ISKANDAR MALAYSIA
URBAN OBSERVATORY

DATA MANAGEMENT & POLICY

• Data For Decision •
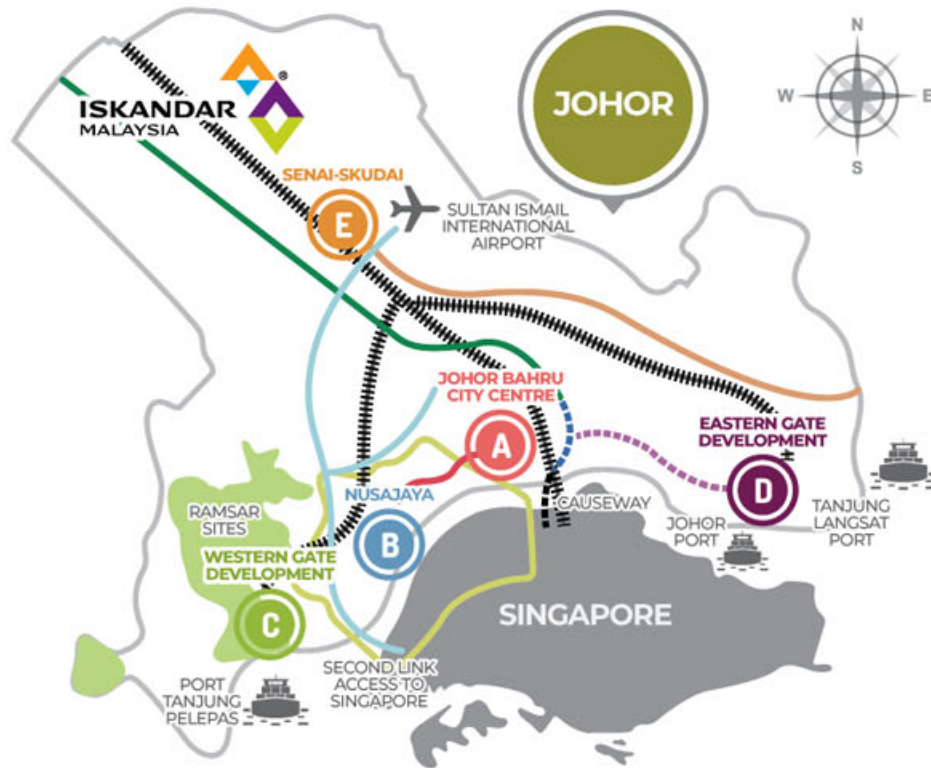
ISKANDAR
MALAYSIA

CONTENTS

"The development of Iskandar Malaysia embraces the Smart City Iskandar Malaysia framework and its 6 dimensions - Smart Economy, Smart Governance, Smart People, Smart Mobility, Smart Living and Smart Environment. As a smart city, sufficient data and accurate information is vital in helping government to plan, businesses to drive their operations and the community to navigate through their daily activities in the city.

This is where Iskandar Malaysia Urban Observatory takes the lead. This data collection and analytic platform is able to support the needs of the government, businesses and community in Iskandar Malaysia. We recognise and appreciate the support given by our partners as this platform requires partners to share their data and when this happens, various information can be analysed and reports used for stakeholders to make the right decision with the information provided."

DATUK ISMAIL BIN IBRAHIM
Chief Executive of Iskandar Regional Development Authority

Legend:

- KTM Service
- North South Expressway
- Singapore - Johor Bahru Ring Road
- Second Link Expressway
- Senai - Desaru Expressway
- Coastal Highway Phase 2
- Eastern Dispersal Link (EDL)
- Bakar Batu - Pasir Gudang Coastal Road
- Rail Transit System - Singapore (Expected Completion 2018)

Iskandar Malaysia, an economic region located within Malaysia's state of Johor, has been rapidly growing since its inception in 2006 and is primed to become the preferred international metropolis to invest, work, live and play. Iskandar Malaysia's development is guided by the Comprehensive Development Plan (CDP) and the Circle of Sustainability, ensuring that the region grows holistically into a prosperous economy with a high-quality living ecosystem and a resilient environment.

Iskandar Malaysia's generous land area, strategic location and abundant ready infrastructure boosted its 9 promoted sectors which are Electrical & Electronics, Petrochemical and Oleo-Chemical, Food & Argo-Processing, Logistics, Tourism, Creative, Healthcare and Financial.

Iskandar Malaysia is also developed to be a Smart City which encompasses the 6 dimensions of Smart Economy, Smart Governance, Smart Environment, Smart Mobility, Smart People and Smart Living, and is proud of its achievement in the creation of this pilot program for Smart cities across Malaysia and the region. The development of Iskandar Malaysia is planned, promoted and facilitated by Iskandar Regional Development Authority (IRDA).

Iskandar Malaysia was formed in 2006 under Government Act 664, which also established the Iskandar Regional Development Authority (IRDA), the organization mandated to plan, promote and facilitate development of the region. IRDA is governed by a Board of Directors with Malaysia's Prime Minister as Chairman, and State of Johor Chief Minister as Co-chairman. There are five cities governed by local authorities within Iskandar Malaysia and the IRDA works with the respective authorities to ensure Iskandar Malaysia's vision of becoming a sustainable, inclusive and smart regional corridor in Malaysia, and a 'Metropolis of International Standing' by 2025.
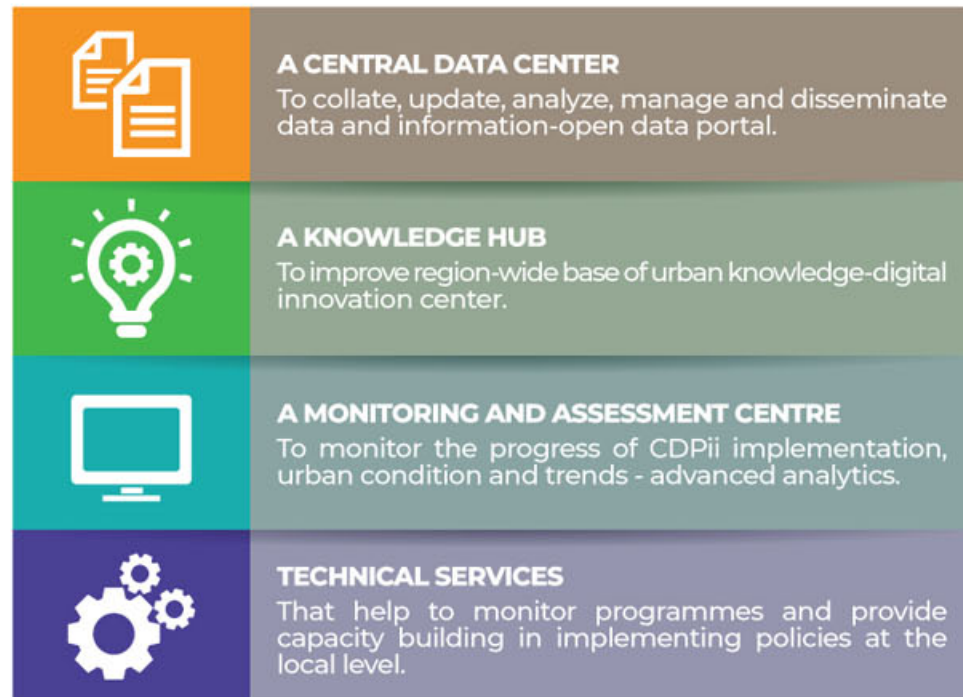
The CDP not only looks to align to the 11th Malaysia Plan, but is also focused on regional growth and enhanced inclusion according to the Sustainable Development Goals (SDGs) framework.

The CDP includes the proposal to develop the Iskandar Malaysia Urban Observatory (IMUO) as the core platform to establish baseline data, to support development planning, and to ensure balanced regional development within Malaysia. Beyond supporting immediate IRDA needs, the CDP sets the more ambitious goal for the IMUO of benchmarking Iskandar Malaysia to regional and global standards. The CDP also stresses the strategic value of developing shared performance targets with state and local governments in Iskandar to enhance IRDA's growing role in streamlining and coordinating planning at different levels of subnational government.

03 | WHAT IS IMUO?

The IMUO project is a four-year collaboration between the Iskandar Regional Development Authority (IRDA), the United Nations Development Programme (UNDP) and the Malaysian Administrative Modernization and Management Planning Unit (MAMPU) aimed at developing strategic and targeted outputs to support a larger, ongoing initiative established at the national level. The IMUO will entail development of a centralized data center and an advanced regional analytics platform to collate, update, analyze, manage and disseminate data and information in Iskandar Malaysia. It will also act as a knowledge hub to improve the region-wide base of urban knowledge on Iskandar Malaysia.

Guided by IM's Comprehensive Development Plan and the Sustainable Development Goals (SDG) framework, the IMUO project will be an essential tool in transforming Iskandar into a sustainable smart region through evidence-based spatial planning and policy making. The outputs from this project will serve as building blocks to empower IRDA to better plan and implement subnational programs that are tailored to the needs of the region.

A CENTRAL DATA CENTER
To collate, update, analyze, manage and disseminate data and information-open data portal.

A KNOWLEDGE HUB
To improve region-wide base of urban knowledge-digital innovation center.

A MONITORING AND ASSESSMENT CENTRE
To monitor the progress of CDPii implementation, urban condition and trends - advanced analytics.

TECHNICAL SERVICES
That help to monitor programmes and provide capacity building in implementing policies at the local level.

Iskandar Malaysia Urban Observatory (IMUO) is a data center to harvest, update, analyze, manage and disseminate data and information on Iskandar Malaysia. The IMUO acts as a knowledge center to enhance the knowledge of cities of the whole Iskandar Malaysia. A monitoring and assessment center were established to monitor the progress of Iskandar Malaysia in implementing the second Comprehensive Development Plan (CDPii) as well as the conditions and trends of its cities. The IMUO also provides technical services that helps stakeholders to monitor programs and targets and provides the capacity building in implementing policies at local level.

The IMUO objectives as follows :

01 To be developed as an effective and sustainable Urban Observatory development model.

02 To enhance collaboration and information sharing among agencies through 'shared performance target'.

03 To transform government agencies to make 'informed decision' using big data analytics on 'authoritative data'.

04 To utilise Sustainable Development Goals (SDGs) and Iskandar Malaysia Region monitoring indicators which have been identified as effective and principled.

4 priority areas of strategic value and function of Iskandar Malaysia Urban Observatory (IMUO) are :

01 Regional planning and development.

02 Shared performance targets with state and local governments that constitute part of the IMUO.

03 Achieve international benchmarking standard.

04 Drive the digital economy.
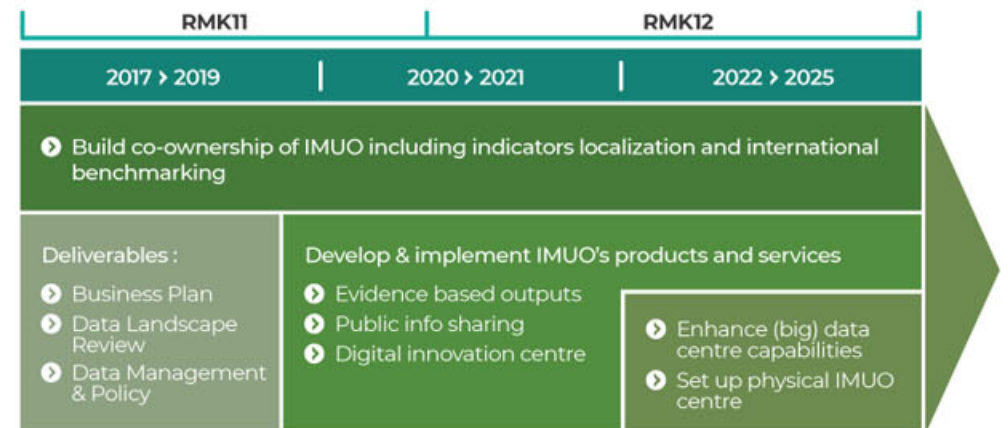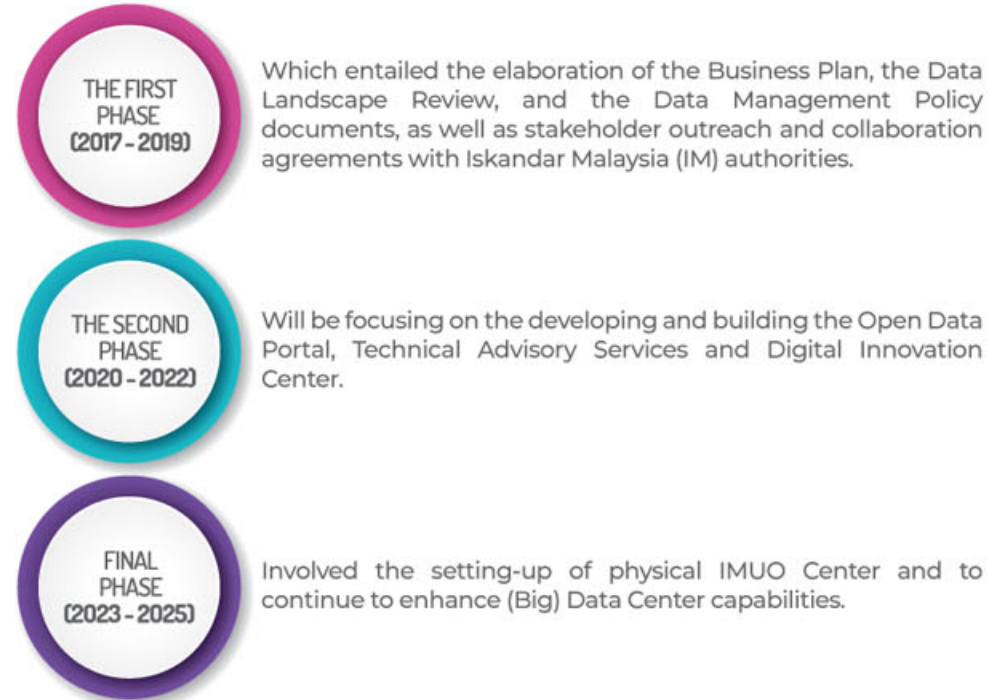
04 IMUO VISION AND MISSION

IMUO vision and mission is set in accordance to the vision and mission for Iskandar Malaysia.

VISION

"A Strong and Sustainable Metropolis of International Standing through data analytics."

MISSION

"To be the catalytic driver of evidence-based decision-making and data-driven insights that give rise to better outcomes for all."

TAGLINE

"Data for Decisions"

Using the "Data for Decision" theme, the IMUO enables Iskandar Malaysia to monitor and assess the CDPii strategies and programme. The IMUO will enable various outputs and 'deliverables' that will contribute to the Iskandar Malaysia vision towards becoming an international status metropolis and ready for the post-sustainability phase through information sharing between the federal, state, local governments, private sector and community towards an "informed society".

05 IMUO DEVELOPMENT TIMELINE

The IMUO will be implemented in phases which are inter-related and involve various stakeholders in the process, from now until 2025.

THE FIRST PHASE (2017 - 2019)
Which entailed the elaboration of the Business Plan, the Data Landscape Review, and the Data Management Policy documents, as well as stakeholder outreach and collaboration agreements with Iskandar Malaysia (IM) authorities.

THE SECOND PHASE (2020 - 2022)
Will be focusing on the developing and building the Open Data Portal, Technical Advisory Services and Digital Innovation Center.

FINAL PHASE (2023 - 2025)
Involved the setting-up of physical IMUO Center and to continue to enhance (Big) Data Center capabilities.

RMK11		RMK12
2017 › 2019	2020 › 2021	2022 › 2025

❯ Build co-ownership of IMUO including indicators localization and international benchmarking

Deliverables :
❯ Business Plan
❯ Data Landscape Review
❯ Data Management & Policy

Develop & implement IMUO's products and services
❯ Evidence based outputs
❯ Public info sharing
❯ Digital innovation centre

❯ Enhance (big) data centre capabilities
❯ Set up physical IMUO centre

06 | BENEFITS OF IMUO

GOVERNMENT

- ▶ Evidence-based decision making platform
- ▶ Transparency, accountability in policy making
- ▶ Efficient resource allocation, less reliance on external consultants
- ▶ Upskilling government staff on analytics
- ▶ Monitoring policies implementation and impact

BUSINESS | ACADEMIA

- ▶ Enhance investment and business strategies, decisions, business opportunities, innovation and research
- ▶ Create and attract data science professional for Iskandar Malaysia

COMMUNITY | CSO

- ▶ Better informed personal choices & decisions e.g. in relation to recreation, housing, education, collaboration on initiatives and projects
- ▶ Public sensing and participation

07 | IMUO DATA MANAGEMENT AND POLICY

IMUO Data Management and Policy (DMP) provides a framework and operational handbook to IMUO, stakeholders and partners in the ecosystem for data governance, data processing, features and functions, system design and enabling technologies. It outlines principles for effective data management, and roles and responsibilities of IMUO's management. The DMP is a guideline document for implementing policies, processes, standards, and frameworks that collect, protect, deliver, and enhance the value of data and information assets to make IMUO operations efficient and effective.

08 | METHODOLOGY

Stakeholder engagements was conducted to ensures that IMUO builds solid partnerships while trying to understand the needs and wants of each stakeholder. Their power and interest in the IMUO project are all unique which require specialized consultation requirements and through engagements, the following components are derived for DMP :

01 Data Landscape Review
02 Solution Providers Consultation
03 Federal & Local Agencies Consultation
04 Dekstop Review

DATA MANAGEMENT & POLICY
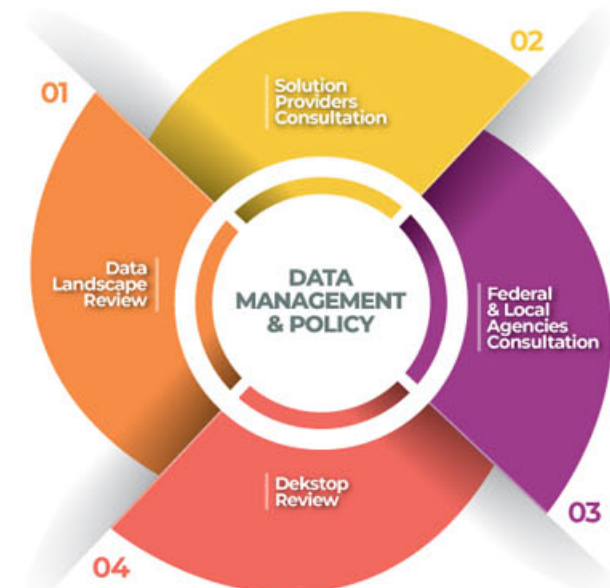
No	Inputs	Description
1	**Data landscape Review**	The DLR provides five (5) recommendations to address the gaps in advocating collaboration, improving data sharing governance, developing a flexible data platform and promoting innovation.
2	**Solution Providers Consultation**	Consultation with international and local companies to gather information on current product and services in data management, data analytics, geospatial analytics, system architecture, customer references, future trends and technologies.
3	**Federal and Local Agencies Consultation**	Consultation with federal and local agencies to understand their data management plans and initiatives, challenges and readiness to embark on IMUO journey.
4	**Desktop Review**	Insights on global best practices in data management policy, governance, trends, data analytics, and technology.

09 INTEGRATING A GENDER PERSPECTIVE INTO DATA COLLECTION

The United Nations Department of Economics and Social Affairs (UNDESA) has recommended the integration of gender perspectives into statistics as an instrument for policy changes. In the spirit of the SDGs Goal 5 - Gender Equality, IMUO will also incorporate gender-based factors that influence gender roles and access to resources, including the benefits derived by both genders from access to resources, facilities and services. Gender statistics are defined by the sum of the following characteristics :

▶ Data are collected and presented by sex as a primary and overall classification.

▶ Data reflect gender issues.

▶ Data are based on concepts and definitions that adequately reflect the diversity of women and men and capture all aspects of their lives.

▶ Data collection methods take into account stereotypes and social and cultural factors that may induce gender bias in the data.

## 10 DATA MANAGEMENT POLICY FRAMEWORK

IMUO VISION
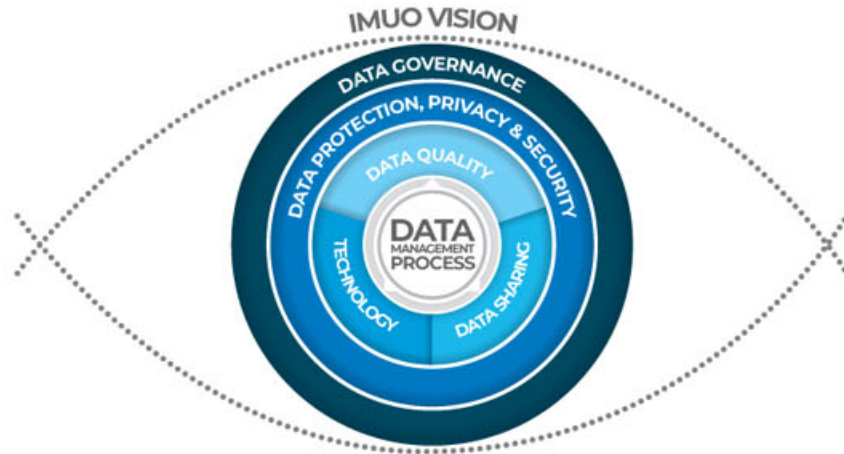
A data management policy framework has many components to it. All the parts complement each other and work together as a whole. Missing a component will cause issues. The following is a brief description of all the elements of a data management policy framework that should be adhered to support the improvement in managing and securing the data across IMUO platform.

No	Key Focus Area	Description
1	Data Management Process	Establish a proper and logical end-to-end process for IMUO's data flow from the data provider and data collector to data users.
2	Data Protection, Privacy and Security	Outline the requirements and controls that need to be embedded to protect and preserve data integrity, confidentiality and availability.
3	Data Quality	Outline the principles and standards to be adopted to maintain high-quality data in a manner that it can be efficiently shared, exchanged and understood between data providers and data users.
4	Data Sharing	Outline the means to empower and allow the sharing and use of data by IMUO, data providers and data users according to the intended purposes of IMUO.
5	Application Software and Technology	Outline the relevant technology, platforms and solutions that could deliver the features and functions required to execute the data management process effectively and efficiently.
6	Data Governance	Outline a high-level data governance and management structure as well as define roles to govern, manage, coordinate and monitor compliance by IMUO, as well as its effectiveness in implementing all of the above components.

11 IMUO DATA MANAGEMENT PROCESS

IMUO's data management process covers three key aspects :

01 **Data Processing** - the collection, preparation, integration and quality assessment of primary data and secondary data.

02 **Open Data Portal** - making the data available and accessible on the open data portal to all users.

03 **Data and Geospatial Analytics** - generating and presenting the results of analytics to data users.
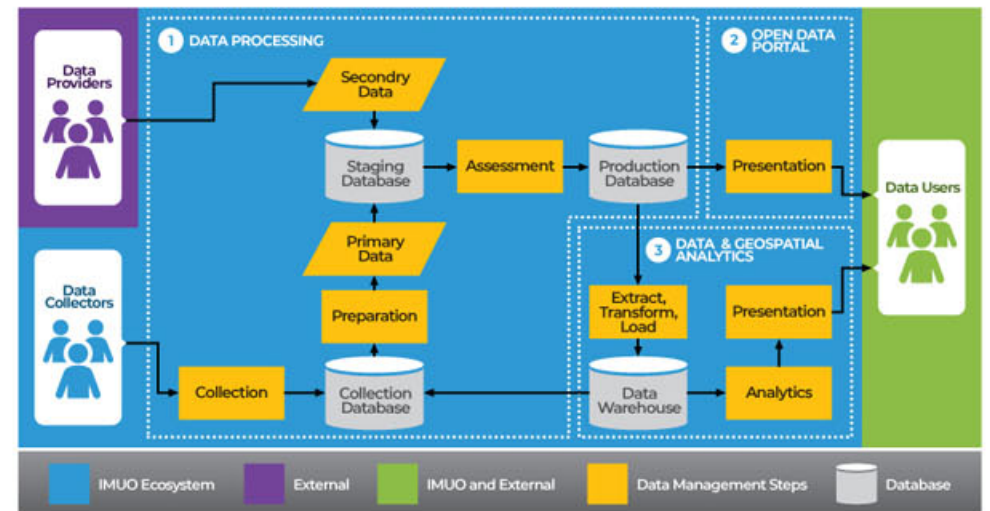
Key Guiding Principles :

▶ Data are processed according to standards and quality dimensions.

▶ Secondary data must be prepared by the providers, IMUO to provide support, training and resources.

▶ Only relevant data are collected for IMUO usage.

▶ Primary data collection to embark for collection of data currently not available by adopting reliable and effective data collection methodologies.

▶ Incorporate meaningful parameters in datasets such as gender and minorities data.

▶ Segregation of responsibility for data preparation and assessment.
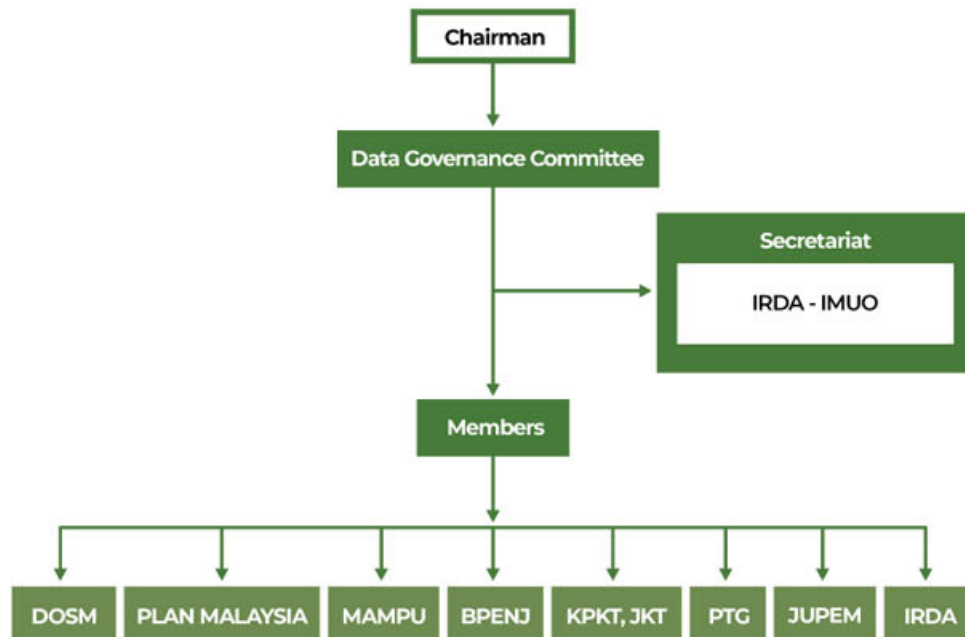
12 IMUO DATA GOVERNANCE

Data governance is the overall management of the availability, usability, integrity and security of data used in an organisation. A sound data governance programme includes a governing committee, well-defined standards, policies, agreements and processes, as well as a plan to execute those processes.

A two-tier governance system is proposed to ensure transparent and accountable data management by setting up the Data Governance Committee (DGC) and Data Management Committee (DMC).

▶ **IMUO** DATA GOVERNANCE COMMITTEE (DGC)

The DGC governs and advises the Data Management Committee (DMC) on data management policies, processes and technology according to IMUO's overall strategy.

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                    │   Chairman   │
                    └──────┬───────┘
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              ┌──────────────────────────┐
              │ Data Governance Committee │────────┐
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DOSM	PLAN MALAYSIA	MAMPU	BPENJ	KPKT, JKT	PTG	JUPEM	IRDA

The purpose of the DGC is to :

01 Provide advice and guidance on the use of data assets as per IMUO's organisational strategy, including the integration of gender perspectives in policy-making.

02 Promote the adoption of data policies and instil a culture of proper data sharing among IMUO's stakeholders.

03 Review and approve the DMC's recommendations on programmes, projects, policies, and proposals.

04 Present findings from data analytics to the Board of Directors for decision-making.

▶ **IMUO** DATA MANAGEMENT COMMITTEE (DMC)

The DMC's role is to develop and implement the data management standards established by the DGC.
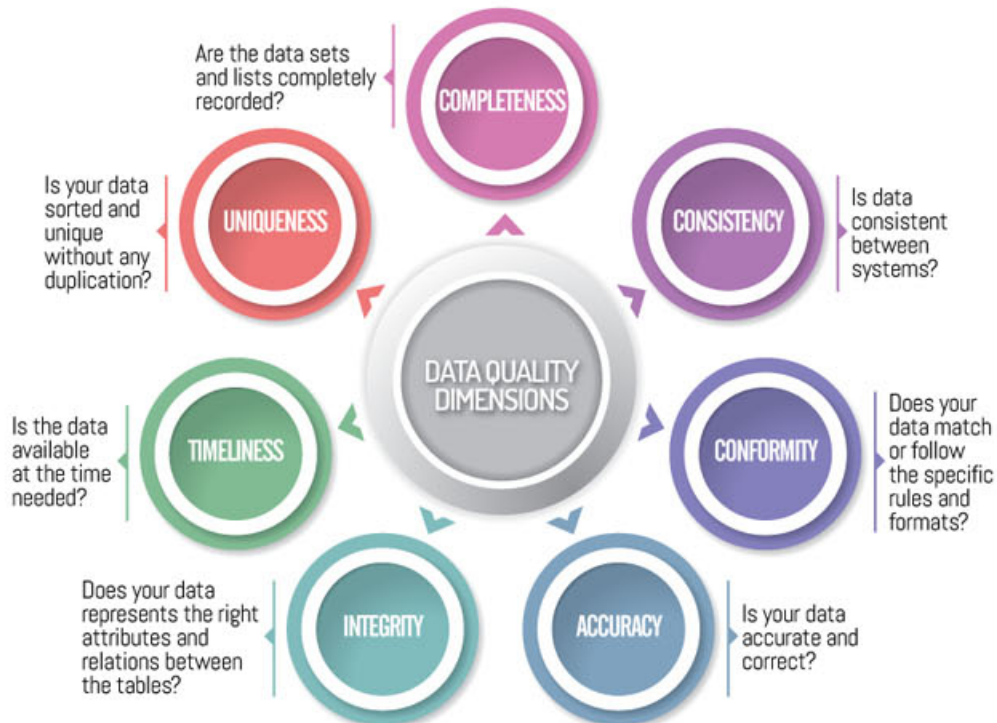
The purpose of the DMC is to :

01 Develop and implement data management policies, standards and procedures that detail the roles and responsibilities of all parties, as well as governance of data and metadata.

02 Develop data quality rules and a data quality checklist for assessment.

03 Develop and make recommendations for an information security programme.

04 Define commonly used technologies, models, definitions, and processes to support data sharing, coordination and collaboration, facilitate decision-making and maintain operations efficiency.

05 Provide guidance and recommendations on data accessibility and quality, strategic planning and IMUO's performance.

13 DATA QUALITY

In the context of IMUO, the achievement of high-quality data will hinge on the following :

01 Compliance with regulations, pre-determined internal and external standards, definitions and guidelines to ensure integrity.

02 Complete comprehensive metadata.

03 Producing comprehensive, accurate and timely analytics for informed decision-making by management.

04 Fulfilling data users.

It is the responsibility of DMC to draw up a comprehensive data quality checklist with clear rules to assess the quality of each dataset.

Are the data sets and lists completely recorded? — **COMPLETENESS**

Is your data sorted and unique without any duplication? — **UNIQUENESS**

Is data consistent between systems? — **CONSISTENCY**

DATA QUALITY DIMENSIONS

Is the data available at the time needed? — **TIMELINESS**

Does your data match or follow the specific rules and formats? — **CONFORMITY**

Does your data represents the right attributes and relations between the tables? — **INTEGRITY**

Is your data accurate and correct? — **ACCURACY**

14 DATA STANDARDS

Data standards refer to the rules by which data is described and recorded in a manner that allows it to be shared and exchanged efficiently, as well as understood by data providers and users.

Setting data standards ensures that data of a specified, standard format can be shared, exchanged and understood across IMUO's stakeholder groups with little or no need to direct additional resources to cleanse data.

01 **Eliminates redundancy between systems** - Enables the reuse of data and software for multiple purposes as well as ensures consistency of code sets.

02 **Improves reliability and transparency** - Conveys common and precise meaning of data that is shared and reused.

03 **Promote analytics** - Correlations are easier to construct when standard formats are used.

04 **Cost reduction** - Deriving long-term economic savings from using a standard presentation and publishing mechanism to provide regular access to information.

QUALITY STANDARDS GUIDELINE

Follow Data Dictionary set by MAMPU

Follow Geospatial standards from MaCGDI

Follow defined file types by IMUO

Align with standards from DOSM

Follow defined metadata (dataset description) by IMUO

Align with standards from UNStats Quality Assurance Framework
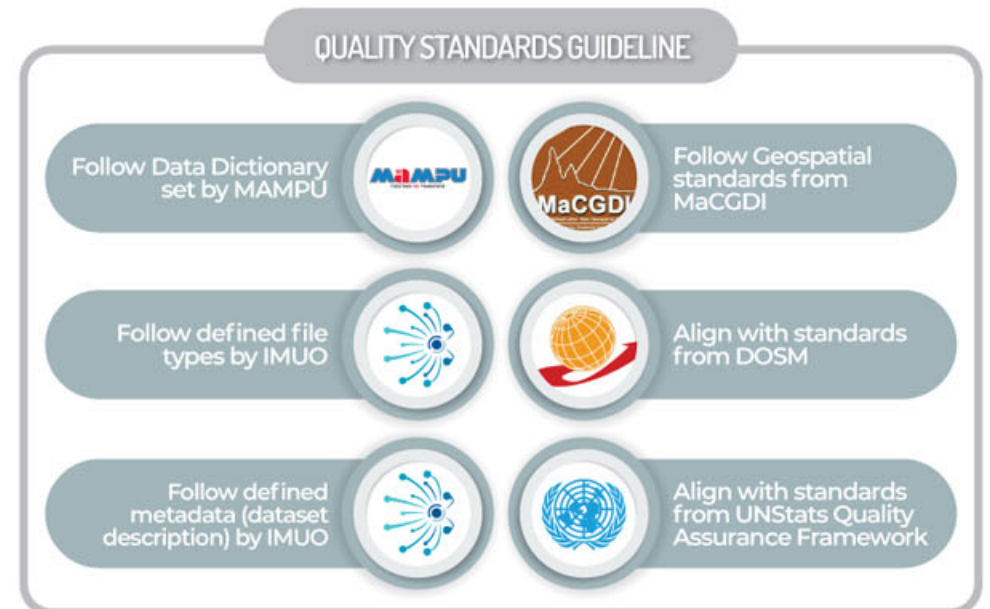
15 DATA PROTECTION, PRIVACY AND SECURITY

IMUO's procedures and practices will comply with all relevant legislation including the following :

LAW OF MALAYSIA
REPRINT
Act 88
OFFICIAL SECRETS ACT 1972

LAW OF MALAYSIA
ACT 709
PERSONAL DATA PROTECTION ACT 2010

General Data Protection Regulation

IMUO will consult information security experts like CyberSecurity Malaysia in its effort to ensure the entire operations for IMUO is supported by a robust, systematic and holistic information security framework to protect the integrity, confidentiality and availability of digital and physical data.

Measures to be taken:

- ❯ Institute robust policies and controls particularly on information security with advise from CyberSecurity Malaysia.
- ❯ Conduct ongoing and comprehensive risk assessment.
- ❯ Design security controls that commensurate with the complexity.
- ❯ Promote and sustain strong information security culture.
- ❯ Governance reporting on information security.

KEMENTERIAN SAINS, TEKNOLOGI DAN INOVASI

CyberSecurity M A L A Y S I A

16 DATA SHARING AND COLLABORATION AGREEMENT

It is important to understand that data sharing is an expected part of every data management plan requirement. Different agencies have different requirements on when research data should be made available. Some agencies require that the data be made available at the time of publication while others simply require the data to be available within 12 months or within a "reasonable time" after publication. There are cases when data sharing may not be appropriate.

IMUO's data will be classified based on a set of criteria that includes, but is not limited to, the following :

01 The sensitivity of content, such as that containing personal, identifiable data and official secrets.

02 Organisational and data users' needs.

03 Associated impact, risks and value of sharing data.

04 Appropriate criteria for data classification by data providers.

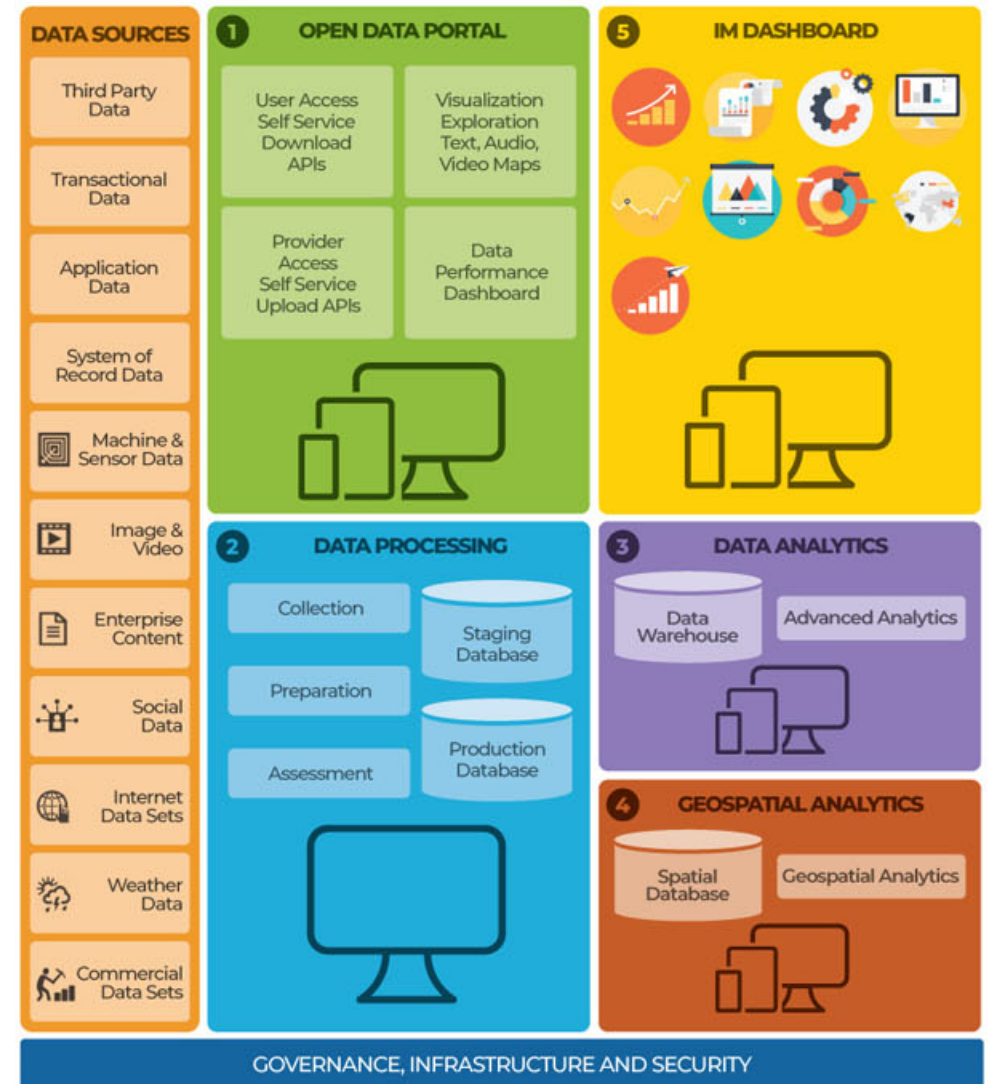| No	Classification	Accessibility	Terms of Use for Data Users
1	Open Data	Available to anyone	Follow MAMPU's policy on open data terms of use.
2	User-Specific Data	Limited to specify group of data users and IMUO e.g. inter government agency only, selected private users etc.	**Non-Open Primary Data** - To be established by IMUO. - Can be guided by creative commons licence type.
3	Internal IMUO Use Only	Limited to IMUO employees based on related functional objectives.	**Non-Open Secondary Data** - Consult with the data providers to establish the appropriate terms.
4	Restricted	- For IMUO employees performing certain roles that requires the use of the restricted data. - Adopt approach on a "need-to-know" basic.	- Can be guided by creative commons licence type.

Collaboration Agreement with Data Providers

- ▶ IMUO's request, usage and management of secondary data within the scope permitted by data providers, and in compliant with applicable legislations and policies;
- ▶ IMUO's reciprocal data sharing model that caters to the demand or needs of data providers which may be in the form of value-added data exchange, provision of data services or other suitable benefits; and
- ▶ Rights, responsibilities and accountabilities between IMUO and data providers.

No	Components	Description
1	**Purpose And Responsibilities**	▶ Specific data, formats and granularity levels required from data providers. ▶ Purpose of data sharing should be consistent and aligned with IMUO's mission and functions. ▶ Responsibilities of data providers with respect to preparing data according to IMUO's data quality requirements as well as frequency and timeline of submission to IMUO.
2	**Terms of Use**	▶ In accordance with the relevant laws, standards and policies, including PDPA and OSA.
3	**Non-Compliance And Termination of Agreement**	▶ Data providers have the right to withdraw from IMUO's ecosystem after arbitration. ▶ IMUO is liable for any legal consequences of non-adherence with data-sharing agreements such as mismanagement and misuse of data.

17 IMUO APPLICATION SOFTWARE

The IMUO will encompass five main software applications areas. The features, functions, applications, tools, and software contained within these areas will collectively support the acquisition, analysis and management of data in the IMUO, as well as the relationship between applications.

DATA SOURCES
- Third Party Data
- Transactional Data
- Application Data
- System of Record Data
- Machine & Sensor Data
- Image & Video
- Enterprise Content
- Social Data
- Internet Data Sets
- Weather Data
- Commercial Data Sets

1 OPEN DATA PORTAL
- User Access Self Service Download APIs
- Visualization Exploration Text, Audio, Video Maps
- Provider Access Self Service Upload APIs
- Data Performance Dashboard

5 IM DASHBOARD

2 DATA PROCESSING
- Collection
- Preparation
- Assessment
- Staging Database
- Production Database

3 DATA ANALYTICS
- Data Warehouse
- Advanced Analytics

4 GEOSPATIAL ANALYTICS
- Spatial Database
- Geospatial Analytics

GOVERNANCE, INFRASTRUCTURE AND SECURITY

Application	Description
Open Data Portal	Platform for data providers and data users collaborating with IMUO, where datasets are published and consumed respectively. The quality of this dataset will be administered by IMUO according to the data quality requirements.
Data Processing	Set of tools to be procured by the IMUO for use in collection and preparation of datasets to ensure efficient data processing. The software is available as open source or off-the-shelf and often contains self service functions that allow a non-technical person to process data.
IM Dashboard	The Iskandar Malaysia (IM) dashboard will show the latest performance of Iskandar Malaysia at least on monthly basis and be offered to external parties on a subscription basis with chosen data themes or subjects. It will consist of analytics, insights, strategic data that are not available in the open data portal such as detail demographic, construction status, building and housing status, crimes hotspots, alerts, and breaking news.
Data Analytics	Features and functions related to more advanced software required to undertake predictive and prescriptive analytics. These advanced data processing tools include features where datasets from production database can be correlated and transformed to serve analytical needs according to subjects or themes.
Geospatial Analytics	Location-based and time (geo-referenced) data, which can be used by geospatial analytic system to build maps, graphs, statistics, and cartograms, making complex relationships understandable. The geospatial engine for analytics will have the capability to handle large amounts of data utilizing specialised methods and tools.

18 BIG DATA PLATFORM

IMUO is expected to accumulate huge volumes of data over time, having a stable, scalable and secure data platform is vital to ensure that it can cater to demand for analytical resources in a timely fashion.

Components	Description
Data Providers and Sources	Various kinds of data in structured and unstructured form, transactional and machine data, third-party and commercial data etc.
Data Collection	Data can be collected using various techniques or via manual acquisition, and ingested and harvested through integrating multiple data sources.
Data Preparation	Data can be stored in data lakes provided by Hadoop Distributed Files System (HDFS) or regular data warehouses and data marts. The data can be queried using SQL or NoSQL from data lakes and data warehouses according to its format. The use of In-Memory or Hadoop Computing Cluster will help to speed up data processing and analysis.
Analytics	Once data are collected and prepared according to standard requirements, it can be presented to and shared with users or further analysed using data and geospatial analytics.
Present	Data is presented via a web browser either in a full desktop or mobile mode, or presented using native mobile applications.
Data Users and Types	Among the numerous types of users, each will have well-defined access privileges, either as public users - who can only access open data - or private users who can access restricted data according to their stipulated access levels.

19 CLOUD COMPUTING INFRASTRUCTURE

IMUO shall use cloud computing to host its data management and analytics platform; this will give it more control and flexibility in resource management and security. It would be ideal for IMUO to have a private cloud, hosted at any data centre in Malaysia, over which it would have control in order to comply with government policy on hosting government data locally and securely.

The newest Malaysian cloud computing service provider has opened in Nusajaya Tech Park in Iskandar Puteri, within the Iskandar Malaysia region.

As setting up a new data centre is not viable for IMUO due to the huge capital outlay, hosting its data platform at a cloud service provider would be a better option; this will allow IMUO to start small and progressively build up its product and service offerings over time. The cloud service provider should fulfil the following criteria :

01 The centre is physically and securely located in Malaysia.

02 Has scalable, high-speed internet broadband.

03 Rated at least as a third-tier data centre by global standards.

04 Able to provide big data architecture and a platform.

05 Able to scale up resources based on demand.

06 Provide back-up and immediate recovery solutions during a disaster (Business Continuity Planning).

20 RECOMMENDATIONS - APPLICATION SOFTWARE AND TECHNOLOGY PROVIDERS

No	Application Software & Technology	Provider
1	Open Data Portal	ckan
2	Data Processing Tools	SAS MIMOS TM ONE
3	Advanced Analytics	SAS
4	Geospatial Analytics	esri
5	IMUO Dashboard	SAS tableau
6	Big Data Platform	cloudera HORTONWORKS
7	Cloud Computing (PaaS, SaaS)	TM ONE MIMOS
8	Lead System Integrators (To implement the chosen application software and technologies listed above)	MIMOS TM ONE