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EMISSION INVENTORY COMPARISON: CHINA CASE IN 2002

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1. Introduction

At the 6th workshop at IIASA in February 2004 we gave a presentation on emissions in China . However, at that time the new version of the "China Energy Statistical Yearbook (2000-2002)" was not available, so the emission data used in the comparison was estimated from the energy matrix of provincial data in 1999 and extrapolated to 2000, using total energy data from the "China Statistical Yearbook 2002".

As discussed at the presentation of the last workshop: despite rapid GDP growth (up 32% from 1996 in 2000), the energy consumption figures in 1999 and 2000 were 13-14% smaller than that of 1996, in the Government's 'China Statistical Yearbook 2002'. For this reason our estimate of coal consumption after 1996 was enlarged using the modification factor derived from a regression with the GDP trend from Sinton J.(2002).

In spring 2004 the energy matrix data from 2000 to 2002 was published. It was said previously that the questionably low consumption data after 1996 would be revised, but the trend was not modified and the problem still remains. Therefore in this version we have tentatively chosen to use a simple extrapolation from 1999 of the GDP modified provincial data, which was used in the comparison at the last workshop, to 2002 using the country's total energy matrix in the new version of the statistics. The procedure for calculating the detailed sectors matrix is the same as the last version for 1999 and 2000.

Last year, many new reports on emission factors became available and we have since revised our emission factors using the figures from these new papers. Available information on observed emission factors in China is very limited, but we have considered this where it is available. We have also considered a rapid change of control technologies, etc, for applying EU,US or Japan information to China.

As a result the data quality of the revised emission estimates is expected to be better than the previous version. However, energy data reliability and emission factor applicability are still limits to the quality of data that need to be improved. This comparison is expected to be an opportunity for such an improvement.

2. Features of our emission inventory

The aim of our emission inventory for China is to develop reliable and detailed emission data with high resolution by region and timescale. The features of our estimates for China are (1) detailed energy demand sector, (2) inclusion of biomass fuel used in the domestic sector, (3) consideration of boiler or furnace size and type, for emission factor application and energy efficiency assumptions, (4) a reliable and small grid-sized regional resolution, using the polygon data of the population distribution.

However, we have not estimated emissions from open fire buring of biomass, so for this comaprison we have quoted from Streets, D.(2003) or Bond, T.(2004).

3. NO_x emission comparison in China.

We revised NOx emission facotors for 2002 and compared with Streets,D.(2003). Emission differences by source categories are mainly due to emissions factor differences. For example, NOx emission factors for power plants by Streets,D.(2003) are higher than our estimates. Our new emission factor for pulverized coal combistion power plant boiler is 343gNO2/GJ based on observation in China. Our new emission factor for biomass fuels, which is derived from the new CORINAIR small combustion source data, are higher than that of Streets, D.(2003). In terms of the transport sector our previous emission factor was slightly lower. In this revision our new emission factors are now at a similar level to Streets, D.(2003), but our average for the sector is higher. Vehicle emission factor levels in China are likely to be different by province, for example, in big coastal cities it would be lower than that of inland areas, where many older vehicles are still used. However, in our present version such regional variations have not been considered explicitly yet.

4. NMVOCs emission comparison in China.

Our previous estimate of NMVOCs emission in 2000 and 1999(partly by sector) was smaller than that of Streets, D.(2003). Our tentative estimate in 2002 using the same emssion factors as 2000 is larger than that for 2000 from Streets, D.(2003). In our estimate, one type of power plant boiler, middle size stoker boilers are given higher emission factors than in Streets, D.(2003), where they are around 15g/GJ for older plants and around 1.5g/GJ for new plants (I guess the same as Klimint,Z. (2002)). So power plant emissions in our estimate are larger compared to other estimates. There are many remaining uncertain elements in this NMVOCs emission estimate. In our estimation Japan case (obtained from 1960's to 1980's) was applied to such cases. Partly difference from other estimates would come with this reason.

5. BC and OC emission comparison in China.

In terms of BC and OC emissions, Bond, T. et al(2004) estimate Global emissions in 1996. We revised our BC and OC emission factors partly quoting from Bond,T.(2004). As part of the BC,OC emission factors, TPM,PM10,PM2.5,PM1.0 or PMfine emission factors are used, so we refered to several new and old PM emission factors to determine the BC,OC emission factors - including data for Japan and limited Chinese observation data. BC emissions in 1996 by Bond,T.(2004) are larger than any other results, and that of OC emission is the smallest, which means that the OC/BC ratio in Bond,T.(2004) is the smallest. The OC/BC ratio of Streets,D(2003) is the largest. OC emissions from our new estimate in 2002 is the largest, but BC emission in 2002 is smaller than that of Bond,T (2004) in 1996. The difference within these results is due mainly to emissions factor differences for biomass fuels.

6. SO2 emission comparison in China.

We have not considered a comparison of SO2 emissions yet, because of on going revision.

7. Regional Distribution

In this abstract paper there is no space to compare regional distributions. In the previous comparison there were differences in the provincial data within our estimate, Streets, D. and the China Environmental Yearbook. After finishing our SO2 emission estimate we will then undertake a regional comparison.

Reference:

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8)Amann,M. et al(1999)A Comprehensive Assessment of Large-Scale Environmental Problems in East-Asia, IIASA, No.98-129
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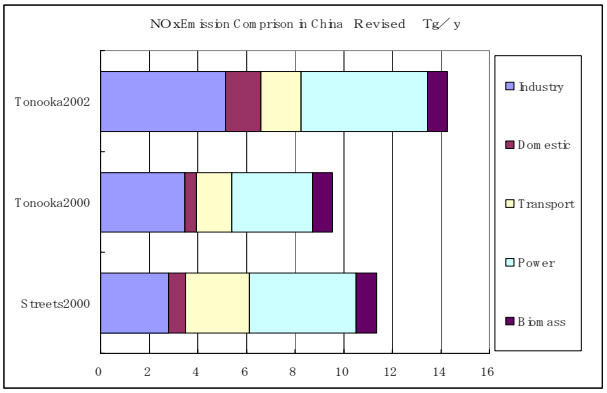
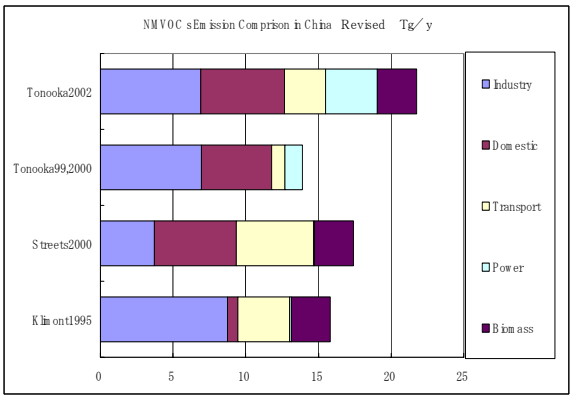
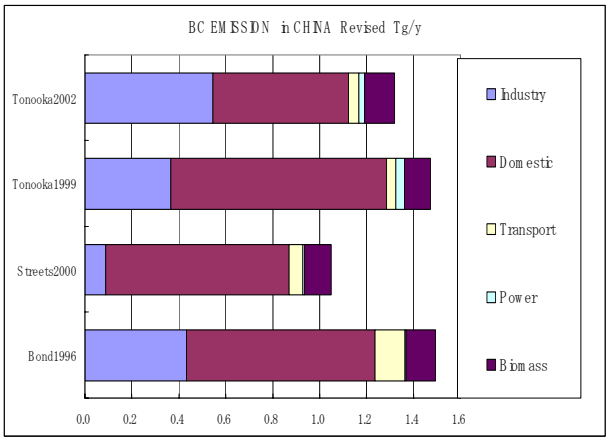


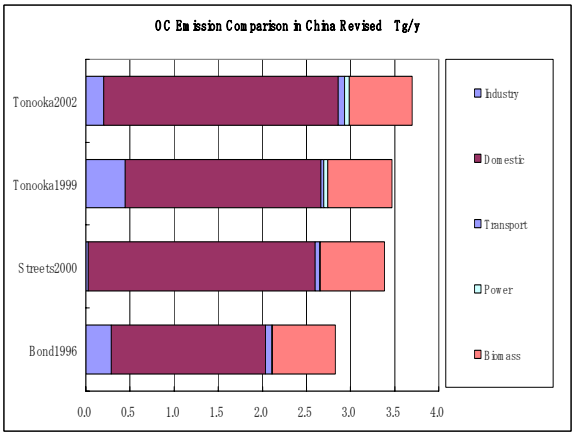
a: NOx



b: NMVOCs



c: BC



d: OC