

All that glitters is not gold: opportunity costs of gold mining

Jakub Kronenberg

Department of International Economics, University of Lodz, Poland, kronenbe@uni.lodz.pl

Keywords: resource extraction; mountain ecosystems; fairness of sustainable development; compensation payments; valuation of environmental goods and services

Abstract: Resource extraction precludes sustainable forms of land use and poses long-term threats. This is illustrated by a case study of Kumtor gold mine in the Kyrgyz Republic. Some opportunity costs of mining (foregone benefits from tourism, hunting, cottage industry and pastoralism) can relatively easily be quantified. However, they remain negligible compared to the benefits the mine brings to the Kyrgyz economy. Others are less evident and refer to potential international compensation payments for foregone unsustainable development projects. These depend on international stakeholders' willingness to pay for environmental goods and services degraded by the mine. Setting up a system of such payments would ensure fair relations between developed and developing countries.

1. Introduction

With increased demand for resources necessary to satisfy the needs of a growing and increasingly affluent world population, new large-scale mining projects open in previously inaccessible areas. They are perceived as essential for economic growth in poor countries, and often are carried out with the use of foreign capital and financial support from multilateral development agencies. However, as poor countries often lack democratic political structures and strong institutions, such projects may not result from a balanced analysis of all potential costs and benefits. The long-term problems related to a mine, might result from the loss of the mine's and the surrounding area, and of ecological functions of that area. In particular, opportunity costs of developing such projects are rarely taken into consideration – what other development opportunities might have been pursued, had a given project not been realised. Both external and opportunity costs often refer to sustainability – not only does a project degrading the environment impose costs on other stakeholders, it also prevents other, sustainable uses of the same area (cf. Norton-Griffiths and Southey 1995; Akpalu and Parks 2007).

The aim of this paper is to test whether there are viable economic alternatives for large-scale unsustainable projects, using an example of Kumtor gold mine in the Kyrgyz Republic.¹ The

¹ By definition, mining is unsustainable as once it exploits a resource, this resource is no longer available. However, following the logic of weak sustainability, benefits from resource exploitation might be used to generate other forms of capital that would replace the initial resource's potential of contributing to further development. In countries with poor institutions and large corruption, the benefits generated by large-scale investment projects may not be used for the development of local communities that suffer most from the initial resource being exploited or degraded. Indeed, this is the case in the present example, where impoverished communities live just next to one of the largest gold mines in the world.

analysis is performed at the national level, comparing the gross contribution of Kumtor to the Kyrgyz economy with the potential benefits (gross revenues) that might have been generated had the mine not been established. This analysis is based on data collected in 2007 and 2008 in the Kyrgyz Republic, consulting local and international stakeholders, and using locally accessible resources.

The following section presents background information on the Kyrgyz Republic and Kumtor, while section 3 focuses on the benefits and opportunity costs of the mine. This is followed by results and discussion in section 4 and conclusions in section 5.

2. Background

The Kyrgyz Republic is a mountainous country, with 94% of its territory at 1000 metres above sea level and higher. It is one of the poorest republics of the former Soviet Union (in 2007 the Kyrgyz GNI per capita was USD 590) and it belongs to the countries struck most seriously by the economic crisis following the Union's collapse. In 1995, GDP was half the 1990 level, and still it has not recovered (Figure 1). Between 1990 and 1994, industrial production fell by 65%. However, the country was politically stable and relatively open to international contacts.

During the time of the Soviet Union, the Kyrgyz Republic was used by central authorities as a resource base. Mining was economically inefficient and many of its detrimental social and environmental impacts can still be traced today. Nevertheless, many local decision makers and foreign advisors promoted the idea of developing mining further.

In 1992, a joint venture was created between the Kyrgyz government and Cameco, a Canadian company, to exploit the large Kumtor gold deposit.² The Kyrgyz contribution was the deposit and the total cost of the project was USD 452.2 million.

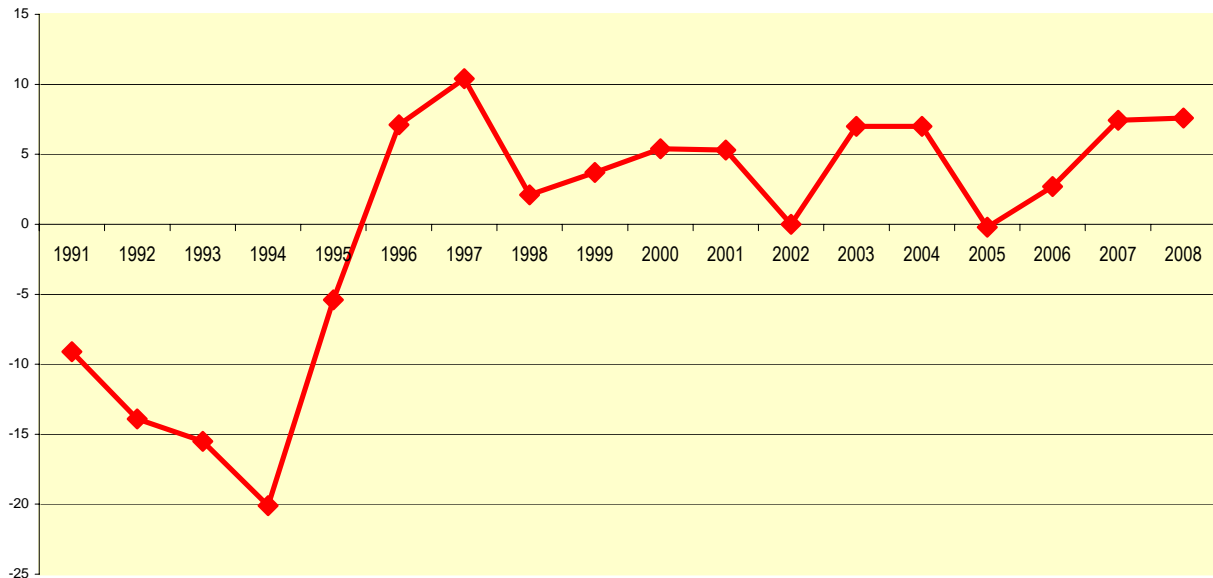
Today, mining is a core industry in the Kyrgyz Republic; and Kumtor is the country's most important enterprise, contributing in different years up to 10% of GDP, 41% of export earnings and 43% of industrial production. Between 1997 and 2007, the mine produced 6.2 million ounces (or 191 tons) of gold. Currently, the mine is expected to operate until 2014 but the closing date keeps being extended as new resources are discovered. This dependence of the economy on one company makes it vulnerable to the volatility of gold prices and to what happens within the company. Three important accidents in the mine (in 1998, 2002 and 2006) had an important impact on the country's GDP (Figure 1).

The mine is located in the Issyk-Kul province, at the elevation of 4000–4400 metres above sea level (41°52'N; 78°11'E; Figure 2). The area around Issyk-Kul lake and in particular the

² The joint venture was called Kumtor Gold Company, and its subsidiary operating the mine – Kumtor Operating Company. Both are referred to as Kumtor or the mine throughout this text.

mountains in its south-eastern surroundings represent particularly valuable ecosystems and the most promising sites for the development of tourism. The lake and its surroundings are protected by the Issyk-Kul Biosphere Reserve.

Figure 1 Annual change of GDP for the Kyrgyz Republic, 1991–2008



Source: World Bank and National Statistical Committee of the Kyrgyz Republic online databases.

Figure 2 Location of Kumtor mine



Source: Bruce et al. 2008, p. 25.

The most important environmental impacts of the mine are discussed by Torgoev and Aleshin (2001, pp. 104ff) and they can potentially affect an area much larger than that occupied by the mine. According to UNDP (2006, p. 59), ‘the negative environmental impact from Kumtor is equal to the man-made environmental impact of two entire regions of Kyrgyzstan’. Large-scale gold mining is listed among three most important environmental problems in the country (OSCE et al. 2003) and mining in general as the country’s worst environmental problem (UNDP and SAEPF 2007, p. 31). Thus, the scale of Kumtor’s environmental impact parallels the scale of its contribution to economic indicators.

3. Data

In the following, we shall compare the benefits that Kumtor generates for the Kyrgyz economy with the opportunity costs of gold mining.

3.1. Kumtor

The benefits that Kumtor mine brought to the Kyrgyz economy in the years 1994–2007 amount to USD 854.6 million, divided into the following categories:³

- tax and other obligatory payments (USD 150.6 million);
- salaries, withholding tax and deductions to pension fund (USD 191.6 million);
- procurement of local goods and services (USD 234.1 million);
- infrastructure-related investment, including procurement of energy (USD 136 million); and
- other payments, including acquisition of shares from the government, dividends, sponsoring (USD 142.3 million).

It might be debatable to what extent some of these categories benefit the country and to what extent they are the mine’s costs only (e.g. USD 41.6 million for high-voltage power line connecting Kumtor with the national grid). However, all of them represent expenses made by the company in the Kyrgyz Republic and thus contributed to GDP growth.

Taxes constitute the most obvious category of benefits, but the company was freed from most of them until 2002, and afterwards benefited from a number of exemptions (Bruce et al. 2008, p. 138; Figure 3). A particularly important benefit arose in 2004, when the Kyrgyz government sold part of its shares in the mine, earning USD 86 million. Sustainable development projects sponsored by Kumtor are meant to help local populations with economic survival after the mine closes and focus on tourism, biodiversity and agriculture. However, the scale of Kumtor’s contribution,

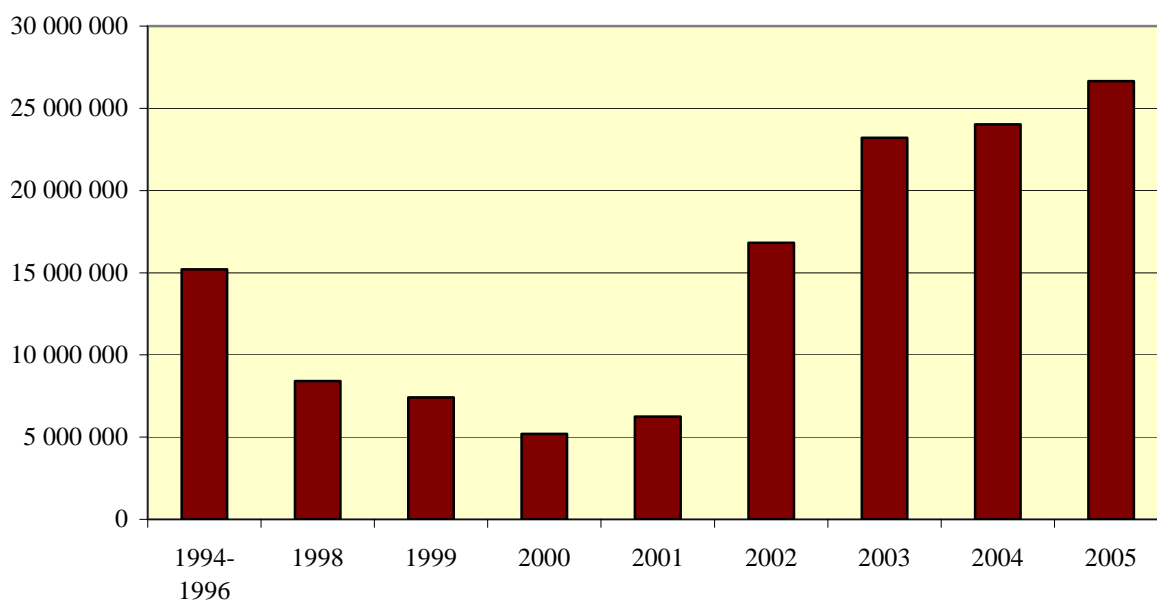
³ Data on the contribution of Kumtor to the Kyrgyz economy are difficult to access and there are many inconsistencies between various editions of these data coming from the same source, Kumtor Operating Company. The data used here were kindly provided by Mr. Sergey Dedukhin of KOC.

combined with its sponsoring activities, remains small compared to other types of benefits it generates for the economy (USD 360,000–924,000 per year).

The above list is exhaustive and includes both direct and indirect benefits, the example of the latter being payments for local goods and services, translating into employment opportunities in companies cooperating with the mine. However, the list does not include external benefits, some of which are listed below:

- access to state-of-the-art mining technologies;
- improved image of the country among other potential investors;
- increased involvement of Canadian development organisations; and
- road to the mine providing access to the surrounding mountains.

Figure 3 Taxes paid by Kumtor Operating Company and Kumtor Gold Company (USD)



Source: KOC environmental reports 1998-2005; Bogdetsky (2001).

The negative externalities related to the mine's activity refer, among others, to the risk of accidents, which may discourage tourists from visiting the neighbouring areas, including the Issyk-Kul lake. The May 1998 accident in which about 1762 kg of sodium cyanide were spilled in Barskoon river that flows into Issyk-Kul led to serious concerns about the safety of the mine. The costs of medical treatment, lost agricultural produce, relocation of over 5500 Barskoon village inhabitants, and restoration of the environment amounted to USD 4.6 million and were to be covered mostly by Kumtor. Lost revenues from tourism were significant as most reservations for the summer period were cancelled. The maximum losses of the tourist sector might have reached

USD 1 million. Paradoxically, the accident also led to important external benefits, such as increased environmental awareness in the country, which triggered Kumtor's closer cooperation with local communities and its environmental protection efforts.

Environmental and social costs of mining often appear after the mine is closed, thus attention needs to be paid to decommissioning and reclamation plans. In the case of Kumtor, the planned costs of closing the mine amount to USD 21 million (Bruce et al. 2008, p. 136). Unlike many other mining projects which assume a zero salvage value, this one expects to fund about 75% of the costs by selling the remaining property. There are at least two risks related to this plan:

- that the decommissioning and reclamation costs will turn out to have been underestimated, possibly because of some unexpected environmental costs; and
- that the salvage value will not be realised.

Any closed mine with all the chemical substances left behind poses a threat for future generations. In the case of Kumtor, this is exacerbated by the fact that the mine is located in the permafrost zone, conditions of which are likely to change with global warming. Furthermore, Kumtor is located next to the sources of the largest river of Central Asia (Naryn which joins with Kara-Darya to form Syr-Darya) and to the sources of another river that flows into Issyk-Kul.

3.2. Alternatives

Foregoing the development of gold mining, other sources of revenue might be exploited in the same area. These might offer infinite streams of direct and indirect benefits, had they conformed to the idea of sustainable development.

3.2.1. Tourism

Local experts' views on the potential tourist attractiveness of the area occupied by Kumtor vary significantly. On one hand, the mountains are too high and inaccessible for trekking, and on the other, they are not high or exceptional enough for alpinists who usually seek the longest or the most spectacular ascents. However, wildlife watching is one aspect that might attract tourists to this area, in particular argali (*Ovis ammon*), including its rarest subspecies – Marco Polo sheep (*Ovis ammon polii*), and snow leopard (*Uncia uncia*). Thus, there is an opportunity to develop wildlife-based eco-tourism in this area.⁴

Adjacent to Kumtor mine is Sarychat-Ertash reserve established in 1995 to protect the high-altitude ecosystems of the central Tien Shan. Some insights into potential eco-tourism in this area can be related to eco-tourism options in the reserve. Apart from generating income and thus creating incentives to protect nature, the presence of tourists might also intimidate poaching that plagues all

⁴ Creating a year-round ski base might be another opportunity but it would also be a large investment project, with significant environmental impacts.

protected areas in the Kyrgyz Republic. Eco-tourism might be linked to watching wildlife or participating in research. The reserve's profits may be as high as USD 500 for a 10 day stay per person, although the cost per participant would be much higher (the revenue of USD 1000 would be unexaggerated for a Kyrgyz tour operator). As this would be a niche market (extreme conditions, low likelihood of seeing the biggest attraction – snow leopard), only limited numbers of tourists would visit the area. Receiving two groups, 10 persons each, the country might earn USD 20,000 annually. Additional income opportunities would emerge for other organisations and people in the Kyrgyz Republic related to other needs of the tourists.

Before the mine was established, its area functioned as an important migration route for ungulates (Emil Shukurov, personal communication). Had the mine not been created, the area might have offered bigger gains from wildlife-based eco-tourism. In this case, the demand might be at least twice the above, generating USD 40,000 of revenue altogether. This could potentially increase, had the programme gained momentum.

3.2.2. Hunting

Trophy hunting provides another source of revenue in the Kyrgyz Republic. National hunting limits are set at about 70 heads of argali and up to 1000 heads of ibex (*Capra sibirica*), the most important trophies available in the country. These limits are divided between all hunting operators (84), with the largest share assigned to the governmental agency GlavOhota. Hunters choosing GlavOhota pay USD 15,000–20,000 for killing an argali and 3,500 for killing an ibex, all included (accommodation, guides, catering, transportation). The prices of other operators are higher.

Had hunting been community-based, the benefits would accrue to the local community, providing an incentive to protect the resource and use it on a sustainable basis. Meanwhile, the current system is plagued by corruption and inability to stop poaching and only deteriorates the situation of Kyrgyz biodiversity, in particular with reference to Marco Polo sheep.

Argali can only be hunted in two of the large designated areas, one of which lies close to the mine. As these two are the largest hunting areas in the country, it can be assumed that more ibex are hunted there than in the other three. Thus, approximately, the area around Kumtor might provide 35 heads of argali and 300 heads of ibex annually, generating USD 1.66 million of gross revenue.

3.2.3. Cottage industry

The area around Kumtor mine has few inhabitants, concentrated in two communities: Ak-Shirak (the closest) and Inylchek, both at the other edges of Sarychat-Ertash reserve. In an attempt to fight poaching, relatively popular with these communities having few other economic opportunities, the Snow Leopard Trust involved them in their Snow Leopard Enterprises programme. In exchange for

their commitment not to poach, the SLT purchases handicrafts produced in participating communities and offers them additional training. In 2007, the total revenues of both communities were USD 8,701, plus a conservation bonus of USD 2,723 paid as a reward for refraining from poaching (Asel Tagaeva, personal communication).

3.2.4. Agriculture (pastoralism)

Kumtor is located above the upper limit of cultivation (around 3250 m), in the high-mountain tundra. This ecosystem is not suitable for agriculture, neither can it provide useful medicinal or dye plants, common in the lower-lying alpine meadows. It is not even suitable for pastoralism, with the sole exception of transhumant pastoralism of yaks.

Yak breeding can only provide supplementary income to nomadic families, as it is subject to high risk and only offers minor earnings. In a study of a similar area in Nepal (Degen et al. 2007), annual revenue from yaks totalled USD 1726 per herd owner (with a typical herd counting 51 yaks). Deducting the costs of hiring a shepherd and buying additional food, the owner received less than USD 1000 as a profit. Had the area of the mine been used as part of a summer pasture for yaks, at least two herds might benefit from it, contributing to the annual revenue of USD 3452.

3.2.5. Biodiversity

The Kyrgyz are not particularly interested in protecting biodiversity and they do not visit the protected areas, similar to the inhabitants of other poor countries (Norton-Griffiths and Southey 1995). The fact that international stakeholders are more interested in the protection of nature in poor countries reflects the differences of national and overseas stakeholders' perceptions of the value of environmental goods and services. While national stakeholders are interested in use values (e.g. from tourism or hunting), overseas stakeholders focus on non-use values (existence, bequest and altruistic values), as most of them would not personally visit and use the protected areas.

Estimating the value of poor countries' ecosystems (including the value of their biodiversity) could be used to justify protection and in more sophisticated measures, such as systems of compensation payments for poor countries, foregoing unsustainable development projects. These would also require independent and comprehensive assessments of those projects' environmental impacts.

3.2.6. Clean water

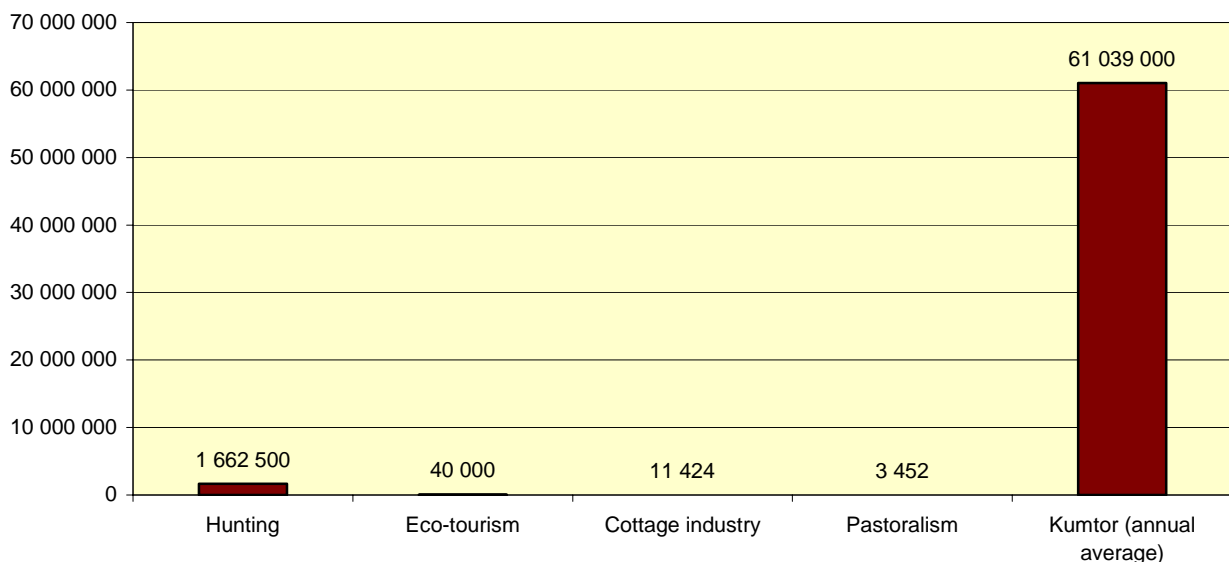
Kyrgyz mountains provide fresh water also to other Central Asian countries, which was acknowledged in regional agreements signed between the former Soviet republics. The mine is located in the area of active glaciers, in the vicinity of the sources of two drainage basins. Any pollution caused by the mine would thus affect the entire drainage basin – on one side it is the

Issyk-Kul of which no river flows out, but on the other it is the Naryn (Syr-Darya). Some officials and experts in the Kyrgyz Republic argued that the country should be compensated for the water it provides to its neighbours, especially as, based on the old agreements, it has to pay most of the water management costs, thus subsidising the neighbouring water-using countries (OSCE et al. 2003, p. 11; Sehring 2005, pp. 42-43). The compensation system could be linked to eliminating potential risks related to water pollution, an example of which might be large-scale gold mining.

4. Results and discussion

The potential quantifiable annual benefits of alternative, sustainable uses of the land occupied by the mine (the opportunity costs of mining) are negligible compared to those related to the mine (Figure 4). Indeed, they are smaller than the inconsistencies in data on the benefits accruing from the mine presented in various sources. Furthermore, not all of them are true opportunity costs of mining. As the area is large and sparsely populated, and the alternative activities modest in their scale, mining does not necessarily preclude some of them. Thus, the balance of benefits and costs of mining depends on those opportunity costs that are more difficult to quantify, including the monetisation of non-use values of biodiversity and potential compensation payments for the sake of protecting clean water resources. The importance of these depends on the extent to which the project under consideration might affect them.

Figure 4 Benefits for the Kyrgyz economy from sustainable resource use and from Kumtor (USD)



The example of Kumtor demonstrates the gains that a country can earn using its resources in an unsustainable way. Doing this, the country deprives itself, and other stakeholders, of the resource and the area where it is exploited, and of other potential benefits of area. Thus, had other

stakeholders been interested in preserving a given area, they would need to compensate the country, and the compensation would have to equal the benefits of unsustainable projects, less the benefits gained through a different activity, acceptable by the donor.⁵ This would provide an incentive for the donors to help a beneficiary identify other potentially acceptable development paths. Such compensation is indeed embodied in the idea of Snow Leopard Enterprises, but its scale remains negligible.

A relevant scheme would need to reward those who might benefit from an unsustainable project – constituting a compensation for foregone benefits. However, as with taxes, there is a risk that these payments would be captured by corrupt institutions. Thus, strengthening institutions emerges as an additional objective. The projects funded from such a scheme would have to focus on sustainable resource use and motivate their beneficiaries to activity. It would also require raising the awareness of inhabitants of the importance of environmental goods and services.

If external and global services provided by Kyrgyz ecosystems are taken into consideration in international cooperation, then the Kyrgyz Republic will have less incentives to undermine the health of ecosystems, on which, largely, other countries depend. Clearly, there is a need for international cooperation, especially between the rich and the poor. However, such compensation payments might also originate from neighbouring resource-using countries exposed to increased environmental risk related to mining (as Uzbekistan and Kazakhstan). A reformed regional water management system might provide part of the compensation. All the above is a matter of the Kyrgyz Republic internalising the external and global benefits arising at its territory. Thus, it would increase the fairness of the current international dimension of sustainable development.

In 2006, the Kyrgyz Republic received USD 311 million in official development assistance. In comparison, potential compensation for foregone income from one mine only would be about USD 60 million. Compensation payments would constitute a new form of cooperation related to maintaining the health of the global ecosystem. Compensation for foregoing ‘dirty’ development would be motivated by the fact that ecosystems are complex and interconnected and generate benefits for different countries, thus demonstrating the need to protect them in their entirety.

Apart from payments, support for studying the impacts of large-scale investment projects, including their opportunity costs would also be necessary. Current calls for protecting the environment in poor countries have to be complemented by making them aware of the importance of environmental goods and services and compensating the potential foregone benefits. Further research is necessary into how international compensation payments could be organised, whether

⁵ In the opposite case, if the Kyrgyz Republic protected the site, it would subsidise all those interested in having it protected (either for use or non-use reasons) with the amount equal to potential gains from Kumtor, less the benefits arising from other, acceptable activities (cf. Norton-Griffiths and Southey 1995).

they should be linked to development aid, international environmental or trade agreements, or included in regional trade agreements.

5. Conclusions

The case of Kumtor mine illustrates a number of sustainable development themes, such as the divergence between weak and strong sustainability, indicating the failure of the former, especially in the case of corrupt and inefficient institutions. This is further aggravated by the lock-in problem – using land for gold extraction precludes many other uses of this land. Future generations will inherit a potential source of problems and precluded development opportunities, if the mine is not properly decommissioned and if global warming undermines the company's assumptions concerning for example the physical properties of the tailings dump's bottom. Kumtor is only one of many mines in the country, some operated by Chinese companies, with almost complete lack of transparency and few or no environmental precautions.

Economic dependence on one sector increases the country's vulnerability to external (and indeed, also internal) shocks, such as gold price fluctuations or accidents. The need for diversification of sources of growth has been identified by the UN and other experts as the most important challenge for the Kyrgyz economy. Furthermore, there is a risk that mining depletes other resources, degrading environmental goods and services. Although the present analysis does not support the argument of stopping one mine from development and acknowledges the benefits it brings, it indicates that there are limits to further development of mining in a poor and mountainous country, such as the Kyrgyz Republic.

Usually, discussions on the international dimension of sustainable development focus on the fact that the world's rich are responsible for most of the demand for resources extracted all over the world, including in poor countries. Thus, consumers in rich countries should also pay the external and indirect costs of resource extraction required to satisfy their demand. The present paper confirms that these externalities are often difficult to estimate and need to be studied further.

However, the international dimension of sustainable development also has to be viewed from a different perspective. Many environmental goods and services are supranational, regional or global. Ecosystems' ability to provide these benefits depends on their completeness and on the complex interactions between their elements. Changing the properties of ecosystems might affect some of the above goods and services. Thus, a country protecting ecosystems might internalise the external and global benefits arising at its territory. This could be achieved through an international system of compensation payments, paying the costs of foregone benefits from large-scale investment projects which undermine the properties of ecosystems. Such a system would allow poor countries to afford foregoing unsustainable development opportunities. How much of ecosystems of

the country can be converted into unsustainable projects, would depend on the willingness to pay of the international community, inflating those projects' opportunity costs.

References

- Akpalu, W. and P.J. Parks (2007), 'Natural resource use conflict: gold mining in tropical rainforest in Ghana', *Environment and Development Economics*, **12**(1), 55-72.
- Bogdetsky, V. (ed.) (2001), *Mining industry and sustainable development in Kyrgyzstan*, London: International Institute for Environment and Development.
- Bruce, I., D. Redmond, H. Thalenhorst (2008), *Technical report on the 2007 year-end mineral reserves and resources Kumtor gold mine*, Toronto: Strathcona Mineral Services Limited.
- Degen, A.A., M. Kam, S.B. Pandey, C.R. Upreti, S. Pandey and P. Regmi (2007), 'Transhumant Pastoralism in Yak Production in the Lower Mustang District of Nepal', *Nomadic Peoples*, **11**(2), 57-85.
- Norton-Griffiths, M. and C. Southey (1995), 'The opportunity costs of biodiversity conservation in Kenya', *Ecological Economics*, **12**(2), 125-139.
- OSCE, UNEP, UNDP (2003), *Addressing environmental risks in Central Asia*, Bratislava: UNDP Regional Office for Europe and the CIS.
- Sehring, J. (2005), 'Water policy in Kyrgyzstan and Tajikistan: problem perception and agenda setting', *Journal of Academic Studies*, **7**(25), 37-54.
- Torgoev, I.A. and Y.G. Aleshin (2001), *Ekologia gornopromyshlennovo kompleksa Kyrgyzstana (Ecology of the mining complex of Kyrgyzstan)*, Bishkek: Ilim (in Russian).
- UNDP (2006), *The influence of civil society on the human development process in Kyrgyzstan*, Bishkek: UNDP.
- UNDP and SAEPF (2007), *Kyrgyzstan: environment and natural resources for sustainable development*, UNDP: Bishkek.