

A new approach to energy and sustainable development: the Sustainable Development Scenario

One of the novelties of the 2017 *World Energy Outlook (WEO)*, the International Energy Agency's flagship publication, is a new scenario that provides an integrated way to achieve three critical policy goals simultaneously: climate stabilisation, cleaner air and universal access to modern energy.

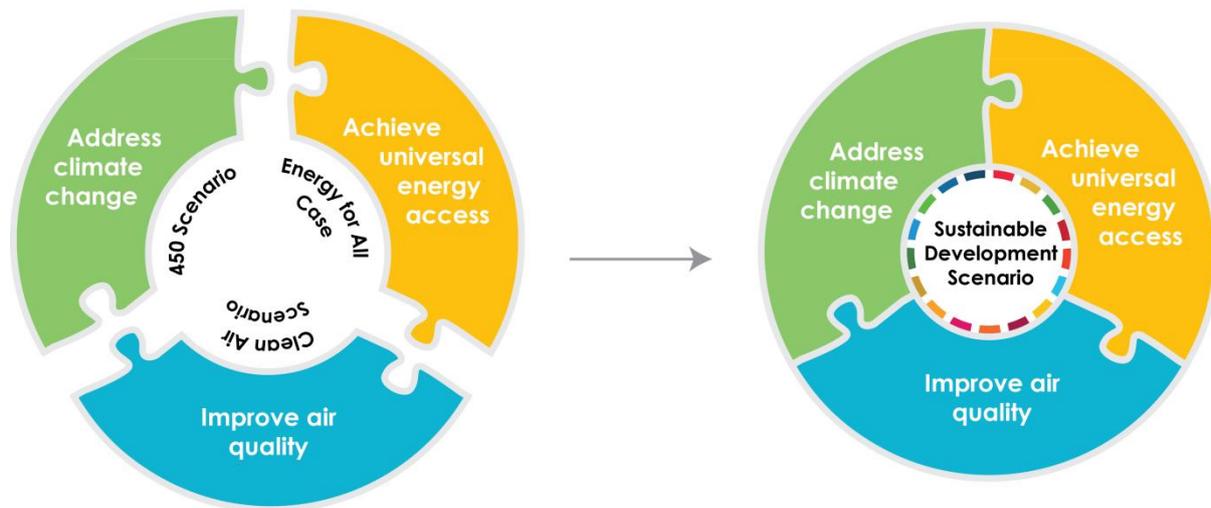
The new scenario – the **Sustainable Development Scenario** – provides a benchmark for measuring progress towards a more sustainable energy future, in contrast with the WEO's traditional projections that track current and planned policies. Specifically, it integrates the objectives of the three Sustainable Development Goals (SDGs) that are most closely related to energy. In doing so it integrates the WEO's climate-focused 450 Scenario, which becomes one of its three main pillars.

There are many reasons to develop a scenario that looks at the broader energy picture. Expanding energy access is a key priority for many developing countries, with 1.1 billion people still lacking access to electricity. Nearly two out of every five people on Earth, or 2.8 billion people, are also without access to clean fuels and technologies for cooking. The smoke from cooking with polluting fuels leads to about 2.5 million premature deaths per year, with women and children suffering the worst effects. Countless hours are spent gathering fuelwood, a burden borne also mostly by women. The recent [Energy Access Outlook 2017](#) showed that with current and planned policies, technologies and investment trends, the world is set to fall far short on the goal of universal energy access by 2030: by that time, nearly 700 million people still lack electricity and around 2.3 billion still rely on polluting fuels for cooking.

Despite its benefits, modern energy can also bring environmental and health costs that threaten sustainable development. Energy is the main source of global greenhouse-gas (GHG) emissions and if no further action is taken beyond measures already implemented and announced, the world will fail to achieve the objectives of the Paris Agreement on climate change. Energy is also the principal source of air pollution linked to severe human health impacts. Today, premature deaths from outdoor air pollution are estimated at around 3 million a year, and are set to rise to more than 4 million if no further action is taken. Achieving universal energy access while also reducing GHG and air pollutant emissions in the energy sector is therefore essential for achieving sustainable development. Progress towards these goals will also underpin achievement of many of the other SDGs, such as those on gender equality, poverty alleviation, education and sustainable cities.

The individual elements of the Sustainable Development Scenario are not new to the IEA (Figure 1). The *WEO* has carried out pioneering work on access to modern energy services for nearly 15 years, starting with the **Energy for All case** in 2003. On climate change, the *WEO* has identified energy sector pathways that are compatible with climate targets for the past decade, notably through annual updates of the **450 Scenario**. The link between energy sector activity and air pollution has also been a *WEO* focus for many years, culminating in [Energy and Air Pollution](#), a *WEO* special report published in 2016 that explored the human health consequences of energy-related air pollution, and presented a **Clean Air Scenario**.

Figure 1: Connecting individual policy targets in the Sustainable Development Scenario



An integrated scenario

The Sustainable Development Scenario brings these pieces together for the first time, recognising their inter-related nature but also the competing priorities faced by policy-makers. While most governments recognise that urgent and necessary action is needed to tackle climate change, they also face pressing near-term social priorities, including energy access and air pollution. Increasingly, energy sector development pathways need to move hand-in-hand with economic development, social priorities and environmental needs, supporting policy objectives in all those areas. Further, focussing on a specific goal in isolation creates a risk of locking in an energy sector pathway that impedes or increases the cost of achieving other goals.

The integrated scenario shows how policy makers can achieve the three objectives simultaneously. In the Sustainable Development Scenario, universal access is achieved by 2030, and by 2040 both energy-related CO₂ emissions and premature deaths from air pollution are halved, relative to projections with no further policy action. In many cases, perceived trade-offs are either small or non-existent. The recent [Energy Access Outlook 2017](#) presented a scenario where universal energy access is achieved by 2030 at least cost, without any further specific policy action on climate change. It showed that achieving universal access does not increase net GHG emissions, in part because of a substantial reduction in methane emissions due to a lower reliance on biomass for cooking, and because renewables are increasingly the lowest-cost option for electricity access.

Taking an integrated approach to energy and sustainable development also strengthens energy security. Achieving universal access addresses the most extreme form of energy insecurity – the lack of modern energy services. The Sustainable Development Scenario also leads to a significant increase in the use of domestic resources, such as renewables and energy efficiency, contributing to energy security through declining use and imports of fossil fuels, while making an essential contribution to climate stability.

The 450 scenario as an input to the Sustainable Development Scenario

The WEO 450 Scenario has become a widely-recognised benchmark for climate action in the energy sector in recent years. It has not disappeared, but has become a key building block of the Sustainable Development Scenario. To create the new scenario, we started by considering the energy requirements to meet universal access. Next, we considered the constraints of both the low-

carbon transition and the need to move towards cleaner air. For climate change, the starting point was an updated 450 Scenario.

The outcome, however, is different, because of the need to consider air pollution in parallel, as well as integrating the latest technology costs and the requirements of achieving access for all. In general, the combined policy goals mean a faster switch towards decentralised and renewable technologies than in the previous 450 Scenario – for example solar PV. A key exception is the use of modern biomass energy, which features less prominently because the combustion of bioenergy releases noxious air pollutants. The centralised technologies with the longest investment lead-times also see reductions in the Sustainable Development Scenario relative to the 450.

Aligning the Sustainable Development Scenario with the Paris Agreement objectives

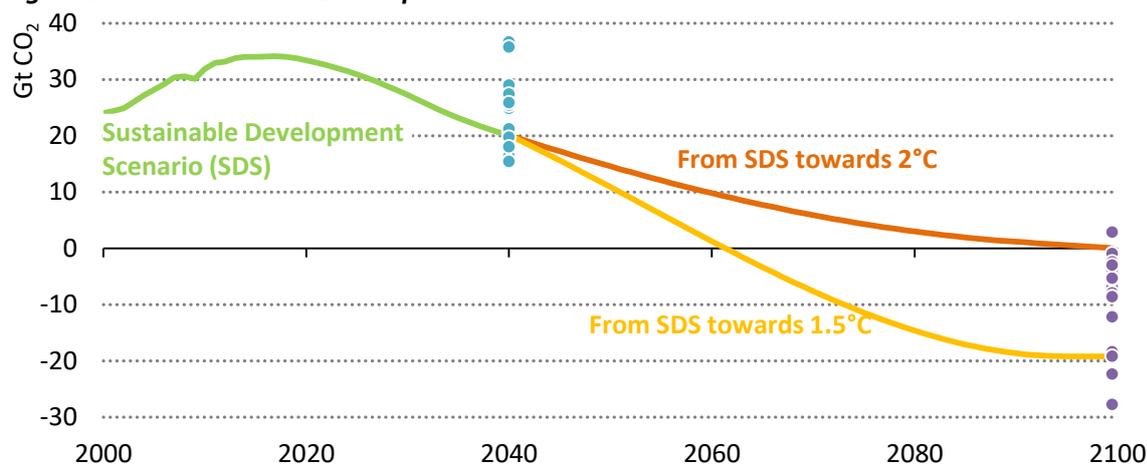
One of the key global goals of the Paris Agreement on climate change is to hold the rise in the global average temperature to well below 2°C above pre-industrial levels, and pursue efforts to limit the increase to 1.5°C.

The final temperature outcome of any energy-related carbon dioxide (CO₂) emissions pathway cannot be known precisely, due to a range of factors such as uncertainties in how the global climate responds to GHGs, the importance of action outside the energy sector (such as in land-use) and the strong role of other GHGs besides CO₂, whether emitted by energy or non-energy sources. Despite these uncertainties, the Sustainable Development Scenario will put the world on course towards meeting the long-term objective of the Paris Agreement.

In the scenario, global CO₂ emissions peak before 2020 and decline swiftly. By 2040, emissions are at the lower end of a range of publicly available decarbonisation scenarios, all of which estimate a temperature increase of around 1.7-1.8 °C in 2100 (Figure 2).

The ultimate temperature outcome will depend on how emissions continue to evolve beyond the model horizon of 2040, and in particular at what point global CO₂ emissions reach zero and, potentially, then turn net-negative. A future period of negative emissions would allow a slower fall in emissions for the same temperature outcome (although the temperature rise may overshoot before falling back to the desired level). A range of outcomes are possible. For example, if emissions continued to gradually decline towards zero in 2100, this would likely correspond to holding the temperature rise to below 2 °C. If emissions fell much faster, hitting zero around 2060 and then becoming significantly negative, this would likely limit the global temperature rise to 1.5 °C. While this level of negative emissions falls within the range modelled by other scenarios in 2100, the challenge of achieving it should not be underestimated. Global negative emissions would require large-scale deployment of technologies that achieve net removal of CO₂ from the atmosphere, all of which face severe technical, economic and resource constraints.

Figure 2: The Sustainable Development Scenario relative to other recent decarbonisation scenarios



Emissions from scenarios projecting global temperature rise of around 1.7-1.8°C: ● 2040 ● 2100

Note: Chart shows energy and process-related CO₂ emissions. Dots represent emissions in 2040 and 2100 from all Representative Concentration Pathway (RCP) 2.6 scenarios in the most recent [Shared Socioeconomic Pathways \(SSP\) database](#).

The Sustainable Development Scenario combines ambitious climate policy with significant action on achieving energy access and creating cleaner air – an integrated approach that speaks to energy policy priorities in a very wide range of countries.

To further bring forward the point of net zero global emissions, and so to increase the chances of a lower global temperature rise, the *WEO-2017* also presents a climate-focused “Faster Transition Scenario” – similar to the one developed by the IEA for the G20 presidency in 2017, in [Perspectives for the Energy Transition: Investment Needs for a Low-Carbon Energy System](#). This scenario depicts an energy transition of exceptional depth, scope and speed, leading to faster reduction of emissions before 2040, for example additional investment to avoid locking in high-carbon infrastructure and to create conditions for increased innovation. Its sole focus on climate, however, means missing out on achieving the important parallel policy objectives.

The WEO-2017 will be released on 14 November 2017. A webinar discussing the Sustainable Development Scenario is planned for 16:30 CET on 24 November 2017.