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Cycleloop Personal Rapid Transit: An Exploratory Study for Last Mile Connectivity in Urban Transport

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Abstract : In this paper, author explores for most sustainable last mile transport mode addressing present problems of traffic congestion, jams, pollution and travel stress. Development of energy-efficient sustainable integrated transport system(s) is/are must to make our cities more livable. Emphasis on autonomous, connected, electric, sharing system for effective utilization of systems (vehicles and public infrastructure) is on the rise. Many surface mobility innovations like PBS, Ride hailing, ride sharing, etc. are, although workable but if we analyze holistically, add to the already congested roads, difficult to ride in hostile weather, causes pollution and poses commuter stress. Sustainability of transportation is evaluated with respect to public adoption, average speed, energy consumption, and pollution. Why public prefer certain mode over others? How commute time plays a role in mode selection or shift? What are the factors play-ing role in energy consumption and pollution? Based on the study, it is clear that public prefer a transport mode which is exhaustive (i.e., less need for interchange – network is widespread) and intensive (i.e., less waiting time - vehicles are available at frequent intervals) and convenient with latest technologies. Average speed is dependent on stops, number of intersections, signals, clear route availability, etc. It is clear from Physics that higher the kerb weight of a vehicle; higher is the operational energy consumption. Higher kerb weight also demands heavier infrastructure. Pollution is dependent on source of energy, efficiency of vehicle, average speed. Mode can be made exhaustive when the unit infrastructure cost is less and can be offered intensively when the vehicle cost is less. Reliable and seamless integrated mobility till last ¼ mile (Five Minute Walk-FMW) is a must to encourage sustainable public transportation. Study shows that average speed and reliability of dedicated modes (like Metro, PRT, BRT, etc.) is high compared to road vehicles. Electric vehicles and more so battery-less or 3rd rail vehicles reduce pollution. One potential mode can be Cycleloop PRT, where commuter rides e-cycle in a dedicated path – elevated, at grade or underground. e-Bike with kerb weight per rider at 15 kg being 1/50th of car or 1/10th of other PRT systems makes it sustainable mode. Cycleloop tube will be light, sleek and scalable and can be modular erected, either on modified street lamp-posts or can be hanged/suspended between the two stations. Embarking and dis-embarking points or offline stations can be at an interval which suits FMW to mass public transit. In terms of convenience, guided e-Bike can be made self-balancing thus encouraging driverless on-demand vehicles. e-Bike equipped with smart electronics and drive controls can intelligently respond to field sensors and autonomously move reacting to Central Controller. Smart switching allows travel from origin to destination without interchange of cycles. DC Powered Batteryless e-cycle with voluntary manual pedaling makes it sustainable and provides health benefits. Tandem e-bike, smart switching and Platoon operations algorithm options provide superior through-put of the Cycleloop. Thus Cycleloop PRT will be exhaustive, intensive, convenient, reliable, speedy, sustainable, safe, pollution-free and healthy alternative mode for last mile connectivity in cities.

Keywords : cycleloop PRT, five-minute walk, lean modular infrastructure, self-balanced intelligent e-cycle
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