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Urban land management in Vietnam: Lessons from experience and technology application orientation

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ABSTRACT

Vietnam is currently going through a vigorous process of urbanization, as well as digital transformation and modern technology application. Urban land management in Vietnam is still confronted with numerous challenges and limitations. Building digital land databases, applying GIS, AI and IoT technology in monitoring and governingland resources, and developing integrated management platforms are becoming the major trends in many countries. This article aims to summarize some lessons from experience in managing urban land in Vietnam, consequently proposing some suitable technology applications in order to enhance efficiency, transparency and management capacity in the land sector.

1. Introduction

In the context of rapidly accelerating urbanization in Vietnam, urban land management has played a key role in maintaining sustainable development, stabilizing the harmony between economic development and environmental protection, as well as improving residents' life quality. Land is not just a scarce resource but also the foundation for every activity related to urban planning, construction and infrastructure investment. Therefore, the requirement is to enhance land management ability in a modern, transparent and effective way.

However, reality shows that urban land management in Vietnam still faces numerous challenges like fragmented and outdated data, inconsistent information systems, limited information access and sharing among management agencies, and a low level of technology application in management compared to practical demands. These issues have directly placed an impact on urban planning, construction permitting, land use management and the resolution of citizen's complaints.

Meanwhile, digital transformation and updated technological application are opening up new opportunities to improve the quality of land management. Building digital land databases, adopting GIS, AI, and IoT technology in supervising and managing land resources, as well as developing integrated management platforms, are becoming the major trend in many countries.

This article aims to summarize some of the key lessons learned in urban land management in Vietnam, consequently proposing some suitable technological application orientations in order to boost efficiency, transparency and administrative capacity in land management. Analyses within this paper can serve as a reference point for managers, policymakers and local authorities during the process of digital land transformation specifically, and urban management as a whole.

The main research methodology of this editorial involves analysis, evaluation and synthesis. Drawing upon previous studies and government's summary reports, the author investigates and assesses the prominent achievements in urban land management in some Vietnamese localities. This forms the basis for summarizing and extracting valuable lessons from experience. Besides, the author uses a comparative method to evaluate existing shortcomings and challenges, making way for the possibility and effectiveness of proposing technological solutions for land management.

2. Lessons from urban land management in Vietnam

2.1. Prominent achievements

In recent time, many Vietnamese cities have proactively applied technology into land management, bringing about practical effectiveness.

Quang Ninh – Land management model integrated with urban digital transformation

Among the leading localities in urban digital transformation, Ha Long city (Quang Ninh province) stands out for adopting 3D GIS technology in planning and technical infrastructure management. Since 2012, Ha Long has been working with the Center for Architectural Consulting and Construction Investment (under the Institute of Architecture, Urban and Rural Planning – Ministry of Construction) to implement a 3D GIS system, supporting the creation, monitoring and adjustment of urban plans. This system allows for the integration of three-dimensional spatial data with attribute data for buildings, land parcels and technical infrastructure, helping to visualize the urban landscape, simulate development scenarios as well as evaluate the impact of planning on urban space and its inhabitants.

One of the significant highlights is that Ha Long city was chosen as a research site for GIS technology application to assess its implementation of land use plan up to 2020. According to the results published in the Journal of Science of Resources and Environment,

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thanks to GIS application, the adherence rate of land use plan reached 80,15 %, demonstrating the effectiveness of GIS in monitoring and adjusting land use planning in reality. The use of GIS does not only help to transparently present information but also facilitates inspection, auditing and decision-making in land management.

In addition, Quang Ninh has integrated data related to land, planning, construction permitting and urban governance onto a unified platform, which is operated by the Intelligent Operation Center (IOC) of the province. This system does not only help management agencies to access and process data in real time, but also allows residents to look up planning information through the user-friendly mobile application called "Ha Long Smart City". [1]

A unique aspect of Quang Ninh's approach is the strong political determination from its authority, shown through the release of numerous specialized resolutions on digital transformation, which specifically highlight the role of land data and Geographic Information Systems (GIS) in urban management. Concurrently, the province has also prioritized training local officials in IT, GIS and the use of management software, ensuring that the system is not only implemented but is also utilized and maintained.

The key lesson learned from Quang Ninh is that success in digitizing land management does not come from investing in isolated pieces of equipment, but from an integrated, synchronizing and cross-sectoral vision, along with the long-term commitment of the provincial authority and the proactive utilization of data to serve the residents. Quang Ninh's model can be regarded as the suitable blueprint for replication in other localities that are currently transitioning towards digital urban management.

Hai Phong – Step-by-step building geographic databases for land management and modern urban development

The city has applied GIS technology to digitize cadastral maps as well as to support the inspection and monitoring of land use in industrial parks and new urban areas. Besides, this city has also executed an online system for issuing land use rights certificates, reducing processing time. The key operations that have applied the technology include:

- Establishing an interconnected urban database on a GIS foundation: Hai Phong city has implemented the building of an interconnected urban database on a GIS foundation, serving digital transformation initiatives in the construction sector. This system helps integrate data from multiple fields such as land, planning, environment, traffic, making way for better management and decision-making in urban development.

- Developing a smart city based on a GIS foundation: Hai Phong is planning its smart city development with a prioritized roadmap to avoid scattered, disconnected efforts to suit every unit's specific conditions. The application of GIS has been considered as a crucial solution to effectively manage and implement urban planning, while also serving the needs of both residents and businesses.

- Applying GIS in water resource management: The city has also researched and applied GIS technology to develop a system for managing and monitoring freshwater resources. This system allows for the creation of a unified geographic database of freshwater resources, visually presenting the location and operational process of waste sources, assisting the managers in grasping the water pollution situation and making timely decisions to protect the freshwater sources. [2], [3], [4]

These efforts show that Hai Phong is actively applying GIS technology in land management and urban development, improving management efficiency and better serving the public.

Da Nang – A pioneering city in building an integrated land management platform

Da Nang is one of the localities that pioneer building a land management platform that is integrated, synchronized and serves as a foundation for a smart city. This city has developed Da Nang Planning and Architecture Information Portal (https://quyhoach.danang.gov.vn) – an online website allowing residents, businesses and authorities to access planning information by land lot, parcel or specific address.

Beside integrating detailed, zonal and general planning information, the system also connects with data on construction permits, architecture and current land status. The map layers are digitized and visually presented in a 2D format, effectively supporting the task of monitoring, planning and permitting.

Significantly, Da Nang also builds a shared land database connected with the Department of Natural Resources and Environment, the Department of Construction, the Department of Planning and Architecture and the people's committees of districts. As a result, the managing agencies can process procedures faster, avoid data clashes and minimize the time spent on resolving land-related complaints and denunciations. This is an outstanding model of "multi-sector integrated data" at the urban level. [3], [4], [5]

The lesson from Da Nang demonstrates that the integration within data system, combined with a user-friendly interface for the public, is the key to achieving meaningful digital transformation, helping the city control planning, limit construction violations and enhance citizens' satisfaction.

Binh Duong – Linking land management with a smart city model

Being a locality with rapid industrialization and urbanization, Binh Duong has proactively built a smart city model, where land management plays a crucial role as a data infrastructure. The province has executed GIS application in the field of construction and urban planning, integrating land data with technical infrastructure, administrative boundaries and planning maps.

Data related to land, planning, construction permitting is connected with the Intelligent Operation Center (IOC), facilitating real-time management. Additionally, Binh Duong also uses GIS data for spatial analysis, selecting investment locations and developing synchronized technical infrastructure, thereby reducing land resource waste and preventing overlapping plans.

A notable point is that Binh Duong has established close cooperation with technological companies (such as VNPT, Becamex) to implement solutions under a PPP model, utilizing private sector resources and international experience. [5], [6]

The lesson from Binh Duong is that by connecting land data with a smart city strategy and effectively mobilizing private sector participation, land management transcends being merely an administrative tool. Instead, it becomes a "data backbone" guiding the development of intelligent urban spaces.

Ho Chi Minh City – Digitizing planning and extending land information access

Ho Chi Minh City, with a role as the country's biggest urban center, has launched numerous digitalization initiatives in land management, especially at the district level. The city has built a system called "Ho Chi Minh City Digital planning map" (quyhoach.hochiminhcity.gov.vn), helping the public look up land use planning, zoning, architecture and legal details of land parcels through its website and mobile application.

In addition, the city has implemented some online public services in the field of land registration, transfer of land use rights and issuance of land use certificates – especially in districts like Thu Duc, Binh Thanh and District 7. The connection of data between the Department of Natural Resources and Environment and the Land Registration Office is progressively being established, minimizing the time spent on processing applications and increasing transparency. [5], [7]

The city has also released a project applying GIS and remote sensing in land and construction management, aiming to standardize data, connect departments and assist real-time spatial policy management.

The lesson from HCMC highlights the crucial role of publicly disclosing land and planning data to citizens. This approach can reduce administrative pressure, enhance transparency and foster a healthy development of the real estate market.

2.2. Existing shortcomings and challenges

Despite gaining certain achievements, urban land management in Vietnam is still facing systematic limitations. These existing shortcomings do not only make it difficult for digital transformation but also cause notable consequences for the urban sustainable development.

2.2.1. Lack of synchronization and interconnected data between departments and management agencies

Current situation: Land management, construction, planning, tax, and finance agencies currently operate with separate data systems, which often lack the ability to integrate, synchronize, or share data in real-time. In some localities, software systems are developed in an isolated manner, serving only short-term objectives, which leads to overlapping or conflicting information.

Impact: This makes it complicated and time-consuming to verify the legal status, planning or land changes. Investors have difficulty in accessing official information, citizens struggle with administrative procedures and the risk of policy profiteering increases due to a lack of transparency.

2.2.2. Data that is not fully digitized and lacks timely updates according to actual changes

Current situation: Many areas haven't got a digital cadastral map, or their data remains in paper format, scattered across commune/ward levels. The process of updating this information after transactions, transfers, site clearance is often delayed, leading to discrepancies between the actual situation on the ground and recorded documents.

Impact: This directly reduces the effectiveness of planning and construction supervision, often resulting in incorrect permits or prolonged complaints. In major cities like Hanoi or Ho Chi Minh City, site clearance for key transport projects is frequently stalled due to the lack of accurate and timely land information.

2.2.3. Limitations in staff capacity and technical infrastructure

Current situation: Some localities lack staff that has the ability to execute and exploit digital land systems. Besides, technical infrastructure remains weak: lack of stable servers, uneven network connectivity, and infrequent software upgrades.

Impact: The system easily malfunctions, loses data or cannot cope with a large volume of requests simultaneously. The public and businesses lose trust in the digital system, and continue to rely on traditional paper-based procedures, lengthening procedure time and increasing administrative costs.

2.2.4. Lack of a clear legal framework for data sharing and protection

Current situation: The connection and sharing of data among departments and sectors remain largely spontaneous, unregulated and lack specific legal provisions concerning data access rights, security, and usage. Unified technical standards for land, planning, and architectural data have not been consistently issued.

Impact: This situation leads to a stagnant effect among management systems, where data is incompatible and cannot be easily used across different departments or administrative levels. This, in turn, reduces the unified operational capacity of urban governments and obstructs large-scale data integration projects (such as smart cities, integrated infrastructure management, etc.).

2.3. Lessons from experience

From the achievements and shortcomings mentioned above, some crucial lessons are to be extracted in order to improve the

efficiency in Vietnamese urban land management in this digital transformation period:

2.3.1. Data serves as the core foundation for the digital transformation in urban land management

A modern management system cannot operate effectively without accurate, complete, and continuously updated data. In reality, many Vietnamese cities still rely on semi-manual land data systems that lack synchronization, leading to discrepancies between data and actual ground conditions.

For instance, in Ho Chi Minh City, many suspended plans persist due to outdated land data, causing delays in site clearance and complex disputes. This demonstrates that if data isn't updated, all technological tools will become meaningless. Therefore, standardizing and continuously updating the land database must be the top priority in every urban digital transformation strategy.

2.3.2. Inter-sectoral integration is not just about technology, but is also an institutional issue

In many localities, land information systems and urban planning systems are disconnected, with each department using different software, resulting in data conflicts and fragmented management.

In contrast, successful models like Da Nang have built an integrated GIS platform where data on land, planning, construction permits, transportation, etc. is centrally managed and shared in real-time. This enables faster decision-making for the city and provides clear, transparent information for citizens and investors.

The lesson here is that effective integration requires a clear legal framework that specifically defines the responsibilities for data sharing and usage among different units. This is not merely a technical challenge but a matter of institutional coordination and governance.

2.3.3. Digital transformation cannot succeed without local operational and maintenance capacity

Many provinces currently implement technology systems based on a "project" model, heavily relying on consultants and contractors. Once the maintenance period ends, systems degrade, lack personnel for updates, bug fixes, or simply remain unused.

Binh Duong is a prime example of simultaneous investment in human resources and infrastructure. The local government there has established the Intelligent Operation Center (IOC) and trained dedicated staff in exploiting GIS data systems, ensuring continuous operation and practical utilization of the system.

Therefore, digital transformation must be accompanied by long-term training programs, capacity building, and clear assignment of specialized teams. Without this, systems will remain merely formal or become "clinically dead" after a few years of implementation.

2.3.4. The role of local authority is a determining factor

Effective implementation of digital transformation programs is impossible if local governments lack political determination or merely delegate it as a task to one responsible department. The success in localities like Quang Ninh and Thu Duc City clearly show that when provincial/city leaders directly command, issue digital transformation resolutions, and coordinate inter-departmental action, progress and results are significantly superior.

For example, in Ha Long, the city government has not only built a GIS data system but also integrated it into construction permitting, planning supervision, and citizen feedback processing, creating a multi-functional smart urban model.

2.3.5. The participation of residents and businesses determine transparency and sustainability

Land management systems should not solely serve officials; they must become tools that serve citizens and businesses. Public information portals like those in Da Nang (online planning access), Ho Chi Minh City (construction permit lookup), or Quang Ninh ("Ha Long Smart City" app) have proven that transparent information does not only help reduce negative practices but also increases social trust.

The lesson here is that for any technology to be effective, it must be user-friendly and user-experience centric. When citizens can "look up instead of asking" and investors can verify information before making decisions, socio-economic benefits will rapidly proliferate.

3. Technological solutions to enhance the efficiency of land management

To enhance land management efficiency in the context of rapid urbanization and digital transformation demand, Vietnam needs to focus on some key, highly integrative and practical technological solutions. These solutions do not only help secure weaknesses in the current system, but also make a stable foundation for modernizing governmental management of urban land.

(1) Optimizing digital land databases – the basis for transparent governance

The optimization of the digital land database is a fundamental and decisive step for the entire digital transformation process in the land sector. A comprehensive, synchronized, and continuously updated real-time data system will help overcome fragmentation and information discrepancies among management agencies. Land data needs to be built based on unified national standards, integrating with other data layers such as planning, technical infrastructure, demographics, and land finance. Applying modern technologies like cloud computing and blockchain will not only enhance security but also ensure scalability and rapid access. When fully implemented, this system will shorten processing times, improve the quality of public services, and lay the

groundwork for developing financial, insurance, and planning products based on accurate land data.

(2) Building integrated management platforms based on digital technology

It is essential to construct an integrated land management platform by connecting various sectors: natural resources - construction - planning - tax - demographics. Utilizing 2D/3D GIS technology for spatial monitoring and AI technology for detecting violations (such as illegal construction or encroachment on public land) will enable urban authorities to more effectively control land use in real-time.

Furthermore, combining remote sensing data and satellite imagery with the land management system allows for monitoring land use changes, thereby supporting timely decision-making on planning, investment, or violation handling.

Successful models in cities like Da Nang and Ha Long have shown that integrated technology platforms do not only boost government operational efficiency but also enhance the capacity to respond to emerging urban management issues.

(3) Developing online public services and ensuring information transparency

Another practical solution is to develop online public service portals for land-related matters and to make planning information publicly transparent. Through user-friendly digital platforms, citizens can easily look up planning details, land parcel legal status, track application progress, or submit reports on land use violations.

Digitizing and providing public services at levels 3 and 4 will not only lessen the administrative burden but also lower social costs, prevent negative practices, and increase satisfaction for both citizens and businesses.

Localities such as Ho Chi Minh City, Hanoi, and Da Nang have successfully piloted online land information lookup via digital maps on websites or mobile applications, yielding clear positive results.

(4) Refining cross-sectoral data governance structures and policies

An indispensable factor for the effective operation of these systems is a robust institutional framework and an inter-sectoral data governance model. Issuing clear legal regulations on sharing, integrating, and protecting digital data will remove barriers to coordination among agencies, thereby ensuring connectivity and consistency in state management.

Additionally, establishing unified national data standards, along with setting up urban data centers at the provincial/city level, will enhance coordination capacity and reduce wasteful investment caused by overlapping systems among individual departments.

(5) Human resources training and promoting public-private partnership models

To ensure sustainability, particular emphasis must be placed on human capacity building and encouraging Public - Private Partnership (PPP) models in system implementation and maintenance. Local officials, especially at the commune/ward level, need to receive thorough training in technology, data, and information security to proactively use and update systems without complete reliance on providers.

Moreover, encouraging the participation of technology enterprises in building, operating, and upgrading systems through PPP mechanisms will accelerate implementation pace, lessen the burden on public budgets, and utilize the innovation capacity of the private sector.

Overall, if these technological solutions are executed synchronously, with clear orientation, and supported by a flexible institutional framework, they can help Vietnam create a modern, transparent land management system that better serves the process of sustainable urban development and long-term economic growth.

5. Conclusion and suggestion

Urban land management is not just a technical field, but is also a key factor in sustainable urban development, directly affecting the effective use of resources, construction order, living environment and trust among citizens. In the context of rapid urbanization, increasing pressure in population, infrastructure and environment, reforming land management methods has become urgent. Current challenges - from fragmented, opaque data to limited staff capacity - reveal that traditional management models have many shortcomings and are no longer suitable for practical needs.

Digital transformation is the essential path to modernize land management. However, success does not only depend on technology application, but also lies in institutional reforms, investment in human resources and the establishment of coordination mechanism among stakeholders. The practical lessons from Quang Ninh, Da Nang, Ho Chi Minh City, and Binh Duong have proven that where there is strong political determination, a clear data integration strategy, capable operational teams, and public engagement, there will gradually form a modern and effective land management foundation.

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