World Academy of Science, Engineering and Technology
International Journal of Industrial and Systems Engineering
Vol:11, No:03, 2017

Vehicle Routing Problem Considering Alternative Roads under Triple Bottom Line Accounting

Authors : Onur Kaya, Ilknur Tukenmez

Abstract : In this study, we consider vehicle routing problems on networks with alternative direct links between nodes, and we analyze a multi-objective problem considering the financial, environmental and social objectives in this context. In real life, there might exist several alternative direct roads between two nodes, and these roads might have differences in terms of their lengths and durations. For example, a road might be shorter than another but might require longer time due to traffic and speed limits. Similarly, some toll roads might be shorter or faster but require additional payment, leading to higher costs. We consider such alternative links in our problem and develop a mixed integer linear programming model that determines which alternative link to use between two nodes, in addition to determining the optimal routes for different vehicles, depending on the model objectives and constraints. We consider the minimum cost routing as the financial objective for the company, minimizing the CO2 emissions and gas usage as the environmental objectives, and optimizing the driver working conditions/working hours, and minimizing the risks of accidents as the social objectives. With these objective functions, we aim to determine which routes, and which alternative links should be used in addition to the speed choices on each link. We discuss the results of the developed vehicle routing models and compare their results depending on the system parameters.

Keywords : vehicle routing, alternative links between nodes, mixed integer linear programming, triple bottom line accounting
Conference Title : ICOR 2017 : International Conference on Operations Research
Conference Location : Prague, Czechia
Conference Dates : March 23-24, 2017

Open Science Index, Industrial and Systems Engineering Vol:11, No:03, 2017 publications.waset.org/abstracts/64786.pdf