



The water quality of Alfios River and the effects on it from the mining activities, in the area of Megalopolis. Estimating the quality of the river system by Phreeqc modeling.

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Alfios is located in Peloponese, in the area of Megalopolis, in southern Greece. In this area, intensive lignite mining activities take place and two power plants for the compulsion of lignite. Alfios River flows near the mines, the power plants and the waste dump areas. In this paper the quality of Alfios River was examined with the application of Phreeqc modeling. Fifty water samples were collected from five different sites of Alfios River along its path (two sites before it enters in the mining area and sites, where the outflow of the power plants takes place below the mining area).

The results from the evaluation of the samplings show:

- From A1 site, before the mining area and the power plants of the area, to A4 site, after the mining area near Kiparissia mine, there is a continuous deterioration along its path as the concentration of SO_4^{-2} , TDS, NO_2^- , Ca^{+2} , Mg^{+2} , NH_4^+ is increased.
- The water in Alfios River is generally of a very good quality and has low val-

ues of sodium and a medium salinity, which shows that there is a very minor influence from the waste dump area.

- The water type of Alfios River is CaHCO_3 above the mining area and $\text{Ca-SO}_4\text{-HCO}_3$ for all the other samples along the mining area.
- The main source of pollution is the sewage of Megalopolis town.
- The mining activity has a small influence of the water quality of Alfios.
- Special role in the chemical composition of Alfios plays the geological settings of the area.
- The increased concentrations of some elements are due to:
 - NO_2^- , NO_3^- : fertilizers and agricultural activities.
 - SO_4^{2-} : is related to the chemical composition of the waste dump materials (flying ash—first analysis took place before the deposit of desulfurization products) and the dissolution of SO_3 of the flying ash.
 - Ca^{+2} , Mg^{+2} : the mineralogical composition of the formations of the area (carboniferous – dolomites, marls and carbonated sediments) and the dissolution of CaO and MgO of the flying ash.

The hydrogeological characteristics of the aquifers in hydraulic connection with the river were studied: a) the aquifer in the waste dump area b) the karstic aquifer and c) the surface water (waste water from the dump areas of the mines). The scenario which was studied is mixing water from a) Alfios River b) water of the dumping area (of bad quality) and c) water of the karstic aquifer (of good quality) in different rates ($90 \div 5 \div 5$) and ($90 \div 8 \div 2$). These rates were tested because of the hydrogeology of the area and the connection between them. The quality of the mixing water was estimated by Phreeqc modeling.

- The result from this mixing was a very good quality water with pH value 7.4
- Al, Ba, Ca, Cl, F, Fe, K, Mg, N, S, Si has similar concentrations with the initials.
- Only the concentrations of Zn, Mn, Na have higher values than the initial

The general conclusion is that there is not significant effect on Alfios from the mining activities of the area.