Draft Country Environmental Analysis Fails to Account for Significant Pollution Costs

Reviewing World Bank's Draft Country Environmental Analysis for Kosovo

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Introduction

The World Bank's Draft Kosovo Country Environmental Analysis (CEA) states that it "gives an indication of which environmental problems inflict the largest costs to Kosovo….This approach is the first step towards a comparison of benefits and costs of abatement options…" The CEA concludes that air pollution impacts, mainly associated with lignite coal combustion, are the most costly environmental damage in Kosovo – representing an astonishing 0.89 to 3.76 percent of GDP.

Although the CEA provides much useful information and cost estimates for many important environmental issues, it unfortunately falls short and does not provide a basis for comparison of abatement options nor does it provide accurate cost estimates for several critical environmental problems chiefly associated with coal combustion and mining. It is critical that the World Bank CEA provide a comprehensive and accurate account of the environmental and societal costs of coal utilization given the World Bank's proposed assistance for further coal development in Kosovo, e.g. a new 600 MW lignite coal power plant and expanded coal mining operations.

The following comments provide information and suggestions to improve the draft Kosovo CEA regarding its accounting of environmental costs associated with coal combustion and mining. The comments focus on: the need for a comparative analyses of energy options; corrections to air pollution costs; and why and how to begin to provide cost estimates on mercury impacts, water shortages, lost agricultural production, and climate change.

No Basis for Comparison

Instead of considering options, the CEA simply states that the strategy to reduce particulate matter (PM) pollution is to "close Kosovo A[1] by 2017 and replace it with a new, state-of-the-art, privately operated 600 MW power plant". There is no evaluation of environmental and economic costs of other alternatives even though such evaluations have been developed by others and in some cases have determined coal to be the more costly option.[2] Instead of realizing that Kosovo has the opportunity to significantly curb its heavy reliance on dirty, carbon-intensive energy production,[3] the CEA simply accepts building more lignite-based power generation – the current largest and most costly source of pollution in the country. This unquestioned acceptance is based on the notion that the new plant will be relatively more efficient and less polluting than the very inefficient old coal plant. This sets a rather low bar and ignores the fact that a new coal plant will still increase the amount of coal mined, transported, processed, and combusted, as well as the waste generated, which will all put additional pressure on an already severely polluted environment (e.g., air pollution, water supply, ash waste, soil contamination, land conversion, etc.) throughout the 50-year life span of the new coal plant.

Given that the expanded use of coal-fired power generation is the most significant economic development and environmental decision facing Kosovo, the CEA should at least provide estimates on how this decision will impact the pressing environmental problems. Furthermore, it must be clearly recognized that even if the CEA recommends public policies to help control the coal-based environmental externalities; the actual damages and

[1] Kosovo A is a 330 MW coal-based power plant that is more than 40 years old. It is considered the largest point source of pollution in the region and will be decommissioned in 2017 because it is technically and economically unfit.

[2] Kammen, Daniel M., Maryam Mozafari and Daniel Prull, 2012. Sustainable Energy Options for Kosovo: An analysis of resource availability and cost. Renewable and Appropriate Energy Laboratory, University of California, Berkeley. January 2012. This analysis concluded that: "…the capital cost of the scenario including a new coal power plant is more than double the cost of the low carbon scenario…. The business as usual path, dominated by an expanded use of low-quality coal, is not the least-cost energy option for Kosovo given the social cost of thermal generation. The coal dominant energy path also burdens future generations with an energy mix that is neither environmentally sustainable nor is it a path that maximizes job creation."

[3] Kosovo A is at the end of its operational life. Although Kosovo must replace the current electricity generation of Kosovo A (330 MW), it does not necessarily have to be further coal-based energy. Furthermore, the new associated mine operation significantly increases the size of mining compared to the old mines, which also are at the end of their operational life.

costs to people's health and agricultural sector will remain substantial. The CEA must highlight this fact and not let this most important environmental reality be diminished.

Under-estimated Air Pollution Health Costs

Several shortcomings of the CEA analysis render the air pollution health costs, mainly associated with coal production and combustion, to be under-estimated:

Population Exposure – The analysis provides no PM concentration for rural areas and thereby excludes 50% of the population from the health effects, which the CEA readily admits "probably underestimates the nationwide health effects". Given the fact that air pollution travels, for a small country like Kosovo the outright omission of the rural population represents a significant error.

Low Wage Rates – There are two main concerns with the wage rates used to determine monetary effects of health impacts (starting on page 25, see Table 2.6). Firstly, on page 25, regarding the costs of morbidity, it states that "Time losses are valued at 50 percent of average wage rates." There is no explanation for why it is taken to be 50 percent instead of 100 percent. Secondly, on page 84, regarding the costs of mortality, it states "The human capital approach values a life at the present value of future income lost due to early mortality…It is estimated at 134,800 Euro – 141,700 Euro for a child of one to three years, and 37,000 Euro for an adult whose death involves 10 years of life lost." These estimates assume that Kosovo wage rates remain very low and do not come in line with the rest of Europe, which assumes that development policy goals, e.g., donor and World Bank projects, to raise income levels in Kosovo would fail.

Annual PM concentrations and acute health impacts – The report states that annual PM concentrations (PM10 and PM2.5) are being used to estimate acute impacts like acute lower respiratory infection (ALRI), emergency room visits, etc. (see Table 2.5 and nearby text). If annual PM concentrations instead of peak PM concentrations are being used to model acute impacts, then this analysis would underestimate the magnitude of the acute impacts.

It would be helpful if the report included in its technical appendix the calculations used in the exposure-response function from the cited literature, defining its explanatory variables (and their averaging-times), and then present the value of the explanatory variables for Kosovo assumed in the health impact estimates for this study. Currently in the report, it appears that annual PM concentrations (PM10 and PM2.5) were used to estimate both chronic and acute impacts, which would under-estimate the acute impacts.

ALRI Mortality baseline – There is reason to believe that the estimated baseline level for acute lower respiratory infection (ALRI) mortality among children under-five years of age is too low because it is based on the average values for Albania, Bosnia/Herzegovina, and Macedonia (see page 23). Relative to these countries, Kosovo represents a country with high PM pollution. The power plants and coal mining processes in Obiliq are considered one of the highest point sources of air and water pollution in the region. Thus, it would be more appropriate to use the high ALRI mortality value from these countries.

Obiliq PM concentrations – The analysis uses an average PM concentration for medium and small cities that is estimated to be lower than the PM concentration annual average for Prishtina (see page 22). However, the highest PM concentration value for Kosovo would be in Obiliq where the lignite coal power plants are located. A higher PM concentration exposure for the population of Obiliq should be accounted for in the cost estimates. Studies in New England[4] find that, although populations within a 30-mile radius of coal-fired power plants make

[4] Levy, J. & J. Spengler. 2002. Modeling the benefits of power plant emission controls in Massachusetts. *J. Air & Waste Manage. Assoc.* **52**: 5–18.

up a small contribution to US aggregate respiratory illness, on a per capita basis, the impacts on those nearby populations are two to five times greater than those living at a distance. Data in Kentucky suggest similar zones of high impact.[5] This is especially important given Kosovo is a relatively small country compared to the United States. Thus, Obiliq's contribution to aggregate respiratory illness is more significant.

Under-estimated Environmental Costs

Although it is true that not all costs can be accurately monetized, the CEA does not make any effort to monetize several pressing environmental problems such as mercury impacts, water shortages, lost agricultural production, and climate change.

Risks from Mercury – The CEA does not address the substantial environmental and health risks posed by mercury. The EU Water Framework Directive (2000/60/EC) defines mercury (Hg) as a priority substance to be limited in the environment on account of the substantial risk it poses to or via the aquatic environment.[6] The EU directive on environmental standards for surface water (2008/105/EC) defines mercury limits. It is important to emphasize that mercury is a substance highly toxic to humans, ecosystems and wildlife and, like lead, of particular concern for children. High doses can be fatal, but even relatively low doses can damage the nervous system and adversely affect developing brains.

The CEA states (page 34) that "…the annual average environmental quality standards for the priority substances (heavy metals) defined by the European Union (EU) for inland surface waters and other surface waters are in general not exceeded, except for cadmium, lead, and nickel (table 3.2)." First of all, the phrase "are in general not exceeded" does not mean compliance with EU directives. Secondly, monitoring in Kosovo is patchy at best and may not have been done specifically for mercury. Moreover, there is reason to believe that mercury may be a serious concern given initial soil analysis (see below) and the fact that a significant source of mercury not addressed in the CEA is a by-product of combustion in power plant flue gases.[7] This airborne mercury is eventually deposited in water and soil. With regards to air emissions, the US EPA Air Toxics Rule (2011) establishes emission limits specifically for mercury from coal-fired power plants.[8]

As an indication of mercury associated with the Kosovo lignite coal plants and mining processes, an initial geochemical analysis[9] of soil found exceedances[10] of European mercury thresholds.[11] Given the substantial

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[5] Epstein, Paul, and J. Buonocore, et. al. Full cost accounting for the life cycle of coal. *Annals of the New York Academy of Sciences*, Volume 1219, February 2011.

[6] The priority substances are defined by Directive 2000/60/EC (the Water Framework Directive), which establishes a list of 33 priority substances including cadmium, lead, mercury, nickel and its compounds, benzene, polyaromatic hydrocarbons (PAH) and DDT. For each river basin, Member States must establish an inventory of emissions, discharges and losses of all substances identified in this Directive. On the basis of this inventory, the Commission must verify whether, by 2018, the objectives of gradually reducing pollution from priority substances and of ceasing or phasing out emissions, discharges and losses of priority hazardous substances are reached.

[7] It is found in varying percentages in three basic chemical forms: particulate-bound mercury, oxidized mercury (primarily mercuric chloride — HgCl2), and elemental mercury. The levels of Hg in the flue gas emissions have been found to be between 7-10 μg Nm-3 (S. Touliou, S.M. Spyrakis, and K. D. Panopoulos, 2009. Mercury and heavy metals emissions from a lignite-fired power plant with FGD. 4th European Combustion Meeting, Vienna University of Technology, Vienna, Austria. April 2009.).

[8] U.S. Environmental Protection Agency. Fact Sheet: Power Plant Mercury and Air Toxics Standards; Overview of Proposed Rule and Impacts. March 16, 2011. http://www.epa.gov/airquality/powerplanttoxics/pdfs/overviewfactsheet.pdf with compliance required by early 2015. Since 2007, at least 45 individual US states have already required power plant mercury regulations. The new Air Toxics Rule will reduce mercury by 91 percent and applies to both existing and new coal fired power plants 25 MW and larger.

[9] World Bank, 2008. Strategic Environmental and Social Assessment (SESA): Environmental and Social Safeguard Advisory Services for Private Sector Participation in the Development of New Generation Capacity, Related Transmission and the Development of the Sibovc

danger posed by this highly toxic substance, priority should be placed in establishing both the water and soil contamination levels and the emission levels from the coal plants. Furthermore, for guidance on monetizing impacts on cognitive development and cardiovascular disease due to mercury exposure see footnote.[12] To account for the costs of mercury abatement, the CEA should begin by including the cost of existing effective air pollution control devices to capture and control mercury emissions, which are considered industry best practice.

Water Supply Shortages: Water supply shortages represent a substantial environmental problem that is not adequately addressed in the CEA. The report rightly emphasizes that Kosovo has few water resources, but with regards to water quantity issues the analysis only provides cost estimates related to providing underserved areas with safe drinking water. The CEA does not estimate costs associated with decreases in overall water quantity. The reality is that if Kosovo continues on its current path of further coal development there may not be enough water to supply the additional 600,000 people or other competing sectors, such as agriculture. On page 41, the CEA states that "For the three main industrial operations – KEK coal-fired power plants, Ferronikeli, and Sharrcem (cement) – water consumption is a more important issue than wastewater generation." The CEA further states (page 34) that "Industrial water needs are 150 million cubic meters (m^3) a year, around 30 percent of total water consumption." However, there is no attempt made to evaluate what impact this consumption has on other sectors or the associated costs of this consumption. In order to be in compliance with Kosovo's Water Law and the EU Water Framework Directive 2000/60/EC[13], Kosovo needs to establish water management practices and a strategy that ensure long-term water supply to the residential, industrial, energy, and agricultural sectors.

In the case of the coal-fired power plants, the CEA should point out the significant water consumption concerns, especially in the context of the planned development of expanded coal power production. The Kosovo B and the new KRPP power plants will both get their water supply from the Iber-Lepence water system. A European Agency for Reconstruction (EAR) water study[14] has already assessed this water system to be "severely stressed."[15] Adding to this concern, it appears that the EAR assessment underestimated the water requirements for hydropower[16] and irrigation. For example, the Ministry of Agriculture, Forestry and Rural Development

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Lignite Field. Government of Kosovo, Ministry of Energy and Mining, World Bank Lignite Power Technical Assistance Project (LPTAP). June, 2008.

[10] The analysis also found exceedances for chromium (Cr), nickel (Ni) and cadmium (Cd). Referring to Italian regulations on threshold values for soil quality.

[11] The World Bank LPTAP SESA (2008) recommended … "to complete the description of the air emissions scenario, quarterly monitoring is proposed at the main stacks of Kosovo A and Kosovo B to investigate the chemical composition of particulates for [potentially harmful to health] trace elements, including: heavy metal content (Mercury, vanadium, Nickel, Cadmium, Lead, Copper, Zinc and Arsenic) and phenols (PAH).

[12] Epstein, Paul, and J. Buonocore, et. al. Full cost accounting for the life cycle of coal. *Annals of the New York Academy of Sciences*, Volume 1219, February 2011; and for direct costs of mercury emissions from coal-fired power plants causing mental retardation and lost productivity in the form of IQ detriments see Trasande *et al*. *Trasande, L., P. Landrigan & C. Schechter. 2005. Public health and economic consequences of methyl mercury toxicity to the developing brain. Environ. Health Perspect.* ***113****: 590–596; and Trasande, L., C. Schechter, K. Haynes & P. Landrigan. 2006. Mental retardation and prenatal methylmercury toxicity. Am. J. Ind. Med.* ***49****: 153–158.*

[13] EU Water Framework Directive 2000/60/EC: The purpose of this Directive is to establish a framework for the protection of inland surface waters, transitional waters, coastal waters and groundwater which…..promotes sustainable water use based on a long-term protection of available water resources; … and thereby contributes to: …- the provision of the sufficient supply of good quality surface water and groundwater as needed for sustainable, balanced and equitable water use,….

[14] *Water supply from the Iber-Lepenc hydro system for the proposed Kosovo C power plant* (February 2008), funded by the European Agency for Reconstruction (EAR) and developed by COWI consortium.

[15] Currently, the water exploitation index (WEI) is assessed at 50% for an average year. Severe water stress can occur where the WEI exceeds 40%.

foresees bringing 18,000 ha under irrigation (with water from the Iber-Lepenc canal) to further develop the agriculture sector in the medium- to long-term (5-10 years). The EAR water assessment only considered scenarios of 5,000 and 10,000 ha for agricultural irrigation development and even so still predicts unsustainable competition for water between potable water needs, agriculture, industry, and energy.

In addition, the expanded coal mining activities associated with the proposed new coal-fired power plant stand to increase industrial water consumption even more. Open pit coal mining requires large amounts of water for the coal processing plant and dust suppression. To meet this requirement mines remove surface or groundwater supplies from nearby agricultural or domestic users. These water resources (once separated from their original environment) are rarely returned after mining, which often leads to a permanent degradation in agricultural productivity and potable water supplies.

To begin monetizing the environmental and economic costs of water consumption/supply shortages, the CEA should start with the EU Water Framework Directive's pricing policy[17] and should account for opportunity costs of less water availability to other sectors, such as agriculture. In addition, with respect to the coal power plants, the CEA should also include the costs associated with the EAR water study's recommended investments to the Iber-Lepence water system, including reduction of leakage from the canal system, a buffer basin, and compensation in the secondary reservoir.

Lost Agricultural Production: The approach of the CEA to quantify the cost of individual types of pollution on individual resources (e.g., water, air, forests) means that the aggregate impact of several sources of environmental degradation that directly impact agricultural production is not prioritized as it should be. Furthermore, the economic costs associated with loss agricultural production are not accounted for in the individual pollution sources (e.g. acid rain, water scarcity, land conversion, soil contamination). The lack of attention given to the agriculture sector is a significant over sight.

Farmland and crops in Kosovo are damaged by a multitude of activities, many of them associated with the use of coal, including: coal mining pollution, coal combustion pollution, lack of irrigation water, soil contamination from acid rain from sulfur-dioxide and carbonic acid emissions[18], and land conversion due to construction and mining activities. As a result, quality farmland in Kosovo is in short supply. Quantifying the aggregate impacts of all of these sources of damage on agriculture is of utmost importance to Kosovo because the agriculture sector is the highest employer in Kosovo and the biggest contributor to GDP. The CEA needs to provide a comprehensive understanding of how the aggregate environmental degradation threatens the objectives and goals of the Agriculture and Rural Development Strategy 2009-13, including increased income levels; improved quality standards; increased employment opportunities; and facilitated entry to the EU.

Further compounding the importance of impacts on agriculture is the fact that in recent years, food prices and, consequently, farmland prices in Europe and specifically in the region have been increasing rapidly. For

[16] The EAR study does not account for the hydropower needs from the Iber-Lepenc water system.

[17] EU Water Framework Directive 2000/60/EC: Article 9: Recovery of costs for water services - 1. Member States shall take account of the principle of recovery of the costs of water services, including environmental and resource costs, having regard to the economic analysis conducted according to Annex III, and in accordance in particular with the polluter pays principle. Member States shall ensure by 2010 – that water-pricing policies provide adequate incentives for users to use water resources efficiently, and thereby contribute to the environmental objectives of this Directive, - an adequate contribution of the different water uses (disaggregated into at least industry, households and agriculture) to the recovery of the costs of water services, based on the economic analysis conducted according to Annex III and taking account of the polluter pays principle…Member States may in so doing have regard to the social, environmental and economic effects of the recovery as well as the geographic and climatic conditions of the region or regions affected.

[18] In addition to acid rain due to sulfur-dioxide emissions, another form of acid rain is due to carbon dioxide emissions of coal plants. When released into the atmosphere, the carbon dioxide molecules react with water molecules, to slowly produce carbonic acid (H_2CO_3). This, in turn, returns to the earth as a corrosive substance. This cannot be prevented as easily as sulfur-dioxide emissions.

example, in some regions of Poland farmland prices have gone up fourfold since Poland joined the EU - from €1,207 per hectare in 2004 to €4,500 per hectare in 2010.[19] In 2011, the average price per hectare in Romania was €1,972, up from €1,700 in 2010, €1,500 in 2009, and just €927 in 2007.[20] In Bulgaria, agricultural land is currently fetching around €5,316 per hectare.[21] Moreover, the escalating food prices need to be factored into the costs associated with foregone agricultural income in Kosovo.

On page 64, the CEA states "Kosovo Energy Corporation's ash disposal and mining operations on average in the last 50 years have taken away roughly 20 hectares of land a year that is dominated by agricultural land…" This estimate appears to only include land used for overburden and ash disposal purposes (see overburden land use on page 68) and, thus, underestimates the agricultural land affected. It does not include land used directly for the mining and power facilities or areas required for safety zones and coal transport, i.e., mainly roads and coal conveyor belt area. The CEA also points out that much of the 1,000 hectares of overburden land that is currently slated to be cleaned up and reclaimed will not be suitable for agriculture again, so this 1,000 ha need to be counted as permanently lost annual agricultural production.

In addition to direct land acquisition, coal-fired power plant discharges have been found to negatively affect soil fertility and crop growth (e.g., one study found a 10 to 30% reduction in germination for pea and wheat crops[22]). Further to the agricultural costs of coal production, open pit coal mining requires large amounts of water for the coal processing plant and dust suppression. These water resources (once separated from their original environment) are rarely returned after mining, which often leads to a permanent degradation in agricultural productivity. Given Kosovo has the real potential for substantial losses to agricultural production related to power plant emissions and coal mining processes, the CEA must account for these losses.

Lastly, the CEA does not assess the impacts on agriculture posed by the proposed new coal-fired power plant and expanded coal mining operations. In addition to the unresolved water supply issues that will impact irrigation discussed above, the project will involve the acquisition of land that is currently under agricultural production as well as fertile land that could be brought under production in the future. The new mining field will acquire approximately 13% of the territory of the Obiliq Municipality, which is mainly inhabited by large families who work in agricultural enterprises or independently as subsistence farmers.[23] There is not enough replacement agricultural land to resettle people who rely on farming for their livelihoods.[24]
Unfortunately, the CEA provides no estimated costs associated with agricultural land and production losses.

Climate Change: The CEA does not provide cost estimates for damages related to climate change. It is important and relatively simple for Kosovo to estimate these costs. Kosovo is vulnerable to climate change because it is already suffering from water shortage concerns and the largest employer in Kosovo is agriculture,

[19] Agra-net, November 2010. Farmland prices surge in Eastern Europe. November 19, 2010. http://www.agra-net.com/portal2/home.jsp?template=newsarticle&artid=20017827353&pubid=ag002 [as assessed on July 4, 2012]

[20] DTZ Echinox's 'Agricultural Land Investment Romania 2012'.

[21] Based on prices shown for sold farm land on Agrilandsales.com on July 3, 2012.

[22] Ajmal, M. and Khan, MA. 1986. Effects of coal-fired thermal power plant discharges on agricultural soil and crop plants. *Environmental Research*, 1986 Apr;39(2):405-17

[23] World Bank, 2008. Strategic Environmental and Social Assessment (SESA): Environmental and Social Safeguard Advisory Services for Private Sector Participation in the Development of New Generation Capacity, Related Transmission and the Development of the Sibovc Lignite Field. Government of Kosovo, Ministry of Energy and Mining, World Bank Lignite Power Technical Assistance Project (LPTAP). June, 2008.

[24] *Ibid.*

which is a climate-sensitive sector. Although Kosovo's greenhouse gas (GHG) emissions represent a small amount relative to global emissions, given acceptance into the EU is a stated goal, the EU's overall climate change targets need to be considered as well as the costs to Kosovo's agriculture sector. Moreover, if Kosovo does eventually join the EU, it will be subjected to the EU's carbon price and its GHG emissions will become a real cost and not simply an externality.

With regards to Kosovo's coal plants, in addition to CO_2 emissions, the coal plants also add to climate change through the substantial PM emissions. Particulate matter is a heat-trapping agent, absorbing solar radiation, and, even at great distances, decreasing reflectivity (albedo) by settling in snow and ice.[25] The contribution of particulates (from coal, diesel, and biomass burning) to climate change has, until recently, been underestimated.[26] Though short-lived, the global warming potential per volume is 500 times that of CO_2.[27] In addition to direct stack emissions, there are also methane emissions from coal mines.

Climate change impacts can be monetized using estimates of the social cost of carbon—the valuation of the damages due to emissions of one metric ton of carbon, of $30/ton of CO_2equivalent (CO_2e), with low and high estimates of $10/ton and $100/ton. This range of the social cost of carbon is consistent with the 2009 National Research Council (NRC) report on the "Hidden Costs of Energy." The CEA could start by calculating the CO_2 costs associated with coal plants Kosovo A and B as follows using the following emissions estimates: Kosovo A equals approximately 2,848,086 tons CO_2e/year and Kosovo B equals approximately 4,249,301 tons CO_2e/year.[28] At $10/ton CO_2e, it would equal $28.5 million/year and $42.5 million/year respectively.

It is important for the CEA to emphasize that even though the new Kosovo C coal-fired-power plant represents lower specific CO_2 emissions relative to the old Kosovo A plant, ultimately it will result in higher total CO_2 emissions.

Recommendations to Improve the Kosovo CEA

Compare Abatement Options - Energy Alternatives: Given the extremely high social and environmental costs associated with lignite coal development, it is essential to thoroughly investigate energy alternatives. The CEA should provide a review of existing comparative analyses of life cycle costs of all electricity generation options[29] and if needed recommend additional analyses in order to guide future energy development as well as the appropriate social, environmental, and tax policies.

Account for Agricultural Losses: Given Kosovo has the real potential for substantial agricultural losses resulting from coal mining pollution, coal combustion pollution, lack of irrigation water, soil contamination, and land conversion, the CEA needs to provide an estimate of aggregate costs to agricultural production. In addition, the

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[25] *Hansen, J., M. Sato, P. Kharecha, et al . 2007. Climate change and trace gases. Philos. Transact. A Math Phys Eng Sci.* ***365****: 1925–1954. ;and Jacobson, M.Z. 2002. Control of fossil-fuel particulate black carbon and organic matter, possibly the most effective method of slowing global warming. J. Geophys. Res.* ***107****: (D19), 4410, doi:10.1029/2001JD001376, 22pp. [pp ACH 16-1 to 16-22]. http://www.stanford.edu/group/efmh/fossil/fossil.pdf (accessed December 9, 2010).; and Ramanathan, V. & G. Carmichael. 2008. Global and regional climate changes due to black carbon. Nat. Geosci.* ***1****: 221–227..*

[26] Epstein, Paul, and J. Buonocore, et. al. Full cost accounting for the life cycle of coal. *Annals of the New York Academy of Sciences*, Volume 1219, February 2011

[27] *Ibid.*

[28] Department of Environment, Corporation Services, KEK J.S.C, 2010. Environmental Report 2010. Pristina, 2010.

[29] See: Kammen, Daniel M., Maryam Mozafari and Daniel Prull, 2012. Sustainable Energy Options for Kosovo: An analysis of resource availability and cost. Renewable and Appropriate Energy Laboratory, University of California, Berkeley. January 2012.

CEA needs to provide a comprehensive understanding of how all the environmental damages to agriculture overall threaten the objectives and goals of the Agriculture and Rural Development Strategy 2009-13, including increased farming, increased income levels; improved quality standards; and increased employment opportunities.

Account for Climate Change Costs: Climate change impacts can be monetized using estimates of the social cost of carbon—the valuation of the damages due to emissions of one metric ton of carbon. It is important for the CEA to emphasize that even though the new Kosovo C coal-fired-power plant represents lower specific CO_2 emissions relative to the old Kosovo A plant, ultimately it will result in higher total CO_2 emissions.

Water Supply Shortages: The CEA should provide the environmental and economic costs of water consumption/supply shortages (e.g., opportunity costs), specifically associated with existing and planned lignite power generation. The CEA should emphasize the development of a comprehensive policy, institutional and planning framework for water resource management in the Iber-Lepenc system.

Include Mercury Damages: The CEA should place priority on establishing the mercury contamination levels for water and soil and should obtain the mercury emission levels from the current and planned coal plants. The CEA should estimate the costs to cognitive development and cardiovascular disease due to mercury exposure from coal plant emissions.[30]

Improve Estimated Air Pollution Health Costs: The CEA should fix several short comings in the air pollution health costs, including: PM concentration exposure levels for rural populations; increased wage rates; peak PM concentrations for acute health effects; ALRI mortality baseline based on high value from comparison countries; and a higher PM concentration exposure for the population of Obiliq.

Funding Sources: As the CEA notes, the Ministry of Environment and Spatial Planning's already low budget is being further reduced. This will make compliance and enforcement of existing and new environmental protection plans and policies very difficult. The CEA needs to emphasize that funds are immediately needed for clean enterprises, water treatment, land, and environmental monitoring. In addition to donor money, fund-generating methods should include: transport fees on coal haul trucks and a comprehensive structure of credits and taxes to remove misaligned incentives, specifically for environmentally damaging activities and fuel sources.

Action Plan: The CEA needs to prioritize an action plan to prevent predicted severe environmental costs and societal damages. The action plan needs to be based on comprehensive comparisons of abatement options.

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[30] For costs of mercury emissions from coal-fired power plants causing mental retardation and lost productivity in the form of IQ detriments see Trasande *et al*. *Trasande, L., P. Landrigan & C. Schechter. 2005. Public health and economic consequences of methyl mercury toxicity to the developing brain. Environ. Health Perspect.* ***113****: 590–596; and Trasande, L., C. Schechter, K. Haynes & P. Landrigan. 2006. Mental retardation and prenatal methylmercury toxicity. Am. J. Ind. Med.* ***49****: 153–158.*