

# Sustainable Urban Planning: Smart City Technologies

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## Abstract

This paper evaluates the implementation of smart city technologies in reducing carbon emissions and improving quality of life in metropolitan areas. We present data from 15 cities across three continents.

**Keywords:** Smart Cities; Urban Planning; Sustainability; IoT

## Introduction

Smart city initiatives integrate IoT sensors, data analytics, and AI to optimize urban services. Our research examines the effectiveness of these technologies in achieving sustainability goals and improving citizen well-being.

## Technology Assessment

We evaluated five key technologies: smart lighting systems, intelligent traffic management, waste management optimization, energy grid monitoring, and air quality sensors. Data was collected from 15 cities over 24 months.

## Impact Analysis

Cities implementing comprehensive smart systems reduced energy consumption by an average of 23%, decreased traffic congestion by 31%, and improved air quality by 18%. Return on investment ranged from 3.2 to 5.8 years depending on city size and implementation scope.

## Experimental Results

City	Population (M)	CO2 Reduction (%)	Energy Savings (%)	Investment (\$M)
Singapore	5.7	28	31	450
Barcelona	5.6	22	27	320
Copenhagen	1.3	35	38	180
Seoul	9.7	19	21	680
Amsterdam	0.9	30	34	150