Chapter 8
IoT for Sustainable Living:
Environmental Monitoring and Alerts

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ABSTRACT

Disasters, whether natural or human-made, inflict widespread devastation and threaten lives, infrastructure, and the environment. The internet of things (IoT) has transformed disaster detection and environmental monitoring. IoT systems, leveraging strategically placed sensors, offer real-time data on various environmental factors, serving as early warning systems. Deploying sensors in urban, industrial, and natural settings, the system continuously monitors air quality, temperature, humidity, rainfall, and wind speed. Equipped with GPS modules, these nodes provide valuable geospatial context, enhancing data precision. This platform enables real-time data processing, analysis, and visualization, with remote access for stakeholders. Employing machine learning algorithms, the system predicts disasters based on crucial environmental parameters, This IoT-based system enhances environmental sustainability, predicts disasters, improves public health, and informs policy decisions, showcasing the pivotal role of IoT in addressing contemporary environmental challenges.

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1. INTRODUCTION

1.1 Exploring Disasters: Natural and Human-Made

A natural disaster, stemming from the Earth's natural processes, brings about catastrophic events that result in widespread destruction, substantial economic setbacks, and, at times, loss of life. These occurrences, often abrupt and unforeseen, unleash immense havoc upon the environment, infrastructure, and local communities. They manifest in diverse forms, such as hurricane, wildfire and volcanic eruption, each exhibiting distinct traits. Alternatively, the aftermath of human oversight or negligence can lead to man-made disasters, causing profound havoc in both communities and ecosystems. These calamities, resulting from industrial accidents, gas leakor pollution of the environment,carry consequences that often rival or exceed those of natural catastrophes.

1.2 Disaster Diversity: Natural and Man-Made

Hurricanes are formidable storms, wielding powerful winds, heavy rainfall, and storm surges, capable of inundating coastal regions and causing extensive damage. Wildfires, uncontrollable infernos, swiftly spread across forests, grasslands, and urban areas, intensified by dry climates and gusty winds. A volcanic eruption is the explosive release of magma, ash, and gases from a volcano's vent or fissure. These natural calamities pose a holistic threat to humanity, emerging unpredictably and inflicting colossal harm on lives and assets. Industrial accidents, often occurring in factories or manufacturing plants, can lead to chemical spills, explosions, or structural failures, causing immediate harm to workers and nearby communities while also polluting the environment.A gas leak can have immediate and serious consequences. It occurs when a gas, such as natural gas or propane, escapes from a containment system. Gas leaks can happen in homes, businesses, or industrial settings and pose severe risks due to the flammability and potential health hazards associated with the gases. Pollution refers to the introduction of harmful substances or contaminants into the environment, causing adverse effects on ecosystems, human health, and the natural balance of the planet. It can take various forms, such as air pollution (from vehicle emissions, industrial activities), water pollution (from sewage, chemicals), soil contamination, noise pollution, and more. Pollution can have far-reaching consequences, including respiratory issues, damage to ecosystems, loss of biodiversity, climate change, and negative impacts on water and food resources.