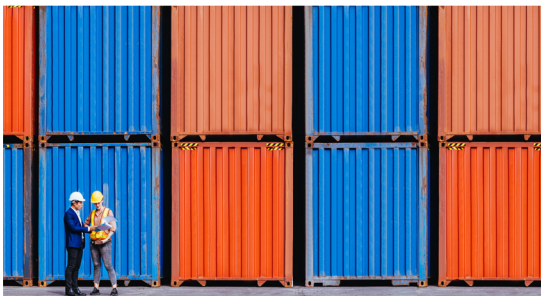
SEPTEMBER 2021
IB: 21-09-B

ISSUE BRIEF

# CLEAN TRUCKS NEW JERSEY CAN REDUCE THE STATE'S TRUCK POLLUTION PROBLEM

Tailpipe pollution from cars, trucks, and buses is the leading source of harmful air pollution in New Jersey.[1] Each year, vehicles on New Jersey's roads release tons of smog-forming pollutants and particulate matter, which have been linked to increased illness and death, primarily from heart and lung diseases.[2] While New Jersey's 423,000 commercial trucks and buses account for less than 10 percent of all vehicles on the road, they are responsible for 44 percent of emissions of nitrogen oxides (NOx)—a precursor to smog—and 39 percent of fine particulate matter from all on-road vehicles, causing an outsize impact on the public health of New Jersey residents.[3] These emissions disproportionately impact communities of color, according to an analysis by the Union of Concerned Scientists of air pollution data available for 2014 for the Northeast and Mid-Atlantic regions.[4]

In addition to contributing to air pollution, the transportation sector accounts for 42 percent of greenhouse gas emissions in New Jersey.[5] Electrifying the transportation sector is vital to achieving the state's climate goal of an 80 percent reduction in emissions by 2050 (relative to 2006 levels) under the Global Warming Response Act.[6] New Jersey's 2019 Energy Master Plan states that "the transportation sector should be almost entirely decarbonized by 2050."[7] It also recommends that the state take "concrete steps to start to phase out motor gasoline and diesel consumption as quickly as possible."

New Jersey has already started to reduce emissions from passenger vehicles, but full decarbonization of all vehicles in the state is the ultimate goal. Moreover, replacing high-polluting diesel trucks and buses with zero-emission vehicles (ZEVs) is an important first step in reducing GHG emissions and alleviating some pollution impacts for New Jersey communities that live along transportation corridors or in heavily trafficked areas.[8] Luckily, the technology to make these changes already

For more information, please contact:
Simon Mui, Ph.D., smui@nrdc.org
Kevin Shen, kshen@ucsusa.org

www.nrdc.org
www.ucsusa.org

exists: Around the world, zero-emission technologies—such as battery electric and fuel cell vehicles—have been developed commercially and are being deployed globally as regional and long-haul semi-trucks, box trucks, large pickup trucks, and school and transit buses.[9] All that is needed now is the political will to implement programs that will replace dirty diesel trucks with zero-emission trucks throughout the state.

## A "CLEAN TRUCKS NEW JERSEY" PROGRAM WOULD ENCOURAGE ZERO-EMISSION TRUCKS THROUGHOUT THE STATE

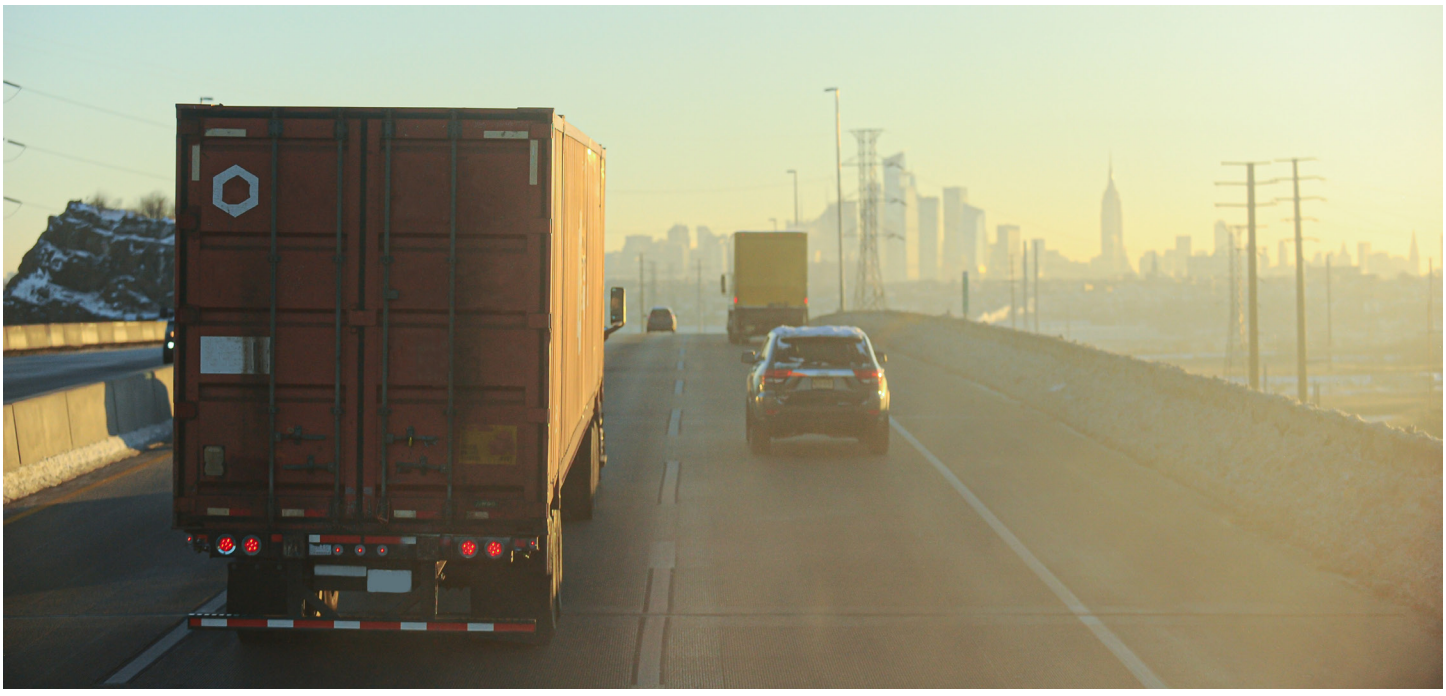
New Jersey is taking steps in the right direction. In July 2020 under Governor Phil Murphy, New Jersey joined 14 other states and Washington, D.C., in committing to accelerating deployment of zero-emission trucks and buses, including a goal of ensuring that 30 percent of all new truck sales are zero-emission by 2030, increasing to 100 percent by 2050.[10] To support this commitment, the New Jersey State Department of Environmental Protection should use the authority given to it by the federal Clean Air Act and adopt a Clean Trucks New Jersey program to encourage zero-emission truck deployment.[11] New Jersey should also work with neighboring states to adopt similar programs, since trucks registered in those neighboring states frequently operate in New Jersey as well.

Clean Trucks New Jersey should be built on two foundational policies for trucks that are also being considered by surrounding states including New York, Connecticut, and Massachusetts:[12]

- **The Advanced Clean Truck (ACT) rule.** This would provide a mechanism for the state to achieve—on a more aggressive timeline—its electric truck and bus goals by requiring truck manufacturers to increase their sales of zero-emission trucks to between 40 percent and 75 percent of the market, depending on the type of truck, between model years 2025 and 2035.
- **The Heavy-Duty Omnibus (HDO) rule.** This would require manufacturers of internal combustion–engine trucks to reduce emissions of NOx by by 75 percent, relative to current standards, in model year 2025 and by 90 percent starting in model year 2027.

While adopting the ACT and HDO rules under a Clean Trucks NJ program are important first steps, New Jersey must also adopt additional measures designed specifically to ensure reductions in air pollution from transportation in communities of color and low-income communities (i.e., environmental justice communities). Environmental justice communities are exposed to disproportionately high levels of air pollution in New Jersey and across the country.[13] The ACT and HDO rules are state-level rules for manufacturers; they do not require that fleets specifically deploy or utilize zero-emission trucks or that they limit the use of existing dirtier trucks in environmental justice communities. New Jersey must fill this gap with additional regulations.

Therefore, any Clean Trucks NJ program must come in combination with other policies and programs such as creating zero-emission zones where the use of internal combustion engine vehicles is limited; replacing and retrofitting existing diesel equipment; establishing deployment and incentive programs for EV charging infrastructure; and mandating emission-reduction measures that target environmental justice communities, transportation corridors, and port regions.[14]



## CLEAN TRUCKS NJ WILL REDUCE UNHEALTHY SMOG AND AIR TOXICS

To understand the benefits of Clean Trucks NJ, MJ Bradley & Associates (MJB&A) produced a new, independent report, *New Jersey Clean Trucks Program: An Analysis of the Impacts of Zero-Emission Medium- and Heavy-Duty Trucks on the Environment, Public Health, Industry, and the Economy*. Relative to a business-as-usual case, the consultancy analyzed three scenarios, under which (1) New Jersey adopts an ACT rule; (2) the state adopts both an ACT and an HDO rule; and (3) the state goes further, under a "100 x 40" approach, and achieves 100 percent ZEV sales across all truck categories by 2040 while also achieving a cleaner electricity grid mix. Scenario 2, adoption of both the ACT and the HDO rules, is most representative of what a Clean Trucks NJ program could achieve (though it is worth noting that the study did not identify the specific communities that would experience pollution reductions, nor the magnitude of reductions in specific communities).

According to the study, Scenario 2 (or Clean Trucks NJ) would result in cumulative reductions from 2024 through 2050 of 245 tons of fine particulate matter and more than 144,000 tons of NOx. In 2050, this would be equivalent to an 82 percent reduction in NOx and 13 percent reduction in $PM_{2.5}$ compared with business as usual. If the state adopted more ambitious policies in addition to Clean Trucks NJ, resulting in Scenario 3's "100 x 40" parameters, New Jerseyans could see approximately 33 percent greater public health benefits compared with the ACT plus HDO rules case (Table 1).[15]

**TABLE 1: CUMULATIVE PUBLIC HEALTH BENEFITS OF A NJ CLEAN TRUCKS PROGRAM UNDER THREE SCENARIOS, 2024–2050**

| Health Metric | Scenario 1: ACT Rule Only | Scenario 2: ACT and HDO Rules (Clean Trucks NJ) | Scenario 3: 100 percent ZEVs by 2040 |
|---|---|---|---|
| Avoided Health Cases | 50,095 | 135,770 | 181,409 |
| Avoided Premature Deaths | 85 | 228 | 303 |
| Avoided Hospital Visits | 91 | 246 | 325 |
| Monetized Value (2020$, millions) | $994 | $2,662 | $3,543 |

"Avoided Hospital Visits" includes hospital admissions and emergency room visits. "Avoided Health Cases" includes reduced cases of acute bronchitis, exacerbated asthma, and other respiratory symptoms, as well as reduced restricted-activity days and lost workdays.

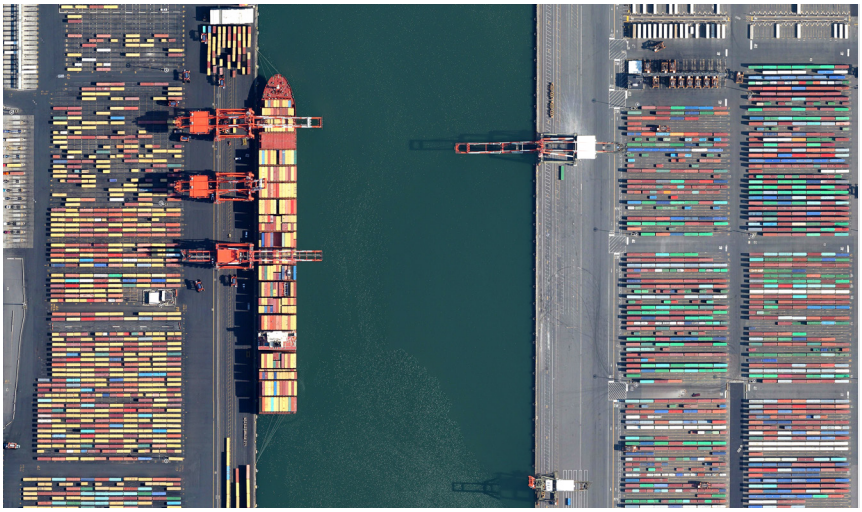
*Source:* MJ Bradley & Associates (2021)

## KEY BENEFITS OF A CLEAN TRUCKS NJ PROGRAM

The MJB&A study projected that a NJ Clean Trucks program would result in the replacement of more than 270,000 diesel trucks and buses with ZEVs (59 percent of the in-use fleet) by 2050. Key state-level benefits between 2024 and 2050 would include:[16]

- Reducing unhealthy smog and air toxics by cutting NOx emissions by more than 144,000 metric tons and $PM_{2.5}$ pollution by 245 metric tons.
- Improving public health by avoiding nearly 136,000 respiratory-related illnesses, 250 hospital admissions and emergency room visits, and 230 premature deaths.
- Cutting greenhouse gas emissions by nearly 19 million metric tons ($CO_2$-equivalent).
- Saving fleet owners nearly $420 million annually, by 2050, in fuel and maintenance costs.
- Creating more jobs in the United States than are replaced in 2035, with an average wage almost double the average wage for jobs that are replaced, and increasing the annual gross domestic product.
- Delivering net societal benefits of $11.6 billion, including public health benefits, avoided social costs of carbon, and fleet-owner and utility-customer savings.
- Reducing the annual electricity bill of the average New Jerseyan in 2050 by $14 and the average commercial customer by $60 as excess utility revenues from ZEV truck fleets are returned to all utility customers.
- Attracting $68 million per year in investments in public and truck depot–based EV charging infrastructure.

Accelerating the deployment of zero emission trucks and buses would dramatically lower pollution from these vehicles compared to today's levels. The report found that in 2050, the NJ Clean Trucks Program would contribute to reducing truck and bus emissions by 91 percent for NOx, by 77 percent for $PM_{2.5}$, and by 41 percent for GHGs compared to today's levels.



It is clear from MJB&A's study that the adoption of the ACT and HDO rules as part of a NJ Clean Trucks program would deliver benefits to state residents and the economy, including a reduction in unhealthy smog and air toxics.[17]

When inhaled, fine particulate matter from tailpipe emissions ($PM_{2.5}$) can cause inflammation of the lungs, decrease lung function, change heart rhythm and blood flow, and increase blood pressure.[18] Nitrogen oxides (NOx) can react in the atmosphere to form smog, also known as ozone; smog causes irritation and inflammation of the lungs, resulting in worsened asthma, coughing, and lowered resistance to lung infections. The collective impacts from truck and bus pollution include increases in health symptoms, emergency room visits, hospital admissions, and premature deaths. Children, pregnant women, and the elderly and those with preexisting heart or lung disease are especially vulnerable to air pollution.[19] New studies also suggest that exposure to air pollution increases the mortality rate from COVID-19 across the United States and globally.[20]

A recent study published in *Science Advances* also shows that $PM_{2.5}$ disproportionately impacts people of color.[21] This includes pollution from heavy-duty diesel vehicles in addition to other sources such as light-duty gasoline vehicles, off-road vehicles and equipment, construction sources, industrial facilities, and electricity-generating units. In New Jersey, the county with the greatest vehicle pollution, Camden County, is 71 percent Latinx.[22]

A previous study by MJB&A (2020) showed that communities in Newark and Elizabeth located adjacent to ports and related goods movement infrastructure (e.g., warehouses, logistics centers, and rail yards) face disproportionate health impacts from truck pollution, and that these communities are largely populated by people of color and/or low income.[23] Additionally, these community members face a legacy of cumulative impacts from multiple other sources of pollution including industry and electricity generation. The 2020 MJB&A report also stated that current initiatives and policies "have not gone far enough in reducing emissions . . . and do not adequately focus on medium- and heavy-duty vehicle pollution or improving local air quality within environmental justice communities." It pointed to the need for air quality improvement policies to directly target unhealthy smog and air pollution in these communities.[24]

Indeed, as noted above, additional rules that are specific to environmental justice communities must be developed to address this issue. The ACT and HDO rules, while a good first step, cannot be relied on alone to address the disproportionate health impacts on communities of color and low-income communities from truck emissions.

Therefore, additional, targeted actions must also be taken by New Jersey's state and local government in environmental justice communities to prioritize deployment of ZEVs—such as by establishing fleet purchase requirements, creating local ordinances for low-/zero-emission zones, and replacing and retrofitting existing diesel equipment in environmental justice communities. Together with mandatory emission-reduction measures on non-transportation sources, state and local governments can potentially ensure or deliver even greater health benefits to those communities adjacent to or near freight infrastructure.[25]

## CLEAN TRUCKS NJ WILL REDUCE CLIMATE POLLUTION

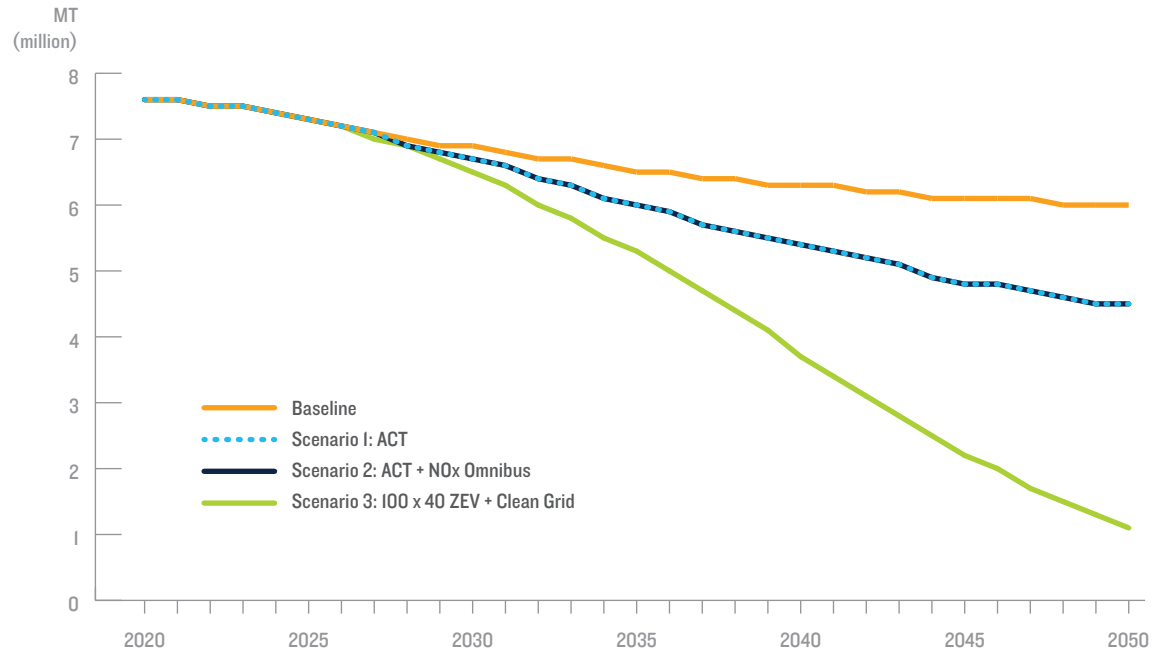
New Jersey can make significant inroads to addressing carbon pollution by adopting the Clean Trucks NJ program.

New Jerseyans already feel the effects of climate change—from extreme weather events like hurricanes to coastline erosion to more frequent and intense heat waves.[26] More than half of New Jerseyans live in counties that experience at least nine more days of extreme heat than they did in the past.[27] If high levels of climate-related pollution continue, average temperatures in the state are expected to exceed historical records by about 5 °F to 10 °F by the end of the century.[28] These changes come with real economic and social costs: In 2012, Hurricane Sandy led to 273 premature deaths, more than 6,600 hospital admissions, and $3.1 billion in total health costs in New Jersey, New York, and other states.[29]

Environmental justice communities can be especially vulnerable to the impacts of climate change, which can increase levels of air pollution even further and exacerbate existing public health harms.[30] These communities may also have reduced resiliency to recover economically from extreme weather events and reduced access to services, among other barriers.[31]

As mentioned earlier, the transportation sector is the largest contributor of climate pollution in New Jersey (42 percent), and within that sector commercial trucks are a major source.[32] The adoption of a Clean Trucks NJ program would result in nearly 19 million metric tons ($CO_2$-equivalent) of climate pollution avoided from 2024 through 2050—equivalent to the pollution from almost five coal-fired power plants over a single year. Annual emissions from the truck and bus fleet in 2050 would be 41 percent lower than today's levels (Figure 1). Under a 100 x 40 ZEV scenario, avoided climate pollution would grow to nearly 55 million metric tons from 2024 to 2050. Annual emissions from the truck and bus fleet in 2050 would be 86 percent lower than today's levels.

**FIGURE 1: PROJECTED GREENHOUSE GAS EMISSIONS FROM MEDIUM- AND HEAVY-DUTY TRUCKS FLEETS IN NEW JERSEY UNDER THREE SCENARIOS. (NOTE THE LINES FOR SCENARIOS 1 AND 2 OVERLAP)**



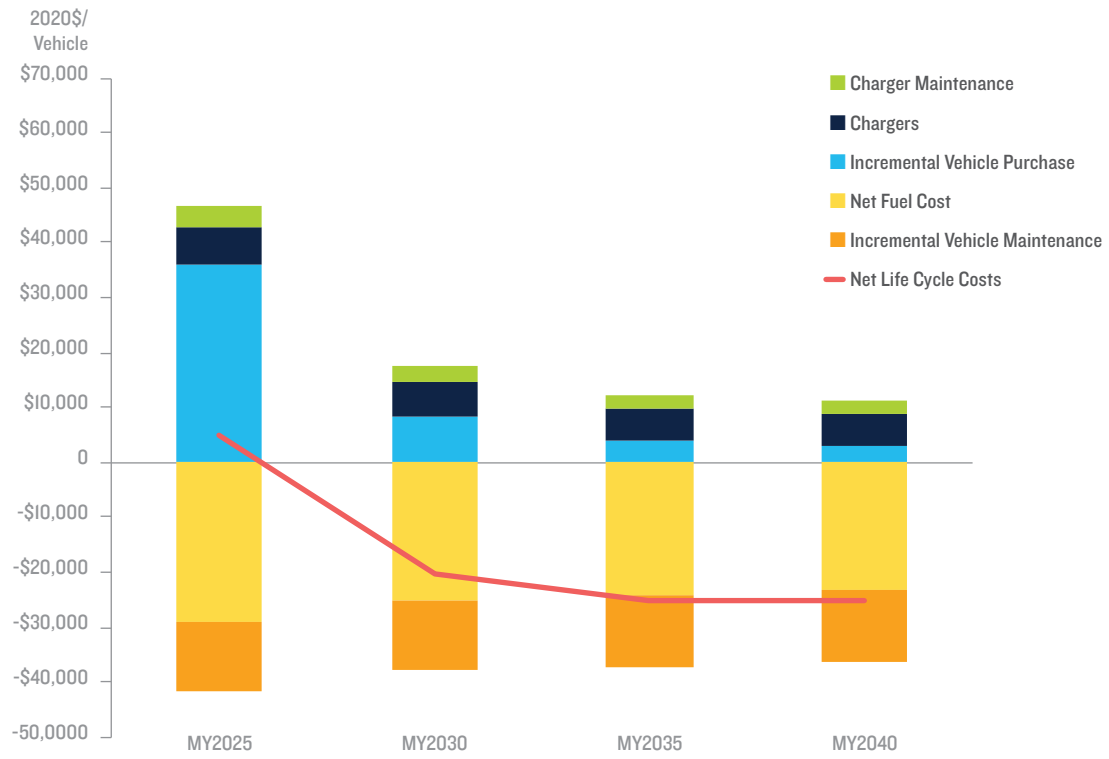

*Source:* MJB&A, *New Jersey Clean Trucks Report*, Figure 5.

## CLEAN TRUCKS NJ WILL SAVE MONEY FOR FLEET OWNERS AND NEW JERSEYANS

Economically, fleet owners stand to benefit from a Clean Trucks NJ program. Under all scenarios, the average ownership costs of new ZEV trucks are expected to drop and will be no more expensive than diesel trucks by 2024 to 2030. Figure 2 shows the incremental costs and savings for a fleet owner purchasing a new ZEV truck, relative to a new internal combustion truck, in model years 2025, 2030, 2035, and 2040. ZEV fleet owners will see incremental costs from the charging infrastructure needed as well as the upfront vehicle cost itself, but they will also see significant savings from fueling with electricity rather than diesel and from reduced maintenance costs. After 2030, new ZEV trucks will provide fleet owners with significant savings on average, as shown by the "net life cycle costs" line. And with state or federal incentives, fleet owners would save even more. By 2050, fleet-wide net savings are projected to be $419 million annually in New Jersey under a Clean Trucks NJ program. A 100 x 40 ZEV scenario would more than double net savings to $843 million annually in 2050.

Alongside this shift, fleets will largely shift from purchasing diesel to purchasing in-state electricity. Under a Clean Trucks NJ program, net utility revenue will grow by $70 million in 2050. These net revenues could be returned to utility customers in accordance with rules established by the state Board of Public Utilities. The result: annual savings of about $14 in 2050 for the average New Jerseyan and $60 for the average commercial customer. To realize these savings for fleets and for New Jerseyans, the state must drive forward with the Clean Trucks NJ program.

**FIGURE 2: PROJECTED LIFETIME INCREMENTAL COSTS AND SAVINGS OF ZEVS RELATIVE TO COMBUSTION VEHICLES IN NEW JERSEY (ALL SCENARIOS)**




*Source:* MJB&A, *New Jersey Clean Trucks Report*, Figure 6.

## CLEAN TRUCKS NJ WILL CREATE ECONOMIC BENEFITS

When coupled with domestic manufacturing policies, a Clean Trucks NJ program can also deliver economic benefits for the whole nation, including net gains in jobs, wages, investments, and gross domestic product. According to MJB&A's models, Clean Trucks NJ is projected to deliver 349 net jobs in 2035, while a 100 x 40 ZEV truck scenario would deliver 357 jobs. Under all scenarios, annual compensation for the added jobs would be nearly double the wages for the jobs they replace.

To support the growth of zero-emission trucks in New Jersey, the state can expect additional public and private investments in EV truck charging infrastructure, including at depots and public charging stations for fleets. These public and private infrastructure investments are estimated to grow by about $1.7 billion between 2024 through 2050 under a Clean Trucks NJ program.[33] Under the more aggressive 100 x 40 ZEV scenario, the needed investment would grow to almost $3.0 billion, helping to support and stimulate New Jersey's clean transportation economy.

## CLEAN TRUCKS NJ IS A TRIPLE WIN: FOR PUBLIC HEALTH, THE CLIMATE, AND THE ECONOMY

All told, a Clean Trucks NJ program is expected to deliver $11.6 billion in societal benefits from 2024 through 2050, including climate and public health benefits and savings to fleets and utility customers (Figure 3). And that's a conservative estimate. The Clean Trucks NJ scenario assumes a business-as-usual electricity grid mix through 2050; speeding up the transition from fossil-based electricity generation to renewable energy will only increase public health and climate benefits.[34]

New Jersey must adopt a Clean Trucks NJ program without delay to begin reaping these benefits.

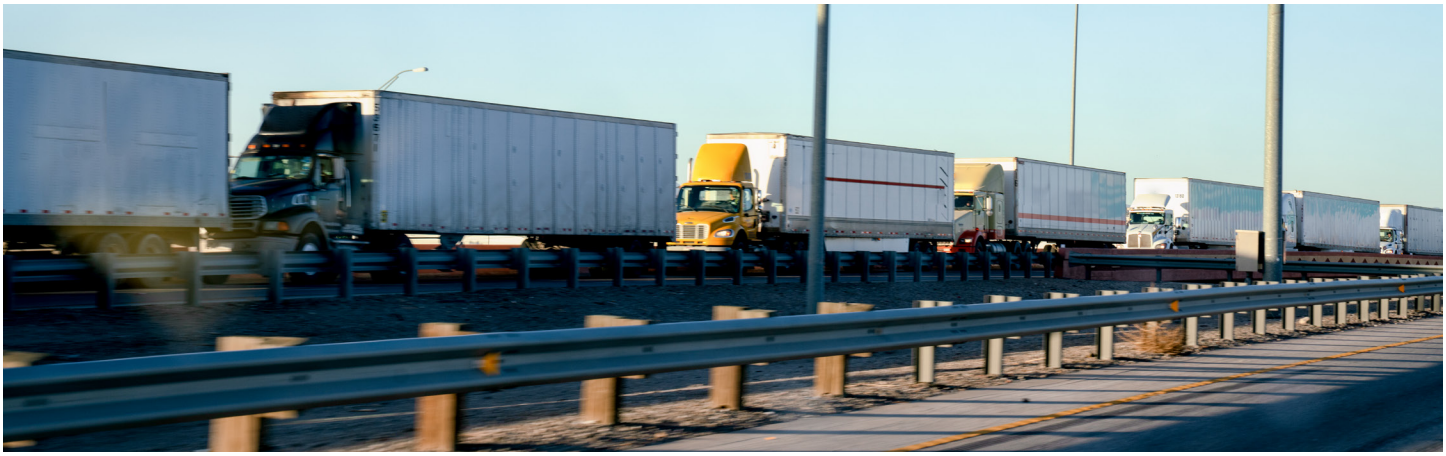
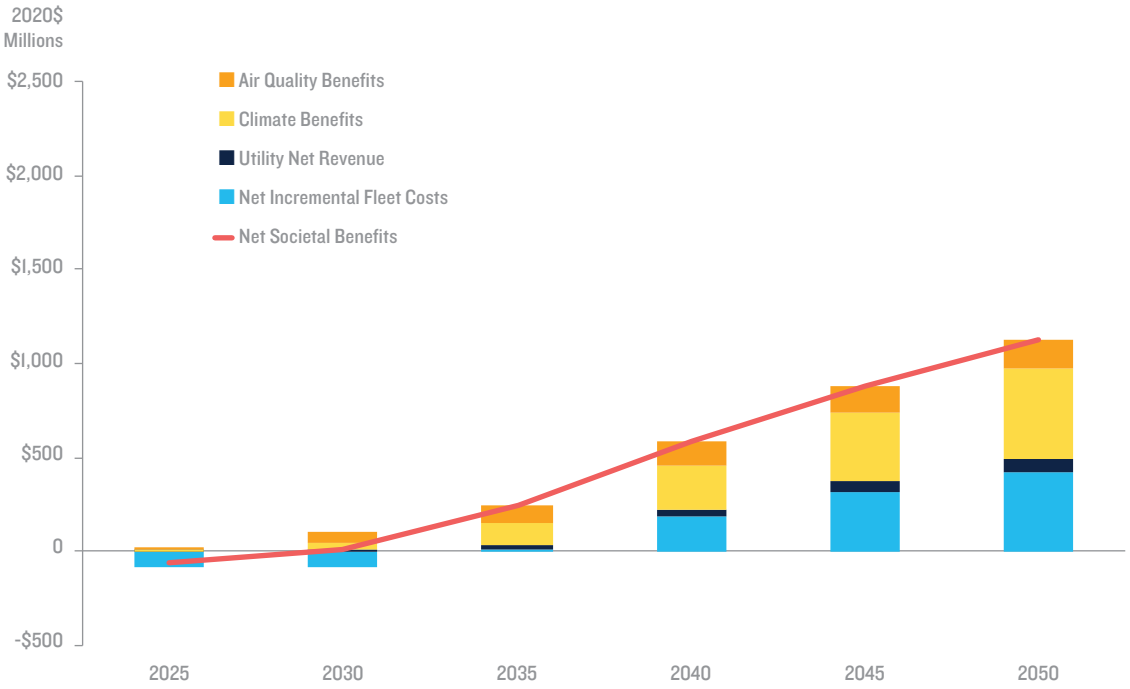


**FIGURE 3: ANNUAL SOCIETAL BENEFITS FROM ADOPTION OF THE CLEAN TRUCKS NJ PROGRAM (SCENARIO 2)**




*Source:* MJB&A, *New Jersey Clean Trucks Report*, Figure 9.


## ACKNOWLEDGMENTS

The MJ Bradley & Associates New Jersey Clean Trucks Program report was commissioned by the Natural Resources Defense Council and the Union of Concerned Scientists. New Jersey Environmental Justice Alliance and Clean Water Action served as advising contributors to the project and this issue brief.

ENDNOTES

1 Helaine Barr et al., *New Jersey's Global Warming Response Act: 80 x 50 Report,* New Jersey Department of Environmental Protection (hereinafter NJDEP), 2020, https://www.nj.gov/dep/climatechange/docs/nj-gwra-80x50-report-2020.pdf.

2 Dana Lowell et al, MJ Bradley & Associates (hereinafter MJB&A), *New Jersey Clean Trucks Program*, 2021, https://www.ucsusa.org/sites/default/files/2021-09/nj-clean-trucks-report.pdf. Dana Lowell et al., *Clean Trucks Analysis*: *Technical Report—Methodologies and Assumptions,* MJB&A, June 2021, https://mjbradley.com/clean-trucks-analysis. Also see American Lung Association, "Particle Pollution," last updated April 20, 2020, https://www.lung.org/clean-air/outdoors/what-makes-air-unhealthy/particle-pollution. Also see Centers for Disease Control and Prevention, "Particle Pollution," last reviewed September 4, 2019, https://www.cdc.gov/air/particulate_matter.html.

3 MJB&A, *New Jersey Clean Trucks Program*. ChargEVC, *Full Market Vehicle Electrification in New Jersey*, October 7, 2020, http://www.chargevc.org/wp-content/uploads/2020/10/ChargEVC-Full-Market-Electrification-Study-FINAL-Oct-7-2020.pdf.

4 Maria Cecilia Pinto de Moura and David Reichmuth, "Inequitable Exposure to Air Pollution From Vehicles in the Northeast and Mid-Atlantic," Union of Concerned Scientists, June 21, 2019, https://www.ucsusa.org/sites/default/files/attach/2019/06/Inequitable-Exposure-to-Vehicle-Pollution-Northeast-Mid-Atlantic-Region.pdf.

5 Barr et al., *New Jersey's Global Warming Response Act*. The New Jersey GHG inventory for transportation represents direct greenhouse gas tailpipe emissions from vehicles and does not include upstream greenhouse gas emissions associated with crude oil production, refining, and transportation of fuels.

6 Ibid.

7 New Jersey Office of the Governor, *2019 New Jersey Energy Master Plan: Pathway to 2050*, 2019, https://nj.gov/emp/docs/pdf/2020_NJBPU_EMP.pdf.

8 See Clean Water Action and New Jersey Environmental Justice Alliance. See "Coalition for Healthy Ports," https://www.cleanwateraction.org/features/coalition-healthy-ports-ny-nj (accessed June 2, 2021). Also see Nicky Sheats, Ana Isabel Baptista, and Cynthia Mellon, "Addressing Cumulative Impacts of Pollution Through Local Land Use Policy Tools," lecture at the Edward J. Bloustein School of Planning and Public Policy, Rutgers University, March 28, 2017, https://njeja.org/wp-content/uploads/2021/08/Addressing-Cumulative-Impacts-Through-Local-Land-Use-and-Policy-Tools.pdf. We note that the ACT and Omnibus rules, which regulate truck manufacturers, can address some, but not all, of the impacts of freight facilities on communities, including other environmental and quality-of-life impacts.

9 ICF, *Medium- and Heavy-Duty Electrification in California: Literature Review—Final Report,* December 2018, https://www.caletc.com/assets/files/Literature-Review_Final_December_2018-1.pdf. It is noted that transit bus requirements are covered under a separate rule in New Jersey (N.J.S.A. 48:25-3, the Electric Vehicle Law) that requires 100 percent of new transit bus purchases to be electric by 2032.

10 *Multi-State Medium- and Heavy-Duty Zero Emission Vehicle: Memorandum of Understanding*, July 13, 2020. https://www.nescaum.org/documents/multistate-truck-zev-governors-mou-20200714.pdf/view.

11 The Clean Air Act allows other states to adopt California's motor vehicle emission standards under Section 177, 42 U.S. Code § 7507, https://www.law.cornell.edu/uscode/text/42/7507. For more information on the rules, see California Air Resources Board, *Advanced Clean Trucks Fact Sheet*, June 20, 2020, https://ww2.arb.ca.gov/resources/fact-sheets/advanced-clean-trucks-fact-sheet; https://ww2.arb.ca.gov/rulemaking/2020/hdomnibuslownox.j Also see Patricio Portillo, "California Omnibus Rule Adds Momentum to Cut Truck Pollution," NRDC Expert Blog, August 27, 2020, https://www.nrdc.org/experts/patricio-portillo/california-omnibus-rule-adds-momentum-cut-truck-pollution.

12 Other states that have adopted or are currently considering adoption include California, Washington, Oregon, and Colorado.

13 New Jersey Environmental Justice Alliance, "Study Reveals Importance of Driving Down Dirty Diesel Emissions in EJ Communities in Newark Area," June 14, 2021, https://njeja.org/newark-community-impacts-of-mobile-source-emissions/.

14 Clean Water Action and New Jersey Environmental Justice Alliance, "Coalition for Healthy Ports." Also see Sheats, Baptista, and Mellon, "Addressing Cumulative Impacts of Pollution."

15 Derived by comparing the monetized value of Scenario 3 versus Scenario 2 in Table 1.

16 While MJB&A expects local improvements to occur, the extent and which neighborhoods was not determined. Future modeling is necessary to assess this issue.

17 MJB&A, *New Jersey Clean Trucks Program.*

18 Iyar Kheirbek et al., *Air Pollution and the Health of New Yorkers: The Impact of Fine Particles and Ozone,* New York City Department of Health and Mental Hygiene, 2011, https://www1.nyc.gov/assets/doh/downloads/pdf/eode/eode-air-quality-impact.pdf.

19 Jane E. Brody, "Air Pollution's Invisible Toll on Your Health," *New York Times,* June 28, 2021, https://www.nytimes.com/2021/06/28/well/live/air-pollution-health.html?referringSource=articleShare.

20 Andrea Pozzer et al., "Regional and Global Contributions of Air Pollution to Risk of Death From COVID-19," *Cardiovascular Research* 116, no. 14 (2020): 2247–53, https://doi.org/10.1093/cvr/cvaa288.

21 Christopher Tessum et al., "PM2.5 Polluters Disproportionately and Systematically Affect People of Color," *Science Advances* 7, no. 8 (April 28, 2021): eabf4491, https://www.science.org/doi/10.1126/sciadv.abf4491.

22 Pinto de Moura and Reichmuth, "Inequitable Exposure to Air Pollution."

23 Paul Allen et al., *Newark Community Impacts of Mobile Source Emissions: A Community-Based Participatory Research Analysis*, MJB&A, November 2020, http://www.njeja.org/wp-content/uploads/2021/04/NewarkCommunityImpacts_MJBA.pdf.

24 Ibid, p. 17.

25 We note the MJ Bradley *New Jersey Clean Trucks* study is a state-level analysis and does not evaluate the distributional effects of the air pollution reductions and resulting health benefits at the community level. Additional analysis to look at the distributional effects is currently being developed and may be issued as a follow-on study.

26 NJDEP, *New Jersey Scientific Report on Climate Change*, June 30, 2020, https://www.nj.gov/dep/climatechange/docs/nj-scientific-report-2020.pdf.

27 Kim Knowlton, "Not Your Mother's Summer: NRDC Maps Hot Summer Days," NRDC Expert Blog, October 24, 2017, https://www.nrdc.org/experts/kim-knowlton/not-your-mothers-summer-nrdc-maps-hot-summer-days. "Extreme heat days" are defined as those days, from June 1 to August 31 in the years 2007 to 2016, on which the daily maximum temperature exceeded the 90th percentile value calculated from June to August daily maximum temperatures from a 1961-to-1990 reference period for the same monitoring station.

28 Ibid.

29 Vijay S. Limaye et al., "Estimating the Health-Related Costs of 10 Climate-Sensitive U.S. Events During 2012," *GeoHealth* 3, no. 9 (September 2019): 245–65, https://doi.org/10.1029/2019GH000202.

30 Cecilia Martinez and Nicky Sheats, "Protecting Environmental Justice Communities from the Detrimental Impacts of Climate Change," chapter 15 in *Global Climate Change and Human Health: From Science to Practice*, George Luber and Jay Lemery, eds. (San Francisco: Jossey Bass, 2015), 431-64.

31 Ibid.

32 Barr, *New Jersey's Global Response Act*. Also see NJDEP, *New Jersey Air Emission Inventories*, last updated January 28, 2020, https://www.nj.gov/dep/baqp/inventory.html.

33 MJB&A, *New Jersey Clean Trucks Program*. Table 4, p. 21.

34 Ibid, Appendix, p. 25.