

# Executive Summary



## Improving air quality and reducing health costs through renewable energy in Turkey

Assessing the co-benefits of decarbonising the power sector

Coal- and natural gas-fired power plants in Turkey are significant sources of atmospheric emissions that are harmful to people's health and the environment. This study analyses the impacts of the pollutants CO, SO<sub>2</sub>, NO<sub>2</sub>, and PM<sub>10</sub> on human health. Turkey's need for electricity will continue to increase in the coming years. Recognising that coal- and natural gas-fired electricity generation are major contributors to atmospheric pollutants and related health impacts, it is evident that an increased share of renewable energy in electricity generation would help lessen the problems of air pollution and reduce costs for the Turkish health system.

This study examines the co-benefits to human health and health cost savings resulting from increased deployment of renewable energy in Turkey.<sup>1</sup> This research project is carried out in the context of the COBENEFITS project, which assesses a range of additional co-benefits of renewable energy in developing countries, besides reducing energy sector greenhouse gas emissions, when compared to conventional energy systems.

### Four Electricity Generation Scenarios

The co-benefits assessment for Turkey takes a policy-directed scenario approach, to connect with existing policy environments and learn from comparing the socioeconomic performance of various potential energy transition pathways in Turkey. The reference policy pathways, as the scenarios are called in this context, have been developed and selected in consultation with government and expert organisations, to allow for:

- Connectivity and comparability with Turkey's official climate and energy policies, strategies, or roadmaps (existing or considered), to ensure the political relevance and usability of the assessment results.
- Suitability as calculation basis for scientifically sound, quantitative assessments of socio-economic impacts.

Against this background, four scenarios were defined to assess the potential benefits of increasing the share of renewable energy in Turkey's future electricity generation mix. Each scenario targets the year 2028 and assumes different levels of wind- and solar-based generation capacities

1. Scenario 1: **Current Policy** is in line with TEİAŞ plans, which assume 14 GW wind and 6 GW solar (PV) by the year 2026. In the current analysis, these values are extended to 16 and 8 GW respectively to reflect the capacities in 2028.
2. Scenario 2: **New Policy** adds 1 GW per year between 2018 and 2028 to the installed capacities of wind and solar.
3. Scenario 3: **Additional Renewables** targets 20 GW installed capacity for both wind and solar.
4. Scenario 4: **Advanced Renewables** targets 30 GW installed capacity for both wind and solar.

<sup>1</sup> The term 'co-benefits' refers to simultaneously meeting several interests or objectives resulting from a political intervention, private-sector investment or a mix thereof (Helgenberger et al., 2019). It is thus essential that the co-benefits of climate change mitigation are mobilised strategically to accelerate the low-carbon energy transition (IASS, 2017a).



- **Key policy opportunity 1: Turkey can significantly reduce the number of premature deaths related to air pollution from fossil-fuelled power plants.** With the Current Policy scenario, mortality will increase from 2,103 in 2017 to 2,333 in 2028. Under the Advanced Renewables scenario, estimated mortality would be reduced to 1,564 cases in 2028, thus avoiding more than 750 deaths in that year alone.
- **Key policy opportunity 2: Turkey can generate significant health cost savings by decarbonising the power sector.** Under the Current Policy scenario, annual health care costs will increase from USD 2.04 billion in 2017 to USD 2.5 billion in 2028. By following the Advanced Renewables scenarios, health cost savings in 2028 can amount to USD 764 million.
- **Key policy opportunity 3: The Ministry of Energy can support measures to track progress in reducing health impacts and related health costs** by ensuring access to air pollutant emission data from individual power plants, detailing the relevant fuel, technological, and emission control standards. Public monitoring and technical analysis of power plants can improve the quality and reliability of air pollution and health cost assessments. This can be facilitated by public access to technical data on thermal power plants such as filtration methods, combustion techniques, water consumption, fuel usage, and atmospheric pollution releases.

#### KEY FIGURES:

- 750 premature deaths can be avoided in the year 2028 by increasing the share of renewables in the power sector.
- Health cost savings can amount to USD 764 million in the year 2028 alone.
- Asthma among children younger than 14 years can be reduced by almost 1 million cases in 2028.

#### COBENEFITS

Improving air quality and reducing health costs through renewable energy in Turkey. Assessing the co-benefits of decarbonising the power sector

available on  
[www.cobenefits.info](http://www.cobenefits.info)

#### KEY FINDINGS:

- The highest SO<sub>2</sub> concentrations are observed at the Edirne – Keşan, Amasya – Suluova, and Çorum – Mimar Sinan stations. The highest NO<sub>2</sub> concentrations are observed at the Ordu – Ünye, Samsun – Yüzüncüyıl, and Kayseri – Hürriyet stations. Hourly CO concentrations are high at some locations, in some instances more than 10 times the Turkish air quality standards.
- Annual PM<sub>10</sub> concentration (averaged over all available air quality stations) is 54 g/m<sup>3</sup>, breaching the air quality standard of 40 g/m<sup>3</sup> and clearly revealing that the air pollutant of greatest concern in Turkey is PM10. The highest PM10 concentrations are observed at Iğdır, Kahramanmaraş – Elbistan, and Ankara – Kayaş.
- The number of restricted activity days can be reduced by 18,100 days in 2028, thus improving Turkey's economic output.
- Turkey can significantly reduce the number of premature deaths related to air pollution from fossil-fuelled power plants, preventing more than 750 deaths in the year 2028. This calculation is based on YOLL (years of life lost) data relating to the effects of CO, SO<sub>2</sub>, NO<sub>2</sub>, and PM10.
- Turkey can generate significant health cost savings, amounting to USD 764 million in 2028. These cost savings result from reduced morbidity (chronic bronchitis, congestive heart failure, lung cancer) and mortality and from fewer hospital admissions and asthma cases.

		Base Year 2017 (2028, MW)	2028 Scenario 1: Current Policy	2028 Scenario 2: New Policy	2028 Scenario 3: Additional Renewables	2028 Scenario 4: Advanced Renewables
Health Effects	Mortality (cases)	2,103	2,333	2,042	1,892	1,564
Health Costs	Annual Health costs (USD million) (Mortality, morbidity and hospital admissions combined)	2,129	2,506	2,218	2,062	1,719

**Table 1: Health benefits and health cost savings under different energy scenarios**

**Source:** Base year 2017 data are based on our own research; 2028 projections based on IASS/IPC (2019)

