UTC Project Information – **Center for Transportation, Environment, and Community Health**	
Project Title	Mobility in Post-Pandemic under Social Distancing Guidelines: Congestion, Emission, and Transit Contact Network
University	Cornell University (CU) New York University (NYU)
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Funding Sources and Amount Provided (by each agency or organization)	USDOT: $22,936 Cornell: $6,815
Total Project Cost	$29,751
Agency ID or Contract Number	Sponsor Source: Federal Government CFDA #: 20.701 Agreement ID: 69A3551747119
Start and End Dates	10/01/2020 – 09/30/2021
Brief Description of Research Project	COVID-19 has raised new challenges for transportation in the post-pandemic era. The social distancing requirement, with the aim of reducing contact risk in public transit, could exacerbate traffic congestion and emissions. This project proposed a simulation tool to evaluate the trade-offs between traffic congestion, emissions, and policies impacting travel behavior to mitigate the spread of COVID-19, including social distancing and working from home. Open-source agent-based simulation models were used to evaluate transportation system usage for the case study of New York City. A Post Processing Software for Air Quality (PPS-AQ) estimation was used to evaluate the emissions impacts. Finally, system-wide contact exposure on the subway was estimated from the traffic simulation output. The social distancing requirement in public transit was found to be effective in reducing contact exposure, but it had negative congestion and emission impacts on Manhattan and neighborhoods at transit and commercial hubs. While telework can reduce congestion and emissions citywide, in Manhattan the post-COVID negative impacts were higher due to behavioral inertia and social distancing. The findings suggested that contact exposure to COVID-19 on subways is relatively low, especially if social distancing practices are following. The proposed integrated traffic simulation models and emission estimation model can help policy makers evaluate the impact of

policies on traffic congestion and emissions, as well as identify hot spots, both temporally and spatially.

Describe Implementation of Research Outcomes (or why not implemented)

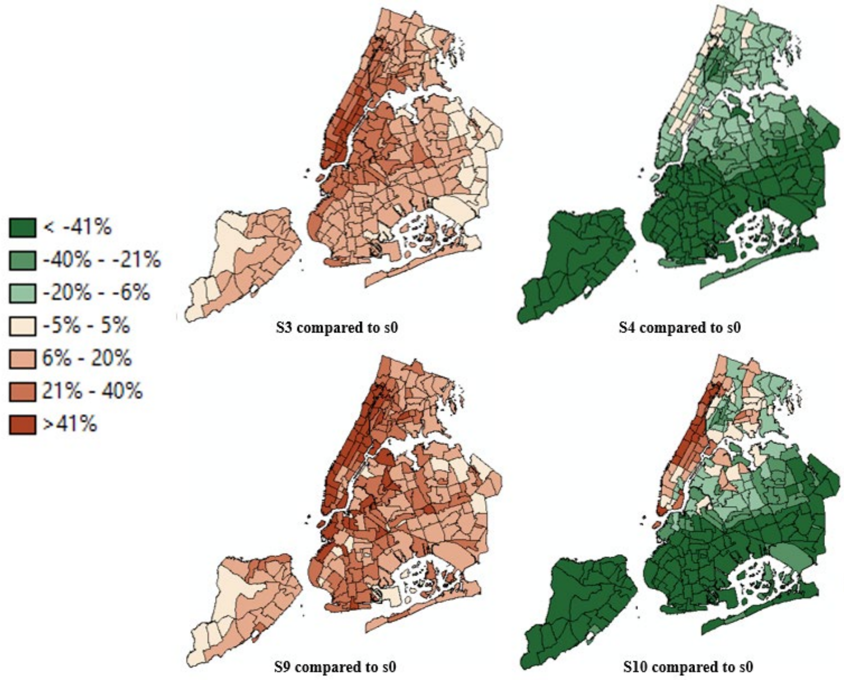
Place Any Photos Here

The research produced a modeling framework for New York City that includes an integrated travel activity-based travel simulator and vehicle emission model.

The research showcased the estimated daily trade-offs between traffic congestion, emissions, and subway contact exposure.

Scenarios	Performance measures increase/decrease				
	Total travel time costs (million $ per day)		GHG emissions (million tons per day)		Subway contact exposure (% change)
	Citywide	Manhattan	Citywide	Manhattan	
Mode preference change (s0 -> s6)	+96.58	+18.08	+26.54	+1.31	-40%
With transit capacity reduction (s6 -> s9)	+10.06	+6.89	+2.37	+0.76	-16%
Implementing telework (s9 -> s10)	-93.20	-10.65	-15.23	-1.23	-75%
Implementing SWHs (s9 -> s11)	-19.97	-1.63	-0.33	0.00	-3%

The impact of COVID on behavior change (s0 -> s6) increased travel time costs by $96.58 million citywide and $18.08 in Manhattan, while GHG emissions increased by 26.54 million tons citywide and 1.31 million tons in Manhattan. With fewer people using transit in s6 due to behavior change, contact exposures decreased 40% compared to the base scenario. By adding transit capacity reductions due to social distancing (s6 -> s9), travel time costs further increased by $10.06 million citywide and $6.89 million in Manhattan, while GHG emissions increased by 2.37 million tons citywide and 0.76 million tons in Manhattan, but contact exposure went down 16%. In search of solutions, we studied alternative scenarios with telework and staggered work hours. By implementing telework (s9->s10), $93.2 million of travel time costs can be saved citywide and $10.65 million can be saved in Manhattan, while 15.23 million tons of GHG emissions can be saved citywide and 1.23 million tons can be saved in Manhattan. Telework can also benefit public health, with decreased contact exposure of 75% in s10 compared to s9. Staggered work hours (s9->s11) would save travel time costs of $19.97 million citywide and $1.63 million in Manhattan, while not having large effect on GHG emissions and contact exposure.

	 Percentage change of total $PM_{2.5}$ emission inventory per area with/without transit capacity restrictions and transit capacity restrictions combined with telework (24 hours).
Impacts/Benefits of Implementation (actual, not anticipated)	Benefits from this project include a better understanding of transportation systems' performance under an unprecedented disruption, and a framework that can help increase the resiliency of transportation systems while protecting public health and achieving climate change goals.
Web Links • *Reports* • *Project website*	http://ctech.cee.cornell.edu/final-project-reports https://www.systemseng.cornell.edu/news/gao-co-authors-paper-congestion-and-emissions-economic-reopening-post-pandemic