GREEN CLIMATE FUND

CARBON SEQUESTRATION THROUGH CLIMATE INVESTMENT IN FORESTS AND RANGELANDS IN KYRGYZSTAN (CS-FOR)

Kyrgyz Republic
Food and Agriculture Organization of the United Nations

CLIMATE CHANGE AND ECOSYSTEM-BASED NRM: IMPLICATIONS FOR THE PROJECT

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LIST OF ACRONYMS

AA	*Aiyl Aimak* (rural municipality area)
AO	*Aiyl Okmotu*
CBD	UN Convention on Biological Diversity
CBFM	Community Based Forest Management
CCCC	Coordination Commission on Climate Change
CFM	Collaborative Forest Management
CPMDP	Community Pasture Management and Livestock Development Plans
CS-FOR	Carbon Sequestration through Climate Investment in Forests and Rangelands
EA	Ecosystem Approach
EbA	Ecosystem-based Adaptation
GDP	Gross Domestic Product
GHG	Greenhouse Gas Emissions
GIS	Geographical Information System
IFAD	International Fund for Agricultural Development
INDC	Intended Nationally Determined Contribution
INRMCRP	Integrated Natural Resource Management and Climate Resilience Plans
IUCN	International Union for Conservation of Nature
JC	*Jaiyt* Committees
JFM	Joint Forest Management
FAO	Food and Agriculture Organization of the UN
FC	Forest Code
LC	Land Code
LMPD II	IFAD Livestock and Market Development Programme II
MAFIM	Ministry of Agriculture, Food Industry and Melioration
NAP	National Action Plan
NBSAP	National Biodiversity Strategy and Action Plan
NGO	Non-governmental Organization
NRM	Natural Resource Management
NSSD	National Strategy for Sustainable Development
PLFD	Pasture, Livestock and Fishery Department
PPP	Public-Private Partnerships
PUU	Pasture Users Unions
SAEPF	State Agency for Environment Protection and Forestry
SDG	Sustainable Development Goals
SFF	State Forestry Fund
SFM	Sustainable Forest Management
SLF	State Land Fund
TNC	Third National Communication
UNCCD	UN Convention to Combat Desertification
UNFCCC	UN Framework Convention on Climate Change
WB	World Bank

I. PARADIGM SHIFT

In the second half of 2017, upon agreement of the Government of Kyrgyzstan, FAO began the process of developing a proposal for the project "Carbon Sequestration through Climate Investment in Forests and Rangelands in Kyrgyzstan (CS-FOR)". The goal of the project is to contribute to the development of a low carbon emission and climate-resilient economy. The project objective is to intervene in key hot spots of target areas with adapted forest and pasture investments and to clearly transform management of pasture and forest resources at the national and local levels to ecosystem-based sustainable NRM by enhancing an integrated and participatory approach, which is adaptive to climate change and responsive to needs of local communities. As co-benefit, increasing significantly forest coverage - in hotspots with high risks of hazards such as landslides, mudslides and floods – the project will also reduce the exposure of rural communities. In other words, mitigation become an investment opportunity for the Country and an opportunity to promote and support sustainable and low emission development of rural areas.

Through an ecosystem-based and community driven approach, the project will generate benefits for both adaptation and mitigation to climate change. The paradigm shift objectives of the project will include: (a) for adaptation, increased climate resilient sustainable development; and (b) for mitigation, shift to low-emission sustainable development pathways. More specifically, the project's paradigm shift will be ensured by the combined efforts of the following: (i) policy support to enhance the enabling environment needed to sustainably scale up mitigation in the country, attract public and private investments in the forestry and pasture management sectors, promote evidence-based decision making (via remote sensing and GIS monitoring among the others) and enhance community's participation in forest and pastures governance; (ii) investments on ecosystem restoration (forests and pastures) to increase - with new methods and approaches - carbon sink potential in target areas; and (iii) support rural dwellers in reducing the negative impacts of livelihood strategies on forests and pastures.

The project will therefore address the issues of climate change mitigation and adaptation in four regions in Kyrgyzstan, including interconnectedness between ecosystems (i.e. pasture and forest land), but also how livelihoods can be improved through alternative activities. By analyzing climate trends and change projections (including through the georeferencing tool developed by the project), the project will implement ecosystem-based measures that consider the three dimensions of sustainability (environmental, social and economic), while supporting actions to ensure success (including institutional, policy/legislative, participatory and social inclusion aspects).

Climate change is and will increasingly become a problem in Kyrgyzstan, as it affects the ecosystem and people living in it. So, the question was: what can be done to address this? We looked at: (i) the status of the climate scene in the country and in the target areas; (b) the status of the natural environment; and (iii) what activities people are doing in the context of the natural environment. When we did that, we saw that people's activities (their livelihoods) affected the state the environment is in – and *vice versa* – climate change impacts the natural environment,

and hence people's livelihoods. So – activities of people have to somehow be managed to not tax the environment. But the state the natural environment also needs to be improved, because in this case, doing that *both* mitigates climate change and helps people have a healthy and resilient ecosystem base in which to undertake their activities, in a more sustainable way. So, we need to work with communities because they are the ones who benefit from a healthier environment so they can continue their activities – and more so, improve their income-generating potential. At the same time, national climate change objectives can be met. Once we saw that, we also saw that there are some regulatory issues, since the main environments are pastures and forest ecosystems, and these are governed in two different ways, by two different governmental bodies, with two different sets of rules/legislation. Having said that, there are some "supra" pieces of policy in place, which set out similar objectives for both pastures and forests: national development goals, sustainable development goals, Intended Nationally Determined Contribution (INDC) for climate change – these set the legislative basis for streamlining governance.

The principal issues in Kyrgyzstan that CS-FOR will address include livestock production, pasture management, afforestation/reforestation, improving livelihoods and people's resilience and adaptation to climate change, and supporting streamlined policy in NRM. These issues have been identified as crucial in light of the vulnerability of both persons and natural and productive resources to the impacts of climate change, and the need to support people to earn incomes and benefit from sustainable livelihoods.

Furthermore, all these issues are interlinked, from the ecosystem level to the institutional and governance levels. They are also part of a larger, global picture, in that results of the project – especially with regards to climate change adaptation and mitigation – feed into global processes including the UN Framework Convention on Climate Change (UNFCCC) and its related agreements/processes and achieving the Sustainable Development Goals (the UN 2030 Agenda for Sustainable Development (2030 Agenda) and its 17 Sustainable Development Goals - SDGs). At the national level, project outcomes feed into national-level responsibilities for implementation as per Kyrgyzstan's Intended Nationally Determined Contribution (INDC) and the SDGs. Improving land degradation and biodiversity are also contributions to the UN Conventions on Biological Diversity (CBD) and Desertification (UNCCD).

II. KEY ISSUES – NATIONAL CONTEXT[1]

NATURAL RESOURCES

Ecosystems

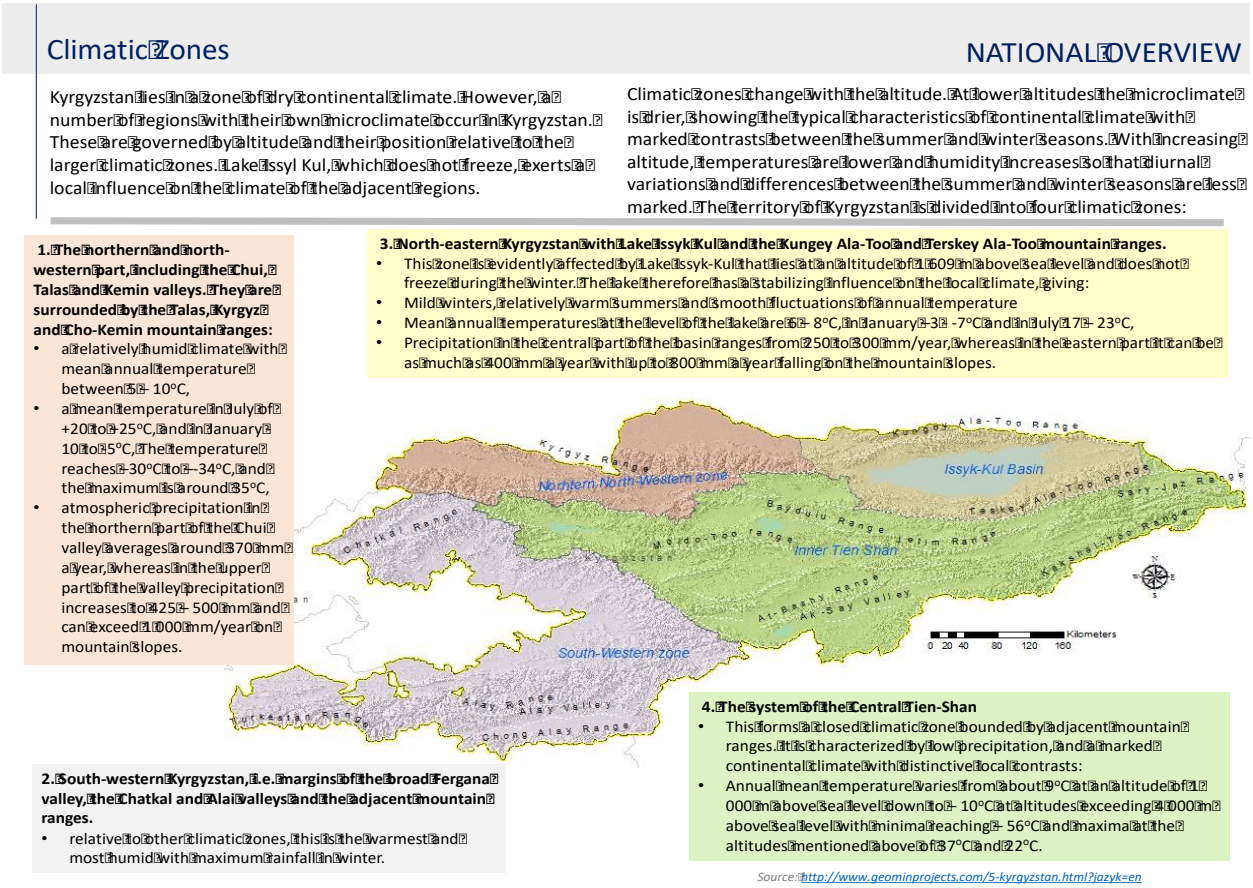
There are over 20 ecosystems in Kyrgyzstan, ranging from glaciers and snow fields to deserts, with rangelands and forests covering almost half the country's territory. Forest cover, however, is relatively small, making up 5.6% of the total land area. The climate of Kyrgyzstan is continental

[1] This Section has been primarily extracted from the IFAD COSOP SECAP, 2017.

with hot summers and cold winters, although conditions vary widely - from a low dry continental climate in the mountain slopes to a "polar" climate in the highly elevated areas of the Tien Shan and Pamir ranges.

The diversity of the natural-climatic conditions and landscapes of Kyrgyzstan (Figure 1) is categorized into four climatic zones: 1) Valley – foothill zone (up to 900–1200m), characterized by hot summers, and moderately cool and snowless winters with low precipitation; 2) Mid-mountain zone (from 900–1200m to 2000–2200m) with a typical moderate climate with warm, sufficiently humid summers and moderate cold, snowy winters; 3) High mountain zone (from 2000–2200 to 3000–3500 m) which varies between cool summers and cold, sometimes snowy winters. July temperatures here are 11–16°C. Winter is long (November-March), with temperatures ranging from -10°C to -3°C in the colder months; and 4) Nival zone (from 3500m and higher) characterized by a harsh and very cold climate. It is a zone of snow fields, rocks, glaciers and humidity accumulation belt. Even at the lower reaches of this zone, average July temperatures do not exceed 4–7°C; in January, they go down to -19°C to -22°C[2].

Figure 1: Climatic zones of Kyrgyzstan



[2] The Ministry of Agriculture and Melioration of the Kyrgyz Republic. 2014. The National Action Plan (NAP) and the Activity Frameworks for Implementing the UNCCD in the Kyrgyz Republic for 2015-2020.

Biodiversity

The varied geography and climate of Kyrgyzstan account for its high biodiversity – while the country makes up only 0.13% of global landmass, it hosts approximately 1% of the world's flora and fauna. The mountain ecosystems of the Kyrgyz Republic are also particular in that they support unique plants and animals, with a high degree of concentration of biodiversity not only at the ecosystem, but also at the species level. According to the Third National Biodiversity Strategy and Action Plan of the Kyrgyz Republic (submitted in 2016), entitled "Biodiversity conservation priorities of the Kyrgyz Republic till 2024"[3], Kyrgyzstan is home to around 166 viruses and bacteria, 3676 species of fungi and other lower plants, 3,869 species of higher plants, 101 species of protophyte, 14,600 insects and other arthropods, over 1,500 other invertebrates, 75 species of fish, 4 amphibians, 33 reptiles, 390 birds and 84 mammals. The invertebrate fauna is not fully explored. The Red Book of the Kyrgyz Republic includes 57 species of birds, 23 mammals, 2 amphibians, 8 reptiles, 7 species of fish, 18 arthropods, 83 higher plant species and 4 mushrooms.

Plant genetic resources are important in Kyrgyzstan, not only for ecological reasons but also economic potential: they include rich and varied sources of medicinal plants (over 200 species) and crop wild relatives (e.g. licorice (*Glycyrrrhiza glabra*), barberry (*Berberis*), barnyardgrass leafless (*Anabasis aphylla*), Fergana spurge (*Euphorbia ferganica*), thyme (various types) (*Thymus*)). The walnut forests in the south of the country are especially valuable; the Vavilov center of origin of walnuts is in Central Asia.

Vegetation

The predominant vegetation types found in the mountains are desert, semi-desert, and steppe on all the lower slopes and foothills and in some of the outlying ranges and major basins. Patches of riverine woodland exist in a few, low altitude places. At higher altitudes, steppe communities, dominated by various species of grasses and herbs occur, while shrub communities are widespread in the lower steppe zone. Spruce forests, the only coniferous forest type, occur on the moist northern slopes of the Tien Shan, while open juniper or archa forest occurs widely between 900 and 2,800 metres above sea level. Subalpine and alpine meadows occur in the western part of the mountains, from 2,000 to 4,000 metres, and above. At the highest and coldest elevations, there is limited vegetation cover, with cushion plants, snow-patch plants and tundra-like vegetation.

Water

The Kyrgyz Republic holds 30% of the total water resources of Central Asia, mainly stocked in rivers, glaciers, and snow massifs, but also in lakes and groundwater. The world's second-largest high-mountain lake, Issyk-Kul, is in Kyrgyzstan. Kyrgyzstan can be divided into two hydrological zones: (i) the flow generation zone (mountains), covering 171,800 km^2, (or 87% of the territory); and (ii) the flow dissipation zone of 26,700 km2 (or 13% of the territory). The annual average

[3] https://www.cbd.int/doc/world/kg/kg-nbsap-v3-en.pdf

volume of water totals 2,438 km^3 including 50 km^3 of surface river runoff, 13 km^3 of potential reserves of ground water, 1,745 km^3 of lake water and 650 km^3 of glaciers. Most of the rivers of the country have a snow-and glacier-type of alimentation; increasing temperatures (which have been observed over the last few years) will increase their flow. During the period from 1973 to 2000 the total river flow increased by 6.3% compared to the preceding period, and in the next 20 years a further increase in flow of 10% has been forecasted based on worked-out models. In the longer term, largely due to the rapid melting of glaciers, while the country will likely have enough water for its own needs in the future, it may not be able to meet demand in its role as a critical supplier to the Central Asia region.

CLIMATE CHANGE

The geography and topography of Kyrgyzstan make it one of the most hazard-prone countries in Central Asia, and climate-induced disasters are already occurring. Hazards such as drought, land and mudslides, avalanches, squalls, downpours, icing, frosts, breakthrough of glacial lakes, floods, river erosion and earthquakes are all common occurrences in Kyrgyzstan. The vast majority of the population lives in the valleys and foothills of the mountains, where vulnerability to these events is particularly high. On average, natural disasters are responsible for US$30-35 million average annual costs in damages and economic losses that represent 1-1.5% of the country's GDP[4]. Limited state and local government resources available for disaster reduction and response exacerbate the population's high vulnerability to natural disasters.

The Ministry of Emergency Situations of the Kyrgyz Republic reported that the number of floods, mudflows, landslides and avalanches has significantly increased during the last decade. The number of emergency situations in 2016 was higher than average, and natural disasters caused a total of 1.6 billion KGS of economic damage.[5] Osh and Jalalabad regions are most prone to natural disasters, with mudslides and landslides occurring along Kok-Art, Changet, It-Agar, Padysha-Ata, and Yassy watersheds. The biggest number of landslides and mudflows in 2016 was registered in Osh (152 landslides, 425 mudflows) and Jalalabad oblasts (114 landslides, 261 mudflows), while in other parts of the country the number of landslides were no more than 25 and the number of mudflows no more than 84.[6] One of the key reasons for these disasters is the degradation of vegetation along mountain slopes, caused by heavy anthropogenic pressure from livestock overgrazing, erosion of river banks, and unsustainable harvesting of timber and fuelwood.

The UN Framework Convention on Climate Change (UNFCCC) projects that grassland productivity will decline in the semi-arid and arid regions of Asia by as much as 40-90% for an increase in temperature of 2-3°C combined with reduced summer precipitation. The Third National Communication (TNC) of the Kyrgyz Republic under the UN Framework Convention on Climate

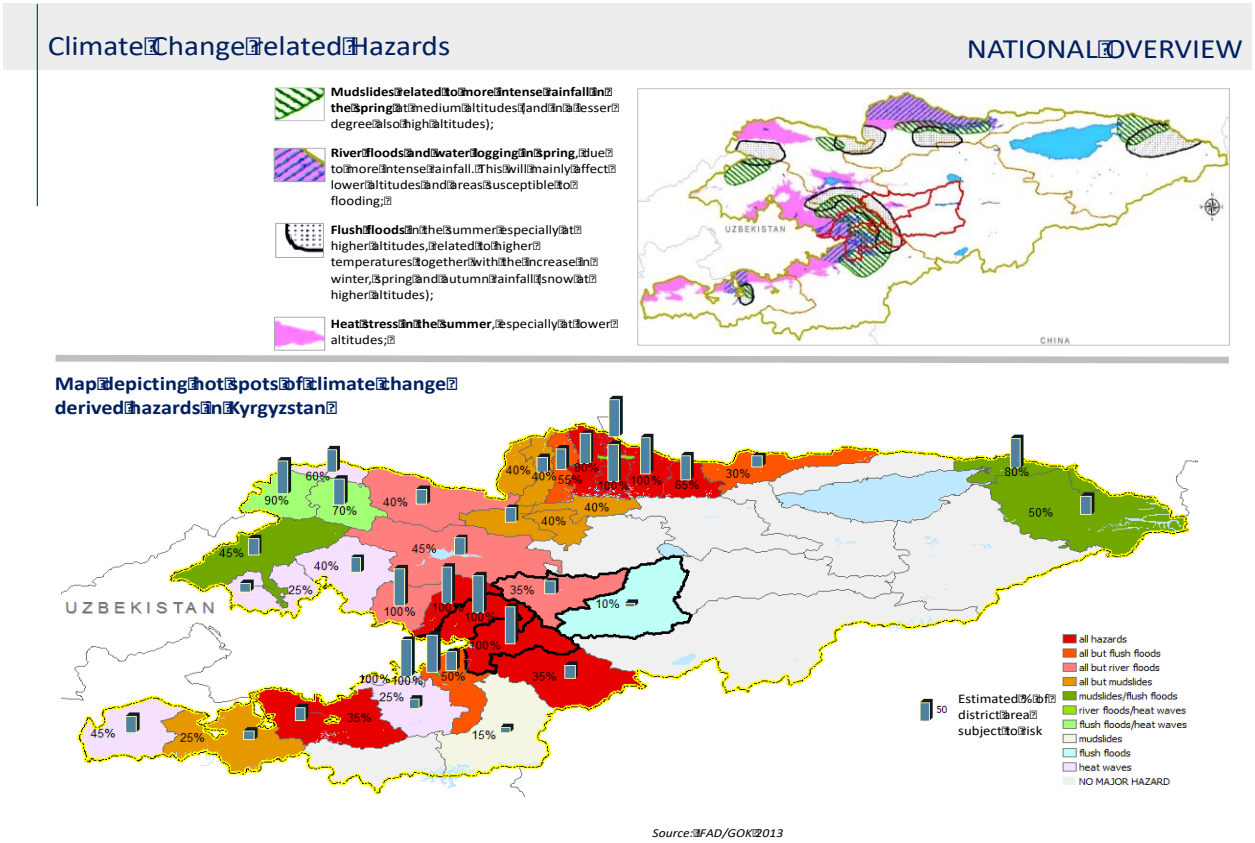
[4] GFDRR Disaster Risk Management Programmes for Priority Countries, Kyrgyz Republic case study.
[5] Ministry of Emergency of the Kyrgyz Republic data
[6] Monitoring and forecasting of disasters and hazards on the territory of Kyrgyzstan. Ministry of Emergency of the Kyrgyz Republic, 2017

Change was issued to the UNFCCC in 2017[7]; according to this most recent submission, and in line with the first and second national communications, an increase in the average annual temperature is observed in all climatic zones and regions across Kyrgyzstan. A similar increase in average annual temperatures has also been observed at all altitudes. Over the last century, the air temperature of the territory of the Kyrgyz Republic increased by 0.8°C. With regards to precipitation, estimates foresee variable trends - local increases and decreases - in the different parts of the country in the short term, with a general, sharp decrease after 2030-2040.

Hazards

The frequency and severity of floods (and associated river bank erosion) and droughts are projected to increase as a result of increasing temperatures and reduction of snowfall. In particular, river floods and water logging in spring, heat stress in summer, mudslides and flash floods and snow melting in summer will increasingly be experienced; the intensity of rain and snowfall is expected to increase, together with the frequency of heat waves. Maximum and minimum temperatures across Kyrgyzstan are expected to increase gradually over the course of this century (Figure 2). Recurrent extreme weather events and marked changes in microclimate are already being observed.

Figure 2: Climate change-related hazards



Source: IFAD/GOK 2013

[7] It should be noted that the TNC does not use most recent data – only up to 2010. Presumably, this is because more recent data was unavailable.

Future hazards related to climate change are projected to include:

- River floods and water logging in spring will mainly have an impact at lower altitudes. Rainfall will be more intense, affecting areas more susceptible to flooding. Infrastructures would be more frequently affected, pastures less accessible and livestock could suffer more stress.
- Heat stress in summer. More probable droughts will reduce the availability of water needed to face heat stress. Furthermore, changes in climate can lead to an increased outbreak of animal diseases.
- Mudslides. At medium altitudes (and to a lesser degree also at higher altitudes) rainfall will be more intense in spring, increasing the risk of mudslides that could affect the access of livestock to spring pastures.
- Flash floods and snow melting in summer are due to the increase in temperatures together with the increase in winter, spring and autumn rainfall (snow at higher altitudes). Livelihoods will be more affected by these hazards, because there will be less access to pastures, damages in infrastructures and so forth. Higher altitudes (and in some degree also medium) are more susceptible to this hazard.

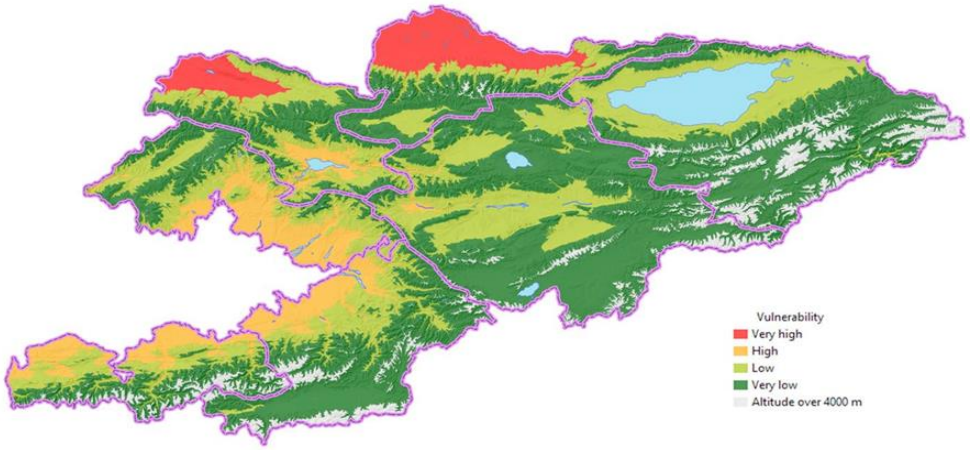
Vulnerability

Forests and pastures - already under pressure due to human-driven activities - are among the most sensitive resources being impacted by climate change. Forest are overexploited for logging and fuel, while pastures are overgrazed in the lower/middle altitudes due to limited access to high altitude summer pastures. Reduced productivity of low altitude pastures and decreased resilience of forest ecosystem are increasing the vulnerability of communities and negatively impacting rural livelihoods; changes in weather impact the livestock sector (and hence livelihoods), mainly in terms of pasture health and availability as well as animal health.

Areas (Figure 3) most vulnerable to climate change are:

- *Water*. The combination of decreased rainfall and the significant reduction of glaciers will have a negative impact on water availability and river-flow, with changes in intra-annual distribution. The depletion of water resources might lead to an increase of arid and semi-arid desert areas from current 15% to 23-49% in 2100. This entails the danger of future, greater shortages and potential disputes over water resources in Central Asia, which might have a serious impact on the regional geopolitical balance.
- *Agriculture and livestock*. Temperature changes will extend the areas favourable to certain crops, such as cotton and grapes and will require overall shifts in the actual distribution of crops. Major events that threaten to reduce agriculture productivity include extended summer drought, hailstorms, windstorms, late spring and early fall frosts, and winter thaws. Decreased summer precipitation may significantly reduce the productivity of highland pastures in several parts of the country.
- *Extreme climate events.* The overall probability of landslides, mudflows, avalanches, high waters and breaches of high-mountain lakes will locally increase or decrease in different parts of the country, with a sharper increase in the central part of the country.

Figure 3: Map of levels of vulnerability to climate change in Kyrgyzstan[8]



An analysis of future climate conditions in Kyrgyzstan conducted for the formulation of the IFAD Livestock and Market Development Programme II (LMDP II), based on different climate change scenarios, found that overall, there would be shorter winters and earlier springs – this will have an impact on pastureland which will be more productive, but at the same time, these resources could be more intensively exploited by the livestock sector. At the first level of altitude (below 1500 masl) the main factor regarding vulnerability will be heat stress in summer; average maximum temperatures will increase by 2.5°C. Middle altitudes (1500-2500masl) are considered of low vulnerability because increases in maximum temperatures in summer will not reach 30°C, so the vegetative activity will not be negatively affected, and in general livestock will not suffer heat stress. Milder winters will benefit pastures and livestock. Rainfall could increase in spring, autumn and winter, and remain stable in summer. With these changes, pastures and livestock will have better conditions, despite the increasing likelihood of water deficits in summer at certain locations (more detailed water balance studies are required). The most important hazards are river floods, mudslides and water logging in spring, and snow melting in summer. Finally, areas at high altitude (above 2500masl) are considered as very low vulnerability, as general increases in temperatures will benefit pastures and livestock, especially in summer and the likelihood of relevant droughts will probably be low even in summer. Flash floods and snow melting in summer are the main hazards at this altitude.

Emissions

In the Kyrgyz Republic, the TNC used data from 1990 (just before independence) to compare with greenhouse gas (GHG) emissions in 2010[9]. In 2010, total GHG emissions in the Kyrgyz Republic were only 45.4% of 1990 emissions. Also in 2010, the contribution of the country to total global

[8] *Source:* IFAD Livestock and Market Development Programme II (LMDP II). Design Completion Report. WP 6. Climate change impact on pastures and livestock systems – summary report.

[9] It should be noted that the TNC does not use most recent data – only up to 2010. Presumably, this is because more recent data was unavailable.

GHG emissions from fossil fuel combustion was 0.023%, while the population was 0.079% of the world's total population – thus, the per capita GHG emissions was less than one-third of the world average (about 2.2 tonnes CO2-eqv per capita in 2010). The emission reduction by sector in 2010 (as compared with 1990 levels) was: energy (-66.8%); industrial processes (-41.8%); agriculture (-23.1%); and waste (-14.6%)[10]. While agriculture is generally a major emitter of GHGs, the historical trends of agricultural growth (or decrease) in Kyrgyzstan are such that today, emissions are still relatively low. Having said that, the planned economic development of Kyrgyzstan is expected to lead to a sharp increase in greenhouse gases emissions.

One of the main factors determining the emissions from the agriculture sector is the number of livestock and poultry. Since 1995, there has been a consistent increase in numbers of all categories of livestock except for pigs. The exceptional growth of poultry is notable, with a sharp rise seen in 1997. In terms of methane emissions from the Enteric Fermentation and Manure Storage Systems categories, in 2010 there was a significant increase in emissions from dairy cattle and a decrease in those of sheep and goats, as compared to 1990. Methane emissions increased from 56.6% in 1990 to 63.8% in 2010, while nitrogen oxides emissions also decreased, from 43.4% in 1990 to 36.2% in 2010[11].

AGRICULTURAL PRODUCTION

Context

Over 90% of Kyrgyzstan is made of mountains. Arable agriculture is only possible on about 5-7% of the land with 75% of it depending on irrigation; an estimated 65-82% is classified as pasture. The main crops grown are wheat, barley, maize (for grain and silage), potatoes, melons, oilseed crops and different types of vegetables. Fodder crops are also grown, especially lucerne (on the better irrigated land) and sainfoin (on the less well irrigated hill slopes)[12]. Approximately 64% of the Kyrgyz population relies on livestock for their primary source of income, and pastures are the basis for livestock breeding; pasture management is a main concern for the country (Figure 4).

According to the Kyrgyz State Design Institute of Land Management "Kyrgyzgiprozem", large areas of agricultural land are in poor condition, and are affected by land degradation (an estimated 50-80%). This includes erosion, salinization and alkalization, water logging of arable soils, trampling and contamination of pasture vegetation (mainly unpalatable plants) and organic soil carbon content that has declined from 3% to 1.5%. – which, cumulatively, lead to a reduction of soil fertility and soil depletion. Some estimates by the Land Registry place the total area of land subject to erosion at 6.4 million ha, 700,000 has of which is arable land. 11.2 million ha of land (of which 1.3 million irrigated), are prone to wind and water erosion; 1.2 million ha (of which 146,600 irrigated), are saline; 480,200 (of which 98,800 irrigated) are alkalinized[13]. Inappropriate tillage practices have eroded soil and led to poor soil fertility on an estimated 770,000 ha of

[10] The Kyrgyz Republic Intended Nationally Determined Contribution (UNFCCC).

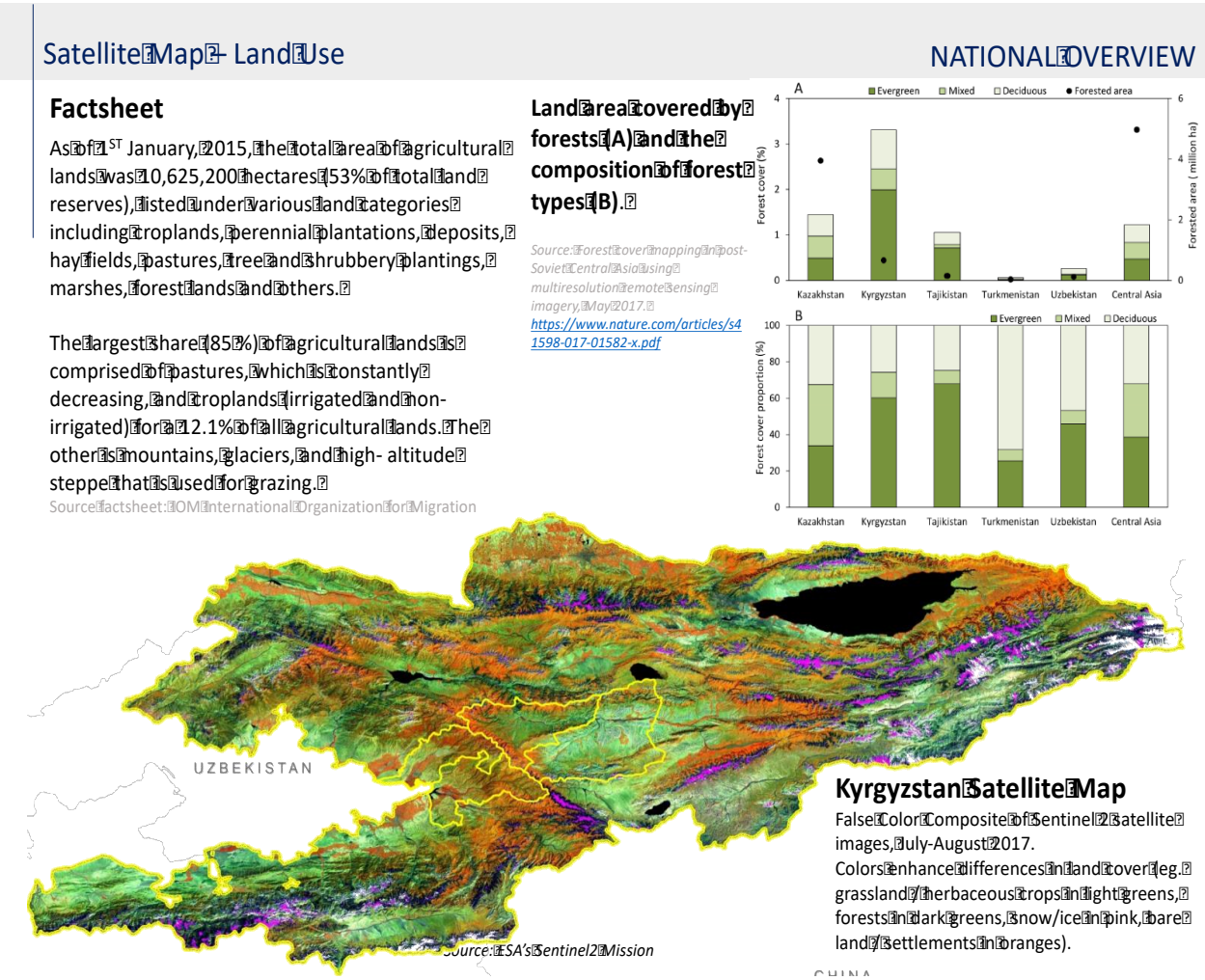
[11] *Ibid.*

[12] Fitzherbert. Country Pasture/Forage Resource Profiles – Kyrgyzstan. http://www.fao.org/ag/agp/agpc/doc/counprof/kyrgi.htm

[13] The Ministry of Agriculture and Melioration of the Kyrgyz Republic. 2014. The National Action Plan (NAP) and the Activity Frameworks for Implementing the UNCCD in the Kyrgyz Republic for 2015-2020.

arable land. These factors have damaged soil ecosystem services (chemical, biological, hydrological) and led to reduced ecosystem functions which are critical for resilient agriculture, especially in light of climate change.

Figure 4: Land use



Pastures

Pastures in Kyrgyzstan cover almost half of the country, or about 80% of agricultural land. An additional 12% of the country is classified as forestland without forest cover, which means they are largely shrub land utilized as grazing land. Most of the rangelands are located at altitudes between 1,000 and 3,500 meters, in intermountain valleys and mountain slopes, with about one-quarter found at elevations greater than 3,500 meters. Pasturelands play a key role in the country's economy, society and culture.

Traditionally, Kyrgyzstan was a pastoralist society which practiced transhumance. This way of life is still integral to the culture, and although a sedentary lifestyle and collectivized livestock

production was introduced during the Soviet period, transhumance is still practiced. Livestock rearing systems for sheep and goats, and for a major proportion of cattle, include seasonal transhumance to intermediate and high-mountain pastures. Migration begins in April/May and finishes in September/October. Pasture resources are considered for summer (higher altitudes; further away from inhabited areas), spring/autumn (middle altitudes), and winter (closest to inhabited areas).

Table 2. Pasture resources in the Kyrgyz Republic[14]

Type of pasture	Altitude	% Total rangeland area
Summer pastures	2500 to 3500	43%
Spring-Autumn pastures	1500 to 2500	30%
Winter pastures	Various	25%

Pasture degradation is one of the more important environmental problems throughout Central Asia, affecting a strategic resource for economic development, food security and environmental health. Pastures in Kyrgyzstan are degraded to varying degrees. Degradation is responsible for a decrease in species diversity and ecological flexibility to respond to climate change; severe erosion in places; and declines in forage production. Species composition of pastures adjusts to both wet and dry years and along the elevation gradient. High species diversity facilitates adaptation to livestock grazing pressure and ensures ecosystem resilience to climate change.

According to FAO (2000), pasture productivity declined steadily since the 1960s and by 1993 was reported to be about 300 kg/ha of dry matter, due to overstocking and poor grazing management. Productivity of the summer pastures declined from 640 kg/ha to 410 kg/ha and the spring and autumn pastures from 470 kg/ha to 270 kg/ha over the thirty years preceding 1993. The productivity of winter pastures decreased even more dramatically from 300 kg/ha to less than 100 kg/ha and encroachment of woody and unpalatable weeds affected about 50,000 km^2. The same FAO study estimated the maximum carrying capacity of Kyrgyzstan's grazing land at 7,000,000 sheep equivalents (accepted ratio: one horse = 6 sheep: one cow or yak = 5 sheep; one goat = 0.7 sheep).

Livestock. The livestock sector accounts for about half of agriculture's contribution to the Kyrgyz Republic's GDP, and is one of the strongest components of the rural economy. Livestock products represent a substantial part of the diet, and as much as 20% of total food consumption in Kcal/capita. As in other countries in Central Asia, livestock has been a safety net for the poorer segments of the rural population, and smallholders own over 90% of livestock. Since 1995 livestock numbers have been increasing, particularly in recent years. This has increased pressure on pastures and created an imbalance in their utilization, with under-grazing of distant summer pastures and overgrazing of village/near-by pastures.

[14] IFAD. Livestock and Market Development Programme II. Design Completion Report. 2013.

The economic significance of poor rural households' livestock production is significant. In 2015, peasant farms produced 49.5% and households produced 37.8% of total livestock output. Both households and peasant farms kept comparable proportions of cattle and dairy cows; peasant farms raised slightly more sheep and goats than households (56% compared to 43.6%); and households raised more poultry than peasant farms (46.8% compared to 37.8%). Peasant farms and households produce approximately 1.5 million tons of milk annually with Gross Agricultural Output (GAO) of meat and milk being nearly equivalent (peasant farms produce 50% of cattle live weight and 43% of raw milk; households produce 48% of cattle live weight and 45% of raw milk).

Having said that, livestock productivity is still far below its potential because of low levels of investment in livestock productivity, pastureland degradation, the prevalence of major livestock diseases and parasites, and reduced veterinary services. Pasture conditions deteriorated during the Soviet period with the intensive use of pastures, and in the recent past, with village and close-by (winter) pastures being severely overused and degraded, while the more remote summer pastures have been underutilized as a result of poor access often caused by deteriorating infrastructure. Average degradation of pastures has reached 49% with over 70% of winter pasture areas being degraded, according to the data of the Kyrgyz Ministry of Agriculture, Food Industry and Melioration (MoAFIM). The World Bank (WB) estimates that milk production could increase by 70% and mutton and beef production could increase by 50%, but animal product commercialization rates remain low: 64% for live animals at slaughter age, 52% for milk, and 34% for wool.

Livestock fodder, forage and feed grain production has been increasing, in line with the growth in number of livestock, but is still below potential. Feed grain requirements are high, at approximately 0.75 million tons/year, but households have little or no land, so they do not produce fodder or forage crops and peasant farmers do not produce fodder in sufficient quantity or quality. As a result, feed requirements are met through natural grazing, or though feed grain imports.

Forests

In the Kyrgyz Republic, almost all forests are state owned. As of January 1, 2010, the afforested area (forests and shrubs) of the Kyrgyz Republic was 1,123,200 hectares, or 5.6% of total area of the country. According to the Forest Code of the Kyrgyz Republic, forest lands include: forested land, including land covered with forest vegetation as well as scattered forest stands, plantations, nursery gardens, glades, burned-out forest, open woodlands and vacant plots; and non-forest land but which is part of the forest ecosystem, including agricultural and other land plots as well as lands where forest were removed for construction/utility purposes[15]. About 90% of all forests grow at altitudes between 900 and 2500 m above sea level. Although forests form a relatively small proportion of the country's total territory, they are highly diverse - main mountain forest types include spruce, juniper, walnut and floodplain/riverside forests.

[15] http://www.fao.org/forestry/30655-067a616376e5bf5ebac056446ec010d1f.pdf

Over one million people live in or near forests, and rely on forest products, such as berries, fruits, nuts, mushrooms, medicinal plants, timber and firewood, for a number of uses including food, heating and cooking, construction materials, and sources of income. Riparian forests play an important regulation function along the shores of rivers and lakes. Over the last thirty years, however, it was estimated that forest cover has been reduced by at least 50%, threatened by logging, forest clearing to create pasture and crop land, and intensive livestock grazing. Almost one million ha of forestland are used for grazing livestock. The Kyrgyz Forest Service stated a long-term objective of increasing forest cover to 6% by 2025-2030.

Climate change adaptation and mitigation in the agriculture sector

Climate change adaptation and mitigation are priority areas for Kyrgyzstan, especially as linked to the risks to people's livelihoods, the environment, the national economy, and achieving wider sustainable development goals. This is particularly the case as climate change events are already occurring in the country, and have already had environmental, social and economic impacts. As described in the previous sector, the nature of Kyrgyzstan's physical characteristics, physical resources and economy is heavily based on pastureland and the agriculture and livestock sectors. But more importantly is that the Kyrgyz population is greatly reliant upon the ecosystem services provided by pastureland, forests, water and soil. Adaptation to climate change has been more articulated in policy[16] than mitigation, although mitigation is also addressed in Kyrgyz climate change policies (see for example the Kyrgyz Republic's Intended Nationally Determined Contribution submitted to the UNFCCC), and should be integrated in development actions in light of the expected economic growth of the country. In fact, Kyrgyzstan has enormous mitigation potential through pasture and forest land restoration/rehabilitation/restoration, with added conservation/enhancement benefits to other ecosystem services, and increased ecosystem resilience in light of stress, including climate impacts.

III. ECOSYSTEM-BASED MANAGEMENT APPROACHES

Context

For at least 40 years (at the international level, when the environment came into the international agenda since the Declaration of the United Nations Conference on the Human Environment (1972)), efforts have been made to link human and environmental well-being. Broadly speaking, it was recognized (in different fora) that human health depends on the health of the environment. In 1987, Our Common Future was published, defining sustainable development as "…development that meets the needs of the present without compromising the ability of future generations to meet their own needs" – and defined sustainable development by highlighting the interlinkages between social, economic and environmental issues. In 1992, the outcomes of the United Nations Conference on Environment and Development (UNCED) included Agenda 21, the Rio Declaration on Environment and Development, the United Nations Convention to Combat Desertification (UNCCD), the Statement of Forest Principles, the United

[16] e.g. Climate Change Adaptation Programme and Action Plan for 2015-2017

Nations Framework Convention on Climate Change (UNFCCC) and the United Nations Convention on Biological Diversity (CBD).

More recently, in 2015, the Paris Climate Agreement and the Sustainable Development Goals were adopted, both of which gave new momentum for countries to move forward in sustainability issues and protecting ecosystems for enhancing adaptive capacity to climate change; both call for the integrated management of natural resources to support people and the planet.

To address the multiple dimensions of sustainability, integrated approaches are needed. The difference in approaches is what their entry point is – is it ecosystem-based? Climate change? Forestry (e.g. Sustainable Forest Management)? Land management (e.g. Sustainable Land Management)? Or is it spatial boundary-based (e.g. watershed, or agro-ecological zone)? A common aspect of an integrated approach is that it considers "technical" aspects but also the enabling environment of the approach – i.e. what conditions are needed to make it successful?

In 2000, Parties at the Fifth Conference of Parties of the CBD endorsed the description of the Ecosystem Approach (EA) and operational guidance and recommended the application of the principles and other guidance on the EA. The EA is the primary framework for action under the CBD to achieve its three objectives (conservation, sustainable use and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources). Ecosystem-based Adaptation is another approach (that "follows from" the EA) which addresses climate change within the context of sustainable development.

Ecosystem approach

The Ecosystem Approach (EA) is defined as: "a strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way", and is based on the application of scientific methodologies focused on levels of biological organization (essential structure, processes, functions and interactions among organisms and their environment), while recognizing that humans, with their cultural diversity, are an integral component of many ecosystems. It also acknowledges the need for adaptive management in dealing with the complex and dynamic nature of ecosystems, and that its implementation depends on local, provincial, national, regional or global conditions, and can be implemented in different ways[17]. The EA has five points of operational guidance and twelve complementary and interlinked principles.

The five points of operational guidance are: (i) focus on the relationships and processes within an ecosystem; (ii) enhance benefit-sharing; (iii) use adaptive management practices; (iv) carry out management actions at the scale appropriate for the issue being addressed, with decentralization to lowest level, as appropriate; and (v) ensure intersectoral cooperation. The twelve EA principles are:

[17] CBD COP 5 Decision V/6 (2000).

Principle 1: The objectives of management of land, water and living resources are a matter of societal choices.
Principle 2: Management should be decentralized to the lowest appropriate level.
Principle 3: Ecosystem managers should consider the effects (actual or potential) of their activities on adjacent and other ecosystems.
Principle 4: Recognizing potential gains from management, there is usually a need to understand and manage the ecosystem in an economic context.
Principle 5: Conservation of ecosystem structure and functioning, in order to maintain ecosystem services, should be a priority target of the ecosystem approach.
Principle 6: Ecosystem must be managed within the limits of their functioning.
Principle 7: The ecosystem approach should be undertaken at the appropriate spatial and temporal scales.
Principle 8: Recognizing the varying temporal scales and lag-effects that characterize ecosystem processes, objectives for ecosystem management should be set for the long term.
Principle 9: Management must recognize the change is inevitable.
Principle 10: The ecosystem approach should seek the appropriate balance between, and integration of, conservation and use of biological diversity.
Principle 11: The ecosystem approach should consider all forms of relevant information, including scientific and indigenous and local knowledge, innovations and practices.
Principle 12: The ecosystem approach should involve all relevant sectors of society and scientific disciplines.

Understanding and "internalizing" these points of operational guidance and principles in any project/initiative implementation brings together a complexity of levels (e.g. scientific, scales (temporal/spatial); the entry point of this approach is ecosystems and biodiversity, and it might be said that the dimension of social equity is better articulated in Ecosystem-based Adaptation approaches.

Ecosystem-based Adaptation

Three closely aligned definitions of the Ecosystem-based Approach (EbA) have been developed, but three things that they all have in common are: (i) climate change adaptation as the entry point; (ii) focuses on ecosystem services (as opposed to ecosystems) and biodiversity; and (iii) is people-centric, focusing on the benefits people derive from biodiversity and ecosystem services, and how these benefits can be used in light of climate change and other socio-economic and environmental co-benefits.

The definitions are: (i) CBD[18]: "…the use of biodiversity and ecosystem services as part of an overall adaptation strategy to help people to adapt to the adverse effects of climate change"; (ii) UNEP: "…the use of biodiversity and ecosystem services as part of an overall adaptation strategy to help people and communities adapt to the negative effects of climate change at local, national,

[18] Secretariat of the Convention on Biological Diversity (2009). Connecting Biodiversity and Climate Change Mitigation and Adaptation: Report of the Second Ad Hoc Technical Expert Group on Biodiversity and Climate Change. Montreal, Technical Series No. 41, 126 pages.
https://www.cbd.int/doc/publications/cbd-ts-41-en.pdf

regional and global levels"; and (iii) IUCN: "…the use of the biodiversity as part of the overall adaptation strategy to help people adapt to adverse impacts of climate change". In essence, EbA aims to increase the resilience and reduce the vulnerability of people and the environment to climate change through a range of ecosystem management activities[19].

EbA is characterized by three elements and five criteria:

Element A: EbA helps people adapt to climate change
- Criterion 1: Reduces social and environmental vulnerabilities
- Criterion 2: Generates societal benefits in the context of climate change adaptation

Element B: EbA makes active use of biodiversity and ecosystem services
- Criterion 3: Restores, maintains or improves ecosystem health

Element C: EbA is part of an overall adaptation strategy
- Criterion 4: Is supported by policies at multiple levels
- Criterion 5: Supports equitable governance and enhances capacities

A characteristic of EbA is that shares many of the EA principles and operational guidance, there are also some conceptual differences, as mentioned earlier – these include the entry point of climate change adaptation, people-centered approach and the focus on ecosystem services (as opposed to ecosystems). There are, however, also other socio-economic and environmental co-benefits – including climate mitigation benefits, supporting the restoration/rehabilitation/ management of a range of other ecosystem services, and ensuring consideration of social-ecological dimensions (including social equity-related processes and policies), to name a few.

Considerations

Over a long period of time, pasturelands and forests have become heavily degraded. Causes are multiple, including past policies and management regimes (dating from pre-Soviet times), lack of coherent, or conflicting, integrated pasture and forest policy, governance, institutional and regulatory frameworks, poor natural resource management practices, tenure arrangements, but also other issues such as data collection, monitoring and reporting.

The ecosystem-based approach used in this CS-FOR project acknowledges that improving interlinked environmental, climate and sustainable livelihood dimensions requires a systems approach, and that climate change mitigation can be an entry point. Addressing the biophysical ecosystem does not suffice – the enabling environment, including social dimensions (e.g. participation, equity, "ownership"), economic opportunities for beneficiaries, achieving national environmental, sustainable development and climate change objectives, governance, and capacity building must also be tackled. As the name implies, given the "ecosystem-based" nature of project interventions, key issues are not addressed in "silos", but rather as an integrated package.

[19] https://www.iucn.org/theme/ecosystem-management/our-work/ecosystem-based-approaches-climate-change-adaptation

IV. WHY CS-FOR ACTIVITIES?

NATIONAL CLIMATE CHANGE POLICY CONTEXT

It has been clearly articulated in national climate policy that mitigation and adaptation are priority areas for Kyrgyzstan, especially as linked to the risks to people's livelihoods, the environment, the national economy, and achieving wider sustainable development goals. This is particularly the case as climate change events are already occurring in the country, and have already had environmental, social and economic impacts. The Kyrgyz Government's National Strategy for Sustainable Development (NSSD) 2040 is expected to be adopted in 2018. It is accompanied by the "Forty Steps Programme," aiming, among other things, to preserve forests and biodiverse ecosystems through social forestry and joint forest management, and by regenerating natural resources. Step 39 – Environmental Sustainability - aims at establishing an adequate legal framework and providing state support for environmental protection; and Step 40 - Mountainous Forests - emphasizes the fragility of mountainous forest ecosystems and the need for protection and afforestation.

The Kyrgyz Republic's Third National Communication (TNC) to UNFCCC states that expected climate change will negatively impact the national economy (firstly, agriculture), and the health of populations and natural ecosystems - identifying an urgent need for adaptation activities. Climate change is also a matter of importance in other policy objectives of Kyrgyzstan – and the fact that climate change is addressed in different environmental and sustainability fora is just another example of why an ecosystem-based approach is important. In fact, as the Fifth National Report of the Kyrgyz Republic to the Convention on Biodiversity states, "Conservation of natural ecosystems and restoration of degraded ecosystems is essential in order to achieve common goals of the Convention on Biological Diversity and the United Nations Framework Convention on Climate Change, as ecosystems play an important role in the carbon cycle and climate change adaptation, while providing a wide range of ecosystem services, it is necessary for the welfare of the people."

United Nations Convention to Combat Desertification (UNCCD).
The National Action Plan (NAP) and the Activity Frameworks for Implementing the UNCCD in the Kyrgyz Republic for 2015-2020 has many actions on land degradation that are highly relevant – and in fact, directly linked – to climate change adaptation measures for the agricultural and livestock sectors, and particularly for pasturelands. In particular, the contribution of research to the prevention of land degradation and desertification outlines relevant measures: a) carrying out research to identify promising agricultural technologies, economic land degradation assessment, recommendations for improving the herbage (crops) of pastures, methods for effective land management, etc.; b) making predictions on climate change, water shortage onset periods, and the development of adaptation measures; c) introduction of knowledge systems for sustainable land management through networks (World Overview of Conservation Approaches and Technology (WOCAT), DryNet etc.); d) preparing recommendations for the establishment of protective forests of drought-tolerant tree species, based on the identification of adaptive capacity of natural vegetation, for example, *Haloxylon*, as an effective method to combat

desertification and land degradation; and e) improving land resources monitoring using GIS technology.

The National Action Plan (NAP) and the Activity Frameworks for Implementing the UNCCD in the Kyrgyz Republic for 2015-2020 highlights that strengthening the capacity for state management of land resources, effective land-use policies, as well as achievement of sustainable use of land resources will be necessary. For this, national agencies, institutions involved with land resources, as well as training of farmers require support from experts in land use planning and management at local and national levels. The principal condition is to maintain and increase the potential productivity of the land while maintaining vital ecosystem functions of soil. Particularly relevant is the inclusion of adaptation measures to climate change in local plans for social and economic development of the regions of the country. Available data on the oblasts shows that currently the issue of projected climate change and the issues on desertification/land degradation remain poorly understood on the ground. Issues of adaptation to climate change are weakly reflected in local socio-economic development plans.

United Nations Convention on Biological Diversity (CBD).
The Third National Biodiversity Strategy and Action Plan (NBSAP) of the Kyrgyz Republic was submitted to the CBD in 2003, and the Fifth National Report in 2014. Strategic Target 4.2 under the NBSAP's "Action Plan for implementation of biodiversity conservation priorities of the Kyrgyz Republic for 2014-2020" is: "Increase the resilience of ecosystems, and thus increase the contribution of biodiversity to carbon stocks, contributing to climate change mitigation and adaptation and to combating desertification". More specifically, during the period 2015-2020 the intention is to "Implement measures for sustainable development of mountain forests and land resources in the face of climate change on the area of 30.0 thousand ha."

Use of biodiversity and ecosystem services under ecosystem-based adaptation is summarized in the framework of a common adaptation strategy. It includes the sustainable management, conservation and restoration of ecosystems to provide services that help people to adapt to the adverse effects of climate change. Priority adaptation measures in the agriculture sector involve technical, capacity building, institutional and monitoring aspects.

The Priority Directions for Adaptation to Climate Change in the Kyrgyz Republic till 2017 has also identified key climate change adaptation measures aimed at enhancing institutional and technical capacity to increase the resilience of the agro-ecosystems and rural population to climate change impacts. Some adaptation measures are listed below:

Priority adaptation measures on water resource management. Improving water maintenance using techniques for water saving, storage and distribution (including promotion of, or rehabilitation of: efficient and water saving irrigation technologies (e.g. micro-pressurized irrigation techniques such as drip irrigation); rainwater harvesting systems; and irrigation and drainage systems, pumping systems and water reservoirs); improving sustainable water resources use through the introduction of economic motivation for sustainable water management; introduction of the principles of integrated water resource management;

enhancing soil moisture retention capacity by conserving/increasing tree cover; forestation in field edges and irrigation canals for reduction of water losses, to reduce wind erosion impact, and recover eroded/salinized lands; capacity building for water users and water user associations; integration of local water management into regional planning; preservation of river run-off formation zones; ensuring appropriate recording of water resource allocation and reporting; strengthening of international cooperation with regards to the conservation and use of transboundary water resources; and raising awareness and education about water scarcity and efficient use, water resources quality and quantity, social and economic consequences of climate change including issues associated with growing water deficits, and water conservation/saving practices.

Priority adaptation measures for the livestock sector. Introducing rational range utilization and monitoring techniques for the various types of pastures (summer, spring/fall, winter); rehabilitating degraded rangelands in mountains, deserts and flooding areas and forests; improvement of vegetative cover with climate-adapted species/varieties, including silvo-pastoral systems with tree plantation for improving soil humidity and shade for livestock in summer; establishing guaranteed fodder reserves based on efficient irrigation, and growing/making use of adapted fodder crops; support fodder production in irrigated lands and haymaking in rainfed areas; improving livestock productivity (beef production) through rapid fattening; developing climate-proof infrastructures to cope with climate hazards, such as shelters for livestock, wind protection, water supply systems and water points in vulnerable areas, thermal insulation in stabling facilities, etc.; improving and maintaining infrastructures to facilitate access to and services in mountain pastures; controlling livestock numbers; providing targeted technical assistance on adaptation priorities to strengthen the implementation of Community Pasture Management and Livestock Development Plans (CPMLDPs); and building capacity (policy makers, extension agents, NGOs, land users, researchers) and research.

Priority adaptation measures on agricultural production. Improving crop production through sustainable agricultural practices (e.g. crop rotation systems, no-till/mini-till, soil nutrient improvement, soil salinity reduction, plant protection); promoting integrated rangeland management and cattle breeding development, taking into account adaptation to climate change; optimizing crop allocation, with a focus on seed quality; growing drought- and salt-resistant crops; promoting high-yield early- and late-ripening crop varieties; promote kitchen gardens through interventions such as building greenhouses; improving existing legislation, policies and economic mechanisms on soil and water conservation, rational use of resources, and integrated land management aspects; enforcing policy aimed at introducing resource saving and low-waste agriculture production technologies, and improved agriculture processing techniques; developing agriculture/climate expert-advisory systems to facilitate the use of updated scientific and practical agronomic information by farmers.

Priority adaptation measures on monitoring/climate risk management. Improving monitoring and forecasting system for anomalous/extreme weather events; (ii) promoting infrastructure sustainability in light of extreme weather events (e.g. retention structures along river banks – although planting natural vegetation, as applicable, is preferred – or could be done

concomitantly); developing weather-climatic risk insurance systems; improving the monitoring of quantity and quality of water resources, through a combined use of remote sensing and field observations; developing forecast modelling methodologies for assessing future water resources and drought early warning systems; permanent monitoring of flora and fauna under conditions of climate change; improving climate forecasting (Early Warning Systems) and servicing; and improving nationwide structures of hydrological and agro-meteorological monitoring systems.

Priority adaptation measures on biodiversity and forest conservation. Afforestation (spruce forest, forest pasture, riparian stripes); preservation and restoration of wetlands, as habitat for local biodiversity but also important for ecosystem resilience especially in light of climate change; and promotion of collective forest management and social forest conservation principles.

Priority adaptation measures in the agriculture sector involve technical, capacity building, institutional and monitoring aspects. The Priority Directions for Adaptation to Climate Change in the Kyrgyz Republic till 2017 also identified key climate change adaptation measures aimed at enhancing institutional and technical capacity to increase the resilience of the agro-ecosystems and rural population to climate change impacts.

TECHNICAL CONSIDERATIONS

An ecosystem-based natural resource management approach that is one that recognizes the array of ecosystem interactions, including humans. It is holistic, and does not take a "silos" approach. For the CS-FOR climate change mitigation project, climate is the "entry point" – mitigation is possible through changes in agriculture and management practices, reducing CO_2 (carbon dioxide) emissions, CH_4 (methane) and N_2O (nitrous oxide), but also increasing sequestered carbon. CS-FOR specifically aims to also use mitigation interventions to improve people's resilience, and reduce vulnerability to, climate change – by increasing people's adaptive capacity, strengthening the legal and institutional framework, and encouraging green value chains.

Through afforestation/reforestation/restoration activities, the project will reduce greenhouse gas emissions and increase carbon sequestration potential. There will be added ecosystem resilience benefits by improving/enhancing ecosystem services. Adaptation measures will be linked to mitigation activities, address adaptation constraints[20], and target improving livelihoods through sustainable production primarily around the livestock sector. The development of Integrated Natural Resource Management and Climate Resilience Plans (INRMCRPs) by PUUs and *lezkhoses* will set the framework for both mitigation and adaptation activities, bringing together technical aspects but also social (e.g. participatory processes, gender balance), involvement of different stakeholders (including public-private partnerships - PPP), and local governance - INRMCRPs are also the basis of institutional cooperation at the local level. Finally, sub-projects will also fall under the aegis of INRMCRPs.

[20] Adaptation constraints include: poor governance and inefficient pasture management; pasture degradation; lack of access to assets and infrastructure; limited access to extension services; and monitoring and data collection.

Plant materials

Whether for afforestation/reforestation[21] activities, rehabilitating rangelands, or providing additional winter fodder, *using native species is the preferred option*. Native species are better suited to thriving in local climactic and geographic conditions – often, they are considered "insurance" for adapting to climate change. Increasing (native) vegetative cover contributes to carbon sequestration and climate regulation, which is a major project objective, but also benefits other ecosystem services necessary for resilient ecosystems; these include provisioning, supporting, regulating and even cultural services. For example, increased vegetation assists in flood control, reduces soil erosion, improves water retention, contributes to soil fertility, provides food and raw materials, preserves genetic resources, and provides habitat for pollinators. Planting vegetation (trees) also acts as windbreaks and shade shelter.

In planting crops (e.g. fodder crops), sustainable agricultural practices should be used – this means managing ecosystem services for crop production rather than using external inputs (such as pesticides and fertilizer). For example, leguminous crops improve nutrient cycling in the soil; Integrated Pest Management manages the ecosystem to attract natural predators of unwanted pests.

A key aspect is management and monitoring of planted areas. Key questions include: (i) where is the planted material coming from?; (ii) how can the supply of plant material be ensured?; (iii) how will survival rates of newly planted vegetation be ensured?; (iv) how can communities be incentivized to undertake afforestation/reforestation/restoration activities?; and (v) will such activities be implemented is "allowed" areas?

Where is the planted material coming from? Plant material (e.g. for fodder production, afforestation/reforestation, crop production) must be sourced from legally approved points. In the case that plant material is non-native, national and international legislation must be adhered to, including obtaining certification/clearances. In the case that plant material comes from traditional/local/indigenous communities, what are their user rights? Traditional/local/indigenous communities must be consulted, and their agreement obtained writing. These same communities should be involved in the participatory processes for managing plant resources.

How can the supply of plant material be ensured? Seedlings should be purchased from authorized nurseries; if engaging in the context of green value-chain development (e.g. public-private partnerships (PPP)), the role of nurseries could be expanded to include deployment of seedlings and training to communities, on planting and care of the same. Again, native species are the preferred option.

[21] Afforestation is the establishment of a forest or stand of trees in an area where there was no previous tree cover. Reforestation is the natural or intentional regeneration of existing forests and woodlands that have been depleted, usually caused by natural disasters or direct/indirect human activity.

How will survival rates of newly planted vegetation be ensured? First of all, community engagement is essential. Communities (*leskhozes*, PUUs, through Integrated Natural Resource Management and Climate Resilience Plans (INRMCRPs)) should be at the forefront of on-the-ground management of newly planted areas. Rotational grazing plans will ensure cattle do not trample on/eat newly covered areas; fencing is a "hard" action. However, both need to be monitored for compliance. Monitoring is also necessary to track establishment progress. Training communities to undertake monitoring activities must be given. Monitoring can feed into national forest data, which has to be made openly accessible to leskhoz staff, forest users, pasture users and NGOs – access to accurate data is essential for developing informed management plans. At the national level, longer-lease tenure and accountability arrangements should be in place for communities to have "ownership/long-term commitment" to improving and maintaining vegetative cover; SFF and SLF roles, responsibilities and legal framework would need to be aligned, for this to occur with a long-term vision.

How can communities be incentivized to undertake afforestation/reforestation/restoration activities? Communities need to be incentivized to undertake activities, especially in light of temporary restricted access to certain areas (e.g. resting areas in rotational grazing, fenced areas). First of all, land users/managers/beneficiaries need to be in a position to make informed decisions as to why they should improve habitat (and ecosystem resilience) – to this end, training on the trends and climate impacts is important. Beneficiaries should be incentivized, as part of a long-term sustainability vision – this includes knowledge but also linking mitigation activities with adaptation activities such as income diversification – agroforestry can be an opportunity.

Will such activities be implemented in "allowed" areas? In principle, activities should not be undertaken in protected areas. According to IUCN**, "**A protected area is a clearly defined geographical space, recognized, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values"**.** Having said that, there are different IUCN categories of protected area: (i) I(a) - Strict Nature Reserve; (ii) I(b) - Wilderness Area; (iii) II - National Park; (iv) III - Natural Monument or Feature; (v) IV Habitat/Species Management Area; (vi) V -Protected Landscape/ Seascape; (vii) VI - Protected area with sustainable use of natural resources. A number of these categories include human activity in the area, but in terms of project operations, *it is not recommended to work in protected areas* – however it needs to be clear what category of land is being targeted in the project area – including national-level arrangements for buffer zone areas. Based on INRMCRPs developed by *leskhozes* and PUUs, the project may work in buffer zones – (potential) activities would be solely afforestation/forest rehabilitation. But there are still essential questions that need to be answered: what is the (protected area/buffer zone) category of land? Who lives inside/near that land? What is the state of the environment inside the land area? What national legislation governs the land? (Written consent from the relevant Government institutions must be obtained, to work in buffer zones.)

Livestock

The issue of livestock is inextricably linked to pasture and forest cover as well as to people's livelihoods and economic potential, for multiple reasons including: being one of the reasons for

pasture degradation; availability of forage primarily from pastures (regardless of whether or not in SFL or SFF land); access to grazing areas; managing livestock grazing (intensive rotational grazing) while rehabilitating vegetative cover; increased productivity; herd size and monitoring herd numbers; and understanding the linkages between livestock production and climate change. Livestock is the primary source of income of target communities, but is also used as "insurance" sources of cash. Herd sizes are high because of this, but also because of the risk of diseases.

More specifically, the ability of livestock farmers to harmonize the use of their pastures for sustainable NRM is constrained by many problems, including: the low breed value of grazed animals; non-diversified livestock production and poor husbandry practices with high methane emissions (methane emissions per animal and per unit of product are higher when the diet is poor); lack of technical knowledge of small livestock holders; poor governance arrangements on pasture management; inefficient management of community livestock; shortage of feed during the winter months; environmental degradation; and lack of access to quality fodder seed and infrastructure - all of this further exacerbated by climate change. The ecosystem-based approach of CS-FOR should focus on decreasing the pressure on pastures and reducing methane emissions by promoting (intensive rotational) grazing management (including access to pastures through small infrastructure such as roads and bridges, and providing animal watering points), improving fodder availability, income diversification, and more productive livestock generating higher returns. Animal health care then needs to be addressed.

Forage/fodder availability: Availability of forage is linked to pasture amelioration through increasing and improving vegetative cover, as discussed in "plant materials", above. This also includes any potential hybrid hay or silage fodder production for winter months – if non-native species must be introduced, this must follow national regulations and procedures and FAO's Environmental and Social Safeguards. Rotational grazing management, through INRMCRPs, should be developed; a crucial aspect of these are monitoring herd size and compliance with the grazing plans. Another crucial aspect is the pasture resting time. Sourcing fodder for winter months is an issue since winter pastures are more severely degraded. This is also linked to the section above ("plant materials"), with regards to sourcing of seeds; PPPs can be a mechanism for ensuring fodder availability and provision.

Pasture improvement: Again, as CS-FOR will use an ecosystem-based approach, pasture improvement does not happen through a "silos" approach, but through different pathways. While improving vegetative cover is one, and rotational grazing another, so is livestock selection – and this, in its turn, is linked to reducing methane objectives. Cattle is the major source of livestock owned by herders in the CS-FOR target areas, followed by sheep and goats. Sheep and goats, however, are better suited to mountain areas, and better adapted to accessing highlands which are otherwise hard-to-reach for larger animals such as cattle. Summer, spring and autumn pastures consist principally of perennial grasses and *Cyperaceae*, which are reasonably resilient under heavy grazing. As part of PUU discussions in formulating INRMCRPs, shifting the proportion of livestock species grazed in different pastures could be considered (i.e. greater number of cattle in close (winter, spring/autumn) pastures and prevalence of small ruminants in remote (summer)

pastures). Access to remote pastures is essential, and hence building roads and bridges – these activities need to adhere to national and FAO Environmental and Social Safeguards requirements for environmental impact assessment, if and as needed.

Pasture improvement can also be achieved by reducing livestock's pressure on pastures by providing diversified income generating opportunities, which must, however, be promoted as ecologically sustainable options. For example, improving vegetative cover provides improved habitat and forage for pollinators – here, honey production becomes a natural transition to a diversified source of income. Other opportunities can be shifting to poultry, but here care must be taken to ensure conformity to environmental standards in light of, for example, housing and waste disposal.

Reducing methane emissions: This activity, described in detail in the WP on Livestock, will require trade-offs. Applying primarily to cows and sheep, the most promising approach is by improving the productivity and efficiency of livestock production, through better nutrition and breeding. Improved breeds would be more efficient in terms of energy expenditure, products (dairy, meat) and reduced methane emissions. Although native, main cattle in the project areas are low productive breeds - in particular, there is scope to improve cattle and sheep breeds by crossing with non-native species. In Kyrgyzstan, these hybrids already exist. The trade-off is weighing the cost/benefit ratio between the non-use of only native breeds (conservation targets), ecosystem improvement (more efficient pasture use, reduced methane emissions) and improved economic benefits (arising from improved dairy, meat).

Animal health: Currently, animal health is an issue because of the presence of major diseases (brucellosis, echinococcosis and foot-and-mouth disease). These cause high mortality, low productivity and high herd numbers as more livestock is kept to make up for animal losses due to disease. Higher herd numbers increase pressures on pastures. Improved veterinary services and diagnostic laboratories will assist in preventing diseases.

Sub-projects and green value-chain activities

An ecosystem-based approach calls for all sub-projects and green value-chain activities to be environmentally-driven, while providing social and economic benefits. By being environmentally-driven, sustainable sub-projects and green value-chain activities will be "internalized" in the country, preventing future environmental un-sustainability in the long-term, and beyond the time scope of CS-FOR. It would work on a "getting it right the first-time round" principle, contributing to multiple sustainable development goals (as elaborated in the 2030 Agenda for Sustainable Development). Environmental and social safeguards criteria must be applied to all sub-projects.

VI. ENABLING ENVIRONMENTS FOR ECOSYSTEM-BASED MANAGEMENT IN CS-FOR

CONTEXT

This Working Paper has described an "ecosystem-based management approach", highlighting the importance of an integrated approach to natural resource management, inclusive of nature but also humans, and the underlying structure ("enabling environment") to achieving objectives (e.g. legal and institutional frameworks). In the context of CS-FOR, an ecosystem-based approach has a clear opportunity for capitalizing on mitigation actions to improve the environment beyond afforestation/reforestation/restoration of forest and pasture lands, and livestock grazing management; mitigation actions have other environmental co-benefits, especially improving ecosystem services and resilience to stress. In addition, as part of an ecosystem-based approach, mitigation actions afford adaptation opportunities and benefits to humans. CS-FOR supports climate change adaptation via on-farm investments to increase productivity, reduce natural resource (forest and pastures) dependency and contribute to low emission sustainable development and resilient agriculture pathways.

Beyond environmental sustainability, an ecosystem-based approach tackles the enabling environment which supports successful achievement of environmental goals. These enabling conditions should place farmers, communities and other beneficiaries/stakeholders in the position to practice and implement an ecosystem-based approach on a long-term basis, thus allowing for and supporting a contextualized, adaptive ecosystem-based management, i.e. providing support not only to large-scale, blanket approaches but to alternative approaches that take local specificities and needs into account and adapt to these In the context of CS-FOR The legal and institutional framework is not just an aspect of the enabling environment, but given the inextricable links between pastures and forests, and the uses people have for these, it is a major project component. There are also other elements – for the purpose of CS-FOR, we highlight some, including social inclusion (participatory processes, gender, stewardship), monitoring and reporting (and communication and dissemination of evidence-based results and monitoring (both ground-level but also using the georeferencing tool developed by the project) to feed into INRMCRPs and national level commitments (e.g. SDGs, biodiversity, INDCs, etc.)), and access to assets (e.g. natural resources, markets).

REGULATORY AND INSTITUTIONAL FRAMEWORK[22]

The improvement of the policy and legal framework for adapting to climate change and strengthening institutional cooperation and coordination are key priorities of the Government. The Government established a Coordination Commission on Climate Change (CCCC) in November 2012 chaired by the Vice Prime Minister, who also is supervising environmental issues. The key objective of the CCCC is to lead and coordinate activities of various agencies and ministries in implementation of the country's commitments under the United Nations

[22] This section is extracted from the Working Paper: Evidence-Based Strengthening of the NRM Governance Sector Assessment and Recommendations for the CS-FOR Project

Framework Convention on Climate Change and the Kyoto protocol. CS-FOR will support these priorities and contribute to integrating the rangeland-forest ecosystem management strategy for climate adaptation.

Regulatory framework

The Constitution of the Kyrgyz Republic declares state ownership of natural pastures and forests. These lands make up part of the State Forestry Fund (SFF) and are managed by environmental and forestry legislation. The Ministry of Agriculture, Food Industry and Melioration (MAFIM) is the state body at the central level responsible for defining policy in regulating state pasture land use (except pastures of the SFF). Forest ecosystems of the SFF and pasture lands of the State Land Fund (SLF) are governed by two different sets of legislation. The Forest Code and a range of legal and normative acts and regulations govern tenure regime and arrangements on SFF lands. The Land Code, Pasture Law and other land-related set of legislation regulate the use and management of SLF pastures (refer to Working Paper on NRM).

Following the collapse of the Soviet Union, land reforms focused on the privatization of arable land. Collective and state farms were restructured, then dismantled, by 1997. Pasture land remained under the overall responsibility of MAFIM, however no bodies were managing these lands at the ground level; pastures were managed in an "open access" manner, resulting in the degradation of grassland resources, especially near villages.

The Forest Code (1999) is the main legal framework for forests and regulates the State Forest Fund management. The SFF includes forests and their adjacent land as well as lands not covered by forest, which can be used for afforestation. Forest land units are given for perpetual use (without time limits) to the *leskhozes* -- territorial state forest management bodies (FC Art. 13). They also can be leased out for perpetual use to state and municipal organizations according to the Land Code (LC Art. 34). All other organizations, companies, and individuals can access forest only for term-based use.

The Pasture Law (2009) was intended to improve pasture management in efforts to reduce poverty and stimulate economic growth through the fair allocation of pasture use rights to improve access and reduce conflicts, in arresting pasture resource degradation by enforcing pasture rotation, and in pasture management by local governments and users based on planning, and collecting pasture fees for local development and pasture maintenance.

The State Programme for Development of Pasture Management for 2012-2015 and a corresponding Action Plan (Government Resolution #89) were adopted by MAFIM in February 2012. The Programme aimed to improve the wellbeing of the people, ensure food security, and preserve the environmental integrity of pasture ecosystems. Pasture monitoring is a key element for improved management. The State Programme lacks a roadmap outlining how these aims are to be achieved and which institutions should be tasked with specific functions and activities to improve pasture monitoring and use regulation. The MAFIM is currently in the process of developing a new Pasture Management Strategy and Programme for 2018-2040, providing an opportunity to bridge policies on two pasture systems' management.

Forestry development policy has lagged behind. The last National Forest Policy was adopted in 1998 (Presidential Decree #300, October 6, 1998), and was based on the three pillars of "State, Man, and Forest," aiming to ensure sustainable forest management by recognizing forests as valuable ecosystems that need to be protected. The Policy of 1998 aimed to decentralize management of forest resources to grant more autonomy to the *leskhozes,* to engage communities in the management through Community Based Forest Management (CBFM) or Joint Forest Management (JFM) approaches; and to transfer specific economic functions to the private sector, such as the maintenance and improvement of forest resources. However, that policy was not implemented in full due to several key factors, including weak technical capacity in the State Agency for Environment Protection and Forestry (SAEPF), limited state funding, and low commitment of the SAEPF leadership to the decentralization of management to the level of leskhozes and transfer of functions to the private sector. The Presidential Decree #300 of 1998 stipulated that a new Concept of the Forestry Development 2040 had to be in place in 20 years, i.e. by December 2017. SAEPF is currently in process of finalizing this concept; the draft Concept is accompanied by the Action Plan for 2018-2022. The draft Concept is aimed at advancing Sustainable Forest Management (SFM) to ensure economic prosperity, social well-being, environmental safety and wellness of the nation.

Tenure

Government Resolution #360 (2002) intended to bring SLF pastures back to regulated management by the state regional, district administrations and local governments. These respective bodies could lease out pasture plots to users through competitive auctions. However, because regional and district administrations were far from users and the resources themselves, that management system did not function well. In practice, large pasture plots were leased by better off or even absentee farmers who subleased them to communities through community shepherds. The 2009 Pasture Law fully changed the tenure arrangements of pasture resources. The Law was based on traditional transhumant grazing practices and decentralized management of pastures to local governments, which in turn delegated pasture management to Pasture Users Unions (PUUs) with all residents of the Aiyl Aimak (AA – rural municipality area) as members. By 2011, PUUs were formed in almost all 475 AAs and elected executive bodies as Pasture or *Jaiyt* Committees (JCs) which by Law include representatives of the users, *aiyl kenesh*, head of the *aiyl okmotu* and other stakeholders. In some areas youth committees, village health committees, and other community organizations are also members of the JCs. In areas where communities use pastures of both SLF and SFF, management of the *leskhoz* is also included in the JC. The changes were made to the Land Code to adjust provisions related to pasture management by the local government bodies, and to the Tax Code and Budget Code to reflect arrangements for payment of land tax and pasture use fees. A pasture use right is granted for one year based on application of the user to the JC.

A new tenure group-based arrangement for forest management known as Collaborative Forest Management (CFM) was introduced in 2001 and intended to empower a group of households or a community to manage large patches of forest land to better preserve the forests while improving livelihoods. Under this tenure arrangement, the *leskhoz* defines forest area (usually

up to 5 ha) and allocates it for use under the CFM initially for 5 years, and then extends to 49 years. The payment for use of forest resources is provided in labour in terms of forest activities, such as cuttings, clearings, and other maintenance work undertaken by the lessee. The arrangement is practiced mostly in the nut-fruit forests in the South of the country, where competition for forest plots Is high and economic incentives of users to undertake forest maintenance activities are sufficient. The arrangement has had mixed results. While it has advanced local community access to forest resources, it has not been seen as improving forest conditions and resource regeneration. In many cases it has led to the fragmentation of forest ecosystems into plots managed by individual households. Some users with 50-year leases decided to grow agricultural crops on their plots. The arrangement favoured households with sufficient human and technical resources able to maintain and protect the forest as per the requirements, while poorer and female-headed households have been largely excluded.

Forest resources can be accessed through two major types of tenure: i) lease of the SFF land for productive purposes, including for grazing livestock; and ii) permit to use or harvest resources. Leases can be seasonal or long term with a limit of up to 49 years. The permits can be for felling and forest resources use and only for a season within each year. Leases and permits are issued by the *leskhoz* based on applications from users.

Institutional framework

The institutional setup for rangeland and forest resource management is fragmented, with various ministries and agencies in charge of various resources. SFF pastures, together with the natural forests, were managed by the Forestry Committee and SAEPF at the national level, and by the *leskhozes* on the ground.

The MAFIM is an authorized state body at the central level responsible for defining policy in regulating state pasture land use (except pastures of the SFF). It is charged with developing technical and legal regulations on pasture use, pasture land tenure recommendations, pasture condition standards, and quality assessment methodologies and monitoring. It also oversees pasture monitoring, pasture management plans, and provides support to local governments and PUUs on pasture use (Pasture Law, article 14). In 2016, the Pasture Department within the MAFIM merged with two other departments and became the Pasture, Livestock and Fishery Department (PLFD), responsible for developing policy and legislation in pasture management and use, and providing technical and other support to local governments and PUUs. The State Land Management Institute *Giprozem* under MAFIM is responsible for monitoring pastures and for pasture border demarcation. There is no cooperation between these departments within the one ministry and they continue to overlap and duplicate some functions.

Pastures of the State Forestry Fund (SFF) are managed by the SAEPF and *leskhozes*. Use regime of these grazing areas is defined by the Forestry Code and other forest specific regulations, and is different from the current tenure regime of the municipal pastures. The major differences are that municipal pasture lands are managed by local governments with the users, who ensure a higher transparency in the allocation of use rights and funds received and are more responsiveness to the needs of local communities. Legal mechanisms aim to limit pasture

degradation. The use fee and grazing area allocation is based on the number of livestock, and funds collected from the use go to the local budget for various community needs and to improve pasture infrastructure and conditions. Forests are managed by SAEPF and its territorial divisions and forestry enterprises and units

Considerations

There are no legal acts or provisions, which would bring these two sets (forest and pasture) of legislation into synergy to protect fragile resources and to harmonize management and tenure arrangements. The only attempt to build cooperation was a Memorandum of Cooperation between the SAEPF and MAFIM) in April 2013, which aimed to tackle the problem of pasture ecosystems management in an integrated manner. The memorandum had set a condition for Pasture Committees (PCs) to rent pasture lands from the *leskhoz* for three to five years; while this was an improvement, it lacked follow-up support and implementation on the ground.

State institutions at the national and local levels do not have lines of coordination of their activities and often operate in contradiction of each other's policy and legal frameworks. Such fragmentation and narrow focus lead to inefficient management. Forestry reforms have not yet reached the ground level of the *leskhozes*, while pasture management reforms in contrast were focused on the ground level and have not yet affected the national level.

To improve coordination and cooperation between different agencies dealing with management of pasture-forest natural resources and to enhance ecosystem-based adaptation, the CS-FOR Project would support the CCCC in activities aimed at integrating forest-pasture ecosystem resilience and climate change.

CONNECTING THREADS

Social inclusion

Social inclusion is a key element in an ecosystem-based approach for the success of any intervention/project/initiative. This is because inclusion of all stakeholders increases the chances of long-term commitment to project objectives ("stewardship"), even beyond the duration of the project. Participatory processes for decision-making and planning are the main pathway, but not only – the rights of all beneficiaries/users and "owners" of natural resources – including minority groups (women, youth, indigenous communities if present) must be recognized, respected, and heard. Often, minority groups are holders of knowledge that would not be reflected in discussions or, in the case of CS-FOR, in INRMCRPs, if not tapped. Furthermore, all stakeholders should be part of implementation as well - including monitoring activities.

Monitoring

Monitoring supports project objectives, long-term ecosystem sustainability, and reporting to relevant institutions (including aggregated reporting of the Government of Kyrgyzstan to international processes). It also is important for providing evidence-based knowledge to breach science-policy gaps. Ground-level monitoring should be part of INRMCRPs, and local-level

institutions could be appropriated with means for enforcing non-compliance with INRMCRP activities (e.g. herd sizes, rotational grazing). Training for monitoring needs to be budgeted. At a macro-level, CS-FOR will scale up and mainstream georeferencing and geospatial analysis via Geographical Information System (GIS) among public institutions and the public. Georeferencing is a cost- and time-effective opportunity to ensure efficient and effective data management. In order to ensure accuracy of reporting, precision of monitoring and accountability of results, the project will improve its monitoring and evaluation and knowledge management processes by applying georeferencing and geospatial analysis processes.

Access to assets

Beneficiaries' access to assets – be they natural resources or market – is yet another element of an enabling environment that increases the chances of a successful project. Access to natural resources is an issue that needs to be addressed during INRMCRP formulation. It can also be addressed for example in access to pastures, through the construction of small-scale infrastructure. Regulatory and institutional frameworks regarding land tenure and lease options are also involved. Ecosystem-based approach projects can also create new business opportunities. CS-FOR should allow provisions for project beneficiaries to have access to markets and to financial mechanisms; the green-value chain component in particular addresses this.