The contribution of renewable energies in meeting the climate challenge

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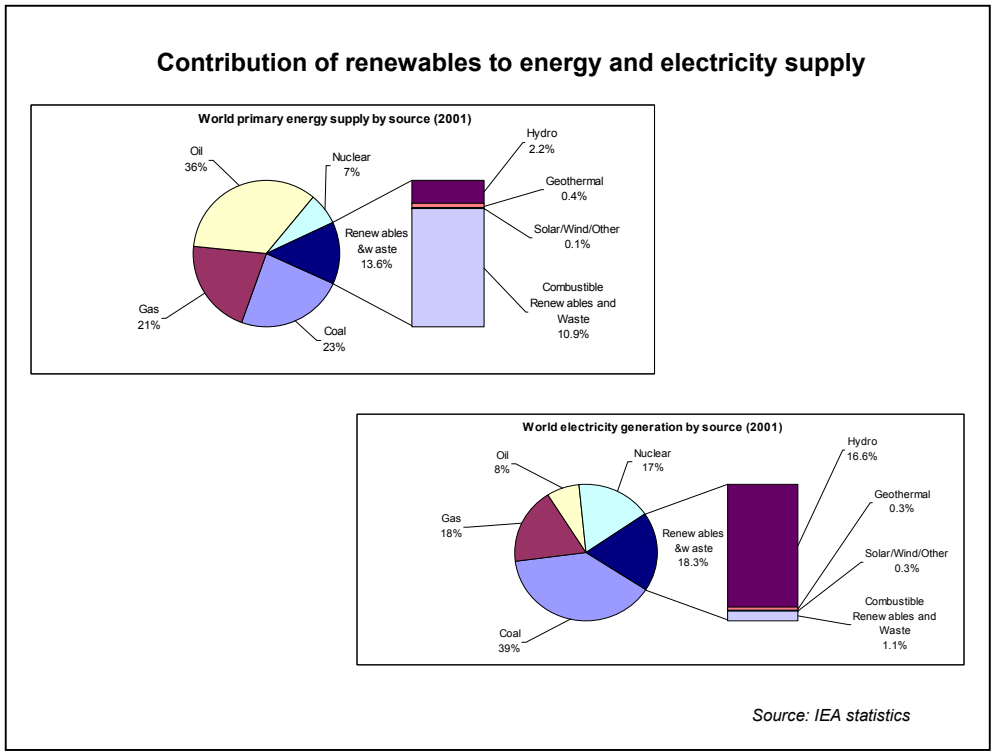
www.unfccc.int

Distinguished delegates,

1. Introduction

We have come here to discuss the status of renewable energies in the world and have already seen in many presentations that progress in the development and use of renewables has been impressive. In 2001, wind, solar, hydro and geothermal energy, together with combustible renewables and waste, provided about 14% of the world's primary energy supply.



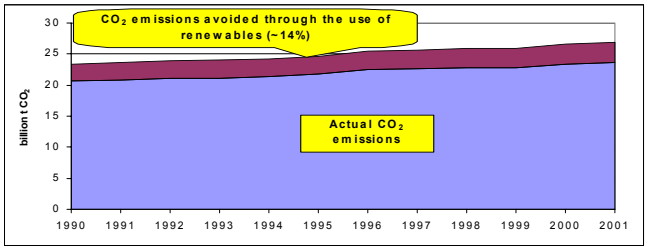
The steady development of renewables was driven, above all, by the aspiration for sustainable development. By using sources of energy that are renewable and often infinite, we can alleviate the impact of energy production and use on the environment, and can also become less dependent on fossil fuels whose supply is finite by nature.

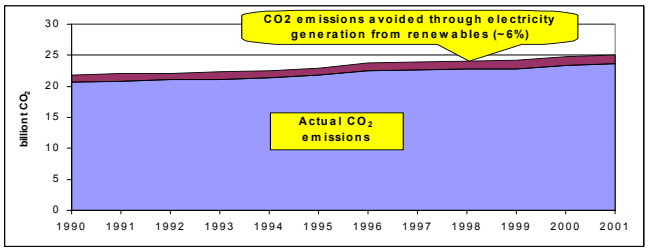
Within the broad context of sustainable development, climate change is an issue for which renewable energies can, may or even must play a key role. In front of this audience, I don't have to emphasise the urgency of tackling climate change. I trust that you are well aware of the expected climate change impacts. The work of the Intergovernmental Panel on Climate Change (IPCC) has lead to a broad consensus on the scientific basis for action. Recent news about a disintegrating Arctic ice cap and the increased frequency of extreme weather events and associated damage, have added to the sense of urgency. Also worrying are the latest measurements of the alarmingly rapid growth in atmospheric CO_2 concentrations that have reached a record high of 379 ppm at Mauna Loa in March (well above the 280 ppm of pre-

industrial times and with a 3 ppm increase from the year before rising substantially more quickly than the average annual growth of 1.8 ppm over the last decade).

The reason for the central role of renewables is obvious: renewable energies are fully or almost fully carbon-free. Consequently, every kWh of renewable electricity and every calorie of renewable heat mean some CO_2 saving. For the world, on average, about 2.3 tonnes of CO_2 are released per tonne of oil equivalent supplied. This means that the above-mentioned 14% of renewable energies in the world's energy supply help us avoid the emission of more than 3 billion tonnes of CO_2 every year.[c]

CO_2 emissions avoided through the use of renewables





Source: IEA statistics

2a. Support of renewables as part of national climate-related policies – developed countries

We keep track of the climate policies of our Parties through the National Communications that are submitted at regular intervals. They provide interesting information on the use of renewable energy. According to the latest national communications under the Climate Change Convention, practically all developed countries actively support the development and use of renewables as part of their climate policies. The main policy tools used are indicative or mandatory targets, for example for electricity production from renewables, sometimes combined with a system of "green" certificates; carbon taxation to increase the competitiveness of renewables against fossil energies; feed-in tariffs and other financial incentives;

support for research and development; and efforts to raise public awareness of the importance of renewable energies.

Major policy tools
Source: national communications of Annex I Parties to UNFCCC

• indicative or mandatory targets
• "green" certificates
• carbon taxation
• feed-in tariffs and other financial incentives
• support for research and development
• efforts to raise public awareness

Here in Germany support for renewable energies is a prominent part of the national climate and energy policies and we have heard many details on that over the past days. As one result, electricity generation from wind energy in Germany leapt by a factor of 200.[d] It is striking that wind-based power generation in Germany represents about one-third of the total wind-based power generation in the world.[e]

In the United Kingdom, the Renewables Obligation, in combination with Renewables Obligation Certificates, has been used since 2002 as the main tool to facilitate the development of renewable energy sources. This system is operating successfully within a liberalized power market and it aims to ensure that the share of renewable energies in electricity production reaches 10% by 2010.

Another example can be given for Finland. The combination of CO_2 tax and other financial incentives, support to research and development, and well-targeted information campaigns, have made Finland a leader in the use of biomass-based fuels.

Iceland is a pioneer in the use of renewable, geothermal energy for the production of hydrogen. More than 70% of the energy supply in Iceland is now from renewable energy.[g] Relying on the combination of renewables and hydrogen, this country may soon give us demonstrable evidence that a decarbonized energy system, also covering transport, is possible.

The achievement of the European Union (EU) targets will save about 130 million tonnes of CO_2 equivalent, which is equivalent to about 3% of GHG emissions of the EU in 2002 – a considerable amount.[h] EU member states are now also obliged to set national indicative targets for a minimum proportion of biofuels and other renewable energy fuels in the transport market for 2010. This is important given that

greenhouse gas emissions in the transport sector are the fastest growing. The experience of Brazil with its biofuel programme, which even allows for exports, shows that this should be an achievable target.

Production and use of renewable energy do not exist in isolation – they occur in real energy markets that are becoming increasingly liberalized and competitive. That is why progress in technologies to utilize renewable energy, leading to their improved competitiveness in comparison with traditional energy sources, is of utmost importance. Such progress has already brought tangible fruits, such as the impressive fall of the costs of wind-based electricity generation over the last years. It is extremely important to continue and intensify our efforts to facilitate progress in technologies to utilize renewable energies and to spread the knowledge about these efforts. Our online database TT:Clear (see http://ttclear.unfccc.int) supports such an information exchange, as it provides many useful examples.

The climate change strategy of the United States of America integrates a broad National Climate Change Technology Program. Research and development in renewable energy sources is a notable part of this programme, which helped, along with other Federal programmes and numerous initiatives at the level of individual States, to increase in the year 2003 alone the wind-based generating capacity in the United States of America by more than 30%.

These examples show that, although the importance of renewable energy is far from being limited by climate change considerations, during the last decade climate change has become a major driver for the penetration of renewables into national energy supply systems. Given the urgency of the problem, it is essential that this process will continue.

2b. Support of renewables as part of national climate-related policies – developing countries

The efforts to use renewable energy are not limited to developed countries. Developing countries implement various measures addressing the problem of climate change. The national communications of these countries show that among these measures the support of renewable energy sources occupies a notable place.

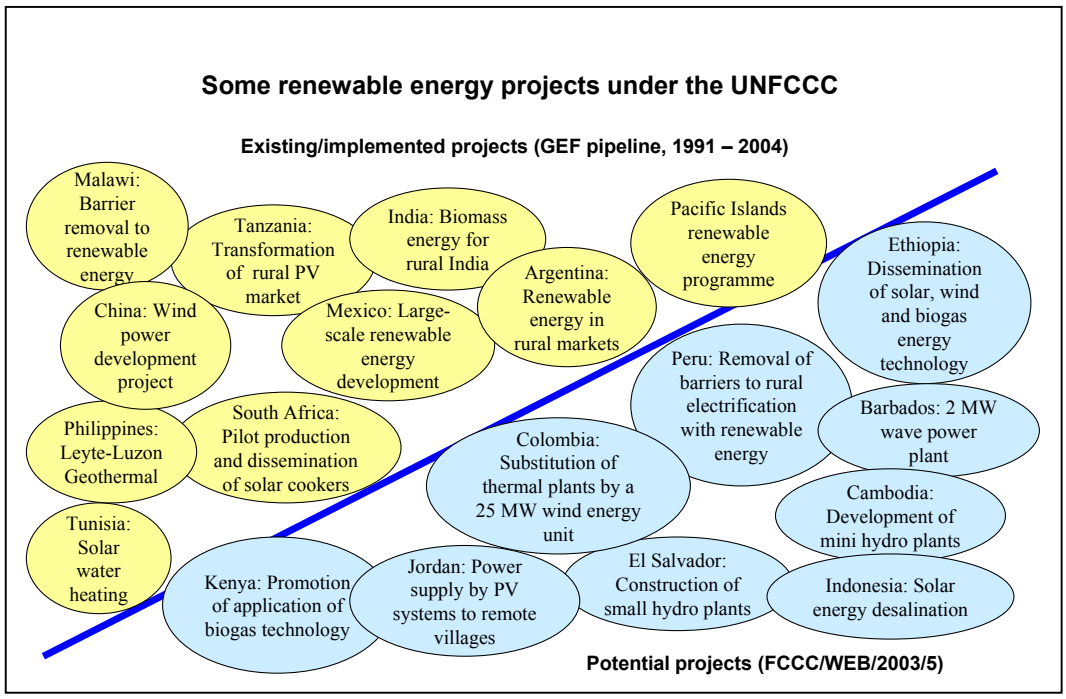
Hydro energy traditionally plays an important role in many developing countries, for example in China, where hydro-based electricity generation increased more than two-fold from 1990 to 2001.[l] Latin America, richly endowed with hydro resources, accounts for one-fifth of the world's hydro generation.[m]

But the last years saw a notable expansion from the traditional use of hydro energy to the development of non-hydro types of renewable energy. This process has profound implications, in particular because it can bring energy to those people in many rural and remote areas in developing countries, which are suffering from the consequences of shortages or absence of energy.

Electricity generation from wind and solar energy in India grew from 32 GWh in 1990 to about 1,970 GWh in 2001 – an impressive growth of more than 45% per year.[n] Although this is still a tiny portion of national electricity generation, only about 0.3%, this rapid growth indicates clearly what potential renewable energy has in the developing world – especially if we remember, first, the rapid growth of electricity demand in developing countries and, second, that wind and solar energy may be replacing carbon-intensive fuels such as coal and oil.

In the Philippines, the use of geothermal energy increased about two-fold in the 1990s and it now accounts for more than 20% of both primary energy and electricity produced in the country.

Having said this, I realize now that I may be misleading you by highlighting these positive examples. The other side to the coin is that, too often, developing countries cannot afford to develop the much cleaner but more complex and still more expensive renewable energy. That is why financial assistance and technology transfer are such important activities under the Climate Change Convention and the Kyoto Protocol. During the period from 1991 to 2004, the Global Environment Facility, operating as the financial mechanism for the Climate Change Convention, allocated more than 660 million US$ in some 60 countries for projects supporting the development of renewable energies as part of the 'Climate Change' focal area.[s]



I am sure that the transfer and operation of renewable energy technologies will occupy a prominent part in the projects to be undertaken as part of Joint Implementation and the Clean Development Mechanism (CDM) under the Kyoto Protocol. Developing countries have a high interest in such CDM projects as we can

see clearly from more than one hundred national communications of non-Annex I countries.[t]

Among the first baseline and monitoring methodologies for CDM projects that the CDM Executive Board has already approved, two relate to renewable energy projects, and many more are in the process of being approved. Several small- and large-scale renewable energy CDM projects, such as the El Gallo Hydro in Mexico or the Kunak Bio Energy Project in Malaysia, are already in the final stages of consideration. Thus, CDM is becoming real and there is no doubt that the potential is huge. Implementation of such projects would contribute notably to the worldwide efforts to mitigate greenhouse gas emissions, while contributing to sustainable development.

3. Challenges and remaining barriers

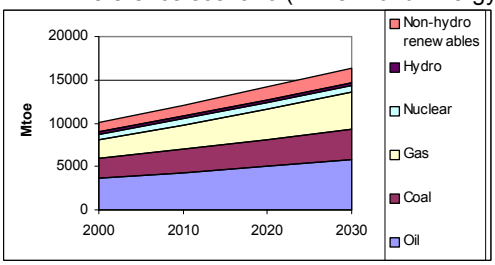
I hope that I have shown that renewable energies are already helping us to mitigate greenhouse gas emissions. One should not be over-optimistic, however. We all know that the high percentages of increases in renewables are usually combined with relatively low increases in absolute numbers – the world energy supply is still dominated by fossil fuels. That is why policy efforts to sustain the emerging applications of renewables and to accelerate technology progress remain as topical as ever. I am sure that this conference will provide a strong positive impetus for such efforts.

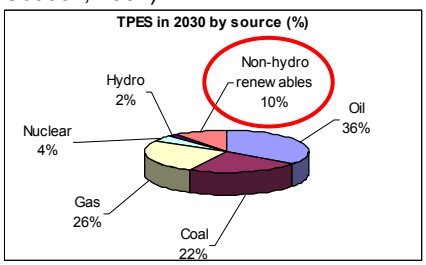
4. Conclusion

We do not know how fast the contribution of renewables to energy supply will grow in the future. The available projection studies show a wide range of possible futures for renewable energies. As an example, we can compare the reference scenario of the International Energy Agency (upper part of the graph below) and a scenario aiming at a stabilization of CO_2 concentrations in the atmosphere at 450 ppm developed by the German Advisory Council on Global Change (lower part of the graph below). The striking feature is the different role that renewables play: 10% in the reference scenario and 24% in the climate-driven scenario.

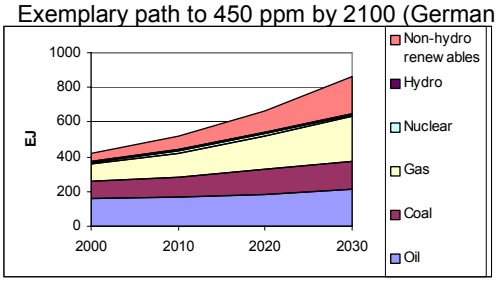
Alternative futures for 2030

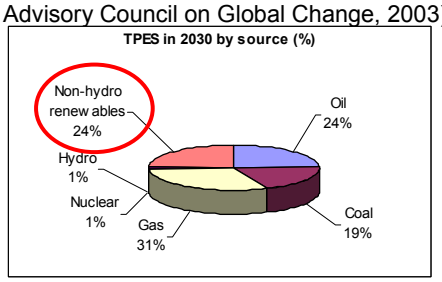
Reference scenario (IEA's World Energy Outlook, 2002)





Exemplary path to 450 ppm by 2100 (German Advisory Council on Global Change, 2003)





Such differences reflect, among other factors, a certain policy gap between environmental policy makers and energy policy makers. It is important that we all realize that such gaps exist and make conscious efforts to close them in favour of decisions and actions leading to a more sustainable world.

Where, within this range of possible futures, we will find ourselves in the years to come will depend on our actions now. Today's actions relating to renewables will have a decisive impact on greenhouse gas emissions because there is visible correlation between the development of renewable energy and the time when greenhouse gas emissions will be stabilized.

Renewables – CO_2 emissions – CO_2 concentrations…

A path to stabilization around 550 ppm with renewables

	Share of renewables in TPES (%)		Annual CO_2 emissions with LUCF ($Gt\ CO_2$)		CO_2 atmospheric concentration (ppm)	
Scenario	**2050**	**2100**	**2050**	**2100**	**2050**	**2100**
Illustrative A1F1	10	20	88	104	520-640	825-1250
Marker B2	24	39	40	49	445-530	545-770

Source: IPCC's Third Assessment Report, table 6-1

The more renewable energies develop, the greater are the chances that greenhouse gas concentrations in the atmosphere will stabilize sooner and at a lower level. Thus, renewable energies are indeed a key component of any long-term solution to the problem of climate change.

As I have already said, renewables have made an impressive progress over the last 10 to 15 years. Now, with climate change mitigation being a key driver in their development, we can expect even more impressive progress in the coming years, especially if our action to facilitate this progress becomes as resolute as we all wish. This will be in the interest of sustainable development – and to the benefit of our climate.

Thank you for your attention.

Notes and references:

[a] Source: IEA energy statistics, version of January 2004.
[b] For results of full chain analysis, see the summary of the EC-funded ExternE project (http://www.externe.info) or the review of electricity generation chains in IAEA Bulletin 42/2/2000 "Greenhouse Gas Emissions of Electricity Generation Chains: Assessing the Difference".
[c] Source: IEA statistics of CO2 emissions, version of January 2004.
[d] Source: latest German energy balances at www.ag-energiebilanzen.de (data for 2003 are provisional)
[e] The number is for 2001, taken from IEA energy statistics; more exactly, it is calculated for the sum of wind and solar generation.

[g] The number (72.9% exactly) is from IEA energy statistics for 2001.
[h] The number (126 Mt CO2-eq exactly) is from the NC3 of the EU. For comparison, this is about 3% of EU's GHG emissions in 2002.

[j] The information on the US was taken mostly from DOE Reports on Wind Energy Accomplishments in 2003 (April 06, 2004) at http://www.eere.energy.gov/windandhydro/.

[l] Data from IEA energy statistics.
[m] Source: IEA's Key World Energy Statistics 2003.
[n] Source: IEA energy statistics, version of January 2004. In addition, the following book, released at COP-9, was used: "Climate Change and India: Issues, Concerns and Opportunities", edited by P.R. Shukla, S.K. Sharma and P.V. Ramana, New Dehli (2002).
[o] The percentages are from IEA energy statistics; the reference to the National Action Plan on Climate Change is from the NC1 of the Philippines, page 75.
[p] The text for Brazil is based on the draft chapters of the initial national communication of Brazil. Although the communication has not yet been completed, the drafts are publicly available at the Internet site of the Ministry of Science and Technology (www.mct.gov.br/clima/ingles/comunic/Default.htm).

[r] In addition to alcohol fuel, biodiesel is produced and marginally used in Brazil. But this is much less developed than the use of alcohol.
[s] Source: query in the GEF Project Tracking System under http://www.gefonline.org/home.cfm (for programme 6 under the "Climate Change" focal area.
[t] This is prepared based on the summary in www.unfccc.int/resource/webdocs/2003/05.pdf.
[u] The IEA scenario is taken from WEO-2002; the German scenario is from "World in Transition Towards Sustainable Energy Towards Sustainable Energy Systems", German Advisory Council on Global Change (WBGU), 2003