Chapter 3
Applying Internet of Things (IoT) for Green and Sustainable Future:
Intellectual Property Rights (IPRs) Raising Carbon Neutrality for Smart-Sustainable Cities

Saurabh Chandra
https://orcid.org/0000-0003-4172-9968
Bennett University, Greater Noida, India

Bhupinder Singh
https://orcid.org/0009-0006-4779-2553
Sharda University, India

Anjali Raghav
https://orcid.org/0009-0004-0248-7956
Sharda University, India

ABSTRACT

The urgency of considering climate change and working for carbon neutrality has accelerated cutting-edge models in energy generation and urban sustainability worldwide. This impetus to address climate change and the shift that cities demonstrate towards a more sustainable, carbon-neutral future has catalyzed city willingness towards solutions that deliver reduced emissions and improve the quality of our urban media. This provides a fantastic context for how smart cities can reduce greenhouse gas use by working both wind and solar renewable agents with very low, even zero, marginal costs. Wind turbines produce clean electricity. Solar energy is made up of photovoltaic panels that capture solar power. Renewable technologies in cities give them a tremendous opportunity to shift away from fossil fuels, cut carbon emissions, and drive international carbon neutrality goals. This chapter underlines the call for diverse pathways concerning intellectual property rights on renewable energy sources to build a sustainable and greener future.

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1. INTRODUCTION

The cities are looking for creative ways to reduce carbon emissions while enhancing the quality of life for their residents in response to growing concerns about climate change and environmental sustainability (Sinha et al., 2021). Wind and solar energy have become practical choices for reducing the negative environmental effects of traditional fossil fuels and guaranteeing a more sustainable, greener future (Salam & Salam, 2020). To achieve the dual objectives of sustainability and carbon neutrality, renewable energy sources must be integrated into broader energy infrastructure and urban environments (Bibri, 2018). The way it produces, uses, and manages energy in cities may change as a result of the confluence of cutting-edge technology, renewable energy, and the Internet of Things (IoT) (Varjovi & Babaie, 2020). It examines the interplay between IoT-based technologies and wind-solar renewable energy, highlighting their importance in creating smart, sustainable communities with carbon neutrality as a primary objective (Ahmad & Zhang, 2021). Cities are poised to become beacons of sustainability, free from carbon emissions and with higher quality of life because of IoT technology and renewable energy sources such as wind or solar power. The bottom line is that a range of options using green renewable energy and advanced technology solutions are essential for enabling a cleaner, greener, environmentally friendly urban future and dealing with challenges posed by the ongoing rapid worldwide Urbanisation eroding slowly environmental degradation into our of living. In this chapter, we discuss how smart cities can be transformed into either carbon neutral or sustainable by the utilization of renewable energy sources such as solar and wind combined with IoT. It evaluates the opportunities, constraints and prospects of this holistic approach with actual examples to demonstrate its viability.

The knowledge of the problems posed by increasing urbanization and climate change is the main driving force behind this chapter (Bibri & Krogstie, 2020). Over two-thirds of the world's population is predicted to live in cities by 2050 due to the exceptional urban population growth rate (Albreem et al., 2021). Urbanization stresses infrastructure and energy resources tremendously, even as it fosters technological advancement and economic growth (Issa Zadeh et al., 2023). It has been demonstrated that traditional energy sources, which mostly rely on fossil fuels, are unsustainable and harmful to the environment (Cantarero, 2020). As a result, the paradigm has shifted to favor renewable energy sources (Sodiq et al., 2019). Due to their enormous potential and small carbon footprint, solar and wind energy have emerged as leaders (Clark & Cooke, 2016).

The clean and plentiful energy sources are provided by wind and solar energy, which harnesses the sun's and wind's infinite power (Tiwari et al., 2022). The utilization of renewable energy sources has the potential to drastically reduce greenhouse gas emissions and reliance on limited fossil resources (Li et al., 2023). However, efficient integration and management are required to realize their full potential (Elavarasan et al., 2021). This is where the Internet of Things (IoT) enters the picture (Ahmed et al., 2017). The Internet of Things (IoT) refers to a network of networked devices, sensors, and systems that gather and analyze data in real-time (Silva et al., 2023). IoT may be used to optimize energy production, distribution, and consumption in the context of renewable energy (Cortese et al., 2022). IoT can improve energy efficiency, minimize waste, and encourage sustainable energy practices through smart grids, buildings, and smart infrastructure (Thornbush & Golubchikov, 2019).

The global perspective is dominated by environmental sustainability and carbon neutrality (Zhukovskiy et al., 2021). The pressing need to address climate change has driven a radical rethinking of our energy systems and urban development methods (Jayachandran et al., 2022). Reduced greenhouse gas emissions, the transition to renewable energy sources, and the construction of smart and sustainable cities