Chapter 1 The Role of Transportation in Environmental Sustainability and Climate Change Mitigation

Aylin Tepecik https://orcid.org/0000-0002-3886-4301 Erciyes University, Turkey

ABSTRACT

The type of transportation used in urban areas is important in terms of environmental sustainability. Cities trigger greenhouse gas production and thus climate change with the services they offer. Environmental problems have increased with increasing greenhouse gas emissions and traffic congestion. In ensuring environmental sustainability, the importance of green transportation types that reduce the number of motor vehicles and fossil fuel dependency, consume less energy, and reduce vehicle-related pollutant problems are mentioned and play an active role in reducing environmental problems. The importance of this study is to address the transportation sector, which is an important source of greenhouse gases, the relationship between the effects of climate change and the transportation sector, and the examination of green transportation policies in reducing the effects of climate change. The study reveals environmentally friendly transportation types in sustainable transportation policies with green transportation systems.

DOI: 10.4018/979-8-3693-6695-0.ch001

Copyright © 2025, IGI Global. Copying or distributing in print or electronic forms without written permission of IGI Global is prohibited.

INTRODUCTION

The population living in urban areas in particular is increasing worldwide. While 39% of the world population lived in cities in 1980, this rate increased to 54% in 2015. It is estimated that this rate will increase to 66% by 2050 (United Nations 2014). In parallel with the increase in population, the increasing number of motor vehicles and the dependence of cities on fossil energy sources increase the effects of climate change. Traffic density also increases with the increase in the number of vehicles. This situation causes an increase in the time spent in traffic, an increase in the consumption of petroleum-derived fuels widely used in the transportation sector, and an increase in the share of greenhouse gas emissions, leading to environmental pollution. Cities are the places where climate change occurs and its effects are felt the most. With the increasing human population, consumption needs have started to increase day by day, and in line with these needs, land use patterns, use of natural resources, and energy consumption habits have started to change.

Due to excessive use of fossil fuels, industrialization, misuse of land, agricultural activities, deforestation, production of construction materials, waste, population growth, and urbanization, the amount of greenhouse gas emissions in the atmosphere is increasing (Demirbaş and Aydın 2020). Total greenhouse gas emissions worldwide have increased by approximately 50% between 1990 and 2020 (World Bank, 2022). Fossil fuels, which meet the majority of energy consumption, cause global warming and climate change. When fossil energy sources are used, their negative effects on the environment are greater than renewable energy sources, and they release pollutants and greenhouse gases into the environment (Erdoğan, 2020).

The greenhouse effect is the fact that the gases in the atmosphere are more permeable to short-wave sunlight and less permeable to invisible wavelength light reflected from the earth due to accumulated greenhouse gases, and the parts close to the ground warm more than expected (Öztürk, 2002). The most common greenhouse gases that cause this effect and are formed in the atmosphere as a result of both natural processes and human activities are: water vapor, carbon dioxide, methane, nitrous oxides and ozone (Shah et al. 2024). The greenhouse effect caused by the presence of greenhouse gases occurs in the troposphere layer of the atmosphere, which is responsible for the emission of 30-40% of the toxic gases in the atmosphere. These pollutants that contribute to greenhouse gas emissions contribute to climate change. Rising temperatures triggered and amplified by rising carbon dioxide levels increase ozone formation, and in addition, increased water vapor leads to more chemical reactions and ozone production (Arshad et al. 2024). These pollutants that deteriorate air quality; It affects climate change patterns, changing precipitation, temperature distributions and ecosystem dynamics (Ding et al., 2017).

20 more pages are available in the full version of this document, which may be purchased using the "Add to Cart"

button on the publisher's webpage: www.igi-

global.com/chapter/the-role-of-transportation-in-

environmental-sustainability-and-climate-change-

mitigation/360765

Related Content

Perspectives on Teacher Research: Teachers Report Challenges in Examining Classroom Practice

Salika A. Lawrence, Rochelle G. Kaplanand Ellina Chernobilsky (2017). *Literacy Program Evaluation and Development Initiatives for P-12 Teaching (pp. 191-206).* www.irma-international.org/chapter/perspectives-on-teacher-research/164854

Using AI to Improve Urban Sustainability: Sophisticated Pollution Control and Environmental Monitoring in Safer Cities

M. I. Anju, Ishwarya Kothandaraman, R. Arunadevi, Kavitha Esther Rajakumari, K. Fouzia Sulthanaand M. Robinson Joel (2025). *Citizen-Centric Artificial Intelligence for Smart Cities (pp. 61-90).*

www.irma-international.org/chapter/using-ai-to-improve-urban-sustainability/378883

Preparing for the Future: Staying Ahead of Obsolescence

Paula Millerand James O. Connelly (2022). *International Journal of Smart Education and Urban Society (pp. 1-15).* www.irma-international.org/article/preparing-for-the-future/303566

2-3-Year-Old Children and the Use of Smart Devices

Daiga Kalninaand Armands Kalnins (2020). International Journal of Smart Education and Urban Society (pp. 64-74).

www.irma-international.org/article/2-3-year-old-children-and-the-use-of-smart-devices/242957

The SURegen Workbench: A Web-Based Collaborative Regeneration Tool

Yun Chen, Yonghui Song, Samantha Bowkerand Andy Hamilton (2012). *International Journal of E-Planning Research (pp. 44-64).*

www.irma-international.org/article/suregen-workbench-web-based-collaborative/66411