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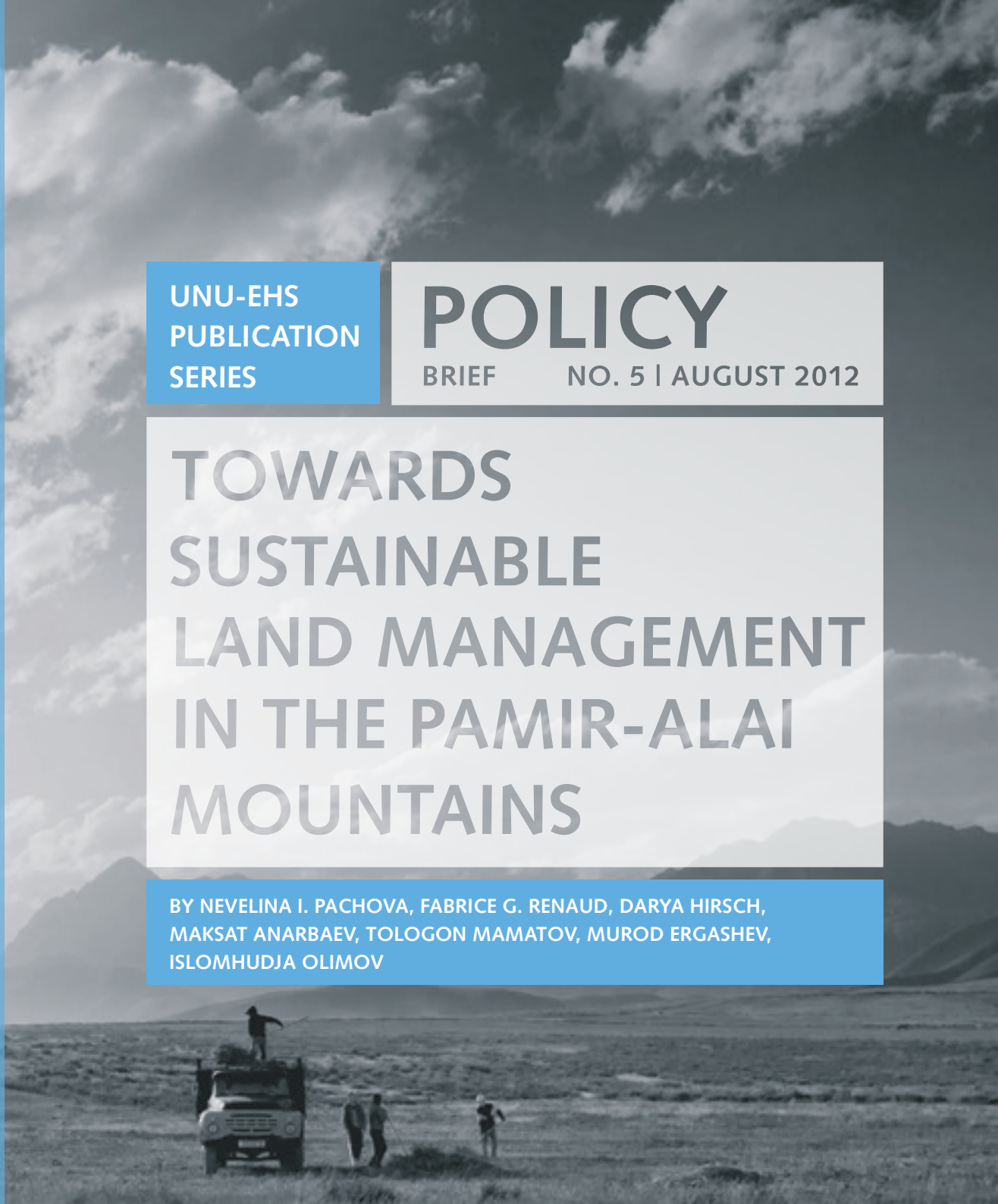
POLICY

BRIEF

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TOWARDS SUSTAINABLE LAND MANAGEMENT IN THE PAMIR-ALAI MOUNTAINS

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∴ About the Sustainable Land Management in the High Pamir and Pamir-Alai Mountains (PALM) project ∴

The Global Environment Facility (GEF)/United Nations Environment Programme (UNEP)/United Nations University (UNU) PALM project is an initiative of the governments of Tajikistan and Kyrgyzstan which aims to restore, sustain and enhance the productive and protective functions of the transboundary ecosystems of the High Pamir and Pamir-Alai mountains, so as to improve the social and economic well-being of the rural communities and households utilizing the region's ecosystem resources to meet their livelihood needs, while preserving its unique landscape and globally important biodiversity.

Development objective: To address the links between poverty, vulnerability and land degradation through the promotion of sustainable land management practices that contribute to improving the livelihoods and economic well-being of the inhabitants of the High Pamir and Pamir-Alai mountains.

Environmental objective: To mitigate the causes and negative impacts of land degradation on the structure and functional integrity of the ecosystems of the High Pamir and Pamir-Alai Mountains through mainstreaming sustainable land management tools and practices from household, community, local government, national and regional levels.

Key outcomes:

1. **Enhanced regional cooperation** between Tajikistan and Kyrgyzstan creating the enabling regional strategic planning as well as national legislative, policy, institutional, technical and economic incentive environment for the sustainable management of the High Pamir and Pamir-Alai mountain ecosystems.
2. **Improved capacity of Tajikistan's and Kyrgyzstan's public and private sector research agencies and advisory support service providers** to promote sustainable land management within the High Pamir and Pamir-Alai Mountains.
3. **Reduction in rural poverty and economic vulnerability** through restoration and enhancement of the productive and protective functions (ecological goods and services) of the High Pamir and Pamir-Alai mountain ecosystems.
4. **Generic guidelines developed for up-scaling and replication of the lessons learned** from the project's experience with sustainable land management, within comparable transboundary mountain regions within Asia and elsewhere.

→ <http://www.ehs.unu.edu/palm/>

Towards Sustainable Land Management in the Pamir-Alai Mountains

by Nevelina I. Pachova, Fabrice G. Renaud, Darya Hirsch, Maksat Anarbaev, Tologon Mamatov,
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Forewords

The United Nations Millennium Declaration has put member countries, including Tajikistan to the task of transiting towards sustainable development, which should guarantee a balance between the resolution of socio-economic problems and environmental preservation.

Tajikistan, together with other Central Asian countries, is making efforts to ensure sustainable land use and biodiversity conservation so as to improve the well-being of people, especially in high mountain regions. The international project on "Sustainable Land Management in the High Pamir and Pamir-Alai Mountains" (PALM) is an initiative of the Governments of Tajikistan and Kyrgyzstan that seeks solutions to the interconnected problems of land degradation and poverty in the Pamir and Alai mountains shared by the two countries.

Mountain regions are characterized by a high level of poverty. Mountain inhabitants are thus dependent on the natural resources and forest ecosystems for meeting their livelihood and energy needs. This often puts pressures on the fragile mountain ecosystems and contributes together with other factors to aggravating environmental problems such as desertification, degradation of land and soil resources and irrational water use.

In the framework of the PALM project, the joint efforts of the Tajik Committee for Environmental Protection and the Agency on Environmental Conservation in Kyrgyzstan, supported by the Global Environment Facility (GEF), the United Nations Environment Programme (UNEP) and the United Nations University (UNU) have yielded positive results in addressing land degradation problems in the Pamir-Alai mountains.

The Strategy and Action Plan on Sustainable Land Management in the High Pamir and Pamir-Alai mountains, which was developed in the framework of the PALM project and the Memorandum of Cooperation on joint implementation of the Strategy which was signed between Tajikistan and Kyrgyzstan, constitute major steps towards the resolution of environmental problems in the transboundary region.

The numerous forums, round tables, workshops and trainings on different aspects of land use and management carried out in the framework of the project contributed to raising the awareness and increasing the ecological education of the local population.

Research activities and stakeholder consultations undertaken in the project identified the need for and contributed to legal and policy changes aimed at improving the enabling environment for sustainable land management (SLM), such as the development of a law "On pastures" and a law "On mountain territories".

Furthermore, 114 micro-projects testing promising technologies and approaches for improved use and management of lands were identified and implemented by local communities in the framework of the PALM project. This constitutes an enormous achievement and an important step towards increasing the experience and knowledge of the local population, introducing new technologies on SLM and improving the well-being of disadvantaged social groups.

Using this opportunity, I would like to thank the management of UNU, GEF and UNEP for supporting the implementation of the transboundary PALM project.



Talbak Salimov

*Chairman of the Committee for Environmental Protection
under the Government of the Republic of Tajikistan*

The Pamir-Alai mountains are located in Osh Oblast of the Kyrgyz Republic – a region rich in historical and natural values. In the past, leaders, such as Kurmanzhan Datka, ruled the region with extreme foresight and care. Today, it is our task to preserve the beautiful but fragile environment that we live in, for our own good, since disruptions in one part can affect many others, and for the well-being of the future generations that will inherit it.

Juniper forests and natural water resources with rich recreational potential distinguish the unique habitat of the Alay and Chon-Alay valleys from other parts of the Republic. Those features make the region favourable for the development of alternative livelihoods options, such as ecological tourism, in parallel to traditional livestock production.

The GEF/UNEP/UNU funded project “Sustainable Land Management in the High Pamir and Pamir-Alai Mountains” seeks to find scientifically-based approaches to developing the region's potential while preserving the fragile environment and land resources of the Pamir-Alai mountains through balanced and sustainable management approaches.

Notably, the project enabled the development of a transboundary Strategy and Action Plan for Sustainable Land Management to guide efforts at mainstreaming SLM as a basis for improving the livelihoods of the mountain inhabitants and the state of the fragile ecosystems of the Pamir-Alai region. Biodiversity conservation and rational use of natural resources lie at the centre of the regional strategy as they should underlie the long-term development of the country.

I am very pleased that actions undertaken by the project “Sustainable Land Management in the High Pamir and Pamir-Alai Mountains” were based on and directed towards promoting the principles and practices of sustainable land use and ecosystem conservation. Appreciation for guiding the process is due to UNU, the international executing agency of the project, as well as to UNEP and GEF for supporting the implementation.

In conclusion, I would like to express my wish to see a replication of the conservation activities undertaken by the project, the careful attitude towards nature that it propagated and, finally, its efforts to raise environmental awareness and actively support environmental initiatives of local communities in the Pamir-Alai Mountains.



Aidaraliev Asylbek

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Abbreviations and acronyms

AgLaw	<i>Australian Center for Agriculture and Law</i>
CDE	<i>Center for Environment and Development</i>
GBAO	<i>Gorno-Badakhshan Autonomous Oblast</i>
GEF	<i>Global Environment Facility</i>
GIS	<i>Geographic Information Systems</i>
NGO	<i>Non-Governmental Organization</i>
PALM	<i>Pamir-Alai Land Management</i> <i>(Sustainable Land Management in the High Pamir</i> <i>and Pamir-Alai mountains)</i>
SLM	<i>Sustainable Land Management</i>
UNE	<i>University of New England</i>
UNEP	<i>United Nations Environment Programme</i>
UNU	<i>United Nations University</i>
UNU-EHS	<i>United Nations University</i> <i>Institute for Environment and Human Security</i>
WOCAT	<i>World Overview of Conservation Approaches</i> <i>and Technologies</i>

Background

The High Pamir and Pamir-Alai mountains of Tajikistan and Kyrgyzstan are home to some of the poorest communities in Central Asia and in the world. Marginalized from political processes, isolated from emerging markets by long distances and dilapidated infrastructure, and increasingly threatened by natural hazards associated with a changing climate, communities across the region have been struggling to meet their livelihood needs on their own since the aftermath of independence in the early 1990s.

Land is the basis for life in the High Pamir and Pamir-Alai mountains but it is increasingly degraded. Increased population numbers, widespread poverty, combined with a loss of traditional agricultural knowledge during the decades of centralized planning and collective farming, limited access to agricultural advice and opportunities for experimentation with new land use technologies and approaches and non-agricultural livelihood options as well as inadequate legal, policy and institutional frameworks to support sustainable use and management of the region's resources, have been driving the over-exploitation of scarce arable land, pastures, forests and wildlife in the vicinity of rural settlements across the High Pamir and Pamir-Alai mountains.

Degradation of the fragile mountain ecosystems has in turn reduced the already limited livelihood base of rural households and the services they provide to the broader region and the global community. Productivity declines and loss of productive lands due to degradation have reduced income from land and resilience to hazards, thus increasing human insecurity, outmigration and social tensions. At the same time, changes in the water regulating and carbon storage potential of the region's forests and pastures have contributed to regional and global processes with implications for the livelihoods of communities downstream and worldwide. In addition, both poverty and ecosystem degradation have

posed pressures on endemic and endangered wildlife, making the mountains of Central Asia a global biodiversity hotspot.

Recognizing the importance and determined to address the complex nexus of poverty and land degradation in the Pamir and Alai mountains, the Committee on Environment Conservation under the Government of Tajikistan and the National Center for Mountain Regions Development in Kyrgyzstan, with support from UNU, UNEP and a range of international partners, initiated an integrated and transboundary project on Sustainable Land Management in the High Pamir and Pamir-Alai Mountains in Central Asia (PALM). Project implementation began in September 2007 with financial support from GEF and continued until May 2012.

The PALM project catalysed a set of multi-level processes aimed at strengthening the enabling environment for SLM and the capacities of key technical agencies to support it in the future. It also facilitated pilot communities across the region with assessing the state of their land resources, identifying, testing and evaluating promising technologies and approaches for improving their livelihoods, while reducing pressures on degraded croplands, pastures and forests. The project activities, outputs and achievements are described in detail in the final project report (PALM, 2012b).

Purpose of this document

The goal of this Policy Brief is to synthesize the knowledge generated through project implementation in the form of a set of targeted recommendations for follow-up and up-scaling of the promising reform processes initiated by the project, and of the best practices tested and validated through field research and participatory community-led trials. In addition, generic guidelines for replicating some of the methodological approaches employed by the project, based on lessons learned from their application, are included in text boxes, so as to inform the design of similar activities in other transboundary mountain regions.



Summary of recommendations

1. *Support the implementation of the Regional Strategy and Action Plan for SLM*
2. *Continue legal, policy and institutional capacity-building and reforms for SLM*
3. *Strengthen the institutional base for SLM knowledge management and sharing*
4. *Enhance systemic capacities for advisory service provision for SLM*
5. *Enable the integration of research in land use planning and development*
6. *Mainstream participatory land use planning in local government decision-making processes*
7. *Stimulate investments in the up-scaling and replication of good SLM practices*
8. *Develop an integrated monitoring system to track changes and inform decision makers on SLM.*
9. *Up-scale and embed the SLM approach in the broader development of the region*



Generic guidelines for developing a regional strategy and action plan on SLM

The development of a regional strategy and action plan on SLM is a complex undertaking. A successful outcome requires the mobilization of a wide range of expertise, appropriate methodologies and an adequate process. The PALM project experiences suggest that the design of strategic planning processes can be supported by considering the following key steps at the onset:

Step 1: *Establish a strategy development team with a wide range of expertise*, including: (i) general project management and coordination skills; (ii) scientific expertise in the field of agriculture, ecology, economics, sociology, institutions, policies, law and Geographic Information Systems (GIS), among others; (iii) capacities for professional moderation of multi-level stakeholder consultations; (iv) adequate language, including official terminology, editing and communication expertise; and (v) familiarity with regulatory procedures and modalities as well as capacities to monitor policy changes and capture windows of opportunities for obtaining endorsement by relevant governmental institutions and for ensuring the commitment of policymakers for follow-up.

Step 2: *Identify, jointly with the strategy development team, an appropriate process and research methodologies for eliciting and integrating knowledge and views of experts from diverse disciplines and stakeholders from different decision-making levels.* The Sustainable Development Appraisal methodology (Giger et al., 2009), developed by the Center for Development and Environment and adapted for use in the PALM project, comprises a series of steps that could guide strategic regional planning. In

addition, specialized baseline documentation methodologies, such as the World Overview of Conservation Approaches and Technologies (WOCAT, www.wocat.net), and analytical frameworks, such as the Millennium Ecosystem Assessment (MA, 2005), could aid the research process. Experts engaged in the strategy development process, however, need to be involved in specifying the process and selecting the research approaches best suited to the goal, environment and capacities of the team. New approaches and methodologies are best combined with established ones and adequate time, appropriate training and relevant funding, are to be provided for them to be taken on board and applied adequately.

Step 3: *Integrate stakeholder inputs at various stages of the strategic planning process through a combination of formal and informal processes and structures.* Formal stakeholder consultation processes, such as planning workshops and consultative draft reviews, are essential for data validation and integration of research results and stakeholder knowledge and views in the definition of strategic priorities. For a successful outcome, consultations should be structured so as to enable different stakeholders to have a say in group discussions, expectations should be managed and expert knowledge should be channeled so as to contribute, rather than dominate discussions. The approach employed in the PALM project proved successful (Autenrieth, 2010) and can be used to inform other stakeholder consultations processes in the region. In addition to the formal processes, a social network of partners can help to facilitate the work with stakeholders from different levels, and continuous engagement of a set of key stakeholders in the strategic planning process can help to gain trust and commitment to follow-up.

Recommendation 1:

Support the Implementation of the Regional Strategy and Action Plan for SLM

To raise awareness, mobilize action and focus efforts on addressing the underlying causes of land degradation and on mitigating its negative impacts on the transboundary ecosystems of the region and the livelihoods of its inhabitants, the PALM project facilitated the development of a Regional Strategy and Action Plan for Sustainable Land Management in the High Pamir and Pamir-Alai Mountains (PALM, 2011). The Strategy outlines key issues and priorities that require policy attention and suggests a range of targeted directions for action by different stakeholders. It includes four action plans on forest and wildlife management, on increasing the efficiency of farming, on sustainable pasture use and livestock breeding, and on reducing risks of and vulnerability to natural hazards. In March 2011, the Strategy was endorsed by the Chairmen of the environmental agencies of Tajikistan and Kyrgyzstan and by the heads of the constituent administrative regions, namely Gorno-Badakhshan Autonomous Oblast (GBAO) and Jirgital Region in Tajikistan and Osh Oblast in Kyrgyzstan through the signature of a Memorandum of Cooperation. Commitment to implementation is high and follow-up activities are underway. Up-scaling can be supported by:

Strengthening local government capacities to drive and enable the implementation process. The Strategy is currently in the process of being integrated in the local development plans of GBAO, Jirgital and Osh. To operationalize it, the capacities of local government officials across the region to facilitate and enable participatory land use planning, agricultural innovation, development of alternative livelihoods and resource mobilization need to be strengthened. A Handbook on Sustainable Land Management

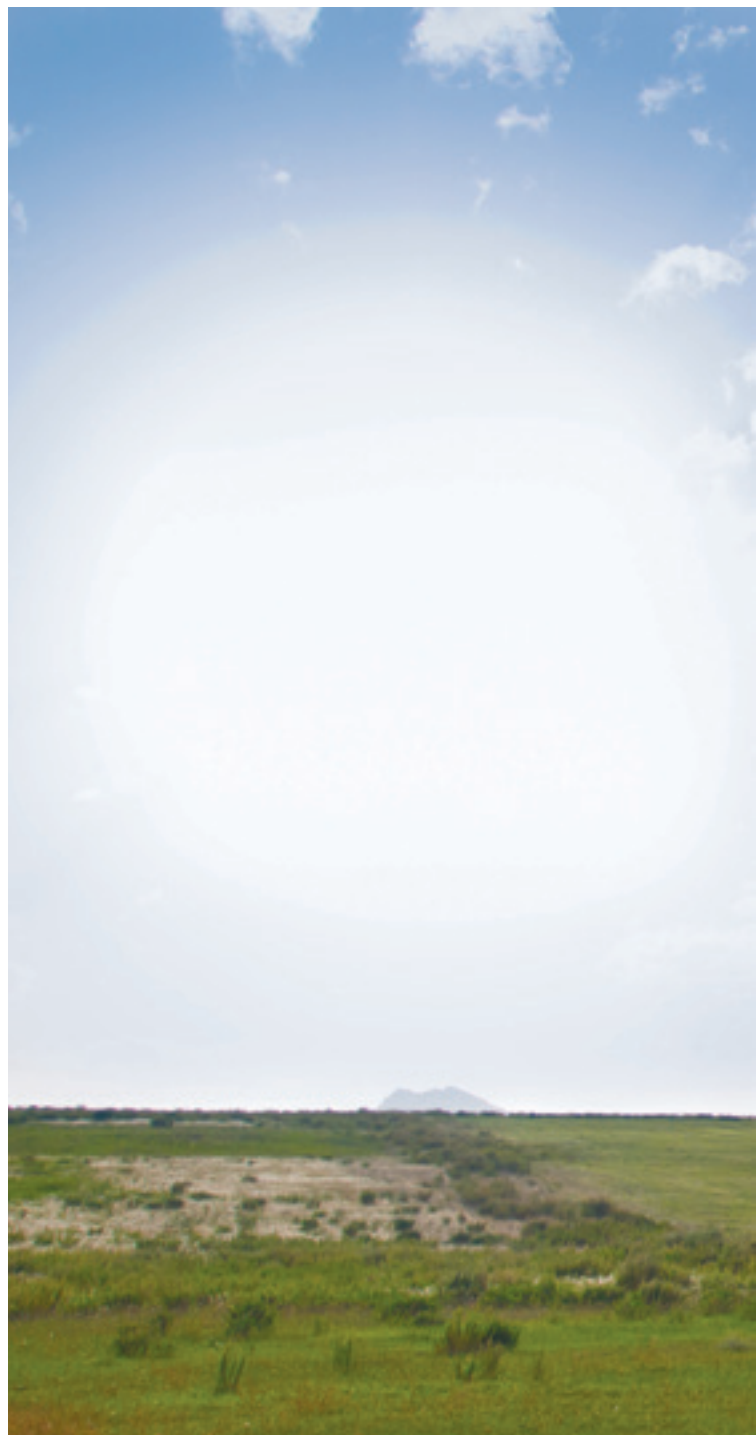
(PALM, 2012a), which documents successful technologies and approaches tested in the framework of the PALM project, can aid local government officials in implementation. Additionally, support and guidelines are needed to enable the integration of climate change issues and adaptation options in local level planning and to strengthen capacities for enabling private sector development and improving access to advisory services and innovative financing.

Facilitating the operationalization of a mechanism for trans-boundary coordination. The Memorandum of Cooperation on implementation of the Strategy which was signed in March 2011 provides a basis for follow-up. In the framework of the PALM project several coordination meetings of the signatories and other interested stakeholders were facilitated in 2011 and 2012. Discussions confirmed the need for the establishment of a transboundary coordination mechanism to ensure and enable follow-up. A biannual rotational secretariat based at designated national institutions in the two countries is the preferred alternative. Support in the initial years of operationalization would be required to enable regular transboundary coordination and resource mobilization for selected activities.

Mobilizing resources for addressing targeted transboundary development issues. The endorsement and integration of the Strategy in transboundary decision-making fora, such as inter-governmental committee meetings, national development programmes, including the National Programme on Pasture Development in Kyrgyzstan and the National Strategy on SLM

Financing in Tajikistan, as well as in the regional development plans of GBAO, Jirgital and Osh, constitute steps already undertaken to enable the re-allocation of national and local budgets to facilitate SLM. State funds, however, would need to be complemented by other resources, such as development support with targeted policy issues and private sector investments in market developments to enable the implementation of the Strategy.

Priority transboundary issues identified in the strategy require and deserve particular attention as they cannot be addressed by individual governments on their own. Notable among those are: 1) transboundary biodiversity conservation; 2) regulation of transboundary pasture use; 3) improvement of legal frameworks on transboundary relations (border check-points, customs, sanitary control and veterinary services, etc.); 4) strengthening of transboundary economic relations; 5) development of different types of tourism across the region; and 6) forecasting of and adaptation to climate change.







On the development of a law “On protection of soil fertility on agricultural lands” in the Kyrgyz Republic

The privatization of land in the Kyrgyz Republic in the 1990s was initiated to prevent soil fertility reduction and soil degradation, the irrational use of soil and its pollution. It resulted in a transition to small-scale agricultural production and intensive exploitation of the fertile layer of soil.

The land legislation in Kyrgyzstan aims to create conditions for a market-based development of the agricultural sector. Land management specifically targets the establishment and development of a secondary market for land.

Despite the above-mentioned measures, according to statistical data, land productivity in Kyrgyzstan is decreasing, and land degradation and salinization as well as the amount of unused land are on the rise. The outcome of these changes is a decline in the fertility of soil, in other words the depletion of the resource base for agricultural production. In this context, soil protection becomes an overriding priority for landowners and authorized agencies of the state administration.

In this regard, the development of a law “On protection of soil fertility on agricultural lands” in the framework of the PALM project is a major achievement for Kyrgyzstan.

The development of the above-mentioned legislative act was recommended by the Legal Task Force of the PALM project in Kyrgyzstan upon a careful review and analysis of relevant documents and legislation. From 2009 to 2011, the Legal Task Force of the project analysed the legal, policy and institutional base for SLM in Kyrgyzstan. The assessment was conducted by leading experts, including members of the Parliament of the Republic.

The law will create a basis for the development of legal mechanisms for state regulation of activities in the area of sustainable land use and soil protection. These mechanisms will be directed at soil conservation, prevention of pollution and degradation, and restoration of degraded and polluted lands and their environmental, sanitary and economic functions.

In the legislation, “land” is defined as a natural resource used as a basis for production through various land use technologies. The new law for the first time defines land as a degradable resource and focuses on protecting and restoring one of the key soil properties, namely its fertility.

Overall, the law complies with the principles and norms of international law in the field of land use and management and creates the legal basis for state regulation of activities in the field of soil conservation in Kyrgyzstan.

Talantbek Uzakbaev

Chair of the Committee for Agricultural Policy, Water Resources, Ecology and Local Governance, Parliament of the Kyrgyz Republic

Recommendation 2:

Continue legal, policy and institutional capacity-building and reforms for SLM

An adequate legal, policy and institutional environment is essential for enabling SLM. While both Tajikistan and Kyrgyzstan have a significant body of policies and legislation pertinent to SLM, few are implemented and even less are monitored and evaluated as a basis for continued improvement and reforms. To strengthen the legal, policy and institutional environment for SLM, particularly in mountainous regions of Tajikistan and Kyrgyzstan, the PALM project facilitated the identification of reform needs of particular relevance to these regions, and enabled follow-up to recommended changes through targeted trainings, stakeholder consultations and international experience exchange. As a result, in Kyrgyzstan, the project stimulated and supported the development of a law on soil that specifies responsibilities for ensuring soil health and preventing land degradation. The draft law was endorsed by the Parliament and is currently under review by the President of the country. In parallel, in Tajikistan, the project contributed to the drafting of two new laws – on pastures and on mountain territories – which are being finalized for submission to the parliament for review. To follow-up on those achievements and enable the realization of the full potential of the initiated changes, future activities need to focus on:

[Continuation of legal, policy and institutional reforms needed to enable SLM with increased involvement of stakeholder in the legal and policy development process.](#) The PALM project identified the need for a wide range of legal, policy and institutional reforms from the transboundary to the local level (Lim, 2012a,b; PALM, 2010a,b,c). A number of the recommendations have been integrated in the agendas of inter-governmental commit-

tee meetings and targeted legislative reforms at the national level have been undertaken as noted above. Additional support is needed to address remaining legislative and policy gaps, such as the need to ensure equitable access and benefit sharing from biodiversity conservation in Tajikistan, to introduce economic incentives for SLM in Kyrgyzstan, and to ensure the rights of land users to be involved in policymaking concerning the use and management of land resources they depend on for their livelihoods in both states. Making stakeholder consultations an integral part of the policy-development process is essential for improving the transparency, equity and effectiveness of policy and legislative reforms. The manual for participatory policy and legislative development prepared by the PALM project provides useful guidance on how this can be done (Hannam, 2011b).

[Establishment and operationalization of a system for monitoring and evaluation of legislative, policy and institutional reforms for SLM.](#) The development and operationalization of effective processes and mechanisms for tracking and evaluating progress in implementation of requisite reforms, as well as of the effectiveness and impacts of relevant legislation can help to strengthen the link between legal and policy development and implementation, and is thus a logical priority for follow-up. An effective monitoring system needs to reflect the multi-level processes involved in policy implementation and to create and institutionalize possibilities for stakeholder involvement of and feedback in monitoring and evaluation. Guidelines for the development of such a system at the national level and criteria for evaluation of the effectiveness of transboundary resource use and manage-

ment regimes have been elaborated in the framework of the project (Hannam, 2011a; Lim, 2012c). Adequate procedures for operationalizing them need to be integrated in the design of new legislation at the national level as well as in the institutional mechanism for follow-up and implementation of the regional strategy.

Continued capacity development for legal, policy and institutional reforms for SLM. Ensuring the necessary expertise for follow-up to the legislative and policy reforms initiated by the project would also require continued trainings, both for professionals through targeted short-term courses, and for students through specialized degree programmes. The methodological approaches for analysis, development and evaluation of legal, policy and institutional frameworks of relevance to SLM developed and tested in the PALM project (UNE, 2009a, b and 2010; Hannam, 2011a, b) provide a solid base for the development of such training and educational programmes in the future. They can be complemented by additional conceptual and methodological developments that reflect the legislative, policy and institutional requirements for enabling the two countries to benefit from emerging knowledge and approaches to environmental conservation, including transboundary ones, green financing and preparedness and adaptation to climate change. As indicated by the experiences of the project, capacities for legal, policy and institutional reforms are best strengthened through regional and transboundary programmes that enable cross-fertilization of ideas as well as economies of scale and enhanced regional understanding and commitment for coordinated follow-up.







Generic guidelines for strengthening the enabling legal, policy and institutional environment for SLM

The legal, policy and institutional environment and frameworks can enable or constrain sustainable resource use and management practices. Strengthening capacities for SLM reforms and catalysing follow-up action requires formal trainings but also hands-on learning through stakeholder consultations and international exchange. Involvement of key institutional stakeholders in the development of the recommendations can also stimulate follow-up action and ensure the sustainability of the undertaken reforms. With view of the above, key steps to consider and integrate in the design of an effective programme for legal, policy and institutional support are as follows:

Step 1: Design a customized programme for capacity-building and reform of the legal, policy and institutional environment for SLM. Strengthening the legal, policy and institutional environment for SLM requires an understanding of the principles and practices of SLM and the extent to which they are embodied in existing legal, policy and institutional frameworks. A diagnostic capacity assessment, including analysis of key elements that legal, policy and institutional frameworks should contain in order to enable SLM, can help identify capacity gaps and reform needs and serve as a baseline for designing a programme for targeted capacity development and reform. In the case of Kyrgyzstan and Tajikistan, specific legislative gaps and inconsistencies of relevance to SLM were identified, but also participatory processes in legislative development and mechanisms for legislative monitoring and evaluation more broadly were found to be lacking, thus targeted trainings on those aspects were developed and carried out. The manuals and guidelines on the principles of SLM on legal, policy and institutional analysis, as well as on participatory legislative development and evaluation of the effectiveness

and impacts of reforms developed in the framework of the PALM project (UNE, 2009a, b and 2010; Hannam, 2011a, b) provide a solid basis for designing a customized programme for strengthening the legal, policy and institutional environment for SLM in other transboundary mountain ranges.

Step 2: Stimulate follow-up on recommended legal, policy and institutional reforms. Opportunities for exchange of experience among experts from different countries and stakeholder consultations on targeted issues can stimulate learning and motivate follow-up actions on recommended legal, policy and institutional reforms. In the framework of the PALM project, exchange of experiences between Tajikistan and Kyrgyzstan enabled the cross-fertilization of ideas and stimulated the development of a soil law in Kyrgyzstan, drawing upon experiences from Tajikistan, and draft laws on pastures and mountain territories in Tajikistan, based upon examples of existing legislation in Kyrgyzstan. Those developments were supported by the mobilization of stakeholder interest and action through policy round tables and targeted consultations within each country, in addition to bilateral consultations and experience exchange.

Step 3: Ensure the sustainability of the enhanced capacities and undertaken change. Engaging technical officers from relevant state agencies, educators and policymakers, such as parliamentary members in the process of capacity-building, analysis and consultations, can ensure that the programme strengthens individual but also institutional capacities for legal, policy and institutional reforms. In the framework of the PALM project, this strategy stimulated targeted follow-up on some of the recommended reforms and led to the integration of elements of the project trainings in university teaching, thus contributing to the sustainability of the project outcomes in the long-term.

Recommendation 3:

Strengthen the institutional base for SLM knowledge management and sharing

Decisions related to the use and management of land are based on existing knowledge, which is growing but increasingly fragmented. Ensuring that knowledge of relevance to SLM is available to all relevant stakeholders as a basis for informed decision-making requires an adequate institutional base for efficient and effective management and sharing of knowledge. In the framework of the PALM project, different approaches for information and knowledge sharing among stakeholder groups were pilot-tested. Project experiences suggest that strengthening the capacities of farmer groups, policy networks and knowledge hubs on SLM at selected universities, and enabling them to link up and engage in joint activities can lead to tangible improvements in SLM knowledge management and exchange which is essential to support decision-making on land use. In view of the above, future activities need to focus on:

[Strengthening the capacities of specialized farmer groups to access and disseminate SLM knowledge locally.](#) Farmer groups, such as those established in the framework of the PALM project, already hold SLM knowledge and expertise that other farmers could benefit from. They have already begun to disseminate their knowledge locally, upon request or more broadly through facilitation by the project's farmer-to-farmer exchange visits and open days. Enabling such groups to take their knowledge a step further through integration in relevant professional networks, licensing and, where needed, additional training support could help them turn into specialized knowledge hubs capable of providing support and services to other farmers locally. Such a transformation

could be facilitated by advisory service providers, professional associations and other agencies with a stake in SLM knowledge sharing.

[Supporting the establishment of national coordination groups on strategic policy issues.](#) Strategic policy priorities, such as those identified in the regional SLM Strategy, require coordinated actions by different stakeholders based on a shared knowledge base and understanding. Thematic coordination groups, such as the Pasture Coordination Council (2011), which was established in the framework of the PALM project under the leadership of the Pasture Department of the Ministry of Agriculture of Kyrgyzstan, provide fora for exchange of policy relevant knowledge and information and a functional institutional framework for coordination among stakeholders. In Kyrgyzstan, the Council has already met several times and contributed to the harmonization of tools and methods for pasture assessment among stakeholders involved in supporting the implementation of the new pasture law. In Tajikistan, a similar coordination group involving major donors, government agencies and non-governmental organizations (NGOs), was established and supported the development of an integrated draft law on pastures. The establishment and facilitation of the work of similar thematic coordination groups on the other key priority issues identified in the regional strategy, such as cropland, forest and wildlife management, can facilitate the coordinated search for legal, policy and institutional solutions, as well as technical responses to outstanding problems related to the degradation of land.

Engaging educational institutions in SLM knowledge syntheses, management and dissemination. Educational institutions are essential for the establishment and dissemination of a long-term shared knowledge base on SLM. To explore this potential, the PALM project engaged closely with local universities, such as the University of Osh in Kyrgyzstan and the Tajik Agrarian University in Dushanbe. Drawing upon the knowledge and experiences generated by the project, both are currently engaged in integrating SLM in the university curricula. They also begin to compile and synthesize data and knowledge from other projects working on related issues so as to be able to serve as SLM knowledge centers that can support SLM knowledge management and sharing beyond the borders of the universities. A closer engagement of those and other universities with farmer groups on a regular basis, e.g. through targeted vocational trainings for young farmers and farmer field schools, as well as a better integration in development and policy networks through jointly beneficial research could provide useful services to key stakeholder groups in SLM, while keeping the educational system up to date with emerging issues and trends, thus enabling the establishment of a solid SLM knowledge base that can inform policymaking and the resolution of emerging problems in the long-term.





Recommendation 4:

Enhance systemic capacities for advisory services provision for SLM

Increased access to agricultural knowledge and information is essential for stimulating innovation and supporting the transition from large-scale state-owned to small-scale individual farming (Herring, 2012). Access to agencies that can provide agricultural advice and services to farmers in the Pamir-Alai mountains, however, is limited. State agencies tasked with this are chronically under-resourced, while NGOs, which have a larger outreach due to donor funds, have been mostly focused on humanitarian relief and infrastructural aid, thus often lacking the necessary technical capacities to provide agricultural advice and support SLM. To enhance their capacities, the PALM project supported the development and testing of training modules on more than 20 SLM topics at targeted sites across the region. The new knowledge has already stimulated positive change at the pilot communities, demonstrating the effectiveness of the modules and the need for up-scaling them. Ensuring access to trainings and support for all communities across the Pamir-Alai region, however, requires systemic changes in the way trainings and advice are made available. Those include:

Expanding the outreach of existing advisory service providers through institutional innovations. Currently, NGOs and government agencies engaged in advisory service provision are most often located in regional centers and high personnel and transportation costs constrain their outreach to remote mountain regions. Decentralization of advisory services through the establishment and support of locally-based groups of expert farmers who can take over some of the functions of service providers (see also Recommendation 3), combined with a targeted exploration

of low-cost options for knowledge and service provision e.g., through specialized radio programs, and increased use of mobile technologies as a way of reaching out to farmers, are some institutional transformations that could improve the efficiency and effectiveness of service provision and should be more effectively explored.

Strengthening the demand-driven orientation of capacity-building and advisory service provision. High demand for agricultural knowledge and willingness to pay for agricultural services indicated in the course of the project suggest that a partial commercialization of service provision is an avenue that deserves to be explored. Service commercialization can be expected to increase access to but also raise the quality of the services provided due to increased consumer demands and expectations. It can also reduce the widespread dependence on aid in some parts of the region. The high levels of poverty among mountain farmers, however, suggest that a full cost-recovery of service provision would remain a challenge, thus targeted state funds for supporting agricultural service provision and additional resource mobilization would remain a must. Access to additional resources is also important so as to ensure that poor farmers are not left without adequate access to knowledge and information due to resource constraints.

Mainstreaming gender issues in SLM service provision. In some parts of the Pamir-Alai mountains, social structures and gender roles preclude women's access to trainings when training providers and the majority of the participants are male. Special efforts



should thus be made to ensure that specialized trainings are provided for women groups separately in regions, where gender may be a barrier to participation in joint trainings. Employing female trainers is also likely to increase the participation of women in trainings in such regions. Furthermore, special efforts should be made to engage female-headed households as they might

be subject to isolation even within female groups. Given the fact that women are often the sole care-takers of land due to the seasonal outmigration of men, gender considerations should be given special attention for increasing the outreach and effectiveness of agricultural advisory service provision in the future.

Recommendation 5:

Enable the integration of research in land use planning and development

Research, in both Kyrgyzstan and Tajikistan, was well-developed and integrated in land use planning and development during the Soviet time but has been largely under-funded and marginalized in the post-independence transition. To explore and demonstrate the capacities of research to re-integrate in land use planning and contribute to SLM, the PALM project supported eight research projects on selected priority themes which were carried out by joint teams of local and international researchers (see Annex). The studies demonstrated that to contribute to SLM in the context of a decentralized planning, a changing climate and market-oriented development, research needs to tackle a diverse range of topics beyond land use per se. They also showed how some of the challenges facing the Pamir-Alai region and driving land degradation processes, such as access to clean and affordable energy, new markets and crops adapted to the changing climate in the mountains, can be tackled through adaptive research. Experiences from the project, however, also highlighted systemic capacity gaps in the research field in both Tajikistan and Kyrgyzstan that need to be addressed. Targeted policy attention and efforts are needed to:

[Ensure that land users and other stakeholders in land use and management are involved in setting research priorities and defining the research design.](#) During the Soviet time, state priorities determined research directions and shaped research design; top-down decision-making ensured that research recommendations were implemented on the ground. In the context of decentralized land use and development, the diverse range of land users and decision makers involved in the use and management of

land need to be taken into account and if possible engaged in the process of identifying what needs to be researched but also in defining the research design. This is needed to ensure the relevance and legitimacy of the research, but also to enable contextual issues, local knowledge and the information needs of the intended end-users to be captured, so that the research results are accurate and meaningful to those who should take them into account.

[Encourage the development, adaptation and application of interdisciplinary research frameworks and approaches that can meet emerging land use and management knowledge needs.](#) Land has multiples values and functions which can be promoted or harmed by alternative uses and management goals. In a policy context that sets SLM as an over-arching goal, the economic, social and environmental impacts and implications of alternative land use and management practices, approaches and policies need to be identified and assessed. Distinguishing those is a challenging task given the complexity of the social-ecological systems involved but recent advances in inter-disciplinary research make it a possible one (MA, 2005; Förster et al., 2011). Encouraging research approaches that enable the integration of knowledge from diverse disciplines is a necessary step towards enabling research to contribute to SLM. This is particularly important for Kyrgyzstan and Tajikistan, where research is still largely compartmentalized by disciplinary divides. Institutional transformations in research institutes, but also capacity-building through targeted training and hands-on research are some of the approaches that can enable a systemic change.



Enable the integration of local researchers in international scientific and development networks. North-south research partnerships encouraged in the PALM project research component demonstrated the value of knowledge exchange through joint scientific work. It is expected that most of the established partnerships will remain and continue to generate benefits in the future. Additionally, the capacities of local researchers to engage

in new partnerships should be enhanced so as to enable access to additional funds, but also to the methodological advances needed to keep decision makers on land use and management in the Pamir-Alai mountains informed and prepared to cope with and adapt to the dynamically changing social-ecological landscape in the fragile mountain environment.

Recommendation 6:

Mainstream participatory land use planning in local government decision-making processes

The disintegration of state-owned collective farms and distribution of cropland and livestock among individual farmers in the early 1990s enabled farmers in Kyrgyzstan and Tajikistan to start making land use and management decisions on their own. However, many of the land resources farmers depend on, such as forests and pastures, remained state-owned and continued to be collectively used. Limited specification of the responsibilities and duties of individual farmers and the communities as a whole concerning the use and management of shared lands or incentives to maintain their quality resulted in their degradation. In recognition of the problem and in line with the general trend of decentralization of decision-making in both Kyrgyzstan and Tajikistan, over the past several years legal and policy reforms in both countries have begun to give communities more rights but also more responsibilities for the use and management of shared lands and the trend is expected to increase. Most of these policies and legislation, however, have not been operationalized yet due, among other reasons, to the limited experience and capacities of community leaders and local government officials to enable and facilitate participatory decision-making on the use of shared lands. Outputs and experiences from the PALM project, which supported the pilot-testing of community-based land use planning at numerous communities across the Pamir-Alai mountains, can support the operationalization of the recent and emerging legislation. It can do so by serving as a basis for the:

Development of an integrated approach to community-based land use planning that facilitates coordinated decision-making and action. While the general trend towards decentralized

decision-making on land use and management in Kyrgyzstan and Tajikistan is common, the use and management of croplands, pastures, forests and wildlife is most often guided by separate rules and regulations, thus a sectoral, rather than a synergetic and integrated approach to the use and management of different land resources is the rule rather than the exception. To ensure the ecologically sustainable and socially equitable management of the ecosystems of the High Pamir and Pamir-Alai mountains, decentralized decision-making on the use and management of land needs to be based on a set of common principles that recognize the complexity of social-ecological systems. Furthermore, procedures need to be put in place that enable the consideration of trade-offs between different land uses, the resolution of conflicts and the monitoring of the trends and dynamics of the broader socio-ecological system of which individual land use systems are a part. Local governments have an important role to play in the development and implementation of such an integrated system and the guidelines for rapid land degradation assessment (McDonagh et al., 2009) and community-based land use planning (Tengberg, 2010) developed in the framework of the PALM project provide a base to build on. Additionally, emerging experiences from implementation of community-based land use and management approaches used by different government agencies and donor-funded projects with respect to individual resources need to be taken into consideration.

Specification of a procedure for integrating participatory land use planning in local government decision-making. To enable the widespread utilization of an integrated approach to community-



based land use planning, a procedure for integrating it in local government decision-making needs to be specified and tested. The procedure needs to reflect the differences in the ownership structure, use rights and prescribed management approaches with respect to different types of land uses. Furthermore, it needs to be customized for use in Kyrgyzstan and Tajikistan in line with differences between government structures, decision-making rules and specific legislation concerning land use in the two countries.

[Strengthening of community and local government capacities for participatory land use planning](#). Community-based land use planning is a process that requires facilitation, in addition to formal institutional endorsement and support. The agencies engaged in the pilot-testing of the approach developed by the PALM project could support the operationalization and up-scaling of the upgraded integrated approach through direct facilitation and/or targeted trainings for local community leaders and government officials. Such training support should be coordinated, endorsed and funded jointly by relevant national agencies and international donors.

Recommendation 7:

Stimulate investments in the up-scaling and replication of good SLM practices

Sustainable land use and management is already practiced by individual farmers and communities across the Pamir-Alai mountains. The PALM project contributed to that by enabling pilot communities across the region to identify and validate SLM technologies and approaches suited to their conditions with the help of small grants. A number of the pilot-tested SLM practices have been already replicated by neighbouring farmers and communities. Many, however, require legitimization, both formal and informal, of the desired land use change, as well as improved access to financing for up-scaling and replication. To enable further investments in SLM, policy changes that incentivize farming integration and SLM investments would be required and private sector companies with a stake in SLM should be engaged alongside with government and donor agencies in the search for innovative financing opportunities. Specifically, targeted efforts would be needed to:

Encourage the integration of farmers in specialized production groups. SLM practices pilot-tested in the framework of the PALM project most often required the involvement of more than one household. This ensured the legitimacy and community support of the undertaken land use change, but also enabled the generation of the needed start-up capital through resource pooling and led to cost savings from economies of scale. Stimulating the up-scaling of SLM thus requires incentivizing the integration of farmers into common interest groups. Elements of the legal and policy frameworks required for this already exist. In Kyrgyzstan, for example, *jamaats*, groups of households, can be registered as a legal entity and serve as a unit of production. Tax disincentives

and administrative processes, however, constrain the formal integration of agricultural production and few incentives for engaging poor households in cooperative agricultural groups exist. To ensure the necessary basis for the up-scaling and replication of good SLM practices, the relevant legislation should be revisited and revised.

Develop micro-finance schemes that enable and stimulate investments in SLM. In addition to resource pooling, up-front investments in SLM can be financed by credit schemes. Currently, however, access to micro-financing in the Pamir-Alai mountains is limited. Furthermore, micro-credits are available for short periods and at excessively high rates. Stimulating and enabling investments in SLM would thus require the development of credit schemes with longer payback periods that reflect the often delayed return to investments in SLM, and lower interest rates that cover partially the higher risks associated with novel activities. Furthermore, possibilities for group credit should be enhanced since many of the SLM investments require the involvement of multiple members of the community. Collective credit options could also enable poor farmers, who cannot otherwise afford to take a credit on their own, to benefit from SLM. Public-private partnerships can help to share the risks and benefits associated with such micro-finance schemes. Furthermore, community groups should be engaged as equal partners in the micro-credit schemes, as they can mobilize individual payments and serve as a payback guarantee.

Facilitate the integration of mountain farmers in regional and global environmental markets. Forests and pastures in the Pamir-Alai mountains are important carbon sinks and the farmers who take care and manage them well should be able to get a share from the global benefits their actions generate. Carbon markets, as well as certification of environmentally clean production and payments for ecosystem services all provide emerging opportunities for financing environmentally sustainable production. Mountain farmers in the Pamir-Alai region, however, are yet to benefit from them. Opportunities for engaging in such environmental markets should be explored to enable cost-sharing of investments in SLM practices, which produce dispersed ecological benefits that cannot be utilized by local farmers to cover the production costs and meet their livelihood needs. Capturing such opportunities, however, is a complex undertaking that requires novel rules and institutions to be set, new skills developed and multiple stakeholders involved. It is best preceded by feasibility studies and pilot-tests that are needed to generate the necessary knowledge and know-how for designing and operationalizing such innovative financing schemes.



Generic guidelines for designing an SLM impact monitoring system

Experiences from the implementation of the PALM project impact monitoring system suggest that a number of key elements are essential for capturing impacts, ensuring reliability of the results, and contributing to the sustainability of project outcomes. The following key steps should be considered in the design of project-based SLM impact monitoring:

Step 1: Identify suitable tools and approaches for engaging beneficiaries and stakeholders in the assessment of project impacts.

Engaging stakeholders in the assessment of project impacts is essential for capturing project achievements and catalysing follow-up. Approaches for doing so differ. To be effective they should be simple, targeted and should bring a value to the stakeholders engaged. In the PALM project, focus group discussions proved a simple but effective approach for getting feedback from implementation, while engaging pilot communities in reflecting on their experiences. Simple, visual tools, such as hand-drawn maps, timelines, ranking and income source assessments for different stakeholder groups, were appreciated as learning tools, while providing valuable monitoring data and results. Furthermore, back-of-the-envelope calculations of cumulative impacts and discussions of trade-offs of alternative technologies and approaches based on collective, rather than individual values, stimulated commitment for follow-up investments, changes in approaches when alternatives were found to be more beneficial for the community as a whole, and corrective actions when negative communal impacts were noted. Participatory monitor-

ing is thus a valuable tool for ensuring the sustainability of project interventions and should be integrated in development projects more widely.

Step 2: Employ a diversity of monitoring tools and approaches to ensure reliability of the monitoring results. The impacts of project interventions are often multi-faceted. Capturing them requires the use of a diversity of monitoring tools and approaches. In addition to complementing each other, different tools and approaches can enable the triangulation of results thus serving as an insurance against methodological, data collection or related problems which are common challenges in field-level data collection in development projects.

Step 3: Engage educational institutions and students as partners in the data collection and analysis of the results. Educational institutions are often best suited and most interested in undertaking or supporting impact monitoring which can serve as a field laboratory for hands-on training and learning. In the framework of the PALM project, a number of universities and students were involved in the impact monitoring. Given the short-term nature of their involvement, they were primarily engaged through in-depth case studies (Jedemann, 2011; Jorgensen, 2012; Herring, 2012; Nitusova, 2012), which provided valuable insights for understanding specific issues and for a better interpretation of the overall monitoring data. To optimize the benefits from such an approach, the integration of educational institutions as partners is best built in the design of the monitoring system and adequate funds, supervision and linkages between the studies are planned for and ensured from the start.

Recommendation 8:

Develop an integrated monitoring system to track changes and inform decision makers on SLM

The Pamir-Alai mountain environment is fragile and the communities inhabiting the region are vulnerable even to small changes in the ecosystems they depend on. Maintaining the delicate balance between humans and nature in the Pamir-Alai mountains thus requires a system that can provide continuous feedback to decision makers with a stake in ensuring human security and the flow of goods and services from the mountain ecosystems of the transboundary region. The data, capacities and resources needed for the establishment of such a system are currently fragmented across stakeholders from all decision-making levels. Integrating them into a functional monitoring system requires targeted efforts aimed at:

[Participatory baseline assessment and agreement on the goals of the monitoring system.](#) A baseline assessment of on-going monitoring and of existing knowledge and information gaps with view of a commonly agreed goal is an essential first step towards the development of an integrated monitoring system. Such an assessment would require the engagement of the various state agencies, research institutes, advisory service providers and development programmes and projects involved in data collection and analysis of different aspects of the complex social-ecological systems of the Pamir-Alai mountains, but also the likely end-users of the information from the monitoring system. The Regional Strategy and Action Plan for SLM in the Pamir-Alai mountains developed in the framework of the PALM project

sets clear policy goals and targets with respect to SLM in the region and can serve as a basis for defining the overall goal of the monitoring system. Emerging policy issues considered of relevance and specific information needs of different stakeholder groups can then help to define the scope and inform the design of the system.

[Development of a conceptual framework and methods for integrated monitoring of changes in the socio-ecological systems of the Pamir-Alai mountains.](#) To understand the complex dynamics of changes in the social-ecological system of the Pamir-Alai mountains, a conceptual framework that reflects current knowledge of the key elements of the system and the interactions among them is essential. Such a framework can help to structure the monitoring system and support interpretation of the collected data. With view of the diversity of processes driving changes in the system at different levels, micro and macro-level monitoring approaches and tools should be developed and integrated and stakeholders best-positioned to monitor and understand changes at different levels should be engaged in the monitoring and assessment. Tools and approaches for participatory, multi-level monitoring of changes in human well-being and land resources pilot-tested in the framework of the PALM project can support the methodological development of the integrated monitoring system (McDonagh et al., 2009; Tenberg, 2010). Furthermore, lessons learned from SLM impact monitoring carried out in the

framework of the project can be taken into account in the design of the system (see page 30).

Validation of the conceptual framework and hands-on capacity-building for its operationalization. The conceptual framework would require a pilot-trial prior to operationalization to validate its effectiveness, test its relevance and assess and strengthen capacities for implementation. Monitoring is a costly and time-consuming undertaking, thus ensuring its value prior to operationalization of the system is essential. A pilot-test can also help to identify problems with and modify the conceptual framework and/or monitoring and evaluation approaches as needed. It can also help assess existing capacities for implementation and strengthen them through hands-on training. Alternatively, the system can be adapted, if needed, to reflect existing capacities without compromising the quality of the outputs. In parallel, targeted trainings may be provided for specific fields where capacities are found to be most limited or lacking. To ensure the feasibility and sustainability of such a system, it is best designed and carried out based on existing monitoring programmes and approaches.





Recommendation 9:

Up-scale and embed the SLM approach in the broader development of the region

Land degradation and poverty are not unique to the Pamir-Alai ranges and the approach used to address them in Tajikistan and Kyrgyzstan can inform the design of similar initiatives in other parts of the Pamir and Alai mountains and in other transboundary ranges in the region, where loss of biodiversity, reductions in the productive functions of land and human insecurity are similarly widespread. Future initiatives, however, would need to better integrate climate change, water management and adaptation issues in the design from the outset. Furthermore, with view of the growing range of regional threats and opportunities for the development of mountain ranges, a broader regional approach may be better suited as a framework for future initiatives. With view of the above, future efforts should focus on:

[Integrating climate change, water management and adaptation in the SLM governance systems of the Pamir-Alai mountains.](#)

Climate change is a growing threat to the Pamir-Alai mountains and the changes in temperature and precipitation regimes associated with it pose mountable challenges to the livelihoods and security of the mountain communities inhabiting the region's river valleys, mountain slopes and arid plateaus. Integrating those threats in the multi-level land use planning system in the Pamir-Alai mountains initiated by the PALM project is essential for increasing preparedness and strengthening capacities for adaptation across governance levels. Water management issues should be given particular attention in the context of climate change adaptation and the implications of climate change for water management should be considered in a broader regional context.

[Mainstream SLM and climate change adaptation in the Tian-Shan mountains.](#)

The Tian-Shan mountains shared by Kyrgyzstan, Kazakhstan, Uzbekistan and China face challenges similar to those in the Pamir-Alai and are among the regions that can benefit from the experiences of the PALM project. Successful approaches employed by the PALM project could inform the design of regional strategic development plans that integrate and focus the efforts of all regional partners around a set of SLM issues of joint importance. Exchange of experience across the four states could also enable cross-fertilization of ideas and learning that can help to mainstream SLM principles and practices in the governance and management of land resources in the broader region. It should be noted, however, that differences among the four countries and their political relations are likely to affect the prospects of regional cooperation and should be taken into account in the design of initiatives requiring regional cooperation.

[Embed the SLM approach in a broader regional cooperation framework and context.](#)

Shared regional challenges, such as climate change, water management, loss of biodiversity and the multi-faceted implications of growing regional integration through infrastructural improvements, trade and tourism development constitute the broader regional context in the framework of which challenges and opportunities for mainstreaming SLM in the mountains of Central Asia should be situated and considered. All of them merit regional scientific cooperation, which should be explored and pursued as a basis for exchange of experiences and knowledge that could inform and support the processes initiated in the framework of the PALM project and their recommended up-scaling in the Tian-Shan mountains.

CENTRAL ASIA

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Annex:

List of research projects and publications

Focus area	Research project	Implementing agency	Publications
Croplands	Assessing the impact of sustainable land use systems for enhancing food security and mitigating climate change in the Tajik Pamirs	<ul style="list-style-type: none"> • Soil Institute, Tajik Academy of Agricultural Sciences, Tajikistan • North-South Research Project, Center for Development and Environment (CDE), University of Bern, Switzerland • Joint FAO/IAEA Division of Nuclear Techniques in Food and Agriculture, International Atomic Energy Agency (IAEA), Vienna, Austria 	<p>Sosin, P., G. Nekushoeva, and B. Wolfgramm (2012). <i>Rational use of land resources in the Western Pamir</i>. Soil Institute, Tajik Academy of Agricultural Sciences, Dushanbe, Tajikistan. (Russian).</p> <p>Studer, S. (2012). <i>Land use of Gunt Valley, Tajikistan. A Classification Based on 1968/71 CORONA Imagery and a Comparative Change Analysis with Today's Land Use</i>. BSc thesis, Department of Integrative Geography, University of Bern, Switzerland (English).</p> <p>Reinhard, M. (2011). <i>Land cover and land use mapping in the Western Pamirs. Tajikistan as a foundation for an assessment of the Ecosystem Services of the agricultural system</i>. MSc thesis, Department of Environmental Sciences, ETH Zurich, Switzerland (English).</p> <p>Tobler, M. (2011). <i>Assessment of dominant land-use systems in the Tajik Pamir on the basis of a soil spectral library</i>. MSc thesis, Department of Environmental Sciences, ETH Zurich, Switzerland (English).</p>

Focus area	Research project	Implementing agency	Publications
Pastures	Identification of new high-forage crops resistant to climate change in the Tajik Pamirs	<ul style="list-style-type: none"> • Public Association “Kishovarz,” Tajikistan • Pamir Biological Institute, National Academy of Sciences of the Republic of Tajikistan 	<p>Aknazarov, Kh. (2011). Productivity of fodder crops in the Pamir in the context of global climate change. <i>Journal of the Academy of Sciences of the Republic of Tajikistan, Department of Biological and Medical Science</i> (Russian).</p> <p>Aknazarov, Kh., and U. Bakhtierov (2011). Assessment of fodder crop cultivation potential in the Pamir in the context of global climate change. In Proceedings of the International Conference “Plant Physiology and Development of Crop Cultivation in Tajikistan” (Russian).</p> <p>Aknazarov, Kh. (2011). <i>Recommendation on fodder crop cultivation in different regions of the Pamir</i>. NGO “Kishovarz”, the Pamir Biological Institute and the PALM Project, Tajikistan (Russian).</p> <p>Aknazarov, Kh. (2009). Towards an assessment of fodder resources of the Pamir. <i>Journal of the Academy of Sciences of the Republic of Tajikistan, Department of Biological and Medical Sciences: 4(169)</i> (Russian).</p>
	The Herders’ Manual: Managing Pastures and Livestock in Kyrgyzstan and Tajik Pamirs	<ul style="list-style-type: none"> • University of Central Asia, Bishkek, Kyrgyzstan 	Inam-ur-Rahim, I., and D. Masseli, eds. (2011). <i>Herders Manual for Western Tajikistan</i> . University of Central Asia, Bishkek, Kyrgyzstan (Russian, Tajik and English).

Focus area	Research project	Implementing agency	Publications
Biodiversity	Maintenance and rational use of medical and useful plants in the Pamir and Alai regions of Kyrgyzstan	<ul style="list-style-type: none"> • Public Fund “Bioresources” • Phytotechnology Innovation Center, National Academy of Sciences of the Kyrgyz Republic 	<p>Dolotbakov, A. (2012). Preliminary information on wild useful plants in Pamir-Alai, Kyrgyzstan. In Proceedings of the International Conference “Conservation and rational use of the gene pool of wild fruit trees of global significance,” Almaty, Kazakhstan (Russian).</p> <p>Rogova, N., Shalpykov, K., and A. Dolotbakov (2012). <i>Recommendations on cultivation and use of some medicinal plants</i>. Public Fund “Bioresource”, Bishkek, Kyrgyzstan (Russian).</p> <p>Dolotbakov, A. (2011). Conservation and rational use of biodiversity of useful and medicinal plants in Pamir-Alai and introduction of new species into cultivation for enhancing of socio-economic development in Kyrgyzstan. Public Fund “Bioresource”, Bishkek, Kyrgyzstan</p>
Livelihoods	Value chain assessment of selected mountainous products in Alaikuu and Kashka Suu Aiyl Okrugs of the Kyrgyz Republic	<ul style="list-style-type: none"> • Rural Development Fund, Kyrgyzstan 	<p>Shapakov, K., Tabaldieva, J., and A. Davletalieva (2011). Sustainable Land Management in the Pamir Alai Region: Value Chain Assessment of Selected Mountainous Products in Alaikuu and Kashka Suu Aiyl Okrugs of the Kyrgyz Republic. <i>Advances in Management & Applied Economics</i> 1 (2): 1792-7552 (online) (English).</p>
	Market-based incentives for sustainable management of indigenous goats in Pamirs of Tajikistan	<ul style="list-style-type: none"> • NGO «Zeravshan Kashmiri», Tajikistan • Odessa Centre Ltd., Warwickshire, UK 	<p>McGregor B.A., Kerven, C., and S. Toigonbaev (2011). Sources of variation affecting cashmere grown in the Pamir mountain districts of Tajikistan and implications for industry development. <i>Small Ruminant Research</i> 99: 7–15 (English).</p>

Focus area	Research project	Implementing agency	Publications
Water and Energy	Regional water and small hydropower potentials in the Pamir-Alai mountains in Kyrgyzstan	<ul style="list-style-type: none"> • Kyrgyz GIS Association • Kyrgyz Center of Geoinformation Systems, Kyrgyzstan • Centre for Geoinformatics, University of Salzburg, Austria 	<p>Chymyrov, A., Nazarkulova, A., and E. Zheentaev (2012). <i>Assessment of Regional Water and Small Hydropower Potentials in the Pamir-Alai Mountains</i>. Information Leaflet. Kyrgyz GIS Association, Bishkek, Kyrgyzstan (Russian, Kyrgyz and English).</p> <p>Chymyrov, A., Smith, A., and A. Nazarkulova (2010). Geospatial modeling for the regional water and small hydropower potentials in the Pamir-Alai mountains. In Proceedings of the Fourth Central Asia GIS Conference - GISCA'10 "Water: Life, Risk, Energy and Landuse", 27-28 May, 2010, Bishkek, Kyrgyzstan (English).</p> <p>Nazarkulova, A., Chymyrov, A. and J. Strobl (2010). Regional Water and Small hydropower Potentials in the Pamir-Alai Mountains. In Proceedings of the Fifth Central Asia GIS Conference - GISCA'11 "Geoinformatics: managing environment, resources and risk", 19-20 April, 2011, Almaty, Kazakhstan (English).</p>
	A preliminary investigation into the ability and cost effectiveness of inter-seasonally stored solar thermal energy to provide for indoor heating needs in the Tajik Pamirs	<ul style="list-style-type: none"> • Center for Sustainable and Innovative Technology, Mountain Societies Development Support Programme (MSDSP), Aga Khan Foundation (AKF), Tajikistan 	<p>Shariff, J., and A. Khudonazarov (2012). Challenges in implementing a project on inter-seasonally stored solar thermal energy to provide for indoor heating needs in the Pamir Mountains (in preparation).</p>

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