



MICRO-CREDENTIAL

LAND MANAGEMENT IN CENTRAL ASIA

3.- Systems and System-Based Approach

Economic Systems of LM

LM-W03-V17



Co-funded by
the European Union





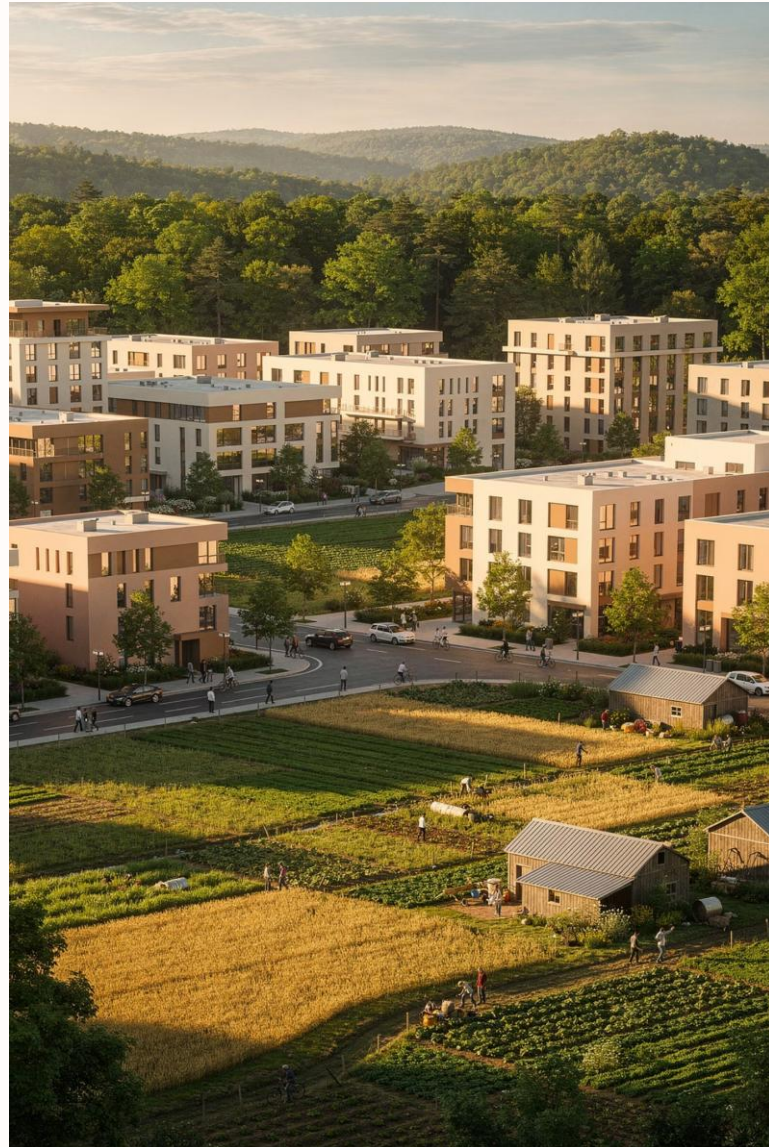
Economic Systems of Land Management

Foundations, Innovations, and Impact

Exploring how land governance, sustainable practices, and decision-support technologies shape economies, communities, and our environmental future.

CHAPTER 1

Land is the foundation upon which economies are built — from the farms that feed nations to the cities that drive innovation. Understanding how we govern, allocate, and manage land is essential to unlocking sustainable growth and shared prosperity.



Land systems — the interconnected web of laws, institutions, and registries that manage land rights and use — form the invisible infrastructure of every economy. When these systems function well, they fuel entrepreneurship, catalyze innovation, and create jobs at every scale.

Laws & Registries

Formal frameworks that define ownership, resolve disputes, and provide legal certainty for investors and communities alike.

Entrepreneurship

Secure land access empowers individuals to start businesses, build housing, and invest in productive enterprises.

Global Investment

The World Bank has invested **\$2.9 billion** to strengthen land systems across 31 countries, recognizing their economic multiplier effect.

When land rights are formally registered and digitized, they become powerful economic instruments. Property owners can leverage registered titles as collateral to access credit, fueling investment in homes, businesses, and agricultural improvements.

10.5%

Credit Access Boost

Average increase in urban credit access
through digital land records

8M

Parcels Registered

Land parcels registered in Indonesia's
landmark titling program

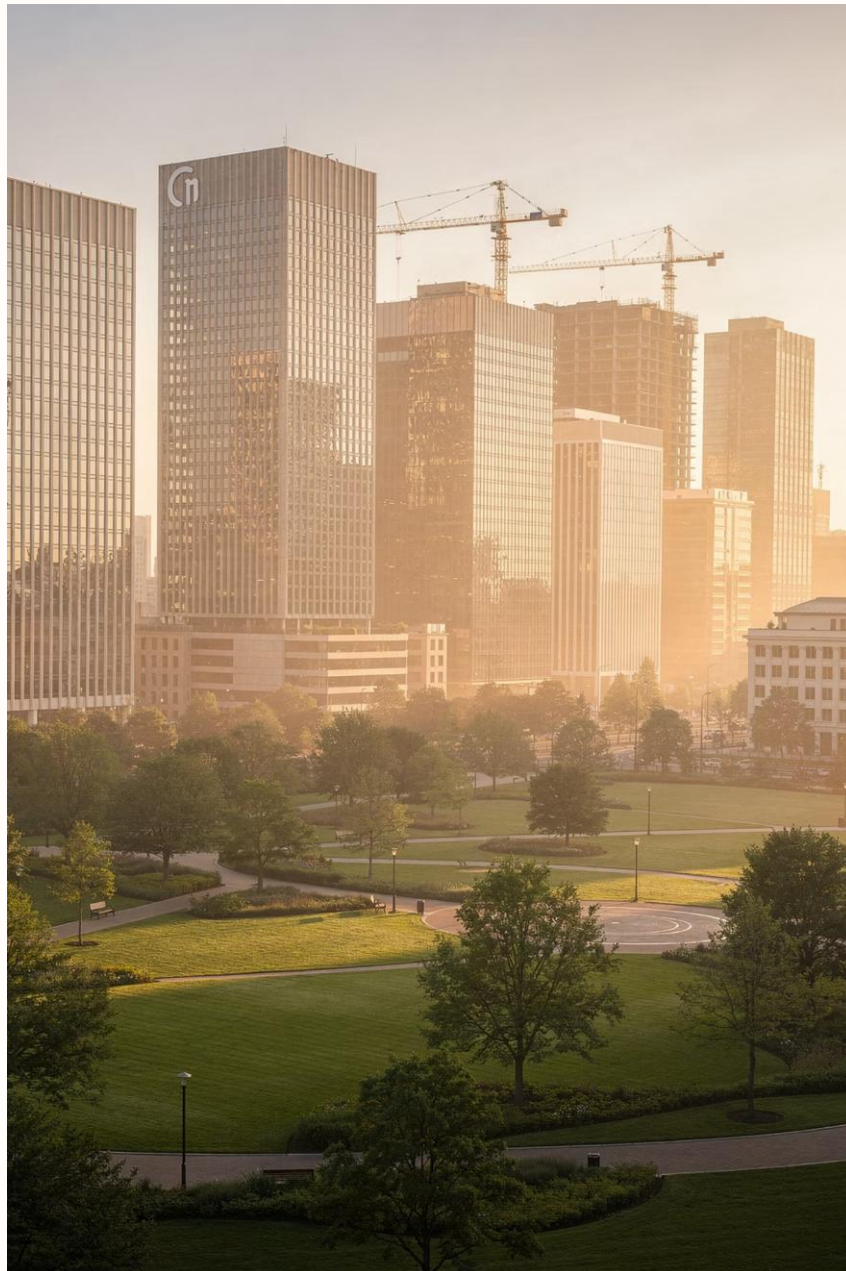
Indonesia's Success Story: By registering 8 million land parcels — 42% to women — Indonesia demonstrated that formalizing land rights not only drives economic activity but also advances gender equity and social inclusion.

42%

Women Beneficiaries

Share of Indonesian land parcels
registered to women, securing their
tenure

LAND SYSTEMS SHAPE CITIES AND ECONOMIES



From towering skylines to thriving green corridors, the way we manage land determines the character, resilience, and economic vitality of our cities. Transparent land governance attracts investment, guides sustainable growth, and ensures that urban expansion serves both people and the planet.

Land and property taxes represent one of the most reliable and equitable sources of public revenue — yet they remain dramatically underutilized in many developing nations. Closing this gap could fund critical infrastructure, education, and public services. Efficient land valuation systems and modern registries can bridge this revenue gap, enabling governments to fund roads, schools, hospitals, and green infrastructure — all from the land beneath our feet.



Sustainable land management is not just an environmental imperative — it is an economic strategy. Balancing productivity with ecosystem stewardship yields lasting returns for farmers, communities, and nations.

THE COST-BENEFIT REALITY OF SUSTAINABLE LAND PRACTICES

A comprehensive analysis of 363 global case studies from the WOCAT database (1990–2012) reveals a compelling economic case for sustainable land management. The data shows that conservation and productivity can go hand in hand.

Short-Term Viability

Of SLM technologies were found profitable or cost-neutral within the first few years of adoption

These findings challenge the myth that sustainability is too costly. The vast majority of sustainable practices pay for themselves — and the long-term returns are overwhelmingly positive.

Long-Term Value

Of practices perceived as positive or very positive long-term investments by land users and experts

Despite strong long-term returns, the transition to sustainable land management is not without obstacles. Understanding and addressing these barriers is essential to scaling adoption globally.

1

High Upfront Costs

Many SLM practices require significant initial investment in terracing, irrigation, or soil restoration — a barrier for smallholders with limited capital.

2

Short-Term Support

Targeted subsidies, micro-loans, and extension services can bridge the gap, accelerating adoption during the critical early years.

3

Broader Benefits

The benefits of SLM extend far beyond individual land users — healthier watersheds, carbon sequestration, and stronger local ecosystems benefit entire communities.

FOOD SECURITY AND GENDER EQUITY THROUGH LAND ACCESS

The Evidence Is Clear

When women gain equitable access to land, the effects ripple across entire economies. Research consistently shows that empowering women farmers leads to measurable gains in productivity, nutrition, and community well-being.

Production Increase

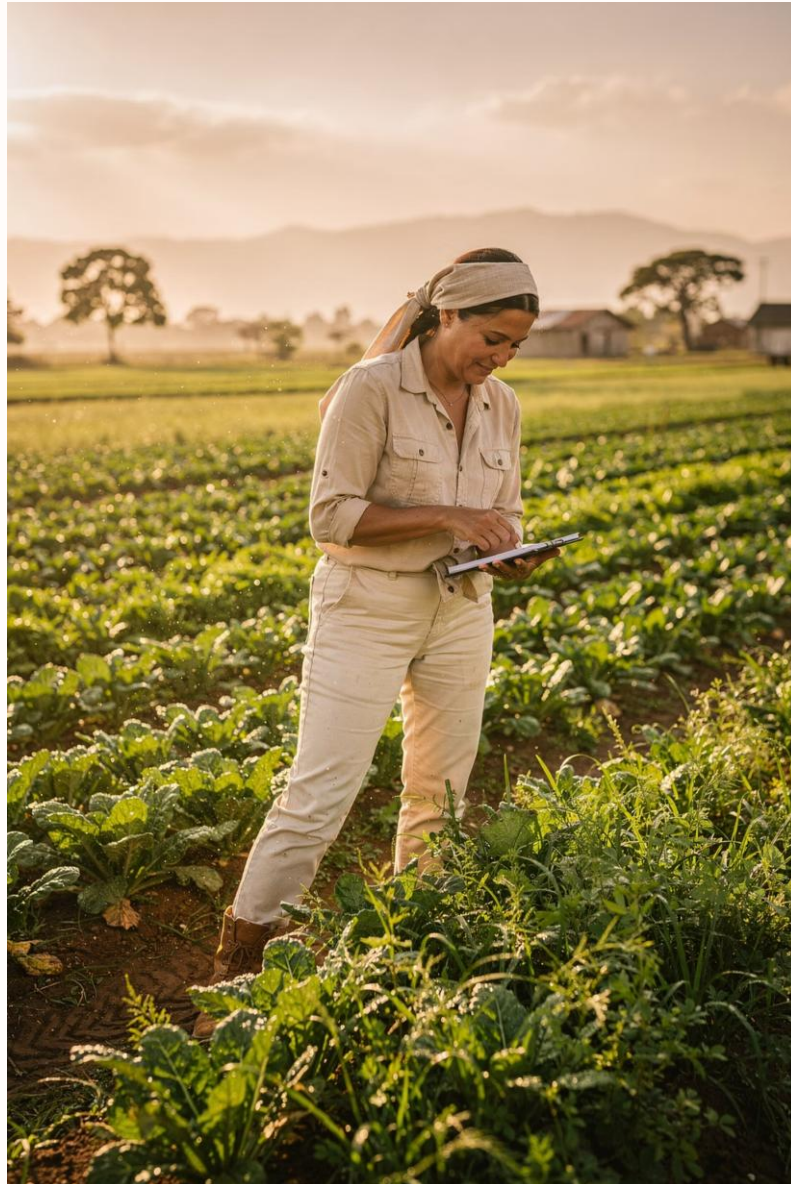
Potential rise in food production when women gain equal land access

Positive ripple effects extend to children's nutrition, health outcomes, and educational attainment — creating generational change.

National Output

Potential increase in national agricultural output through gender equity

EMPOWERING WOMEN EMPOWERS FOOD SECURITY



When women have the right to own and manage land, they don't just grow food — they grow futures for their families, communities, and nations.

CHAPTER 3

Advanced technologies — from GIS to artificial intelligence — are transforming how planners, policymakers, and communities make decisions about land. These systems turn complex data into actionable insights.



The EMDS platform represents a breakthrough in how governments and agencies approach land planning. By integrating geographic information systems, logic-based reasoning, and advanced decision modeling, EMDS enables holistic, data-driven landscape management.

GIS Integration

Combines spatial data with ecological models to visualize landscape conditions and identify priority areas for intervention.

Bayesian Modeling

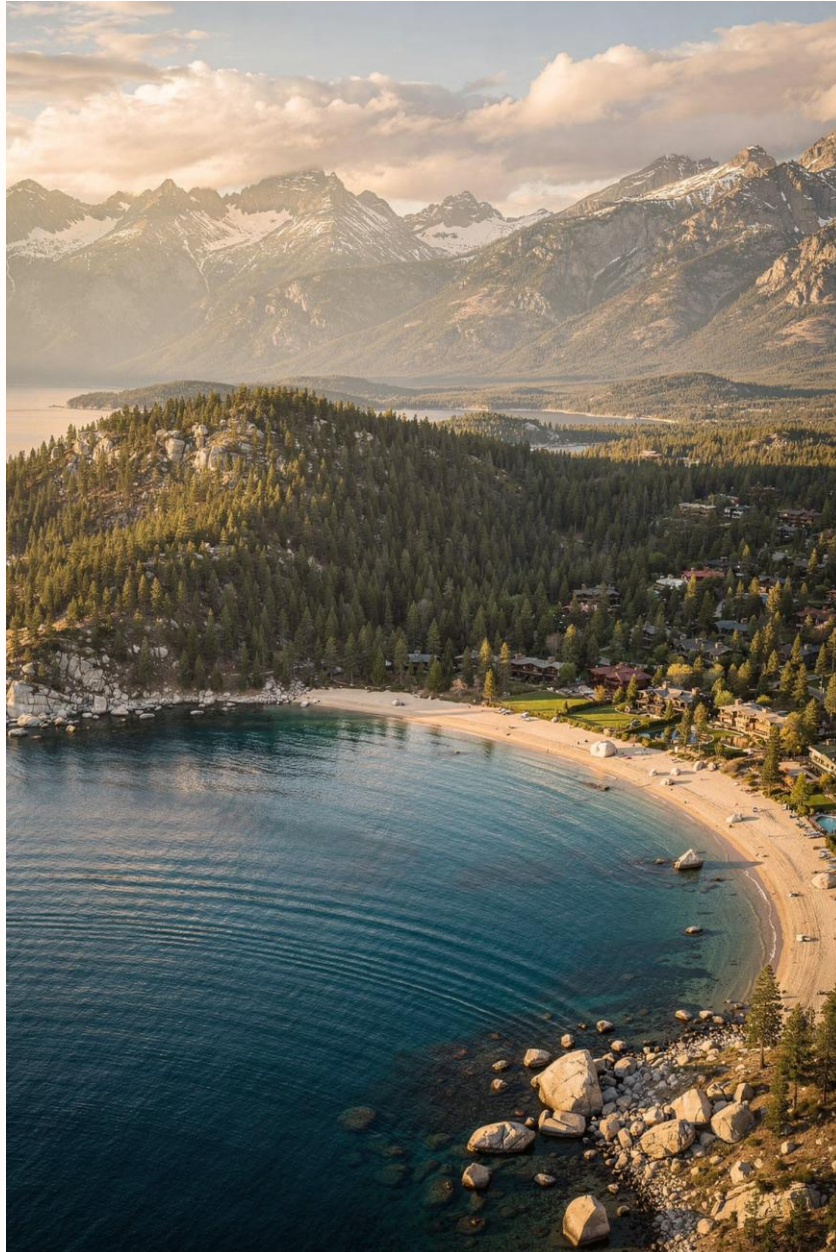
Advanced probabilistic models assess uncertainty and help planners evaluate trade-offs between competing land management strategies.

Cloud Deployment

New cloud-based architecture allows distributed teams to access EMDS from anywhere, enabling collaborative decision-making at scale.

EMDS is used nationally for forest restoration planning, landscape resilience assessments, and wildfire risk reduction across the United States.

CASE STUDY: LAKE TAHOE BASIN FOREST RESILIENCE



In one of its most impactful applications, EMDS was deployed to evaluate forest resilience strategies across the iconic Lake Tahoe Basin. The system assessed **five distinct management strategies** over a 100-year planning horizon, modeling their effects on ecosystem health, biodiversity, and wildfire risk.

By simulating long-term outcomes, EMDS helped decision-makers identify the most promising approaches to reduce catastrophic wildfire risk while preserving the basin's ecological integrity and recreational value.

Land fragmentation — where ownership is scattered across many small, irregular plots — is a persistent barrier to agricultural efficiency worldwide. LandSpaCES tackles this challenge head-on with intelligent automation.

Identify Fragmentation

Analyze existing land parcels and ownership patterns using GIS data

Optimize Redistribution

Expert system logic generates alternative consolidation scenarios

Validate & Implement

Solutions match expert human judgment
— proven in Cyprus field trials

Applied successfully in Cyprus, LandSpaCES produced consolidation plans that matched the quality of experienced human planners — but in a fraction of the time.



The contrast is striking: fragmented plots on the left limit mechanization, waste resources on boundaries, and reduce yields. Consolidated farmland on the right enables modern farming techniques, reduces costs, and dramatically improves productivity — transforming the economic potential of rural communities.

INTEGRATED LAND USE PLANNING FOR SUSTAINABLE DEVELOPMENT



Modern land management demands integrated approaches that balance competing priorities — economic growth, environmental protection, social equity, and climate resilience — through collaborative planning and advanced simulation tools.

LUWES is a pioneering multi-stakeholder platform designed to help regions navigate the complex trade-offs between economic development and emissions reduction. It brings together government, industry, and civil society to chart a sustainable course for land use.

Scenario Simulation

Models different land use futures to forecast emissions trajectories and economic outcomes under varying assumptions.

Opportunity Cost Analysis

Calculates the real economic cost of shifting land from high-emission to low-emission uses, enabling informed negotiation.

Stakeholder Negotiation

Supports transparent dialogue among diverse interests, helping identify policies that balance growth with climate commitments.

SIX KEY STEPS OF LUWES PLANNING PROCESS

The LUWES methodology follows a structured, iterative process that moves from data collection to policy implementation, ensuring that every decision is grounded in evidence and stakeholder consensus.

Compile & Zone

Gather existing plans, identify land use zones, and establish the spatial framework for analysis.

Opportunity Costs

Calculate the economic opportunity costs of proposed land use changes for each zone.

Negotiate Priorities

Identify cost bearers and facilitate stakeholder negotiation on shared priorities.

Baseline Emissions

Develop baseline emissions scenarios using current land use patterns and trends.

Implement & Monitor

Deploy policy interventions, track outcomes, and adapt strategies over time.

Simulate Reductions

Model emission reduction scenarios and evaluate their feasibility and impact.

LRIMS is a GIS-based platform that integrates diverse data layers — climate patterns, soil composition, water availability, vegetation cover, and socio-economic indicators — into a unified decision-support system for sustainable agriculture and land planning.

Climate & Soil Data

Integrates temperature, rainfall, and soil quality data to assess agricultural potential under changing conditions.

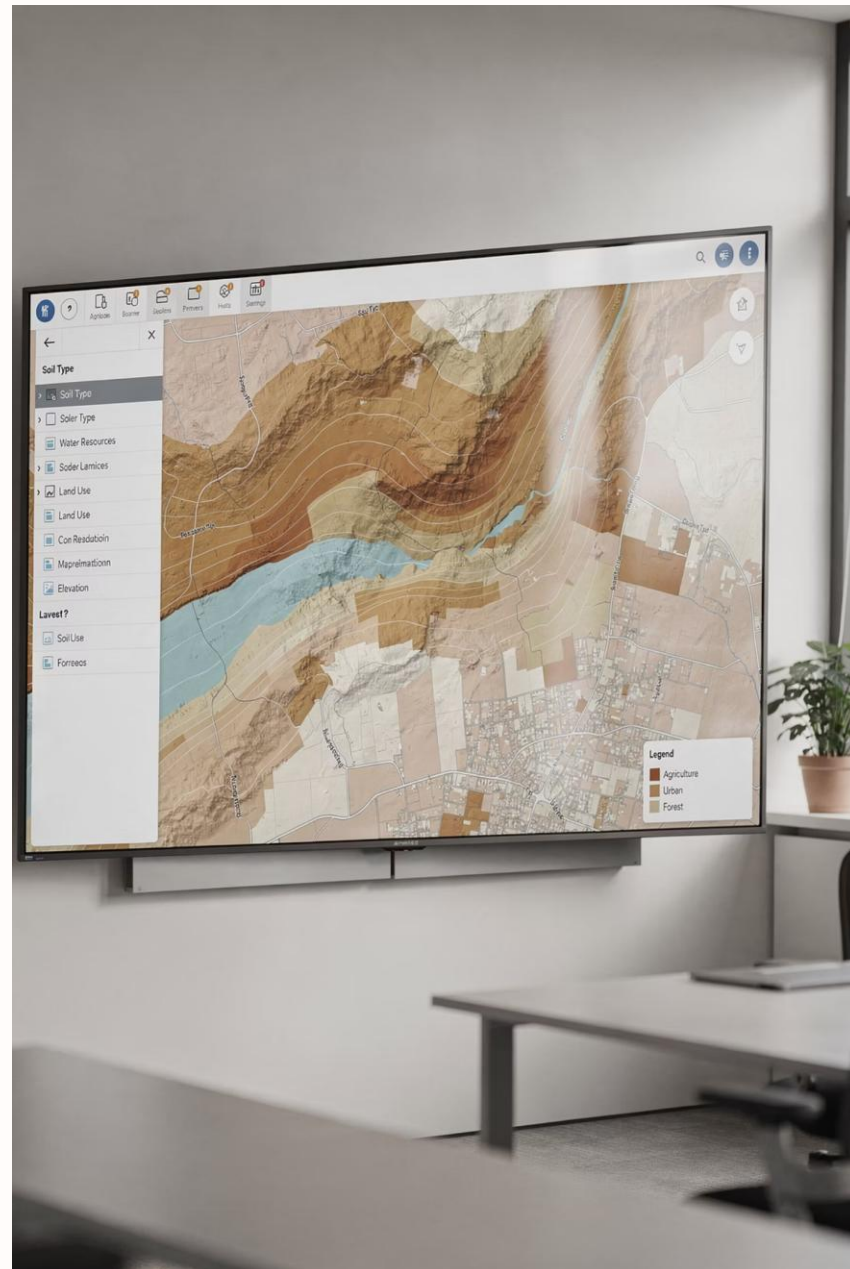
Water & Vegetation

Maps water availability and vegetation health to guide sustainable irrigation and crop planning decisions.

Socio-Economic Context

Incorporates population density, market access, and livelihood data to align planning with community needs.

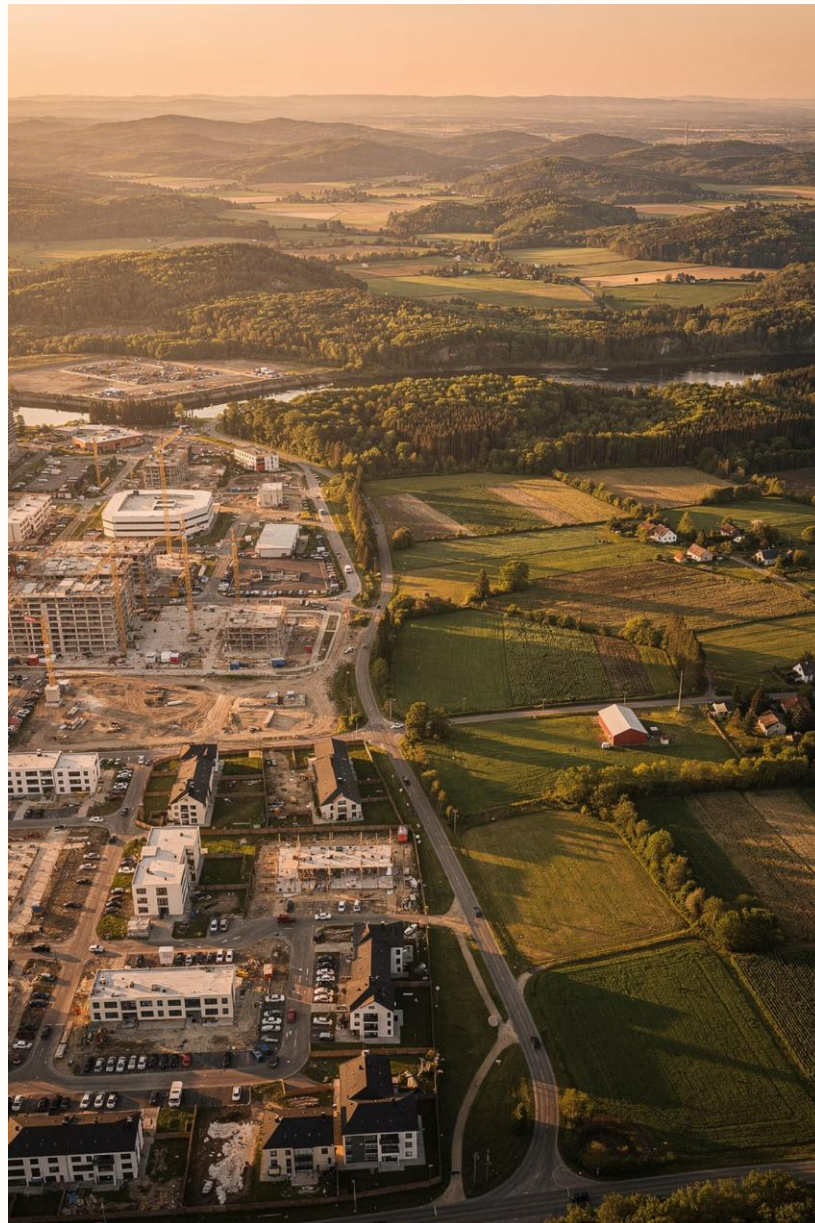
Successfully applied in Libya and similar contexts, LRIMS enables land suitability analysis aligned with evolving climate conditions — helping planners make smarter, more resilient choices.



Modern GIS platforms overlay soil composition, water resources, climate projections, and land use patterns into a single, interactive view. This integration empowers planners to identify optimal locations for agriculture, conservation, and development — turning complexity into clarity and enabling data-driven land management at unprecedented scale.

CHAPTER 5

As global pressures intensify — from surging mineral demand to rapid urbanization and climate disruption — the economics of land management face unprecedented challenges that demand innovative, equitable solutions.



RISING DEMAND FOR CRITICAL MINERALS AND INDIGENOUS LAND

The green energy transition is driving an extraordinary surge in demand for critical minerals — lithium, cobalt, nickel, and rare earth elements. Yet much of these resources lie beneath Indigenous and traditional lands, creating a profound tension between economic imperatives and human rights.

 **The Stakes Are High:** Without formal recognition and protection of Indigenous land rights, the mineral rush risks triggering disputes, displacement, and environmental destruction. Securing these rights is essential to enabling sustainable, ethical investment in the clean energy future.

450%

Mineral Demand Rise

Projected increase in demand
for critical minerals by 2050

~50%

Rights Recognized

Share of Indigenous land rights
formally recognized worldwide

By 2050, two-thirds of the global population will live in cities — placing enormous pressure on land systems to provide housing, infrastructure, green spaces, and climate resilience. The way we plan and manage urban land today will define the livability of cities for generations to come.

Housing & Green Spaces

Balancing density with livability requires innovative land use policies that integrate parks, urban farms, and affordable housing.

Disaster Risk Integration

Linking land systems with disaster risk data guides resilient urban planning — keeping vulnerable populations out of harm's way.

Equitable Growth

Land use planning must balance economic growth, social equity, and environmental protection to build inclusive, climate-ready cities.

LAND MANAGEMENT AS A CATALYST FOR SUSTAINABLE ECONOMIC FUTURES

Unlock Capital

Strong, transparent land systems unleash private investment, create jobs, and generate stable infrastructure funding.

Balance Ecosystems

Sustainable land management proves that economic viability and ecosystem health are not in conflict — they are inseparable.

Empower Decisions

Decision support tools and integrated planning enable smarter, more equitable land use at every scale.

Build Resilience

Investing in land systems today shapes resilient economies and thriving communities for generations to come.



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