

The Palestinian Land Administration: Challenges and Pathways to Modernization

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Abstract— This paper examines the intricate framework governing land ownership and surveying in Palestine. It explores the evolution of this system through the Ottoman, British, Jordanian, and contemporary Palestinian periods. The intricacies of land administration in Palestine are characterized by numerous legal, political, and technical obstacles, which are deeply rooted in a history marked by fluctuating governance and conflict. The original Ottoman registration system, which utilized descriptive books (Dafter Tabu), transitioned to the British Mandate's cadastral surveys based on the Palestine 1923 coordinate system. This process remains unfinished, with only 30% of the West Bank surveyed by 1967. The paper delves into the shift from traditional surveying techniques to modern technologies such as GNSS, LiDAR, and GIS, which provide significantly enhanced precision for cadastral mapping. A significant concern highlighted is the instability of the geodetic network, which is influenced by tectonic plate movements and urban development. This situation necessitated the creation of the new Pal-GRF2023 geodetic reference frame to ensure measurement accuracy. The research identifies key focus areas, including advancing integrated GIS-based land information systems, resolving land disputes, and safeguarding land rights. The analysis underscores the importance of employing precise methodologies to restore boundary points from historical cadastral records and to implement modern 2D and 3D surveying technologies, thereby improving the accuracy and efficiency of the national land registration system. The findings presented aim to contribute to the establishment of a robust land administration framework that promotes sustainable development and secures property rights for the future.

I. INTRODUCTION

Creating a transparent, precise, and legally robust land administration system is fundamental to national progress, economic resilience, and social cohesion. Secure land tenure is the bedrock for investment, agricultural efficiency, urban development, and the fair taxation required for public services. It reduces conflicts, offers collateral for loans, and cultivates a sense of safety among the populace. Although these principles are globally applicable, their implementation in Palestine is particularly intricate, as the technical and engineering hurdles of land surveying are deeply intertwined with a turbulent history marked by fluctuating political authority, legal disarray, and enduring conflict [1]. Defining and registering a land parcel—a primarily technical process in many countries—becomes a multifaceted challenge in Palestine, reflecting a century of unresolved historical issues. Here, the following is presented: a thorough examination of the development and present condition of land ownership and surveying in Palestine,

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exploring historical contexts, the deterioration of essential geodetic frameworks, the shift to contemporary surveying technologies, and the ensuing obstacles that hinder the establishment of a cohesive and effective national cadaster.

II. HISTORICAL EVOLUTION OF LAND OWNERSHIP AND SURVEYING SYSTEMS

A. *The Ottoman Era (1858-1917): Foundations of Descriptive Registration*

The origins of the current complexity can be traced to the Ottoman Land Law of 1858, which marked the initial systematic attempt to regulate land ownership in Palestine. This legislation classified land into various categories, such as private (Mulk), state (Miri), and religious endowment (Waqf). The Ottoman Land Law of 1861, often referred to as the "Dafter Tabu", fundamentally reshaped land administration in the Ottoman Empire, building upon existing legislation. This crucial reform introduced a formalized system for land registration, moving away from previous, less structured approaches. The Ottoman authorities strategically established five dedicated land registration offices in Palestine to ensure the effective implementation across various regions. These pivotal offices were Megiddo, Safed, Nablus, Jerusalem, and Gaza.

Under the Dafter Tabu system, a more detailed method of documentation was employed using three distinct registers. Each register served a specific purpose in clarifying and managing land-related information. One register meticulously recorded owner claims, providing a clear record of asserted land rights. Another documented all land sales deals, formalized transactions, and ensured their legal recognition. Finally, the "Tapu Senedi" register was explicitly dedicated to officially registering land titles, serving as the ultimate legal proof of ownership. This comprehensive registration system marked a significant stride towards centralizing and standardizing land ownership records, aiming to minimize disputes and streamline land-related dealings throughout the empire.

Nevertheless, this system was inherently limited; it functioned as a descriptive registry based on written records detailing a parcel's location, ownership, and approximate size, lacking the backing of accurate maps or drawings. This non-spatial methodology inevitably resulted in ambiguity, boundary conflicts, and a deficiency in legal certainty,

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establishing a foundation of imprecision that would pose challenges for future administration [2].

B. The British Mandate (1923-1948): Introduction of Scientific Cadastral Surveying

The British Mandate period (1923-1948) commenced with adapting Ottoman laws. It witnessed the pivotal shift with the Land (Settlement of Title) Ordinance 1928, a crucial initiative aimed at land registration through cadastral survey. It is worth highlighting here that the above-mentioned Ottoman laws did not discriminate or influence the ownership rights regarding their ethnic or religious background. However, several mandated policies influenced Palestine's geopolitical relations. Beginning with the Balfour declaration of 1917, land transfer ordinances in 1920, and the absentee landlords, all of these policies facilitated land transfers. They began to influence the region's political geography, social tolerance, and harmony in ways that resonate today.

On the other hand, the period marked a significant transformation in developing the surveying approaches, bringing forth the principles of contemporary, systematic cadastral surveying. The authorities of the Mandate initiated the "Taswia," or land settlement process, aimed at conclusively addressing ownership claims and establishing an indisputable title record. A key component of this initiative was the creation of a scientific geodetic framework: the Palestine 1923 Grid (Pal1923). This coordinate system, developed from a network of around 15,000 geodetic triangulation points ("Trigs"), enabled the production of cadastral maps where each parcel was associated with a block and delineated by measured coordinates and a calculated area. For the first time, land registration was connected to a scientifically sound spatial representation [3]. Fig.1 shows the established Pal1923 major triangulation network stations [4][1].

C. Post-1948 Fragmentation of the Jordanian and Egyptian Administration (1948-1967)

After the 1948 conflict, the West Bank was placed under Jordanian administration, initiating a period marked by the integration and adaptation of both British Mandate and Ottoman legal frameworks. During this time, a series of legislative measures were enacted to harmonize the administrative and legal situations across both banks of the Jordan River.

Promulgating the Land and Water Settlement Law No. 40 in 1952 was a significant step in this process. This was subsequently followed by the 1953 legislation, which notably superseded the Ottoman law concerning the usufruct of state lands (Miri). This critical amendment reoriented the benefits derived from Miri lands to accrue to both the Jordanian and Palestinian populations, reflecting an attempt to unify land tenure principles and distribution across the newly integrated territories. Notably, the extent of Egyptian involvement in the Gaza Strip was constrained by Cairo's perception of its temporary administration over the territory. This perspective significantly limited the scope of their interventions.

From the cadastral survey perspective, efforts that the British had initiated were continued with Jordanians by densification of the British Trig Networks. Nevertheless, this advancement was suddenly interrupted by the war of 1967. At

that point, only approximately 30% of the West Bank had been thoroughly surveyed and registered through the systematic Taswia process.

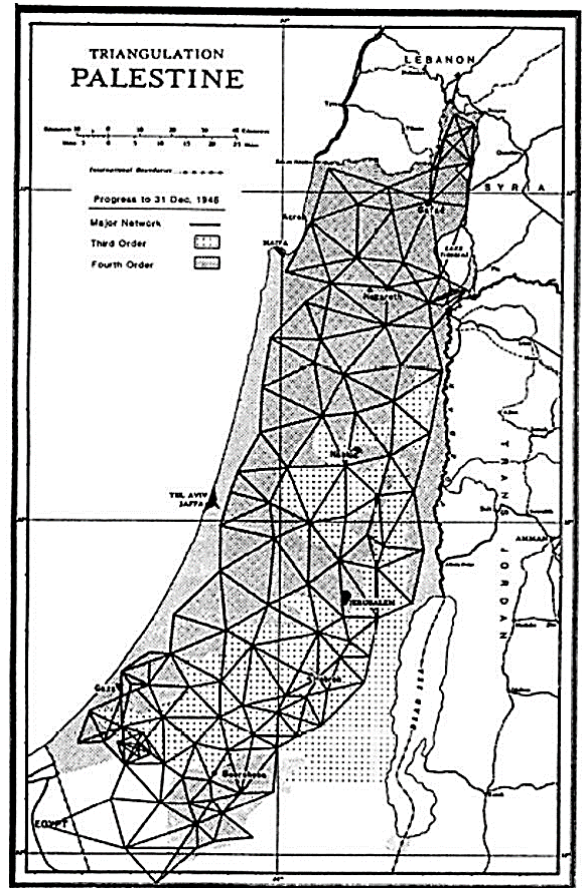


Figure 1. The major triangulation points of the Pal1923 system [3].

D. The Impact of Israeli Occupation and Oslo Accords (1967-Present) and Palestinian Authority (1994-Present)

The ensuing Israeli occupation resulted in a suspension of all official cadastral surveys and land registration activities for Palestinians. Around 51% of the West Bank was designated state land, further complicating land tenure and access issues. These are some consequences of several military ordinances, starting with No. 2 in 1967, which suspended all the laws that contravene the occupation orders, followed by two military ordinances, No. 725 and No.947 in 1981, to create the civilian administrations in Gaza and the West Bank, respectively.

Accordingly, due to the absence of a viable official registration system for the majority of the land, ownership and transactions have since depended on a mix of inherited Ottoman and Jordanian laws, along with informal mechanisms such as external sales contracts, periodic powers of attorney, and inheritance documents—approaches that do not provide the legal security associated with a formal title [5][6].

Following the establishment of the Palestinian Authority (PA) in 1994, and subsequently the Palestinian Land Authority (PLA) in 2002 and the Land and Water Settlement

Commission in 2016, a dedicated effort commenced to resume the daunting task of completing the national cadaster, addressing decades of legal and physical neglect [7][8].

In light of the political complexities that impact land administration in Palestine, it is essential to consider the post-Oslo classifications that continue to influence territorial governance. The 1995 Oslo II Accord formally divided the West Bank into three administrative zones: Area A, under complete Palestinian civil and security control; Area B, with Palestinian civil authority and joint Israeli-Palestinian security oversight; and Area C, comprising approximately 60% of the West Bank, under complete Israeli civil and military control. Area C, which contains most of the West Bank’s agricultural and developable land, presents the most significant obstacles to cadastral development due to Israeli restrictions on building permits, land registration, and infrastructure expansion [11]. These classifications fragment governance and shape the scope and urgency of technical, legal, and institutional reforms necessary for a unified land administration system. Fig.2 shows the West Bank and Gaza Oslo classifications of administrative zones.



Figure 2. Oslo Accords administrative zones.

This historical fragmentation reflects significant technical and engineering obstacles. The core of the cadastral system, the Pal1923 geodetic network, has notably deteriorated over the last century. Numerous physical "Trig" markers have been lost due to urban development or intentional destruction. More critically, the entire network has experienced tectonic deformation. Palestine lies on the active Dead Sea Rift, which serves as the boundary between the Arabian and Sinai plates, leading to relative displacements of as much as 30 centimeters between points within the network. This crustal movement has caused considerable distortions in the original coordinate system, making it unsuitable for the high-precision requirements of contemporary surveying [9][3]. Acknowledging this significant shortcoming, the PLA launched a project in 2023 aimed at creating a new geodetic

reference frame, Pal-GRF2023. This updated system is designed to be compatible with modern Global Navigation Satellite System (GNSS) technology and the International Terrestrial Reference Frame (ITRF/), thereby offering a stable and precise foundation for all future surveying endeavors. Fig.3 shows the distribution of the main stations utilized for Pal-GRF2023 realization.



Figure 3. PAL-GRF2023 major stations in the West Bank.

The development of the geodetic framework has coincided with a transformation in surveying technology. Historical cadastral maps were produced using traditional techniques—chain and compass, theodolites, and plane tables—with the final outputs drafted by hand. Although these methods were sophisticated for their era, they possessed inherent accuracy limitations and required significant labor. Over the years, the original map sheets have experienced physical deterioration due to environmental factors such as temperature and humidity. In contemporary Palestine, surveyors employ advanced technologies, including Total Stations, Real-Time Kinematic (RTK) GNSS, Unmanned Aerial Vehicles (drones), and LiDAR scanning. These modern instruments provide centimeter-level precision and facilitate the swift acquisition of extensive high-resolution 2D and 3D datasets [10].

This technological advancement, nonetheless, introduces a considerable challenge: the amalgamation of historical data with contemporary measurements. Restoring boundary points from antiquated British and Jordanian cadastral sheets necessitates a methodology capable of reconciling the geometric inaccuracies present in the old maps with the high precision of modern surveys, all while considering the distortions inherent in the underlying geodetic network. Consequently, this paper explores the intersection of these historical, legal, and technical aspects [3]. It examines the engineering solutions essential for establishing a modern, fair, and efficient land administration system for Palestine that

honors historical claims, resolves current disputes, and lays a secure groundwork for the nation's future development. The table summarizes the review of the Palestinian land registration according to each period, including key laws and legislative

measures, surveying methods, utilized geodetic framework, status of the primary cadastral outcome, and significant challenges.

TABLE I. EVOLUTION OF LAND ADMINISTRATION SYSTEMS IN PALESTINE

Period	Dominant Authority	Key Land Law/System	Surveying Methodology	Geodetic Framework	Status of Cadaster/Key Outcome	Notable Challenges/Impacts
Ottoman Era (1858-1917)	Ottoman Empire	Ottoman Land Law of 1858, "Dafter Tabu"	Descriptive registry (written records)	None (non-spatial)	Ambiguity, boundary conflicts, and lack of legal certainty	Imprecision, the foundation of future challenges
British Mandate (1923-1948)	British Mandate	"Taswia" (Land Settlement Process)	Scientific cadastral surveys (triangulation)	Palestine 1923 Grid (Pal1923)	Cadaster initiated, but remained unfinished (interrupted by the 1948 conflict)	Introduction of "absentee property" laws and political influence on land transfers
Jordanian Administration (1948-1967)	Jordan	Continued British cadastral efforts	Cadastral surveys	Pal1923 (continued)	Only ~30% of the West Bank was surveyed and registered by 1967	Interrupted by the 1967 war, large un surveyed areas
Israeli Occupation & PA (1967-Present)	Israel (Area C), PA (Areas A & B)	Mix of Ottoman, Jordanian, Israeli, and PA laws; informal mechanisms	Traditional (limited), modern (GNSS, LiDAR, GIS)	Pal1923 (deteriorated), Pal-GRF2023 (new)	Suspension of Palestinian activities, 51% West Bank designated state land, informal tenure prevalent—ongoing PA efforts in A & B.	Political fragmentation (Oslo Accords Area C), Israeli restrictions on registration/development, legal insecurity, land disputes

III. PROPOSED METHODOLOGIES FOR A UNIFIED LAND ADMINISTRATION SYSTEM

Addressing the complex challenges of land administration in Palestine necessitates a comprehensive and integrated approach that combines technological advancements, legal reforms, and strategic planning. The historical fragmentation and technical deterioration discussed earlier cannot be resolved through isolated solutions. Instead, a thorough framework based on three fundamental pillars is suggested: (1) a substantial technical and geodetic modernization to create a spatially accurate foundation; (2) a practical legal and institutional reform to align laws and expedite tenure formalization; and (3) the establishment of an integrated planning and information system to guarantee sustainable management and foster public trust. This section delineates the specific methodologies associated with these pillars, aimed at collaboratively constructing a secure, fair, and efficient national cadastre for Palestine.

A. Technical and Geodetic Modernization

The fundamental basis of any contemporary cadastre is its geodetic reference framework. The precision and reliability of all ensuing measurements and legal descriptions are contingent upon this framework. Consequently, the technical modernization of Palestine must begin with the reinstatement of this essential foundation and the methodical incorporation of historical data into it. The comprehensive implementation of the Palestinian Geodetic Reference Frame 2023 (Pal-GRF2023) represents the most crucial technical advancement. The suggested approach entails its full operationalization through a series of essential actions. Initially, a dense array of Continuously Operating Reference Stations (CORS) needs to be established throughout the West Bank. These stations will deliver real-time, centimeter-accurate positioning data for surveyors utilizing GNSS (Global Navigation Satellite System)

receivers. This development will eliminate dependence on the outdated and sparse physical 'Trig' markers associated with the previous Pal1923 system [10]. Subsequently, a national initiative is necessary to communicate the official transformation parameters between Pal1923, the Israeli Grid, and the newly established Pal-GRF2023. A multi-parameter transformation model must be formulated, such as a 7-parameter Helmert transformation integrated with a distortion grid model. This model will address the systematic datum shift, non-linear distortions resulting from tectonic activity, and historical surveying inaccuracies. The Palestinian Land Authority (PLA) ought to provide open-access software tools and explicit guidelines for private and public surveyors to execute this transformation precisely, ensuring that all new survey activities are carried out within the cohesive national framework.

Hybrid Surveying Methodologies for Data Acquisition. With a stable geodetic framework, the data acquisition process for the remaining 70% of unsurveyed land and the resurveying of contested regions can be conducted effectively. A singular technology is inadequate for Palestine's diverse terrain and urban density [12]. Therefore, a hybrid methodology is suggested:

- **Urban and Peri-Urban Areas:** It is recommended that a combination of Terrestrial Laser Scanning (TLS) and drone-based photogrammetry (UAVs) be utilized. This strategy swiftly captures intricate 3D details of buildings, boundaries, and infrastructure with high accuracy. The resulting point clouds and orthophotos yield a comprehensive dataset essential for defining property boundaries in three dimensions, which is particularly important for apartments and multi-level structures [13].
- **Rural and Agricultural Areas:** The most effective method for delineating large, open parcels is Real-

Time Kinematic (RTK) GNSS surveying. This can be enhanced with high-resolution satellite imagery to discern land use patterns and occupancy, thereby providing preliminary data for community-based adjudication processes prior to the arrival of field teams [10].

Integration of Historical Cadastral Data and sheets from both British and Jordanian origins serves as a crucial, though not flawless, legal and historical archive. A systematic approach for their digital restoration and geometric alignment is imperative. This process encompasses three distinct phases: first, Scanning and Georeferencing. All historical paper maps must undergo high-resolution scanning. Subsequently, they will be georeferenced within the new Pal-GRF2023 framework by pinpointing control points that remain recognizable on-site (for instance, road intersections and stable building corners) and have been accurately measured using GNSS technology, second, Vectorization, and Adjustment. The scanned maps will be vectorized to transform parcel boundaries from raster images into intelligent digital entities (polygons). Initially, these vectors will exhibit geometric inaccuracies. A least-squares adjustment procedure will then be implemented, utilizing the georeferenced control points and the original field book measurements (when available) as observations to refine the parcel geometry and enhance its positional precision mathematically. This procedure must also assess the spatial uncertainty associated with each restored boundary [14]—finally, Digital Archiving. The adjusted vector data, original scanned maps, and relevant metadata (such as date and original surveyor) must be preserved in a centralized GIS database. This establishes a digital audit trail, connecting the contemporary parcel representation to its historical origins.

B. Legal and Institutional Reform

The historical cadastral sheets originating from both British and Jordanian sources constitute an essential, albeit imperfect, legal and historical repository. A methodical strategy for their digital restoration and geometric alignment is essential. This undertaking involves three separate stages: initially, Scanning and Georeferencing. All historical paper maps must be scanned at a high resolution. Following this, they will be georeferenced within the new Pal-GRF2023 framework by identifying control points that are still discernible on the ground (such as road intersections and stable building corners) and have been precisely measured using GNSS technology. Second, Vectorization and Adjustment. The scanned maps will be subjected to vectorization, converting parcel boundaries from raster images into intelligent digital entities (polygons). At first, these vectors may display geometric inaccuracies. Subsequently, a least-squares adjustment procedure will be applied, employing the georeferenced control points and the original field book measurements (when available) as observations to mathematically refine the parcel geometry and improve its positional accuracy. This procedure must also evaluate the spatial uncertainty linked to each restored boundary [14].

C. Integrated Planning and Information Systems

The ultimate pillar involves the establishment of a centralized, digital Land Information System (LIS) that acts as the definitive source of truth for all data about land and serves

as the driving force for national planning and development. The development of a National LIS, grounded in the LADM Standard, should be based on ISO 19152: Land Administration Domain Model (LADM). This global standard offers a conceptual framework for structuring land-related information, emphasizing the connections between individuals and land through rights, responsibilities, and restrictions. A Palestinian LIS constructed upon this model would encompass:

- **Spatial Data:** The modified cadastral parcels, topographic information, administrative boundaries, utility networks, and zoning plans were derived from the technical modernization pillar.
- **Legal/Textual Data:** Information regarding ownership, title registration numbers, mortgages, liens, easements, and historical transaction records sourced from the legal reform pillar.
- **Valuation Data:** Assessed property values intended for taxation purposes.



Figure 4. LADM main components [12].

Phased Implementation and Public Access through A national rollout of such a comprehensive system represents a significant endeavor. A phased implementation is proposed to begin with pilot projects in various municipalities that reflect diverse geographic contexts (for instance, a densely populated urban area and a rural agricultural region). Insights gained from these pilot projects can be utilized to enhance the methodologies, software, and workflows prior to broader implementation. Moreover, the Land Information System (LIS) should be structured to include a public-facing web portal. This portal would offer tiered access to information, enabling the general public to view general parcel maps and zoning regulations. At the same time, registered professionals (such as lawyers and surveyors) and property owners would have secure access to more comprehensive title information. Such transparency is essential for fostering public trust, mitigating corruption, and empowering citizens and investors. Ultimately, this integrated system will revolutionize the cadaster, transforming it from a static registry into a dynamic instrument for sustainable urban planning, equitable taxation, environmental conservation, and effective infrastructure development, thereby securing Palestine’s land for the future [12].

Given the jurisdictional constraints in Area C, securing Palestinian land rights in this zone demands a multifaceted strategy. Palestinian institutions should initiate international advocacy campaigns backed by geospatial documentation and

historical land claims, emphasizing cases where ownership can be substantiated through legacy cadastral records. This should be supported by collaborative legal appeals to international forums and diplomatic channels to challenge unlawful expropriations [15]. On the planning front, community-based master plans should be developed at the village cluster level using participatory GIS methodologies. These plans, aligned with sustainable development goals, can form the basis for international lobbying, humanitarian infrastructure projects, and legal counterclaims. Moreover, leveraging high-resolution GNSS and remote sensing tools to document existing land use patterns can strengthen the Palestinian Authority's capacity to assert rightful development claims under humanitarian and planning law frameworks [11].

IV. ANALYSIS

A comprehensive framework for land administration in Palestine, integrating technical modernization, legal reform, and advanced information systems, is anticipated to yield profound enhancements and transformative outcomes. These methodologies aim to establish a robust, equitable, and efficient national cadastre by directly addressing historical fragmentation and legal complexities. This section outlines expected improvements across each pillar, leading to broader socio-economic and governance benefits crucial for sustainable development and securing property rights. Table II summarizes the proposed methodologies and their anticipated outcomes. The technical modernization pillar is crucial for achieving spatial accuracy. Full operationalization of Pal-GRF2023, through a dense CORS network, will provide real-time, centimeter-level positioning, eliminating reliance on the degraded Pal1923 system and ensuring consistent, highly accurate spatial data for all land parcels. This stable geodetic foundation will foster unprecedented data interoperability, building public trust and facilitating data exchange across various entities. Furthermore, hybrid surveying methodologies, combining TLS/UAVs for urban areas and RTK GNSS with satellite imagery for rural regions, will enable rapid and precise 2D and 3D data acquisition. This approach is tailored to Palestine's diverse terrain and will significantly reduce the time and cost of surveying, supporting detailed urban planning and infrastructure development. Finally, integrating historical cadastral data through scanning, georeferencing, and adjustment will digitally restore and reconcile legacy records, creating a digital audit trail and reducing boundary disputes by reconciling old descriptions with new, accurate measurements.

Beyond technical accuracy, legal and institutional reforms are vital to securing property rights. Streamlining the 'Taswia' (land settlement) process through an area-based, participatory approach with community engagement will accelerate national cadastre completion and resolve disputes more efficiently than traditional court methods. Furthermore, a time-bound 'regularization law' will formalize informal tenure, enhancing legal security for de facto owners and expanding the formal property market and tax base. Institutionalizing Alternative Dispute Resolution (ADR) mechanisms, such as mediation and arbitration services under the PLA, will provide faster, more accessible, and culturally sensitive means of resolving land conflicts, thereby reducing the burden on the judicial system. The final pillar is creating a centralized, digital Land

Information System (LIS). Developing this LIS based on the LADM standard will ensure a standardized framework for integrating all spatial, legal, and valuation data, serving as a 'single source of truth' for land-related information. This centralized data will empower government agencies with accurate, real-time information for evidence-based policy-making, supporting sustainable urban planning, equitable taxation, and infrastructure development. A phased implementation, starting with pilot projects, and designing a public-facing web portal with tiered access, is also proposed. This approach will build public confidence, mitigate risks, and empower citizens and investors by providing transparent access to land information, reducing corruption, and increasing accountability. The synergistic application of these methodologies promises broad national benefits. A secure and transparent land administration system, underpinned by precise cadastral data and formalized tenure, will enhance economic stability by reducing transaction risks, attracting investment, and enabling land to serve as collateral. Formalizing currently informal land holdings will unlock significant latent economic potential, boosting GDP and job creation. Furthermore, the combination of accurate boundary definitions, streamlined 'Taswia,' and institutionalized ADR is projected to significantly reduce land disputes, fostering greater social cohesion and alleviating the burden on the judicial system. The national LIS, acting as a 'single source of truth,' will provide critical data for improved governance, enabling equitable taxation, precise urban planning, and efficient infrastructure development. Finally, the formalization of tenure and secure registration within the LIS will provide robust legal protection for landowners and support informed land-use planning for environmental stewardship. By establishing a dynamic, adaptable LIS on a stable geodetic frame, the system is designed to be resilient to future environmental changes and societal needs, securing property rights for the future.

V. CONCLUSION

In conclusion, the comprehensive application of the proposed methodologies—technical modernization, legal reform, and integrated information systems—is poised to transform land administration in Palestine fundamentally. The expected enhancements in spatial accuracy, legal certainty, and data accessibility will rectify historical deficiencies and lay a secure foundation for future national development. The projected outcomes, including economic stability, reduced disputes, improved governance, and strengthened land rights, underscore the critical importance of this integrated approach for Palestine's long-term prosperity and social harmony.

Historically burdened by fragmentation, technical degradation, and legal complexities, the intricate framework of land administration in Palestine necessitates a transformative approach. This paper has detailed a comprehensive strategy built upon three interconnected pillars: robust technical and geodetic modernization, pragmatic legal and institutional reform, and establishing an integrated Land Information System. The synergistic application of these methodologies is poised to fundamentally reshape how land is managed, owned, and utilized across the nation. The technical advancements, particularly the full implementation of Pal-GRF2023 and the adoption of hybrid surveying techniques, promise

unprecedented spatial accuracy and data reliability, overcoming decades of imprecision and network instability. This precision and the systematic integration of historical cadastral data will provide a transparent and verifiable spatial foundation for all land records. Concurrently, legal reforms, including the accelerated 'Taswia' process and the formalization of informal tenure, are critical for translating this technical accuracy into legally secure property rights for a significant portion of the population. The institutionalization of Alternative Dispute Resolution mechanisms will further alleviate the burden on the judicial system, fostering more accessible and efficient conflict resolution. Finally, developing a national LIS based on the LADM standard will serve as a centralized, authoritative "single source of truth" for all land-related information, enhancing data interoperability and

supporting evidence-based governance. A phased implementation with transparent public access will build trust, empower citizens, and facilitate data-driven planning for urban development, taxation, and environmental stewardship. Ultimately, this integrated system will foster economic stability by securing land as a viable asset, promote social harmony by reducing disputes, and strengthen land rights protection, laying a resilient foundation for Palestine's long-term prosperity and sustainable development in a continually evolving landscape.

TABLE II. SUMMARY OF PROPOSED METHODOLOGIES AND EXPECTED OUTCOMES

Pillar/Methodology	Key Action/Mechanism	Anticipated Enhancement/Outcome
Pillar 1: Technical & Geodetic Modernization	Full Implementation of Pal-GRF2023	Unprecedented spatial accuracy and stability for all land data, eliminating reliance on degraded old systems.
	Hybrid Surveying Methodologies	Efficient, high-precision data acquisition across diverse terrains (2D/3D cadastres); comprehensive mapping of all land types.
	Integration of Historical Cadastral Data	Legal continuity, historical reconciliation, reduced boundary disputes, and a digital audit trail for land records.
Pillar 2: Legal & Institutional Reform	Streamlining & Accelerating "Taswia"	Rapid completion of national cadaster; community-led dispute resolution; increased formal land tenure.
	Formalizing Informal Tenure	Enhanced legal security for de facto owners; expanded formal property market and tax base.
	Alternative Dispute Resolution (ADR)	Reduced burden on the judicial system; faster, more accessible, and culturally sensitive conflict resolution.
Pillar 3: Integrated Planning & Information Systems	Development of National LIS (LADM)	Centralized, authoritative "single source of truth" for land data; improved data interoperability and accessibility.
	Phased Implementation & Public Access	Increased public trust and transparency; empowerment of citizens and investors; data-driven planning and governance.
Overarching Outcomes	Economic Stability & Investment	Secure land tenure as collateral, reduce investment risk, and create an efficient land market.
	Social Harmony & Dispute Reduction	Clear boundaries, formal titles, accessible dispute resolution, and enhanced community stability.
	Improved Governance & Public Services	Efficient tax collection, data-driven urban planning, and effective infrastructure development.
	Land Rights Protection & Environmental Stewardship	Secure and enforceable property rights; informed land-use planning for environmental sustainability.

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