CO2 Emissions, Inequality, and Growth: How Does the Republic of Moldova Compare to the Baltic States and the EU Average?

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Abstract

Based on the assumption that the Republic of Moldova lags behind the Baltic states in terms of sustainable and inclusive growth, this research analyzes Moldova's position regarding CO2 emissions, carbon inequality, income inequality, and economic growth relative to the Baltic states and the EU average. The findings show that Moldova's GDP/PPP is the lowest among the analyzed countries, although the Baltic states also rank below the EU average. While Moldova's CO2 emissions and carbon inequality are significantly lower than those of the Baltic states and the EU average, both indicators have risen since the start of the analyzed period. Income inequality in Moldova is lower than in Lithuania and Latvia but remains above the EU average. Regarding the top 10% share of national income, Moldova ranks below the EU average but higher than Latvia. Generally, Moldova's economic and environmental challenges highlight the need for policies promoting sustainable and inclusive growth

Key words: income inequality, CO2 emissions, inclusive economic growth, sustainable growth
J.E.L. classification: D31, Q54, Q56, O40, O15, Q01 O44

1. Introduction

The crisis caused by an extended COVID-19 pandemic followed, by the war in Ukraine and the resulting inflation has affected the low-income developing countries the most. More specifically, these effects include, on the one hand, declines in per capita income and on the other hand they relate to increased energy, fertilizer and food prices. In line with IMF data, the aforementioned effects led to an enhanced ascending trend of poverty and inequality, deepening the gap between advanced and emerging market and developing economies. Moreover, the advanced economies seem to be resuming their pre-pandemic trend by 2025 in terms of economic activity and output, whereas the emerging markets and the low-income developing countries will most probably still struggle in the medium term (IMF, 2022, p.13). That is why taking care that growth is inclusive and sustainable is more important today than ever especially in attaining well-being for all, which as everyone knows is a moving target.

According to UNCTAD's improved 2021 Inclusive Growth Index (IGI), the counties are assessed against four pillars: economy, living conditions, equality and environment. In the new IGI, besides a larger focus on the gender inequality the environmental aspects appear as a distinct pillar (UNCTAD, 2021). Meanwhile, it should be noted that while the inclusivity aims at ensuring that each and every individual contributes to and benefits from growth, the sustainability makes sure that the future generations are able to enjoy what we are benefiting from today (Elira, 2021, p.99). At the same time, sustained prosperity can be achieved if the human, physical and natural capital is preserved, developed and increases over time. If we fail to safeguard the natural capital, the living standards will decline, the future generations will not benefit from prosperity, and the individuals at the bottom of the distribution scale will be the ones to bear the toughest consequences. Therefore, in order to be inclusive, growth needs also to be sustainable (Bhattacharya *et al*, 2021, p. 4). The release of nitrogen and phosphorous, biodiversity loss, chemical pollution, air pollution, unsustainable freshwater use, soil erosion and deforestation pose serious threats on the sustainable economic development.

In this context, it is worth providing some data regarding the particular situation in the Republic of Moldova and the Baltic states with reference to some of the aforementioned elements. Thus, with regard to the air quality it can be noted that the Republic of Moldova ranks differently in comparison with the Baltic states depending on the pollutant. As regards the ambient particulate matter pollution, Moldova with 14.8 (μg/m3) showed the highest pollution measured as the average annual population-weighted PM2.5, compared to Latvia 11.6 (μg/m3), Lithuania 9.22 (μg/m3) and Estonia 6.15 (μg/m3). The same with the ambient ozone pollution, measured as the average seasonal population-weighted ozone, Moldova shows the highest level of pollution 38.1 (ppb), followed by Latvia (36.4 ppb), Estonia (35.9 ppb) and Lithuania (34.4 ppb). However, with regard to the household air pollution from solid fuels measured as the proportion of population using solid fuels, the ranking is different: Latvia (0.12), ranks first, followed by Estonia (0.09), Moldova (0.06) and Lithuania (0.03) (HEI, 2024). Regarding the quality and the availability of water, according to the baseline water stress, that measures the ratio between total water withdrawal and available renewable surface water supply, Moldova is in the medium-high (2-3) category as well as Lithuania, whereas Latvia falls into the low-medium (1-2) category and Estonia is in the low (0-1) risk category (World Resources Institute, 2023). As concerns the forest loss, the data for the analyzed countries are as it follows: in Moldova, a 3.8% decrease in tree cover was noted from 2000 to 2023. In Lithuania, a 18% decrease in tree cover has been attested since 2000, in Estonia - 22% and in Latvia – 26% respectively. With regard to the forest gain, from 2000 to 2020, Moldova gained 36.5 kha of the tree cover, equal to < 0.1% of the global total. Latvia gained a tree cover equal to 0.22% of the global total, Lithuania – an equal to 0.18% and Estonia an equal to 0.13% (Global Forest Watch, 2023).

In this research, however, the emphasis will be laid on the climate change issue as reflected in the amount of CO2 emission, as an indicator of sustainability. It should be mentioned that the Baltic states joined the Climate Ambition Alliance: Net Zero 2050 that started in 2020, whereas Moldova is not yet part of this initiative. However, in 2024, Moldova made significant progress by passing a comprehensive climate action law, committing the country to achieving net-zero emissions by 2050 (see Law on climate actions, 2024).

From a different perspective, a sustainable economic growth is negatively affected by the climate change as it leads to precarious social and economic consequences, as for example global warming is said to have increased the global economic inequality between countries by about 25% over the last half century (Diffenbaugh *et al,* 2019, p. 9809). Moreover, a 2020 study carried out by the World Bank revealed that if no action is taken with regard to climate change, over 100 million people might end up in extreme poverty by 2030. And if the global CO2 emissions are not reduced to zero the situation will become even worse after 2030. And again, the poorest regions are the ones that will suffer the most (Hallegatte *et al*, 2020). Thus, to address the climate change issue, the scientists revealed that the increase of the global temperature should not exceed and should be much below 2°C above pre-industrial levels. However, keeping the global warming to well below 2°C means to reduce the CO2 emissions by 25-30% by 2030, and to get to net-zero by 2080. Thus, to make sure the objective is achieved, the target of 1.5°C warming should lead to net-zero emissions by 2050 (Pörtner *et al*, 2022, p.128).

In addition, it should be made clear that the inequality arises from the fact the GHG emitters are the ones that benefit from their activities, whereas the cost of the emissions is to be shared by everyone. Therefore, it becomes important to price the carbon so as to provide an incentive to reduce the emissions. The main instruments for carbon pricing are to apply a carbon tax or a GHG emissions trading system. Roughly speaking, the first one sets a tax on certain emission sources while the second established a limit on GHG emissions by particular sources (Haites, 2018, p. 956). The approach to carbon pricing should be gradual so as to start from lower taxes on products consumed by the poor population, such as kerosene and fair measures of revenue recycling, i.e. redistribution to protect vulnerable energy consumers, should be applied (Boulard *et al*, 2021, p.34).

The revenue measures should target the poor as they usually spend more on energy as compared to their income thus, affecting their purchasing power, and the loss should be compensated. Such measures could include means-tested direct transfers, in-kind transfers, pro-poor spending, or tax subsidies. A universal dividend might also be applied (Bhattacharya *et al*, 2021, p. 21). More specifically, with regard to recycling carbon tax revenue, we can note that due to consuming more, as richer households have larger houses, the rich households usually pay more than the poor ones.

However, as it turns out, relative to income the poor households pay more. Therefore, the inequality increases, because the poor household pays more tax relative to its income, and so has less after-tax income to spend. According to some authors, one way to fix this issue is by a social transfer introduced by the government to the poor households. Governments do not need to redistribute all carbon revenues to compensate poor and vulnerable groups. In some countries, less than 30% of carbon revenues transferred as cash to the poor would equalize the poorest two quintiles, and over 70% of carbon tax revenues could be used to cover other important issues (Vogt-Schilb *et al*, 2019, p. 2).

As well, the carbon taxation could be complemented with direct regulation of the GHG emissions or energy efficiency. Here as well the regulations and standards should include financial incentives or programs at the Government level for the poor to ensure compliance. And in the same order of ideas, the developed countries are strongly encouraged to allocate funds to financially motivate the developing countries to decrease their emissions (Dong *et al*, 2021, p.13). In the context of the analyzed countries, it should be mentioned though that by 2023, both Estonia and Latvia had increased their carbon tax rates. Estonia's carbon tax rose to €2 per metric ton of CO_2 (about $2.18), and Latvia's to €15 per metric ton of CO_2 (about $16.31) (Taxfoundation, 2023). Lithuania and Moldova, however, had not implemented carbon taxes. Lithuania relies on the EU Emissions Trading System (EU ETS) to price carbon emissions, while Moldova has not established a carbon pricing mechanism.

In the context of obtaining the status of an EU candidate country by the Republic of Moldova, and as a result of the need to fulfill certain conditionalities including related to the environmental ones, as well as the current situation described above, we consider it important to analyze what the position of the Republic of Moldova is in terms of income inequality, CO2 emissions and growth compared to the Baltic states. This analysis should provide a first-step context of the current standing of the Republic of Moldova for further more complex research. It should be mentioned that the Baltic states have been selected as reference EU countries because they seem to be more comparable with the Republic of Moldova as the countries share a common past, even though one much allow for the quite large discrepancies in many respects among these countries.

Thus, the hypothesis of this research is that the Republic of Moldova is lagging behind the Baltic states in terms of inclusive and sustainable economic growth, even though the assumption is that the CO2 emissions are lower than in the Baltic states due to lack of performant economic activity.

The novelty of the research resides in the fact that the situation of the Republic of Moldova in terms of income inequality, carbon inequality and growth is being analyzed, at the stage where the country has an EU accession candidate status and has started the negotiation process. The current status of the Republic of Moldova is analyzed in comparison with the Baltic states and the EU average in order to understand where the country is now and provide the basis for further steps and action. The methods used include description, analysis, synthesis and generalization of statistical data in the attempt to get an insight into the proposed assumptions. The research consists of an introduction that discusses the general context related to the analyzed topic, the literature review part, the research methodology, results, conclusions and references.

2. Literature review

In a range of researches, inequality has been analyzed as related to such phenomena as GHG /CO2 emissions, growth, energy consumption and poverty at the country and at the international level. For instance, the historical evolution of weighted international inequality in CO2 emissions attributed territorially and the global inequality in carbon footprints attributed to final consumers was analyzed by a team of researchers to answer the question of whether the scenarios of carbon emission redistribution are feasible for mitigating climate change as per the Paris Agreement and for reaching the sustainable development goal of eradicating poverty. One of the findings was that to implement the proposed scenarios the reduction in global inequality should be unprecedented. And a proposed solution is a fast decarbonization of the global energy supply so as to decrease global carbon emissions without relying much on carbon inequality reduction (Semieniuk *et al*, 2020).

As income inequality is assumed to be linked to energy consumption, CO2 emissions, and growth, a number of researchers focused on analyzing the interrelation between these factors. A group of authors analyzed the correlation between the CO2 emissions, energy consumption, income inequality,

and poverty within the framework of the Environmental Kuznets Curve (EKC). The results of the study showed that the correlation between income inequality, poverty, and energy consumption and the CO2 emission differs depending on whether a country is a developed or a developing one. Specifically, in the developed countries no significant correlation was attested whereas in the developing countries the results have revealed that income inequality, poverty, and energy consumption positively affect the CO2 emission. The research also proved the EKC hypothesis, in line with which the relationship between per capita income and CO2 emissions has an inverted U-shape in the developed countries but it was not validated in the case of the developing countries (Akbas *et al*, 2021, p.7).

A U-shape relationship has also been attested between GDP per capita and the GHG emission per capita in a research in which the link between income inequality and consumption-based GHG emission per capita was analyzed by applying the country-level data for 1990–2014. The researchers argue that due to the prevailing economic structures, the relationships between the aforementioned phenomena is non-linear and confirm the existence of a U-shape relationship between GDP per capita and the GHG emission per capita. Moreover, the research shows that the poorest countries experience the highest effect of the inequality on GHG emission (Baležentis *et al*, 2020). Whether the renewable energy might be affecting income inequality was considered in a study that aimed at investigating the impact of renewable energy consumption on income inequality in a panel group of developed economies over the period of 1990–2014. The outcome of the study is that an increase in renewable energy consumption leads to a decrease in income inequality. The study has shown a double effect of renewable energy sources use tackling on the one hand some of the environmental issues and contributing, on the other hand to the reduction of income inequality (Topcu *et al*, 2020). Moreover, another study focused on analyzing the different contributions of various income groups to carbon emissions in a period of 25 years. Using new data on global and national income inequality, combined with national consumption emissions over the mentioned period the researchers related the emissions to income levels for the populations of 117 countries. The study also puts forward scenarios of carbon inequality based on different possible trajectories of economic growth and carbon emissions (Kartha *et al*, 2020).

At the same time the impact of income inequality on CO2 emissions was analyzed in a thesis where the author has tried to understand if by reducing the income inequality the per capita CO2 emissions would actually increase. Using a grouped fixed effects estimator, the relationship between the two phenomena in a two-way error component model was analyzed. As a result, it has been found that the impact of income inequality on CO2 emissions depends on the level of income, i.e. if the income is below a certain threshold and the income inequality is reduced, this brings about an increase in CO2 emissions, while on the other hand, if the income is above that threshold it leads to an opposite result (Granser, 2021). Affirming that not all the human beings contribute equally to climate change, Chancel (2022), estimated the global inequality of individual greenhouse gas emissions based on data on income and wealth inequality, environmental input-output tables and a framework that separates the emissions from consumption and those from investments. The conclusion is that in 2019, the bottom 50% of the world population emitted 12% of global emissions while the top 10% emitted 48% of the total. A significant difference in emissions has been revealed between the bottom 50% of the world population and the top 1%. Furthermore, the study has revealed that the total emissions from the global top 1% of the world population results from their investments and not as much from their consumption (Chancel, 2022).

Nevertheless, based on a study that shows that in high-income countries a huge increase in economic inequality has been attested over the past 30–40 years, the impact of "extreme wealth and precarious poverty" should be considered on energy consumption, access to energy services and also on CO2 emissions (Galvin *et al*, 2018). It is interesting to note that some researchers, have argued that climate change affects inequalities between countries in two ways: the rising temperatures from greenhouse gas accumulation has a more detrimental effect on the low-income countries and at the same time the high costs of climate change mitigation by reducing emissions is likely to make the poor countries lag behind the developed countries from the economic point of view. Based on these assumptions, the researchers have tried to come up with scenarios that showed the joint effects of the mitigation costs and climate damages on inequality.

The results proved that the uncertainties related to socioeconomic assumptions and damage estimates are the main drivers of future inequalities (Taconet *et al*, 2020).

Other authors sensed the existence of a correlation between the well-being, which among other dimensions includes the environmental component, and the income inequality. In a study carried out across several Central Eastern European countries after joining the European Union in 2004, the researchers managed to identify the canals through which income inequalities linked either directly or indirectly with certain dimensions of well-being, showing that on long term income inequalities are impacted by the well-being status, including the dimension related to the natural environment. The research also revealed a decreasing trend of the CO_2 emissions per capita in all CEE countries except for Poland, Latvia, and Lithuania and that the levels of CO_2 emissions per capita are very heterogeneous among the CEE countries (Szczepaniak *et al*, 2021).

3. Research methodology

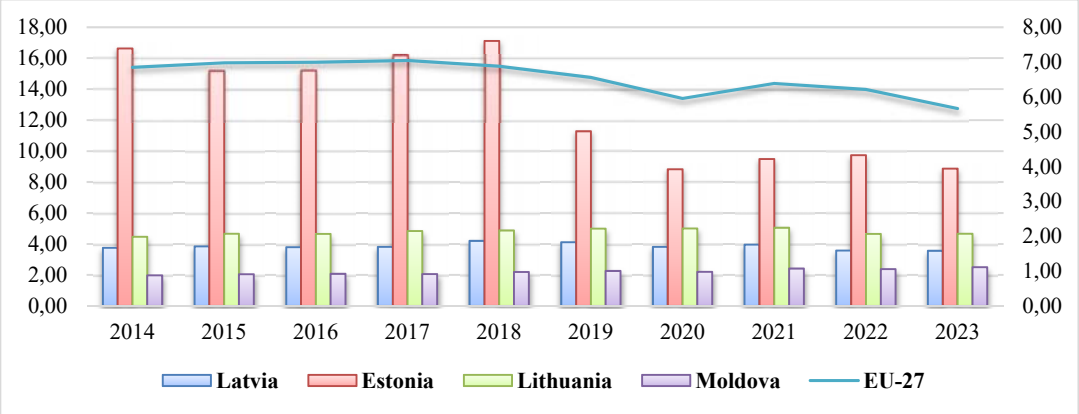
In order to present the picture of the situation in in the Republic of Moldova and in the Baltic states, data on fossil CO2 emissions were retrieved, including the data on carbon inequality, by presenting a comparison between the top 10% carbon emitters in all the analyzed countries, as well as on income inequality (GINI coefficient and top 10% national income share, as these two indicators capture different perspectives) and on the GDP/PPP as an indicator of growth. The selection of these indicators is based on the attempt to understand where the Republic of Moldova ranks in terms of inequality, sustainability and growth as compared to the Baltic states and the EU average. The data used in this research have been retrieved from EDGAR emission database for fossil CO2 emissions, the World Bank Database for GDP/PPP, the National Bureau of Statistics for the GINI coefficient for the Republic of Moldova and EUROSTAT for the Baltic States and EU-27 average, and the World Inequality Database for the top 10% national income share and the top 10% average personal carbon footprint.

Thus, the position of the Republic of Moldova in terms of economic growth (GDP/PPP as an indicator), income inequality (two indicators - GINI and the top 10% national income share) and climate change (Fossil CO2 emissions per capita as a direct indicator of human-produced greenhouse gas) was compared to the Baltic states and the EU average. The carbon inequality, in particular, was analyzed based on the data on the top 10% carbon emitters for each Baltic state and the Republic of Moldova. The data from 2014 to 2023 were analyzed for CO2 emissions, GDP/PP and Gini, to reflect a year 2014 before the signing of the Paris Agreement in 2015, as a starting point, and to the most recent available data. For top 10% income share and top 10% carbon emitters, the period from 2001-2020/2021 was selected to follow the dynamic for a longer period.

4. Findings

The data for the analyzed years presented below (Figure 1) show a large discrepancy in terms of fossil CO2 emissions per capita in the Baltic states. Estonia has consistently exhibited the highest emissions, significantly exceeding those of the other Baltic states and the EU average throughout the analyzed period. Although Estonia's emissions showed a descending trend from 2018 to 2020, they increased in 2021 (9.49) compared to 2020 (8.83) with a slight increase in 2022 (9.74) and a decrease in 2023 (8.87). Despite this slight decrease in 2023, Estonia's emissions remained dramatically higher than the EU average. Lithuania's CO2 emissions have changed only mildly during the analyzed period. The country reached its peak emissions in 2021 (5.05) with a slight increase compared to 2020 (5.00). However, emissions decreased a bit in 2022 and 2023, staying below the EU average. Latvia displayed uneven changes in CO2 emissions during 2014–2023, peaking in 2018 (4.20) and taking a descending trend since then. The Republic of Moldova consistently emitted the least CO2 per capita during the analyzed period compared to the Baltic states. However, its emissions increased steadily, reaching a level of 2.50 in 2022. Moldova's emissions have remained well below the EU average throughout the analyzed period. Notably, as of 2023 all the analyzed countries emitted less than the EU average, which declined from 6.85 in 2014 to 5.66 in 2023. Thus, Estonia's emissions remain a notable outlier.

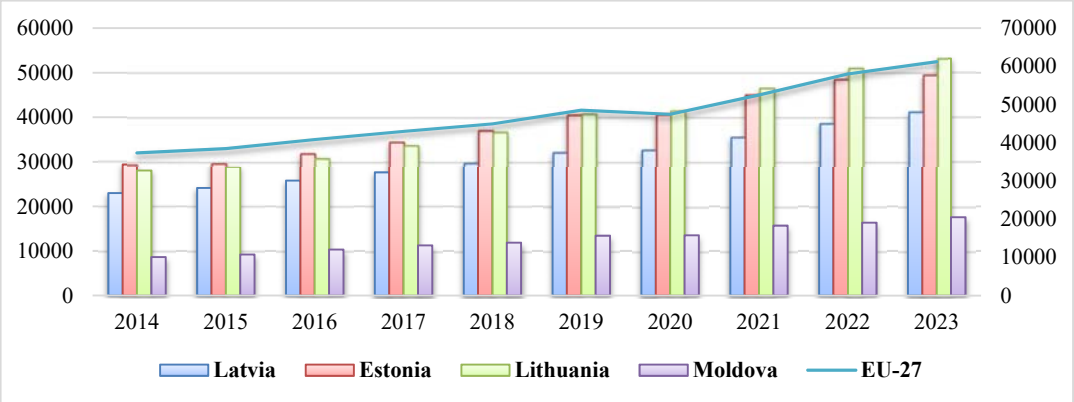
Figure no. 1: Fossil CO2 per capita emissions in Baltic states, Rep. of Moldova and EU-27 for 2014-2023 (metric units)



Source: EDGAR Community GHG Database (a collaboration between the European Commission, Joint Research Centre (JRC), the International Energy Agency (IEA), and comprising IEA-EDGAR CO2, EDGAR CH4, EDGAR N2O, EDGAR F-GASES version EDGAR_2024_GHG (2024) European Commission. https://edgar.jrc.ec.europa.eu/report_2024

With regard to GDP/PPP, all the analyzed countries followed a generally increasing trend from 2014 to 2019, with a notable decline in 2020 due to the global economic impact of the COVID-19 pandemic. This was followed by a recovery in 2021, when GDP/PPP exceeded the 2019 levels. The growth trend continued through 2022 and 2023 for all countries. When comparing GDP/PPP levels to the EU average, it remains evident that none of the analyzed countries have reached or come close to the EU-27 average during the analyzed period. Lithuania and Estonia consistently recorded the highest GDP/PPP among the analyzed countries, with Lithuania reaching $53,184.8 dollars in 2023 and Estonia with $49,500.7 dollars. Latvia followed, with its GDP/PPP growing to $41,251.8 dollars in 2023. Moldova, as expected, presented the lowest GDP/PPP, reaching only $17,596.9 dollars in 2023—less than half of Latvia's GDP/PPP, which remains the lowest among the Baltic states. Despite steady growth across the period, the GDP/PPP levels of the Baltic states and Moldova highlight significant economic disparities compared to the EU average, which increased from $37,327.1 dollars in 2014 to $61,217.6 dollars in 2023 (Figure 2).

Figure no. 2: GDP PPP for Baltic states, Rep. of Moldova and EU for 2014-2023 ($)

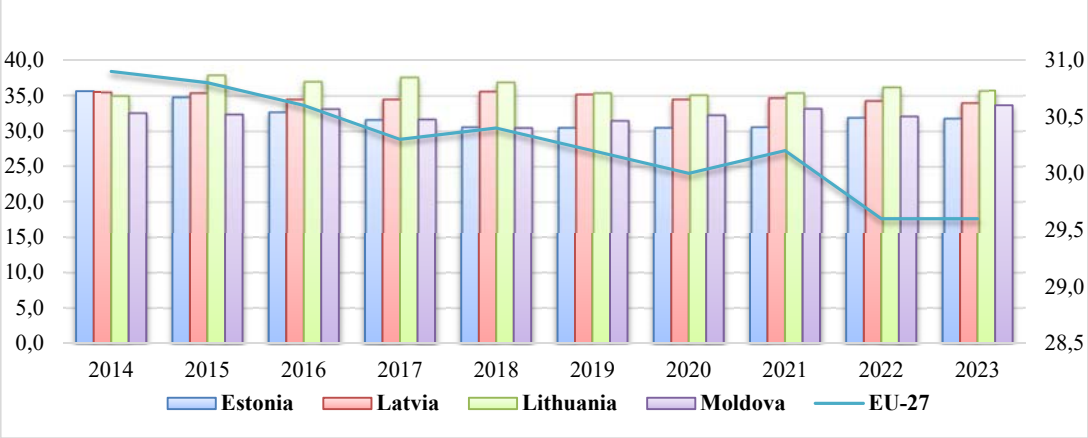


Source: World Bank, https://data.worldbank.org/indicator/NY.GDP.PCAP.PP.CD?locations=MD-LT-LV-EE-EU

Another interesting observation is that income inequality, expressed by the GINI coefficient, continues to exceed the EU average in all the analyzed countries. Estonia has shown a decreasing trend since 2014, with the GINI coefficient declining steadily from 35.6 in 2014 to 31.8 in 2023. Between 2018 and 2021, the GINI coefficient stabilized around 30.5–30.6 but has slightly increased since 2021. Lithuania consistently exhibited the highest GINI coefficient since 2015, peaking at 37.9

in 2015 and ending at 35.7 in 2023. Latvia follows closely, with fluctuations between 35.5 in 2014 and 34.0 in 2023. Meanwhile, Moldova showed varying trends throughput the analyzed period, reaching 33.6 in 2023. The EU-27 average GINI coefficient is on a descending trend, down to 29.6 in 2023, highlighting the consistent disparity in income inequality between the analyzed countries and the EU average since 2017. (Figure 3).

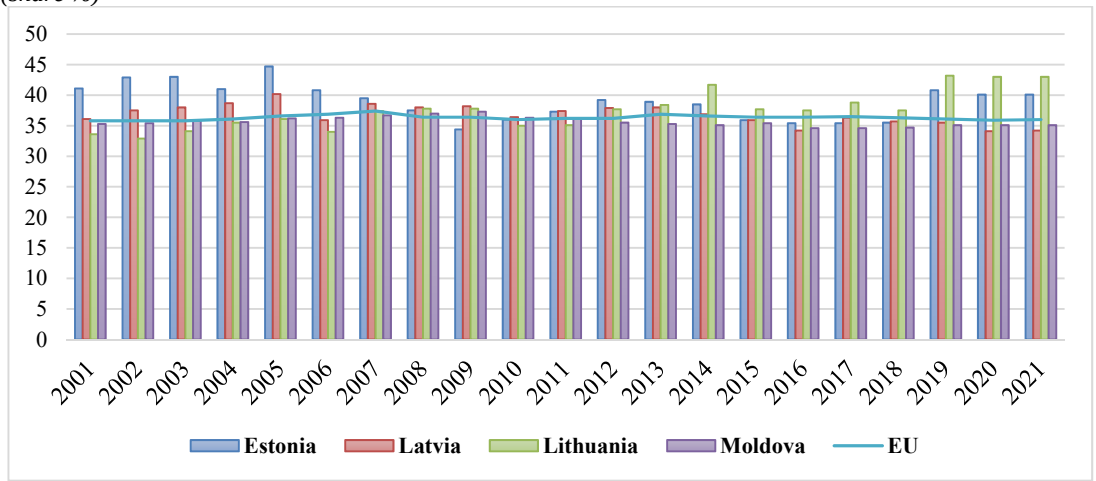
Figure no. 3: GINI for Baltic states and EU (equivalized disposable income) and Rep. of Moldova (disposable income) for 2014-2023



Source: EUROSTAT https://ec.europa.eu/eurostat/databrowser/view/tessi190/default/bar?lang=en, NBS https://statistica.gov.md/index.php/en?l=en

In the context of the sustainable economic growth – income inequality nexus, it is worth analyzing the top 10% national income share (considered to be the layer of the highest CO2 emitters (Gore, 2020)). The data presented in the diagram below for a period of 21 years (Figure 4), show the lowest 10% share of national income in 2021 in Latvia (34.2%) followed by the Rep. of Moldova (35.1%), both ranking below the EU average (36%). Lithuania (43%) and Estonia (40.1%) show the highest top 10% national income share and rank much above the EU average. It should be mentioned though that the top 10% share in Estonia was much lower during 2019-2021, than in 2005 (44.7%). In Lithuania and Estonia, a significant increase occurred after 2018 and stayed relatively at the same enhanced level between 2019-2021 (in Lithuania between 43 and 43.2 % and in Estonia - between 40.1 and 40.8 %). In Moldova, a slight increase occurred after 2018 and stayed at the same level until 2021 (35.1%).

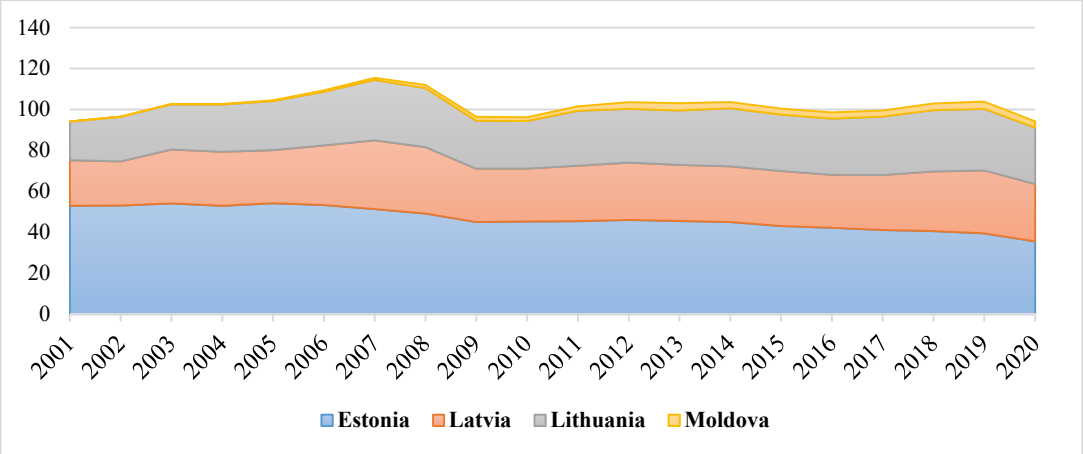
Figure no. 4: Top 10% national income share, Baltic states, EU and Rep. of Moldova for 2001-2021 (share %)



Source: WID https://wid.world/data/

The trend of carbon inequality is presented in the diagram below. According to the data, for 21 years (2001-2020), Estonia, even though it presents a decrease in CO2 emissions of the top 10%, still shows the highest level of emissions (36 tCO2e/cap) in 2020 followed by Latvia and Lithuania which reach the same level of emissions (28 tCO2e/cap) in 2020. The Republic of Moldova, even though showing a significant increase in the emissions of the top 10% since 2001 (compare: 0.1 tCO2e/cap in 2001 and 3.1 tCO2e/cap in 2020), presents much lower emissions than the Baltic states that have the lowest level of the top 10% emitters. As for the trend, in 2020 all the countries show a decrease in the emissions of top 10% compared to 2018and 2019, even though except for Estonia, the level of top 10% emitters increase compared to 2001, the beginning of the analyzed period (Figure 5).

Figure no. 5: Top 10% average personal carbon footprint (all sectors), Baltic states and Rep. of Moldova 2001- 2020, (tCO2e/cap, average per capita group emissions)



Source: WID https://wid.world/data/

5. Conclusions

The analysis reveals significant disparities in fossil CO2 emissions, economic performance, and income distribution across the Baltic states and Moldova. Estonia stands out as an outlier with persistently high per capita CO2 emissions, despite recent reductions. In contrast, Latvia and Lithuania have maintained more stable emissions, while Moldova, given its economic limitations, shows a comparatively low but steadily rising carbon footprint. Even though there has been economic growth across all countries, particularly after the pandemic, none have reached the EU-27 average GDP/PPP, with Moldova remaining far behind. Income inequality persists, with GINI coefficients consistently above the EU average, particularly in Lithuania. The top 10% of earners in the Baltic states hold a disproportionate share of national income and contribute significantly to CO2 emissions.

Thus, the preliminary descriptive analysis indicates that the Baltic states and Moldova must address these disparities through targeted policies. Estonia's focus should be on further diversifying its energy sources and implementing carbon pricing mechanisms, while Lithuania and Latvia should enhance social redistribution measures to reduce inequality. Moldova's development strategy should prioritize green investments and economic diversification to foster equitable, low-carbon growth. EU support, in the form of cohesion funds and green transition assistance, could be used once available, to bridge the economic and environmental gaps.

6. References

- Akbas, Y.E. and Lebe, F., 2021. *Poverty, income inequality, and energy consumption based on EKC hypothesis: Evidence from developed and developing countries.* https://doi.org/10.21203/rs.3.rs-288310/v1

- Baležentis, T., Liobikienė, G., Štreimikienė, D. and Sun, K., 2020. The impact of income inequality on consumption-based greenhouse gas emissions at the global level: A partially linear approach. *Journal of environmental management*, 267, p.110635. https://doi.org/10.1016/j.jenvman.2020.110635
- Bhattacharya, A., Ivanyna, M., Oman, W. and Stern, N., 2021. Climate action to unlock the inclusive growth story of the 21st century. https://doi.org/10.5089/9781513573366.001
- Boulard, C., Leuven, K.U. & Mariani, B., 2021. EEB: A carbon pricing blueprint for the EU. *European Environmental Bureau.* [online] Available at: https://eeb.org/wp-content/uploads/2021/03/A-Carbon-Pricing-Blueprint-for-the-EU2.pdf [Accessed 2 June 2023]
- Chancel, L., 2022. Global carbon inequality over 1990-2019. *Nature Sustainability*, 5(11), pp.931-938. https://doi.org/10.1038/s41893-022-00955-z
- Diffenbaugh, N.S. and Burke, M., 2019. Global warming has increased global economic inequality. *Proceedings of the National Academy of Sciences,* 116(20), pp.9808-9813. https://doi.org/10.1073/pnas.1816020116
- Dong, Y., Ma, S., Zhang, B., Wang, W.X. and Pacheco, J.M., 2021. Financial incentives to poor countries promote net emissions reductions in multilateral climate agreements. *One Earth*, 4(8), pp.1141-1149. https://doi.org/10.1016/j.oneear.2021.07.006
- Elira, B., 2021. Green Infrastructure and Manufacturing: Analysis of IE and SM Innovations for Future Generations. *Journal of Machine and Computing*, pp.97-105. https://doi.org/10.53759/7669/jmc202101011
- Galvin, R. and Sunikka-Blank, M., 2018. Economic inequality and household energy consumption in high-income countries: a challenge for social science-based energy research. *Ecological economics*, 153, pp.78-88. https://doi.org/10.1016/j.ecolecon.2018.07.003
- Global Forest Watch. [online] Available at: https://www.globalforestwatch.org/ [Accessed 6 October 2023]
- Gore, T., 2020. Confronting Carbon Inequality: Putting climate justice at the heart of the COVID-19 recovery. [online] Available at: https://oxfamilibrary.openrepository.com/handle/10546/621052 [Accessed 12 July 2023]
- Granser, L., 2021. *Analysis of the impact of income inequality on CO2 emissions* (Doctoral dissertation, Wien). [online] Available at: https://scholar.archive.org/work/6gkrlxbap5axdapojvivdimia4/access/wayback/https://repositum.tuwien.at/bitstream/20.500.12708/16964/1/Granser%20Laura%20-%202021%20-%20Analysis%20of%20the%20Impact%20of%20Income%20Inequality%20on%20CO2...pdf [Accessed 13 February 2024]
- Haites, E., 2018. Carbon taxes and greenhouse gas emissions trading systems: what have we learned?. Climate policy, 18(8), pp.955-966. https://doi.org/10.1080/14693062.2018.1492897
- Hallegatte, S. and Walsh, B., 2020. COVID, climate change and poverty: avoiding the worst impacts. *World Bank.* October, 7. [online] Available at: https://blogs.worldbank.org/en/climatechange/covid-climate-change-and-poverty-avoiding-worst-impacts [Accessed 01 February 2024]
- Health Effects Institute. 2024. *State of Global Air 2024*. [online] Available at: www.stateofglobalair.org. [Accessed 01 January 2025]
- IMF Annual Report (2022). Crisis upon Crisis. [online] Available at: https://www.imf.org/external/pubs/ft/ar/2022/english/ [Accessed 14 June 2023]
- Kartha, S., Kemp-Benedict, E., Ghosh, E., Nazareth, A. and Gore, T., 2020. *The Carbon Inequality Era: An assessment of the global distribution of consumption emissions among individuals from 1990 to 2015 and beyond*. https://doi.org/10.21201/2020.6492
- Law on climate actions No. 74 of 11 April 2024, Official Gazette of the Republic of Moldova, 2024, no 209-212/16.05.2024. [online] Available at: https://monitorul.gov.md/ro/monitor/2901 [Accessed 14 June 2023]
- Pörtner, H.O., Roberts, D.C., Adams, H., Adler, C., Aldunce, P., Ali, E., Begum, R.A., Betts, R., Kerr, R.B., Biesbroek, R. and Birkmann, J., 2022. Climate change 2022: Impacts, adaptation and vulnerability. *IPCC.* [online] Available at: https://www.ipcc.ch/report/ar6/wg2/ [Accessed 6 July 2023]
- Semieniuk, G. and Yakovenko, V.M., 2020. Historical evolution of global inequality in carbon emissions and footprints versus redistributive scenarios. *Journal of Cleaner Production*, 264, p.121420. [online] Available at: https://doi.org/10.1016/j.jclepro.2020.121420 [Accessed 14 June 2023]
- Szczepaniak, M. and Geise, A., 2021. Examining the relationships between income inequalities and different dimensions of well-being in selected Central Eastern European (CEE) countries. *Plos one,* 16(4), p.e0250469. https://doi.org/10.1371/journal.pone.0250469

- Taconet, N., Méjean, A. and Guivarch, C., 2020. Influence of climate change impacts and mitigation costs on inequality between countries. *Climatic Change*, 160(1), pp.15-34. https://doi.org/10.1007/s10584-019-02637-w
- Taxfoundation (2023) [online] Available at: https://taxfoundation.org/data/all/eu/carbon-taxes-in-europe-2023/ [Accessed 6 October 2023]
- Topcu, M., & Tugcu, C. T. (2020). The impact of renewable energy consumption on income inequality: Evidence from developed countries. *Renewable Energy,* 151, 1134-1140. UNOPS, Climate Initiatives Platform. https://doi.org/10.1016/j.renene.2019.11.103 [Accessed 6 October 2023]
- UNCTAD, SDG Pulse. UNCTAD takes pulse of the SDGs 2021. [online] Available at: https://unctad.org/system/files/official-document/SDGPulse2021_en.pdf [Accessed 14 June 2023]
- Vogt-Schilb, A., Walsh, B., Feng, K., Di Capua, L., Liu, Y., Zuluaga, D., Robles, M. and Hubaceck, K., 2019. Cash transfers for pro-poor carbon taxes in Latin America and the Caribbean. *Nature Sustainability*, 2(10), pp.941-948. https://doi.org/10.1038/s41893-019-0385-0
- World Resources Institute, 2023. Aqueduct Water Risk Atlas. [online] Available at: https://www.wri.org/aqueduct#aqueduct-tools [Accessed 14 June 2023]