

## THE ECONOMIC DIMENSION OF CLIMATE CHANGE

*FLORINA BRAN*

**ABSTRACT. - The economic dimension of climate change.** The acceptance of human agency for climate change by a scientific consensus, although controversial, could be interpreted as another step for strengthening the motivation for action at all levels. The paper argues that this motivation could be strengthened even more by revealing the economic dimension of climate change. In this framework, the paper aims to construct an economic argument for increasing the intensity climate change action. Milestones of climate change action and the rational for climate change cost estimates are firstly explored to set the framework of the main analysis. This then is focused on the predictions of different integrated assessment models in terms of GDP losses to be expected in different scenarios. By gathering the common characteristics of these outcomes there were found some economic reasons for more intense mitigation and adaptation actions.

**Key words:** climate change, climate change action, cost estimates, economic reason, integrated assessment

### 1. Introduction

The acceptance of human agency for climate change by a scientific consensus, although controversial, could be interpreted as another step for strengthening the motivation for action at all levels. Economic incentives are recognized as powerful tools in environmental policy (Bran and Ioan, 2002), although they can be enacted only in combination with other traditional tools (legislation).

In this framework, the paper argues that motivation for action could be strengthened even more by revealing the economic dimension of climate change. In this framework, it is envisaged to construct an economic argument for increasing the intensity climate change action.

The paper's structure comprises firstly a brief overlook on what climate change action is and which are the possible causes of its low path. Further, there is discussed the rational of climate change cost estimates and then, by analyzing the characteristics of integrated assessment outcomes, there is built an economic argument for more intense mitigation and adaptation action. This argument is relevant for governmental level, where climate change is addressed by various measures in different departments.

For a further improvement in climate change action it would be useful to explore the economic dimension perceived by companies and by individuals, and especially how they manage to integrated long term costs and benefits in current decision making.

## **2. Climate change action**

Climate change was for a long time surrounded by uncertainty and reluctance especially for accepting its human agency. Thus the debate shifted from the recognition of the process itself to possible consequences and the causes of its deployment. After several decades, there is now possible to make some statements regarding climate change, such as:

- In near term ( the next decade) the impact of climate change will be observable;
- The impact of climate change will hit all regions, countries, and communities but it will be differentiated. The most vulnerable to climate change impact are the least developed countries, small island developing states, and the continent of Africa and poor communities from everywhere;
- Climate change related hazards (hurricanes, floods, and droughts) will become more intense and more frequent;
- Salinization and inundation will heat low lying coastal areas;
- Water flow will be reduced significantly in river basins depending on glacier ice melt.

Climate change is one of the most prominent environmental issues approached on national and international policy agenda. Nevertheless, Huq (2006) developed an argument that supports insufficient action. Such action could be represented by mitigation (reducing the emission of greenhouse gases) and by adaptation. Huq (2006) also emphasizes that although mitigation is important adaptation necessitates more focus on the behalf of all actors. For many ecosystems and communities (mainly the poor and vulnerable) within the next two decades will be unavoidable environmental changes triggered by climate change. This is also supported by the Stern Review (2006) by stating that “only a small portion of the cost of climate change between now and 2050 can be realistically avoided, because of inertia in the climate system”.

The fourth IPCC assessment report (2007) reveals that a catastrophic evolution of the climate system could be avoided by redoubling the mitigation efforts and combining them with adaptation in all countries.

The climate consensus, supported by the closely exhaustive study on “The Physical Science Basis” (IPCC, 2007), in the light of the argument developed by Ioan and Rădulescu (2008), could be interpreted as a collective initiative to

*Abordări conceptuale și metodologice*

strengthen the motivation for climate change action. Since developed countries already have a climate policy, there is a global market for greenhouse gas emissions, renewable energies have stronger support as ever, businesses disclose their contribution to climate change mitigation we could say that society is already active. Thus, the issue is not to be active, but to be more active. What more active means could be approximated by looking to the gap between what is needed and what is achieved.

What prevent an appropriate reaction to climate science's findings is considered several studies focusing on communication, but we argue that it is possible that economic reasons to lie beneath such reluctance.

### **3. Rational of climate change cost estimates**

Cost estimates of climate change are built by on a rational that explains the relation between the volume of an economy's output and the quantity and quality of its capital stock, size and quality of labor, and the economy's overall level of technology. Climate change could affect both, capital and labor. Thus, extreme weather could affect capital by damage to land, infrastructure, installations, plants, while diseases and heat stress would lower labor's size and quality.

Conceptually, these consequences are also explained by referring to externalities which are consequences of an action that are inflicted not only on the participants but the on society as a whole. Nevertheless, climate change has its particular features as externality as it is stressed in the Stern Review (2006). These characteristics are:

- the causes and consequences are global
- impacts will persist because greenhouse gases are expected to last for hundreds of year in atmosphere
- uncertainties and risks are large.

Climate change will impact by important changes in the natural environment that, on their turn, will generate damages for individuals and for the whole society. Such perspectives motivated scientists to explore the size of these costs in different situations and by using different methodologies.

According to Llewellyn (2007), the most common way of estimating costs of climate change is in terms of the reductions it may bring to gross domestic product (GDP). They also stress that such estimates face important empirical difficulties because calculations must take, as their starting point, projections extending many decades into the future.

#### 4. Economic reasons for climate change action

Long-term predictions are biased by the limits of unpredictable changes and the complexity of the models. Nevertheless, there are several attempts that give quite precise information about the economic dimension of climate change in terms of costs. These predictions are made through complex models that compare the results for a complete inaction and for the continuation of climate policy implementation.

Modeling the economic impact of climate change is a difficult task because it requires quantitative analysis of a very broad range of environmental, economic and social issues. The unidirectional chain that lies below these models is represented in fig.1

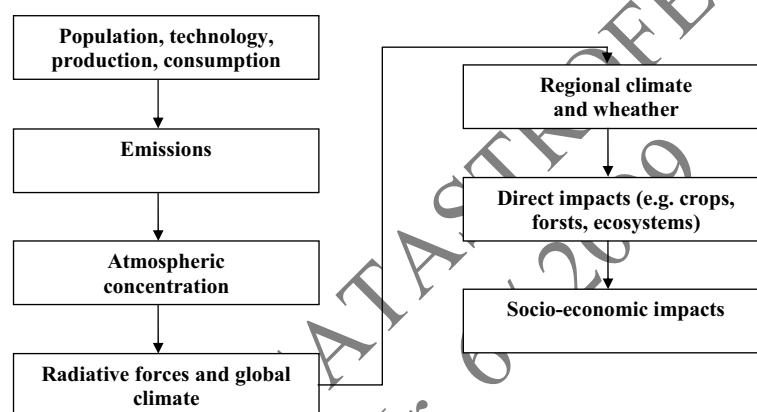


Fig. 1. Modeling climate change from emissions to impacts (Source: Hope (2005))

In reality, the chain is not unidirectional. In the real climate-human system there will be feed-backs between many links in the chain.

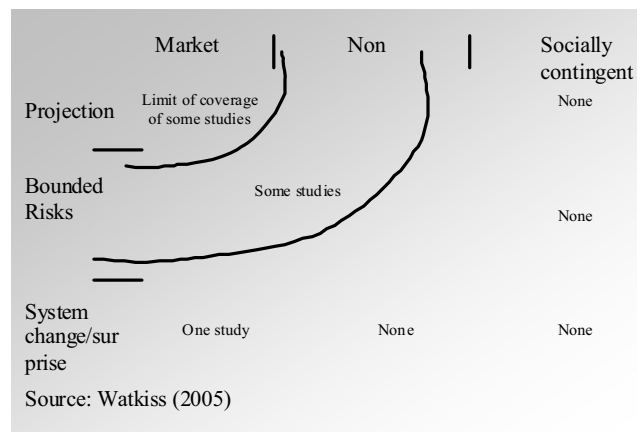
Two of climate change costs models (World Integrated Assessment General Equilibrium Model – WIAGEM; and PAGE) reached very close estimations.

In case of inaction climate change costs will amount for 20 USD trillions in 2100, representing 6 to 8 percent of global economic output at that time. This cost could be halved if the current and provisioned mitigation actions will be enforced. The amounts are correlated with the scenarios of temperature rises. Thus, in the first case, global mean temperature is expected to raise with 4 Celsius

*Abordări conceptuale și metodologice*

degrees, while in case of climate policy enforcement the raise will be the half of this, being of 2 Celsius degrees.

Another recent assessment of climate change economic impact is undertaken in the Stern Review. It reports on several results of climate change models (Mendelsohn, Tol, and Nordhaus) and also on the results of its own model. The coverage of several models in terms of prediction is presented in fig.2.



**Fig. 2.** Coverage of existing integrated assessment studies

According to the explanation presented in the Stern Review, the vertical axis captures uncertainty in predicting climate change, with uncertainty increasing as we go down. There are three categories:

- Projection – high confidence on the direction of these changes and bounds can be placed around their magnitude (i.e. temperature change and sea-level rise);
- Bounded risks – more uncertainty about the direction and magnitude of these changes, though reasonable bounds can be placed around them (i.e. precipitation, extreme events);
- System change and surprises – large uncertainty about the potential trigger and timing of these changes (e.g. weakening of the thermohaline circulation, collapse of the West Antarctic Ice Sheet). However, evidence on the risk of such changes is building.

The horizontal axis captures uncertainty in the economic measurement of impacts, with uncertainty increasing as we go from left to right. There are again three categories:

- ‘Market’ impacts – where prices exist and a valuation can be made relatively easily, such as in agriculture, energy use and forestry;

- 'Non-market' impacts – directly on human health and the environment, where market prices tend not to exist and methods are required to create them;
- 'Socially contingent' responses – large-scale, 'second-round' socio-economic responses to the impacts of climate change, such as conflict, migration and the flight of capital investment.

The results of Stern Review model predict higher costs than the precedent models, estimating that in case of Business as usual (BAU) global GDP losses will be comprised in the 5-20% interval. In several notes, the report underline that these losses will be situated in the upper part of the interval and that they could be much higher for poor countries.

Ackerman and Stanton (2006) consider that climate change models are incomplete because economic forecast has inescapable limitations. Nevertheless, they provide ambitious, extensive attempts at comprehensive cost calculations. The economic limitations are due to difficulties in assigning dollar values to all of the non-market and socially contingent impacts of climate change, nor to the uncertain but growing risks of true catastrophe. In fact, the models omit some of the most troubling potential consequences of climate change. A similar message could be found in the Stern Review (2006) where is stated that existing forecasts of climate change costs omit important impacts which could increase strongly the cost estimates.

Climate change cost estimates through integrate assessment models provide economic reasons for more intense climate change mitigation and adaptation action. These reasons consist in the fact that costs will be lower in case of action and that the costs differences will be significant.

Although there are differences among the results of different models and also important limitations that affect the accuracy of predictions, all models are able to demonstrate that perseverant enforcement of climate change mitigation and/or adaptation measures could bring cost reductions. These reductions are explained by taking in account the results of these actions, represented by:

- lower intensity of the climate change process (expressed as a diminished increase in global temperature) for mitigation actions;
- less exposure and vulnerability to the forthcoming natural hazards (expressed as diminished damages) for adaptation actions.

The cost reductions to be brought by climate change actions are expected to be significant. Models provide different outcomes in the amounts of climate change costs. Nevertheless, there are some common characteristics of these outcomes such as:

- climate change action could halve the costs and
- predicted amounts could be too optimistic because of the difficulties encountered in quantifying important impacts of climate change.

The importance of economic incentives in the contemporary world is beyond any doubt. By fostering the economic reasons for climate change action in

*Abordări conceptuale și metodologice*

different communication channels have the potential to improve motivation. An important barrier is however the occurrence of costs which is lagged and which alters the strengths of acting as an incentive for present actions.

## 5. Conclusions

Climate change is on the top of environmental debates and political agendas. Since 1992, then the UN's Framework Convention on Climate Change was signed, there were made progresses especially in mitigation efforts. Nevertheless, recent evaluations revealed that actions addressing climate change, especially adaptation, are not intense enough. We explored the possible causes of this low action readiness and argued that, along with communication problems, there could be an economic explanation beneath this.

Climate change cost estimates were explored at global level, the most common way being in terms of the reductions it may bring to GDP. Based on this rational and considering a chain of causes and effects that starts from population, technology, production and consumption, goes through regional climate and weather and ends with socio-economic impact several models were constructed (Mendlesohn, Tol, Nordhaus, WIAGEM, PAGE, Stern).

These models provide an integrated assessment that is limited by constructive elements and scope. For example, models fail to depict the multidirectional linkages between climate change and socio-economic impact and do not cover properly the changes in fields where value exceeds market. Such shortcomings could alter predictions by making them too optimistic.

The common characteristics of climate change cost estimates models are that they predict lower costs in case of perseverant climate change policy enforcement and that these costs are significantly lower (around fifty percent) than in case of inaction. Cost reductions arise from both mitigation and adaptation actions.

The economic dimension of climate change give room for more active governmental intervention in mitigation and adaptation. For a further improvement in climate change action readiness it would be useful to explore the economic dimension of climate change at micro level, and especially how this dimension is perceived by company executives.

## REFERENCES

1. Ackerman, F., Stanton, E. (2006), *Climate change – cost of inaction*, Report to Friends of the Earth England, Wales and Northern Ireland, <http://ase.tufts.edu/gdae/Pubs/rp/Climate-CostsofInaction.pdf>, 24.11.2008.
2. Bran, F. Ioan, I. (2002), *Ecosferă și politici ecologice*, Editura ASE, București.

*Riscuri și catastrofe**Victor Sorocovschi*

3. Hope, C. (2005), *Integrated assessment models* in Helm, D. (ed.), *Climate-change policy*, Oxford University Press.
4. Huq, S. (2006), *Why Should Development NGOs worry about Climate Change?*, International Institute for Environment and Development.
5. Ioan, I., Rădulescu, C.V. (2008), *Climate change discourse of oil companies*, in *Proceedings of the QIEI 2008 International Conference on Quality-Innovation-European Integration*, 2008, Department for Interchangeable Manufacturing and Industrial Metrology; Karlsplatz.
6. IPCC (2007), *The Physical Science Basis*, <http://www.ipcc.ch/ipccreports/ar4-wg1.htm>, 12.12.2008.
7. Llewellyn, J. (2007), *The business of climate change*, Lehman Brothers.
8. Stern, N. (2006), *Stern Review: The Economics of Climate Change*, Cambridge.
9. Watkiss, P. (2005), 'Methodological Approaches for Using Social Cost of Carbon Estimates in Policy Assessment, Final Report, Culham: AEA Technology Environment.

RISCURI ȘI CATASTROFE  
Vol. VIII, Nr. 6 / 2009