

Research Article

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Environmental impact assessment regulation applications and their analysis in Turkey

<https://doi.org/10.1515/chem-2022-0125>

received November 9, 2021; accepted January 4, 2022

Abstract: Since the 1970s, the environmental impact assessment (EIA) has been employed as an environmental management tool to minimize or prevent the potential environmental impacts caused. Its use in Turkey was mandated from February 7, 1993. An EIA, which is of particular concern to the mining sector, is implemented in many sectors. In this study, after providing brief information about the EIA regulation, an analysis has been done by determining the status of mining activities in EIA applications. In conclusion, mining has comprised 31% share of EIA-required activities since 1993, when EIA regulation took effect in Turkey. In addition, it was learned that 16% of the applications related to mining activities were unable to get an EIA permit and could not launch their operation.

Keywords: environmental impact assessment, environmental impact assessment decision, mining, Turkey

1 Introduction

Mining is one of the oldest production areas in human history, and mineral resources are as important today as they have been in the past. Mineral resources play a major role in creating wealth, providing job opportunities and technological development, supplying essential raw materials, developing local businesses, expanding social infrastructure, and enabling the economic development of a country through the collection of taxes and royalties [1].

Mining is an industry in which investment costs are high and investment cost recovery is risky. In addition, it is an activity wherein location cannot be chosen, that is,

it must be carried out at the source. Apart from all those difficulties, it is a branch of industry that, like any production process, can have environmental effects. Still, it is possible to minimize or eliminate environmental impacts during mining operations through the adoption of systematic measures, especially, at the planning stage, thus ensuring sustainability of production so that operations can continue. To ensure sustainability, the environmental impact assessment (EIA) process should be applied in mining enterprises.

Environmental protection has become an important issue of national and public concern [2]. As a result of “polluter pays” principle that is now in place, mining companies are struggling to achieve their goals of reducing or eliminating waste production [3]. Furthermore, in 2017, a zero-waste policy was introduced in Turkey to ensure efficient resource utilization, and prevention of or reduction in waste production, separate collection of waste at the source, and recycling of waste. Also, getting permits when there are environmental protection issues are shown to have been the biggest problem faced by the mining industry in the past decade in Turkey [4]. Thus, a complete assessment of the environmental impacts through the EIA is particularly important for plants planning to commence operation in near future. EIA is a critical tool for the environmental protection in Turkey as a developing country [5].

Global mineral demand is determined by both social and financial factors. A range of tools and techniques have been developed to ensure effective environmental protection, as EIA is one of the most widely used ones [6]. EIA is typically defined as applying scientific methods and techniques to predict the likely effects of a proposed project for both the construction and operation stages and developing/establishing/setting out appropriate preventive action [7]. The goal of the EIA is to identify the negative environmental and health impacts that can be caused by a foreseen situation and to take necessary precautions accordingly. Such an assessment is made by determining the scope and severity of the physical, ecological, and socio-economic impacts of an activity by experts using scientific methods. It consists of several

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components, including the introduction of necessary measures to eliminate negative effects [8].

The concept of EIA refers to an environmental protection method aiming to be performed beforehand to determine possible environmental impacts caused by an operation and to minimize or eliminate those impacts by taking appropriate measures. The EIA is also a planning step for mining operations, as it covers the measures to be taken before the operation is started. For that reason, it constitutes one of the functions of mining engineering. The mine operator needs to consider EIA work as part of business planning and to carry out environmental planning studies before the operational phase [9]. Mining engineers know that the production processes should also contribute to the EIA applications for mining activities. Only mining engineers who have received education in mining engineering, know the production aspect of mining engineering, and at the same time have environmental awareness, can know the environmental impacts that could occur in mining activities, how much impact there could be at which stage, and how much waste could be produced. Therefore, it would be appropriate for the Ministry of Environment and Urbanization, which leads and controls the EIA process, as well as for the mining enterprises that apply for EIAs to utilize mining engineers' expertise in the EIA processes of the mines [10].

Because all kinds of environmental impacts are pre-assessed in the EIA process, environmental reviews are carried out for mining operations. At the end of that assessment, different environmental effects that may occur are identified, depending on the nature of the mining activity. Hence, many technical and legal obligations will have been fulfilled for the mining business.

The EIA forms a democratic and transparent process in which all parties come together regarding the activities to be carried out and where they can present their opinions, objections, and suggestions. All parties concerned have the right to express their views on the relevant activity, especially during the public participation process. Making good use of that process is important to prevent negative reactions that may occur during the application of the activity, because the parties are informed about the subject, and their participation in the project is ensured prior to the activity. With that information available to the public, complaints that may occur after the project has reached the operational stage will be prevented.

It should be emphasized that the cost of reclaiming an environmentally damaged environment is much higher than the cost of protection with pollution prevention measures and that it is a more rational approach to carry out an activity without destroying and polluting the environment.

Accordingly, it is of utmost importance to eliminate the perception that EIA processes are only legal obligations and to use the EIA as an effective tool to leave a healthy environment worth living in for future generations [11].

A growing number of countries require certain enterprises to be subjected to an EIA. EIAs are not only applied to the products or projects, but they are also applied to policies and program [12]. EIA is being used globally, either as a planning tool or a management tool, to minimize the harmful consequences of development [13]. EIA first came into force in the USA in 1970, and developed countries such as Canada, West Germany, and France soon followed its implementation. The years in which the EIA regulation came into force in different countries are given in Table 1.

In Turkey, implementation began in 1993 with a regulation issued based on Article 10 of the Environmental Law and has become a legal obligation. Activities required to apply for EIA are given as Annex I and II in the annexes of the regulation. Annex-I includes activities with high environmental impacts and high capacities. An EIA report is required for those activities and is assessed by the Ministry of Environment and Urbanization.

As a result of that assessment, the Ministry decides either "*Environmental Impact Assessment Positive*" or "*Environmental Impact Assessment Negative*." In Annex II, smaller enterprises with lesser environmental impacts than the activities in Annex I are listed. A project introduction file including the capacity, the technology used, the type and amount of waste to be produced, and the method of waste disposal is requested from those companies.

Table 1: Years when EIA regulation was enacted in some countries [14]

Country	Year
USA	1970
Canada	1973
West Germany	1975
France	1976
Luxemburg	1978
Mandate by EU	1985
Italy	1985
Portugal	1987
England	1988
Spain	1988
Flanders	1989
Poland	1990
Greece	1990
Czech Republic	1991
Belgium	1992
Turkey	1993

Information about environmental features and the operation site is also requested. After the project introduction file regarding the activities in Annex-II is reviewed, the decision “*Environmental impact assessment is required*” or “*Environmental impact assessment is not required*” is made. That decision is made by the Ministry of Environment and Urbanization according to the regulation. However, authority can be transferred to The Office of the Governor by the Ministry.

In the report for the EIA process, detailed information is given on the workflow chart, capacity, area covered, technology, number of staff, and so forth. In addition, the project impact area is clearly specified according to the land use conditions. It is necessary to examine in detail the areas remaining in Annex V (sensitive list of locations) and to indicate, according to the grid system, in which area it is located and in which blocks the vegetation types in the project area are located. The flora-fauna within the project impact area, the national and international conservation status (if any), any endemic species, the expected consequences of the project activities, and the precautions to be taken should all be clearly described.

In order to determine what effects the proposed activity will have on the environment, the following information must be delineated: natural resources in the project, how much surface excavation will be required, where and how any excavation waste will be stored, the water consumption (both drinking and utility water) for the facility, and from where and how the water will be supplied. Also, the types of waste (solid waste, liquid waste, dust, etc.) to be produced by the facility, as well as the possible amounts of those wastes, should be assessed according to the relevant regulations. The technologies and materials to be used in the enterprise are specified in detail, and precautions to be taken against accidents that may occur are described.

After the potential environmental impacts of the project have been determined, the procedures to be taken to minimize or completely prevent those environmental impacts are given in detail.

Finally, in performing a general assessment of the project, it is undertaken that all necessary permits will be obtained and that the relevant regulations will be followed within the scope of the Environmental Law No. 2872 and other legislation.

As a rule, the EIA process must be applied to any activities that may have an environmental impact. In our country, the Ministry of Environment and Urbanization determines which activities will be subjected to an EIA procedure, and they are listed in the Annex of the EIA regulation. The kind of process to be applied to each type of activity is also stated [15].

Activities subject to the EIA process are listed in two separate groups as Annex I and II in the regulation.

Mining activities included in Annex I:

- Surface mining planned on the land surface of 25 hectares or more (including excavation and dumping area).
- Open-pit coal mining with a working area greater 150 hectares (including areas for both excavation and dumping).
- Mineral processing plants employing biological, chemical, electrolytic, or heat treatment methods, as well as any waste plants linked with the processing plants.
- Plants that are engaged in one or more of crushing, screening, washing, and mineral processing operations at 400,000 tons/year or more.
- Thermal power plants and other combustion systems with a total thermal power of 300 MW or more.
- Plants where explosive and/or flammable materials are produced.
- Cement plants.

Mining activities included in Annex II:

- Any mining operations not included in Annex I.
- Facilities for cutting, processing, and sizing of marble and decorative stones with an annual capacity of at least 5,000 m³ and/or 250,000 m².
- Methane gas extraction and storage (>1,000,000 m³/year).
- Plants involved in the extraction, storage, or processing of carbon dioxide, shale gas, or other gases (with exception of workshop-type filling facilities).
- Plants not included in Annex I but performing at least one of crushing, screening, washing, and mineral processing operations.
- Any mineral processing and/or waste facilities (not included in Annex I) related to those processing facilities.
- Coal processing plants:
Coal gas and coke plants,
Coal briquetting plants,
Coal washing plants.
- Facilities for storage, classification, and packaging of petroleum coke, coal, and other solid fuels (excluding retail units).
- Lime and/or plaster plants.
- Magnesite processing plants.
- Perlite and similar mineral expansion plants.
- Mining, petroleum, and geothermal resource exploration projects (except for those using seismic, electrical, magnetic, electromagnetic, geophysical, or similar methods).
- Ready-mixed concrete plants: plants for the production of materials using cement or related bonding agents; plants that produce pre-stressed concrete elements, aerated concrete, precast concrete panels, and similar products (production capacity ≥ 100 m³/hour).

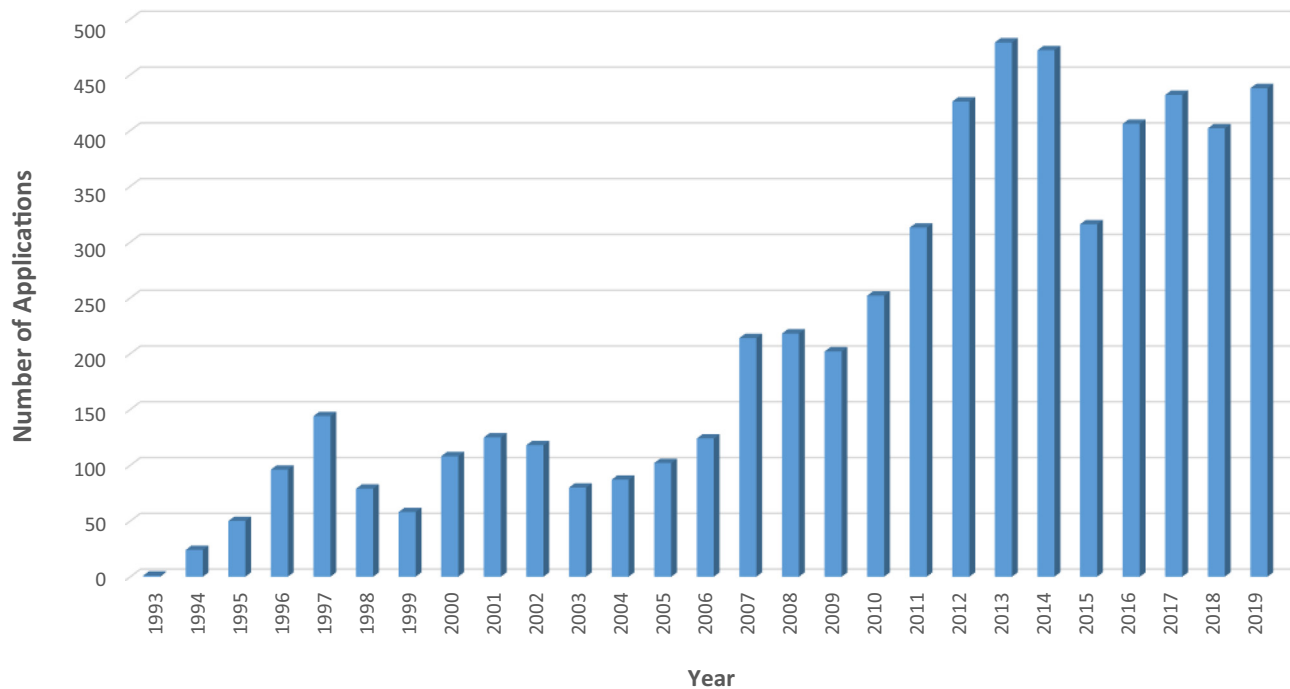


Figure 1: The yearly distribution of EIA applications in Turkey [16].

- Brick or tile production facilities (raw material capacity [materials for preparing mud] 1,000 tons/year and above).
- Ceramic or porcelain production plants (raw material capacity [materials used in mud preparation, priming, glazing, etc.] $\geq 1,000$ tons/year).
- Clinker grinding plants.
- ANFO explosive manufacturing plants.
- Plants where salt is extracted and/or processed (except screening or packaging).

2 Materials and methods

In this current study, the results of applications related to mining and all EIA applications to the Ministry of Environment and Urbanization for EIA between 1993 and 2020 were statistically analyzed. In the 26 years since the EIA regulation was introduced in Turkey, 6,310 EIA applications have been submitted to the Ministry of Environment and Urbanization, 559 of which were concluded negative. Most of the denied applications did not comply with the legislation. All data related to mining were extracted from the general data obtained from Ministry of Environment and Urbanization and analyzed [16].

Of all the EIA applications for mining, percentage of mining in EIA applications, types of EIA positive mining

operations, percentage of mining in denied or canceled EIA applications, the most denied or canceled mining activity, and type-diversity distribution rates among the mining applications were analyzed statistically.

3 Results and discussion

Many sectors that have an impact on the environment implement EIAs, with the mining sector being one of the most important sectors in which the EIA procedure is applied. The EIA procedure is mandatory for almost all mining-related activities.

The environmental factor in mining is important because the production activities of exploiting natural resources are carried out in contact with nature. Therefore, mining activities are widely included in EIA studies. The numbers and percentages of enterprises, in terms of sectors, that applied to the Ministry of Environment and Urbanization for EIA from 1993, when EIA was enacted, until January 1, 2020 are presented in Figure 1 [16]. It is seen that the highest number of applications was observed in 2013.

Of the 6,310 EIA applications received from 1993 to 2020, 91.2% were concluded positive, while the results of the rest 8.8% were negative, as shown in Figure 2 [16].

Figure 3 shows that of the 6,310 EIA applications, 1,961 or 31% of them were for the mining sector. Thus,

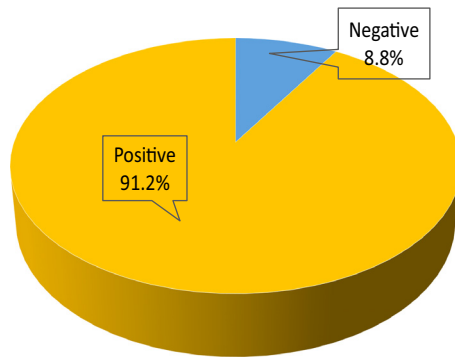


Figure 2: Chart showing % EIA applications concluded as positive and negative [16].

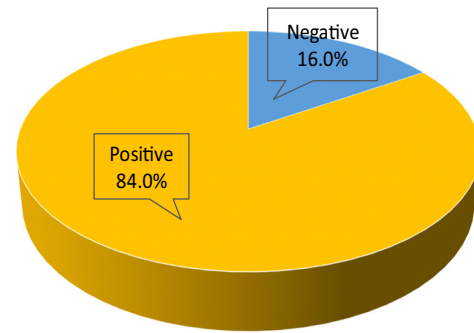


Figure 4: Proportion of positively and negatively concluded EIA applications of mining sector.

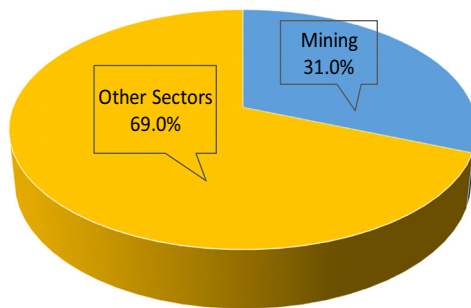


Figure 3: Proportion of mining sector in all EIA applications.

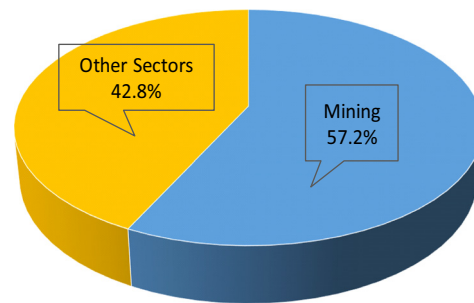


Figure 5: Proportion of negatively concluded EIA applications of mining sector versus other sectors.

the mining sector accounts for the majority of EIA applications [16].

Figure 4 shows the outcome for the EIA applications related to the mining sector. Among the 1,961 EIA applications for the mining sector, 320 of them were concluded negative, which corresponds to 16% of all mining sector-related EIA applications. Considering the overall negative conclusion rate of 8.8% for EIA in all sectors, the mining sector has almost twice the negative conclusion ratio of the EIA of all sectors.

For the 559 negatively concluded EIA, 320 or 57.2% are from the mining sector as shown in Figure 5 [16]. In

other words, more than half of the negatively concluded EIA are from mining sector.

The mining sector comprises 31% of all EIA applications. Figure 6 shows the subdivisions within the mining sector.

According to Figure 6, EIA applications of the mining sector in Turkey largely consist of industrial raw materials. The second are metal mines, followed by coal and coal-related plants and explosives-related plants.

Table 2 shows the type distribution of minerals in industrial raw materials and EIA negative and cancellation rates [16]. Considering the distribution of industrial

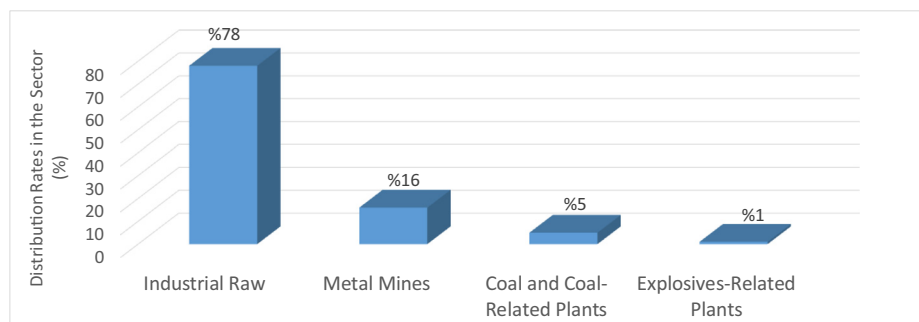


Figure 6: Type distribution for mining-related EIA applications.

Table 2: Type distribution of industrial raw materials applications for EIA and EIA negative or cancel rates

Type distribution of industrial raw materials	Total number of EIA applications	Ratio (%)	Number of EIA negative or cancel	EIA negative or cancel (%)
Quarry, crushing, and screening plants	887	57.71	150	16.9
Ready-mixed concrete, crushing, and screening plants	129	8.39	13	10
Marble quarry and capacity increase	107	6.96	27	25.2
Cement plant and capacity increase	82	5.34	7	8.5
Basalt quarry, crushing, screening, and capacity increase	58	3.77	12	20.7
Clay quarry, including bentonite	51	3.32	6	11.8
Pumice quarry and processing	29	1.89	2	6.9
Feldspar quarry and processing	24	1.56	1	4.2
Gypsum quarry	24	1.56	2	8.3
Silica sand and preparation plant	18	1.17	4	22.2
Calcite quarry, crushing, screening, and capacity increase	14	0.91	—	—
Clinker production and grinding	14	0.91	1	7.1
Andesite quarry	13	0.85	3	23.1
Marn quarry	11	0.72	—	—
Quartzite quarry	10	0.65	2	20
Salt mines	9	0.59	—	—
Fly ash separation storage facility	9	0.59	3	33.3
Magnesite quarry and preparation plant	8	0.52	—	—
Trass quarry	8	0.52	2	25
Marble (organized industrial zone)	7	0.46	—	—
Ceramic tile production	6	0.39	—	—
Perlite mine and related plants	5	0.33	—	—
Granite quarry	5	0.33	2	40.0
Others	9	0.59	2	11.1
Total	1,537		239	15.55

raw materials operations for which EIA applications have been made, the increased demand for aggregate, which constitutes the basic raw material of the construction sector, has led to an increase in quarries. The type

distribution of mines in industrial raw materials agrees with this opinion. Among all mining applications, the total number of applications just for quarries, ready-mixed concrete, crushing, and screening plants is 51.78%. Almost

Table 3: Type distribution of metal mines applying for EIA and EIA negative or cancel rates

Type of metal mines	Total number of EIA applications	Ratio (%)	Number of EIA negative or cancel	EIA negative or cancel (%)
Gold and related investments, including silver	101	34.12	22	21.8
Chromium mines, processing and capacity increase	76	25.68	10	13.2
Iron mines and processing	39	13.18	8	20.5
Lead, zinc mines, and processing	35	11.82	6	17.4
Copper mines and processing	32	10.81	5	15.6
Manganese production	6	2.03	3	50
Nickel and cobalt	3	1.01	1	33.3
Antimony production	3	1.01	—	—
Magnesium production	1	0.34	—	—
Total	296		55	18.58

all the applications for industrial raw materials are in the sectors that provide raw materials to the construction industry. In addition, it was determined that 15.5% of EIA applications for industrial raw materials resulted in denial or cancellation.

According to Table 3, when the diversity of metal mines is examined, we see that gold and silver enterprises take first place with 34.12%. They are followed by mines of chromium, iron, lead, zinc, copper, manganese, and other metals. Especially, since the turn of the century, gold mines in various regions of Turkey have taken first place in EIA applications. Of the EIA applications for metal mines, 18.58% have been denied or canceled [16].

As shown in Table 4, of all the EIA applications for coal-related facilities, 68.04% are comprised of thermal power plants and related facilities, 19.59% are of coal preparation and process facilities, 9.28% are of coal mines, and 3.09% are of flotation plants. The data obtained for mining business in Turkey show that only 5% of EIA applications for mining operations were for coal-related facilities and that there were only 9 applications made for them in the 26-year period. It has been found out that 21.45% of EIA applications regarding coal and related facilities have been denied or the applications were canceled. It has been determined that denied or canceled EIA applications for coal and related facilities have been the highest in the mining sector, at 21.45%.

Of the EIA applications, 31 applications were made in the explosive materials sector, with a rate of 1%. All those applications were related to the construction of explosives storage units. Only one of those applications was denied [16].

4 Conclusion

According to the EIA regulations of Turkey, the EIA process is required for all mining activities. The data from the Ministry of Environment Urbanization show that there were 6,310 EIA applications in Turkey over 26 years, between July 2, 1993 and January 1, 2020. Of those applications, 1,961 were related to mining and constituted 31% of the total applications. The largest share of EIA-applied mining activities belongs to industrial raw materials, with 78%. It is followed by metal mines (16%), coal and related facilities (5%), and explosives storage facilities (1%).

Between 1993 and 2020, of the 1,961 EIA applications for mining operations, 320 were not permitted to operate by the Ministry, either because their environmental

Table 4: Type distribution of coal and coal-related plants applied for EIA and EIA negative or cancel rates

Type of coal operation	Total number of EIA applications	Ratio (%)	Number of EIA negative or cancel	EIA negative or cancel (%)
Thermal power plant and related plants	66	68.04	17	25.7
Coal crushing, screening, and processing	19	19.59	3	15.8
Coal mines	9	9.28	1	11.1
Coal flotation	3	3.09	—	—
Total	97		21	21.45

impact was too significant or because they were canceled as per the regulations. Applications denied or canceled constituted 16% of mining-related applications. According to the data of the Ministry of Environment and Urbanization, the rate of EIA negative or cancellation decisions corresponds to 15.55% for industrial raw materials, 18.58% for metal mining, and 21.45% for coal plants. In light of these rates, it can be said that mining operations are limited due to environmental reasons or non-compliance with the legislation and so the EIA process has served its purpose.

It is possible to create a general profile of the mining activities for which the EIA process was applied in the past 26 years with the EIA application data from the Ministry of Environment and Urbanization. Now that almost all mining activities require EIA application, it would be reasonable to make inferences about the state and orientation of the mining sector in Turkey. The data from the Ministry indicates that, considering applications for EIA in the past 26 years, the mining sector appears to be largely oriented toward industrial raw materials mining in Turkey.

In a study of EIA applications in 1999, the rates of mining applications were determined to be 90% for industrial raw materials, 5% for metal mines, and 5% for energy mines (coal, etc.) [17]. In a similar study conducted in 2007, applications were 77% for industrial raw materials, 16% for metal mines, and 4% for coal [10]. This study shows that the percentage of applications related to industrial raw materials has decreased from that in 1999 and has remained close to the percentage in 2007 ever since. It was observed that metal mines increased from 5% in 1999 to 16% in 2007 and have maintained that trend in 2020. Applications regarding coal remained at the same level. It is understood that the increase in metal mines is due to an increase in gold mining operations in Turkey. The findings indicate that gold and silver enterprises constitute 34.12% of applications related to metal mines.

Aiming to minimize the environmental impacts of commercial activities, the EIA is a globally accepted environmental protection method that has been applied for many years. In Turkey, due to misunderstandings, the technical EIA study is seen as a bureaucratic obstacle by mining operators. However, the EIA study is a technical task necessary for any business that has environmental effects, and it requires an interdisciplinary study with experts from various disciplines, depending on the type of activity. There is insufficient awareness about EIA in Turkey because there have not been many scientific studies about EIA and because engineering students are not taught about EIA at a satisfactory level in the universities.

Therefore, it would be good to review the curriculum of every engineering discipline in this respect.

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Funding information: There is no funding for this work.

Conflict of interest: The author declare that he has no known competing financial interests or personal relationships that could have appeared to influence the work reported in this article.

Ethical approval: The conducted research is not related to either human or animal use.

Data availability statement: There is no data available for this article.

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