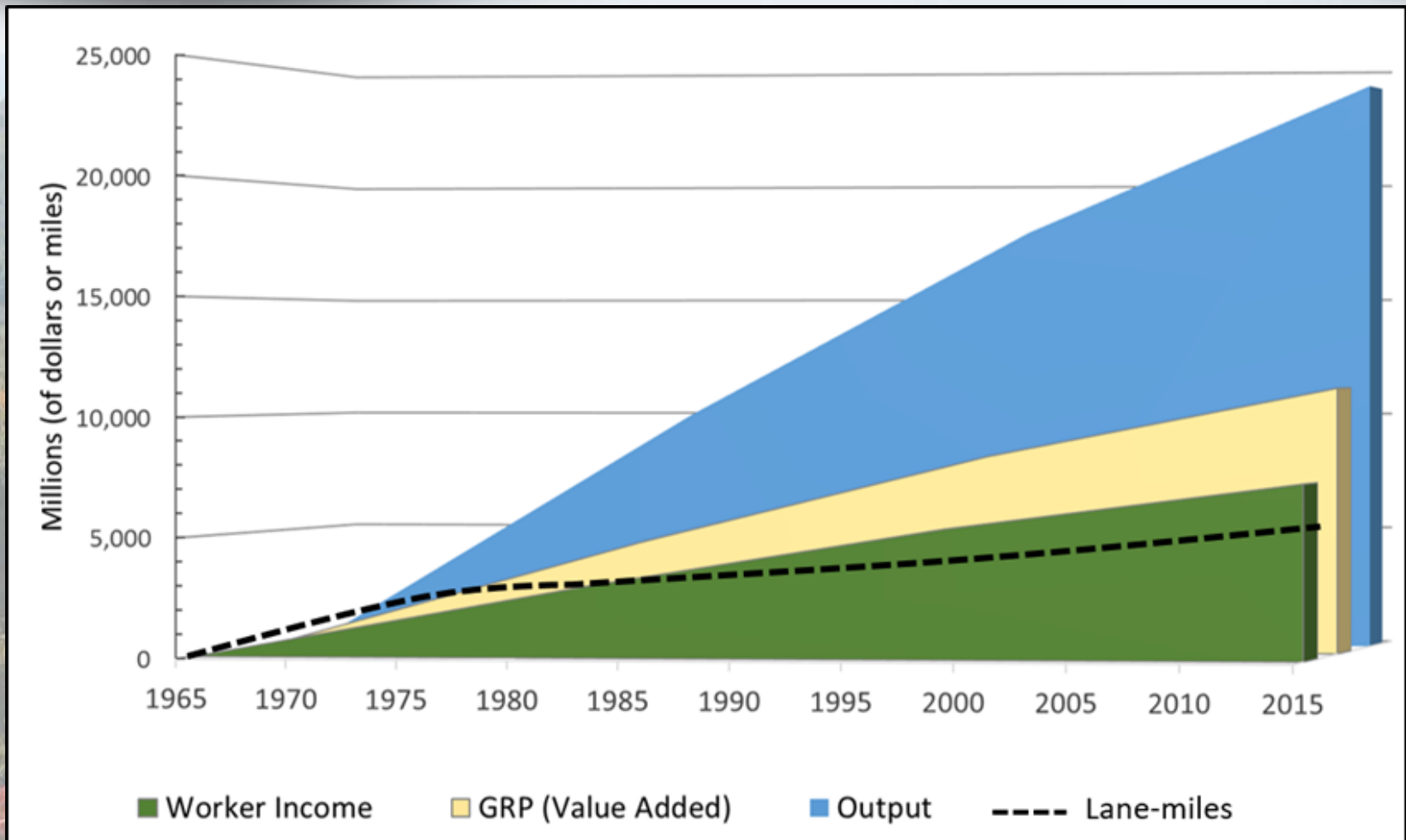


Economic Impact: Appalachia and States

Table 5: Impact of ADHS Projects on the Economy of Appalachia and Appalachian States

Increase compared to “no build” case	As of 1983	As of 1999	As of 2015
13-State Appalachian Region			
Business Output (Revenue) in \$M/year	\$9,959	\$15,207	\$24,183
GRP (Value Added) in \$M/year	\$4,611	\$7,037	\$11,173
Worker Income in \$M/year	\$3,006	\$4,587	\$7,282
Employment level (single year)	69,385	105,897	168,336
Lane-Miles Built to date	4,356	4,623	5,119
Appalachian Region			
Business Output (Revenue) in \$M/year	\$8,063	\$12,312	\$19,578
GRP (Value Added) in \$M/year	\$3,733	\$5,697	\$9,046
Worker Income in \$M/year	\$2,434	\$3,714	\$5,895
Employment level (single year)	56,174	85,734	136,284
Lane-Miles Built to date	3,527	3,743	4,144

Economic Impact over Time (1965-2015)



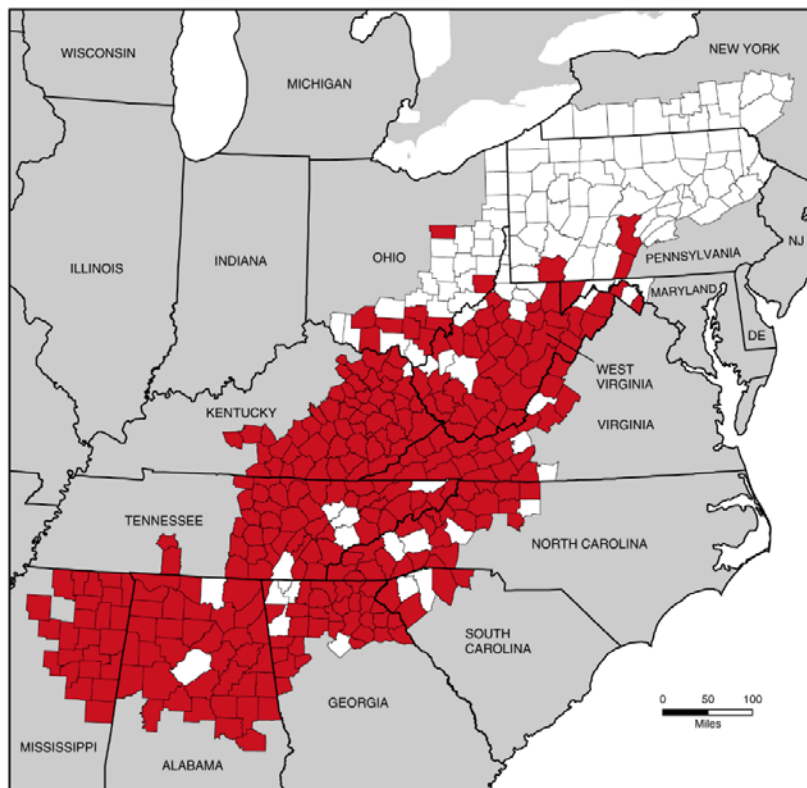
Reduction in Appalachian Poverty by County – 1960 to 2010/2014

High-Poverty Counties in the Appalachian Region

(Counties with Poverty Rates At Least 1.5 Times the U.S. Average)

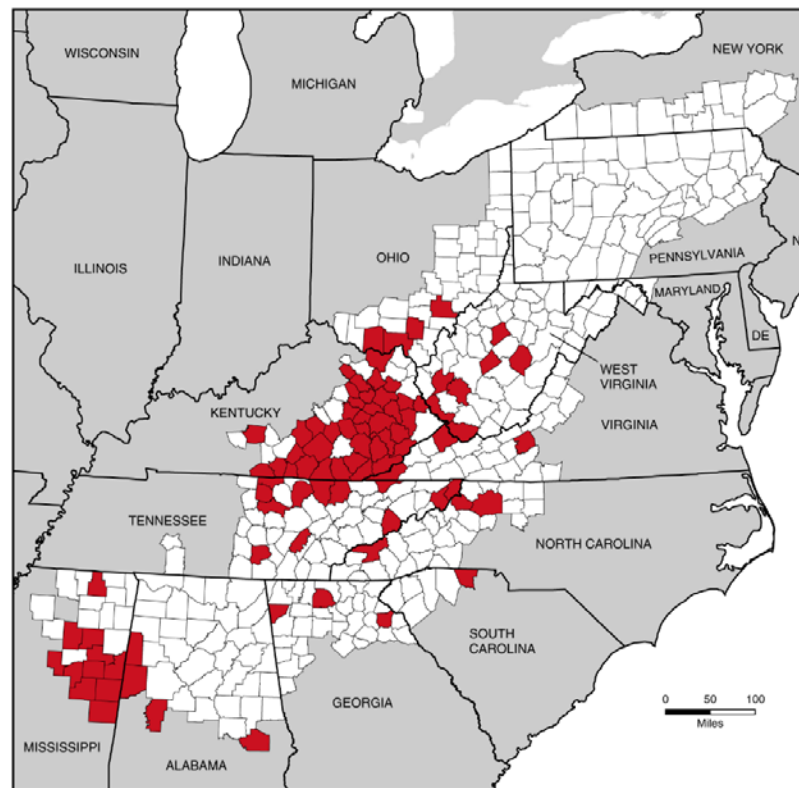
1960

295 High-Poverty Counties



2011–2015

87 High-Poverty Counties



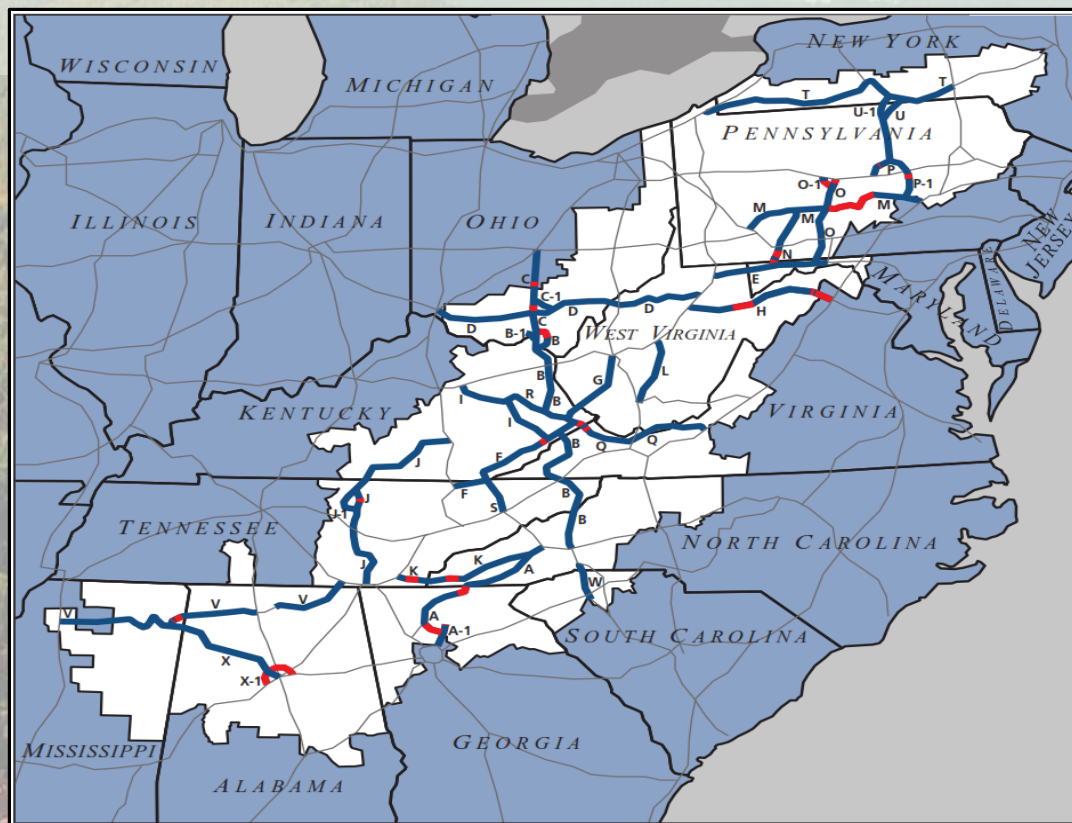
Data Source: Office of Economic Opportunity data from U.S. Dept. of Agriculture, Economic Research Service, 1960

Data Source: U.S. Census Bureau, American Community Survey, 5-Year Estimates, 2011–2015

Forecasting Analysis – ADHS Completion: 2016 to 2045

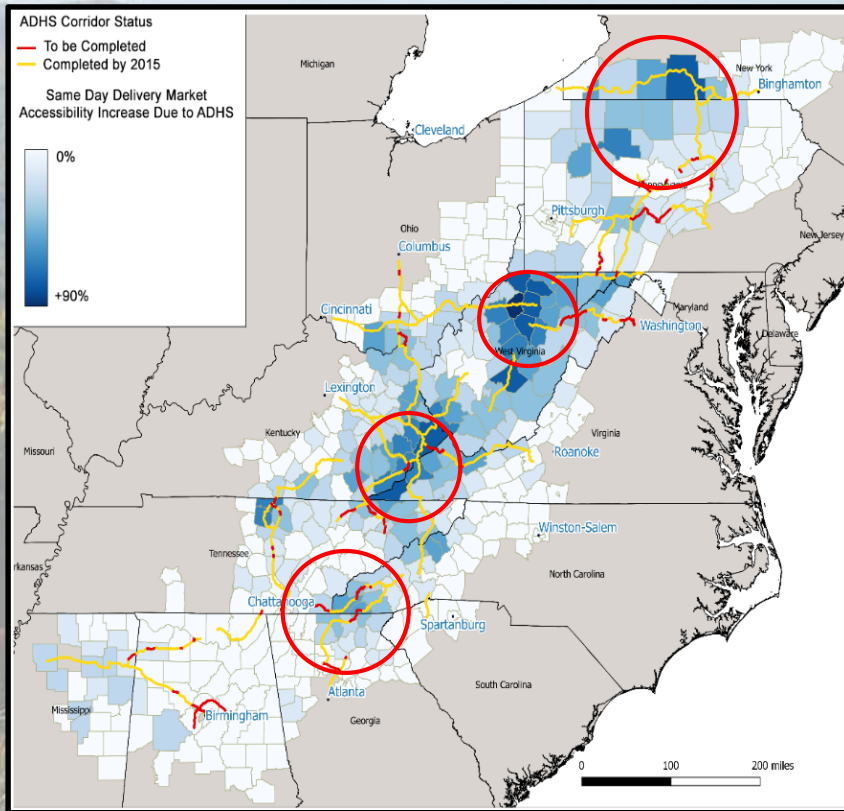
Table 6: Future Completion of the ADHS by Investment and Miles Over Time

	2016–2025	2026–2035	2036–2045	Total
ADHS Cost to Complete (\$M)	\$3,374.0	\$2,192.4	\$5,348.4	\$10,914.8
Highway Miles to be Completed	120.6	57.3	117.4	295.3

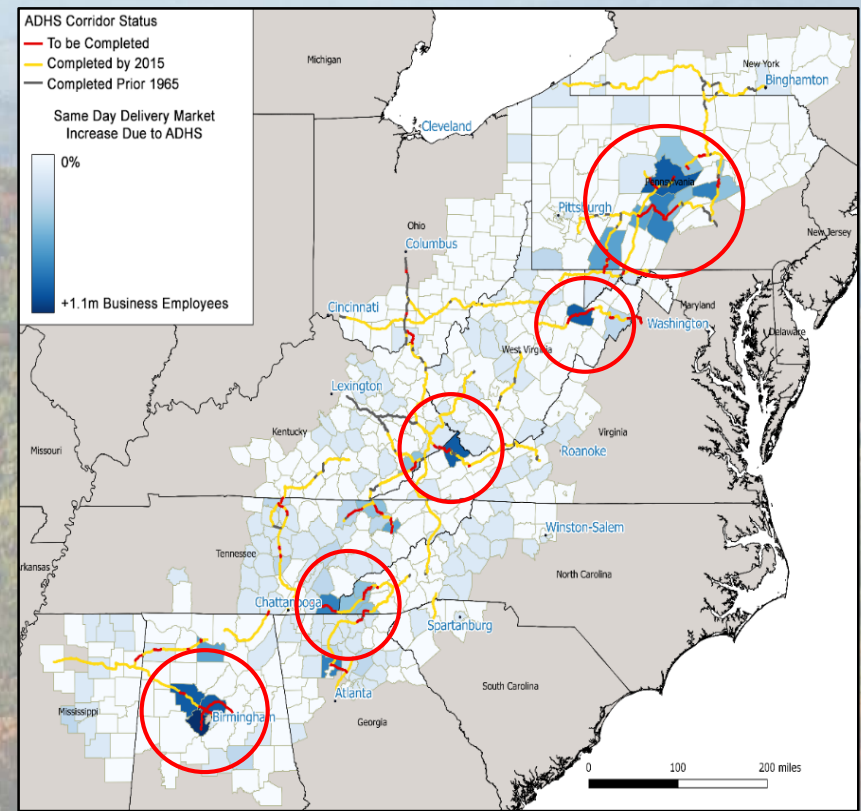


Same-Day Delivery Market Access by 2045

Percent Increase in Same-Day Delivery Market, 1965-2015

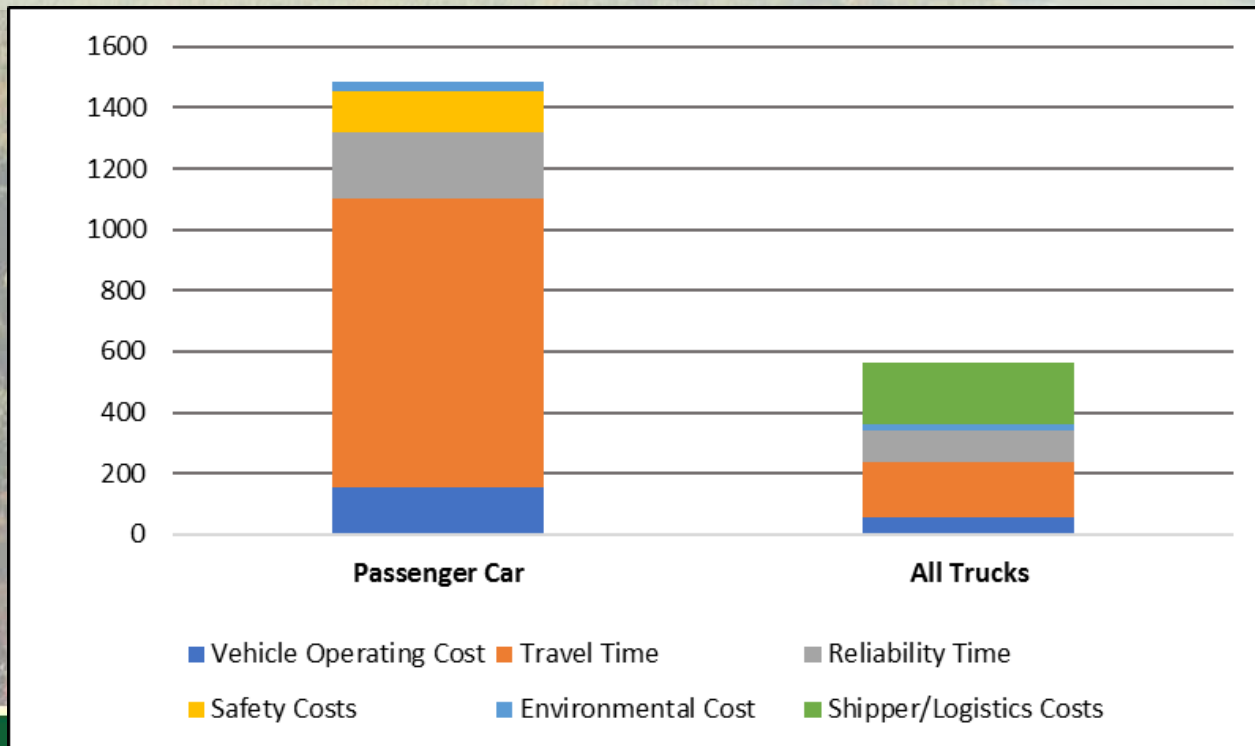


Percent Increase in Same-Day Delivery Market, 2016-2045



Value of Travel Benefits by 2045

Category of Value	2025	2035	2045
Vehicle Operating Cost	\$48.2	\$59.7	\$212.5
Travel Time	\$259.1	\$319.0	\$1,128.1
Reliability Time	\$72.4	\$89.8	\$321.0
Safety Costs	\$29.8	\$36.4	\$127.9
Environmental Cost	\$6.9	\$10.4	\$45.7
Shipper/Logistics Costs	\$42.6	\$54.7	\$201.4
Market Access (productivity gain only)	\$128.1	\$230.0	\$248.9
Total	\$587.1	\$799.9	\$2,285.6



Economic Impact 2045: Appalachia & 13 States

Table 10: Annual Economic Impacts of ADHS Completion (In Constant Dollars)

Annual Economic Impact of Completing ADHS *	Appalachia			Appalachian States		
	As of 2025	As of 2035	As of 2045	As of 2025	As of 2035	As of 2045
Business Output (\$M Sales)	\$2,982	\$4,855	\$6,717	\$3,875	\$6,299	\$8,704
Value Added (\$M GRP)	\$1,450	\$2,356	\$3,269	\$1,883	\$3,056	\$4,236
Wage Income (\$M Earned)	\$909	\$1,474	\$2,063	\$1,181	\$1,913	\$2,673
Employment (Jobs)	19,821	29,674	36,156	25,751	38,502	46,849

Top industries impacted by ADHS completion: professional and business services, leisure and hospitality, education and health care, retail trade, manufacturing, warehousing and transportation

ADHS Completion: Benefit-Cost Analysis

Discounted net present value of 2016-2045 benefits and costs

Benefit and Cost Elements	Regional Perspective	National Perspective
	with 7% discount rate	with 7% discount rate
Vehicle Operating Cost Savings	\$1,053	\$1,659
Travel Time Saved	\$5,602	\$8,622
Reliability Time Saved	\$1,589	\$2,526
Safety Benefit	\$637	\$950
Environmental & Emissions Benefit	\$223	\$358
Logistics and Supply Chain Savings	\$986	\$1,786
Market Access (Productivity Gain)	\$1,994	\$419
Total Cumulative Benefits	\$12,083	\$16,320
Total Cumulative Costs	\$4,471	\$4,471
Benefit-Cost Ratio	2.7	3.7

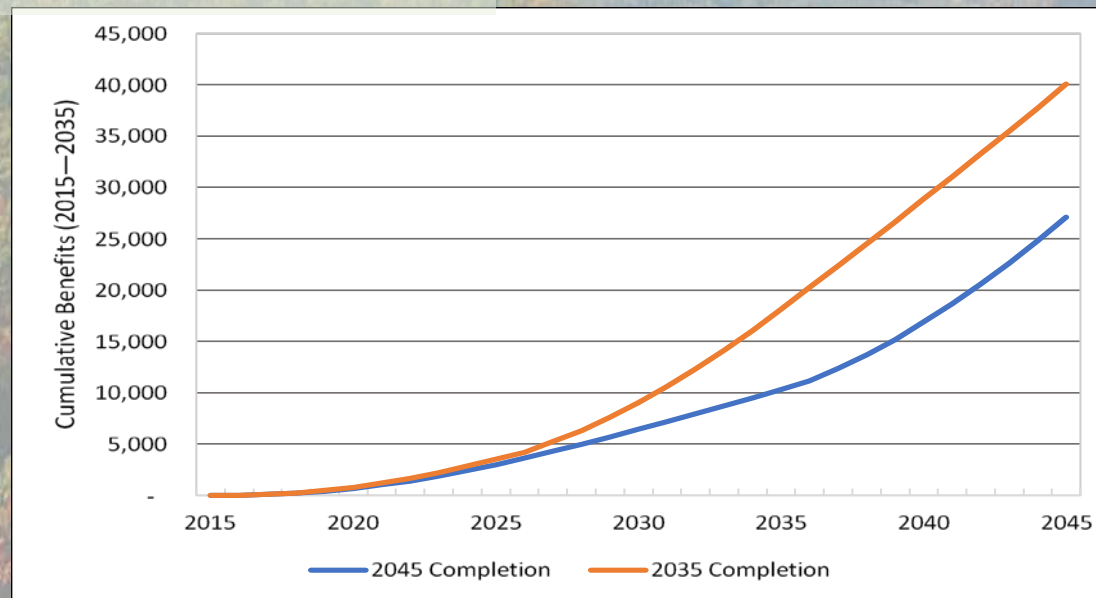
Benefit-cost ratios increase to 5.1 for the region and 7.1 for the US if using a 3% discount rate

Impact of Accelerating ADHS Completion – 2035 versus 2045 – Large Projects Accelerated

Corridor Name	State	Estimated Completion Year (2045 or sooner)	Assumed Completion Accelerated Schedule (2035 or sooner)	Estimated Cost (Undiscounted) \$M
Corridor H	West Virginia	2042	2035	\$810.0
	Virginia	2026	2026	\$138.3
Corridor K	Tennessee	2025	2025	\$535.5
	North Carolina	2028	2028	\$760.5
Corridor M	Pennsylvania	2045*	2035	\$1,477.1
Corridor N	Pennsylvania	2045*	2035	\$510.1
	Maryland	2022	2022	\$183.9
Corridor Q	Virginia	2021	2021	\$474.1
	Kentucky	2019	2019	\$371.2
Corridor X1	Alabama	2045	2035	\$2,966.4
Other Corridors	Multiple States	varies	varies	\$2,687.7
All Corridors	Multiple States	varies	Varies	\$10,914.8

Impact of Accelerating ADHS Completion – 2035 versus 2045

Benefit and Cost Elements	Cumulative Value (2015-2035)	Cumulative Value (2015-2035)
	2045 Completion	2035 Completion
Vehicle Operating Cost Savings	\$820	\$1,537
Travel Time Saved	\$4,396	\$8,231
Reliability Time Saved	\$1,231	\$2,315
Safety Benefit	\$505	\$944
Environmental and Emissions Benefit	\$125	\$243
Logistics and Supply Chain Savings	\$732	\$1,382
Market Access (Productivity Gain)	\$2,511	\$3,497
Total Cumulative Benefits	\$10,320	\$18,149

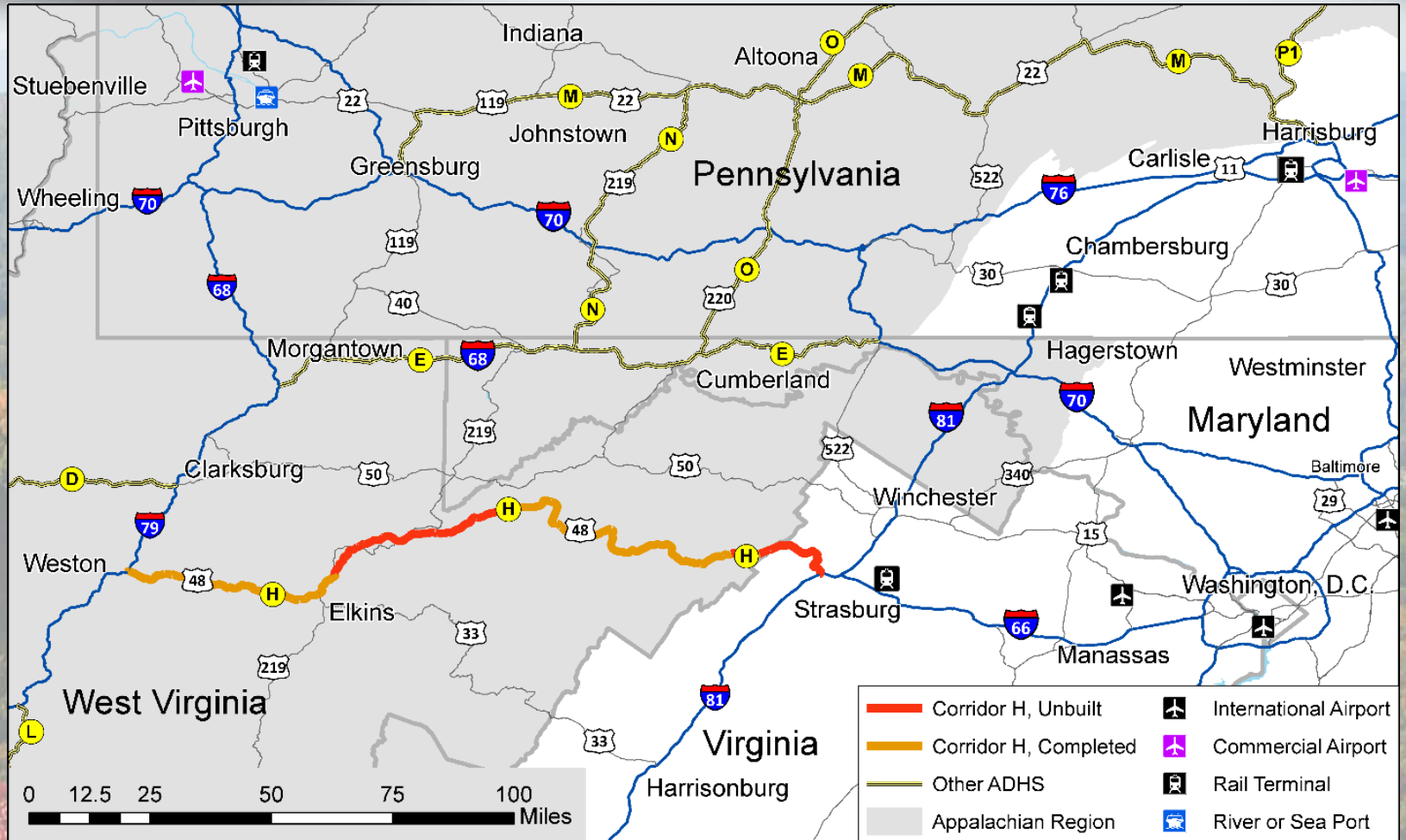


Major Corridor-Specific Analysis: Impacts & Benefit-Cost Analysis

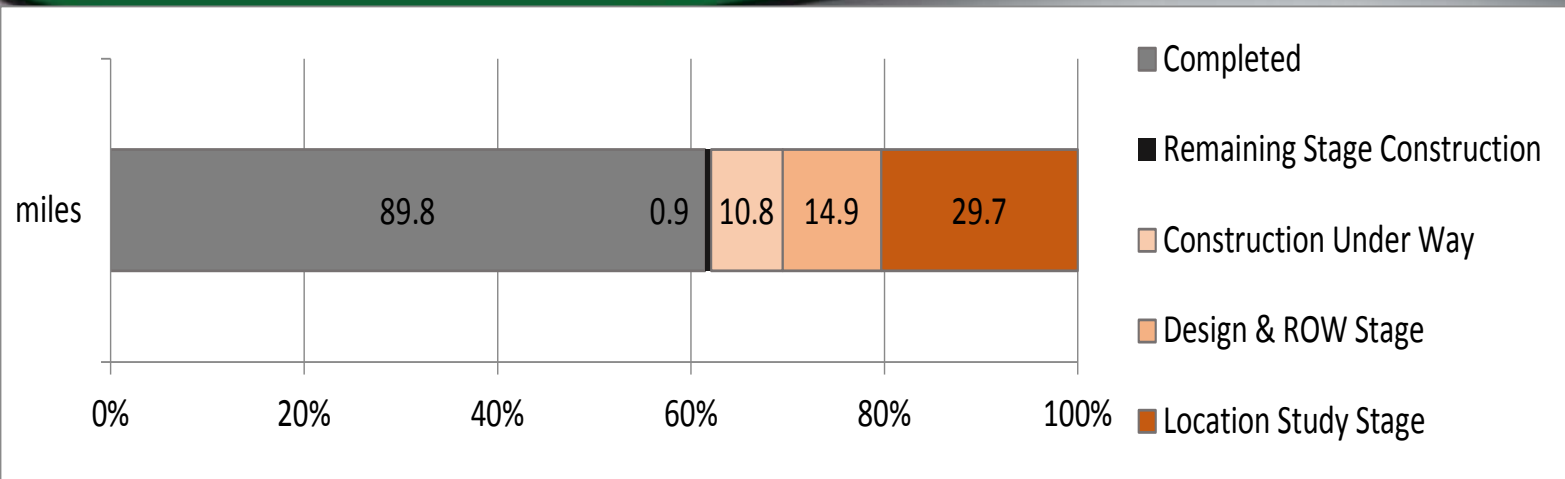
	H	K	N	Q	X1
Investment Cost (\$ mil)	948	1,296	694	845	2,966
Benefit-Cost Analysis					
Societal Benefits (\$ mil, discounted 7%)	761	1,623	373	1,458	3,078
Cost (\$ mil, discounted 7%)	278	887	239	739	727
Benefit-Cost Ratio	2.7	1.8	1.6	2.0	4.2
Economic Impact Analysis					
Gross Regional Product (after 10 yrs) (\$ mil)	166	205	61	97	1,395
Employment Change (after 10 Yrs)	1,852	2,368	700	987	13,937

The estimated benefit-cost ratio is over 1.0 for all major corridors, meaning benefits are expected to exceed costs, resulting in a positive ROI

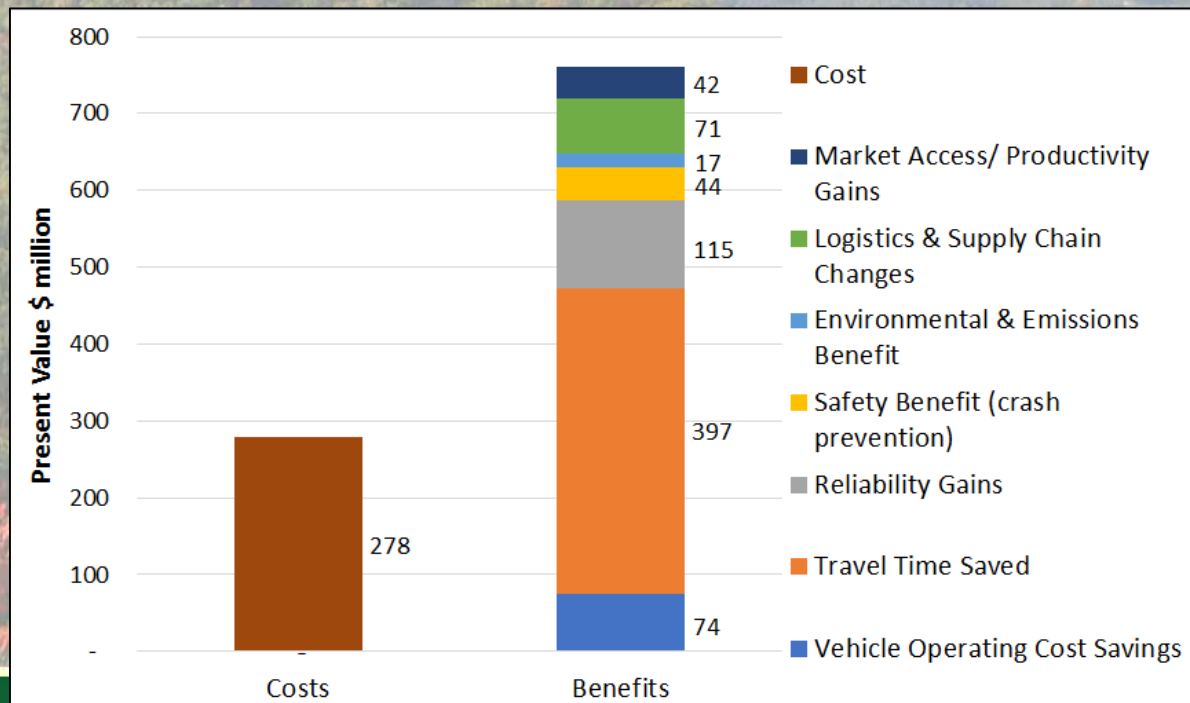
Corridor H – WV and VA



Corridor H – WV and VA: Strong ROI



The estimated benefit-cost ratio is 2.7 to 4.8 (depending on discount rate assumption)



Summary of Findings

ADHS Investment to Date

- Significant travel time, reliability, labor access, business delivery gains
- Cost savings + productivity gains of \$10.7 billion/year as of 2015
- 20% of car benefits, 31% of truck benefits are outside of the 13 states
- Accountable for 168,000 jobs and \$11 billion of GRP/yr. as of 2015

Forecast ADHS Completion

- Expect 121 million hours of more time savings/year by 2045
- Cost savings + productivity gains of \$1.8 billion/year as of 2015
- Present value of benefits/costs = 3.7 return on investment (ROI)
- Expected to enable +47,000 jobs and +\$4.2 billion of GRP/yr. by 2045 (77% of gains in Appalachian counties, rest elsewhere in 13 states) (jobs concentrated in knowledge industries, also tourism)

Final report documents online at:

https://www.arc.gov/research/researchreportdetails.asp?REPORT_ID=135

Research Consultant: EDR Group and WSP / Parsons Brinckerhoff

Questions? Contact

Ryan Brumfield, rbrumfield@arc.gov

Dan Hodge, dan@hodge-econ.com

Resources – links available in download pod

- FHWA: <https://www.fhwa.dot.gov/specialfunding/adhs/>
- ARC: <https://www.arc.gov/adhs>
- ADHS technical report documents:
https://www.arc.gov/research/researchreportdetails.asp?REPORT_ID=135
- FHWA economic development resources
https://www.fhwa.dot.gov/planning/economic_development/
 - Recordings of previous webinars
 - Case studies
 - Link to ITED information
- International Transportation and Economic Development (ITED) conference, June 6-8 in Washington, DC