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■ WC-53

Wednesday, 12:30-14:00 - Room: 8007 (building: 202)

Sustainability and Equity in Ecosystems, Ecology and Food

Stream: Sustainable and Resilient Systems
Invited session
Chair: Davide Donato Russo

1 - Optimizing Earthwork Management for Sustainable Urban Development: A Mixed-Integer Linear Programming Approach
Che-Fu Hsueh, Yunzhu Lin

This study focuses on promoting green, sustainable, and healthy urban development via comprehensive earthwork management, integrating both ready-for-use and over-wet soil. We enhance the latter by blending it with specifically recycled incinerated waste granules and lime, converting unusable wet soil into a valuable resource. This not only saves disposal costs but also notably reduces carbon emissions. Our mixed-integer linear programming model, designed to optimize acquisition, dispatch, and utilization of earthwork from diverse sources, effectively tackles transportation and resource allocation challenges, ensuring efficient earthwork planning aligned with sustainable construction and conservation principles. Applied to an aerotropolis project in Taiwan, our model demonstrated significant cost efficiencies in earthwork acquisition and disposal, achieving considerable savings compared to traditional methods. Sensitivity analyses on different parameters are also provided. This approach exemplifies the integration of innovative waste management and optimization techniques in urban construction, offering a replicable model for future sustainable development projects.

2 - Environmental Models as a Tool for Ecological and Economic Decisions-Making
Marian Reiff, Ivan Brezina, Juraj Pekár

Achieving sustainable development is one of the biggest challenges today. It is also one of the reasons why the green economy has come to the fore in recent years. Therefore, nowadays, it is attractive to formulate new optimization goals based on established economic and ecological priorities, which are incorporated into economic and ecological models, as green initiatives provide an impetus to move away from the traditional understanding of economic processes. This implies the need to modify optimization processes to link economic and ecological approaches to evaluate the economic and ecological efficiency of the decision-making process. The first works since 1960 can be registered in problematics of environmental control via mathematical programming models. For example, individual companies can use management decision-making methods to address previously mentioned issues and formulate ecological-economic structural models, reverse logistics models, more ecologically friendly distribution models, air and water pollution models, eco-efficiency evaluation models (emission regulation), and resource allocation models. This work was supported by the Grant Agency of Slovak Republic - VEGA grant no. 1/0120/23 Environmental models as a tool for ecological and economic decisions making.

3 - Exploring Consumer Preferences for Subscription: Promoting Sustainable Food Alternative for Synergy between Local and Global Communities
Prashant Kumar, Nomesh Bolia

The focus on sustainable health-oriented food choices has become significant on a global scale. The trend towards consuming organic and sustainable products has seen notable growth, particularly catalysed by the impact of the COVID-19 pandemic. Consumers are now willing to pay a premium for organic and sustainable foods. The promotion of these products has the potential to uplift the income of farmers and processors relying on these products, especially in developing nations like India. This work involves a case study in India, with the motivation of assessing consumers' subscription inclinations to natural sweetener (jaggery). Jaggery prepared from sugarcane juice is an unrefined medicinal sugar with the potential to substitute white sugar across various applications. This survey-based study utilizes structural equation modeling to analyse the impact of utilitarian values, customer attitude, customer awareness, hedonic motives and perceived barriers on subscription intentions. The promotion of jaggery consumption not only aligns with India's commitment to endorse indigenous products with the potential to create rural employment but also contributes to the global efforts towards achieving SDGs, particularly SDG1, SDG8 and SDG13. This research aims to develop a comprehensive subscription model that considers consumer preferences, pricing strategies, economic viability and other adaptive mechanisms to effectively scale this product based on local and global conditions.

4 - Evaluate the Fairness of the Distribution of Health Services for Older People in Italy: A Methodological Approach
Davide Donato Russo

The aim of this methodological proposal is to assess the fairness of healthcare services for various age groups, with particular attention to older individuals and their unique requirements. The significance of pharmacies, hospitals, and para-pharmacies as crucial providers of specialized services underscores the issue of pedestrian access to healthcare services, especially for older adults. Expanding the scope of this methodological approach to incorporate walkability and economic indices is another objective of this study. Fairness and walkability play pivotal roles in establishing an age-friendly environment, particularly for individuals with specific needs such as older pedestrians. This aspect is particularly significant for gaining insights into the accessibility of essential services. In our methodology, we acquired data regarding the distribution of the Italian population across diverse geographical areas and age groups. We then integrated this information with the distribution of health services in Italy. By leveraging the concept of convolution between matrices, we have developed a novel, generalizable methodological approach to analyze the fairness in the distribution of services across various territorial entities, including municipalities, provinces, and regions. We evaluate the concept of fairness, focusing on older people, through the combination of kernel convolution and economic indices for service inequalities (i.e., Gini coefficient).

■ WC-54

Wednesday, 12:30-14:00 - Room: S01 (building: 101)

Demand-responsive public transport 2

Stream: Public Transport Optimization
Invited session
Chair: Dilay Aktas
Chair: Pieter Vansteenwegen

1 - Designing a hybrid urban mobility system: framework and bi-level model
Seyedehsima Madani, Kris Braekers, Imre Keseru

Although traditional public transportation, known as a fixed-route transit (FRT) system, is a cost-efficient transit mode in areas with high demand, it is often perceived as inconvenient due to the lack of flexibility. On the other hand, demand-responsive transit (DRT) systems, known as a flex-route transit system (e.g. dial-a-ride services), have a high per-capita operating cost due to their personalized nature. To combine the flexibility of DRT with the cost-efficiency of FRT, the development of a hybrid transit system could be considered a solution. This research focuses on such a hybrid systems that integrate FRT and DRT systems, leveraging the advantages of both. In this research, first, a unifying framework that classifies different models of FRT and DRT integration is presented. Second, a bi-level optimization approach is proposed to model the design of a hybrid transit system in which users may travel through a combination of FRT and DRT. At the upper level, decisions are made on the FRT lines to be included in the network and