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# LOW CARBON APPLICATION IN KUALA LUMPUR AND ISTANBUL

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## ABSTRACT

Carbon neutrality and peak carbon dioxide emissions have become widespread sustainability targets worldwide, particularly in emerging nations, as urbanisation and industry have accelerated. Both cities have developed policies to combat climate change, such as green construction, sustainable infrastructure, improved public transit, promoting renewable energy sources, and waste management programmes. Despite their dedication, every city faces specific difficulties. Istanbul and Kuala Lumpur are both cities affected by climate change, however, both cities manage fast urbanisation while juggling development and sustainability. This study emphasises the low-carbon initiatives of the cities, their parallels and divergences, and offer insights into urban planning and the formulation of policies that will lead to sustainable cities. It also analyses the suitable options for low carbon application that could be applied in both countries, including the use of non-renewable energy and increasing the use of clean energy to reduce CO2 emissions from buildings.

***Keywords:*** *low carbon applications, climate change, sustainable infrastructure, public transportation enhancement, green buildings*
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## INTRODUCTION

There has been increased concern regarding global climate change, mostly caused by energy-related carbon dioxide (CO2) emissions. To efficiently cut CO2 emissions while maintaining economic growth, some countries have sought new development paths, with low-carbon development becoming commonly advocated (Raihan et. al., 2022). Low-carbon development, in general, is a new pattern of political and economic development aimed at lowering CO2 emissions and promoting sustainable development of the environment, economy, and society. According to Varjú (2018), a low-carbon city can maintain low-carbon manufacturing and consumption, build a resource-efficient and environmentally friendly society, and accomplish a well-sustainable energy ecological system.

## RESEARCH ISSUES

Researchers have emphasised the effects of renewable and non-renewable energy consumption, as well as economic growth, on carbon emissions in developing economies is now primarily focused on developing countries, which have long been seen as a zone of rapidly rising economies. This increases the need for energy, which these economies must supply using renewable or non-renewable resources. Non-renewable energy sources have historically played a crucial role in promoting economic progress in developing nations, which has led to a high level of dependence. This dependence continues to produce negative externalities such as carbon emissions and global warming (Hanif, Aziz, & Chaudhry, 2019).

## RESEARCH OBJECTIVES

- To analyse existing low-carbon applications in Malaysia and Turkiye that contribute to global warming and climate change
- To identify the use of electric vehicles, the use of public transportation, and the implementation of CO2 emission-reduction policy.
- To propose appropriate construction that is energy-efficient buildings and infrastructure that is critical to low-carbon development.

## METHODOLOGY

This study used a qualitative research method. Case studies, preliminary studies, observations, and site and context studies are research method approaches. As part of the overall design process, analysis and synthesis are used to develop appropriate solutions that can meet the goal and objectives.

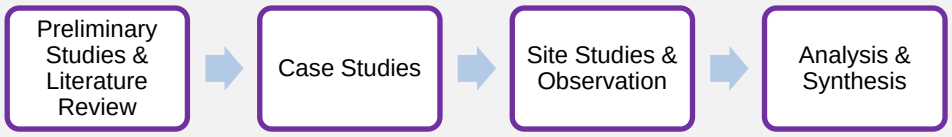



Figure 1: Data Collection Methodology
(Source: Authors, 2023)

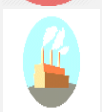
## RESEARCH FINDINGS

### Carbon Usage in ISTANBUL and KUALA LUMPUR

**ISTANBUL**

The heavy traffic and dense population of Istanbul cause large vehicle-related carbon emissions.

Carbon emissions are produced with the burning of fossil fuels, although renewable energy sources are being expanded.



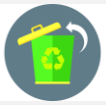
Istanbul's manufacturing, textile, and food processing sectors produce emissions that add to the city's carbon footprint.

## Carbon Usage in ISTANBUL and KUALA LUMPUR

**KUALA LUMPUR**

The heavy traffic in Kuala Lumpur causes large vehicle-related carbon emissions.

Carbon emissions are produced with the burning of fossil fuels, although renewable energy sources are being expanded.



Managing waste properly is essential for lowering carbon emissions. Methane emissions from landfills are reduced as a result.

## Solar Energy Usage in ISTANBUL and KUALA LUMPUR

**ISTANBUL**

With increasing solar installations, Istanbul has good solar potential. Solar energy adoption is still comparatively modest, though. The Turkish government provides incentives, including as feed-in tariffs and investment support, to encourage the use of solar energy.

**KUALA LUMPUR**

Due to Kuala Lumpur's favourable solar potential, the number of buildings with solar panels is rising. By implementing programmes like net energy metering and feed-in tariffs, the Malaysian government encourages the use of solar energy.

## Renewable Energy Usage in ISTANBUL and KUALA LUMPUR

**ISTANBUL**

Istanbul applied the use of hydropower, wind, and solar energy. The city's renewable energy portfolio is expanding as solar installations increase, wind power projects are built along the coast, and hydropower units do their part. The Turkish government offers incentives and assistance for the growth of renewable energy sources (Gönül, Duman, Deveci, & Güler, 2021).

**KUALA LUMPUR**

Solar, wind, biomass, and hydropower are used as renewable energy sources in Kuala Lumpur. While wind power projects are being applied in appropriate places, solar installations are rising. Small-scale hydropower and biomass are further sources of renewable energy. Through initiatives, incentives, and legislation, the Malaysian government encourages the use of renewable energy sources (Rahim, Che, Hasanuzzaman & Habib 2019).

## DESIGN CONCEPTS

**“CARBON OFFSET”**

**AND**

**“TRANSIT ORIENTED DEVELOPMENT (TOD)”**

## CARBON OFFSET

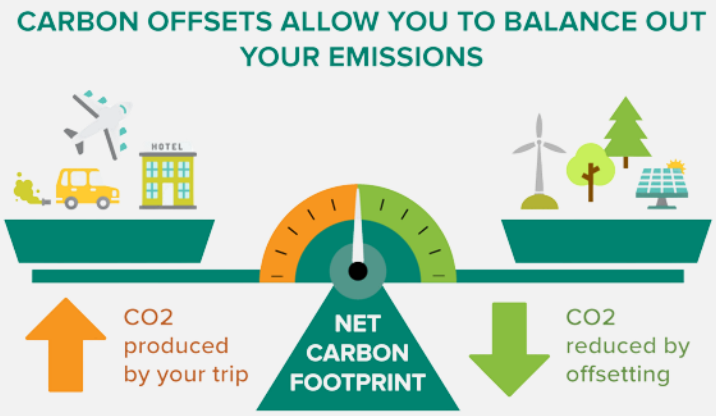



Figure 2: Carbon offset (Source: sustainabletravelinternational, 2020)

By assisting initiatives that reduce greenhouse gas emissions, carbon offsetting helps balance out carbon emissions. This is how it goes:

1. Calculate activity-related emissions.
2. Pick a suitable offset initiative, such as reforestation or the use of renewable energy.
3. Determine the projected project's potential to reduce emissions
4. Independently examine the project's impact to confirm it.
5. Invest in offsets to make up for emissions, helping to finance the project.
6. Achieve carbon neutrality through emission offsets.

## TRANSIT ORIENTED DEVELOPMENT (TOD)


Figure 3: Transit Oriented Development
Source: Mimano (2020)

Communities centred on public transportation that are walkable are created via transit-oriented development (TOD). Compactness, diversified land use, pedestrian-friendly design, less parking, and community involvement are some of its characteristics. TOD encourages sustainability, lowers emissions, boosts air quality, and makes cities more livable.

## PROJECT COMPONENTS

## PROJECT 1: BIOPHILIC CITY


**OBJECTIVES**

1) By incorporating nature into urban settings, a biophilic city improves citizens' well-being by promoting relaxation, stress reduction, and better mental and physical health.

2) Ecological sustainability is a top priority in biophilic cities, which incorporate nature to protect biodiversity, enhance air and water quality, use less energy, and slow down climate change.

3) Incorporating green infrastructure, such as parks and urban trees, into these communities helps them become more resilient to climate-related problems like floods, heat waves, and storms.

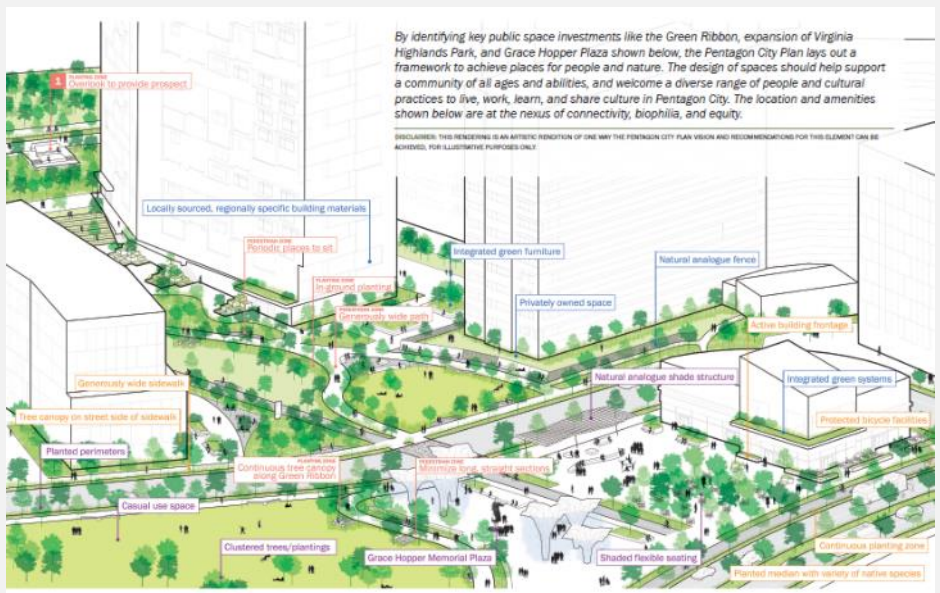



Figure 4: A biophilic city: Incorporating nature into urban settings
Source: DeVoe, J. (2021)

## BIOPHILIC CITY PROJECT COMPONENTS

Green Infrastructure

Sustainable Transportation

Accessible Nature

## PROJECT 2: SOLAR LIGHT STREET


**OBJECTIVES**

1) Solar energy is used to power the lighting in solar light streets, minimising reliance on grid electricity and energy consumption. The environmental impact and carbon emissions are reduced by this clean and renewable source.

2) By eliminating the need for pricey grid electricity, solar-lit roadways result in long-term cost reductions. Operational costs after the initial installation outlay are quite low.

3) By lowering the carbon impact of conventional street lighting, solar light streets enhance environmental sustainability. They help to create a better and more sustainable urban environment by reducing climate change, air pollution, and light pollution.

Figure 5: Solar Light Street
Source: Houseal Lavigne (2023)

## SOLAR LIGHT STREET PROJECT COMPONENTS

Photovoltaic (PV) solar panels

Light Poles

Sensors and Controls

## PROJECT 3: SELF-CONTAINED MOBILITY HUB

**OBJECTIVES**

1) To become energy independent and cut transportation-related greenhouse gas emissions

2) To promote the widespread use of electric cars (EVs) by building up a robust charging infrastructure and offering financial incentives to people and businesses to make the conversion to EVs.

3) To lessen air pollution, combat climate change, and provide an environmentally friendly transportation network that satisfies community mobility demands while having the least possible negative environmental impact.

Figure 6: Self-contained mobility hub
Source: Intelligent Transport. (2021)

## PROJECT 4: ECO INDUSTRIAL PARK

**OBJECTIVES**

1) To encourage businesses to reduce waste production, support recycling and reuse, and adopt resource-efficient methods in order to spread the idea of a circular economy.

2) To combine sustainable design elements and green construction principles, such as energy-efficient structures, water-saving techniques, parks, and infrastructure.

3) By luring companies, startups, and green sectors that share our concern for the environment, to promote economic development and job creation inside the eco-industrial park.


Figure 7: Eco Industrial Park
Source: De Sousa Silva, C., Lackóová, L., & Panagopoulos, T. (2016)

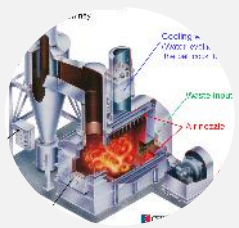
## SELF- CONTAINED MOBILITY HUB PROJECT COMPONENTS

Scooter Charging Stations

Solar EV Charging

Green Rest Hub

## ECO INDUSTRIAL PARK PROJECT COMPONENTS



Smokeless Incinerators

Renewable Energy

Industry Zoning

## PROJECT 5: EcoThermInsulate: THE SUSTAINABLE HEAT CONTROL PROJECT

**OBJECTIVES**

1) Increasing insulation reduces heat gain in the summer and loss in the winter, improving energy efficiency. This keeps the inside at a constant temperature while using less energy and paying less for utilities.

2) Improving a building's insulation decreases energy consumption, boosts HVAC performance, reduces carbon emissions, and encourages sustainability.

3) For environmental sustainability, insulation minimises heat gain and loss, lowers energy consumption, and lowers greenhouse gas emissions.

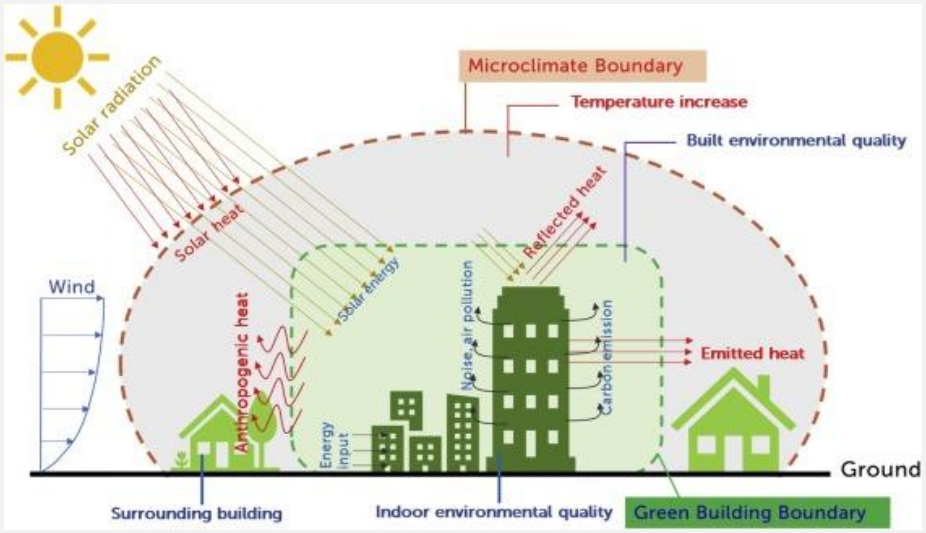
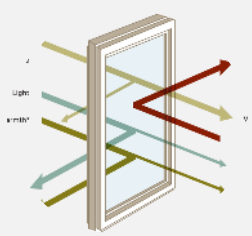



Figure 8: The sustainable heat control project
Source: He (2019)

### EcoThermInsulate PROJECT COMPONENTS

Air Conditioning (HVAC) System



Low-Emissivity (low-e) Glass or Insulated Frames

Insulation Batts

## PROJECT 6: ECOCITYSCAPE

**OBJECTIVES**

1) To lessen city carbon emissions, put sustainability practises into place, and promote renewable energy sources.

2) To increase energy efficiency in infrastructure, transportation, and buildings using smart technology, eco-friendly building practises, and renewable energy. The project's main objectives are to optimise energy utilisation and lower overall energy consumption.

3) To encourage the use of renewable energy by building a solid infrastructure and supporting clean energy technologies, thereby lowering reliance on fossil fuels for a sustainable energy future.


Figure 9: Ecocityscape
Source: Xinyang University South Bay Campus Master Plan (2023)

### ECOCITYSCAPE PROJECT COMPONENTS

Renewable Energy Infrastructure

Sustainable Transportation


Smart Cities Technologies

## PROJECT 7: ZERO WASTE POLICY

A key turning point in the evolution of waste management occurred in Korea during the 1980s with the adoption of the Waste Management Law (Kim, 2021). This regulation provided the framework for a methodical, comprehensive strategy to waste management that was responsible for 60% of the recycling rate. With a recycling rate of only 25% in 2021 and 28.1% in 2019, respectively, Malaysia and Turkiye both have poor recycling rates when compared to other emerging nations. To aid in trash management, both Malaysia and Turkiye should embrace this regulation.

**OBJECTIVES**

1) To encourage people to properly separate their waste at the point of disposal and to assist in the source separation of various recyclable materials, such as paper, plastic, glass, metal, and cardboard

2) To encourage individuals to recycle more by making it pleasant and accessible

3) To reduce the overall amount of garbage going to landfills by diverting things that can be recycled from the waste stream..


Figure 10: Zero Waste Policy
Source: FORCE Project: Cities Cooperating for Circular Economy (2023)

### EcoThermInsulate PROJECT COMPONENTS


Recycling Bin


Waste Management Law

Smart Waste Management

## PROJECT 8: ECO-FARMING

**OBJECTIVES**

1) Eco farming encourages soil conservation, water management, and biodiversity preservation in order to reduce the use of synthetic chemicals, such as pesticides and fertilizers, which can affect ecosystems, water bodies, and wildlife.

2) Eco farming lessens reliance on synthetic inputs and improves overall farm sustainability by protecting and promoting biodiversity by building habitats for beneficial organisms, supporting natural pest management, and keeping native plant species.

3) To ensure food security while preserving and enhancing soil fertility using sustainable methods

Figure 11: Eco-farming
Source: Asian Development Bank (2022)

### ECOCITYSCAPE PROJECT COMPONENTS

Organic and Chemical Free Product

High Technology Farming

Agricultural R&D

## PROJECT 9: CARBON SOLVE

**OBJECTIVES**

1) To achieve carbon neutrality by balancing emitted carbon with removal and mitigation actions for a net-zero carbon footprint.

2) To put in place strong carbon offset programmes that support sustainable projects and produce a considerable amount of carbon credits to offset emissions and help slow down global climate change.

3) Increasing adoption of carbon capture technology to effectively capture and store CO2 from significant emitters and lower greenhouse gas emissions.

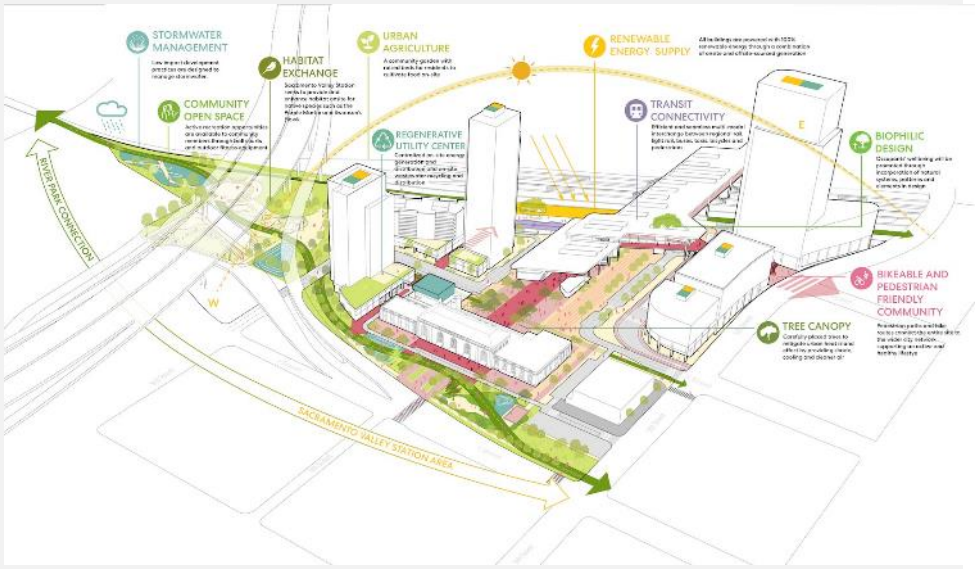



Figure 12: Carbon Solve
Source: Davis (2023)

## CARBON SOLVE PROJECT COMPONENTS

Advance Carbon Capture Technologies

Research and Development

Collaboration and Partnerships

## CONCLUSION

In conclusion, Kuala Lumpur and Istanbul have both made great efforts to deploy low carbon applications and have both acknowledged the urgent need to combat climate change. These projects include the creation of green structures, the improvement of public transportation, the promotion of renewable energy sources, and waste management programmes.

Both cities are committed to low-carbon applications, but they have different problems. Rapid urbanisation in Kuala Lumpur necessitates a careful balancing act between growth and sustainability. Istanbul, on the other hand, is sensitive to the effects of climate change, such as increasing sea levels and extreme weather occurrences, because of its geographic location.

The low carbon initiatives in Kuala Lumpur and Istanbul can be compared to learn important lessons about urban planning and the implementation of sustainable city policies. Stakeholders can take inspiration from such tactics and modify them for their particular circumstance by highlighting the similarities and differences between the cities.

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