Panel 3.3 Lead in petrol: a reflection on the German experience

Hans von Storch et al. ([7])

Environmental matters in the early 1970s featured strongly in German politics (Peters, 1980), and Germany was the first European country to impose restrictions on the lead content in petrol. From 1972, German production and importation of petrol with more than 0.4 g Pb/l was prohibited (down from the usual 0.6 g Pb/l), and from 1976 the stricter limit of 0.15 g Pb/1 was imposed. A preliminary analysis of newspaper coverage found that the health dangers of leaded petrol entered the German press in the 1960s. Comparable British articles at that time focused on urban smog.

Unleaded petrol (0.013 g Pb/1) was introduced in Germany in October 1984. Prohibiting the sale of leaded petrol in Germany was not an option because the European Union did not then allow such trade restrictions among its members. Instead, Germany introduced tax incentives for unleaded petrol in 1984, and in 1985 its availability at all German gas stations became mandatory. Enhanced tax incentives in 1986 made German unleaded petrol cheaper than the leaded variety, and its market share increased steadily.

In 1985, the EU mandated that by October 1989 super unleaded petrol had to be available for sale in all member states, alongside the leaded variety (Council Directive 85/210/EEC). In addition, member states were asked to adopt a 0.15 g Pb/1 limit voluntarily. Unleaded petrol was defined as containing no more than 0.013 g Pb/1. In 1987, Directive 87/416/EEC emphasised the importance of the availability of unleaded petrol for sale in every country. All Member States were then allowed to prohibit national production and sales of leaded 92-octane petrol because of damage to public health and the environment.

According to Löfgren and Hammar (2000), by 1995, unleaded petrol had conquered over 80 % of the market in Germany, Sweden, Finland, Denmark, the Netherlands and Austria, but less than 30 % in France, Greece and Portugal. Higher leaded petrol prices and the widespread adoption of cars using leadaverse catalysts were the two most important factors in reducing the market share of leaded petrol. Löfgren and Hammar also note the importance of effectively informing the public that unleaded petrol can safely be used with non-catalyst cars.

Road lead emissions totalled an estimated 31 000 metric tonnes in 1955 in Europe and this nearly quadrupled to 119 000 in 1975 with increasing car use. While road transport and petrol consumption continued to rise, subsequent petrol lead content regulations nearly halved road lead emissions to 62 000 tonnes in 1985. As unleaded petrol conquered increasingly higher market shares, road lead emissions dropped further to 42 000 tonnes in 1990 and to 19 500 in 1995.

Overall, favourable terms of competition were experienced by producers of cars with high technical standards, who had already gathered experience with catalyst systems on the US market (Hagner, 2000).

Blood levels in Germany with and without the reduction of lead in petrol

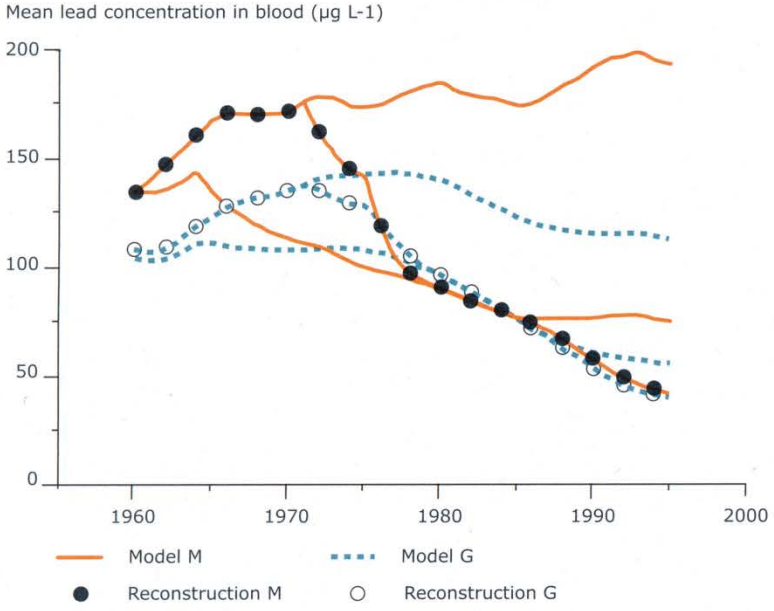
In the 1970s, lead in blood (PbB) values were reaching a level that health officials considered potentially harmful for foetuses and small children. To estimate how PbB levels may have developed if regulations of the use of lead in petrol had been implemented differently a model based on lead emissions was applied. In the case of no or delayed regulations, the model estimates that PbB levels well beyond the critical level would have emerged. Thus, the regulation instituted in Germany since the 1970s has reduced health hazards significantly.

The macroeconomic costs of the regulation seem to have been insignificant in spite of concerns that they would be substantial (Hagner, 2000). In fact, the case of leaded petrol demonstrated the limited utility of purportedly objective cost-benefit analyses, as the costs claimed at the time of the regulations turned out to be significantly biased, due to the vested interests that supported the analyses.

([7]) Adapted from von Storch et al. (2003) with permission from authors.

Panel 3.3 Lead in petrol: a reflection on the German experience (cont.)

Figure 3.2 Scenarios for mean PbB (µg L-1), as derived by the Münster model (M, orange, continuous) and for the Germany model (G, blue, dashed)



Note: Scenario 1 presents an evolution without regulation (i.e. continuing use of 0.6 g/l lead in petrol in Germany, upper curves).

In scenario 2 no unleaded petrol has been introduced in Germany in 1985 (middle curves).

In scenario 3, the regulation was instituted in Germany already in 1961 (lower curves). The reconstructed lead levels in blood are also given as open (Germany model) and full circles (Münster model).

Source: Helmholtz-Zentrum Geestacht Centre for Material and Coastal Research

The conclusion of a successful regulation in terms of limiting risks for human health should not downplay the consequences of the introduction of tetraethyl lead as an anti-knock additive in petrol, in particular since alternatives were known and available already in the 1920s and 1930s (Kitmann, 2000). Heavy metals such as lead pose a large-scale and long-term environmental problem as reduced emissions have limited influence on accumulations in the soil, which will remain for centuries. The strategy of protecting the environment from persistent substances must be based on continuous assessment and precautionary principles (Johansson et al., 2001).