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## Economics of Land Degradation in Central Asia

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# MAIN FINDINGS

1. The annual costs of land degradation in Central Asia through land use and cover change (LUCC) accounted for 6 billion USD between 2001 and 2009. These costs were mainly caused by rangeland degradation (4.6 billion USD), followed by desertification (0.8 bln USD), deforestation (0.3 billion USD) and abandonment of croplands (0.1 billion USD).
2. The costs of action are about 53 billion USD calculated over a 30-year horizon. The resulting losses, if nothing is done, may equal almost 288 billion USD during the same period. Thus, every dollar invested into land restoration may return about 5 USD in Net Present Value during this period.
3. Better access to markets, extension services, secure land tenure, and livestock ownership among smallholder crop producers are the major drivers of sustainable land management.

## Introduction

Central Asia is strongly affected by land degradation. This has negative consequences on crop and livestock productivity, agricultural incomes, and rural livelihoods. The land degradation hotspots are concentrated in the north of Kazakhstan, and stretch over Eastern Kazakhstan to the southern part of Central Asia, covering Kyrgyzstan, the north-west of Tajikistan and the southern parts of Uzbekistan and Turkmenistan (Figure 1). The major types of land degradation are:

- Secondary salinization in the irrigated lands.
- Soil erosion in the rainfed and mountainous areas.
- Loss of vegetation, desertification or detrimental change in the vegetation composition of rangelands.

## Drivers of degradation

The major drivers of land degradation in the region include: unsustainable agricultural practices; the expansion of crop production to marginal areas; inadequate maintenance of irrigation and drainage networks; and overgrazing practices near settlements.

## Study methods and data

In this study the Total Economic Value (TEV) framework was applied. The TEV framework accounts for the total losses of all ecosystem services due to land degradation, both provisional (ex, declines in crop yields due to land degradation) and non-provisional (ex, lower carbon sequestration in the soils

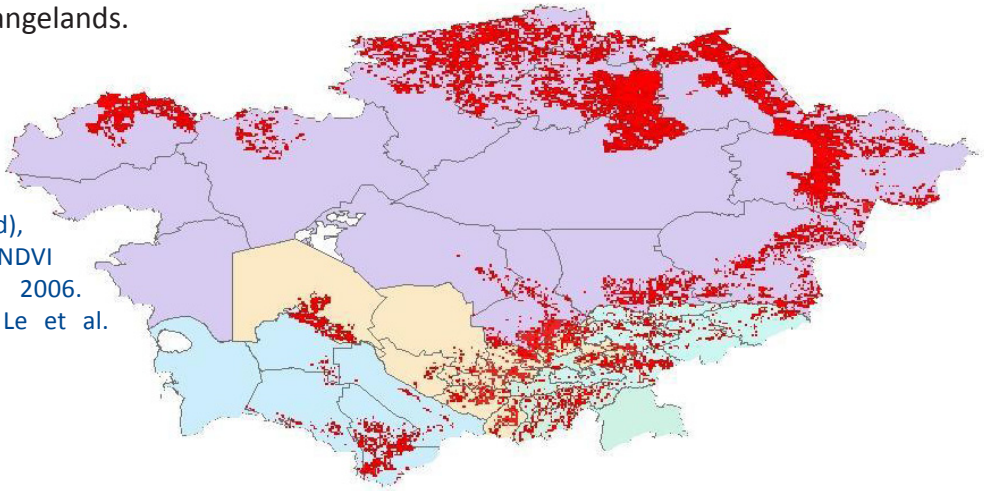

Figure 1: Land degradation hotspots in Central Asia (in red), a negative change in NDVI between 1982-84 and 2006. Source: adapted from Le et al. (2014).

due to land degradation). The study is based on remotely sensed satellite data on the extent of land use and land cover changes (LUCC) in Central Asia between 2001 and 2009. The drivers of sustainable land management have been analyzed using data derived from household surveys in Central Asia. Drivers consist of biophysical factors (e.g. climate conditions, agro-ecological zones), institutional factors (e.g. market access, land tenure), access to rural services (e.g. access to extension) and other household characteristics.

## Results

Over the last ten years, Central Asia has experienced a wide range of changes in land use and land cover:

- Abandonment of formerly rainfed croplands in Kazakhstan.
- Continuing desiccation of the Aral Sea.
- Conversion of barren lands into other land covers (e.g. shrublands and grasslands).
- Increase in forest areas across the region, especially in Kazakhstan.

## Economic impacts of land degradation

The total annual costs of land degradation due to land use/cover change only (i.e. without the costs of land degradation due to lower soil and land productivity within the same land use), were about 5.85 billion USD between 2001 and 2009. Most of these costs, about 4.6 billion USD, are related to land use changes that lead to soil erosion or desertification. Yet, land improvement is an ongoing process in the region. This includes the transition from low productive croplands to grasslands in northern Kazakhstan. This finding contradicts other results that highlight widespread land degradation in the area. A possible explanation for this is that even though the value of provisional services of these lands may have declined (no more grain harvests), the total value of ecosystem services provided by these areas in northern Kazakhstan may have actually increased after conversion from croplands to rangelands/woodlands (ex, higher carbon sequestration).

## Cost of action to address land degradation

The results show that the costs of action against land degradation are lower than the costs of inaction in Central Asia by more than five times: The costs of action were found to equal about 53 billion USD, whereas if nothing is done, the resulting losses may equal almost 288 billion USD during the same period.

## Drivers of Sustainable Land Management (SLM)

About 39% of the surveyed households in the region do not use any SLM technology, while the remaining 61% use at least one method.

| Country | Annual cost of land degradation in 2009, in current billion USD | Annual cost of land degradation per capita, in USD | GDP in 2009, in current billion USD | The cost of land degradation as a share of GDP (in percent) |
|---|---|---|---|---|
| Kazakhstan | 3.06 | 1782 | 115 | 3% |
| Kyrgyzstan | 0.55 | 822 | 5 | 11% |
| Tajikistan | 0.50 | 609 | 5 | 10% |
| Turkmenistan | 0.87 | 1083 | 20 | 4% |
| Uzbekistan | 0.83 | 237 | 33 | 3% |
| Total | 5.85 | 769 | 178 | 3% |

Table 1: The costs of land degradation in Central Asia through land use and cover change.
Source: Authors' calculations using MODIS and TEEB datasets.

| Country | Annual TEV cost of land degra-dation (2009) | Annual provisio-nal cost of land degra-dation (2009) | Cost of ac-tion (6 ye-ars) | Cost of action (30 years) | Cost of inac-tion (6 years) | Cost of inac-tion (30 ye-ars) | Ratio cost of inac-tion/ action |
|---|---|---|---|---|---|---|---|
| Kazakhstan | 24 | 11 | 22 | 22 | 102 | 138 | 6 |
| Kyrgyzstan | 4 | 2 | 6 | 6 | 22 | 29 | 5 |
| Tajikistan | 4 | 2 | 4 | 4 | 17 | 24 | 6 |
| Turkme-nistan | 7 | 3 | 10 | 10 | 35 | 48 | 5 |
| Uzbekistan | 7 | 3 | 11 | 11 | 36 | 49 | 5 |
| Central Asia | 47 | 20 | 53 | 53 | 213 | 288 | 6 |

Table 2: Costs of action vs inaction in Central Asia (in billion USD).

Among the most frequently used practices are integrated soil fertility management, with varying levels of fertilizers and manure; and more efficient irrigation techniques such as drip irrigation. Factors that positively affect SLM adoption are: better access to markets and extension services, learning about SLM from other farmers, private land tenure among smallholder farmers, livestock ownership among crop producers, smaller household sizes and lower dependency ratios. In general, it seems that households are more likely to adopt SLM practices when they live in areas with higher land degradation.

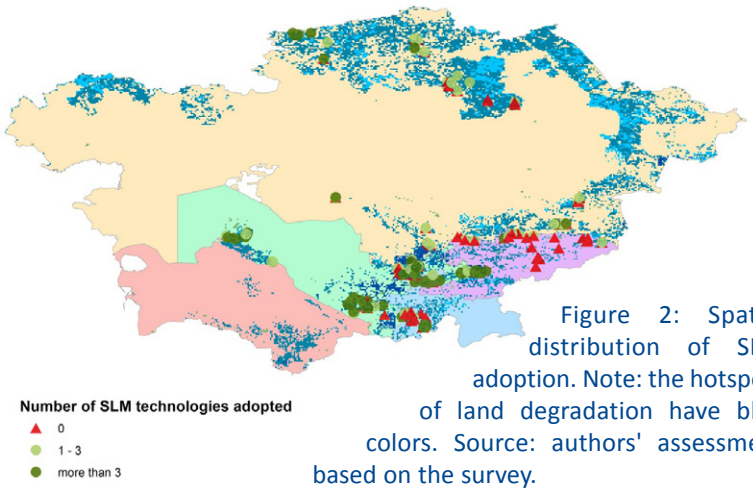


Figure 2: Spatial distribution of SLM adoption. Note: the hotspots of land degradation have blue colors. Source: authors' assessment based on the survey.

## Conclusions

We find that dissemination of sustainable land management practices and better access to extension services, markets and credit are crucial factors to address land degradation in Central Asia. The annual costs of land degradation due to land use change are about 5.85 billion USD, most of which caused by rangeland degradation, desertification, deforestation and the abandonment of croplands. The costs of actions to address land degradation are substantially lower than the costs of inaction. In fact, every dollar invested into land restoration could yield about five dollars in returns in net present value over a 30-year period.

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