

**WBGU**

German Advisory Council on Global Change  
(WBGU)



# Solving the climate dilemma: The budget approach

Summary for  
Policy-Makers





# Summary for policy-makers

## A NEW APPROACH TO THE GLOBAL CLIMATE PROBLEM

The vast majority of scientists now agree that if global warming exceeds a mean temperature of 2°C it will lead to dangerous, irreversible and practically uncontrollable consequences for both nature and mankind. A total of 133 countries, including the 16 major economies and the European Union, have acknowledged the significance of this temperature limit. Many of these countries have made it their target to limit the rise of the global mean temperature to 2°C or less as a guard rail for their endeavours in climate policy.

Latest research shows that there is only a realistic chance of restricting global warming to 2°C if a limit is set on the total amount of CO<sub>2</sub> emitted globally between now and 2050 (CO<sub>2</sub> global budget). WBGU is moving this global budget to the forefront of its considerations in creating a new global climate treaty, which is due to be negotiated at COP 15 of the UN Framework Convention on Climate Change (UNFCCC) in Copenhagen. Combined with fundamental concepts of equity the WBGU budget approach provides concrete figures for each of the emission limitations, which all countries will have to accept in order to prevent the destabilization of the planet's climate system.

The Kyoto Protocol only made provision for emission reduction targets for a minority of countries in a rather arbitrary manner. The proposals made public by various countries and groups of countries in the run-up to the Copenhagen summit are not essentially more ambitious than their forerunners and hardly likely to bring about compliance with the 2°C guard rail. In future, however, not only the industrialised countries, but also the newly industrializing and developing countries will have to clearly limit the amount of greenhouse gases they emit, in order to prevent dangerous climate change. It is also becoming increasingly obvious that the explicit negotiating of individual emission reduction commitments for a very large number of countries is highly likely to overburden the current mode of negotiation within the UNFCCC. The budget approach advocated by the WBGU will enable not only the reduction targets

of the industrialised countries up to 2020 to be based upon a systematic foundation, but also the increasing decarbonization commitments that will have to be achieved by the newly industrializing and developing countries. This can lead to the growth of common understanding among all signatory states concerning the medium- and long-term actions necessary in order to implement the UNFCCC. The climate policy solution proposed by WBGU also has other merits: it creates a considerable degree of inter-temporal and interregional flexibility. The solution makes it possible to dispose largely without restrictions over national greenhouse gas budgets during the long budget time period, based on a small number of rules that ensure compliance with the national and global decarbonization targets up to the middle of the 21st century. The intensive trading of emission allowances between all countries should be explicitly possible. This flexibility and the taking into account of historical responsibilities give rise to various ways of financing mitigation and adaptation measures and promoting the transfer of technology between the industrialised and the developing countries.

The budget approach proposed by WBGU can provide new impetus and orientation for negotiations at the climate change summit in Copenhagen. Furthermore, based on the budget approach, WBGU's special report outlines framework conditions for a climate-friendly world economy of the future and describes institutional requirements. WBGU also points out that the urgently needed breakthrough in international climate policymaking cannot succeed without the strong leadership commitment of several key countries.

## URGENT NEED TO ACT FROM A SCIENTIFIC POINT OF VIEW

New research findings illustrate that the physical leeway for the protection of the Earth's climate has become very narrow. It is urgently necessary to take stock at both global and national levels.

- Several of the impacts of climate change are taking place far more rapidly than previously expected, particularly the global sea-level rise.

- The budget of CO<sub>2</sub> emissions still available worldwide could be derived from the 2°C guard rail. By the middle of the 21st century a maximum of approximately 750 Gt CO<sub>2</sub> (billion metric tons) may be released into the Earth's atmosphere if the guard rail is to be adhered to with a probability of 67%. If we raise the probability to 75%, the cumulative emissions within this period would even have to remain below 600 Gt CO<sub>2</sub>. In any case, only a small amount of CO<sub>2</sub> may be emitted worldwide after 2050. Thus, the era of an economy driven by fossil fuels will definitely have to come to an end within the first half of this century.
- Prominent milestones must be put in place in order to implement a comprehensive transformation process of this magnitude: it is of paramount importance that the level of global emissions reaches its peak by the year 2020 at the latest because otherwise the reduction of emissions in the subsequent period would have to take place at a speed that would fully overstrain the technical, economical and social capacities of our societies.

The evidence of current research illustrates that the turning point towards sustainability can no longer be postponed. WBGU's analysis explicitly shows that over 100 countries immediately need to introduce a process of transformation that swiftly stabilises emission levels, then significantly reduces them and finally achieves complete decarbonization of all relevant socio-economic processes by the middle of the 21st century. There are only 65 nations whose emission paths currently seem to be within the climate-friendly range, and all of them are poor developing countries. This illustrates the extreme time pressure the climate negotiations are currently under and stresses that a radical global transformation process is necessary in order to achieve a low-carbon world economy. The negotiations are currently still in a deadlock because short-term national interests are blocking a prompt and effective global climate protection agreement which would be compatible with the 2°C guard rail.

#### COMPASS FOR THE NEW GLOBAL CLIMATE TREATY: THE WBGU BUDGET APPROACH

A whole range of greenhouse gases and several other factors are responsible for anthropogenic climate change. CO<sub>2</sub> from anthropogenic sources must, however, play a key role in all considerations regarding climate protection due to the large amounts released and the extensive length of time it is retained in the environment (up to thousands of years). Consequently, the WBGU budget approach concentrates on the predominant fossil-fuel CO<sub>2</sub> emissions. Sep-

arate measures are proposed for dealing with the other climate-relevant gases and sectors.

The starting point of the WBGU budget approach is the calculation of the global amount of CO<sub>2</sub> that may be emitted between now and 2050 in accordance with precautionary considerations. This global budget of cumulative CO<sub>2</sub> emissions needs to be equitably distributed among all countries. From an ethical point of view, the best solution is to equally allocate emissions on a per-capita basis, so that national emission budgets can be calculated according to the size of the population. Thus each country has a precisely defined "atmosphere capital" which it can flexibly manage and trade on international markets between now and the year 2050. A number of variations on the budget approach are possible. In particular there are a small number of parameters via which the national distribution of the global budget can be politically negotiated. These are the time period, the probability of complying with the 2°C guard rail and the size of population. The option favoured by the WBGU takes the historical responsibility of the industrialised countries into account, but above all it looks towards the future: the entire CO<sub>2</sub> budget acceptable within the bounds of the 2°C guard rail for the time between 2010 and 2050 is equally distributed across the various countries of the planet on a per-capita basis, taking 2010 as the demographic year of reference (Fig. 1). Thus the responsibility for future emissions is distributed among the people of all regions and countries of the world. With respect to the "polluter pays" principle, an additional financial compensation between north and south will be aimed for, oriented on the national differences in terms of per-capita emissions in the time period from 1990 to 2010. The main purpose of these transfer payments is to finance adaptation measures and to stop deforestation in developing countries.

In order to guard against the danger of CO<sub>2</sub> mismanagement, in the opinion of WBGU, each country should draw up explicit decarbonization road maps that include internationally measurable and verifiable interim targets. These road maps would not only have to be oriented on the national CO<sub>2</sub> budgets, but also on the actual national emission reduction potentials. The balance between the emission paths of the various countries in accordance with their decarbonization road maps and the reference profiles in accordance with their CO<sub>2</sub> budgets is to be achieved by means of international emissions trading between states and by other flexible mechanisms.

The approach developed by the WBGU ties in with the vision of climate justice involving the long-term convergence of per-capita emissions jointly formulated by German Chancellor Angela Merkel and the Indian Prime Minister Manmohan Singh. For the

period 2010–2050 the distribution of the global CO<sub>2</sub>-budget proposed by WBGU amounts to average yearly emission allowances of around 2,7 t CO<sub>2</sub> per capita of the world population of 2010, which may in part be redistributed among states by making use of the flexible mechanisms. Each country should, however, tend to design its climate protection strategy in such a way that towards the end of the budget time period its real emissions converge with the approximate level of 1 ton of CO<sub>2</sub> per capita per year (Fig. 2).

Due to the currently striking differences between the per-capita emissions of industrialised and developing countries, emission trading and other flexible mechanisms will bring about considerable financial and technological transfers, which could in turn open up attractive possibilities for sustainability investments for the countries supplying emission allowances. In this respect, the implementation of the WBGU budget approach would decisively promote climate-friendly and sustainable development worldwide. Figure 2 outlines the amount of leeway an international climate partnership using the proposed mechanisms would create and how the emission profiles of the major groups of countries could then look. Thus the budget approach furnishes an opportunity for a worldwide historical climate compromise.

Within the context of the budget approach, all groups of countries will have to make far-reaching concessions: the industrialised countries will be expected to make extensive emission reduction commitments as well as comprehensive technological and financial transfers. For their part, the newly industrializing and developing countries will also have to accept the fact that catch-up economic development based on the burning of fossil fuels no longer has a future, so that they also initiate the transition to a low-carbon society as soon as possible. The way, however, will be paved for them by means of considerable transfer payments, which means they can cost-effectively avoid the lock-in on fossil fuel pathways. All countries benefit from the fact that they avoid a no longer manageable climate change with all of its accompanying disastrous consequences and costs.

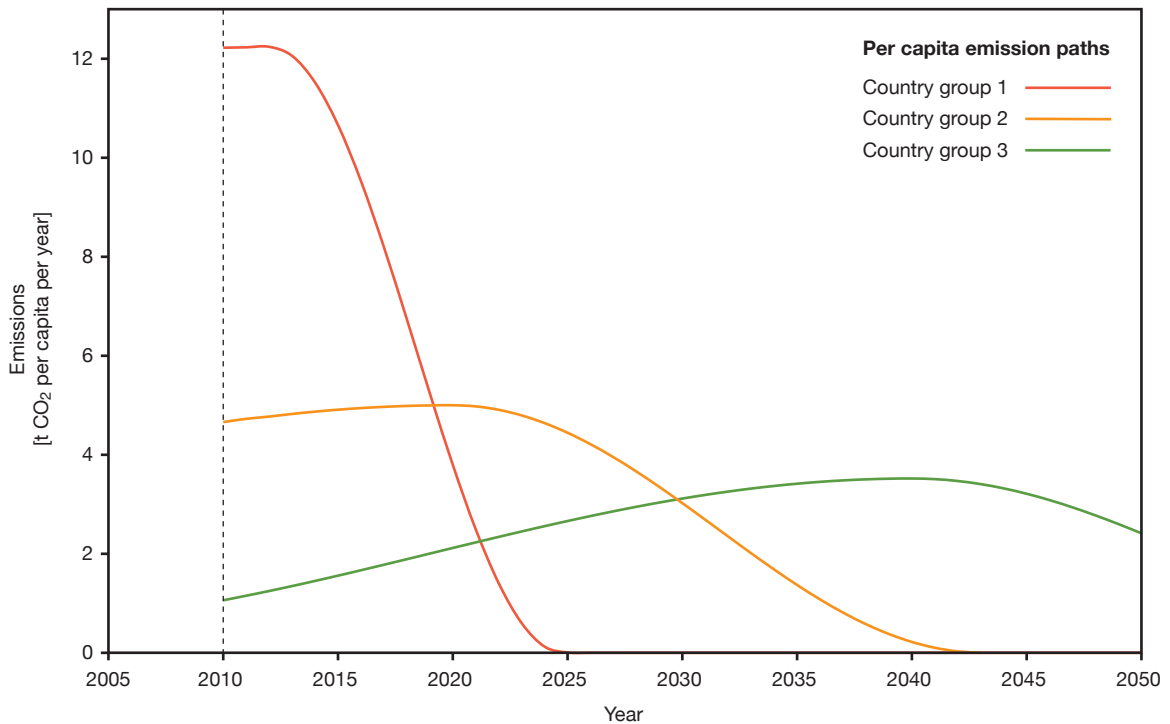
WBGU highlights how international climate protection can be combined with a global development partnership between “high-emission” and “low-emission” countries. It also becomes increasingly obvious that India could become a key player in a global climate treaty in the spirit of the WBGU budget approach. Due to its relatively low per-capita emission levels despite its high rate of economic growth, India can develop a somewhat slower transformation process towards a low-carbon economy than China, for instance. China would have to develop and implement an ambitious decarbonization strategy due to

its currently higher per-capita emission rate. It should be in the interest of the industrialised countries to support China by means of cooperation in a spirit of partnership so that China does not become one of the main buyers of emission allowances.

#### THE RECOMMENDATIONS IN DETAIL

The WBGU budget approach is designed to serve as a compass and a framework of orientation for international climate protection policymakers in the medium and long term. Based on its analyses, WBGU concludes that parties to the UNFCCC will have to agree on the following general principles in Copenhagen:

- The *2°C guard rail* is adopted as legally binding in international law.
- For carbon dioxide – the greenhouse gas crucial to climate protection efforts in the long term – a *global emissions budget* for fossil sources up to the year 2050 that is compatible with the *2°C guard rail* is adopted on a legally binding basis.
- The following *milestones* are stipulated: (1) The peak year of worldwide CO<sub>2</sub> emissions is to be reached between 2015 and 2020; (2) Global emissions by mid-century are to be reduced to a level consistent with the narrow emissions budget remaining post-2050.
- The global CO<sub>2</sub> budget is distributed among the world’s population on an equal per-capita basis so that *national CO<sub>2</sub> budgets* can be calculated for all countries, and adopted on a legally binding basis. These budgets provide orientation for countries on how swiftly and substantially their CO<sub>2</sub> emissions need to be reduced.
- Each country is committed to producing internationally and objectively verifiable *decarbonization road maps*, which provide information on the planned national emissions path up to the year 2050. These road maps should be based on the national CO<sub>2</sub> budgets as well as on the national emissions reduction potential.
- In addition, for the countries with presently high per-capita emissions, *reduction commitments up to 2020* are agreed in order to avoid delaying decarbonization efforts.
- *Flexible mechanisms* (international emissions trading and Joint Implementation) as well as appropriate additional financial and technological transfers by the industrialized countries are agreed upon.
- A decision is taken to establish a *world climate bank*, which will be responsible (1) for scrutinizing the national decarbonization road maps as to their plausibility and feasibility, and (2) for enabling the flexible mechanisms and transfers.
- The *separate regulation of CO<sub>2</sub> from non-fossil sources, other relevant greenhouse gases and fur-*



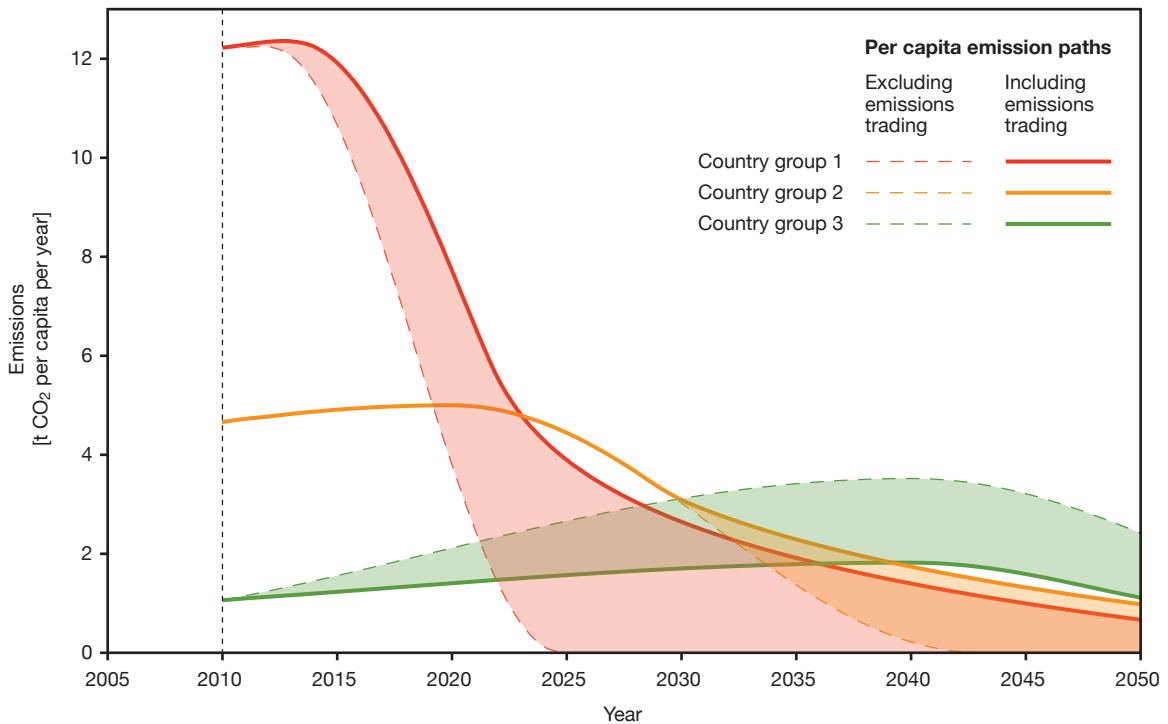
**Figure 1**

Examples of per-capita emission paths of CO<sub>2</sub> for three groups of countries according to the budget approach without emission trading. Although they allow compliance with national budgets, they would only be partly practicable in reality. The countries are grouped according to their annual CO<sub>2</sub> emissions per capita from fossil sources, whereby the CO<sub>2</sub> emissions are estimates for 2008 and the population figures are estimates for 2010. *Red*: Country group 1 (>5.4 t CO<sub>2</sub> per capita per year), mainly industrialised countries, (e.g. EU, USA, Japan) but also oil-exporting countries (e.g. Saudi-Arabia, Kuwait, Venezuela) and some newly industrializing countries (e.g. South Africa, Malaysia). *Orange*: Country group 2 (2.7–5.4 t CO<sub>2</sub> per capita per year), which includes many newly industrializing countries (e.g. China, Mexico, Thailand). *Green*: Country group 3 (<2.7 t CO<sub>2</sub> per capita per year), mainly developing countries (e.g. Burkina Faso, Vietnam) but also large newly industrializing countries (e.g. India, Brazil). Source: WBGU

ther radiative forcing substances creates opportunities for swift reductions in total emissions harmful to the climate. The following agreements are made in order to achieve these objectives: (1) In order to avoid CO<sub>2</sub> emissions resulting from deforestation and land-use changes and to conserve terrestrial carbon stocks, a separate legally binding regime is agreed upon in which swift and effective measures taken in developing countries have absolute priority. (2) The fluorinated greenhouse gases (industrial gases) currently covered by the Kyoto Protocol are dealt with in a special agreement modelled on the Montreal Protocol. (3) The other persistent greenhouse gases dealt with in the Kyoto Protocol are included in the budget calculation. (4) For non-persistent radiative forcing substances not covered by the Kyoto Protocol at present (including soot particles and ozone-forming gases), special reduction commitments are agreed upon within the framework of national air pollution control measures in order to achieve an effect as quickly as possible.

This package of measures implies a clear and long-term oriented course of action, incentives and institutional framework conditions designed to foster a low-carbon world economy. International competition for the most innovative decarbonization strategy could then begin.

The stocktaking of climate research and climate policy carried out by WBGU shows that the race against time must be won: climate-friendly innovations, investments and institutions in both business and society at national and international levels have to be pushed ahead with at a greater pace in order to avert a no longer manageable level of global warming with all its implications. Above all, the changes necessary in the global society must take place by decoupling economic growth from the burning of fossil fuels – including the newly industrializing and developing countries. The imminent transformation of the modern global industrial society towards a low-carbon society is an unprecedented historical challenge – technologically, economically and socially. Courageous political action is now called for



**Figure 2**

Examples of per-capita emission paths of CO<sub>2</sub> from fossil sources for three groups of countries according to the budget approach, which could emerge through emission trading (*unbroken curves*). Here it is assumed that the countries of group 1 will raise their budgets by 75% by purchasing emission rights for 122 Gt CO<sub>2</sub>. The countries in group 2 purchase additional emission rights for a total amount of 41 Gt CO<sub>2</sub>. The countries of group 3 become sellers of a total of 163 Gt CO<sub>2</sub> and, accordingly, their budget sinks by approximately 43%. Towards the end of the budget time period there is a convergence of the actual CO<sub>2</sub> emissions at approximately 1 ton per capita per year (relating to the population in 2010). The *broken curves* show the theoretical per-capita emission paths for CO<sub>2</sub> without emission trading from fig. 1. The areas between the curves illustrate the traded amount of emission allowances. Due to the fact that the illustration shows the per capita situation and the country groups have varying sizes of population, the areas between the purchasing country groups 1 and 2 do not coincide with the area of the selling country group 3.

Source: WBGU

– either that or an honest declaration of surrender in the face of the size of the climate challenge and the years lost in the cause of climate protection since the Earth Summit in Rio de Janeiro of 1992.