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Climate Change and Transit Twitter Chat
April 21, 2023

Summary

National RTAP held our third #ClimateTransit Twitter chat on April 21, 20231 to discuss how climate change could impact rural communities and transit agencies. We also discussed how transit agencies can prepare for potential effects of a changing climate, as well as tackle their emissions to mitigate potential climate impacts. The chat was moderated by Kate Mason, Communications Manager, Center for Transportation and the Environment (CTE), Harrison Carpenter-Neuhaus, Communications Associate, Climate Nexus, and Cara Marcus, Knowledge and Resource Manager, National RTAP. The chat was fun as well as informative, including a virtual snack of a chocolate chip cookie halfway through the chat and a surprise appearance by Darth Vader.

There were over **11,663** impressions from this far-reaching Chat. Participants included CALSTART, Cambridge Systematics, Center for Transportation and the Environment (CTE), chORUS, Climate Nexus, Dave Bikes, a doctor from Mumbai, Florida RTAP, Institute for Transportation & Development Policy (ITDP), International Transportation Learning Center (ITLC), a licensed social worker, Mountain Line, National Center for Applied Transit Technology (N-CATT), National Center for Mobility Management (NCMM), National Transportation Library (NTL), Open Plains Transit, Shared-Use Mobility Center (SUMC), Successful World, TransitCenter, Transit Planning 4 All, Transit Workforce Center, Transportation Research Board (TRB), and many others.

Visit the chat transcript for questions asked during the chat and panelist and participant replies. Answers to chat questions are provided below.

Question 1: How can using & investing in public transit help fight climate change?

Answers:

- Harrison explained that the transportation sector is the largest source of climate pollution in the U.S. Since public transit is one of the most energy-efficient forms of transportation, getting more people on trains and buses can have big climate benefits. Public transit riders saved 63 million metric tons of climate pollution emissions in 2018 — that's the equivalent

of taking 16(!) coal plants offline for a whole year. A trip on public transit emits 55% less climate pollution than driving or ride-hailing. He shared several resources for further information: Public Transportation is a Climate Solution, Public Transportation's Impacts on Greenhouse Gas Emissions, and Sources of Greenhouse Gas Emissions.

- A public transit, walking, and biking infrastructure can reduce CO2 emissions by 25%, according to Harvard School of Public Health's Health Benefits of TCI Policy Scenarios.
- According to the EPA, transportation accounts for almost 30% of greenhouse gas emissions in the US! "It's crucial that we invest in cleaner and more sustainable transportation options to reduce our carbon footprint," advised Kate.
- From an Oakland resident who goes by the Twitter handle Dave Bikes: By providing affordable, convenient, safe, and comfortable mobility without a car. How do we increase transit mode share from <5% to >25% is the most important question.
- A social worker explained that cars represent about 30% of emissions in the US. Congregate travel through public transportation systems helps connect transport of resources and people in a significantly less carbon intensive process.
- Public transportation produces 95% less carbon monoxide, 90% less volatile organic compounds and about 50% as much carbon dioxide and nitrogen oxide per mile compared to private vehicles, according to Citizens for Modern Transit.
- When a lot of people take transit, emissions go down. Light duty vehicles – or trucks– come with a lot of emissions, both for the vehicles and the roads. "Making transit the preferred option for people to move around is a great way to reduce emissions," shared Adrienne Heller from Cambridge Systematics.
- "We would never try to improve building efficiency by making the perfect HVAC system but leaving the windows open. We need both. Just like we need transit and electrification of buses, cars, and trucks," said Beth Osborne from Transportation 4 America. Public transit is a shared infrastructure that reduces individual car emissions. "Improving accessibility increases usability of that shared infrastructure!" she exclaimed.
- The National Center for Applied Transit Technology (N-CATT) shared that public transit is a great investment that can lead to more efficient land uses and reduce the per capita carbon emissions related to transportation.
- Program Coordinator Nate Seeskin and Partnerships and Engagement Associate Macey Miner from the Shared-Use Mobility Center (SUMC) feel that public transit helps people make lower-emission transportation choices. Mobility hubs can also empower people to couple their transit trips with other modes of shared mobility.
- The National Transportation Library's Transportation and Climate Change Collection has information on greenhouse gas emissions reduction strategies, impacts of climate change on infrastructure, and integrating climate change considerations into decision making. Their Transportation and Climate Change Clearinghouse has monthly bibliographies with new articles and reports on the topic.

Question 2: How could climate change affect transit systems and the riders who rely on them?

Answers:

- Stephanie Lewis from Florida RTAP talked about how their friends in Broward County were severely impacted by 26" of rain in 12 hours. As we saw in Ft. Lauderdale, FL this month, extreme weather events can significantly impact transportation infrastructure. Climate change threatens to make these kinds of events more intense and more frequent. After the flood in Fort Lauderdale, Micro Mover services with Circuit operated on a limited basis due to impassable roadways and the Community Shuttle and Water Trolley services were suspended.
- Extreme weather will have big impacts, including on transit– from polar vortexes to hurricanes to heat waves. Heated bus shelters, air-conditioned vehicles, and flood protection of critical transit facilities are all critical, explained Price Armstrong from Cambridge Systematics. Preparedness is key. Resilience has evolved to include risk-based approaches and frameworks to prioritize asset management practices that maintain infrastructure for mobility and accessibility.
- CALSTART explained how extreme weather events can negatively impact our transportation systems. Energy resiliency is more important than ever. Transits like Anaheim Transportation Network are leading the way in installing systems like microgrids to support their zero-emission fleet.
- Kate discussed how increasing zero emission transit options for Black and other minority communities is imperative to build climate resilience, improve social and economic equity through mobility, and support a healing process for a history of pollution-related inequities. The impacts of environmental, social & economic injustice in underserved communities will be compounded as climate change worsens. According to Islam and Winkel (2017), these communities have less capacity to adapt & recover from the impacts of climate change.
- The social worker stressed how it's not just a matter of vehicles being zero emissions, but a grid that supports electric charging also becoming zero. Additionally, we need to center resilience. Cars are vulnerable to flooding and overheating. Train infrastructure can be made durable.
- NCMM discussed how climate change is going to be creating new and more intense natural disasters + our transit systems are going to need to be responsive. Transit systems are also going to be integral in taking care of communities when the weather gets dangerously hot or cold. We are already seeing some examples of this responsiveness. In 2020, Tulare County, CA (Visalia Transit), used their buses as cooling centers in over 100 degree heat. And systems are preparing for responses in the case of natural disasters. Earlier this year, William Wagner of NCMM went to Washington and worked with 30 agencies from 3 different counties to help prepare for natural disasters. If we begin to see large numbers of people moving from previously livable areas that become inhospitable, mobility managers will become essential in interacting with and working with new populations who need to learn how to use transit.
- N-CATT stated that climate change has a profound impact on our cities and regions. Climate migration is impacting travel patterns and agencies will have to rethink how and where services operate to ensure populations aren't left behind.

- The National Academies of Sciences completed a review of the draft Fifth National Climate Assessment. This report addresses how climate change is happening as a result of #GHG emissions and is projected to continue changing.
- The National Highway Institute's course, Understanding Past, Current and Future Climate Conditions, covers projections of precipitation, temperature & sea levels & potential impacts on transportation facilities.

Question 3: How do zero emission buses compare to their diesel or natural gas counterparts?

Answers:

- According to Kate, transportation accounts for a significant portion of greenhouse gas emissions (30% of GHG emissions in the U.S.). By transitioning to zero emission vehicles, we can combat climate change and reduce emissions. Zero emission buses are 4x more fuel efficient than comparable new diesel buses. Better fuel efficiency means less waste and more efficient use of natural resources, resulting in cost savings for operators. Zero emission vehicles produce no harmful tailpipe emissions, and do not rely on fossil fuels to operate, mitigating the impacts of climate change and providing direct air quality benefits to the communities they serve. Studies show that electric buses charged by electricity are responsible for fewer carbon emissions than conventional diesel buses in every part of the U.S. electrical grid. Electric vehicles are and will be the cleaner option. She shared a Union of Concerned Scientists study.
- From Harrison -- Diesel buses are notoriously polluting both the environment and human health, and diesel emissions are strongly associated with higher levels of asthma and other diseases. Zero emissions buses avoid those tailpipe toxins entirely! Electric buses produce 62% less climate pollution than the average diesel bus over their life cycle and emit ZERO pollution on the road. And as the power grid gets cleaner, so does electric bus charging. He shared an article about Diesel Engines and Public Health.
- Adrienne felt that zero emission buses are quieter and have no tailpipe emissions – they're very pleasant to have in your community and to use as a passenger. In the long run, they'll be cheaper to operate and maintain.
- Beth added that there is less maintenance required with Electric vehicles, making transit more reliable. However, specialized training is required. Zero emission buses require different types of maintenance–agencies need to consider issues like battery ranges and charging infrastructure. Learn more here in an article from National RTAP, SUMC, and TWC.
- Zero emission buses have lower fuel costs and a lower total cost of ownership, replied CALSTART. Check out the California HVIP Total Cost of Ownership Estimator for more details.
- FTA's Zero-Emission Bus Evaluation Results: King County Metro Battery Electric Buses evaluation compared three electric buses to a hybrid fleet, diesel fleet, and trolley fleet.
- The Propane Council published an article: Considering Refueling with Propane Autogas or Recharging with Electric? Here's What to Know. Oats Transit recently took part in a propane bus demo in Missouri. The project was in partnership with the Missouri Propane Gas Association.
- Read Carnegie Mellon's Which Alternative Fuel Technology is Best for Transit Buses for some comparisons.

- Read N-CATT's resource on low or no emission vehicle implementation.

Question 4: What are the benefits of shifting to clean transit technologies like electric buses?

Answers:

- From Harrison: Electric motors are super-efficient, converting up to 77% of the input power (from the electrical grid) into vehicle energy. In comparison, diesel buses convert just about 45% of fuel energy into vehicle power. Electric buses have some unique advantages — they're quiet, produce zero tailpipe emissions, and they're even being used as backup batteries to help keep the lights on when the power grid is strained.
- Buses release the least amount of CO2 emissions compared to a car with one person, transit network company and domestic air travel. See the American Bus Association's Comparison of Energy Use & Emissions from Different Transportation Modes.
- If electric vehicle chargers are placed in the right locations, drivers can help reduce electricity demand, store solar energy & avoid costly infrastructure investments, according to an MIT study.
- Transit buses can provide emergency backup power to shelters and hospitals. Learn more about the first-of-its-kind vehicle-to-building resilience hub in Oakland, CA — funded by the California Energy Commission, shared Kate. In addition to reducing greenhouse gas emissions and improving air quality, zero emission buses are quieter, more energy-efficient, and have lower lifetime costs. Each battery electric bus will contribute 6 hours of backup power to critical loads at the resilience hub, and fuel cell battery electric buses will provide up to 11 continuous hours of backup power, displacing nearly 100 lbs of carbon emissions per hour compared to traditional diesel backup generators.
- SUMC experts discussed how electric vehicles are key in the fight for environmental justice. Calexico On Demand, a Clean Mobility Voucher Options pilot, provides electric microtransit rides to members in this border community. Beforehand, Calexico had no transit system!
- Clean transit options like electric buses improve the air quality in our communities which results in health benefits for citizens, according to CALSTART. One benefit that may be overlooked is reduced noise pollution by removing loud diesel buses from our neighborhood streets. As someone from a rural region, the social worker can't wait for more electric vehicles, for a reduction in ambient noise. Noise pollution is not just disruptive to peace of mind, but also to local animal life.
- Fewer emissions, less maintenance. "We should want the best for transit riders and those affected by it," stressed Beth.
- Cambridge Systematics believes that air quality is critical. Poor air quality has serious consequences. Recent studies show worse educational outcomes for kids with high particulate matter (PM) exposure, explained Price. Creating American jobs, improving air quality, reducing our dependence on foreign oil, added Adrienne.

Question 5: What are some of the best ways rural transit agencies can start to reduce their climate impacts?

Answers:

- Some transit agencies like Island Transit are making a clean energy transition by replacing their fossil-fueled buses with a zero-emissions fleet including both electric and hydrogen fuel cell buses.
- Great work is being done in Boise. You don't have to be a huge city to start shifting to cleaner transit. Valley Regional Transit is already rolling out electric buses in Idaho's Treasure Valley.
- Starting small can still make a big difference. By rolling out just 6 electric buses, MnDOT is avoiding 30,500 gallons of fossil fuels every year.
- Transit agencies across the country are beginning to embrace electric buses to decarbonize their fleets. There's a lot more to be done, but the momentum is building! Read more from Smart Cities Dive.
- N-CATT's Green Energy Guide is a tool for educating small-urban, rural, and tribal transit agencies on existing and emerging options for powering their transit operations with green electric power.
- SUMC thinks that sometimes, thinking micro is the right solution! Microtransit has served many rural communities well. Pilots in communities like Wilson, NC have met the needs of customers living in low-density areas. N-CATT shared its factsheet on various microtransit installations.
- From NCMM: Connecting people with transit options that allow for fewer trips with more people in one vehicle helps reduce climate impact.
- EVenergi shares tips for a successful zero-emissions transition, such as approaching the transition systematically and re-evaluating procurement strategies.
- You can start by looking at data on emissions. This article provides an introduction to the many ways to do this and tools that can help. Take this AASHTO course, Environmental Triggers: Air Quality Impacts, to learn more about air quality and the environment.
- Price advised that getting people out of cars and onto buses, even if they use diesel, is a win for the environment. Smaller actions: implement and enforce a "No Idling" rule, reduce single-person rides if operating demand response, and use hybrid non-revenue vehicles.
- Kate talked about how small or distributed wind turbines can be found at farms, rural electric cooperatives, and schools throughout the country. Wind power could be an appealing option for many rural transit agencies with access to adequate wind resources.
- Beth knows that people in rural America have been forced to go further and further for basic necessities as we close things like rural hospitals and clinics. "We should invest significantly more in rural transit to reduce climate impacts and connect people to jobs and needs," she said.

Question 6: How do transit agencies get the funding for low or zero emission buses?

Answers:

- This year, FTA allocated $1.22 billion in funds to support the deployment of low- or zero-emission vehicles and related infrastructure through Low No. Another $469 million was made available for the Buses and Bus Facilities Program. FTA's Low or No Emission Vehicle Program 5339(c) webpage includes information on the FTA grant and technical assistance webinars and reports. Earlier this year, the presidential administration announced $1.7 billion in funding for clean transit buses, and there are a number of other state and local programs to help transit agencies make the switch.

- CTE guides transit agencies through battery electric bus and fuel cell battery electric bus deployment projects while minimizing risks. Its project management and technical assistance are eligible expenses under the Low-No and Bus and Bus Facilities grant programs.
- Transportation 4 America has information on its website about the infrastructure law and where to get funding for transit. Check it out. Beth feels that in the next reauthorization, we should fight for more money for transit. She feels we should not have to spend $4 on highways to get $1 for transit. "Let's just fund transit as it deserves on its own merits and not tag it to 20% of highways," she exclaimed.
- CTAA's Looking Beyond FTA: Some Transportation Programs of Note defines new programs that can help fund or zero-emission buses, such as the Congestion Mitigation and Air Quality Improvement Program.
- FHWA opened applications for the Promoting Resilient Operations for Transformative, Efficient, and Cost-Saving Transportation (PROTECT) Grant Program. Apply through August 18, 2023.
- From CALSTART – FTA announced $1.7 billion in funding available for zero-emission transit and states like California and New York are leading the way with incentive programs to assist transit agencies to move to zero-emissions. Adrienne added that if you're in California, the Cali Air Resources Board (CARB), Hybrid and Zero-Emission Voucher Incentive Project (HVIP), air quality districts, and utilities provide a lot of funding. Transit funding is often a community project, and zero emission buses even more so.
- Nationally, a lot of funding comes through the Federal Lo-No grant programs, Congestion Mitigation and Air Quality (CMAQ) funding, and Volkswagen settlement funds were the resources that Adrienne shared.

Question 7: How can federal and state policies help transit agencies switch to cleaner transportation infrastructure?

Answers:

- The easy answer from Harrison: "They can directly support purchases of clean transportation technologies!" Federal and state grant funding for electric transit buses have already had a huge impact on electric bus adoption, he added. To make a full shift to clean transportation, we need the infrastructure that supports it. For electric buses, that means updating the grid, especially transmission, to support charging. Government has a big role to play here. He shared an article by Smart Cities Dive and an article by Bloomberg.
- "Infrastructure planning is essential, and policy can play a big role," stated Kate. "Establishing standards for charging infrastructure are vital for a smooth transition." Share shared an article from Utility Dive.
- The National Academies of Science, Engineering and Medicine are launching Climate Crossroads, a major new initiative to help the nation meet the challenges of climate change. Nominate an expert for the Climate Crossroads new advisory committee to steer its work.
- The National Association of State Energy Official's Transportation Electrification: State-Level Roles and Collaboration among Public Utility Commissions, State Energy Offices, and Departments of Transportation highlights examples of success.
- EPA announced new proposed federal vehicle emissions standards aimed at accelerating the ongoing transition to cleaner vehicles and tackling the climate crisis.

- Read this article about federal and state initiatives for the electric vehicle transition, such as idle reduction laws, greenhouse gas emissions standards, and zero-emission vehicle mandates.
- CALSTART recommended that working together, federal, state and utility partners can continue to work to lower barriers to the adoption of zero emission buses. "Together we will continue to see the adoption of zero-emission buses increase."
- N-CATT believes that moving away from policies that support automobiles is a big part. Investments in bus lanes, bus priority, Complete Streets, bike lanes, are all apart of moving away from single occupancy trips and to cleaner transportation.
- A 2021 study by CTE found that a nationwide zero emission transit transition is feasible by 2035 at a cost between $56.22B and $88.91B. Check out the roadmap for federal lawmakers to support this objective.
- Offering and supporting technical assistance is key! Programs like SUMC's Mobility Innovation Collaborative and the California Clean Mobility program guide agencies through implementing various innovative shared mobility projects.
- "Procurement help is huge," said Price. Smaller agencies struggle to get good pricing and timelines for vehicles, and statewide or even multistate procurements can address that. Adrienne wrote a great blog about ways that agencies at the fed, state, and local can work together to gear up for a zero-emission future and prioritize equity.

Question 8: Has the pandemic changed the way rural transit agencies are operating and planning for the future?

Answers:

- "Yes!" declared NCMM. During the pandemic rural transit agencies were some of the first to start providing innovative incidental uses of transit vehicles for things like food and medication delivery. Transit agencies are looking more holistically at rider needs now. NCMM has some great examples of what transit agencies did during the pandemic to adjust to their community's needs. In Atoka, OK, Jamm Transit partnered with public schools to bring free meals to children who normally relied on school meals. In Monterey County, CA, Monterey-Salinas Transit provided a mobile Wi-Fi bus that helped children attend online classes, and they certainly weren't the only ones to do so.
- From Kate: Reduced vehicle traffic during COVID-19 lockdowns and resulting improvements to air quality provided a glimpse of the progress we can make if we focus investment on transit and the shift to zero emission technologies.
- "Many transit agencies are in a tough spot right now," explained Harrison. The pandemic dealt a real blow to ridership, and now many systems are facing serious fiscal cliffs. Transit Center breaks down the situation. To realize the benefits of mass transit, agencies need strong & stable funding streams that ensure service can meet riders' needs without making fares unaffordable. He shared an article that described this.
- CALSTART explained that funding, operator shortages and lower ridership post-pandemic continue to hamper transit service. Transit systems continue to look at innovative ways to serve their community and many are doing so with Zero Emission services like microtransit.
- Price knows that social isolation is a trending topic, and transit in rural areas is a key to the solution. As people age, especially in auto-oriented suburbs and exurbs, rural transit agencies are a lifeline to grocery shopping, medical care, and social activities.

Question 9: How do transit agencies prepare bus operators and maintenance teams for low or zero emission buses?

Answers:

- Many fleet operators will require technical assistance as they transition to zero emission fleets. CTE recommends that agencies with 10 or more vehicles develop a fleet transition plan to support future vehicle procurements and fueling infrastructure buildout. Without a carefully developed workforce development plan, agencies will struggle with the skills demands of emerging zero emission bus technologies. CTE is working with partners like TWC to identify skills gaps and create a foundation for training curricula. Workforce development has been a continual focus of conversations with agency partners as well as the FTA and national policymakers. Partnerships and cooperation across the industry are required for adequate training of the industry's workforce. Transit agencies looking to deploy zero emission buses can read the CTE Guidebook for deploying ZEBs, which includes best practices, lessons learned, and expert insights to help you achieve the maximum benefit and mitigate risk.
- The Department of Energy launched the Battery Workforce Challenge to boost electric vehicle battery research and train the next generation of EV technicians.
- APTA has some great examples of how transit agencies like AC Transit, Metro Transit MN, and Metro Los Angeles have trained their teams on electric buses.
- From Adrienne: Training and creating institutional support are huge here. For unionized agencies, engaging unions early is key– Partnering with union leadership can help build support for ZE technology and helps the agency understand the needs of different departments.
- CALSTART stated that a properly trained workforce is key to successful transition to zero-emission transit buses. Bus operators and maintenance personnel have unique responsibilities and need when moving to zero emission buses. They recommended everyone to use technical assistance partners like TWC to help you prepare their workforce.

Question 10: How can transit agencies with limited resources maximize the quality of service for rural communities while helping to protect the environment?

Answers:

- "Protecting the environment goes hand in hand with improving service," stressed Kate. Antelope Valley Transit Authority is shifting to a zero-emission fleet, and the cost savings are helping the agency expand service.
- Rural agencies can integrate its transit offerings with other shared mobility services, shared SUMC. CATA in Meadville, PA, for example, launched a bikeshare system serving the town and surrounding areas.
- U.S. Pirg's Paying for Electric Buses provides case studies of how transit agencies have funded electric buses.
- State purchasing contracts can reduce procurement burdens for rural agencies. They offer maximum flexibility without having to name specific participating operators, making it easier for rural agencies to purchase from them. Read this FTA resource to learn more.

- Adding zero emission vehicles to your transit agency's fleet could make you one of your utility's largest customers. Establishing a good relationship with your electric utility is key to a successful deployment and could help to minimize costs. CTE and N-CATT have a resource that can help.
- Kate talked about how the FAST ACT allowed agencies to purchase from any state contract. Currently three state contracts contain zero-emission bus options: California, Georgia, and Virginia. Learn more.
- "A focus on the environment can and must complement a focus on the customer," said Price. For example, integrating NEMT and regular public transit scheduling can increase service efficiency and give more options to riders.
- If you're applying for grants, read U.S. DOT's Checklist for a Strong Climate Change Mitigation, Adaptation and Resilience Grant Application.
- From CALSTART: Take advantage of funding opportunities like the FTA Low or No Emission Vehicle Program to support the purchase of #ZeroEmission transit buses and learn how collaborating with your utility can help you use financial resources efficiently.
- Transit Planning 4 All recommends inclusive planning! Rural transit agencies can become more aware of what consumers really need and focus limited resources on the projects that matter most.

Question 11: What has your agency or organization done to reduce the impact of climate change through transit innovation?

Answers:

- FTA recognizes transit agencies for environmental work excellence. A total of 222 transit agencies from Maine to Hawaii participated in the FTA Climate Challenge.
- Pullman Transit is leveraging state and federal funding and adding more electric buses to their fleet.
- Mountain Line's switch to electric buses is expected to cut local emissions by 68% when complete.
- NASA sent an air quality monitor into orbit. TEMPO can measure harmful pollutants in the atmosphere all the way down to the neighborhood-by-neighborhood level.
- The Alabama Department of Transportation hosted its inaugural Spring Clean Day on April 14, 2023.
- Cambridge Systematics has resources, Equitable EV rollout, Resilience & climate change, and Making a business case and communications strategy for resilience investment.
- CTE is proud to work on behalf of the Zero Emission Bus Resource Alliance (ZEBRA), a professional association of 65 transit agencies, to provide training programs, shared research, and technical assistance.
- Climate Nexus is lucky to work with partners pushing the climate change and transit conversation. Institute for Transportation & Development Policy put out a great report showing why transit must play a vital role in making a just energy transition! Harrison gave a shout-out to Transit Center, who recognize that well-funded and frequent transit service is vital to both climate justice and racial justice!

Stay tuned for the fifth annual #RuralTransitDay Twitter Chat on July 14, 2023!