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Economic and Social Dimensions of Climate Change

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POLICY MAKERS' SUMMARY SOCIAL COSTS OF CLIMATE CHANGE

Chapter 6 Summary for Policy Makers IPCC WG3 SAR

The literature on the subject in this section is controversial and mainly based on research done on developed countries, often extrapolated to developing countries. There is no consensus about how to value statistical lives or how to aggregate statistical lives across countries. Monetary valuation should not obscure the human consequences of anthropogenic climate change damages, because the value of life has meaning beyond monetary value. It should be noted that the Rio Declaration and Agenda 21 call for human beings to remain at the centre of sustainable development. The approach taken to this valuation might affect the scale of damage reduction strategies. It may be noted that in virtually all of the literature discussed in this section 1). the developing country statistical lives have not been valued equally at the developed country value 2). other damages in developing countries are also not equally valued at the developing country value. Because national circumstances, including opportunity costs, differ, economists sometimes evaluate certain kinds of impacts differently amongst countries.

The benefits of limiting greenhouse gas emissions and enhancing sinks are (a) the climate change damages avoided and (b) the secondary benefits associated with the relevant policies. Secondary benefits include reductions in other pollutants jointly produced with greenhouse gases and biological diversity conserved. Net climate change damages include both market and non-market impacts as far as they can be quantified at the present and, in some cases, adaptation costs. Damages are expressed in net terms to account for the fact that there are some beneficial impacts of global warming as well which are however, dominated by the damage costs. Non-market impacts, such as human health, risk of human mortality and damage to ecosystems, form an important component of available estimates of the social costs of climate change. The literature on monetary valuation of such non-market effects reflects a number of divergent views and approaches. The estimates of non-market damages, however, are highly speculative and not comprehensive.

Non-market damage estimates are a source of major uncertainty in assessing the implications of global climate change for human welfare. While some regard monetary valuation of such impacts as essential to sound decision making, others reject monetary valuation of some impacts, such as risk of human mortality, on ethical grounds. Additionally there is a danger that entire unique cultures may be obliterated. This is not something that can be considered in monetary terms, but becomes a question of loss of human diversity for which we have no indicators to measure economic value.

The assessed literature contains only a few estimates of the monetised damages associated with doubled CO2 equivalent concentration scenarios. The estimates are aggregated to a global scale and illustrate the potential impacts of climate change under selected scenarios. Aggregating individual monetised damages to obtain total social welfare impacts implies difficult decisions about equity amongst countries. Global estimates are based upon an aggregation of monetary damages across countries (damages which are themselves implicit aggregations across individuals) that reflect inter-country differences in wealth and income - this fundamentally affects the monetary valuation of damages. Taking income differences as given implies that an equivalent impact in two countries (such as an equal increase in human mortality) would receive very different weights in the calculations of global damages.

To enable choices between different ways of promoting human welfare to be made on a consistent basis, economists have for many years sought to express a wide range of human and environmental impacts in terms of monetary equivalents, using various techniques. The most commonly used of those techniques is an approach based on the observed willingness to pay for various non-market benefits. This is the approach that has been taken in most of the assessed literature.

Human life is an element outside the market and societies may want to preserve it in an equal way. An approach which includes equal valuation of impacts on human life wherever they occur may yield different aggregate global estimates than those reported below. For example, equalizing the value of a statistical life at a global average could leave total global damage unchanged but would increase markedly the share of these damages borne by the developing world. Equalizing the value at the level typical in the developing

countries would increase the monetised damages several times, and would further increase the share of the developing countries in the total damage estimate.

Other aggregation methods can be used to adjust for differences in the wealth or incomes of countries in the calculations of monetary damages. Because the estimates of monetary damage tend to be a higher percentage of national GDP in low-income countries than for high-income countries, aggregation schemes, which adjust for wealth or income effects, are expected to yield higher estimates of global damage than those estimated in this report.

The assessed literature quantifying total damages from 2 to 3 degrees Celsius warming provide a wide range of point estimates for damages given the presumed change in atmospheric greenhouse gas concentrations. The aggregate estimates tend to be a few percent of world GDP, with in general, considerably higher estimates of damage to developing countries as a share of their GDP. The aggregate estimates are subject to considerable uncertainty, but the range of uncertainty cannot be gauged from the literature. The range of estimates cannot be interpreted as a confidence interval given the widely different assumptions and methodologies in the studies. As noted above, aggregation is likely to mask even greater uncertainties about damage components.

Regional or sectoral approaches to estimating the consequences of climate change include a much wider range of estimates of the net economic effects. For some areas, damages are estimated to be significantly greater and could negatively affect economic development. For others, climate change is estimated to increase economic production and present opportunities for economic development. For countries having a diversified industrial economy and an educated and flexible labour force, the limited set of published estimates of damages are of the order of one to a few percent of GDP. For countries having a specialised and natural resources based economy (e.g. heavily emphasizing agriculture or forestry), and a poorly developed land-tied labour force, the limited set of published estimates of damages are several times larger. Small islands and low-lying coastal areas are particularly vulnerable. Damages for possible large-scale catastrophes, such as major changes in ocean circulation, are not reflected in these estimates. There is little agreement across studies about the exact magnitude of each category of damages or relative ranking of the damage categories. Climate changes of this magnitude are not expected to be realised for several decades and damages in the interim could be smaller. Damages over a longer period of time might be greater.

IPCC does not endorse any particular range of values for the marginal damage of CO2 emissions, but published estimates range between $5 and $125 (1990 US) per tonne of carbon emitted now. This range of estimates does not represent the full range of uncertainty. The estimates are also based on models that remain simplistic and are limited representations of the actual climate processes in being and are based on earlier IPCC scientific reports. The wide range of damage estimates reflects variations in model scenarios, discount rates and other assumptions. It must be emphasized that the social costs estimates have a wide range of uncertainty because of limited knowledge of impacts, uncertain future technological and socio-economic developments and the possibility of catastrophic events or surprises.

(1) The value of a statistical life is defined as the value people assign to a change in the risk of death among a population.

(2) The concept of willingness to pay is indicative, based on expressed desires, available resources and information of a human being at a certain point in time. The values may change over time. Also other concepts, such as willingness to accept compensation for damage, have been advanced, but not yet widely applied in the literature and the interpretation and application of willingness to pay and other concepts to the climate problem may evolve.

(3) Due to time lags between findings in the natural sciences, their use in determination of potential physical and biological impacts, and subsequent incorporation into economic analysis of climate change, the estimates of climate change damages are based mainly on the scientific results from the 1990 and 1992 IPCC reports.

(4) See the Assessment Reports of Working Groups One and Two.