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*Promoting environmental policy that contributes to good health*

# TOOLKIT

## Coal Power Generation and Health in Three Regions of Turkey; Çanakkale, İzmir and Tekirdağ

HEAL - Health and Environment Alliance

# TOOLKIT:
## COAL POWER GENERATION AND HEALTH IN THREE REGIONS OF TURKEY; ÇANAKKALE, İZMİR AND TEKİRDAĞ

**HEALTH AND ENVIRONMENT ALLIANCE - HEAL**

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Dear Reader,

This report presents the human health aspect of power generation and air pollution and summarizes the environmental and health-related burden and primarily the air pollution caused by energy generation from coal in Çanakkale, Tekirdağ and İzmir in Turkey.

As HEAL, we have compiled information about energy policies in Turkey, the link between air pollution and energy production, the presence of heavy industry in power generation, recent findings on the environmental and health conditions of Çanakkale, İzmir and Tekirdağ and the opinions of medical actors in the first section of this report. In the second section of this report, which is HEAL's second toolkit following "Iskenderun Toolkit: Coal power generation and health in Iskenderun Bay, Turkey" readers can also find national and international calls for action, sample messages, open letters, and a communication guide.

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Kind regards,

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The Health and Environment Alliance (HEAL) is a leading European not-for-profit organisation addressing how the environment affects health in the European Union (EU). With the support of more than 75 member organisations, HEAL brings independent expertise and evidence from the health community to different decision-making processes. Our broad alliance represents health professionals, not-for-profit health insurers, doctors, nurses, cancer and asthma groups, citizens, women's groups, youth groups, environmental NGOs, scientists and public health research institutes. Members include international and Europe-wide organisations as well as national and local groups.

# Index

# The State of Play on Energy Generation in Turkey

In Turkey

**fossil fuels have 67%**

**coal has 33.8%**

shares of the electricty production in 2016

Each year in Turkey

**28,881**

people die early because of air pollution

**Energy and electricity generation in Turkey is still dependent on fossil fuels with 33.8% of the total electricity generated from coal and 67% from fossil fuels in 2016. Over the last ten years, coal-based power generation doubled and fossil fuel-based power generation increased by 150% .**

In addition to the growth in electricity generation and installed electricity capacity, per capita energy consumption is also increasing in Turkey. Between 2006 and 2016, the total installed capacity increased nearly 2.5-fold and climbed to 78.5 GW[1]; the per capita consumption of energy has had an increasing trajectory since 2001[3], for instance, the per capita energy consumption increased by 7.47% between 2013-2015, in just two years[4]. This development stands in contrast to the strategies developed to increase the efficiency of activities to tackle climate change and to protect the environment, which are set out in Turkey's Energy Efficiency Strategy Document[2].

Moreover, Turkey aims to increase the share of coal in the electricity production[5]. As of the end of 2016, the coal-based installed electricity capacity of Turkey was 17.3 GW[1]. In addition to this, 65 units of new coal-fired power plants with a capacity of 69.5 GW are planned to be built (in planning or under construction)[6]. This increase is nearly equivalent to Turkey's total installed capacity of 78.5 GW in 2016.

One of the milestones of the Turkish coal-dominant electricity production plan is the **increase in the lignite coal-powered electricity generation to promote the use of local, lignite coal. While local coal yielded 36 GWh of electricity generation in 2014[7], it is projected that this generation will double in 2019 with an output of 60 GWh[8].** Coal sites within the scope of this goal include Konya-Karapınar, Afşin Elbistan, Eskişehir Alpu, Afyon Dinar, Tekirdağ-Çerkezköy and İstanbul-Çatalca, Manisa-Soma and Malatya[8].

The running of each additional coal-fired power plant means an increase in harmful air pollutants and greenhouse gases. According to the International Panel on Clime Change (IPCC), the burning of fossil fuels and the carbon dioxide released into the atmosphere as a result of industrial processes are responsible for 78% of the increase in emissions between 1970 and 2010. Coal is responsible for 44% of the global $CO_2$ emissions caused by fossil fuels and 72% of worldwide $CO_2$ emissions are caused by electricity and heat generation[9,10].

Fossil fuel-based energy generation and use are the main reason for the pollution caused by humans; it is estimated that 85% of particulate matter and almost all of nitrogen oxide and sulfur oxide emissions are caused by energy generation activities worldwide[11]. Studies on air pollution and energy are growing. According to a study by the IMF, in Turkey, fossil fuel-related air pollution generates approximately US$ 19.4 billion in health costs and US$ 13.2 billion in climate change costs[12]. Studies estimate that if fossil fuel subsidies were ended and fossil fuels were repriced according to their environmental and health costs, 73.8% of premature deaths could have been prevented in Turkey in 2010. In this methodology coal has the highest share in the prevention of premature deaths (72.9%)[13].

# LIGNITE USE IN ENERGY GENERATION AND HEALTH

While the energy industry in Turkey aims to increase local coal-based electricity generation to 60 GWh in 2019, the share of lignite in local coal was observed to be over 90% between 2002-2013. The lignite coal found in Turkey is low in calories and high in ash and humidity[14], causing higher rates of air pollution and more health issues when it is burned.

Moreover, there are several scientific studies pointing to the adverse effects of $SO_2$, PM, heavy metals and radioactivity released from lignite-fired thermal power plants[15].

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# The Review of Air Pollution In Turkey

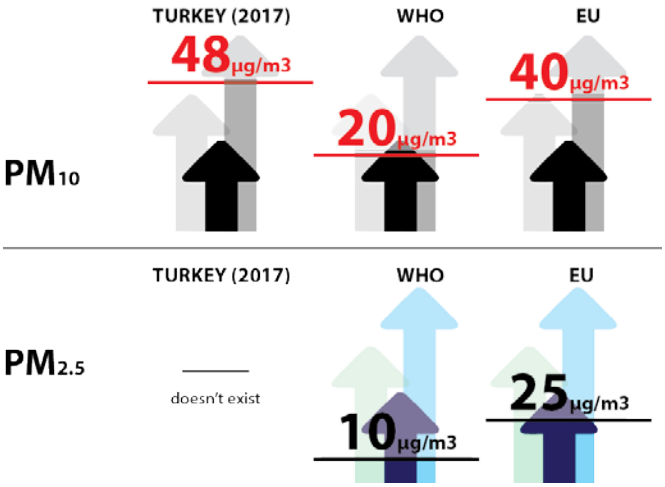
**According to 2012 data by the World Health Organization (WHO), every year 32,668 premature deaths are caused by outdoor air pollution in Turkey. According to the European Environment Agency's (EEA) data, almost the entire urban population in Turkey (97.2%) is exposed to unhealthy levels of particulate matter ($PM_{10}$)[16]. The Lancet Commission on Environment and Health's findings for 2017 indicate that, in Turkey, environmental pollution causes 42,000 and air pollution causes 33,431 premature deaths every year[17].**

The ranking for the diseases that cause the almost 33,000 premature deaths according to the WHO's data are ischemic heart diseases (14,813), paralysis (10,053) and lung cancer (6,498), respectively (estimation for the ranking of these three diseases only covers those above 25 years of age).

The limit values relating to the emissions that cause air pollution in Turkey have been determined by the Regulation on Air Quality Assessment and Management. This regulation includes hourly, 24-hour and annual average limit values of $PM_{10}$, $SO_2$, $NO_2$, NOx, Pb, Benzene and CO emissions and the maximum number of days these limit values can be exceeded in a year. Although this regulation aims to lower these limit values to align with the EU's, as demonstrated later in this report, the national limit values have already been exceeded in many cities.

However, any limit values are not effective enough to protect human health. Turkey should start working on lowering its limit values down to the WHO's limits, determine limit values for $PM_{2.5}$ and devise an action plan and legislation for when these limit values are exceeded.

Annual Average Threshold Value Comparison for PM10 and PM2.5 Emissions




## LINK BETWEEN ENERGY POLICIES AND AIR POLLUTION

**Globally, fossil fuel-based energy generation and use are considered to be the main reason for pollution caused by humans; it is estimated that 85% of particulate matter (PM) and almost all of nitrogen oxide ($NO_x$) and sulfur oxide ($SO_x$) emissions are caused by energy generation activities**[11]. In Turkey, thermal power plants are responsible for a significant portion of the air pollution caused by the energy industry. According to a report by European Environment Agency evaluating data for 2011, the energy use and demand (except for the transport sector) responsible for 99% of sulfur dioxide ($SO_2$) emission, 48% of nitrogen dioxide ($NO_x$) emissions, 99% of carbon monoxide (CO) emissions, 35% of non-methane organic compound (VOC) emissions[16]. According to the national emission reports $NO_x$ emissions nearly tripled and $SO_2$ emissions almost doubled from 1990 till 2014[18].

# SECTION 1:
# Coal power generation and health in Çanakkale, İzmir and Tekirdağ, Turkey

# TEKİRDAĞ

## THE STATE OF ENVIRONMENT AND PUBLIC HEALTH IN TEKİRDAĞ

population of
1 million

Industry
dominant economy

45 lignite
sites

2 planned coal power plants:
Çerkezköy EÜAŞ: lignite coal
Çebi Termik Santrali: imported coal

In 2017 Tekirdag locals breathed polluted air at
172 days out of 365

**With a population of one million, The Tekirdağ Province is one of the most important industrial and agricultural areas of both the Marmara Region and Turkey with 13 Organized Industrial Zones (OIZ), 45 lignite sites and active lignite coal mines. The rapid industrial growth in the area attracted internal migration, increasing further the population of Tekirdağ. An agriculture-dependent province since 1970s, Tekirdağ became heavily industrialized later on[19].**

Approximately one million people reside in the districts of Tekirdağ Province, which is located in the Ergene Section of the Marmara Region. Stretching along a 60-km shoreline north of the Marmara Sea, Tekirdağ neighbors İstanbul (population of 15 million), Edirne and Çanakkale. The industrial activities in Tekirdağ also affect these cities, the entire Ergene Basin and the Marmara Region. Industry provides for the most jobs in the area with prominence in textile, agriculture, food, leather and machine-metal sectors[20]. Industrial activities are mainly focused in the Ergene and Çerkezköy area, while the city center and Marmara Ereğlisi are the logistic hubs of the area with four seaports[21,22]. There are about 1500 industrial facilities in Tekirdağ, 73% of which are in the OIZs located in different parts of the province. The largest and oldest OIZ is the Çerkezköy Organized Industrial Zone and the other industrial zones are the Çorlu Leather Organized Industrial Zone, Çorlu 1 OIZ, Ergene 1 OIZ, Ergene 2 OIZ, Hayrabolu OIZ, Kapaklı OIZ, Malkara OIZ, Muratlı OIZ, Tekirdağ OIZ, Veliköy OIZ, Velimeşe OIZ and Yalıboyu OIZ[21]. Textile, leather, chemical, metal and food sectors are centered around the Çerkezköy, Kapaklı, Çorlu, Ergene and Muratlı districts of Tekirdağ; food-, land-, agriculture- and animal husbandry-dependent industries developed in Süleymanpaşa, Malkara, Hayrabolu, Şarköy and Saray; iron-steel, chemical, coal and petroleum products storing sectors advanced in Marmara Ereğlisi[22].

# AIR QUALITY

**Tekirdağ's population breathed polluted air during half of 2017 and for two thirds of 2016.**

There are five air quality monitoring stations in Tekirdağ, accessible via the national air monitoring station web database. According to this data, **24-hour PM10 value reading of Tekirdağ Central MTB station located in Tekirdağ's city center showed that the national limit values were exceeded for 172 days in 2017 and 230 days in 2016.** However, according to legislation, the 24-hour average values should not exceed limit values more than 35 times. Moreover, we should consider that the values used for this comparison were well above both the EU and the WHO standards, meaning these were threshold values allowing for even more pollution.

Each station active in 2016 and 2017 also measured the annual average $SO_2$ levels, as the lignite mined in the region is high in sulfur. As $SO_2$ can cause serious health problems in a very short time, the EU and the WHO define the threshold values over hourly and 24-hour averages; when we look at the hourly data, the average appears to have been exceeded on many days of the year. This is also mentioned in an academic study on $SO_2$ and health problems under the section titled "public health status".

Two of the five stations in Tekirdağ only became operational in 2017 and PM2.5 measurements were done in Çerkezköy and Çorlu stations of Tekirdağ. It is a very important development for public health that $PM_{2.5}$ readings are carried out, however, the limit values for $PM_{2.5}$ emissions have not yet been included in the legislation of Turkey. Emission data of critical pollutants such as $NO_2$, $SO_2$ and $NO_X$ are still inaccessible at the Ministry of Environment and Urbanization's Tekirdağ station, located in central Tekirdağ.

Annual Air Pollution Emission in Tekirdağ Between 2017-2014

| Station Name | Emissions | 2014 | | 2015 | | 2016 | | 2017 | |
|---|---|---|---|---|---|---|---|---|---|
| | | 2014-Annual Mean | *Number of Days That 24 Mean Values of PM10 Exceed 100µg/m³* | 2015-Annual Mean | *Number of Days That 24 Mean Values of PM10 Exceed 90µg/m³* | 2016-Annual Mean | *Number of Days That 24 Mean Values of PM10 Exceed 80µg/m³* | 2017-Annual Mean | *Number of Days That 24 Mean Values of PM10 Exceed 70µg/m³* |
| Tekirdağ | PM10 | 50 | *12* | 75 | *78* | 71 | *96* | 58 | *94* |
| | SO2 | 31 | | 24 | | 27 | | 26 | |
| Tekirdağ - Çerkezköy-MTHM | PM10 | 45 | *20* | 39 | *14* | 41 | 29 | 42 | *39* |
| | PM2.5 | 27 | | 24 | | 23 | | 27* | |
| | SO2 | 18 | | 16 | | 26 | | 22 | |
| | NO2 | 22 | | 22 | | 23 | | 24 | |
| Tekirdağ - Çorlu - MTHM | PM10 | - | *0* | - | *0* | - | 0 | 35 | 5 |
| | SO2 | - | | - | | - | | 31 | |
| | NO2 | - | | - | | - | | 39 | |
| Tekirdağ - Çorlu OSB - MTHM | PM2.5 | - | | - | | - | | 27* | |
| | SO2 | - | | - | | - | | 18 | |
| | NO2 | - | | - | | - | | 26 | |
| Tekirdağ - Merkez-MTHM | PM10 | 73 | *61* | 81 | *99* | 102 | *230* | 81 | *172* |
| | SO2 | 42 | | 44 | | 45 | | 22 | |
| | NO2 | 47 | | 43 | | 45 | | 48 | |

Turkey national limits exceeded

Pm10 24 mean values are exceeded more than 35 times in a year

Source: Ministry of Environment and Urbanization, Air Monitoring Station data

*EU limits were used as there were no set limit values for PM2.5 emissions in the legislation of Turkey.

**Steps to take for a complete assessment of the air quality in Tekirdağ:**

**•The monitoring infrastructure of the Tekirdağ central station should be improved:** Monitoring should be initiated for the main sources of emissions (primarily for $PM_{10}$, $NO_2$, NOx and Ozone) at the Tekirdağ station located in central Tekirdağ.

**•New air quality monitoring stations:** There are still some districts without an air monitoring station that are within the area where industrial activities are focused. New air quality monitoring stations should be built in every district to analyze especially the effects of polluting sectors.

**•Independent scientific research on air quality should be encouraged:** Scientific research that brings together universities and the civil society on the effects of air pollution and polluting sectors should be supported.

**•$PM_{2.5}$ threshold values should be included in the legislation:** Active monitoring of $PM_{2.5}$ in two out of five stations shows progress in infrastructure. Legislation for $PM_{2.5}$ threshold values should be established immediately.

**•Actions should be binding when air quality standarts are exceeded:**The limit values set out in the national legislation have been exceeded multiple times at different stations in Tekirdağ, and it is evident that neither the Provincial Clean Air Action Plan nor these measurements have any effect. An action plan should be devised for when the limits are exceeded, and air pollution values should be considered while devising regional plans and making decisions for investment.

# HEAVY METALS AND CHEMICALS IN WATER AND SOIL

## Coal

The use of coal constitutes a threat not only in terms of air pollution but also due to the heavy metals and chemicals that are being released. A recent study on coal ash in Saray, Tekirdağ has revealed that lignite is a stronger pollutant than many other types of coal in the region. According to the study, **coal ash in Saray, Tekirdağ contains significant concentrations of toxicants (**e.g. V, Cr, Co, Ni, Zn, As, Rb, Sr, Mo, Cs, W, and U), causes high $SO_2$ emissions, and includes more trace elements, that pose environmental risks, in comparison with that of the brown coal ash across the world. The study points out that the ash from burning coal is extensively released into air without any restrictions[23].

## Water

Ergene Basin and Ergene River, surrounding the city of Tekirdağ, are under pressure. The Ergene river is contaminated with substances from the textile, iron, steel and other heavy industries. These substances mix with soil, groundwater, surface water and even agricultural crops, emerging as a threat to public health.

- A 2010 study by the State Hydraulic Works of Turkey found above-the-limit lead concentrations in Çerkezköy groundwater that is also used as drinking and running water[24].
- Another study conducted in Çorlu the same year revealed that the groundwater in Vakıflar, Çorlu contains lead, cadmium, and chromium in amounts exceeding the limits set by WHO, EPA and Turkish Standards Institution[25].

## Soil and Food

The impact of heavy metals can be traced in the soil and even in agricultural crops, in addition to water.

- In a 2005 study, lead concentrations in the agricultural soil around the Çorlu-Çerkezköy highway were read above the limits[26].
- In Çorlu, Şarköy, Marmara Ereğlisi districts of Tekirdağ as well as the central district of Tekirdağ, lead in soil was found to be above the limit values[27].
- In 2001, a study looking into heavy metal concentrations in Ergene river and the surrounding

surface water as well as in rice in that region, concluded that lead, zinc, nickel, manganese and iron in rice were above the limit values[28].

- A thesis dated 2011 indicated that the Ergene River, and rice irrigated with the Ergene and Meriç mix water contain a heavy metal concentration at toxic levels[29].
- In 2012, twelve out of twenty-five kashar cheese sampled from the Thrace region for heavy metal concentration, were found to contain mercury in amounts over the Turkish Food Codex limits[30]. The study noted manufacturing industry as well as water and soil pollution as potential causes of this amount.
- According to a study spanning 2011 and 2012, shrimp samples collected from Tekirdağ shores have lead, arsenic, and copper concentrations above the Turkish Food Codex limit values[31].

# PUBLIC HEALTH

In Tekirdağ, studies on air pollution and human health are gaining momentum. In 2016, a study was carried out in Tekirdağ to examine the link between outdoor air pollution and mortality rates[32]. According to the study 1,865 total deaths occured between 1st January 2016- 25th December 2016 in Tekirdag central distinct, Süleymanpaşa. During the same period the 24 hour mean values of $SO_2$ amd $PM_{10}$ recorded by national air quality monitoring system exceeded the national limits more than once. In this study, a correlation analysis was made by daily air pollution limits (considering mean, minumum, maximum, median values and standard deviation) and daily mortality rates. **The study founds that there was a correlation between $SO_2$ emissions and mortality.**

The presence of heavy industry presents a major public health risk. A 2008 report by Turkish Medical Association on Dilovası, a predominantly industrial district such as the Tekirdağ province, demonstrated that **the risk of death from cancer was 4.4 times higher for a person who lived in Dilovası for at least 10 years than a person who lived in Dilovası less than 10 years**[33]. Besides air pollution, heavy metals also affect human health. A 2017 study investigated the correlation between heavy metal concentrations and cancer in Turkish Thrace. Results of the study indicated a potentially **strong relationship between lead concentrations (textile and leather sectors), and bladder and renal cancers**. Another finding was an increase in all types of cancer between 2006 and 2011[24]. According to a study in 2012, the neighborhoods surrounding **Ergene, Marmaracık and Çorlu streams, known as contaminated by the industries, had increased number of cancer cases.** The distance between the settlements and the locations of the wastewater disposal system was observed to be of significance there[34].

# AN OVERVIEW OF COAL FIRED POWER PLANTS IN TEKİRDAĞ

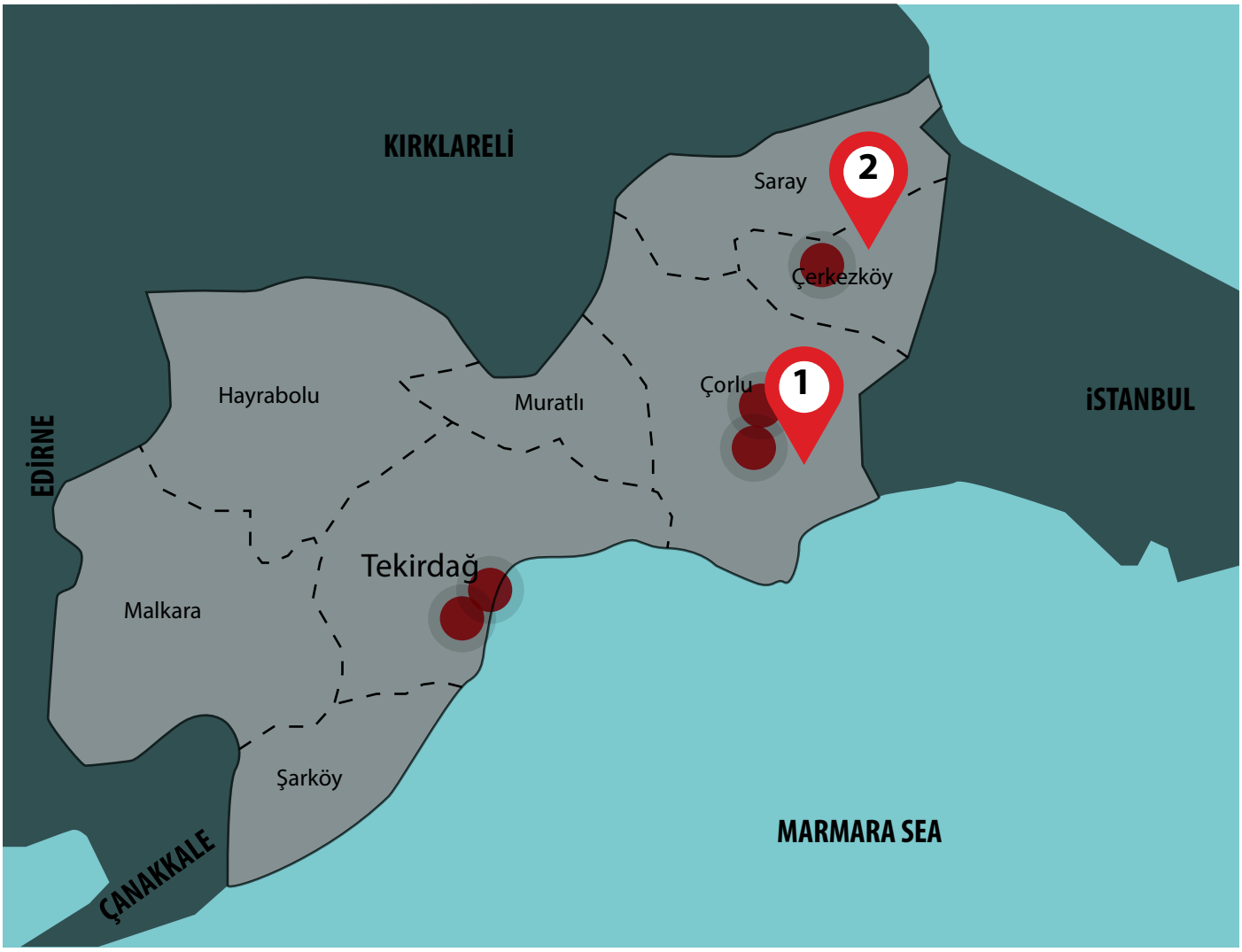
- **There are 2 planned coal power plants in Çerkezköy and Marmara Ereğlisi districts. The coal power plant planned to be built in Çerkezköy will use lignite, the plant in Marmara Ereğlisi plans to use imported coal.**
- **Industry sector is responsible for 76% of the electricty consumption.**
- **Planned coal power plants are prohibited in the region by Development Plan and Regional Development Plan.**
- **Lignite coal extracted from Malkara and Hayrabolu districts contains high air pollutant emissions and are low in calories.**

**The primary demand for power in Tekirdağ comes from industrial facilities. In 2016, industry consumed 76% of electricity generated[35].** Tekirdağ is also the city with the highest growing electricity consumption in Thrace, with a 75% increase from 2011 to 2015[35]. **There are 45 lignite mines in the Malkara, Süleymanpaşa, Hayrabolu and Şarköy districts of Tekirdağ**[36]. In 2016, 620 thousand tons of lignite coal from these regions were used for domestic heating purposes[37]. Also in the same year, industrial facilities in Tekirdağ used 715 thousand tons of local lignite mined in Malkara, Hayrabolu and Soma as well as 145 tons of imported coal[37].

All types of fossil fuels, predominantly coal, bring about air pollution and other environmental problems. **However, as the Ministry reports indicate, the sulfure and ash concentrations of these local lignites are high when the calorific values are low.** Most of the industrial plants that consume lignite in Tekirdağ still lack adequate infrastructure for elimination and reduction of dust, sulfure dioxide ($SO_2$) and nitric oxide ($NO_X$) emissions[37]. Therefore, mining and using lignite in Tekirdağ lead to further air pollution, posing an increased danger for human health.

In an attempt to prevent industrial air pollution in Tekirdağ, a decision was made in 2009, obliging industrial facilities that want to use coal to obtain an authorization for emissions and undergo a supervision. As of the end of 2015, the Local Environmental Board decided to ban the use of locally produced coal by private organizations and businesses that provide public services in winter 2016-2017 in all the district centers, and employ, wherever a proper infrastructure is available, alternative clean energies. The Board has approved the 2015-2020 Tekirdağ Clean Air Action Plan. **The "Thrace Sub-region Ergene River Basin Environmental Revision Plan" approved in 2011 prohibited the operations of coal-fired thermal power plants as well as heavy industries including iron and steel production plants and mining facilities**.

**Although there is no coal-fired power plant currently operating in Tekirdağ, this city frequently hits headlines with thermal power plant plans. The two coal-fired power plants in the pipeline for the city are Electricity Generation Company's (EUAS) thermal coal-fired power plant based on locally produced lignite and ÇEBİ thermal power plant based on imported coal.** In addition, the MEDA thermal power plant was planned for the region, but its licence was recently cancelled.




**1** **Planned**
EÜAŞ Çerkezköy Coal Plant,
lignite coal

**2** **Pre-license is under evalation**
ÇEBİ Coal Plant,
730 MW, imported coal

**Air Quality**
**Monitoring Stations**

# TEKIRDAĞ ÇERKEZKÖY EUAS COAL POWER PLANT

Despite the upper scale plans and decisions taken in previous years, there is a construction plan by EUAS (Electricity Generation Company) to build a coal power plant with local lignite over a 500-hectare area in Çerkezköy[38], the district where the largest organized industrial zone in Tekirdağ is based.

A previous announcement had reported that the larger part of the thermal power plant would be mostly within Istanbul provincial borders. In October 2017, the area for the plant was changed to Pınar region near Kapaklı district of Çerkezköy. As the thermal power plants set for Çerkezköy, Tekirdağ and Vize, Kırklareli were not conform to the 1/100,000 and 1/25,000 upper scale plans, the said districts were announced as "Energy Generation Areas" with the "Change to the Ergene River Basin Environmental Revision Plan". The changed coordinates of the Çerkezköy thermal power plant were announced in October 2017 along with the revised 1/25,000 and 1/100,000 upper scale plans. Despite the subsequent opposition by public institutions, local authorities and NGOs, in January 2018, it was announced that the plan would remain the same[39].

The General Directorate of Mineral Research and Exploration studies frequently refer to the lignite fields in this area, specifying that, between 2005-2016, 573.6 million tons and 618 million tons of lignite reserves were explored in the Trakya Çerkezköy basin and the Tekirdağ-Malkara field, respectively[40]. Although EUAS' prospective thermal power plant is set to be fired with domestic lignite to establish the security of energy supply and open the lignite fields to production, this decision is worrying as it concerns the environment and human health, and is in contradiction with the upper scale plans. The environmental status reports prepared by the Ministry of Environment and Urbanization stresses that the lignite in the area causes a high level of air pollution and has a low calorific value. The goal to reduce the use of coal is mentioned frequently. Trakya Development Agency, the organization in charge of the upper scale development plans, has also stated that the abundant natural resource of the region, the lignite is of low calorific value and potentially an environmental pollutant, therefore not suitable for use[41].

A 2018 study estimates that if the Çerkezköy thermal power plant was operationalized, the resulting exposure to $PM_{2.5}$ and $NO_2$ would alone cause 141 premature deaths in a year[42], and if it continued its operations for 40 years, which is the average life of a thermal power plant, it **would cause 5,640 premature deaths in total.** As these figures can be calculated only to a limited extent, thus represent the emissions of only some of the pollutants, the actual results would be far more dire. In HEAL's 2015 report it's estimated that air pollution created by coal power plants in Turkey cause approximately 3,000 premature deaths every year[15].

# ÇEBI COAL POWER PLANT

The Çebi Power Plant with 730 MW installed capacity, planned for construction in Marmara Ereğlisi near one of the region's largest iron and steel plant, is designed to use imported coal. **According to the Environmental Impact Assessment report on the plant, under evaluation since its submission in 2013, the rationale behind choosing imported coal was that domestic coal is inefficient in terms of calorific value and includes high concentrations of ash and sulphur, air pollutants**[43]. This fact, however, does not necessarily imply that imported coal would not cause pollution. Instead, environmental pollution due to coal, and sea transportation of coal will impose an extra burden of pollution in the region.

# STATEMENTS OF HEALTHCARE PROFESSIONALS

"Preventive health services constitute the foundation of good physician practices. It is a public health specialist's priority to prevent diseases before occurring, and to protect and improve health. Air pollution is a pressing issue in Tekirdağ and across the entire Thrace region. Poor air quality was repeatedly mentioned in the reports of the Ministry of Environment and Urbanization, and with the Environmental and Development Plans, restrictions were imposed on thermal power plants and the iron-steel industry to prevent the region from further pollution. The heavy industry-based development model for Tekirdağ needs to be modified immediately. Tekirdağ should utilize its existing agricultural and tourism potential, and the agricultural lands in the region must be declared as protected agricultural areas. Human health needs to be prioritized while devising plans for energy policies and development tools. The objective here must be to achieve a sustainable environment. The use of fossil fuels and the industrial pollution pose serious health risks to the ecosystem, human beings in particular. Defending the citizens' right to live in a clean environment is a fundamental duty for physicians; therefore, to protect local citizens and their right to live in a healthy environment, we demand the fossil fuel-based energy generation to be abandoned."

**Assoc. Prof. Dr. Gamze Varol, Head of the Department of Public Health, Namık Kemal University**

"Central Tekirdağ and its districts are facing a serious problem of environmental pollution due to industrial facilities and a sharp increase in internal migration to the area, caused by a poorly planned industrialization. While the infrastructural problems still persist everywhere in Tekirdağ, the fast and unplanned industrialization, initiation of operations in industrial areas before the completion of decontamination and infrastructure works, the lack of controls and a rapid population growth have added to air pollution each passing day and have reached extremely hazardous levels for human health. This resulted in an increase in diseases that affect all the systems in the human body, especially respiratory diseases and cancer cases."

**Gökhan Gözde, MD, Chairman of the Tekirdağ Medical Chamber**

"According to WHO data, every year approximately seven million people lose their lives due to diseases caused by indoor and outdoor air pollution. Numerous studies have proven that air pollution increases the frequency of occurrence of especially respiratory and cardiovascular diseases. Given that we breathe on average 12 times a minute and each breath is 500 ml, 360 liters of air enter into our lungs in one hour. We don't have the ability to control or hold our breathing. Many hazardous particles and gas fill our lungs and maybe from there spread throughout our body. When drinking a glass of water, we always want to make sure that it is clean. Then, why don't we show the same attention to the air we breathe?"

**Assoc. Prof. Dr. Levent Cem Mutlu, Chest Diseases Specialist**

"A part of the Ergene Basin, which is home to one of the most fertile lands of Turkey, the province of Tekirdağ and its surrounding region have been in the spotlight for the air and water pollution in recent years. In parallel, respiratory diseases occupy a large portion of the health problems in the region. Carbon monoxide, the main component of air pollution, carbon dioxide and nitric oxide as well as the photochemical pollutants generated from reaction of these gases with sunlight are emitted by thermal power plants as a result of combustion of fossil fuels, coal in particular, causing more air pollution. This means a susceptibility to respiratory infections and an increase in respiratory diseases and inflammation in chronic obstructive pulmonary disease (COPD). Therefore, the thermal power plants that are planned to be built in our region should be reconsidered given the fact that they will add to the existing pollution levels and respiratory problems. "

**Kahraman Şahin, Specialist MD, Pulmonary Medicine Specialist**

"We are living on the most fertile land of our country, that is Thrace with the Marmara Sea on the one side, Istıranca forest and floodplains on the other. We are talking about a land that has a coast on the Black Sea, the Marmara Sea and the Aegean Sea. We will always be against any initiative, including thermal power plants, that would damage the natural ecosystem on these lands which must be declared to be "Protected Agricultural Areas". We will continue to defend and uphold our fundamental human right to live, and we will make every effort to protect our Thrace."

**Ufuk Ersöz, President of Süleymanpaşa City Council**

# ÇANAKKALE

## THE STATE OF ENVIRONMENT AND PUBLIC HEALTH IN ÇANAKKALE

Population of
520k

Agriculture
dominant economy

6 lignite
sites

coal power plants
4 in operation (3,245 MW)
1 under construction (330 MW)
9 planned (10,310 MW)

Çan district:
annual $PM_{10}$ and $SO_2$ values are above the national standarts

**With a population of 520.000, Çanakkale is one of the provinces with the highest rural population in the Marmara Region and in Turkey at large. Air pollution from coal plants is the most critical environmental problem in the city[44]. When there are four coal powver plants in operation and 1 under construction, 9 other coal power plants are planned to be built. When the industry is mainly dependent on agriculture and forestry currently, environmentally hazardous sectors such as coal power plants, iron-steel and cement industry and mining are increasing[45].**

Çanakkale, situated at the junction of Marmara and Aegean seas, hosts national parks, historical landmarks and the largest islands of Turkey. Çanakkale's natural values offer health, culture, marine and nature tourism opportunities[46]. Dominated by the agricultural industry, a total of 755 industrial companies are located in the city with food, furniture, wood products, soil products as well as iron and steel industries respectively. Çanakkale also hosts three Organized Industrial Zones (Çanakkale OIZ, Biga OIZ and Ezine OIZ) and seven smaller scale industrial sites. However, environment and public health are under pressure from heavy industry activities: Reinforcing bars and cement are manufactured in and exported from the city; scrap iron that is hazardous to human health and causes accumulation of heavy metals in humans is imported and processed in the city. The largest scrap iron and steel plant in Turkey is located in Biga, Çanakkale[46].

Districts such as **Çan (two sites in the district center, Çomaklı and Karlıköy areas), Yenice (Örencik)** and **Bayramiç (Çırpılar)** have lignite coal sites[47] while gold, metal mines and industrial raw material deposits are found in the hinterland of the districts[48]. The following are the companies operating in mining and energy industries in the area: Çan Lignite Company, Electricity Generation Company (EÜAŞ) Çan Thermal Power Plant, Factories of Kaleseramik Çanakkale Kalebodur Ceramics Inc. in Çan district; cement and clinker manufacturing facility of Akçansa Cement Industry Inc. in Ezine district; iron and steel manufacturing facility of İÇDAŞ Steel Energy and Shipyard Transport Inc. and İÇDAŞ Bekirli Thermal Power Plant and Cenal Thermal Power Plant in Biga district[46].

According to a report on environmental problems published by the Ministry of Environment and Urbanization (MEU) in 2016, **air pollution is the most critical environmental problem in Çanakkale. The report also clearly demonstrates that air pollution is caused by coal-fired power plants**[44]. The report also mentions sulfur pollution from coal-fired power plants that use lignite. Çan Thermal Power Plant in Çanakkale uses domestic lignite and the average annual rates of $SO_2$ and $PM_{10}$ in Çan district create health hazards for humans.

# AIR QUALITY

## People in the Çan district of Çanakkale breathe health-harming air

In Çanakkale, there are four air quality monitoring stations accessible via public database of national air monitoring stations. According to data provided by Çan station located around coal-fired power plant of Çan, annual average rates of $PM_{10}$ and $SO_2$ are above threshold values specified in WHO, EU and Turkish regulations and pose a risk to human health. There is no air quality measurement station in the district of Biga, which hosts three coal-fired thermal power plants (Çanakkale Biga and Çanakkale İçdaş) as well as the largest scrap iron and steel plant of Turkey. $PM_{2.5}$ measurements are recorded in Lapseki but so far, no threshold value is specified for $PM_{2.5}$ in Turkey.

The Action Plan for Clean Air in Çanakkale published by the Ministry of Environment and Urbanization in December 2017 focuses on air pollution in the district of Çan. However, instead of considering measures to prevent pollution from large sources such as heavy industry and coal-fired thermal power plants, the plan lists clean air activities on domestic heating and personal consumption.

Annual Air Pollution Emission in Çanakkale Between 2017-2014

| Station Name | Emissions | 2014 | | 2015 | | 2016 | | 2017 | |
|---|---|---|---|---|---|---|---|---|---|
| | | 2014-Annual Mean | *Number of Days That 24 Mean Values of PM10 Exceed 100µg/m³* | 2015-Annual Mean | *Number of Days That 24 Mean Values of PM10 Exceed 90µg/m³* | 2016-Annual Mean | *Number of Days That 24 Mean Values of PM10 Exceed 80µg/m³* | 2017-Annual Mean | *Number of Days That 24 Mean Values of PM10 Exceed 70µg/m³* |
| Çanakkale | PM10 | 23 | 0 | 27 | 1 | 24 | 1 | 26 | 12 |
| | SO2 | 12 | | 10 | | 9 | | 11 | |
| Çanakkale - Biga İçdaş | SO2 | 14 | | 4 | | 4 | | 4 | |
| | PM10 | 19 | *0* | 22 | *1* | 17 | *0* | 23 | *0* |
| | NO2 | 0 | | 9 | | 9 | | 15 | |
| Çanakkale - Can-MTHM | PM10 | 71 | *69* | 70 | *73* | 63 | *47* | 66 | *52* |
| | SO2 | 134 | | 89 | | 58 | | 25 | |
| | NO2 | 23 | | 20 | | 19 | | 21 | |
| Çanakkale - Lapseki-MTHM | PM2.5 | 21 | | 17 | | 14 | | 20 | |
| | SO2 | 8 | | 8 | | 10 | | 10 | |
| | NO2 | 11 | | 9 | | 9 | | 10 | |

Turkey national limits exceeded

Pm10 24 mean values are exceeded more than 35 times in a year

Source: Ministry of Environment and Urbanization, Air Monitoring Station data

*EU limits were used as there were no set limit values for PM2.5 emissions in the legislation of Turkey.

**Brief evaluation and recommendations for the Action Plan for Clean Air in Çanakkale[49];**

•The Plan states that the high rates of $SO_2$ emissions measured at the monitoring station in Çan were caused by the use of coal that contains high sulfur mined in the region. The action plan prohibits the use of coal supplied by TKİ (Turkish Coal Enterprises) Çan Lignite Company for heating purposes in the Çan district in addition to a ban on sales to households. However, the same type of coal is used in the 18 Mart Çan Coal-Fired Power Plant owned by EÜAŞ which is exempt from similar restrictions.

•The report notes that the flue stacks of 18 Mart Çan Power Plant emits $SO_2$ (sulfur dioxide) above standards. The action plan includes a decision to establish a desulfurization unit in the said power plant but the implementation of the decision was deferred until the end of 2019[50]. Furthermore, flue stack emissions from power plants and other large burning plants in Turkey are monitored by Continuous Emission Monitoring systems but the information provided by these systems is still unavailable to the public on the internet.

•The report states that coal in the open-pit coal mine in central Çan burns after rainfall and emits $SO_2$. Although there have been decisions to respond immediately to fire incidents that may occur due to burning coal, there is no decision for shutting down this coal mine where high-polluting lignite coal is extracted.

•The report mentions raising awareness among the public on the use of clean energy sources for domestic heating, with priority given to individual measures. However, a similar decision is not pronounced for electricity generation and industry. Use of clean energy resources must be specified as a priority for energy production facilities as well.

•The average annual rate of $PM_{10}$ measured by the station in Çan is above national threshold values and poses a risk to human health. Furthermore, according to national legislation, the 24-hour average rate of $PM_{10}$ must not exceed the threshold value for more than 35 days a year. The threshold value in Çan, however, has exceeded fifty-two days in 2017. The Action Plan does not mention any notice to be issued on days where the threshold value is exceeded.

•The Action Plan for Clean Air reports PM2.5 measurements in the station in Çan, while no PM2.5 on the Çan station could be found on web database of air monitoring by the MEU.

**Steps that should be taken for a thorough assessment of air quality in Çanakkale:**

•**Monitoring infrastructure of stations in central Çanakkale must be improved:** The adequacy of locations and the number of stations in central Çanakkale must be verified and all main emission sources must be monitored.

•**Monitoring infrastructure must be established in the district of Biga:** Iron and steel and coal-fired power plants are situated in the district of Biga. Monitoring stations must be built in the district and their locations must be confirmed.

•**Full and correct dataflow:** PM2.5 data on the station in Çan stated in the Action Plan for Clean Air by MEU cannot be accessed on the online database of air quality by MEU. Database available to the public must be updated.

•**Making public information provided by Continuous Emission Monitoring Systems available to the public**: The Action Plan provides data on chimney emissions of thermal power plants and iron and steel plants in the region. However, these data are not available to the public either in Çanakkale or across the country. These monitoring systems must be made available to the public online with a view to understand the load caused by major polluters and to carry out more scientific research.

•**Scientific research on air quality must be supported:** Support must be given to scientific research conducted mainly on negative health effects posed by future coal plants and heavy metal pollution as well as on environmental load caused by heavy industry.

# HEAVY METALS AND CHEMICALS IN SOIL AND WATER

## Coal and Coal-Fired Power Plants

Academic research is available on the content of lignite coal mined in especially the Çan district of Çanakkale, noise effects of open-pit mining[51], coal storage sites of power plants and heavy metal pollution from coal power plants (CPPs);

•In 2008, a study similar to the one on trace elements of coal in Tekirdağ was carried out on lignite coal mined in Çan, Çanakkale. Accordingly, although trace element concentrations are similar to other types of coal in world standards, high rates of ash (4.42%-36.72%) and sulfur (8.10%) content is found in coal mined in the Çan region[52]. $SO_2$ (sulfur dioxide) pollution in the region due to high rates of ash and sulfur in coal was emphasized in the MEU reports as well.

•According to another study by Çanakkale 18 Mart University and İzmir Institute of Technology in 2010[53] **fly ash emitted by the flue stack** of 18 Mart Çan coal-fired power plant **contains trace elements that pose a threat to human health and cause soil and water pollution**. **High amounts of uranium (U) and vanadium (V) was found** in the flue. Additionally, **arsenic (As) values in the coal storage site are above normal values and pose health hazard for humans.**

•According to the Action Plan for Clean Air formulated by the MEU that includes data by "Continuous Emission Monitoring System" supervised by MEU, **the chimney of 18 Mart Çan Power Plant emits sulfur dioxide above threshold values**[49].

•Action Plan for Clean Air reports spontaneous combustion in coal sites after rainfall and consequent $SO_2$ emission[49].

## Water

In addition to lignite coal fields; Çan, Yenice and Bayramiç districts also have numerous valuable mineral deposits and clay mines used for ceramic industry in the region. Among valuable metals, mining of especially gold causes many environmental problems. While Çanakkale is under risk of environmental pollution to be caused by coal plants, gold mines that are planned in the region also continue to draw criticism from the society.

•According to a study conducted in 2007, aluminum concentration above limits was detected in underground and surface waters in Çan Plain[53]. It is assumed that mining causes the pollution.

• Since 1980, open-pit coal mining activities have been carried out in Çan district, in which private companies are also involved. Unfortunately, some of the coal mining companies abandon mining sites without rehabilitation, which create artificial ponds. According to a study made in 2014[54] underground and surface waters containing high levels of sulfur concentration accumulate in these artificial ponds which then become acid ponds. **Acid ponds formed after coal mining in Çan district contain many dissolved metals, metalloids and other toxic substances posing environmental risk and the water in acid ponds mix with underground water.**

•Development Agency reported high levels of industrial water pollution in central Çanakkale[46] and Biga, a district that hosts the biggest scrap iron and steel plant of Turkey and two coal-fired power plants.

## Soil and Food

Çanakkale is among the major cities in Turkey in terms of agricultural land and agricultural production. According to Farmer Registration System data, there are 22.809 farmers, 165 thousand hectares of registered agricultural estate and 556 agricultural businesses with nearly 12.000 employees in Çanakkale. In terms of agricultural production and agriculture-based means of living, food products made up 88% of Çanakkale's trade volume in 2015 which include products specific to the region such as kapya pepper[56].

•Despite this agricultural richness, Turkey's **largest scrap iron and steel** plant **is situated in Biga, Çanakkale.** Scrap iron and steel processing is one of the major causes of heavy metal accumulation. During the scrap melting process, heavy metal components in metal dyes in scraps are released into the air[57].

•Moss is used as biological quality element/ biological indicator in scientific studies. "Hypnum cupressiforme L. ex Hedw", a type of moss, was used in a study on heavy metal pollution in central Çanakkale[58]. It was found that between 12.06. 2002 and 17.03.2003, central Çanakkale was exposed to high levels of iron, nickel, manganese, lead and chromium pollution. Another important finding in the study refers to more intense pollution in especially lower areas. It is observed that pollution from coal and petroleum products accumulate more on moss species especially in lower regions.

# THE HEALTH OUTLOOK

Studies are available on negative human health effects of air pollution caused by coal-fired power plants in Çanakkale;

•In 2015, Çanakkale 18 Mart University carried out a study based on monthly average indoor air quality measurements and respiratory health screenings. As a result, it was found that **indoor air pollution and prevalence of asthma cases** were **highest in Çan district** where 18 Mart Çan Power Plant, lignite mines and soil products industry are located. The study also notes that the most prevalent respiratory health issue was dyspnea[59]. Although the said study deals with indoor air pollution, indoor air pollution is linked to outdoor pollution.

•According to a 2010 Greenpeace study on negative health effects of coal plants, three coal-fired power plants operating in Çanakkale (except Cenal Coal-Fired Power Plant only recently active in Biga), caused a total loss of 2.650 life years and 42.910 workdays in 2010[60].

Çanakkale Biga©Greg Mc Nevin / GCCA

# AN OVERVIEW OF COAL FIRED POWER PLANTS IN ÇANAKKALE

- **There are 4 operating coal power plants with total 3,245 MW capacity in Çan and Biga districts. In addition, a CPP with 330 MW capacity is being built in Biga district and there are 9 CPPs with 10,310 MW capacity in the pipeline.**
- **Industry sector is responsible for 76% of the electricty consumption.**
- **Planned coal power plants are in consistent with the Development Plan strategy.**
- **Lignite coal extracted from Çan district contains high air pollutant emissions. Çanakkale Clean Air Action Plan prohibited the usage of this coal for domestic use when still Çan CPP is using for electricty production.**
- **Turkey's largest iron and steel production from scrap locates in Biga district.**

In Çanakkale, the majority of power is consumed by the industry, in 2016 their share in power consumption was 76% (2.679 GW consumed by the industry, whereas 3,533 total consumption)[61]. Coal-fired power plants can be found especially in the Biga and Çan districts.

As of January 2018:

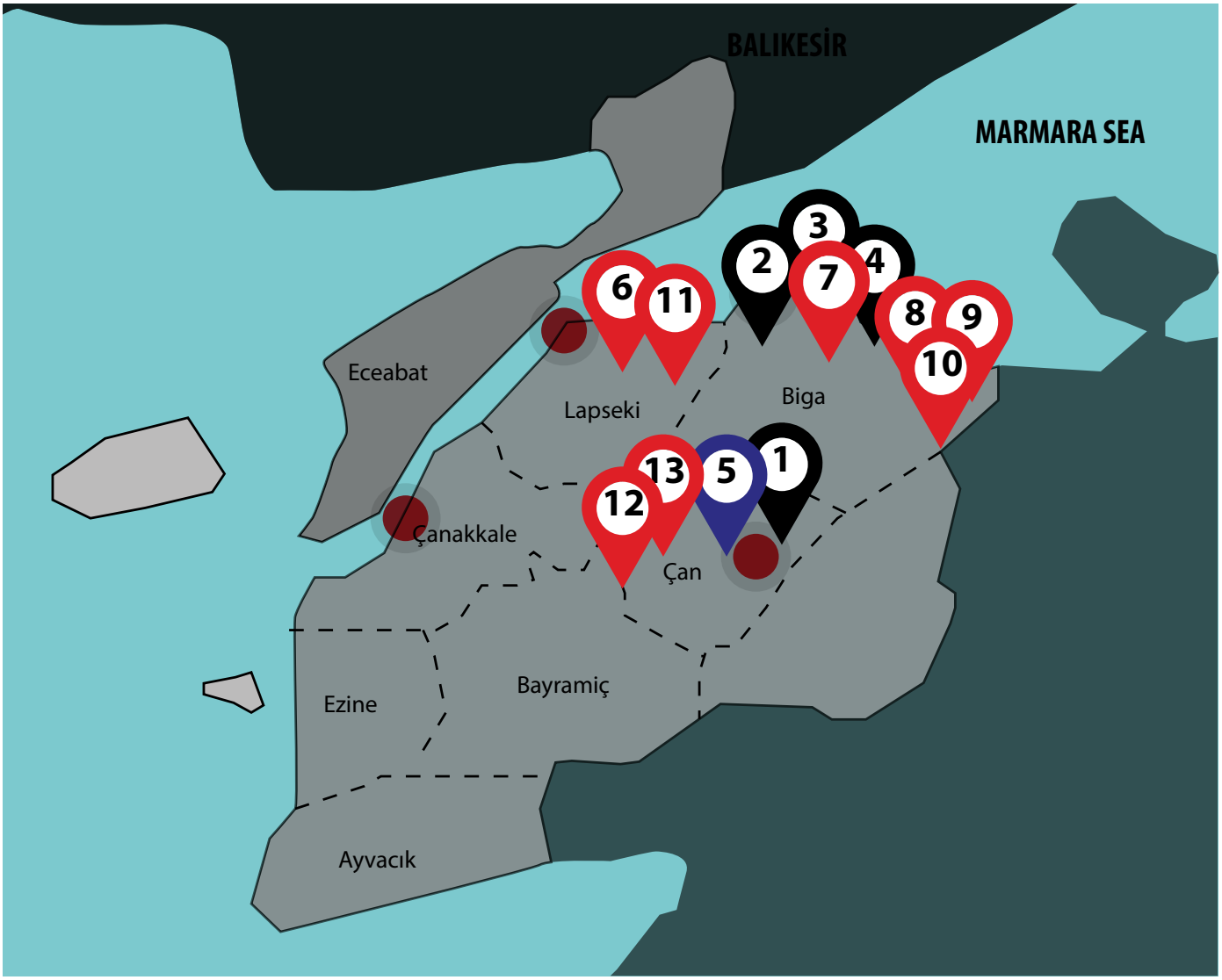
• In Çanakkale's Çan district there is one coal fired power plant that works with domestic coal, in Biga district there are three coal-fired power plants that use imported coal. The most recent power plant is Cenal CPP with 1,600 MW capacity, commissioned in December, 2017. Total power generation of all four power plants is 3,245 MW.

• 18 Mart Çan Power Plant using local lignite coal with high sulphur and powder content is located in the middle of three villages in Çan district. Çan-2 Power Plant, planned to have 330 MW installed capacity will be built very close to Çan Power Plant.

• Planned (at the stages of pre-licensing and licensing) nine power plants' total installed capacity will be 10,310 MW, which is three times the capacity of currently operational thermal plants*.

Southern Marmara Development Agency, working under coordination of Turkish Development Ministry, has identified Çanakkale's development strategy as "ecological development" and has put "developing health tourism focused on treating patients with chest diseases and asthma" among its development plans[62]. Unfortunately, these development strategies do not match Çanakkale's coal based energy future and coal based industry model.

*Licence and pre-licence information of the planned CPPs are compiled from EIA reports or EPDK web sites. However in EPDK's web site unaccesible datas has been observed time to time. For example a pre-licenced project under evaluation became unaccesible without any information.




**1** **In operation:**
Çan Coal Plant,
320 MW, lignite coal

**2** **In operation:**
İÇDAŞ Değirmencik Coal Plant,
405 MW, imported coal

**3** **In operation:**
İÇDAŞ Bekirli Coal Plant,
1200 MW, imported coal

**4** **In operation:**
Cenal Coal Plant,
1320 MW, imported coal

**5** **Under construction:**
Çan 2 Coal Plant,
1380 MW, lignite coal

**6** **Planned and licenced:**
Kirazlıdere Coal Plant,
1600 MW, lignite coal

**7** **Planned and licenced:**
Karaburun Coal Plant,
1600 MW, lignite coal

**8** **Planned and pre-licenced:**
Ağan Coal Plant,
1580 MW, imported coal

**9** **Pre-license is under evalation**
Naren Coal Plant,
1200 MW, imported coal

**10** **Planned and pre-licenced:**
Biga Integrated Coal Plant,
1540 MW, imported coal

**11** **Pre-license is under evalation**
Namal Coal Plant,
1000 MW, imported coal

**12** **Planned and pre-licenced:**
Çırpılar Coal Planti,
200 MW, lignite coal

**13** **Pre-license is under evalation**
Helvacı Coal Plant,
270 MW, lignite coal

**14** **Pre-license is under evalation**
Irmak Coal Plant,
1320 MW, imported coal

**Air Quality Monitoring Stations**

# ÇAN 18 MART POWER PLANT

Four lignite coal fields in Çan and two in Bayramiç and Yenice can be found in the region. Çan Lignite Enterprise, has been nationalized after being managed by private sector until 1979. Çan Lignite Enterprise, where there is open coal mining, is located close to residential areas.

The Çan 18 Mart Power Plant, together with Afşin A and Afşin B, is one of three power plants that has not been privatized[63]. The Çan Power Plant uses lignite coal mined in Çan district and it is **Turkey's first fluidized-bed thermal power plant**[64]. Fluidized bed technology is used for generating power from coal, which is especially high in ash and sulphur but low in calories. Coal with high calories (until its use by households was prohibited), extracted in Çan district, was used in household heating and low calorie coal was used in fluidized bed Çan Thermal Power Plant[65]. Fluidized bed technology was launched in Çan Thermal Power Plantin 2003 following a pilot project; however, flue gas desulfurization unit was opened in 2007[65]. It is known that the plant causes 500 thousand tons of coal fly ashes per year. And despite all desulfurization efforts, **it is impossible to decompose sulfur from coal and prevent sulfur emission both when using coal to generate power and when using coal for the industry**[65].

The Ministry of Environment and Urbanization's Action Plan for Clean Air addresses the flue gas problems of thermal power plants and **reports the high amount of sulphur dioxide emission from the plant's flue, while informing about the spontaneous combustion after rain in the coal fields located in the region.** All these factors deteriorate the already low air quality in the region. **Ministry of Environment and Urbanization banned the sales offices in Çan from selling Turkish Coal Enterprises' coals to households based on the Action Plan for Clean Air**, completed in December 2017, for the reasons of improving the air quality and due to the fact that 90% of all coal used in household heating is domestic lignite coal in Çan district.

# BIGA DISTRICT

In Biga there are three coal-fired power plants; Turkey's largest iron and steel production from scrap and an integrated İçdaş Değirmencik CPP with 405 MW installed capacity, İçdaş Bekirli CPP, managed by İÇDAŞ again, with 1200 MW installed capacity, and Cenal CPP commissioned in December, 2017[66]. All three plants use imported coal and the ports in the region are used to do the import. The burden which the coal-fired power plants bring upon maritime transportation and its environmental effects as well as sea fillings of the power plants in this region, sea water usage and proximity to residential areas are all sources of serious concern.

# PLANNED COAL PLANTS

In 2017, TEMA (the Turkish Foundation for Combating Soil Erosion, for Reforestation and the Protection of Natural Habitats) and Right to Clean Air Platform carried out a study to analyze the impact of coal plants in Çanakkale on air quality and health[67]. In order to reveal the cumulative effects, the study used the CALPUFF air pollution modelling methodology to take the secondary interaction of polluting emissions and meteorological data into account more effectively. At the time of the study, there were three operational plants as well as two plants under construction. Furthermore, another 11 are currently in the planning stage. The scenario, where all CPPs currently under construction and at the planning stage become operational, there will be 16 CPPs with a capacity of 15.000 MW generating power from coal.

In this scenario, changes in $PM_{2.5}$, $NO_2$ and $SO_2$ were calculated. According to this calculation, in the region between Bandırma and Çanakkale $PM_{2.5}$ burden may increase up to 150% in the region and up to 25% in Istanbul. **Thus, the air pollution caused by coal fired power plants may result in 1,130 early deaths* in a year[67].** Same study also analyzed the effects of CPPs on soil, and claimed that the acid deposition resulting from power plants will be 20 to 80 kg/hectare in the coastline of Biga, Çan and Marmara.

Another modelling study on air quality was also realized in 2017 by Istanbul Technical University[68]. The study reveals that in the case of all planned power plants being operational, the $SO_2$ limit values stated in regulations of many regions will be exceeded. The study also touches upon the insufficient number of air quality monitoring stations in the region and the selection of station locations.

*The results are at 95% confidence level.

Çanakkale Biga©Greg Mc Nevin / GCCA

# İZMİR

## THE STATE OF ENVIRONMENT AND PUBLIC HEALTH IN İZMİR

Population of
4,3 million

Service
dominant economy

5 lignite
sites

coal power plants
1 in operation (350 MW)
1 planned (700 MW)

Bayraklı & Gaziemir
districts breathe harmful air

Aliağa district:
heavy-industry zone

**İzmir is Turkey's third largest city with a population of 4.3 million and is threatened by air pollution caused by heavy industry and coal-fired power plants. The province of İzmir boasts iron and steel, ship-breaking and cement facilities and thirteen OIZs. Industrial electricity demand is high and İzmir's per capita industrial electricity consumption accounts for twice Turkey's average.**

In 2017, İzmir boasted a population of about 4.279 million and was ranked Turkey's third largest city after Istanbul and Ankara. The majority of the population is employed in the service sector[69]; while the central districts are commerce, industry and tourism-intensive, the less populated remote districts are more agriculture and husbandry-intensive whereas the coastal districts are more tourism-intensive.

While in Turkey per capita industrial electricity consumption is 1,076 kWh, Izmir accounts for almost twice as much with 2,091 kWh[70]. The metal industry and sub-industries account for the majority of the industrial sector. There are thirteen organized industrial zones in Izmir, and industry is especially intensive in the districts of Aliağa and Torbalı. Menemen, Kemalpaşa and Menderes are other important industrial centers. The international seaports play an important role in the industrial sector. The districts of Bergama and Kınık boast industrial mining and quarrying activities. There are also five lignite fields in the area.

The operational İzdemir Coal-Fired Power Plant Unit 1 has an installed capacity of 350 MW and is located in the Aliağa district, home to heavy industries and the highest coal-fired power plant concentration. While most of the planned coal-fired power plants have been cancelled, the Kınık Coal-Fired Power Plant of 700 MW is still in the pre-license assessment stage. Also the approved Environmental Impact Assesment of the planned İzdemir Coal-Fired Power Plant unit-2 with 350 MW capacity was been cancelled according to the outcome of the law suits.

# AIR QUALITY

## People in Bayraklı and Gaziemir of Izmir districts breathed polluted air in 2017

Aliağa, Kemalpaşa and Torbalı have high industry-caused air pollution levels but no air quality monitoring stations. In Izmir, there are eight stations that can be accessed through the national air monitoring web database. The most striking feature of these stations are the irregular and incomplete emission measurements. $NO_2$ emissions are not measured by most stations and as for the stations that measure $NO_2$ emissions, data relating to more than half of the year is missing (See Annex). Furthermore, none of the stations in Izmir measure $PM_{2.5}$.

The annual average $PM_{10}$ emissions of the İzmir Bayraklı station, which is located in proximity to central İzmir and is surrounded by mountains and the sea, are higher than the limit values of the WHO, EU and Turkish regulations, are hazardous to human health. Even if the geographical characteristics of the region play a role in these high figures, the industrial air pollution that has been reported in Aliağa, Kemalpaşa and Torbalı districts is also being transported to these areas and to Izmir's residential areas. **The fact that air quality monitoring stations have not been built in the industry-intensive Aliaağa, Kemalpaşa and Tobalı districts is an important shortcoming as they are imperative for a comprehensive air quality assessment.**

Annual Air Pollution Emission in İzmir Between 2017-2014

| Station Name | Emissions | 2014 | | 2015 | | 2016 | | 2017 | |
|---|---|---|---|---|---|---|---|---|---|
| | | 2014-Annual Mean | *Number of Days That 24 Mean Values of PM10 Exceed 100µg/m³* | 2015-Annual Mean | *Number of Days That 24 Mean Values of PM10 Exceed 90µg/m³* | 2016-Annual Mean | *Number of Days That 24 Mean Values of PM10 Exceed 80µg/m³* | 2017-Annual Mean | *Number of Days That 24 Mean Values of PM10 Exceed 70µg/m³* |
| İzmir - Alsancak | PM10 | 33 | 6 | 32 | 6 | 42 | *39* | 38 | 27 |
| | SO2 | 9 | | 7 | | 7 | | 12 | |
| | NO2 | 15 | | 4 | | 25 | | 27 | |
| İzmir - Bayrakli | PM10 | 63 | *54* | 57 | *50* | 54 | *49* | 50 | *65* |
| | SO2 | 6 | | 5 | | 17 | | 8 | |
| İzmir - Bornova | PM10 | 40 | 3 | 46 | 15 | 44 | 15 | 45 | 33 |
| | SO2 | 8 | | 18 | | 7 | | 9 | |
| | NO2 | 21 | | 2 | | 170 | | 30 | |
| İzmir - Çigli | PM10 | 37 | 10 | 40 | 14 | 35 | 15 | 34 | 18 |
| | SO2 | 10 | | 11 | | 14 | | 13 | |
| İzmir - Gaziemir | PM10 | 18 | 0 | 33 | 21 | 51 | 37 | 60 | *91* |
| | SO2 | 7 | | 14 | | 11 | | 8 | |
| İzmir - Güzelyalı | PM10 | 51 | 22 | 41 | 15 | 39 | 17 | 37 | 18 |
| | SO2 | 6 | | 7 | | 9 | | 17 | |
| | NO2 | 21 | | 10 | | 2 | | 26 | |
| İzmir - Karşıyaka | PM10 | 39 | 12 | 29 | 3 | 20 | 3 | 47 | 20 |
| | SO2 | 6 | | 9 | | 10 | | 14 | |
| | NO2 | 16 | | 2 | | 4 | | 24 | |
| İzmir - Sirinyer | PM10 | 47 | 26 | 46 | 29 | 46 | 30 | 42 | 32 |
| | SO2 | 8 | | 11 | | 15 | | 12 | |
| | NO2 | - | | - | | - | | 22 | |

Turkey national limits exceeded

Pm10 24 mean values are exceeded more than 35 times in a year

Source: Ministry of Environment and Urbanization, Air Monitoring Station data

*EU limits were used as there were no set limit values for PM2.5 emissions in the legislation of Turkey.

**Steps that need to be taken in order to perform a complete air quality assessment in Izmir:**

**•Develop a province - wide, extensive monitoring infrastructure:** There is a need to establish an air quality monitoring infrastructure, most notably in regions where iron and steel plants and coal-fired power plants are located, by taking into account the location of coal-fired power plants and the number of stations. Regular measurements should begin urgently in Kemalpaşa, Torbalı and Aliağa, which have been indicated to have low air quality in the Clean Air Action Plan.

**•Develop monitoring infrastructure for all pollutants:** Stations with $NO_2$ measurement infrastructures should take measurements and provide data every day of the year, and infrastructure should be developed for the remaining stations. Furthermore, all stations should begin to measure $PM_{2.5}$.

**•Encourage independent scientific air quality research:** Research on the impact of İzmir's air pollution on human health, which will bring together academia and civil society, should be encouraged and information flow from state institutions should be ensured.

# HEAVY METALS AND CHEMICALS IN SOIL AND WATER

### The Aliağa Province: The Heavy Industrial Zone

Aliağa's economy was agriculture-intensive until 1961, when it was **acknowledged as a "Heavy Industrial Zone" by the 1961 Constitution**. As a result, an industry-intensive economic process began from the 1970's onward, and with the establishment of the petrochemistry industry, Aliağa was transformed into an industrial city in a period of 15 to 20 years[71].

Aliağa is one of the dirtiest locations in the province as well as in the region. The PETKİM petrochemical complex, the TÜPRAŞ İzmir Refinery, steel and iron plants, rolling mills (heavy industry facilities where steel and/or aluminum are melt and re-shaped), ship-breaking facilities (twenty-one facilities)[70]**, scrap recycling facilities, fuel filling andfuel selling facilities, LPG filling facilities, natural gas cycle plants, Liquid natural gas terminals, fertilizer industry, paper mills, concrete production facilities, coal storages and organized industrial zones of various scale are located in Aliağa.**

In Antiquity, Aliağa was host to four Aiolean cities along the Aegean coast and the cities' ruins can still be seen today. Aliağa-Menemen, Foça and Seferihisar-Selçuk are the natural breeding ground of the endangered Mediterranean monk seals. The most important pollutants in the area are classified as permanent organic pollutants, volatile organic compounds, $SO_2$, NOx, $O_3$, particulate matter and metals. Electricity production in the area causes particulate matter (PM), CO, SOx and NOx emissions and steel mills and ship-breaking facilities cause heavy metal emissions[72]. A table of sectoral emissions can be found on page 31 of the İzmir Province 2017 Environmental Status Report published by the İzmir Branch of the Chamber of Environmental Engineers of the Union of Chambers of Turkish Engineers and Architects (TMMOB).

According to the "Clean Air Plan" featured in İzmir's Urban Regional Master Development Revision Plan of 1/25.000scale, Aliağa and its vicinity have exceed their pollutant capacity[73].

A 2008 study analyzed the volatile organic compounds, particulate matter (PM), trace elements, PCBs and PAHs and concentrations. According to the study, the concentrations measured in Aliağa are above İzmir's average and world average and more hazardous to human health (Sofuoğlu et al., 2008)[74].

### Steel and Iron Facilities

Materials such as scrap, slag/dross and chimney dust, which are stored in the open in iron and steel plants, emit dust and become important pollutants in storage areas and during transportation. Since these facilities melt metal scrap, the dust emitted by these piles of scrap contain heavy metals, trace elements and toxic organic pollutants. According to a study conducted by İzmir DokuzEylül University, iron and steel plants and refineries in Aliağa is the biggest source of trace elements[75].

### Water

Izmir's Gediz, Küçük Menderes and Bakırçay rivers constitute important basins. The Gediz Basin, which includes the Bird Paradise has been declared a Ramsar Area of international importance. The Bakırçay River begins in the hinterland of Manisa, flows through the Soma district of Manisa, the Bergama and Kınık districts of İzmir, supplying drinking water sources on its course and reaches the Aegean Sea at the Çandarlı Province of İzmir. Unfortunately, the Soma Coal-Fired Power Plants and the coal washing facilities in Soma, which are located in close proximity to the source of the Bakırçay River, pollute the entire basin. The basin water is classified as class III and IV polluted water[70]. A 700 MW coal-fired power plant is planned for the Kınık district of İzmir, which is located on the course of the river. The project is in the pre-license stage.

### Soil and Food

Stack gases and open scrap storages of of iron and steel plants and ship-breaking facilities cause contamination of the soil with heavy metals. A recent study conducted by İzmir DokuzEylül University at Aliağa looked into the relationship between pollution and the trace elements found in plants. The study concluded that there were significant differences in the Pb, Cd, Zn, Cb, Mn and Fe levels of oak leaves and pine needles in areas with iron and steel plants, and that these differences decreased as the distance to the facilities increased[75].

## The Health Outlook

One of the studies that revealed the impact of Aliağa's pollution on human health was done by academicians from İzmir DokuzEylül University in 2011. The study analyzed the causes of deaths in Aliağa and their relationship with socio-demographic variables. One of the most striking outcomes of the study is that the cancer-caused death rate for people who have resided in the area for 15 to 29 years is 4.7 times more than for those who lived there for less than 15 years[76]. There are many studies on the environmental pollution in İzmir, and notably Aliağa, which should be encouraged to be read from a public health perspective.

# AN OVERVIEW OF COAL FIRED POWER PLANTS IN İZMİR

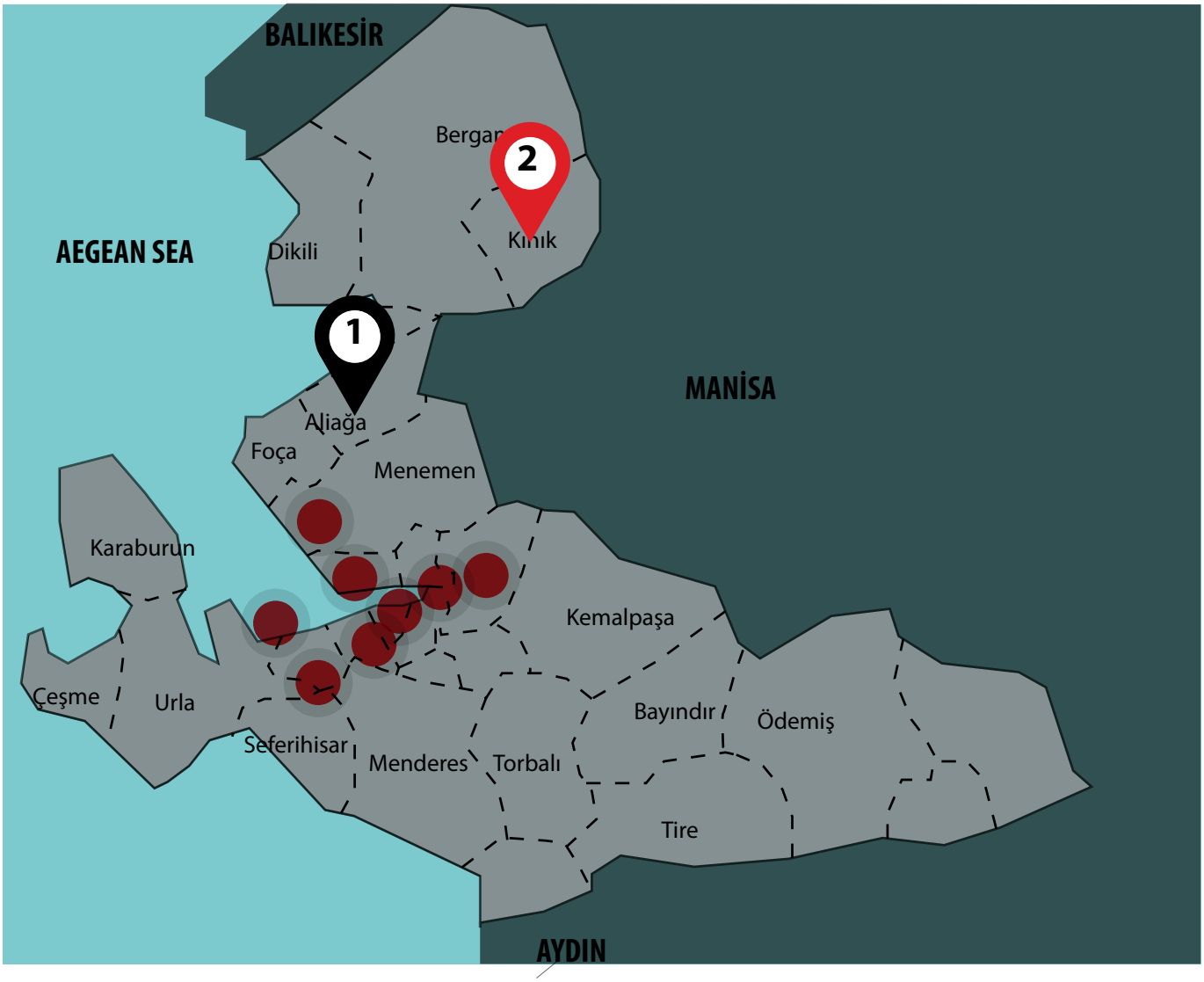
- **There is 1 operating coal power plant with total 350 MW capacity in Aliağa district. In addition, a CPP with 700 MW capacity is being built in Kınık district.**
- **The per capita industrial electricity consumption of Izmir is twice the Turkey's average.**
- **Zoning plan: Aliaga district is heavily polluted over its capacity.**
- **Approved EIA decision of the operating Aliağa coal power plant had been filed by the community and the EIA decision was cancelled but the plant continues operating with a new EIA plan**

In İzmir, the industrial sector accounts for 45% of the electricity consumption[70]. This may seem as a low figure however, taking into account that the per capita industrial electricity consumption in Turkey is 1,076 kWh, İzmir's 2,091 kWH is twice Turkey's average. The main metal industry accounts for 33% of İzmir's manufacturing industry, whereas the non-metal mineral manufacturing accounts for 23%, and coke coal, refined oil products and nuclear fuel manufacturing account for 17%. In 2012, total industrial and residential coal consumption was 57,000 tons[78]. The area boasts five lignite fields, and the Cumaovası and Tire fields are the only fields that can be economically utilized[78]. The remaining fields are located in Torbalı, Bergama-Çalan and Bergama-Ürkükler regions.

The share of renewable resources in electricity production in İzmir is increasing. 15% of Turkey's wind power installed capacity is located in İzmir, and wind power plants are mainly concentrated along the coastline. Even though İzmir's solar energy potential is high, licensed solar electricity production investments are not permitted on account of its geographical position. Geothermal resources are mainly used for residential heating: 59% for residential heating, 36% for greenhouse heating and the remaining 5% for hot springs and thermal spring tourism. Geothermal sources in Seferihisar, Dikili and Balçova are warm enough to be used for electricity generation[94].

İzmir has always been familiar to coal-fired power plant projects. Coal-fired power plants were initially planned to be built within the borders of ÇakmaklıKöyü-Gencelli in Aliağa 20 years ago but the project was abandoned following the local communities' negative reactions[80]. The approved EIA of the İzdemir Coal-Fired Power Plant Unit 1, which was the only operational coal-fired power plant in the region, was canceled in 2016 but still continues to operate. A list of canceled power plants has been provided in the coming chapters.

As of January 2018, there are no planned coal-fired power plants in İzmir according to the data provided by the EPDK system. The 700 MW planned coal-fired power plant in Kınık will be using domestic coal. Local administrations and local communities are voicing out their objections in the EIA meetings.




**In operation:**
Aliağa Coal Plant,
750 MW, imported coal

**Planned and pre-licenced**
Kınık Coal Plant
700 MW, lignite coal

**Air Quality Monitoring Stations**

## İZDEMIR COAL POWER PLANT

The 350 MW Unit 1 of the İzdemir Coal-Fired Power Plant in Aliağa began the EIA process in 2009 and became operational in 2014[70]. The plant is being operated with supercritical pulverized boiler technologies and imported coal. The law suits for the cancellation of the approved EIA of İzdemir's Unit 1 of were concluded in December 2016; the EIA was cancelled even though the power plant became operational in 2014. The cancellation of an operational coal-fired power plant's approved EIA report in Turkey is a historical event and the cancellation ruling indicates that the region's pollution capacity is full. Nevertheless, İzemir Energy has applied for a new EIA and received a approved EIA in March 2017. The coal-fired power plant continues to operate.

İzdemir's Unit 2, which was planned to be built next to Unit 1, received a approved EIA in 2010. Chambers and private citizens have filed law suits for the cancellation of the approved EIA. The expert report of the law suit underlines that the impact of the coal-fired power plant on tourism and archeological sites has not been comprehensively addressed and that the location of the plant needs to be reviewed. The location of the planned power plant is in the proximity of archeological sites, and the slag/dross storage areas coincide with olive trees that are protected by law. Furthermore, despite the area's high pollution levels, there was no cumulative impact assessment. The EIA report alleges that a cumulative air quality modeling was prepared, but it was not attached to the EIA report[73].

**The proved Environmental Impact Assesment plan of İzdemir's Unit-2 has been cancelled as the outcome of the law suits because of the aforementioned reasons. The expert committee reports during the proceedings and the causes for cancellation can constitute a precedent not only for Aliağa, but for the other heavy industry-intensive regions of Turkey as well.**

## OTHER COAL-FIRED POWER PLANT PROJECTS THAT HAVE BEEN CANCELLED

- The 800 MW AliağaCoal-Fired Power Plant project that was planned to use imported coal belong to ENKA Energy. The favorable EIA that was received in 2010 was cancelled in December 2016. **In 1990, a 50-kilometer long human chain in Aliağa formed for the cancellation of ENKA's coal-fired power plants was one of Turkey's biggest environmental protests.**
- In October 2016, SOCAR (Azerbaijan State Energy Company) announced that it shelved the 600 MW coal-fired power plant it was planning to build in Aliağa. The Socar coal-fired power plant planned to use imported coal was going to be built in the development area of the antique city of Cyme, which is an archeological site categorized as having highest conservation priority.

# The Role of Heavy Industry in Energy Production

## THE IRON AND STEEL INDUSTRY

The iron and steel industry in Turkey began in 1932 when the first facility became operational[81]. Turkey produced 33.2 million tons of steel in 2016[81]. In addition to steel mills and rolling mills, iron and steel facilities also include pipe plants, machining and other units. Each of these units exhibit different environmental issues in relation to their production processes.

The Integrated Pollution Prevention and Control Directive, which came into force during the EU harmonization process of environmental policies, is one of the directives that will have the most impact on the environmental investments of the iron and steel industry. This directive's primary focus is on the emissions caused by the iron and steel facilities.

The pollution caused by iron and steel production comes primarily from the energy input to operate the facility and from the main factors that cause pollution during the melting process, such as the rust, oil, plastic material, paint and coating material content of the scrap that is being used. The dust that is released in the air during iron and steel production and the dust that is mostly composed of particulate matter (96% of the dust is PM10[82]), heavy metals, sulphur and nitrogen oxides, Volatile Organic Compounds (VOCs) and Persistent Organic Pollutants (POPs) are toxic, hazardous and persistent pollutants that threaten human health.

Energy consumption is very important in iron and steel production. In electric steel plants -where scrap is melted and electricity accounts for 65%, natural gas for 30% and fuel-oil for 5% of the energy consumption- electricity consumption is the second biggest industrial cost after raw materials, and constitutes approximately 15% of the industrial costs[82]. Proximity to railways and and sea routes is also important for the transportation of raw material and final products. Hence, the Turkish steel and iron industry' site selection takes into account a location's proximity to sea routes and railways, and to coal mines if the coal extracted in the area fulfils the quality criteria, as well as whether the location provides the opportunity to build an integrated coal-fired power plant.

# HEALTH IMPACTS OF CEMENT PLANTS

"The Health Impacts of Cement Plants" written by Associate Professor Dr. Alpaslan Türkkan from Uludağ University's Department of Public Health and a member of the Bursa Medical Chamber addresses the health impacts of cement plants. The intensive energy consumption and emissions -most notably sulphur oxide, nitrogen oxide, particulate matter and carbon dioxide emissions- cause air pollution and have negative impacts on human health. The cement industry is highly polluting and threatens the health of plant workers as well as of the population that resides in the proximity of the plants[83].

The main health impacts consist of, but are not limited to, respiratory, cardiovascular and digestive ailments. Dioxin, which is one of the emissions of cement plants, causes all kinds of cancer, and affects the immune system, nervous system, endocrine system and reproductive functions (WHO, 2014c; Mishra ve Siddiqui, 2014). Dioxin and furan are also known to be endocrine disruptors.

Endocrine disruptors refer to substances that interfere with fertility, fetus development and reproductive and developmental hormones. In addition to dioxin and furan, heavy metals such as lead, mercury and cadmium that are emitted by cement plants are also endocrine disruptors. Endocrine disruptors are also claimed to interfere with mental functions, increase aggressiveness, cause hyperactivity and birth defects, as well as prostate and breast cancer (GÜLER, 2012).

Chromium VI, a cement plant pollutant, causes dermatitis, sensitivity and lesions upon contact and hasadverseeffects on kidneys and the immune system (EPA, 2000).Chromium VI is known to have caused sperm damage and reproductive system defects in male lab animals (ATSDR, 2008). The cadmium blood level of people living near cement plants is higher than those who live far away (Işıklı et al., 2006). Cadmium has a long biological half-life (19-38 years) and remains in the human body for an extended period of time. Cadmium causes osteoporosis, teeth loss, kidney disease, lung and prostate cancer, persistent headaches, vertigo, nausea, vomiting, insomnia and asthma(CDC, 2013).

**The Impact of Cement Plants on Agriculture**

The negative impacts of the dust emitted by the chimneys of cement plants have been proven in a study conducted in Çanakkale. According to this studyin 2006, the structure of the leaves that came into contact with the dust suffered changes, twig and leaf growth-development was adversely impacted, fruit development declined and caused major yield loss. The impact of cement plants' chimney dust on plants is attributed to the fact that the dust, which accumulates on the leaves, blocks the light needed for photosynthesis,as well as changes in surface pH and lower chlorophyll pigmentations. The negative impact was also observed in olives trees that were located at a 500-meter distance from the cement plant. Researchers commented that "even though the facility indicated that the chimneys had filters, it was proven to be insufficient" (Uysal et al., 2003). The studies that demonstrate the damages caused by the dusts of cement plants clearly prove that the cement plants need to be far away from agricultural areas[84]

# SECTION 2:
# The Toolkit: From Information to Action

# THE TOOLKIT

## How to Track Down the Coal Projects in Your Region

It is important to be informed about the coal-fired plant projects in advance so that you can develop your awareness-raising, educational and advocacy strategies in a properly and timely manner, and do not miss out on opportunities for intervention - such as public consultation meetings, deadlines for legal action, etc. Coal power plant projects can be tracked at different stages, such as pre-investment, pre-licensing and licensing, and environmental impact assessment, from different sources. You can start by consulting online energy sector portals and newspapers about new announcements.


### First Step: Pre-Licence

Every company that wants to build a new plant needs to register with the Energy Market Regulation Authority (EPDK) and apply for a pre-license. In case the required documentation is in place and the pre-licensing evaluation is on, EPDK adds the application on its online database. Here you can search by the name and type of the plant, the company, province of construction, and you can see the status of the pre-licensing process:
http://lisans.epdk.org.tr/epvys-web/faces/pages/lisans/elektrikUretimOnLisans/elektrikUretimOnLisansOzetSorgula.xhtml


### Second Step: EIA

Once a company submits the environmental impact assessment application file to the MoEU in line with the regulation's requirements, the Ministry has to announce that the EIA process has started, the application file is open for public review and opinion. The documents can be found at the Ministry's web site, where you can make a search by province of the investment. http://www.csb.gov.tr/gm/ced/index.php?Sayfa=duyuruliste&Il=1. The EIA process is particularly important since you can get or ask for a variety of information and data about the project, which will enable you to raise your concerns on health impacts of coal projects on an informed basis.
http://www.csb.gov.tr/gm/ced/index.php?Sayfa=duyuruliste&Il=1


### Third Step: Licence

You can also track a coal power plant project through the licensing process, which follows pre-licensing and EIA, along with some other permitting (i.e. gaining the property rights, construction plan and permit, etc). The licensing process is again coordinated by EPDK and the authority has to announce the application and its status online
http://lisans.epdk.org.tr/epvys-web/faces/pages/lisans/elektrikUretim/elektrikUretimOzetSorgula.xhtml

### Other Steps

In some cases licence and pre-licence information are not accessible. In these cases you can follow legal tools for the public access. For detailed information please see "legal actions" pages on this report.

# Collecting Evidence on The State of The Environment

## Start with official reports by the Ministry of Environment and Urbanisation (MoEU)

- The MoEU prepares and publishes annual reports on the state of environment in each province via its provincial directorates. You can reach these reports on the website of the MoEU General Directorate of Environmental Management, or on the website of the Provincial Directorate of the Ministry in your own city. The reports brings together data and information air, water, soil pollution, waste management and other environmental factors in the designated province.
- The MoEU has an online monitoring system for air quality in each province. You can get the data on daily air quality measurements from this web site: http://www.havaizleme.gov.tr/Default.ltr.aspx. You can also get consolidated data on air quality in your region from periodic bulletins by the Ministry of Environment (November 2011-October 2014: http://www.csb.gov.tr/gm/cygm/index.php?Sayfa=sayfahtml&Id=1494; November 2014-onwards: http://www.csb.gov.tr/gm/ced/index.php?Sayfa=sayfaicerik&IcId=1236)

## Check the resources which may be available through the universities in your region

- The professors of environmental sciences in the city university may have research studies on the environmental pollution in your region. These studies will help you have a comparative understanding of existing environmental burden on local people.
- Since these research studies may have complex scientific language, you may consider asking for help from the university professors or students of environmental sciences in your city to support you in your search and assessment.
- Identify if there are any inconsistencies between the official data and data collected via independent researches. These inconsistencies may be points of further access to information requests and demands to improve environmental and health monitoring in your region.

## Set your references for a healthy assessment of the state of environment in your region

- Search for the national and international environmental standards to be able to compare the environmental status in your region. It is always safe to make or refer to a comparison of national and international standards to be able to see any possible gaps and demand for stricter regulations on environmental polluting industries. For example, there is no legal regulation on PM2.5 air pollution concentrations in the Turkish environmental legislation; but the WHO sets guideline limits for human health.
- A list of useful national and international legislation on pollutants from coal-fired power plants is given in Part 2 of this toolkit.

# Collecting Evidence on The State of The Health

## Start with official reports by the Ministry of Health

- The Ministry publishes, together with the Turkish Statistical Institute, statistics on causes of deaths, although they can't be broken down to regions/cities. Still they provide a general understanding of burden of disease in Turkey. HEAL's report "The Unpaid Health Bill in Turkey" includes a review of this data underlining possible interconnections with poor air quality in the country.

## Investigate the coal-fired power plant projects in detail

- Public health departments of medical faculties or health organisations are rich resources of information on the state of health. For example, the Society of Public Health Specialists publishes annual reports on Public Health in Turkey with a wealth of data compiled through researches on site or meta-analyses.
- Ask for any specific epidemiological studies from these resource persons, which may help you highlight the link between the environmental burden and associated health burden in your region.

## Digging deeper - Search for even more evidence

- If you cannot reach particular data or information on the state of environment and health (i.e. burden of disease statistics) or information on coal-power plant projects in your region, you can apply to official access to information mechanisms (Ministry of Health: http://bilgiedinme.saglik.gov.tr/; Ministry of Environment: http://www.csb.gov.tr/turkce/index.php?Sayfa=beb; Energy Market Regulation Authority: http://www.bimer.gov.tr/Forms/pgMain.aspx). You may ask for legal assistance from the city bar or voluntary lawyers to support you in the application process.

# National Calls:
# Public Health and Energy Production

## Health Impact Assesment (HIA)

Health Impact Assesment tool has not been adapted in Turkish legistilation. HIA designed to bring together public health professionals, urban planners and other experts to analyse health effects of a planned action, plan or project. In 2017 December HEAL and Turkish Medical Association organised HIA training to inform public health and legal experts about the HIA tool. Afterwards in the legal case on the planned nuclear power plant in Mersin that Adana Legal Bar has been carrying on, the expert report decided on the necessity to conduct a HIA. Which can be used as a leading case for the planned coal power plants and other health harming projects.

Relevant news: https://www.evrensel.net/haber/344352/santral-kurulan-bolgede-kanser-vakalari-5-yilda-12-kat-artti

## Right to Clean Air Platform

Since November 2014, TTB and specialty associations who are active in public health issues, together with environmental NGOs, regularly meet and consult each other on the increasing coal threat the Turkish population faces. The Right to Clean Air Platform was established with the initiative of this group in October 2015 for advocacy purposes against the Turkish Government's energy strategy based heavily on coal power from the health dimension of the issue.

http://temizhavaplatformu.org/

## Bursa DOSAB Project

A coal-fired power plant is planned to be built in the city centre of Bursa in the DOSAB industrial zone. Settlements as close as 750 m to the planned facility mean people will be even more exposed to air pollution than normal, and the factories are known for their high air emissions. Bursa Chamber of Medicine, as well the Society of Public Health Specialities and Turkish Thoracic Society became parties to the legal proceedings. The professors of public health in the city university are also actively involved in the public engagement against the CPP Project.

See a report by Professor Pala of Uludag University on health impacts of coal power plants: Pala, K. (2014). Kömürlü Termik Santrallerin Sağlık Etkileri, Türk Tabipleri Birliği Bursa Tabip Odası, Bursa.

# National Findings: Public Health and Energy Production

## Unpaid Health Bill

HEAL announced Unpaid Health Bill report in 2015 that investigates effects of air pollution due to coal power plants on health. The report provides the first-ever figures on the costs to public health from existing coal power plants in Turkey, revealing that the total costs are up to 3.6 billion EUR per year (10.72 billion Turkish Lira) covering costs of premature death, chronic lung disease and heart conditions associated with exposure to polluted air from coal plants.

http://env-health.org/IMG/pdf/03072015_heal_odenmeyensaglikfaturasi_tr_2015_final.pdf

## Social Costs of Energy Choices

In 2004, the TTB published a report on social costs of energy policies, particularly coal and nuclear power and clean renewable resources. The report concludes that there is a need of a comprehensive comparison of the risks of energy resources, communication of risk and risk perception in society in energy decision processes. It also identifies nine principles in environmental health for "health for all": equal rights, inter-sectoral approach, public participation, democracy, international cooperation, promotion of environmental health, subsidiarity, sustainable development, and the precautionary principle.

See full report here: Gürsoy, U. (2004). Enerjide Toplumsal Maliyet ve Temiz ve Yenilenebilir Enerji Kaynakları, Türk Tabipleri Birliği Yayınları Ankara

## Case study: Yatagan Coal Power Plant

The health community was involved in coal power generation discussions since the early 2000s. The TTB had site investigations on health impacts of Yatagan CPP, one of the oldest lignite-fired plants in Turkey, and published a comprehensive report. TTB's investigation found that there were twice as many patients being treated for respiratory tract problems in the Yatagan state hospital than in hospitals in Mugla, with no coal plants. For bronchitis, asthma and emphysema, the rate was three times as high.

The report was used in legal cases against the CPP in the city centre of Yatagan, where dust filters and desulfurisation systems were not installed for years, and when installed did not operate properly.

See full report on health impacts of Yatagan CPP: http://www.ttb.org. tr/kutuphane/yatagan-rpr.pdf;

# International Calls: Public Health and Energy Production

## Kolkata Call to Action

The World Federation of Public Health Associations (WFPHA) brings together over 100 associations from across the world. In February 2015, the WFPHA adopted the Kolkata Call to Action: Healthy People – Healthy Environment. The WFPHA calls upon health care providers, government leaders, and all representatives of civil society to take urgent action to mitigate environmental conditions that are contributing to the deaths and disease of millions of inhabitants of our small planet. The Call to Action underlines that the profound threat to human health from global warming and resulting climate change is central to the challenges of this century. There is a need for national and international policies to ensure there is a rapid transition away from fossil fuels over the next decade to ensure the health of national populations and humanity's future.

http://www.wfpha.org/images/events/150216_Kolkata_Call_to_Action_FINAL.pdf

## WHO Air Resolution

In May 2015, the WHO adopted the first ever resolution on air quality and health. The resolution urges Member States to strengthen their efforts in 14 ways to improve air quality, for example through developing multi-sectoral cooperation and measures; enabling health systems to take a leading role in raising awareness; facilitating relevant research; improve surveillance. Requests are also included for WHO.

http://apps.who.int/gb/ebwha/pdf_files/WHA68/A68_R8-en.pdf

## Europe Beyond Coal

Each year we access to more studies about how coal power plants are harming our health. Civil society groups and citizens across Europe have been working together to help heal coal's social, health, environmental, and economic damage under Europe Beyond Coal campaign with the aim of switching from dirty coal, oil and gas to a universally accessible, affordable and renewably powered energy system and energy efficiency until 2025-2030.

https://beyond-coal.eu/

# International Findings: Public Health and Energy Production

## Lancet Countdown

The Lancet Countdown is an international collaboration that conducts researches about the effects of climate change on health and report its findings annually. In its report at 2017, the health benefits of stopping using coal for electricty production was highlighted.

http://www.thelancet.com/journals/lancet/article/PIIS0140-6736(17)32464-9/references

## Hidden Price Tag: Fossil Fuel Subsidies and Health Costs

The Health and Environment Alliance (HEAL) has launched the report "Hidden Price Tags: How ending fossil fuel subsidies would benefit our health" providing the first-ever comparison of fossil fuel subsidies and the costs to health associated with air pollution from fossil fuels. Burning fossil fuels causes deadly air pollution and climate change. Yet virtually all governments spend huge amounts of public money – their citizens' taxes – on supporting the oil, gas and coal industry in fossil fuel energy production. Despite nearly a decade-old commitment to end such financial support, the report reveals that on average, in G20 countries, the health costs associated with fossil fuels, are over six times higher than the subsidies:2,758 billion USDvs 444 billion USD (2,600 billion Euro vs 416 billion Euro).

http://env-health.org/IMG/pdf/healthandenvironmentalliance_hidden_price_tags_report.pdf

## The Lancet Commission on Pollution and Health

The Lancet Commission on Pollution and Health is a two-year project that has involved more than 40 international health and environmental authors. Using data from the Global Burden of Disease study, it brings together comprehensive estimates on the effects of pollution on health, provides economic costs, and reveals the extent of contaminated sites across the world for the first time. The Lancet Commission's study in 2017 reveals that pollution is linked to an estimated nine million deaths each year worldwide – equivalent to one in six (16%) of all deaths. Most of these deaths are due to non-communicable diseases caused by pollution such as heart disease, stroke, lung cancer and chronic obstructive pulmonary disease (COPD). The report also finds that pollution as a result of outdoor and indoor air pollution, water and soil contamination, and chemical pollutants is one of the largest risk factors for premature death. With almost all of these deaths (92%) occurring in low- and middle-income countries, and pollution disproportionately affecting the poor and marginalised in every country worldwide, the authors of the report aim to end neglect of the issue across the political spectrum, and mobilise the will, resources, and the leadership needed to confront it.

http://gahp.net/commission-pollution-health/

# Six Tips On Environmental Health Communication

When you use the information provided in this health toolkit or any other health information, please be aware of the following:

**Use simple, clear language**
Scientific studies are hard to understand for the average citizen who do not have a health background. Try to reword the evidence in a language that is easily understood by everybody.

**Identify your target audience**
Decision-makers, investors, journalists or the public will respond to different arguments being made. For example, decision-makers and investors are more likely to listen to economic (cost) arguments, while journalists always look for health messengers. Before you communicate your concerns it is therefore important to have a strategy and identify whom you want to direct your message to.

**Make the local link**
Citizens, journalists and decision-makers are more likely to hear your message if you make the link to their life and surroundings. Collect information on how healthy or unhealthy people are in your region and include it in your communication (without carrying out new research). You can also look for others that will help to communicate with the public (see next point).

**Find allies and messengers**
Together we are much more powerful than by ourselves. Look for doctors and health experts in your region who can help you with interpreting the data and are also available to speak in public. You can find the list of health groups that have been active to prevent new coal plants under "Useful information".

**Look for good practice**
In Turkey and around the world, more and more health organisations are speaking out about a healthy energy future, and the need to phase out coal power generation. Spreading the word about what others are doing shows that you are not alone in your struggle and helps to make your case.

**Last but not least: Be aware of uncertainties in the evidence**
Air pollution is one of the most researched topics in environmental health, and there is no doubt that polluted air impacts our health in many ways. When it comes to the impacts of air pollution in Turkey the picture becomes less clear because there are important data gaps. For example, the number of people dying from cancer is not available for all regions. When you communicate on a certain study or health problem you should therefore always be aware of the limitations of the evidence and not overstate the case. But data gaps can also be an opportunity to demand more epidemiological studies and transparency in health statistics.

# Six Tips On Developing Your Messaging On Coal And Health

The six tips below allow you to bring together powerful messages for successful and impactful communication:

**Use clear and to the point messages**

Journalist and the general public are not experts on the topic of health, air quality and coal power generation. So the outreach messages should be clear and written in a way for everybody to understand. This means that long sentences should be avoided.

**Create targeted messages**

One key step for getting the messageheard by different target audiences is to include targeted messages. Journalists and civil society have different topics or issues they are interested in, and start to listen to. Showing different aspects of the issue will increase your chances to reach a broad audience.

**Use different media tools and build connections**

Information channels and media tools have diversified in last 30 years, and access to information is now much easier. There are now a range of specialised and diversified media channels and tools to reach smaller target audiences. Easier access to information has also transformed the public's approach to searching: for example, individuals can set up filters for their searches on the internet, which will present themost interesting messages for individuals.

**Go local, go universal**

If your message is related to local issues, linking your message with the broader political and cultural issues will increase your potential audience. In cases where your core message is related to universal issues, inserting elements that relate your messages to a local context will increase their attractiveness.

**Personalise your messages**

Powerful messages include details about the impact on daily life and society. Thus, associating the messages with this is mind is very important to empower your target audience.

**Present your message in different ways, with emphasis**

The people who will disseminate your message and the media channels will filter your message according to their political and cultural preferences. Presenting your message in different ways may increase your chances of it being picked up.

For example, the message "The world is phasing out coal, Turkey should too" could be presented in different ways to different media outlets, such as by stressing the beginning "The World is phasing out coal" as the main message. The information on Turkey would then be the targeted message.

# Guidelines For Writing A Good Press Release

**1**

**Draw attention with a good headline**

The beginning of a press release is the most important part, just as it is with a magazine article, a book or a promotional leaflet. A strong headline will pull in journalists seeking good stories. Your headline should be as engaging as it is accurate. A good headline should not be more than 50 characters.

**2**

**Get right to the point in the first paragraph**

As journalists are busy people, you should assume that they will only read the first sentence and then scan the rest. Get the message of your press release out quickly. Every important point should be addressed in the first few sentences. The subsequent paragraphs then give supporting information.

**3**

**Include facts**

It's easy to fill up a page with a creative, colorful narrative. Leave the artistry to the writers -- pack your press release with hard numbers that support the significance of your message. If you make a claim about a certain development, for example more coal plants will be build, you need evidence to back it up. Quantify your argument and it will become much more compelling.

**4**

**Make your press release grammatically flawless**

Proofread your press release before sending it out. Even a single mistake can dissuade a journalist from taking you seriously.

**5**

**Include quotes whenever possible**

There is a source of natural colour that cannot be replicated: quotes. Including a good quote from a local doctor, for example, or an asthma patient will give a human element to the press release.

**6**

**Use spacing and bold characters**

Adding spaces to the press release will ease reading the document. In addition, writing some of the key words that you want to be seen in bold characters will also help you to lead the press to read your key messages.

**7**

**Provide links for more information**

The page limit on your press release does not stop you from directing the readers to sources of more information. Providing relevant links to your group or website, where prospective writers can learn more about your mission.

**8**

**One page is best -- and two is the maximum**

As with most good writing, a shorter version is usually better. Limit yourself to one page, though two pages is acceptable. This will force you to condense your most salient information into a more readable document.

**9**

**Include your contact information**

A common oversight that can render a press release less impactful is a lack of contact information for journalists to follow up with. Do not forget to include an email address and phone number.

# Sample Messages

These messages can be used in our communication with local authorities, fellow citizens, the media and investors to explain the health threats of coal-fired power plants.

One large coal-fired power plants emits thousands of tons of hazardous air pollutants each year, which contribute to air pollution, harming our health. In addition, coal-fired power plants also release large amounts of CO2, which fuels climate change and people's lives. Climate change threatens health because of more frequent and more intense heat waves, air pollution can be greater, and allergy seasons prolonged. The elderly, children, those already suffering from health problems, or poor people are likely to be hit the hardest.

http://env-health.org/IMG/pdf/20052015_hr_coal_report_turkey_final.pdf

Because the average lifetime of a plant is 40 years, hazardous emissions would continue for decades.
The air pollutants released from a coal-fired power plant include PM, SO2, NOx and heavy metals, such as mercury. The WHO and many studies have demonstrated that these pollutants are harmful to health. PM is particularly harmful, because the tiny parts can even enter the bloodstream. SO2 and NOx react in the air to form particulate matter and ozone, which again impact health.

http://www.euro.who.int/__data/assets/pdf_file/0004/193108/REVIHAAP-Final-technical-report-final-version.pdf

Health impacts of air pollution include cardiovascular and respiratory disease (heart attacks, strokes, lung cancer, increase in asthma attacks and possibly causing asthma, aggravation of chronic obstructive pulmonary disease (COPD) which is a chronic lung disease, but also impacts on children's healthy development.

http://www.euro.who.int/__data/assets/pdf_file/0004/193108/REVIHAAP-Final-technical-report-final-version.pdf

The International Agency for Research on Cancer (IARC) of the WHO says outdoor air pollution causes cancer in humans. The WHO says that indoor and outdoor air pollution are both among the leading avoidable causes of disease and death globally, and the world's largest single environmental health risk.

https://www.iarc.fr/en/media-centre/iarcnews/pdf/pr221_E.pdf

Coal-fired power plants are the main source of mercury, a highly toxic heavy metal. In Turkey, over 10 tonnes of the heavy metal were emitted from plants in one year, mostly into the air. Mercury has been shown to impact the development of the brain and nervous system of children.

http://env-health.org/IMG/pdf/20052015_hr_coal_report_turkey_final.pdf

In a study conducted by TTB to investigate the health effects of the coal-fired power plant Yatagan, there are twice as many patients being treated for respiratory tract problems in the Yatagan state hospital than in hospitals in Mugla, with no coal plants. For bronchitis, asthma and emphysema, the rate is three times as high.

http://www.ttb.org.tr/kutuphane/yatagan-rpr.pdf

# Sample Letter to an Investor

The following can be used for an open letter to a potential investor for a new coal plant, be it Turkish or international. The letter should include both recent scientific evidence as well as information on the local situation.

Dear,

It has come to our attention that [insert name of company] plans to build a new coal-fired power plant in [insert name of location]. [Insert name of your organisation and 1-2 sentences description] would like to express our concerns about these plans, for the health of people in the Iskenderun Bay region and beyond.

Coal-fired power plants are a particular threat to health, because in addition to releasing large amounts of $CO_2$, a large plant also emits thousands of tons of hazardous air pollutants such as particulate matter (PM), sulphur dioxide, nitrogen oxides and heavy metals such as mercury. These pollutants contribute to poor air quality in the Iskenderun Bay region and beyond, which then harms the health of adults, people who are chronically ill and our children.

There is no scientific doubt that the pollutants released by coal-fired power plants harm people's health. The World Health Organization (WHO) recently reviewed new scientific evidence and warned that particularly children's health is affected by air pollution, even already in utero. The International Agency for Research on Cancer (IARC) of the WHO also confirmed that outdoor air pollution causes cancer.

A recent analysis also highlighted that there are already high health costs from the about 20 existing coal plants in Turkey. Air pollution from these plans causes 2,876 premature deaths in Turkey, over 4,300 hospital admissions and 637,643 lost working days every year, with health costs of up to 10.72 billion Turkish Lira. Plans of the Turkish government of quadrupling coal capacity in our country, including the plant in [insert location] would lead to skyrocketing health costs.

We are concerned that the pollution from the plant would particularly affect people in the vicinity of the plant. [Insert some description of the area, any health evidence that is available, to give the human story to the letter]

[Insert name of organisation] therefore calls on you to drop plans to build the plant in [insert name of location].

Regards,

[Name]
[Job position]
[Organisation]

# Sample Letter to the Health Ministry

Dear Minister [insert name] / Dear Mrs./ Mr. [insert name - if you are addressing somebody in the ministry]

I contact you from [Insert name of your organisation and 1-2 sentences description] about an important issue for disease prevention in Turkey, that is the quality of the air that we breathe and the role that coal power generation plays in it.

There is an increasing body of evidence that demonstrates the harmful impacts of air pollution on our health: the World Health Organization (WHO) recently reviewed the state of the evidence and found that the harm to health of air pollution may have been underestimated. Air pollution is not only a risk factor for cardiovascular and respiratory disease, it is also harming the healthy development of children, and even linked to the rise in diabetes. The International Agency for Research on Cancer (IARC) of the WHO found that outdoor air pollution causes cancer.

In Turkey, according to the European Environment Agency (EEA), 97.2% of the urban population are exposed to unhealthy concentrations of particulate matter (PM10). PM is especially harmful to health, because the particles can enter deeply into the body and can even cross into the bloodstream. No information is available on the extent of exposure of the population to PM2.5, the smaller pollutants.

Even though air quality is influenced by many different factors, my organisation [insert name] is particularly concerned about the contribution of fossil fuel energy generation to air pollution, with its harmful effects on our health. A recent report by the Health and Environment Alliance (HEAL), endorsed by leading Turkish health and medical organisations, showed that already the existing 20 coal-fired power plants cause health costs of up to 10.72 billion Turkish Lira every year. We are worried that the plans of the Turkish government to increase coal power capacity by four will lead to a significant increase in health impacts from air pollution, and would counter any efforts by the Ministry of Health in disease prevention.

Minister [insert name], the different forms of energy generation are closely linked to our health, either through health harm caused by fossil fuels, or through health benefits, for example from renewable energy. We would like to encourage you and your ministry to become more involved in energy-related matters, be it at national or at the local level. For example, health considerations are often not part of an environmental impact assessment for a new coal plant, or calculations are not done properly. The expertise by the health ministry could greatly improve these assessments to ensure that the health of the Turkish population is adequately considered.

Your contribution to energy political decisions will be an indispensable part of any disease prevention efforts in Turkey.

We would be pleased to provide any further information in a personal meeting.

Regards,
[Name]
[Job position]
[Organisation] [Logo]

# Legal Tools

## TAKE ACTION

You can use this list to track EIA process of a coal power plant or determine the missing / wrong estimations, informations and decision regarding its health impacts.

## HEALTH IMPACT ASSESMENT

Health Impact Assesment has not been adapted in Turkish legistilation and also its not a part of Environmental Impact Assesment (EIA) process. It's also not obligatory to involve any health experts to the EIA report.

The public health commission of the Turkish Medical Association (TTB) has recently published a public health checklist for legal experts and expert witnesses who review EIA reports of projects. The checklist includes health considerations for the review of an EIA report such as:

- the impact on health; what kind of impact and its duration and timing;
- the geographic extent of impact; the likelihood, magnitude, and permanence (i.e. severity) of impacts; measurability of impact; health
- data availability/data gaps; the quality of evidence; population affected,and distribution/equity of impacts, risk groups; the composition of the EIA team (any health experts?); and also availability of information on burden of disease (morbidity and mortality data) for the project region specifically on those diseases associated with environmental, particularly air pollution, i.e. reproductive and developmental disorders, diseases and disorders of nervous and endocrine systems, immune system, respiratory and circulatory systems.

## CHECK LIST:

- Check if an EIA has been carried out and if a zero-intervention option was included in the assessment.
- Check also the Ministry of Health, Public Health Institute or its provincial directorate is asked to provide an opinion on the project's possible public health impacts.
- Urge the health authorities publicise their submitted opinion via the law on right to access to information.

## Environmental Impact Assessment (EIA)

New coal power plants with at least 300 MW thermal power have to undergo a mandatory Environmental Impact Assessment (EIA) before a building permit can be issued, as foreseen by the Regulation on Environmental Impact Assessment[14]. For smaller power plants, the authorities subject the project to an EIA on a case-by-case basis or by applying general criteria in a screening procedure. The project developers have to document all foreseeable impacts on the environment which should by complying with existing environmental regulation. Public consultation is an important component of the EIA process, which has often been able to hold up or completely stop a coal plant proposal.

## ACCESS TO INFORMATION:

If you live in an area where the air quality is lower than the national standards and there are one or more existing coal-fired power plants; make an information request to the Ministry of Environment for the emission data from these facilities, as well as the status of their emission permits, the status and efficiency of the treatment units.

## Public Access to Information

The Air Quality Assessment and Control Regulation aims at informing the public on air quality via information and alert thresholds. The Ministry of Environment has an online database of air quality monitoring results, where one can find daily measurement results from air quality monitoring stations. The ministry also publishes monthly, seasonal and annual reports including verified monitoring data.

However, there is no legislation in place in Turkey which makes accessible to the public detailed information on the emissions and the off-site transfers of pollutants and waste from individual industrial facilities, industrial activities or economic sectors in specific regions/ river basin districts of the country. On the other hand, the Law on Right to Access to Information is in place since 2003 and it enables the citizens to request any information/data within the records of the public institutions as defined by the law. This law can be used to identify the contribution of the existing coal-power plants in your regions to the low air quality.

The law also comes handy to get information about the burden of disease and public health status in a given region which is under risk of pollution by existing and future planned coal power plants.

# Useful Contacts

## Turkish health and medical organisations

Right to Clean Air Platform - http://temizhavaplatformu.org/
Turkish Medical Association (Türk Tabipleri Birliği – TTB) - http://www.ttb.org.tr/
Turkish Society of Public Health Specialists (Halk Sağlığı Uzmanları Derneği – HASUDER) - http://www.hasuder.org/
Turkish Thoracic Society (Türk Toraks Derneği – TTD) - http://www.toraks.org.tr/
Turkish Respiratory Society (Türkiye Solunum Araştırmaları Derneği – TÜSAD) - http://www.solunum.org.tr/
Turkish Occupational Medicine Society (İş ve Meslek Hastalıkları Uzmanları Derneği - İMUD) - http://imud.org.tr/
Turkish Neurological Society (Türk Nöroloji Derneği) - http://www.noroloji.org.tr
Turkish Society of General Practitioners (Pratisyen Hekimlik Derneği - PHD) - http://www.phd.org.tr
Tekirdağ Chamber of Medicines: http://www.tto.org.tr/
İzmir Chamber of Medicines: http://www.izmirtabip.org.tr/

## Turkish environmental organisations

Ecology Collective - http://ekolojikolektifi.org/tr/
TEMA - http://tema.org.tr/
Greenpeace Mediterranean - http://www.greenpeace.org/turkey/tr/
Yuva Association - http://yuva.org.tr/
WWF Turkey - www.wwf.org.tr/
Green Thought Society - http://web.yesildusunce.org/
Environmental and Consumer Protection Association - http://cetko.org/
Heindrich Böll Stiftung Derneği Türkiye Ofisi: https://tr.boell.org/tr

## International health and medical organisations and collaborations

Health and Environment Alliance (HEAL) - www.env-health.org
Global Climate and Health Alliance - http://www.climateandhealthalliance.org/
Healthy Energy Initiative - http://www.healthyenergyinitiative.org/
World Federation of Public Health Associations http://www.wfpha.org/
European Federation of Public Health Associations https://www.eupha.org/
World Health Organization (WHO) – Air Pollution and Health http://www.who.int/topics/air_pollution/en/
World Medical Association (WMA) - http://www.wma.org

## International environmental organisations

CAN Europe: www.caneurope.org
350.org Türkiye: http://350turkiye.org/

# Detailed Air Pollution Emissions in Tekirdağ

| | | 2014 | | | | 2015 | | | | 2016 | | | | 2017 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| İstasyon Adı | Parametre | Ölçüm Yapılmayan Gün Sayısı | 2014-Yıllık Ortalama | 2014-Yıllık Ortalama Ulusal Sınır Değer | *PM10 24 saat Ortalamasının 100µg/m³'ün Üstüne Çıktığı Gün Sayısı* | Ölçüm Yapılmayan Gün Sayısı | 2015-Yıllık Ortalama | 2015-Yıllık Ortalama Ulusal Sınır Değer | *PM10 24 saat Ortalamasının 90µg/m³'ün Üstüne Çıktığı Gün Sayısı* | Ölçüm Yapılmayan Gün Sayısı | 2016-Yıllık Ortalama | 2016-Yıllık Ortalama Ulusal Sınır Değer | *PM10 24 saat Ortalamasının 80µg/m³'ün Üstüne Çıktığı Gün Sayısı* | Ölçüm Yapılmayan Gün Sayısı | 2017-Yıllık Ortalama | 2017-Yıllık Ortalama Ulusal Sınır Değer | *PM10 24 saat Ortalamasının 70 µg/m³'ün Üstüne Çıktığı Gün Sayısı* |
| Tekirdağ | PM10 | 79 | 50 | 60 | 12 | 35 | 75 | 56 | 78 | 37 | 71 | 52 | 96 | 4 | 58 | 48 | 94 |
| | SO2 | 67 | 31 | 20 | | 24 | 24 | 20 | | 33 | 27 | 20 | | 22 | 26 | 20 | |
| Tekirdağ - Çerkezköy-MTHM | PM10 | 16 | 45 | 60 | 20 | 5 | 39 | 56 | 14 | 27 | 41 | 52 | 29 | 15 | 42 | 48 | 39 |
| | PM2.5 | 19 | 27 | - | | 5 | 24 | - | | 29 | 23 | - | | 43 | 27 | - | |
| | SO2 | 11 | 18 | 20 | | 16 | 16 | 20 | | 14 | 26 | 20 | | 13 | 22 | 20 | |
| | NO | 159 | 0 | - | | 88 | 14 | - | | 13 | 12 | - | | 13 | 13 | - | |
| | NO2 | 11 | 22 | 60 | | 14 | 22 | 56 | | 13 | 23 | 52 | | 13 | 24 | 48 | |
| | NOX | 178 | 0 | - | | 88 | 42 | - | | 13 | 42 | - | | 13 | 44 | - | |
| | CO | 14 | 421 | * | | 14 | 381 | * | | 12 | 328 | * | | 12 | 575 | * | |
| Tekirdağ - Çorlu - MTHM | PM10 | 365 | - | 60 | 0 | 365 | - | 56 | 0 | 366 | - | 52 | 0 | 313 | 35 | 48 | 5 |
| | SO2 | 365 | - | 60 | | 365 | - | 56 | | 366 | - | 52 | | 313 | 31 | 48 | |
| | NO | 365 | - | - | | 365 | - | - | | 366 | - | - | | 313 | 16 | - | |
| | NO2 | 365 | - | 20 | | 365 | - | 20 | | 366 | - | 20 | | 313 | 39 | 20 | |
| | NOX | 365 | - | - | | 365 | - | - | | 366 | - | - | | 316 | 63 | - | |
| | O3 | 365 | - | - | | 365 | - | - | | 366 | - | - | | 313 | 24 | - | |
| Tekirdağ - Çorlu OSB - MTHM | PM2.5 | 365 | - | - | | 365 | - | - | | 366 | - | - | | 318 | 27 | - | |
| | SO2 | 365 | - | 20 | | 365 | - | 20 | | 366 | - | 20 | | 316 | 18 | 20 | |
| | NO | 365 | - | - | | 365 | - | - | | 366 | - | - | | 316 | 12 | - | |
| | NO2 | 365 | - | 20 | | 365 | - | 20 | | 366 | - | 20 | | 316 | 26 | 20 | |
| | NOX | 365 | - | - | | 365 | - | - | | 366 | - | - | | 319 | 44 | - | |
| | O3 | 365 | - | * | | 365 | - | * | | 366 | - | * | | 316 | 23 | * | |
| Tekirdağ - Merkez-MTHM | PM10 | 15 | 73 | 60 | 61 | 9 | 81 | 56 | 99 | 25 | 102 | 52 | 230 | 19 | 81 | 48 | 172 |
| | SO2 | 13 | 42 | 20 | | 18 | 44 | 20 | | 20 | 45 | 20 | | 25 | 22 | 20 | |
| | NO | 193 | 27 | - | | 70 | 75 | - | | 21 | 41 | - | | 21 | 41 | - | |
| | NO2 | 13 | 47 | 60 | | 11 | 43 | 56 | | 21 | 45 | 52 | | 21 | 48 | 48 | |
| | NOX | 363 | 50 | - | | 70 | 188 | - | | 21 | 109 | - | | 21 | 110 | - | |
| | CO | 36 | 1288 | * | | 18 | 1189 | * | | 18 | 1093 | * | | 21 | 1504 | * | |

# Detailed Air Pollution Emissions in Çanakkale

| | | 2014 | | | | 2015 | | | | 2016 | | | | 2017 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| İstasyon Adı | Parametre | Ölçüm Yapılmayan Gün Sayısı | 2014-Yıllık Ortalama | 2014-Yıllık Ortalama Ulusal Sınır Değer | *PM10 24 saat Ortalamasının 100µg/m³'ün Üstüne Çıktığı Gün Sayısı* | Ölçüm Yapılmayan Gün Sayısı | 2015-Yıllık Ortalama | 2015-Yıllık Ortalama Ulusal Sınır Değer | *PM10 24 saat Ortalamasının 90µg/m³'ün Üstüne Çıktığı Gün Sayısı* | Ölçüm Yapılmayan Gün Sayısı | 2016-Yıllık Ortalama | 2016-Yıllık Ortalama Ulusal Sınır Değer | *PM10 24 saat Ortalamasının 80µg/m³'ün Üstüne Çıktığı Gün Sayısı* | Ölçüm Yapılmayan Gün Sayısı | 2017-Yıllık Ortalama | 2017-Yıllık Ortalama Ulusal Sınır Değer | *PM10 24 saat Ortalamasının 70 µg/m³'ün Üstüne Çıktığı Gün Sayısı* |
| Çanakkale | PM10 | 63 | 23 | 60 | 0 | 7 | 27 | 56 | 1 | 31 | 24 | 52 | 1 | 24 | 26 | 48 | 12 |
| | SO2 | 37 | 12 | 20 | | 26 | 10 | 20 | | 16 | 9 | 20 | | 3 | 11 | 20 | |
| Çanakkale Biga İçdaş | SO2 | 75 | 14 | 20 | | 14 | 4 | 20 | | 21 | 4 | 20 | | 41 | 4 | 20 | |
| | PM10 | 67 | 19 | 60 | *0* | 14 | 22 | 56 | *1* | 15 | 17 | 52 | *0* | 39 | 23 | 48 | *0* |
| | NO | 212 | 18 | - | | 43 | 5 | - | | 14 | 3 | - | | 28 | 4 | - | |
| | NO2 | 212 | 0 | 60 | | 43 | 9 | 56 | | 14 | 9 | 52 | | 28 | 15 | 48 | |
| | NOX | 212 | 3 | - | | 43 | 13 | - | | 14 | 12 | - | | 26 | 19 | - | |
| | CO | 62 | 93 | * | | 75 | 67 | * | | 63 | 90 | * | | 163 | 206 | * | |
| | O3 | 106 | 7 | - | | 23 | 11 | - | | 28 | 13 | - | | 28 | 16 | - | |
| Çanakkale Can-MTHM | PM10 | 11 | 71 | 60 | *69* | 26 | 70 | 56 | *73* | 25 | 63 | 52 | *47* | 15 | 66 | 48 | *52* |
| | SO2 | 4 | 134 | 20 | | 39 | 89 | 20 | | 21 | 58 | 20 | | 4 | 25 | 20 | |
| | NO | 232 | 2 | - | | 107 | 13 | - | | 24 | 11 | - | | 4 | 13 | - | |
| | NO2 | 8 | 23 | 60 | | 37 | 20 | 56 | | 24 | 19 | 52 | | 4 | 21 | 48 | |
| | NOX | 363 | 111 | - | | 107 | 40 | - | | 24 | 36 | - | | 4 | 41 | - | |
| | O3 | 6 | 50 | - | | 38 | 46 | - | | 18 | 44 | - | | 4 | 45 | - | |
| Çanakkale Lapseki-MTHM | PM2.5 | 22 | 21 | - | | 23 | 17 | - | | 16 | 14 | - | | 21 | 20 | - | |
| | SO2 | 21 | 8 | 20 | | 28 | 8 | 20 | | 12 | 10 | 20 | | 17 | 10 | 20 | |
| | NO | 175 | 0 | - | | 90 | 1 | - | | 16 | 3 | - | | 17 | 1 | - | |
| | NO2 | 21 | 11 | 60 | | 30 | 9 | 56 | | 20 | 9 | 52 | | 19 | 10 | 48 | |
| | NOX | 194 | 8 | - | | 91 | 9 | - | | 16 | 13 | - | | 17 | 12 | - | |
| | O3 | 22 | 63 | - | | 25 | 71 | - | | 21 | 51 | - | | 28 | 71 | - | |

# Detailed Air Pollution Emissions in İzmir

| | | 2014 | | | | 2015 | | | | 2016 | | | | 2017 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| İstasyon Adı | Parametre | Ölçüm Yapılmayan Gün Sayısı | 2014-Yıllık Ortalama | 2014-Yıllık Ortalama Ulusal Sınır Değer | *PM10 24 saat Ortalamasının 100µg/m³'ün Üstüne Çıktığı Gün Sayısı* | Ölçüm Yapılmayan Gün Sayısı | 2015-Yıllık Ortalama | 2015-Yıllık Ortalama Ulusal Sınır Değer | *PM10 24 saat Ortalamasının 90µg/m³'ün Üstüne Çıktığı Gün Sayısı* | Ölçüm Yapılmayan Gün Sayısı | 2016-Yıllık Ortalama | 2016-Yıllık Ortalama Ulusal Sınır Değer | *PM10 24 saat Ortalamasının 80µg/m³'ün Üstüne Çıktığı Gün Sayısı* | Ölçüm Yapılmayan Gün Sayısı | 2017-Yıllık Ortalama | 2017-Yıllık Ortalama Ulusal Sınır Değer | *PM10 24 saat Ortalamasının 70 µg/m³'ün Üstüne Çıktığı Gün Sayısı* |
| İzmir - Alsancak | PM10 | 3 | 33 | 60 | 6 | 30 | 32 | 56 | 6 | 15 | 42 | 52 | 39 | 17 | 38 | 48 | 27 |
| | SO2 | 3 | 9 | 20 | | 22 | 7 | 20 | | 31 | 7 | 20 | | 14 | 12 | 20 | |
| | CO | 6 | 266 | * | | 192 | 292 | * | | 299 | 74 | * | | 274 | 87 | * | |
| | NO | 149 | 10 | - | | 234 | 3 | - | | 312 | 5 | - | | 363 | 5 | - | |
| | NOX | 150 | 25 | - | | 234 | 6 | - | | 312 | 30 | - | | 363 | 32 | - | |
| | NO2 | 149 | 15 | 60 | | 234 | 4 | 56 | | 312 | 25 | 52 | | 363 | 27 | 48 | |
| İzmir - Bayrakli | PM10 | 11 | 63 | 60 | 54 | 25 | 57 | 56 | 50 | 19 | 54 | 52 | 49 | 19 | 50 | 48 | 65 |
| | SO2 | 58 | 6 | 20 | | 38 | 5 | 20 | | 13 | 17 | 20 | | 10 | 8 | 20 | |
| İzmir - Bornova | PM10 | 40 | 40 | 60 | 3 | 38 | 46 | 56 | 15 | 49 | 44 | 52 | 15 | 75 | 45 | 48 | 33 |
| | SO2 | 16 | 8 | 20 | | 35 | 18 | 20 | | 35 | 7 | 20 | | 43 | 9 | 20 | |
| | CO | 15 | 898 | - | | 54 | 563 | - | | 34 | 750 | - | | 48 | 983 | - | |
| | NO | 53 | 12 | - | | 242 | 2 | - | | 111 | 143 | - | | 125 | 9 | - | |
| | NOX | 53 | 34 | - | | 242 | 3 | - | | 111 | 313 | - | | 125 | 23 | - | |
| | NO2 | 53 | 21 | 60 | | 242 | 2 | 56 | | 111 | 170 | 52 | | 125 | 30 | 48 | |
| İzmir - Çigli | PM10 | 29 | 37 | 60 | 10 | 27 | 40 | 56 | 14 | 23 | 35 | 52 | 15 | 9 | 34 | 48 | 18 |
| | SO2 | 75 | 10 | 20 | | 70 | 11 | 56 | | 84 | 14 | 52 | | 9 | 13 | 48 | |
| İzmir - Gaziemir | PM10 | 150 | 18 | 60 | 0 | 22 | 33 | 56 | 21 | 9 | 51 | 52 | 37 | 15 | 60 | 48 | 91 |
| | SO2 | 150 | 7 | 20 | | 14 | 14 | 56 | | 20 | 11 | 52 | | 15 | 8 | 48 | |
| İzmir - Güzelyalı | PM10 | 12 | 51 | 60 | 22 | 42 | 41 | 56 | 15 | 8 | 39 | 52 | 17 | 19 | 37 | 48 | 18 |
| | SO2 | 15 | 6 | 20 | | 26 | 7 | 20 | | 20 | 9 | 20 | | 13 | 17 | 20 | |
| | CO | 7 | 394 | - | | 3 | 267 | - | | 8 | 295 | - | | 72 | 443 | - | |
| | NO | 69 | 11 | - | 0 | 76 | 5 | - | 0 | 73 | 1 | - | 0 | 75 | 4 | - | 0 |
| | NOX | 69 | 31 | - | | 76 | 15 | - | | 73 | 3 | - | | 75 | 30 | - | |
| | NO2 | 69 | 21 | 60 | | 76 | 10 | 56 | | 73 | 2 | 52 | | 75 | 26 | 48 | |
| İzmir - Karşıyaka | PM10 | 5 | 39 | 60 | 12 | 66 | 29 | 56 | 3 | 6 | 20 | 52 | 3 | 0 | 47 | 48 | 20 |
| | SO2 | 6 | 6 | 20 | | 45 | 9 | 20 | | 10 | 10 | 20 | | 1 | 14 | 20 | |
| | CO | 5 | 212 | * | | 48 | 170 | * | | 39 | 45 | * | | 365 | - | * | |
| | NO | 184 | 7 | - | | 97 | 1 | - | | 97 | 1 | - | | 97 | 5 | - | |
| | NOX | 184 | 23 | - | | 75 | 3 | - | | 97 | 5 | - | | 97 | 29 | - | |
| | NO2 | 184 | 16 | 60 | | 75 | 2 | 56 | | 97 | 4 | 52 | | 97 | 24 | 48 | |
| İzmir - Sirinyer | PM10 | 12 | 47 | 60 | 26 | 20 | 46 | 56 | 29 | 18 | 46 | 52 | 30 | 16 | 42 | 48 | 32 |
| | SO2 | 20 | 8 | 20 | | 35 | 11 | 20 | | 28 | 15 | 20 | | 54 | 12 | 20 | |
| | CO | 365 | - | - | | 365 | - | - | | 366 | - | - | | 334 | 619 | - | |
| | NO | 365 | - | - | | 365 | - | - | | 366 | - | - | | 334 | 8 | - | |
| | NO2 | 365 | - | 60 | | 365 | - | 56 | | 366 | - | 52 | | 334 | 22 | 48 | |
| | NOX | 365 | - | - | | 365 | - | - | | 366 | - | - | | 334 | 30 | - | |

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