



CLIMATE CHANGE – BETWEEN COSTS AND BENEFITS

CARMEN VALENTINA RĂDULESCU¹, FLORINA BRAN², CRISTINA POPA³

ABSTRACT. – **Climate change – between costs and benefits.** At global and regional levels the effects of climate change start to show up. While some of the countries make efforts to alleviate these effects and to find solutions, others are facing economic or political restraints that prevent them in applying the principle of common responsibility. The complex social, economic, and environmental implications of climate change's effects focused a growing part of research on the analysis of costs and benefits. Although controversial, one of the methods used – the cost-benefit analysis – revealed that in most of the cases the prevention costs are lower than the costs of inaction. Prevention measures bring benefits by anticipating the impact and minimizing the risks for ecosystems and economy. The paper presents in its first part the controversies regarding the cost-benefit analysis, and continues, in the second part, with estimations on costs and benefits of certain policy instruments that target emission reduction.

Keywords: climate change, prevention, policy instruments, cost-benefit analysis

1. INTRODUCTION

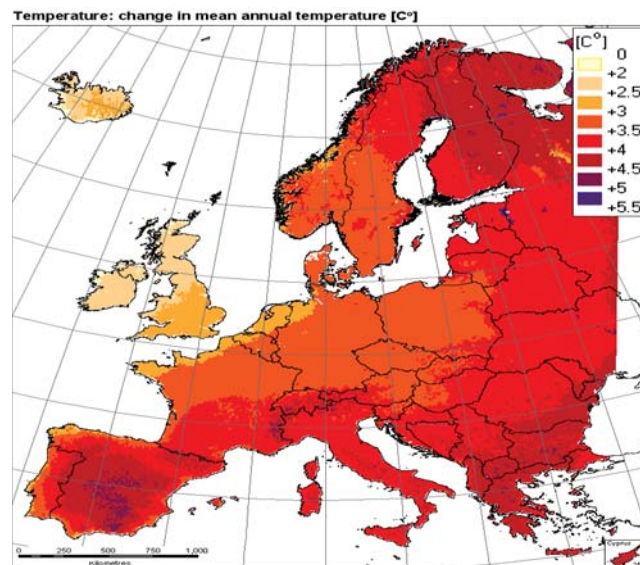
Among the hypotheses debated along time by the scientific community regarding the causes of global warming the most realist assessment of the climatic system advances the idea of anthropogenic causes, carbon dioxide being the predominant greenhouse gas. According to IPCC (2007) this gas accounts for 83% of the total greenhouse gas (GHG) emissions. Estimates indicate that in this century it will occur a major global climate change due to a 1.4-5.8°C increase of the average temperature, with wide economic, social, and environmental implications (fig.1).

The reaction of global community to these facts is embodied by world strategies such as: Kyoto Protocol (1997) aiming to reduce the GHG emissions; Viantiane Agreement (2005) that envisages targets freely chosen by parties and the promotion of less polluting technologies; the Copenhagen Agreement (2009) that pursued the negotiation of a new global agreement as follow up for the Kyoto Protocol in terms of GHG emission reductions, with confusing results to date.

¹ Bucharest Academy of Economic Studies, Faculty of Agro-Food and Environmental Economics, Bucharest, 010961 Mihail Moxa 7, Romania, e-mail: cv_radulescu@yahoo.com

² Bucharest Academy of Economic Studies, Faculty of Agro-Food and Environmental Economics, Bucharest, 010961 Mihail Moxa 7, Romania, e-mail: florinabran@yahoo.com

³ Ministry of Environment and Forests, e-mail: cris20072002@yahoo.com



Source: PRUDENCE project

Fig. 1. Change in mean annual temperature by the end of this century

Although the anthropogenic contribution to climate change is now beyond the bulk of the debate, there are many uncertainties that interfere with meaningful decisions toward a low carbon future. The paper aims to contribute in this subject area by focusing on the potential of cost-benefit analysis to bring in new milestones in order to support decision making. Thus, in the first part we will look to the method itself and will explore some counter arguments for its wider application. Further, we examine the costs of climate change and reveal the benefits of the most widely applied emission reduction measures. Finally, we state a range of conclusions that highlight the relation between costs of prevention and costs of inaction.

2. THE COST-BENEFIT ANALYSIS OF CLIMATE CHANGE – DIVERGENT OPINIONS

At global level a number of researchers made analyzes that aimed to highlight the costs and benefits associated with climate change. One of the reports with high visibility (the Stern Review) used a quite controversial method – cost-benefit analysis (CBA). In other reports, Baer (2007), Tol (2006), and Yohe (2006) developed their own CBA methodologies.

The data gathered by the Stern Review regarding the economic aspects of climate change lead to a quite simple conclusion: the benefits of energetic early action exceed by far the economic costs of inaction. The report considers that the risk of serious climate change effects could be substantially reduced if the level of GHG will be stabilized at 450-550 parts per million (ppm). It also suggests that the annual cost of reducing GHG emissions equals almost 1% of the world GDP and it will lead to a ceiling of carbon dioxide concentration at 550 ppm until 2050.



Another milestone in climate change reporting is provided by the Intergovernmental Panel on Climate Change (IPCC). In the latest report (IPCC, 2007) there is suggested that the macro-economic effects of reducing or stabilizing carbon dioxide concentration at the 445-710 ppm for 2030 vary between a slight increase in global GDP to a decrease of 3%, depending on the stabilization target.

The Stern Review performs the following actions: (1) assesses the probable costs of climate change until 2200 under the “business as usual” scenario, meaning that no measure is applied in order to control the level of emissions; (2) assesses the costs and benefits of different means of reducing GHG emissions and stabilizing climate; and (3) assesses the policy options within the light of the (1) and (2) assessments.

Munasinghe et al. (1995) consider that an analysis of costs and benefits provides a useful framework for the organization of information regarding alternative actions for approaching climate change. Nevertheless, the authors stress that the application of CBA for climate change encounters serious difficulties due to the global and regional pattern of the issue. The economic assessment of the climate change consequences is the central element of the traditional CBA, but the confidence in the estimations (especially non-commercial consequences) is low. In addition, the techniques of CBA would not be useful in analyzing aspects such as equity. For example, it does not provide indication on who should bear the costs.

Along time the Stern Review was subject of many debates and attracted both criticism and favorable resolutions. For instance, Cole (2007) considers that the Stern Review benefited from a too large media propaganda compared with other academic analyzes. This intensive promotion is determined by the prestige of the author, since the use of CBA is quite unclear from both theoretical and practical standpoints. Meanwhile, the author argues that the publication of the report has no impact on the United Kingdoms policy regarding climate change.

Dasgupta (2006) also criticizes the Stern Review. He argues that if the premises of the model would be followed the investment rate should reach 97.5% of what is produced today for increasing the living standards of future generations. The main weaknesses of the model stand in: (1) the impossibility of modeling tasks to consider all the socially relevant costs and benefits that express a local or global concern; and (2) neglecting social processes, which by their nature are less appropriate for quantitative analyzes, but which play a key role for a certain course of events (Cojanu, 2008).

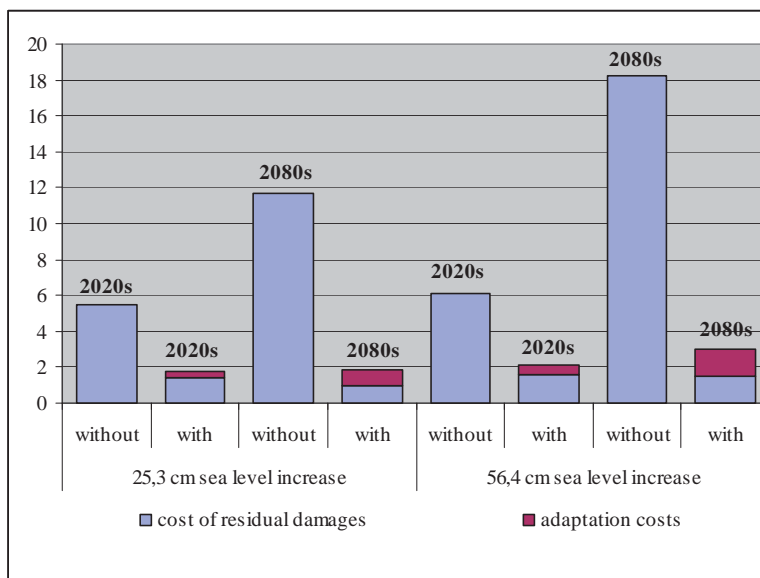
In June 2008, the Commonwealth Scientific and Industrial Research Organization published the *Cost-Benefit Analysis of Climate Change: Stern Revisited*. This report analyzes the economic approaches of climate change, with a special focus on the Stern Review. The authors consider that the large number of uncertainties that surround the relation among climate change’s causes, their potential impact and assessment raise questions on the exactness of the conclusions.



3. THE COSTS OF CLIMATE CHANGE

The costs of GHG emission reduction to a level that could avoid the devastating effects of climate change is estimated to be the equivalent of 1% of the global GDP, while the costs of uncontrolled climate change will reach 5% of the global GDP with a high probability to increase toward 20%. In 2008, Stern states that due to the fact that climate change is deploying faster than it was predicted, the costs of emission reduction will be larger, respectively 2% of the global GDP. The Stern Review concludes that, on the long run, the preventive actions to limit climate change will be less costly than the damages caused to economies by ignoring climate change. Meanwhile, adaptation could reduce costs, in case that there are specially designed policies for the elimination of barriers that prevent private action to contribute to its potential.

The preliminary estimates of the Stern Review suggest that in case of a 4.4°C increase of global mean temperature the additional costs of adaptation for infrastructure and buildings could account as much as 1-10% of the total investments made in construction sector by OECD countries. The additional costs of constructing new infrastructure and buildings that are more resistant to climate change in OECD countries could vary from 15 to 150 billion dollars per year (0.05-0.50% of GDP). If temperature increases with 5-6°C it is very likely a sudden increase in the costs of adaptation measures and, consequently, a lower relative effectiveness of these measures.



Source: Green Paper regarding climate change adaptation

Fig. 2. Costs of residual damages and adaptation measures in different climate change scenarios



Fig.2 illustrates that the damages caused by the increase in sea level could be, in case that no adaptation measure is taken, four fold larger than the costs of additional protection dams against floods. In case that no measure is taken, the costs of damages will increase significantly from 2020s until 2080s.

4. BENEFITS OF EMISSION REDUCTION MEASURES

By using appropriate instruments such as regulations and standards, taxes and levies, commercial licenses, voluntary agreements, subsidies, financial incentives, research and development programs, and information instruments it will be possible to contribute significantly for the reduction of emissions and the mitigation of effects.

The Emission Trading Scheme (ETS) is the most conclusive example of how a market based instrument could approach an ecological issue. Through the Directive regarding emission trading it is aimed to maximize the opportunities to reduce emissions and minimize the costs in industry. The scheme establishes a system of transactions which provides a financial incentive for emission reduction. The system guarantees the existence of emission rights buyers represented by the companies that exceeds the emission limits and that these companies will have to pay substantial penalties in case that they choose not to buy emission rights. According to some estimates, the ETS contributes to emission reduction where it is more efficient from an economic point of view and reduces the cost of emission reduction approximately with one third.

Meanwhile, in order to support the green energy, each member state has established a subsidizing system consisting in preferential prices, competitive obligations or offers, associated with a wide range of fix subsidies and fiscal mechanisms. The green certificates represent an example in this respect. These are documents received by producers from the energy transport operator that certify the fact that the producer delivers energy in the grid. At their turn, electricity providers are confined by the state to acquire green certificates according to the quantity of energy sold by them for encouraging the production of “clean” energy.

The carbon market constructed within the framework created by the Kyoto Protocol is another illustration about how the use of incentives could help toward meeting the goals established by an international agreement. According to the estimates of IPCC (2007) there is an economic potential in all sectors involved in GHG emission reduction. This potential is large enough to offset the foreseen increase of global emissions and even for reducing these emissions below the current level. Thus, the economic benefits of ceiling the increase of global emissions to a level that corresponds the a 2°C in global mean temperature increase will exceeds the costs of emission reductions needed for going beyond this threshold. Although initially there will be expenses for the transformation of the energy sector and GHG emission reduction, the incomes will come as saving of money from avoiding the damages produced by climate change. Approximately



30% of the provisioned emissions of residential and trade sectors could be reduced by 2030 with a net economic benefit.

5. CONCLUSIONS

At global level there were made a number of assessments with the goal of highlighting the costs and benefits of climate change. Although it is controversial, CBA remains one of the most widely used methodology for performing this assessment. It revealed, in various frameworks, that the cost of prevention is far lower than the cost of damages.

By using appropriate instruments such as the ETS and green certificates in Europe or the global emission trading system implemented within the framework of the Kyoto protocol it is possible to reach the emission targets that will maintain the global mean temperature below the threshold of 2°C increase.

We conclude that the various uncertainties that surround the assessment instruments available today should not be considered as barriers. Thus, ACB proved to be a good support for decision making, although the result provided by its application were different from one area to another. This case is also supportive for the adaptive management, in which each measure should be regarded as an experiment and the measures should be compared in terms of their results. Therefore, the focus on quantitative environmental information and the possibility to integrate environmental and economic information gains another stimulus.

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