Aligning corporate greenhouse-gas emissions targets with climate goals

**IEA ETP2014 2DS scenario versus other mitigation scenarios**

In our article we use the 2DS scenario as presented in the 2014 Energy Technology Perspectives report of the International Energy Agency as an external source for emissions and activity pathways towards 2050 for various sectors. The pathways from this scenario influence the targets the Sectoral Decarbonization Approach sets for companies. There are many more mitigation scenarios available that are compatible with a 2 °C pathway. However, 2DS is the only scenario that contains sufficient (publicly available) detail to adequately create sector intensity pathways. Because of the lack of an alternative, it is important that 2DS can be regarded as representative for all 2 °C scenarios. This additional analysis shows how 2DS compares to other 2 °C scenarios and discusses the impact of scenario selection.

Because a wide range of 2 °C scenarios exist, we compare 2DS to the scenarios in category 1 in the IPCC scenario database\(^2\) (i.e. 430-480 ppm CO\(_2\)e. concentration\(^2\)). For this set of scenarios, we retrieved the annual global CO\(_2\) emissions from fossil fuels and industrial processes from 2010 to 2050, and the amount of CO\(_2\) emissions allocated to three major sectors: power generation, transport, and industry. We retrieve this information for the years 2010, 2020, 2030, 2040, and 2050, to match the temporal steps of 2DS. Because the base year of 2DS is 2011, the 2DS data is extrapolated to 2010. Figure SI-1 shows the min-max range of the global emission pathway, the 20-80% range, and the median. Furthermore, the global emissions in 2DS are plotted.
As depicted in figure SI-1, the emissions from 2DS are substantially higher in 2010 (higher than any 2 °C scenario in the IPCC database). This can be explained by the fact that 2DS has the latest base year, and is the newest scenario. The scenarios in the AR5 database also includes older scenarios that still allowed for earlier emission reductions. In general, the fit between the 2DS scenario and the median of 2 °C scenarios in the literature is very good. In 2050, however, the emissions in 2DS are relatively high (above the 80% range of the scenarios in the literature). The analysis of the three sectors showed that the emissions pathway of the power sector according to 2DS was similar to the median of the IPCC database, and that the emissions pathways of industry and transport deviated significantly from the median in the IPCC scenarios.

The electricity sector is the only sector for which carbon intensity data are available for many scenarios. Therefore, it was possible to compare the carbon intensity pathway of electricity from 2DS with those of the IPCC scenarios.

Figure SI-1: Global CO₂ emissions from fossil fuels and industry according to the IPCC 2 °C scenarios and the IEA's 2DS scenario.
Figure SI-2: Global average carbon intensity according to the IPCC 2 °C scenarios and the IEA's 2DS scenario.

Figure SI-2 displays the results of this comparison. Similar to the pathway in figure SI-1, the 2DS intensity in 2010 is significantly above that of the IPCC scenarios, likely for the same reason. From 2020 to 2040, the 2DS intensity is very close to that of the median of the IPCC scenarios. In 2050, the carbon intensity in 2DS deviates slightly from the median of the IPCC scenarios, but not significantly.

This analysis shows that the 2DS scenarios for total emissions and for the electricity sector emissions are well in line with the median scenarios in the literature, but for the specific sectors transport and industry is less representative of the literature as a whole. This can be caused by differences in the modelling method and different assumptions on activity and technology development. Finally, because 2DS does not account for other emissions besides CO₂ from fossil fuels and industrial processes, it could favour certain technologies without accounting for other negative externalities whereas other scenarios can take those into account.

Figure 2 also shows that the range of 2 °C scenarios in the IPCC database increases with time, indicating the uncertainty. However, because the convergence term of the formula ($p_t$) described in the methods approaches zero over time, medium-term targets (especially as the 2020 and to some
extent the 2030 targets commonly set by companies) are affected more by the company’s current performance than by the sector pathway.

The comparison in this analysis can only be made on a highly aggregated level, because of the lack of detail in 2 °C scenarios in the IPCC database. We suggest that future research aims at increasing the level of detail in integrated assessment models.

References


23. IPCC. AR5 Scenario Database. (2014). at <https://secure.iiasa.ac.at/web-apps/ene/AR5DB>