

Marius, Cosmin Boianiu

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# MITIGATION VS. ADAPTATION: A CRITICAL OVERVIEW OF EU CLIMATE CHANGE POLICIES AND THEIR IMPACT ON AGRICULTURE

MARIUS COSMIN BOIANGIU<sup>1</sup>

**Abstract:** *The paper does a qualitative assessment of the current European Union policies for dealing with climate change. In the EU mitigation policies are derived from the international agreements for reducing and limiting greenhouse gases emissions. Mitigation policies have a strict compliance regime using both positive and negative reinforcement. On the other side, adaptation measures, meant to increase nature's and society's resilience to climate change negative impact, are designed more as recommendations complementing sectoral policies. Agriculture has a relatively low potential of curbing GHG emissions but are some of the most vulnerable sectors to climate change. By examining the relative projected efficiency of EU's mitigation efforts compared to the overall goal of stopping global warming, the paper finds that there is clear imbalance between mitigation policies and adaptation policies. It concludes that in the absence of matching binding commitments from other large emitters of GHG, the climate objective will not be met. This requires at European level a medium and long-term strategy for the societal and economic adaptation to the new climate conditions and, on short-term, more focus on adaptation policies in vulnerable sectors such as agriculture.*

**Keywords:** *Climate change policies; European Union; mitigation; adaptation; agriculture*

**Jel Classification:** *O38, Q01*

## INTRODUCTION

The systemic and global changes of climate conditions due to the increase of average global temperature are one of the greatest challenges for humanity. As global warming is determined mostly by the increase in atmospheric concentration of greenhouse gases<sup>2</sup> (GHG), as a consequence of anthropogenic activities, the main approach to mitigate this effect has been through global, regional and national policies aimed at reducing overall GHG emissions. However, climate change has an increasingly negative impact both on ecosystems and human society and economy, which require strong adaptation policies and measures.

The European Union's climate framework is one the most advanced set of policies globally in dealing with climate change. It currently stands as a binding aggregated commitment of the European Union and its Member States under the Paris Agreement but it is in fact an extension of policies initiated previously under the Kyoto Protocol. The main climate objective of the Paris Agreement is to limit the rise of average global temperature below 2°C over the pre-industrial period level. However, despite the apparent urgency of the situation, the international regulatory regime of the Paris Agreement is less strict than that of the Kyoto Protocol, which preceded it. The current working assumption of scientific research is that the level of emission reductions and limitations under the Paris Agreement will not be enough to meet the climate objective. This will put vulnerable economic sectors such as agriculture at high risk and would require more emphasis on adaptation policies.

In this context, there is scope for a critical examination of EU's policies in climate change, as well as of the balance of resource allocation between mitigation efforts versus adaptation ones. The opportunity of such evaluations is highlighted even more by the imminent start in 2018 of the preparation of the EU's Multiannual Financial Framework (MFF) post-2020.

## MATERIAL AND METHODS

The paper performs a qualitative assessment of the main climate change mitigation policies of the European Union under the Paris Agreement. It reviews the projected efficiency of said policies

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<sup>1</sup> PhD Candidate, Economy Doctoral School, Bucharest University of Economic Sciences, mariuscosmos@yahoo.com

<sup>2</sup> Gases that trap heat in the Earth's atmosphere: water vapor - H<sub>2</sub>O; carbon dioxide - CO<sub>2</sub>; methane - CH<sub>4</sub>; nitrous oxide - N<sub>2</sub>O; fluorinated gases

against the defining goal of limiting global warming and taking into consideration the level of commitment from the other major emitters of GHG.

It also surveys the principal EU adaptation policies, with a focus on agriculture, which is one of the most vulnerable to the impact of climate change.

The main information sources are EU's and United Nations' policy documents, reports of the Intergovernmental Panel on Climate Change (IPCC) as well as of the Global Carbon Project, for emissions data.

## RESULTS AND DISCUSSION

The Kyoto Protocol (KP) was adopted in December 1997 under the United Nations Framework Convention on Climate Change (UNFCCC). The Kyoto Protocol entered into force in February 2005. The Parties to the Kyoto Protocol – 37 industrialized countries and the European Community – committed to binding *GHG* emission reduction targets.

The main policy drivers of the KP were the quantified national emission limitation or reduction commitments included in Annex I of the Protocol. Under the Protocol, the EU's aggregated emissions reduction commitment was of at least 5 per cent below 1990<sup>3</sup> levels in the period 2008 to 2012. The document listed also a series of non-binding policy measures to promote sustainable development: enhancement of energy efficiency, protection of sinks and reservoirs of greenhouse gases, promotion of sustainable forms of agriculture, research and development of new and renewable forms of energy, of carbon dioxide sequestration technologies, limitations or reductions of GHG in the transport sector etc.

The commitments under Annex I could be also met through verifiable net changes in GHG emissions and removals by sinks resulting from direct human-induced land-use change and forestry activities, limited to afforestation, reforestation and deforestation.

Following the Kyoto Protocol, the Paris Agreement (PA) was adopted on 12 December 2015 by the Parties to the UNFCCC. 169 Parties have ratified so far the PA, which entered into force on 4 November 2016.

Acknowledging that “*climate change is a common concern of humankind*”, the Agreement sets as principal objectives (Article 2) to:

- a. hold the increase of the global average temperature to well below 2 °C above pre-industrial levels and pursue efforts to limit the temperature increase to 1.5 °C above pre-industrial levels (mitigation);
- b. increase the ability to adapt to the adverse impacts of climate change and foster climate resilience and low greenhouse gas emissions development (adaptation); and
- c. make finance flows consistent with a pathway towards low GHG emissions and climate-resilient development.

The Paris Agreement eliminates binding quantitative commitments and replaces them with “*nationally determined contributions*”.

These contributions are entirely voluntary in the Agreement's framework and are to be renewed every five years, with the understanding that “*efforts of all Parties will represent a progression over time*”. In replacing the quantitative commitments, the PA uses qualitative descriptions both for the timelines for reaching the stated objectives (“*the Parties aim to reach global peaking of greenhouse gas emissions as soon as possible*”, “*anthropogenic emissions by sources and removals by sinks of greenhouse gases in the second half of this century*”) and for the amplitude of needed actions and measures (developed countries “*should continue taking the lead by undertaking economy-wide absolute emission reduction targets*”, while developing countries “*should continue enhancing their mitigation efforts, and are encouraged to move over time towards economy-wide emission reduction or limitation targets in the light of different national circumstances*”).

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<sup>3</sup> Several EU countries chose 1989 as reference year

The EU and its Member States communicated the following Intended Nationally Determined Contribution (INDC): “a binding target of an at least 40% domestic reduction in greenhouse gas emissions by 2030 compared to 1990, to be fulfilled jointly”. Furthermore, the European collective pledge included a commitment to devise a policy on how to include Land Use, Land-Use Change and Forestry (LULUCF) into the 2030 greenhouse gas mitigation framework before 2020.

Also included in the communicated pledge was a list of sectors grouped by emission source, which constitute by-and-large the cross-sectoral range of EU’s mitigation policies:

Energy (Fuel Combustion, including energy industries, manufacturing industries and construction, transport; Fugitive emissions from fuels; CO<sub>2</sub> transport and storage);

Industrial processes and product use (Mineral, Chemical, Metal and Electronic industries; Non-energy products from fuels and solvent use etc.);

Agriculture (Enteric fermentation; Manure management; Rice cultivation; Agricultural soils; Prescribed burning of savannas; Field burning of agricultural residues; Liming; Urea application; Other carbon-containing fertilizers);

Waste (Solid waste disposal; Biological treatment of solid waste; Incineration and open burning of waste; Wastewater treatment and discharge);

Land Use, Land-Use Change and Forestry (Afforestation, reforestation; Deforestation; Forest management; Cropland management; Grazing land management)

The European commitment is internally binding through the EU law (regulations, directives, and decisions). It is therefore highly prescriptive and to a certain extent punitive in nature.

The core instrument for achieving the ambitious target of 40% GHG emission reduction in 2030 compared to 1990 level – one of the highest at global level – is the *EU emissions trading system* (EU ETS). It is an EU-wide system of gradual limitation of emission allowances for more than 11,000 heavy energy-using installations. This system covers around 40% of total EU GHG emissions. In July 2015 the European Commission proposed a directive for the ETS revision for phase 4 (2021-2030), which aims to achieve by 2030 a 43% in EU ETS emissions compared to 2005 levels. Sectors covered by the ETS are: power and heat generation; energy-intensive industry sectors including oil refineries, steel works and production of iron, aluminium, metals, cement, lime, glass, ceramic, pulp, paper, cardboard, acids and bulk organic chemicals; civil aviation.

The sectors that are not covered by the EU ETS – transport, buildings, agriculture and waste – are included in a legislative proposal called the “*Effort Sharing Regulation*” (ESR), which sets annual binding GHG emission targets for each Member State in these sectors that account for almost 60% of total EU emissions. The emissions reductions by 2030 as per 2005 levels in these sectors range from around and below 40% for countries like Luxembourg, Sweden, Denmark, Finland, Germany, France and UK to 0-10% for low GDP/capita countries like Bulgaria, Romania, Latvia, Hungary, Croatia, Poland or Lithuania. The contribution of non-ETS sectors to the overall EU reduction target is expected to be of at least -30% compared to 2005 levels.

The proposal acknowledges the low mitigation potential of the agriculture and land use sector but provides for the possibility of using for compliance in a given year of a certain quantity up to the sum of total net removals and total net emissions from deforested land, afforested land, managed cropland and managed grassland (Article 7).

The role of agriculture and land use in GHG (especially CO<sub>2</sub>) emissions reduction is considered mostly through the combined effect of removals of GHG (through actions like afforestation or conversion of arable land into grassland resulting in CO<sub>2</sub> sequestration) and emissions (actions such as draining of wetlands, forest harvesting or ploughing up grasslands).

To complement the ESR on agriculture and land use sector, the European Commission presented in July 2016 a legislative proposal that integrates the LULUCF sector into the EU climate policy framework under the Paris Agreement. The proposal introduces a binding commitment for each Member State that emissions will not exceed removals in the following land use categories: afforested land (land use reported as cropland, grassland, wetlands, settlements, and other land

converted to forest land); deforested land; managed cropland; managed grassland and managed forest land.

In the fields of energy and transport, which provide the bulk of GHG emissions, several legislative proposals are envisaged to assist in achieving the overall target under the Paris agreement:

- a revised Renewable Energy directive to ensure a minimum share of 27% renewable energy sources in the EU energy consumption by 2030 (includes specific targets for the use and developing of advanced biofuels, food-based biofuels and electro-mobility as well as for the heating and cooling sector);
  - a package of measures to improve the energy efficiency of the Union with at least 27% by 2030 and to accelerate the efficiency improvement of the building sector (accounting for 40% of energy consumption in Europe);
- proposals for setting new CO<sub>2</sub> emission standards for cars and vans post-2020, reducing emissions from heavy-duty vehicles and reducing the GHG intensity of vehicles fuel.

Global CO<sub>2</sub> emissions – the main indicator for GHG emissions - have been on a constant upward trend since 1990 despite the policy commitments under the Kyoto Protocol and lately the Paris Agreement. The global emissions from fossil fuel and industry in 2016 were 36.2 Gigatonnes (Gt) CO<sub>2</sub>, a 62% increase over 1990 levels. The projection for 2017 is 36.8 Gt CO<sub>2</sub>, a 2% increase over previous year.

The top four emitters in 2016 covered 59% of global emissions: China (28%), United States (15%), EU (10%) and India (7%). Among these four emitters, the EU is the only one with binding targets of GHG emission reductions and whose aggregated emissions have fallen since 1990.

China – the largest emitter – has indicated as commitments: to achieve peaking of carbon dioxide emissions around 2030; to lower CO<sub>2</sub> emissions *per unit of GDP* by 60% to 65% from the 2005 levels; to increase the share of non-fossil fuels in primary energy consumption to around 20%; and to increase the forest stock volume by around 4.5 billion cubic meters on the 2005 level.

United States pledged the intention to achieve an economy-wide target of reducing its greenhouse gas emissions by 26%-28% below its 2005 level in 2025 and to make best efforts to reduce its emissions by 28%.

India's non-binding INDC (like in the cases of China and United States) was to reduce the emissions intensity of its GDP by 33% to 35% by 2030 from 2005 level.

It is evident that EU's mitigation efforts are not matched by those of the other three big emitters. Even more, given its relatively low share of the global emissions (10%), the EU's mitigation policies are not expected to have a relevant impact on achieving the main climate objective of the Paris Agreement, i.e. the limitation of global average temperature to well below 2 °C above pre-industrial levels. A recent study (Millar *et al.*) show that if emissions peak and decline to below current levels by 2030, and continue afterwards on a much steeper decline, it could result in a likely range of peak warming of 1.2-2.0 °C, which is consistent with the Paris Agreement but will require much more vigorous mitigation commitments and action.

Millar et al. assessed that the goal of limiting global warming to 1.5 °C is not yet a geophysical impossibility but that would likely require delivery on strengthened pledges for 2030 followed by “challengingly deep and rapid mitigation.”

On the adaptation side, the Paris Agreement establishes the global goal of “*enhancing adaptive capacity, strengthening resilience and reducing vulnerability to climate change, with a view to contributing to sustainable development and ensuring an adequate adaptation response in the context of the temperature goal referred to in Article 2*”.

Recommended actions on adaptation include: sharing information, good practices, experiences and lessons learned; strengthening institutional arrangements to support the synthesis of relevant information and knowledge; strengthening scientific knowledge on climate, including research, systematic observation of the climate system and early warning systems; assisting developing countries in identifying effective adaptation practices, needs and priorities; and, improving the effectiveness and durability of adaptation actions.

The main adaptation policy document at EU level is the EU strategy on adaptation to climate change adopted in April 2013, two years before the EU INDC was presented. The strategy focuses on three key objectives:

- Promoting action by Member States, through the adoption of comprehensive adaptation strategies;
- Promoting better informed decision-making through the developing of the European Climate Adaptation Platform (Climate-ADAPT); and,
- Promoting adaptation in key vulnerable sectors through agriculture, fisheries and cohesion policy.

One of the action lines envisaged by the strategy is the facilitation of climate-proofing of the Common Agricultural Policy, by providing guidance on how to integrate adaptation into the CAP. This guidance aims to help managing authorities and other stakeholders involved in programme design, development and implementation during the 2014-2020 budget period (through the European Agricultural Guarantee Fund and the European Agricultural Fund for Rural Development, with an annual budget of approximately €59 billion).

. Member States and regions can also use funding under the 2014-2020 Cohesion Policy and CAP to address knowledge gaps, to invest in the necessary analyses, risk assessments and tools, and to build up capacities for adaptation.

Climate change has a high degree of regional variability and therefore agriculture is impacted differently from one region to another. The variations of climate conditions – increased atmospheric CO<sub>2</sub> concentration, changes in precipitation patterns, higher temperatures and increased frequency of extreme events such as floods and droughts - affect water resources, state of soils, biodiversity, pest and diseases, which in turn could lead to significant impact of agriculture and livestock productivity.

The main indicators of climate change impact in agriculture are irrigation water requirements, water-limited crop productivity, soil carbon stocks, soil moisture and growing season for agricultural crops.

## CONCLUSIONS

The projections of the current commitments of the Parties to the Paris Agreement (*business-as-usual scenario*) indicate that the climate objectives of the Paris Agreement will not be met. In this case, global warming and climate change will continue to put an increasing stress on the ecosystems, societies and economies of the world, requiring more focus on adaptation strategies, policies and actions.

Currently at EU level there is an evident imbalance between the scope and resource allocation of mitigation policies – acting with limited efficiency against the main climate objectives – and that of adaptation policies, meant to counter the adverse impact on some of the most climate-sensitive sectors such as agriculture or land-use.

Based on such conclusions, the EU's Multiannual Financial Framework (MFF) post-2020 would offer an opportunity to adjust this imbalance through more resource allocation for tackling the identified systemic and/or regional risks and challenges related to climate change.

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