# Transport electrification for sustainable urban networks

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| Although transportation has long been recognized as one of the key factors for economic development, it is responsible for a significant amount of global greenhouse gas emissions and major pollutants that cause serious health problem, especially in urban areas. Besides, the rapid development of transportation also brings a great concern on the energy security. In order to reduce the side effects of transportation system, Electric vehicles (EVs) have emerged as a promising solution toward the sustainable transportation due to their positive effects on the environmental issues and energy crisis. However, the adoption of EVs still be very limited compared to conventional gasoline vehicles due to the lack of appropriate charging infrastructure. Furthermore, the electrification of transportation may cost a significant amount of money and also result in more congestion (i.e., en-route and charging congestion) due to the routing and charging behaviours of EVs’ drivers.  Having these concerns in mind, in this study, we focus on answering the questions where and how to deploy the charging facilities in order to promote the widespread adoption of EVs and improve the system performance in the presence of EVs. The objective is not only minimizing the investment cost of charging infrastructure but also minimizing the en-route and charging congestion by capturing routing choice behaviours of travellers with stochastic demand and driving range. In order to consider the mutual interaction between planning decision and traffic flow pattern on the network, the problem is firstly formulated as a bi-level optimization problem and then solved by a meta-heuristic. Finally, the proposed framework is tested through numerical test and some managerial insights into the facility planning and system performance also be provided. |