






THE EFFECTS OF ESKİŞEHİR CEMENT PLANT ON AIR POLLUTION, AGRICULTURAL POLLUTION, HUMAN AND ENVIRONMENT

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ABSTRACT. With the industrial revolution, the establishment of large factories, industrialization and the increase in the human population have increased the human pressure on natural resources significantly. Major mining and processing activities are carried out worldwide in order to meet the increasing raw material need with the accelerated production processes. The effects on the nature of the mining activities carried out in many countries rich in natural resources, especially Turkey unfortunately is often devastating. The short and long-term effects of unconsciously established facilities on the biotic and abiotic environment without taking into account the short and long-term environmental impact assessments, especially in the regions where the old enterprises are located, appear noticeably and dramatically. Unfortunately, sometimes serious irreversible deterioration occurs in habitats and ecosystems in the areas where these facilities are located. There are also many different industrial facilities within the borders of Eskişehir province. Eskişehir Cement factory, which is the subject of this study, was chosen because it has been the subject of complaints by the local people for years and unfortunately, environmentally friendly solutions to solve these complaints were not brought. The negative effects of mining activities on human health and the environment can be minimized by scientific measures. The most important aim of our study is to draw attention to facilities experiencing similar environmental problems to the Eskişehir Cement factory.

Keywords: *Eskişehir cement plant, air pollution, agricultural pollution, human and environment*

INTRODUCTION

The industrial revolution has had many effects on humanity and the environment. Between these effects, especially the prolongation of average human life and the increasing population indirectly affected the environment and nature. The increase in the human population brings with it increasing demands. On the other hand, the impacts of the factories established unconsciously in order to meet the increasing demands of the human population on the environment can reach destructive levels. The best example of this situation is global warming, which we visibly feel today as a result of the increasing atmospheric concentrations of greenhouse gases that are unconsciously released into the atmosphere. Undoubtedly, the biggest factor in the emergence of global warming is the relentless increase in the carbon footprint per individual in the last 200 years with the industrial revolution. Considering the permanent damage to natural vegetation and their habitats in order to carry out industrial activities, we come across the fact that we are very close to the irreversible line [1, 2].

As in all the world in recent years, environmental pollution is one of Turkey's most important problem. As mentioned above, the effects of industrial activities on the

environment are on a global scale, but every facility built unconsciously damages the biotic and abiotic environment in their region depending on the production process they perform. The effects of unplanned facilities that are not nature and environment friendly, and waste disposal processes are not carried out properly affect human health directly or indirectly with the environment. Moreover, these impacts can cause permanent damage or fatal consequences depending on the amount and type of environmental pollutants created in the long term. One of the activities known to cause the aforementioned damages when carried out in unconscious facilities is mining activities. Undoubtedly, mining activities have been an activity that has been tried to facilitate human life from past to present. However, the realization of very large-scale mining and operation activities in order to meet the raw material needs arising with the industrial revolution resulted in more pollution of the environment [3,4, 5].

The effects of environmental pollution emerging as a result of increasing industrial activities have reached noticeable levels in our country, especially in recent years. The increasing number of factories established has led to the need for new lands where these factories will be established. When selecting the locations of these facilities, it is imperative to select suitable areas, taking into account many important issues such as the damage they may cause to the environment and ecosystem in the short and long term, and their effects on local people. In addition, it is necessary to determine and control the necessary waste disposal processes in the regions where the facilities will be established, to determine the species and ecosystem diversity of the region where biodiversity studies will be carried out in the relevant areas. Also, the creation of the species conservation action plans is important to establish the nature friend facilities. However, keeping commercial concerns at the forefront during the location selection process and therefore establishing facilities by making the wrong location unfortunately causes serious problems in human, animal and plant life. In the ongoing process, the fact that these factories continue their activities inadequate or without taking any precautions against the pollution they create can sometimes create irreversible problems in terms of health [6, 7, 8].

There are also many different industrial facilities within the borders of Eskişehir province. Eskişehir Cement Factory, which is the subject of this study, was chosen because it has been the subject of complaints by the local people for years and unfortunately, environmentally friendly solutions to solve these complaints were not brought. The negative effects of mining activities on human health and the environment can be minimized by scientific measures. The most important aim of our study is to draw attention to this problem and offer solutions to facilities experiencing similar problems through the relevant sample facility.

ESKİŞEHİR CEMENT FACTORY

Eskişehir Cement Factory was put into service in 1954. The factory is 23 km away from Eskişehir center, on the Eskişehir-Bursa highway, around Çukurhisar village in the center (Fig. 1). The location of the factory established on the side of the highway is located at a point united with the city center. Due to the fact that the city center and the fields, gardens and vineyards are side by side, the dust from the factory chimneys threatens the health of the people living in the village, as well as agricultural activities.

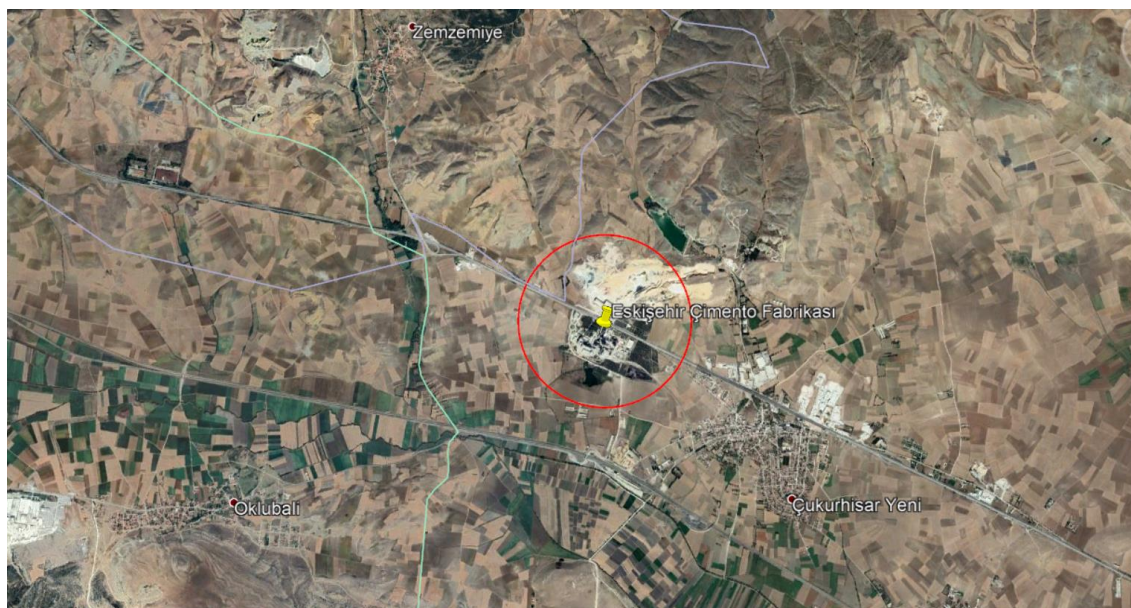


Fig. 1. Location of Eskişehir Cement Factory

Eskişehir Cement Factory creates a serious visual pollution for Çukurhisar neighborhood center and its immediate surroundings. The main reason for this pollution is the air released from the factory chimneys without sufficient infiltration into the atmosphere. Cement particles (dust) suspended in the smoke coming out of the chimneys when the factory is operating can even be seen in the atmosphere around the factory. Moreover, these particles discharged into the atmosphere are transported to the agricultural areas and settlements around the factory by atmospheric air movements. The distance between the center of Çukurhisar neighborhood, which is the closest to the factory, and the factory center is approximately 2 km. Apart from Çukurhisar district, the distance between Oklubalı and Zemzemiye districts and the factory is approximately 4.5 km. Although other settlements are relatively affected by the factory, it is seen that the residents of Çukurhisar district are the most exposed to factory wastes. Especially the trees, agricultural areas and residences in the areas close to the factory are often exposed to a light ash-colored sediment and those living here are constantly breathing these dust.

During our works, it was stated by the local people that after the Eskişehir Cement Factory was put into operation, there was a loss of yield in the fields and gardens of the people of the region, especially the fruit trees close to the factory were dried and their fruits fell. It has been determined that the dust emitted to the environment during the cement production process, in particular, covers the plants in lands closer than 1 km to the cement factory, reducing the amount of light on the plants and clogging their pores. It is seen that this situation has clearly caused the local people who have lands in the region to lose economically, especially when compared with the areas not affected by these dusts. Due to the prevailing wind direction, especially in the south and southeast of the district, dust accumulation on the upper surface of the plant leaves is higher than in other directions, and dust accumulation decreases as it moves away from the factory.

Falling of leaves, dimensional shrinkage, and chlorosis was detected in fruit trees affected by the flue dust of Eskişehir Cement Factory. Again, dwarfing has been observed in plants. Also, there is a serious decrease in resistance to plant pathogens in plants exposed to pollution. The reason for the shrinkage of the leaves can be considered as the

adaptation of the plant to the negative external environment conditions created by cement powders.

As a result, photosynthesis and transpiration in the plant are partially prevented by the effect of cement particles accumulating on the plants. It is of vital importance to keep the stomata open and to provide air circulation between the cells for both oxidative phosphorylation and photosynthesis to occur in plants. Besides, another important condition for photosynthesis is that sunlight can reach the leaves without any obstacle. Microscopic cement powders limit this vital activity. The most obvious and serious consequence of this situation is that it causes a decrease in the growth and yield of plants.

WASTE MATERIALS ARISING IN THE CEMENT PRODUCTION PROCESS AND ITS POSSIBLE ENVIRONMENTAL EFFECTS

Cement production is a process where each stage has separate damage to nature. For example, fossil fuels are used extensively as an energy source from the extraction and transportation of raw materials required for cement production and the cement production process from these materials. One of the important and indispensable stages in cement production is the firing of the cement raw material at 1350-1450 ° C. During this process, fossil fuels are used as fuel in incinerators. The wastes of these fuels are left in the atmosphere. It is known that 5-6% of the carbon dioxide released into the atmosphere with the human effect is generated by cement factories. In the process of firing cement, the use of industrial wastes and waste sludge as alternative fuels has started to be used as the cost is lower than fossil fuels. Although this method seems to be a way to get rid of waste, the burning of this industrial waste in furnaces causes the release of intensive toxic metals into the air [9, 10, 11, 12].

Cement itself is a very serious contaminant due to the toxic chemicals in its structure. For example, cement powders contain elements such as antimony, arsenic, lead, cadmium, chromium, cobalt, copper, manganese, nickel, thallium, tin, vanadium, zinc, beryllium, selenium, tellurium and mercury, some of which are highly toxic. Considering this situation, the severity of the pollution caused by cement dust spray, which we observe intensively in the environment within the borders of Çukurhisar district of Eskişehir province, becomes clearer [9, 10, 11].

Defined as one of the major environmental risk factors, air pollution is cited as the cause of many premature deaths every year. It is observed that many diseases, especially respiratory system diseases due to air pollution, occur at higher frequencies in populations where people are exposed to pollutants [3, 13].

Cement factories are one of the most important sources of atmospheric pollution in their regions. Sulfur oxides, nitrogen oxide, carbon monoxide, carbon dioxide, dust and particulate matter, volatile organic compounds (VOCs), dioxin, furan, methane and heavy metals are the main pollutants released into the atmosphere from cement factories. Using industrial wastes instead of fossil fuels in cement kilns is the most important source of heavy metals, dioxin and furan. Heavy metals are metals or semi-metals that enter the body by inhalation and mouth and have toxic effects even in small amounts. Since heavy metals cannot be removed from the body, side effects occur when they exceed the toxic limit by biomagnification. The main clinical symptoms that occur as a result of long-term exposure to heavy metals are depression, headache, skin, digestive, hormone, prostate, cardiovascular, troitis and immune system problems and serious diseases such as cancer,

Alzheimer's, Parkinson's, ALS, MS. It is a fact that today everyone knows that aromatic compounds such as dioxin and furans are toxic and carcinogenic [14, 15].

In the areas where cement factories are located, the most important factor responsible for the transport of heavy metals to the lungs by respiration is the particles released into the atmosphere. Particle size is directly related to the amount of heavy metal taken into the body. Therefore, the amount of diseases related to toxic by-products is visibly higher in areas where toxic particles are released into the atmosphere and where factories do not have proper particle filters in their chimneys [13].

One of the most important factors affecting the chemical properties of the soil of a region is the pollutant elements in that region. Cement factories discharge heavy metals into the soil in particulate form, especially in their immediate surroundings. This affects the whole ecosystem in the region due to the physicochemical properties of the soil [16, 17, 18, 19, 20].

Another pollutant released into the atmosphere from cement factories is nitrogen and sulfur oxides. These turn into acidic components in the atmosphere and mix with soil and water with precipitation. Changes in acid rain and soil and water pH directly cause adverse effects on aquatic organisms and vegetation living in these habitats. In soils exposed to acid rain for a long time, productivity decreases with the decrease in biological activity and the change in physicochemical structure [21].

As a result; Cement is one of the building materials that are difficult to produce due to the many toxic substances released during the production process. For this reason, production activities carried out without taking necessary measures cause serious irreversible damage to nature and humanity. The important thing here is to consider the profits and losses of cement production. Turkey is among the countries from producing more cement needs. It is a very sad situation that a building material whose production is so harmful to nature and living beings is chosen as an export product. With this article, it is aimed to raise awareness about the harms of cement on nature and the environment.

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