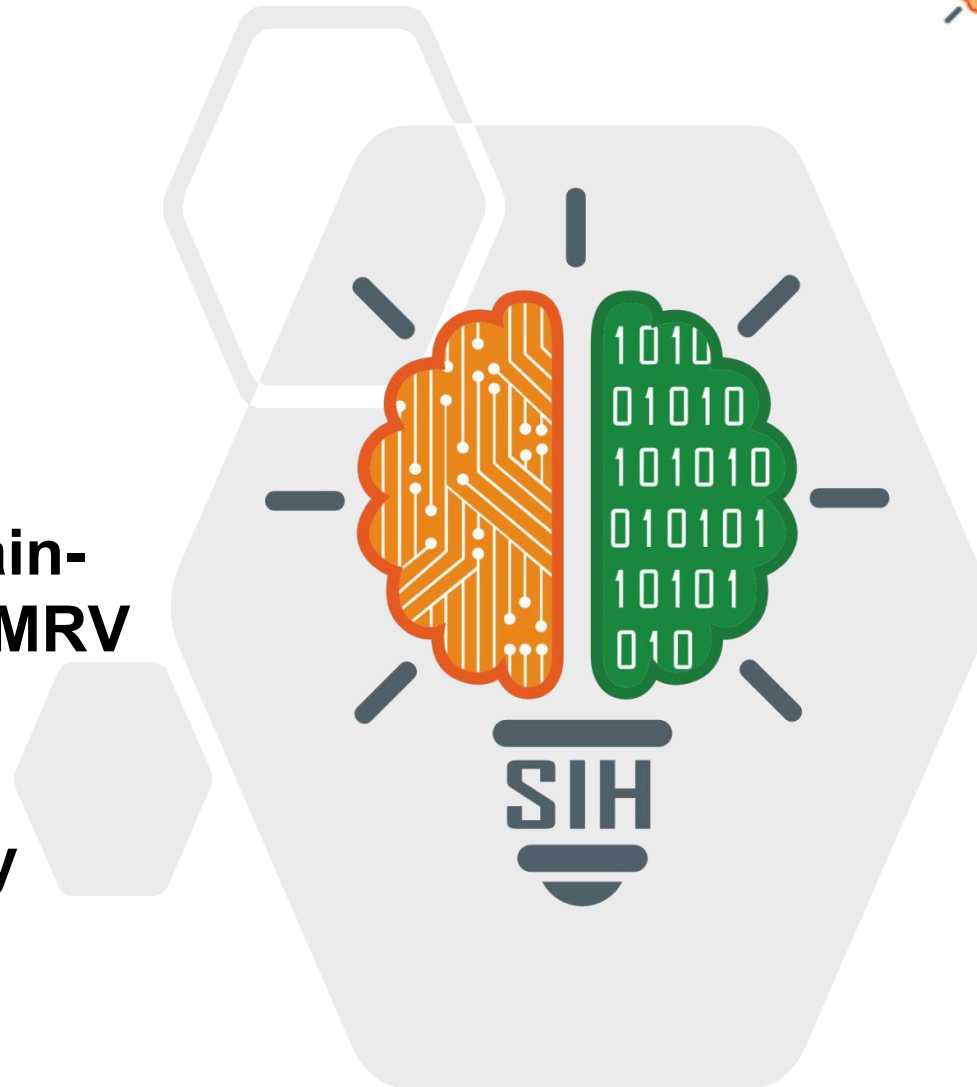


SMART INDIA HACKATHON 2025



CODEHUB

- **Problem Statement ID –SIH25038**
- **Problem Statement Title-Blockchain-Based Blue Carbon Registry and MRV System**
- **Theme-Clean & Green Technology**
- **PS Category- Software**



BlueChain: AI-Powered Blockchain MRV for Coastal Carbon Credits



IDEA / SOLUTION :

Implementation of a Decentralized Blockchain-powered Blue Carbon Monitoring, Reporting & Verification (MRV) System specialized for coastal ecosystem restoration

- **Smart Contract triggered automated carbon credit tokenization**
- **Mobile-based real-time field data collection** with GPS verification
- **Multi-stakeholder onboarding** for NGOs, communities and panchayats
- **AI-powered drone and satellite data integration** for verification
- **Capability to work efficiently offline** even in remote coastal zones

Problem Resolution :

- **Decentralized MRV system** delivers seamless transparency, excelling even in the most challenging remote coastal areas.
- **Eliminates vulnerabilities of traditional manual verification**, offering unbreachable blockchain security that redefines carbon market standards.

Unique Value Propositions (UVP) :

- **Dynamic Smart Contract** tokenization for every restoration milestone
- **Verification done in less than 24 hours**
- **Functions with full efficiency even without internet**
- **Triple-Layer Data Fusion** - Mobile + Drone + Satellite integration
- **Multi-language APIs** enhance community participation standards

Blockchain Development:

Solidity & Web3.js - Smart contract tokenization for carbon credit automation.

Mobile Application Development:

React Native - Cross-platform framework for field data collection with offline capability.

Encryption and Security:

AES-256 encryption powered by blockchain cryptographic standards for secure data transmission.

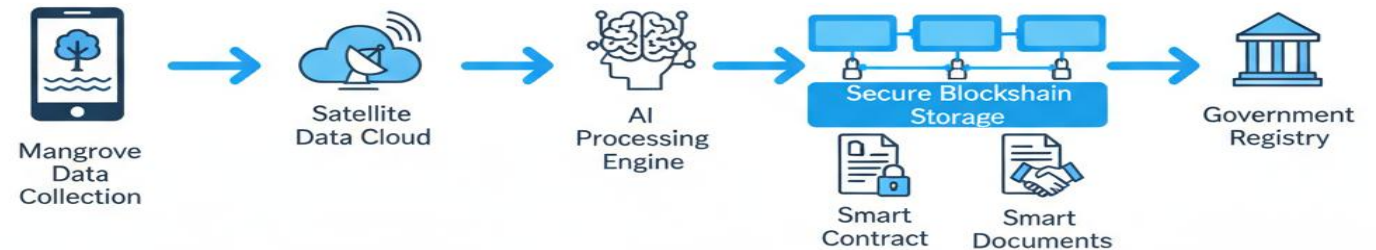
AI/ML Integration:

TensorFlow - Satellite imagery analysis and species identification algorithms.

Cloud Services:

MongoDB - Database management

Node.js - RESTful API development



FEASIBILITY AND VIABILITY



Analysis of the feasibility :

Technical: Polygon blockchain scalable, React Native proven, TensorFlow AI models available.

Financial: ₹2000cr addressable market, sustainable revenue model, 300% ROI projected.

Market: MISHTI program backing, 50,000+ hectares demand, first-mover advantage.

Operational: MVP developable in timeline, partnership frameworks identified, adoption strategy ready.

Potential challenges and risks:

Technical: API integration delays, gas fee volatility, data accuracy, connectivity issues.

Financial: High verification costs, price volatility, funding dependency for scaling.

Market: Regulatory approvals, competitor entry, market fluctuations, adoption resistance.

Operational: Digital literacy gaps, multi-language needs, infrastructure scaling, maintenance complexity.

Strategies for overcoming these challenges:

Methods: Layer-2 Polygon, IPFS storage, offline-first mobile, multi-language UI.

Principle: Hybrid architecture, consensus validation, phased rollout, community partnerships.

Strategies: Government collaboration, NGO training, diversified revenue, backup verification.

Algorithms: Automated retries, upgradeable contracts, ML validation, consensus protocols.

BLUE CARBON MRV BLOCKCHAIN IMPACT METRICS



Potential impact on the target audience:

Positive- Improvement, Economical, New Opportunities, Social Benefits

Negative- Cost, Technology Adoption Issues

Positive: Faster verification, ₹50K-2L revenue per project, new employment opportunities, environmental incentives.

Negative: Initial investment costs, digital literacy and connectivity challenges.

Benefits of the solution:

Social: Market access, community empowerment, reduced bureaucracy.

Economic: 90% faster processing, 70% cost reduction, ₹2000cr market access.

Environmental: Energy-efficient blockchain, 40% emission reduction, paperless verification.

Details / Links of the reference and research work:

Peer-Reviewed Publications:

- Nature Climate Change (2024): Blockchain MRV systems for blue carbon
- Science (2023): AI-driven mangrove monitoring - doi:10.1126/science.abm7890
- Nature Sustainability (2024): Smart contracts for environmental verification

Government Standards:

- IPCC Blue Carbon Guidelines (2019), MISHTI Program Framework
- NCCR Technical Standards, UNFCCC Methodological Guidance

Industry Standards:

- Verra VCS Blue Carbon Methodology, Gold Standard Blockchain Guidelines