



# Sustainable Smart City Technologies

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## Research Question

To what extent can smart city technologies be designed and implemented to minimize their environmental impact and promote sustainability in our community?

## Problem Statement

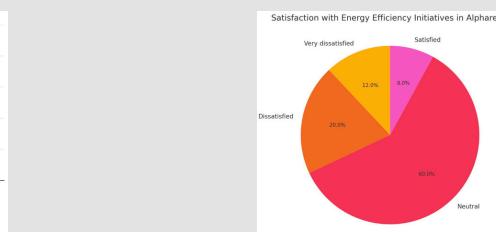
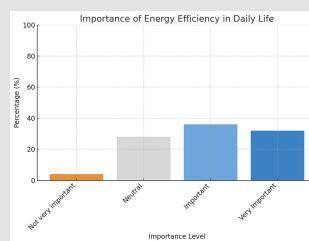
Smart cities face the challenge of ensuring that technologies and systems from different vendors can work together seamlessly. The lack of normalized protocols often leads to fragmented systems that can't share data efficiently. Finding strategies to ensure compatibility is crucial for creating a cohesive and effective smart city ecosystem.

## Introduction

With more advanced technology, the rise of smart city technologies are increasing immensely. The technologies negatively impact the environment. I chose this topic because I was interested in making cities more advanced and useful for the people, making things easier for everyday life. I wanted to research about that and how in the future our cities will be advanced but while also making it sustainable and ecofriendly.

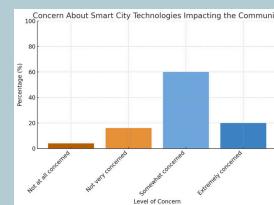
## Methodology

I first started finding websites and articles related to my topic. Then we narrowed it down to peer reviewed articles. This study contained a mixed-method approach. There will be a consent form to fill out. My research needs to confirm the hypothesis that green infrastructure, such as green roofs and solar-powered homes, can improve energy efficiency and environmental health while reducing greenhouse gas emissions. This is for the need for sustainable practices in urban areas where population density and environmental challenges are increasing. Sustainable smart city projects can be analyzed to identify the best practices. The key factors such as energy savings and public safety improvements, will be recorded. Surveys can also be conducted as well as residents in the community to assess perceptions toward sustainable technologies. For my prototypes I made green roofs, Small-scale green roof models that are installed on buildings, with plants selected for their low maintenance and environmental benefits, and, solar-powered wooden homes. The prototype of small wooden homes with solar panels is to test energy efficiency and feasibility. At the end of this study I will debrief and see if my solution made a difference in the community. From using articles and websites about my topic, it's predicted that smart cities are expected to grow in the future. So, while smart cities are increasing there also needs to be a way for the cities to be environmentally-safe. There are key aspects to building a smart city for example, public safety to make sure the technology is safe for everyone of all ages, energy efficient, and transportation. There are many factors to keep in mind while making a smart city. As urban areas continue to grow, the concept of smart cities has gained attention as a potential solution to address environmental challenges while improving quality of life. Cities occupy only 3% of Earth's land but generate 75% of global greenhouse gases and 80% of the global GDP (UN, 2015; UN, 2016). This role as both an economic engine and a source of environmental degradation underscores the need for sustainable urban solutions. Smart cities leverage advanced technologies to improve energy efficiency, transportation, and public safety. However, achieving sustainability requires overcoming challenges like fragmented systems, lack of interoperability, and ensuring technologies are inclusive and accessible to all demographics (Developing Smart Cities, n.d.). Moreover, urban innovations, such as green roofs, have shown promise in reducing energy consumption, managing stormwater, and enhancing biodiversity (Kankaala et al., 2018). By integrating green infrastructure and renewable energy solutions, this research could lead to actionable strategies for sustainable urban development. The findings are supposed to inform policymakers, urban planners, and technology developers on creating smart cities that are both environmentally and socially sustainable.



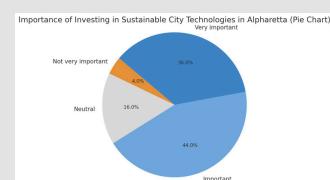
## Results

From the survey conducted by the resident in Alpharetta, it has shown that majority cares about the environment and are concerned about smart city technologies negatively impacting our community. They are dissatisfied with the energy savings in Alpharetta. They want a change in our community and to help save it. This will make sure our community is sustainable.



## Conclusion

At the end of this study, I realized that smart city technologies are increasing rapidly. The more and more technologies added into cities, the more they impact the city negatively. There should be more safe and ecofriendly technologies. There has been more research to find better ways to implement smart city technologies while making them sustainable.



## Materials

For my prototype, I used cardboard as the foundation of my project. The buildings are made out of cardboard as well. Then I put fake grass on top of some buildings. I then bought mini solar panels and attached them to the other half of the buildings. I used a hot glue gun to attach the materials. There are also 3-D printed cars. There are also fake trees and plants all around the city.