# **1. Problem Overview**

Land Ownership Disputes: Many African countries, including Kenya, face challenges with land ownership disputes due to corruption, poor record-keeping, forgery, and the complexity of tracing land ownership history.

Need for Transparency: There is a need for a system that ensures transparency and immutability in land ownership records to build trust among stakeholders—landowners, buyers, legal authorities, and government agencies.

# **2. Proposed Solution**

Onchain Application for Verification:

Build a blockchain-based platform to digitize, verify, and maintain tamper-proof records of land titles.

This system will provide easy verification for existing digitized land titles, allowing stakeholders to access transparent and trusted ownership records.

# **3. Key Features**

Land Title Registration:

Upload land title information to the blockchain.

Ensure the process is integrated with existing government databases for authenticity.

Include document validation using a unique ID or QR code for tracking purposes.

Ownership Verification:

Provide a public portal where users can verify land title details using the unique ID.

Allow prospective buyers, legal authorities, and financial institutions to verify ownership details instantly.

Immutable Record History:

Maintain a history of transactions for each land title.

Implement a smart contract mechanism that records ownership transfers, mortgages, and any claims on the property.

Integration with Government:

Establish an API connection with government databases where land records are being digitized.

Allow authorized personnel (like government registrars) to update records while ensuring that updates are logged immutably.

User Access and Permissions:

Different levels of access for different users (government officials, landowners, buyers, financial institutions).

Implement permissioned access so only verified users can register new titles or modify specific data.

# **4. Technical Stack**

Blockchain Platform: Use a public or consortium blockchain that supports smart contracts. Some viable options could be:

Base: Layer 2 solution for Ethereum, allowing faster transaction

Ethereum: Widely adopted, well-documented, and has smart contract capabilities.

Polygon: Layer 2 solution for Ethereum, reducing transaction fees and latency.

Hyperledger Fabric: Suitable if you prefer a permissioned blockchain network.

Smart Contracts: Develop smart contracts to enforce rules on:

Ownership transfer.

Recording of property details and encumbrances.

Verification and validation of land title authenticity.

Frontend: Develop a web-based platform using frameworks such as React.js for the user interface.

Backend:

Use Node.js for backend logic and API integration.

Use IPFS (InterPlanetary File System) for storing documents like scanned copies of deeds in a decentralized manner.

# **5. Key Stakeholders**

Government Agencies: Key players in registering and updating land titles.

Landowners: The individuals who will be registering their property.

Buyers and Investors: Use the platform to verify property ownership.

Legal Authorities: Need to access immutable records for dispute resolution.

Financial Institutions: Verify ownership for collateral purposes.

# **6. Workflow**

Registration:

Government agencies register digitized land records, creating a corresponding blockchain entry.

Landowners verify their registered property using a unique ID and can make claims if there are discrepancies.

Verification:

Buyers, banks, or other interested parties access the public portal to verify land ownership and encumbrances using a unique property ID.

Ownership Transfer:

Ownership transfers are recorded via a smart contract.

The new ownership details are validated by government authorities before becoming permanent on the blockchain.

Update and Dispute Resolution:

Government officials can update records as per court orders or other legal processes, with all changes being tracked immutably.

Dispute claims can be raised by parties, and all actions are logged.

# **7. Security Considerations**

Data Privacy: While ensuring transparency, it is essential to protect sensitive information.

Use encryption to secure personally identifiable information (PII) while keeping public ownership data transparent.

Smart Contract Security: Audit all smart contracts to ensure no loopholes can be exploited.

Access Control: Implement multi-factor authentication for access to critical functions like updating records or registering new titles.

# **8. Potential Challenges and Solutions**

Government Integration: Getting access to the official land records database might require significant bureaucratic processes.

Solution: Start with a pilot project involving a few counties, which could later scale up to a national level.

Data Entry Errors: Errors during initial data entry could cause issues.

Solution: Use double-entry verification where two independent entries are cross-verified before uploading to the blockchain.

Acceptance by the General Public: Some people might be wary of using a digital platform for land registration.

Solution: Educate the community about the benefits, emphasizing transparency, immutability, and ease of property verification.

# **9. Prize-Winning Potential**

Innovation: This project leverages blockchain's core strengths—security, transparency, and immutability—to solve a real-world problem. This aligns perfectly with the hackathon's theme of addressing local challenges.

Community Impact: Land disputes are a major problem in many countries, and providing a transparent, immutable record will help bring peace of mind to many landowners.

Scalability: The solution can start small, covering a specific region, and eventually scale to a national or even continental level.



