

# An Optimization Model for the Maintenance Programming of Urban Green Areas

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## Abstract

Maintaining public green spaces is vital for health, safety, and hygiene, especially when the green areas are neglected and are not in optimal conditions. An efficient schedule of fleets for the maintenance of green areas is necessary to maintain a healthy environment. This paper presents the analysis of a mixed-integer linear optimization model for optimal maintenance scheduling, which takes into account factors such as weed growth and sequencing. A comparison between traditional methods and the proposed model is made, measuring the use of resources. Lastly, a case study of a specific area in Monterrey, Nuevo León, Mexico is presented to demonstrate the benefits of a proper maintenance schedule.

## Keywords

Urban green areas, maintenance scheduling, MIP model

## Biographies

**Leonardo G. Hernandez-Landa** holds a BSc. in Industrial Engineering and a PhD in Engineering from the graduate program in System Engineering at Department of Mechanical and Electrical Engineering, Universidad Autónoma de Nuevo León (UANL). Leonardo is currently a professor of operations management at Department of Industrial Engineering, UANL in San Nicolás de los Garza, México, where he joined in 2016. Dr. Hernandez' research has primarily focused on methods for solving difficult discrete optimization problems arising in logistic, routing and transportation systems. Previously, he has conducted funded research on vehicle routing problems with accessibility and route design. Dr. Hernandez is a SNI Fellow second highest country-wide distinction granted by the Mexican System of Research Scientists, where he has been a member since 2017.

**Argelia Vargas-Moreno.** Director of the Faculty of Chemical Sciences at the Autonomous University of Nuevo León, she was previously vice director of the department of industrial engineering. Professor of Industrial Engineering, Methods engineering, and Operations research to undergraduate and graduate students. Worked as project engineer at Hylsa, at TUBACERO and IMSA. She has been recognized by the SEP with the PRODEP certification; Professor Vargas-Moreno is Member of the IISE and is the faculty advisor of student chapter # 358. Her academic publications include books on the following topics: Industrial Engineering, methods engineering, statistics, probability and accounting.

**Arlethe Y. Aguilar Villarreal** holds a Master's degree in Industrial Engineering with a focus on Productivity and Quality from the Autonomous University of Nuevo León. Among the areas she has worked in as a professional are Production Control, Inventories, Logistics, Purchasing, Project Engineering, Quality, and Sales. She is currently a full-time Professor of Industrial Engineering and Administration at UANL, teaching courses such as Computer-Aided Design, Entrepreneurship Training, and Intellectual Property. She holds the PRODEP certification from the SEP. She is also a member of the Institute of Industrial Engineers and a member of the American Society for Quality. At the moment, she is pursuing a Doctorate in Philosophy with a Specialization in Administration, developing a line of knowledge focused on Competitiveness in business