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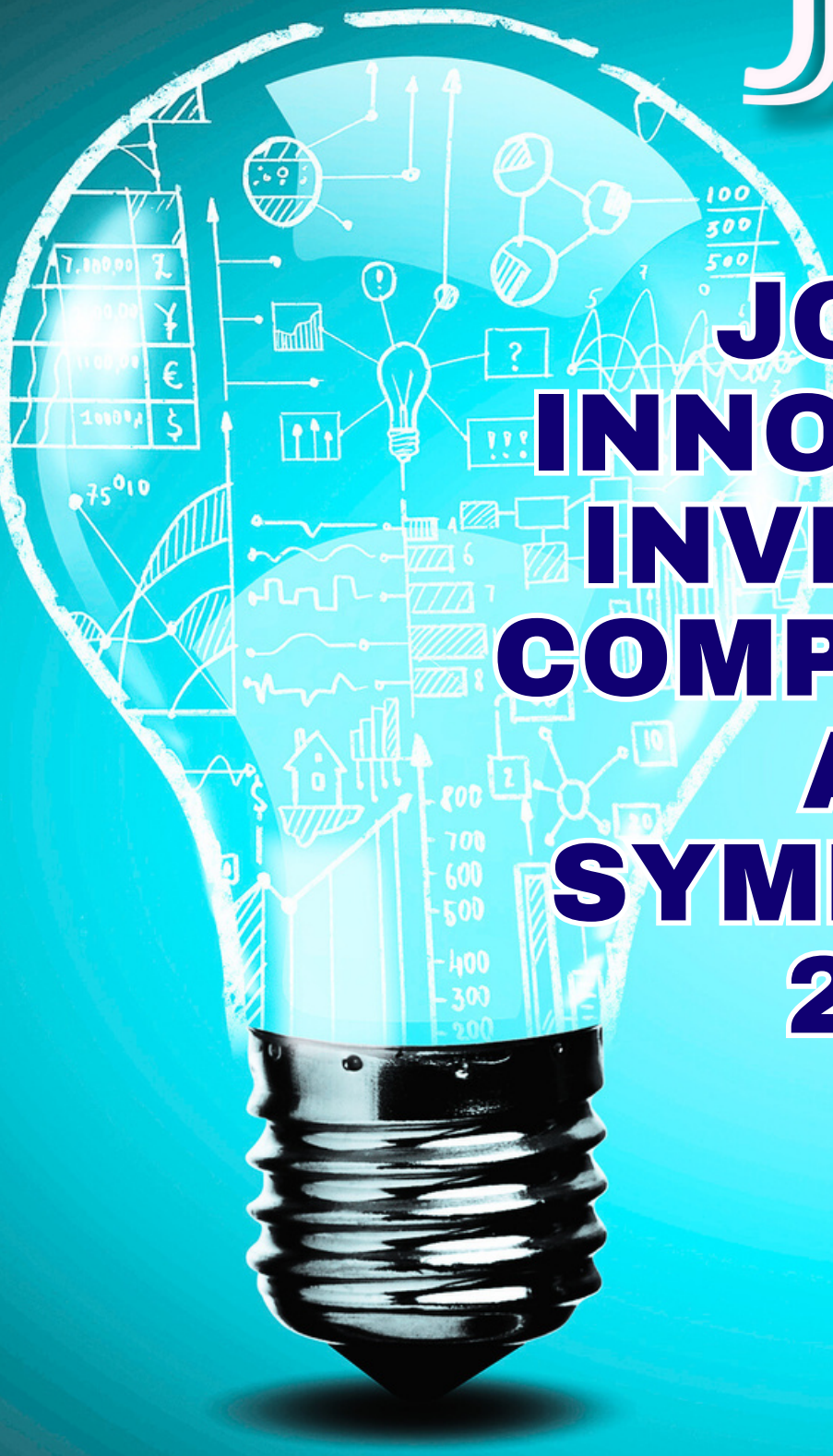

JOHOR INNOVATION INVENTION COMPETITION AND SYMPOSIUM 2023

" Innovation Inspires a Society to be Critical and Creative"

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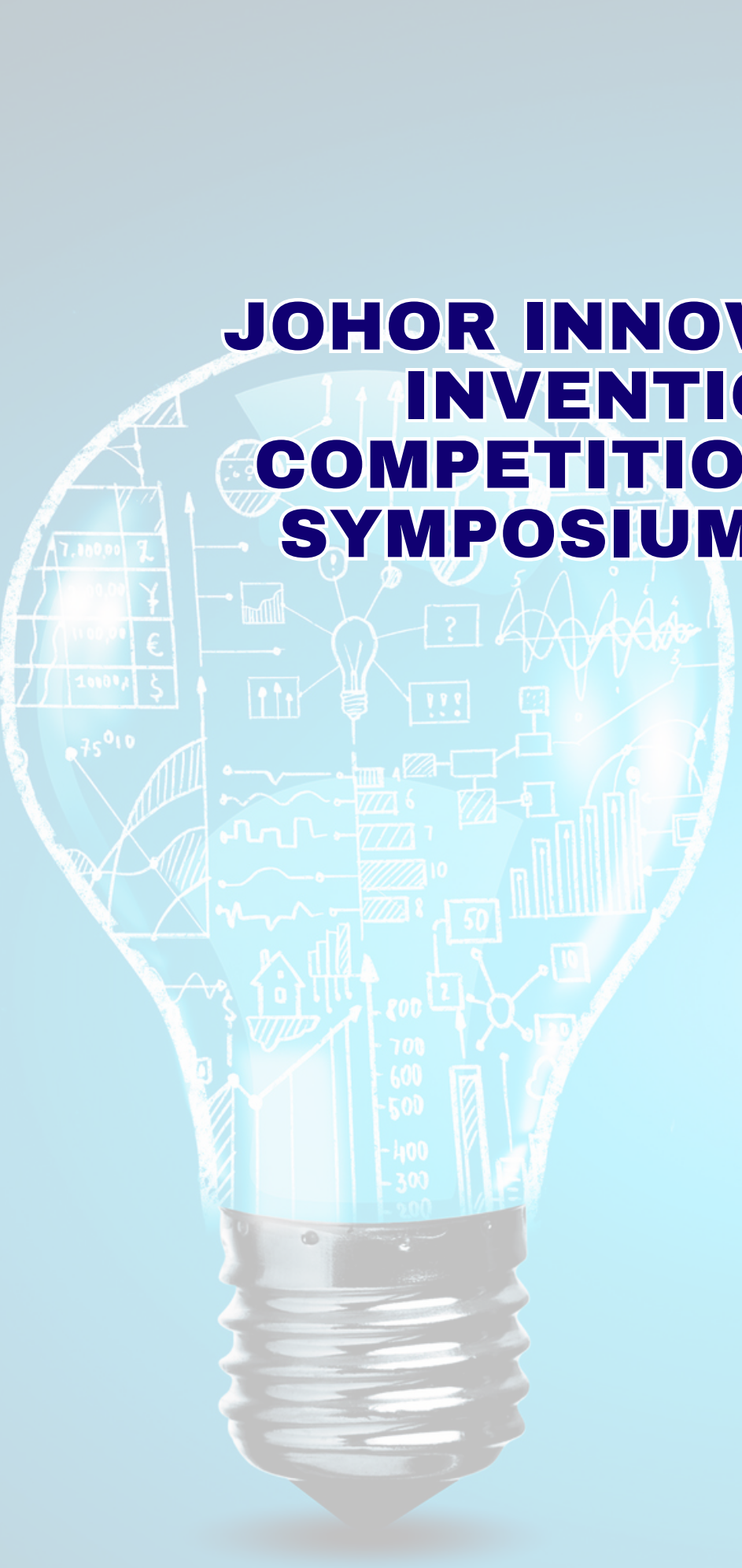

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Editors-in-Chief

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Kampus Pasir Gudang

2023

First Edition 2023

e ISBN: 978-967-0033-17-4

Editors-in-Chief: AHMAD KHUDZAIRI KHALID & NUR INTAN SYAFINAZ AHMAD

Art & Cover Designer: DR. WAN MUNIRAH WAN MOHAMAD & DR. NUR IDAYU ALIMON

Published in Malaysia by
Universiti Teknologi MARA Cawangan Johor
Kampus Pasir Gudang
81750 Masai

Preface

In the name of Allah, the Almighty who gives us the enlightenment, the truth, the knowledge and with regards to Prophet Muhammad (peace be upon him) for guiding us to the straight path. We thank to Allah for giving us guidance and strength to write this e-book.

This e-book compiles the extended abstracts that submitted to Johor Innovation Invention Competition and Symposium 2023 (JIICaS2023), where JIICaS2023 is a virtual platform for all creative minds to share and present their invention and innovation. The extended abstracts are divided into two categories, which are Category A (Higher Educational Student/ Any Recognized Institutional Students in Malaysia) and Category B (Primary/ Secondary School Students / Special Education School Students in Johor). Each abstract gives a brief background on the innovation or project.

We hope that this e-book will help the readers to get to know the innovation done by the students from both categories and get some ideas to develop future innovation products.

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DEVELOPING LOW CARBON PARKS THROUGH THE 360° TREE MANAGEMENT

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ABSTRACT

Urban parks can help incredible cities and reduce energy consumption by mitigating the heat island effect. However, effectively managing urban parks can take time and effort, especially when striving for sustainable development. To address this challenge, the 360° Tree Management innovation has been created to assist park managers in promoting sustainability and enhancing community well-being. This innovation has three main goals: 1) providing a comprehensive and integrated system for tracking tree inventory and development, including species, location, size, and number; 2) evaluating the health and vitality of park trees; and 3) managing and reducing carbon emissions during park management. By assessing carbon-saving potential and implementing suitable landscape patterns, urban parks can play a vital role in mitigating climate change and promoting environmental sustainability.

Keywords: Low carbon parks; Landscape management; Landscape maintenance

1.0 INTRODUCTION

According to the Sustainable Development Report 2022, Malaysia ranks 72nd out of 163 countries regarding Sustainable Development Goal (SDG) performance. The SDGs were established in 2015 as a blueprint for the peace and prosperity of people and the planet, both now and in the future. Comprised of 17 goals to be achieved by 2030, the SDGs include Climate Action, which is SDG 13. However, Malaysia has been struggling to progress in this area, especially concerning CO2 emissions, which have been steadily increasing over the years, according to the World Bank. Carbon dioxide, or CO2, is the main gas affecting global warming, negatively impacting the world. Thus, Malaysia has established the Low Carbon City Framework (LCCF) to address this issue.

One of the programs implemented by LCCF is the Urban Park initiative, which aims to reduce carbon emissions in urban areas. Planting greenery is believed to help sequester carbon, as plants use photosynthesis to create food and grow. During this process, they use sunlight, water, and CO2 to produce oxygen and sugar, with the exchange of gases occurring through stomata, usually located on the lower surface of leaves. However, some scholars found that landscape development also emits carbon. Carbon emission in the landscape is due to production, construction, transportation, management, maintenance, removal, disposal, and recycling over their entire life cycle. Misni et al. (2020) discovered that the number of trees is insufficient and not balanced with users and that the outdoor environment is not meeting carbon reduction targets. Therefore, it is crucial to have good planning and management to reduce carbon production and reach the carbon reduction target.

2.0 OBJECTIVE

The objectives of the innovation are:

i. To create sustainable parks with low carbon emissions through an effective landscape management system.
ii. To manage and produce the quality of trees in urban areas as a source of carbon sequestration.
iii. To reduce the time taken by the park managers to solve tree issues
iv. To improve the quality of life of urban communities.

3.0 INNOVATION: THE 360° TREE MANAGEMENT

The 360° Tree Management is a systematic tree management database that can provide essential information for managing trees in urban parks. This innovation has three main goals which are:

i. **Tree Inventory:** A comprehensive and integrated system for tracking tree inventory and development, including species, location, size, and number.
ii. **Assess the Health and Vitality of Trees:** Analyzing tree health by monitoring trees' growth with proper maintenance. This allows park managers to identify the factors influencing tree health and vitality and develop strategies to enhance carbon saving.
iii. **Manage and Reduce Carbon Emissions in Park Management:** Urban parks significantly mitigate the urban heat island effect. Healthy trees can create "cool islands" within cities and reduce the absorption of heat radiation by the ground. This helps lower energy consumption, particularly during the summer or hot weather.

As depicted in Figure 1, each tree located in the urban parks will contain five data components. To maintain an informative and practical database, the operator is suggested to update the tree data every six months to keep track of its progress and identify any potential problems.

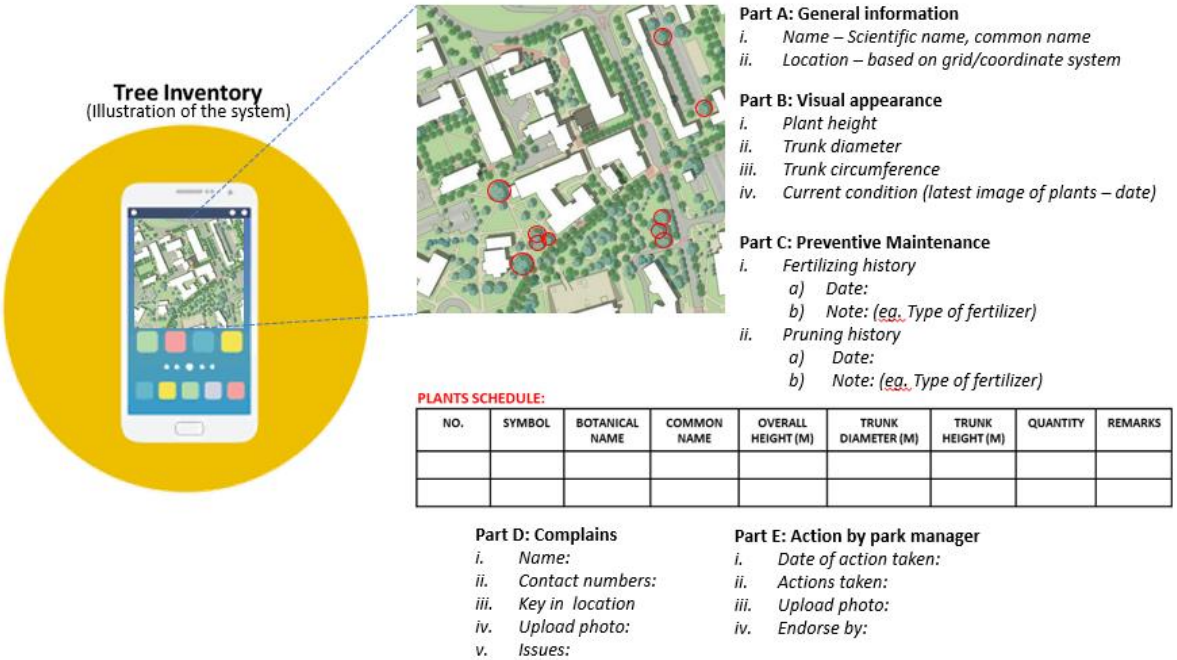

Figure 1: Illustration of the system on Tree Inventory

Healthy and rapidly growing trees are crucial as the amount of CO2 a tree captures depends on its size, age, and other factors. Trees that are healthy and growing well absorb more carbon from the atmosphere. Predicting the impact of trees is possible using a tree carbon calculator

created by academic research and the USDA Forest Service (Figure 2). By utilizing the calculator and database from the 360° Tree Management innovation, we can estimate how much oxygen trees can generate and how much carbon they can store based on age and size. Trees play an essential role in the environment by producing oxygen and serving as a carbon sink, and this tool helps us understand their potential impact.

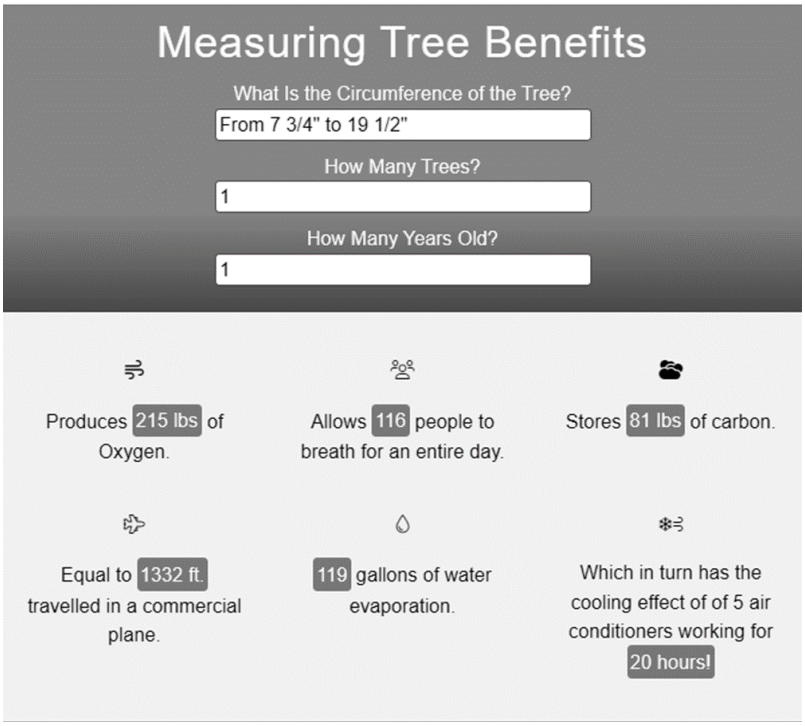

Figure 1: An example of a tree carbon calculator to measure tree benefit.
Source: Academic research and USDA Forest Service

4.0 ADVANTAGES

Following are some advantages of putting the innovation into practice:

i. A systematic database system that records and evaluates tree history and measures tree benefit.
ii. Park managers can effectively maintain urban parks due to their ease of management.
iii. Efficient prevention of tree issues can be achieved by promptly identifying and resolving problems with trees.
iv. Improve the tree value.
v. Enhance the awareness of healthy trees.
vi. Increase carbon sequestration of urban parks.
vii. Reduce carbon emissions in urban areas.
viii. Help to mitigate climate change.
ix. Enhance the quality of life for urban communities.

5.0 CONCLUSION

In conclusion, climate change has negatively impacted the environment and people. We must reduce or mitigate the carbon in the atmosphere to counteract these negative impacts. One way to reduce carbon in the city is by creating urban parks, as trees absorb CO2 during photosynthesis. Through the innovation of 360° Tree Management, park managers and landscape architects can utilize this system to incorporate the park's design and park management with the carbon sequestration rate of the proposed trees.