

Ecosystem Services in the Eastern Pamirs of Tajikistan. Can a price be ascertained?

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Mountains are identified as regions which will continue to play an important role in the world's sustainable development. In settings such as High Asia, interrelationships between highlands and lowlands are of crucial importance, but also critical and often overlooked are developments confined to the highlands. Mountain areas are specifically addressed in Agenda 21 and the Millennium Ecosystem Assessment (MA) (Hassan et al. 2005). Despite the range of analytical studies about the importance of mountain systems, however, the Global Environment Outlook 3 (UNEP 2002, 66) states that most "mountain commons are ecologically under-managed and suffer from the classic 'commons syndrome': while all seek to benefit, stakeholders lack coordination, incentives and instruments for joint care.

For mountain regions such as the Eastern Pamirs the MA identifies six ecosystem services, including "grazing", "water" and "energy" (Hassan et al. 2005, 689). For Central Asian Mountains just "food", "water", "biodiversity" and "others" are of relevance, but "energy" is not specifically mentioned (Hassan et al. 2005, IX). These inconsistent statements reflect insufficient knowledge informing discussions about ecosystem services - not only in Central Asian mountains but also more generally (e.g. Boyd & Banzhaf 2007) and in global reports.

For the Pamirs the limited number of studies and publications identify energy issues as a key issue besides grazing. All studies recognize the increasing use of dwarf shrubs as fire wood after the collapse of the Soviet Union in the Eastern Pamirs. Before the independence of Tajikistan the region was supplied with all fossil fuels – coal and diesel – from outside, and the Pamirs were an integrated part of the Soviet-style Gosplan system of resource attribution and distribution. Coal was mainly used for heating and cooking, diesel for generators, and fire wood for cooking. With independence this supply structure immediately collapsed, and coal and fuel is no longer freely traded.

Fuel wood extraction is in direct competition to grazing, another provisioning ecosystem service. Grazing and energy pose the most important ecological services in the Eastern Pamirs and are strongly linked, not only because of the competition for the dwarf shrubs but also because animal dung is a further significant energy resource (Fig. 1). Dwarf shrubs are important fodder plants, especially in winter when they still have high protein content and can be accessed by animals. Contrary to published assumptions, dwarf shrubs are still not rare, even when in relative close proximity to settlements (figure 2);

The third ecosystem service, omitted in the MA are cultural services (cultural, spiritual, amenity) which include recreation and eco-tourism (Hassan et al. 2005). Tourism is a small but growing market in the Eastern Pamirs. Presently two groups dominate in the tourism sector: First, individual travellers and small groups which are partly managed by local entrepreneurs; second, trophy hunters, visiting the Pamirs for rare game. The latter tourism activity is managed along a value chain connecting affluent overseas hunters with the local entrepreneurs in the Pamirs. Hunting

concessions restrict the utilization of areas for grazing and fire wood collections and therefore could conserve ecosystems if managed properly. On the other hand, hunting concessions could provide a significant income for local residents who are employed by hunting companies. Their role for provisioning ecosystem services as in the Tajik National Park is of interest, as well as the legal and institutional setup.

Other ecosystem services are of minor importance in the Eastern Pamirs. Water for the local populace is not a significant issue. Because of the aridity and the lack of extended glaciations, the Eastern Pamirs' are of minor importance as a water tower for Central Asia as compared to the Western Pamirs, Hindu Kush and the Pamir-Alay Range. Crop production is limited under the prevalent climatic conditions.

Based on the evaluation of available published sources and our personal experiences from extensive field work in the region during the last decade, we rate natural resource exploitation in the fields of energy, pastoralism, legal and illegal hunting and tourism as the most important issues related to sustainable development in the Eastern Pamirs. In addition they are strongly interdependent fields of human action. In the terminology of de Groot et al. (2002) the four identified services belong to Production Functions (grazing, energy, hunting) and Information Functions (tourism, trophy hunting), but their utilization would directly influence and is based on Regulation and Habitat Functions.

In the methodological concept of ecosystem services the functions provide goods and services which have a certain value. The total value of an ecosystem is then generated by ecological, socio-cultural and economic values, and this total value determines decision-making processes in policy and ecosystem management (de Groot et al. 2002). In that model the feedback of human action influences only Ecosystem Structure and Processes. We would argue that the global, regional, and local political and socio-economic frames also directly influence the value of ecosystem services (Fig. 3). The collapse of the Soviet supply system is a prime example of a survival strategy based on re-valuation of natural resources such as pastures and plant material. As an example, the value of dwarf shrubs has significantly increased, and as a consequence it is now commercialized in a substantial manner.

Given the economic value of dwarf shrubs on the one hand and the abundance of dwarf shrubs and its wide subsistence use on the other, especially also in regions where hardly any alternatives exist, there is a problem in fixing a price for the service. In this context, we can only discuss relative value compared to the service "fodder" - but without any alternatives fire wood will always be collected despite the problems that might follow. In this case study, it is doubtful whether a price can be set for ecological services at all (Chee 2004).