How Long Will Resources Last?

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Tackling the problem of climate change is currently at the top of the political agenda. One particular feature of climate change is that it is a global phenomenon in two respects: firstly, every single country's behaviour is crucial and, secondly, every single country will be hit by the consequences of climate change. Consequences of and responsibilities for climate change, however, are unequally distributed. There are considerable differences across countries with respect to energy generation, emission intensity as well as resource endowments. This makes tackling climate change a particularly complicated issue.

The bi-monthly *ifo Schnelldienst* (in German) is currently publishing a series of short articles on this topical issue. In order to further illustrate the global character of climate change and to highlight differences across countries, each article provides thematic maps which display informative facts related to climate change. A selection of these articles will also appear in *CESifo Forum*.

The first article deals with the question: how long will resources last? A widely used method to tackle this problem is the so-called reserve-to-production (R/P) ratio. It expresses the number of years a given stock of an exhaustible resource can be exploited using a given exploration rate. It is calculated by dividing the proved reserves of a geographical unit in a specific year by the resource production of this specific year. In many cases this ratio is reported on the continental or the global level.

Figure 1 displays the R/P ratios for oil, natural gas and coal at the country level. There are two striking features. First, considerably higher ratios are present for coal than for oil and natural gas. Only in very few countries such as Venezuela and several Gulf States will oil last for more than 80 years. For coal, in contrast, similar ratios are present in a larger number of countries. Second, there are also clear differences in geographical distribution. While higher R/P ratios for oil and natural gas are mainly present in the Gulf region as well as in Northern Africa, coal is more equally distributed and also available in North and South America as well as many regions in Asia.

Based on these figures interesting conclusions can be drawn with respect to recent political debates on energy security as well as on climate change. Oil, natural gas and coal are important input factors for many industrial countries. Many types of fuel are derived from oil, while gas and coal are used for the production of energy. The differences in the geographical distribution indicate that maintaining energy security in the long run will involve dealing with various political constellations. Due to the differences in the ratios themselves, however, there are different degrees of urgency.

As oil, gas and coal are fossil resources, the usage of which involves the emission of CO_2, there are negative impacts on the climate. In this context Sinn (2008) has pointed to the possibility of a so-called Green Paradox. The basic thought is that the owners of fossil resources face increasing environmental taxes and, as a result, will bring forward rather than postpone the extraction of their resources. This, of course, has severe consequences for the global climate. The R/P ratios presented in this article, however, indicate that the immediacy of this problem varies for the three resources. As the largest R/P ratios are observed for coal, here the scope for extraction path changes is the largest; for the cases of the other resources extraction path changes appear to be relatively limited.

It should be noted, however, that the expressiveness of the R/P ratio is limited. The ratio is mainly driven by the production of the resource in a given

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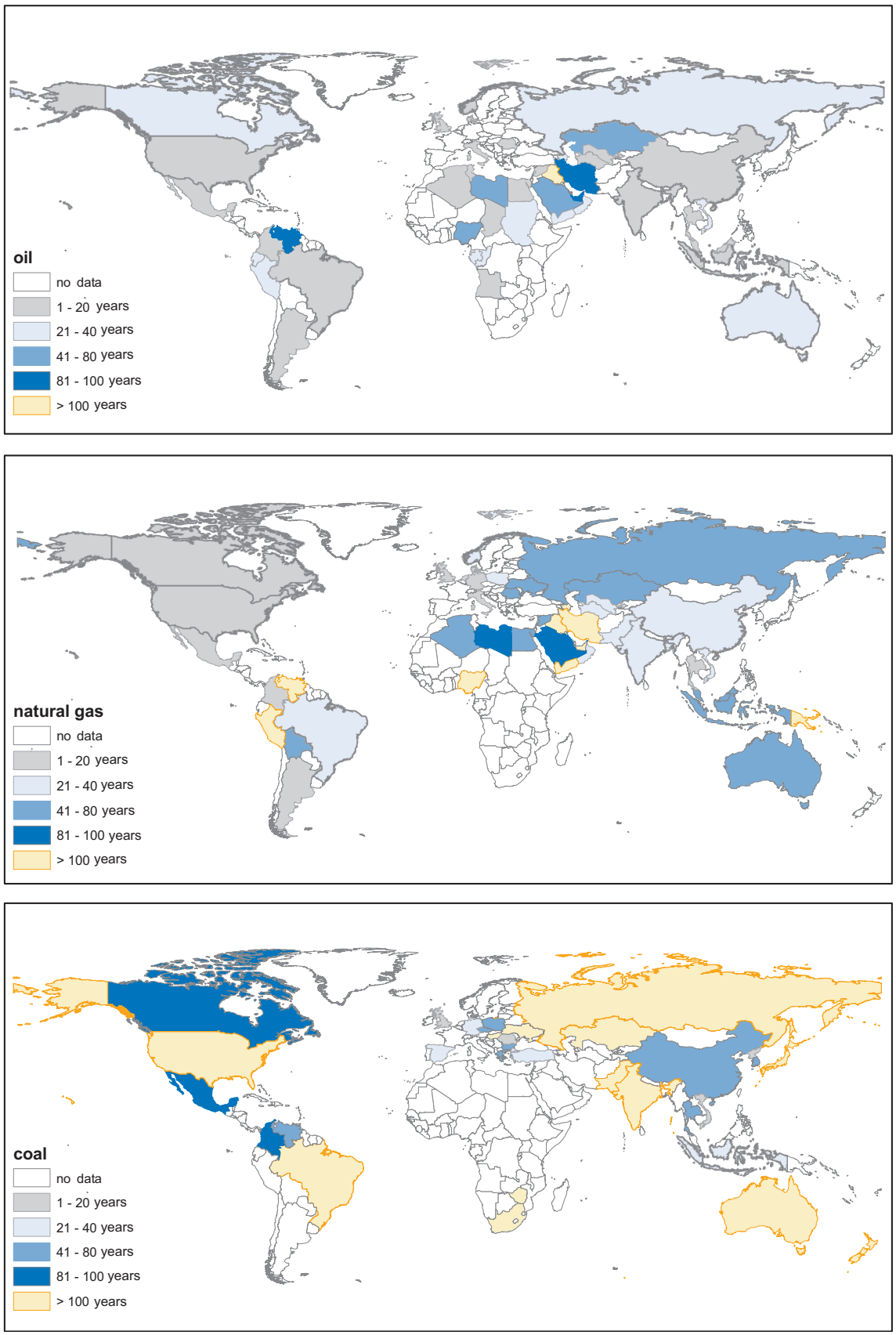
Figure 1

Reserve - to - Production Ratio 2007



Source: British Petroleum (2008).

year. This production rate, however, depends on a variety of factors. The geological features of an oil field, for example, are of particular importance. Depending on the permeability of the oil field, the rate of production can vary between 2 percent and 15 percent of the reserves. In addition, political and economic conditions are also important – consider, for example, OPEC decisions or situations in countries such as Iraq or Venezuela. Finally, the R/P ratio should not be interpreted such that production remains constant for the estimated period of time and then suddenly terminates. Production is likely to decline over time, which results in the frequently discussed bell-shaped extraction paths with production peaks.

Reference

British Petroleum (2008), *Statistical Review of World Energy,* http://deutschebp.de.

Sinn, H. W. (2008), "Public Policies against Global Warming: A Supply Side Approach", *International Tax and Public Finance* 15, 360–394.