Chapter 10
Human-Machine Nexus for Digital Rebound Fostering Futuristic Energy-Efficiency: Ecological Footprint of Technology for Smart-Sustainable Urban Mobility

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ABSTRACT

Human-machine interaction plays a pivotal role in realizing energy-efficient and sustainable urban mobility. There is a vital contribution of HMI in facilitating more environmentally responsible transportation solutions. Through the seamless interaction between users, smart infrastructure, and autonomous vehicles, HMI-driven approaches promise to optimize traffic flows, reduce energy consumption, and minimize emissions. In the rapidly urbanizing world, the evolution of smart-sustainable urban mobility is a pressing concern, necessitating the judicious integration of cutting-edge technology with ecological sustainability. This chapter explores the multifaceted nexus between human-machine interaction, technology, sustainability,

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and urban mobility, with a specific focus on the ecological footprint of technology within the context of smart-sustainable urban transportation systems.

INTRODUCTION

The proliferation of smart cities and their mobility ecosystems is marked by the increasing reliance on technology to optimize traffic management, enhance energy efficiency, and improve user experiences. However, the often-overlooked ecological consequences of this rapid technological integration, including the paradoxical "digital rebound," are significant concerns that require comprehensive exploration (Kunkel & Tyfield, 2021). The digital rebound effect, wherein efficiency gains from technological advancements are offset by increased consumption, poses a formidable challenge to the aspiration of sustainable urban mobility (Bibri et al., 2023). The understanding of and addressing the intricate relationships between human interaction with technology, ecological impact, and energy consumption is essential (Yigitcanlar et al., 2020).

Digital rebound effects, characterized by increased energy consumption resulting from improved technology, are a specific concern within the context of urban mobility. The nexus between human-machine interaction, technology, sustainability, and urban mobility is central to the realization of a smart-sustainable urban future. As cities continue to evolve, it is imperative to understand and harness the power of human-machine interaction to forge a sustainable path forward in the face of digital rebound, ultimately fostering a futuristic urban landscape that prioritizes energy efficiency and environmental responsibility (Son et al., 2023).

Objectives of the Chapter

The chapter can advance knowledge of the relationship between humans and machines in the context of urban mobility, give suggestions for energy-efficient solutions and direct policymakers toward the promotion of sustainable behaviours in smart cities. This chapter has the following objectives to-

- examine the state of urban mobility technologies and evaluate the current technologies for sustainable and intelligent urban mobility. It also access the ecological footprint of contemporary technology by determining their effects on the environment and patterns of energy use
- scrutinize human-machine communication in urban transportation and analyse the function of interaction between humans and machines in relation to urban transportation.