Transportation sector is one of the largest emission sources and is a cause for human health concern due to the high dependency on personal vehicle in the U.S. Transportation mode choice studies are currently limited to micro- and regional-level boundaries, lacking of presenting a complete picture of the issues, and the root causes associated with urban passenger transportation choices in the U.S. Hence, system dynamics modeling approach is utilized to capture complex causal relationships among the critical system parameters affecting alternative transportation mode choices in the U.S. as well as to identify possible policy areas to improve alternative transportation mode choice rates for future years up to 2050. Considering the high degree of uncertainties inherent to the problem, multivariate sensitivity analysis is utilized to explore the effectiveness of existing and possible policy implications in dynamic model in the terms of their potential to increase transit ridership and locating critical parameters that influences the most on mode choice and emission rates. Finally, the dissertation advances the current body of knowledge by integrating discrete event simulation (multinomial fractional split model) and system dynamics for hybrid urban commuter transportation simulation to test new scenarios such as autonomous vehicle (AV) adoption along with traditional policy scenarios such as limiting lane-mile increase on roadways and introducing carbon tax policy on vehicle owners. Overall, the developed simulation models clearly indicate the importance of urban structures to secure the future of alternative transportation modes in the U.S. as the prevailing policy practices fail to change system behavior. Thus, transportation system needs a paradigm shift to radically change current impacts and the penetration of AVs can be one of the reforms to provoke this transition since it is expected to revolutionize mode choice, emission trends, and the built environment.

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The public is welcome to attend.