



**LAND MANAGEMENT, ENVIRONMENT & SOLID-WASTE:  
INSIDE EDUCATION AND BUSINESS IN CENTRAL ASIA  
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**MICRO-CREDENTIAL**

**LAND MANAGEMENT IN CENTRAL ASIA**

**2.- Land Management Concepts and Control Processes**

***Concept of Land Management and Control Systems  
PDF W02***



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## 1. SUMMARY OF KEY IDEAS

- Land management and control systems refer to the organized framework used to regulate, monitor, and guide the use and protection of land resources.
- These systems combine administrative, legal, technical, and economic tools to ensure that land is used efficiently and sustainably.
- Land management focuses on planning, allocation, development, and protection of land, while land control ensures compliance with laws, regulations, and land use policies.
- Modern land management systems rely on cadastral systems, land registration, geographic information systems (GIS), and monitoring mechanisms.
- Effective land management and control systems help prevent illegal land use, land degradation, and conflicts over land ownership

## 2. LEARNING OBJECTIVES

After studying this topic, students should be able to:

1. Define the concept of land management and control systems.
2. Explain the main functions and elements of land management and control.
3. Understand the role of land control in ensuring lawful and efficient land use.
4. Identify the institutions and tools used in land management systems.
5. Recognize the importance of land management and control in sustainable development and environmental protection.

## 3. INTRODUCTION

Land is a fundamental natural resource that supports agriculture, urban development, infrastructure, and ecological systems. Because land resources are limited, it is necessary to manage them carefully and regulate their use. For this reason, countries establish land management and control systems that help organize the distribution, use, and protection of land.

The concept of land management refers to the planning, organization, and administration of land resources to achieve economic, environmental, and social objectives. At the same time, land control systems are responsible for monitoring land use, enforcing regulations, and preventing violations such as illegal land occupation or misuse.

Land management and control systems involve several important components, including land use planning, land registration, cadastral systems, land monitoring, and government supervision. These

systems help ensure transparency in land ownership, improve land productivity, and support sustainable development.

#### 4. DEFINITION OF LAND MANAGEMENT

An in-depth exploration of how humanity plans, protects, and sustains the land that supports all life on Earth — from agricultural fields to urban centers, from ancient forests to protected wilderness. Land management is the **intentional process of planning, organizing, and directing activities** that affect how land is used, developed, and conserved. It is a multidisciplinary practice that draws on ecology, economics, urban planning, agriculture, and public policy to achieve specific social, environmental, and economic objectives. The scope of land management is remarkably broad. It encompasses the use, development, and conservation of land resources for **multiple purposes** — including food production, housing, recreation, biodiversity protection, water management, and industrial development. Whether applied to a single parcel of farmland or an entire national territory, land management provides the framework for making informed decisions about one of humanity's most critical assets.

Effective land management requires a deep understanding of soil science, hydrology, ecology, legal frameworks, and community needs. It is both a science and an art — relying on data-driven analysis while also demanding sensitivity to cultural, historical, and social contexts. **Land management is not a single action — it is an ongoing, adaptive process** that responds to changing environmental conditions, population pressures, technological advances, and societal priorities. It is as relevant in a dense urban neighborhood as it is in a remote wilderness area. Our planet faces an unprecedented convergence of environmental pressures. Rising global temperatures are altering weather patterns, increasing the frequency of droughts and floods, and accelerating soil degradation across every continent. Approximately **75% of the Earth's land surface** has been significantly altered by human activity, according to the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES). Without deliberate, science-based land management, these trends will only accelerate. Deforestation, urban sprawl, and intensive agricultural practices are stripping the land of its natural resilience. Ecosystems that once absorbed carbon, filtered water, and supported wildlife are being lost at alarming rates. Land management offers the framework to reverse these trends — or at least slow them — by integrating ecological principles into every decision about how land is used.

At the heart of land management lies a delicate balancing act: meeting the needs of a growing human population — projected to reach **9.7 billion by 2050** — while preserving the ecosystems and biodiversity upon which all life depends. This balance is not merely aspirational; it is essential for survival. Healthy land supports food production, clean water, carbon sequestration, and countless other **ecosystem services** that underpin human well-being. When land is degraded, these services diminish, often with cascading consequences for communities, economies, and cultures. Effective land management ensures that development and conservation are not viewed as opposing forces, but as complementary goals that can — and must — be pursued together.

The choices we make about land use today will determine the quality of life for generations to come. This reality makes land management not just a technical discipline, but a moral responsibility.



As the world becomes increasingly urbanized — with over **55% of the global population** now living in cities and that figure projected to reach 68% by 2050 — urban land management has emerged as one of the most consequential forms of land stewardship. How cities plan, zone, and develop their land determines the quality of life for billions of people. Zoning is the foundational tool of urban land management. By designating specific areas for residential, commercial, industrial, and recreational use, zoning ensures that incompatible activities are separated and that the urban fabric functions efficiently. Modern zoning approaches increasingly incorporate **mixed-use development**, which reduces commute times, encourages walkability, and creates more vibrant neighborhoods.

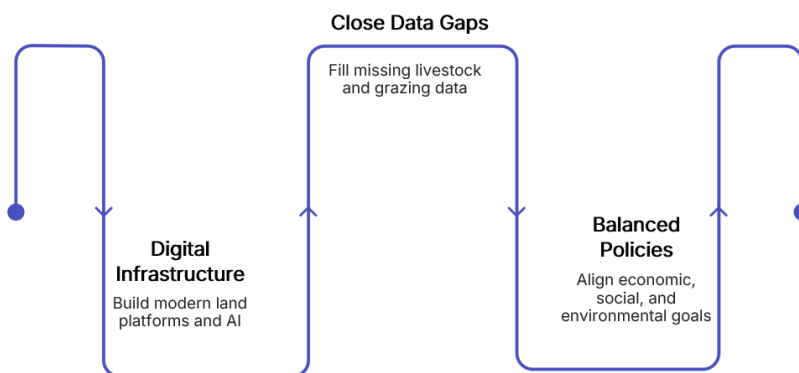
#### 4.1. Land Managed and Managing Systems

From the soil beneath our feet to the digital platforms that track every parcel, land management sits at the intersection of technology, policy, ecology, and human aspiration. This presentation explores how modern systems are reshaping the way we govern, protect, and optimize one of our most fundamental resources — the land itself. Land use decisions shape economies, ecosystems, and communities on every continent. How we allocate, regulate, and steward land determines food availability, housing affordability, biodiversity health, and climate resilience. Yet these decisions are increasingly complex, driven by competing demands and accelerating change. By 2050, nearly 70% of the world's population will live in cities, placing immense pressure on surrounding land for housing, infrastructure, and services. Rising temperatures, shifting rainfall, and extreme weather events are transforming land productivity and threatening vulnerable ecosystems worldwide.

The magnitude of global land management challenges is staggering. Modern systems now track and administer **over 3 million land assets worldwide**, yet fragmented ownership structures, overlapping jurisdictions, and complex legal frameworks continue to create inefficiencies and disputes. Rising land values in both urban and rural settings have intensified competition among stakeholders — from governments and developers to farmers and conservation groups. Each party brings legitimate but often conflicting demands for how land should be used, protected, or developed. Without coordinated, transparent systems, these competing pressures lead to degradation, inequality, and missed opportunities for sustainable growth.

Modern GIS mapping overlays reveal the intricate mosaic of land uses — agriculture, urban development, and natural forests competing for space. These spatial visualization tools have become indispensable for planners, policymakers, and land managers seeking to understand patterns, resolve conflicts, and plan for the future. The digital revolution has fundamentally transformed land administration. Platforms like **LAMS** (Land Asset Management System) and **MaintStar** have replaced paper-based records with powerful, integrated software ecosystems that streamline data management, automate workflows, and connect stakeholders in real time. All land records, ownership documents, and transaction histories stored in a single, secure cloud environment — dramatically improving transparency and reducing errors associated with manual record-keeping. From lease renewals to compliance tracking, automated workflows eliminate bottlenecks, ensure deadlines are met, and free personnel to focus on strategic decision-making rather than administrative tasks. Seamless integration with Geographic Information Systems enables spatial visualization, overlay analysis, and map-based decision support — turning raw data into actionable geographic intelligence.

Across the world, communities are demanding — and increasingly winning — a seat at the table where land use decisions are made. From town halls in rural Scotland to participatory planning workshops in urban centers, citizen engagement is proving essential for creating land governance that is both legitimate and effective. When people have a say in how their land is used, outcomes are more equitable, resilient, and widely supported.



The oil and gas sector manages thousands of lease agreements, right-of-way contracts, and surface use permits across vast geographies. Missing a single obligation deadline can result in millions in penalties or lost production rights. Throughout this exploration, one truth has emerged with clarity: the way we

manage land determines the health of our ecosystems, the fairness of our economies, and the resilience of our communities. By harnessing technology, strengthening governance, and centering human values, we can unlock sustainable opportunities that serve both people and planet.

## 5. CONSCIOUS AND SPONTANEOUS LAND MANAGEMENT

Across the globe, Indigenous communities have nurtured the land for millennia through practices rooted in reciprocity, reverence, and deep ecological knowledge. This presentation explores how conscious and spontaneous stewardship — drawing on ancient wisdom and adaptive, place-based approaches — can heal degraded landscapes, restore biodiversity, and reconnect humanity with the living systems that sustain us all. For most of human history, land was held in common — managed collectively by communities who understood themselves as part of the ecosystems they inhabited. Over the past three centuries, a radical transformation took place, reshaping the very concept of land from a shared living entity into a private commodity to be bought, sold, and exploited.

Industrial land use strips forests bare, depletes soils, and fractures habitats. Deforested regions lose up to 90% of their original biodiversity, leaving behind barren, erosion-prone landscapes vulnerable to climate extremes. Where Indigenous communities retain stewardship, forests thrive. Research consistently shows that Indigenous-managed lands harbor greater biodiversity, store more carbon, and exhibit stronger resilience to drought, fire, and disease.

The prevailing Western paradigm treats land as a resource to be dominated and optimized for human benefit alone. This anthropocentric approach externalizes environmental costs — pollution, habitat destruction, and climate disruption — treating them as acceptable trade-offs for short-term economic gain. Environmental damage is pushed onto future generations, marginalized communities, and non-human species who bear the greatest burden. Around the world, Indigenous peoples have cultivated sophisticated systems of land care grounded in spiritual connection, collective intelligence, and deep ecological knowledge. Their practices offer transformative blueprints for healing the earth.

In Aotearoa New Zealand, the Māori concept of *kaitiakitanga* embodies a profound philosophy of guardianship that extends far beyond environmental management. It is a holistic practice that weaves together ecological care with spiritual growth, cultural identity, and community wellbeing. Stewardship is understood as a journey of personal and collective growth — an awakening of consciousness that deepens the guardian's relationship with the land and all living beings.

On the slopes of Hawai'i Island, the Pu'uwa'awa'a Community-Based Subsistence Forest Area represents a groundbreaking model of Indigenous-led ecological restoration. Once dominated by fire-prone invasive grasslands, this landscape is being transformed back into thriving native dryland forest through a framework built on cultural values. Across Australia, Indigenous ranger programs are demonstrating the power of cultural burning and traditional land management within protected areas. Rangers bring generations of knowledge to bear on modern conservation challenges — combining cultural burning

practices with scientific monitoring to manage fire risk, restore native vegetation, and protect endangered species. Their work proves that the most effective conservation happens when those with the deepest connection to Country lead the way.

The most resilient landscapes are those managed by the communities who know them best. Place-based stewardship weaves together ecological knowledge, cultural memory, and collective action to create landscapes that nourish both people and planet. The Indigenous Landscape Initiative represents a growing movement to return land management authority to Native knowledge-keepers and their communities. By centering traditional ecological knowledge alongside modern restoration science, these projects demonstrate that the most effective approach to landscape resilience is also the most ancient.

At the heart of regenerative land management lies community. Across continents, gatherings like these bring together Indigenous knowledge holders, farmers, conservationists, and youth to share ancestral seeds, traditional planting techniques, and stories of the land. These moments of connection are not peripheral to restoration — they *are* restoration, rebuilding the social fabric that holds living landscapes together. When knowledge flows freely between generations and cultures, the land responds in kind.

The path forward is neither purely technical nor purely traditional — it is a living integration of consciousness, adaptability, and joy. What does it look like to manage land with both intention and spontaneity, both wisdom and wonder?

### 5.1. Elements of the Land Management Process

A comprehensive guide to understanding, planning, implementing, and sustaining responsible land stewardship for a resilient future. Land management is the deliberate process of overseeing the use, development, and conservation of land resources to achieve sustainable development outcomes. It is not confined to a single discipline — rather, it encompasses a wide spectrum of activities including agriculture, forestry, water resource management, human settlements, recreation, and conservation. At its core, land management seeks to balance competing demands on the land, ensuring that each parcel serves its highest and best use while preserving ecological integrity for future generations.

Effective land management requires collaboration among planners, ecologists, policymakers, and communities to create strategies that harmonize human activity with natural systems. Healthy land underpins nearly every aspect of human well-being. It provides the ecosystem services we depend on daily — clean air, fresh water, fertile soil, and biodiversity. Yet, these services are under mounting pressure from population growth, climate change, and unsustainable land-use practices. Without intentional management, land degradation accelerates — topsoil erodes, water tables drop, and habitats fragment. The consequences ripple through food security, public health, and economic stability. Land management intervenes in this cycle, establishing practices that prevent degradation and promote long-term productivity, ensuring that the land continues to serve both people and nature.

Modern land management operates within a paradigm that integrates four interrelated dimensions: **rights** (who can use the land), **responsibilities** (how it must be maintained), **restrictions** (what activities are limited), and **risks** (what threats must be managed). This framework supports governments, businesses, and communities by providing multifunctional information systems that inform decision-making at every level. From productive farmland and managed forests to bustling urban centers and protected natural parks, effective land management recognizes that each land use plays a vital role in a healthy, functioning landscape. The challenge — and the art — lies in ensuring these diverse uses coexist in balance.

The Meridean Barrens Management Plan offers an instructive example of land management planning in action. This plan began with a detailed assessment of the site's ecological features — rare prairie habitats, native plant communities, and sensitive wildlife corridors — alongside its community values, including educational and recreational significance.

The plan's goals center on **habitat preservation**, maintaining the barrens' unique ecological character, while allowing **controlled public access** that fosters environmental education without compromising the landscape. Importantly, the plan incorporates **adaptive strategies for climate change resilience**, recognizing that shifting weather patterns may alter vegetation composition and fire regimes in the decades ahead. This forward-looking approach ensures the plan remains effective well into the future. A well-designed management plan map overlays property boundaries with resource zones, conservation areas, and planned activity zones. These visual tools translate complex data into actionable spatial guidance — making it easy for land managers, regulators, and stakeholders to understand precisely what happens where, and why. Successful land development requires a disciplined engineering approach that balances technical requirements, regulatory compliance, and community aspirations. These eight critical elements form the backbone of any well-executed development project.

#### Encroachments & Unauthorized Uses

Trespassing, illegal dumping, and boundary encroachments require firm but dignified responses grounded in legal authority and community dialogue.

#### Climate Change Adaptation

Shifting precipitation patterns, rising temperatures, and increased wildfire risk demand adaptive strategies — from forest species transitions to enhanced water management infrastructure.

#### Technology- Enabled Enforcement

Remote sensing, drone surveillance, satellite imagery, and GIS analytics provide powerful tools for monitoring vast landscapes and detecting changes before they become crises.

Modern land stewardship is increasingly powered by technology. Drones equipped with multispectral cameras can survey hundreds of acres in a single flight, detecting invasive species encroachment, erosion

patterns, and changes in vegetation health that would be impossible to spot from the ground. Combined with GIS platforms and real-time data dashboards, these tools transform land management from a reactive discipline into a proactive science — identifying problems before they escalate and enabling faster, more informed decision-making.

## 6. FUNCTIONS OF LAND MANAGEMENT

The sheer scale of federal land management is staggering. In Nevada alone, the Bureau of Land Management oversees **more than 48 million acres** under Resource Management Plans (RMPs). These comprehensive plans define how every parcel of public land is used, protected, and monitored — from mineral extraction rights to wildlife corridors and recreational access points.

Land management is not a bureaucratic abstraction. It directly shapes economic opportunity, environmental resilience, and social well-being for millions of Americans. The decisions embedded in RMPs ripple outward, influencing local employment, regional water quality, energy production, and the long-term health of entire ecosystems. Getting land management right is essential to building a sustainable future. Effective land management is far more than zoning or permitting — it is the **integrated stewardship of land, water, biodiversity, and environmental systems**. At its best, land management weaves together scientific knowledge, policy frameworks, and community engagement to ensure that natural resources serve both present needs and future aspirations. The stakes could not be higher. Land management directly supports **food security** by maintaining productive agricultural soils. It safeguards **ecosystem services** — from pollination and carbon storage to clean water filtration. And it underpins **community well-being** by providing stable tenure, equitable access, and recreational opportunities that sustain physical and mental health. Land is not static terrain — it is a **dynamic, living system** that responds to how we treat it. Healthy rangelands sustain livestock, support native vegetation, filter water, and sequester carbon. When managed with care and scientific rigor, land becomes a self-renewing engine of ecological and economic productivity that serves communities for generations.

One of the most fundamental functions of land management is **designating how land will be used**. This involves careful planning to allocate parcels for agriculture, livestock grazing, outdoor recreation, conservation, energy development, and urban growth. Each designation carries trade-offs that must be weighed against competing demands. Federal agencies like the BLM operate under a mandate of **"multiple use and sustained yield"** — ensuring that public lands serve a wide variety of needs without compromising their long-term productivity. In Nevada, Resource Management Plans define which lands are open, restricted, or closed for mineral exploration, wildlife habitat protection, and recreational access.

Protecting the ecological integrity of our landscapes is a cornerstone of effective land management. This means safeguarding **watersheds, wildlife habitat, and the ecological processes** that sustain life — from soil formation and nutrient cycling to pollination and natural flood control. Land managers apply rigorous **land health standards** to evaluate whether soils remain productive, water quality stays high, and biodiversity is maintained. The BLM's **Fundamentals of Land Health** provide a science-based framework

that guides restoration and protection efforts across millions of acres, ensuring that degraded lands are rehabilitated and healthy lands remain resilient in the face of climate change and human pressure.

Livestock grazing on public lands is one of the most visible — and contentious — functions of land management. Agencies like the **BLM and US Forest Service** administer millions of acres of grazing allotments through thousands of permits, each defining herd sizes, grazing seasons, and land use conditions. When done well, managed grazing can actually improve grassland health by stimulating plant growth and reducing wildfire fuel loads. When done poorly, it leads to soil erosion, water pollution, and habitat loss.

The difference between healthy land and degraded land is often the result of management decisions — not natural forces. **Overgrazing, unchecked development, and neglect** can strip soil of its productive capacity, destroy wildlife habitat, and contaminate water sources. These consequences are not just environmental; they are economic and social, undermining livelihoods, reducing property values, and eroding community resilience. The visual contrast between well-managed and poorly managed landscapes tells a powerful story about the stakes of our choices.

### 6.1. Economic Nature of Land Management

An in-depth exploration of how land — our most fundamental economic asset — shapes prosperity, drives sustainability, and demands integrated stewardship for future generations. Understanding the irreplaceable foundation upon which all economic systems are built — and why land demands a category of its own in economic thinking. Land is far more than a surface for buildings and farms. It encompasses a vast array of natural resources — soil, minerals, water, the atmosphere, plant life, and animal populations — that together form the indispensable base for all economic production. Without access to these resources, no enterprise can function, no capital can be formed, and no society can prosper.

As economist **Raleigh Barlowe** articulated in 1958, land is pivotal not only for day-to-day entrepreneurship but also for long-term capital accumulation and the sustained prosperity of societies. His foundational insight remains deeply relevant: the way we manage land today determines the economic opportunities available to future generations.

Traditional economic metrics such as land rent and capitalization capture only a fraction of land's true value. While these figures reflect what markets are willing to pay, they systematically ignore the vast array of **ecosystem services** that land provides — services that are essential to human well-being but rarely carry a price tag. These include **supporting services** like nutrient cycling, **regulating services** such as water purification and carbon sequestration, and **cultural services** including recreation and spiritual significance. By omitting these values, we systematically undervalue our natural capital, leading to degradation that imposes enormous hidden costs on society (Mirzabaev et al., 2015).

This aerial perspective reveals how agriculture, forests, urban areas, and water bodies coexist within a single landscape. Each land use generates distinct economic values — from crop yields and timber revenue

to water filtration and biodiversity habitat. Recognizing these overlapping contributions is critical to understanding land's true economic worth and making informed management decisions.

Integrated Land Management represents a paradigm shift in how we approach land use planning. Rather than managing forests, water resources, agriculture, settlements, and infrastructure as separate sectors, ILM strategically plans all land uses together to **reduce cumulative human impacts** and sustain natural resources for the long term. This approach recognizes that decisions made in one sector inevitably affect others. A dam project impacts downstream agriculture. Urban expansion reduces forest cover. Agricultural runoff degrades water quality. ILM seeks to manage these interdependencies proactively rather than reactively.

**Zambia's WAVES program** (Wealth Accounting and Valuation of Ecosystem Services) exemplifies this integrated approach, combining forest landscape restoration with national economic planning — supported by the World Bank and Global Environment Facility (GEF).

## 6.2. Land Management Concepts Review

An in-depth exploration of the principles, practices, governance frameworks, and emerging trends shaping how we steward the world's most vital resource — the land beneath our feet. Land management is the comprehensive process of overseeing and directing land use and development to strike a careful balance between human needs and the health of natural ecosystems. It encompasses a broad spectrum of disciplines — from agriculture and forestry to water resources, urban development, and biodiversity conservation.

Effective land management requires a holistic paradigm that integrates social, economic, ecological, and institutional factors into unified decision-making. No single entity can manage land in isolation — it demands coordination across governments, private enterprises, and local communities working toward shared objectives. This mosaic illustrates the diversity of land uses that land managers must reconcile — productive farmland, thriving forests, expanding urban areas, and vital water bodies. Each land type provides unique ecosystem services and economic value, yet all are interconnected through shared watersheds, climate systems, and human communities. Effective land management recognizes these interdependencies and plans accordingly.

Nature operates by rules that transcend property lines. Understanding these ecological principles is fundamental to making land management decisions that endure. On the ground, sustainable soil conservation looks like farmers applying mulch, building terraces, planting cover crops, and carefully managing water flow across their fields. These techniques — refined over generations and enhanced by modern science — represent the frontline of the fight against land degradation. When practiced consistently, they can restore soil health within a few seasons and dramatically increase crop yields while protecting downstream water resources. A science-driven approach that places soil ecosystem services at the center of all land use decisions — ensuring every acre delivers its maximum ecological and economic potential.

Land management doesn't happen in a vacuum — it's shaped by the laws, institutions, rights, and power dynamics that determine who controls the land and how it is used. Land Administration Systems form the institutional backbone of land governance worldwide. They provide the frameworks through which societies define, allocate, and manage rights to land — from individual ownership to communal stewardship.

LAS define who owns land, what they can do with it, and what restrictions apply — creating the legal certainty needed for investment and stewardship.

## 7. CONCLUSIONS

Land management and control systems play a vital role in ensuring the rational and sustainable use of land resources. They help coordinate land allocation, regulate land use activities, and protect land from degradation and misuse.

By combining effective policies, legal frameworks, and modern technologies such as GIS and digital land records, governments can improve land governance and ensure fair access to land resources. Strengthening land management and control systems is therefore essential for economic development, environmental sustainability, and social stability.

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