**Conclusion and Future Work**

This study created a strong data-based system to understand how traffic and air pollution are connected in cities across the UAE. It used detailed satellite images such as (Sentinel-5P), local air quality sensors like (OpenAQ), and population-based movement data from Google. The work was implemented in two parts where one looked at the past (2020–2022) and the other predicted future trends (2023–2025). A special mapping method called ‘geohashing’ was used to group data by location. This was useful in helping compare patterns across different areas in a clear and detailed way. Also, this helped uncover both expected and unusual links between pollution and how people move around. In the historical analysis, the study confirmed that when people move around less, the NO₂ levels also drop which is supporting the idea that car emissions are a major cause of air pollution in cities. However, some exceptions stood out such as zone thqf4, where pollution stayed high even though there wasn’t much change in how people moved. This shows that factories and other fixed sources can also cause a lot of pollution Therefore, the environmental policies should not only focus on traffic but also consider these non-mobile sources. The prediction models showed that although the number of people move around affects pollution, population density has the strongest and most consistent impact over time and across different places. Many machine learning (ML) models like Random Forest and Gradient Boosting performed better than simple linear models because they could detect complex patterns in the data. The future predictions suggest that if things stay the same, pollution levels might remain high or even get worse, particularly in busy city areas or industrial zones. In addition, our framework used simulations based on made-up changes in movement, location shifts, and population factors in order to test how future environmental risks might play out. These tests showed that machine learning models are useful not only for studying past data, but also for helping cities plan better for the future.

**Future Work**

To enhance the precision, applicability, and impact of the proposed framework, several future directions are envisioned:

* **Integration of Meteorological and Topographical Variables:**  
  Including factors like wind direction, temperature layers in the atmosphere, air pressure, and land elevation can make pollution models more accurate. These variables help explain why pollution levels such as PM and SO₂, differ from one area to another, and how pollutants spread across different zones.
* **Tracking Multiple Pollutants:**  
  Adding more pollutants like PM2.5, carbon monoxide (CO), and ozone (O₃) would give a fuller picture of environmental risks. These pollutants come from different sources and affect health in different ways, so studying them over time and across locations can help us better understand overall air quality.
* **Using Time-Based Deep Learning Models:**  
  Models like LSTM or Temporal Convolutional Networks (TCNs) can better understand how pollution and movement change over time. These models are especially useful for spotting patterns related to events such as public holidays, unusual weather, or new regulations, helping predict how such events impact air quality.
* **Mapping Industrial Emissions with Zoning Data**  
  By collecting data on emissions from factories and combining them with zoning maps like residential, commercial, and industrial areas. We can better identify where pollution is coming from, and this would also help assess how well current land-use policies are working in managing environmental impacts.
* **Live Monitoring and Smart Decision Tools:**  
  Creating a visual platform that combines real-time satellite images, sensor readings, and prediction results would support smarter city planning. This tool could help issue timely air quality warnings and test the impact of different policy decisions, making it a valuable asset for managing urban environments.
* **Modeling the Impact of Green Policies**  
  Future studies can test how different environmental policies such as traffic charges, switching to electric vehicles, or setting pollution limits might affect air quality and traffic over time. Running these scenarios would help decision-makers create smarter, data-backed policies.
* **Expanding to Neighbouring GCC Countries**  
  Applying this framework to nearby countries like Saudi Arabia, Qatar, and Bahrain could support regional planning by revealing pollution that crosses borders and highlighting shared environmental and infrastructure challenges.

Building on these directions, this study supports the shift toward smarter and more adaptive environmental management in urban areas. By merging technologies like satellite sensing, AI, and dynamic policy modelling, cities can move beyond reactive measures and adopt proactive, evidence-based planning. The UAE’s unique combination of urban growth, environmental challenges, and investment in innovation makes it a key location for testing these forward-looking approaches.