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UNIVERSITÉ LAVAL | Faculté des sciences de l'administration
Département d'opérations
et systèmes de décision

Séminaire conjoint CIRRELT / Département OSD

Hani Zbib

Professeur adjoint, Université du Québec à Montréal

From the Curb to the Plant:
Optimizing Sustainable Waste Management Systems

Abstract: The world generates over 2 billion tons of waste annually, expected to rise to 3.5 by 2050. To address this, municipalities worldwide are transitioning to sustainable solid waste management (SWM) policies anchored in circular economy and recycling principles. However, implementing these policies introduces significant logistical and operational challenges due to technological choices, infrastructure design, and operational planning, requiring a system-wide, integrated SWM approach (from the source of generation to final treatment) to ensure efficient, timely, and cost-effective service for citizens. This necessitates critical decisions across waste storage, separation, collection, transportation, and treatment.

Municipalities must determine how and where waste is sorted, influencing bin sizing and placement, collection policies, and sorting infrastructure needs. Waste collection requires optimizing fleet composition (single- vs. multi-compartment vehicles, compression mechanisms, loading systems, automation, etc.), collection pattern choices, crew scheduling, multi-day scheduling, and routing decisions. Beyond collection, municipalities must decide whether to transport waste directly to treatment facilities or use a multi-echelon network of transfer stations with waste skips, and how to route each waste type to its designated treatment facility.

Optimizing these interconnected decisions is essential to designing sustainable yet cost-efficient SWM systems. In this talk, I will present key research contributions that address these challenges through modeling and optimization approaches for curbside recyclable SWM. I will discuss fleet composition, multi-commodity routing, multi-echelon network design, multi-day scheduling, and bin sizing and placement, demonstrating how the integration of technological, infrastructural, and operational considerations can lead to SWM systems capable of meeting the demands of modern circular economy sustainability policies.

Biography: Hani Zbib is an assistant professor in Operations Management at the department of Analytics, Operations, and Information Technologies at the University of Quebec in Montreal (UQAM). He holds a MSc in Engineering with a specialisation in Transport and Logistics from the Technical University of Denmark (Denmark), and a PhD in Economics and Business Economics from the University of Aarhus (Denmark). After completing his PhD, he became a postdoctoral fellow at the department of Logistics and Operations Management at HEC Montreal. His research interests revolve broadly around the design of intelligent, sustainable, and resilient logistics systems through the integration of data-driven modeling, predictive and prescriptive analytics, and the combination of Operations Research (OR) and Machine Learning (ML) methods. His work primarily focuses on three key application areas: public-sector logistics,, disaster operations management, and food distribution.

Vendredi
28 mars 2025
9 h

Université Laval
Pavillon Palasis-Prince
Salle 3213

Ouvert à tous

Café et viennoiseries

Responsable :
Jacques Renaud

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