ERASMUS-EDU-2023-CBHE
Project number: 101129032

Duration: 36 months
(01/01/2024 – 31/12/2026)

LESLIE
LAND MANAGEMENT
ENVIRONMENT &
SOLID-WASTE

Co-funded by
the European Union

BUKHARA STATE UNIVERSITY
1930

MICRO-CREDENTIAL

CLIMATE CHANGE FOR SUSTAINABLE LAND MANAGEMENT IN CENTRAL ASIA

3.- The Carbon Cycle, Land Use and SLM

Land Use Change, Desertification and Soil Carbon in Central Asia

CC-W03-V11

Why Land Matters in Central Asia



FOOD

Productive land provides food production, livestock grazing, and water regulation.

STABILITY

In arid and semi-arid climates, the health of the land dictates both economic survival and environmental stability.

CARBON

Beyond surface agriculture, land functions as a massive, critical carbon reservoir.

HEALTHY LAND | The foundation for food security, carbon storage, and regional stability.

Co-funded by the European Union

Land Use Change in Central Asia

Pre-Soviet Era

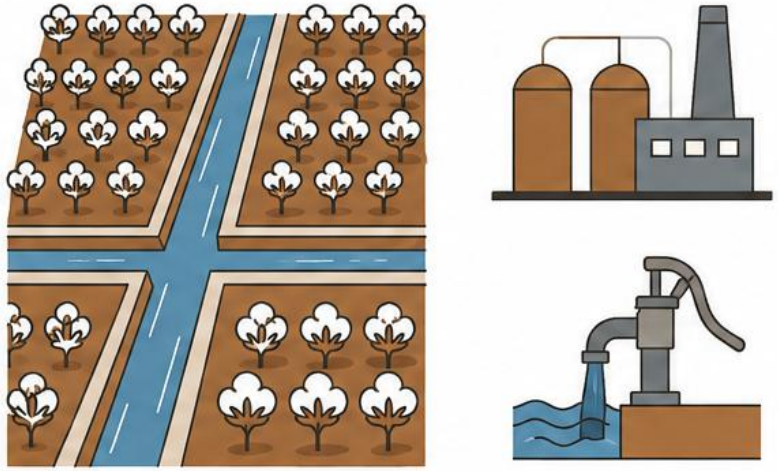


Dryland ecosystems

- Native vegetation
- Nomadic grazing

Large-Scale Irrigation & Agricultural Expansion

Soviet / Post-Soviet Era



- Irrigated agriculture
- Large-scale irrigation
- Cotton expansion

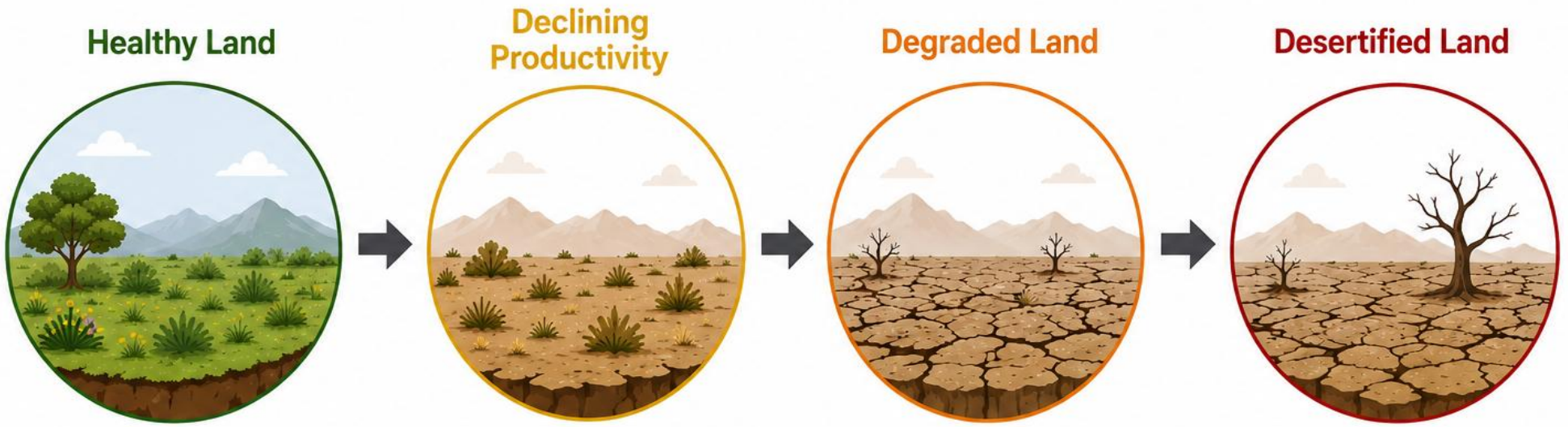
Co-funded by the European Union

Drivers of Land Degradation

	Soil Impacts	Water Impacts
Human Practices	**Intensive Cultivation**  Frequent tillage disrupts soil structure and accelerates organic matter loss.	**Poor Irrigation**  Inadequate drainage combined with high evaporation leads to severe soil salinization.
Environmental Stressors	**Overgrazing**  Excessive livestock pressure strips vegetation, exposing topsoil to the elements.	**Climate Stress**  Droughts and high climate variability act as threat multipliers, accelerating erosion.

Co-funded by the European Union

Understanding Desertification



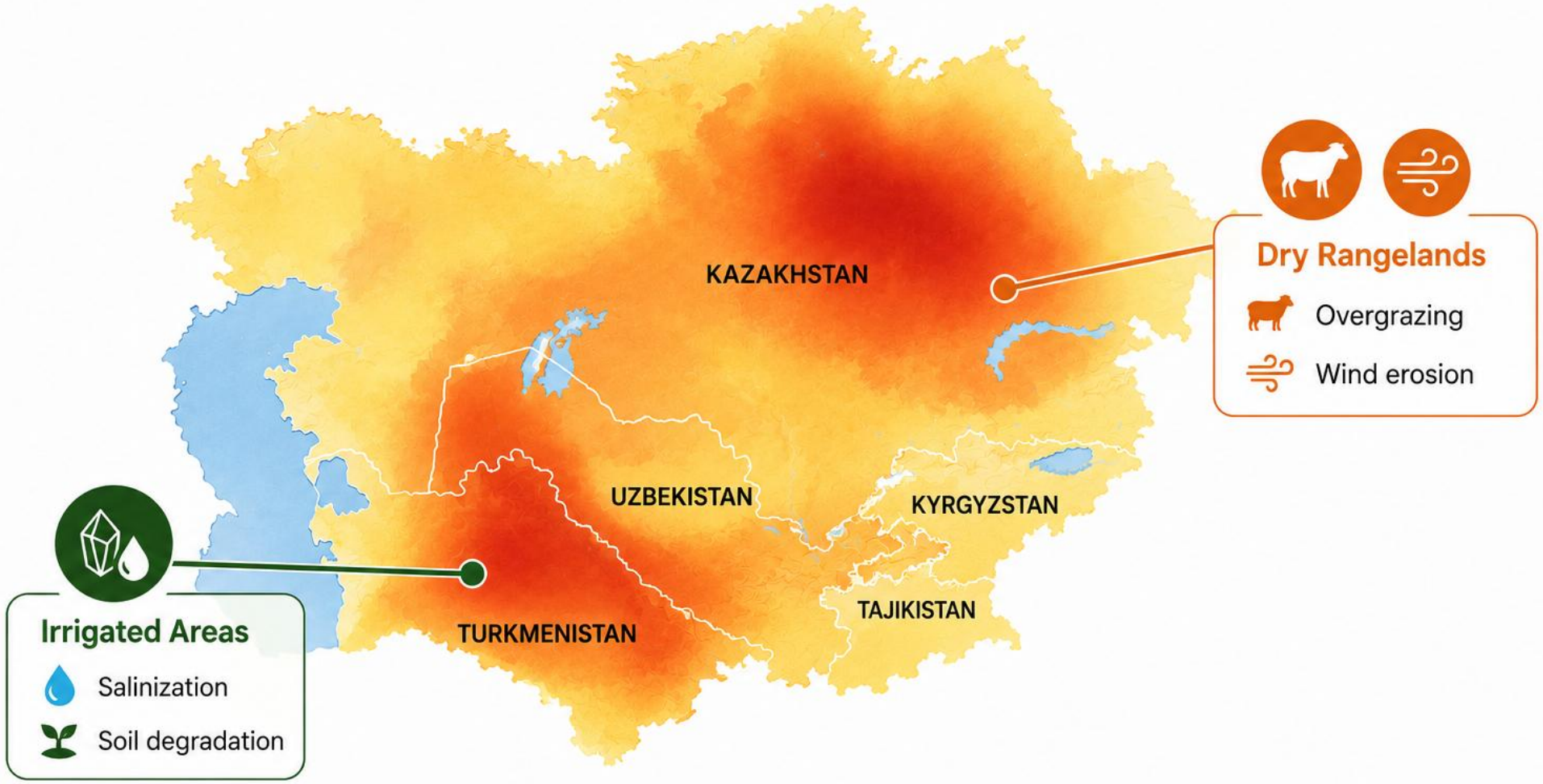
Impacts Over Time

- Declining productivity
- Reduced water availability
- Loss of biodiversity and ecosystem services
- Impacts on livelihoods, food security, and stability

Key Takeaway: Desertification is a chronic loss of soil productivity, not simply moving sand dunes.

Co-funded by the European Union

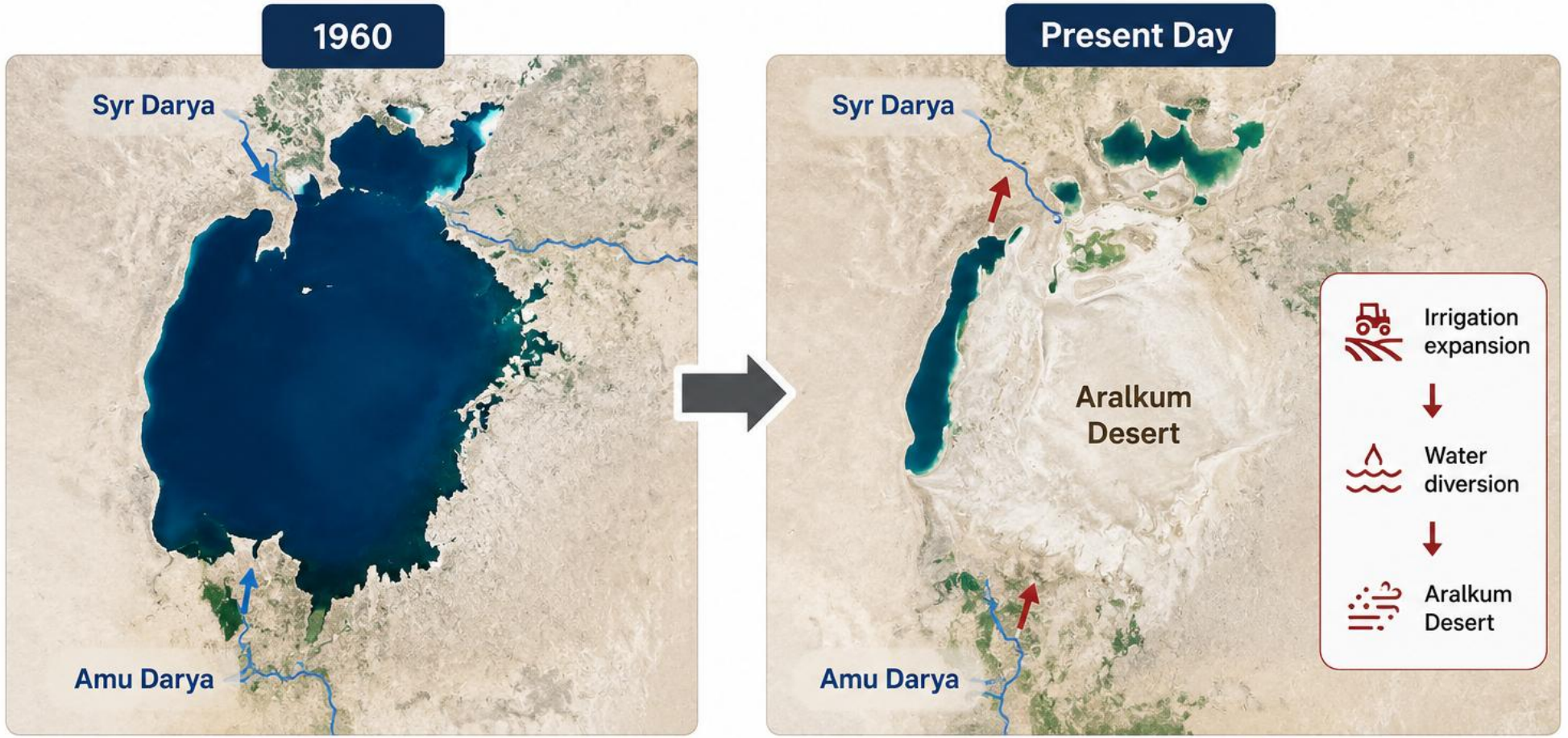
Desertification in Central Asia



Desertification affects both **farming** and **grazing** systems across Central Asia.

Co-funded by the European Union

Case Study: The Aral Sea Basin

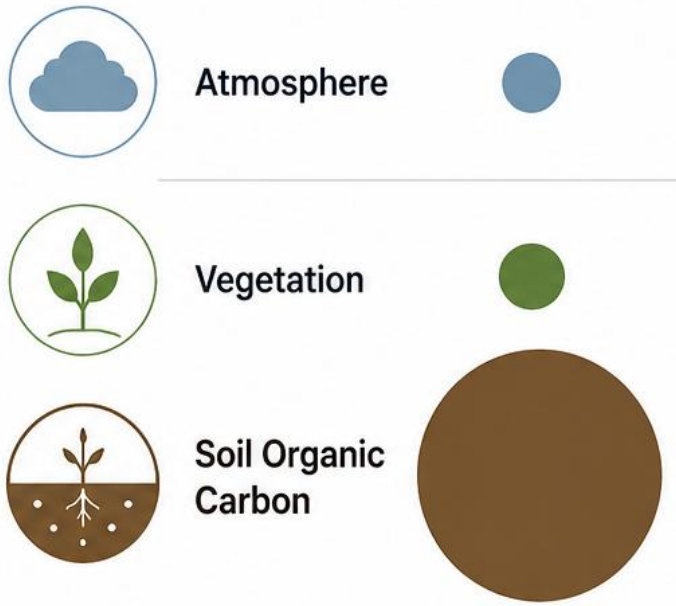


Key Takeaway: The Aral Sea is the ultimate symbol of how unsustainable water use triggers catastrophic land degradation.

Co-funded by the European Union

Soil Organic Carbon: The Hidden Carbon Reservoir

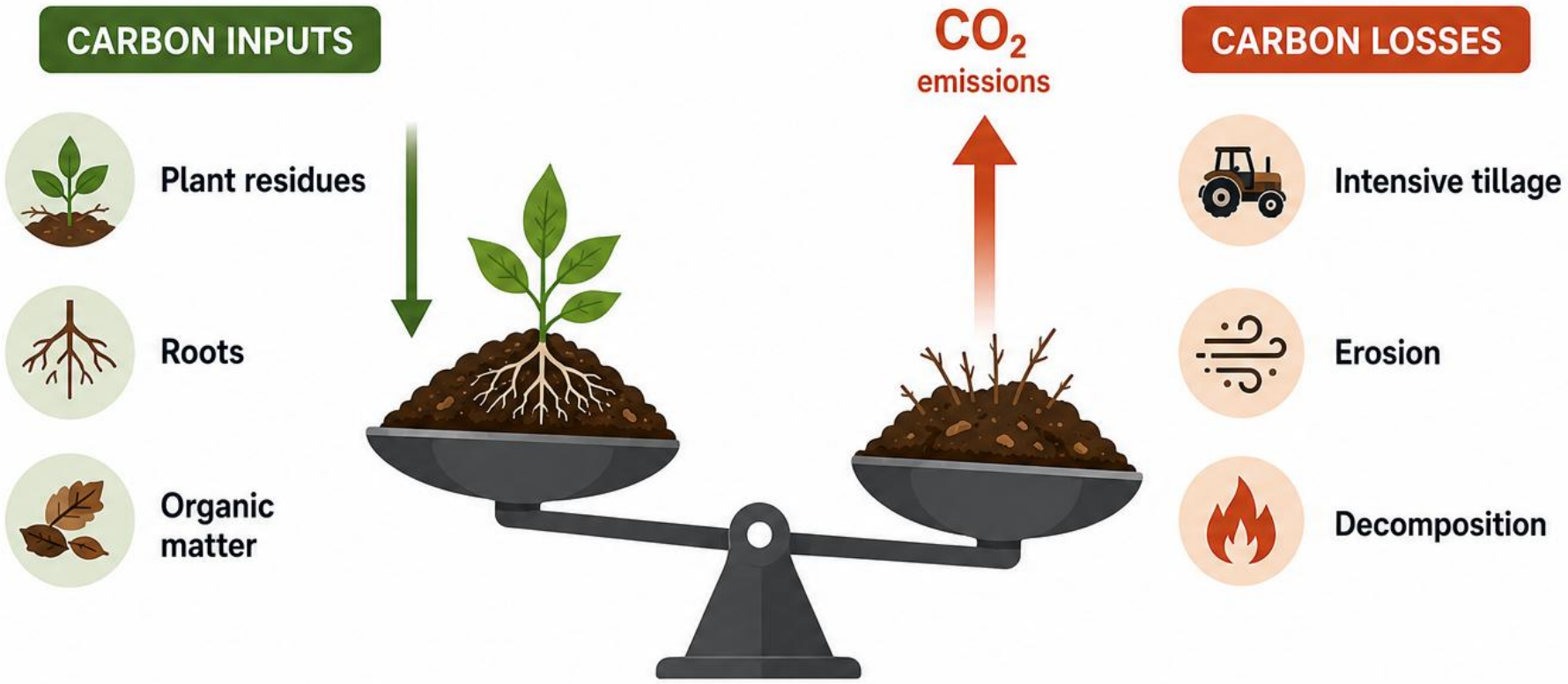




Key Takeaway: Soils store more carbon than the atmosphere and all vegetation combined—making them a critical foundation for land health and climate stability.

Co-funded by the European Union

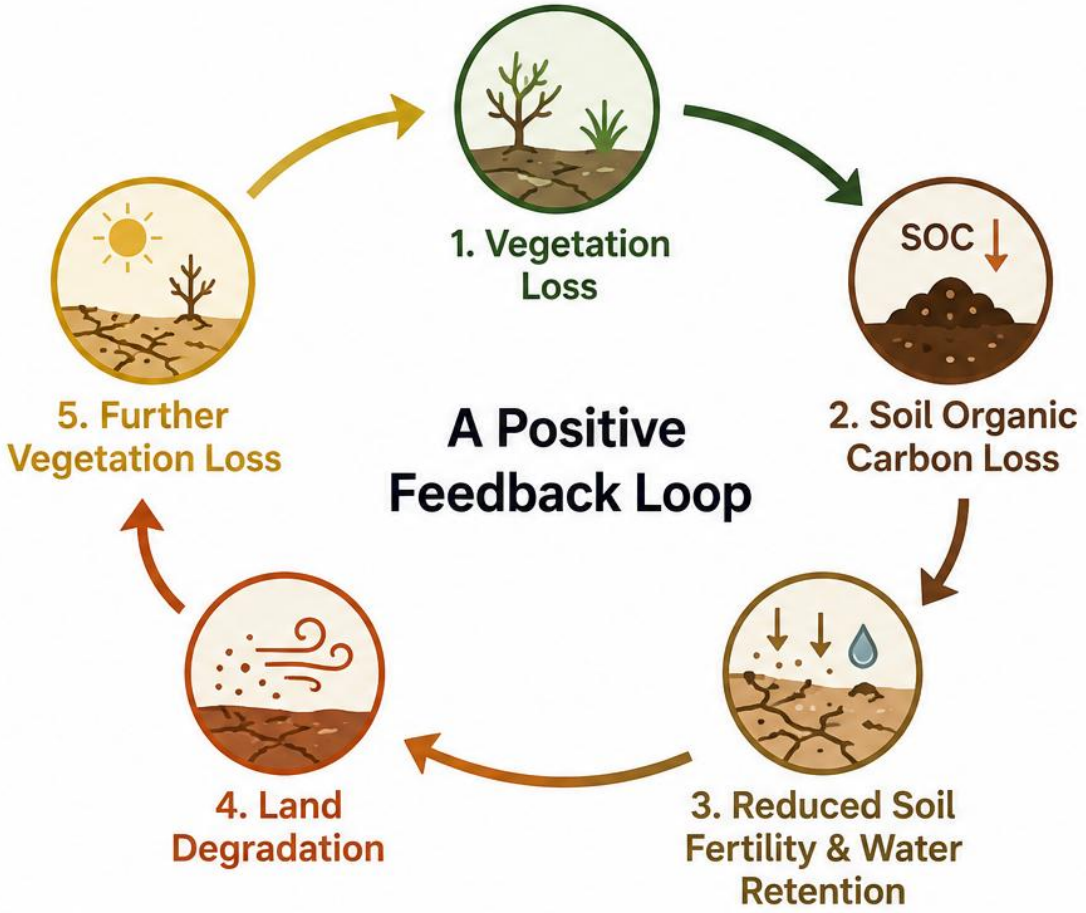
How Land Use Change Affects Soil Carbon



When losses exceed inputs, soils lose carbon and fertility. → CO_2 Soils shift from carbon sinks to carbon sources.

Co-funded by the European Union

Desertification and Soil Carbon Loss



KEY TAKEAWAY: Desertification and carbon loss fuel each other, creating a vicious cycle that is difficult to reverse.

Co-funded by the European Union

Evidence from Central Asia

Widespread land degradation across the region drives soil carbon loss



Wind & Water Erosion

Up to **75%** of agricultural land is affected by erosion in some areas.

Soil Salinization

Affects over **20 million** hectares, reducing soil fertility and productivity.

Overgrazing

Degrades rangelands across vast areas, lowering vegetation cover and soil carbon.

Co-funded by the European Union

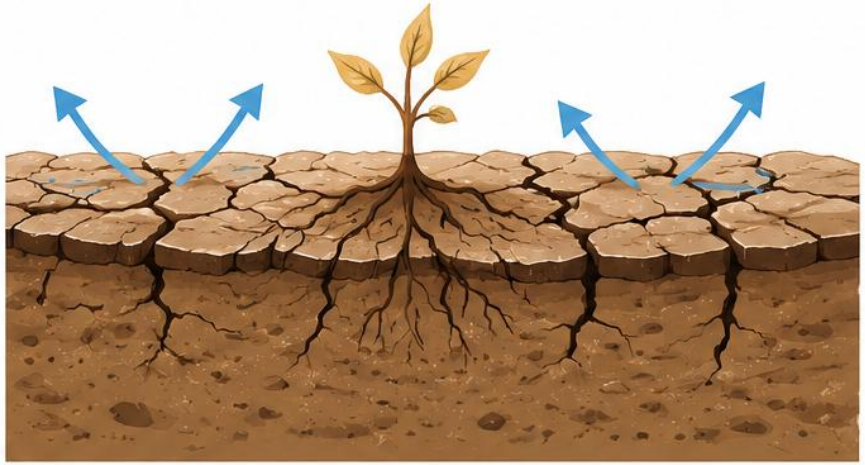
Why Soil Carbon Matters

High SOC Soil



- More water retention
- Deep roots
- Greater resilience

Low SOC Soil

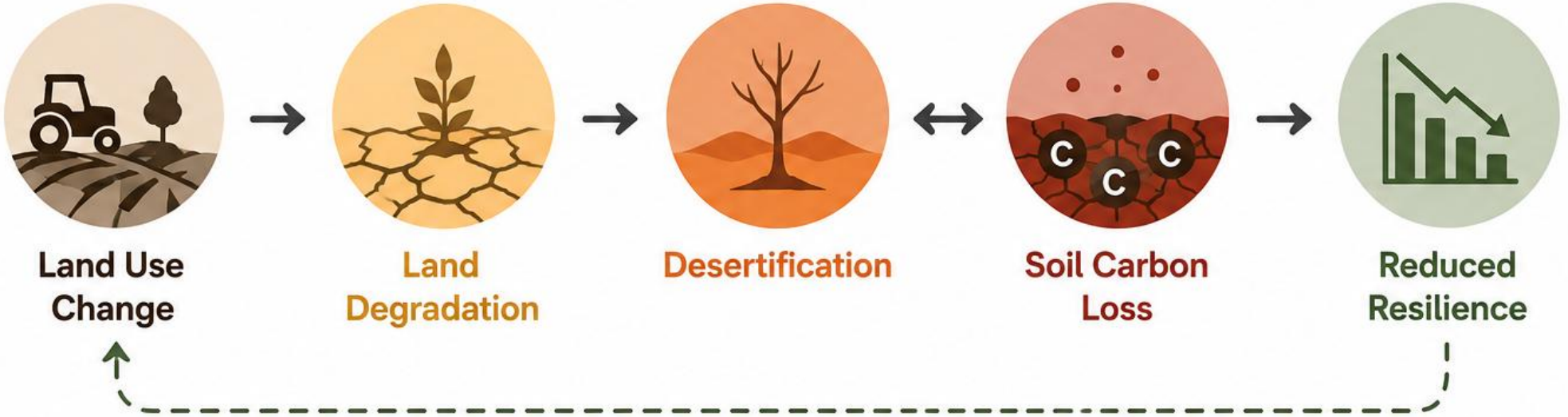


- Runoff / water loss
- Shallow roots
- Lower productivity

Higher soil carbon supports water retention, strong roots, and productive, resilient soils.

Co-funded by the European Union

Key Conclusions



Key Takeaway:
Breaking this cycle through **Sustainable Land Management** is essential for protecting soil carbon and securing the future of Central Asia's drylands.



Reinforcing cycle
Degradation and carbon loss amplify each other.

Serious consequences
Threatens productivity, stability, and food security.

Sustainable solutions
Essential to break the cycle and build resilience.

Long-term priority
Protect soil today to secure tomorrow.

Co-funded by the European Union

ERASMUS-EDU-2023-CBHE
Project number: 101129032

Duration: 36 months
(01/01/2024 – 31/12/2026)

LESLIE
LAND MANAGEMENT
ENVIRONMENT &
SOLID-WASTE

Co-funded by
the European Union

BUKHARA STATE UNIVERSITY
1930

MICRO-CREDENTIAL

CLIMATE CHANGE FOR SUSTAINABLE LAND MANAGEMENT IN CENTRAL ASIA

3.- The Carbon Cycle, Land Use and SLM

Land Use Change, Desertification and Soil Carbon in Central Asia

CC-W03-V11