Research Article





The Impact of the TC "Kosova" in Contamination with Heavy Metal, in the River Sitnicë, Groundwater and Soils of this Area

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ABSTRACT

We have analyzed elements, such as: As, Cd, Cr, Co, Fe, Mn, Ni, Pb and Zn in river Sitnicë, of TC"KOSOVA. Sitnicë river, traverses the zone of Obilic, where are TC"KOSOVA 'A and B ". In soil samples, we found; As, Cd, Cr, Co, Fe, Mn, Ni, Pb and Zn and if these values are compared with international standards allowed, have value, for two seasons, April -August, in samples of soil, wasteland and farm land. The results of this study, the samples analyzed are reading methods: ICP-OES and SAA, contemporary methods for reading and analysis of trace metals. Also, the values presented are compared with other values, which are presented in different papers, local and international.

Keywords: Power Plants "KEK", heavy metals, water, river, Sitnicë, soil.

INTRODUCTION

n this research we are focused, in pollution of heavy metal in the area affected, by the plants Kosovo¹. The industrial giant, to produce energy by burning fossil material such as lignite, has left as waste ashes in landfills around the plants, has released tons of all as polluting particles in the air, the residual in the soil, so these are indicators that the impact of heavy metals in the environment; air, surface water and soil, is more than evident^{1,2}.

Over time, the amount of dust particles, arising from the stacks and the amount of ash landfills, distributed by winds, polluting more and more, the environment with heavy metals^{1,5}. Add to this the impact of coal exploitation activity as raw materials for power plants, since the basins of mine where digging excavators, transfer conveyor^{8,10}, separation before combustion process and storage, are sources of pollution with dust and particles coal in air, water and land surface around power stations, ^{2,9,11}. For the deposition of heavy metals, essential, and those that disrupt the natural balance of the anthropogenic factor^{6,12,13}, the research through chemical analysis, we derived experimental results, which allow us to provide environmental impact assessment, the elements present^{2,5}.

All this enables, to take appropriate measures with existing methods, the prevention and elimination of environmental pollution, which contamination will be a permanent risk to people's health and living world in general^{3,13}.

For the determination of heavy metals are applied analytical techniques; ICP-OES and SAA^{4,6}. The influence of different components as pollutants released by technological processes, is not denied, because indirectly and is continuing with consequences for the environment and living things that live there^{5,7,9}. Discharging water, penetrate into underground layers, by transfer pollutants and heavy metals^{14,15}, which the plant absorbs and carries them to the animals or even humans^{5,16}. Also, wash the adjoining lands and waters rainfalls, entailed quite toxic substances, which amount to crops, then the underground migration, reach wells used for drinking water¹⁷.

MATERIALS AND METHODS

The study of the scope in this work, involves the existing state of the environment in the area of power plant Kosova. Study subjects have received river Sitnicë, water body as a recipient from the reference point, outside of pollution, part of the river that passes through the area of power plant Kosova, and the state of the river a few miles, then the energy complex. We are also focused on analyzing the groundwater, wells in the vicinity of these areas and analyzing wasteland and farmland. The objective of setting have been, concentrations of heavy metals, where sampling was conducted in two seasons time, in April and August/2013, comparisons are made in different seasons of time. Laboratory work was conducted in the laboratory "Agroved" in Fushë Kosovë, IHMK and IKSHP, where methods are used; ICP-OES and SAA. Water samples were set in polyethylene bottles PVC, in quantities of two liters. Furthermore, there was 1ml samples conservation of HCl/L. Soil samples were collected in fallow lands and farmland, at 15-30 cm depth, the amount about of 3-5kg, which after mixing and divisions is reduced to 1kg. The sample was dried in air, is tenuous at mills and then dried in electric oven temperature 105 °C to constant weight. For analysis were taken 1-5 g. Method 3052 is used for the treatment of soil sample, and the method 3015, is used for treating the



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water sample. It used guide for ICP-OES working-form 12 working guide for microwave-form13, working guide mill <75µ-form-14.2, working guide mill <2mm-form-14.1, working guide separator samples, forms 14.3 and working guide for balance, form 14. In the treatment of water samples, the samples are filtered first, and then from each sample, take 50 ml and place in Teflon, each sample is added from 1ml HCl and 5ml HNO₃, and then becomes the samples mineralization in microwave. To the working principle of microwave, first elected assigned program 15, thereafter elected Teflon type DAP-100, set the number of teflons and go with the start, by the time programmed by; 5-15-20 and 25 minutes.

After mineralization, samples drawn from Teflon, filtered in 100 ml normal container, leveled with distilled water until the signs, there after taken this sample, eprovete therein placed in autosimpler and ICP-OES read. While, in the treatment of soil samples, we initially 3.5 g sample of soil, placed in teflon, then add 10ml water regal, microwaveable, certain selected program (19), thereafter elected teflone type DAP-100, set the number of Teflon. After becoming extraction, filtering samples, leveling with distilled water in containers of 100ml and now normal samples are ready for ICP-OES reading. Below, are presented sampling points, along the river Sitnicë, Vragoli village of Fushë Kosovë municipality, the zone of power plant "Kosova" and the Municipality of Kastriot, to the village Gllavatin for this municipality, groundwater sampling points, in the zone of power plant "Kosova" and samples of soils in this zone.

RESULTS AND DISCUSSION

The results in this work, are presented in figure form, for each sampling points are presented the values of the concentration of heavy metals in the environment; soil, surface water and groundwater.

We determination of heavy metals in surface waters, in the river Sitnicë and groundwater (wells) and soil of the TC "KOSOVA zone". As seen, the concentration of heavy metals, including all body parts hydro. Referring to the furthest sampled point, reflect a normal concentration of analyzed elements. The river Sitnicë, except to the extent of the contamination of the areas, covered by the grace of emissions from chimneys, there the pollution that comes from the dust of ash, landfills and coal dust from separations wards, which come out wind and dissolve from the flushing of atmospheric water. A quantity of water flowing in the river Sitnicë, and considerable amount of water penetrating capillaries, until the layers of groundwater. Values and analytical techniques; ICP-OES and SAA, indicate that the contamination of the water approaching the first and second degree of water quality. Increasingly under restrictive values, allowed effluent parameters, which can be downloaded into water, or public sewage network, the standards developed by the Ministry of Environment and Spatial Planning, the Republic of Kosovo. From surface waters, Figure 1 and 3, for the month of April,: S1(Ref.Sample)- SW; S2-SW; S3-SW, and containing the flow of Sitnicë, dominate metals; Co, Fe, Mn, Pb and Zn, whereas groundwater, except became presence of Fe, which is not detected at the point S2-UG.W, the analytical techniques used in laboratory work. In analyzing the soil, which refer to results from Figure 2 and 4 of these areas, we have the presence of all heavy metals such as; As, Cd, Cr, Co, Fe, Mn, Ni, Pb and Zn. According to the standards for maximum permitted levels, downloading and distribution of pollutants in the soil. In Figure 2, we have increased concentrations in this point; S1-Wasteland, for these metals: As; four times, Cr, Pb, for three times and Zn in small increments. Metals Cd and Co, are permitted levels of concentrations. While the point S2-Formland, have exceeded the allowed values, the concentrations in the following metals as: As, Cr, Ni and Pb, with concentration exceeding 1.3 times. Metals; Cd, Co and Zn, are permitted levels of concentrations. In the summer season, at August, for water, refer to the results from figure 7 to determine the SAA, according to the results, we can conclude that there is an increase of the concentrations of heavy metals such as; Co, Fe, Mn, Pb, Ni and here we have the presence of Ni, since last season, was not detected. It is obvious that it is the result of laundering fields from multiple spring rains this year. We have the presence of; Fe, Mn, Pb, Ni and Zn, attend the most influential areas of power plants "Kosovo". Even in this season monitoring, are not detected; As, Cd, and Cr in surface waters and groundwater. For sampling at April, the analysis of the soil sample, which we refer to results from Figure 6 and 8, the points S1-Wasteland and S2-Farmland, we have the presence of all heavy metals such as; As, Cd, Cr, Co, Fe, Mn, Ni, Pb and Zn. Elements, Cd, Co and Zn also to S2-Formland, are permitted levels of concentrations. Metals that are not in Figure 4, are not part of the reading and interpretation of the results table.

CONCLUSION

In our surroundings where we live, near of the Kosovo power plants, we are attacked from the potential pollutant as: CO₂, NO_x, SO₂ and airborne particles in powder form, the ashes, from remaining after the burning of fossil material, such as coal. Given that coal has heavy metal content, which necessarily are more concentrated in the rest of combustion and knowing also the potential activities thermal energy, with a working time by more than half century of power plants "Kosovo "and work more than thirty years of power plant "Kosova B", has made uninterrupted pollution of air, soil, surface water and groundwater. The impact of pollution from these energetic capacities, reaches several tens of kilometers, however, we are limited in the most likely affected by pollution. We was appointed the object of research the river Sitnicë, which traverses the lengthwise (horizontal portion) of these territories, carrying with them the general pollution, all the types, exceeding the regional and local boundaries. Heavy metals in plants can pass through the water and then indirectly in the daily food, human and animal organisms.



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Figure 1: The concentration of heavy metals, in water samples, tested by the method; ICP-OES, April-2013.



Figure 3: The concentration of heavy metals in water samples, tested by the method; SAA, April-2013.







Figure 7: The concentration of heavy metals in water samples, tested by the method, SAA, August- 2013.



Figure 2: The concentration of heavy metals in soil samples, tested by the method; ICP-OES, April- 2013.



Figure 4: Concentration of heavy metals in soil samples, tested by the method, SAA, April-2013.



Figure 6: The concentration of heavy metals in soil samples, tested by the method; ICP-OES, August-2013.







Small amounts of heavy metals may be necessary for health, but in increased quantities, can cause acute or chronic poisoning. Making continuously heavy metals, released from the coal mines and from the power plants burning of coal, leading to bioaccumulation in plants and animals, bringing the risk of mention.

This can result in reduced damage to the central nervous system, decrease energy level, damage to blood composition, lungs, kidneys, liver and other vital organs. By doing experimental research-laboratory, the results obtained we can conclude that, have the presence of heavy metals such as; Pb, Mn, Fe Ni and Zn in surface waters of the river and underground water (wells), up to second degree level of the pollution. In soil analyzes, we detect all the investigated heavy metals such as; As, Cd, Cr, Co, Fe, Mn, Ni, Pb, Zn and according to their concentration, the level of pollution with heavy metals, reaches to a high degree of pollution, passing the maximum allowed values for some time, according to the national and international standard. We find that, in recent years there has worked to stop the intensity of pollution, with these measures, such as:

- Two old blocks A1 and A2, the power plant "Kosova A" has stopped Further work.
- Are set filters to reduce flying ash particles, to a minimum, in blocks A3, A4 and A5.;
- Has implemented the function to transfer the ash with plumbing pipe system, after the exploitation of the coal;

Is being applied reclamation of ash (covering the surfaces of the ash dumps, with thick layers of earth and then to doing greening with plants low and high), in order to prevent transfer of particles ash from the winds and also not to be rinsed landfills from the rain. The power plant of "Kosova B", has a more pronounced emission after filter design is made according to the standards of the time and already outdated, filters are overused, almost out of order. It should intervene in the future, for the design of new filters, in line with European standards. Also, should minimize the capacity of the power plants that burn the fossil and to make the other alternative, sources that can orient in the environmental healthy, energy, such as; water, wind, bioenergy and solar energy.

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