Land Record Management System

S.V. Gunjal[1], Thorat Chaitali[2], Nale Rutuja[3]

[1]*Professor, Dept. of Cloud Computing and Big Data, P.Dr.V.V.P. Institute of Technology and Engineering, Loni,*
Maharashtra, India
[2,3]*Final year Diploma Student, P.Dr.V.V.P. Institute of Technology and Engineering, Loni,*
Maharashtra, India

---***---

Abstract - To facilitate the sale or evaluation of the region, it is essential to retrieve information pertaining to land ownership. Many people are interested in purchasing land for future construction of homes or other structures, or in investing in real estate generally. This can only happen when a thorough screening of potential locations or properties has been completed. Local governments at the state and county levels are responsible for maintaining land ownership data worldwide. It is necessary to contact the relevant agencies in order to accurately determine the borders of a parcel or plot of land. The majority of land records are physically stored, which makes searching for and retrieving them a laborious and time-consuming process. Not all states have reliable land information retrieval systems that can be relied on to give up-to-date data. In response to this need, the current project is developing a land information system in Sacramento, California, with the capability of providing accurate details about every given piece of property. Using Codename One, a cross-platform mobile programming language based on Java, an interactive land information system may be built. This system can then run on many devices. The user can input or examine the pertinent land data using this system. In addition to the SQLite database, the Google Maps API, and GPS have all been employed to successfully extract the location.

Key Words: Java, Codename One, Google Maps API, GPS, SQLite Database.

1.INTRODUCTION

A planet's land is among its most essential and priceless natural resources. Agriculture, the creation of homes and businesses, transportation systems, manufacturing, and public works are all dependent on it. It is thus fundamental to human existence and progress. The use of land is directly or indirectly related to nearly every facet of urbanization and economic progress. The need for land resources is growing substantially in tandem with the expanding urban population. Sustainable development and better quality of life depend critically on the efficient and effective use of land, which is a finite and non-renewable resource.

The patterns of land use are significantly impacted by urbanization. Better access to public services, more fair distribution of infrastructure, and balanced development are all results of well-planned and managed land resources. Problems including overcrowding, damaged ecosystems, unplanned communities, and diminished resources can result from ineffective land management. Consequently, attaining sustainability and social upliftment over the long run requires methodical planning of land use and regular monitoring. In order to preserve natural ecosystems and provide for both current and future generations, sustainable land management is essential.

Obtaining accurate, thorough, and trustworthy land information is the first and most important stage in making efficient use of available land. Information about property borders, ownership, land types, terrain, and use patterns can be found in comprehensive land surveys. Typically, state-level land management authorities, government organizations, and land revenue departments are responsible for collecting and maintaining this data. Transparency in land transactions, management of land acquisition processes, and maintenance of land records are all responsibilities of these agencies.

Manual records, paper-based paperwork, and antiquated survey procedures are common in traditional land information systems; nevertheless, these can cause inefficiencies, delays, and errors. There is a great chance to enhance the precision, availability, and openness of land records with the development of contemporary technology like GIS, remote sensing, satellite images, drones, and digital land record management systems. Digital platforms and automated technologies can improve decision-making, decrease disputes, and promote efficient land governance by upgrading existing processes.

Sustainable urban development, efficient allocation of resources, and open administration can only be achieved with the incorporation of contemporary technical solutions into land management systems. To achieve sustainable development that doesn't harm the environment or the economy in the long run, a land information system that is both organized and technologically advanced is essential.

[1] Syed Asad Abbas Bokhari et al. studied examined artificial intelligence applications to overcome cybersecurity challenges. The research findings indicate that artificial intelligence is progressively converting into an indispensable technology to enhance information security performance. Individuals are not capable anymore of fully secure project-level cyberattacks, and artificial intelligence offers the desired analytics and threat intelligence that security practitioners might use to minimize the likelihood of an infringement and strengthen the security structure of an enterprise. Since more technologies computing in cybersecurity is the capacity to evaluate and eliminate risk faster. Several individuals are concerned about cybercriminals' capability to perform incredibly advanced cyber and technological attacks. Moreover, artificial intel license can contribute to the detection and classification of hazards, the structuring of incident management, and the detection of cyberattacks before their occurrence.

[2] Mohammed Aljebreen et al. designed an automated LULCC RFDADL algorithm on RSIs. The aim of the LULCC RFDADL system can be to identify the different types of land cover on RSIs. In the presented LULCC-RFDADL method, several stages of operations have been included namely dense Efficient Net feature extractor, RFDA-based hyper parameter tuning, MSCAE classification, and

SOA-related parameter optimizer. The development of RFDA and SOA supports optimally choosing the hyperparameters related to the dense Efficient Net and MSCAE models respectively. The achieved outcomes of the LULCC-RFDADL algorithm were examined under the EuroSAT database. The simulation out comes show the promising result of the LULCC-RFDADL algorithm with other methods with respect to diverse metrics. The LULCC-RFDADL model improves classification accuracy, making it valuable for applications in environ mental monitoring, urban planning, and natural resource management..

[3] P. K. Indukala et al. presented an IoT-driven platform for the capture of subterranean microseismic vibrations in regions prone to landslides. The proposed microseismic edge sensing system, incorporating geophone sensors (SM-s nodes), was deployed to continuously record and transmit real-time microseismic data from landslide-prone areas of Chandmari, in the state of Sikkim, in North eastern Himalayas. The proposed system successfully captured the slope instability events in June 2020, and earthquake events in September 2018, and March 2020. Results from laboratory experiments and field deployments demonstrate the effectiveness of the proposed sensing system in capturing subtle pre-triggers of slope instabilities, precipitated by rainfall and earthquakes. This forms the basis for a cost-effective, non-intrusive, and long-term spatiotemporal monitoring solution, setting a robust foundation for an efficient early warning system in landslide-prone regions.

In this publication's second section, we will look at previous study that was called a Litereature Survey. In Section 3, we lay out the course of action with a detailed discussion of the recommended technique. This article is structured as follows: Part 4 covers the experimental evaluation, Section 5 discusses prospective improvements, and Section 5 finishes with a conclusion on the existing plan.

2. LITRATURE SURVAY

[4] Giacomo Bilotti et al. presented a model of Bronze Age ivory distribution, travel affordance and probability across the Western Mediterranean. We combined two different models both based on environmental variables and site location, allowing for a more complete assessment of site distribution and testing the recently published v.net. model's algorithm implemented in GRASS GIS. The network model identifies potential routes based on travel costs between existing sites, possibly indicating pathways for raw material and artefact dissemination. The results highlight the presence of significant hubs, such as Sardinia, Sicily, and the Strait of Gibraltar. However, the lack of sites in some areas, which is most likely caused by a research bias, results in their underrepresentation. In order to overcome this issue, we employed a predictive model based on a FETE LCP den sity and a point process from radiocarbon dated sites. This is due to the fact that the covariate used relies solely on environmental variables, such as elevation, distance from the coastline, and the river network.

[5] Guoping Zhang et al. studied, that effect of radiometric resolution on ICESat 2-aided bathymetry is quantified using images obtained from the Landsat mission. By connecting the pixel values of mul tispectral images with the seafloor photons extracted from ICESat-2,the water depth

ofLandsatETM+,OLI,andOLI-2 images was estimated, respectively, the results with a spatial resolution of 30 m were obtained. The results in Culebra, Puerto Rico, show that the three sensors have acceptable performance in bathymetry, among which the performance of OLI is the best ($R2 = 0.95$, MAE = 1.92 m, RMSE = 2.53 m), OLI-2 is slightly inferior to OLI, and ETM+ is the worst. Through analysis, radiometric resolution's effect on bathymetry is shown in two aspects. Firstly, with the improvement of radiometric resolution, the change of water color with water depth can be described more accurately.

[6] Basma M. Mohammad El Basioni et al. presented the development of a conceptual design of a dynamic system that accommodates the spatial–temporal dynamics of the agricultural soil char acteristics to realize a land suitability assessment (LSA) based on the factor analysis method. The IoT-based LSA software system is built using other enabling technolo gies. It utilizes web development to augment the system with a user-friendly interface that can be opened by any browser from anywhere. The system uses the database technology to store the raw and processed field data. Furthermore, the system uses digital mapping toolboxes to manage the geographic information of the agricultural f ields and the data layers of their sensed data. The paper reviewed the recent trends in the system-enabling tech nologies and the selection of the approaches that were used to design and implement the proposed system. A vanilla JavaScript front end with some librar ies for providing some functionalities communicates with a Node.js back-end through HTTP methods and WebSocket communication.

[7] Laila Junaid Kashif Bilal et al. In sum, addressed that problems facing today's Land Administration System(LAS)neednovelapproachesthatcansimultaneously improve efficiency and transparency in property exchanges. The traditional manual and physical operations of LAS have become inefficient, extravagant and fraudulent. Moreover, digitization has not succeeded in solving the crux of the problems: centralized databases and manipulation risks, as well as insufficient user involvement. Inefficiency, lack of transparency and room for fraud have also been long-standing problems in the classical lease and mortgage management systems. Instances of double spending still abound currently. With the emergence of Blockchain, land management looks set to receive a major boost. The characteristics that come naturally with blockchain–decentralization, transparency, immutability and traceability-could help completely trans form the LAS. While some researchers have integrated Blockchain with land lease and mortgage management applications, they have failed to provide a complete solution.

[8] Feshalbhai Naguji et al. researched proposes an AI and blockchain-based land registry system for agriculture and industry 5.0 to solve the challenges faced by traditional land registry systems. The proposed system provides a more secure, transparent, and efficient land registry system that can benefit citizens and the economy as a whole. First, a standard land registry dataset is used to efficiently bifurcate the

fraudulent and non-fraudulent land data. For that, different AI algorithms, such as LightBGM, XGBoost, DT, LR, and SVM, are incorporated to perform binary classification on the land registry dataset.

[9] Abdullah Ayub Khan et al. presented that first addresses current challenges in machine learning techniques and related enabling technologies when using remote sensing data management. The analysis of previously published state-of-the-art techniques makes it feasible. Issues with data transformation, transmission, deliverance, storage, and optimization come up throughout the applicational domain analysis of each item. This report high lights research gaps in open research topics for technological maturity and addresses some of the challenges with potential remedies. That being said, this paper makes three distinction tributing. First, the PSO computational technique handled data from devices that were remotely sensed over the planned dispersed network.

[10] Ashank Priyadarshi et al. addressed we have been able to develop a system that tackles the major problems of the land registry system in India. We have been able to develop three different modules that cover each aspect of the problem statement. The first module takes into account then or misnumbered paper-based land documents that are available and digitizes them for future use by any entity. The second module is responsible foren Suring security and providing an efficient means of data transfer over the network. The third module makes use of IPFS and the most well-known and effective blockchain, Ethereum, to create a decentralized storage solution that is spread throughout a peer-to-peer network and is extremely quick to access. All the modules are designed in such a way that they can be used as standalone components for other research projects as well. The future scope of the work would involve finding more efficient algorithms for data extraction from the land documents and also planning to conduct validation in selected regions. The mechanism for fetching the data can be provided to the Indian Government for them to update their digital database of land records and to help with their blockchain project involving the same.

[11] Shuaiying Wu et al. studied that we investigated the spatiotemporal characters tics of InSAR deformations and groundwater levels from observation wells across Los Angeles and Orange County from. In contrast, the seasonal deformation is primarily concentrated in the CPOC. Continuing our investigation into GWS changes and aquifer characteristics, we proceeded to train the OGPR model. This model was specifically employed to directly predict both the long-term and seasonal hydraulic head changes at InSAR pixel scale across the entire study region. The results revealed a mean increase of 0.28 ± 0.05 m/yr for long-term groundwater levels during the study period, which is related to the ascending phase of multiyear groundwater level changes, such as the 6.5-year water cycle in the SGV and CPOC. The pronounced variations in seasonal groundwater level changes are particularly prominent in the SGV and CPOC, which is found to be correlated with heavy winter precipitation.

[12] Deeksha Singh Pushkar et al. established a clear connection between rapid population growth, ecological changes, and variations in surface thermal properties in Agra city. Using multi-temporal Landsat satellite imagery, the analysis examined land use/land cover (LULC) changes and land surface temperature (LST) variations from 2014 to 2024. The findings reveal a substantial increase in built-up areas and urban settlements compared to other land use classes. Consequently, the city has experienced a significant rise in LST, predominantly due to the growing concentration of impervious surfaces and the reduction of natural vegetation. The studies further identified regions within the citys centre that are particularly vulner able to the Urban Heat Island (UHI) effect, with densely built-up zones exhibiting the highest temperature intensities. The ongoing development and loss of natural land cover have notably degraded Agras microclimate. These results highlight the urgent need for effective UHI mitigation strategies, especially in rapidly urbanizing areas like Agra.

[13] Sara Arribas, et al. addressed that LST trends in the Iberian Peninsula and Balearic Islands was conducted using EOS-Aqua MODIS data. Through an initial qualitative analysis, we identified significant concentrations of LST trends across various regions in the IP-BI. For the entire year, we analyzed daytime and nighttime over passes separately, revealing average trends of 0.1 K/year at daytimeand0.07K/year at night time. Seasonality was extracted from the data to accurately analyze LST trends, highlighting winter as the season with the highest concentration of regions showing significant positive trends, notably in December. Additionally, we observed phenomena such as hotter nights, summer lengthening, and winter delay. We also examined the interplay between LST trends and different variables such as the NDVI, an elevation model and the degree of continentality. The seasonal analysis revealed distinct patterns in LST trends across different seasons. Winter showed the strongest correlations, with daytime LST trends increasing in high-altitude, sparsely vegetated, and regions with high continentality.

[14] Pui-Yu Ling et al. introduced a practical, predictive framework for land cover change prediction tool that empowers stakeholders to proactively plan interventions. By integrating advanced ML pipelines with an intuitive, cloud-based interface, the tool provides an accessible and reproducible workflow for scenario-based planning—bridging technical modeling and real-world decision-making. Our case study demonstrates the framework's utility in visualizing land cover risks under alternative planning options, helping users anticipate habitat loss before it occurs. Future work should focus on scaling the workflow across diverse geographies and formalizing evaluation benchmarks that link technical performance to conservation outcomes [33]. Collabo rations with local partners will be key to refining usability and ensuring the framework's adoption in adaptive conservation strategies.
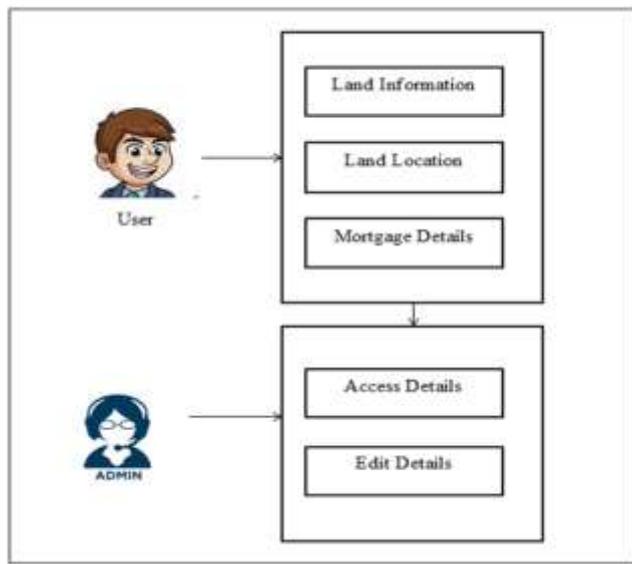
3. METHODOLOGY

Fig 1 System Overview

The proposed methodology for the purpose of enabling a Land information system has been depicted in the system overview given in the figure 13 above. The detailed steps utilized for this purpose.

Step 1: Database Retrieval – To save the land information MySQL Lite database is utilized which is embedded in the Codename One API. This has been utilized to achieve retrieval of records from the MySQL Lite. A database is created for the purpose of executing a query. Once the database is interfaced, the columns are extracted and analyzed for the presence of data. If the data is present in the database, then iteration is ran to retrieve the data sequentially in a list.

Step 2: Location extraction through GPS – GPS is used to extract the current location of user. Figure 8 depicts the code snippet for the purpose of extraction of the location from the GPS sensors in the mobile device. In Codename One, Location Manager class is utilized to create an instance which is used to extract the location through the use of static built-in method getLocationManager (). getCurrentLocationSync () method which extracts the location through the mobile GPS and returns it a Location instance. This instance is then utilized to get the longitude and latitude of the particular location in the form of decimal data type that is later converted into a string format.

Step 3: Location Extraction through Google Maps – Google Maps API is used to retrieve land location via search. This is utilized to get the location using Google Maps. getInstance() built-in static method of Display class is used to open the specified URL to fetch the longitude and latitude from the selected location. Due to technical difficulties mentioned in section 5.6 we copy the latitude and longitude values from the map and then parsed. The input location

provided in the previous step contains some unwanted characters. These characters must be removed, for which the input values are parsed using the parser. The parser trims the input text and eliminates the spaces. After which the respective longitude and latitude are extracted using substring () function. The resultant values are trimmed to obtain the longitude and latitude respectively.

Step 4: Setting the style for the text field – To make the user interface aesthetically pleasing without effecting the functionality the text fields have been stylized. This has been utilized to provide styling to the text fields. set Border () built-in function is used to provide the rounded corners to the border. strokeColor () and stroke Opacity () built-in functions are used to set the color to the text fields to make it visually appealing and functional.

Step 5: Menu Formation – Side menu is included in the graphical user interface to allow user to navigate through different actions that are available in the application. It shows how methods defined in "Edit Profile" and "Add Land Info" forms are added to side menu using the Toolbar class reference. Other menu options are added in the similar fashion to the side menu. The side menu then can be utilized by the user to quickly navigate from one form to another.

4. RESULTS AND DISUSSIONS

The proposed method makes use of the Java programming language and the NetBeans Integrated Development Environment (IDE) to develop a reliable Land Record Management System. The development environment consists of a laptop with the Windows operating system, powered by an Intel Core i5 processor, 8 GB RAM, and 500 GB internal storage. For database management, SQLite is used to efficiently store and manage land ownership records, user details, and transaction data.

The effectiveness of the proposed system has been evaluated under different operating conditions to ensure reliability and efficiency. The experimental results obtained from the implementation of the system are discussed below.

Scalability Analysis of Database Transactions

The scalability of data processing in the proposed Land Record Management System is analyzed by evaluating database transaction performance. The system supports multiple user roles such as administrator, government officer, and citizen, each having separate login access to manage and verify land records on the platform.

The system stores various types of information such as land ownership details, land transfer records, survey numbers, and user authentication data in the database. The transaction density and the time required for processing database operations are recorded and analyzed. The summarized results of these database transactions are presented in Table 1.

S. No	No. of Database Transactions	Time Taken (in Seconds)
1	256	0.48
2	541	0.95
3	801	1.62
4	965	1.88
5	1299	2.05

Table 1: Land Record Management System Transaction Time Estimation Table
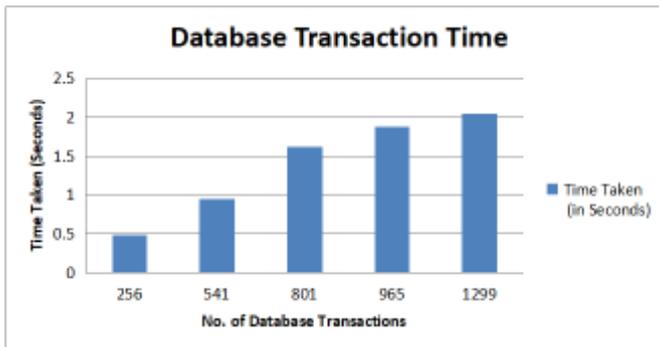
Figure 2: Land Record Database Transactions

The graph shown in Figure 2 is generated using the data from Table 1. The graphical representation illustrates the relationship between different system operations and the time required to complete them in the SQLite database.

This analysis helps in understanding the efficiency of database storage and retrieval mechanisms used in the proposed system. The results show that database operations such as record insertion, updating land ownership details, retrieval of land records, and user authentication are performed efficiently with minimal processing time.

The findings demonstrate that the SQLite storage mechanism is effectively utilized for handling land record transactions. This improves the system's reliability, scalability, and durability in managing large volumes of land-related data.

5. CONCLUSIONS

The Land Information system application has been designed effectively in this research. The Codename One approach has been instrumental in achieving the cross-platform compatibility for the application. This application is a valuable asset in organization and management of the land information, which has been analyzed in detail in this research article. This article also discusses the future research prospects and probable directions upon which the proposed application can be improved further. This application will also serve as a guideline for future developers using Codename One. Another very valuable addition to this application for future research prospects, is the option to include bank mortgaging system. The inclusion of the bank mortgaging system would allow the users to avail mortgaging services and look at the prevalent rates of interest on mortgaging. Inclusion of such a feature would also allow the users to view the mortgage details if they are already present, such as, balance, number of installments, Date of completion etc. This would be highly convenient as it would combine the facilities of a banking application and integrate it with the land information system for both the buyers and the sellers.

REFERENCES

[1] S. A. A. Bokhari and S. Myeong, "The Influence of Artificial Intelligence on E-Governance and Cybersecurity in Smart Cities: A Stakeholder's Perspective," in *IEEE Access*, vol. 11, pp. 69783-69797, 2023, doi: 10.1109/ACCESS.2023.3293480.

[2] M. Aljebreen, H. A. Mengash, M. Alamgeer, S. S. Alotaibi, A. S. Salama and M. A. Hamza, "Land Use and Land Cover Classification Using River Formation Dynamics Algorithm With Deep Learning on Remote Sensing Images," in *IEEE Access*, vol. 12, pp. 11147-11156, 2024, doi: 10.1109/ACCESS.2023.3349285.

[3] P. K. Indukala, U. G. Gosh and M. Vinodini Ramesh, "IoT-Driven Microseismic Sensing System and Monitoring Platform for Landslide Detection," in *IEEE Access*, vol. 12, pp. 97787-97805, 2024, doi: 10.1109/ACCESS.2024.3427386.

[4] G. Bilotti, M. Kempf, and J. M. Morillo Leon, "Modelling land and water based movement corridors in the Western Mediterranean: a least cost path analysis from chalcolithic and early bronze age ivory records," *Archaeological and Anthropological Sciences*, vol. 16, no. 8, Art. no. 122, Aug. 2024, doi: 10.1007/s12520-024-02029-x

[5] G. Zhang, S. Xing, Q. Xu, S. Guo, P. Li, and D. Wang, "Performance of Landsat ETM+, OLI and OLI-2 Imagery in ICESat-2-Aided Coastal Bathymetry: The Effect of Radiometric Resolution," *IEEE Access*, vol. 12, pp. 148645-148652, May 2024, doi: 10.1109/ACCESS.2024.3401626.

[6] B. M. Mohammad El-Basioni and S. M. Abd El-Kader, "Designing and modeling an IoT-based software system for land suitability assessment use case," *Environmental Monitoring and Assessment*, vol. 196, no. 4, Art. no. 380, Mar. 2024, doi: 10.1007/s10661-024-12483-8.

[7] L. Junaid, K. Bilal, J. Shuja, A. O. Balogun and J. J. P. C. Rodrigues, "Blockchain-Enabled Framework for Transparent Land Lease and Mortgage Management," in *IEEE Access*, vol. 12, pp. 54005-54018, 2024, doi: 10.1109/ACCESS.2024.3388248.

[8] F. Naguji, N. K. Jadav, S. Tanwar, G. Pau, G. Sharma, F. Alqahtani, and A. Tolba, "GreenLand: A Secure Land Registration Scheme for Blockchain and AI-Enabled

Agriculture Industry 5.0," *IEEE Access*, vol. 12, pp. 120994-121009, 2024, doi: 10.1109/ACCESS.2024.3451627.

[9] A. A. Khan *et al*., "Secure Remote Sensing Data With Blockchain Distributed Ledger Technology: A Solution for Smart Cities," in *IEEE Access*, vol. 12, pp. 69383-69396, 2024, doi: 10.1109/ACCESS.2024.3401591.

[10] A. Priyadarshi and T. R. Sree, "Multi-Tier Blockchain-Based Land Registry Using Fog Computing," in *IEEE Access*, vol. 13, pp. 13238-13249, 2025, doi: 10.1109/ACCESS.2025.3528457

[11] S. Wu *et al*., "Assessing Groundwater Level Change and Aquifer Parameters Across Los Angeles and Orange County Using InSAR Measurements and Machine Learning," in *IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing*, vol. 18, pp. 12559-12571, 2025, doi: 10.1109/JSTARS.2025.3567660.

[12] A. Mishra, D. S. Arya, and A. Kumar, "Investigating the effects of land use, land cover change, and urban heat island effects in Agra city, India, using a remote sensing approach," *GeoJournal*, vol. 90, no. 5, Art. no. 256, Oct. 2025, doi: 10.1007/s10708-025-11234-x.

[13] D. G. Marín, J. L. Casanova, and A. Romo, "Analyzing Land Surface Temperature Trends in the Iberian Peninsula Using EOS-Aqua MODIS Data," *Remote Sensing*, vol. 16, no. 14, Art. no. 2561, Jul. 2024, doi: 10.3390/rs16142561.

[14] P. -Y. Ling *et al*., "User-Driven Land Cover Change Prediction Map Tool for Land Conservation Planning," in *IEEE Geoscience and Remote Sensing Letters*, vol. 23, pp. 1-5, 2026, Art no. 8000805, doi: 10.1109/LGRS.2025.3636286.