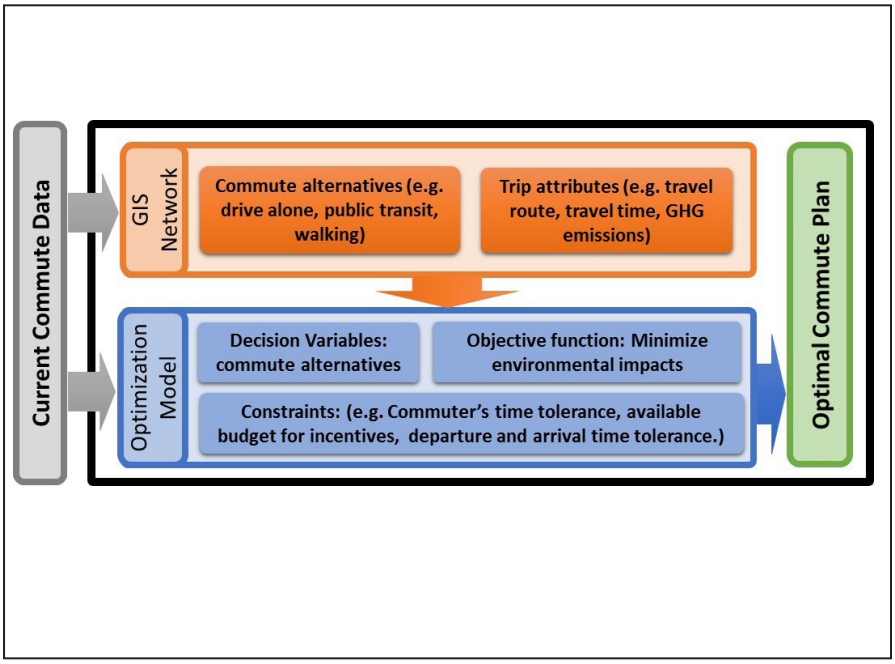
MOUNTAIN-PLAINS CONSORTIUM

RESEARCH BRIEF | MPC 18-361 (project 510) | December 2018

Business and Commute Optimization System: Development and Denver-based Case Study



the **ISSUE**

There is a need to mitigate traffic congestion and reducr transportation emissions.

the **RESEARCH**

This research explores an optimization system designed to identify optimal tradeoffs between two important transportation objectives of minimizing greenhouse gases and air pollution emissions and total travel time while meeting preferences and convenience of business commuters. The developed optimization system is designed to generate detailed solutions that identify optimal commute plan for each commuter while motivating commuters using monetary incentives supported by employers to cover extensions in commute duration. The developed optimization system consists of a travel survey, a Geographical Information System (GIS) model, and a multi-objective optimization model.

MOUNTAIN-PLAINS CONSORTIUM REGION 8

A University Transportation Center sponsored by the U.S. Department of Transportation serving the Mountain-Plains Region. Consortium members:

Colorado State University
North Dakota State University
South Dakota State University
University of Colorado Denver
University of Denver
University of Utah
Utah State University
University of Wyoming

Lead Investigator(s)

Moatassem Abdallah
moatassem.abdallah@ucdenver.edu

Caroline M. Clevenger
caroline.clevenger@ucdenver.edu

University of Colorado-Denver

Mehmet Ozbek
mehmet.ozbek@colostate.edu
Colorado State University

Co Investigator(s)

Aly Tawfik

Project Title

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Research Assistant(s)

Shahryar Monghasemi, GRA

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the **FINDINGS**

Research findings document the development of optimal selection of individualized business commute alternatives in order to minimize greenhouse gas and air pollution emissions, commute time and cost. The optimization system is integrated with GIS to quantify various commute attributes such as trip time, distance, cost, and greehouse gas and air pollution emissions for each possible commute alternative of each commuter. The output of the GIS is fed into an optimization model to minimize environmental impacts, and commute time and cost. The model integrates a number of constraints to maintain commuter tolerance, commute logic, and carpool for two commuters.

the **IMPACT**

The results of the optimization system show that the reduction of greenhouse gas and air pollution emissions is dependent on commuter tolerance. For example, a 15-minute time extension in commute tolerance can reduce greenhouse gas and air pollution emissions by only 13%, while increasing commuter tolerance by 35 minutes can achieve a 25% reduction. Furthermore, the optimization system is designed to compensate commuters due to the inconvenience of extending in their commute times by using monetary incentives.

For more information on this project, download the entire report at http://www.ugpti.org/resources/reports/details.php?id=933

For more information or additional copies, visit the Web site at www.mountain-plains.org, call (701) 231-7767 or write to Mountain-Plains Consortium, Upper Great Plains Transportation Institute, North Dakota State University, Dept. 2880, PO Box 6050, Fargo, ND 58108-6050.