Keywords
Energy consumption; Emissions; Urban passenger transport

Overview
With the rapid growth of vehicle population, the urban passenger transport sector is greatly responsible for the increase in energy consumption, greenhouse gases (GHG) emissions, as well as atmospheric pollutants (NO\textsubscript{x}, CO, HC, PM\textsubscript{10}). In this paper, we first develop an urban passenger transport LEAP model at the city level to extrapolate energy consumption and emissions; and then take Tianjin city as an empirical case to calculate final energy consumption, CO\textsubscript{2} emissions and pollutant emissions of Tianjin’s urban passenger transport sector during 2010-2040 under three scenarios, i.e. BAU (business as usual) scenario, PP (the 12\textsuperscript{th} five-year plan policy) scenario, and CP (comprehensive policy) scenario. The results show that due to the public transport promotion, energy consumption and CO\textsubscript{2} emissions in 2040 can be reduced by 23.7% and 23.9% in the PP scenario, compared to BAU. The most reduction in energy consumption, CO\textsubscript{2} and pollutant emissions can be achieved under CP scenario, in which vehicle population regulation is the most effective and easy to be implemented. Emission standard regulation is the most effective measure to reduce atmospheric pollutant emissions in all the scenarios and green energy promotion is especially effective to reduce PM\textsubscript{10}.

Methods
Using a LEAP software to develop an urban passenger transport model at the city level and to extrapolate energy consumption and emissions. Tianjin city is then taken as an empirical case. Scenario analysis is made to study the impacts of different policy measures on energy consumption and emissions in Tianjin’s passenger transport sector.

Results
There is a great reduction in energy consumption, CO\textsubscript{2} emissions as well as four pollutants under PP and CP scenarios. In 2040, the energy in the transport sector will consume 25.7 Mtoe and 13.7 Mtoe in PP and CP scenarios, respectively, compared to 33.7 Mtoe in the BAU; the CO\textsubscript{2} emissions will release 73.8 Mt and 37.7 Mt in PP and CP scenarios, respectively, compared to 97.0 Mt in the BAU; the emissions of four pollutants emitted from the transport sector, namely CO, HC, NO\textsubscript{x}, PM\textsubscript{10}, will be 324.8 Tt, 39.3 Tt, 100.9 Tt and 440.2 t in the PP and 205.4 Tt, 23.5 Tt, 54.7 Tt and 257.1 t in the CP, compared to 942.9 Tt, 94.7 Tt, 191.0 Tt and 2663.4 t, in the BAU, respectively.

Conclusions
It is obvious from the results that it is easier to reduce pollutant emissions than to reduce energy consumption and CO\textsubscript{2} emissions. This is because ESR can directly limit the emission factor which is one of the determinants of the pollutant emissions. Therefore, energy conversation and CO\textsubscript{2} reduction should be of the top priority in the urban passenger transport sector in the long run. Due to the restrict control on vehicle sales, VPR will be the most effective measure to save energy and reduce CO\textsubscript{2} emissions in the CP scenario. It can be also revealed from the results that no single measure can achieve all the reduction targets. The measure such as PTP that has a significant effect on energy reduction, may not work well for pollutant emissions; GEP that can largely reduce PM\textsubscript{10} emissions may not work well for CO emission.

References


