

# Extending LADM to Support eLAS Implementation Toward Sustainable Land Administration: A Case Study in Malaysia

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**Key words:** sustainable land administration, Land Administration Domain Model (LADM), electronic Land Administration System (eLAS), Sustainable Development Goals (SDGs)

## SUMMARY

The rapid urbanization and infrastructural development in Malaysia have necessitated a shift from traditional land administration practices to more advanced systems that can accommodate the complexities of modern land use. This study investigates the integration of the Land Administration Domain Model (LADM) with electronic Land Administration Systems (eLAS) to foster sustainable land administration in Malaysia. As the nation grapples with rapid urbanization and the complexities of modern land use, traditional land administration practices have proven inadequate. The study posits that adopting LADM, an internationally recognized standard, can standardize land administration processes, enhancing consistency, interoperability, and sustainability. By leveraging eLAS, which automates land administration functions such as cadastral surveying, land registration and land information management, Malaysia can aim to create a comprehensive land information infrastructure that supports effective decision-making and policy implementation. However, the study also identifies significant challenges, including data quality, interoperability, and the necessity for robust legal and institutional frameworks to facilitate successful eLAS implementation with LADM support. The study emphasizes the importance of a collaborative approach involving government agencies, private sector stakeholders, and the public to address diverse needs and align land administration practices with the Sustainable Development Goals (SDGs). Ultimately, the study highlights the critical role of standardized frameworks in enhancing the efficiency, transparency, and accessibility of land administration systems. By providing insights into the practical challenges and benefits of integrating LADM with eLAS, this study contributes to the broader discourse on sustainable land governance in the digital age, offering pathways for Malaysia to achieve a more efficient and sustainable land administration system that meets the demands of its evolving urban landscape. Through this case study, valuable insights provided into the practical challenges and benefits of integrating LADM with eLAS, paving the way for a more sustainable future in land administration.

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## 1. INTRODUCTION

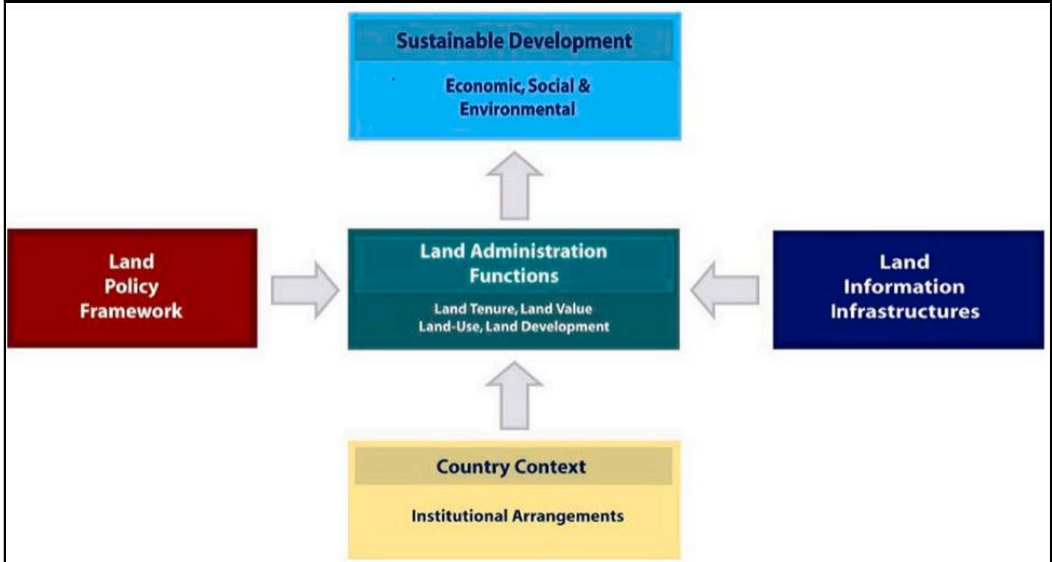
Sustainable land administration in Malaysia is an imperative component of the nation's broader agenda for sustainable development. Sustainable land administration or governance represents a critical paradigm shift in the management and stewardship of land resources, acknowledging the intricate interplay between environmental, social, and economic factors. Land administration encompasses the processes of recording and managing land ownership, land use, and land value (Williamson, I. 2015). As Malaysia continues to urbanize and develop economically, the need for a robust, transparent, and efficient land administration system becomes increasingly crucial. Sustainable land administration ensures that land resources are managed in a manner that supports economic growth, social equity, and environmental protection (World Bank Group, 2017). Sustainable land administration or governance within the land administration system represents a comprehensive and forward-thinking approach to managing land resources. By incorporating principles of equity, environmental stewardship, and community engagement into land administration practices, nations can build a foundation for enduring prosperity (Enemark, S. 2012). This approach not only ensures responsible land use and tenure security but also aligns with broader global agendas such as the Sustainable Development Goals (SDGs) (World Bank Group, 2017).



Figure 1. The 2030 Agenda for Sustainable Development Goals (SDGs) Components (UN, 2015)

Figure 1 above, is the 17 components of the 2030 Agenda for SDGs. The SDGs are designed to eradicate poverty, protect the earth, and ensure peace and prosperity for all by 2030 (UN, 2015).

Malaysia's current land administration system faces several challenges, including inefficiencies, lack of transparency, fraud, forgery and difficulties in data management (Ganason, A. 2022). These issues can lead to land disputes, corruption, and an overall lack of trust in the system (Oruonye, E. D. et al. 2021). Sustainable land administration seeks to address these problems by integrating modern technology and international standards to improve the efficiency and reliability of land-related processes (Hull, S. et al. 2020).



**Figure 2.** Land Management Paradigm Perspective of land administration functions (Williamson, I. et al. 2010); (Adam, A. G. 2023)

The advent of eLAS marks a transformative shift in the way we manage and govern land resources. An eLAS integrate various functions such as cadastral surveying, land registration, and land information management. This integration is crucial for creating a comprehensive land information infrastructure that supports decision-making and policy implementation (Adam, A. G. 2023). This paradigm shift not only enhances the efficiency and accuracy of land-related transactions but also fosters transparency and reduces the likelihood of disputes (Hull, S. et al. 2020). By digitizing cadastral maps, automating registration processes, and providing accessible online interfaces, eLAS contribute to improved land governance, equitable access, and sustainable development (Hull, S. et al. 2020).

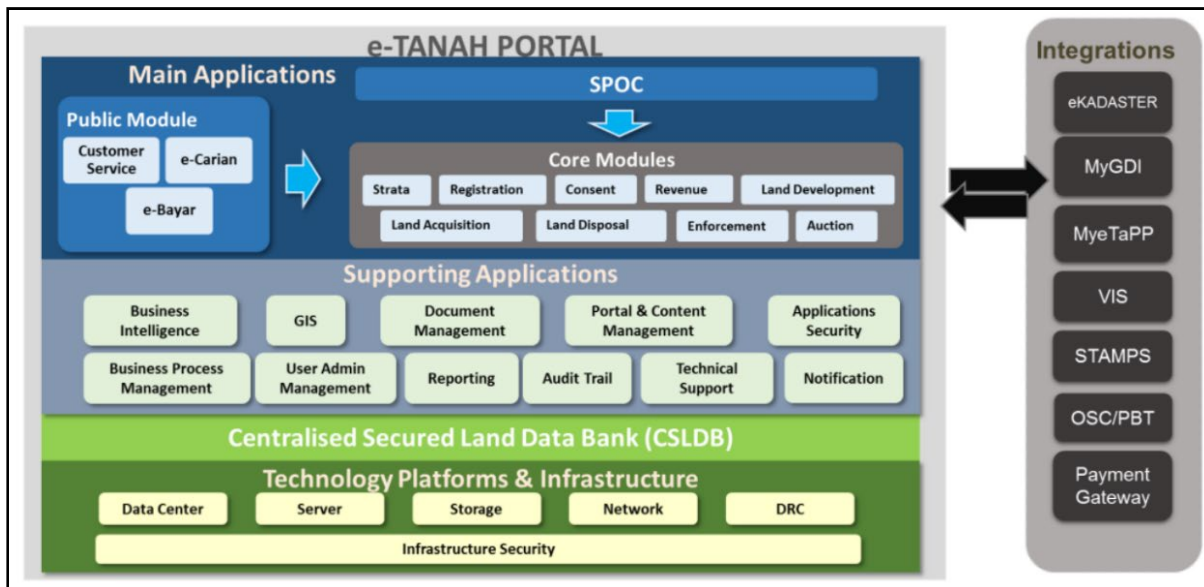
One of the critical components of achieving sustainable land administration to be focus in this study is the adoption of the LADM. The LADM is an international standard that provides a structured framework for managing land information. By implementing LADM, Malaysia can standardize land administration practices, enhance data consistency and ensure interoperability among different stakeholders. In addition to adopting international standards, Malaysia is also focusing on the development and implementation of eLAS by expending e-Tanah system implementation throughout Peninsular Malaysia. eLAS leverages digital technology to automate land administration processes, thereby reducing the time and cost

associated with these activities. The integration of LADM with eLAS can lead to a more transparent, efficient, secure and accessible land administration system. Achieving sustainable land governance involves addressing several complex issues and challenges such as, ensuring equal access and control over land, secure tenure rights, developing accurate cadastral data, institutional and legal frameworks and integrating various land uses and interests (Olfat, H., & Shojaei, D. 2019). Sustainable land administration requires comprehensive and coordinated efforts to address legal, technical, institutional, and socio-economic challenges. Modernizing eLAS with LADM integration and leveraging technology, while ensuring inclusivity and equality, are key steps towards achieving this goal.

## 2. eLAS IMPLEMENTATION IN MALAYSIA

The land administration system in Malaysia is based on the Torrens System except for the State of Sabah, which was introduced by Sir Robert Torrens from South Australia around 1882 in the State of Selangor through the General Land Administration (Fathi Yusof, 2016). Since then, land legislation in Malaysia has developed and three (3) main pieces of legislation have been introduced, namely the National Land Code 1965 (Act 56) for the formalities of land transactions in Peninsular Malaysia which every state have their own land laws, the Sarawak Land Code (Cap 81) in the State of Sarawak and the Sabah Land Ordinance ( Cap 68) in the State of Sabah (Fathi Yusof, 2016). The three (3) principles that the Torrens System holds are the mirror principle which is the information registered on the title is a reflection on the land, the screen principle which is the information on the title giving a complete picture of the title without having to study the history of the land and the principle of insurance which is a form of protection against land fraud or fraud (Fathi Yusof, 2016). The land administration system in Malaysia uses only two (2) principles which are the mirror principle and the veil principle.

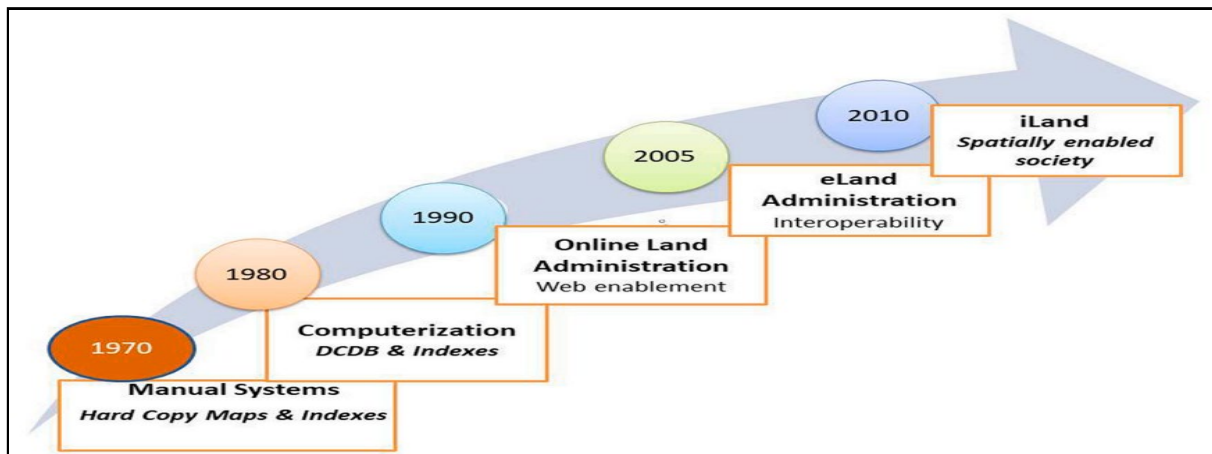
eLAS is a digital framework designed to manage land information and transactions electronically. It encompasses various components such as land registration, cadastre, valuation, and spatial planning. The primary objectives of eLAS include improving the accuracy of land records, reducing corruption, facilitating access to land information, and streamlining land transactions (Williamson, I. et al. 2010). Early 2000s, the Malaysian Government began to develop an online portal for land transactions, allowing citizens to view and manage land and property information from home through the internet mechanism, information at the fingertips (Halid, S. N. B. et al. 2022). In the mid-2000s, the government introduced electronic land registration, enabling the electronic recording of land transactions and the maintenance of a digital database of land ownership information (Halid, S. N. B. et al. 2022). In this era, various land management and administration systems have been introduced and used such as the Land Revenue Collection System (SPHT), Computerized Land Registration System (SPTB), e-Land System, Secure Land Management System (SELAMAT) and Cadaster Data Management System. (SPDK). (Sallehuddin Ishak et al. 2017). The government is working to integrate eLAS with other government systems, such as tax and revenue collection systems, to improve efficiency and reduce the risk of fraud (Karim, N. S. A. et al. 2011).



**Figure 3.** e-Tanah system architecture (JKPTG, 2019)

In 2021, the Government have acknowledged that will use e-Tanah system as a unified eLAS in Peninsular Malaysia ahead year 2026. Up to now, Kuala Lumpur, Perak, Putrajaya, Labuan and Selangor have implemented e-Tanah. Figure 3 above show the e-Tanah basic architecture fir for all state. The e-Tanah system is an integrated land management and administration system through the full use of computers to achieve the government's desire to implement electronic government in public services (JKPTG, 2019). This system aims to speed up the process of land dealings by users in the land office and access to information by customers without neglecting the security aspect (JKPTG, 2019). e-Tanah is an integrated system intended to replace previous legacy systems (JKPTG, 2019). Customers can apply for land matters at the Single Point of Contact (SPOC) counter which is a local counter to improve service more efficiently for customer satisfaction (JKPTG, 2019). The addition of online services such as application status checks, private searches, form filling and online help that will improve the achievement of the land administration system (JKPTG, 2019). Integration with systems from other agencies such as the Inland Revenue Board (LHDN) and the National Registration Department (JPN) for the implementation of related matters (JKPTG, 2019).

Figure 4 below show the evolution of eLAS globally toward spatially enabled society land administration system. The evolution of eLAS in Malaysia has been driven by the global eLAS evolution toward sustainable land administration system that is the need to improve the efficiency and accuracy of land transactions as well as reduce bureaucracy in the land sector (World Bank Group, 2017). Overall, the modernization of the land administration system in Malaysia has helped improve the quality, effectiveness, accuracy, transparency and integrity of Government service delivery but not yet archiving interoperability and spatially enabled society (Ganason, A. 2022) ;(Halid, S. N. B. et al. 2022).



**Figure 4.** Evolution of modern land administration system (Adam, A. G. 2023).

## 2.1 eLAS Implementation Issues and Challenges Toward Sustainable Land Administration

Sustainable land administration is crucial for achieving SDGs, particularly in the context of rapid urbanization, population growth, and environmental concerns. The implementation of eLAS has been proposed as a solution to enhance land administration efficiency, transparency, and accessibility (de Zeeuw, K. et al. 2020). However, while the implementation of eLAS presents a transformative opportunity for enhancing land governance, it is accompanied by a range of challenges that must be addressed. Technical difficulties, capacity building, data quality, user acceptance, legal frameworks, and interoperability are critical issues that require strategic planning and stakeholder engagement (Idris, K. A. 2024). By proactively addressing these challenges, stakeholders can harness the potential of eLAS to promote sustainable land administration, ultimately contributing to improved governance, equitable access to land resources, and the achievement of SDGs.

The journey toward effective eLAS implementation is not merely a technological upgrade but a comprehensive approach to fostering transparency, accountability, and efficiency in land management practices (Unger, E. M. et al. 2022); (de Zeeuw, K. et al. 2020). New technology approach such as blockchain-based solution, 3D visualization and geospatial domain is likely can boost eLAS implementation towards sustainable land administration (Idris, K. A. 2024). With also good governance approach suggestion such as efficient, effective, inter-agency collaboration, data sharing, interoperability and integration for implementing eLAS toward sustainable land administration (Azadi, H. et al. 2023). This study will explore the possibility to extending LADM supporting eLAS implementation in addressing challenges and issues on data quality and interoperability toward sustainable land administration. Furthermore, identifying expected issues and challenges regarding the LADM extension to support eLAS implementation toward sustainable land administration in Malaysia.

## 3. WHY LADM?

LADM is an international standard designed to facilitate the efficient management and exchange of land-related information. Developed by the International Organization for

Standardization (ISO) and designated as ISO 19152, LADM aims to standardize the representation of land administration systems, ensuring consistency and interoperability across various jurisdictions and contexts (Zamzuri, N. A. A. et al. 2021). LADM provides a conceptual framework for describing the relationships between people, land, and rights. It encompasses key components such as land parcels, legal entities, and administrative units, as well as the rights, responsibilities, and restrictions associated with land. By offering a common language and structure, LADM supports the integration of cadastral and land registration data, enhancing the accuracy and reliability of land information systems (Rajabifard, A. et al. 2021).

The establishment Malaysian LADM Country Profile aims to harmonize wide range of land administration aspects, including rights, restrictions, responsibilities, and the representation of spatial units in both two-dimensional and three-dimensional formats (Choon, T. L. et al. 2015). Thereby, its enhancing the efficiency of land registration processes and supporting the development of a national Spatial Data Infrastructure (SDI). By leveraging international standards, the Malaysian LADM Country Profile not only addresses local land administration challenges but also positions Malaysia as a proactive participant in the global discourse on land management. This initiative is expected to improve data consistency, quality, and accessibility, ultimately leading to better governance and sustainable land use practices (Choon, T. L. et al. 2015) ;(Rajabifard, A. et al. 2021).

**Table 1.** LADM country profile criterias to address challenges and issues on data quality and interoperability by eLAS implementation toward sustainable land administration

<b>Criteria</b>	<b>Discription</b>
Alignment with SDGs	The Malaysian LADM profile aims to support the realization of various SDGs by providing a structured framework for land administration that enhances the management and equitable distribution of land resources. This alignment helps in addressing critical areas such as poverty eradication, environmental sustainability, and social equity (Chen, M. et al. 2024).
Improved Land Governance	The LADM facilitates better land governance by standardizing land administration practices. This standardization helps in reducing ambiguities in land rights and ownership, thereby promoting transparency and accountability in land management (Chen, M. et al. 2024).
Enhanced Data Management	The LADM provides a comprehensive framework for managing land-related data, which is essential for effective decision-making in land administration. By utilizing the LADM, Malaysia can improve the efficiency of data collection, processing, and dissemination, leading to more informed policy-making and land management practices (Chen, M. et al. 2024).
Support for Policy Development	The insights derived from the LADM can inform the development of policies that address land-related issues, such as gender disparities in land rights and disaster risk management. This capability allows policymakers to create targeted strategies that enhance land administration and contribute to sustainable

Criteria	Description
	development (Chen, M. et al. 2024).
Facilitation of Stakeholder Engagement	The LADM framework encourages collaboration among various stakeholders, including government agencies, local communities, and private sector actors. This engagement is crucial for ensuring that land administration practices are inclusive and reflect the needs and rights of all stakeholders involved (Chen, M. et al. 2024).
Integration of 3D Attributes	The LADM standard supports the incorporation of 3D spatial units, which is essential for managing complex marine environments where both land and marine spaces are involved. This capability allows for better representation and management of rights, responsibilities, and restrictions (RRRs) in marine areas, which are increasingly recognized as critical for sustainable development (Zamzuri, N. A. A. et al. 2021).
International Standards Compliance	By adopting the LADM, Malaysia aligns its land administration practices with international standards, facilitating cross-border transactions and enhancing cooperation with other countries. This alignment is essential for sustainable land administration as it promotes best practices and knowledge sharing (Zamzuri, N. A. A. et al. 2021).

Table 1 above show criterias of LADM country profile that viable and possibly can manage challenges and issues on data quality and interoperability by eLAS implementation toward sustainable land administration. Overall, the expansion of the Malaysian LADM country profile supporting eLAS implementation toward sustainable land administration is motivated by the need for a robust, integrated, and sustainable approach to land administration system that can adapt to the complexities of modern governance challenges. Its possibly can serve as a vital tool for advancing sustainable land administration by promoting effective governance, enhancing data management, and supporting the achievement of SDGs.

### 3.1 Issues and Challenges Expanding LADM supporting eLAS Toward Sustainable Land Administration in Malaysia

In Malaysia, the integration of LADM with the eLAS presents a significant opportunity to enhance land governance and promote sustainable land administration. However, the expansion of LADM to support eLAS in Malaysia faces several issues and challenges that must be addressed to achieve sustainable land administration. While the integration of LADM can enhance sustainable land administration by improving data management, governance, and stakeholder engagement, it is essential to address the technical, institutional, and socio-economic challenges that may arise (Chen, M. et al. 2024). From literature, there are issues and challenges have arise when expanding LADM into supporting eLAS implementation to archive sustainable land administration environment, such as:



### 3.1.1 Technical Challenges:

One of the primary technical challenges in expanding LADM to support eLAS is the need for data standardization and interoperability. Currently, Malaysia's land administration relies on various independent systems, such as e-Tanah and eKadaster, which operate primarily in 2D. The transition to a 3D cadastre, as proposed by LADM, requires significant modifications to existing databases and data models (Zulkifli, N. A. et al. 2021). The current strata XML format used by the Department of Survey and Mapping Malaysia (DSMM) is not compliant with LADM standards, necessitating a comprehensive data conversion process (Zulkifli, N. A. et al. 2021). The transition to a 3D land administration system requires the development of new data collection methods, standards, and protocols that can accurately capture and represent vertical land use (Rajabifard, A. et al. 2021).

Moreover, the integration of spatial and administrative data poses challenges in terms of data accuracy and consistency. The existing systems may contain discrepancies that need to be resolved before a unified LADM-compliant system can be established (Zulkifli, N. A. et al. 2021). The LADM framework promotes a standardized approach to land data management, but achieving interoperability between different jurisdictions and systems remains a complex task. In Malaysia, where multiple agencies are involved in land administration, the lack of a unified data standard can lead to inconsistencies and inefficiencies in data sharing and collaboration (Rajabifard, A. et al. 2021). Ensuring that all stakeholders adhere to the same data standards is crucial for the success of the eLAS initiative.

### 3.1.2 Institutional Challenges:

Institutional challenges also play a significant role in the expansion of LADM to support eLAS. The Malaysian land administration system involves multiple agencies, each with its own mandates, processes, and information management systems (Zulkifli, N. A. et al. 2021). This fragmentation can lead to inefficiencies and hinder the establishment of a cohesive land administration framework. The legal and institutional frameworks governing land administration in Malaysia also present challenges to the expansion of LADM. The existing laws and regulations may not fully accommodate the principles of LADM, particularly concerning the recognition of 3D rights and the management of marine resources (Zamzuri, N. A. A. et al. 2021).

The successful implementation of LADM in Malaysia also hinges on the establishment of a supportive legislative and regulatory framework. Current land laws and regulations may not adequately accommodate the nuances of 3D land administration, leading to potential conflicts and ambiguities in land rights and ownership (Rajabifard, A. et al. 2021). Furthermore, the lack of a clear policy framework and governance structure to guide the integration of LADM with eLAS can create uncertainty. Without strong leadership and commitment from government authorities, the expansion of LADM may stall, and the potential for improved land administration may not be realized (Chen, M. et al. 2024).

### 3.1.3 Socio-Economic Challenges:

The socio-economic context in Malaysia presents further challenges to the expansion of LADM supporting eLAS. Rapid urbanization and population growth have increased the demand for land, leading to complex land use issues (Zulkifli, N. A. et al. 2021). The LADM framework, with its emphasis on 3D property rights and responsibilities, has the potential to

address these issues by providing a more comprehensive understanding of land use and ownership. However, the successful implementation of LADM requires the active participation of various stakeholders, including landowners, developers, and local communities. Resistance to change, particularly among traditional landowners who may be unfamiliar with new technologies, can pose significant barriers to the adoption of LADM and eLAS (Zulkifli, N. A. et al. 2021). Moreover, public awareness and acceptance of eLAS and LADM are vital for successful implementation. Many landowners and stakeholders may be unfamiliar with the concepts of digital land administration and may be resistant to change (Chen, M. et al. 2024).

Capacity building is essential for the successful implementation of LADM and eLAS in Malaysia. Many stakeholders, including government officials, land administrators, and the public, may lack the necessary knowledge and skills to effectively utilize the new systems (Zamzuri, N. A. A. et al. 2021). Therefore, targeted training programs and workshops are essential to equip professionals with the competencies needed to navigate the complexities of 3D land administration. Additionally, fostering a culture of continuous learning and adaptation within land administration agencies will be vital for sustaining the momentum of LADM implementation. Implementing a comprehensive LADM-driven eLAS system also involves significant financial investment, which can be a major hurdle for many jurisdictions in Malaysia (Rajabifard, A. et al. 2021). The costs associated with upgrading technology, training personnel, and conducting public awareness campaigns can strain limited budgets, particularly in less developed regions.

The expansion of the LADM to support eLAS in Malaysia presents both opportunities and challenges. While the potential benefits of a sustainable land administration system are significant, addressing the issues of 3D data integration, data standardization, Institutional collaboration, legislative frameworks hurdle and sosio-economic challenges in public and industries awareness and acceptance, capacity building and financial constraints is crucial for successful implementation. By proactively tackling these issues and challenges, Malaysia can pave the way for a more efficient, transparent, and sustainable land administration system that meets the needs of its rapidly evolving urban landscape to archive SDGs targets. The journey toward a robust eLAS supported by LADM is not only a technical endeavor but also a commitment to fostering sustainable land administration for future generations.

#### **4. DISCUSSION**

As Malaysia continues to urbanize rapidly, the need for efficient, transparent, and sustainable land administration becomes critical. This article highlights how the traditional land administration practices in Malaysia are inadequate to cope with modern land use complexities, necessitating a shift to digital land administration system as eLAS is required. But, the implementation of the eLAS in Malaysia faces several current issues and challenges in achieving sustainable land administration. One of the primary challenges is the inconsistency and fragmentation of land records across various states and local jurisdictions, which complicates the standardization and integration processes necessary for a cohesive eLAS. Ensuring data accuracy and integrity during digitization is another critical issue, as errors or omissions can undermine the system's reliability and trustworthiness. Furthermore,

resistance to change from stakeholders accustomed to traditional methods also poses a barrier, necessitating effective change management and stakeholder engagement strategies. Lastly, ensuring robust data security and privacy measures is essential to protect sensitive land ownership information from cyber threats and unauthorized access. Addressing these challenges is crucial for the successful deployment of eLAS and the realization of sustainable land administration in Malaysia.

This study found extending the LADM to support an eLAS in Malaysia holds significant potential for enhancing sustainable land administration. By integrating LADM with eLAS, Malaysia can create a unified, standardized framework that improves data interoperability, accuracy, and accessibility across various land administration entities. This integration can streamline processes, reduce redundancies, and enhance the efficiency of land registration, cadastral mapping, and land use planning. Additionally, the LADM's flexibility in accommodating different legal and institutional land tenure systems aligns well with Malaysia's diverse land tenure arrangements, facilitating a more comprehensive and inclusive approach to land administration. Ultimately, this synergy between LADM and eLAS can support sustainable land management practices, foster transparency, and contribute to socio-economic development by providing a robust infrastructure for secure land transactions and efficient resource management as to archive SDGs.

However, this study delves into the challenges and issues associated with integrating LADM with eLAS, focusing on data quality and interoperability. One significant aspect discussed is the role of eLAS in transforming land administration through digitalization, which includes cadastral surveying, land registration, and land information management. This digital transformation aims to create a comprehensive land information infrastructure that supports decision-making and policy implementation. Despite the potential benefits, the study acknowledges the technical difficulties, socio-economic challenges, institutional and legal framework required to implement eLAS with the support of LADM effectively. One significant challenge is the integration of LADM with the existing diverse and fragmented land administration systems across the country's various states and regions, which may have different legal and institutional frameworks. Ensuring data compatibility and interoperability between legacy systems and the new LADM-compliant eLAS requires substantial technical effort and investment. Furthermore, ensuring data security and privacy in the digital system is also a critical concern, especially given the sensitive nature of land ownership information. By addressing these challenges, the integration of LADM and eLAS can lead to a more transparent, efficient, and accessible land administration system in Malaysia. The case study provides valuable insights into the practical challenges and benefits of this integration, contributing to the broader discourse on sustainable land administration practices in the digital age.

## 5. CONCLUSION

In conclusion, the study findings emphasize the importance of adopting standardized frameworks to ensure consistency, interoperability, and sustainability in land administration practices. The study highlights the potential for enhancing sustainable land administration practices in Malaysia. By integrating LADM with eLAS, Malaysia can aim to create a

standardized, interoperable, and sustainable framework for land governance. This integration is expected to address the complexities of modern land use, improve efficiency, and increase transparency in land administration. The study underscores the importance of a collaborative approach involving various stakeholders, including government agencies, private sector entities, and the public, to ensure that the system meets diverse needs and supports the nation's SDGs. However, the study also acknowledges significant hurdles, such as data quality issues, technical complexities, and the need for robust legal and institutional frameworks. The digital transformation through eLAS, which includes cadastral surveying, land registration, and land information management, aims to create a comprehensive land information infrastructure to support decision-making and policy implementation. While acknowledging the technical, socio-economic, institutional, and legal challenges, the study provides valuable insights into the practical benefits and obstacles of integrating LADM and eLAS. The findings contribute to the broader discourse on sustainable land administration practices in the digital age, emphasizing the need for effective collaboration and strategic planning to overcome the identified challenges and achieve the desired outcomes. The case study of Malaysia not only highlights the practical challenges of implementing such integration but also offers valuable insights into the potential pathways for achieving sustainable land administration, contributing to the global discourse on land management and sustainable development.

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