Short Communication

Environmental Development in Central Asia: towards Sustainability?

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Abstract

This article deals with the environmental development of the post-socialist countries of Central Asia, Mongolia, and Afghanistan. We aimed at such targets and indicators used in the seventh Millennium Development Goal that have been documented with consistent and comparable data from the United Nations, namely carbon dioxide emissions and energy use and improved water sources and facilities. The countries of interest cannot be considered as significant global CO_2 emitters, however, the steady tendency towards industrialization and urbanization can be seen in the data. The data on proportion of the population using improved drinking water sources and sanitation facilities are optimistic even on a global scale. However, the regional specifics of Central Asia discover further significant dimensions of the water problem, especially water pollution.

Keywords: Central Asia, Afghanistan, Mongolia, environment, Millennium Development Goals.

INTRODUCTION

This article deals with the environmental development of the post-socialist countries of Central Asia, Mongolia, and Afghanistan. As the 2015 end date for achieving the Millennium Development Goals (MDG) is approaching, we look at present developments in this sphere of interest. Two main research questions are studied: 1. Whether a significant change in fossil fuel combustion and energy use has occurred in the countries of interest. The main indicators used here are various measures of carbon dioxide emissions, 2. What development has there been

Table 1. Specific targets (7.A to 7.D) of the seventh Millennium Development Goal and indicators (7.1 to 7.10) of their fulfilling. GDP – gross domestic product, PPP – purchasing power parity. Source: Millennium Development Goals Indicators (2009).

Target 7.A: Integrate the principles of sustainable development into country policies and programmes and reverse the loss of environmental resources.
7.1 Proportion of land area covered by forest
7.2 CO2 emissions, total, per capita and per $1 GDP (PPP)
7.3 Consumption of ozone-depleting substances
7.4 Proportion of fish stocks within safe biological limits
7.5 Proportion of total water resources used
Target 7.B: Reduce biodiversity loss, achieving, by 2010, a significant reduction in the rate of loss.
7.6 Proportion of terrestrial and marine areas protected
7.7 Proportion of species threatened with extinction
Target 7.C: Halve, by 2015, the proportion of people without sustainable access to safe drinking water and basic sanitation.
7.8 Proportion of population using an improved drinking water source
7.9 Proportion of population using an improved sanitation facility
Target 7.D: By 2020, to have achieved a significant improvement in the lives of at least 100 million slum dwellers.
7.10 Proportion of urban population living in slums

Table 2. Carbon dioxide emissions (CO2) and energy use indicators. The Carbon Dioxide Information Analysis Centre (CDIAC) is the primary climate-change data and information analysis centre of the U.S. Department of Energy Source: United Nations Statistics Division (2013).

Carbon dioxide emissions (CO_2), thousand metric tons of CO_2 (CDIAC)

	1990	1995	2000	2005	2006	2007	2008	2009	2009/1995
Afghanistan	2677	1269	781	997	1272	1889	3777	6315	5.0
Kazakhstan		166731	127769	176947	192114	220042	229441	225803	1.4
Kyrgyzstan		4474	4529	5222	5093	6425	5695	6722	1.5
Mongolia	10044	7924	7506	8808	9443	10561	10942	14503	1.8
Tajikistan		2450	2237	2464	2703	3286	3102	2835	1.2
Turkmenistan		34620	35647	45375	46197	53494	55027	48162	1.4
Uzbekistan		100912	119951	111821	116464	116889	124905	116508	1.2

Carbon dioxide emissions (CO_2), metric tons of CO_2 per capita (CDIAC)

	1990	1995	2000	2005	2006	2007	2008	2009	2009/1995
Afghanistan	0.21	0.06	0.03	0.04	0.04	0.06	0.13	0.21	3.2
Kazakhstan		10.47	8.54	11.66	12.55	14.22	14.66	14.25	1.4
Kyrgyzstan		0.97	0.91	1.04	1.00	1.25	1.09	1.28	1.3
Mongolia	4.58	3.44	3.11	3.46	3.65	4.02	4.10	5.35	1.6
Tajikistan		0.42	0.36	0.38	0.41	0.50	0.46	0.42	1.0
Turkmenistan		8.27	7.92	9.56	9.62	11.01	11.19	9.67	1.2
Uzbekistan		4.40	4.84	4.31	4.44	4.41	4.66	4.29	1.0

Carbon dioxide emissions (CO_2), kg CO_2 per $1 GDP (PPP) (CDIAC)

	1990	1995	2000	2005	2006	2007	2008	2009	2009/1995
Afghanistan				0.05	0.06	0.12	0.17	0.53	
Kazakhstan		1.78	1.47	1.19	1.26	1.27	1.23	0.16	0.1
Kyrgyzstan		0.84	0.44	0.50	0.59	0.48	0.55	0.05	0.1
Mongolia	2.48	1.53	1.30	1.08	1.10	1.04	1.40	0.71	0.5
Tajikistan		0.52	0.32	0.24	0.27	0.24	0.20	0.39	0.8
Turkmenistan		3.56	2.86	1.66	1.72	1.55	1.28		
Uzbekistan		2.76	2.64	1.88	1.72	1.69	1.46	0.12	0.0

Energy use (kg oil equivalent) per $1,000 GDP (Constant 2005 PPP $)

	1990	1995	2000	2005	2006	2007	2008	2009	2009/1995
Kazakhstan	628	730	442	385	421	416	422	396	0.5
Kyrgyzstan	676	424	326	299	294	297	254	271	0.6
Mongolia	640	581	444	351	362	349	326	345	0.6
Tajikistan	338	373	359	243	235	235	209	180	0.5
Turkmenistan	1428	1621	1388	819	750	779	696	572	0.4
Uzbekistan	1129	1278	1261	897	870	792	753	673	0.5

in the local population's access to drinking water and sanitation facilities in urban and rural areas. The study has mainly become closely connected to the seventh Millennium Development Goal "Ensure environmental sustainability" (Table 1). We aimed at such targets and indicators of the MDG7 that are documented with consistent and comparable data. From a methodological viewpoint, the analysis of secondary statistical data of the United Nations has been used.

RESULTS AND DISCUSSION

Carbon dioxide emissions and energy use

Kazakhstan, followed by Uzbekistan, has still the biggest value of absolute metric tons of carbon dioxide (CO_2)[1] in the observed period (1990 – 2009). If we aim at the ratio between metric tons of CO_2 emitted in 2009 and 1995 (2009/1995), both mentioned countries show a slight increase (Table 2).

[1] Data on metric tons of CO_2 and further CO_2 emissions indicators are presented by the UN as "global monitoring data", based also on data provided by countries (country data).

Table 3. Proportion of land area covered by forest. Source: United Nations Statistics Division (2013).

	1990	2000	2005	2010	2010/1990
Afghanistan	2.1	2.1	2.1	2.1	1.0
Kazakhstan	1.3	1.2	1.2	1.2	0.9
Kyrgyzstan	4.4	4.5	4.5	5	1.1
Mongolia	8	7.5	7.2	7	0.9
Tajikistan	2.9	2.9	2.9	2.9	1.0
Turkmenistan	8.8	8.8	8.8	8.8	1.0
Uzbekistan	7.2	7.6	7.7	7.7	1.1

A similar slight increase that did not reach double figures, was also shown in the other countries of interest - Kyrgyzstan, Mongolia, Tajikistan and Turkmenistan. On the contrary, Afghanistan has shown a five times higher value in 2009 than in 1990. We also compare Table 2 data with main world CO_2 emitters and with the Czech Republic (data from 2009): the Czech Republic 108 121, China 7 687 114, Japan 1 101 134, Russia 1 574 386 and the USA 5 299 563 thousand metric tons of CO_2. In comparison with these figures this study's countries of interest cannot be considered as important world CO_2 emitters.

The proportion of land area covered by forest hardly changed in all the countries of interest in the observed period (Table 3). However, there are considerable differences among countries (Fig. 1) in the population using solid fuels: Afghanistan 85%, Kazakhstan 9%, Kyrgyzstan 34%, Mongolia 72%, Tajikistan 34%, Turkmenistan 5% and Uzbekistan 11% (most recent data from 2010). It is evident that Central Asian countries that have significant (even from a global point of view) fossil fuel deposits (crude oil, natural gas) burn solid fuels to a considerably smaller extent than Afghanistan and Mongolia.

The dominance of Kazakhstan among countries of interest in metric tons of CO_2 emissions per capita is evident. It is followed by Turkmenistan. Afghanistan again shows the highest value of the ratio 2009/1995 and this country also has a relatively high population (30 million, the highest value of the countries of interest). This is evidence of the intensive post-war re-construction and the implementation of new, previously not existing technologies in Afghanistan. For comparison, in 2009, the value for the Czech Republic was 10.36; China 5.76; Japan 8.70; Russia 11.00 and the USA 17.22 metric tons of CO_2 emissions per capita. Thus, Kazakhstan still recorded, even in a global comparison, disturbingly high values of CO_2 emissions *per capita*. The development of the indicator 'kilograms of CO_2 emissions per USD 1 of GDP' documents the gradual dematerialization of the economies in the countries of interest in the observed period. Afghanistan is once more an exception, when its values increased (from 0.05 kg CO_2 in 2005 to 0.53 in 2009), thus documenting the rather intensive industrialization than a transition to an economy based more on services. The indicator energy use ('unit kilograms of oil equivalent per USD 1,000 of GDP') in the countries of interest (apart from Afghanistan) shows a decreasing tendency: ratio 2008/1995 oscillates around 0.5.

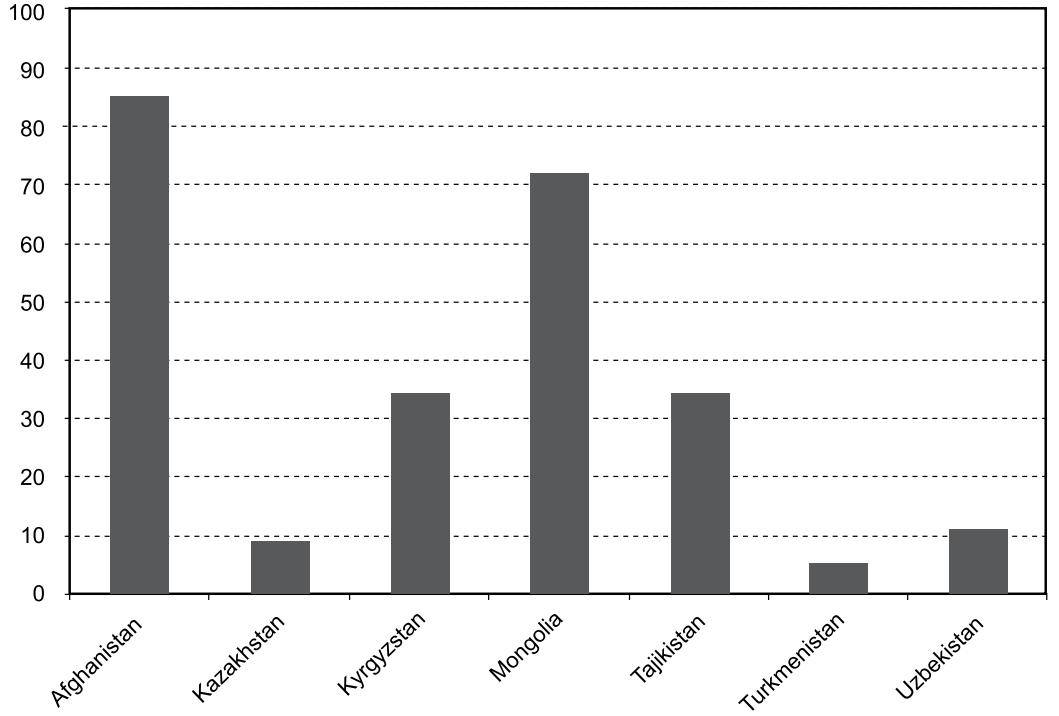

Fig. 1. Population using solid fuels in 2010, percentage. Own graph. Source data: United Nations Statistics Division (2013).

Table 4. Proportion of the population using improved drinking water sources and sanitation facilities. Source: United Nations Statistics Division (2013).

Proportion of the population using improved drinking water sources, urban

	1990	1995	2000	2005	2006	2007	2008	2009	2010	2010/1995
Afghanistan		6	36	66	72	78	78	78	78	13.0
Kazakhstan	99	99	99	99	99	99	99	99	99	1.0
Kyrgyzstan	98	98	98	99	99	99	99	99	99	1.0
Mongolia	74	76	86	95	97	99	100	100	100	1.3
Tajikistan		93	93	92	92	92	92	92	92	1.0
Turkmenistan	97	97	97	97	97	97	97	97	97	1.0
Uzbekistan	97	97	98	98	98	98	98	98	98	1.0

Proportion of the population using improved drinking water sources, rural

	1990	1995	2000	2005	2006	2007	2008	2009	2010	2010/1995
Afghanistan		1	18	35	39	42	42	42	42	42.0
Kazakhstan	96	92	91	91	91	90	90	90	90	1.0
Kyrgyzstan		66	73	80	82	83	85	85	85	1.3
Mongolia	54	29	37	46	48	50	51	53	53	1.8
Tajikistan		49	50	52	53	53	53	54	54	1.1
Turkmenistan		72	72	72	72					
Uzbekistan	90	85	83	82	82	81	81	81	81	1.0

Proportion of the population using improved sanitation facilities, urban

	1990	1995	2000	2005	2006	2007	2008	2009	2010	2010/1995
Afghanistan		36	46	56	58	60	60	60	60	1.7
Kazakhstan	96	96	97	97	97	97	97	97	97	1.0
Kyrgyzstan	94	94	94	94	94	94	94	94	94	1.0
Mongolia		66	65	65	64	64	64	64	64	1.0
Tajikistan	93	93	93	95	95	95	95	95	95	1.0
Turkmenistan	99	99	99	99	99	99	99	99	99	1.0
Uzbekistan	95	96	97	99	99	100	100	100	100	1.0

Proportion of the population using improved sanitation facilities rural

	1990	1995	2000	2005	2006	2007	2008	2009	2010	2010/1995
Afghanistan		27	28	29	29	30	30	30	30	1.1
Kazakhstan	97	97	97	98	98	98	98	98	98	1.0
Kyrgyzstan		93	93	93	93	93	93	93	93	1.0
Mongolia		28	28	29	29	29	29	29	29	1.0
Tajikistan		87	89	92	93	93	94	94	94	1.1
Turkmenistan	97	97	97	97	97	97	97	97	97	1.0
Uzbekistan	76	78	87	96	98	100	100	100	100	1.3

Industrialization is the main, but not the only important variable that affects CO_2 emissions. Martínez-Zarzoso and Maruotti (2011) refer to the impact of urbanization on CO_2 emissions in developing countries. According to their findings, an inverted-U shaped relationship between urbanization and CO_2 emissions can be seen and the differential impact of urbanization on CO_2 emissions should also be taken into account in discussions of climate change policies.

Relatively high values of CO_2 emissions per capita in Kazakhstan and Turkmenistan have an impact on the higher, in the observed countries, values of ecological footprint (EF). The EF has been estimated for all the countries of interest except Afghanistan: Kazakhstan 4.45; Kyrgyzstan 1.87; Mongolia 4.3, Uzbekistan 2.65; Turkmenistan 3.62 and Tajikistan 0.9 global ha per capita (NationMater.com, 2008). On the contrary, in Mongolia, the EF is related rather to different variables than CO_2 emissions.

Improved water sources and facilities

Data[2] show that (except in Afghanistan) significant changes did not take place since the beginning of monitoring of indicator values (Table 4). Only this one country shows, in the 2010/1995 ratio, a strong increase in the usage of improved drinking water sources. Countries of Central Asia and Mongolia have a 2010/1995 ratio very close to 1.0 for the usage of improved drinking water sources as well as improved sanitation facilities regardless of whether in urban or rural areas.

However, the difference between urban and rural figures in all the countries of interest is evident in various years and also in 2010 out of which the most recent data are available. The proportion of the population using improved sources and facilities is higher in urban areas. This finding, on the one hand, was expected, as urban-rural relationships are very similar at least for the countries of Central Asia due to the uniformity stemming from their Soviet past. On the other hand, significant differences in the amount of development aid received have taken place since 1991 for different reasons. Differences among countries can be seen in the scale the regime is isolated and in their different orientation (to the West, China, Iran etc.). A typical example of a country that is closed and has oriented itself in a different way is Turkmenistan (Horák, 2012). On the contrary, there are countries open for development assistance initiated by the West such as Mongolia and Kyrgyzstan. That is why the data (rural-urban differences) show some differences after approximately 20 years of work.

Regarding the absolute values of the proportion of population, the urban values of Central Asian countries are approaching 100%. Optimism caused by these data is higher than the information on the global average of improved water sources obtained from the UN: "*by 2015, an estimated 86 per cent of the population in developing regions will have gained access to improved sources of drinking water, up from 71 per cent in 1990"* (UN Summit, 2010). Compared to this global average, the urban areas of the observed countries (except for Afghanistan) are better. On the contrary, rural areas did not reach the global average in 2010. If we evaluate the populations' access to drinking water, a further feature of developing countries cannot be omitted: the pollution of drinking water sources. Water pollution by industrial, agricultural or mining activity is a serious problem in the countries of interest as significant salinization of water happens (Tajikistan 7th and Turkmenistan 8th rank out of 141 countries of the world). The content of total dissolved solids in water in these countries is at the forefront (Uzbekistan 1st, Turkmenistan 8th and Kazakhstan 15th rank). Water pollution from industry, especially from food-processing is at the forefront in Kyrgyzstan - 7th rank from 114 countries (NationMaster.com, 2008). The state of water management projects and the future outlook in the most seriously affected country, Uzbekistan, have already been discussed (Kment and Krepl, 2012).

Even in a relatively recent study (Törnquist et al., 2011), strong water pollution from industry and agriculture is still referred to. Based on the situation in Central Asia these authors conclude that the polluted groundwater is associated with much higher health risks than surface water. Health risks can increase considerably, if the downstream population must switch to a groundwater-based drinking water supply during a surface water shortage. It is relevant to the countries of interest with a predominantly arid climate, that the regions are generally vulnerable to this problem due to the ongoing irrigation expansion and climate changes.

The feasibility of development projects aimed at water purification in Central Asian countries is strongly affected by the social situation as described e.g. by Surkova (2012). We have referred to the low feasibility of the mentioned projects for social reasons elsewhere (Kment, 2009). Similarly, Johnson et al. (2008) in their summarizing study on the general situation in developing countries state that rural areas of these countries are populated with poor people who are unable to obtain the basic needs for clean water and sanitation. Moreover, due to economic, social, and political risks in these areas, it is difficult to build a business organization focusing on immediate returns of capital investment.

CONCLUSIONS

The findings of this study correspond to a considerable extent with the findings of other authors, which can be summarized as follows: MDG's targets and indicators have already been achieved in sporadic cases, however, it is necessary to postpone the overall achievement of the MDGs, or directly reconsider the entire development idea of MDGs. Nevertheless, it is not an ambition of this study to judge the MDGs as a whole. We aimed closely at selected data in the framework of environmental development in several developing Asian countries.

The countries of interest cannot be considered as significant global CO_2 emitters. Only Kazakhstan has, from a global viewpoint, increased the values of CO_2 emissions per capita. The countries of interest have on average less effective energy use (related to GDP) than the main developed countries.

[2] The indicators "proportion of the population using improved drinking water sources" and "proportion of the population using improved sanitation facilities" are estimates. The values are estimated by an international agency and are based on national data, such as surveys or administrative records, or other sources.

Hence, they do not contribute to global environmental pressure in any significant way. Nevertheless, the steady tendencies of industrialization and urbanization can be seen in the data, which document the typical evolution of developing countries in the environmental sphere.

Data on the proportion of the population using improved drinking water sources and sanitation facilities are optimistic even on a global scale. However, the regional specifics of Central Asia add further significant dimensions to the water problem. The pollution of sources of drinking water is strong here, particularly in localities. The arid character of a predominant part of the observed territory means the generally lower accessibility of water. Analyzed statistical data is therefore necessary to understand in this context as well. Re-formulation of development goals and strategies of international organizations should be based on newest studies that deal with many further dimensions of the problem.

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