GLOBAL LAND OUTLOOK

Northeast Asia Thematic Report

Partnerships to Achieve Land Degradation Neutrality

United Nations
Convention to Combat Desertification

This Global Land Outlook (GLO) Northeast Asia Thematic Report was produced by the members of the Desertification, Land Degradation and Drought Northeast Asia Network (DLDD-NEAN), a regional cooperation platform and reporting entity to the United Nations Convention to Combat Desertification (UNCCD). The report was produced with the generous funding of the Republic of Korea's Changwon Initiative.

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Partnerships to Achieve Land Degradation Neutrality

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PREFACE

Jaehyun Kim, Ph.D.
Minister
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Land is a vital resource for livelihoods, prosperity and human wellbeing. Today, billions of people around the world rely on land for their livelihoods. In Northeast Asia alone, about 1.5 billion people depend directly on the land. Thus, the wise management and protection of land resources is crucial to securing our sustenance. Yet, despite some positive changes in recent times, land degradation is worsening at an alarming rate. Deforestation, land degradation, and unsustainable land management threaten our lives and are responsible, both directly and indirectly, for many economic, social and environmental issues.

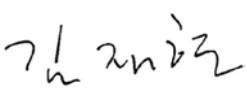
In particular, countries in Northeast Asia face the growing threats of desertification, land degradation and drought (DLDD). In China, it is estimated that "more than 40 per cent of Chinese arable land is degraded" (China Daily 2014). "The annual cost of land degradation in Mongolia is estimated at 2.1 billion United States dollars (USD)" (UNCCD, 2018). Sand and Dust Storms (SDS) hit the region each year, causing significant damage to life and property.

With the impacts of DLDD and SDS often being transboundary, they are not only a national issue, but also a regional one, requiring transboundary cooperation. One country alone would not be able to tackle these issues adequately. Thus, regional cooperation is essential to address the shared challenge of DLDD and SDS.

In response to the above challenges, countries in Northeast Asia have been joining forces to combat DLDD and SDS in the region through diverse cooperative frameworks. This report highlights the regional cooperation, particularly between Korea, China, Mongolia and Russia, and outlines its growth in recent decades, showcasing good practices and lessons learned from a range of cooperative projects undertaken in the region.

This report, supported by the Changwon Initiative, is the result of collective efforts by government officials, experts, NGOs, and representatives from international organizations from the region and beyond. Participants shared their experiences and opinions, which together made this report possible.

I sincerely hope that this Northeast Asia Thematic Report will provide a meaningful message that can inform collaborative efforts in other regions and further stimulate sub-regional cooperation. I also hope that this report will provide a platform to explore a more sustainable, integrated approach to cope with regional DLDD and SDS issues, and ultimately build more effective and sustainable partnerships in the region.



EXECUTIVE SUMMARY

In the Northeast Asia sub-region, environmental pollution, transboundary sand and dust storms (SDS), agricultural expansion, deforestation and overgrazing are growing challenges that are being further complicated by the impacts of climate change. Desertification, land degradation and drought (DLDD) are a significant problem affecting soil, air and water quality, threatening forest and woodlands, pasture and rangelands as well as irrigated and rain-fed croplands that support the livelihoods of more than half of the sub-region's population. The increasing risk of SDS originating in this sub-region as well as in the neighboring sub-region of Central Asia – due to degraded land and unsustainable water use – is causing damage not only in and around source areas but also off-site hundreds and even thousands of kilometers downwind.

SDS and DLDD are inextricably linked, and not restrained by administrative boundaries. This results in transboundary impacts with about 25 per cent of SDS sources being attributed to intensive land-use and poor management. Recent assessments of the severity of DLDD and SDS impacts on the economy and human health have sparked unprecedented levels of environmental cooperation within the sub-region, promoting joint actions in affected countries, and leading to sustained bilateral or multilateral partnerships to more effectively address sources, drivers, and impacts.

These cooperation frameworks have been relatively successful in leveraging the concerted and targeted action of governments, scientific communities, international organizations, non-governmental and civil society organizations, the private sector and the general public. Given the lessons learned in the joint design and implementation of projects on the ground, these frameworks have the potential to accelerate progress towards regional and national commitments by strengthening coordination mechanisms, enhancing resource mobilization efforts, and setting common policy priorities.

One such framework, the DLDD-Northeast Asia Network (NEAN) is an official reporting entity to the UNCCD which meets annually in conjunction with other fora to discuss thematic issues. The Network operates on three levels (high-level meetings, working groups, and technical/scientific exchanges) and represents a new cooperation platform for the implementation of the UNCCD at the sub-regional level. Environmental cooperation is not only essential for defusing environmental threats and challenges in the region but can also serve as a means in fostering broader cooperation and collaboration across borders.

The countries of the Northeast Asia sub-region have been combatting DLDD and SDS for decades with a growing number of stakeholders working on different aspects and at various levels. The sub-region has basic infrastructure that can be leveraged to address the challenges, gaps and uncertainties inherent in dealing with such complex multifaceted issues. Today, there is a need to improve coordination amongst the various actors involved in current partnerships and establish new ones that allow for long-term planning, monitoring and follow-up, improved access to information, and the enhanced capacity to address uncertainties, such as climate change.

KEY MESSAGES

SDS play an integral role in the biosphere but they also present a range of hazards to environmental and economic sustainability, not only for residents of drylands, but also for populations a great distance from the source; DLDD is often recognized as an aggravating factor increasing the frequency and intensity of SDS.

There are ongoing efforts at the global, regional and national levels to strengthen SDS monitoring and early warning networks to enhance forecast capacity, and to develop risk management plans for vulnerable groups as well as for different sectors, including health, food and transportation.

China has adopted a comprehensive approach to ensure the smooth implementation of integrated measures for combatting DLDD and increasing SDS source mitigation, including a co-funding system at various levels of governments, local administration and inter-ministerial coordination and evaluation mechanisms for large-scale programmes, green business investment mechanisms, and obligatory environmental improvement campaigns.

In Mongolia, the Green Wall Programme aims to create a belt of trees in the transitional zone between the Mongolian Gobi and the steppe regions to reduce forest loss, desertification and sand movement; the Korea Forest Service is providing technical assistance and sharing aspects of its successful reforestation experience in the once denuded lands of the Republic of Korea (ROK).

The ROK successfully restored its land and forest during the second half of the 20th century; restored forests have yielded multiple benefits including not only for forestry and biomass production, but also environmental and social benefits, such as biodiversity conservation, disaster risk reduction, and greater educational and recreational opportunities.

NGOs from the ROK and Japan have fulfilled a unique and active role in combatting desertification in the sub-region with numerous projects in China and Mongolia; many of which engage directly with local communities and deploy technical expertise in land restoration, agroforestry, land management, renewable energy, and other rural development activities.

Community-based rangeland management in Mongolia and China is showing great promise in improving environmental and livelihood conditions; this approach allocates tenure over relatively large areas to pastoral groups so they can exchange more information, cultivate stronger leadership, and develop mutually agreed upon rules for livestock movements and seasonal grazing practices.

Russia's Altai Forest Carbon Project is one example of an economic mechanism to compensate for the greenhouse gas emissions through a system of incentives to establish protective forest belts, prevent land degradation, forest fires, and soil erosion, and to raise awareness about the potential of sustainable value chains for the private sector.

In Russia, Mongolia and China, there are several cooperative frameworks that support the creation and maintenance of transboundary protected areas (TPAs) that involve local communities, indigenous peoples, protected area staff, conservation officials, civil society, and scientists with the goals of preserving biodiversity, combatting land degradation, and adapting to climate change.

Forest and landscape restoration is a key element in many strategies to address the DLDD and SDS challenges, encompassing a wide range of activities that combat land degradation, biodiversity loss and climate change; to varying degrees, all the countries in the Northeast Asia sub-region are now programming and implementing actions to restore forest landscapes, including in transboundary areas.

Innovative finance and sustainable value chains are helping to restore degraded and vulnerable ecosystems, and transform rural economies for a more sustainable future; the desert green economy model implemented by the Elion Resources Group in China has demonstrated the great economic potential of turning environmental challenges into opportunities based on land restoration.

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Global Land Outlook
NORTHEAST ASIA THEMATIC REPORT

Contents

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1. INTRODUCTION

WHY PARTNERSHIPS?

Environmental problems are frequently embedded within the competing interests of various stakeholders, such as government, corporations, farm cooperatives, labour unions, consumers, NGOs, etc., who commonly view one another as adversaries. Traditionally, government is responsible for the protection of public goods, the private sector is seen as the driver for economic growth, and civil society organizations are looked upon as the champions of social cohesion and environmental sustainability. Thus, environmental partnership decisions often need to reconcile multifaceted sustainability issues with national, bilateral and multilateral strategic goals.

Typically, a partnership in the land-use sector is an arrangement in which two or more parties cooperate to design, promote or implement policies and practices that improve land management and reduce land degradation. These arrangements inevitably involve different levels and intensity of government and stakeholder engagement, with a demarcation of responsibilities and benefit sharing. Ideally, the mutual benefits of the combined efforts of these various actors will lead to new configurations of state bodies, private entities, and civil society – from the local to regional to global level. This type of collaboration often leads to transformational or systemic change, which fosters more sustainable land use.

At the 2002 World Summit on Sustainable Development, partnerships were recognized as an important tool for achieving sustainable development, seen as a complex challenge that demands the active involvement of multiple sectors and stakeholders within society. The concept of sustainable development stresses the need for the concurrent attainment of social equity, environmental health and economic wealth. These partnerships can focus on global issues – such as sustainable forestry/livestock or commodity value chains –,

global and regional issues – such as sand and dust storms (SDS), air/water pollution or transboundary protected areas –, or local issues – such as those which work to improve the livelihoods of those directly involved in land management, in order to address the challenge of desertification, land degradation and drought (DLDD).

The roles and functions of partnerships that address DLDD and SDS can often be quite varied and may include one or more of the following:

- accessing investments, technologies, expertise, or public support;
- setting political agendas to support good land governance and policy reform;
- building the means, mechanisms or tools for implementation;
- generating, sharing and disseminating knowledge and lessons learned;
- improving institutional effectiveness and problem solving;
- increasing and broadening stakeholder participation; and
- creating sustainable value chains for improved livelihoods and environmental sustainability.

In the context of the United Nations' Sustainable Development Goals (SDGs) and the 2030 Agenda for Sustainable Development, partnerships have the potential to link up with existing institutions, multilateral agreements and measurable targets, such as achieving land degradation neutrality by 2030 (SDG target 15.3). They can also promote more effective leadership and guidance at various scales that benefit from improved accountability, systematic reviews, and monitoring/reporting mechanisms, such as those enshrined in the SDG indicator framework and annual reports. One such mechanism, described in section 2, is the DLDD Northeast Asia Network, which is designated as an official reporting entity to the United Nations Convention to Combat Desertification (UNCCD).

Land Degradation Neutrality (LDN) has been defined by the Parties to the UNCCD as "a state whereby the amount and quality of land resources, necessary to support ecosystem functions and services and enhance food security, remains stable or increases within specified temporal and spatial scales and ecosystems". As of early 2019, over 120 countries, including Russia, China and Mongolia, have participated in the UNCCD's LDN target-setting programme which helps countries establish measures to conserve, sustainably manage and restore land resources (i.e. soil, water and biodiversity) in the context of land-use planning. As the UNCCD secretariat transitions to the implementation phase, a brief overview of capacity building efforts is illustrated in Figure 2.

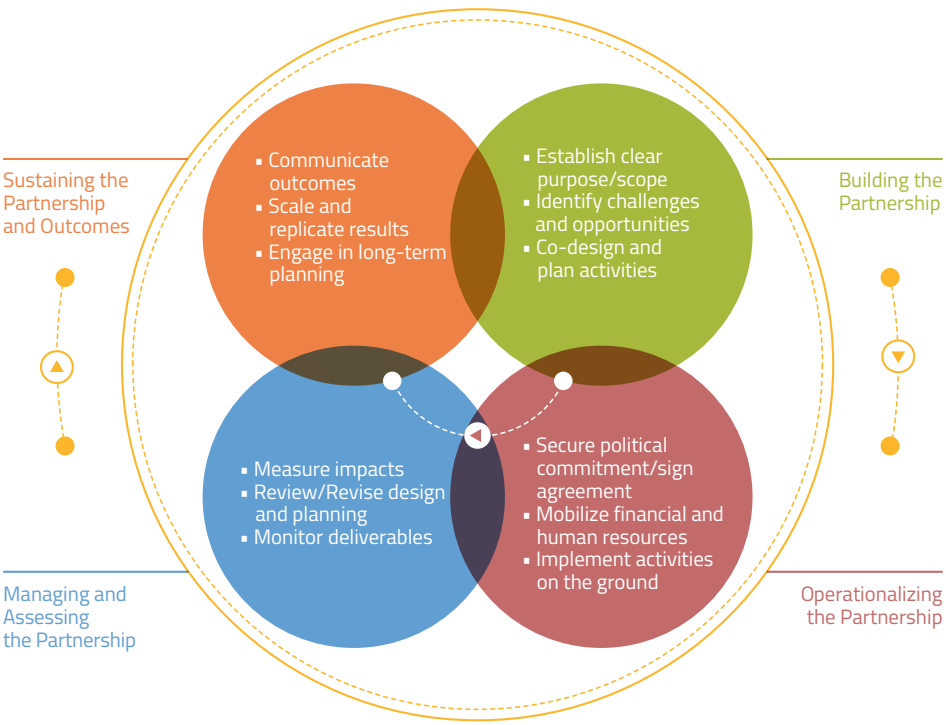
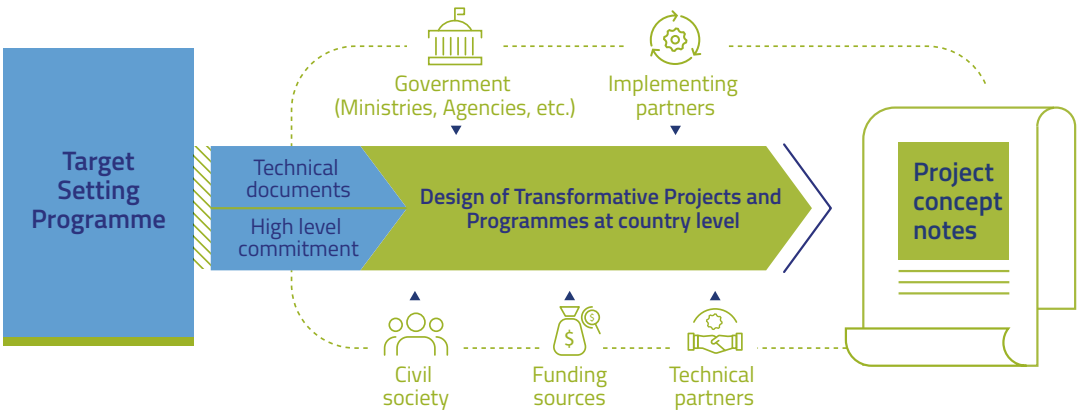


Figure 1: The partnership cycle

Figure 2: LDN: from targets to action on the ground



NORTHEAST ASIA

Northeast Asia is a vast and diverse sub-region comprising six countries: Peoples' Republic of China (China), Democratic People's Republic of Korea (DPRK), Japan, Mongolia, Republic of Korea (ROK) and the Russian Federation (Russia). More than 1.5 billion people, or one-fifth of the global population, live in Northeast Asia – from the sparsely populated high plains of Mongolia and the Russian Siberia and Far East, to the densely populated coastlines of China, the Korean peninsula and islands of Japan. These countries not only share borders, hydrological cycles and atmospheric circulation, but also long-standing historical, cultural and economic relationships. The region's natural capital is the foundation for economic growth and sustainable development, with many feedback mechanisms in this vast and complex resource-environment-socio-economic system.

The temperature declines, and the sun's thermal radiation becomes weaker from south-to-north, from sub-tropical and temperate to frigid zones. In general, rainfall decreases gradually from the Pacific to the hinterland of the Central Asian continent, from humid and sub-humid to semi-arid and arid zones. Across this vast region, ecoregions range from temperate deciduous broadleaved forests in the south to temperate mixed forest and polar tundra in the north. The eastern extents are dominated by forests, transitioning to grasslands and deserts moving westward.

Figure 3: Land Cover Map of Northeast Asia[7]

In the last century, human population growth and migration have led to the rapid expansion of cultivated areas, cities and industrial zones, increasing pressure on ecosystems and their goods and services. This pressure is concentrated in the temperate and the eastern coastal zones, whereas the northern frigid and inland arid zones tend to have very low population densities. In general, economic development decreases from east-to-west while in the Russian Far East region economic development remains low throughout. The least developed areas are mostly located throughout the inland and transboundary regions of Mongolia, China and Russia.

Environmental pollution, the expansion of agricultural land, deforestation and overgrazing are growing challenges that are being further complicated by the impacts of climate change. DLDD is a significant problem in Northeast Asia, affecting soil, air and water quality, threatening rangelands, irrigated, and rain-fed agricultural land, which support the livelihoods of more than half of the region's population. The increasing frequency of SDS originating in this sub-region (Northeast Asia), as well as in the sub-region of Central Asia is causing damage not only close to the source areas, but also hundreds and even thousands of kilometres downwind. In China, SDS now occur on a regular basis, resulting in economic losses and severe impacts on the livelihoods of people, mainly in the northwest and northeast.

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MONGOLIA

Mongolia is a landlocked, high plateau country, with a total land area of 156.6 million hectares, facing serious problems of deforestation, land degradation and desertification. It is composed predominantly of pastureland (126 million hectares), followed by arable land (1 million hectares) and urban areas. Mongolia experiences a cold, harsh climate and a short growing season, including frequent droughts and severe winters, known as dzuds. Dzud are exacerbated when a summer drought combines with a harsh winter and vast numbers of livestock die from either starvation or cold. Grass is unable to grow across the vast steppes in summer and the millions of animals that live there cannot put on enough weight to survive the winter cold. The impacts of the dzud are made worse by overgrazing and desertification.

Environmental pressures are increasing due to climate change and shifting grazing patterns. Recent significant increases in livestock numbers, combined with declines in pastoral mobility, have led to high livestock densities and long-term heavy grazing, contributing to land degradation and desertification. This is especially the case in the central and northern regions of the country. This is compounded by deforestation for fuelwood and the expansion of agricultural land, as well as by unsustainable irrigation practices and water-use for mining activities. In the past, livestock grazing was carried out in a semi-nomadic manner, with frequent changes in pasture, allowing for regeneration. Over the past two decades, herders have become more settled and have concentrated their livestock near villages and water sources, greatly exceeding the carrying capacity of the land in these locations. Other factors contributing to land degradation include an increase in private livestock holdings leading to contract herders; the reduction of pasture areas due to desertification and soil erosion; and pasture reallocation for agricultural cultivation, construction and mining.

A recent assessment estimates that 77.8 per cent of Mongolia's total land area is affected by degradation, of which 35.3 per cent is defined as slightly degraded, 25.9 per cent as moderately degraded, 6.7 per cent as severely degraded and 9.9 per cent as extremely degraded. Desertification and land degradation are now seen as a threat to national security. To date, numerous forest restoration and land rehabilitation activities had been conducted in Mongolia, but most have shown poor results. This is mainly due to climatic conditions, as well as a lack of government investments in field applications of ecological research. Nevertheless, a good national rangeland health assessment and monitoring programme exists, and some progress has been made in linking this more closely to management at the local level.

CHINA

China is among the 12 mega-biodiverse countries in the world. Stretching 5,000 kilometres from east to west, and 5,500 kilometres from north to south, China is a vast country with widely varying landscapes, including mountains, high plateaus, sandy deserts and dense forests. Of the total land area, forest cover accounts for 20.36 per cent, while the stock volume of forest plantations may be the largest in the world; meanwhile, grasslands cover 41.7 per cent, cultivated land, 14.86 per cent, and deserts, 27.46 per cent. Based on the UNCCD's definition of desertification, China has an area of 3.32 million km2 of drylands, which are prone to desertification, covering 34.6 per cent of its total land mass (498 counties in 18 provinces).

Since 1994, China has implemented a national desertification and sandification monitoring system, with reporting undertaken every five years. From 2004 to 2014, China's desertified land showed a dual reduction in area and degree: the total area of desertified land fell by 12,120 km^2 with an average annual reduction of 2,424 km^2. In the same period, the total area of sandification fell by 9,902 km^2 with an average annual reduction of 1,980 km^2. Despite some positive trends, such as forest cover increasing from 8.6 per cent in 1949 to 20.36 per cent at present, accounting for 25 per cent of the global net increase in leaf area, many natural areas and habitats continue to be threatened. About 90 per cent of grasslands are experiencing different degrees of degradation and desertification. Accelerated urbanization, industrialization, and the unsustainable exploitation of land resources have increased pressure on habitats and ecosystems.

Overview China's integrated approaches to reverse the desertification process

After China's ratification of the UNCCD and its commitment to Agenda 21, desertification prevention and control were prioritized in the national agenda, and subsequently integrated into the state social and economic development plan as effective approaches to defend the ecological security of the nation. Today, China has pledged to combat desertification with science-based, integrated measures using legal frameworks for policies, legislation and regulation, so as to foster a sustainable ecological civilization based on systematic land-use planning.

Numerous efforts are being made to reverse the trends of land desertification – from the national and provincial to the collective and individual levels. The earliest local and regional efforts to introduce windbreaks and sand dune fixation took place in the 1950s in the Shaanxi and Gansu province. In the 1970s, increased SDS disasters triggered the first national programme, called the Three Norths Shelter-Belt Programme. This is known as the "Green Great Wall" of China and is said to be the largest afforestation programme in the world. In the early 1980s, the government implemented integrated small watershed management projects; while, in 1991, the Law on Water and Soil Conservation was passed by which all construction projects which potentially disturb soil or land are obligated to develop and implement a soil conservation programme. Also, in 1991, the first National Master Plan on Sandy Desertification Prevention and Control was approved and set the basic guiding principles of prevention, sustainable use and restoration.

The ever-increasing international cooperation (bilateral and multilateral) has also played an important role in the efforts to reverse desertification trends through financial support, knowledge and technology transfers, and capacity building. Since the year 2000, the government has emphasized the need for ecological restoration and increased public awareness for natural resource conservation. At the level of implementation, various national land improvement programmes aim to balance the conversion of arable land or forest land through land rehabilitation, or via afforestation elsewhere, in line with the concept of Land Degradation Neutrality. As a result of the numerous development models, programmes and initiatives documented in this report, land degradation and desertification expansion in China is gradually being contained.

Figure 4: China strategy and actions

The IPBES regional assessment report concludes that a consistent increase in forest cover in Northeast Asia is correlated with a decline in fuelwood demand and an increase in the protected area coverage of key biodiversity areas.[15]

RUSSIA

This report focusses exclusively on the Russian Siberia and Far East: the eastern territory of Russia between Altai and Lake Baikal in Eastern Siberia and the Pacific Ocean, composed of the Siberian and Far Eastern Federal Districts, which share a land border with China, Mongolia and DPRK. This area, of approximately 3,125,000 km^2, is important because it represents natural vegetation processes and their environmental relationships over a large territory, from polar deserts in the north to diverse mixed broad-leaved forests and Korean pine in the south. These landscapes are among the best preserved forest ecosystems in the world.

In 2002, Russian legislation was altered to allow foreigners to lease agricultural land for up to 49 years, which also allowed for the purchase of land by Russian-majority shareholder companies. Virtually all of the arable land in the Russian Siberia and Far East is concentrated in its southernmost border provinces. Approximately 20 per cent of that land or approximately 670,000 hectares is owned or leased by Chinese companies, either directly or indirectly through joint ventures with Russians. The growing economies in Asia, especially China, are demanding energy and natural resources from Russia's vast wilderness, such as oil, gas, timber, water and minerals. In the rush to profit from these exports, the preservation of unique ecosystems is rarely a priority.

Since the 1990s, a vibrant and diverse environmental conservation movement has grown in Russia, and today conservation organizations work at all levels of society – from tiny "initiative groups" organized by villagers to protect local springs or forests, to indigenous tribes that oversee the management of subsistence land resources, to well-networked national organisations that lobby the government. The most biodiverse region in Russia, the Amur-Heilong, home to the Amur River, and to vast forests and endemic tigers, leopards, cranes, and bears, is threatened by the demand for

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natural resources. Experience in the Russian Far East shows that protected areas are an effective way to preserve high-value ecosystems. In view of this, Russian conservationists have been collaborating with Chinese counterparts to create several transboundary protected areas.

REPUBLIC OF KOREA (ROK)

Approximately 30 per cent of the ROK's land area consists of lowlands; the remainder consisting of uplands and mountains. The great majority of lowland areas lie along the coasts, particularly the west coast, and along the major rivers. Traditional slash and burn agriculture and a lack of sources of heating other than firewood put some pressure on Korean forests in the 19th century. However, these forests were predominantly degraded as a result of illegal logging and overcutting for construction during the Japanese occupation of Korea, from 1910-1945. This led to a breakdown of the traditional system of forest management, and a seizure of approximately 50 per cent of Korean forest lands to support Japan's military, industrial and domestic needs.[16]

In the early part of 20th century, especially the period during and after World War II and the Korean War, much of the existing Korean forests were cut down, which led to severe flooding and soil erosion. A combination of reforestation efforts and policies designed to reduce the use of firewood

(e.g. restriction of inflow of firewood into Seoul and other major cities, starting in 1958) helped to spark a recovery in the 1950s. Comprehensive reforestation programmes starting in the 1970s and continuing into the late 1990s helped accelerate the increase in forest volume. In 1980, forest cover reached a peak of 65 per cent of total land area as compared to a low of 35 per cent in 1955.[17]

A key driver behind the concerted reforestation efforts was the strong leadership of the ROK government. The political commitment towards developing the economy and alleviating poverty placed forest rehabilitation efforts at the core of the economic agenda. Consequently, forest rehabilitation was directly linked to major development plans on the national agenda. The ROK is now playing an important role in moving the global forest restoration agenda forward. Its experience has provided useful insights to developing countries, such as China, India, and Vietnam, which have carried out similar forest transition projects from 1990 to 2005.

DEMOCRATIC PEOPLE'S REPUBLIC OF KOREA (DPRK)

The DPRK's vegetation ranges from temperate to frigid zones, with more than 80 per cent considered mountainous and cultivation largely confined to coastal strips in the east and west. Large-scale deforestation, which has been ongoing for decades, has been associated with cycles of severe food shortages and natural disasters, such as flooding, drought, and landslides. In 2003, forest covered over 70 per cent of the country, mostly on steep slopes. However, food shortages led to accelerated deforestation, as the government promoted the cultivation of sloping lands, hills and mountains. Subsequently, it is estimated that forest cover has been significantly reduced, from 8.2 million hectares in 1990, to 5.7 million in 2010.[18]

Most recently, the DPRK government is trying to manage the transformative influence of emerging economic and social forces. It is attempting to attract foreign investment into its four special economic zones and 19 economic development zones, while at the same time managing the expectations of a growing entrepreneurial class who have accrued wealth through economic market reforms. At present, the most promising avenues for environmental engagement with the DPRK exist via international NGOs, institutions and treaty regimes, such as the UN Framework Convention on Climate Change, and other multilateral environmental agreements, including the UN Convention on Biological Diversity, UN Convention to Combat Desertification, and the Ramsar Convention on Wetlands.

JAPAN

Japan is an island nation territory which extends for 377,973 km^2, most of which is rugged and mountainous, with 66 per cent under forest cover and about 12 per cent consisting of arable land. Terrestrial protected areas account for 14.93 per cent of Japan's total land area. As of 2012, forested area covered approximately 25.08 million hectares.

By 1570, Japan's population had reached ten million, and villagers' needs for subsistence forest products had increased correspondingly. In addition, large-scale military conflict during the 1500s required large quantities of timber for the armies. By 1670, the population had increased to nearly thirty million, and except for Hokkaido, the old growth forests had been completely logged. Soil erosion, floods, landslides, and barren lands became ever more common.

It is difficult to single out the initial tipping point towards improved land stewardship. The centuries-old tradition of cooperation among villagers seems to have been its driver. They often had to work collaboratively, protecting the community against bandits, allotting rice fields, irrigating water, and storing rice. Until then, village cooperation had not extended to forest management. However, villages started responding to the forest crisis by refining the management of satoyama secondary forests for subsistence needs, and for the first time, planting sugi and hinoki plantations to help satisfy the timber demands of the rulers.

Managed forestry continued to develop and expand in conjunction with a "virtuous cycle" of mutually reinforcing silvicultural improvements, social institutions for forest land use, and timber marketing cooperatives. Extending village cooperation to forest management stimulated a series of mutually reinforcing changes that slowed deforestation and eventually led to the reforestation of Japan after World War II. Finally, Japan's switch to imported wood, fossil-fuel energy, and chemical fertilizers by the 1980s eliminated the demand for forest products from satoyama secondary forests, and greatly reduced the demand for sugi and hinoki.

The Japanese Ministry of the Environment supports efforts to combat desertification, both nationwide and around the world. This includes an empowerment project for nomads in Mongolia to combat desertification caused by climate change, as well as a project to transfer technology for combatting desertification using traditional knowledge and indigenous technology, in Africa.

SCOPE OF THIS REPORT

The countries of Northeast Asia have been combatting DLDD and SDS for decades with a growing number of stakeholders working on different aspects and at various levels. The region has basic infrastructure that can be leveraged to address the challenges, gaps and uncertainties inherent in dealing with such complex multifaceted issues. However, there is a need to facilitate coordination amongst actors involved in current partnerships in the region so as to allow for long-term planning, monitoring and follow-up, improving access to information, overcoming language barriers, and addressing uncertainties, such as climate change.

The aim of this GLO Northeast Asia Thematic Report is to document the main elements of partnerships, programmes and projects that are ongoing or have been completed in the region. This report represents an important effort to bring together key actors, demonstrate success stories and lessons learnt, and enhance the future effectiveness of regional partnerships and cooperation.

In section 2, the report will review the existing networks and coordination activities taking place in the Northeast Asia region with respect to DLDD and SDS issues.

In section 3, case studies and best practices contributing to the LDN target shall be showcased. These include:

- national, bilateral and multilateral efforts to assist local communities impacted by DLDD and SDS;
- collaboration and innovation to improve and scale-up sustainable land management practices for local, national and regional benefits;
- transboundary protected areas and the enhanced delivery of ecosystem services;
- innovative financing arrangements and sustainable value chains for land-based commodities; and
- institutional, scientific and technical exchanges within and between countries.

The report concludes with a regional synthesis, and recommendations for the way forward.

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2. REGIONAL COOPERATION IN NORTHEAST ASIA

Cooperation on environmental issues in the Northeast Asia region has advanced significantly over the last few decades. The unique and shared challenges of Desertification, Land Degradation and Drought (DLDD) and Sand and Dust Storms (SDS) are acknowledged as an important trigger for increased bilateral and multilateral collaboration to promote and implement Sustainable Land Management (SLM) and ecosystem restoration projects and programmes, along with other nature-based solutions to common environmental concerns.

Through its development and funding partnerships, the UNCCD aims to implement SLM worldwide, and to reach its targets for land degradation neutrality (LDN). Investments in the UNCCD help to facilitate policy reform, leverage further and larger investments, and initiate change at the national level.

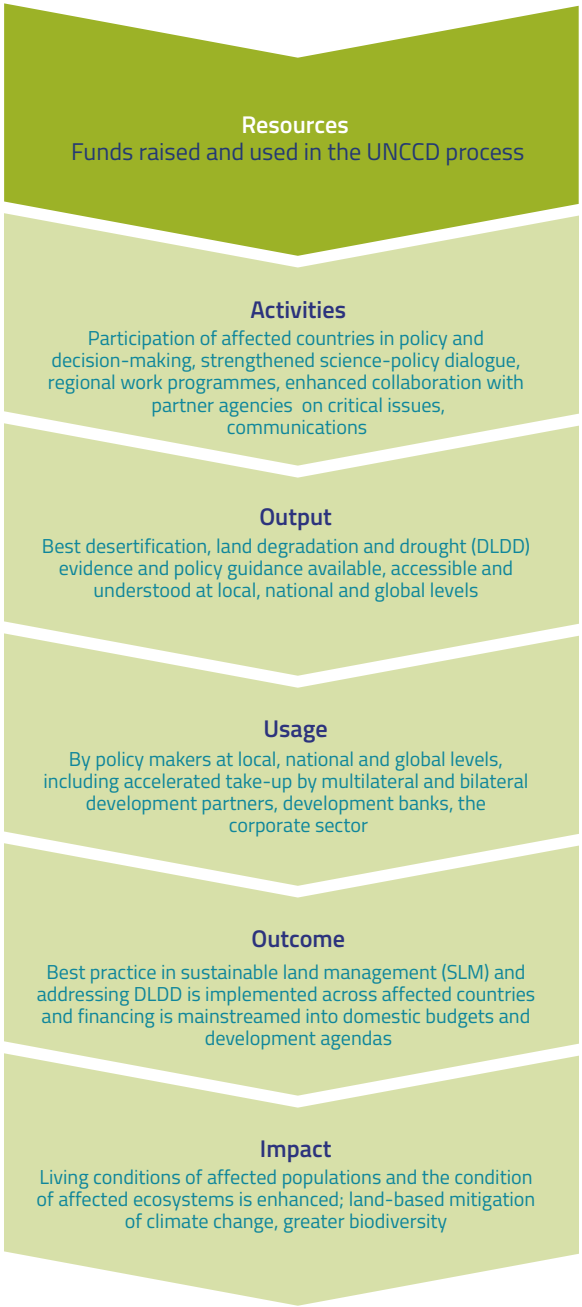

Figure 5: UNCCD Partnership Impact Chain

DUST FALLING LIKE RAIN

DLDD and SDS present immediate and growing threats to environmental sustainability, economic development, and the quality of life throughout the region. They are not new phenomena. Three thousand years ago, Chinese historical documents recorded "yellow dust", "raining dust" and "dust and soil falling like rain". "Dust with wind falling like raining" (霾) was a specific terminology included in the earliest-known Chinese dictionary Erya, dating from the 3rd century AD. Subsequently, "wind-blown dust falling like rain" was used in classical poetry,[1] however current usage of this character

> Sand came down from the sky like misty rain in the first month (spring) - A drought dried up the wells and springs in the second month. (21st year of Adalla Isageum's reign; 20th February – 19th April; AS 2) This is the first instance of yellow or Asian Dust (황사 hwangsa in Korean) on record which was recorded steadily from this time on throughout the Joseon Dynasty.[3]

refers to haze, pollution or smog. Korean scholars first recorded "dust falling like rain" using the Chinese characters 雨土from 174 AD.[2]

The incidence of SDS events in China, the ROK and Japan has increased steadily from the 15th century. More recently, the rate of DLDD accelerated, notably in the period from the 1940s to the 1990s. This is similar to the American Dust Bowl a decade prior, both occurring primarily due to agricultural expansion and deforestation. Within and beyond China, these phenomena negatively impact food and water security, force the closure of schools, airports, and factories, and have resulted in billions of dollars in economic losses, while posing serious health hazards for millions of people.[4]

SDS and DLDD are inextricably linked, and not restrained by man-made geographical boundaries. This results in transboundary impacts with about 25 per cent of SDS sources being attributed to intensive land-use and poor management. SDS have been a unifying challenge in Northeast Asia, promoting joint actions in affected countries, leading to bilateral or multilateral cooperation to effectively address sources, drivers, and impacts. The recent assessment of the severity of SDS impacts on the economy and human health has sparked unprecedented levels of environmental cooperation within the region.[5] This involves cooperation frameworks that attempt to leverage the concerted and targeted action of governments, scientific communities, international organizations,

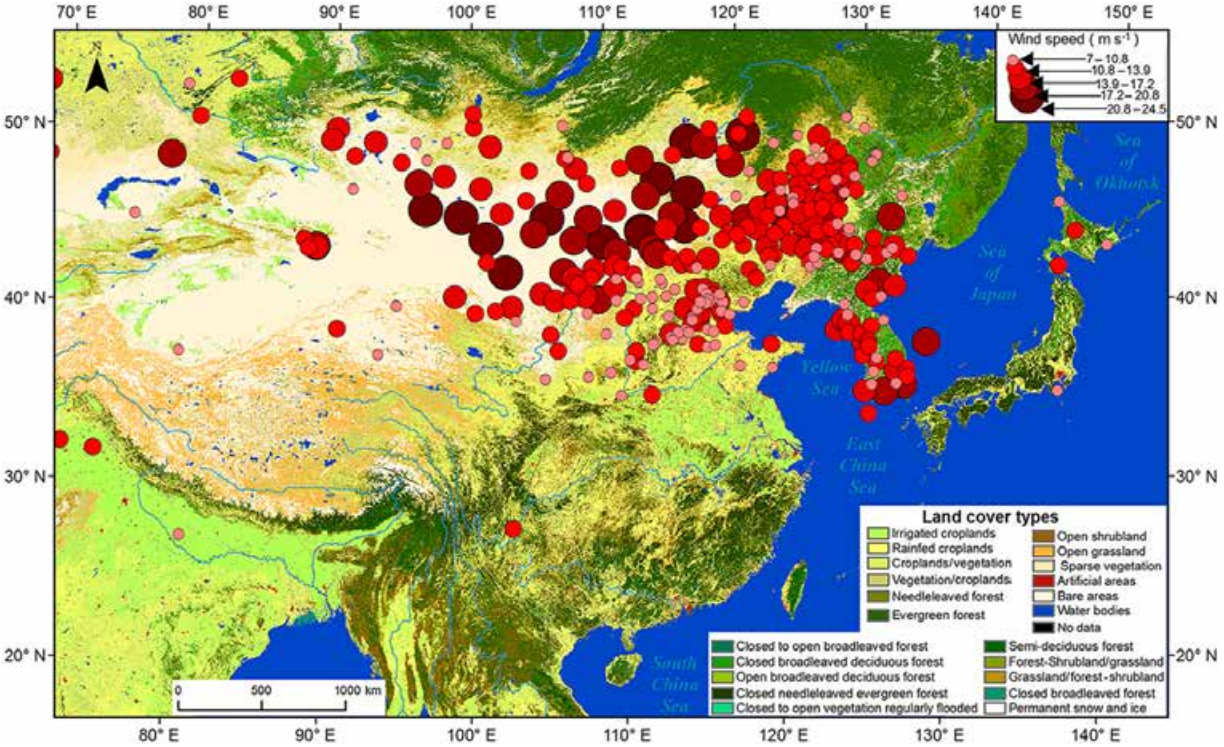

Figure 6: Maximum wind speed across East Asia during 2nd – 7th May 2017[22]

non-governmental and civil society organisations, the private sector and the general public. These frameworks have the potential to expedite progress towards meeting regional commitments by strengthening coordination mechanisms, enhancing resource mobilization efforts, and setting common policy priorities, while avoiding overlap and the duplication of efforts.

BILATERAL EFFORTS

Some of the earliest bilateral cooperation, starting in 1990, took the form of China-Japan joint research and scholarship exchanges on greening the desert, conserving water resources, and controlling soil erosion. The Desertification Research Project launched a two-year "Feasibility study on the environmental assessment of desertification in arid and semi-arid areas", in which the Japanese National Institute for Environmental Studies was the lead organization. Following the feasibility study, a three-year program was launched on "Research on the evaluation of interaction between desertification and human activities". It included an evaluation of human activities on desertification in semi-arid and sub-humid areas by the National Institute of Agro-Environmental Sciences and the National Research Institute of Agricultural Economics, in cooperation with Institute of Geography, Chinese Academy of Science, in eastern China.[6]

Subsequently, the Japan Association for Greening Deserts assisted local governments in the Inner Mongolia and Ningxia provinces in China with desertification control and the cultivation of economically beneficial plants in arid and semi-arid areas. A milestone of Sino-Japanese cooperation was reached in 1996 when the Sino-Japan Friendship Center for Environmental Protection was established, promoting joint research. Through the Center, Japan has contributed to environmental stewardship by supporting a training programme for Chinese staff members; to date, more than 3,700 of them have studied at Japanese universities.

The ROK established bilateral agreements on environmental cooperation with China in 1993, and with Russia in 1994. In 2007, the ROK signed a Memorandum of Understanding (MoU) with Mongolia on the monitoring, research and conservation of nature reserves. The ROK's bilateral efforts have been particularly focussed on avoiding and reducing the threats and impacts of SDS. To this end, the Korea Forest Service has launched and completed several small-scale forest plantation projects in China and Mongolia.

In 2000, the Chinese government put forward the Western Development Strategy, which highlights the need for a good ecological environment to attract business investment, but also positions ecological restoration as one of the priorities for

Before/After in Baiyin City, Gansu Province

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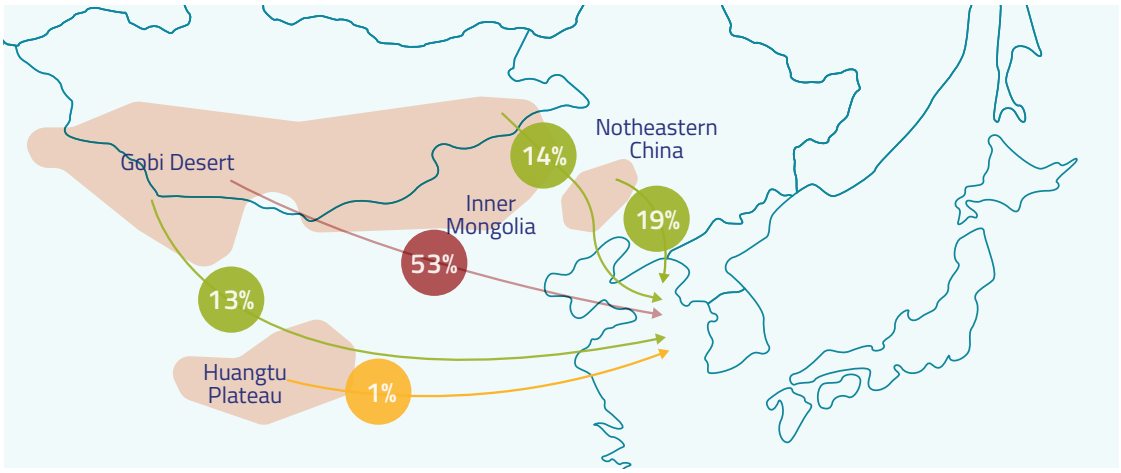
international cooperation. Shortly thereafter, heads of government from China and the ROK reached a consensus on cooperation efforts regarding afforestation, as well as environmental protection and flood control. In November 2000, the Korea Forest Service, the Korea International Cooperation Agency and China's State Forestry Administration signed an implementation agreement on "Cooperation in afforestation in the five provinces in the western part of China". This agreement marked the official launch of the project in question, which lasted for five years and afforested approximately 8,000 hectares (see Table 1). During that time, the ROK provided grants of USD 5 million to five western provinces (Xinjiang, Gansu, Inner Mongolia, Ningxia and Guizhou). In addition, the project facilitated the exchange of expert guidance and training to promote technology transfers and academic cooperation in the field of forestry between the two countries.

Meanwhile, bilateral environmental cooperation between China and Russia has been regularized as a sub-committee of the prime ministers' meeting since September 2006. This cooperation is primarily focussed on the prevention of water pollution in the transboundary river basin area, the Heilongjiang or Amur River. The conservation of endangered species, in particular the Amur tiger and leopard, is another point of mutual interest that has increased their research and joint Russian-Chinese studies for their conservation and cross-border migration.[7]

Table 1: Afforestation projects in western China co-funded by the ROK and China

Target		Area (ha)	Duration	Budget (USD 1,000)	
				ROK	Chian
Total		8,040	2001-2005	5,000	4,990
Area affected by desertification	Baiyin, Gansu Province	1,540	2001-2005	1,000	1,880
	Tongliao, Inner Mongolia	3,000	2001-2005	1,000	720
	Pingluo, Ningxia	1,200	2002-2005	1,000	800
	Tulufan, Xinjiang Province	1,000	2003-2005	1,000	590
Karst erosion control	Xiuwen, Guizhou Province	1,300	2003-2005	1,000	1,000

Figure 7: Origin of SDS and Routes (2002-2011)[3]



MULTILATERAL COOPERATION

Bilateral cooperation has traditionally been carried out in the form of aid from the more economically developed countries, namely Japan and the ROK; however, after the mid-2000s when China experienced greater economic growth, the focus of environmental cooperation in the region shifted to multilateral cooperation.[9] As a precursor, the Symposium of ROK-Japan Environmental Science, held in 1988, was the first environmental forum in the region. This evolved into the Northeast Asia Conference on Environmental Cooperation, involving China, Mongolia and Russia, and included the participation of central and local government officials, as well as non-governmental organizations and scientists. As SDS is considered a priority area for cooperation, a joint working group on SDS source area assessment and land restoration was established subsequent to the conference.

Following the Rio Earth Summit in 1992, the North-East Asian Sub-regional Programme for Environmental Cooperation (NEASPEC) was established to promote comprehensive environmental cooperation among member states in the region – China, Japan, Mongolia, Russia, the ROK, and the DPRK. This was facilitated by the United Nations Economic and Social Commission for Asia Pacific (UNESCAP) as the permanent secretariat. In 2005, a Regional Master Plan was jointly developed by the Asian Development Bank (ADB), UNESCAP/NEASPEC, the United Nations Environment Programme (UNEP) and the United Nations Convention to Combat Desertification (UNCCD) with the goal of enhancing the prevention and control of SDS through strengthened transboundary cooperation.

Regional cooperation in devising and implementing the transboundary conservation of threatened landscapes and seascapes is expanding and showing positive results.[8]

Regional Master Plan for the Prevention and Control of Dust and Sandstorms in Northeast Asia[10]

The regional master plan includes two major activities: (i) establishment of a regional network for SDS monitoring and early warning, and (ii) demonstration projects for the prevention and control of SDS, including investment strategies. The demonstration projects proposed four localities in China (Alashan, Ordos, Xilingol, and Hulunbuir) and Mongolia (Ovorhangai, Omnogobi, Sukhbaatar, and Dornogobi), as well as one cross-border area between China and Mongolia (Erinhot-Zamiin Uud area). This master plan has been used as a reference for regional cooperation activities and to develop the Northeast Asia Sub-Regional Action Programme to Combat Desertification and Dust and Sandstorms (NESRAP) of the UNCCD and North-East Asia Multi-Stakeholder Plan (NEAMSP) of NEASPEC.

In addition, a regional network for SDS monitoring and early warning was implemented through a collaboration of national meteorological agencies and the World Meteorological Organization (WMO). In 2007, the WMO launched a research programme entitled Sand and Dust Storms Warning Advisory and Assessment System with a regional node for Asia and Central Pacific, hosted by China. In 2017, the Asian SDS regional forecast center was formally accredited and demonstration projects are currently being implemented by national authorities.

Throughout Northeast Asia, SDS are now regarded as a common trans-boundary environmental problem which damages agricultural production and living conditions in source areas. While recently there has been a great effort to control sand in desertified grasslands, SDS still have various adverse impacts in downstream countries, both on human health and regional climate conditions. Therefore, desertification control, rehabilitation and sustainable land use in SDS source areas are essential for their long-term prevention and mitigation.

China, Japan and the ROK have so far been involved in several studies on combatting desertification, examining both reactive and proactive approaches. Since 1999, SDS have been a featured topic at the annual TEMM – a meeting comprising the environment ministers of the ROK, China and Japan, with a view to promoting and strengthening cooperation on an extensive range of environmental issues. A Tripartite Presidents Meeting, involving the respective national environmental research institutions, has been held annually since 2004 to enhance cooperation at the scientific level. In terms of overseas development assistance, Japan reported spending around USD 375 million in 2003 and 2004 alone, in order to combat desertification in China. The ROK, meanwhile, has provided over USD 10 million since 2001 to plant trees and shrubs in desertified areas.

In 2007, the TEMM launched a large-scale joint project to combat SDS consisting of a Tripartite Director-General meeting, two working groups, and a steering committee to establish monitoring and early warning networks, and provide policy-relevant scientific knowledge for decision-makers. The China-Japan-ROK trilateral summit is an annual gathering of Heads of State first held in December 2008 in response to the economic crisis of the same year. In September 2011, the three countries launched the Trilateral Cooperation Secretariat, based in Seoul. While subsequent summits focussed on economic, trade and disaster risk issues, at the 6th trilateral summit in 2015, the three leaders adopted a Joint Statement of Environmental Cooperation, which stressed the necessity of continued and strengthened cooperation in addressing a range of common environmental problems in nine priority areas, including DLDD and SDS.

To strengthen and promote cooperation in mitigating sand emissions from desertified land, the respective Directors General agreed to produce a new joint research action plan for the 9th Tripartite Director General Meeting for Joint Research on Dust and Sandstorms (9th TDGM on DSS) held in April 2014. At this date, they also confirmed the timeline regarding the initial drafts of new joint research action plans produced by the ROK, noting that: they would be discussed respectively at Working Groups I and II (WG I and WG II) meetings in 2014; they would be reported to the 9th DSS Steering Committee Meeting; they would be approved at the 10th TDGM on DSS; and that they would be adopted at the 17th Tripartite Environment Ministers Meeting (TEMM17) in 2015.

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UNCCD AND INTERGOVERNMENTAL ORGANIZATIONS

Desertification is identified as one of the contributing factors to the increase in SDS at end of the 1990s. The adoption of the UNCCD in 1994, along with its regional implementation annexes, triggered more regional and sub-regional cooperation on desertification. The UNCCD promotes activities at the national, sub-regional and regional levels in the form of coordinated and integrated action programmes. Through its Asia Regional Coordination Unit, the UNCCD supports the preparation and implementation of National Action Programmes (NAPs) for China and Mongolia, and monitors national, sub-regional and regional progress towards achieving the Convention's goals, which include biodiversity and climate change goals. Regional activities can also be launched through Sub-Regional Action Plans (SRAPs) and Thematic Programme Networks (TPNs). Each network deals with one core aspect, which is either a cause or an effect of desertification and aims at providing and promoting regional solutions through improved and innovative regional cooperation and information exchange.

In 2008, the Northeast Asia Forest Network, a trilateral ministerial cooperation platform joining China, Mongolia, and the ROK, adopted the Northeast Asia Sub-Regional Action Programme to Combat Desertification and Dust and Sandstorms (NEASRAP). It is a framework plan for the network to implement its future cooperation activities under the UNCCD and relies heavily on the principles of partnership building. It outlines several proposed programmes and collaborative mechanisms on information sharing, joint research, capacity-building, technology transfer, and other projects.

DLDD NORTHEAST ASIA NETWORK

In 2011, the Northeast Asia Forest Network was expanded and transformed into the Northeast Asia Network for Desertification, Land Degradation and Drought (DLDD-NEAN) by a MoU between ministers from China, the ROK and Mongolia. This MoU occurred upon the margins of the UNCCD COP11 in Changwon (ROK), in 2011. Current active members include China, Mongolia and the ROK, whereas Russia, the DPRK and Japan can participate as observers; the Korea Forest Service acts as the secretariat. The DLDD-NEAN is an official reporting entity to the UNCCD and operated by a Steering Committee which meets annually in conjunction with fora to discuss thematic sub-regional issues. The Network operates on three levels (high-level meetings, working groups, and technical fora) and there are three types of membership: countries (either as members or observers), institutions (including NGOs and IGOs), and the private sector.

The establishment of the DLDD-NEAN created a new cooperation platform for the implementation of the UNCCD at the sub-regional level. Its main functions are to: (i) address issues relating to desertification and SDS; (ii) cooperate in addressing relevant forest issues which contribute to the prevention of DLDD; and (iii) contribute to the implementation of sustainable forest management (SFM) and SLM activities. A feasibility study on the 'Joint demonstration project for prevention and control of dust and sandstorms' originated in Erlinhote, China and Zamiin Uud, Mongolia source areas' was conducted between 2012 and 2013 in collaboration with the UNCCD secretariat.

NORTH-EAST ASIAN SUB-REGIONAL PROGRAMME FOR ENVIRONMENTAL COOPERATION (NEASPEC)

Since its establishment in 1993, as an intergovernmental cooperation framework, NEASPEC has worked with member governments and various partners to collaborate and build capacity in prevention and control of SDS in North-East Asia. As a follow-up on the implementation of the Regional Master Plan for the Prevention and Control of Dust and Sandstorms in Northeast Asia, NEASPEC – in partnership with the Institute of Desertification Studies (IDS), and the Chinese Academy of Forestry – organized a capacity

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building programme on Combatting Desertification in North-East Asia and carried out training workshops in 2011[11] and 2013[12].

Noting the critical role of multi-stakeholder engagement and the need to enhance cooperation amongst key players, NEASPEC convened an international workshop on Combatting Desertification and Land Degradation, jointly with the former State Forestry Administration (now called the National Forestry and Grassland Administration) of China in 2015, to develop the "North-East Asia Multi-stakeholder Plan (NEAMSP)"[13]. Participants from governments, international organizations, academia, NGOs and the private sector discussed and adopted the NEAMSP as an open and inclusive approach to facilitate the exchange of information and coordination amongst various stakeholders[14].

CIVIL SOCIETY ORGANIZATIONS

NGOs from Japan and the ROK have been working with local groups in China and Mongolia since the 1990s to alleviate poverty and prevent desertification. Through this work, many of these NGOs have been addressing the ecological, political, economic and cultural drivers of desertification to devise area-appropriate solutions. Some early examples of NGO involvement are listed below, with more detailed and recent examples highlighted in section 3 of this report.

- Greening Desert Practice Association, initiated in 1980 by Professor Toyama Seiei, which facilitated China and Japan community-based cooperation in the restoration of desertified land to improve local livelihoods;[18]
- Japan's Green Earth Network (GEN) has been working around Datong in China's Shanxi Province since 1992;
- Organization for Industrial, Spiritual and Cultural Advancement International (OISCA)—another Japanese NGO—has been conducting afforestation programs along the Yangtze River and in Inner Mongolia since 2000;
- The ROK's Northeast Asian Forest Forum (NEAFF) was established in 1998 by former forestry officials and scientists, and held its first international seminar on desertification in 1999;
- The Korean Federation for Environmental Movement (KFEM), the largest and most prominent environmental NGO in the ROK, has been working with the Chinese NGOs, Friends of Nature and Echoing Steppe, since 2003.

North-East Asia Multi-stakeholder Plan (NEAMSP) of NEASPEC[15]

The NEAMSP, developed at the 2015 NEASPEC workshop, has been developed as a practical tool to support and bring together multi-stakeholders to combat desertification and land degradation in the region by creating an interconnected community for enhanced action. NEAMSP supplements existing multilateral mechanisms including the NEASRAP, DLDD-NEAN and the Regional Master Plan for the Prevention and Control of Dust and Sandstorms in Northeast Asia. It aims to (i) establish a platform for information exchange and expertise sharing; (ii) create cooperative linkages amongst governmental departments and civil society organizations, public-private partnerships, and the close combination of research and development with grass-roots practice; (iii) support regional ecological restoration and sustainable utilization of resources; and (iv) contribute to efforts to achieve LDN targets in the Northeast Asia sub-region.[16] The overall goal of the NEAMSP is to support stakeholders in their endeavour to scale-up SLM practices, improve the quality of life for rural populations, and secure ecosystem health and services for future generations. Some of the activities envisioned under these six priority areas are already underway and can serve as reference for future action.

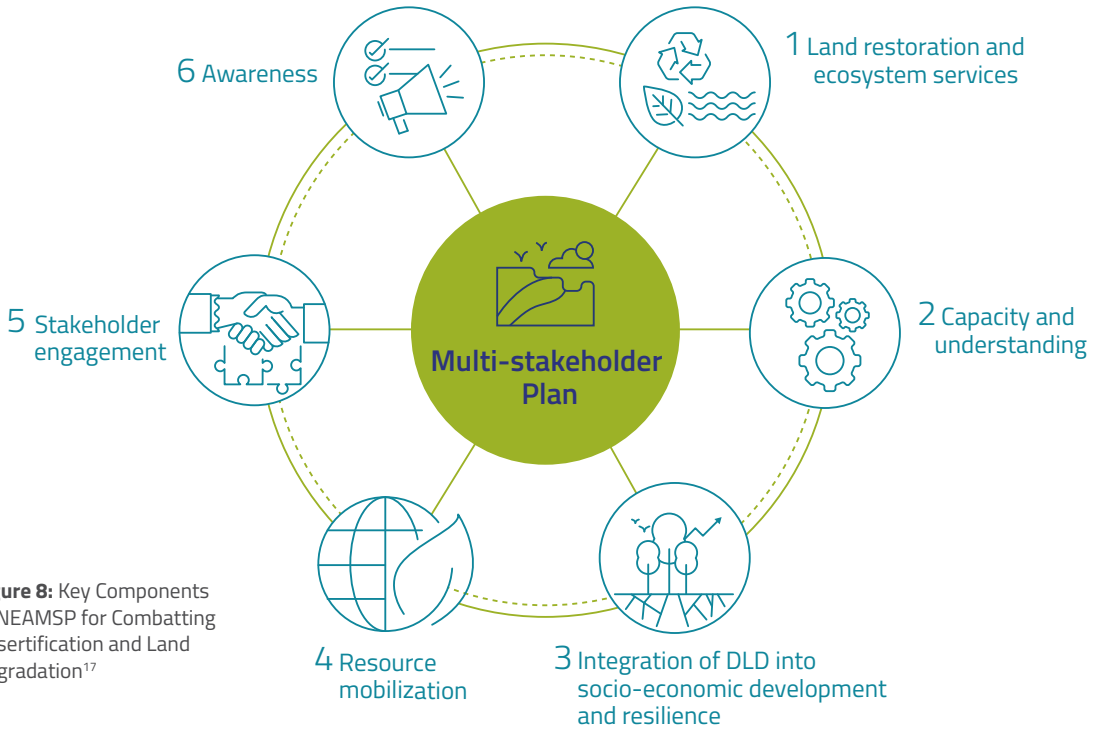

Figure 8: Key Components of NEAMSP for Combatting Desertification and Land Degradation[17]

FUTURE COOPERATION

Environmental cooperation in Northeast Asia is not only essential for defusing environmental threats and challenges in the region but also for nurturing cooperation in "softer" areas as a means by which to alleviate political tensions.[20] With these goals in mind, Northeast Asian countries have pursued environmental cooperation, both bilaterally and multilaterally, with specific bodies, such as NEASPEC and TEMM, both established to coordinate activities. However, the results of efforts thus far have been largely consultative in nature, revolving around information sharing. The drivers and impacts of DLDD and SDS remain acute yet there are a number of pathways that could be considered, so as to scale-up action on the ground.

One option would be for NEASPEC and its six member states to strengthen multilateral cooperation via the proposed multi-stakeholder platform to deal with comprehensive environmental issues and facilitate multinational projects conducted by governments, scientific institutions,

NGOs and private actors. Ideally, this would involve the active membership of Mongolia, the DPRK and Russia, which would be seen as a natural step since NEASPEC already includes these nations, and all countries (except the DPRK) regularly hold bilateral meetings.

The DPRK's participation is critical as the country is suffering from accelerating environmental degradation, including deforestation which is linked to a decline in agricultural productivity and increased vulnerability to disasters, such as floods and droughts. In the Pyongyang Joint Declaration of September 2018, the ROK and the DPRK agreed to actively engage in inter-Korean environment and forest cooperation in order to protect and restore the natural ecosystem, and as a first step, to endeavour to achieve substantial results in the currently on-going forestry cooperation.[21]

Another option to enhance future regional cooperation would be to task the DLDD-NEAN as a core implementation partner/platform for achieving LDN and enhancing the implementation of the UNCCD, including SDS source mitigation. To support this future work of the DLDD-NEAN, the UNCCD's Asia Regional Coordination Unit could play an important role, including the revision of the SRAP if deemed necessary. The UNCCD already functions as a partnership bridge, however it could provide further guidance and help design collaborative projects.

Partnerships with the private sector, individuals and NGOs, can help countries meet the growing gaps in funding to finance conservation efforts.[37]

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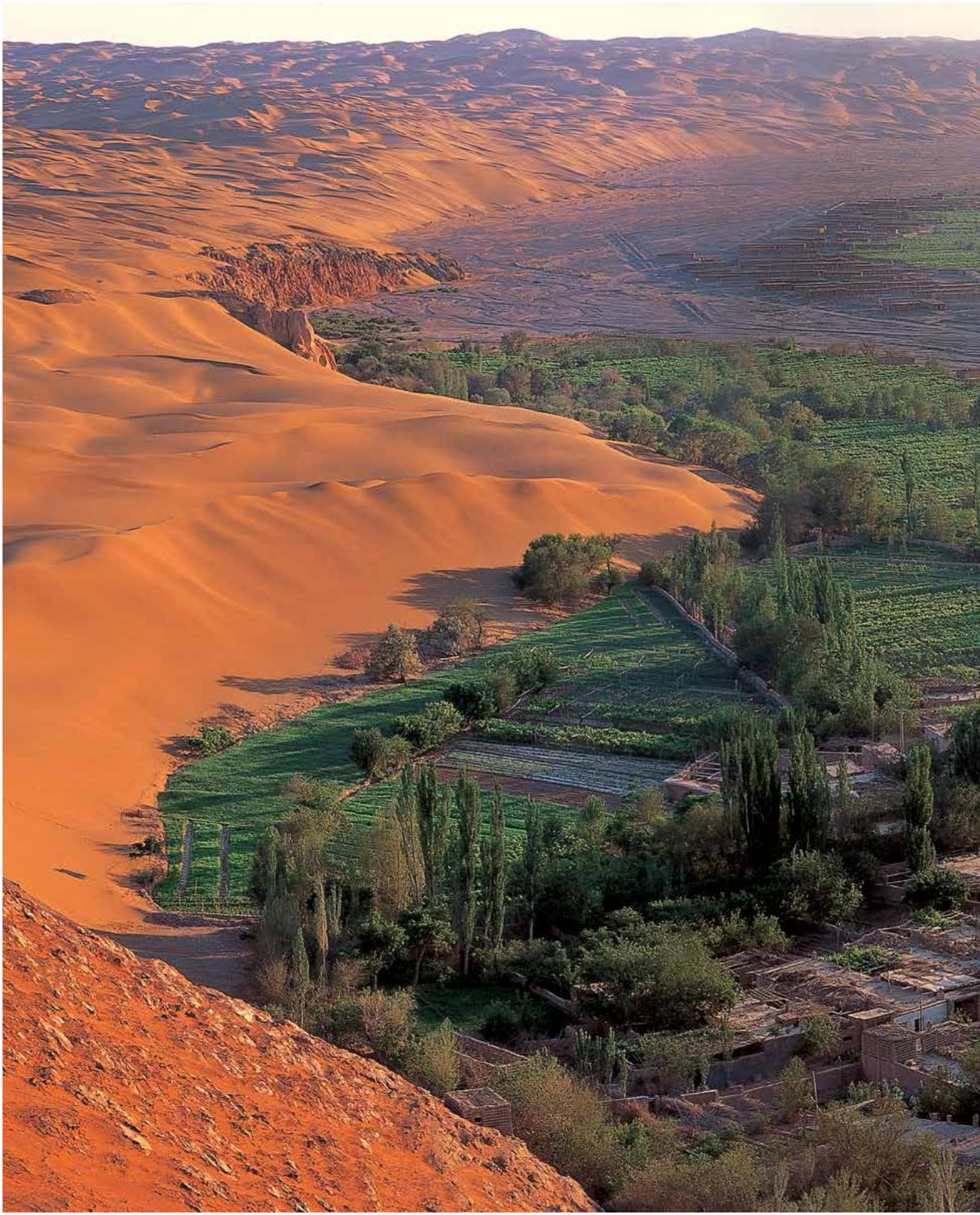

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3.DESERTIFICATION: SAND AND DUST STORMS

SDS play an integral role in the biosphere but they also present a range of hazards to environmental and economic sustainability, not only for residents of dryland environments but also for populations a great distance from the source, sometimes greater than 1000 km. For example, dust from the Northeast Asian deserts of China and Mongolia is frequently transported over the Korean Peninsula and Japan, and across the Pacific Ocean to the North American continent. Early warning of imminent SDS events, and advice on health risks and mitigation options, can be achieved through a variety of means. In the ROK, warnings of yellow dust events transported across the Korean peninsula from China and Mongolia are issued by the Korea Meteorological Administration using local media and text alerts.[1]

Dust blown from China, Mongolia and Central Asia has greatly affected the Northeast Asia region and prompted the first Master Plan for Asian Dust Damage Prevention (2008–2012). The plan involves 14 governmental organizations and focusses on: (i) establishing a platform for monitoring dust storms; (ii) developing a strategy to protect against damage; (iii) establishing the Northeast Asian sub-regional cooperation network; and (iv) strengthening domestic disaster management. The second phase of the Plan (2013–2017) adopted a precautionary approach to disaster risk management with particular attention given to vulnerable populations. It aims to strengthen the SDS monitoring network to enhance forecast capacity, and to develop risk management plans – for vulnerable groups, as well as for different sectors including health, food, and air transportation. It also aims at implementing regional cooperation for SDS mitigation.[2]

The SDS problem in Northeast Asia has also prompted formulation of a Regional Master Plan for the Prevention and Control of Dust and Sandstorms in Northeast Asia, a project involving the governments of China, Japan, Mongolia and the

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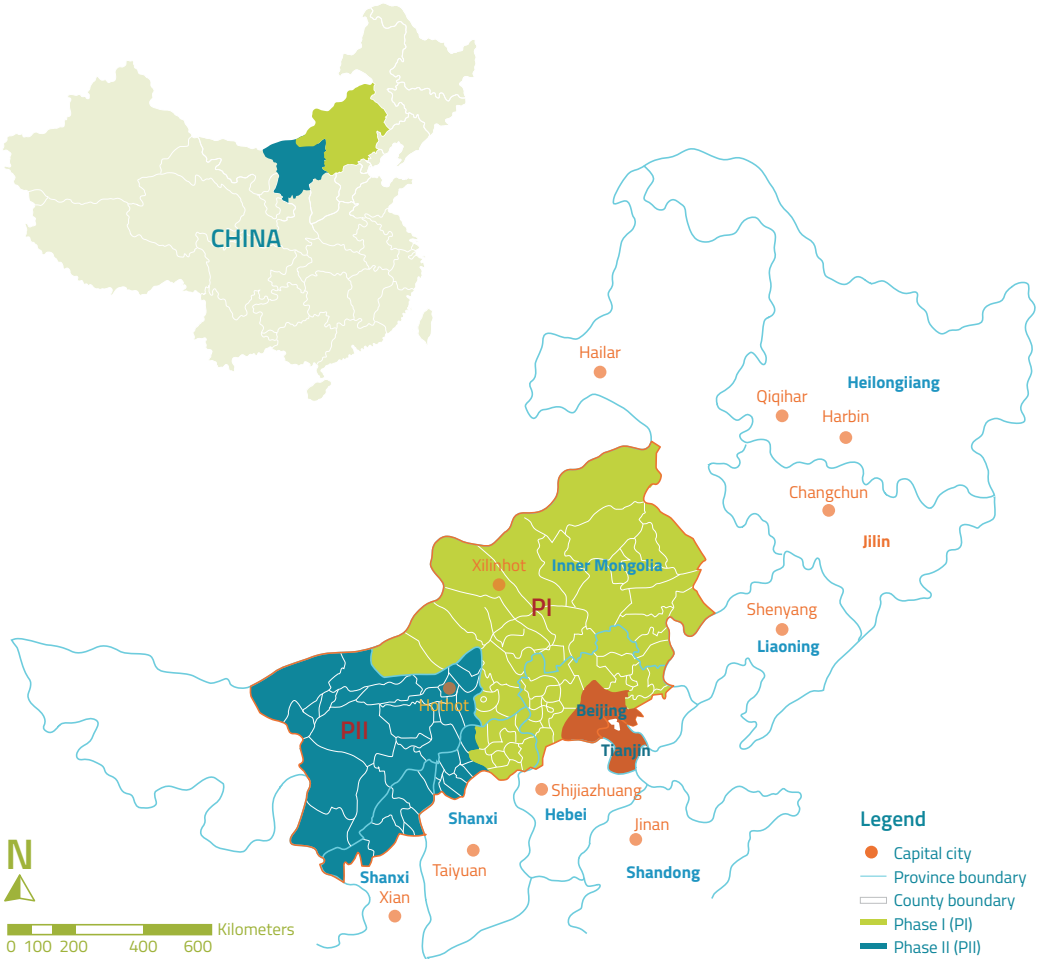
ROK. The plan has two components: (i) a phased program to establish regional monitoring, forecasting and an early warning network for SDS in Northeast Asia, which has been realized within the WMO SDS-WAS Asia Node, with a regional center hosted by the China Meteorological Administration; and (ii) an investment strategy to strengthen mitigation measures and to address the root causes of SDS in source areas.[3] In this section, a number of public, private and non-governmental partnerships to combat SDS in the region shall be detailed.

3.1 BEIJING–TIANJIN SAND SOURCE CONTROL PROGRAM

In 2002, China was the first country in the world to issue a law on the prevention and control of desertification, and to begin implementing large-scale projects to combat desertification, including the Beijing-Tianjin Sand Source Control Program and other tree planting projects. Throughout the 1990s, the cities of Beijing and Tianjin, and many areas in North China, were repeatedly subjected to SDS events. The Beijing-Tianjin Sand Source Control Programme is a regional ecological restoration project initiated in the northern parts of the country. It involves a mix of measures, including grazing restrictions, and the conversion of cropland to forest or natural grassland. From 2010-2014, the area of sandified land in the country shrank by an annual average of 1,980 km^2. The results have been very positive, for instance, in Beijing in 2000, the city was impacted by 13 SDS events but in recent years, the frequency of such events has been reduced to 2-3 a year.[4]

Phase I of the Program (2000-2010), including 75 counties in four provinces and one autonomous region (Beijing, Tianjin, Hebei, Shanxi and Inner Mongolia), was formulated jointly by the State Forestry Administration, the Ministry of Agriculture, the Ministry of Water Resources and five provincial governments, based on the National Ecological Improvement Master Plan. It is based on the national monitoring assessment on the status of land degradation, the land-use system, and the root causes of land degradation, as well as SDS source and path mapping. Interventions promote an integrated approach and the combination of biological and engineering measures, including conservation, afforestation and reforestation measures such as: natural regeneration; the conversion of farmlands to forests; sand stabilization in hilly areas; afforestation by aerial seeding; grazing prohibitions; and the development of a shelter forest network. In parallel, support for alternative livelihoods was provided through the construction of livestock sheds, provision of forage processing mechanisms, installation of water-saving irrigation facilities, small-scale integrated watershed management, and the resettlement of farmers.[5]

Figure 9: Phases I and II of the Sand Source Program



Phase I has thus contributed to the aims of creating a green ecological barrier in northern China, reducing the incidence of SDS events in Beijing and Tianjin as well as increasing regional economic development. Over 7.5 million hectares of barren mountains and virgin lands were converted to forest plantations, 9.3 million hectares of grasslands stabilized, 15,000 km2 of small watersheds brought under control, 213,000 irrigation projects established, 11 million m2 of greenhouses erected, and 127,000 feed machines purchased.[6] A recent study of the Beijing-Tianjin Sand Source Region investigated the interlinked role of drought and ecological restoration on vegetation trends of vegetation activities. The results demonstrate that vegetation activity ("greenness") increased in over 50 per cent of the source region during the period from 2000-2010, with 58 per cent of the study area showing increased greenness. However, a decreasing trend in vegetation activity was observed in the southwest to northeast regions of the program. The decreasing trends are partly explained by droughts, which offset the ecological restoration program-induced increase in vegetation activity in the source region.[7]

Phase II of the Program (2013-2022): The overall goal of Phase II is to further mitigate SDS impacts on the Beijing and Tianjin areas, and to complete the construction of the ecological barrier to reduce the frequency of SDS in the area. The specific ecological objectives aim to consolidate the progresses made in Phase I by 2022. The goal being to contain the overall desertification process in the project area, markedly improve the ecological environment, further increase the ecosystem stability, and further reduce the wind and sand harms.

The project also has economic and social objectives, which it also aims to fulfil by 2022. These are: optimizing the economic structure of the project area; steadily improving the capacity of sustainable development; achieving sustainable and effective usage of forest and grass resources; achieving a balance between carry capacity and livestock population; achieving transformative

change of husbandry production patterns; advancing special industry to a better quality and higher efficiency; improving livelihoods and income (at an above average level) of the farmers and herdsman in the project area; comprehensively improving the living and production conditions of the residents in the project area; and, finally, ensuring the project area communities are on track for the achievement of sustainable development, with improved production, prosperous lives and a sound ecosystem.

Phase II was approved in 2012 with an investment of RMB 87.8 billion (USD 16 billion) and the program area was expanded from 75 counties in five provinces to 138 counties in six provinces, now including Mu Us Sandland and the Kubuqi Desert. The major tasks of Phase II are as follows:[8]

- Improving the quality of existing vegetation on degraded and desertified grasslands, by enhancing protection through zero grazing or enclosures, and managing an area of 7 million hectares of public forests;
- Increasing vegetation cover by strengthening afforestation and grassland restoration on a total of 6.6 million hectares;
- Converting farmlands on steep slopes to forests, and converting severe sandified farmland to grasslands;
- Strengthening desertified land control to curb local erosion and sand dune encroachment by engineering sand dune fixation of 0.4 million hectares;
- Improving the capacity of water/soil conservation and water-use efficiency to rationalize the use of land and water resources. Done by implementing small, integrated water shed management initiatives over an area of 21 thousand km^2 and building 100,000 water supply facilities and 610,000 water saving facilities;
- Developing grassland resources sustainably, and promoting the development of animal husbandry by supporting the development of forage cultivation, grass seed harvesting bases, building warm sheds for livestock, fresh forge storage cellars and forage processing machineries;
- Reducing the ecological stress of the region by relocating 0.4 million people.[9]

Phase II follows a whole-of-government approach: To ensure smooth implementation of the integrated measures, the SDS source mitigation programme established an inter-ministerial coordination and evaluation mechanism composed of the National Development and Reform Commission (responsible for integrated planning), the Ministry of Finance (responsible for budget allocation and expenditure assessment), the Ministry of Agriculture (responsible for implementation of agriculture related activities), the Ministry of Water Resources (responsible for water supply and irrigation facilities), and the State Forestry Administration (responsible for forest related activities and monitoring and assessment on the effectiveness of the project).

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Transformation of desert village, 2009-2017

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3.2 FUTURE FOREST

Future Forest is an NGO based in the ROK, and established in 2001. A former ROK Ambassador in China, who experienced severe dust storms during his service in China, realized the necessity of combatting desertification in the region. He began tree planting projects with young Korean and Chinese volunteers aiming to prevent soil erosion and land degradation, which are the main causes of SDS afflicting Northeast Asia, including China, the ROK, the DPRK, and Japan.[10]

Each year, since 2002, Future Forest dispatches trained Green Corps consisting of 100 young, mostly Korean but also Chinese and international volunteers to the deserts of China, to plant trees with the local people directly affected by desertification. Every spring when SDS arise, Future Forest's Green Corps wages war against dust storms and desertification with shovels and saplings. As a result of continuous efforts, the expansion of desert has stopped and a forest of willows and poplars protect the once-abandoned desert villages.

The Great Green Wall (GGW), a 16 km long windbreak forest in the Kubuqi desert of Inner Mongolia, China, is regarded as one of the most successful projects in fighting desertification in the world. The Kubuqi desert is the closest desert to the Koreas as well as one of the main sources of SDS affecting the capitals of Beijing and Seoul. In October 2006, partnering with the All-China Youth Federation and the local Dalateqi government, sponsored by the Korea Forest Service, Future Forest initiated the GGW project, a large-scale afforestation project to stop the eastward expansion of the desert. At first many people, including some scientists, were pessimistic and opposed the project because they thought that a moving sand dune desert could not be stopped by the planting of trees. However, a study done in 2017 on the project sites found that a 20km-long barrier was formed against dust generation, confirming the effects of the long-term tree-planting project in combatting desertification.

Monitoring progress in the Kubuqi desert

While a reliable monitoring scheme for SDS generation can be difficult, the Kubuqi desert provided an excellent case study environment due to its well-organised infrastructure and ground survey data sets. The research project involved applying a satellite and ground data fusion approach to continually monitor sand dust generation over multiple test sites. Vegetation changes resulting from anti-desertification activities were, in this manner, incorporated into the continuous satellite observations. The results confirmed the establishment of a 20 km barrier with significant mitigation effects on the sand and dust generation – an up to 80 per cent decrease since 2008 was validated in both high-resolution drone and satellite analyses. The project enabled a better understanding of SDS generation in sandy deserts, which will be applicable to other efforts to combat desertification, as well as to SDS early warning. Future studies will be conducted over more extensive areas with a focus on changes in ground water, an essential factor in combatting desertification.[11]

The GGW, now consisting of more than ten million trees, is located at the eastern edge of the desert, and stands not only to prevent its expansion but also to recover the productivity of the land. The GGW afforestation project also provides an effective platform for people to participate in, and be a part of the global objective of reaching the target of LDN by 2030. It requires a significant raising of awareness followed by an equally massive allocation of resources. Corporate sponsorships, such as Samsonite Korea's sponsorship in the spring 2017 and 2018, contributed to broader participation in the region. From 2017-2019, the Korea Foundation sponsored the Green Corps programme as a type of public diplomacy program.

3.3 CHINA'S THREE NORTH SHELTERBELT CONSTRUCTION PROGRAM (THE GREEN GREAT WALL)

In 1978, China made a significant decision to implement the Three-North Shelterbelt Program in the three northern regions of the country, for the purposes of addressing severe disasters, such as SDS, drought and soil erosion, and ecological degradation issues.[12] The program covers 551 counties in 13 provinces and accounts for about 42 per cent of China's total land area, which is composed of 95 per cent wind and sand hazard affected areas, and 40 per cent water erosion affected areas. It is planned to be implemented in eight phases of three stages, from 1978 to 2050, with a goal of 37 million hectares of total afforestation. It is the largest, longest and most difficult forest programme in the world.

From the start of its implementation to 2018, the GGW project has afforested a total of 46.1 million hectares; forest coverage has increased from 5.05 per cent to 13.57 per cent, with a net increase of the forest area of 21.56 million hectares. The Comprehensive Assessment Report on the Effectiveness of the Three North Shelter Belt Programme, released in 2018, shows that it contributes to 61 per cent of water erosion reduction, and to a 10 per cent improvement of the yield in the previously low agricultural production area. Simultaneously, there has been a 10 per cent restoration of land desertification, with the restored forest ecosystem capturing 2.31 tons of carbon in accumulation. This can offset 5.23 per cent of the country's total carbon emission by industries, in the period from 1980-2015. The program also contributed to regional socio-economic development, having provided job opportunities to 313 million rural laborers. Finally, ecotourist development based on the improved ecosystems and natural resources has attracted 380 million visitors.[13]

Plantations and shelterbelts created early in the Program are now entering more mature stages. Recent observations of the China Meteorological Administration show that the rate of land degradation has been controlled, and the ecological conditions of key management areas have improved. Peer-reviewed studies suggest that the greening trend has continued to increase in the 'Three North' region during the past three decades – much faster than in any other regions in China. Given the fact that this trend may not directly associated with phenological change and increase in water stress, the achievement of multiple ecological restoration programs may have greatly contribute to this vegetation activity increase in the 'Three North' regions.[14,15] At the same time, other scientists caution that there is a need for

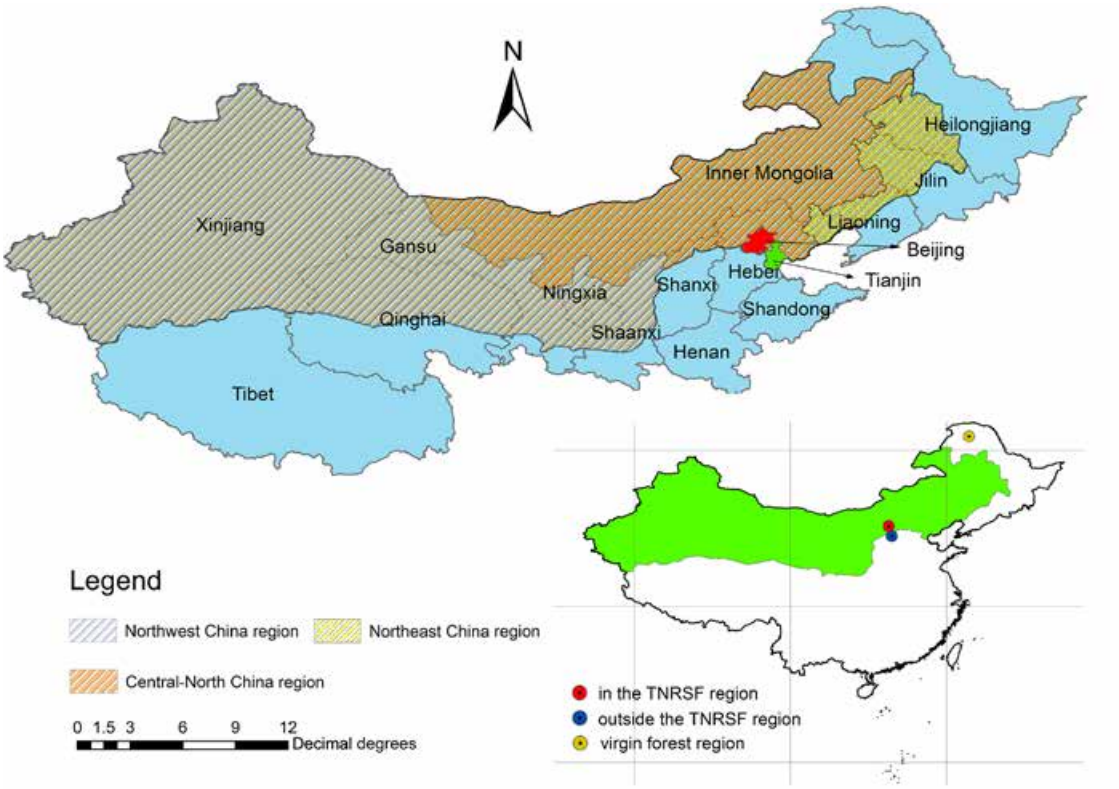

Figure 10: Map of Three North Shelterbelt Program.

Transformation from 1984-2012

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stronger and more direct evidence so as not to risk overstating the impacts of the Program.[16]

The latest phase of the Program lists the improvement of degraded forests as a key focus, including the further development of policies, measures and methods for restoring degraded forests. In 2015, the Ministry of Finance and the State Forestry Administration carried out a pilot restoration of degraded forests in 50 counties spanning 9 provinces and released a Guide to Degraded Shelterbelt Restoration.

© Green Asia Network

3.4 GREEN ASIA NETWORK

The Green Asia Network (GAN) is an international NGO that seeks to bring people together to lead sustainable lives in harmony with nature. To achieve this, the GAN developed the Sustainable Regional Development Model, which focusses on SLM, local self-sufficiency, and community empowerment. The GAN works with local communities and deploys technical expertise in agroforestry, land management, renewable energy, and community development to mitigate and adapt to climate change.[17]

The GAN carries out afforestation projects in Mongolia, specifically targeting areas affected by climate change and desertification, with over 450,000 trees planted on 450 hectares. The GAN believes strongly in empowering locals by training them in afforestation and agricultural practices, thus creating jobs and developing a self-reliant community model. For example, using well-adapted indigenous trees has increased the cultivation of fruit trees and cash crops with the support of various Mongolian and ROK partners.

Climate change and desertification in Mongolia have been exacerbated not only by the reduction of grassland but also by severe winters (dzuds). In 2002, nearly ten million herd animals died, leaving twelve thousand herders in poverty. In 2009-2010, the dzud killed approximately eight million herd animals (one fifth of the entire herd population in Mongolia) and produced twenty thousand eco-refugees. Sixty percent of the herders who lost their homes and livelihoods were forced to live below the national poverty line, with no electricity or water, in urban ghettos.

Another of the GAN's priorities is the establishment of eco-villages for eco-refugees focussed on the three pillars of environmental, economic and social development. This encourages self-reliance through local residents' participation and capacity building, including the creation of cooperative associations. The key focus is upon technological innovation, which increases efficiency in the cultivation of fruit trees and cash crops and helps build a long-term infrastructure for the community.

The GAN also organizes eco-tours for participants that recognize the seriousness and damage brought on by climate change and desertification. They dig wells and plant and manage trees as

part of an experience to feel a new sense of nature and culture. During their stay, participants think about the causes of the environmental crisis and try to find alternatives. They also study the global challenges and achievements of visiting international organizations. The GAN's eco-tour has two principles: 'Labour is a pleasant education' and 'Sharing'. Through the eco-tour program, participants learn to respect their global village neighbours and to become global citizens.

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4. FOREST AND LANDSCAPE RESTORATION

The threat posed by degradation can seem daunting. Vast areas are affected. The causes are complex and tough to address. However, our growing understanding of how natural systems work, and of their importance to human well-being and security, present huge opportunities for positive change. Through the SDGs and other agreements, the international community is committed to putting the ways that we use and manage the Earth's natural capital onto a more sustainable track. Forest and landscape restoration has emerged as a key element in strategies to meet this challenge, encompassing our efforts to address land management, biodiversity conservation and climate change. An assessment by the Global Partnership on Forest and Landscape Restoration identified approximately two billion hectares of the world's deforested and degraded forest lands where opportunities for restoration may be found – an area larger than South America.[1]

Land-use and governance systems have changed dramatically over the last century in Northeast Asia, including the development of large-scale irrigated agriculture, the mining of oil, gas and metals, and rapid industrialization. Changes in Russia and Mongolia, such as institutional arrangements regarding land tenure, were influenced greatly by the dissolution of the Soviet Union, while China aggressively promoted policies of economic development that led to desertification in some regions. After the Japanese occupation and the Korean War, the ROK put an emphasis on restoring much of their forest landscapes, supported by policy frameworks that encouraged public participation. To varying degrees, all the countries of Northeast Asia are now designing and implementing actions to restore forest landscapes, including in trans-boundary areas.

Restoration actions could range from on-the-ground activities – such as habitat protection, sustainable natural resource management, assisted natural regeneration, sand-dune stabilization, seeding and the planting of trees, shrubs and

Restoration must transcend sectoral barriers, including those between agriculture, forestry, environment and finance ministries. This effort requires new ways of doing business at all levels, including the landscape level. It also must draw in researchers, civil society and the private sector.[3]

grasses for multiple purposes – to policy improvements, the provision of financial incentives, capacity development, and continuous monitoring and learning. To be effective and sustainable, these actions should be implemented at the landscape level. This is due to the seasonal availability of limited resources – such as water and biomass over large territories – and the long-distance movements (e.g. upland–lowland transhumance or other long-distance spatial movements linked to a nomadic lifestyle) and strategies that people, livestock and wildlife have developed over the ages to access said resources. If implemented in such a manner, both ecological and socio-economic sustainability can be ensured.[2]

4.1 ROK FOREST REHABILITATION PLAN

About half a century ago, the ROK was a deforested country. 35 per cent of the country's territory was devastated, and the lowest growing stock was only about 5.6m3/ha. At that time, forest rehabilitation seemed to be impossible because the per capita GDP of the ROK was about USD 82 which was the lowest among the least-developed countries. However, Korea is now a green nation with forests covering 64% of its territory and the growing stock reaching 125m^3/ha.[4]

In fact, even during the Goryeo (918-1392) and the Joseon (1392–1897) dynasties, there were already policies in place aimed at limiting reckless deforestation and protecting forests on the Korean Peninsula. These policies were intended to maintain the stable supply of timber resources within the country, as timbers were in high demand across all socio-economic sectors, for fuelwood, construction and warships. Deforestation on the Korean Peninsula significantly increased, however, during three main periods: the late Joseon Dynasty in the 18th century, due to population growth; the Second World War (Japanese Colonial Period); and the Korean War, due to the war effort.

Even after the formation of the ROK government, the forests of the country remained in very degraded shape; they had been continuously destroyed due to illegal logging, slash-and-burn farming, and fuelwood collection. In the 1950s and 1960s, despite the ongoing Korean War, the Forest Act (1951) was enacted, and various project plans were established as part of the United Nations Korean Reconstruction Agency (UNKRA) assistance. A few such plans were the 3-year Reforestation Plan (1952-1954), the Forest-land Erosion Control Plan (1953-1957), and the Second Private Forest Reforestation Plan (1954-1963). However, regardless of these efforts, the results were not successful. This was due to a lack of budget, the absence of a driving force

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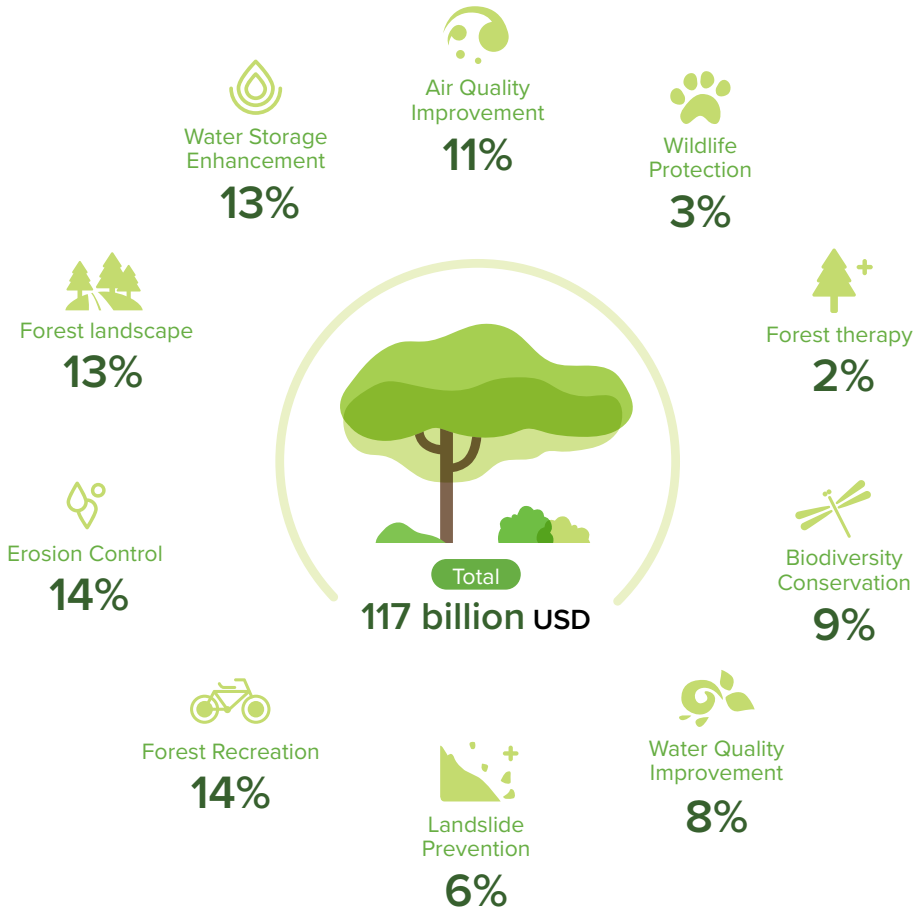

Figure 11: Estimate of public services from forest rehabilitation

behind the plans, continued illegal logging, and unrestricted deforestation for fuelwood.

Based on the lessons learnt from the previous failure, the ROK established the First and Second National Forest Rehabilitation Plans under three principles – 1) Afforestation by the people; 2) Rapid Afforestation; and 3) Economic Afforestation. A very detailed plan was implemented even at the village level, and the implementation capacity of the government was strong enough to carry out the plan. Had there been no previous failures, it would have been impossible to promote and implement this integrated plan at the national level. Success factors of the ROK's National Forest Rehabilitation Plan can be summarized as follows.

The first and most significant factor was the strong implementation capacity of the government of the ROK. With the establishment of National Forest Rehabilitation Plan, in 1973, the Korea Forest Service was separated from the Ministry of Agriculture and Forestry. It was transferred to, and became affiliated with, the Ministry of Home Affairs, which made it possible to engage local government and police in implementing forest policies. Through this, the forest sectors were significantly expanded within local government, and the National Forest Rehabilitation Plans were adequately implemented, even at the village level. As a result, many civil servants in forestry departments were promoted, which motivated them to work even harder.

The second success factor was people's participation. Certainly, there was strong government leadership in the early stages, however, later, the role of village efforts became increasingly significant. Acknowledging the importance of income generation through tree planting, the government established a tree nursery in each village. In this manner, village people produced seedlings, and the local government bought and utilized them for greening projects. The government induced people's participation by encouraging the ideology of "Planting tree is Patriotism". This was done through different mechanisms of the greening campaign, including mass-communication, advertisement, and publishing commemorative stamps on the national greening. A particularly successful element was Arbor Day, which was

designated and promoted as a national ceremonial day to encourage all people, schools, and public offices to participate in tree planting activities. Later on, the Food and Agriculture Organisation (FAO) emphasized that the government-led tree planting activities alone would not have led to the success of the Korean forest rehabilitation – in other words, the participation of the people had been key.

The third factor was evaluation and learning. Cross-checking for the survival rate of planted trees was a very effective measure. This measure ensured that survival rates in one given province were checked by another province. This contributed immensely to the successful reforestation. There were a few measures which facilitated the learning process, one of which was national- and provincial-level forest-owners-conventions, where forest owners exchanged information and knowledge, including about relevant government policies and new technologies.

The fourth success factor was the implementation of reforestation on the landscape level. Learning from the failure of the previous policy, the government realized that it could be difficult to succeed in forest rehabilitation if people live near the mountains and continue to exploit forests. As a result, the government developed measures to reduce deforestation. Alternative fuel conversion policies were developed, which encouraged people to substitute fuelwood for fossil fuels. Through the 'movement policy', the government also promoted the resettlement of about 300,000 slash-and-burn farmers and provided them with new income sources. Thanks to these efforts, migration to cities increased as the economy grew, and the use of fossil fuels also increased as incomes rose. Hence, the pressures on forests decreased over time.

Since the successful implementation of reforestation across the nation, forest production has increased greatly. It is also economically successful, and the reforestation industry amounts to USD 8.2 billion as of 2017. It is also worth noting that the percentage of non-timber forest products is relatively high, reaching more than 30 per cent. One of the positive effects of the successful reforestation can be seen in the increased forest public services, such as biodiversity conservation, forest recreation and therapy, improved air quality, erosion control, increased forest water resources, and many more. As per the evaluation by the National Institute of Forest Science (NIFoS) of the ROK, forest public services amount to USD 117 billion USD per year.

4.2 MONGOLIA'S GREEN WALL PROGRAMME

In accordance with Governmental Resolution #44 of 2005, a total 3,700 km length, or 200,000 hectares area of land in Mongolia shall be covered with main and sub-forest strips over three phases, from 2005 to 2035, under the Green Wall Programme (GWP). The objective is to create a belt of trees in the transitional zone between the Mongolian Gobi and the steppe regions in an effort to reduce forest loss, as well as the currently accelerating desertification, sand movement and SDS caused by climate change and human activities. The focus is on planting tree species with tolerance to drought, cold, salt and other natural and anthropogenic impacts, especially in arid and semi-arid regions.

Over the years, the GWP has been supported by laws and campaigns to combat desertification by engaging both the public and forest sector in planting trees.[5] As of 2019, the Programme is being implemented in 82 *soums* of 20 *aimags* with over 1,600 hectares of land afforested to date. According to the Ministry of Environment and Tourism, since its implementation, a total investment cost of 2,127 million MNT (~USD 1 million) has been drawn from

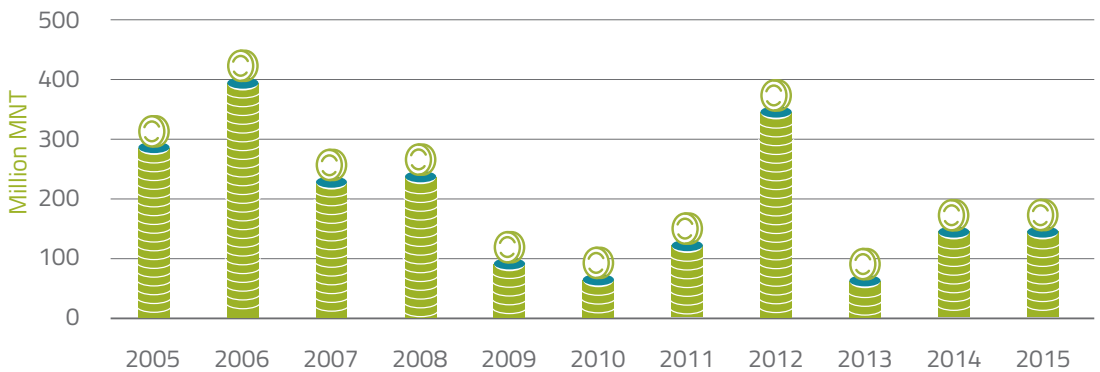

Figure 12: State budget allocation

Figure 13:
Three phases of GWP 2005-2035

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the state budget.[6] Many international and bilateral initiatives also support the implementation of the GWP. These include the "Keep Mongolia Green", a 10-year programme launched by 17 districts in the ROK for the Rotary Centennial, the Green Belt Programme supported by the Korea Forest Service, and community-based, self-sustaining afforestation undertaken by the NGO Green Asia Network.

Rotarians planted 94,000 trees in the initiative's first year, 2005, to create 80 hectares of windbreak forest in the south Gobi. Each year since then, a project in a different area of the country has been added, creating a mosaic of demonstration sites for forest windbreaks and agriculture.[7] The rotary initiative has had a great impact on locals to raise awareness of the importance of land reclamation for both the environment and livelihoods. Because of this initiative, a total of 177 hectares of forest windbreak have been created in different locations. This, in turn, laid the foundation for the ROK and Mongolian governments to partner on larger afforestation efforts.

In 2007, the Korea Forest Service joined up with the Green Belt Programme to reduce the environmental damage caused by yellow dust and to combat desertification. The 10-year project (2007-2016), called the "Greenbelt Plantation Project in Mongolia to Combat Desertification and Mitigate Dust and Sandstorms," was conducted in collaboration with the Mongolian Ministry of Environment and Green Growth. The Korea Forest Service dispatched plantation experts to Mongolia to share many aspects of its successful reforestation experience in the once denuded lands of the ROK. The project has planted more than 3,000 hectares, including drought-tolerant Siberian elm (Ulmus pumila) and sea buckthorn (Hippophae rhamnoides), and Saxaul (Haloxylon ammodendron), a rare and endangered native species in the Gobi region.[8]

During its initial stages, the Green Belt Programme had to overcome many challenges due to the hostile desert environment, and lack of experience and knowledge of appropriate afforestation techniques. Educational programs on forest planting and management technologies involved more than 200 Mongolian public servants as well as experts involved in nursery and forest industries. The Programme also raised Mongolians' awareness of the significance of forests, which motivated the public to continue supporting forest protection and management.[9] Activities for phase two (2017-2021) of the project include: the development of a multi-stage training program; joint research and enhanced capacity building for plantation management; the creation of urban forests for recreational purposes; tree planting day in Mongolia; and stronger cooperation with civil society organizations.

4.3 CHINA'S COMPULSORY TREE PLANTING CAMPAIGN

In 1981, the Chinese Congress adopted "the Resolution on Carrying out the National Compulsory Tree Planting Campaign" stipulating that citizens, aged 11 and above, are obligated to plant 3-5 trees every year, or to devote the equivalent amount of effort to related afforestation activities. This campaign is believed to be the most effective and largest tree planting campaign in the world in terms of scale and number of participants. People from all walks of life, from national leaders to primary school students, have participated, with over 54 billion

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Kökyar Protection Forest

The city of Aksu, northwest China, is situated between the Tian Shan mountain range in the north and the Taklimakan Desert in the south, at the banks of Aksu River. In an extremely arid climate (1868 mm evaporation and only 75 mm precipitation per year), it is fully dependent on the regular water supply provided by the Aksu River. In the 1980s, SDS were increasingly perceived as a problem that inhibited public life (occurring an average of 11.5 days per year, with visibility levels of less than 1 km).

The Kökyar Protection Forest is one example of the Chinese Tree Planting Campaign. In 1986, local authorities decided to establish a peri-urban shelterbelt plantation, the so-called Kökyar Protection Forest. The aim was that the poplar shelterbelts and orchards would provide regulating ecosystem services and reduce SDS impacts on Aksu City. The total area of the plantation reached 3,800 hectares in 2005.

The effort of planting the shelterbelt was made possible by the annual mass mobilization of Aksu citizens, as part of the National Compulsory Tree Planting Campaign. The establishment costs amounted to about USD 10,000 per hectare. The permanent maintenance of the plantation is facilitated by leasing orchard plots to private fruit farmers. From the perspective of the local economy, annual net benefits generated by Kökyar fruit farmers more than compensate for the annual government maintenance, resulting in an average overall cash net benefit of at least USD 1,600 per hectare in the long term.[12]

However, this alleged success story neglects important ecological costs downstream in the watershed where the Aksu River empties into Tarim River, China's biggest inland river that nourishes natural riparian forests. Water extraction from the Aksu River for the irrigation of the Kökyar shelterbelt consumes more than twice as much water as well-adapted natural forests, with the effect that the Kökyar afforestation area of 3,800 hectares is counterbalanced by a forest loss of 8,000 hectares in the downstream areas, and thus overall the project results in a net forest loss. Future afforestation projects must take into consideration water balances within the entire watershed.[13]

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trees planted in the last 30 years. The campaign no doubt inspired the international community and the development of the global Billion Tree Campaign, which has planted over seven billion trees, including 2.6 billion in China.[10]

Tree planting activities in China are also integrated with various other initiatives promoting SLM, including the adoption of land for greening, purchase of carbon credits, and a contribution fund for those who would rather give cash than plant trees. As result of the campaign, the vegetated area in cities has now reached 1.35 million hectares, with a total green coverage of about 38 per cent.[11]

4.4 MONGOLIA'S TUJIIN NARS FOREST RESTORATION

Most of Mongolia's forests are distributed in the north, including the pine tree forest called Tujiin Nars, located in Selenge Aimag near the Russian border. This forest was stripped bare by fires and illegal loggers during the 1990s. Timber extracted from Tujiin Nars was used for fuel wood, construction, furniture building, and other private uses. The extent of deforestation was reported in the media and sparked a national outcry for the government to respond.

Even after gaining protected status in 2003, illegal logging continued unabated as the Mongolian Law on Forests was not strictly enforced. For the next five years, it was seen as a war zone between rangers and illegal loggers. By 2009, a confluence of factors, including technical and financial support from the ROK, turned Tujiin Nars into one of the most successful reforestation efforts in Mongolia. What contributed most to its success was a stronger economy, stricter forestry laws, committed public servants, increased government spending, and increased environmental awareness.[14]

In 2012, the First Hanwha Solar Forest was established in Tujiin Nars, with more than 350,000 people participating through the Tree Planet application (see section 3.5.5) whereby 230,000 trees were eventually planted.[15] The successful establishment of forest plantations in Tujiin Nars is strongly linked to the transplanting of seedling materials originating from tree species native to northern Mongolia, such as pines and larches, for instance the Scots pine and Siberian larch. The survival rates at various ROK NGO sites were reported by the World Bank to be between 50-65 per cent, while other experts document survival rates at more than 80 per cent.

The North East Asian Forest Forum (NEAFF) and Yuhan Kimberly Co Ltd (YK) provided financial support to enhance seedling production capacity building (establishing two forest nurseries in the Selenge province, and at Tujiin Nars as well as to create forest plantations of over 3,000 hectares. The continuous investment of these organizations

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Every person is responsible for

18.5 tonnes

of carbon dioxide (CO_2) per year

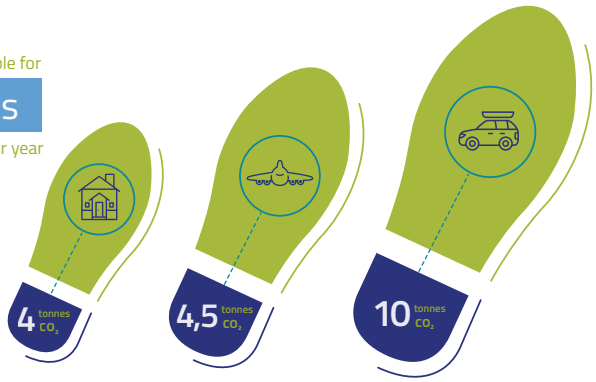


Figure 14: Carbon Footprint

to thinning operations has improved the growth and productivity of these plantations. These sites were sometimes thirty times more expensive than similar projects funded by the Mongolian government. They included advanced technologies; resources for basic facilities, such as greenhouses and irrigation systems; employment of site managers; fence installations, etc. Experience has, however, shown that the higher the investment for foundation and maintenance of a planting site, the greater the survival rates of the trees planted.[16]

The most important lesson which Tujiin Nars teaches other environmental movements is the importance of holistic development; that creating a political, social, and economically positive environment and community is the integral element in creating real change. With most of the 700 km^2 being fully restored to Scot pine, the Tujiin Nars' National Protected Area is now becoming a popular tourist spot.[17] In total, over 21,000 hectares of land were successfully reforested between 1997 and 2012.

4.5 RUSSIA'S ALTAI FOREST CARBON PROJECT

In 2011, an inventory of the forest belts in Russia's Altai region estimated a more than 50 per cent area loss. This loss led to increased soil degradation processes and dust storms. A greenhouse gas absorption project was undertaken in the agricultural areas of the Altai region. This was called "Carbon Sequestration through Afforestation in Remote Areas of the Siberian Region of the Russian Federation" and was organized within the framework of the Kyoto Protocol. The project's main objective is to create an economic mechanism to compensate for the greenhouse gas emissions of industrial enterprises and transport, primarily air transport. Its specific goals are to create a system of incentives to establish protective forest belts, prevent land degradation and soil erosion, and to raise awareness about the potential of sustainable value chains for the private sector.[18]

The first pilot forest carbon sequestration project was implemented on degraded agricultural areas that had been abandoned, encompassing over 10,000 hectares in the Zalesovsky district of the Altai Territory.[19] It is estimated that for the entire period of the pilot project about 4.5 million tons of CO_2 were sequestered. Initiated by the nonprofit organization Center for Environmental Innovation, calculations of the forest and soil carbon sinks were carried out by a group of scientists from Lomonosov Moscow State University, Polzunov Altai Technical University, and the Altai State Agrarian University.

The project results were verified by a French independent expert organization, Bureau Veritas, and a German expert organization, Tüv Nord.[20]

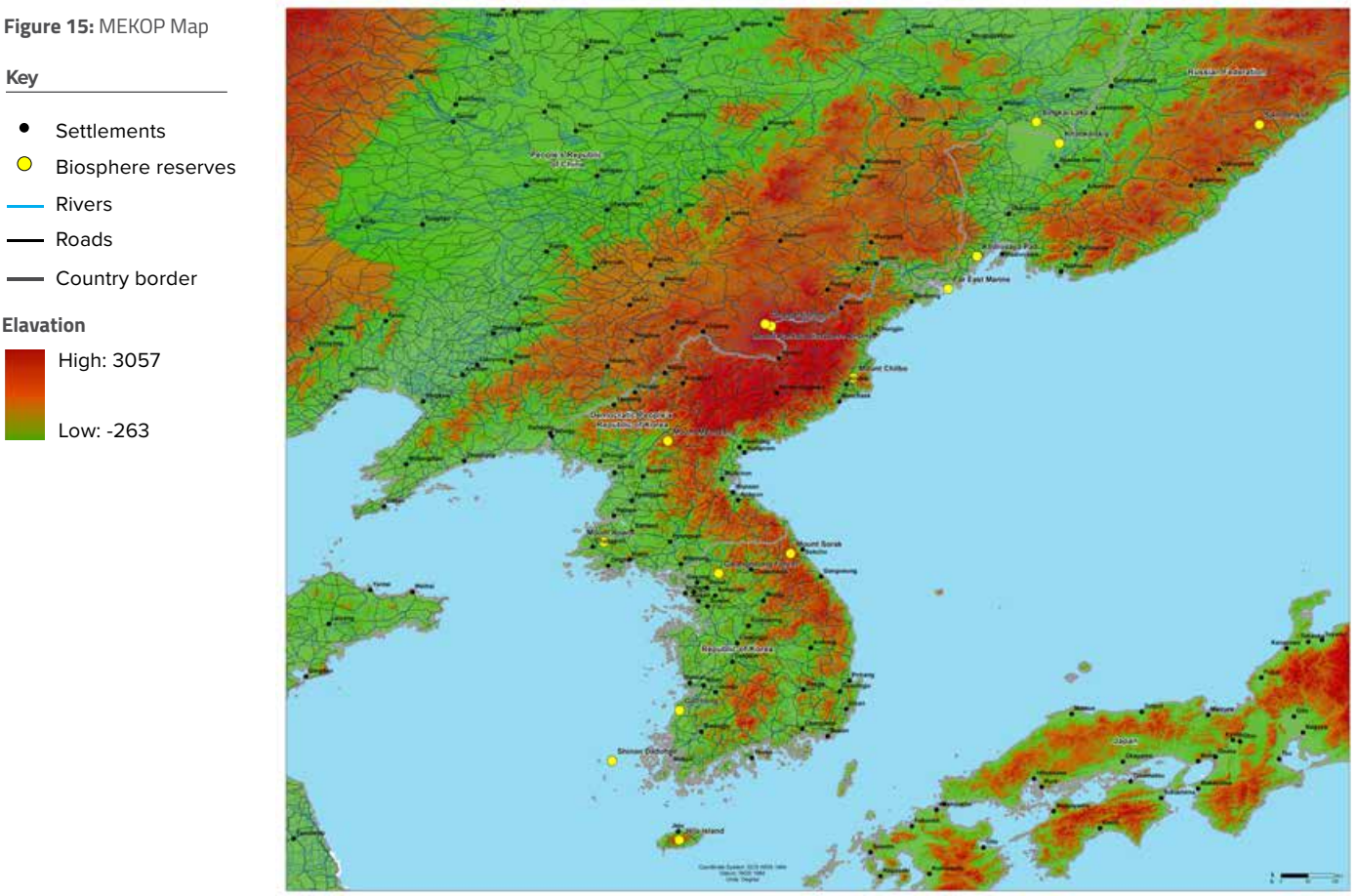
The project has received international support on the crowd funding platform Bumstarter,[21] from more than 450 people in 59 countries, and more than 100 cities. In 2012, 200,000 tons of CO_2 sequestered by the Forest Project were donated by the Governor of the Altai Krai as a gift to compensate part of the carbon footprint of the Sochi Olympics. Carbon credits can now be accessed to compensate for emissions from industries, flights, offices, banks, and shops with an easy-to-use carbon calculator.[22]

Since 2010, the World Wildlife Fund (WWF), in partnership with the Yves Rocher Foundation, planted seven million trees in the Republic of Altai and Arkhangelskaya Oblast to help recover over 2,100 hectares of damaged forest. The primary aim was to compensate landscapes for the loss of forest related to fires in the 2000s that destroyed over 70,000 hectares. In 2018, over 480,000 Siberian pines were planted, and 146 hectares were reforested under this partnership.[23]

Baekdu daegan (or Paektu daegan) is the Korean name for the mountain range that stretches the length of the Korean Peninsula along the eastern coast, extending into China and Russia. Funded by the FAO, the Centre for Econics and Ecosystem Management at Eberswalde University for Sustainable Development, Germany, is developing a conceptual proposal for the ecoregion called "Mountain Ecosystems of the Korean Peninsula and Adjacent Areas" (MEKOP). The MEKOP ecoregion is a complex of ecosystems and encompasses the majority of forests, and important headwaters of the Korean Peninsula.[24] It includes a vision for a mega-biosphere reserve Baekdu daegan. This could also represent a key step towards a joint peace park with the DPRK, as well as towards transboundary cooperation with China and Russia.[25]

Human well-being in the MEKOP eco-region is directly dependent on its numerous ecosystem goods and services. Nevertheless, its healthy functioning is being threatened by various human pressures, which present a challenge for sustainable development, and are likely to become even more severe with the effects of climate

Figure 15: MEKOP Map



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change. Safeguarding the MEKOP eco-region will require large-scale sustainability strategies and management approaches that inspire regional and local action.

With funding from the Deutsche Bundesstiftung Umwelt (German Federal Environmental Foundation) and the FAO, a series of trainings and workshops have been conducted at various conservation sites on ecosystem-based adaptive management, with a special focus on risks and vulnerabilities. These were based on the MARISCO ("adaptive MAnagement of vulnerability and RISk at COnservation sites"), which enables the co-production of knowledge in a systemic and holistic way.[26] One such workshop involved experts from the DPRK at the Mt. Myohyang Biosphere Reserve, declared UNESCO Biosphere Reserve in 2009, covering over 74,000 hectares. The approach is predicated on the recognition of human well-being and social services in conservation objectives, such as the need for peace, health services, food safety, cultural life and financial services. An assessment of past, present and future ecosystem criticality was undertaken. Following on from this, the current trends in change, level of manageability and quality of knowledge were analysed. Based on these analyses, strategies were formulated to mitigate the problems.

As a result of these workshops, participants proposed a range of potential activities for both the whole MEKOP eco-region, as well as for biosphere reserves as focus areas. For instance, at the regional level, proposals included the promotion of education for sustainable development. Another key proposal was to begin a comprehensive and holistic MEKOP ecosystem assessment. On the level of biosphere reserves, it was proposed to develop and implement the concept of "biosphere villages" as learning sites, where best practices would be showcased and shared with the wider community.

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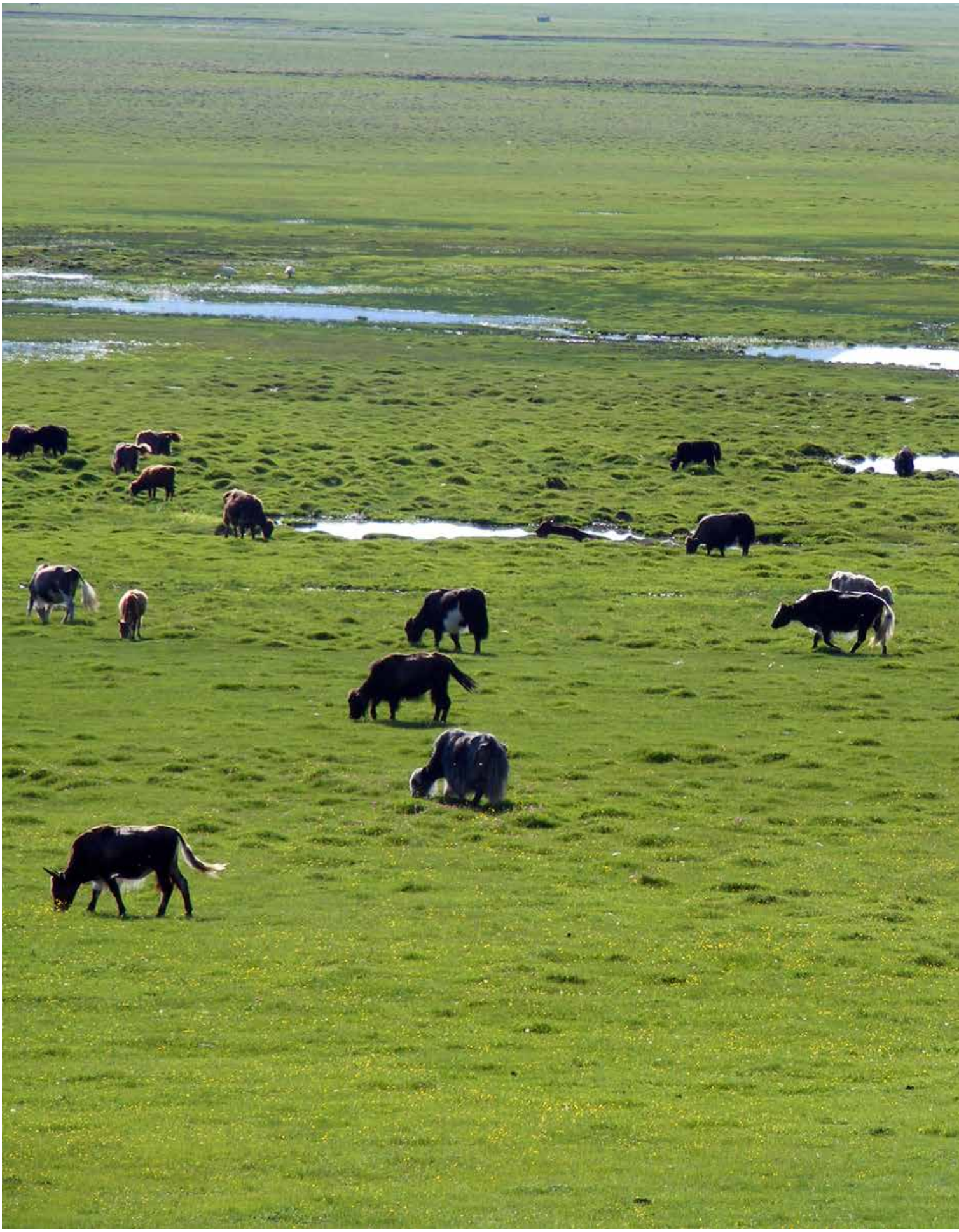

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5. GRASSLAND AND RANGELAND MANAGEMENT

Rangelands are by nature extensive, of low productivity per unit of area, and spatially and temporally variable. Extensive pastoral livestock production is perhaps the most sustainable use of such landscapes to support local livelihoods.[1] Sustainable use in these variable landscapes calls for flexible and mobile herd management that allows pastures to rest and recover. In this way, pastoralists use resources when and where they are abundant over space and time. In this context, the coordination of movement, timing of grazing, and protection of grazing reserves are more important strategies than fencing land and attempting to control stocking rates.[2] In some cases, communities are able to work together to self-regulate their herd movements, respect grazing reserves, etc. In others, collective tenure can support these activities by providing more secure rights. However, formal tenure can also limit mobility and flexibility, especially in the Mongolian context, where herders may need to move very long distances into other districts or provinces during droughts or dzuds.

Coordination of movement and seasonal grazing is best achieved by allocating pasture tenure over relatively large areas to pastoral groups, who can most effectively and efficiently coordinate movements, seasonal use and access by outsiders. This type of management, where rights are collectively held, and management coordinated at the group-level, is called community-based rangeland management (CBRM) and may take the form of informal customary arrangements or more formal organized groups.[3] Collective and group tenure arrangements can facilitate group herding arrangements between households, which in turn enable the realization of economies of size in herd supervision. Another benefit associated with collective and group tenure is that it facilitates mobility and seasonal resting of pastures, which together are key to sustainable use in many places. It also enables equal access to pastoral resources, particularly important when the distribution of forage and water across a given terrain is irregular.

Pasture User Groups

Semi-nomadic or mobile pastoralism is the backbone of food security in Mongolia. More than 210,000 rural households keep around 80 million livestock comprising sheep, goats, cattle, yak, horses and camels. Up to 50 per cent of the population depends directly or indirectly on livestock production for their livelihoods. Rangeland degradation is increasing and now affects 70 per cent of the territory, with overgrazing and the lack of effective regulation as the main causes.

Since 2006, the Green Gold Project and other NGO and donor-initiated projects have facilitated collective actions among nomadic herders, organizing pasture user groups to implement measures to prevent rangeland degradation. They join forces in many ways to overcome environmental and economic hardships that herders face in their everyday lives. Herder groups have revitalized traditional practices, such as rotating among and within seasonal pasture areas, setting aside pasture reserves, seasonally resting pastures, and introducing new practices, such as hay-making and feeding during winter. The results are increased productivity and a reduction in herd size so as to operate within the carrying capacity of the rangelands. Since 2013, a total of 3.4 million hectares of degraded rangeland have been rehabilitated through 700 pasture user groups representing more than 40,000 households. Several cooperatives were created from these pasture user groups; they operate as business entities capable of generating and distributing profits. The presence of the well-organized pasture user groups helps local governments identify investment needs for local development, and to promote camel and yak wool as an alternative to goat cashmere in the global fiber market.[6]

Pastoralists are often reluctant to subdivide their pastures because they fear that this would limit their mobility and flexibility (i.e. limit access) or that it would be difficult to do impartially, and that it would exacerbate disputes between households. The concern for equal access has to be understood in the context of the broader environment, characterized by an absence of non-pastoral sources of livelihood or social welfare. In such an environment, guaranteed access to pasture constitutes an important source of social insurance for both existing and new pastoral households.[2]

Perhaps the most important factor underlying community-based management is that it facilitates flexibility and mobility, which most directly contributes to sustainable use and avoidance of degradation. Flexibility and mobility are important in arid to semi-arid regions, such as western China, which have high spatial and temporal variability in the distribution of rainfall, and consequently of forage, and which are also exposed to climatic extremities, such as droughts and snowstorms. Thus, in northern Xinjiang, during severe snowstorms those households with winter pastures in the mountains are allowed to temporarily relocate their livestock to lower winter pastures on the desert basin, and group boundaries in the latter basin are readjusted to allow for this. Community authority and collective "ownership" make such contingency arrangements possible.[5] More generally, collective tenure can help facilitate equal access to temporally and spatially variable forage resources. Finally, with respect to dispute arbitration, the resolution of intra-village disputes by community-based mechanisms can be superior in terms of speed and cost, when compared with more formal dispute arbitration mechanisms.

5.1 COMMUNITY-BASED RANGELAND MANAGEMENT IN MONGOLIA

Mongolia's vast rangelands, which cover over 80 per cent of the country, are grazed by multiple livestock types, equivalent to 100 million sheep, and sustain globally important wildlife populations, such as the Mongolian gazelle, saiga antelope, and snow leopards. These biologically diverse and culturally valued ecosystems support the livelihoods of roughly 30 per cent of the human population.[7] Despite this natural wealth, and regardless of a centuries-old reverence for the sustainable management of nature, Mongolia's terrestrial ecosystems and nomadic pastoralist culture face multiple interacting challenges in the 21st century.

Following Mongolia's transition to a democracy and free-market economy in the early 1990s, livestock populations grew rapidly. Without effective governance to regulate animal numbers or enforce traditional seasonal herd movements, herders began to graze all year round in certain areas, and pastures near markets and settlements became hotspots of continuous heavy grazing.[8] Furthermore, the warming climate made grasslands already stressed by heavy grazing more vulnerable

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to overuse, leading to potentially irreversible losses of grassland productivity and biodiversity.[9] A series of drought years followed by extremely harsh winters (dzud), caused massive livestock deaths in 1999-2003 and 2009-2010, leaving thousands of herders destitute. Many who lost their herds moved to the city; the rural population continues to decline while herd numbers grow. Increasing urbanization, expanding cultivation, infrastructure development, and a mining boom further imperil Mongolia's "green gold" or grassland natural capital, and the species and livelihoods that depend upon it.[10]

How can this downward spiral of land degradation, rural poverty and livelihood vulnerability be halted? Since 1996, national and international NGOs and donors have supported the formation of over 2,000 CBRM organizations, with the twin aims of improving grassland conditions and reducing herder poverty and vulnerability.[11] CBRM supporters posit that when herders organize to manage their pastures together, they can access and exchange more information, cultivate stronger leadership, and develop mutually agreed upon rules for pasture use. This groundwork helps CBRM organizations build long-term relationships within the group, form ties to outside experts and resources, and ultimately leads members to adopt herd and land management practices that may improve pasture conditions and livelihoods. Some CBRM organizations also engage in joint marketing, small enterprise development and other forms of livelihood diversification.

Does CBRM work in Mongolia? Initial evaluations of Mongolian CBRM found mixed results, with some studies showing positive social and/or ecological outcomes,[12] others showing negative impacts due to elite capture or exclusion of less powerful community members,[13] like single women. Still others showed no effect at all.[14] Past research was nearly always limited to case studies in one ecological zone and did not compare CBRM to conventional management. A recent study compared 77 CBRMs with 65 traditional herder communities in the same geographic and ecological zones, covering 4 major rangeland ecosystems: the forest and mountain steppe, steppe, eastern steppe and desert steppe. Compared to traditional communities with no formal organization, CBRM organizations achieved greater social benefits, such as increased information access and exchange, pasture use rules, pro-activeness, and the use of more effective management practices.[15] One remaining challenge is unregulated herd movements during weather disasters. During the 2009-2010 dzud, communities that saved their pastures for winter became "magnets" for migrants from other territories, leading to overuse and increased vulnerability for the host communities.[16] CBRM shows promising social outcomes, especially when it comes to

Household Tenure and Herd Management in China

Maqu County is a purely pastoral region located in China's southwest Gansu Province. The county Animal Husbandry and Veterinary Bureau (AHB), with financial assistance from OXFAM Hong Kong, has been implementing a pastoral development project since 1999. Under this project, household boundaries in winter pasture have been delineated in the following manner: groups of up to 10 households have been allowed to pool their pastures together and fence the outer boundary. The benefits, as perceived by the pastoralists themselves, include the lowering of fencing costs and the continued realization of economies of size with respect to herd supervision, as households take turns at supplying labor for supervision of the joint herd.[17]

This group tenure arrangement also facilitates the provision of social insurance. Reflecting the ongoing emphasis of policy on equitable distribution, the area of rangeland allocated to households remains based on their early 1980s livestock numbers. However, because household herd sizes are now considerably differentiated, there is a mismatch between the size of household herds and the rangelands allocated to them. With the Maqu County approach, the total number of stock units that can be grazed on the joint pasture and each household's share of this are calculated. Households that graze fewer livestock than the hypothetical carrying capacities of their portions of the joint pasture are compensated by those households that graze more. Poor households are thus guaranteed access to forage equivalent to that produced by their pasture, if they need it, and can earn supplementary income in the form of land rents to the extent that they do not need said land for forage.[18]

changing management methods that can benefit pasture conditions. However, ecological outcomes may be harder to achieve.

What more can be done? CBRM is only part of the solution to the challenges facing Mongolia's rangelands and pastoralists. CBRM needs support from effective policies to protect herder groups' territorial rights, engage herders in government and community-based pasture monitoring, and coordinate cross-boundary herd movements. To incentivize smaller, higher-quality herds, the market must distinguish livestock products based on quality and sustainable production methods, including pasture management and animal welfare standards. Finally, to stem rural depopulation and the potential loss of nomadic culture and traditional ecological knowledge, additional investment in rural schools, herder vocational training and support, decentralization of light industry and livestock processing, and social services is essential.

5.2 PROTECTED AREA DEVELOPMENT IN THE ALTAI MOUNTAINS OF RUSSIA

Mountain ecosystems are highly sensitive to climate change and human disturbances. The Altai Mountains are in the center of the Eurasian continent and considered a "water tower" for the surrounding lowland areas. Wind and water erosion due to overgrazing, and the interruption of seasonal livestock movements, are the main driving forces of land degradation. Therefore, the preservation of natural landscapes and biodiversity in the Altai mountain ecosystems should be a high priority for

I.E. Smelansky

local authorities.[19] The different arid landscapes represented in the Altai Mountains include steppe-tundra, arid ultra-continental larch forest-steppe, and desert steppe found only in the southeast Altai Mountains. While the Sailughem National Park and Ukok Nature Park have been created to preserve these unique high mountain ecosystems, currently they do not restrict pastoralism or promote sustainable rangeland management.

Protected areas are an effective instrument to halt land degradation in the Altai Mountains. To date, a certain network of protected sites has been created, including World Heritage sites, federal and regional sites. A "Provincial Scheme for Protected Areas Development up to 2025 (for Altai region)" has also been approved. According to this scheme, a number of steppe sanctuaries are to be established. Provincial Nature Sanctuaries, such as Loktevskii and Charyshskaya Steppe, already exist in the foothills. Charyshskaya Steppe protects almost 6,000 hectares of poly-dominant true steppes, and meadow steppes, with scattered patches of shrubland and woodland that are home to many species of grasses and forbs (Smelansky, 2009, 2013).[20] Steppe grassland conservation has multiple benefits: it conserves biome-specific biodiversity; prevents soil erosion and soil fertility loss; protects small streams; and helps to minimize wildfires. The steppe protected areas regime enforces the prohibition of pasture conversion into arable land, as well as regulations on grazing and mowing. It helps to regulate fire management and strongly restricts both tree cutting in natural woodlands and afforestation practices in grasslands.

Long-term monitoring of the natural landscapes of the Great Altai Transboundary Biosphere Reserve[22] with modern climate change revealed a retreat of glaciers and changes in the boundaries of the altitudinal zonation.[23] Since 2005, international projects related to the study of global climate change in high mountain areas have been implemented in the Katunskiy Reserve, which is a

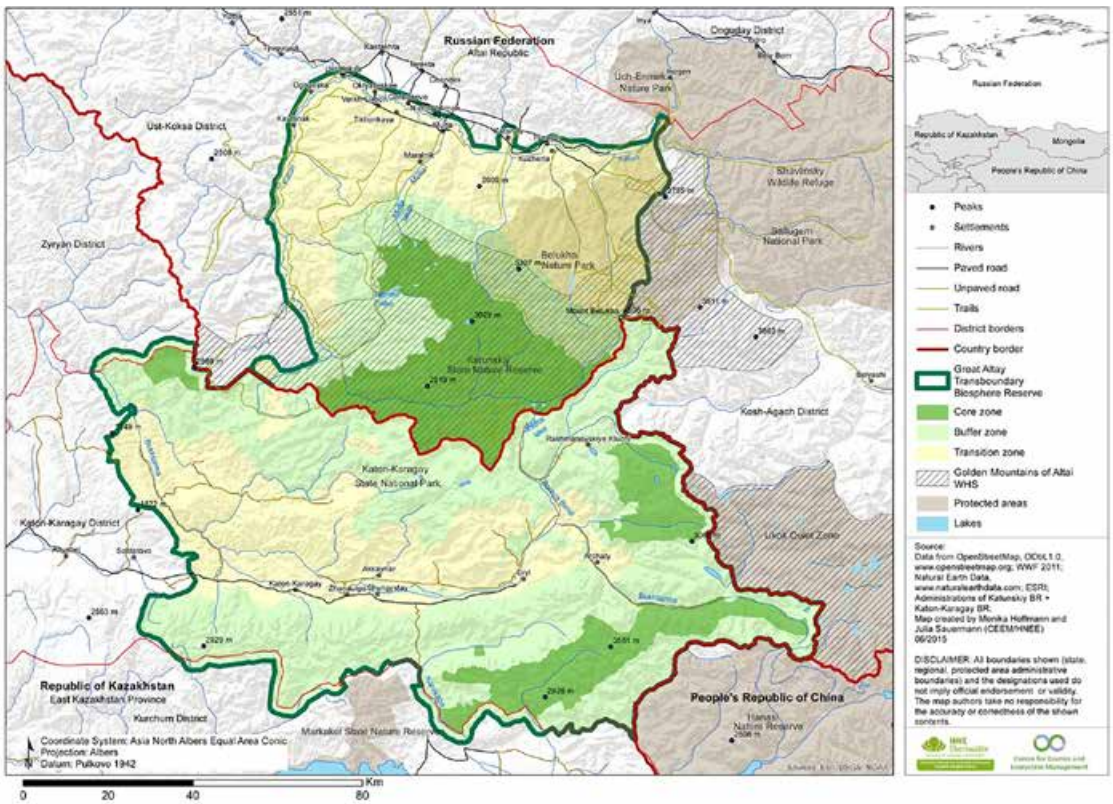

Figure 14: Great Altai Transboundary Biosphere Reserve functional zoning[21]

Biosphere Reserves as model regions for ecosystem-based sustainable development in the Altai Mountains

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The Altai Mountains in Southern Siberia are characterized by a unique geo-political situation: they represent a quadrilateral region, with areas in the Russian Federation, the Republic of Kazakhstan, Mongolia and the People's Republic of China. The mountains have been a quadrilateral UNESCO Biosphere Reserve for approximately two decades.[26] Biosphere Reserves are model regions for sustainable development and for the conservation of biological diversity; they are also areas where new approaches can be tested. However, comprehensive governance and management of biosphere reserves are needed to adapt to the fast environmental and societal changes.[27] To safeguard their sustainable development these dynamically evolving challenges must be addressed.

In June 2017, the bilateral Great Altai Transboundary Biosphere Reserve (TBR) was established by UNESCO. Located in East Kazakhstan (Republic of Kazakhstan) and the Republic of Altai (Russian Federation), the total area covers more than 1.5 million hectares. It comprises the existing Katunskiy Biosphere Reserve in Russia as well as the existing Katon-Karagay Biosphere Reserve in Kazakhstan, which, in turn, cover various national nature reserves and nature parks. The entire core zone of the Russian part of the territory is included in the UNESCO World Heritage Site "Golden Mountains of Altai". The vision of the Great Altai Transboundary Biosphere Reserve focusses on conserving and studying ecosystems in a transboundary context, as well as enhancing the wellbeing of local communities. By doing so, it fosters the sustainable development of border mountain areas.[28]

Both the Convention on Biological Diversity (CBD) and UNESCO, recommend the ecosystem-based approach as suitable for the management of biosphere reserves. The ecosystem-based approach has been applied systematically for the development of the Great Altai TBR management plan by applying the MARISCO method[29]. The methodology is a systemic, ecosystem-based step-by-step procedure grouped into four major phases of management.[30] Core elements of the method include: an ongoing participatory approach, systemic and systematic complex situation analysis, and on-site ecosystem diagnostics analysis. A broad and ongoing participatory approach in both countries, throughout the development of the management plan, was important in order to depict the current situation of the site. From this basis, respective transboundary management strategies for the TBR were derived. The envisioned systemic management reduces vulnerability and increases resilience of the area. In this way, the rising challenges of anthropogenic changes across borders are able to be more adequately addressed. These systemic planning and management solutions for sustainable development are grounded on the principles of biological diversity conservation, and they provide for various partnerships in a TBR context.

National reserve with biosphere status, functioning under the Seville Strategy on Biosphere Reserves. As part of the UNESCO Man and the Biosphere Programme (MAB) Global Change - 'Adaptation Strategies for Mountain Biosphere Reserves', baseline estimates were prepared on climate change and its impact on biodiversity, water resources and land use of the Katunskiy Biosphere Reserve. As a result of these estimates, a targeted basis for the Climate Change Adaptation Strategy for reserve was proposed. It should be noted that this is Russia's first experience in developing an adaptation strategy for protected areas. To adapt to anthropogenic impact, the buffer zone

of cooperation between Protected Areas and the local population is expanding, supporting other land uses, small projects for national businesses, eco-tourism, and youth environmental education.

For example, the Altai-Sayan Mountain Partnership is an example of this. Since 2018, with the support of WWF Russia and the CITI Foundation, this partnership provides a Sustainable Livelihood Program for residents of the Altai Republic, aimed at developing ecological and rural tourism based on local communities. The program is open to residents of pilot villages located near key specially protected natural areas – the Katunskiy and Altai nature reserves, the Sailyugemsky national park, the Belukha natural park and the Ukok rest zone. The municipality's administrations actively support the implementation of the Programme.[24] Microloan competitions were created, the winners of which received interest-free loans for the development of their own business with the condition not to cause damage to the environment. In the Ust-Koksinskiy district, ecological and rural tourism projects are being supported (e.g. guest houses, recreation areas, ethnographic museums, excursion services); as is the production of local environmentally friendly products (e.g. honey, dairy and meat products, wool, herbal teas).[25] Another project was developed and received support for organizing separate rubbish collection at tourist bases. The Katunskiy Reserve has also participated in an international project offering trainings in sustainable natural resource management in mountain regions, as well as environmental awareness-raising events for youth, to ensure the next generation develops a responsible attitude towards nature.

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5.3 THREE-RIVER HEADWATERS REGION OF CHINA

The Three-River Headwater (TRH) region is in the Qinghai-Tibet Plateau of China and covers 363,000 km2 with an average altitude of 4,200 meters. The TRH region is the headstream of the Yangtze River, the Yellow River, and the transboundary Mekong River, which flows through Southeast Asia. Although the TRH region is rich in grassland resources, the ecosystem is extremely fragile due to the significant increase in the intensity and extent of human activities, such as overgrazing, poaching of plants and wildlife, gold mining, etc. An estimated 58 per cent of rangelands in the TRH are considered moderately to severely degraded.

In 2000, the Chinese government established the TRH reserve with an area of over 150,000 km^2 and began implementing a series of grassland restoration measures in order to protect this resource. These measures included grazing bans and rotational systems, retiring livestock and restoring grasslands. Within the TRH reserve, the Sanjiangyuan National Nature Reserve (SNNR) was established in 2003, and the Ecological Protection and Restoration Program (EPRP) began in 2005. Experience to date has shown that the implementation of these projects has contributed to grassland restoration, controlled degradation as well as increased productivity. As animal husbandry in the TRH region is important for local livelihoods, the health of the grasslands not only impacts regional development, but also influences ecological security and the economic development of downstream regions, with further impacts across the whole of China.[31]

The core zone is strictly managed with no grazing and has measures to protect endangered species. All its residents have been resettled elsewhere. A buffer zone promotes conservation but allows for limited and rotational grazing. Multiple-use experimental zones may be used for scientific investigations, eco-tourism, and other green

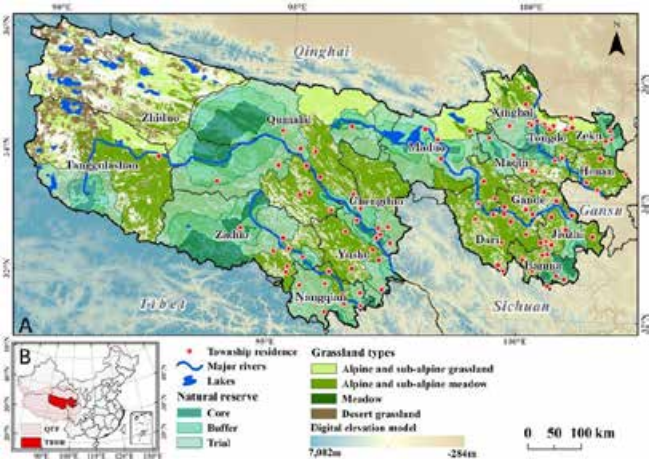

Figure 15: Map of the Three River Headwaters region

industries. To advance the goals of the SNNR, uncontrolled or poorly managed mining, logging, hunting, and grazing have been curtailed. Foreign and other mining firms have replaced the uncontrolled miners, trees have been planted, and measures have been taken to protect endangered species. The government plans to resettle all nomads by 2011. However, since the government also has a poverty reduction program, and a major project resettlement program (e.g. due to new dams), residents from the buffer and the experimental zones may be resettled under these programmes rather than under the ecological resettlement program.

Ecological resettlement in the TRH region has been initiated on a large scale and aims to help degraded landscapes to recover and to improve the living standards of local people in western China. According to data from the State Council's West Development Office, 700,000 rural people were relocated in the context of ecological resettlement during 2000–2005, and 7 million were scheduled to relocate by way of ecological resettlement projects with the aim of poverty reduction. Particularly in China's western regions, which are inhabited by ethnic minorities, some consider that resettlement has become an important means of preserving the ecological environment, improving people's livelihood, and promoting urbanisation.[32] However, policy outcomes are not uniform. According to others, policy rationale and consequences need rethinking from both an ecological and socio-economic perspective.[33]

It is worth pointing out that when customary practices have the potential to be sustainable, are grounded in place-based cultural knowledge (i.e. traditional knowledge) and beliefs, which are maintained and transmitted through active use and interaction with the landscape, removing people may actually lead to loss of essential knowledge and cultural values that could have contributed to sustainable land-use.[34]

China has spent around USD 3.6 billion on restoring 660 million hectares of pastureland. There is little doubt that grazing bans work, the question is whether or not they are cost effective and fairly applied. The sustainability of these bans is in jeopardy if they are imposed without introducing a SLM system, or without supporting herders in generating a stable income. Grazing ban implementation is the responsibility of the Grassland Monitoring and Supervision Station of the Animal Husbandry Bureau (AHB) which monitors the condition of the grasslands and supervises any grazing bans. The local AHB may adjust the rules and regulations to suit the local conditions. Seasonal or total grazing bans imposed abruptly by the State have created uncertainties for herders in their use of rangeland assigned to them, which may have resulted in incentives to overgraze in recent years. Under these circumstances, herders may well seek to make the most use (grossly overstock) these rangelands before their access is further restricted.[35]

Government programs have attempted to provide pastoralists with seasonal grazing pastures but have also required herders to use specific pastures at specific times. Moreover, the national program "Return Grazing land to Grassland" (RGLGL), has involved massive fencing programs, some of which have worsened the situation by accelerating degradation. As is fairly often the case, herders and local land users were not consulted about the location of fences vis-à-vis water point access or migration routes. In all too many places fences were cut, and trespass grazing was rife. Even where government subsidies were accepted as part of the trade-offs sought under the RGLGL, herd numbers have continued to rise. Part of this rise has come from a response to increasing demand for red meat, especially beef, and herd size has increased to cater for it.

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6. TRANSBOUNDARY PROTECTED AREAS

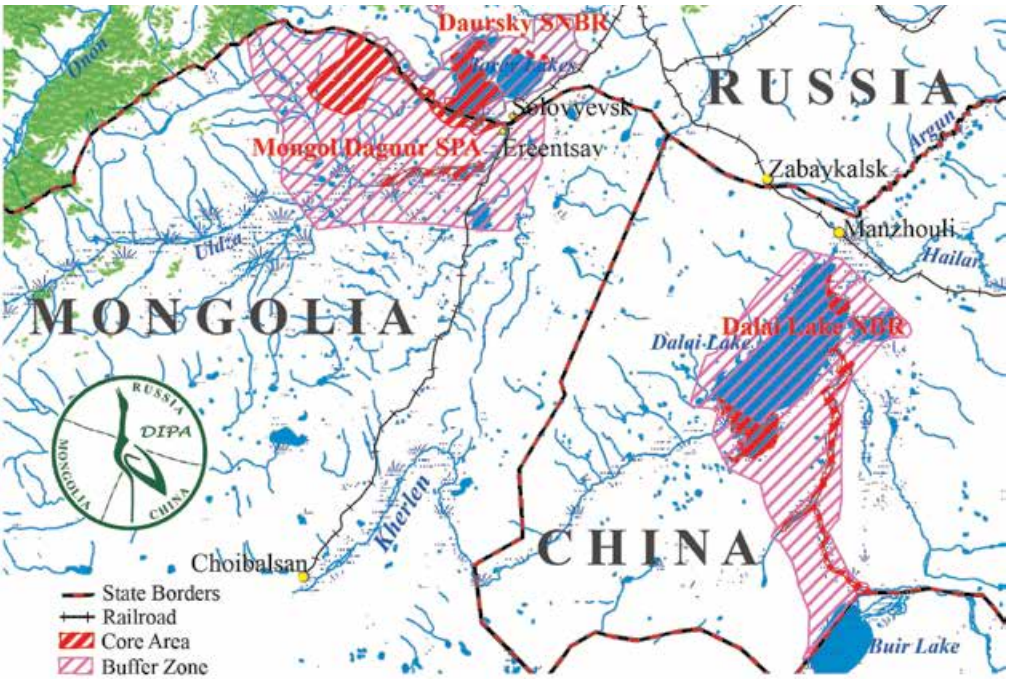
Transboundary Protected Areas (TPAs) in Northeast Asia play an important role in biodiversity conservation, combatting land degradation and adaptation to climate change. Many areas of high biodiversity value straddle international borders and transboundary cooperation has been expanding in recent years to deliver multiple objectives, including enhanced nature conservation outcomes, ecological sustainability, enhanced ability to respond to climate change, sustainable socio-economic development, and the promotion of peace.

In Northeast Asia, there are a number of cooperative frameworks that support the creation and maintenance of TPAs that involve local communities, indigenous peoples, protected area staff, conservation officials, civil society, and scientists. To a certain extent, this is based on the recognition of the fundamental role played by protected areas in the provision of ecosystem services for the development of economic activities. It is also a recognition of the need to increase the extent, connectivity and management effectiveness of the TPAs in order to ensure the continuing provision and sustainability of these services.

The success of TPAs is dependent upon public support of the countries entrusted with their protection and management. This must be fostered by continuous connection with citizens via visitation, communication and awareness raising. In this section, case studies on Russia, Mongolia and China are presented to demonstrate collaboration on shared issues and cooperation with a sense of co-responsibility, and how this can be achieved by working together at transboundary and continental scales.

In recent years, the concept of a coherent policy on the conservation of natural and cultural diversity, coupled with socio-economic development, is emerging in the mountain regions of Russia. The entire core zone of the Russian part of the reserve is part of the Golden Mountains of Altai World Heritage Site that contains the Katunskiy State Nature Reserve

Figure 16: DIPA map



with Mount Belukha. The vision behind the Great Altai TPA is one of conserving and studying its ecosystems in a transboundary context, as well as enhancing the wellbeing of its local communities. By doing so, it fosters the sustainable development of border mountain areas.[1] Despite these positive elements, long-term monitoring of the natural landscapes of the Great Altai TPA with regard to modern climate change have revealed a retreat of glaciers and changes in the boundaries of the altitudinal zonation.[2]

6.1 THE DAURIA INTERNATIONAL PROTECTED AREA (CHINA-MONGOLIA-RUSSIA)

The Dauria International Protected Area (DIPA) was founded at the junction of the borders between Russia, Mongolia and China in 1994.[3] The DIPA was established by a trilateral agreement between the Ministry of Environment and Natural Resources of the Russian Federation, the Ministry of Nature and Environment of Mongolia, and the State Environment Protection Agency of China. Three specially protected nature areas of the three countries were combined to create the DIPA. These were: (1) Daursky Zapovednik (state nature reserve) in Chitinskaya Oblast of Russia; (2) Mongol Daguur strictly protected nature area in Dornod Aimag of Mongolia, which borders on the Russian reserve; and (3) Dalai Nor National Nature Reserve in the Inner Mongolia Autonomous Region of China.[4] Today, the number of protected areas included in the DIPA has grown. Two federal refuges under the management of the Daursky Reserve administration –Tsasucheysky Forest Nature Refuge and Valley of Dzeren Nature Refuge were added to the Russian Part of the DIPA, and two territories – Ugtam Nature Refuge and Nomrog Special Protected Area were added on the Mongolian side.

Dauria is one of the driest and coldest regions of the Central Asian steppes belt: annual precipitation here is 150 to 400 mm and annual temperature fluctuation can be up to 100 degrees C. The largest water arteries of the region are the Onon, Hailar-Argun, Kherlen and Ulz Rivers. The creation of this trilateral protected area, consisting of functionally connected wetland and steppe habitats, was of special importance for biodiversity conservation in Dauria, particularly for the protection of migrant species of birds and mammals.

Besides biodiversity and ecosystem conservation, the main objective of the DIPA is the monitoring of natural processes and phenomena in the Dauria steppe ecosystem. Despite the differences in nature protection regimes and in the management and staff of the three areas, the DIPA as a united international reserve has been a seen as conservation success.[5] Since the first years of its existence, the area succeeded in promoting cooperation between the countries, first in science and later in environmental education. Major achievements thus far include:

- Joint inventory of animals and plants within the reserves to acquire data on biodiversity and distribution of rare species;
- Defining the conditions of regional ecosystems and selecting key areas for conservation of several species;
- Joint research on ecosystem fluctuations and redistribution of animal populations to create an interconnected multi-level regional network of protected areas;
- Programs for conservation of critically threatened species; and
- Integration of economic development planning with conservation planning to achieve sustainability.[6]

A few important lessons have been drawn from the experience of establishing the DIPA.[7] First, it is especially important to consider the interaction between the DIPA and other reserves of the region to construct a network of connected protected areas in Dauria. This enables the design of more effective research projects and more targeted environmental educational programs, while promoting cooperation amongst the three countries. At present, joint activities in different fields bind the DIPA with the Huihe National Nature Reserve in China, the Sokhondinsky Nature Reserve and Alkhanai National Park in Russia, and the Onon-Balj National Park in Mongolia.

Second, cooperative environmental education in the DIPA is one of the biggest advantages over a traditional piecemeal approach to protected areas. It is important not only for popularizing the protected area and raising the level of ecological awareness, but also for strengthening public relations between the neighbouring border regions of Russia, Mongolia, and China.[8]

Third, the identification of common interest is important for successful cooperation.[9] Socio-economic features of the border regions differ considerably in the type of settlements, economic structure, and living standards. Yet the three countries share many social and ecological problems that the DIPA can help resolve by promoting ecological and educational tourism in the region. Finally, the main problems identified concerning the operation of DIPA are: (1) a lack of state financing for international activities; (2) communication problems (absence of translators in reserve staff); and (3) difficulties in crossing the borders to work cooperatively in the border zones, which is mainly due to under-funding of international reserves as a special form of protected area by the national governments of the three Amur basin countries.[10]

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6.2 RUSSIA-MONGOLIA UVS NUUR BASIN

Shared by Mongolia and the Republic of Tuva in the Russian Federation, Uvs Nuur Basin is a transnational World Heritage property in the heart of Asia.[11] The serial property comprises five components in Mongolia and seven in the Republic of Tuva, clustered around the shallow and highly saline Lake Uvs Nuur. Some components are contiguous with each other across the international border, while others are distinct units. Inscribed in 2003 on the World Heritage List (WHL), the total surface area is close to 1 069,000 hectares, with more than 75 per cent in the Mongolian cluster. The central Uvs Nuur Strictly Protected Area in Mongolia covers almost half of the surface area of the entire property. Most of the 12 sites have buffer zones, but only from the Russian Federation side they are included directly in the WHL nomination. Total area of property proposed for inscription onto the WHL[12] is just over 1 million hectares (258,620 in the Russian Federation, 810,233 in Mongolia), including a total area of buffer zones of 170,790 hectares (Russian Federation) and 476,411 hectares (Mongolia).[13]

The Uvs Nuur Lake depression possesses a large range of ecosystems, representing the major biomes of eastern Eurasia, with a number of endemic plants. Although the basin is inhabited and has been used for nomadic pastoralism for thousands of years, the mountains, forests, steppes and deserts are also extremely important habitats for a wide range of wild animals, many of them threatened or endangered. The steppe ecosystem supports a rich diversity of birds, and the deserts, a number of rare gerbil, jerboas and the marbled polecat. The mountains at the western end of the lake's basin are important refuges for the globally threatened snow leopard, mountain sheep (argali) and the Asiatic ibex. Uvs Nuur Lake itself is an important habitat for waterfowl, as well as for birds migrating south from Siberia.[14]

Given the longstanding interaction between livestock, wildlife and vegetation, mobile herding is an integral element of the contemporary ecosystem. However, herding is not sustainable per se, as overgrazing can result in erosion and reduced productivity of the grasslands at the expense of livestock, wildlife and people. As elsewhere in the region, there are signs of increasing pressure on pastures, forests and wildlife, as well as an increasing occurrence of fires. The main challenge for the future of the property and the wider Uvs Nuur Basin will be to maintain the balance between use and conservation at the landscape level, including but not limited to the twelve components of the property. The control of illegal activities in the property, such as poaching and illegal logging, requires adequate equipment, staffing, and funding of law enforcement, as well as transboundary cooperation on a permanent basis.[15] Research also has an important role to play in terms of better understanding the ecology and cultural heritage of the basin in order to accompany conservation and management.[16]

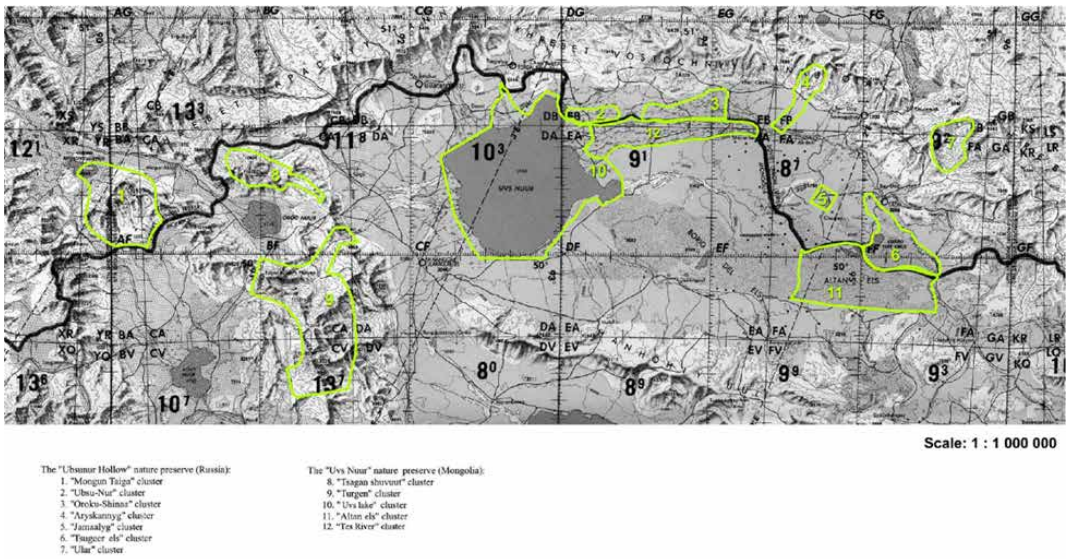

Figure 17: Map of the TBR "Uvs Nuur Basin" with marked clusters boundaries

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Future TPAs

Russia and Mongolia plan to create three TPAs in the Trans-Baikal region, Buryatia and the Altai Republic. The first cross-border reserve "Istoki Amura" will be located in Zabaykalsky Krai, consisting of a security zone, Sokhondinskii reserve, with an area of more than 318,000 hectares. This will connect the reserve with the Mongolian national Park "Onon-Balwinski". The second TPA, in Buryatia, will be created with the purpose of preserving the biological diversity of ecosystems of the Tunkinskaya valley. It is likely to be located within the Russian national Park "Tunkinsky" and the Mongolian national Park "Khubsugul". The third will be created from the national Park "Saylyugemskiy", in the Altai Republic, and the "Selham" reserve, in Mongolia. It should provide a sanctuary for native animals on the ridge Saylyugem and surrounding areas. The establishment of these joint protected areas will enable the two countries to conduct long-term ecological monitoring for the protection of flora and fauna, including activities on restoration and reproduction of rare and endangered species of plants and animals.[17] There is great potential for expanding this network of reserves on the Russian border with the DPRK, China and Mongolia.[18]

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7. INNOVATIVE FINANCE

Achieving transformative changes in land management requires a rethinking of both the rural economy and of its enabling environment. The goals being: to facilitate and promote coordination across government agencies; to establish new consumption patterns; to support small and medium scale enterprises; and to create the right incentives for, as well as ultimately sustain, financial investments. Innovative public-private partnerships and voluntary private, non-market funding mechanisms can promote shared stewardship and connect urban and rural communities, while promoting environmental and economic resilience.[1]

Innovative financing mechanisms can be focussed on paying directly for outputs, such as goods and services from the land, or for inputs, such as technology, infrastructure and institutional arrangements. Ultimately, this reflects the willingness of people and/or their governments to make funds for better land management practices available. Public-private financing mechanisms, such as those illustrated in the Desert Economy Model and the Grain for Green Program, both of which will be further detailed below, combine government support with market-based mechanisms to provide both private and public benefits. Voluntary private, non-market funding mechanisms, such as Ant Farm and Tree Planet, also further detailed below, are quite flexible, transparent and targeted at the local level for specific activities and tangible outcomes.

LDN Fund

One example at the global level is the LDN Fund, which draws on both private and public financing. It has raised USD 50 billion to rehabilitate 300 million hectares of degraded land worldwide, in the next 20 years, reducing carbon emissions by an estimated 20 billion tonnes. Development finance institutions and donor agencies provide funding to offset the risk to private investors. Investments from impact investors or institutional investors, such as pension funds, provide financing to land owners or intermediary organizations in order to rehabilitate degraded land, restoring ecosystems and biodiversity, and returning soil to productive use. Investors see a return based on repayments on the loans or dividends from equity investments in activities, such as farming, that happen on the restored land. In addition, a separately-operated Technical Assistance Facility is being set up to support the development of promising sustainable land-use activities, to build a strong portfolio of projects for the LDN Fund.[2]

7.1 THE DESERT ECONOMY MODEL

The Kubuqi Ecological Restoration Project, also known as the desert economy model, is central to the efforts of the Elion Resources Group, a private company that has been trying to roll back desertification in China for the past 30 years. At its core is the objective to balance the relationship between government, business, local farmers, and the environment. This model started with a salt harvesting operation, after which came the development of a transport network in this remote region. This, in turn, ultimately led to nature-based solutions for economic development and environmental sustainability.

The desert economy model stresses that ecological management in the desert must be economical while at the same time respecting nature and utilizing markets. Thus far, it has turned 6,000 square kilometres of desert green, created 500 billion yuan in value, and helped pull over 100,000 farmers out of poverty. The United Nations Environment Programme estimates the project to be worth USD 1.8 billion over 50 years.[3]

Desertification control and the development of the desert green economy in Kubuqi are rooted in the concept of desert economics, the core of which lies in these key concepts:

1. Deserts can be brought under control to grow food and other environmental assets, turning challenges into opportunities;
2. Extensive and long-term efforts should be made to establish oases in deserts through an improved environment, biodiversity and microclimate, fostering well-balanced ecosystem development and sustainability;
3. Efforts to combat desertification should be economically profitable, industry-based, market-oriented and nature-friendly;
4. Efforts to combat desertification should be supported by innovative technologies, including seed selection, water conservation and soil enhancement, as well as advanced technologies in sustainable agriculture and related value-added industries; and
5. Joint engagement of government, businesses, farmers and herdsmen should be encouraged to form an eco-industry-specific operating model that is market-oriented and industry-based with co-benefits for public well-being.[4]

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"We explore to seek truth, and we are always ready to share the Kubuqi model and our experience, which are improving and maturing day by day, with other countries across the world, so that we can make our due contributions to the building of the green Belt and Road Initiative and the fulfilment of the United Nations target of land degradation neutrality by 2030."

Wang Wenbiao, Chair of the Elion Resources Group

Kubuqi is also unique for being home to China's largest single-stage solar farm, with over 650,000 fixed and sun-tracking panels that channel 1,000 megawatts of electricity into the national grid – about half the power-generating capacity of the Hoover Dam in the U.S. A team of 47 households are employed to maintain and clean the panels using high pressure water jets; the run-off water feeds high value crops that grow underneath, such as liquorice.[5]

7.2 ANT FOREST

As gaming has such a strong influence on youth culture, a major segment of consumers are responding to the incentives and engagement offered through games. Following the successful reception of Alipay's latest social good apps, gamification is a strong contender for propelling the future of sustainability through digital means.[6]

The Ant Forest app, launched as a pilot initiative in 2016 by Alipay, China's leading mobile payment platform, gamifies going green. The app rewards users who engage in activities with a low carbon footprint, such as using public transportation or walking to work.[7] Through an animated, interactive mobile game, participants can collect "energy points" and compete with friends to grow a virtual tree. Gathering enough points means Alipay's parent company Ant Financial will plant a real tree in Inner Mongolia or Gansu province.[8]

© Ant Forest

The company use blockchain to power its donation platform, including an installation of a live camera feed in its newly planted forests so that Ant Forest participants, of whom more than half are millennials, can see the precise results of their efforts. By the end of 2017, Alipay had planted 13.1 million trees as a result of activity on the app and claims to have reduced carbon emission by 2.05 million tonnes. China is on track to increase its forest coverage to 23 per cent of its total land mass by the year 2020.

Two hundred million people—that's 3 per cent of the world's population—are greening their lives because they are getting immediate information about the environmental impact of their choices in a fun and competitive way."

Erik Solheim, former head of UN Environment Programme

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7.3 GRAIN FOR GREEN PROGRAM IN CHINA

Initiated in 1999, the Grain for Green Program (GGP), also known as the Conversion of Cropland to Forest and Grassland Program or the Sloping Land Conversion Program, aims to reduce soil erosion, enhance biodiversity, and conserve natural resources. Two years after its launch, a comprehensive programme was announced for implementation by the West Region Development Office of the State Council of China – the leading authority of China's West Region Great Development Strategy. It is perhaps the largest ecological restoration project in China with strong policy support, and the largest investment, with the widest coverage, and highest direct participation of farmers in the country.

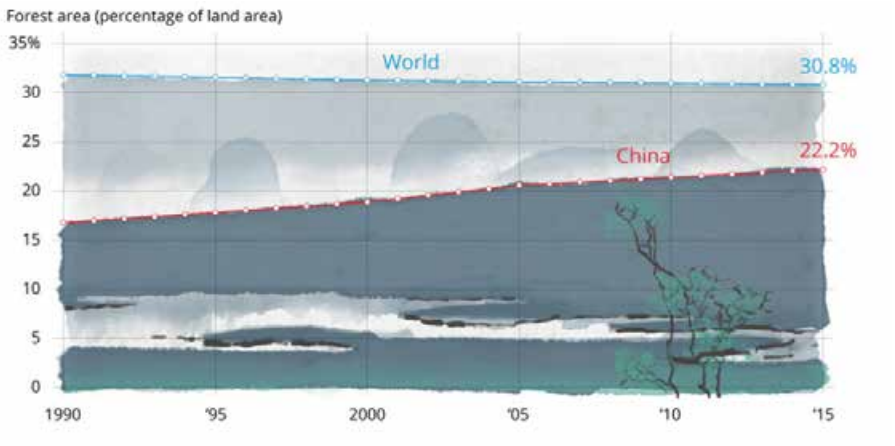
The GGP immediately triggered the adoption of the Government Regulation on the Conversion of Cropland to Forest, which formed the policy basis for the implementation of the programme. The program was undertaken on a voluntary basis of individual farmer households and through direct payment to the participating households for their conversion of sloping and degraded cropland and barren lands into forest and grassland. Although the GGP was originally established for ecological restoration purposes, the goals later expanded to explicitly target poverty alleviation, and it has since become one of China's largest rural development programs, featuring both direct compensation to households and village-level development assistance.[9]

The GGP has since been implemented in 25 provinces, municipalities, and autonomous regions located in central and western China, primarily the upper and middle reaches of the Yellow and Yangtze Rivers. By the end of 2018, it was estimated that the GGP had converted over 9 million hectares of cropland to forest; converted 0.64 million hectares of cropland to grassland;[10] and afforested 30 million hectares of barren lands. In this time period, 40 million farming families have received annual subsidies to plant and manage trees on their own land. Compensation is based on the size of the area managed by households; thus participant subsidies are higher with larger holdings.[11]

According to the policy established in the first round of the GGP, the subsidy for the conversion of farmland into grassland is valid for two years; the subsidy for the conversion of farmland into economic forest is valid for five years; and the subsidy for the conversion of farmland into ecological protection forest is temporarily valid for eight years. The cost for these grain subsidies is borne by the national revenue. During the period of grain and cash subsidies, once they have converted their existing farmlands into forests, farmers must continue their afforestation efforts in barren hills, conditions permitting, under the unified leadership of the county or township government. Subsidies for seeds and seedlings as well as afforestation costs for the GGP on farmlands and barren hills are borne by the government; subsidies are given for afforestation costs, namely the purchase of seeds and seedlings, as well as for lands that are closed for regeneration and maintenance instead of used for other purposes.[12]

The first GGP subsidy lasted for eight years, and was then extended for a further eight years period, in consideration of the time demand for ecological restoration and alternative livelihood development.

Figure 18: China's forests are growing



However, during the second phase, the subsidies were reduced to half the original amount.

The government's policy is based upon the assumption that those who convert sloped farmlands into forests, and manage the forests, will also benefit from them. It adheres to the mechanism of contractual operation by individuals with a combination of responsibility, power and interests. It is important, however, that farmers' ownership of tree crops grown on converted farmland and converted barren hills, within the context of the GGP, is guaranteed. Farmers are entitled by law to go through procedures for changes in land-use and be provided with certificates of tenure to the land on which tree crops were grown by the People's Government above county level. The contracting-out duration would extend to 50 years after farmers have established plantations on farmlands and barren hills. Farmers are entitled by law to inherit and transfer the contract and extend it upon expiration in conformity with relevant laws and regulations.

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The GGP has had significant positive effects on soil organic carbon (SOC) accumulation, which increased by 48.1 per cent, 25.4 per cent, and 25.5 per cent at soil depths of 0–20 cm, 20–40 cm, and 40–60 cm, respectively. The conversion of cropland to forest is more efficient regarding the accumulating SOC than the conversion of cropland to grassland. Conversion from cropland to woodland leads to greater SOC accumulation than does conversion to either shrubland or orchard. The time since the implementation of conversion measures is positively correlated with the SOC accumulation. Thus, the GGP plays an important role in SOC accumulation in terrestrial ecosystems and has great potential to mitigate the effects of climate change in the near future.[13]

7.4 TREEPLANET

TreePlanet, an innovative social enterprise, has planted more than 900,000 trees in 262 forests across 13 countries, including China, India, Indonesia and the United States since 2010, with revenue from its mobile game and crowdfunding. This Seoul-based social enterprise was established with the aim of changing the attitudes of its customers toward forestation, which TreePlanet does by facilitating a personal affiliation with forestry projects. Its commitment has been supported by a local impact investor Crevisse,[14] and an accelerator, SparkLabs Korea.[15] Both consider that TreePlanet's ability to uniquely balance its social and business missions may allow it to become one of the ROK's first publicly listed social enterprises.[16] TreePlanet has focussed on using creative marketing and product design to create a bond with its customers, and to develop a sense of ownership and community for the objective of planting trees.

© Tree Planet.

© Tree planet

Launching a mobile game: the TreePlanet game, lets app users plant real trees through the company's game. It is free to download, and users can choose which part of world they would like their tree to be planted in: Mongolia, the ROK or the Republic of Sudan. The game is very simple, and it involves giving water, fertilizer and potions to your one's tree. The tree grows as one's level increases and there are also missions to complete, such as protecting one's precious tree from pesky sheep trying to damage it. Once the tree reaches level seven, users can send it off to get planted in real life at their selected location.[17]

TreePlanet later formed a partnership with Hollywood-based Zig Zag Zoom, a games-for-a-cause production studio, that bought the license to create a North America-friendly adaptation, dubbed Tree Story.

Crowdfunding: As the app began to spread around the world, TreePlanet spotted an interesting trend – users began naming their trees after K-pop stars. Recognising the appeal of personal identification, the company experimented with new products to engage its clients more directly. In 2012, the company kicked off a crowdfunding platform to group-source funds for commemorative tree-planting projects. The crowdfunding platform has allowed them to expand to broader audiences and has now become an additional factor in TreePlanet's business strategy for forestation.

Raising awareness: TreePlanet sought out existing forestry projects to fund and built relationships with national and municipal parks and forestry management bureaus domestically, and with international aid agencies and NGOs abroad. The Landscaping Division at the Seoul Municipal Government has worked with TreePlanet on several planting initiatives as part of a citywide program to increase greenery in residential areas with the goal of boosting community cohesion. According to the Seoul Municipal Government, TreePlanet have been highly impactful in raising public awareness with regard to these projects.

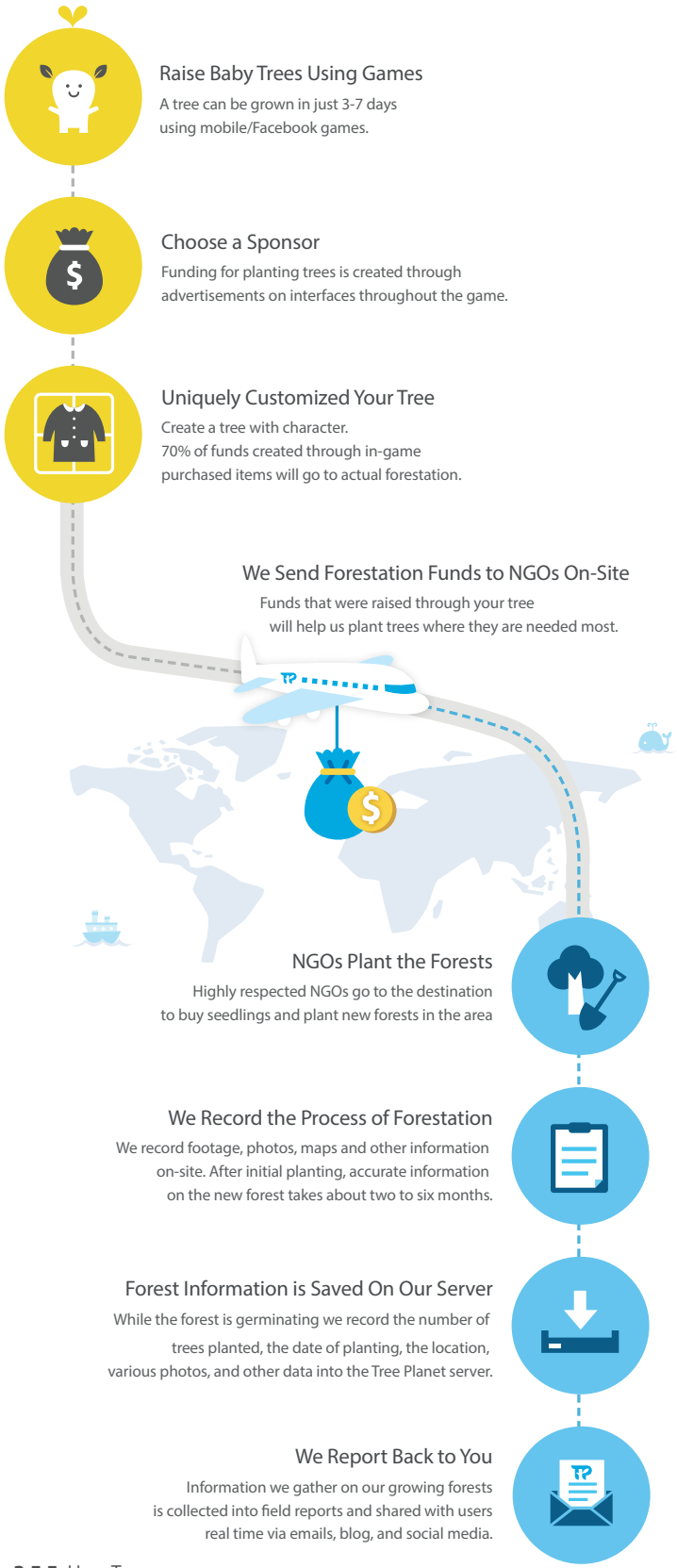

Figure 3.5.5: How Tree Planet Works

"When they first came out they were definitely very unique and I think until now, they're still very unique. I think that the power of gaming is way more scalable than so-called crowdfunding"

Jimmy Kim of SparkLabs, accelerator of TreePlanet

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8. SUSTAINABLE VALUE CHAINS

Given the complexity of global value chains, ensuring the sustainability and responsibility of supply can only be achieved if undertaken in cooperation with all relevant stakeholders, from producers to final consumers. Thus, creating sustainable value chains requires engagement with multiple actors, including businesses and civil society, to ensure that environmental protection, livelihoods and equitable development are embedded in each link of the chain. The aim of this cooperation is to improve working conditions and other human rights, protect and sustainably manage natural resources, and to ensure that development is fair, equitable and socially inclusive.[1]

Sustainable production is contingent on the ability of producers to enhance their capacity to develop and implement better management practices while simultaneously improving yields. Agricultural expansion can be encouraged via financial flows and other economic incentives, as well as by encouraging market awareness in producers. Consumer demand for sustainably sourced commodities also plays a key role. In this section, several cases studies illustrate how the public and private sector, along with civil society, are setting sustainability standards for their suppliers and engaging directly with farmers to safeguard quality of produce, ensure sustainable land-use, and contribute to social benefits.

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8.1 GOJI BERRIES IN CHINA

The bean-shaped Goji berry mainly grows in the Ningxia Hui autonomous region of northern central China and has been used in traditional Chinese medicine for thousands of years to treat eye, liver and kidney ailments. It is often added to soups, stews and teas. Also known as wolfberry, the goji berry contains a mix of vitamins, antioxidants, minerals, amino acids and protein. Some studies have suggested it boosts the immune system and brain activity, protects against heart disease and cancer, and improves life expectancy. The berry, tasting like a cross between cranberry and cherry, has been marketed in the West as a "superfood", a term applied to foods with an alleged array of health benefits, such as acai berries, noni juice and sea buckthorn extract.

The European Union-funded sustainable supply chains initiative Engaging China's Private Sector in Sustainable Management of Medicinal Plants (EGP MAPs) has helped to establish sustainable supply chains for medicinal plant ingredients needed for the traditional Chinese medicine industry. It has also contributed towards improving rural livelihoods and environmental governance in the Hunan and Zhejiang Provinces. More than 1,100 individual wild-collectors and farmers have been supported through EGP MAPS.[2] Developing ecological industries, such as planting the Chinese goji berry or other medicinal herbs, has brought about economic benefits for both local farmers and herders. It has also prevented and controlled desertification. The goji berry forests support numerous ecological functions, including sand fixation. The small goji fruit has turned the former desert into an oasis, enabling the villagers to live a better life. It has been proved to be an effective way to turn ecological management into a viable business and an extra source of income for the people.[3]

> "As goji berries grow in this land, so does our hope."
>
> Hai Chengjun from Hongchuan Village

Hongsipu District, in the northwest Ningxia Hui Autonomous Region, is one of China's largest concentration areas for ecological immigrants. Given the unique soil and climatic conditions, the goji berry industry has become an important manner for migrants to lift themselves out of poverty. The soil is rich in selenium, and the organic goji berries grown are thus of higher quality, which gives them a competitive edge in the market. There are now more than 3,733 hectares of goji berries in Hongsipu. The sandstorms have also disappeared, and local residents are able to enjoy both environmental and economic benefits.[4]

In the Qaidam Basin, located in the center of the Qinghai-Tibet Plateau, a complete goji berry supply chain has been formed from planting, processing, technology research and development to sales. As China's second largest goji berry producing area, Haixi is listed among the seventh group of national agricultural standardization demonstration areas, with over 1,400 companies, cooperatives, and contractors engaged in planting and processing. They involve 8,361 rural households, each of which can earn more than RMB 6,000 every year in the sector. More than 70,000 workers earn a total income in services of over RMB 500 million by gathering goji berry fruits.[5]

8.2 VOLUNTARY FOREST CERTIFICATION IN RUSSIAN FAR EAST

China's forest product imports hit an all-time high in 2016, at nearly 290 million cubic metres (roundwood equivalent volume, a measure of the volume of logs used in the manufacture of wood-based products). This includes all timber products as well as pulp and paper. Imports originated from countries as varied as Russia, Papua New Guinea, Cameroon, the United States and European countries.[6]

Many are from high risk countries, due to poor governance associated with high levels of illegal logging and non-sustainable forest management. On the demand side, Chinese enterprises are keen to ensure that their products meet the legislative requirements of buyers, such as the Lacey Act in the United States, the Clean Wood Act in Japan, and the EU Timber Regulation in Europe, as well as voluntary forest certification schemes.

As a high-risk country, Russian forest product suppliers are increasingly aware of buyers' demand for product certification, such as that offered by the Forest Stewardship Council (FSC). The FSC is an international non-profit, multi-stakeholder organization established in 1993 to promote the responsible management of the world's forests by setting standards on forest products, as well as certifying and labelling them as eco-friendly. This means: respecting the rights of indigenous people; supporting the local population; protecting the health and safety of workers; ensuring sustainable harvesting levels; transitioning from clear cuts to selective logging; and establishing better reforestation practices. The process for verifying responsible forest practices is voluntary, and as such it is up to a forest owner, or the representative of a group of forest owners and operators, to initiate the certification process. Only an accredited certification body can evaluate, monitor and certify that forest products meet FSC standards.[7]

Terney Les is one of the biggest harvesting and wood processing companies in Russia, leasing over 3 million hectares of land in the Russian Far East, most of which is FSC certified. It produces saw logs, veneer and other high value timber products for export, primarily to Japan, on lease holdings that are in forests with high levels of biodiversity and rare species, such as the Amur tiger. As part of its compliance, in 2013, Terney Les identified over 450,000 hectares of high conservation value forests (HCVFs) in their holdings and conducted negotiations with stakeholders to develop management and conservation schemes under this more stringent FSC-HCVF designation.

In order to compensate for the significant economic losses incurred due to this additional level of protection, Terney Les and WWF Russia initiated the forest climate project. It is based on the idea that intact HCVFs have significant potential to accumulate CO_2 as phytomass, soil carbon and forest litter, and thus mitigate the impacts of climate change. When intensively logged, the replenishment of these carbon stocks may take up to 100 years. It is estimated that the avoidance of logging in HCVFs in the Terney Les lease holdings will reduce emissions of 130,000 tons of CO_2 yearly. This decrease of CO_2 released into the atmosphere could be traded on voluntary markets for greenhouse gas sequestration at USD 2-3 per tonne, resulting in earnings of up to USD 400,000 annually.[8]

8.3 SUSTAINABLE CASHMERE PROJECT IN MONGOLIA

Cashmere fibre is combed from domestic goats living in very cold conditions, such that their hair grows as thick and profuse as possible. In the South Gobi, winter temperatures range from -11 to -40 degrees Celsius. China and Mongolia are responsible for 90 per cent of the world's production of raw and processed cashmere. As demand on the international market has grown, herd sizes have also grown, yet Mongolian herders have been earning less money per goat. In the past 20 years, the total number of goats in Mongolia has increased fourfold, with more than 24 million goats. This means more soil erosion and less vegetation for native large mammals in this remote and arid ecosystem. The numbers of gazelle and khulan (an Asiatic wild ass) have fallen, meaning less food for snow leopards, whose population has also dropped.

The Sustainable Cashmere Project was established in 2015 as a partnership between the Oyu Tolgoi mine, the luxury group Kering, the Wildlife Conservation Society (WCS), Stanford University Natural Capital Project and NASA. Its goal was to re-engineer the supply chain of high-quality cashmere to improve the health of the landscape. Herders are guaranteed better than market price fees in return for implementing more sustainable practices, in addition to more direct access to market and financial/technical support for ensuring improved grazing practices. The project also provides vets to help keep herds healthy.[9]

Along with the herders and Kering, representing two ends of the supply chain, WCS is supporting herders and undertaking scientific field studies. The Stanford University Natural Capital Project and NASA are developing ecosystem models that will use remote sensing data to monitor rangeland conditions. The combined efforts of all partners are starting to show benefits through increased engagement with herder cooperatives, improved quality of cashmere and growing interest from other cooperatives to join the initiative. Over time, incentives will include assistance to herders diversify their income, for example through cheese making, and financial packages, such as access to loans and insurance, against loss of herds. Eventually certification will be put in place so that their sustainable practices can be verified and rewarded directly by the market.[10] In a synergistic effort, the Sustainable Fibre Alliance has developed draft certification standards for sustainable cashmere production in Mongolia.[11]

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9. CONCLUSION

The unique and shared challenges of DLDD and SDS are acknowledged as an important trigger for increased bilateral and multilateral partnerships to promote and implement SLM and ecosystem restoration projects and programmes, as well as other nature-based solutions to common environmental concerns.

However, the coordination of the diverse mechanisms employed as part of these partnerships in the Northeast Asia region remains a challenge. By highlighting numerous case studies, this report advances the discussion on how to improve coordination, so as to more effectively address the drivers and impacts of DLDD and SDS, which are expected to remain a major issue in the future.

All DLDD-NEAN partners agree that there is a need for a more comprehensive strategic agenda to address DLDD and SDS in the Northeast Asia region. Such an agenda should integrate the three dimensions of sustainable development: environmental, social and economic.

1. **Environmental sustainability** requires transformative change in the land management sector, such as integrating food production and value-added commodities with environmental management to combat DLDD and SDS. Agriculture and forestry must ultimately put back into the soil as much as they take out. Farmers, as stewards of soil carbon, should be at the center of the effort to address land degradation and reduce SDS sources.
2. **Social sustainability** must be nurtured through the development of human capital, including improved access to basic services like education, health, and livelihood security. This requires effective institutions for the proper governance of natural and economic resources and will only be achieved when human rights are respected.
3. **Economic sustainability** builds upon, and ultimately contributes to, environmental and social sustainability. This entails investments in value chains that reflect the essential diversity of production systems in the region, including

capitalizing on ecosystem services and the certification of sustainably produced goods that support the development of small- and medium-sized enterprises, increase value-added locally, and create jobs for the rural poor.

As outlined in the various case studies included in this report, it is often the enabling investments from the public sector that have unlocked private sector engagement and helped overturn the legacy of underinvestment in rural areas. These efforts are built around sound risk-management, including incentives for the more efficient management of soil and water resources, as well as the strengthening of locally-proven land management practices.

LOOKING AHEAD

Increasing monitoring and assessment efforts: Many of the bilateral or multilateral forest restoration projects have been focussed on tree-planting and sand stabilization. It is often hard to find cases where monitoring and reporting is regularly conducted after projects are completed. This type of evaluation reveals if there is sustained positive impact on the ground and on livelihoods. This sort of evaluation is, however, essential for communication and raising awareness that informs future policy initiatives and helps attract new investments to combat DLDD and SDS in the region.

One prominent exception can be found in some of the bilateral projects and programmes implemented by the ROK and China, where post-project monitoring and assessment was conducted by the National Institute of Forest Science (NIFoS) of the ROK and the National Forestry and Grassland Administration of China. From 2017 to 2018, researchers visited project sites, evaluated the status of the outcomes, analysed the success factors and challenges, and made recommendations for improvements.

The Northeast Asia region consists of different cultures, ethnic groups, and geographies. As a result, many forest plantation projects conducted in the region also reflect this diversity. All the projects implemented, regardless of their differences, required significant technical expertise and human labor. In order to sustain and scale-up these outcomes, special efforts to memorialize these projects will benefit future partnerships in and beyond the region.

Creating an enabling environment: An effective enabling environment is comprised of complementary institutional, financial, regulatory and technical settings and capabilities. This means further developing national and local institutional capacities that can operate within the context of bilateral and multilateral partnerships. This includes establishing and supporting multi-stakeholder coordination mechanisms to facilitate project implementation and engage local communities in order to maximize societal co-benefits.

Political commitment is needed at the highest level, and effective mechanisms must be put into place so as to drive coordination, collaboration and engagement between these various actors. Institutional capabilities are also needed in policy coordination and planning, as well as stakeholder engagement, and implementation and enforcement capabilities. This often requires the identification of a lead agency or NGO responsible for driving implementation, along with mechanisms to ensure horizontal coordination across different sectors and ministries, as well as vertical coordination between different levels of government (i.e. national, provincial, local).

Increased resource mobilization is essential to effectively implement most partnership initiatives; however, it is unlikely that resources available from national budgets will be adequate for some countries. Establishing an effective financial enabling environment includes: the adequate assessment of financial resource requirements; the identification of potential sources of finance; securing and allocating finance; and setting up instruments and mechanisms to incentivize the allocation of financial resources for all project activities, including monitoring and reporting.

Sharing knowledge, information and technical expertise: An effective exchange of knowledge, technology and expertise often involves the establishment of a scientifically sound monitoring system and data infrastructure, as well as technical capacities and tools to support the assessment of DLDD and SDS drivers and impacts. This assessment should broadly include an evaluation of economic, social and environmental co-benefits and trade-offs associated with partnerships and projects.

Some of the major challenges to incorporating knowledge and emerging technologies into policy include low levels of scientific understanding by policy makers, the limited openness of politicians to using this information, the narrow dissemination of research findings, and the lack of incentives and institutional channels. This presents the opportunity for the co-production of knowledge and co-design of projects at local and provincial levels.

Bold decisions and investments made today will determine the quality of Life on Land tomorrow. This Global Land Outlook thematic regional report serves as a timely reminder of the steps we can take to shape a prosperous and more secure future.
A future based on rights, rewards and above all respect for our precious land resources.

GLOBAL LAND OUTLOOK

The United Nations Convention to Combat Desertification (UNCCD) recognizes that addressing and reversing land degradation is one of the key sustainable development priorities for many countries, particularly in the developing world. In response, the UNCCD secretariat and its partners created a strategic communications publication and platform, entitled the Global Land Outlook (GLO), to facilitate insights, debate and discourse on a transformative vision for land management policy, planning and practice at various scales.

The aim of the GLO is to communicate and raise awareness of evidence-based, policy-relevant information and trends to a variety of stakeholders, including national governments formulating their responses to commitments to better manage and restore land resources, including the SDGs and associated targets, such as Land Degradation Neutrality (LDN). The evidence presented in the Global Land Outlook thematic regional reports demonstrates that informed and responsible decision-making can if more widely adopted help to reverse the current worrying trends in the state of our land resources.

United Nations
Convention to Combat Desertification