Climate Change: The Lessons from History

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In an article recently published in e-International Relations, I concluded that the longer we wait for action, the larger the humanitarian and economic costs of climate change will be. It has been estimated that we need an 80 percent greenhouse gas emission cut in the developed countries by 2050 from the 1990 level to achieve a global emission cut of 50 percent. This would enable us to stay below a 2 Celsius degree global warming, which is most likely enough to prohibit the direst prognoses related to climate change. The goal sounds staggering, but the international success story of dealing with acid rain is inspiring. When a consensus about the need to deal with emissions of sulphur dioxide and other emissions causing acidification was finally achieved, the emissions fell rapidly.

Sulphur Dioxide and Acid Rain

Sulphur dioxide together with nitrogen oxides is the major reason for acid rain damaging forests, crops and buildings, and making lakes and streams acidic and unsuitable for fish. The combustion of fossil fuels generates more than 90% of all anthropogenic sulphur. Thus along with a sharp increase in the use of fossil fuels, there was a strongly declining trend in the pH value of precipitation all around Europe in the 1950s and 1960s. The effects of this acid rain were most pronounced in countries, such as Sweden, where much of the ground is covered by thin layers of moraine or earth, with very little capacity to neutralize sulphuric acid. Still, in the late 1960s, sulphur dioxide was also considered a local problem in Sweden to be dealt with by constructing higher chimneys. This thought prevailed at least until Svante Odén raised the alarm in 1967 arguing that acidification could restrict the productivity of forests and cultivated land.[1]

However, Sweden could not solve the problem alone, as the major part of the acid precipitation falling in Sweden originated from Britain or Central Europe. Thus, in order to get international recognition of the problem, Sweden published a report on the damage caused to soils and lakes because of sulphur in the air and precipitation at the 1972 United Nations Conference on the Human Environment in Stockholm. As Norway and Finland, with similar vulnerable soils, joined the lobbying efforts, acid rain was finally recognized as an international problem in 1979 with the Geneva Convention on Long-range Transboundary Air Pollution. The convention was signed by the European Community and the governments of 33 countries, including most European countries, the United States of America and Canada. The convention recognized acid rain as a problem, but did not include any concrete measures to reduce it.

In the same year an article was published about the deposition of air pollutants and their effects on forest ecosystems in the Solling mountain area in northern Germany.[2] The results were popularized by the German news magazine *Der Spiegel* in 1981, predicting that large areas of German forests would be dead within five years as a result of acidification. In the following years, the forest dieback (Waldsterben) and acid rain in general got large media attention all around Europe, and the prospects of widespread and serious forest damage made the public opinion favorable to emission reductions.[3] In this changed political climate, the Nordic countries put forward a proposal for limiting the emissions of sulphur in spring 1983. After two years of negotiating, a protocol requiring the signing countries to reduce their yearly emissions of sulphur by at least 30 percent from their 1980 levels by 1993 at the latest was signed in Helsinki in July 1985.[4]

Finland: Anxiety or Technological Considerations[5]

Finland's emissions of sulphur dioxide had already started to decline in the 1970s; the total emissions of sulphur dioxide fell by one fifth from 1973 to 1978. This was, however, a side-effect of changes in industrial processes rather than an outcome of deliberate policy. The main reason was a rapid decline in emissions from the forest industry as it shifted from sulphite pulping to sulphate pulping which as a side-effect, besides creating longer fibers and thus stronger paper, reduced the emissions per produced pulp by ninety-five percent at best.

Figure 1. Finland´s emissions of sulphur dioxide from fossil fuels and industrial processes.

Source: Jan Kunnas & Timo Myllyntaus, "The Environmental Kuznets Curve Hypothesis and Air Pollution in Finland." *Scandinavian Economic History Review,* Vol. 55 No. 2, 2007, pp. 101–127.

Finally, alarming news about dying forests in Germany in the early 1980s triggered anxiety about large and widespread damage to the forests. This paved way for active measures to decrease sulphur dioxide emissions. First, sulphur dioxide emissions were actively reduced mainly by fuel choices; but in the long run, the installation of desulphurization equipment was most significant. Thus the emissions themselves provoked their downturn through their anticipated negative effects. Although the risks facing German´s as well as Finland's forests might have been overestimated, without active measures the emissions would eventually have reached a level in which the forests would have been seriously damaged.

The Power of Example

One of the main reasons for the failure of the climate negotiations in Copenhagen 2009 and thereafter, is a "wait and see what the others do attitude." The viewpoint, that individual countries can't make anything happen alone, is fatal, faulty and futile modesty. If anything general can be learnt from history that is the power of example. Unilateral measures to curb climate change could provide an example for later comers to follow, allowing them to tunnel through the peak emissions.[6]

As shown above, the international agreement on the reduction of emissions of sulphur dioxide signed 1985 in Helsinki originated from the example and initiative of Sweden. Another similar example can be found from the declining emissions of ozone depleting substances where the United States took the lead without waiting for actions

by the European Community, the forerunner of the European Union. Thus, it managed by its own example to overcome the skepticism and opposition of regulatory measures by the EC, which eventually followed the example. In the end, the actual costs for dealing with the emissions were also much lower than at first anticipated, which made it easier for less eager countries to follow.[7]

Policy Recommendations

From an environmental point of view, it does not matter whether an emission decline is a result of environmental considerations or a by-product of economically dictated technological change, or whether the engine of change is increased wealth or public unease with pollution. However, there is a big difference in the policy implications.

If the environmental damage has to become severe enough to create pressure to reduce the emissions, then in the case of carbon dioxide the prospects are grim indeed. At that point, when the negative consequences are revealing enough to convince all skeptics, it is already too late. For future development of carbon dioxide and other greenhouse gas emissions, the story of declining sulphur dioxide emissions in the 1970s inspires hope that reduction of emissions could be part of normal technological development. By speeding up this kind of development, environmental concerns and policy measures can accelerate the development creating at best a win-win situation according to the Porter Hypothesis, which claims that environmental protection can benefit competitiveness.[8]

Considering the stalemate in climate negotiations since the Copenhagen climate conference in 2009, it is not likely that the global community can make a joint decision to step forward. Someone has to take the first step – showing the example. The European Union´s target to cuts its greenhouse gas emissions by 20 percent by 2020 is a move in the right direction, but clearly not enough considering the scale of the emission reductions needed. China again has recently made large investments in renewable energy, but coal is still its primary source of energy. Charles Weiss and William B. Bonvillian on the other hand hope that the US would take the lead:

The United States should keep in mind, too, that the economic advantages of leadership in technology have been the source of its wealth and well-being. Is it really in America's interest to cede leadership of a technological revolution in energy to other countries that now also understand the innovation-based growth model?[9]

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[1] Lundgren. L. J. *Acid Rain on the Agenda, A picture of a chain of events in Sweden 1966-1968.* Lund: Lund University Press, 1998.

[2] Ulrich B., Mayer R., Khanna P. K., "Depositionen von Luftverunreiningungen und ihre Auswirkungen in Waldökosystem im Solling,". *Schriften aus der Forstlichen Fakultät der Universität Göttingen und der Niedersächsischen Forstlichen Versuchanstalt. Band 58*. Frankfurt am Main: J. D. Sauerländer's Verland, 1979.

[3] The Social Learning Group, *Learning to manage global environmental risks. Vol. 1*. Cambridge, Mass: MIT Press, 2001; Roll-Hansen, N., "Science, Politics, and the Mass Media: On Biased Communication of Environmental Issues," *Sci. Technol. Hum. Val.,* Vol. 19, No. 3, 1994.

[4] UNECE, *The 1985 Helsinki Protocol on the Reduction of Sulphur Emissions or their Transboundary Fluxes by at least 30 per cent*. http://www.unece.org/env/lrtap/full%20text/1985.Sulphur.e.pdf

[5] This section is based on: Kunnas, J. and Myllyntaus,T., "Anxiety and Technological Change – Explaining the

Inverted U-curve of Sulphur Dioxide Emissions in late 20th century Finland." *Ecological Economics*, Vol 69, No. 7, 2010, pp. 1587–1593. See that for a full list of sources.

[6] Kunnas, J. and Myllyntaus, T., "Forerunners and Policy Tunnels",in Leszek Jesień (ed.) *European Union Policies in the Making*. Kraków: Tischner European University, 2008, pp. 249-263.

[7] Sunstein, C. R., *Worst-Case Scenarios.* Cambridge, Mass. : Harvard University Press, 2007.

[8] Porter, M., "America's green strategy," *Sci. Am.* Vol. 264, No. 4, 1991, p. 96; Porter, M., van der Linde, C., "Toward a new conception of the environment – competitiveness relationship," *J. Econ. Perspect.* Vol. 9, No. 4, 1995, pp. 97-118.

[9] Weiss, C. and Bonvillian, W. B., Structuring an Energy Technology Revolution. Cambridge, MA: MIT Press, 2009, p. 7.

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