



## INTERVENTION 1

# Reducing Sulfur in Diesel Fuel

### SUMMARY

Sulfur occurs naturally in petroleum deposits. Refined fuels, such as diesel and gasoline, contain a level of sulfur, which depends on the original crude quality and on the processing methods. Sulfur is both a source of black carbon particles in itself and a corrosive material that can damage and eventually destroy the function of emissions controls. Poor quality fuel can contain 3,000-5,000 ppm of sulfur, while further processing can reduce this to 15 ppm, at some cost.

**Health benefits:** High, when very poor sulfur fuels are replaced. Low sulfur fuel directly reduces particulate emissions and is required for the operation of vehicle catalysts and other technologies. Overall, low sulfur fuel has a high levels of health benefits.

**Carbon benefits:** Overall, reducing sulfur in fuels may have negligible climate impact. While the elimination of black carbon emissions results in a small reduction in climate forcing, sulfur is also associated with white carbon particles, which are climate cooling.

**Cost to Governments:** Generally low, except in those countries where the government has a large stake in the petroleum sector. The main costs of sulfur reduction lie in new petroleum refining requirements and expanded distribution systems. Retrofitting refineries is costly. The incremental investment required for new plants is small. Costs are passed to the consumer.

**Political Feasibility:** Generally good. The main constraint to implementation has been the transition costs to refiners and the extent to which these are passed on to consumers. Timing for changeover can mitigate that impact—natural fluctuations in fuel prices can be more substantive than costs for low-sulfur fuel.

**Ownership:** National governments.

### EXAMPLES

**SANTIAGO.** Chile introduced regulations for low-sulfur transportation diesel fuel in 2004, setting a standard 50 ppm for the metropolitan Santiago area and a higher

one for the rest of the country. By 2013, the standard for the country was reduced to 15 ppm and similar standards were proposed for off-road uses, such as agriculture and mining.

**CHINA** began to regulate sulfur in gasoline in 1999, with a limit of 800 ppm which was reduced in stages to a mandatory standard of 50 on 2011. Diesel had a non-mandatory standard of 500 ppm in 2003, coming down to 50 ppm in 2014. At present, the standard for both China 5 (gasoline) and China V (diesel) is 10 ppm.

**AFRICA.** Fuel (diesel and gasoline) available in many African countries still has relatively high levels of sulfur. Following allegations that “African Quality” fuel is not fully refined, in order to reduce costs to the refiners [Public Eye 2016], many African countries committed to upgrade standards for both imported and locally refined fuels. Where cleaner fuels are not yet available, practical upgrading of vehicle emissions standards is delayed.