# Low carbon society blueprints and primitive attempts of green buildings of existing buildings

**Mohd Hamdan Ahmad**
Faculty of Built Environment & Surveying, Universiti Teknologi Malaysia, 81310 UTM Skudai, Johor DT, Malaysia

Corresponding e-mail: b-hamdan@utm.my

**Abstract.** Rapid development of cities around the world has been the pulling factor for the increased in the rural migration to the cities. It is expected that urban population will increase to more than 60% by 2050 and the biggest growth is expected in the developing countries in Asia. The urban challenges and stresses are contributing to the main issue of climatic changes. One movement to combat and mitigate climate change in the cities is to culture a low carbon urban society. This paper shares the experience of preparing the Low Carbon Society (LCS) Blueprints specifically in matters involving Green Buildings for Iskandar Malaysia and Kuala Lumpur, Malaysia. The focus is on the existing buildings that make up more than 80% of building stocks in the cities. Furthermore, it is easier to manage and regulate new buildings through building submissions whereby the new building has to be designed as green building that will be vetted by respective local authority failing which the building plan will be rejected! Thus, clearly in order to make LCS successfully implemented and achieving target of green building, the most important is the caring for the existing buildings. The paper shares the strategies outlined in the LCS Blueprints and possible approaches to rejuvenate existing buildings into targeted green buildings using low lying fruit strategies before embarking into more expensive active technologies. The layman strategies adopted by house owner in a typical terrace house is used as an interesting case study that is simple and easy to follow with reference to the low-lying fruit principles. The paper discusses on incentives and rewards systems to drive green buildings awareness and implementations of LCS Blueprints for Iskandar Malaysia and Kuala Lumpur. It concluded by showing the illustration of Low Carbon City of the future.

**Keywords:** urbanisation, climate change, low carbon society, existing building

## Introduction

Urbanization is defined as the movement of people from rural to urban areas that provide the increase in the city's population. For some, urbanization is positive move and for others it is seen as rather a negative factor.

At the same time rapid development of infrastructures and economic growth in cities around the world has rapidly increased the rural migration to the major cities around the world. For developing countries like Malaysia and Indonesia, rapid developments of cities are unavoidable as it is the main driving force for economic growth and achieving target of high incomes nation status. But it also provides competitive challenges to urban dwellers in getting good public infrastructure, mass housing, energy, health and education among many others. These urbanization challenges put a burden to the governments that sometimes cause environmental degradation, stresses on employment and social inequality.

Figure 1 and 2 show the urbanization growth for Malaysia and Indonesia respectively [1]. Malaysia hit the 50% mark before 2000, slightly earlier than Indonesia where only after 2000 that 50% population living in cities. However, Figure 2 illustrates that Indonesia has faster and more rapid growth of urbanization in the near future possibly spearheaded by much bigger total population in Indonesia compare to steady growth in Malaysia as seen in Figure 1.

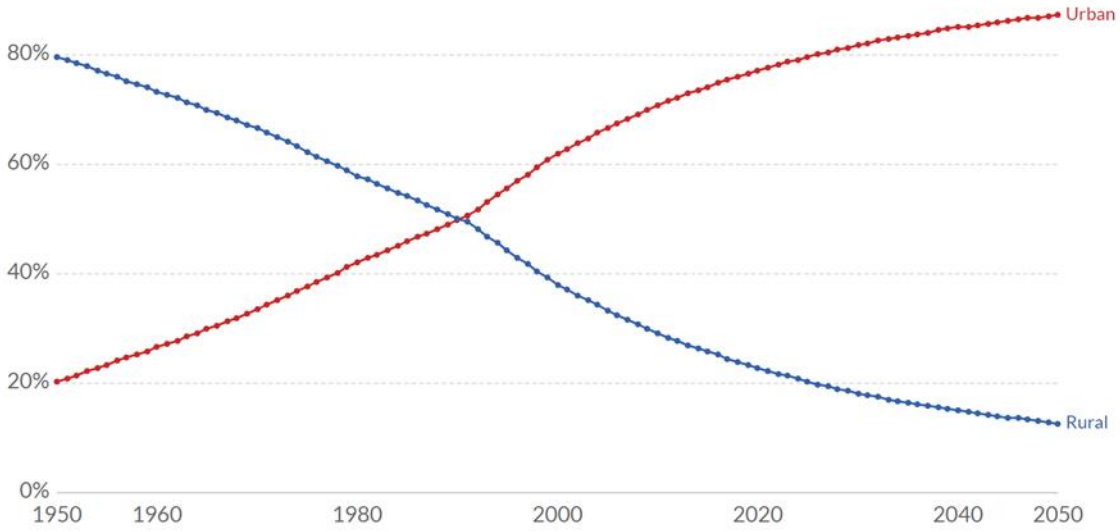


**Figure 1**. Estimated and Projected Urbanization in Malaysia. Source: OWID based on UN World Urbanization Prospects (2018)

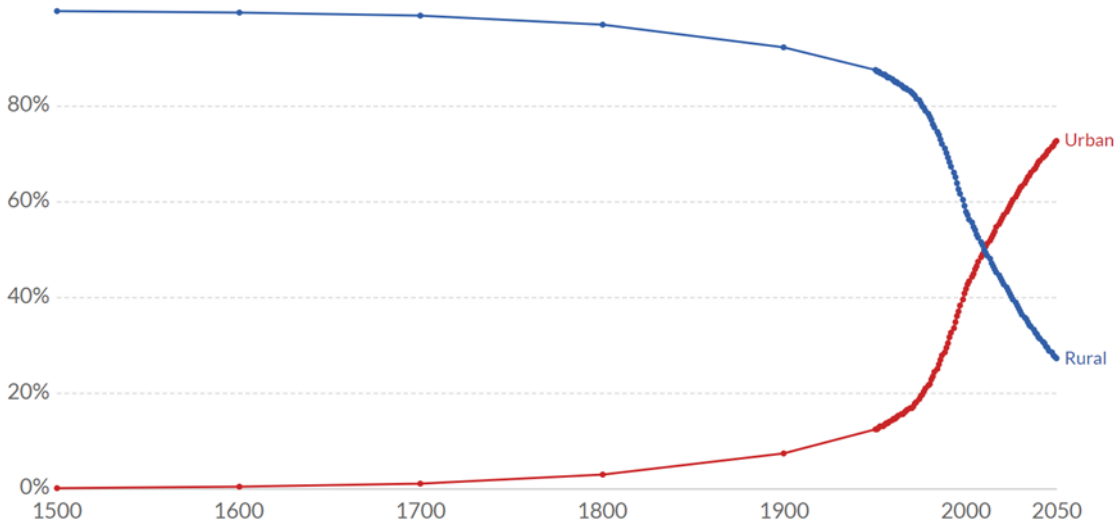


**Figure 2**. Estimated and Projected Urbanization in Indonesia. Source: OWID based on UN World Urbanization Prospects (2018)

It is expected that urban population worldwide will increase to more than 60% by 2050 and the biggest growth is expected to happen in the developing countries such as in Asia as illustrated in Figure 3. The figure also illustrates that the urban density in Malaysia is estimated to be denser than Indonesia [1].

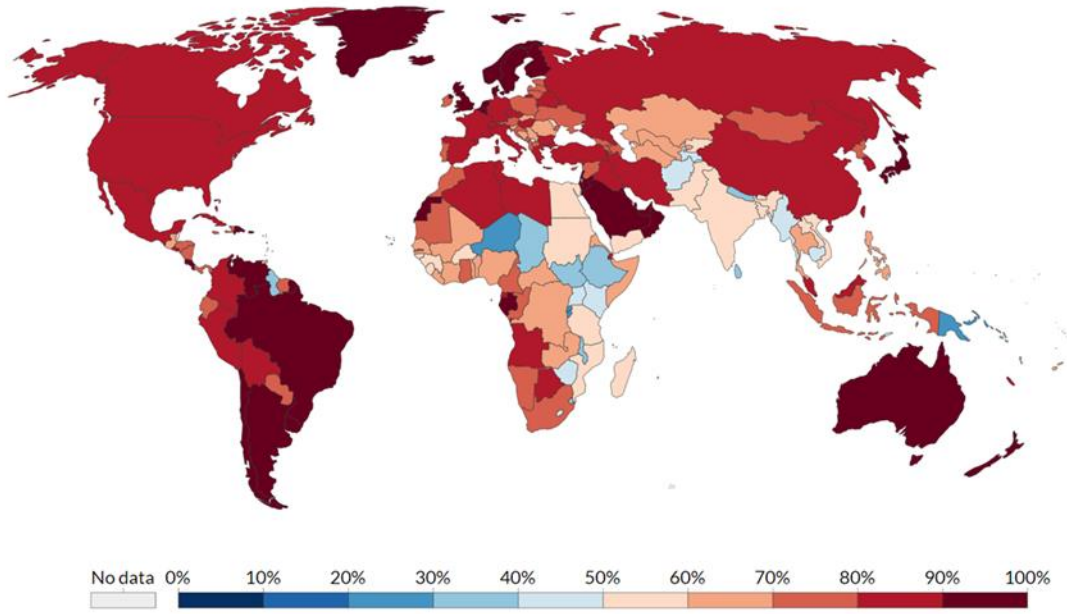


**Figure 3**. Share of the projected population living in the urban areas by 2050. Source: OWID based on UN World Urbanization Prospects (2018)

The objective of this keynote paper is to create awareness on the impact of urbanization to the sustainability of the planet earth. The triple bottom aspect of sustainability which include the environmental, social and the economical domains are discussed with the special emphasis given on the impact and challenges pose to the environment or issues on climate change. The author involvement in creating blueprints for Low Carbon Society (LCS) for Iskandar Malaysia and Kuala Lumpur become the key documents supporting this paper. The aspect of Green Building is highlighted and appropriately, the paper makes special references to Malaysia and Indonesia, as the relevant contexts closer to the participants of the conference.

Further, the focus is on the existing buildings that make up more than 80% of building stocks in the cities. Furthermore, it is easier to manage and regulate new buildings through building submissions whereby the new building has to be designed as green building that will be vetted by respective local authority failing which the building plan will be rejected! Thus, clearly in order to make LCS successfully implemented and achieving target of green building, the most important is the caring for the existing buildings. The paper shares the strategies outlined in the LCS Blueprints and possible approaches to rejuvenate existing buildings into targeted green buildings using low lying fruit strategies before embarking into more expensive active technologies. The layman strategies adopted by house owner in a typical terrace house is used as an interesting case study that is simple and easy to follow. The paper concluded with incentives and rewards systems to drive green buildings awareness and implementations of LCS Blueprints for Iskandar Malaysia and Kuala Lumpur [2].

## Methods

This keynote paper is based on two major blueprints that the author was involved with as green expert. The first blueprint is Low Carbon Society for Iskandar Malaysia 2025 and the second is Low Carbon Society for Kuala Lumpur 2030. The blueprints serve as documents for respective Local Authority to plan and implement programs and activities towards achieving the target of Low Carbon Society. For the region of Iskandar Malaysia the blueprint serves 2 different municipalities, Johor Bahru and Iskandar Puteri and 3 smaller district councils; Pasir Gudang, Kulai and Pontian. The second blueprint is solely for the Metropolitan City Council of Kuala Lumpur or DBKL.

The implementations of certain strategies, programs and initiatives of the two blueprints are observed and discussed. The approach taken for green building initiatives in this paper is on employing low lying fruit strategies that can bring positive impacts with lower cost and is possible to be done by anyone. One of the examples shared here is action taken by the owner of Eco-Bamboo house, in Taman Universiti Skudai, Johor. Eco-Bamboo house was the finalist for Green Accord Initiative Awards under incentive of LCS Iskandar Malaysia.

**Discussion**

One movement to combat and mitigate climate change in the cities is to culture a low carbon urban society. A society that believe in taking actions or doing something that are compatible with the principles of sustainable development by ensuring that the development need within the society are met. The Iskandar Malaysia and Kuala Lumpur LCS Blueprints are a people centric plan with proposed Actions, Sub-Actions, Measures and Programs. Blueprints provide a strategic direction and clear framework for coordinating and consolidating various related but largely unconnected sustainability and climate change mitigation policies and programs. The Blueprints inculcate the thinking of optimising the cities limited resources to be more effectively handled in order to reduce GHG emission that is crucial for mitigating climate change [2,3].

The Low Carbon Green Building Actions in both Blueprints are targeted to increase the numbers of green buildings in the Iskandar Region and Kuala Lumpur Metropolitan City. The Low Carbon Green Building Actions are calculated to contribute 9% and 20% of reduction of GHG emission for Iskandar Malaysia and Kuala Lumpur City respectively [2,3]. The difference is due to the size of the Iskandar Region which is much bigger than Kuala Lumpur and the much higher density of buildings and people in Kuala Lumpur compare to Iskandar Region. Thus, the impact of green constructions and buildings are more significant for Kuala Lumpur. However, for both, the reduction of GHG emissions by changing the behaviour and empowering people and community are estimated to be the same percentage, about 20%.

The increase in the rapid urbanization that drive the population migration in the cities will increase the new building constructions of various types notably residential and commercial buildings or simply non-residential buildings. However, where land is scarce the mixed used development become the new trend and increase the complexity of managing and handling the buildings and their impacts. It is easier to increase the numbers of green building for new building construction but there is always greater challenge to transform existing buildings to become green buildings.

Having low carbon green building implementations can potentially contribute to the following benefits: Enhance and protect biodiversity and ecosystems, improve air and water quality, reduce waste streams and conserve and restore natural resources. Reduce building operating costs, improve occupant's productivity, enhance asset value and profits, as well as optimise life-cycle economic performance. Enhance occupant's health and comfort, improve indoor air quality, minimise strain on local utility infrastructure and improve an overall quality of life.

To use the example of Kuala Lumpur, currently Kuala Lumpur has recorded only 1% green buildings (it is lower in Iskandar Malaysia), but the target set in the blueprint is high and very ambitious to have 60% green buildings by 2030! So how can we achieve it? Therefore, there must be strong enforcement by the respective Local Authorities to only approve green rated buildings for new submission of building plans and developments. At the same time, there must be favourable incentives for building owners of existing building to rejuvenate their properties into green buildings. The incentives can be in the form of reducing taxes and allowance for increasing plot ration etc. The green building awards are another program that can drive competition and pride for building owners. In this aspect Iskandar Malaysia Regional Authority has implemented the GAIA awards [2] which is now into the third year running, while Kuala Lumpur will start its Low Carbon Building Award (LCBA) [3] soon.

In order to achieve green buildings in both new and existing buildings, the author suggested 3 prongs: passive design strategy, energy efficiency and green building management. Further, the possible approaches to design new buildings and rejuvenate existing buildings into targeted green buildings using low-lying fruit strategies before embarking into more expensive active technologies are promoted. One of the examples of this Low-Lying Fruit Principle in designing Green Building is promoted by Lechner [4] as shown in Figure 4.

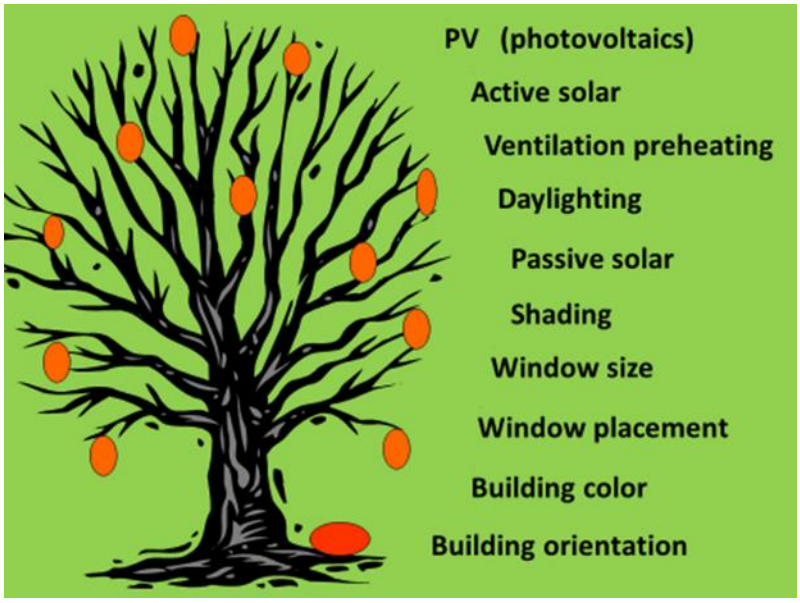


**Figure 4**: Low-Lying Fruit Principle as promoted by Emeritus Professor Norbert Lechner

The Low-Lying Fruit Principle is used to analyse an effort made by the owner of Eco-Bamboo House situated in the residential area of Taman Universiti, Skudai, Johor. The owner bought the property from previous owner and started to do a Do-It-Yourself strategy in order to create what he believes as low cost green building and sustainable lifestyle. The author visited the house as member of GAIA Panel Jury and in this paper attempt to analyse and discuss the Eco-Bamboo house with Low-Lying Fruit Principle.

**Figure 5**. The bamboo trees lining up the north east side of Eco-Bamboo House providing shade to the outdoor areas and the house too

As it is an existing building, the Eco-Bamboo House could not change the building orientation, instead relate the existing building orientation to the passive needs like capturing natural ventilation, harnessing daylighting, appropriate solar panels orientation and shading including using bamboo planting as natural filter and shade as can be seen in Figure 5.

The Figure 6 below illustrates the owner attempting to reduce solar radiation falling on the roof surface using discarded polystyrene covers covering major part of his house. The polystyrene covers are recycled from the wet market nearby and act as first layer for insulation. He also placed soil and plants pomegranate trees making them as simple and cheap green roof! The idea is to reduce solar radiation and heat transfer through the roof section.

**Figure 6**. The polystyrene or polyfoam covers insulating the roof and creating the green roof

As part of building orientation and understanding solar, he also placed coil of black pipes on top of his roof facing west to produce hot water and stored it for daily consumption. Figure 7 illustrates the passive solar thermal water system and how the coil of black pipes placed on top of the roof to absorb heat from the direct sunlight.


**Figure 7**. Thermal hot water system using coil of black pipes placed on the roof

The other Low-Lying Fruit Principle that can be found in the Eco-Bamboo House is the utilisation of natural light, that may be considered as passive daylighting technique. The penetration of daylight

replaces the need for artificial lighting during the day in deeper area of the house. If the light is brighter, he has screen of cloth and netting to filter the light. Figure 8 shows how the daylighting is done by making a hole in the ceiling and replacing the concrete roof tiles with transparent roof materials.

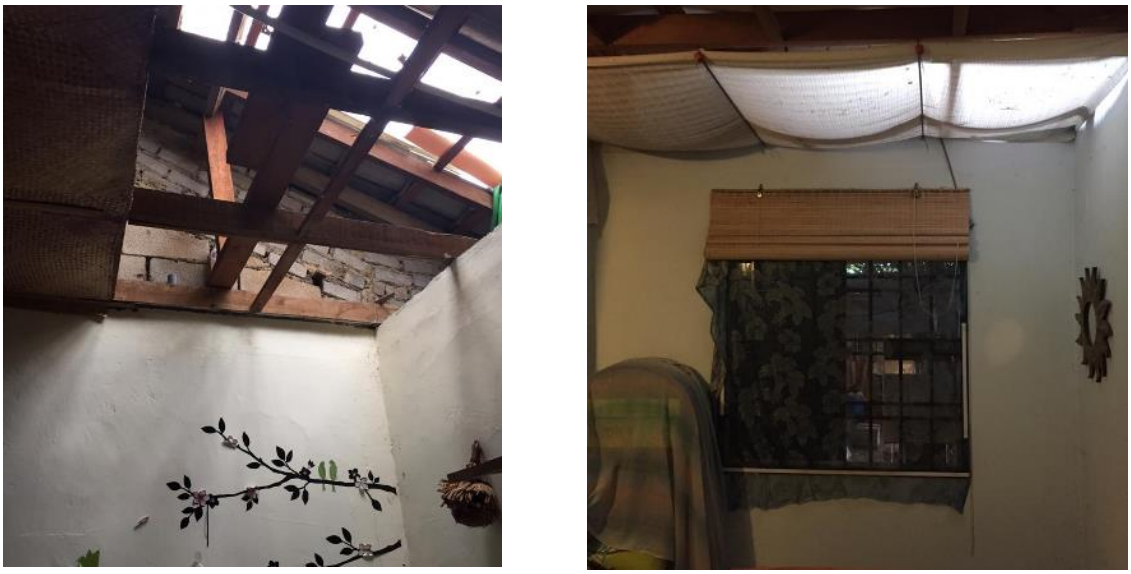

**Figure 8**. Penetration of daylighting to the central part of the Eco-Bamboo house

The other green feature that he has installed in his house is a rain harvesting system that not only store rain waters but purify and avoid mosquito breeding naturally. He uses natural plants and remedy to clean and deter mosquito, thus avoid risk of dengue. The water is actually use to flush his toilets including his own toilet which he placed it outdoor! The stored rain water is also used to water the plants within his compound. The Figure 9 illustrates the rain harvesting system in the Eco-Bamboo House.

**Figure 9.** The rain water harvesting system with bio-organic treatment

Apart from the Low-Lying Fruit Principle as promoted by Lechner, the owner of the Eco-Bamboo House used discarded household materials and recycled them as artworks and sculptures to decorate his house, partly indoor and mostly outdoor areas under his porch and garden areas. He also recycled his fruit waste into natural enzyme remedy for skin and organic washing detergent. Figure 10 shows how the recycled

materials were transformed into art works and sculptures, and how the waste from fruits are turned into natural enzyme-based soap or detergents for home consumption.

**Figure 10**. Recycled materials made into artworks and sculptures while fruit waste turned into organic soap or detergent.

**Conclusion**

The attempts made by the owner of Eco-Bamboo House show how it is easy for anyone to apply Low-Lying Fruit Principles in turning existing buildings to green buildings initiatives. However, even though it is fitting to the green buildings agenda but the primitive approach taken by the owner may give different perception about living green and sustainably to general public which may be looking primitive and untidy. The solutions may need some fine tuning. This is where the role of architects is important to transform existing buildings into green buildings but without incurring very large investment by house or building owners. At the same time, the typical employment of expensive technology as green bashing should be avoided. The thinking that producing green buildings are expensive usually derives from the incorporations of green technology products like photo voltaic system, commercial rain harvesting system and other mechanical means for providing solution for comfort. If the owner of Eco-Bamboo house can convert his house to green buildings primitively by virtue that he was not trained as an architect, then the trained architects can do much better and provide better appreciated show case for others to appreciate green buildings and sustainable buildings that is fitting to the agenda of Low Carbon Society and City.

Finally, with the help of green buildings, the LCS Blueprint for any cities will provide a guide for policymakers, investors, business, NGOs and the public to make informed decisions for policies on investments, development, planning for future growth and managing change in the city. Figure 11 illustrates how the existing city will change environmentally and accordingly to what we envisioned as Low Carbon City where people are taking the centre stage with green buildings, low carbon behaviours and actions, thus making the city more friendly, enjoyable and definitely sustainable.

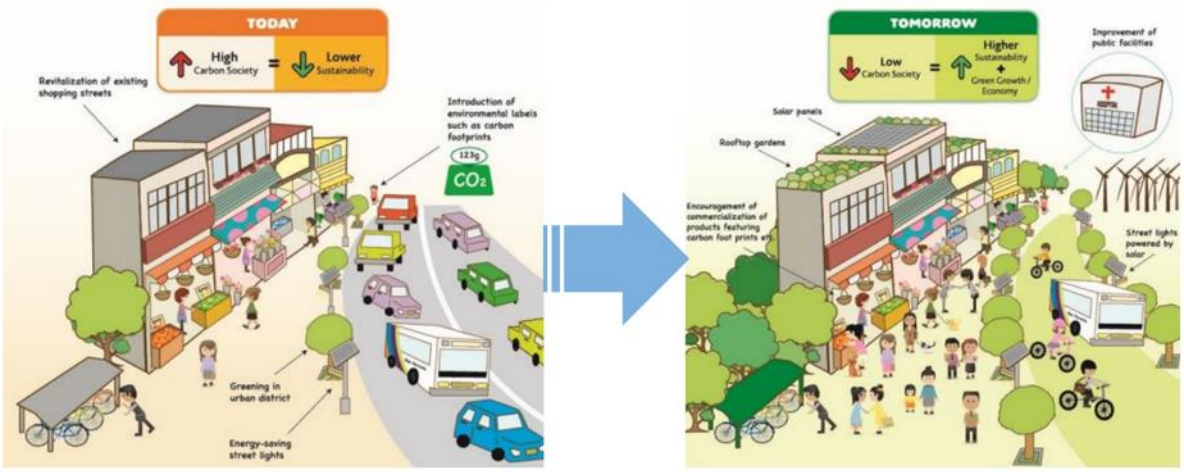


**Figure 11. The transformation of today's existing city to tomorrow's Low Carbon City**

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**References**
[1] Our World in Data (OWID) 2018 UN World Urbanization Prospects 2018 *GitHub Inc*
[2] UTM Low Carbon Research Centre 2013 Low Carbon Society Blueprint for Iskandar Malaysia 2025
[3] Kuala Lumpur City Hall 2018 *Kuala Lumpur Low Carbon Society Blueprint 2030: A Greener Better Kuala Lumpur*
[4] Lechner R 2008 Pick the low hanging fruit first: Use the free and low-cost solar strategist first *Public Lect. Archit. Dep. UTM*