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Deriving requirements for integrated and standardised cadastre profile from the legacy Board of Revenue and the contemporary land administration systems

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Modernising the paper-based manual Land Administration System (LAS) benefits society at large. This study examines the integration and standardisation requirements of LASs in Islamabad, Pakistan, using the Land Administration Domain Model (LADM). The exploratory case study approach assesses land tenure, value, use and development aspects. The existing LASs satisfy LADM requirements for a unified LAS. Systematic transformations are required to upgrade revenue sketch maps and drawings into accurate geospatial data in 2D and above and below-ground infrastructure into 3D. Developing a LADM edition I & II country profile is recommended for land tenure security, socioeconomic development and sustainable urban growth.

Keywords: Real Estate in Pakistan, Urban Immovable Property Tax, Sustainable Cities and Communities, Peace, Justice and Strong Institutions, LADM, British Colonial LAS, Land Valuation

1. Introduction

A Land Administration System (LAS) is crucial for sustainable development. It is based on four main functions: land tenure, land value, land use and land development. Developing and implementing a modern, computerised LAS integrated into a land information infrastructure is essential for sustainable development. The worldwide e-government initiatives in LASs have yielded numerous advantages, such as tenure security, efficient land market and spatial land use planning (Enemark 2006, Williamson *et al.* 2010, Koeva *et al.* 2020, Cheng and Li 2023, Akingbade *et al.* 2012). A well-functioning LAS offers several benefits, such as support in reducing disputes, protection of state land, development of the real estate market, fair property taxation, improved spatial planning and enhanced land tenure, gender and mortgage security (UN-ECE 1996, Lengoiboni *et al.* 2019, Yilmaz *et al.* 2023, Ullah and Hussain 2023, Ali and de Vries 2024, Ahmad 2024, Haque and Khurshid 2023, Khaleel *et al.* 2023, Ayaz and Mughal 2023, Mika 2020).

In the coming decades, most urban expansion is anticipated in Asia and Africa, accounting for 95 percent of the growth. Pakistan's metropolitan population is expected to increase rapidly, from 36 percent of the total population in 2017 to over 50 percent by 2050 (UN 2018). However, some experts believe the estimates may be too conservative (Javed *et al.* 2020, Ali *et al.* 2013a, Arif *et al.* 1998). Given the projected pace of urbanisation in South Asia, particularly in Pakistan, there is a pressing need for a comprehensive understanding of the existing urban LAS to address issues related to land tenure security, land dispute resolutions, vertical city development and sustainable and liveable cities in Pakistan (Javed *et al.* 2014). The term Land Administration (LA) encompasses the processes of collecting and distributing information on land tenure, value, use and development. In contrast to LA, the term LAS includes a set of rules, procedures and institutions that govern the LA process (UN-ECE 1996).

During British rule in Pakistan and South Asia, LA primarily focused on generating revenue through taxes, making it fiscal in nature. Under the legacy British Colonial LAS, the Board of Revenue (BoR) is mainly responsible for managing and administering the Record of Rights (RoR) register. The RoR was a source document for collecting revenue from agricultural landholders. BoR conducts physical settlement surveys to demarcate parcel boundaries and revenue boundary marks. A deed registration (also known as a Record of Deed (RoD) or

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Registry started in 1908 under BoR) is also applicable to each property transaction to generate revenue from urban and rural property holders. As cities grow at a fast pace, the proper use and development of land become increasingly crucial for sustainable urbanisation. Unfortunately, Pakistan still has a manual process for determining and recording urban land ownership, use and value under the contemporary LAS, which is managed and administered by the Development Authority (DA) and the private sector. The contemporary LAS is based on the Allotment File and the Property File to record ownership rights with different tax collection and land survey hierarchies from the legacy LAS. Urban Immovable Property Tax (UIPT) is collected under contemporary LAS as compared to agricultural tax under the legacy system.

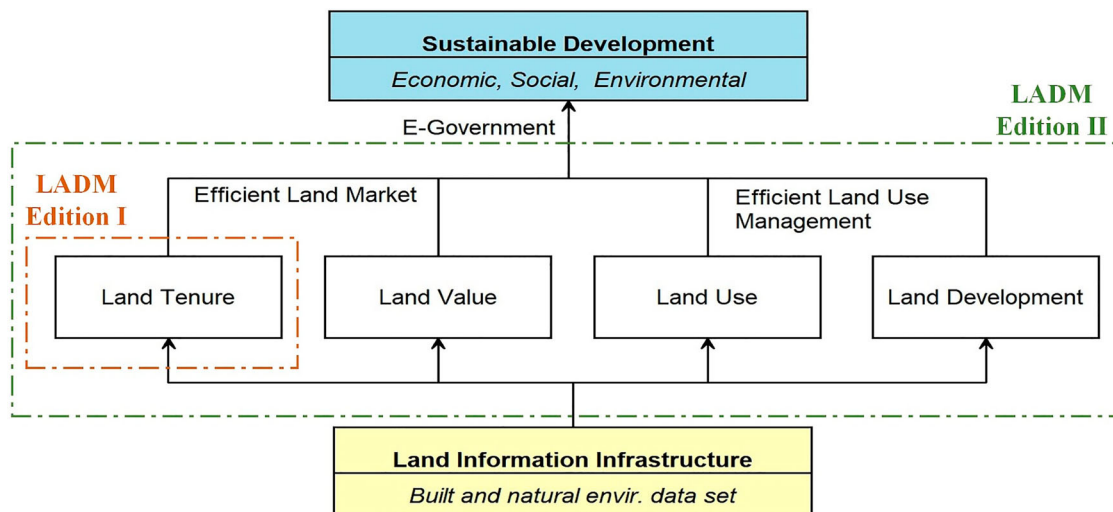
The current global LA paradigm (see Figure 1) acknowledges the significance of providing tenure security for landowners. This is because land is a valuable asset that can be sold for cash (Dale 2006). In this study, the terms land (referring to vacant plots) and property (referring to built-up areas) are used interchangeably.

Most LA-related research in the country is based on the legacy BoR LAS, which covers rural areas. Many researchers have found the feasibility of upgrading existing BoR LAS using modern surveying and geospatial technologies (Ahsan et al. 2017, Ali et al. 2012, Waqas et al. 2024, Shakir et al. 2022, Ali and Shakir 2012, Imran et al. 2013, Adeel 2010, Aslam et al. 2015). LAS-related problems are even more severe in urban areas, resulting in numerous societal and governance challenges, including land grabbing, property undervaluation, corruption and fraud, haphazard development, inadequate urban policies, etc. (Rana and Bhatti 2018, Ahmad and Anjum 2012, USAID 2016, PLRA 2023, Ahsan et al. 2023, Hasan 2022, Malik and Nurunnabi 2024, Malik et al. 2020, Rahman 2024). The interaction between BoR's legacy and DA's contemporary systems has introduced new and complex legal issues (Ahmed 2022, Afzal 2023, Baig et al. 2020, Nazir et al. 2019, Abid 2021). Pakistan is working to modernise the existing LASs (Ali and Imran 2021, World Bank 2022). To

modernise the LASs, it is essential to deeply understand the legacy, the contemporary systems and their past and prospects.

In Pakistan, each administrative division has its own revenue and development authorities to manage LA. However, while some provinces have recently computerised certain aspects of their LA, these initiatives mainly cover attribute records and face challenges in ensuring service delivery (Khan 2020, Siddique 2019, Shabbir et al. 2020, Abdullah et al. 2020). The Land Record Management Information System Punjab Province (LRMIS-P) initiative was executed by Punjab BoR (supported by World Bank) during 2007-2017 to computerise the attribute records in rural areas (Khan 2020, World Bank 2016). There are similar initiatives in Sindh Province, known as Land Administration and Revenue Management Information System (LARMIS) and in Khyber Pakhtunkhwa Province, known as LRMIS. A summary of key services offered by the initiatives (generally referred to as LRMIS), including online availability of ownership information, online issuance of mandatory stamp paper for deed registration and availability of land settlements maps and layout plans in Geographical Information System (GIS) based digital form, is presented in Table 1. For revenue administration, a province is further categorised as Divisions (level-II), Districts (level-III), Sub-Districts (level-IV) and so on; see Figure 5. Pakistan's 'Vision 2025' prioritises smart cities for sustainable urban growth, emphasising the digitalisation and maintenance of land records (Govt of Pakistan 2014). Ahsan, Hussain (Ahsan et al. 2023), Haque (2020), CCP (2019) and Ali (2013) recommend further investigation of the legal and institutional aspects of urban LA, including their implications for standardisation and technological innovation.

The Technical Committee 211 on Geographic Information (TC-211) of the International Organization for Standardization (ISO) developed and published Edition I of the Land Administration Domain Model (LADM) in 2012 (ISO 2012). LADM allows any country to define the semantics and relationships of their local LA into a standardised domain model. Countries across the globe



1 Land administration paradigm for sustainable development concerning LADM Edition I and II (Enemark et al. 2005, Kara et al. 2024)

Table 1 Summary of key services offered under LRMIS in Pakistan

Province/Territory	Online Ownership		e-Registration		e-Stamp		Online Digital Maps	
	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban
Islamabad	No	No	No	No	No	No	No	No
Punjab	Yes	Planned	Yes	Yes	Yes	Yes	Planned	Planned
Sindh	Yes	No	Yes	Yes	Yes	Yes	No	No
Khyber Pakhtunkhwa	Ongoing	No	No	No	Yes	Yes	No	No
Balochistan	No	No	No	No	No	Ongoing	No	No

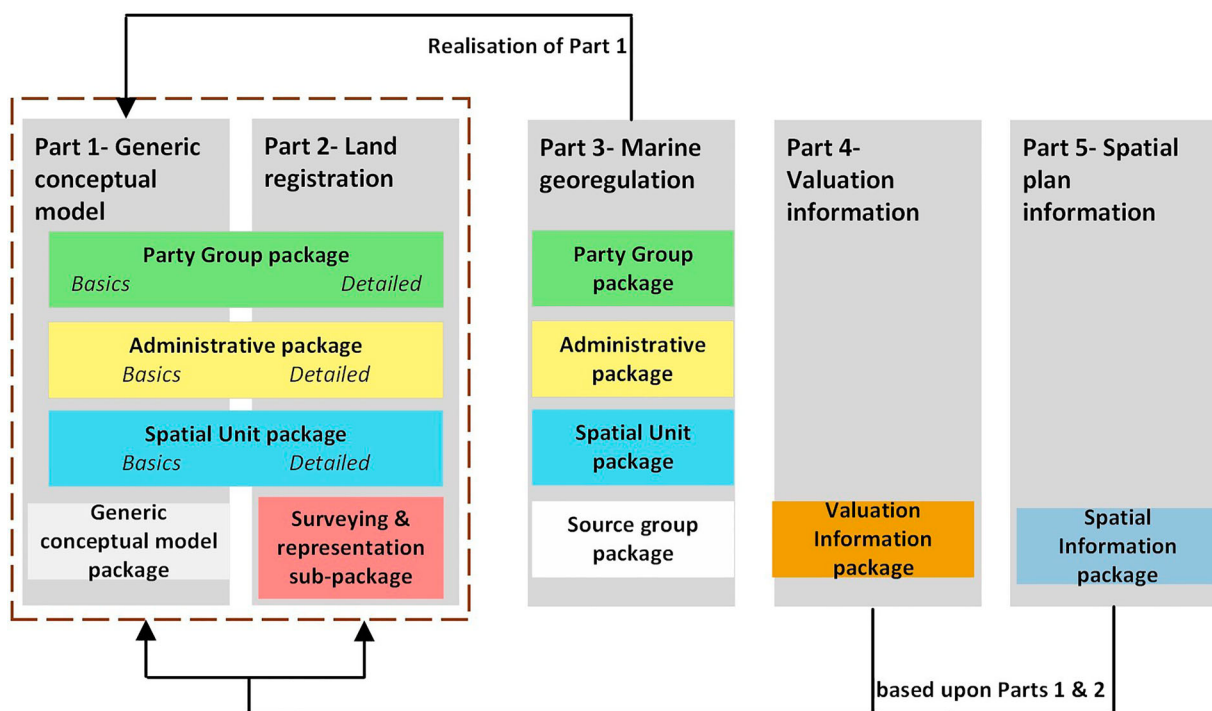
are using LADM to align their LASs with international best practices to enhance efficiency and effectiveness (Lemmen et al. 2015, Kalogianni et al. 2021, Alkan and Polat 2016, Buuveibaatar et al. 2023, Surmeneli et al. 2022, Polat and Alkan 2022, Rajabifard et al. 2021, Morales et al. 2021, Zulkifli et al. 2015, Gürsoy Sürmeneli et al. 2020, Okembo et al. 2023, Adad et al. 2020, Getie and Birhanu 2023, Okembo et al. 2022). As shown in Figure 1, the LADM Edition I allows to incorporate and record the land tenure aspect of overall LAS, while the remaining aspects are being proposed under Edition II of the LADM. The ongoing LADM development to extend Edition I as multi-part standards to include land valuation, use and development as well as marine (water) aspects (Yılmaz et al. 2023, Kara et al. 2024, Buuveibaatar et al. 2023, Indrajit et al. 2020, Kara et al. 2020), see Figure 2. Part 6 of Edition II is in the planning stage to cover implementation and country profile development. Marine georegulation is beyond the scope of this study. The main packages and classes of LADM Edition I are now reorganised into Part 1 and Part 2 in Edition II.

This study focuses on LA processes and the management practices of Pakistan’s contemporary and BoR LASs. The objective is to identify the requirements for designing and developing an integrated and standardised

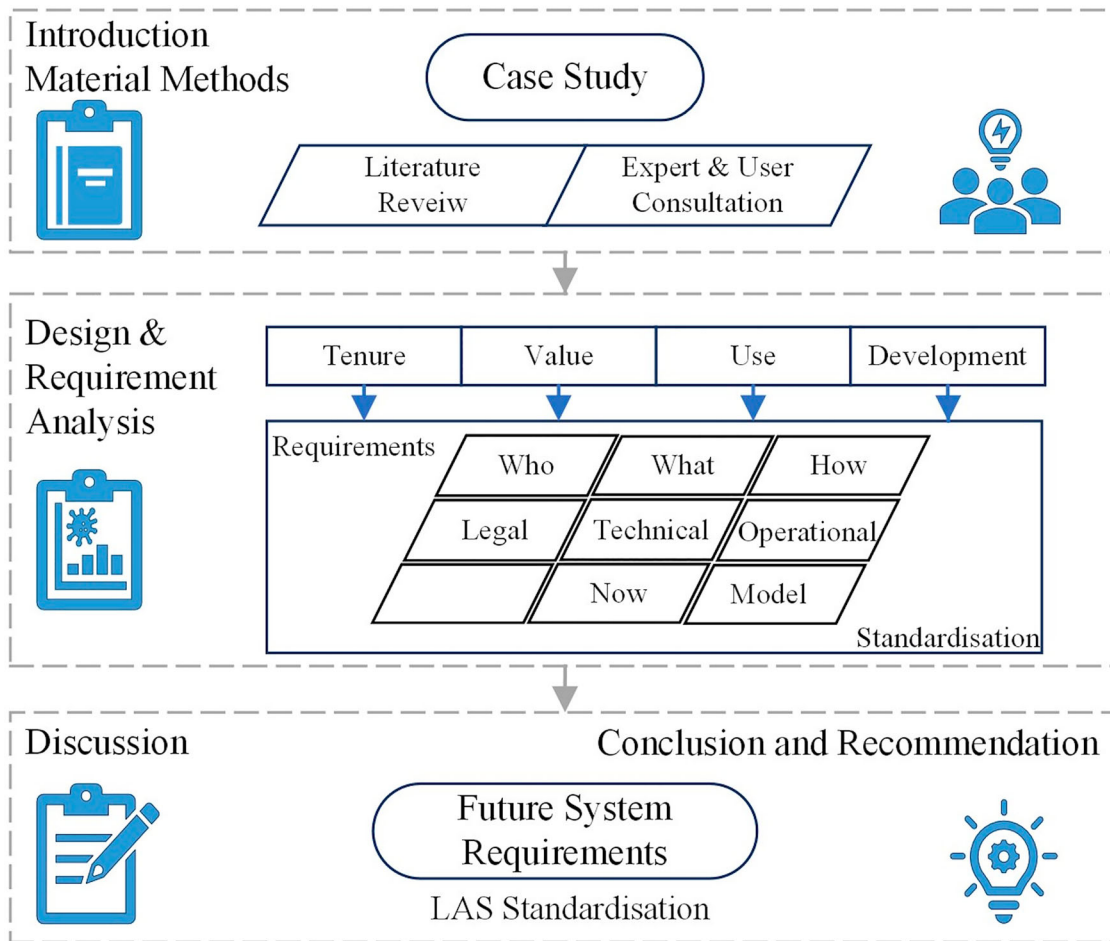
LAS in Islamabad, Pakistan, especially land ownership records (land tenure) in urban areas. The following research questions are examined: (i) Who is responsible for LASs processes and data? (ii) How do legacy BoR and contemporary LASs’ technical, operations and legislation work together? (iii) Can existing LASs be standardised into a domain model? (iv) What are the gaps and requirements for upgrading the existing LASs situation, particularly regarding land tenure? The paper is organised into five sections, with an introduction in this section and a methodology and study area in Section 2. Section 3 provides an insight into the design and analysis of existing LASs, while Section 4 provides requirement analysis. Sections 5 and 6 focus on discussion and conclusion as well as recommendation, respectively.

2. Material methods

Through an exploratory case study approach, this research delves into the LASs in Pakistan. It involves a thorough literature review and consulting with experts and users to comprehensively understand the legal, technical and institutional aspects of the LASs. The study investigates the land tenure, land valuation, land use and land development aspects of the LA to identify



2 LADM Edition II packages overview (Kara et al. 2024)



3 The methodology diagram presents a visual overview of the research components

the gaps and requirements for the design and development of future LAS towards standardisation. A recent study (Ahsan et al. 2023) assessed the status and challenges of urban LASs in Pakistan using questionnaire surveys based on the Framework for Effective Land Administration System (FELA). In continuation, this study includes the expert and user consultation obtained through group discussions and some of the survey findings from Ahsan, Hussain (Ahsan et al. 2023). A detailed diagram of the research methodology is shown in Figure 3.

The study area, Islamabad (Figure 4), is a federal territory and the capital city of Pakistan. It is a planned city, built relatively recently during the 1960s. In 1998, the population of Islamabad was 0.8 million, which increased to 2 million in 2017. The population is expected to reach 4.3 million by 2040, with an average annual growth rate of 4.9 percent, (PBS 2018, Hussain et al. 2022). The city is divided into five zones, with a total area of 906 square km (including a natural reserve area of 204 square km), as illustrated in Table 2. The urban and rural area demarcation is based on Capital Development Authority (CDA) Statutory Regulatory Orders No. 83 (KE) issued in 2002 and given by AGPR (AGPR 2017). Pakistan has 624 designated urban areas or cities, having different boundaries for administration and revenue purposes (PBS 2018, FBR 2021). It's worth noting that while only a small section of Islamabad is officially designated as urban, the Federal Board of Revenue

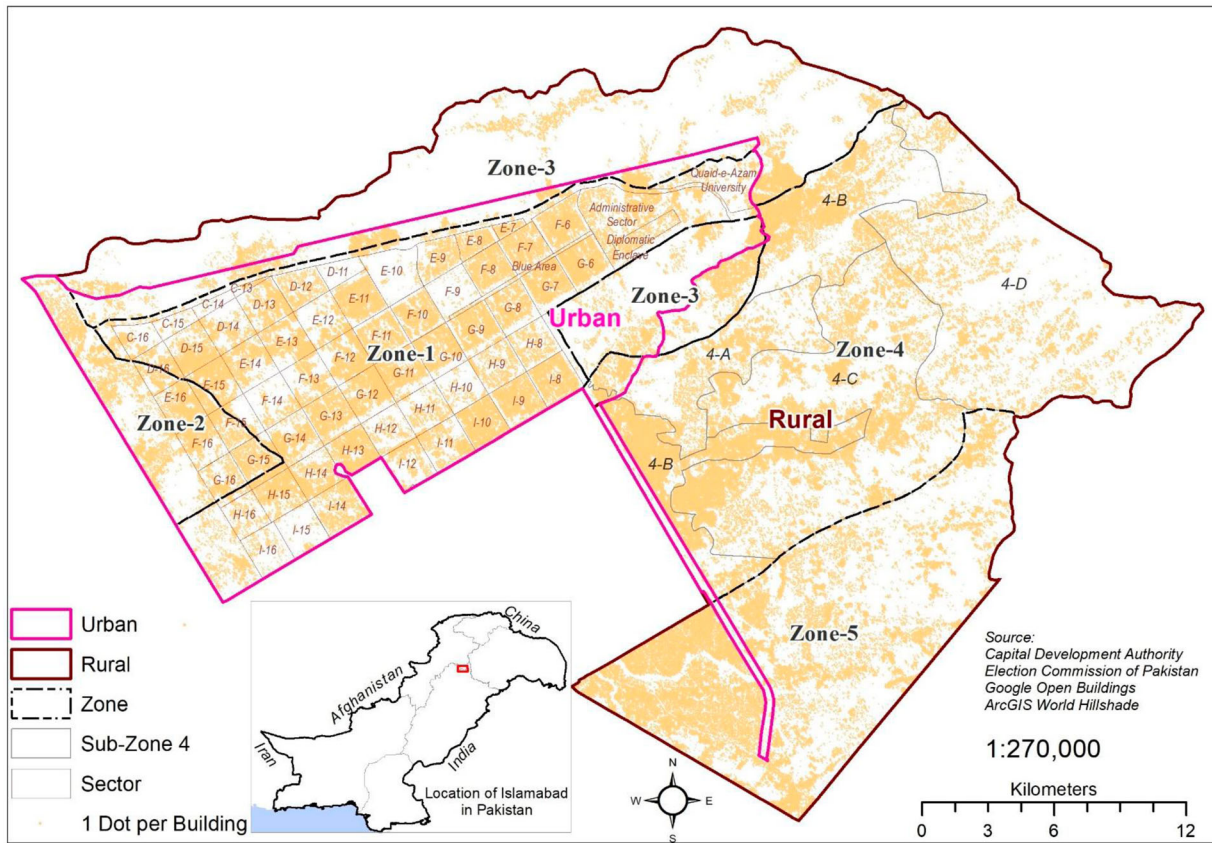
(FBR) considers most of it to be urban for revenue collection purposes. However, the BoR follows the official administrative rural and urban boundaries.

Islamabad had 335,942 housing units in 2017 (PBS 2018). However, the most recent Google open building data set (Sirko et al. 2021) for 2022-2023 reveals that this number has increased to 459,439, also represented in Figure 4 as one dot per building. The Google-maintained open building data¹ is downloaded in tabular form, converted into GIS point format and clipped for the study area.

3. LAS design analysis

Before being granted the status of federal territory in 1960, Islamabad was a part of the Punjab province. Despite being a separate territory, Islamabad does not have a legislative assembly. Hence, it follows most of the laws and regulations of the Punjab province. Islamabad's CDA regulates private housing sector activities, develops housing schemes and provides sanitation and waste management services as a municipal administrator in Zone-1 (see Figure 4). CDA is also responsible for land tenure and valuation in Zone-1. The authority regulates land use and development throughout Islamabad, including the private sector's housing schemes. The land tenure and valuation administered by BoR has jurisdiction in

¹<https://sites.research.google/open-buildings/>



4 Study area map of Islamabad showing building points and administrative boundaries

Table 2 Zoning distribution, their land use pattern and percentage area allocated in Islamabad

Name	Status	Type	Area (percent)
Zone-1	No private housing scheme is allowed	Urban	24.5%
Zone-2	Private housing schemes allowed	Urban	4.4%
Zone-3	Protected natural area, no land use change allowed	Reserved	22.5%
Zone-4	Agro-farming and housing schemes allowed in 2010	Rural	31.2%
Zone-5	Private housing schemes allowed	Rural	17.4%

Zone-2, 3, 4 and 5, which also includes private housing schemes. FBR also maintains a parallel land valuation in Islamabad. The land tenure under CDA is based on the Allotment file, whereas BoR administers Deed registration. The private housing schemes maintain their own land tenure and property registration records, bypassing mandatory deed registration at BoR. The private housing schemes also run a parallel Property file to secure investment, but the Property file has no legal meaning.

Most of the BoR’s laws and regulations related to land tenure and valuation were enacted in South Asia a hundred years ago during the British colonial era (Ali 2013, World Bank 2020, Sengupta et al. 2016). Despite the passage of time, the country’s practices for managing land and property remain primarily opaque, decentralised and outdated (World Bank 2022, Shah et al. 2007, Hull 2008, Hasan et al. 2022b). During British colonial rule,

the LAS mainly focused on rural land tenure and valuation to maximise revenue, as most regions were agriculture-based. The British did not prioritise urban land use and development functions except for collecting urban property tax. Differences exist between the contemporary and BoR LASs in terms of the laws governing them. Each organisation has its rules and legislative framework for LASs in urban and rural areas, as shown in Table 3.

Establishing a well-represented and well-maintained relationship between people and land is crucial for the BoR and contemporary LASs in Pakistan. However, the focus is more on fiscal and organisational aspects (Ali et al. 2013b). Due to urbanisation and city development, most of the rural land under the BoR is being acquired by various entities such as Development Authority (DA), Housing Authorities (HA), Private Housing Societies (PHS), Cooperative Housing Societies (CHS) and Cantonment Boards (CB) under military authorities. Figure 5 provides an overview of the hierarchy, legislation and land transfer from the BoR to contemporary LAS.

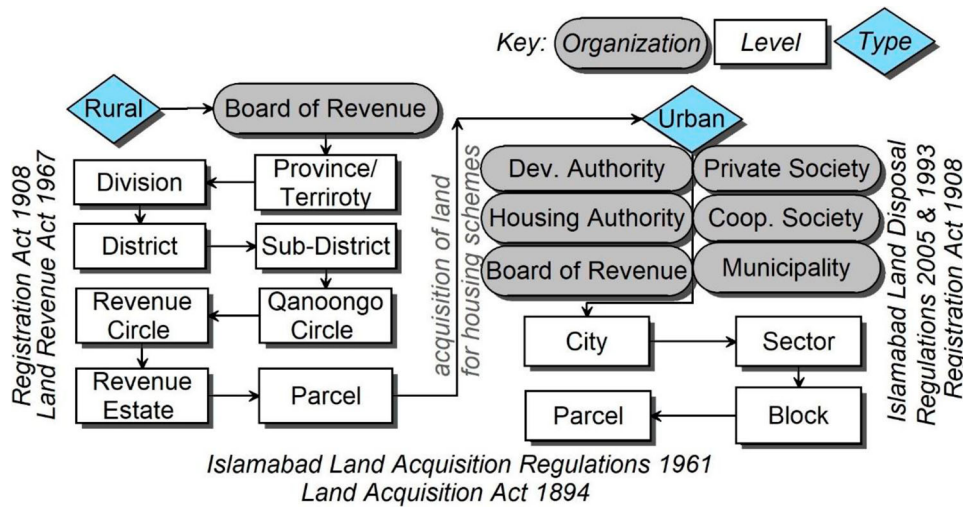
The government, semi-government and private sector are responsible for administering LASs in Islamabad and the rest of the country, as described in Table 4. However, a semi-government organisation remains under government control and is run by an independent Board of Directors. The organisation is established through legislation approved by an Act of Parliament.

3.1. Land tenure

The Registration Act 1908 (Parliament of the Islamic Republic of Pakistan 1908) outlines the property deed

Table 3 LA types and their respective legislations in Islamabad

LA Type	Legislation under BoR's Legacy System	Legislation under CDA's Contemporary System
Land Tenure	Registration Act (Parliament of the Islamic Republic of Pakistan 1908) Land Acquisition Act (Parliament of the Islamic Republic of Pakistan 1894) Transfer of Property Act (Parliament of the Islamic Republic of Pakistan 1882) Land Revenue Act (Parliament of the Islamic Republic of Pakistan 1967), originally introduced as Land Revenue Act 1887 Land Revenue Rules (Board of Revenue 1968)	Land Disposal Regulation (CDA 1993, CDA 2005) and extension in (CDA 2005) Land Acquisition Regulation (CDA 1961) and extension in (CDA 2007) Property Manual (CDA 2006)
Land Value	The Stamp Act (Parliament of the Islamic Republic of Pakistan 1899) Urban Immovable Property Tax Act, 1940 (Repealed)	Urban Immovable Property Tax (UIPT) Act (Parliament of the Islamic Republic of Pakistan 1958) Local Government Act (Parliament of the Islamic Republic of Pakistan 2015) and extension in (Parliament of the Islamic Republic of Pakistan 2021)
Land Use		Islamabad (Zoning) Regulation (CDA 1992) and extension in (CDA 2014) Multi-Unit Buildings (Sub-Division) Regulation (CDA 1999) Residential Sector Zoning (Building Control) Regulations (CDA 2019) Regulation for Planning and Development of Private Housing/Far Housing, Apartment/Commercial schemes in Zone 2, 4 and 5 of Islamabad under Zoning Regulation earlier in 1992 (CDA 2023)
Land Development		Modalities and Procedures under Zoning Regulations (CDA 1992) and extension in (CDA 2020) Real Estate (Regulation and Development) Act (Parliament of the Islamic Republic of Pakistan 2020)



5 Land transfer from British Colonial to the contemporary system for development of housing schemes

Table 4 Types and functions of organisations for LA process in Islamabad.

Who		Function			
Organisation Type	Organisation Name	Land Tenure	Land Use	Land Value	Land Development
Government	Development Authority (DA)	✓	✓	X	✓
	Board of Revenue (BoR)	✓	X	✓	X
	Federal Board of Revenue (FBR)	X	X	✓	X
	Excise and Taxation Department (ET&D)	X	X	✓	X
Semi-Government	Housing Authority (HA)	✓	✓	X	✓
Private	Cooperative House Society (CHS)	✓	✓	X	✓
	Private Housing Society (PHS)	✓	✓	X	✓

registration process in Islamabad and other urban and rural areas of Pakistan. The Act defines registration at (sub) registrar office working under BoR as.

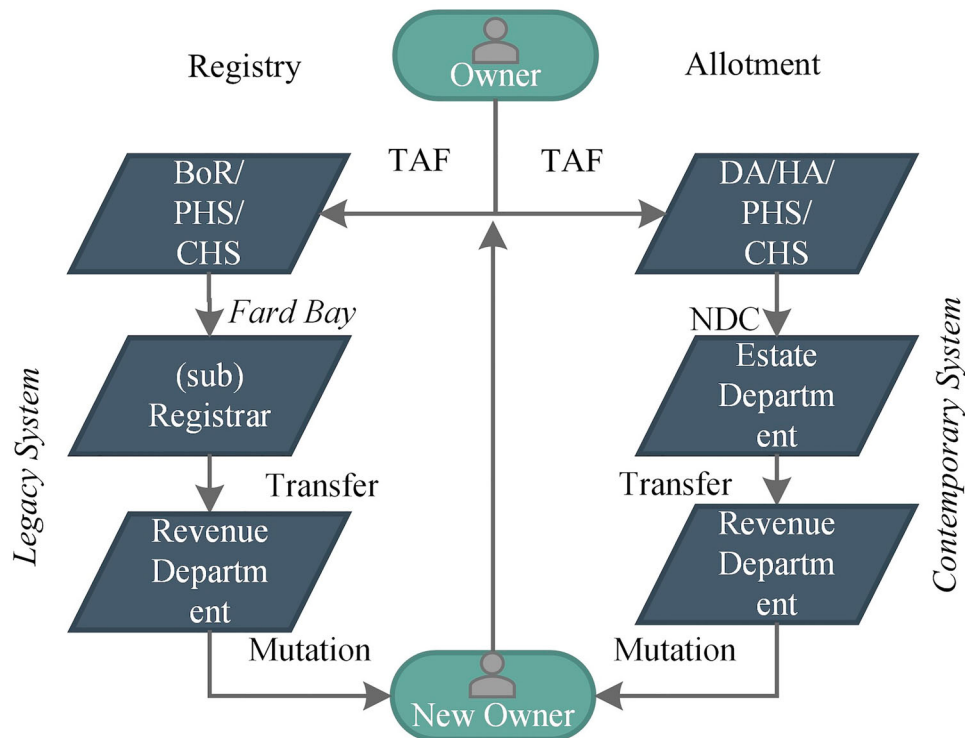
it is mandatory to register all documents which create, assign, or extinguish any right, title, or interest in immovable property worth 100 PKR (0.35 USD) or more

The Property Manual (CDA 2006) outlines the property registration for DA and similar registration is required at HA via distinct legislations. However, PHS and CHS are prohibited from maintaining such records without registration of properties at the (sub) Registrar's office. As per the CDA's Land Disposal Regulations (CDA 2005), allotment is only valid for Zone-1 of Islamabad properties that fall under the jurisdiction of CDA or HAs. Figure 6 provides an overview of property transfer and registration procedures. Legally, PHS and CHS lie in the grey area and are not authorised to conduct land and property transfers themselves within their Estate Department. Both are required to register the transfer deed at (sub) Register's Office. In practice, the PHS and CHS avoid such registration and consequently courts and banks do not recognise the transaction as a legal ownership document. Registration is mandatory for transferred properties through normal sale, mortgage, will, inheritance, grant, lease, court decree and gift of immovable property. Every registered document must be mutated to the respective revenue department to reflect the new ownership. Unfortunately, the PHS and CHS records have not been updated in the BoR or CDA revenue department. Each property transfer type has a different meaning and representation; for example, according to Muslim Personal Law 1962 (Parliament of the Islamic Republic of Pakistan 1962), property

transfer through inheritance is possible among blood relatives and spouses only.

To initiate property transfers at CDA and HAs, individuals must apply through the Transfer Application Form (TAF). From there, the Estate Department verifies the record, which is still maintained in hard copy format. If a property transfer has been previously conducted via a conveyance deed, registration under (sub) Registrar is compulsory even when the property is within CDA's jurisdiction. Before a property can be transferred, the seller must acquire a No Demand Certificate (NDC), which involves nine checks to confirm if the property is free from encumbrances and eligible for sale. While the NDC is valid for one month, the manual record verification process can take several months, causing the validity period of the NDC to expire. According to a survey, 75 percent of 24 property owners/buyers found the property transfer process at CDA (very) challenging and 79 percent were (highly) dissatisfied with the speed of property transfer (Ahsan et al. 2023). In the legacy system, all land and property transactions are conducted through deed registration at the (sub) Registrar's office. The property and land transactions are then mutated in another register known as the Record of Rights (RoR). Besides registration, a separate department in the BoR maintains the RoR register see Figure 6. Although the RoR is not an ownership title register, it is still essential for transferring ownership in urban and rural areas. It is updated every four years and has long been presumed as an ownership title. A *Fard Bay* is required to transfer land rights in rural areas and is based on RoR. This document shows the owner's right to sell the property and is prepared by a revenue official known as a *Patwari*.

BoR conducts physical settlement surveys every 30 years for parcel demarcation using a rectangular (grid)



6 The procedures for the property transfer in Islamabad

survey or *kishtwar* (irregular boundary) survey system. A field book is prepared during the field surveys (conducted with manual chains) to record each parcel measurement. Physical cornerstones or tri-junction pillars are erected on the ground to mark estate boundaries (Ahsan et al. 2017). The mapping and the entire urban LAS are still manual and sketched on paper. The surveying part of the LAS in the country is also manual, without recordation of any coordinate system for boundary marks. The field measurements are carried out manually on the ground to demarcate property boundaries. The measurement of the boundaries is referenced by tri-junction pillars that are physically erected on the ground. These pillars serve as cornerstone markers installed at the confluence of three or more revenue estates.

In accordance with the law, when transferring and registering immovable property, it is mandatory to sketch the location on the registration deed document and provide a description that includes pertinent details such as the direction to the north, street and property numbers, property structure, area name and surrounding properties. Section 22 of the Registration Act permits the utilisation of government-approved maps or surveys as a point of reference for the property's location during the transfer process. However, revenue estate maps (*MussavilLatha*) are sketched on paper and rarely updated (Ali et al. 2013b, Ali and Nasir 2010). In practice, the estate map used by Ahsan, Husain (Ahsan et al. 2017) in 2017 was last updated in 1972 and the one used by Ali (2013) in 2013 was updated in 1955. So, an outdated reference further aggravates disputes and contributes to land tenure insecurity; for example, in the updation of land records, Ashraf, Saeed (Ashraf et al. 2014) used a revenue estate map prepared during the land settlement carried out in 1872. The study found discrepancies in land records and, consequently, land encroachments due to the loopholes. Housing schemes' hard copy layout plans in urban areas are prepared using Computer Aided Drawing software or manual drawing. Irrespective of land tenure, the layout plans serve the planning purpose of the housing schemes. Unfortunately, there is no seamless map to identify the location of land and property in Islamabad or the entire country. The unavailability and manual nature of the data have led to concerns over the security and accuracy of the record for many organisational respondents of the regulatory authority (CDA). 29 out of 44 private housing scheme respondents, including HA's, expressed satisfaction with the current property record-keeping system. Nevertheless, urban LAS stakeholders overwhelmingly prefer computerisation, standardisation and online availability over the existing manual LASs (Ahsan et al. 2023).

Buying and selling land and property in instalments (Property file) is a significant challenge to land tenure security in Pakistan, especially in Islamabad. Housing scheme developers (sponsors) often offer their land for sale in instalments at an early stage of development, even before obtaining the necessary approvals, which poses a risk to the buyers' investment. Unfortunately, in this case, the resulting property file is not registered by the (sub) Registrar's office, nor does it have any designated location on the scheme's layout plan. Sponsors frequently sell these files beyond their actual property value

and are mainly used for investment purposes (Haque and Khurshid 2023, Haque and Hasan 2022). Consequently, unrecorded Property files render legal issues and disputes and can act as a parallel value in the market. In a survey conducted with 67 real estate agents in Islamabad, 66 percent agreed that conflicts and difficulties associated with the property file exist. Out of 55 lawyers surveyed, only 29 percent believed that property files could guarantee safe ownership rights (Ahsan et al. 2023).

The British defined immovable property in the Registration Act 1908 as:

Land, buildings, rights of ways, lights or any other benefit arising out of land and things attached to the earth or permanently fastened to anything which is attached to the earth hereditary allowances, rights to ways, lights, ferries and fisheries, but not standing timber, standing crops or grass, fruit upon and juice in trees, machinery embedded in or attached to the earth.

In 2020, Islamabad Real Estate (Regulation and Development) Act defined immovable property as:

Land, buildings, rights of ways, lights or any other benefit arising out of land and things attached to the earth or permanently fastened to anything attached to the earth, but not standing timber, standing crops or grass.

The global definition of land given by the International Organization for Standardization ISO (2012) is somewhat similar to the ones in Pakistan, as shown below:

The surface of the Earth, the materials beneath, the air above and all things fixed to the soil.

As per the legal criteria for immovable property, it is mandatory for buildings and anything permanently fastened or attached to earth to be registered, along with well-documented Rights, Restrictions and Responsibilities (RRRs). In Pakistan, constructions and utilities lack this comprehensive recordation of their 2D and 3D geometries, RRRs and distinct registers within the existing registration framework, with similar findings in India (Ghawana et al. 2020). For example, a private telecommunication operator lays out its fiberoptic network infrastructure on public land and the government uses private land for high-voltage power transmission lines.

3.2. Land value

In Pakistan, the valuation of property, commonly known as the Deputy Commissioner (DC) rate, is established by the BoR at the provincial level (BoR 2021). However, the FBR issues a separate valuation table for 43 specific cities, such as Islamabad (FBR 2021). Based on its valuation table, the BoR applies Stamp Duty Tax, Capital Value Tax and Town Fee on all land transactions (PLRA 2022). Similarly, the FBR levies Advance Withholding Tax and Capital Gain Tax on each land transaction across the country, utilising its separate valuation table. If a property is sold within four years after its purchase, the Capital Gain Tax may also be imposed. Additionally, the BoR, ET&D at the provincial level and CDA in Islamabad levy Urban Immovable Property Tax annually, based on the property's annual

Table 5 Details of immovable property taxes paid by owner/buyer on each transaction/annually

Payee	Organisation	Type	Rate (2022-23)	Frequency
Owner	E&TD	Urban Immoveable Property Tax (UIPT)	5% annual rental value.	Annual
	CDA			
Buyer	FBR	Capital Gain Tax (<i>optional</i>)	5-15%	Each Property Transfer
	FBR	Advance withholding Tax (Clause 236C)	3%–10.5%	
	BoR	Stamp Duty	3%	
		Town Fee	1%	
		Capital Value Tax	2%	
FBR	Advance Withholding Tax (236 K)	3%–10.5%		

rental value, using a distinct valuation method (ET&D 2022). Table 5 illustrates comprehensive information on all property taxes for immovable property in 2023.

According to Khan (2021), the minimum valuation rate set manually for properties often needs to be revised. Due to the unavailability of location and neighbourhood information in GIS-based digital form, land and property valuation is struggling to establish precise property market value in the country (Aziz et al. 2023). The real estate market in the country faces high demand and limited supply, resulting in exceptionally high property prices, as Wahid, Kowalewski (Wahid et al. 2023) noted. Moreover, a significant disparity exists between property prices determined by the market value and the government. In practice, properties are sold at higher rates, while taxes are paid based on lower government-determined rates through FBR or DC rates (Wani et al. 2020, Haider 2019). To evade taxes, individuals prefer to invest their wealth in real estate (Wahid et al. 2021), circulating unaccounted and black money in the real estate sector. In Islamabad, Ahsan, Hussain (Ahsan et al. 2023) found that most property sales/purchases are profitable for both owners and estate agents. The land and property market in the country is considered a secure investment due to its high profit yield and unregulated nature (CCP 2019, Rasheed et al. 2022).

The Municipal Corporation of Islamabad (MCI) has been granted the authority to collect property tax in urban areas, replacing the CDA. This change has resulted in a need for greater clarity and negotiation over the transfer of power and authority to the MCI, as outlined in the Local Government Act 2015 (Kiyani 2020, DAWN 2021). Due to custodianship issues between CDA and MCI, urban service delivery is suffering from a legal battle.

Pakistan's land and property valuation processes are manual and need modernisation to keep up with rapid urbanisation and unlock full revenue generation potential (Haque 2020). The E&TD finds the process both laborious and time-consuming as the department requires it to conduct door-to-door surveys every five years to levy property taxes. There is a pressing need for a revision and modernisation of these procedures. World Bank (2009) evaluated the UIPT and found its execution inadequate. This led to low revenue collection due to unreliable data and methods. The primary reasons for the shortcomings are the absence of accountability, technology adoption, capacity and reliance on manual records. Nonetheless, some pilot studies utilising modern technologies yielded promising results, with increased tax revenue (Khan 2021, Kelly et al. 2020). The utilisation of property tax for service delivery through local

government is believed to be low (Khan et al. 2022). It is worth noting that local governments receive a relatively small portion of tax revenue for city development projects (Wani et al. 2020). Using 3D data and models has been identified as a critical factor in ensuring efficient property valuation amidst the ongoing trends of rapid urbanisation and vertical development (Kara et al. 2020, Kalogianni et al. 2020, van Oosterom et al. 2020, Ying et al. 2022). However, it is observed that such data and models currently need to be made available in the country, highlighting the pressing need for their integration into the existing LASs.

3.3. Land use

The CDA regulates and directs land use in Islamabad through zoning regulations (CDA 2020). Housing schemes developed by HAs, PHSs and CHSs must follow the regulatory guidelines listed in Table 6. In any housing scheme, 45 percent of the land must be allocated for public amenities. To develop a housing scheme, a registered architect or firm is required to prepare a large-scale layout plan in compliance with the land use guidelines set forth by the authority.

Due to the absence of baseline geospatial data, many Pakistani cities lack spatial plans for sustainable urban development and rational land allocation (Hussain et al. 2020a). Among other factors, the rapid urbanisation of Islamabad has led to a concerning increase in deforestation rates and unauthorised housing schemes. The lack of proper regulations and development practices has contributed to the unsustainable growth of the city, resulting in adverse environmental impacts (Shah et al. 2021). The rural population ratio has dramatically increased in Zone-4 (see Figure 4), which

Table 6 Land use planning guidelines for private housing schemes in Islamabad CDA (2023).

Land Use	Zone 2 & 5	Zone 4
Residential	Not more than 50% Apartment/Vertical Development not more than 15%	Not more than 50% Housing/Farm housing not more than 40% Apartment/Vertical Development not more than 15%
Open/Green Space/Park	Not less than 10%	Not less than 10%
Roads/Streets	Not less than 23%	Not less than 23%
Graveyards	Not less than 2%	Not less than 2%
Commercial Public buildings	Not more than 8% Not less than 7%	Not more than 5% Not less than 5%

has seen most of the development from 1998-2017. The original city plan did not anticipate such rapid growth in this area. Later, in 2010, the CDA recognised the worsening situation and allowed the private sector to develop housing schemes (CDA 2014). The zone was then divided into four sub-zones to manage the existing urban sprawl (CDA 2014, CDA 2020). However, significant violations of land use in the capital city have resulted in the demolition of around 40,000 illegal establishments of buildings and the recovery of 405 hectares of land in Islamabad alone during 2,500 operations against illegal constructions and encroachments in 2019-2020 (Staff Reporter 2021).

Hussnain, Waheed (Hussnain et al. 2020b) concluded that out of 624 designated urban areas (cities), 83 percent of the urban areas are growing without any spatial plan. Pakistan has the highest rate of urban population (56 percent) living in the slums compared to India, Bangladesh and Nepal (World Bank 2020). Among other things, rapid urbanisation without proper planning has also led to the increase of slums and informal settlements in Islamabad (Ahmad 2020). As a regulatory body, the CDA prepares guidelines for the private sector to maintain balanced land use allocation within the housing schemes and to provide civic amenities. The major land use classes in a housing scheme are given in Table 6.

In Islamabad, there are currently 250 housing schemes (CDA 2023), but only 53 have approved layout plans. Of those 53, only 28 have been given a No Objection Certificate (NOC), meaning they have completed all necessary procedures to start development work and offer their scheme properties for sale (CDA 2023); it only accounts for 6.8 percent of the total Islamabad area (Haque and Khurshid 2023). Properties within the NOC-approved schemes are only considered legitimate for sale and purchase. According to a report by AGPR (2017), approximately two-thirds of Islamabad's illegal or unapproved housing schemes have emerged due to criminal negligence, inadequate enforcement and noncompliance with land use and master plan regulations.

Approximately 23 years ago, the development of Ghauri Town's housing scheme in Zone-4 commenced (Zameen 2020) without proper authorisation and NOC. Despite neglecting land use guidelines, the town kept growing to its eight extensions. The town's development has resulted in significant damage to the environment (Abbasi 2021), specifically the Korang River and the Gumrah Kas nullah, which are environmentally sensitive areas. In fact, the 1992 Zoning Regulations specifically cautioned against construction in these areas. Banks do not recognise properties in the town for loans or mortgages due to their illegal status. Additionally, residents cannot obtain legal ownership or mutation records from the revenue department or authorisation for utility connections (Staff Reporter 2021). Comparing images from Google Earth of 2005 and 2023 (Figure 7) shows a rapid urban expansion in Ghauri Town and its surroundings.

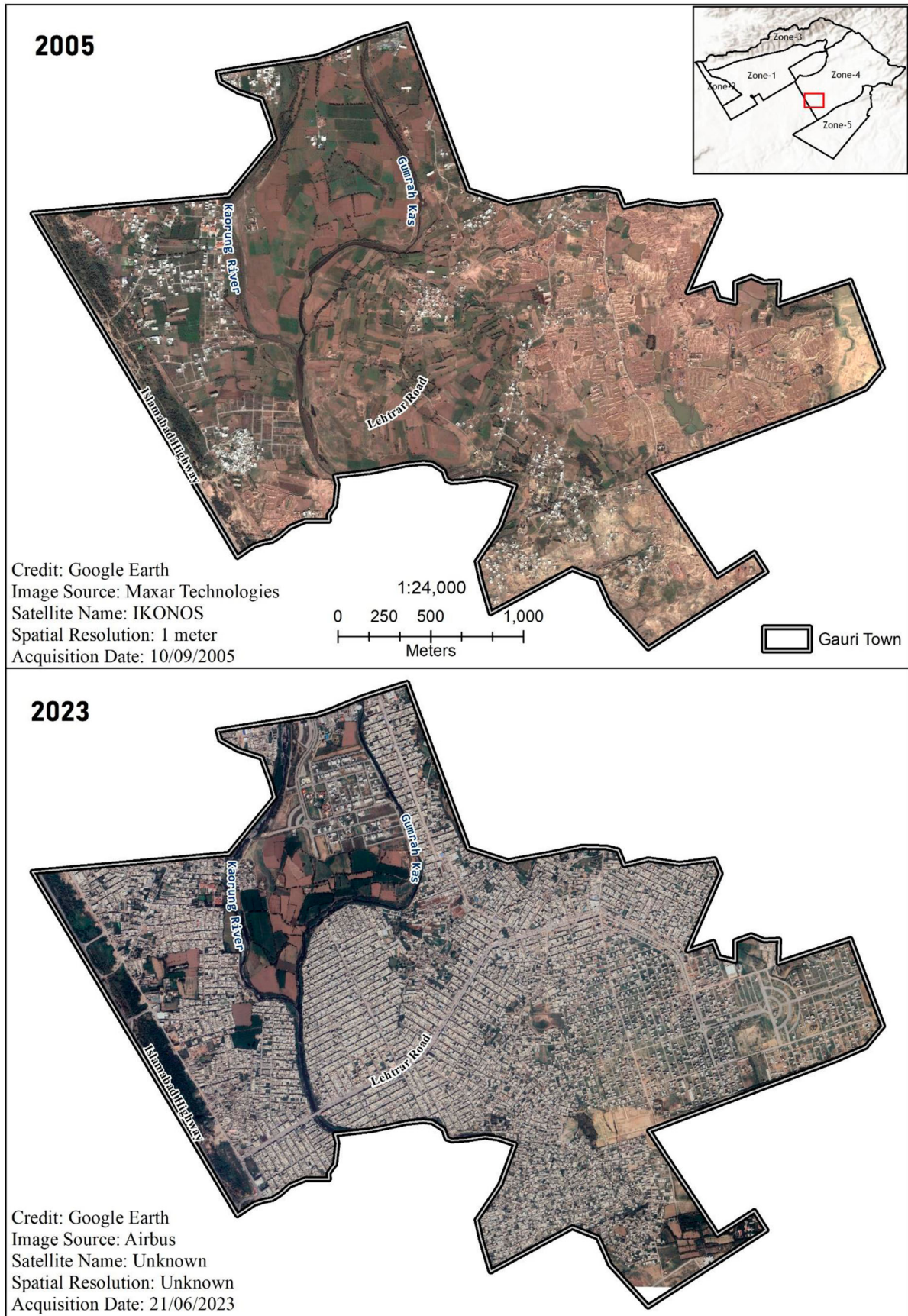
3.4. Land development

Several organisations, including CDA, HAs, PHSs and CHSs, are developing housing, commercial and apartment schemes in Islamabad. A minimum of 400 Kanals

(50 Acres) of land is required to start a housing scheme, while the minimum limit for affordable housing and apartment schemes is 20 Kanals. After obtaining the necessary approval from CDA, the scheme sponsor carries out physical development at the site. CDA evaluates and approves proposed scheme plans, including layout, land use, engineering, and environmental designs, in accordance with regulations. The authority is responsible for ensuring on-the-ground project execution and completion as planned. The scheme's sponsor is responsible for providing civic services and basic infrastructure. To begin development, a private housing scheme must surrender 20 percent of the scheme land to the CDA or deposit the total development cost as security (CDA 2020). As development work progresses, 10 percent of the surrendered land or deposited amount is returned to the sponsor and so on with each 10 percent development. The security deposit ensures compliance with the approved layout plan and the provision of promised infrastructure and civic amenities. The sponsor must provide an underground utility and road network within the scheme and transfer ownership of parks, graveyards, roads and open spaces of the schemes free of cost to CDA through the (sub) Registrar at BoR. The possession of sold plots in a housing scheme can only be handed over to the buyer after completing all the development work.

According to Table 7, the CDA has proposed a timeline for developing the housing scheme. However, the Sector E-12 housing scheme, which the CDA itself sponsors, is still on hold after 33 years since its inception due to the dispute between local villagers and the CDA over land possession. This has resulted in lengthy litigations and manual LAS to resolve the issues, causing chronic delays. As a result, more than 4,000 allottees are still waiting to take possession of their properties and build their homes (Abbasi 2022).

Urban development, if not planned and appropriately regulated, can lead to severe consequences. Currently, 38 percent of the urban population in Islamabad lives in slums. If nothing is done to address the issue, the number of people living in slums in Islamabad could increase significantly over the next decade. Poverty, population growth and other challenges exacerbate the situation (UNICEF 2020). The number of slums in Islamabad has increased from 12 to 63 in the past 20 years (Hasan et al. 2021). Pakistan is also experiencing a severe housing shortage (Hussain et al. 2022). In Islamabad, there is a backlog of 0.1 million houses, while in Punjab province, the backlog is over 2.5 million. The current annual housing demand for developing 25,000 housing units in Islamabad is being met with a maximum of 3,000 units yearly (World Bank 2022, CDA 2020). The housing supply and demand gap in Islamabad continues to persist as the CDA has not developed any new sectors in Zone-1 for the past two decades. As a result, the private sector is building housing schemes, which are unaffordable due to the exceptionally high prices and illegal development (Akhtar and Rashid 2021). The government of Pakistan had initiated a low-cost housing programme called *Mera Pakistan Mera Ghra* (My Pakistan My Home), intending to build 5 million housing units. However, due to the current financial crisis, the programme's development pace has stopped (Hussain 2022).



7 Situation of development in Ghauri Town in 2005 and 2023 (Google Earth downloaded images, further processed in GIS Software)

Table 7 CDA proposed infrastructure development timeline of housing and apartment schemes

Sr. No	Type	Scheme Area	Completion tenure
1	Apartment	20 Kanal	3 Years
2	Apartment	101–150 Kanal	4 Years
3	Apartment	151–200 Kanal	5 Year
4	Housing Scheme	Up to 800 Kanal	3 Years
5	Housing Scheme	801–1600 Kanal	4 Years
6	Housing Scheme	1601–3200 Kanal	5 Years
7	Housing Scheme	More than 3200 Kanal	6 Years

4. Requirement analysis

At CDA, property owners must comply with a comprehensive and repetitive list of twenty-four forms and applications for various property-related transactions, such as establishing ownership, acquisition, transfer, mutation, mortgage, etc., by the Estate Department. Similar records are maintained by HAs, CHSs and PHSs within their organisations. Additionally, the BoR maintains over two dozen registers to assess revenue collection, deed registration, mutation, agriculture, soil and water-related information (Ali 2013). The LASs records do not have any integration and interoperability. A detailed list of attributes maintained by the CDA and BoR is given in Table 8.

4.1. LADM requirements

Lemmen, Van Oosterom (Lemmen *et al.* 2015) and ISO (2012) have discussed the details of packages, their classes and attributes required for the development of country profiles based on Edition I. The LADM Edition I integrates and standardises LASs information in three main packages (Party, Administrative and Spatial Unit) and an additional External package to further record valuation, land use etc related information. The LASs details given in Section 3 and Table 8 against the LADM requirements are summarised in Table 9.

A correspondence of LADM Edition I packages and LASs records in Islamabad is given in Figure 8.

Kara, Lemmen (Kara *et al.* 2024) have provided insight into the classes and attributes necessary for the development of country profiles based on LADM Edition II. Edition II reorganises and refines information from Edition I into two parts: Part 1, the Conceptual Model and Part 2, Land Registration. Most of the information from Edition I's External package is now managed in Part 4, Valuation Information and Part 5, Spatial Plan Information. Furthermore, Figure 9 establishes a correspondence between LADM Edition II and land records in Islamabad.

The basic attributes necessary for developing an integrated and standardised LAS country profile for Islamabad, Pakistan, using LADM are readily available. However, careful attention is needed when upgrading the land and property attribute information in general and location information in existing LASs into the

Spatial Unit package and the Survey and Representation sub-package in particular.

5. Discussion

5.1. Who is responsible for LA processes and data?

Managing the BoR legacy and contemporary LASs in Islamabad, Pakistan, involves multiple organisations, including government, semi-government and private sector at various administrative levels. Each LAS organisation maintains land records and there is a lack of interoperability and integration for data sharing. LA processes and data maintenance is done through manual forms and registers, leading to duplication and redundancy. The Board of Revenue (BoR) manages land registration both in rural and urban areas of the country, while development and housing authorities oversee urban areas lying under their jurisdictions. In Pakistan, there needs to be a more centralised and integrated system for land tenure, value, use and development at the provincial or territorial level. Due to outdated administration and manual data processing, the LASs face severe setbacks in land tenure security, revenue collection and regulating urban land use planning and development. In order to ensure sustainable growth for society and the protection of the environment, it is crucial to address the challenges posed by slow LA processes, the involvement of multiple disintegrated stakeholders and the manual handling of land records.

5.2. How do legacy and contemporary LASs technical, operations and legislation work together?

The legal frameworks in Islamabad, as well as the rest of the country, heavily rely on laws that the British introduced over a century ago. Despite rapid urbanisation and changing relationships between people and land, many regulations remain in use today without any significant amendments. While Islamabad has introduced more recent legislation, the interaction of legacy and contemporary framework has led to chronic delays in land acquisition for housing scheme development, with some property rights holders waiting for decades to build houses. The Supreme Court has even intervened in the matter and instructed to reform some of the land use regulations in Islamabad. There is a certain degree of overlapping in the LASs where a property registration at CDA (along with its registration of Allotment) and a deed registration under BoR are also required. PHS and CHS land and property ownership records do not correspond in BoR or CDA. The stakeholders of LASs are experiencing dissatisfaction with the technical and operational aspects of the systems. The manual and disintegrated nature of LASs does not support catering to the city's significant population of more than two million. Furthermore, the absence of an integrated and specialised property registration and survey system aggravates issues such as prolonged legal disputes, sluggish approval of housing schemes and inadequate monitoring of unregulated urban development. Policy guidelines have long recommended the adoption of technology-enabled systems

Table 8 Details of attributes maintained by various LAS organisations

LA Function	Organisation (Legislation)	Department	Register Name	Attributes	Comments	
Land Tenure	DA/HA (Land Disposal Regulation)	Estate Management Directorate	Allotment File (Property Information Report)	<ul style="list-style-type: none"> • Allotment ID • Transfer Date • Division • District • Sub-District • Zone • Block/Sector • Locality • Property Address • Buyer/Seller Name 	<ul style="list-style-type: none"> • Buyer/Seller Father Name • Buyer/Seller National ID • National Tax No • Property Size • Property Value • Property Site plan • Signature • Photograph • Thumb Impression 	Textual on paper. Property location corresponds to the scheme layout plan prepared by an architect for planning purposes.
Land Tenure	DA/HA (Land Acquisition Regulation)	Land Directorate	Record of Rights	<ul style="list-style-type: none"> • Village • Estate • Sub-District • District • Division • Year • Property Ownership ID • Parcel ID • Owner Name 	<ul style="list-style-type: none"> • Father Name • Tenant Name • Total Area • Crop Area • No. of Trees • Building Value • Total Property Value • Payment status 	Land acquisition by the government for a public purpose
Land Tenure	BoR (Registration Act)	Registration Department	Record of Deed or Deed Registration (Registry)	<ul style="list-style-type: none"> • Stamp Number • Stamp Value • Date • Buyer & Seller Name • Buyer & Seller Father Name • Buyer & Seller Caste • Buyer & Seller National ID 	<ul style="list-style-type: none"> • Property Value • Property Size • Property Site plan • 2 Witnesses • Deed writer • General Power of Attorney • Thumb Impression • Signature • (Sub) Registrar Stamp • Copy of Record of Right 	Textual on (stamp) paper for urban and rural areas
Land Tenure	BoR (Land Revenue Act)	Revenue Department	Record of Rights (RoR)	<ul style="list-style-type: none"> • Village • Estate • sub-District • District • Division • Year • Property Ownership ID • Parcel ID • Owner Name • Father Name • Tenant Name 	<ul style="list-style-type: none"> • Tenant ID • Status (Mortgagee/Owner) • Share in Joint Ownership • Area in Joint Ownership • Soil Class • Source of Irrigation • Payment Tax 	Textual on paper for rural area

(Continued)

Table 8 Continued.

LA Function	Organisation (Legislation)	Department	Register Name	Attributes		Comments
Land Tenure	BoR (Land Revenue Act)	Revenue Department	Field Book Estate Map	<ul style="list-style-type: none"> Parcel ID Tenant ID North Side Length South Side Length 	<ul style="list-style-type: none"> East Side Length West Side Length Length Width Area Land Type Status 	Land Parcel measurements are recorded in a register and shown on a drawn estate map.
Land Value	DA (Urban Immovable Property Tax Act) FBR (Withholding Tax)	Revenue Directorate	Property Tax Record (UIPT, AWT, CVT, CGT, Stamp Duty, Town Fee)	<ul style="list-style-type: none"> Owner Name Date City Zone Locality Property Address Property Type Location Rating Area 	<ul style="list-style-type: none"> Category Property Total Area Covered Area Construction Year No. of Stories No of Rooms Total Tax Arrears Tax Year 	Textual on paper for urban area
Land Value	BoR (Land Revenue Act) ET&D (Urban Immovable Property Tax Act)	Revenue Department	RoR, UIPT, AWT, CVT, CGT, Stamp Duty, Town Fee	<ul style="list-style-type: none"> Village Estate Sub-District District Division Year Property Ownership ID Property Tenant ship ID Owner Name Father Name 	<ul style="list-style-type: none"> Owner Caste Ownership Type Share of Joint Ownership Property Size Agriculture Passbook No Parcel ID Land Use Irrigation source Tax amount 	Textual on paper for rural areas
Land Use	DA	Planning Wing	(Bylaws, Zoning Regulations)	<ul style="list-style-type: none"> Large-scale layout plan of housing scheme showing land use and parcel/plot. Land ownership of proposed housing scheme. Table 3 lists the regulations and guidelines related to the land use and land development housing schemes. 		Manual procedures for approvals, verification, monitoring and evaluation of the schemes
Land Development	DA	Engineering Wing	(Bylaws, Modalities and Procedures)			

for property registration and land tenure (Haque 2020, Hasan et al. 2022a, Kardar 2007).

5.3. Can existing LASs be standardised into a domain model?

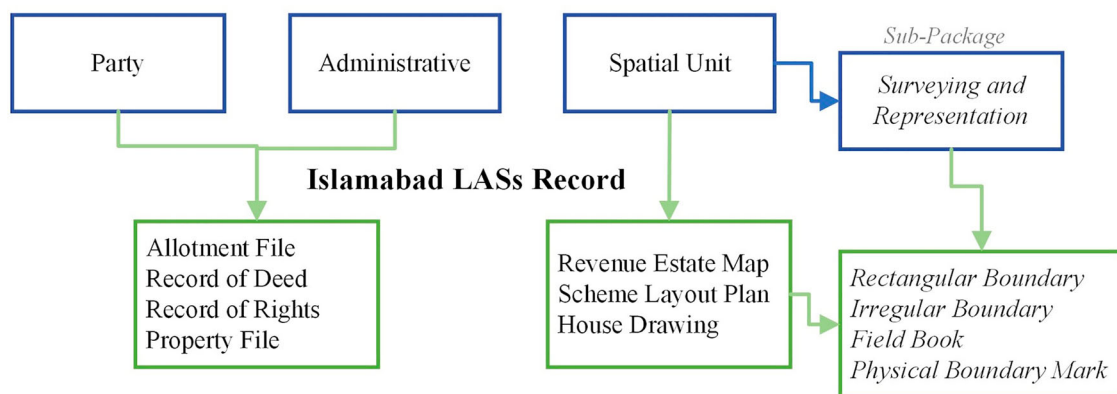
The management of land records in Islamabad, Pakistan, is done by development and housing authorities, as well as BoR and private/cooperative housing societies. These records are kept in the form of allotment files, deed registrations, records of rights and property files. However, there is a critical need for integration and standardisation of the various land records available with different organisations. The mapping part also varies in terms of legacy and contemporary LASs

and is represented through revenue estate sketch maps and layout plans. However, they do not serve the purpose of accurate location identification on the ground, where the former is designed for fiscal and the latter for planning purposes. To address these issues, the LADM allows any country to revamp their LASs into a standardised form. LADM organises LAS into three major categories, including who is involved in land and property (party), how land and property is administered and managed (B.A. Unit and RRRs), and where land and property is located (Spatial Unit and Surveying and Representation). Along with the detailed information provided in LADM Edition I for land tenure, the ongoing development on LADM Edition II extends the standardisation support to land valuation, use, and

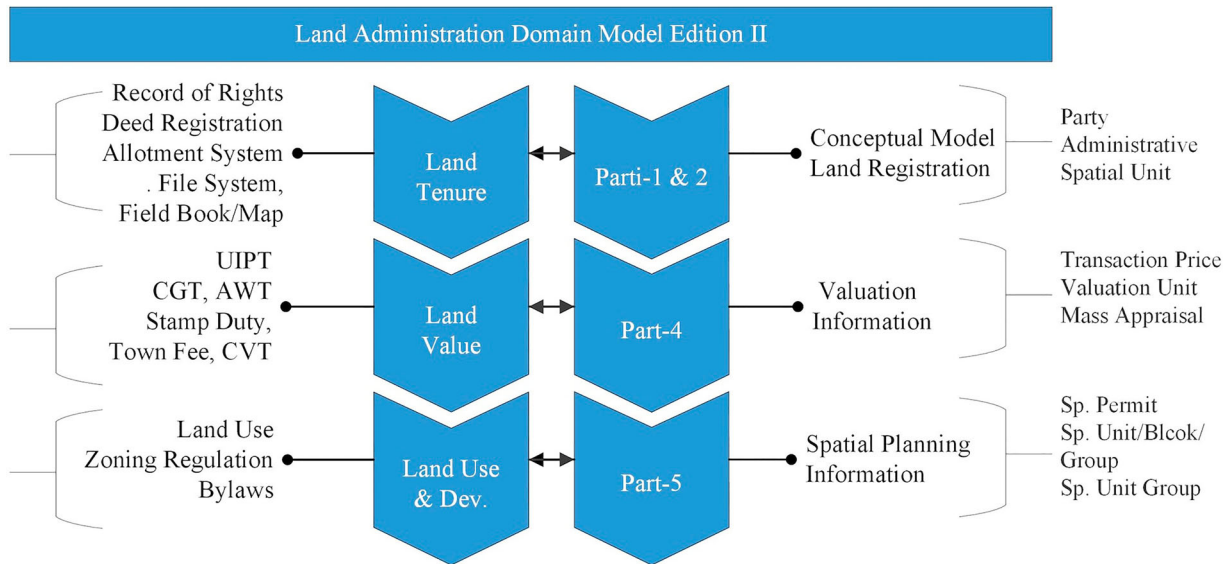
Table 9 LADM requirements Lemmen et al. (2015) and their corresponding LASs record in Islamabad, Pakistan

No	LADM Requirement	Existing LASs record
1	A continuum of land right	The people and their relationship to land and property are recorded through documents such as records of rights, records of deeds, allotment files, and property files. Meanwhile, their respective locations are documented in the form of revenue estate sketch maps, society layout plans, and house drawings.
2	A continuum of land use right claimants (subjects or parties)	The individual ownership of people in Islamabad, including natural persons, women, group of persons, companies, government, etc, are recorded along with the specifics of their individual share in land or property (UN-HABITAT 2012)
3	A continuum of spatial units (objects)	The identification of land and property in the form of textual descriptions and sketch maps in Islamabad can be recorded in the LADM. Additionally, the standard facilitates further advancement by permitting upgrades to 2D and 3D formats.
4	A basic administrative units (or Basic Property Unit)	The spatial units in Islamabad are grouped into different land use categories to form a basic administrative unit.
5	A range of data acquisition methods	Physical surveys are conducted to demarcate the land and property boundaries and to erect boundary pillars. Existing LASs can be further refined by introducing aerial, satellite, and drone images, total stations, Global Positioning System (GPS) devices, etc.
6	A range of authentic source documents	Each land and property transaction is recorded by the respective LAS organisation. However, some transactions under PHS/CHS face specific legal challenges regarding their validity.
7	Transparency	The property registration documents (deed, file, and registry) in Islamabad contain traceable records detailing individuals involved in the execution process, including the witnesses, conveyors, registrar, buyers, and sellers. However, ensuring transparency remains a challenge due to loopholes in the LASs.
8	History	Being a deed-based system, a history is maintained by LASs organisations
9	Different organisations	Various organisations manage the LASs data, yet it often lacks integration and interoperability for sharing among them. For instance, BoR and FBR have different boundaries for land and property valuation and taxation purposes.
10	Keep data to the source (within SDI)	Existing data within the LASs lacks a centralised or distributed repository, leading to redundancy. Efforts are currently underway to address the issue by introducing Spatial Data Infrastructure in Paunjab (World Bank 2022)
11	Existing standards	Islamabad’s LASs lack standards. However, ISO TC-211 standards are recommended.
12	Reference system	Islamabad’s LASs currently operate without a reference system. Instead, they utilise revenue boundary marks that are physically present on the ground. However, these boundary marks necessitate resurveying based on a reference coordinate system.
13	Identifiers	The unique parcel or spatial unit under BoR and contemporary LASs lacks systematic identification. Challenges arise due to the fiscal-based system (Khewat ID) and joint ownership of properties resulting from Muslim inheritance practices, particularly in rural areas and suburbs, which complicate the establishment of a unique spatial unit.
14	Quality	Land and property-related litigations often extend over prolonged periods and inflict suffering on multiple generations, largely due to the inaccessibility, ambiguity, and complexity of land records. Further efforts are imperative to ensure the quality and consistency of various land records, particularly regarding their location, legal status, and integrated administration.

LADM Edition I



8 LADM Edition I packages and their corresponding LASs record in Islamabad



9 LADM Edition II parts/packages and their corresponding LASs record in Islamabad

development as well. The Valuation Information and Spatial Plan Information of Edition II will extend support for better urban planning and revenue generation in Islamabad. Most of the required information to upgrade Islamabad’s LASs into a LADM standard domain model is available. However, considerable efforts are required to transact existing LASs into the LADM. For example, the accurate demarcation of properties on satellite or drone imagery (currently in the form of sketches and drawings) and representation of above and below-ground urban infrastructure in 3D volumetric form require a systematic transaction.

5.4. What are the gaps and requirements for upgrading the existing LASs situation? Particularly land tenure and valuation?

There is a gap in the land record’s updation. Officially, a land transaction through deed registration is mutated in the revenue record every four years and in the revenue maps every thirty years. However, in practice, it is more than that. The current state of land tenure is fragmented and outdated. The conventional surveying technique, based on physical boundary marks and chain measurements, has no record of any coordinate system. The representation of land tenure is on sketches, drawings and physical boundary marks, making it difficult to verify the location of land and properties on the ground. Tracking land ownership and resolving disputes is difficult due to the need for an integrated and updated land registration system. Manual processing of records and valuation field surveys consume most revenue collection, leaving less for actual city development initiatives. The LASs are currently facing a state of deterioration, which is a matter of significant concern. It is imperative to address LASs current state of disrepair and ensure that they are restored to their optimal functioning capacity. Failure to do so could have far-reaching implications for the city’s overall development and sustainability. The rampant pace of city development can be attributed to time-consuming procedures

involved in acquiring land, slow judicial proceedings, land encroachment, lack of capacity, inefficient policies and the manual nature of data and record-keeping. To upgrade LASs, Pakistan requires an accurate, up-to-date, comprehensive, accessible and transparent system supported by modern technologies and data management systems. Overall, upgrading the LASs and conversion of legacy data in the country is a complex and multifaceted long-term process that requires careful planning, collaboration and investment to secure the rights of all stakeholders. The open-source GIS data can be beneficial; for example, the Google buildings dataset can aid in identifying LA-related discrepancies, such as analysing the potential for yearly property tax collection, identifying non-compliances in land use and enhancing spatial planning.

High frequency and prolonged litigations, as well as low revenue collection, are negatively impacting both land tenure and valuation aspects of LASs. Considerable efforts are necessary to upgrade existing LASs, including the following, as suggested by (Ahsan et al. 2017, Ahsan et al. 2023, World Bank 2022);

- Organisations capacity enhancement using modern geospatial and surveying technologies
- Develop a spatial framework for integrated land records
- Conduct new settlement surveys in suburbs
- Revamp the existing revenue-based model to conclusive land and property title
- Implement a unified system of urban land and property registration
- Upgrade conventional surveying and mapping techniques
- Standardise urban LASs, including cadastral maps using LADM Edition I and II
- Systematically elevate existing textual land records into geospatial 2D and 3D LAS
- Revise and effectively enforce laws and policies

To upgrade the legacy and contemporary LASs to an advanced level, innovative surveying, mapping, and record-keeping techniques in urban areas must be

introduced. The Land Records Management Information System (LRMIS) should be expanded to encompass urban areas in Islamabad and integrate comprehensive geospatial capabilities to create a unified system.

6. Conclusion and recommendations

The existing LASs in Islamabad have the potential to be upgraded into a unified system (with an underlying integrated and standardised LADM framework) for land registration and mapping. Implementing a conclusive, digital and geospatially enabled LAS is crucial to rationalising land allocation for housing and preventing environmental degradation and agriculture loss. To achieve this, fundamental reforms are needed based on recognising the interaction between legacy BoR and contemporary LASs. The anticipated system is to be more realistic, unified, regulated and competitive in the market. The computerisation of land records to integrate land tenure, valuation, use and development aspects to enhance the overall functionality of the LAS. Adopting LADM to enhance overall efficiency and communication among various LAS stakeholders. It is imperative to establish a register for urban properties and utilities, encompassing both above and below-ground infrastructure, in a geospatially enabled 2D/3D digital format. Furthermore, enforcing Islamabad's land use and zoning regulations is crucial for sustainable urban development. To create an integrated and standardised LAS in Islamabad, the Board of Revenue and the Capital Development Authority must modify their long-established procedures and processes to adopt the LADM, which is expected to be less challenging in Islamabad and could serve as a positive example for similar reforms in other parts of Pakistan. Both organisations should take the necessary steps to upgrade the existing manual LASs into an integrated and standardised system. To ensure transparency and clarity, existing RRRs must provide explicit descriptions of urban infrastructure development both above and below ground in 2D and 3D form. Establishing a specialised registration and survey authority is crucial in providing dedicated attention to accurate land survey and mapping. Revenue and development organisations should retain effective control over land valuation, use and development to ensure efficient management.

It is recommended that a unified LAS (distributed at various administrative and organisational levels) based on LADM edition I & II be developed to support socio-economic development and implement modern technologies. Coordinated efforts are necessary to ensure sustainable urban growth and address the alarming trend of land use violations and illegal housing scheme development.







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