DECOUPLING ROMANIAN ECONOMY FROM GHGS EMISSIONS: AN OVERVIEW OF KYOTO PROTOCOL IMPLEMENTATION IN ROMANIA

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Abstract
This research outlines a critical review of the Kyoto Protocol implementation in Romania. It takes into account the nominal objectives of the global policy document in relation to their impact or lack thereof on the evolution of the Romanian economy after ratification of the Protocol in 2001. A closer look to the facts and figures regarding GHG emissions reduction in Romania reveals that - while achieved – the aim of decoupling economic growth from carbon emissions may stem from other factors and not Kyoto-based policies. More consistent sustainable development policies will be needed in line with European Union legislation and pledges and if a second and subsequent commitments will be adopted under Kyoto regime.
Keywords
climate change; Kyoto Protocol; decoupling; economic growth; greenhouse gases emissions; sustainable development

Introduction

Climate change is now widely recognized as one of the biggest challenges to have ever confronted humanity. The so-called *greenhouse gases* (GHGs - carbon dioxide/CO_2, methane/CH_4, nitrous oxide/N_2O, ozone/O_3 etc.), naturally present in the Earth's atmosphere, trap a fraction of the heat radiating from the surface and thus keep the Earth warmer than would normally be in their absence.

The accelerated increase of GHG concentration in the atmosphere - mostly due to economic activity and the burn of fossil fuels – is considered as the main driving force of the gradual raise of average global temperature. This quasi consensus emerged after decades of ever growing research in the field. The advent of global warming and its direct relation to anthropogenic GHG emissions had started to preoccupy the scientific community already from the midst of the last century. Scientific literature on the causes and effects of climate changes grew exponentially from 1951 to 1997, doubling every 11 years (Stanhill, 2001).

In spite of growing evidence, policy makers took a much slower path to recognize the threat and take measures to curb it. One of the main reasons for this is the fact that global warming and the associated climate change have a relatively slow progress compared to the usual political and economic cycles within society, with incremental deviations, impossible to discern from year to year, but only over several generations.

Other factors hampering faster political decisions in this case are:

i. The immense complexity of this phenomenon and its effects on natural and human systems;
ii. A diffuse distribution of responsibilities in increasing greenhouse gas emissions;
iii. The global and relatively uniform nature of climate change versus the diverse character of world's economies and societies,
iv. Reduced administrative and financial capacity to effectively counter global warming.

The acknowledgement of the need for an international policy response to this global phenomenon resulted in the adoption of the United Nations Framework Convention on

Climate Change (UNFCCC), in 1992. The aim of the Convention was to stabilize greenhouse gas concentrations "*at a level that would prevent dangerous anthropogenic (human induced) interference with the climate system*." It stated that "*such a level should be achieved within a time-frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened, and to enable economic development to proceed in a sustainable manner*."

However, countries and policy makers realised soon that UNFCCC was not effective by itself in limiting global warming and its negative consequences on climate systems. The Kyoto Protocol (KP) – adopted in 1997 – was meant to address this issue by complementing the UNFCCC with a legally-binding mechanism restricting GHG emissions from industrialized countries.

In the first commitment period - from 2008 to 2012 - 37 industrialised countries, grouped in the Annex B of the Protocol, undertook to reduce their GHG emissions by an aggregate five percent against 1990 levels. Individual commitments varied from 8 per cent in European Union countries and countries in transition in Central and Eastern Europe, 7 per cent in the United States and 6 per cent in Japan, Hungary and Poland. New Zealand, Russia and Ukraine were allowed to keep their emissions steady, while Norway could actually increase emissions by up to 1 per cent, Australia by 8 per cent and Iceland by 10 per cent. United States, which was the biggest GHG emitter, did not ratify the agreement, while Canada and Australia withdrew from KP at a later stage. China and India – other big emitter –

The Kyoto Protocol instituted not only a system for implementation, reporting and verification of GHG emission cuts and limitations but also a mechanism of trading emission allowances. It intended to create a 'carbon' market by putting a price on the Parties' GHG emissions. The Protocol was thus one of the first global policy attempts to reconcile the apparently diverging interests of the ailing environment and a rapidly growing global economy, based on burning fossil fuels as the main source of energy and intensive use of natural resources.

The Kyoto Protocol was planned in such a way as to provide for market-based incentives for the adoption of emission reduction technologies, energy efficiency, clean energies, reduced use of resources, better waste management etc., while keeping the economies growing. Each Party, in achieving its quantified emission limitation and reduction commitments, should also promote sustainable development. In short, one of the underlying aims of the binding agreement was to decouple economic growth and development from GHG emissions and therefore to create an economic basis for stabilising global warming.

As countries currently move towards ratifying the Doha Amendment to the KP, which establishes a second commitment period under KP, it is important to study the impact of the initial commitments of Annex B Parties on their environmental and economic policies.

1. KP implementation in Romania

Romania signed the Kyoto Protocol on 5 January 1999 and was the first country from the Annex B to ratify it, on 19 March 2001. At that moment, Romania was considered a Party "*undergoing the process of transition to a market economy*". According to Article 4.6 of the UNFCCC, all such Parties had the latitude ("*flexibility"*) to choose a base year other than 1990, which was the reference for the rest of Annex B countries. The base year emissions were defined in the KP as the aggregate anthropogenic carbon dioxide *equivalent* emissions in a historical base year. Parties in transition to a market economy were essentially all the Central and Eastern Europe countries (CEECs) that changed their political regime around 1990.

The base year for countries in transition was negotiated in such a way as to reflect the peak of their notoriously energy-intensive industrial output and corresponding GHGs emissions, pre-1990, rather than the sharp drop which had occurred after that, due to profound structural changes of their economies. This way the CEECs' efforts to reduce emissions would have been much easier and allow for the undergoing transformations within their societies to be properly taken into consideration in the KP context.

According to the Kyoto Protocol Reference Manual on accounting of emissions, five countries invoked UNFCCC's Article 4.6 and chose an alternate base year:

- Bulgaria: 1988;
- Hungary: the average of the years 1985 –1987;
- Poland: 1988;
- Romania: 1989;
- Slovenia: 1986.

KP entered into force in Romania on 16 February 2005.

The initial in-country review by the UNFCCC Secretariat, performed by team of designated independent experts in 2007, determined that for Romania the 1989 level of total national emissions was 278,225,022 tons CO_2 equivalent. This quantity includes emissions from five sectors: energy, industrial processes, solvents and other product use, agriculture and waste and excludes emissions and removals from activities related to land use, land-use change and forestry (LULUCF). The latest GHG inventory submission of Romania (2014, version 2.1) (UNFCCC, 2015) lists the total base year level emissions at **285,072,635.05** tons CO_2 equivalent, a slight revision of the initial estimates.

Romania's initial commitment under Kyoto Protocol was that for the five-year period from 2008 to 2012 would limit its total emissions to 92 per cent of the above-mentioned level. Whatever quantitative surplus of emission reductions - accounted as emission allowances called assigned amount units (AAUs) - could be traded to other Annex B Parties having compliance deficits, or used as carry-over for subsequent commitment periods.

The report of the initial review established that in the base year 1989, the most important GHG in Romania was CO_2, contributing 69.2 per cent, followed by CH_4, 17.7 per cent, and N_2O, 11.9 per cent. The report found that the energy sector accounted for 67.7 per cent of the total GHG emissions in the base year, followed by industrial processes (15.5 per cent), agriculture (14.5 per cent) and waste (2.1 per cent).

A common feature of transition from centralized to market economies was deindustrialization. Landesmann M. (2000) notes a general process of "deindustrialization" with falling absolute employment levels in the industrial sectors (comprising manufacturing, mining, water and electricity supply, construction). According to Landesmann, the pattern of structural change post-1990 features two distinct developmental phases: deep 'transformational recessions' followed by economic recoveries in the majority of CEECs, while there was still a negative trend growth rate for Bulgaria and Romania.

Throughout the interval 1990-1999, Romania was characterized by declining industrial production, with a massive reduction in the first years (1990-1993).

Deindustrialization in Romania meant the restructuring, reduction and in many cases complete elimination of highly energy intensive industries and branches. The downsizing of the industrial sector has also significantly modified energy consumption patterns and led to sharp drops in total energy consumption and energy-related emissions. Final energy consumption dropped sharply from 40.7 Mtoe (million metric tons of oil equivalent) in 1990 to 25.1 Mtoe in 1993 and reached a minimum of 22.6 Mtoe in 1999, a year characterized by severe economic depression (Table 1). Industrial energy consumption halved from 25.4 Mtoe

in 1990 to 12.9 Mtoe in 1993. Once providing a considerable part of the total energy consumption, energy consumption from industry dropped in 1999 to a similar level with residential consumption (8.9 compared to 8.7 Mtoe).

Table 1 Romania: Final Energy Consumption by sector (million metric tons of oil equivalent)

	1990	**1992**	**1993**	**1998**	**1999**	
Total	40.7	27.2	25.1	26.3	22.6	
Industry	25.3	14.1	12.9	10.8	8.9	
Transport	3.0	3.9	3.2	3.9	3.3	
Residential	10.5	6.2	6.6	9.4	8.7	
Agriculture/Forestry	1.1	1.4	1.1	0.77	0.46	
Services	0.38	0.62	0.40	0.77	0.79	
Non specified	0.30	0.74	0.75	0.52	0.45	
	2008	**2009**	**2010**	**2011**	**2012**	**2013**
Total	24.8	22.2	22.5	22.7	22.8	21.7
Industry	9.0	6.5	6.8	7.1	6.7	6.3
Transport	5.3	5.4	5.1	5.3	5.4	5.2
Residential	8.0	8.0	8.1	7.8	8.0	7.7
Agriculture/Forestry	0.29	0.37	0.39	0.43	0.49	0.45
Services	1.6	1.7	1.8	1.7	1.7	1.7
Non specified	0.40	0.20	0.21	0.24	0.24	0.19

Source: Eurostat, 2015: Final energy consumption by sector - Romania

However, energy consumption by itself is not a complete indicator for total CO_2 equivalent emissions. The energy mix – the assortment of sources used in energy production – provides for a more direct overview on the CO_2 emissions dynamics when linked with consumption patterns.

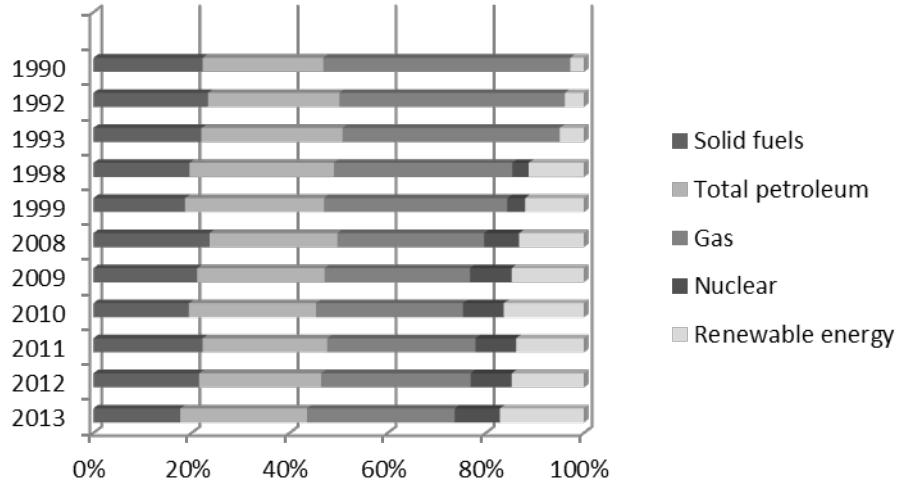
Table 2 Gross inland energy consumption* by fuel type (million metric tons of oil equivalent)

	Total	Solid fuels	Total petroleum products	Gas	Nuclear heat	Renewable energy
1990	58.08	12.73	14.11	28.83	0.0	1.58
1992	46.73	10.76	12.35	21.19	0.0	1.79
1993	46.17	10.13	13.25	20.37	0.0	2.25
1998	41.21	8.05	12.12	14.98	1.36	4.64
1999	36.65	6.86	10.39	13.73	1.34	4.39
2008	40.27	9.60	10.56	12.15	2.89	5.34
2009	35.55	7.55	9.29	10.58	3.03	5.26
2010	35.79	7.00	9.30	10.78	2.99	5.86
2011	36.55	8.16	9.32	11.10	3.03	5.06
2012	35.37	7.60	8.79	10.77	2.95	5.19
2013	32.34	5.75	8.38	9.79	2.99	5.55

Source: Eurostat, 2015: Gross inland energy consumption by type

(*Gross inland consumption is calculated as follows: primary production + recovered products + total imports + variations of stocks - total exports - bunkers. It corresponds to the

addition of final consumption, distribution losses, transformation losses and statistical differences.)



Source: Eurostat, 2015: Gross inland energy consumption by type

Fig. 1 Relative distribution by fuel type in gross inland energy consumption

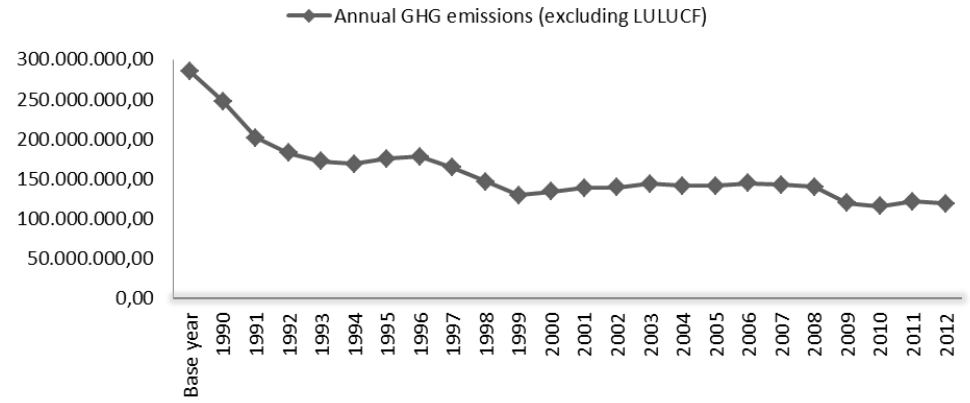
Romania's energy mix in the decade between 1990 and 1999 was highly unbalanced towards fossil fuel sources: solid fuels – mainly coal, petroleum products and gas (see Figure 1), which accounted for the large majority of GHG emissions. Between 1990 and 1993, the influence of the combined nuclear and renewable sources was negligible. This was the legacy Only after 1998-1999 the proportion starts to change, along with increased nuclear and renewable production as well as diminished output in carbon-based sources, all relative to much lower gross energy consumption. The commissioning of the first reactor of the Cernavodă nuclear power plant in 1996 had a significant impact on changing the proportion of low GHG emission sources in the total energy mix.

It is evident from the data above that when the Romanian government negotiated, signed and started to implement the Kyoto Protocol, during the '90s and first half of the '00s, it was already aware that the CO_2 equivalent emissions have decreased drastically. This appears to be a direct consequence of the deep economical transformations and declining industrial output after the base year (1989) and not the result of carefully designed and applied environmental policies.

Romania's Initial Report under the Kyoto Protocol, from May 2007, right before the start of the first commitment period, established that the "*economic decline after 1989 induced by the transition from a planned economy to a market base economy resulted in a relevant decrease of the GHG emissions"*. No policy measures other than economic decline were listed in Romania's initial report to account for the substantial decrease of GHG emissions in the period *before* the entry into force of the Kyoto Protocol in 2005.

Indeed, there was no need for additional policies since the UNFCCC review of Romania's initial report (2008) confirmed that by 2004 the total GHG emissions (excluding LULUCF) decreased by 43.9 per cent compared to the base year. Latest data (GHG inventory submission 2014, version 2.1) puts the level of emissions in 2004 even lower, at around 50 per cent compared to 1989.

The reduction in 1990 versus 1989 was already 13 per cent but the drop in 1991, in just two years, was a massive 29 per cent. In 1993, at the height of industrial decline, CO_2 emissions level indexed to Kyoto base year reached a 40 per cent reduction. The downward trend would stabilise in 1999. Emissions would start then to increase slowly until 2009, another year marked by severe economic downturn.



Source: UNFCCC, 2015: Greenhouse Gas Inventory Data

Fig. 2 Annual greenhouse gas (GHG) emissions for Romania, in tons CO2 equivalent

EU accession and the decoupling of economic growth

Romania will comply without any problems to its emission limitations corresponding to the Kyoto commitments. Throughout the first commitment period - between 2008 and 2012 – Romania maintained GHG emissions at an average of 123,185,991.88 tons CO_2 equivalent (see Table 3), excluding the impact of LULUCF activities, which would sink total emissions even more. Comparing to base year level this means more than 50 per cent discount, well below the committed 8 per cent.

Table 3 Annual GHG emissions for Romania, excluding LULUCF (in tons CO_2 equivalent) - KP 1st commitment period vs. 1989 (base year), absolute values and percentage change-

Base year (1989)	**2008**	**2009**	**2010**
285,072,635.05	139,836,661.19	119,941,988.95	115,823,861.74
100 %	-51%	-58%	-59%
Base year (1989)	**2011**	**2012**	
285,072,635.05	121,538,404.37	118,789,043.18	
100 %	-57%	-58%	

Source: UNFCCC Secretariat, 2015: Greenhouse Gas Inventory Data

As noted before Romania has complied with the Kyoto Protocol already from 1990. It required no particular policy other than the massive industrial conversion related to adoption of a liberalized market-economy. Compliance happened years before the KP was negotiated, adopted and implemented. As such KP's objectives and principles had little to no effect on the actual policies of the Romanian government.

However, by the beginning of KP's 1st commitment period Romania started to adjust its economic and environmental policies to be more in line with UNFCCC and Kyoto framework. This policy course was taken under a different process: integration into the European Union and the adjacent incorporation into national law and practice of the EU's *acquis communautaire* – a set of treaties, laws, regulations, standards and principles that are common to all EU Member States.
Romania signed the Treaty of Accession to the EU in April, 2005 and effectively joined in January, 2007.
In the Report on demonstrable progress in implementing the Kyoto Protocol, the Romanian Ministry of Environment mentioned that the country was in the process of implementing several policies and measures that directly or indirectly reduced GHG emissions, *"as a result of the transposition of the EU acquis communautaire"*. These measures included specific legislation transposing EU Directives in key areas such as promotion of energy from renewable sources, limitation of emissions from large combustion plants, integrated pollution prevention and control or the establishment of the EU Emissions Trading Scheme.
The EU's environmental and climate change programs (EEA, 2014) that were incorporated into Romanian legislation before and after accession contained a wide range of measures meant to: improve energy efficiency and energy savings; integrate climate change objectives and structural changes into key domains such as transport, energy, industry, regional policy and agriculture; stimulate research; take account of the environment in land-use planning and management etc.
The National Strategy on Climate Change of Romania 2005-2007 (NSCC) was the first programmatic document to comprehensively address requirements in climate change stemming from both the future membership of the EU and the international commitments under the UNFCCC and Kyoto Protocol.
The NSCC evaluated several GHG emission scenarios based on different assumptions on GDP growth and a different level of implementation of domestic policies and measures reducing GHG emissions. All scenarios agreed that GHG emissions in the 2012 will remain far below the Kyoto target. GHG emissions were estimated to grow at a lower rate than GDP until 2012. A substantive potential was determined with regard to reducing the *carbon* intensity – the average GHG emission rate – of the economy.
The NSCC's estimations proved to be correct. Romania's economic growth after accession to EU not only featured decreased carbon intensity but managed to decouple from the downward GHG emissions trend (Tables 3 and 4).

Table 4 Real GDP growth rate – volume, Romania
(percentage change on previous year)

2008	2009	2010	2011	2012	2013	2014
8.5	-7.1	-0.8	1.1	0.6	3.5	2.8p

p=provisional
Source: Eurostat, 2015: Real GDP growth rate – volume

After almost a decade of high GDP growth (2000-2008) Romania suffered severe negative growth during the global economic and financial crisis in 2009. Positive growth resumed in 2011 and have maintained steady at around 3 per cent ever since. This robust level is confirmed also in estimates for 2015-2016 (European Economic Forecast, 2015).
By contrast, GHG emissions displayed a negative trend since 2009, which is confirmed by the latest inventory submissions (National Inventory Report of Romania 2015 v. 1). Data for 2013 show further decrease of GHG emissions compared to base year (-64.85 per cent

change, without considering LULUCF), which amounts to approximately 7 per cent reduction over 2012 levels.

The decoupling of Romania's GDP growth from GHG emissions is evident but not conclusive. The decoupling effect has started from 2010 and is continuing. It signals structural changes in the economy – both in the level of energy intensity/efficiency and the nature of its energy supply – and potential with regard to more growth with relative fewer emissions. More data spread over several years will be needed to adequately assess the sustainable character of this effect as Romania's economy grows further.

Now a full EU member, Romania has pledged increased commitments towards climate change mitigation, under the joint EU umbrella. The 2020 climate and energy package is a set of binding legislation for all EU Member States, enacted in 2009, to ensure the EU meets three key targets for 2020:

- 20 per cent cut in GHG emissions (from 1990 levels)
- 20 per cent of EU energy from renewable sources
- 20 per cent improvement in energy efficiency.

Furthermore, the 2030 climate and energy framework adopted in 2014 by EU leaders aim to further the above mentioned targets to even more ambitious goals for the year 2030: minimum 40 per cent cuts in GHG emissions (from 1990); minimum 27 per cent share for renewable energy; minimum 27 per cent improvement in energy efficiency.

Under these umbrella frameworks Romania could actually increase its GHG emissions by 2020 with 19 per cent over 2005 levels (Decision 406/2009/EC). Recognizing their need for economic catch-up, Member States with a relatively low per capita GDP were allowed to increase their GHG emissions at an agreed level that would still contribute to the independent reduction commitment of the Community. Nevertheless if Romania maintains the current trend of decoupled economic growth than the provision of increased GHG emissions by 2020 will not be necessary. Thus Romania's economy would align not only with the sustainable development objectives of the UNFCCC process – including a second commitment period under the Kyoto Protocol – but also with the *decarbonised*[10] paths of the other EU economies.

At the overall level, the EU managed to cut emissions while expanding its economy. According to the European Environment Agency (2015), the European Union is well on track to meet and surpass its 2020 target for reducing greenhouse emissions by 20 per cent. Latest projections revealed by EEA report show that the EU will reach a 24 per cent reduction by 2020 with current measures in place, and a 25 per cent reduction with additional measures already being planned in Member States. Also, looking at the past 25 years the European Commission stated recently that Europe succeeded in cutting emissions by 23 per cent between 1990 and 2014 while the European economy grew by 46 per cent over the same period (European Commission, 2015). Europe's emissions intensity (defined as the amount of emissions to produce a euro of economic value) was reduced by almost half. The decoupling of economic growth from emissions occurred in all EU countries.

Conclusions

This paper provides for a general overview of the way by which Romania engaged in lowering its greenhouse gas emissions under international agreements, especially the Kyoto Protocol. The data reviewed allows for several sets of conclusions:

[10] Term designating economies with minimal output of GHG emissions

i. Kyoto Protocol's influence in determining Romania's climate change policies was very low. Compliance with KP's commitment was achieved just as a passive consequence of the deep economic and industrial transformations connected to the transition from centralized to free market economy.
ii. Accession to the European Union and the process of aligning legislation, standards and regulation to the EU's common denominators had a significant impact on putting Romania's economy on the path of lower GHG emissions and sustainable development.
iii. While analyzing the correlation between economic output and GHG emissions the paper found that Romania's past elapsed from the fall of the communist regime in 1989 could be divided in three distinct phases:
    - A 'conversion' period from 1990 to 1999 featuring deep structural changes of the economy and industrial sectors, including a sharp decline of total energy consumption and shifts in energy consumption patterns; massive discounts of GHG emissions;
    - A 'consolidation' phase – 2000 - 2008 – with the *new* economy growing rapidly under the strong influence of the EU integration process; GHG emissions also growing albeit at a much lower rate; energy sources starting to diversify,
    - Finally, a 'sustainable' period – 2009 – onward – with successful decoupling of economic growth and carbon emissions; GHG emissions on a downward trend; energy mix is stable and relatively balanced with increased output from renewable sources and increased energy efficiency.
iv. Even though decoupling is very recent it reflects the overall trend within EU. It is interesting that while the EU's performance benefited from adding Central and Eastern European countries – whose massive industrial restructuring led to significant overall emissions reduction – the EU designed policies assisted in turn CEECs to maintain economic growth with lower GHG emissions and increased energy efficiency.
v. Romania will easily meet and probably surpass its commitments under EU 2020 and within UNFCCC and Kyoto Protocol (Doha Amendment). However, in order to guarantee that the current decoupling effect is maintained on medium term (2030 and beyond) it needs to apply consistently the sustainable development and green growth policies agreed within the EU.
vi. There is still potential for Romania's economy to progress in decreasing its energy intensity in a wide range of sectors. The present research could be further expanded to look into the dynamics of GHG emission reductions by sector in order to highlight potential for future improvement.

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