Chapter 4
AI Reduces Environmental Toxins in Civil Engineering

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ABSTRACT

This study analyzes how AI reduces civil engineering pollution. AI offers an innovative way to reduce resource consumption, waste, and pollution in architecture and urban development as sustainability and environmental preservation gain popularity. Advancement. The study examines AI applications in resource optimization, waste minimization, energy efficiency, intelligent infrastructure, and real-time pollution surveillance. AI solutions maximize material utilization, improve recycling, and reduce building and infrastructure energy consumption. AI-driven systems enable

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accurate pollution monitoring and predictions, enabling quick actions. However, high implementation costs, inconsistent data, and technical reluctance hinder widespread deployment. The research notes that AI has great potential to promote environmentally sustainable practices, but it must overcome these challenges to be used in civil engineering.

1. INTRODUCTION

Artificial Intelligence (AI) has become a revolutionary influence in various industries, including civil engineering, where it possesses significant potential to tackle environmental issues (Habila et al., 2023). Civil engineering is fundamentally connected to infrastructure development, frequently resulting in considerable environmental consequences, including resource depletion, greenhouse gas emissions, and waste production. As worldwide apprehensions regarding environmental sustainability intensify, the implementation of advanced technologies such as AI has become essential in reducing pollution and promoting sustainable construction methods (Al-Raeei, 2024). AI-driven solutions in civil engineering enable the optimization of resource usage, minimization of waste, and enhancement of energy efficiency in construction projects. Advanced algorithms and machine learning models can evaluate extensive datasets to forecast environmental effects, develop sustainable materials, and monitor pollution levels in real-time. Moreover, AI enhances the advancement of green infrastructure by providing precision in planning, minimizing energy consumption in transportation systems, and assuring adherence to environmental standards (Xiang et al., 2022). This article examines the diverse functions of AI in reducing environmental pollution in civil engineering. The analysis of AI applications in smart building, waste management, and pollution control illustrates how these technologies might transform sustainable engineering methods to address the needs of a more environmentally conscious society.

2. LITERATURE REVIEW

The incorporation of Artificial Intelligence (AI) in civil engineering has garnered considerable interest owing to its capacity to improve sustainability and mitigate environmental contamination. Numerous research have investigated the diverse applications of AI to tackle the environmental difficulties encountered by the construction and infrastructure sectors. This literature review analyzes current research on the role of AI in reducing pollution, emphasizing critical domains such as resource optimization, waste minimization, energy efficiency, and the advancement