

Appendix

METHODOLOGY FOR AIR QUALITY, ECONOMIC AND HEALTH IMPACTS

For this study, conducted with the Centre for Research on Energy and Clean Air (CREA), we followed the same methodology used in HEAL's Chronic Coal Pollution reports. Detailed sources and techniques used in atmospheric modeling, health impacts and valuation can be found in annex 4 of HEAL's Chronic Coal Pollution Turkey report⁴.

Similar to the Chronic Coal Pollution assessments, the impacts and cost presented in this report can be considered an underestimation due to data limitations and estimations. For example:

- We assumed that in the future, the filtration systems will be complete and operated regularly to meet emission limits set out in the relevant Turkish laws. However regular operation cannot be not proven.
- The health impacts are based on the 2013 WHO HRAPIE methodology. Since then, new studies have been published that show higher health impacts both for premature death¹⁸ as well as for disease impacts (morbidity)¹⁹. For NO₂, new evidence has also emerged which points to greater health damage than previously documented²⁰.
- This report also does not consider further health impacts, such as dementia or obesity, which studies point to air pollution as a risk factor.
- Exposure to air pollution in utero or during the early years can increase the risk of falling ill much later in life. However there is currently no methodology to quantify the health impacts or costs from air pollution over a person's lifetime.

SCENARIOS FOR THE ANALYSIS OF AIR POLLUTION FROM COAL POWER PLANTS

1. Business as Usual (BAU):

For the BAU scenario, the end of the official generation licence was taken, assuming them to be the official estimation for the operation period of the operating plants. Plants that hold operation licences but are not yet constructed, or not yet in operation, have not been assessed for their compatibility with the 2053 net zero carbon target²¹.

2. 2030 coal phase out:

This phase out date is taken from Coal Phase out 2030 report² mentioned under section 5, which argued that 2030 is an economically feasible phase out date. This study noted that ZETES-1 and İÇDAŞ Biga plants should be closed by the end of 2022, however, since this has not been officially announced, we have noted 2023 as the coal phase out year. This study also takes the EMBA Hunutlu coal plant, which was under construction in the first half of 2022, and the Akkuyu nuclear plant, into account under both scenarios as Coal Phase out 2030 study suggests.

HEALTH BURDEN AND COST UNDER A 2030 PHASE OUT AND BUSINESS AS USUAL SCENARIO

Health burden and cost with coal plants continued running until the 2050s If Turkey does not adopt a coal phase target, and operate the plants until the generation license ends	Health burden and cost with a 2030 coal phase out If current coal fleet is closed down by 2030	Health impacts prevented with a 2030 phase out
 120,243 Premature deaths	 17,642 Premature deaths	 102,601 Premature deaths
 39,082 Cases of preterm births	 8,107 Cases of preterm births	 30,975 Cases of preterm births
 138,369 Hospital admissions	 23,686 Hospital admissions	 114,683 Hospital admissions
 80,874 New cases of chronic bronchitis in adults	 13,765 New cases of chronic bronchitis in adults	 67,108 New cases of chronic bronchitis in adults
 522,852 Cases of bronchitis in children	 103,017 Cases of bronchitis in children	 419,835 Cases of bronchitis in children
 4,695,502 Days with asthma and bronchitis symptoms in asthmatic children	 923,000 Days with asthma and bronchitis symptoms in asthmatic children	 3,772,502 Days with asthma and bronchitis symptoms in asthmatic children
 278,975,839 Sickness days	 47,642,488 Sickness days	 231,333,351 Sickness days
 33,247,021 Lost working days	 5,640,276 Lost working days	 27,606,746 Lost working days
 HEALTH COST up to 236 billion EUR or up to 3.8 trillion Turkish Lira	 HEALTH COST up to 42 billion EUR or up to 681 billion Turkish Lira ⁶	 HEALTH COST up to 236 billion EUR or up to 3.8 trillion Turkish Lira

LIST OF COAL POWER PLANTS WITH THEIR COAL PHASE OUT YEARS

PHASE OUT SCENARIO	BAO SCENARIO	PROVINCE	UNIT	MW	OPERATING SINCE
2029	2034	Adana	Tufanbeyli Enerjisa Unit 1	150	2016
2029	2034	Adana	Tufanbeyli Enerjisa Unit 2	150	2016
2029	2034	Adana	Tufanbeyli Enerjisa Unit 3	150	2016
2026	2039	Adana	Sugözü İskele Unit 1	660	2003
2026	2039	Adana	Sugözü İskele Unit 2	660	2003
2028	2064	Adana	EMBA Hunutlu Unit 1	660	2023
2028	2064	Adana	EMBA Hunutlu Unit 2	660	2023
2027	2069	Ankara	Çayırhan Unit 1	150	1987
2027	2069	Ankara	Çayırhan Unit 2	150	1987
2029	2069	Ankara	Çayırhan Unit 3	160	1998
2029	2069	Ankara	Çayırhan Unit 4	160	1999
2029	2038	Bolu	Aksa Göynük Unit 1	135	2015
2029	2038	Bolu	Aksa Göynük Unit 2	135	2016
2028	2064	Bursa	Orhaneli Unit 1	210	1992
2029	2052	Çanakkale	Çan 18 Mart TES Unit 1	160	2005
2029	2052	Çanakkale	Çan 18 Mart TES Unit 2	160	2005
2026	2033	Çanakkale	Çan-2 Termik Santrali	330	2018
2027	2062	Çanakkale	Cenal Unit 1	660	2017
2027	2062	Çanakkale	Cenal Unit 2	660	2017
2026	2056	Çanakkale	İÇDAŞ Bekirli Unit 1	600	2011
2026	2056	Çanakkale	İÇDAŞ Bekirli Unit 2	600	2015

PHASE OUT SCENARIO	BAO SCENARIO	PROVINCE	UNIT	MW	OPERATING SINCE
2023	2056	Çanakkale	İÇDAŞ Biga (Değirmencik) Unit 1	135	2005
2023	2056	Çanakkale	Değirmencik Unit 2	135	2009
2023	2056	Çanakkale	Değirmencik Unit 3	135	2009
2026	2057	Hatay	Atlas Unit 1	600	2014
2026	2057	Hatay	Atlas Unit 2	600	2014
2027	2058	İzmir	İzdemir Unit 1	350	2014
2027	2038	Kahramanmaraş	Afşin Elbistan A Unit 1	335	1984
2027	2038	Kahramanmaraş	Afşin Elbistan A Unit 2	335	1985
2027	2038	Kahramanmaraş	Afşin Elbistan A Unit 3	335	1986
2027	2038	Kahramanmaraş	Afşin Elbistan A Unit 4	340	1987
2026	2052	Kahramanmaraş	Afşin Elbistan B Unit 1	360	2005
2026	2052	Kahramanmaraş	Afşin Elbistan B Unit 2	360	2005
2026	2052	Kahramanmaraş	Afşin Elbistan B Unit 3	360	2005
2026	2052	Kahramanmaraş	Afşin Elbistan B Unit 4	360	2006
2028	2052	Kocaeli	Gebze Çolakoğlu-2 Unit 1	190	2003
2029	2057	Kütahya	Polat Unit 1	51	2013
2028	2062	Kütahya	Seyitömer Unit 1	150	1973
2028	2062	Kütahya	Seyitömer Unit 2	150	1974
2028	2062	Kütahya	Seyitömer Unit 3	150	1977
2028	2062	Kütahya	Seyitömer Unit 4	150	1998
2027	2064	Kütahya	Tunçbilek Unit 1	65	1965
2028	2064	Kütahya	Tunçbilek Unit 4	150	1977
2028	2064	Kütahya	Tunçbilek Unit 5	150	1978
2029	2050	Manisa	Soma Kolin Unit 1	255	2019
2029	2050	Manisa	Soma Kolin Unit 2	255	2019

PHASE OUT SCENARIO	BAO SCENARIO	PROVINCE	UNIT	MW	OPERATING SINCE
2027	2064	Manisa	Soma B Unit 1	165	1981
2027	2064	Manisa	Soma B Unit 2	165	1982
2028	2064	Manisa	Soma B Unit 3	165	1985
2028	2064	Manisa	Soma B Unit 4	165	1986
2028	2064	Manisa	Soma B Unit 5	165	1991
2028	2064	Manisa	Soma B Unit 6	165	1992
2029	2063	Muğla	Kemerköy Unit 1	210	1993
2029	2063	Muğla	Kemerköy Unit 2	210	1994
2029	2063	Muğla	Kemerköy Unit 3	210	1995
2028	2063	Muğla	Yatağan Unit 1	210	1982
2028	2063	Muğla	Yatağan Unit 2	210	1983
2028	2063	Muğla	Yatağan Unit 3	210	1984
2029	2063	Muğla	Yeniköy TES Unit 1	210	1986
2029	2063	Muğla	Yeniköy TES Unit 2	210	1987
2028	2062	Sivas	Kangal Unit 1	150	1989
2028	2062	Sivas	Kangal Unit 2	150	1990
2028	2062	Sivas	Kangal Unit 3	157	2000
2027	2033	Şırnak	Şırnak Silopi Unit 1	135	2009
2027	2033	Şırnak	Şırnak Silopi Unit 2	135	2015
2027	2033	Şırnak	Şırnak Silopi Unit 3	135	2015
2028	2058	Yalova	Aksa Santrali Unit 1	100	2013
2028	2063	Zonguldak	Catalagzi-B Unit 1	157	1989
2028	2063	Zonguldak	Catalagzi-B Unit 2	157	1991
2023	2053	Zonguldak	ZETES 1 Unit 1	160	2010
2026	2053	Zonguldak	ZETES 2 Unit 1	615	2010

PHASE OUT SCENARIO	BAO SCENARIO	PROVINCE	UNIT	MW	OPERATING SINCE
2026	2053	Zonguldak	ZETES 2 Unit 2	615	2010
2027	2053	Zonguldak	ZETES 3 Unit 1	700	2016
2027	2053	Zonguldak	ZETES 3 Unit 2	700	2016

REFERENCES

¹⁸ Jie Chen, Gerard Hoek. (2020). Long-term exposure to PM and all-cause and cause-specific mortality: A systematic review and meta-analysis. Environment International.

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<https://doi.org/10.1016/j.envint.2020.105974>.

¹⁹ European Commission Directorate General Environment. (2021, January). Support to the development of the second Clean Air Outlook- Annex. Page 44. Figure 1.9.

<https://ec.europa.eu/environment/air/pdf/CAO2-ANNEX-final-21Dec20.pdf>

²⁰ Huangfu, P. & Atkinson, R.(2020). Long-term exposure to NO₂ and O₃ and all-cause and respiratory mortality: A systematic review and meta-analysis. Environment International,

<https://doi.org/10.1016/j.envint.2020.105998>.

²¹ These plants are: Karaburun and Kirazlıdere in Çanakkale, Ilgın in Konya, Kınık in İzmir, Kipas in Aydın and the additional unit at Çatalağzı in Zonguldak. They have operation licences but construction processes have not started. This also includes Yunus Emre in Eskişehir, which is operational but not operating. However, the EMBA Hunutlu coal power plant in Adana, which has started operation in the second half of 2022, is taken into consideration.

²² One EUR equals to 16.1029 TRY based on the mean value between October 2021 and October 2022.

https://www.ecb.europa.eu/stats/policy_and_exchange_rates/euro_reference_exchange_rates/html/eurofxref-graph-try.en.htm



www.env-health.org