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AD HOC GROUP ON THE BERLIN MANDATE
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Agenda item 3

INFORMATION SUBMITTED BY PARTIES ON POSSIBLE CRITERIA FOR DIFFERENTIATION

Addendum

Note by the secretariat

1. In addition to the submissions already received (see FCCC/AGBM/1997/MISC.3), a further submission has been received from Germany and Japan.

2. In accordance with the procedure for miscellaneous documents, this submission is attached and is reproduced in the language in which it was received and without formal editing.

CONTENTS

PAPER NO.1: GERMANY AND JAPAN

SUMMARY TABLES PROVIDED TO THE UNFCCC BY THE INTERNATIONAL ENERGY AGENCY

Foreword

In the context of the climate change negotiations, the International Energy Agency (IEA) has been asked to provide the UNFCCC Secretariat with several summary tables of relevant available data. The latest IEA Energy Balance data are for 1995. Therefore, this submission includes a time series based upon official IEA energy data for 1990 to 1995.

The emissions estimates given in the attached tables have been estimated by the IEA based on their energy data and the default methods and emissions factors from the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories.* These data are only for energy related CO_2, not for any other greenhouse gases, and may differ from countries' official submissions of emissions inventories to the UNFCCC Secretariat (see Section 1 of this document for further details). These estimates have been published in the new IEA book, *CO_2 Emissions from Fuel Combustion*. Please note that these emissions are only from fuel combustion and represent approximately three-quarters of total CO_2 emissions.

The IEA also publishes data on renewables energy once a year in *Energy Balances of OECD Countries*. In that publication, the data are shown in GWh and TJ and divided into electricity and heat production. Since the UNFCCC Secretariat requested information on the share of renewables in total primary energy supply, the data in this document have been presented differently to conform with that request (see Section 2 of this document for the conventions used to calculate primary energy supply).

For further information on the population and GDP data used to calculate the indicators presented in the summary tables, see Section 3 of this document. It also gives a brief description of the differences between GDP calculated using exchange rates and using purchasing power parities. Section 4 gives some units of conversion which may be used to convert the data in the attached tables to different units and Section 5 gives a brief description of the summary tables included in this document.

Note: No forecast data beyond 1995 were included in this submission because such forecasts are not made by the IEA on a comparable basis.

1. Differences Between IEA Emissions Estimates and UNFCCC Submissions

The estimates of CO_2 emissions from fuel combustion are calculated using the IEA energy data1 and the default methods and emission factors from the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories.* There are many reasons why the IEA estimates may not be the same as the numbers that a country submits to the UNFCCC, even if a country has accounted for all of its energy use and correctly applied the *IPCC Guidelines*. No attempt has been made to quantify the affects of these differences. In most cases these differences will be relatively small. Some of the reasons for these differences are:

- **Energy activity data are extracted from the IEA energy balances and may differ from those used for the UNFCCC calculations.**

  Countries often have several "official" sources of data such as a Ministry, a Central Bureau of Statistics, a nationalized electricity company, etc. Data can also be collected from the energy suppliers, the energy consumers or the customs statistics. The IEA tries to collect the most accurate data, but does not necessarily have access to the complete data set that may be available to national experts calculating emission inventories for the UNFCCC.

- **The IEA uses average net calorific values.**

  The IEA uses an average net calorific value (NCV) for each oil product. These NCVs are constant across countries and over time. As for coal, the different coal types have specific NCVs for production, imports, exports, inputs to public power plants and coal used in coke ovens, blast furnaces and industry, and can vary over time. Country experts may have the possibility of going into much more detail when calculating the heat content of the fuels. This in turn could produce different numbers than the IEA.

- **The IEA uses average emission factors.**

  Again, the IEA uses only the default emission factors which are given in the *Revised 1996 Guidelines*. Country experts may have better information available.

- **The IEA does not have detailed information for the stored carbon calculation.**

  The IEA does not have complete information on the non-energy use of fuels. The amount of carbon stored is estimated using the default values given in the *Revised 1996 Guidelines*. Country experts calculating the inventories may be able to go into much more detail.

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1 The original energy data have been published in *Energy Statistics of OECD Countries*, *Energy Balances of OECD Countries* and *Energy Statistics and Balances of Non-OECD Countries*. The IEA emissions estimates have been published in *CO_2 Emissions from Fuel Combustion*.

- **The international aviation bunker data of the IEA are not sufficiently accurate to be able to exclude aviation bunkers from the national totals.**

  As internationally agreed, emissions from international bunkers should be excluded from national totals in inventories submitted to the UNFCCC. However, it appears that for many countries, the data reported to the IEA for international aviation bunkers are not correct. Often, the bunker data exclude outbound international traffic by domestically owned carriers. Country experts calculating emission inventories may have access to detailed airport statistics or may make estimates specifically for this purpose. As a result, total emissions of countries with a lot of international aviation traffic may be overstated in the IEA emission estimates.

- **The IEA estimates for emissions from fuel combustion include fugitive emissions from fuel transformation.**

  As with any inventory that is calculated using the IPCC Reference Approach, the IEA emissions from fuel combustion contain small quantities of fugitive emissions from fuel transformation (e.g. from oil refineries or coke ovens) which are normally included in the IPCC Source/Sink Category 1 B, Fugitive Emissions from Fuels and consequently not reported in national inventories under Category 1 A, Fuel Combustion.

- **The IEA estimates include emissions from coke inputs into blast furnaces. Countries may have included these emissions in the IPCC category Industrial Processes.**

  National greenhouse gas inventories submitted to the UNFCCC divide emissions up according to source categories. Two of these IPCC Source/Sink Categories are Energy and Industrial Processes. The IPCC Reference Approach estimates national emissions from fuel combustion based on the supply of fuel to a country and by implication includes emissions from coke inputs to blast furnaces in the energy sector. However, when doing detailed sectoral calculations, it is possible to distinguish certain non-energy processes. In the reduction of iron in a blast furnace through the combustion of coke, the primary purpose of coke oxidation is to produce pig iron and the emissions can be considered as Industrial Processes. Care must be taken not to double count these emissions in both the Energy Sector and Industrial Processes. Since the IEA is starting with the Reference Approach, these estimates of emissions from fuel combustion include the coke inputs to blast furnaces.

- **The emissions inventories submitted to the UNFCCC may have been temperature adjusted.**

  Some countries experience wide variations in the annual mean temperature. These differences may mask the underlying emissions trends. As a result, in addition to providing unadjusted data, a few countries adjust their emissions estimates to correct for these temperature variations.

- **The emissions inventories submitted to the UNFCCC may have been adjusted for electricity trade.**

  Certain countries are subject to extensive fluctuations in CO_2 emissions due to electricity trade. The fluctuations are large enough that it is difficult to evaluate the underlying trends. For example, Denmark prefers to be judged on the basis of figures corrected for electricity exchange, when evaluating the CO_2-reduction performance of the country. The adjustment suggested by Denmark is made by adding, in import years, the emissions that would have been emitted, had the imported electricity been produced in Denmark, and similarly, by subtracting, in export years, the emissions in Denmark caused by the export.

- **Countries may be using another version of the Guidelines.**

  The IEA CO_2 emissions estimates have been calculated using the *Revised 1996 Guidelines*. Country inventories may have been calculated using the first *IPCC Guidelines* that were published in March 1995 or the *IPCC Draft Guidelines* that were circulated for review in December 1993. Although the method does not change significantly between the versions for Energy, small differences will occur due to modified default net calorific values, emission factors, fuel lists, treatment of autoproducers, etc.

2. Glossary of IEA Definitions

Total Primary Energy Supply (TPES) is defined by the IEA as primary energy production + imports - exports - international marine bunkers +/- stock changes. When constructing an energy balance, it is necessary to adopt conventions for certain non-fossil energy sources. The IEA, as almost all other international organisations which compile energy balances, uses the **physical energy content method**. The energy content of electricity from non-fossil, non-nuclear and non-geothermal sources is considered to be equal to the energy content of the electricity (i.e. at the rate of 1 TWh = 0.086 Mtoe). The IEA assumes an efficiency of 33% for nuclear and 10% for geothermal when calculating the energy content for these two energy sources. An alternative approach to calculating the energy content for non-combusted energy sources is the **partial substitution method** (no longer used by the IEA). In this type of energy balance, the primary energy equivalent of the non-fossil energy sources are calculated using the average efficiency of combustible fuels (the IEA formerly used 38.5%) and represents the amount of energy that would be necessary to generate an identical amount of electricity in thermal power stations. This method presupposes that a country has a relatively small part of its electricity supply from non-thermal sources. Since these two types of energy balances differ significantly in the treatment of non-fossil electricity, the share of renewables in total energy supply will appear to be very different depending on the method used. As a result, when looking at the percentages of various energy sources in total supply, it is important to understand the underlying conventions that were used to calculate the primary energy balances.

Hydro shows the energy content of the electricity produced in hydro plants, excluding output from pumped storage plants.

Geothermal shows the energy content of electricity produced in geothermal plants assuming an average thermal efficiency of 10 per cent unless the country's actual geothermal process efficiency is known, geothermal heat plants and direct use of geothermal heat.

Solar shows the energy content of solar electricity produced in solar plants, solar heat plants and direct use of solar heat.

Tide, Wave and Ocean shows the energy content of the electricity produced.

Wind shows the energy content of the electricity produced.

Ambient Heat shows the amount of heat extracted from ambient air and water by heat pumps.

Solid Biomass and Animal Products is defined as any plant matter used directly as fuel or converted into other forms before combustion. Included are wood, vegetal waste (including wood waste and crops used for energy production), black liquor (an alkaline spent liquor from the digesters in the production of sulphate or soda pulp during the manufacture of paper where the energy content derives from the lignin removed from the wood pulp) and other (including animal materials/wastes).

Gas/Liquids from Biomass are derived principally from the anaerobic fermentation of biomass and solid wastes and combusted to produce heat and/or power. Included in this category are landfill gas, sludge gas (sewage gas and gas from animal slurries), bio-alcohols and esters for energy use (such as ethanol) and other.

Municipal Waste consists of products that are combusted directly to produce heat and/or power and comprises wastes produced by the residential, commercial and public services sectors that are collected by local authorities for disposal in a central location. Hospital waste is included in this category.

Industrial Waste consists of solid and liquid products (e.g. tyres) combusted directly, usually in specialised plants, to produce heat and/or power and that are not reported in the category *Solid Biomass and Animal Products*.

Non-Specified Combustible Renewables and Waste contains energy from the above categories which cannot be separately identified.

3. Population and GDP

Population and GDP for OECD countries (except the Czech Republic, Hungary, Poland and the Republic of Korea) have come from the OECD publication *Main Economic Indicators*. Population and GDP data for the other countries have been obtained from the World Bank. GDP data for the Czech Republic from 1990 onwards come from the OECD and from 1971 to 1989 are IEA Secretariat estimates.

The GDP data have been compiled for individual countries at market prices in local currency and annual rates. These data have been scaled up/down to the price levels of 1990 and then converted to US dollars using the yearly average 1990 exchange rates or purchasing power parities (PPPs).

In recent years, there have been wide fluctuations in exchange rates, consequently there has been a growing need and interest in developing energy indicators using a measure of GDP which would avoid these fluctuations and better reflect the relative purchasing power of different currencies. As a result, this publication is presenting GDP calculated using PPPs as well as with the traditional exchange rates.

Purchasing power parities are the rates of currency conversion that equalize the purchasing power of different currencies. A given sum of money, when converted into different currencies at the PPP rates, buys the same basket of goods and services in all countries. In other words, PPPs are the rates of currency conversion which eliminate the differences in price levels between different countries. The PPPs selected to convert the GDP from national currencies to US dollars come from the OECD and were aggregated using the Geary-Khamis (GK) method and rebased on the United States. For a more detailed description of the methodology please see *Purchasing Power Parities and Real Expenditures, GK Results, Volume II, 1990*, OECD 1993. The ratio of 1990 PPP/exchange rate for the Czech Republic and Hungary comes from the UN ECE publication *International Comparison of Gross Domestic Product in Europe*, 1990. The PPPs for the other countries come from the CHELEM-CEPII CD ROM (Paris, 1997). For a more detailed description of the methodology please see *The Chelem Database, Harmonised Accounts on Trade and the World Economy*, CEPII (Paris, 1997).

4. Units and Conversions

For the purpose of presenting total primary energy supply (TPES) in this document, the IEA has adopted kilotonnes of oil equivalent (ktoe) as a unit of account. One tonne of oil equivalent (toe) is *defined* as 10^7 kilocalories (41.868 gigajoules). This quantity of energy is, within a few per cent, equal to the net heat content of 1 tonne of crude oil.

General Conversion Factors for Energy

To:	TJ	Gcal	Mtoe	MBtu	GWh
From:	multiply by:				
TJ	1	238.8	2.388×10^{-5}	947.8	0.2778
Gcal	4.1868×10^{-3}	1	10^{-7}	3.968	1.163×10^{-3}
Mtoe	4.1868×10^{4}	10^{7}	1	3.968×10^{7}	11630
MBtu	1.0551×10^{-3}	0.252	2.52×10^{-8}	1	2.931×10^{-4}
GWh	3.6	860	8.6×10^{-5}	3412	1

Conversion Factors for Mass

To:	kg	t	lt	st	lb
From:	multiply by:				
kilogram (kg)	1	0.001	9.84×10^{-4}	1.102×10^{-3}	2.2046
tonne (t)	1000	1	0.984	1.1023	2204.6
long ton (lt)	1016	1.016	1	1.120	2240.0
short ton (st)	907.2	0.9072	0.893	1	2000.0
pound (lb)	0.454	4.54×10^{-4}	4.46×10^{-4}	5.0×10^{-4}	1

Decimal Prefixes

10^{1}	deca (da)	10^{-1}	deci (d)
10^{2}	hecto (h)	10^{-2}	centi (c)
10^{3}	kilo (k)	10^{-3}	milli (m)
10^{6}	mega (M)	10^{-6}	micro (μ)
10^{9}	giga (G)	10^{-9}	nano (n)
10^{12}	tera (T)	10^{-12}	pico (p)
10^{15}	peta (P)	10^{-15}	femto (f)
10^{18}	exa (E)	10^{-18}	atto (a)

5. Description of Attached Summary Tables

This document includes the following data:

- **CO_2 Emissions from Fuel Combustion / Population**

  This indicator is presented in tonnes of CO_2 / capita for all Annex I countries, the non-Annex I regions and World total for 1990 to 1995.

- **CO_2 Emissions from Fuel Combustion / GDP using Exchange Rates**

  This indicator is presented in kilogrammes of CO_2 / US$ using 1990 prices and exchange rates for all Annex I countries, the non-Annex I regions and World total for 1990 to 1995.

- **CO_2 Emissions from Fuel Combustion / GDP using Purchasing Power Parities**

  This indicator is presented in kilogrammes of CO_2 / US$ using 1990 prices and purchasing power parities for all Annex I countries, the non-Annex I regions and World total for 1990 to 1995.

- **The Contribution of Renewables to Total Primary Energy Supply (TPES)**

  The data for renewables and waste have been shown separately as some people consider municipal and industrial waste as part of renewables and some do not.

  For each of the Annex I countries, two pages (divided into 5 tables) have been provided with data for 1990 to 1995. However, the data for the EIT countries is not as complete as for the Annex II countries, so for most of the EIT countries, data have been supplied only for 1994 and 1995.

  The first table gives the actual supply of each type of renewable and waste in kilotonnes of oil equivalent. The second table shows the relative share of renewables and waste in total renewables and waste. The third table (strictly speaking, this fulfills the basic request by the UNFCCC) shows the percentage shares of renewables and waste in total primary energy supply. The fourth table shows the share of each type of renewable in total renewables and the fifth table shows the share of each type of waste in total waste.

  The IEA felt that supplementing the third table with the other tables would help readers better understand how renewables contribute to the energy supply in various countries.

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The remaining part of this text which consists of data tables is not available in electronic format. A hard copy of the document can be obtained from the secretariat of the UNFCCC.