INTRODUCTION TO LOW CARBON CITY

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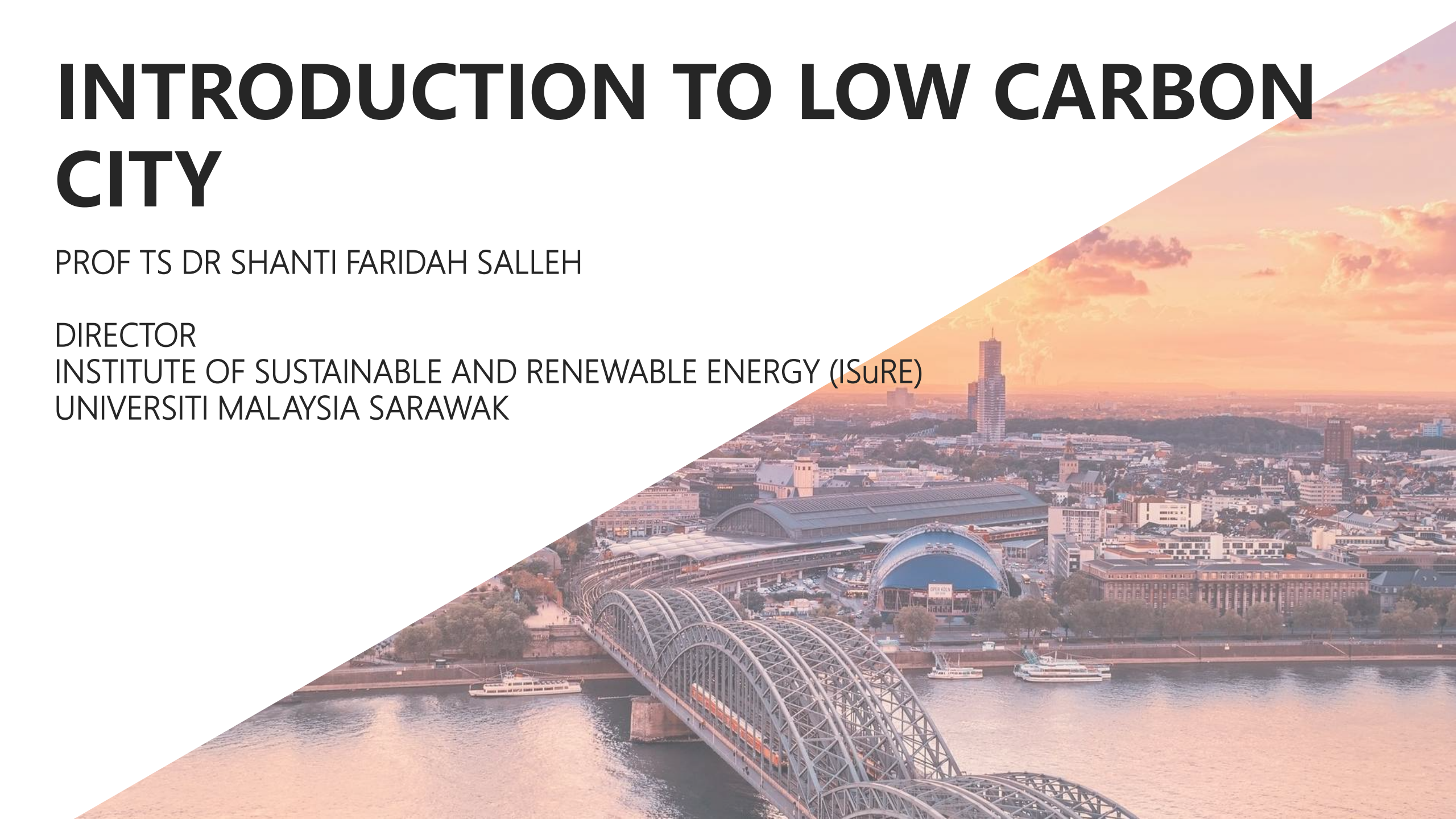

Institute of Sustainability and Renewable Energy

Green Energy

- Green Energy Production & Application
- Green Storage & Mobility
- Green Energy System & Digital Initiative

- ❑ Microhydro
- ❑ Solar
- ❑ Biomass
- ❑ Tidal
- ❑ Wind
- ❑ Hydrogen
- ❑ Battery
- ❑ Fuel Cell
- ❑ Apps and Database

Research Fellows

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Prof Ir Andrew Ragai Henry Rigit
Prof Dr Wan Azlan bin Wan Zainal Abidin
Prof Dr Mohammad Omar Abdullah
Prof Dr Musse Mohamud Ahmed
AP Ir Ts Dr Kismet anak Hong Ping
AP Ts Dr Siti Kudnie bt Sahari
AP Dr Tan Chong Eng
Ir Dr Hazrul bin Mohamed Basri
Dr Yiin Chung Loong
Dr Nazeri Abdul Rahman
Dr Yanuar Zulardiansyah Arief
Dr Hani Awad Albalawi
Dr Wahyu Meka
Ir Dr Muhammad Syukri Imran bin Abdullah

Climate Change

- GHG Inventory
- Carbon Capture & Storage
- Data & Digital Initiative

- ❑ GHG Protocol, Emission, & Estimation
- ❑ CO_2 Capture and Conversion Technologies
- ❑ Sustainable Forest Management
- ❑ Carbon Sequestration

AP Ir Dr Lim Soh Fong (Head)
AP Dr Khairul Adha bin A. Rahim
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Ts Dr Josephine Lai Chang Hui
Ts Dr Hamimah binti Ujir
Mr Mohd Farid bin Atan
Sr Gui Hun Chuen
Dr Nordiana Rajaee
Ir Dr Mohamad Asrul Mustapha
Dr Annisa Jamali
Dr Nur Tahirah Razali
Ir Dr David Chua Sing Ngie
Dr Hafsah Binti Nahrawi

Energy & Sustainability

- Policy & Governance
- Green Growth & Circular Economy
- Social Inclusiveness

- ❑ ESG Index
- ❑ Sustainability Blueprint
- ❑ Circular Economy
- ❑ Green Economy
- ❑ Policy

Dr Florianna Lendai anak Michael Mulok (Head)
Prof Dr Puah Chin Hong
Dr Aazani binti Mujahid
AP Dr Rafeah binti Wahi
Dr Ernisa binti Marzuki
Mdm Noraziah Binti Abdul Wahab
Prof Ir Ts Dr Al Khalid bin Hj Othman
Dr Farah Zaini
Prof. Ar Nurakmal binti Abdullah
Prof. Dr Azhaili Baharun
Ir. Dr Mohamad Asrul bin Mustapha
Dr Mohammad Bodrul Munir
AP Dr Mohammad Affendy bin Arip
AP Dr Maria Josefina Figueroa

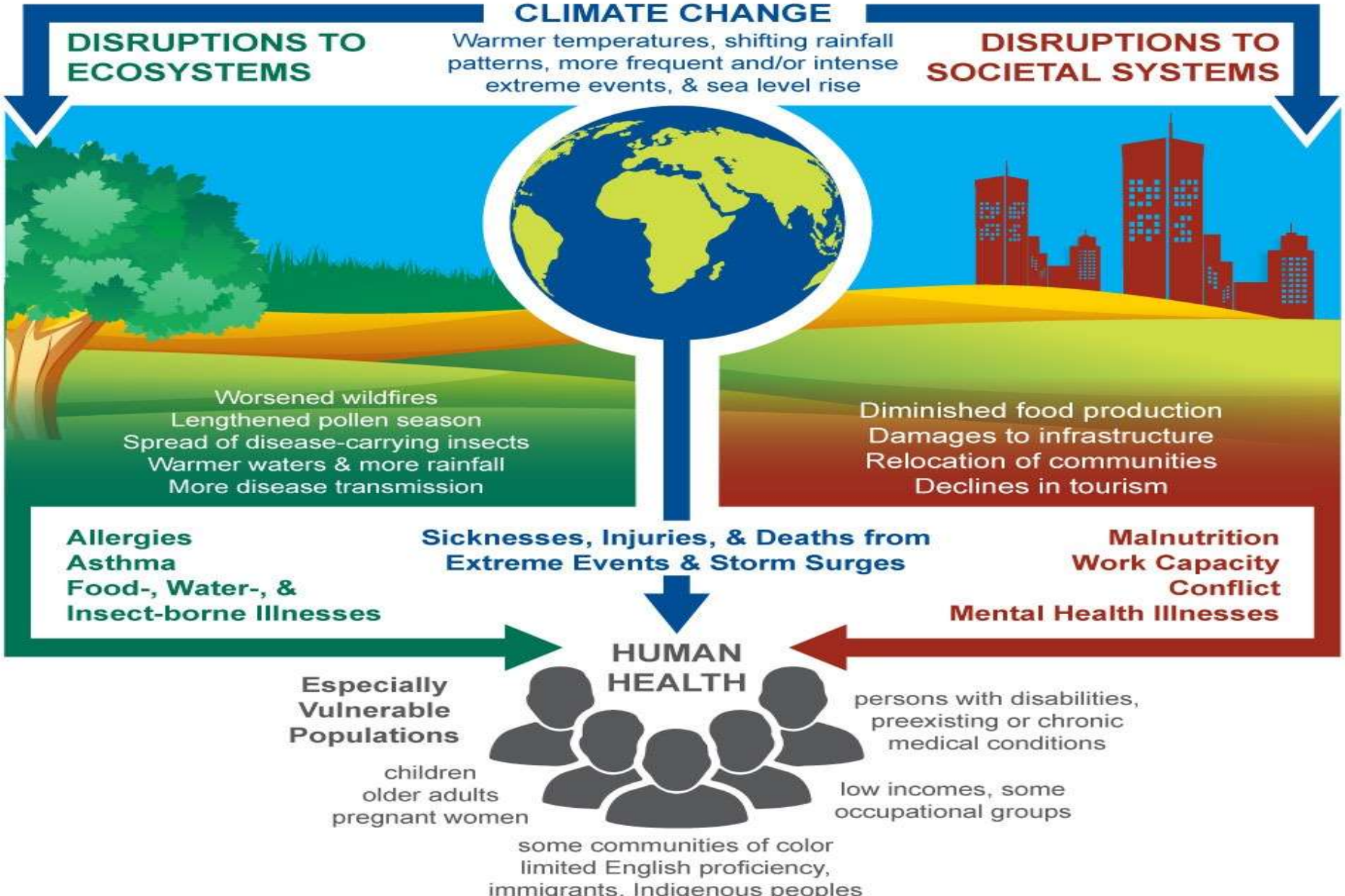
C O N T E N T S

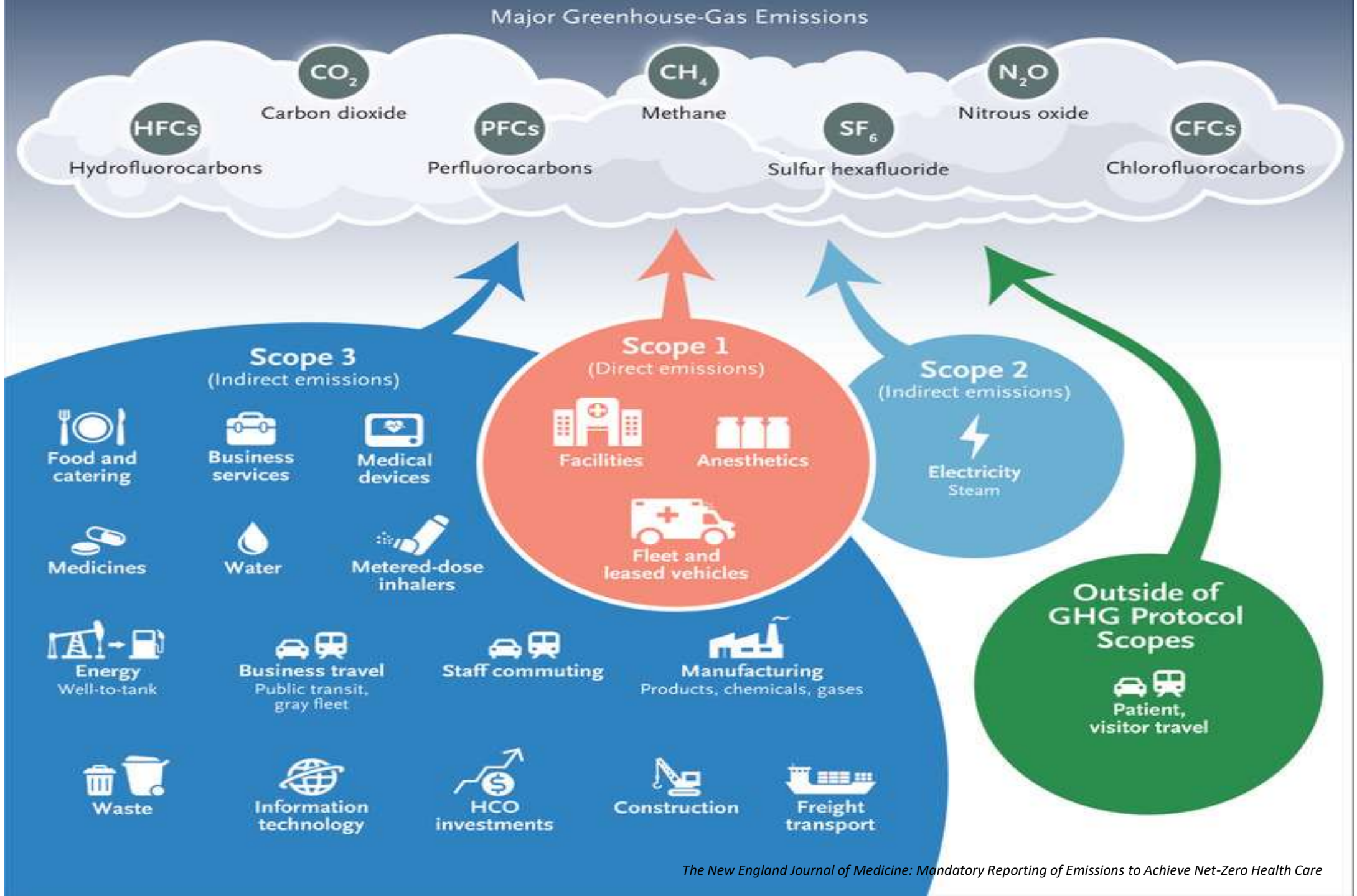
2019

2050

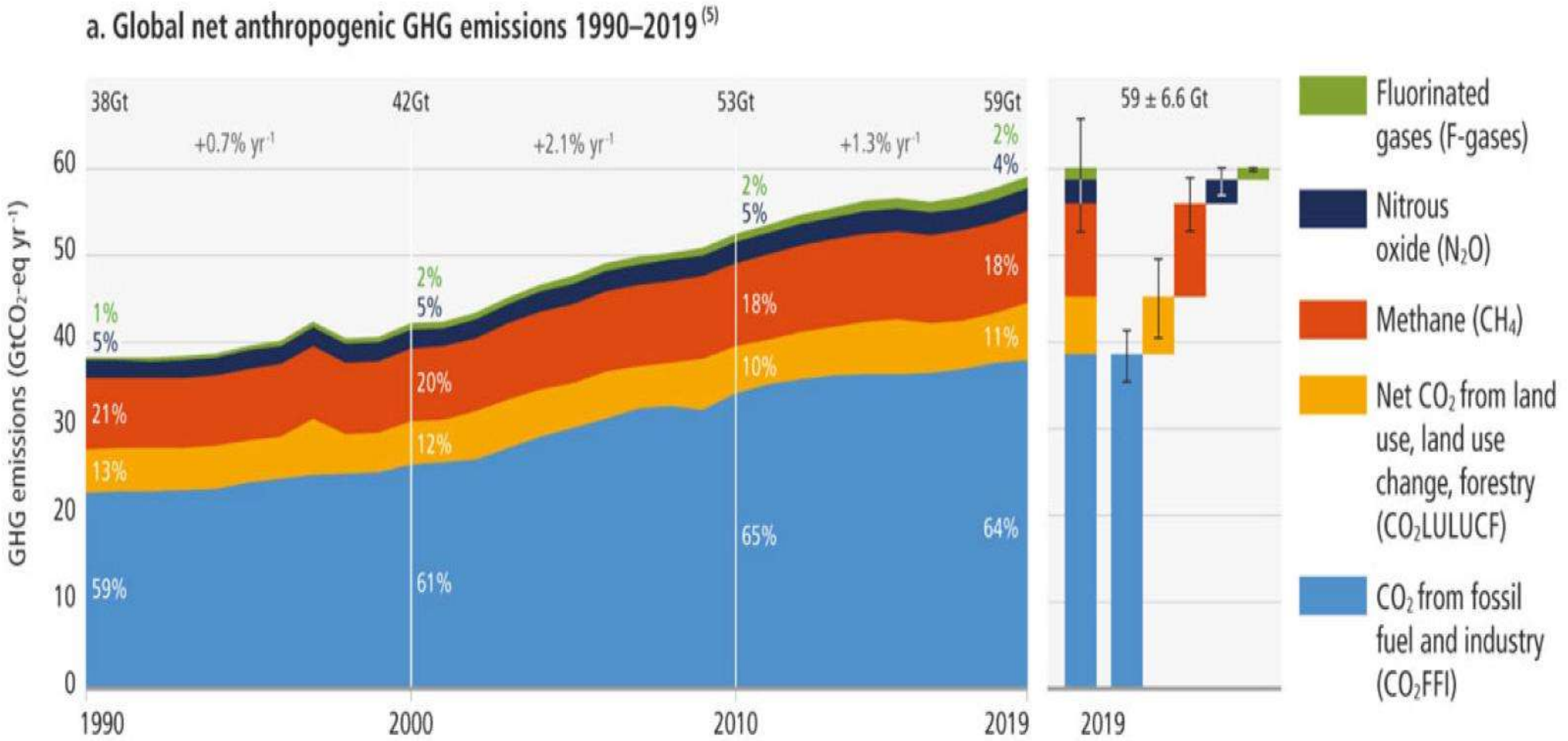
Global Warming

The Impacts of Climate Change on Human Health





The New England Journal of Medicine: Mandatory Reporting of Emissions to Achieve Net-Zero Health Care



https://malaysia.un.org/en/176802-un-climate-report-it%E2%80%99s-%E2%80%98now-or-never%E2%80%99-limit-global-warming-15-degrees

WHAT ARE THE CONCEPTS BEHIND LOW CARBON CITY?

Comprehensive human-supported technological interventions benefit social well-being, economic growth and ecological regeneration in the city

Sustainable development, ecological modernization (reconciling and mutually enhancing ecology and economy), and regenerative sustainability

The ‘Low Carbon City’ can be seen as a direct response to the more recent climate change debate, and the related role of cities; minimizing the human-inflicted carbon footprint by reducing or even eliminating the use of non-renewable energy resources

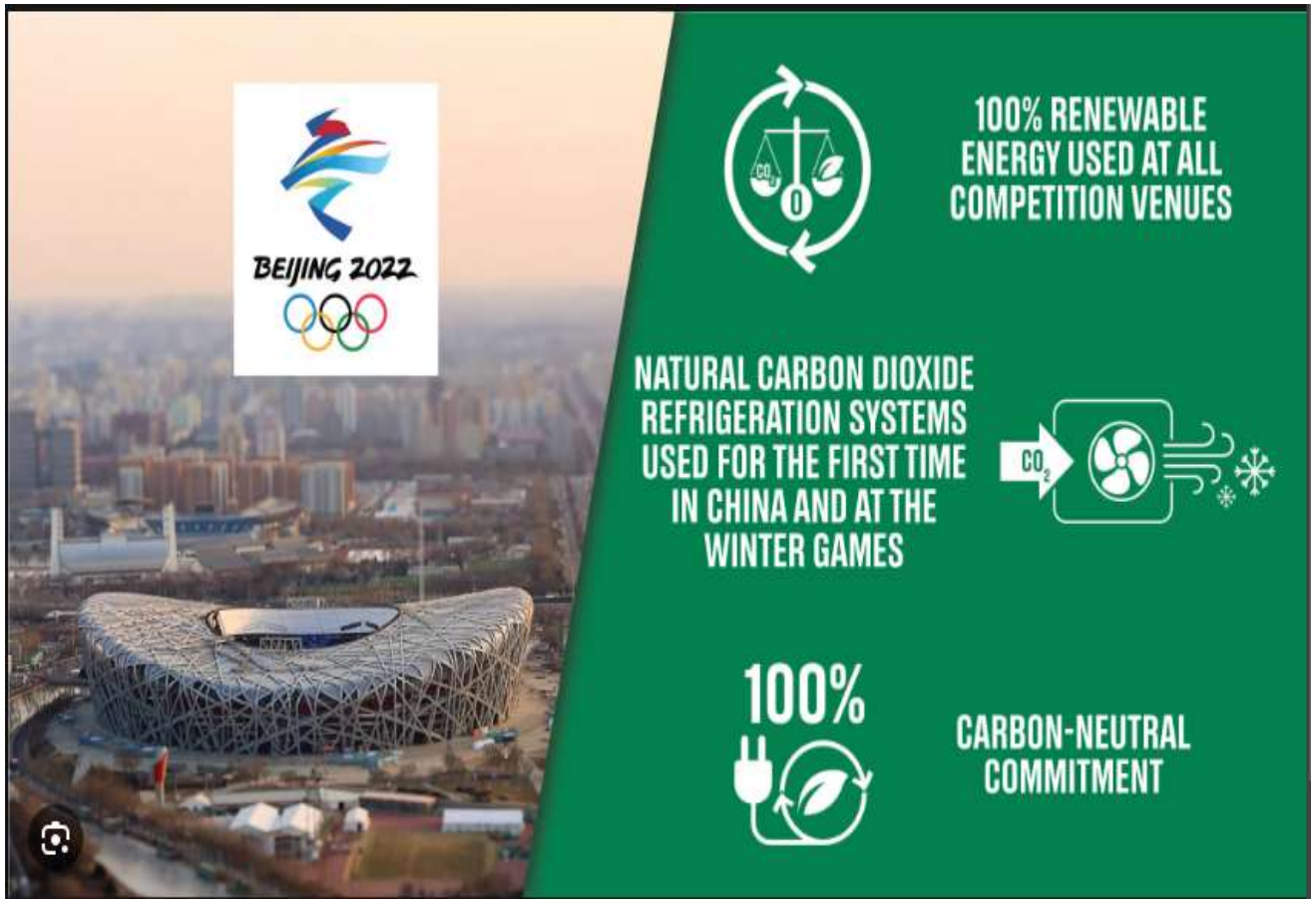
LOW CARBON CITY

Chinadaily.com.cn

Photo by Brian Glanz/FlickrPhoto by Nanda Sluijsmans/Flickr

DEFINITION: LOW CARBON CITY

- A Low Carbon City is a city that implement low carbon strategies to meet its environmental, social and economic needs.
- The city measures, manages and mitigates its carbon emissions to reduce its contribution to climate change.


BEIJING 2022
100% RENEWABLE ENERGY USED AT ALL COMPETITION VENUES
NATURAL CARBON DIOXIDE REFRIGERATION SYSTEMS USED FOR THE FIRST TIME IN CHINA AND AT THE WINTER GAMES
100%
CARBON-NEUTRAL COMMITMENT


Sustaining an incredible future


BIRMINGHAM 2022
Birmingham 2022 promises to be the first Commonwealth Games to leave a carbon-neutral legacy

How Does The Low Carbon City Looks Like?

Renewable Energy for decentralise energy generation

Solar Township/ Buildings

Energy Efficient/ Low Carbon Buildings

Energy & Water consumption reduction

Reduction of Municipal Waste

Transit Oriented Development – reachable by walking and cycling

Lesser/ negligible traffic congestion

Positioning Malaysia in the forefront of low carbon cities development

Urban Environment

Urban Transportation

Urban Infrastructure

Building

Electric Vehicles/ Energy Efficient Vehicles

Efficient & Effective Mass Public Transport

More Green Spaces & Green Connectors

Catalyst of Change and Inspiration to other cities and communities

Plant more high sequestration trees

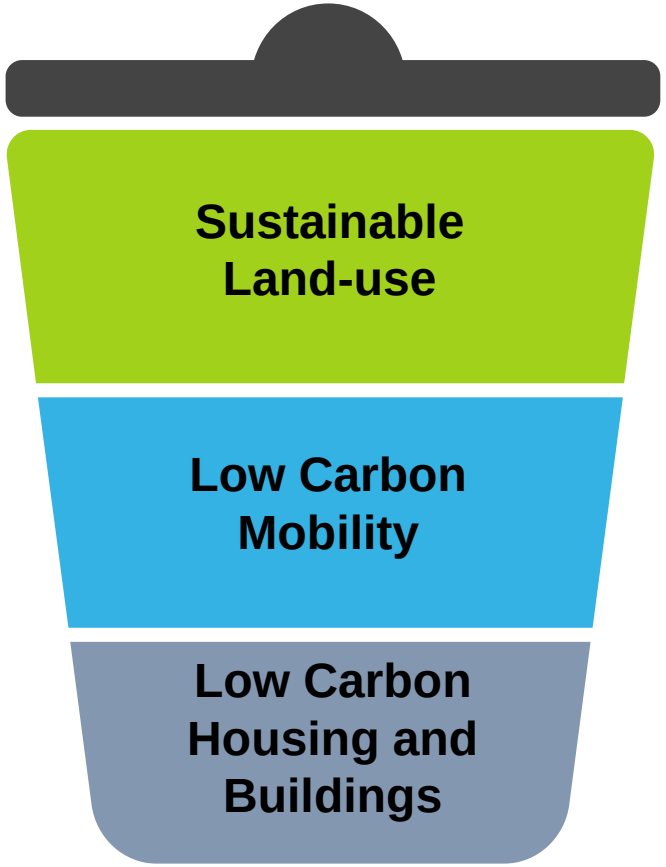
Low carbon emission

Improve standard of living

Government effort is visible & motivates people to value the Environment

Malaysia's Inspiration

WHAT MAKES A CITY "LOW CARBON" ?

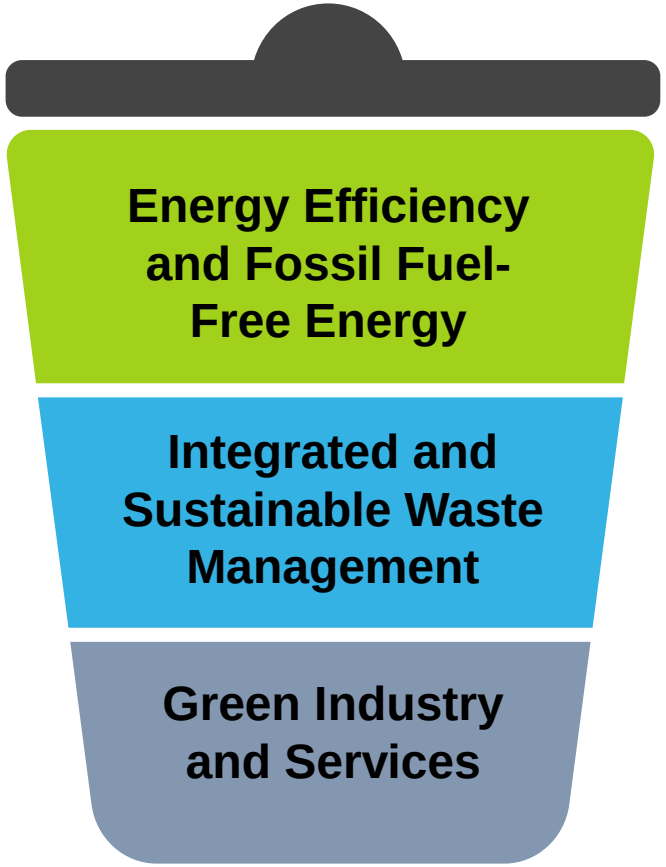


- Land use spatial planning is essential, because it underlies other aspects of a low carbon city
- Encouraging densification and mixed-use development, reducing urban sprawl
- Urban forestry, green spaces

- Improving public transport systems to reach last-mile connectivity, promoting the use of clean fueled-vehicles, and fully integrating mobility into urban planning and development in order to reduce CO_2 emissions and create more livable cities
- Aims to provides alternatives that optimizes and maximises mobility decisions

- Socially equitable and affordable housing options
- Promote resource and energy efficiency
- Addressing vulnerabilities to climate risks
- Retrofitting existing buildings

WHAT MAKES A CITY "LOW CARBON" ?

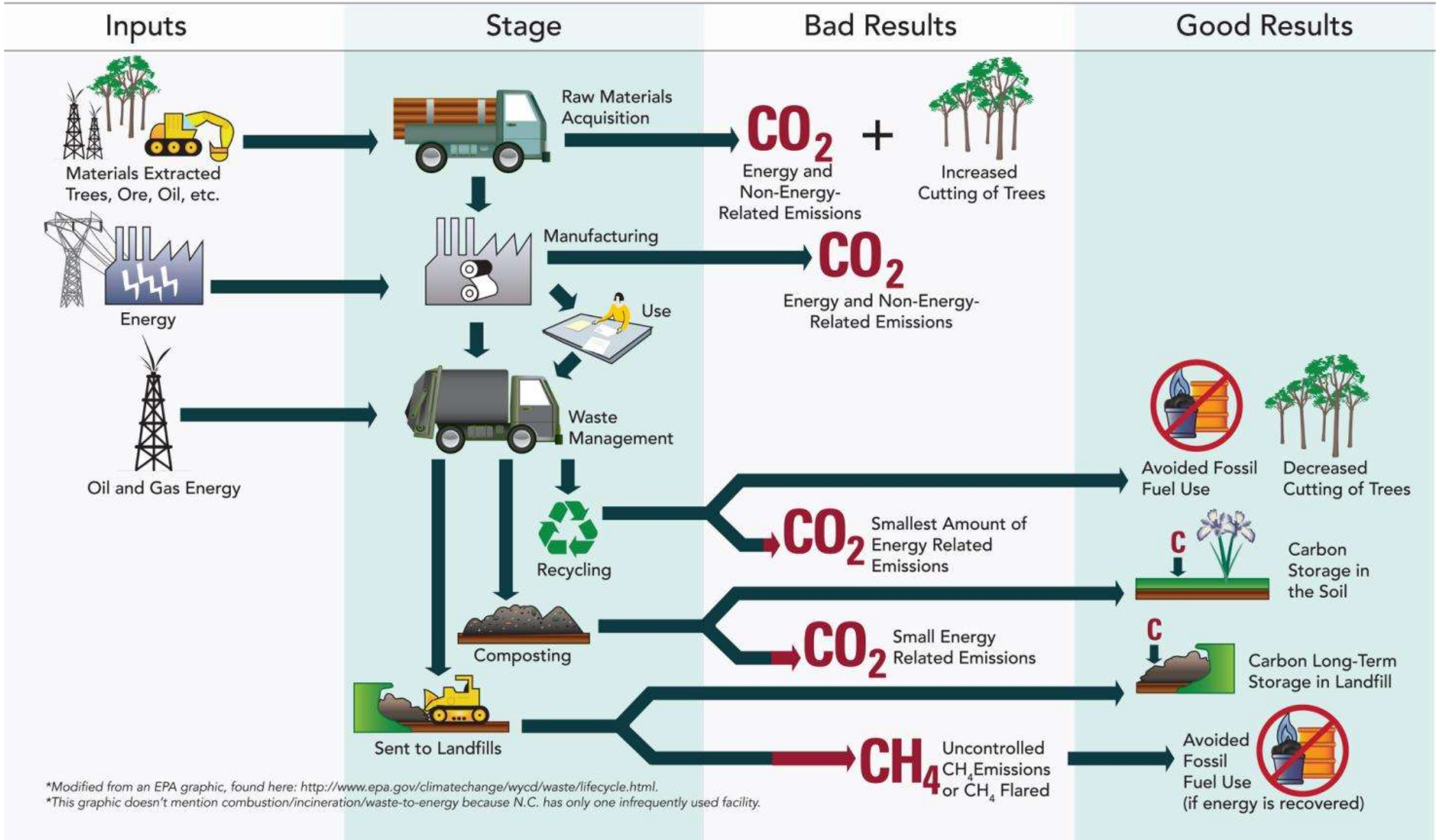


- Energy is supplied from low-carbon sources and as much as possible distributed renewable sources (wind, solar, geothermal, biomass, small hydro, etc.), waste and combined heat and power
- Decentralised energy distribution; energy micro-generation
- Energy efficiency technology & standards

- Policies and practices that minimize waste and recycle
- Residents and urban industries are encouraged to sort and recycle their garbage
- Waste management is integrated with water and energy management, where remaining waste is treated as a valuable feedstock for energy generation

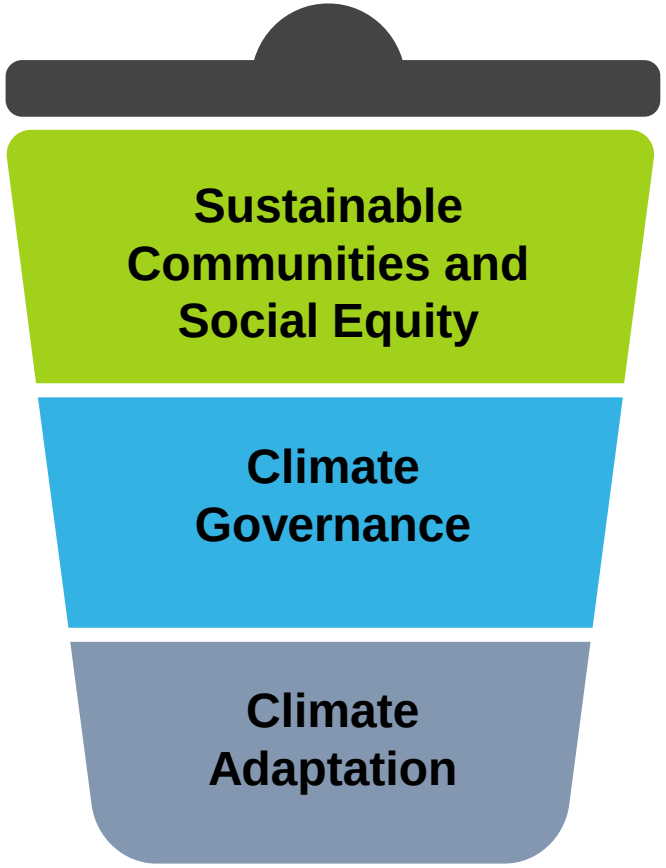
- Maximise opportunities for business and workers created by climate action
- Accelerate voluntary action to decarbonize the economy

Waste and Its Link to Greenhouse Gas Emissions



https://www.deq.nc.gov/about/divisions/environmental-assistance-and-customer-service/recycling/general-recycling-information/other-support-and-information/climate-change-and-circular-economy

WHAT MAKES A CITY "LOW CARBON" ?



- Climate solutions that alleviate social injustices
- Engaging citizens in planning and executing climate initiatives

- Governance that address failures, strengthens incentives, and build capability for climate action
- Embracing multilevel governance; the comprehensive nature of multilevel governance also means that it strengthens and promotes innovation, problem-solving capacity, learning, and the development of solutions that benefit more sectors

- Making cities more resilient and adaptable for future climate changes, such as extreme weather, sea level rise, and increased temperatures
- Increasing recreational opportunities and providing significant social benefits to city residents

Usaha Malaysia Mendepani Perubahan Iklim dan Mengarusperdana Pembangunan Rendah Karbon

Peringkat Antarabangsa

Komitmen Malaysia

1997

Kyoto Protocol

2000

2009

COP 15 Copenhagen Accord

2011

2014

Fifth Assessment Report of the Intergovernmental Panel on Climate Change

2015

COP 21 Paris Agreement

SDG

Sendai Framework for Disaster Risk Reduction

2016

2017

2018

2020

2021

COP 26 Glasgow

First National Communication To The UNFCCC

Tahun 2020 40%

Sasaran pengurangan intensiti pelepasan GHG berbanding KDNK tahun 2005

Second National Communication To The UNFCCC

Low Carbon City Framework

Malaysia Biennial Update Report To The UNFCC

Nationally Determined Contribution (NDC) of Malaysia

Tahun 2030 45%

Sasaran pengurangan intensiti pelepasan GHG berbanding KDNK tahun 2005

DPN 2

Green Technology Master Plan

Low Carbon City Framework

Third National Communication and Second Biennial Update Report To The UNFCC

Third Biennial Update Report To The UNFCC

GHG Sifar Bersih 2050

Aspirasi negara mencapai pelepasan GHG Sifar Bersih seawal-awalnya pada tahun 2050

National Low Carbon Cities Masterplan

RFN 4

Updated Nationally Determined Contribution (NDC) of Malaysia

LCCF: WHAT IS IT ALL ABOUT?

TO GUIDE STAKEHOLDERS TO LEAD BY EXAMPLE & IMPLEMENT LOW CARBON CITIES EFFORT

All cities in Malaysia: **Municipalities, Developers, Universities**

LCCF

CONTRIBUTE TO LOW CARBON AND SUSTAINABLE DEVELOPMENT

LOW CARBON CITIES FRAMEWORK & ASSESSMENT SYSTEM

OBJECTIVE

- **To encourage & promote the concept of low carbon cities and townships in Malaysia.**
- **To increase the compatibility of cities/townships with their local natural system.**
- **To guide cities in making choice/decisions towards greener solutions.**

LCCF Version 1 launched : 8 September 2011

LCCF Version 2 released October 2017

LOW CARBON CITIES FRAMEWORK

LCCF Version 2

4 elements for GHG Reductions

15 Performance Criteria

41 Sub-Criteria

URBAN ENVIRONMENT

- Site Selection
- Urban Form
- Urban Greenery & Environmental Quality

BUILDINGS

- Sustainable Energy Management System
- Low Carbon Buildings

URBAN INFRASTRUCTURE

- Infrastructure Provision
- Waste
- Energy
- Water Management

URBAN TRANSPORTATION

- Reduction Use of Private Motorised Transport on Urban Road
- Increase in Public Transport
- Mode Shift from Private to Public Transport and Non-Motorised Transport
- Use of Low Carbon Transport
- Improvement to Level of Service of Road Links and Junctions
- Utilisation of Transit-Oriented-Development (TOD) Approach

Performance Criteria are **measurable strategies** to **reduce carbon emission** through:- Policy control, technological development, better process & product management, change in procurement system, carbon capture, consumption strategies & others.

LOW CARBON CITIES FRAMEWORK

- 41 Low Carbon Cities Performance Criteria

15 Performance Criteria

4 Elements for GHG Reductions in Cities

URBAN ENVIRONMENT

Development within defined urban footprint : 1-1
Infill development : 1-2
Development projects within transit nodes and corridor : 1-3
Brownfield and Grey field redevelopment : 1-4
Hill slope development : 1-5

Mixed-use development : 2-1
Compact development : 2-2
Road and parking : 2-3
Comprehensive pedestrian network : 2-4
Comprehensive cycling network : 2-5
Urban Heat Island (UHI) effects : 2-6

Preserve natural ecology, water body and bio-diversity : 3-1
Green open space : 3-2
Number of trees : 3-3

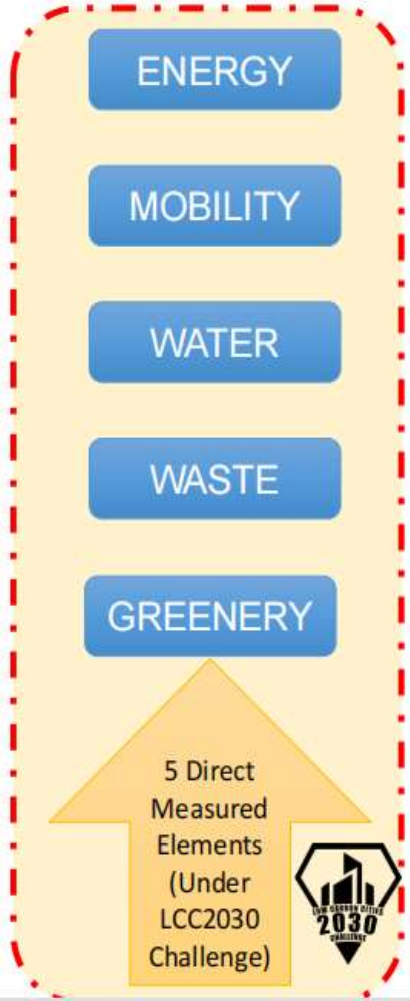
URBAN INFRASTRUCTURE

Land take for infrastructure and utility services : 1-1
Earthworks management : 1-2
Urban storm water management : 1-3

Construction waste management : 2-1
Industrial waste management : 2-2
Household solid waste management : 2-3

Energy consumption : 3-1
Renewable Energy : 3-2
Site wide district cooling system : 3-3

Efficient Water Management : 4-1



URBAN TRANSPORTATION

1-1: Classified Traffic Volume Urban Road Network
1-2: Vehicle-km of Travel by Modes
2-1: Public Transport Ridership
2-2: Public Transport System Improvement and Coverage
3-1: Modal Share of Private, Public, and Non-Motorised Transport
4-1: Use of More Fuel-Efficient Vehicles for Passenger Vehicles and Green Freight Transport
4-2: Number of Charging Stations
5-1: Performance of Road Links and Junctions
5-2: Average Link Speeds and Journey Speeds
6-1: New Development and Redevelopment Schemes Incorporating TOD Concept
6-2: Walking and Cycling Facilities to Support Access and Mobility to/from Public Transit Nodes

BUILDING

1-1: Active and passive designs
1-2: Operational energy consumptions
1-3: Operational water consumptions
1-4: Preserve existing building stock by retrofitting
2-1: Energy management system
2-2: Facility management

LOW CARBON CITIES 2030 CHALLENGE **RECOGNITION**

Provisional Certificate

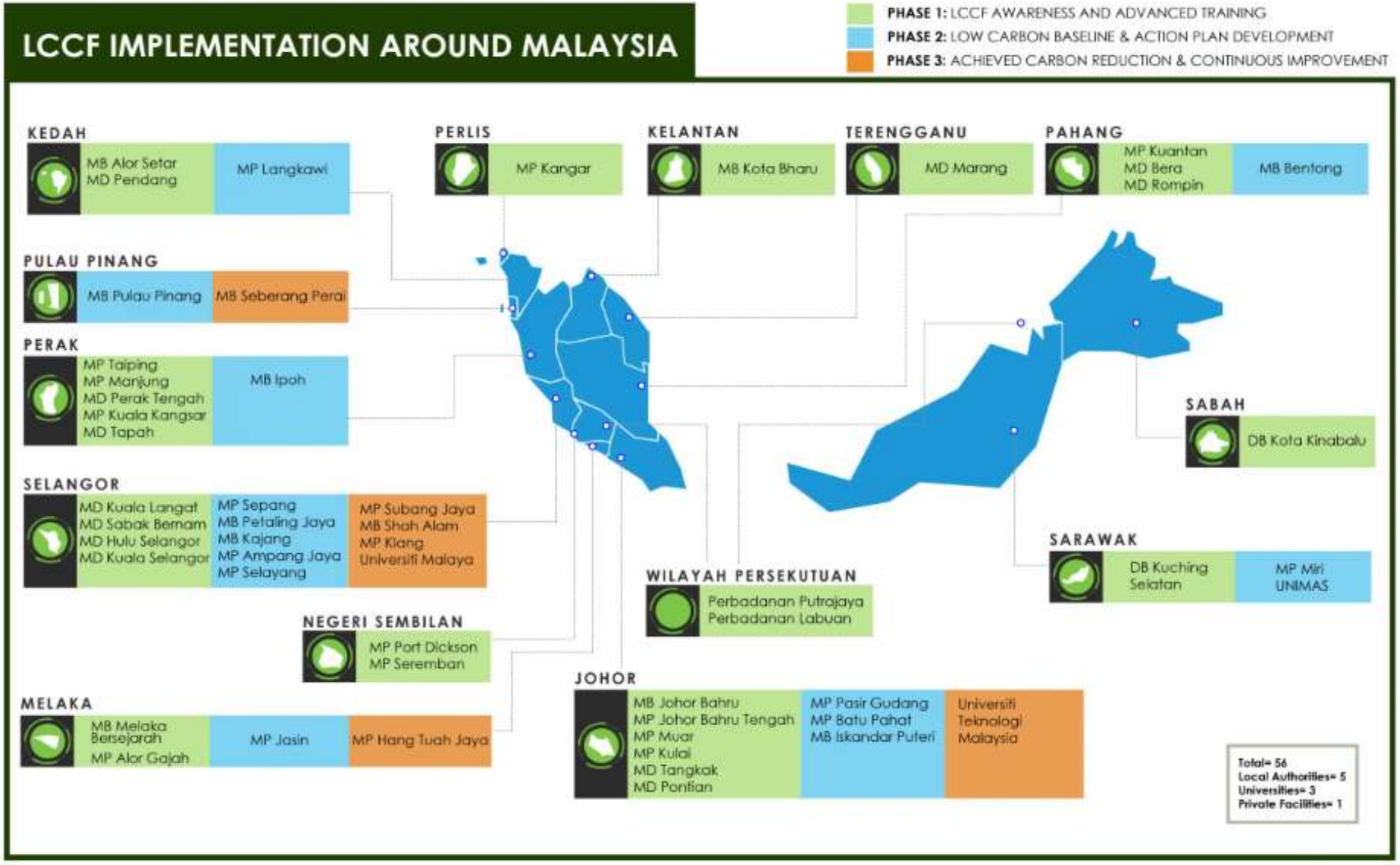
Develop baseline and pledge commitment to reduce emissions

Diamond Recognition

Achieve emissions reduction for each element based on the scale below:

1 Diamond	1% reduction
2 Diamonds	5% reduction
3 Diamonds	10% reduction
4 Diamonds	25% reduction
5 Diamonds	45% reduction

Accelerating Towards A Low Carbon Future
2030 Challenge towards transforming their cities into low carbon cities.



National Low Carbon Cities Masterplan

Spatial Planning and Development

- Incorporation and integration of low carbon reduction strategies and carbon sink elements into all stages of development, programme planning, implementation as well as all aspects of policy making.

Transportation

- Incorporation of strategies that increase the usage of public transportation and improving public transportation infrastructure are essential part of an effective urban development strategy.
- Incorporation of strategies that prioritise lower emission vehicles or lower emission options (such as walking, cycling, etc.) as the alternative of carbon intensive transportation modes.

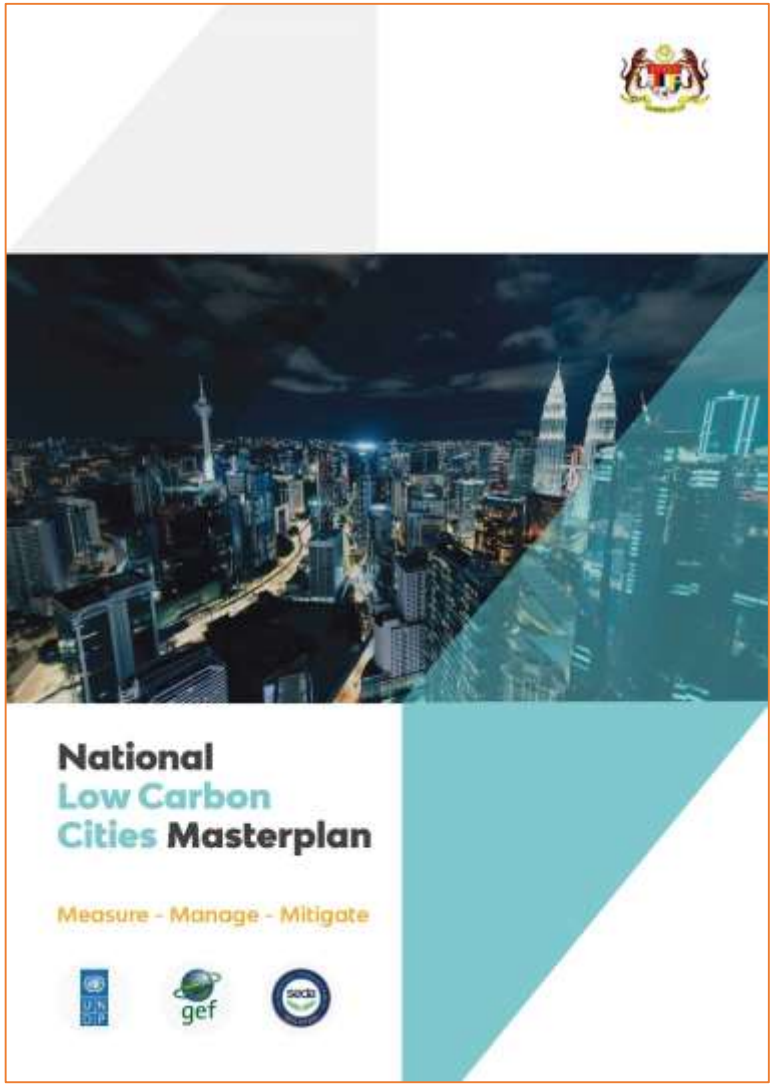
4 FOCUS SECTORS

Energy

- Incorporation of strategies that give attention to green technology and smart city application when striving for energy and resource efficiency. The application of technology can produce significant economic, social and environmental benefits in urban areas.
- Incorporation of strategies which encourage and support desired changes in the behaviour and performance of the water industry, its suppliers and end-users for the purpose of reducing carbon emission attributed to energy use.

Waste

- Incorporation of strategies that view municipal waste as a resource represents an important opportunity to both reduce emissions and achieve economic gains. It also signals good governance to citizens by improving local environmental conditions.



Transforming Malaysian Cities into Low Carbon

KEY DRIVERS

Governance and Implementation Framework

Streamline the governance and implementation framework for low carbon development

Urban Planning

Institutionalise low carbon elements in urban planning

Community Participation

Get community to actively participate in green initiatives

KEY ENABLERS

Funding and Capacity Building

Source for funding, financing and investment system in low carbon development, as well as increase capacity

Data Collection and Analysis

Develop a single window and seamless link to data, information and resources as well as provide a common set of performance management metrics to be used for emissions evaluation

Built Environment and Physical Infrastructure

Strengthen the built environment and physical infrastructure to ensure low carbon and sustainable development at urban level

Source: Ministry of Environment and Water (KASA)

Seven (7) Key Challenges were recognized as barriers to low carbon pathway in most Malaysian cities.

Policies and Direction

- Inconsistent implementation
- Gap in transition from top to bottom
- No specific reference to low carbon agenda
- Intensity versus absolute targets

Implementation and Execution

- Inconsistent implementation
- Not mandatory
- Absence of dedicated unit/entity at all levels

Source of Funding and Financing

- Insufficient and still lacking
- No dedicated fund
- Legal barriers for local government to generate additional income
- Lack of incentives

Low Carbon Development in Urban Planning

- Weak integration between low carbon reduction strategies and existing development's document
- Conflicting and competing development priorities

Community Participation

- Weak in public appreciation and understanding
- Lack of opportunities to participate

Capacity, Capability and Readiness

- Shortage of capable people
- Lack of skills and understanding
- Lack of subject matter experts

Data for GHG Inventory

- Weak in availability and access
- Lack of proper data
- Weak in accuracy
- Inconsistent methodology

The 3M Approach

The 3M Approach

Measurement of the GHG emissions by establishing a baseline and providing periodic monitoring

Management of low carbon development in terms of policy, targets and planning

Mitigation of the GHG emissions through design and implementation of programmes and projects

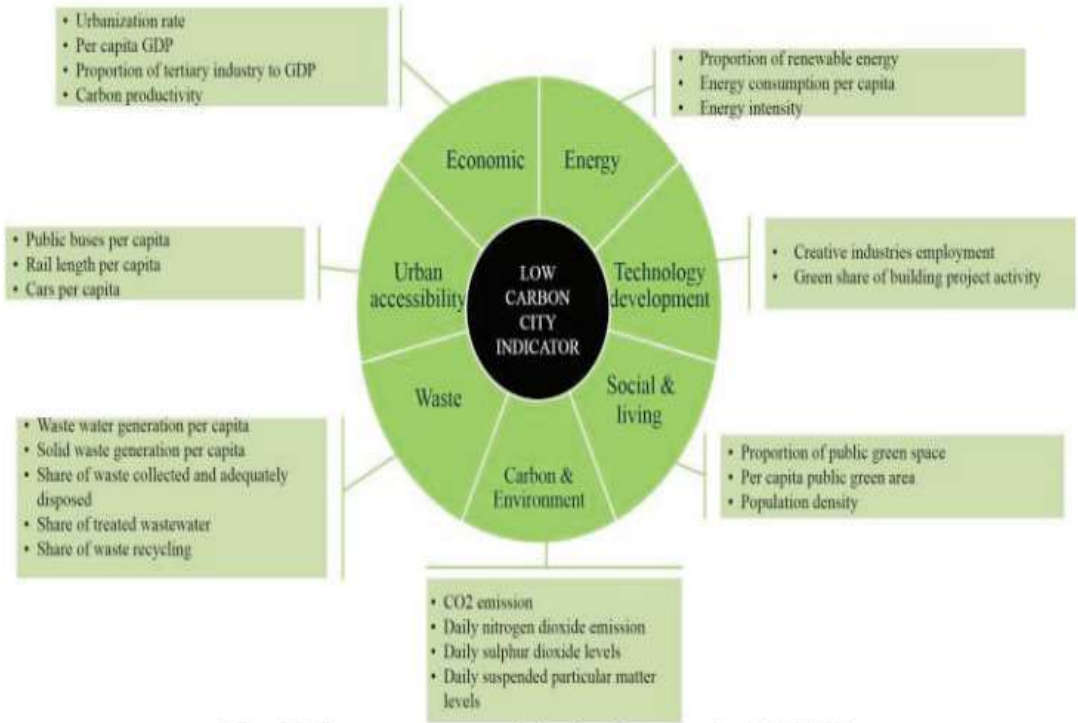


Fig. 2 The category and the indicators for LCCDI

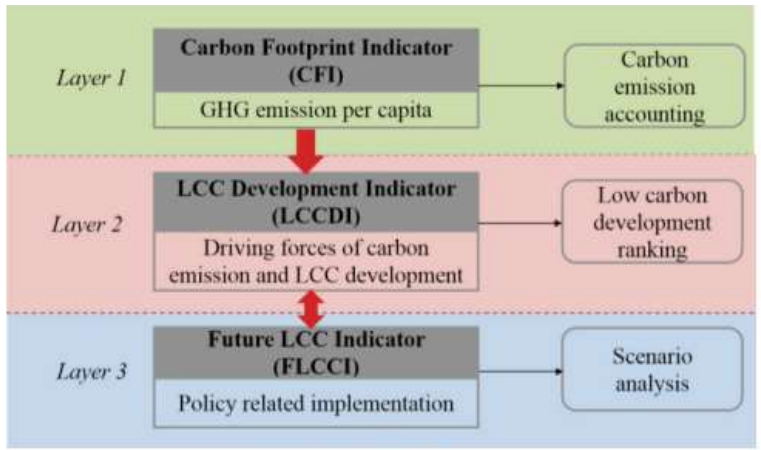


Fig 1. LCCI framework

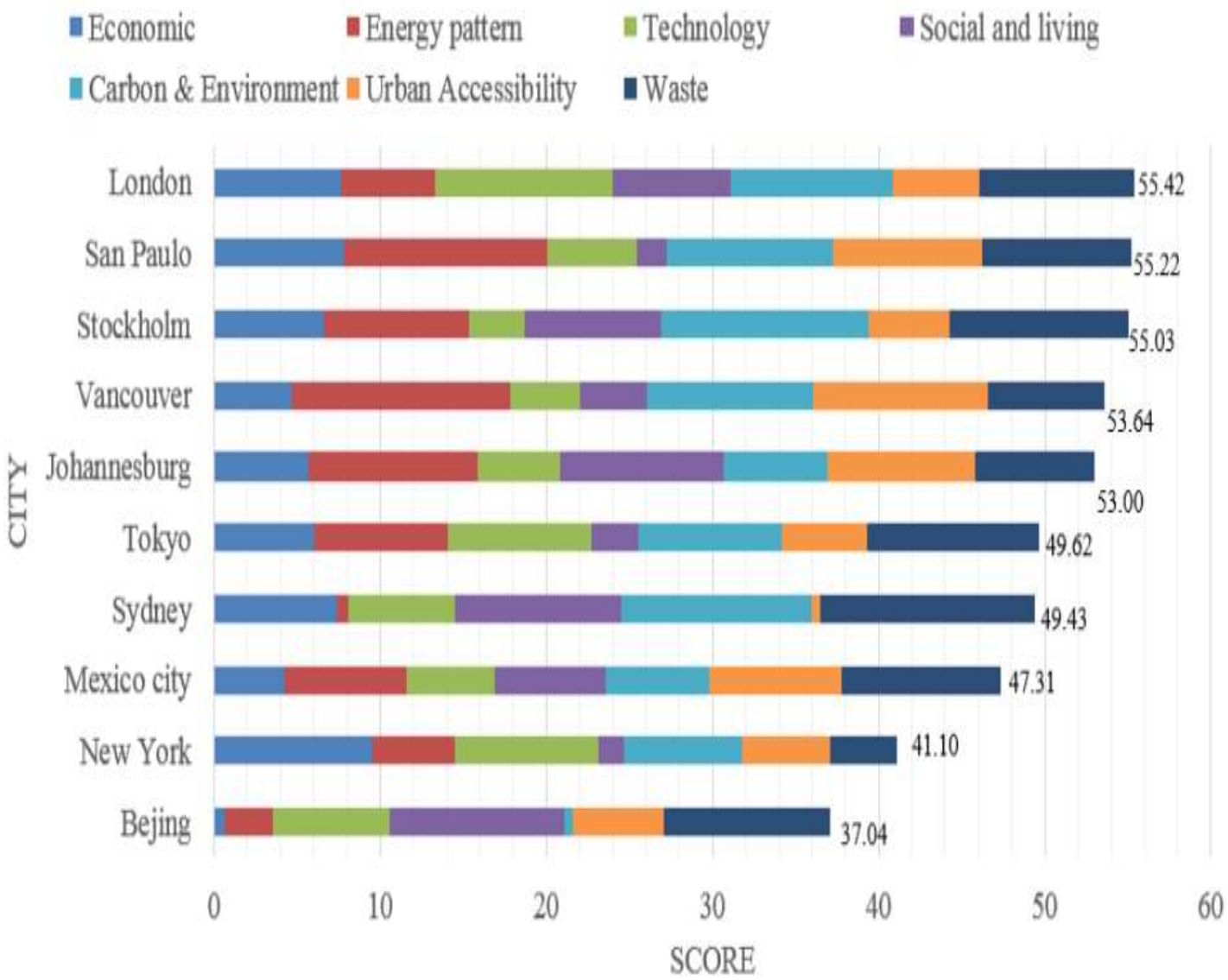


Fig. 3 Low-carbon development ranking of 10 cities.

The 7th International Conference on Applied Energy – ICAE2015
Development of the Low-carbon City Indicator (LCCI) Framework
*Sieting Tana,c, Jin Yangb,d, Jinyue Yanc,d**

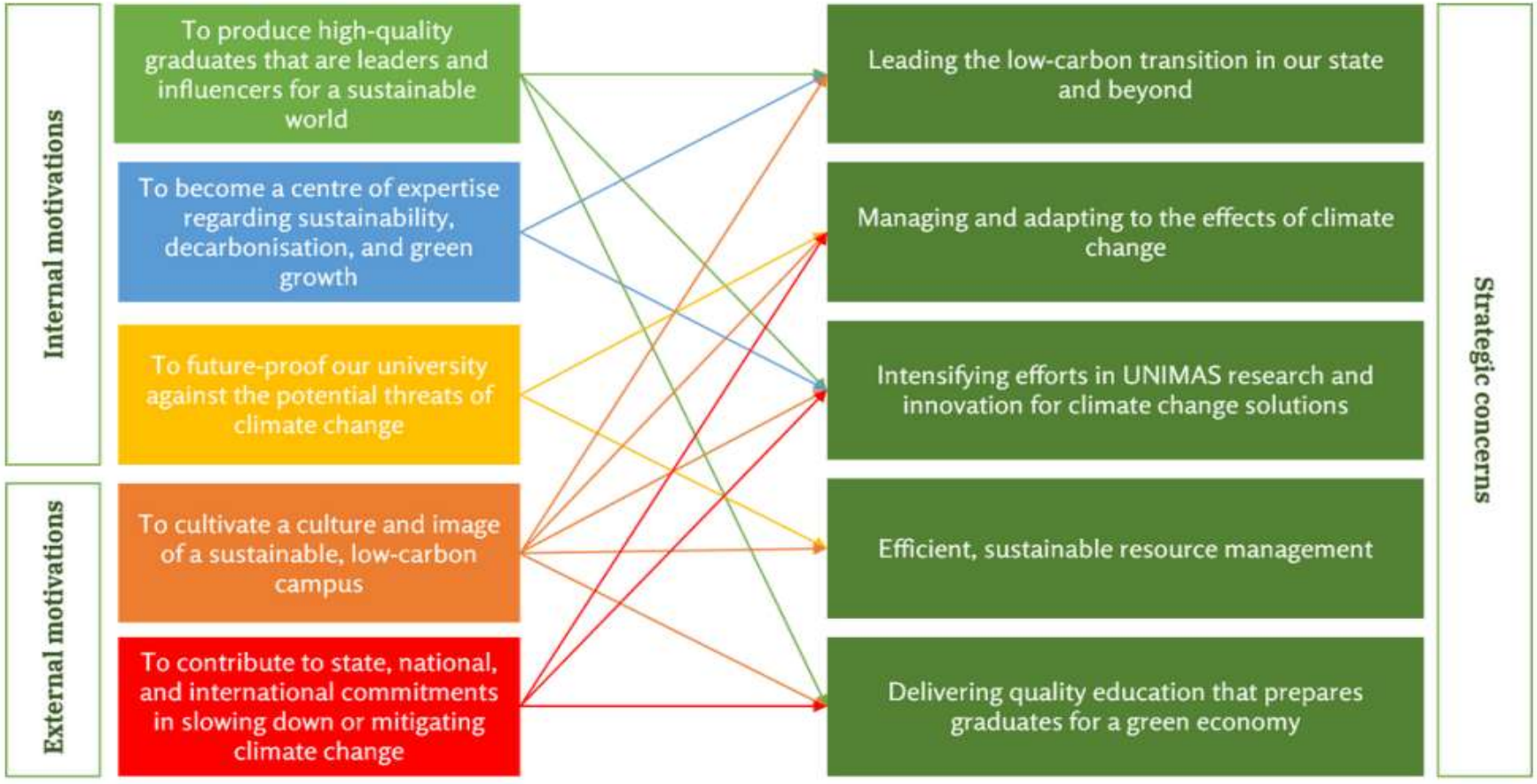
UNIMAS
UNIVERSITI MALAYSIA SARAWAK

Low-Carbon Campus Roadmap 2030

Why UNIMAS develop the Low Carbon Campus Roadmap ?

Our motivations and concerns

We see a clear connection between our motivations – internal and external – and the strategic concerns in formulating this roadmap.



Supporting regional low carbon aspirations

State – Post Covid-19 Development Strategies

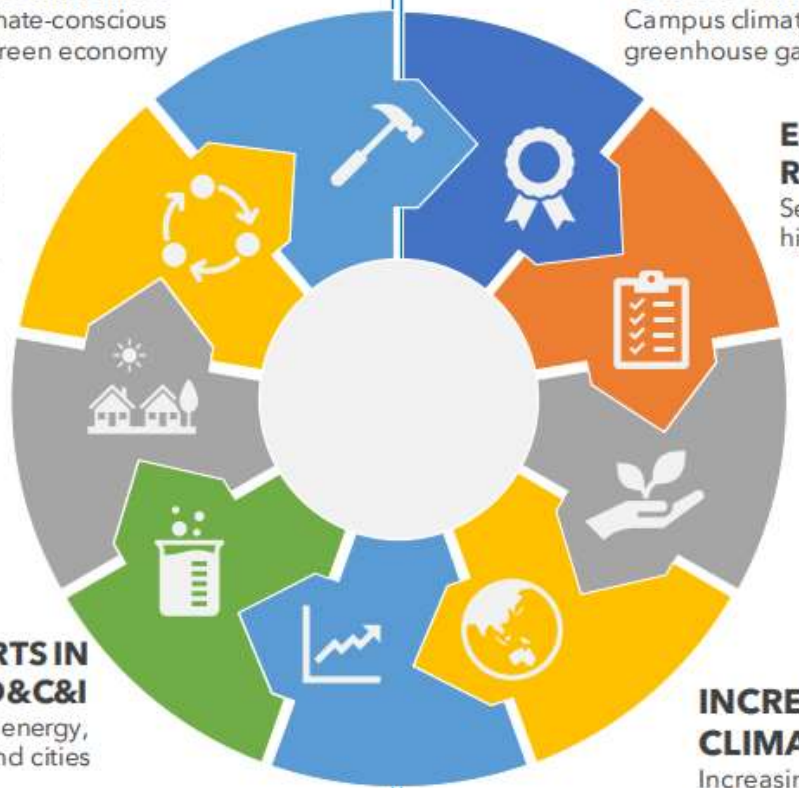
CAPACITY & CAPABILITY BUILDING
Producing skilled, knowledgeable, and climate-conscious graduates that are ready for the green economy

EMBODYING THE CIRCULAR CAMPUS
Creating a campus system and culture that espouses the 9R principles - Refuse, Rethink, Reduce, Reuse, Repair, Refurbish, Remanufacture, Repurpose, Recycle and Recover

UPSKILLING & EMPOWERING LOCAL TALENTS IN DECARBONISATION
Anticipating and fulfilling the skill needs in a low carbon economy with UNIMAS green experts

COMPLEMENTING STATE EFFORTS IN LOW CARBON R&D&C&I
Technological advances that enable green energy, buildings, and cities

SUPPORTING SARAWAK'S CARBON MARKET
Looking to nature-based solutions to kickstart carbon trading in Sarawak



National

CHAMPIONING NATIONAL CLIMATE ACTION POLICIES
Campus climate action reflects national commitments towards achieving greenhouse gases reduction targets

EXEMPLIFYING VOLUNTARY ESG REPORTING FOR HIGHER EDUCATION
Setting the precedent for voluntary ESG reporting in higher education

CREATING AN INNOVATION ECOSYSTEM FOR LOW CARBON TECHNOLOGIES
Active participant in the quadruple helix of academia, industry, government and local communities, resulting in the incubation, development, and commercialisation of decarbonisation technologies.

INCREASING GLOBAL PROMINENCE IN CLIMATE ACTION
Increasing the value proposition, capacity, and capabilities in the global context of climate change adaptation and mitigation

The ULCC Journey

Our process in producing the ULCC roadmap

ISuRE Carbon Neutral Townhall

Aimed to gain inputs and feedbacks from various stakeholders, as well as create collaboration opportunities with various industries in the effort to achieve a carbon neutral campus.

Smart & Sustainable City Hackathon

Running a 72-hour hackathon to generate ideas that help overcome challenges within the state regarding sustainability.

Brainstorming workshop on Carbon Neutral Campus Framework

Engaging our public stakeholders on defining a carbon neutral campus framework.

Action Plan for UNIMAS Low Carbon Campus Roadmap 2030 Workshop

Productive group discussions were held, which resulted in the inception of the strategic pillars and strategies.

Engagement session with non-academic staff

Engaging our non-academic staff for their input on the UNIMAS Low Carbon Campus Roadmap, taking into consideration their concerns and priorities.

Engagement session with UNIMAS students

Engaging our students for their input on the UNIMAS Low Carbon Campus Roadmap, taking into consideration their concerns and priorities.

Engagement session with University Deans & Directors

Engaging our deans and directors for their input on the UNIMAS Low Carbon Campus Roadmap, taking into consideration their concerns and priorities.

Research & Development Impact of ULCC Roadmap 2030

Waste-to-Wealth & Circular Campus

Ultimate 9R Lab

- Teaching and Learning
- Application in Community Context
- Industrial Collaborations

Green Energy

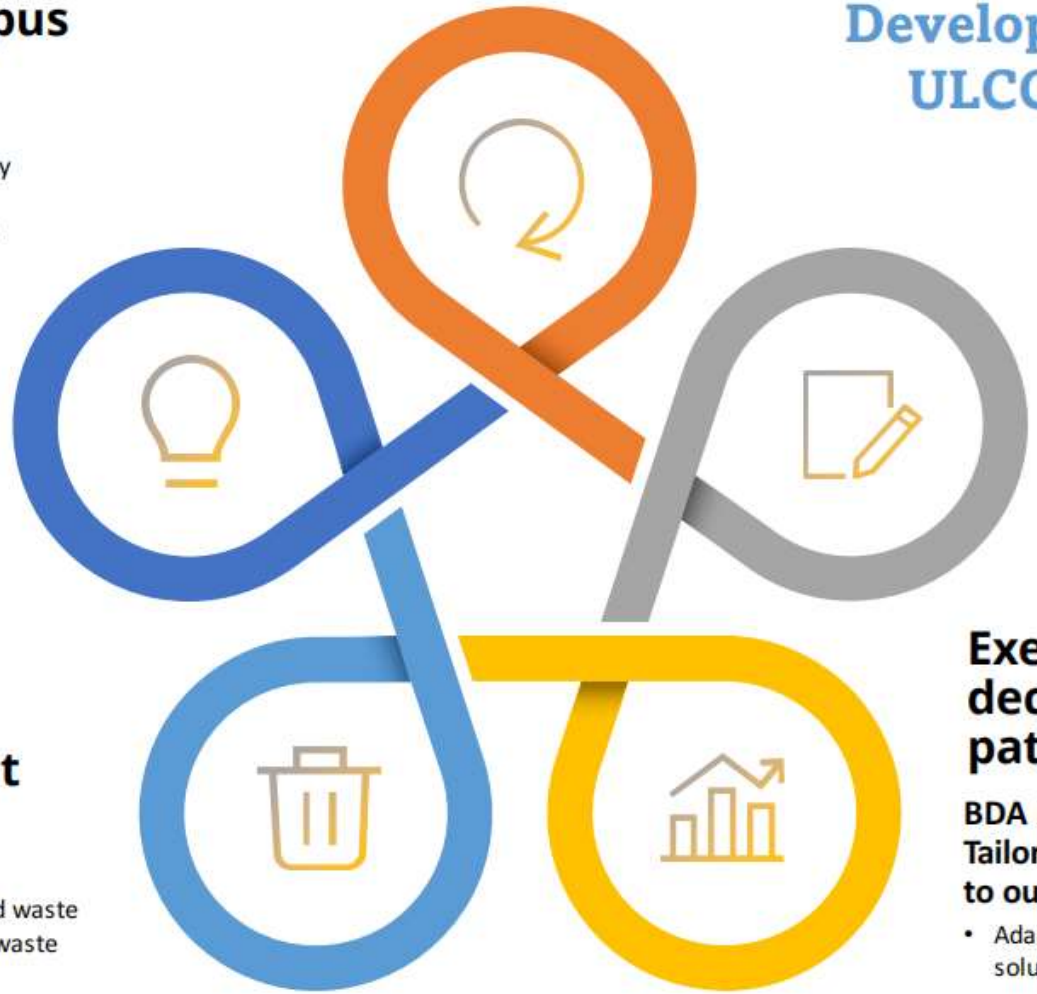
UNIMAS Climate Innovation Accelerator

- Research and development in renewable energy
- Commercialisation and scaling up of green technologies for energy efficiency

Waste management

Integrated waste management

- Exploring recycling and waste recovery for UNIMAS waste



GHG Inventory & Reporting

GHG Dashboard & 4SEE app

- Localising GHG accounting & reporting methodology to our regional context

Exemplifying decarbonisation pathway

BDA Low Carbon City - Tailoring decarbonisation to our region

- Adapting global decarbonisation solutions to our local context

Vision	To become a low carbon campus that embodies sustainable growth.		
Goals	Environmentally responsible organisation	Ready for the green economy	Active citizens for climate change

6 Strategic Pillars

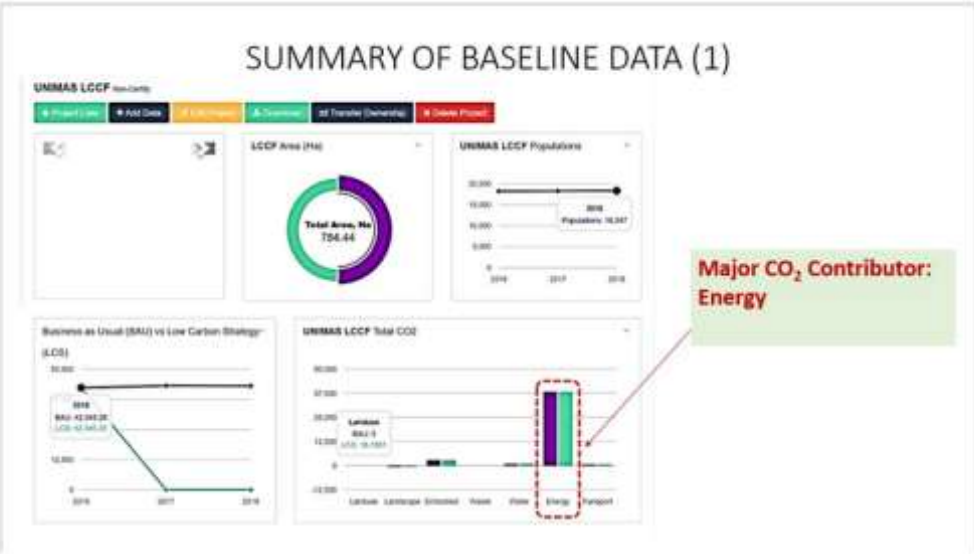
Energy efficiency	GHG inventory	Circular economy & waste management	Capacity & capability building	Sustainable innovative solutions	Low carbon mobility
7	3	4	2	4	2

22 Strategies

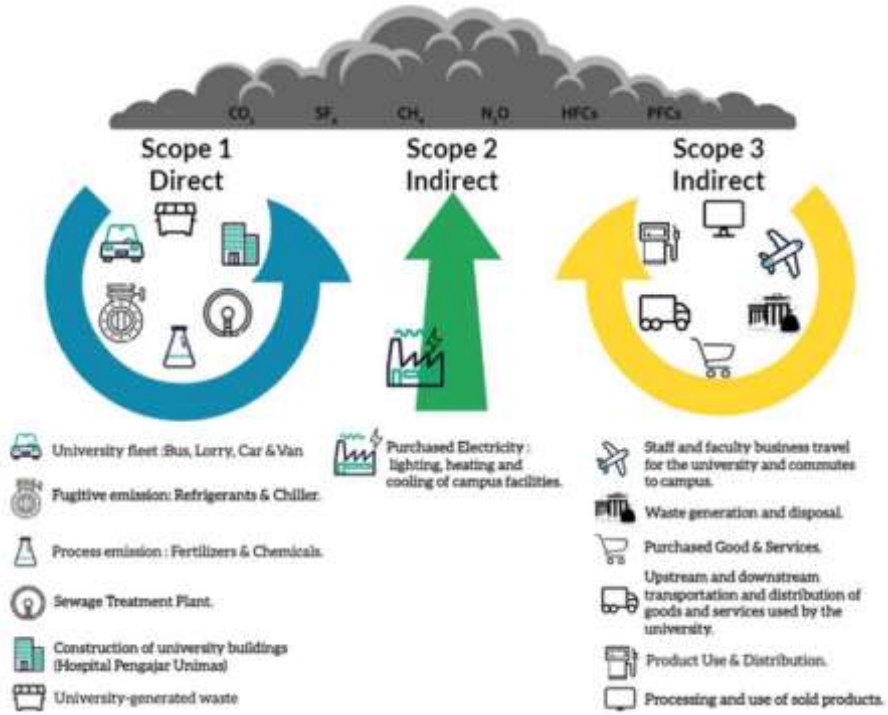
Key Enablers	Good governance & framework	Financial sustainability	Raised awareness & outreach	Low carbon research & discovery
Values	Exemplary | Collegiality | Integrity | Tenacity | Equity			

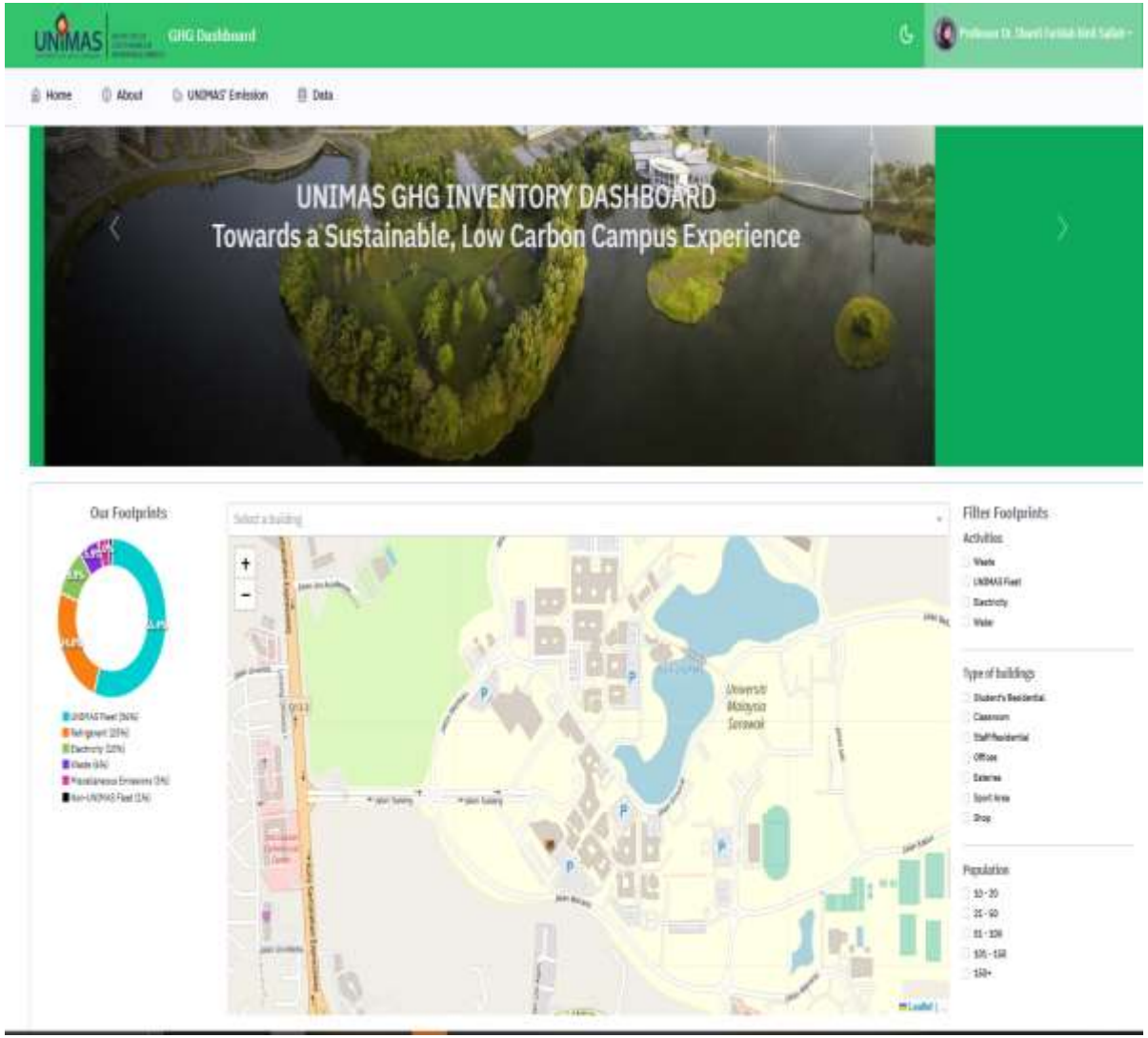
Calculating our climate impact

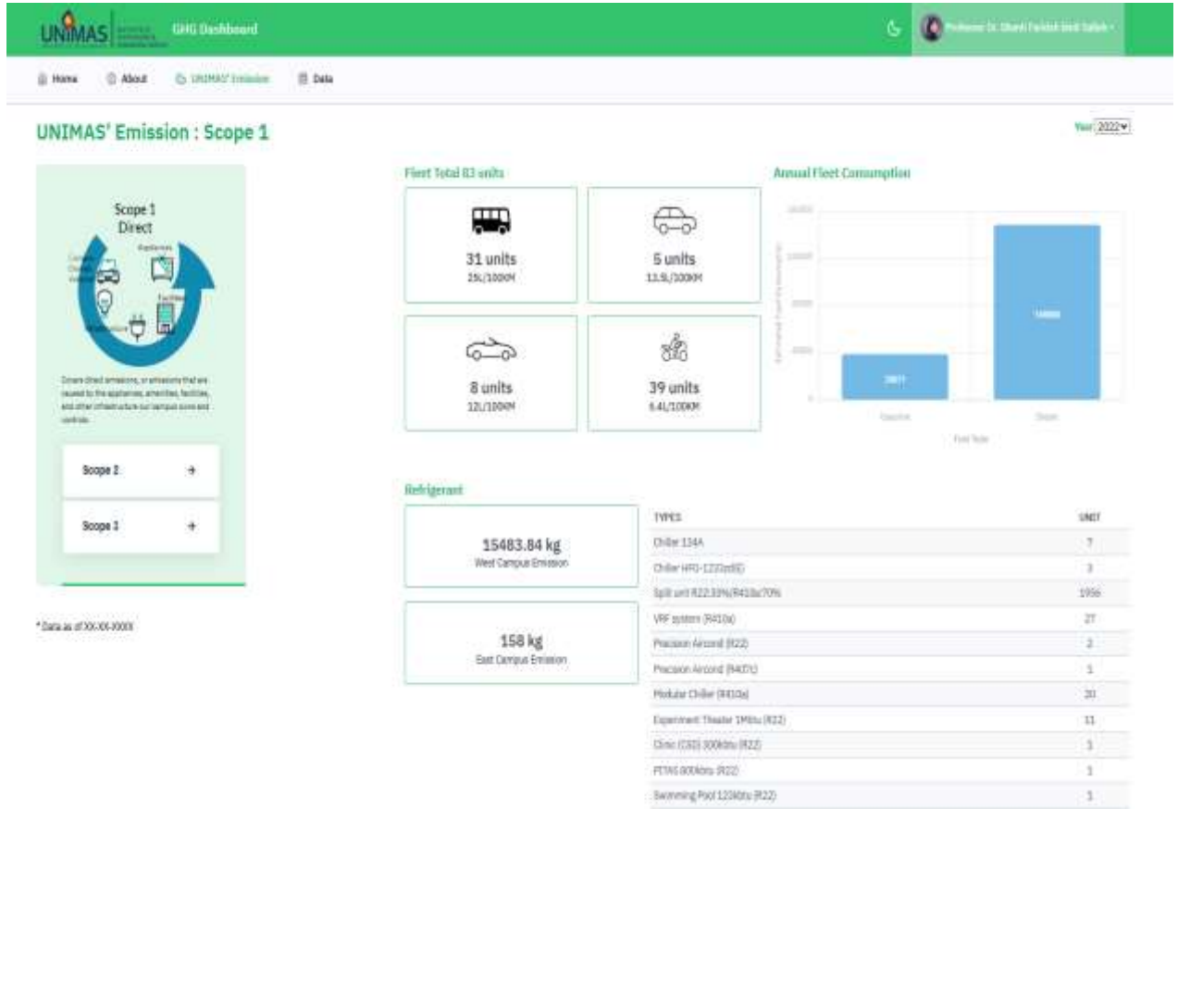
Our campus is a hub of activity – academic and otherwise. When inventorying our GHG emissions, we categorise our campus' emissions following the three (3) scopes defined by the GHG Protocol, the leading international greenhouse gas emissions standards and frameworks provider. We have previously undertaken an inventory of our carbon emissions in 2018, resulting in the baseline data utilised in this roadmap. This inventory of emissions allowed us to pinpoint our strengths and areas of improvement when developing our low carbon campus roadmap.



Carbon emissions baseline data summarised in 2018, based on 2016 emissions.




UNIMAS
GHG Dashboard
Home
About
UNIMAS' Emission
Data
UNIMAS GHG INVENTORY DASHBOARD
Towards a Sustainable, Low Carbon Campus Experience
Our Footprints
Select a building
Filter Footprints
Activities
Waste
UNIMAS Fleet
Electricity
Water
Type of buildings
Student's Residential
Classroom
Staff Residential
Offices
Exterior
Sport Area
Shop
Population
10 - 20
21 - 50
51 - 100
101 - 150
150+


UNIMAS
GHG Dashboard
Home
About
UNIMAS' Emission
Data
UNIMAS' Emission : Scope 1
Year 2022
Scope 1
Direct
Scope 2
Scope 3
Fleet Total 83 units
31 units
25L/100KM
5 units
13.9L/100KM
8 units
12L/100KM
39 units
6.4L/100KM
Annual Fleet Consumption
Refrigerant
15483.84 kg
West Campus Emission
158 kg
East Campus Emission
TYPES
UNIT
Chiller 134A
7
Chiller HFO-1233zd(E)
3
Split unit R22,33%/R410a/70%
1956
VRF system (R410a)
27
Precision Aircond (R22)
2
Precision Aircond (R407c)
1
Modular Chiller (R410a)
20
Experiment Theater 1Mbtu (R22)
11
Clinic (CEC) 300kbtu (R22)
1
PETING 800kbtu (R22)
1
Swimming Pool 120kbtu (R22)
1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Jun 09, 2023, 10:39


UNIMAS
SMART, SUSTAINABLE AND LIVABLE CITY CHALLENGE 2023
ENGAGEMENT WITH BINTULU YOUTH
LOW CARBON CITY

THANK YOU FOR YOUR ATTENTION