

The Genuine Progress Indicator for the transition economies of the Baltic States: reflections on economic welfare and methodological choices

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Abstract

The Baltic States of Estonia, Latvia, and Lithuania have experienced rapid Gross Domestic Product (GDP) growth since the collapse of the Soviet Union and subsequent transition from planned to market economy, reporting increasing levels of consumption and subjective well-being but persistent income inequality, which raises the question of whether economic expansion has translated into genuine welfare improvements. The study provides the first application of an updated Genuine Progress Indicator (GPI) framework to the Baltic States for the period 1995-2023. To assess the robustness of the results, a sensitivity analysis of the components with the greatest influence on GPI values was conducted: valuation of leisure time, the cost of carbon, and the income inequality adjustment. The analysis reveals that economic welfare measured by the GPI has generally exceeded GDP across all three countries in the study period, apart from 2023 in Estonia and Lithuania, offering indications that the welfare returns of additional economic growth might be diminishing. However, the extent to which the GPI exceeds or falls below GDP varies considerably depending on parameter choices. The sensitivity of the GPI to assumptions regarding hourly wages, carbon cost, and inequality baselines highlights methodological challenges that makes cross-country comparisons difficult. These findings caution against uncritical use of the GPI in policy settings and highlight the need for methodological standardisation and clearer valuation guidelines if the metric is to serve as a credible tool for assessing progress beyond GDP.

Keywords: beyond GDP; Genuine Progress Indicator; transition economies; economic welfare; sensitivity analysis

1. Introduction

The emergence of the “beyond GDP” debate is indicative of the failure of the Gross Domestic Product (GDP) indicator to capture the multidimensional nature of economic welfare that extends beyond market-based activities (Fioramonti, 2013; Fitouss et al., 2011; Giannetti et al., 2015). International organisations, policy practitioners, and researchers agree that GDP growth largely fails to capture improvements in real economic welfare as it omits critical factors such as income distribution, environmental degradation, and non-market activities (Giannetti et al., 2015; UN, 2023). Such critiques, ranging from the Stiglitz-Sen-Fitoussi Commission’s report in 2009 (Stiglitz et al., 2009) to numerous scholarly analyses, have spurred interest in new indicators that better reflect social and ecological realities (Hoekstra, 2019; Jansen et al., 2024). The momentum for replacing the GDP with more comprehensive wellbeing metrics is increasing, with Beyond GDP measures increasingly adopted on national, municipal and regional levels, having gained momentum in both academia and public policy (Jansen et al., 2024; Kubiszewski et al., 2025; Raworth, 2017).

Within the Beyond GDP debate, the Baltic States of Estonia, Latvia, and Lithuania present an interesting case: these small post-communist economies underwent a rapid transition from planned to market-based economies in the 1990s and recorded some of the fastest rates of economic growth in Europe in the years preceding the 2008 economic crisis (Aidukaite, 2009; Staehr, 2015). Despite their relatively strong GDP performance, the Baltic States invest less in social protection than older EU members and exhibit some of the continent’s highest income inequalities (Aidukaite, 2009; Eurostat, 2024j). These patterns hint that GDP alone may overstate the welfare gains in such transition economies. Comprehensive assessments beyond GDP remain underexplored in the Baltic context, and there has been little debate to date on the overall effects of the transition as the “universal progress” narrative has been dominant (Avlijaš, 2020). While subjective wellbeing polls such as the World Happiness Report (2025) support the latter narrative, the costs of the transition to a market-based economy and economic growth have very rarely been discussed in the context of transition economies (Tridico, 2010). This gap motivates the present research: to reassess the development of economic welfare in the Baltics through the lens of “genuine” progress rather than just gross output.

The Genuine Progress Indicator (GPI) is one of the most established monetary metrics applied to supplement GDP to reflect net economic welfare (Kubiszewski et al., 2013; Talberth et al., 2007; Talberth & Weisdorf, 2017). The GPI attempts to measure economic wellbeing by accounting for a wider range of benefits of economic activity (including non-market services) and subtracting various social and environmental costs. The GPI concept originated with Herman Daly and John Cobb’s Index of Sustainable Economic Welfare (ISEW) in 1989 (J. Cobb & Daly, 1989) and later evolved into GPI (C. Cobb et al., 1995), which became a widely used framework reflecting an effort to capture “genuine” welfare in monetary terms, integrating economic, social, and environmental dimensions (Talberth et al., 2007). Over the past three decades, the GPI has been calculated for dozens of countries and locales, generally revealing a more tempered view of societal progress than GDP, especially in the developed countries that often exhibit a plateau or decline in net economic welfare despite continued economic growth, which is sometimes referred to as “uneconomic growth” (Kenny et al., 2019; Kubiszewski et al., 2013). Applying this concept to the Baltic States has the potential to uncover

some of the costs and benefits of the economic growth that are not evident in GDP because they are not marketed, e.g., the costs of pollution, income inequalities, unpaid labour, and leisure time, among others.

Recent scholarship has sought to refine the GPI methodology to improve its consistency, comparability of results, and relevance for policy (Bagstad et al., 2014; Talberth & Weisdorf, 2017; Van der Slycken & Bleys, 2023). Theoretically, Talberth & Weisdorf (2017) in their GPI 2.0 methodology attempt to frame GPI as a measure of current economic welfare in a given year as opposed to sustainability that a flow measure such as GPI is not equipped to measure, leaning on the notion of “psychic income”¹ (Fisher, 1906) and with clearer policy relevance aimed at increasing present economic welfare. However, these attempts were not synchronised and have resulted in further divergence of the methods, exhibiting the main problem with the metric, the lack of standardisation (Malinauskaite et al., 2026). Sensitivity analysis has rarely been performed in GPI studies (at least not referring to them as such), but some studies, such as Lazarus and Brown (2022) examined the effects of benchmarking on the GPI results in the United States and the state of California, while Van der Slycken and Bleys (2023) calculated an alternative version of ISEW for Belgium that includes emissions embodied in trade, climate impacts of aviation and shipping, and shadow economy, comparing the results between the different versions. However, neither of these studies has referred to this as “sensitivity analyses”, which is not a commonplace in GPI/ISEW studies. However, as the valuation methods for costs and benefits of economic activity vary greatly between GPI frameworks and studies, sensitivity analysis can shed light on the influence of methodological choices on overall GPI estimates.

This paper introduces the first comprehensive GPI assessment for the Baltic States, using an adapted version of the Talberth and Weisdorf (2017) GPI 2.0 methodology that has previously been applied in the State of Maryland in US (ibid.), Iceland (Cook & Davíðsdóttir, 2021), China (Guan et al., 2024), and Brazil (Senna & Serra, 2021) to evaluate economic welfare trends from 1995 to 2023. The analysis is guided by three research questions:

1. How has the GPI evolved in comparison to GDP in Estonia, Latvia, and Lithuania from 1995 to 2023, and what have been the largest benefit and cost items?
2. How sensitive are the Baltic GPI estimates to changes in the parameters of their highest-contributing components?
3. What insights can the GPI offer about changing economic welfare in the Baltic States, and by extension, other transition economies?

The paper aims to contribute to the Beyond GDP and transition economy literature in three ways: it applies the updated GPI 2.0 framework to the context of small post-communist economies and reassesses whether rapid GDP growth in the Baltic States has translated into genuine economic welfare gains; methodologically, it implements a structured sensitivity analysis of the GPI 2.0 framework, systematically varying key parameters to show how these assumptions shape GPI estimates and their comparability across countries; and provides the first comprehensive long-run GPI accounts for Estonia, Latvia and Lithuania for 1995-2023,

¹ Fischerian concept of “psychic income” uses the definition by Irving Fischer (1906) of economic benefits experienced by consumers rather than the amount of goods and services produced and marketed, as measured by GDP, or the Hicksian notion of income that necessitates non-diminishing stocks of capital.

thereby extending the empirical basis of GPI 2.0 applications beyond the predominantly high-income country cases documented so far.

In the remainder of the paper, the study approach, findings, and discussion are laid out. Section 2 describes the historical context, data, and methods, including the construction of GPI accounts, and outlines the sensitivity analysis conducted on the high-impact parameters of income inequality adjustment, valuation of services from social capital (KS) proxied by the hourly wage rate, and the social cost of carbon (SCC) used to estimate the damages of climate change. Section 3 presents the results, comparing GPI trends in the three Baltic States and highlighting the major cost and benefit items. This study then reports the outcomes of the sensitivity tests to illustrate how varying key parameters affects the GPI outcomes. Section 4 provides a discussion of these results, examining what the GPI reveals about the economic welfare trends in the Baltic States. Finally, Section 5 concludes with a summary of the main insights and adds reflections on the usefulness and limitations of the GPI as a tool for evaluating “beyond GDP” progress.

2. Background and methods

2.1 *The transition of the Baltic States*

The transition from centrally planned to market-based systems has been one of the most significant economic transformations witnessed in Europe since the collapse of the Soviet Union (Alix-Garcia et al., 2016; Mole, 2012). For the Baltic States of Estonia, Latvia, and Lithuania, this process has been closely intertwined with political independence, structural reforms, and integration into the European Union (EU) (G. Černiauskas & Dobravolskas, 2011; Dzemydaitė, 2016). Their transition has been characterised by rapid political and economic reforms, aggressive liberalisation, and integration into Western economic and political institutions, including EU and The North Atlantic Treaty Organization (NATO) accession in 2004 (de Vries & Nemec, 2025). Table 1 highlights the main stages and trends in the economic transition and development of the three Baltic States since 1990.

Table 1. The key economic developments in the Baltic States since 1990.

Period/Stage	Key Developments
Early 1990s: transition shock	All three Baltic States regained independence (1990-1991) and then endured severe economic collapse and hyperinflation in the early 1990s as they transitioned from planned economies to market systems (Staeher, 2015).
Mid-late 1990s: stabilization/recovery	By the mid-1990s, strict stabilization policies curbed the inflation and restored growth across the Baltic States, stimulated by market reforms and increasing trade, with a brief setback during the 1998-1999 Russian financial crisis (Staeher, 2015).
2000-2007: rapid economic growth and EU integration	The early 2000s brought an economic boom, also known as the “Baltic Tiger” period, with some of the world’s fastest GDP growth rates, as all three countries pursued liberalisation and attracted investment, culminating in EU accession in 2004 (Avlijaš, 2020; Kramer, 2012).
2008-2009: global financial crisis	The global financial crisis abruptly ended the economic boom: cross-border capital flows dried up, property bubbles burst, and the Baltic economies plunged into some

	of Europe's deepest recessions (GDP fell around 14-20% in 2009), prompting severe austerity and an International Monetary Fund (IMF) bailout in Latvia (Kramer, 2012).
2010s: recovery and Euro adoption	The Baltic economies rebounded quickly, reaching the pre-crisis GDP levels in early 2010s. Estonia adopted the Euro in 2011, Latvia in 2014, and Lithuania in 2015, subsequently achieving high-income status. Convergence with the rest of the EU slowed and large-scale emigration underscored ongoing challenges (European Central Bank, 2017; Park, 2015; Remeikienė & Gasparėnienė, 2019).
2020s: the COVID-19 pandemic and new shocks	The COVID-19 pandemic caused a short recession in 2020 followed by a rebound in 2021, but Russia's 2022 invasion of Ukraine triggered an energy price spike that sent Baltic inflation to record highs (roughly double the Eurozone average) and dampened real income growth (Hartwell et al., 2022; The Baltic Times, 2024).

From the mid-1990s to the early 2020s, the Baltic economies experienced substantial GDP growth: Estonia saw GDP per capita grow by more than tenfold between 1995 and 2023 (see Figures 1 and 2, and Appendix B); Latvia and Lithuania followed similar trajectories, with periods of rapid expansion, notably before the 2008 financial crisis, and recovery-driven growth thereafter. These developments were facilitated by foreign direct investment, export-led manufacturing, and receipt of EU structural funds (Dzemydaitė, 2016). However, these growth patterns have often masked inequalities, regional disparities, and environmental externalities (Masso et al., 2014; Pädam et al., 2010). GDP growth has been used as a primary indicator of success of this transition, yet such a growth-focused narrative overlooks nuanced welfare dimensions of this transition, as income inequality remained a concern with the Gini coefficient in the Baltic States regularly ranked among the highest in the EU (Avlijaš, 2020; Eurostat, 2024j). Furthermore, emigration, particularly of younger and skilled workers, has constrained labour markets and contributed to population decline, with Latvia and Lithuania losing over 20% of their population since the 1990s (OECD, 2021). Indicators such as life expectancy, educational attainment, and human development have improved significantly in the Baltic States: e.g., life expectancy increased by over five years across the region since 1995 (Eurostat, 2025a) and the Human Development Index (HDI) rose from medium to high/very high levels (UNDP, 2024). However, the public discourse and policymaking remain anchored in GDP-centric development, with minimal debate on any social or environmental trade-offs across the Baltic States (de Vries & Nemec, 2025).

2.2 The GPI methodology

The GPI adjusts personal consumption (household budget expenditures) to income inequality, adds values for positive non-market contributions (e.g., volunteer work and household labour), and deducts various “bads” resulting from economic activity (e.g., the cost of pollution, climate change, crime, and resource depletion) (C. Cobb et al., 1995; J. Cobb & Daly, 1989; Talberth et al., 2007). The updated GPI 2.0 framework by Talberth and Weisdorf (2017) organises its components into essential capital categories: human, social, natural, and financial and built, and updates valuation techniques for some components, such as non-renewable resource depletion and services from natural capital. This study follows Talberth and Weisdorf's (2017) GPI methodological framework by adopting the following calculation formula:

$$GPI_t = \frac{1}{N} \sum_{i=1}^N \left[U_i((HBE_1 - DEFR - HI_i) \times INQ + PP)_i \right. \\ \left. + U_i(s(KH_i + KS_i + KB_i + KN_i)) - dU_i(DKN_1 + POL_i + SC_i) \right]$$

Where $U_i((HBE_1 - DEFR - HI_i) \times INQ + PP)_i$ represents is the utility from consumption of goods and services, $U_i(s(KH_i + KS_i + KB_i + KN_i))$ refers to utility sourced from essential capital, and $dU_i(DKN_1 + POL_i + SC_i)$ is disutility linked to undesirable environmental and social conditions, and the sub-categories are as follows:

HBE = household budget expenditures

DEFR = defensive and regrettable expenditures

HI = household investments

INQ = inequality adjustment

PP = public provision of goods and services

s = services

KH = services from human capital

KS = services from social capital

KB = services from built capital

KN = services from natural capital

DKN = depletion of natural capital

POL = pollution

SC = social costs of economic activity

This GPI study includes 30 sub-indicators, which are listed in Table 2 together with the type of capital they represent, indication whether they constitute welfare addition or deduction, and data sources. The detailed explanations of the assumptions and calculation methods for each sub-indicator are provided in the supplementary material (Appendix A). All estimates were converted to 2024 EUR prices. For the few years where data was not available, the values were interpolated between missing years, and if the last year (2023) was missing, the value of the last available year was used.

Table 2. The 30 GPI sub-indicators used in the study

Sub-indicator	Type of capital	Operation	Data source(s)
Market-based welfare			
<i>Household budget expenditures (HBE)</i>	Financial	Addition	Eurostat (2024d)
<i>Defensive and regrettable expenditures (DEFR)</i>			
Insurance	Financial	Deduction	(Eurostat, 2024i)
Welfare neutral goods	Human	Deduction	(Eurostat, 2024i); Lawn (2013)
Costs of maintaining dwelling services	Built	Deduction	(Eurostat, 2024i)
<i>Household investments (HI)</i>			
Consumer durables	Built	Deduction	(Eurostat, 2024i)/ Kenny et al. (2019)
Goods and services for routine household maintenance	Built	Deduction	(Eurostat, 2024i)
			Eurostat (2024h)

<i>Income inequality adjustment (INQ)</i>	Financial	Deduction	Eurostat (2024g); World Bank (2025)
<i>Public provision of goods and services (PP)</i>			
Education	Human	Addition	Eurostat (2024e)
Healthcare	Human	Addition	Eurostat (2024e)
General public services	Human and social	Addition	Eurostat (2024e)
Utility sourced from essential capital			
<i>Services from human capital (KH)</i>			
External benefits from higher education	Human	Addition	Eurostat (2024d) / Talberth et al. (2007)
<i>Services from social capital (KS)</i>			
Value of leisure time	Social	Addition	Eurofound (2011); Eurostat (2024a); OECD (2025)
Value of unpaid labour	Social	Addition	Eurofound (2011); Eurostat (2024a); Eurostat (2024b); Eurostat (2022)
Value of unpaid labour in the volunteering sector	Social	Addition	Eurofound (2011); Eurofound (2018); ILO (2018)
Recreation, culture and religion	Social	Addition	Eurostat (2024e)
<i>Services from natural capital (KN)</i>			
Services from preserved natural capital	Natural	Addition	BGI Consulting (2020); Talberth and Weisdorf (2017)
<i>Services from built capital (KB)</i>			
Transport	Built	Addition	Eurostat (2024e)
Housing and community amenities	Built	Addition	Eurostat (2024e)
Manufacturing, construction and mining	Built	Addition	Eurostat (2024e)
Services from consumer durables		Addition	(Eurostat, 2024i); Kenny et al. (2019)
Disutility linked to undesirable environmental and social conditions (environmental and social costs)			
<i>Depletion of natural capital (DKN)</i>			
Non-renewable resource depletion	Natural	Deduction	O'Mahony et al. (2018); Van der Slycken and Bleys (2024); Eurostat (2025b)
Avoided depletion via nature protection	Natural	Deduction	Eurostat (2024e)
Soil erosion	Natural	Deduction	Panagos et al. (2018)
<i>Pollution (POL)</i>			
Air pollution	Natural	Deduction	Dechezleprêtre et al. (2019); OECD (2019); Eurostat (2024d)
Climate change contribution	Natural	Deduction	UNFCCC (2024); Rennert et al. (2022); Moore et al. (2024); OECD (2024a, 2024b, 2024c)
Solid waste	Natural	Deduction	Eurostat (2024f); Kinnaman (2009)
Avoided damages via pollution abatement	Natural	Deduction	Eurostat (2024e)
<i>Social costs of economic activity (SC)</i>			
Unemployment	Social	Deduction	Eurostat (2024l); Eurostat (2024a)
Crime	Social	Deduction	Eurostat (2024e)
Commuting	Human	Deduction	Eurostat (2022); Eurostat (2021); EuroDev (2024)

2.3 Sensitivity analysis

The highly influential effect of some of the components and their parameters, e.g., value of leisure time, motivated the authors to perform a sensitivity analysis on three of the most influential components: income inequality adjustment, hourly wage rate that determines the sizeable contributions for the value of leisure time, and the social cost of carbon that presented the highest environmental cost. The Medium estimate in Table 3 presents the baseline case and the basis on which the GPI results are analysed and compared in the Results section, while the Upper and Lower bound estimates are used to illustrate the wide range of GPI results altered by parameter changes. The parameter values and the estimates of components are provided in Appendix D.

Table 3. The parameters used for the sensitivity analysis with the three main scenarios.

	Upper bound (high estimate)	Medium estimate (baseline case)	Lower bound (low estimate)
Inequality adjustment	Eurostat (2024g) Gini with the baseline of the lowest value in the study period	World Bank (2025) Gini with the baseline of the lowest value in the study period	World Bank (2025) Gini with the lowest value recorded globally (24.1)
Hourly wage rate	Average gross adjusted salary per employee (Eurostat, 2024a)	Average gross adjusted salary per employee (Eurostat, 2024a) minus wage tax (OECD, 2025)	GDP expenditure on wages (Eurostat, 2024d) and salaries minus wage tax (OECD, 2025)
Cost of carbon	(OECD, 2024a, 2024b, 2024c) Net Effective Carbon Rates: 77.04 EUR (Estonia), 57.44 (Latvia), and 37.01 EUR (Lithuania) in 2024 EUR per tonne/CO ₂	207 EUR (2024) per tonne/CO ₂ (Rennert et al., 2022)	318 EUR (2024) per tonne/CO ₂ (Moore et al., 2024)

Income inequality adjustment

An index-derived adjustment based on the extent of the Gini coefficient deviation from a baseline year was applied, with the lowest year of income inequality given a base value of 100. The year with the lowest Gini coefficient in Estonia according to Eurostat (2024g) was 2008 (33.6), in Latvia 2023 (36.8), and in Lithuania – 2007 (36.7) (*low inequality adjustment*). Given that the inequality adjustment has a substantial effect on the overall GPI result, a sensitivity analysis was then also carried out using Gini estimates from the World Bank (2025) that were somewhat lower than the Eurostat estimates and with differing years for the lowest Gini values: 1995 (30.1) for Estonia, 1995 (31.0) for Latvia, and 2000 (31.7) for Lithuania (*medium inequality adjustment*). The third and biggest inequality adjustment was performed using the Eurostat Gini rates and shifting the comparative baseline to the lowest Gini recorded globally, which was 24.1 Slovakia in 2023 (ibid.) (*high inequality adjustment*). The latter was done to check how the GPI would be impacted by an income inequality adjustment with a lower base; Slovakia's Gini coefficient was chosen because it was the lowest in 2023 and because it represents a transition economy in Europe that is arguably comparable to the Baltic States (Varblane & Vahter, 2005).

Services from social capital – hourly wage

Average hourly wage was calculated by dividing the “average full time adjusted salary per employee” (Eurostat, 2024a) by the actual work hours (Eurostat, 2024b) (this hourly wage rate represents the *high wage estimate*). Since hourly wage rate had a very sizeable effect on the overall GPI, sensitivity analysis was carried out using two lower hourly wage rate estimates based on two different ways to measure disposable income: one calculated by subtracting average tax on wages estimated yearly by the OECD (2025) from the gross annual salary (*medium wage estimate*) and the other based on the annual GDP expenditure on wages and salaries (Eurostat, 2024m), subtracting the average tax on wages (OECD, 2025), and dividing it by the working population (Eurostat, 2024c) and the actual work hours per person per week (Eurostat, 2024b) (*low wage estimate*). The reason for deducting the taxation on wages was partly motivated by the focus of the updated GPI methodology on experienced welfare in a given year (Fisher, 1906; Talberth & Weisdorf, 2017) as opposed to long-term benefits arguably derived from paying taxes. The taxation rates quoted by the OECD ranged between 36.2% and 43.3% in Estonia, 40.4% and 44.3% in Latvia, and 37.1% and 45.7% in Lithuania during the study period (OECD, 2025). All wages were converted into 2024 EUR using Eurostat (2024h) deflation.

Social cost of carbon

Quantity of man-made greenhouse gas emissions (excluding LULUCF²) (UNFCCC, 2024) was multiplied by the average social cost of carbon using the mean outcome from the meta-analysis of Rennert et al. (2022), where the SCC was estimated to be 185 USD per tonne of CO₂ eq. in 2020 USD (207 EUR in 2024) (*medium carbon cost rate*). Since climate change contribution was the most sizable environmental cost, sensitivity analysis was carried out using a lower and a higher cost of carbon estimates. The *low carbon cost rate* is based on the OECD estimates of the Net Effective Carbon Rates in 2023, which were (in 2023 EUR per tonne of CO₂ eq.) 73.37 EUR in Estonia (OECD, 2024a), 56.31 EUR in Latvia (OECD, 2024b), and EUR 36.3 EUR in Lithuania (OECD, 2024c)³. These rates were chosen as the low estimate because they reflect the actual price of carbon in the three Baltic States in 2023. The *high carbon cost rate* is based on the Moore et al. (2024) global synthesis study, which estimated 283 USD per tonne of CO₂ eq. in 2020 USD (318 EUR in 2024).

The combination of these three parameters resulted in 27 GPI estimates, as the scenario tree in Figure 1 demonstrates. The combination of low inequality adjustment, high wage rate, and low cost of carbon rate resulted in the Upper Bound Estimate (the highest value for the GPI calculated for the three countries), while the high inequality adjustment, low hourly wage rate, and the high estimate of carbon cost resulted in the Lower Bound Estimate. The Medium Estimate, which is used as a baseline case for GPI comparisons in the next section, uses the medium inequality adjustment, medium hourly wage estimate, and medium SCC from Rennert et al. (2022).

² Land Use, Land-Use Change and Forestry (UNFCCC).

³ 77.04 EUR in Estonia, 57.44 in Latvia, and 37.01 EUR in Lithuania in 2024 EUR.

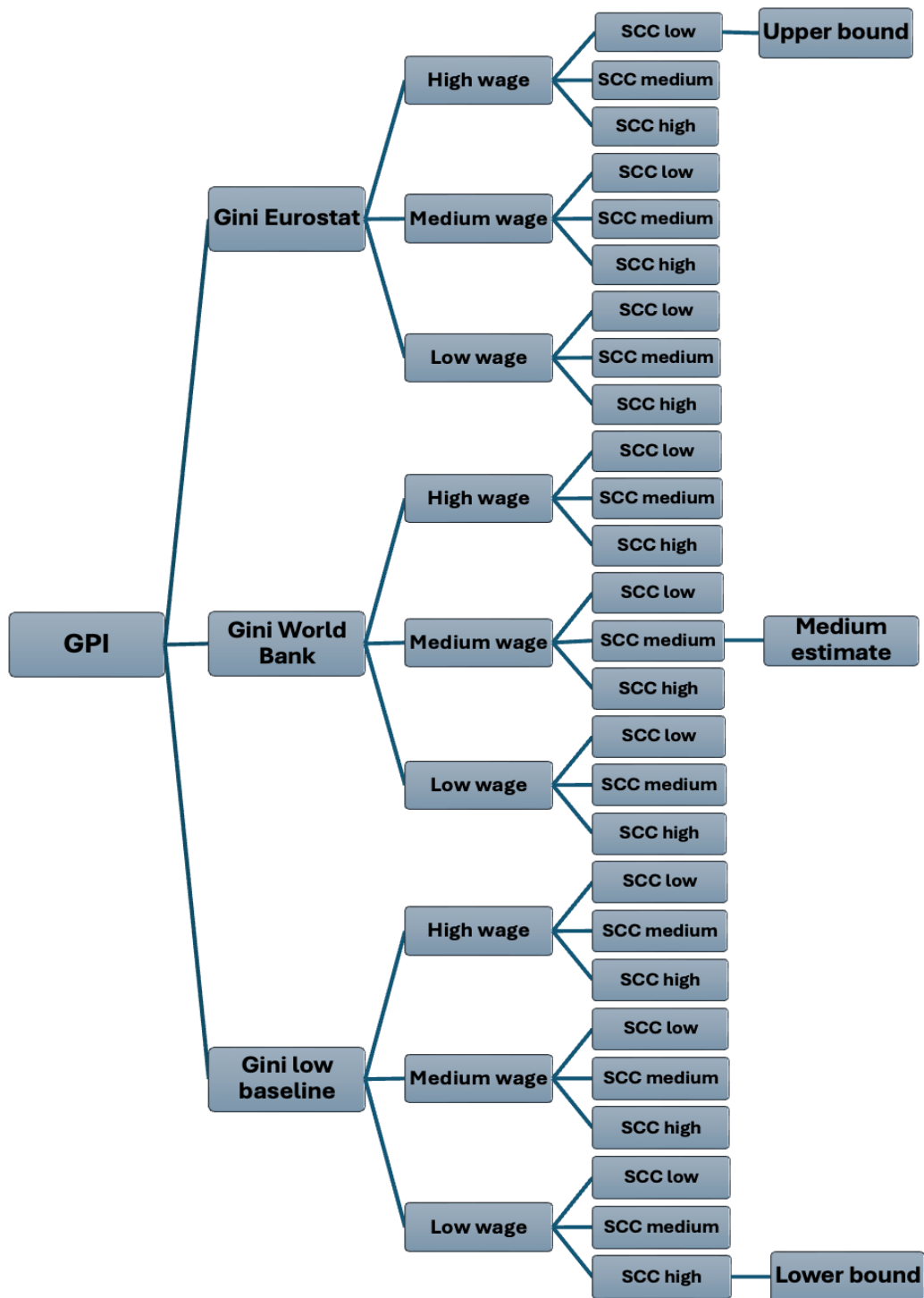


Figure 1. The GPI sensitivity analysis scenario tree.

3. Results

3.1 General results

The results imply that the benefits associated with the economic activity in the Baltic States have generally outweighed the costs since the late 1990s until 2023, as can be seen in Figures

2 and 3, depicting the GDP and GPI for the Baltic States (medium estimate) from 1995 to 2023. Figure 2 presents the GPI and GDP results in absolute terms in million 2024 EUR and Figure 3 – in thousand 2024 EUR per capita. The blue colours represent Estonia (EE), red – Latvia (LV), and greens – Lithuania (LT); darker colours mark GPI and lighter – GDP.

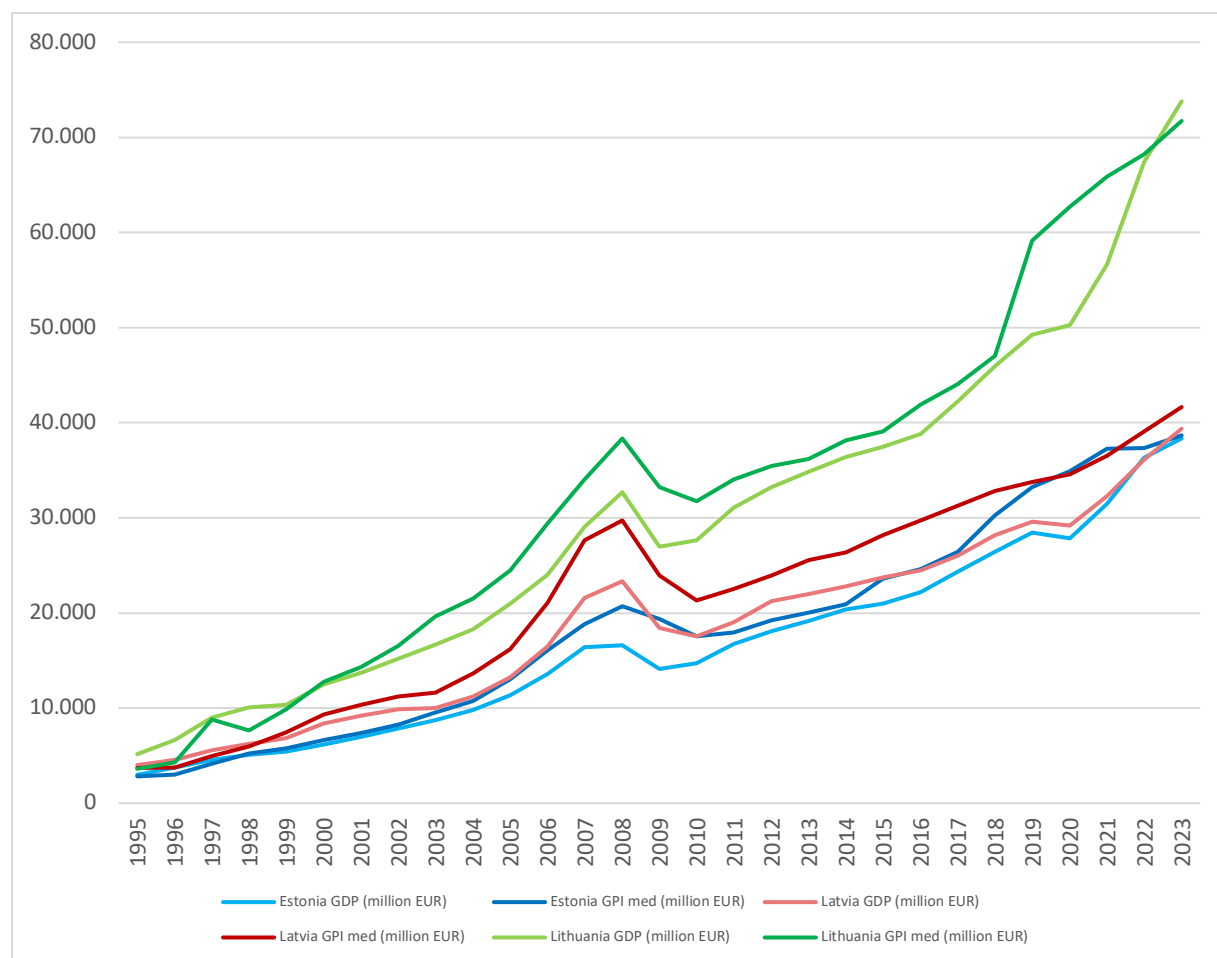


Figure 2. GDP and GPI of Estonia, Latvia, and Lithuania (medium estimate).

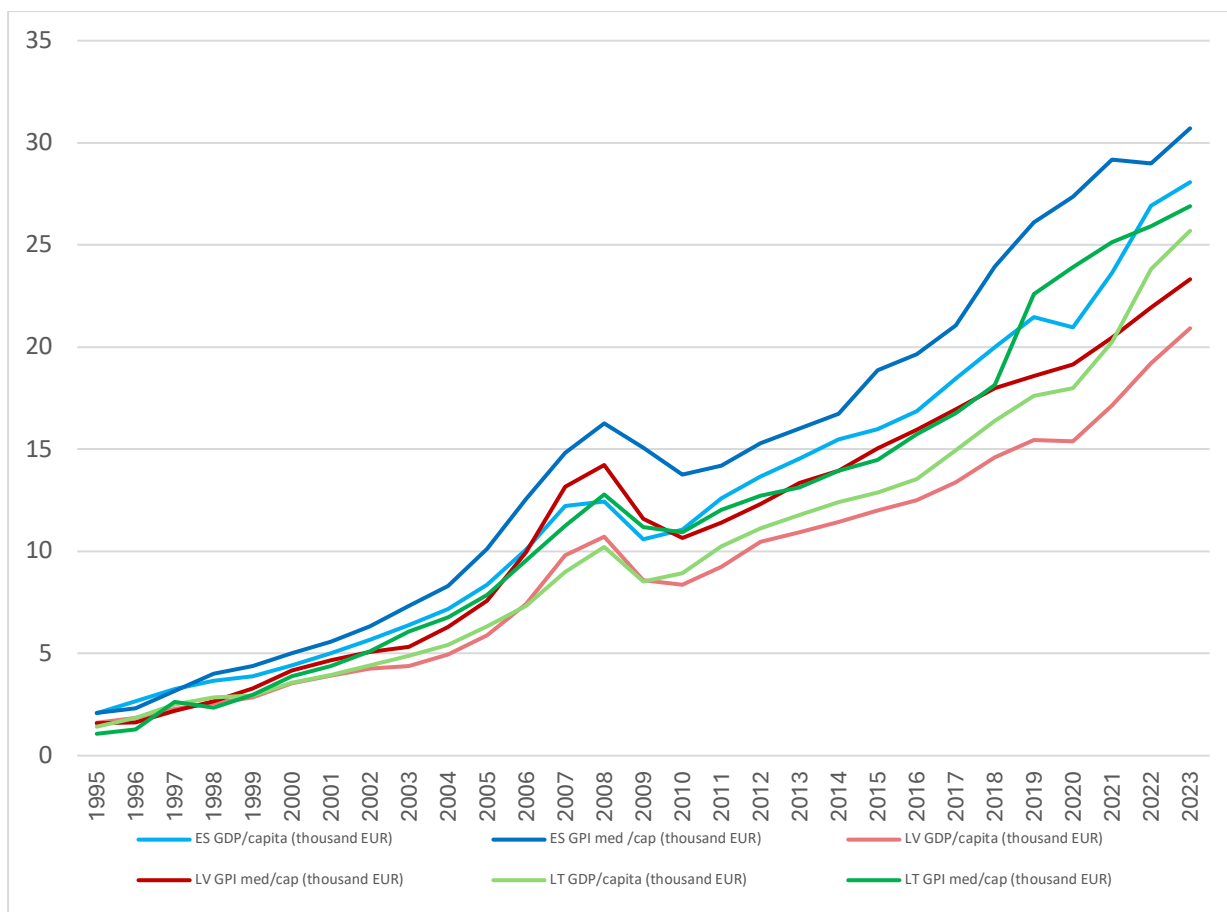


Figure 3. The GPI and GDP per capita results for the three Baltic States.

The three Baltic States have similar GPI (and GDP) per capita trajectories, albeit at differing rates of consumption and growth. All three economies start from relatively low welfare baselines in the mid-1990s with GPI per capita ranging between just over 1000 EUR in Lithuania, 1500 EUR in Latvia, and 2000 EUR in Estonia and growing steadily throughout the assessment period, eventually reaching 30,100 EUR, 23,300 EUR and 26,900 EUR GPI per capita, respectively, in 2023. This indicates more than tenfold growth in economic welfare measured by the GPI. Figure 2 demonstrates that Estonia has consistently maintained the highest GPI throughout the study period, with its GPI (in absolute terms) surpassing GDP from 1997 until 2023. The GPI overtook the GDP in Lithuania in 2000 and remained higher until 2023, and in Latvia, the GPI surpassed GDP in 1998 and has remained higher since.

During the stabilisation and recovery period from 1995 to 1999, the GPI per capita grew on average by 25.5% in the three countries: 20.8% in Estonia, 20.6%, and 35.1% in Lithuania. The average GDP growth rates during this period were 17.2%, 15.6%, and 20.6%, respectively (17.8% on average in all three countries). By the year 2000, the Baltic economies had largely stabilised and recovered from the initial shock of the transition from planned to market systems, showing more stable but still high GPI growth rates between 15% and 30% and GDP growth rates between 14% and 24%.

During the 2000-2007 period of rapid economic growth and EU integration, the GPI per capita growth rates in all three countries averaged to 18% (16.5% in Estonia, 19.3% in Latvia, and 18.1% in Lithuania), while GDP per capita growth during this period averaged to around 16%

(15.5%, 17%, and 15.1%, respectively). Both GDP and GPI showed more steady growth rates than in the 1990s, indicating steady high expansion in both economic output and economic welfare during this period and reflecting increased household consumption and rising wages.

This fast growth that earned the Baltic States the name of “Baltic Tigers” (Åslund, 2015) during the first 15 years of independence ended abruptly during the 2008-2009 global financial crisis that resulted in large GPI per capita contractions, ranging from -7.2% in Estonia to -12.5% in Lithuania and -18.6% in Latvia in 2009. The GDP contraction rates in the same year were even higher: -14.8% in Estonia, -16.5% in Lithuania, and -19.9% in Latvia. This demonstrates that the three economies were severely affected by the crisis, yet the Latvian economy suffered the most both in terms of GPI and GDP per capita (Figure 3). In absolute terms represented in Figure 2, Estonia’s GDP declined by 17.5% in 2009 and recovered to 2007 levels in 2012, while the GPI shrunk by 6.7% in 2009 and recovered to its former level in 2013. In Latvia, the GDP contracted by 17.5% and the GPI by 19.5% in 2009 and both recovered to their pre-economic crisis levels in 2012. In Lithuania, GDP and the GPI contracted by 17.5% and 13.4%, respectively, and while the former recovered to pre-crisis levels in 2012, the latter did not reach its 2007 level until 2014 (Figure 2).

During the 2011-2019 period of post-economic crisis recovery and Euro adoption, the Baltic States’ GPI and GDP per capita growth rates remained stable but much lower than between 1995 and 2008, both averaging to 7.5% across all three economies during this period (Figure 3). The highest average GPI per capita growth rate in the 2010s was in Lithuania – 8.6%, while it averaged to 7.4% in Estonia and 6.4% in Latvia between 2011 and 2019, confirming that the latter was the hardest-hit by the economic crisis and slowest in recovery of the three (Dudzevičiūtė, 2026).

The 2020s brought the economic downturn caused by the COVID-19 pandemic and new shocks related to the Russian invasion of Ukraine and subsequent rise in fuel prices and inflation rates. The COVID-19 pandemic resulted in a slowdown of the GPI per capita growth rates in 2020 that were 4.7% in Estonia, 3.1% in Latvia, and 5.1% in Lithuania, while GDP per capita growth rates the same year were -2.3%, -0.5%, and 2.1%, respectively. However, both GPI and GDP per capita quickly recovered and exceeded the 2019 levels in 2021.

The war in Ukraine and subsequent high inflation (Hartwell et al., 2022) resulted in lower GPI per capita growth rates post-2020 than in the previous decade that fell from average of 7.5% in 2011-2019 to 4.8% in 2020-2023 (4.2% in Estonia, 5.8% in Latvia, and 4.5% in Lithuania). The average GDP per capita growth in the latter period was 7.2% in Estonia, 8% in Latvia and 10% in Lithuania, indicating that economic output grew faster than the net economic welfare measured by the GPI. In Estonia and Lithuania, GDP slightly exceeded the GPI in 2023, while in Latvia the gap between them narrowed (Figure 2).

Overall, the Baltic States demonstrated continuous and substantial economic welfare growth measured by the GPI, yet the GPI growth has been slowing down since 2020. The GPIs of all three countries demonstrate convergence between GDP per capita and GPI per capita towards the end of the assessment period.

3.2 Most influential components

Even though the same method was applied when calculating the GPI, differences in economic structure and social conditions in the three Baltic States led to some cross-country variation. In all three countries, the largest positive contributors to welfare were household consumption (HBE) that followed the growth trajectory of the GDP; KS services, including the value of unpaid labour and leisure time, that constitute the most influential component of GPI growth, especially after 2010; provision of public goods and services, with contributions from education, health, and general public services; and services from KB, with gradually increasing contributions from expenditures on transport, housing, and community amenities. Notably, KS dominated overall GPI growth, driven by rising hourly wages that are applied to the estimates for the time spent on leisure activities and unpaid work.

Figures 4, 5 and 6 show the component contributions grouped into market-based welfare, services from essential capital, and environmental and social costs. The detailed breakdown of all the costs and benefits is provided in supplementary material (Appendix B). All three countries have seen steady growth in benefits from essential capital that grew in tandem with market-based welfare, except for the dips during the 2008-2009 financial crisis and the 2020-2021 COVID-19 pandemic. For instance, the services from social capital (medium estimate) accounted for an average of 84% of the GPI in Estonia, 76% in Latvia, and 80% in Lithuania between 1995 and 2023. During the economic contractions, the social and environmental costs shrunk, in part offsetting these dips: for instance, in 2009, they fell by 15.9% in Estonia, by 18.7% in Latvia, and by 18.0% in Lithuania. In Estonia and Latvia, the market-based welfare surpassed the services from essential capital, in 2023 and 2021, respectively, indicating the diminishing dominance of the latter in the GPI.

In terms of negative contributors to welfare, the key cost components included income inequality adjustment, especially in Latvia and Lithuania where inequality levels remain among the highest in the EU with Gini coefficients of 36.8 and 40.4 in 2023, respectively, while Estonia's Gini coefficient was 35.8 (Eurostat, 2024g, 2024j). The inequality adjustment based on Eurostat Gini averaged to around 19% of HBE in Estonia and Lithuania and 14% of HBE in Latvia throughout the study period. The environmental costs were dominated by climate change damages accounted for 48% (low estimate), 68% (medium estimate), and 76% (high estimate) of social and environmental costs in Estonia; 31% (low estimate), 46% (medium estimate), and 54% (high estimate) in Latvia, and 28% (low estimate), 51% (medium estimate), and 59% (high estimate) in Lithuania. Social costs were most influenced by costs of commuting and vehicle accidents, which accounted for an average of 44% and 36% of social costs in Estonia, 45% and 44% in Latvia, and 48% and 43% in Lithuania throughout the study period. Interestingly, the vehicle accidents accounted for higher costs in the beginning of the assessment period in all three countries, while the commuting costs – towards the end of it (Appendix B). Negative components, such as the cost of pollution and non-renewable resource depletion, remained constant or slightly decreased over the study period as demonstrated in Figures 4, 5 and 6. They were outweighed by the larger positive contributions of market-based and essential capital-based economic welfare components, resulting in overall GPI growth, both in per capita and in absolute terms.

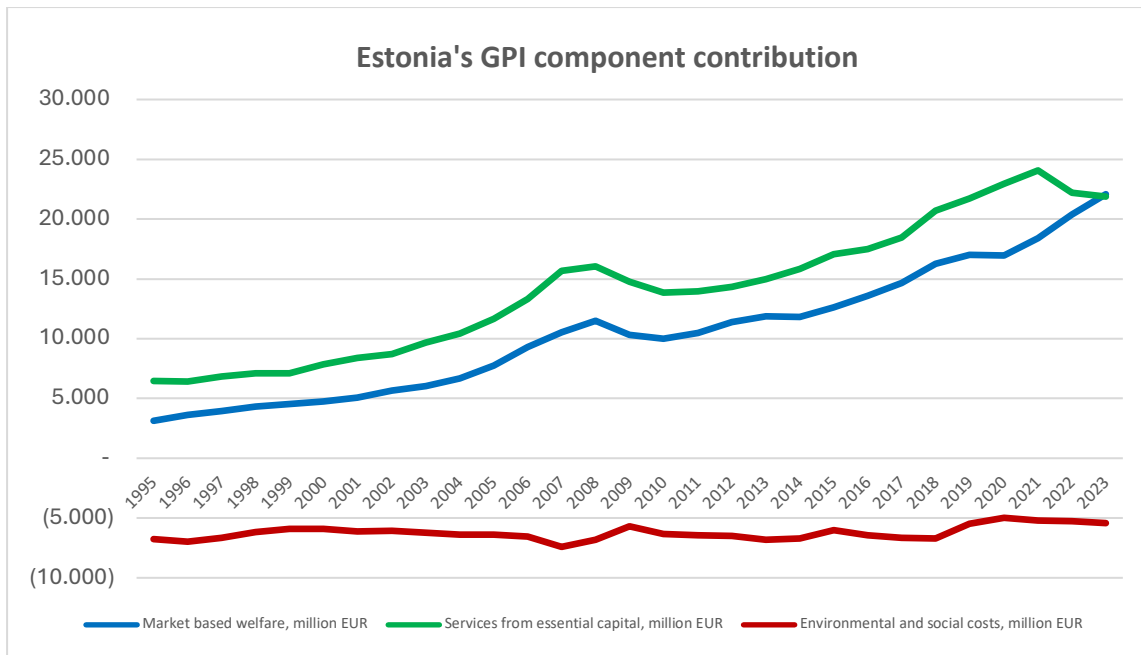


Figure 4. Component group contribution to Estonia's GPI.

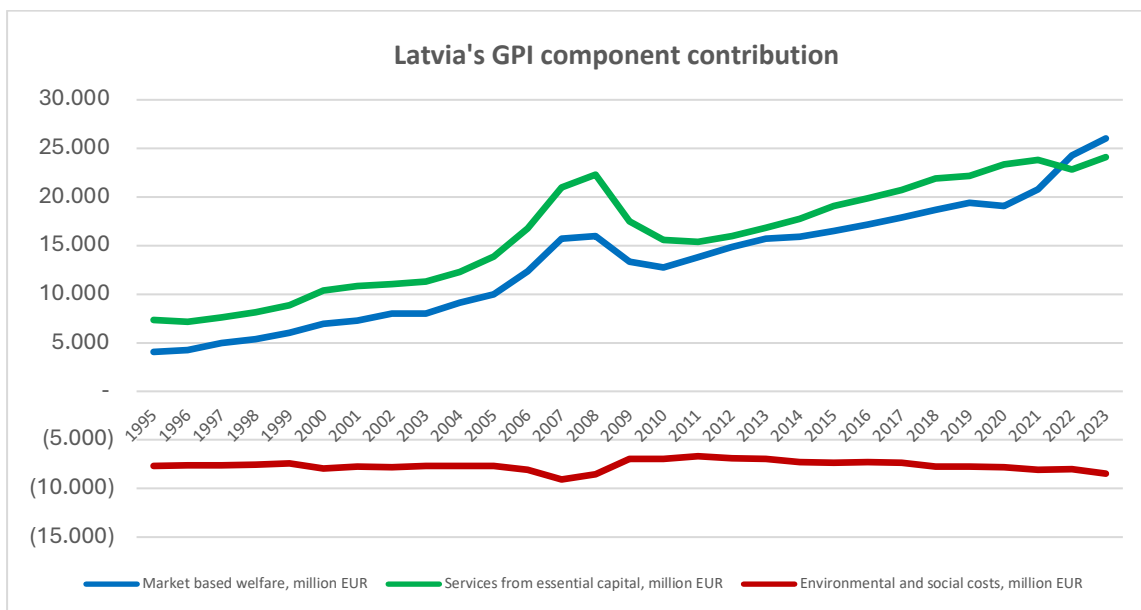


Figure 5. Component group contribution to Latvia's GPI.

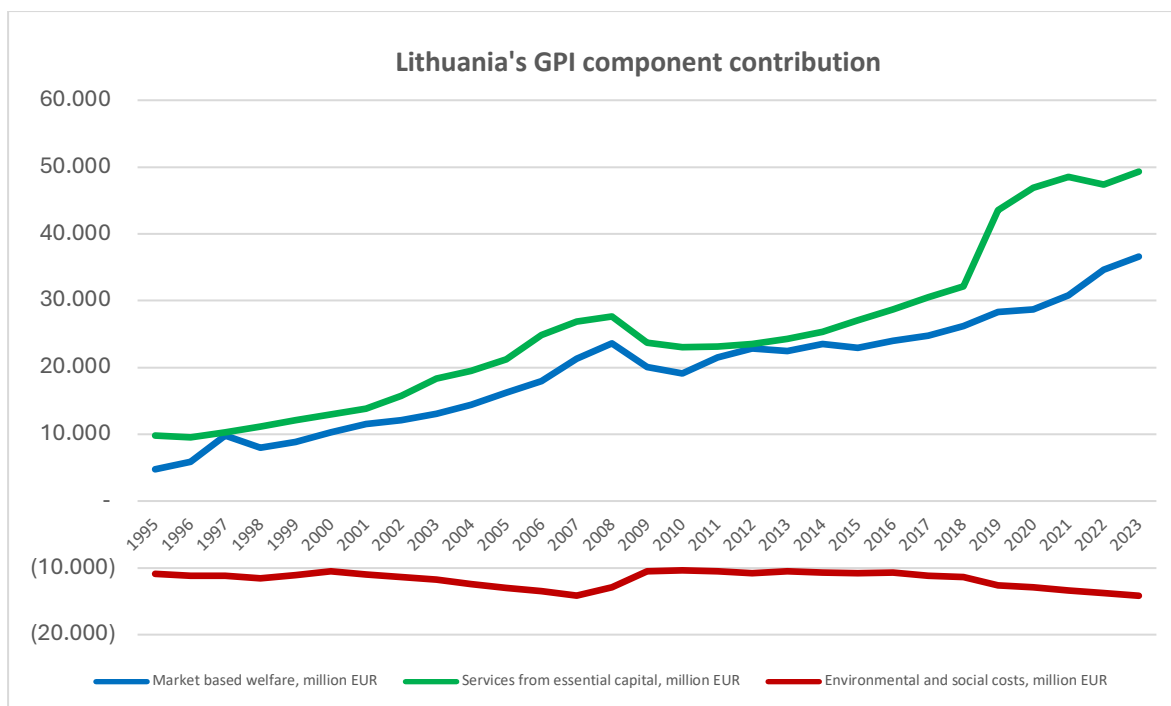


Figure 6. Component group contribution to Lithuania's GPI.

3.3 Sensitivity analysis results

Figures 6, 7, and 8 depict the results of the sensitivity analysis for the GPI results of the three Baltic States (the numerical results can be found in Appendix C). In all three cases, changing the key parameters, especially the hourly wage rate, significantly alters the overall GPI results. The results in the figures below represent the upper bound, medium and lower bound estimates (Figure 1 and Table 3) for Estonia, Latvia, and Lithuania where the effects of the three parameters are summed up. In Estonia, the lower bound GPI estimate averaged to around one-third of GDP, the medium estimate exceeded GDP by 10%, and the upper bound – by 90% on average over the study period. In Latvia, the low estimate amounted to around 44% of GDP, medium estimate exceeded it by 14%, and upper bound estimate – by 85% on average. In Lithuania, the lower bound estimate was on average 62% lower than the GDP, the medium estimate exceeded GDP by 6% on average, and the upper bound estimate – by 84% on average over the study period.

This wide range of estimates (see details in Appendix D, which lists the parameter values and their effects on the respective GPI components in the three scenarios) illustrates the high sensitivity of the GPI to changes to its highest contributing component parameters, especially when they are compounded. In the lower bound estimate, the GPI in all the three states is negative from 1995 to 1999, signalling negative economic welfare in the beginning of the assessment period, while the upper bound GPI per capita estimate in 1999 was over 9,000 EUR in Estonia and over 6,000 EUR in Latvia and Lithuania. In Estonia, the upper bound GPI per capita estimate exceeded the baseline medium estimate by average of 78% (ranging from 235% in 1995 to 37% in 2022), while the lower bound estimate amounted to an average of 62% that was negative of the medium estimate throughout the study period (ranging from 376% smaller in 1995 to 28% smaller in 2023). In Latvia, the GPI per capita bound estimate

was on average 65% higher than the medium estimate (ranging from 180% higher in 1995 to 33% in 2023), while the lower band estimate was on average 41% smaller than the medium estimate in the study period (ranging from 179% lower in 1995 to 25% lower in 2023). In Lithuania, the high estimate of the GPI per capita was on average 81% higher than the medium estimate (from 289% in 1995 to 42% in 2023), and the low estimate – 44% lower (from 255% lower in 1995 to 17% lower in 2023). These large differences demonstrate that the GPI is highly sensitive to parameter choices. The percentage gaps between these GPI per capita estimates are reducing over time as the GPI values increase.

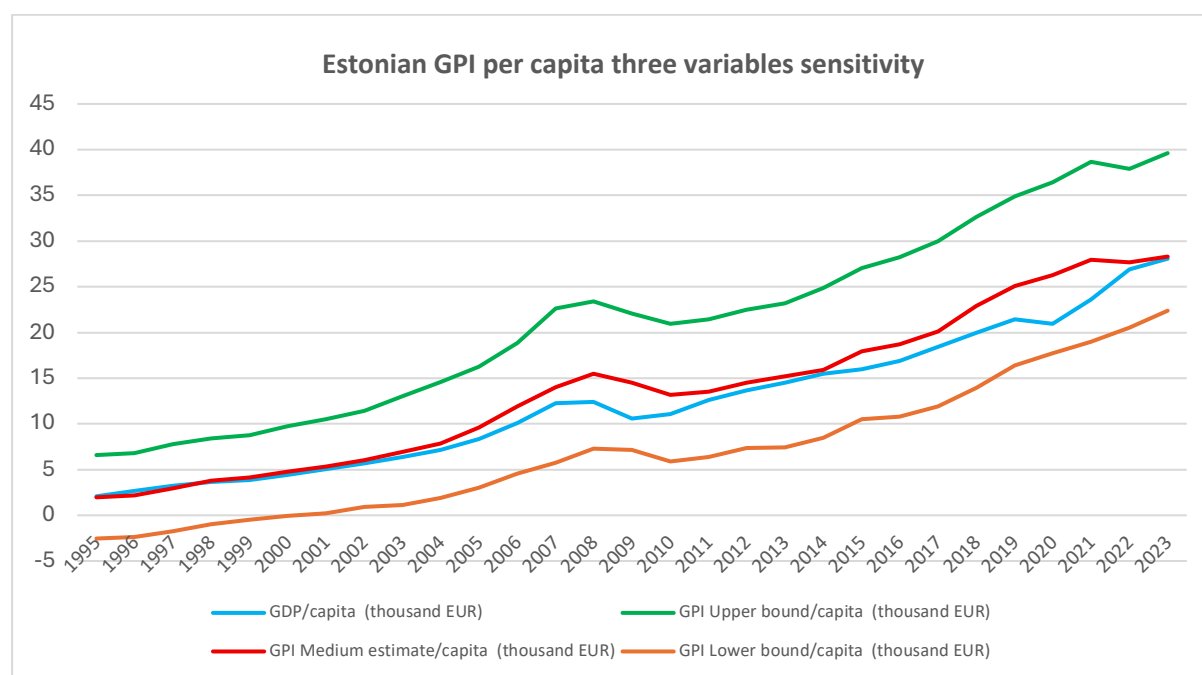


Figure 6. Sensitivity analysis of the Estonian GPI.

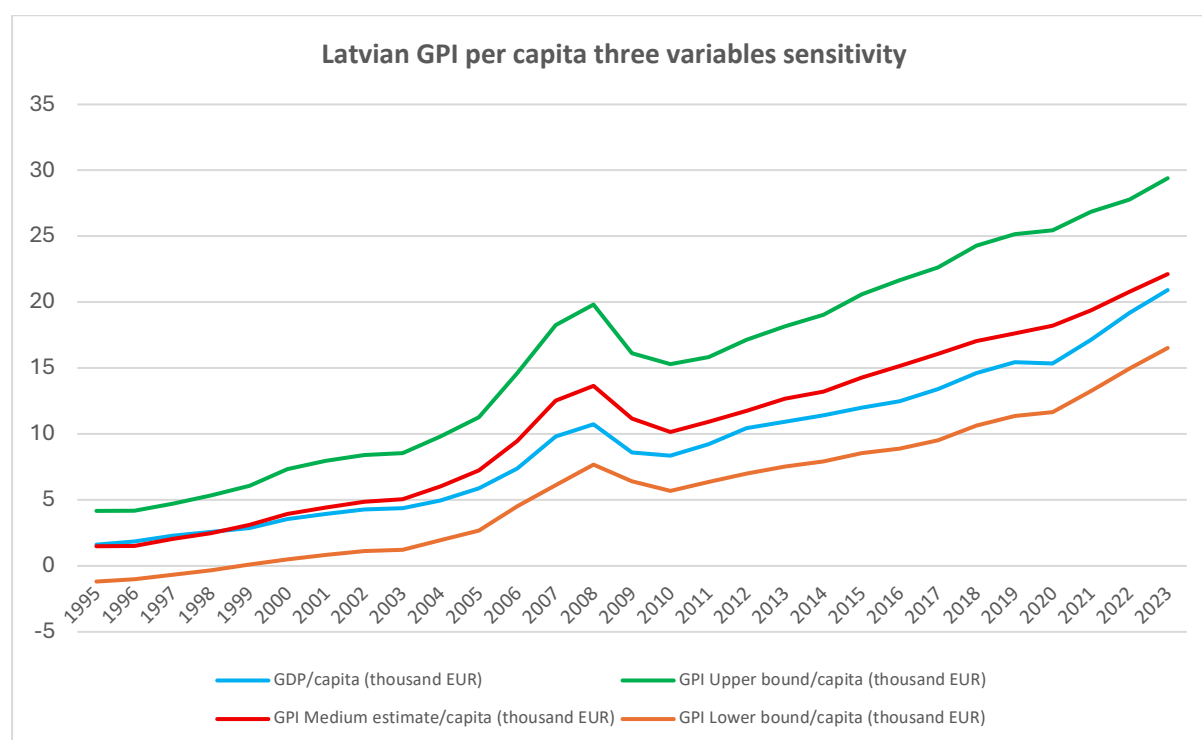


Figure 7. Sensitivity analysis of the Latvian GPI.

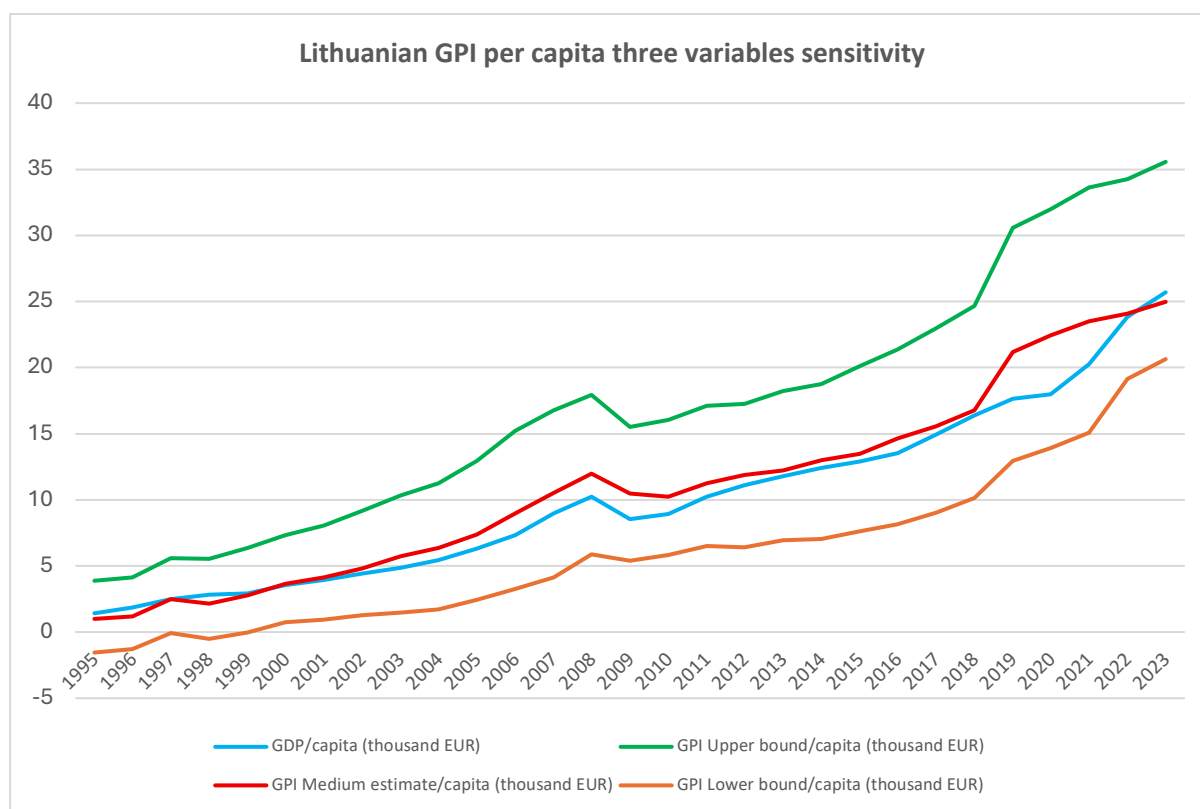


Figure 8. Sensitivity analysis of the Lithuanian GPI.

The Gini coefficient remained between 30 and 40 in all three countries, the highest Gini being in Lithuania (average throughout the study period 39.9 (Eurostat) and 34.8 (World Bank)) and the lowest in Estonia (average 37.6 according to Eurostat and 33.1 by the World Bank), while Latvia's Gini was very close to that of Lithuania's (average 38.7 (Eurostat) and 35 (World Bank)). The relatively high levels of income inequality resulted in sizeable GPI reductions in all scenarios, ranging from 19% to 34% of the total HBE in Estonia, 13% to 38% in Latvia, and 19% to 39% in Lithuania. The increases in hourly wage rates over time have the biggest impact on the GPI results and the differences between the high, medium, and low estimates as the increases in hourly wages from 1995 to 2023 range from 3.4 times (high wage estimate) to 13.4 times (low wage estimate) in Estonia; 3.7 times (high wage estimate) and 16.6 times (low wage estimate) in Latvia; and from 5.5 (high wage estimate) to 28.3 (low wage estimate) in Lithuania. These large ranges and differences result in high divergences in KS contribution estimates that translate into large differences in aggregate GPI results reflected in Figures 6, 7 and 8. The large increases in KS services due to increase in wage rates reflect the increase economic welfare as wages grow.

The alterations in the cost of carbon resulted in sizeable changes in environmental costs and aggregate GPI results, the low estimates being 2-2.5 times smaller than medium estimates and 4 times smaller than the high estimates (details in Appendix D). The cost of climate change based on SCC accounted for an average of between 28% (high estimate) and 62% (low estimate) of the GPI in Estonia; between 17% (high estimate) and 27% (low estimate) in Latvia, and between 32% (high estimate) and 43% (medium estimate) of the total GPI in

Lithuania. These results demonstrate that the choice of the cost of carbon rate has a sizeable impact on overall GPI.

4. Discussion

4.1 GPI and GDP trends in the Baltic States

The Baltic States' GPI trends largely mirrored their rapid GDP growth during 1995-2023, indicating that economic expansion was generally accompanied by increasing economic welfare. Across the three countries, the GPI per capita surpassed GDP per capita by the late 1990s/early 2000s and exceeded it for most of the study period (according to high and medium estimates). This suggests that the post-socialist transition and EU integration delivered genuine economic welfare gains, a finding that is consistent with the narrative that market liberalisation and economic growth brought improvements in living standards and welfare (Klimantas, 2025; Korhonen, 2001). The GPI fluctuated in response to macroeconomic shocks, such as the 2008-2009 economic crisis, the COVID-19 pandemic, and the 2022 Russian invasion of Ukraine. The low and medium estimates in the sensitivity analysis resulted in the GPI falling behind GDP in Lithuania and Estonia in 2023, yet it is too early to tell whether the economic welfare gains from GDP growth are diminishing from this observation. If that would be the case, the results could be indicative of the "threshold hypothesis" observed in some high-income economies, which suggests that additional GDP growth beyond a certain income level ceases to improve genuine economic welfare (Fox & Erickson, 2018; Kenny et al., 2019; Kubiszewski et al., 2013). However, the high sensitivity of the GPI results to the parameter changes observed in this study indicates high uncertainty and warrant caution when interpreting the GPI results.

The increasing household consumption expenditure made a consistently large positive contribution to the GPI, reflecting improving material living standards during the study period, a feature also noted in the literature (Bukovskis, 2022). As wages grew, particularly after the EU accession of the Baltic States in 2004, the monetary values of leisure time and unpaid work increased in tandem, as did public expenditures on education, healthcare, and other public services, resulting in increased economic welfare measured by the GPI. On the cost side, the GPI deductions highlight persistent challenges: income inequality accounted for 4.7% – 23.2% of the GPI deductions, while costs of climate change accounted for 16.6% – 62.4% depending on the estimate⁴. The findings of this study support the transition narrative that economic liberalisation and EU integration has generated genuine economic welfare gains in the Baltic States, but their distributional, environmental, and welfare effects remain uneven and understudied (Beckfield, 2019; Makutėnienė et al., 2023; Masso et al., 2014).

⁴ In Latvia, the mean income inequality penalty amounted to 6.8% (high estimate), 4.7% (medium estimate); or 20.7% (low estimate) of the GPI, in Lithuania – 7% (high estimate), 6.6% (medium estimate), or 23.2% (low estimate), and in Estonia – 5.3% (high estimate), 5.6% (medium estimate), or 17.9% (low estimate). The climate change costs accounted for 62.4% (low estimate), 37.6% (medium estimate); or 27.7% (high estimate) of the Estonian GPI; 26.9% (low estimate), 22.6% (medium estimate), or 16.6% (high estimate) of the Latvian GPI; and 34.5% (low estimate), 42.9% (medium estimate), and 31.6% (high estimate) of the Lithuanian GPI.

Partly due to the post-1990 collapse of large polluting industries (Jahn & Kuitto, 2012; Krūmiņš & Kļaviņš, 2022) and later decarbonisation and pollution control efforts (Miskinis et al., 2023), environmental costs in the Baltic States did not escalate in tandem with rising GDP but remained steady, indicating relative decoupling between them driven by a declining emission intensity of economic activity (Brizga et al., 2014). Other KN components, such as the value of ES from protected natural capital, remain modest under current accounting (where only ES from protected KN are included) averaging to 1.1% of the GPI (medium estimate) in Estonia and Latvia and 1.2% in Lithuania over the study period. This is likely an underestimation and a result of the limitations of economic valuation methods for non-marketed environmental benefits and data shortages on the economic value of ES in the Baltic States. The latter shortcoming resonates with the calls in the GPI literature for a standardised way of including the ES values (Bagstad et al., 2014; Berik, 2020).

The similar GPI trajectories of the three economies are likely a result of the common methodology applied, as well as the shared historical and economic context that has led to comparable development of economic welfare (Salyga, 2024). Estonia, Latvia, and Lithuania are often compared and analysed together as similar case studies in terms of economic development and performance, yet there are marked differences between the countries (Brizga et al., 2014; Dzemydaite, 2017; Tvaronavičienė et al., 2008). Estonia has been leading in terms of economic performance and become known for its early bold market liberalisation policies and digital transition (Kattel & Mergel, 2019). This has been analysed as a strategic development component that enhanced productivity, public sector efficiency, competitiveness, and overall economic performance (Azzopardi et al., 2020; Espinosa & Pino, 2025a, 2025b), which is reflected in Estonia's highest on average GDP and GPI per capita out of the three states. Latvia's GPI and GDP per capita exceeded that of Lithuania's prior to the 2008 financial crisis but has struggled to recover its previous growth rates since, partly due to persistent income inequality and outmigration that partly reflects lack of investment in human capital (Park, 2015; Sommers & Briskens, 2021). Lithuania started off with the lowest GDP and GPI per capita levels of the three states in the 1990s (Figure 3) but showed faster post 2008-2009 financial crisis recovery than Latvia and increased GPI per capita performance, exceeding that of Latvia since 2018 and narrowing the gap with Estonia. This is reflective of the observations that Lithuania's economic performance has been best of the three Baltic States since the global financial crisis due to its investments in manufacturing and technology, steady exports, consumption financed by increasing wages, and targeted fiscal policies, such as structural reforms, expenditure controls, and support for businesses (Spurga, 2025).

4.2 Sensitivity of the GPI estimates to key parameter changes

A sensitivity analysis varying three key parameters showed that even modest changes in the assumptions related to costs of inequality and climate change and the benefits from social capital can lead to significant shifts in GPI outcomes. Among these, the valuation of leisure and unpaid work using the hourly wage rate derived from National Accounts and tax rate information from the OECD (2025) had the most pronounced impact: higher wage rates boost the GPI through larger non-market benefits, whereas lower wage assumptions cause benefit

reduction. The pronounced effects of the hourly wage on the GPI warrants careful consideration when choosing this parameter to estimate wage-based components, such as value of leisure time and unpaid work. Moreover, the high relative weight of social capital services in the GPI raises the question whether the non-market benefits may be generally overestimated in this iteration of the GPI as the social capital contributions were also relatively high, accounting between 24% and 52% of the GPI, in other studies that used similar methods (Cook & Davíðsdóttir, 2021; Senna & Serra, 2021; Talberth & Weisdorf, 2017).

The GPI method used in this study adjusts consumption for income inequality compared to the baseline of the lowest Gini in the study period (Senna & Serra, 2021; Talberth et al., 2007). The lower bound scenario that used a lower inequality baseline of 24.1 resulted in 5-7% lower GPI values (medium estimate), representing economic welfare losses and highlighting that the benchmark used for inequality adjustment greatly influences the GPI. Moreover, the Gini coefficient underestimates actual income inequality because it does not account for non-earned income sources, such as rent, capital gains, dividends, and inheritance, which are usually received by the high-income sector of the society and exacerbate the actual income inequality even further (Luptáčík & Nežinský, 2020).

Changes in carbon cost assumptions affected the costs of climate change and overall GPI results greatly, accounting for between 23% and 43% of the welfare deduction in the GPI per capita (medium estimate). This is much more than the previous GPI 2.0 studies for Iceland (Cook & Davíðsdóttir, 2021) and the US (Talberth & Weisdorf, 2017) where costs of climate change accounted for an average of 1.1% and 2.2% of all welfare costs, respectively. This was at least partly due to Iceland's low GHG emissions, stemming from reliance on renewable energy, and lower SCC rates used in these studies that were 113 USD (2005) and 119 USD, respectively. These large differences illustrate the weight of parameter choices that necessitates an agreement between practitioners on the carbon cost rate applied in GPI studies to account for the damages of climate change.

The sensitivity analysis demonstrates that even small alterations in key assumptions can change the narrative of whether economic welfare measured by the GPI exceeds or lags behind the economic growth measured by the GDP. This observation stresses a need for caution when choosing the parameters and interpreting the results: without standardised guidelines, GPI estimates can be altered (intentionally or not) by arbitrary or subjective choices. Moreover, the significance of the social and financial capital component contributions to GPI outcomes implies that gains in these domains can offset losses in natural capital. Such trade-offs point to the “weak sustainability” approach inherent in the GPI, wherein declines in KN can be compensated by increases in consumption and other market-based components (Giannetti et al., 2015; Huang, 2018; Nourry, 2008).

For the Baltic States, the high sensitivity to wage and inequality assumptions suggests that international GPI comparisons may be misleading as countries with higher wages will automatically report higher non-market benefits. For instance, the 2021 per capita GPI estimate for Iceland (Cook & Davíðsdóttir, 2021) (in 2024 prices) exceeded the Estonian GPI per capita in 2021 by 4.6 times, Latvian – 6.6 times, and Lithuanian – 5.5 times. To make the results between countries comparable, it would be necessary to standardise the GPI method and perhaps adjust GPI to the Purchasing Power Parity (PPP) to account for differences in price

levels between countries, as a higher cost of living does not necessarily translate into higher economic welfare. Moreover, this study demonstrates that using different inequality benchmarks can considerably alter GPI results, yet these benchmarks are often arbitrary, and clear argumentation is lacking in the literature on why the lowest Gini measured in an assessment period is used for the purposes of a comparative baseline (Neumayer, 2000). The use of benchmarks in the GPI has been previously discussed in the literature and often criticised as arbitrary (Dietz & Neumayer, 2006; Lazarus & Brown, 2022), with some GPI and ISEW studies opting to use the Atkinson index which reflects aversion to inequality and welfare losses based on social preferences rather than the Gini coefficient that reflects income distribution (Jackson et al., 1997; Long & Ji, 2019).

The sensitivity analysis reveals the importance of assumptions about the measurement of economic welfare, something also observed by Neumayer (2000) in relation to non-renewable resource depletion and the costs of climate change. In a GPI-focused literature review, Malinauskaite et al. (2026) argued that methodological choices, such as those related to the SCC and value of leisure time, reflect value judgements that are nearly inevitable when estimating human welfare, yet they should be agreed upon by GPI practitioners to enable meaningful comparisons between GPI studies.

4.3 Changes in the economic welfare of the Baltic States according to the GPI

Depending on the scenario used, the decrease in the GPI growth rates in the second half of the study period (2010 onwards) may be indicative that the Baltic countries are moving towards a point where further GDP growth yields smaller marginal improvements in economic welfare compared to the high welfare gains during the early transition and EU integration, possibly indicating diminishing returns of economic growth over time. As Estonia, Latvia, and Lithuania catch up with the older EU members, both economic growth and progress show signs of slowing (Staehr, 2025). This echoes observations in an ISEW study by Van der Slycken and Bleys (2024) for the EU-15 nations, where it was found that while economic growth persisted in the biggest EU economies during the post-2008 recovery, the welfare has increased modestly or stagnated since then. This aligns with broader critiques of neoliberal transition policies, which have often prioritised privatisation and austerity over inclusive, sustainable economic development (Acar, 2018; Kumi et al., 2014; Masso et al., 2014).

For the Baltic States and other European transition economies, adopting a broader economic welfare lens might mean not only seeking higher economic output but also investing more in social development and inclusiveness through social policies and increased investment in human capital (Aidukaite, 2009; Avlijaš, 2020; Luptáčík & Nežinský, 2020; Tridico, 2010). Moreover, since KS is the largest contributor to the GPI, policies that erode leisure time, such as longer working hours or weakened labour rights protection, may reduce societal welfare even when GDP grows, and therefore, ensuring balanced work-life arrangements is integral to maintaining genuine progress. The economic welfare losses due to the income inequality adjustment suggest the need for more redistributive and protective social policies, which is also discussed in the literature focussed on the Baltic States' transition from socialist to capitalist economic and political structures (N. Černiauskas & Čiginas, 2020; Masso et al., 2015).

The results of this GPI study reflect the influence of methodological choices and unique regional conditions of rapid transition from a planned to a market economy, EU integration, with high rates of depopulation (Galstyan et al., 2021; OECD, 2021), and increased wages and consumption, underscoring that welfare trajectories differ across contexts and development stages (Boarini et al., 2014). The importance of considering economic development context in both valuation and interpretation of GPI results has been discussed in the context of the Asia-Pacific (Lawn & Clarke, 2010), the state of Hawaii in the US (Ostergaard-Klem & Oleson, 2014), and more generally by Sollis et al. (2024). For instance, the Baltic States having not yet reached the economic welfare “plateau” observed in some GPI studies in high-income countries might be due to the fact that they started at very low consumption levels and are still “catching up” with the Western economies; it might be a result of the methodological choices and limited data availability for calculating GPI components; or the unique structure and developmental trajectories of these transition economies that do not necessarily coincide with those observed in previous GPI studies. Thus, while the GPI is a useful tool for estimating net economic welfare beyond economic output, its application would benefit from transparent sensitivity analyses and, ideally, a move toward methodological standardisation to enhance credibility and cross-study comparability (Berik, 2020; Malinauskaite et al., 2026).

4.4 Methodological implications and limits of the GPI

The GPI and sensitivity analysis results discussed above raise several critiques of the GPI: the domination of wage-based valuation of leisure and unpaid labour; the arbitrariness of inequality baselines; and assumptions about the cost of carbon that largely determines the environmental cost deductions. In addition to income inequality, absolute poverty persists in the Baltic States at higher levels than the EU average (Aidukaite, 2009; Eurostat, 2024j; Navickė et al., 2019), yet that is not reflected in the GPI, and nor are other important building blocks of societal welfare, such as strength of institutions, gender equality, political freedoms, and critical natural capital (Berik, 2020). This suggests that while the GPI offers a more comprehensive view of economic welfare than GDP, it lacks comprehensiveness as a stand-alone indicator, which is the case for any Beyond GDP index (Jansen et al., 2024). As a potential solution, Costanza et al. (2016) suggested adopting a set of metrics covering different aspects of sustainable wellbeing⁵, where GPI represents the net economic contribution, while life satisfaction surveys represent the qualitative aspects of social capital contribution, and ecosystem service accounts – the contributions of natural capital in physical and monetary terms.

The relatively low share of the natural capital contributions in the updated version of the GPI by Talberth & Weisdorf’s (2017) results from its treatment of ES. Instead of estimating the gains or losses of forests, wetlands, and farmlands from historical benchmarks as in earlier GPI studies (Costanza et al., 2004; Erickson et al., 2013; Lazarus & Brown, 2022), this version of the GPI only includes the values of ES provided by protected KN each year while excluding ES from unprotected KN. The rationale is that only protected ecosystems are intentionally maintained by society (and thus their ES can be considered as benefits of past and present

⁵ Defined here as wellbeing that can be maintained over time without depleting capital stocks (human, social, natural, financial & built) that are essential for human survival and flourishing (Giannetti et al., 2015; Stiglitz et al., 2009; Talberth & Weisdorf, 2017).

investments into KN), whereas unprotected natural areas are more likely subject to eventual development.

This assumption, focusing on services from protected areas and omitting unprotected (agro-) ecosystems marks a methodological choice aimed at better aligning the GPI with experienced “psychic income” (Fisher, 1906; Talberth & Weisdorf, 2017) and the focus on present economic welfare each year. However, in the absence of ES valuation studies or standardised valuation methods, which is the case in the Baltic States, this version of the GPI tends to underestimate natural capital contributions to human welfare and damages to its stocks resulting from economic activity. Thus, apparent welfare gains in the GPI may partly reflect incomplete environmental valuation rather than genuine progress (Bagstad et al., 2014). More comprehensive KN valuation frameworks are needed to ensure that its contributions to human wellbeing and the effects of economic activity on its stocks and ES flows are not underestimated. The efforts to systemise national ES accounting through the System of Environmental and Economic Accounts (SEEA) (UN, 2012, 2024) that is ongoing and the Baltic States⁶ offers a prospect of improved and comparable monetary information on ES valuation in the region and globally. However, it is still early in the process with the first stage of experimental ecosystem extent accounts being implemented (Official Statistics Portal of Lithuania, 2025; UN, 2024).

5. Conclusions

This paper presented the first comprehensive GPI assessment of the Baltic States of Estonia, Latvia, and Lithuania. Its main aim was to shed light on whether rapid economic growth in these economies has translated into genuine economic welfare improvements, and to consider the methodological choices that shape the GPI. The results reveal consistent improvements in economic welfare from 1995 to 2023 across the three countries. A rapid transition from command to market-based economic structures, EU integration, and rising wages generated substantial economic welfare gains that exceeded the social and environmental costs, indicating that the Baltic States have not yet experienced the welfare plateau often found in GPI studies high-income economies. The decomposition of GPI components shows that services from social capital, particularly leisure time, are the primary contributors to economic welfare beyond GDP, while costs of climate change and income inequality act as offsetting influences. Far from being a comprehensive or perfect index, the GPI nevertheless provides a more nuanced view of the costs and benefits of economic activity than the GDP, revealing important contributions of human, social, natural and build/financial capital to economic welfare and the key cost items that diminish economic welfare to be addressed by policy.

The contribution of this research lies in applying the updated GPI 2.0 framework to the Baltic States and in systematically examining how alternative assumptions about wages, inequality and the social cost of carbon alter GPI estimates. This combination of a transition economy

⁶ All three countries are listed as implementing SEEA (Stage III) by their respective statistical offices (SEEA, 2024).

setting and sensitivity analysis remains rare in the Beyond GDP literature. While GPI and related ISEW metrics have been calculated for various countries and regions, including some with characteristics of transition economies, few studies have combined a long-run cross-country analysis with GPI 2.0 and a structured sensitivity assessment. Empirically, the findings affirm that the economic transition in Estonia, Latvia, and Lithuania delivered genuine economic welfare gains since the 1990s that have generally exceeded the costs but also reveal significant methodological challenges that limit the interpretability and comparability of GPI results. The sensitivity analysis demonstrates that GPI outcomes are highly dependent on assumptions about wages, inequality baselines, and social cost of carbon estimates. A GPI framework that is more robust, standardised, and reflective of environmental costs and contributions of ecosystems to economic welfare is necessary for its effective use in policymaking. Future research efforts should prioritise contextual understanding of the development of economic welfare and, where possible, include sensitivity analysis to enhance the relevance and transparency of GPI. Given the susceptibility of the results to changing input parameters, standardised guidelines for the calculation of GPI components would improve the reliability and comparability of GPI estimates. The “Beyond GDP” agenda offers a platform for developing such standards and ensuring their enhancement.

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1 Appendix A. The GPI sub-indicators used in the study with methodological explanations.

Sub-indicator	Type of capital	Summary of calculation method (all values adjusted to 2024 euros using EUROSTAT HICP)	Operation	Data source(s)
Market-based welfare				
<i>Household budget expenditures (HBE)</i>	Financial	Household final consumption expenditure (HFCE)	Addition	Eurostat (2024d)
<i>Defensive and regrettable expenditures</i>				
Insurance	Financial	Derived from itemised HFCE	Deduction	(Eurostat, 2024i)
Welfare neutral goods	Human	Derived from itemised HFCE. Followed assumption of Lawn (2013) whereby 25% of alcohol consumption and 80% of tobacco and narcotics consumption were purchases deemed likely to be welfare declining.	Deduction	(Eurostat, 2024i); Lawn (2013)
Costs of maintaining dwelling services	Built	Derived from itemised HFCE – maintenance and repair of dwelling.	Deduction	(Eurostat, 2024i)
<i>Household investments (HI)</i>				
Consumer durables	Built	Expenditure on consumer durables: cars, furniture and furnishings, and household appliances derived from itemised HFCE.	Deduction	(Eurostat, 2024i)/ Kenny et al. (2019)
Goods and services for routine household maintenance	Built	Expenditure on goods and services for routine household maintenance derived from itemised HFCE. CPI inflation rates based on historical inflation rate of consumer prices (HICP).	Deduction	(Eurostat, 2024i) Eurostat (2024h)
<i>Income inequality adjustment (INQ)</i>	Financial	Index-derived adjustment based on extent of the Gini coefficient deviation from baseline – lowest year of income inequality given a base value of 100. The year with the lowest Gini in Estonia according to Eurostat (2024g) was 2008 (33.6), in Latvia 2023 (36.8), and in Lithuania – 2007 (36.7). Given that inequality adjustment has a substantial effect on overall GPI result, a sensitivity analysis was carried out using Gini estimates from the World Bank (2025) that were somewhat lower than EUROSTAT estimates and with differing year with the lowest Gini values: 1995 (30.1) for Estonia, 1995 (31.0) for Latvia, and 2000 (31.7) for Lithuania. Another inequality adjustment was done by using the EUROSTAT Gini rates and shifting the baseline to the lowest Gini recorded, which was 24.1 Slovakia in 2023 (ibid.). The latter was done to check what impact on GPI would have an income inequality adjustment with a lower base; Slovakia's Gini coefficient was chosen because it was the lowest in 2023 and because it is also a transition economy in Europe.	Deduction	Eurostat (2024g); World Bank (2025)
<i>Public provision of goods and services (PP)</i>				
Education	Human	Itemised expenditure by central government in GDP calculation. General government expenditure by function (COFOG) [gov_10a_exp].	Addition	Eurostat (2024e)
Healthcare	Human	Itemised expenditure by central government in GDP calculation. General government expenditure by function (COFOG) [gov_10a_exp]	Addition	Eurostat (2024e)

General public services	Human and social	Itemised expenditure by local government in GDP calculation on public services from general government expenditure by function (COFOG) [gov_10a_exp] [GF01].	Addition	Eurostat (2024e)
Utility sourced from essential capital				
<i>Services from human capital (KH)</i>				
External benefits from higher education	Human	Benefit transfer approach – annual number of tertiary education graduates in Estonia, Latvia, and Lithuania (ISCED (2011) Levels 5-8) multiplied by annual social payoff as per Talberth et al. (2007) study of 16.000 USD per graduate that was converted to 2024 EUR.	Addition	Eurostat (2024d) / Talberth et al. (2007)
<i>Services from social capital (KS)</i>				
Value of unpaid labour	Social	According to Eurofund (2011), 82% of Lithuanian participants (over 18) in the European Quality of Life Survey (2007) cooked and engaged in housework at least once per week, and 20% cared for elderly and disabled relatives at least once per week. The respective percentages for Estonia were 90% and 14%, and for Latvia – 87% and 24%. The average total number of hours spent on these activities in the 12 member states that joined the EU in 2004, including Estonia, Latvia and Lithuania, were 16.2, and 14.6 hours per week, respectively. These hours were multiplied by 52 weeks (resulting in 842.4; and 759.2 hours per person year), upscaled to the adult populations of Estonia, Latvia, and Lithuania using the population and percentages of people engaged in this work and multiplied by the average hourly wage, which was calculated by dividing gross annual salary per employee (Eurostat, 2024a) by the actual work hours (Eurostat, 2024b) (high estimate). Since hourly wage rate had a very significant effect on the overall GPI, sensitivity analysis was carried out using two lower hourly wage rate estimates: one calculated by subtracting average tax on wages estimated yearly by the OECD (2025) from the gross annual salary (medium estimate) and the another based on the annual GDP expenditure on wages and salaries (Eurostat, 2024m) (instead of “average full time adjusted salary per employee”), subtracting the average tax on wages (OECD, 2025) and dividing it from the working population (Eurostat, 2024c) and the actual work hours (Eurostat, 2024b) (low estimate).	Addition	Eurofound (2011); Eurostat (2024a); OECD (2025)
Value of leisure time	Social	For Lithuania, it was estimated that around 40,5 hours per week (out of 168) on average are left for leisure time when work (8*5=40 hours), sleep (7*8=56 hours), childcare (26,8*0,5=13,4); housework (16,2*0,72=11,7 or 16,2*0,82=13,3), and caring for elderly and disabled relatives (14,6*0,2=2,9), and commuting (average 23 minutes per day or 1,9 hours per week (Eurostat, 2022)) are deducted. This results in an average of around 2106 leisure hours per year (if 200 hours for 5 weeks of annual leave are not added). For Estonia, work and sleep hours were assumed to be the same, while childcare, according to Eurofound (2011) was 26,8*0,47=12,6 hours; housework 16,2*0,9=14,6 hours; caring for the elderly and disabled relatives 14,6*0,14=2 hour per week, and commuting (average 23 minutes	Addition	Eurofound (2011); Eurostat (2024a); Eurostat (2024b); Eurostat (2022)

			per day or 1,9 hours per week (Eurostat, 2022). That leaves around 40,9 hours per week of leisure time, which multiplied by 52 is around 2126,8. For Latvia, according to the same sources, childcare averaged to 26,8*0,42=11,3 hours per person per week; housework 16,2*0,87=14,1 hours; caring for the elderly and disabled relatives 14,6*0,24=3,5 hours, and commuting (average 33 minutes per day) to 2,75 hours per week (Eurostat, 2022). After subtracting these hours, work and sleep (that are assumed to be the same for all three countries), Latvians were left with 40,4 hours of leisure time per week or 2100,8 per year. The number of leisure hours was first adjusted for actual working hours (Eurostat, 2024b) and then multiplied by the average gross hourly wage rate using three estimates (low, medium, and high) as explained above.		
Value of unpaid labour in the volunteering sector	Social		According to the International Labour Organisation statistics portal on volunteer work , 12,7% of Estonians, 13,5% of Latvians, and 9.5% of Lithuanians took part in voluntary work in 2022. In the absence of more exact estimations, this percentage was assumed to be constant throughout the study period. According to Eurofound (2011), the average hours of volunteering per week by the 12 member states that joined the EU in 2004, including the Baltic States, was 6.6 hours per week, which is upscaled to 52 weeks is 343.2 per year. This number was then multiplied by the estimated number of people who volunteer in the three countries and multiplied by the average gross hourly wage rate using three estimates (low, medium, and high) as explained above.	Addition	Eurofound (2011); Eurofound (2018); ILO (2018)
Recreation, culture and religion	Social		Annual national government expenditure in GDP on recreation, culture and religion [gov_10a_exp] [GF08]		Eurostat (2024e)
<i>Services from natural capital (KN)</i>					
Services from preserved natural capital	Natural		To estimate the value of ecosystem services (ES) from protected natural capital in Lithuania, the outcome from the study of the net socio-economic benefit per 1 ha/year of the Natura 2000 network done in 2020 by BGI Consulting was used, which is in accordance with the approach of Talberth & Weisdorf (2017), where only the ES provision of protected areas is included. The 2020 prices used in the study were adjusted to 2024. In the absence of such studies in Estonia and Latvia, a benefit transfer method was used to estimate this value by multiplying the Natura 2000 site areas in both countries by the Lithuanian estimate per 1 ha, given the similarities in the landscape and types of ecosystems.	Addition	BGI Consulting (2020); Talberth and Weisdorf (2017)
<i>Services from built capital (KB)</i>					
Transport	Built		Aggregated annual government expenditures in GDP on transport [gov_10a_exp] GF0405.	Addition	Eurostat (2024e)
Housing and community amenities	Built		Aggregated annual government expenditures in GDP on housing and community amenities [gov_10a_exp] GF06.	Addition	Eurostat (2024e)
Manufacturing, construction and mining	Built		Aggregated annual government expenditures in GDP on mining, manufacturing and construction [gov_10a_exp] GF0404.	Addition	Eurostat (2024e)

Services from consumer durables		Aggregated value of purchases of vehicles, furniture, and household appliances in HFCE from previous five years multiplied by 0.2 as per approach of Kenny et al. (2019). The five years were chosen due to lack of data pre-1990 and observation that the average lasting time of consumer durables these days is fewer than ten years. As the data for expenditure on consumer durables is only available since 1995, the services from consumer durables were assumed to be the same for the period 1990-1995. Depreciation cost was not included as presumably does not affect services that much in five years.	Addition	(Eurostat, 2024i); Kenny et al. (2019)
<i>Disutility linked to undesirable environmental and social conditions (environmental and social costs)</i>				
<i>Depletion of natural capital (DKN)</i>				
Non-renewable resource depletion	Natural	“Transition cost” approach delineated by O'Mahony et al. (2018) was used to approximate costs of replacing fossil fuel energy with renewable energy sources. Cost of €575.99 per tonne of oil equivalent in €2010 was used to estimate the transition costs from non-renewable to renewable energy resource use. The data on final consumption of non-renewable energy sources in thousand tonnes of oil equivalent was sourced from all three states from Eurostat (2025b) simplified energy balance sheets and include fossil fuels and peat.	Deduction	O'Mahony et al. (2018); Van der Slycken and Bleys (2024); Eurostat (2025b)
Avoided depletion via nature protection	Natural	Avoided depletion costs approximated by annual government expenditure in GDP on protection of biodiversity and landscape [gov_10a_exp] GF0504 adjusted for inflation with base year 2024 using Eurostat HICP.	Deduction	Eurostat (2024e)
Soil erosion	Natural	The estimate of annual GDP loss due to soil erosion through reduced agricultural productivity for the three countries, which were 0.0003% for Estonia, 0.0004% for Latvia, and 0.0005% for Lithuania in 2010. It is assumed that this percentage of GDP loss remained constant throughout the study period.	Deduction	(Panagos et al., 2018)
<i>Pollution (POL)</i>				
Air pollution	Natural	Calculated based on the estimate of economic cost of air pollution by the OECD (2019), which was, 1.27% of the Estonian, 6.31% of the Latvian, and 4.74% of the Lithuanian GDP per annum in 2019 and assumed to be constant throughout the study period.	Deduction	Dechezleprêtre et al. (2019); OECD (2019); Eurostat (2024d)
Climate change contribution	Natural	Quantity of man-made greenhouse gas emissions (excluding LULUCF) was multiplied by average cost of carbon using the mean outcome from the meta-analysis of Rennert et al. (2022), where social cost of carbon (SCC) was estimated to be 185 USD per tonne of CO2 eq. in 2020 USD. Since climate change contribution was the most significant cost environmental cost, sensitivity analysis was carried out using a lower and a higher cost of carbon estimate. The lower estimate is based on the OECD estimates of the Net Effective Carbon Rates in 2023, which were (in 2023 EUR per tonne of CO2 eq.) 73.37 EUR in Estonia (OECD, 2024a), 56.31 EUR in Latvia (OECD, 2024b), and EUR 36.3 EUR in Lithuania (OECD, 2024c). The high rate of cost of carbon is based	Deduction	UNFCCC (2024); Rennert et al. (2022); Moore et al. (2024); (Cook et al., 2016; OECD, 2024a, 2024b, 2024c)

	Solid waste	Natural	on the study by Moore et al. (2024) synthesis study, which estimated SCC of 283 USD per tonne of CO2 eq. (in 2020 USD). All rates were converted into 2024 EUR. Volume in tonnes of total waste generation in each Baltic State was multiplied by external cost of waste generation in the study by Kinnaman (2009) where external marginal cost of landfilled solid waste in Europe was estimated between \$5.39 and \$8.76 per tonne, with average cost per tonne at around \$7 (2006-USD). Note that total waste generation has only been reported by Eurostat (2024f) every second year between 2004 and 2022, and the rest was extrapolated based on the averages of waste between the two nearest years. From 1995 to 2004, solid waste was assumed to be constant.	Deduction	Eurostat (2024f); Kinnaman (2009)
	Avoided damages via pollution abatement	Natural	Avoided costs to human well-being approximated by annual government expenditure in GDP on pollution abatement [gov_10a_exp] GF0503.	Deduction	Eurostat (2024e)
<i>Social costs of economic activity (SC)</i>					
	Unemployment	Social	Average unemployed persons per year multiplied by gross average annual salary from Eurostat economic indicators.	Deduction	Eurostat (2024l); Eurostat (2024a)
	Crime	Social	Total annual government expenditure of operating law courts and prisons in the three states.	Deduction	Eurostat (2024e)
	Commuting	Human	Aggregation of direct cost of commuting and indirect time spent commuting to work ⁷ . Commuting time cost calculated based on the time spent commuting one way from Eurostat (2019), which was 23 minutes on average per employed person in Estonia and Lithuania (around 1.9 hours per week) and 33 minutes (around 2.75 hours per week) in Latvia; multiplied by 47 weeks, 180 hours per employed person per year, assuming that it remained constant throughout the period of analysis. It was then multiplied by the average gross hourly wage rate in the three countries and the number of employed individuals each year. Average distance travelled per person/ day was 10.2 km, and 45% of that (4.59 km) was commuting to work. 67.8% of respondents used a car to commute to work, which is around 3.11 km/day. According to EuroDev (2024), the cost per 1 km of driving in countries comparable to the Baltic States, e.g., Poland, Slovakia and Slovenia, averaged to around 0.22 EUR per km, or around ~0.69 EUR person/day if multiplied by the daily commuting distance above. This number was upscaled to the working populations of Estonia, Latvia and Lithuania each year, assuming 235 working days/ year.	Deduction	Eurostat (2022); Eurostat (2021); EuroDev (2024)
	Vehicle accidents	Social	Approach of Kubiszewski et al. (2015) was followed, whereby cost of vehicle accident equalled number of deaths multiplied by Value of Statistical Life (VSL) estimated via meta-analysis by the OECD (2012), which for EU-27 countries was 3.6 million (2005-USD). Note that the data on road traffic deaths for the Baltic countries from Eurostat is only available since 2000, and for the years	Deduction	Kubiszewski et al. (2015); Eurostat (2024k); OECD (2012)

⁷ Since no data was found on the modes of transportation used or distances travelled to work in Lithuania and Estonia, it was assumed that they were similar to Latvia's that was included in the EUROSTAT (2021) publication on passenger mobility statistics based on a survey data from thirteen EU Member States (nine pilot surveys and four national surveys on passenger mobility, including Latvia).

1995-1999 the numbers of fatalities were estimated by calculating an average of the 5 subsequent years.

2 Appendix B

3 The breakdown of the main GPI components in the three Baltic countries.

4 Estonia

Year	Household final consumption expenditure	GINI (Eurostat)	Income inequality adjustment Eurostat	Total defensive and re-gretable expenditures	Total household investments	Total public goods and services	Market-Based Welfare (Total)	Services from social capital medium wage	Services from built capital	Services from human capital	Services from protected natural capital	Services from Capital Assets (Total)	Depletion of natural capital	Cost of pollution medium SCC	Social costs of economic activity	Environmental and social costs (Total)	GPI medium estimate	GDP	National population	GPI per capita	GDP per capita	GPI/GDP ratio
	Million EUR (2024)		Million EUR (2024)	Million EUR (2024)	Million EUR (2024)	Million EUR (2024)	Million EUR (2024)	Million EUR (2024)	Million EUR (2024)	Million EUR (2024)	Million EUR (2024)	Million EUR (2024)	Million EUR (2024)	Million EUR (2024)	Million EUR (2024)	Million EUR (2024)	Million EUR (2024)	Million EUR (2024)	Individuals	EUR (2024)	EUR (2024)	
1995	1805.30	40.90	1332.34	-62.50	-121.00	1982.31	3131.15	5569.13	714.54	78.86	111.26	6473.79	-72.10	-4409.98	-2298.25	-6780.33	2824.61	5156.90	1436634.00	1966.13	3589.57	0.55
1996	2442.30	40.90	1799.32	-86.06	-166.00	2051.83	3599.10	5523.76	680.24	99.37	111.26	6414.63	-78.69	-4615.75	-2278.50	-6972.94	3040.78	6639.40	1415594.00	2148.06	4690.19	0.46
1997	2922.80	40.90	2148.22	-98.16	-209.70	2088.69	3929.05	5893.20	714.98	119.88	111.26	6839.31	-70.53	-4566.15	-2003.36	-6640.04	4128.32	8966.60	1399535.00	2949.78	6406.84	0.46
1998	3212.10	40.90	2365.74	-113.87	-218.50	2279.08	4312.45	6081.62	751.45	140.38	111.26	7084.72	-62.71	-4216.14	-1869.14	-6147.99	5249.18	10070.00	1386156.00	3786.86	7264.69	0.52
1999	3305.80	40.90	2448.09	-122.44	-203.40	2396.29	4518.54	6161.24	695.45	158.29	111.26	7126.24	-60.58	-3978.28	-1849.28	-5888.14	5756.63	10339.70	1390244.00	4140.74	7437.33	0.56
2000	3635.80	40.90	2700.70	-132.45	-215.90	2376.57	4728.92	6838.42	713.96	190.43	111.26	7854.07	-75.06	-3910.13	-1935.35	-5920.54	6662.45	12503.70	1396985.00	4769.17	8950.49	0.53
2001	4112.70	40.90	3061.66	-138.16	-247.70	2407.98	5083.79	7313.01	750.57	207.35	111.26	8382.19	-94.41	-4020.40	-1996.25	-6111.06	7354.92	13690.70	1388115.00	5298.49	8862.80	0.54
2002	4588.30	40.90	3392.42	-165.14	-293.70	2711.89	5645.47	7533.27	832.27	220.76	111.26	8697.56	-63.74	-3900.50	-2094.07	-6058.32	8284.70	15177.20	1379350.00	6006.24	11003.15	0.55
2003	5043.40	40.90	3706.42	-186.82	-344.90	2865.33	6040.03	8464.77	881.44	242.91	111.26	9700.38	-65.25	-4312.59	-1839.99	-6217.82	9522.59	16674.60	1370720.00	6947.14	12164.85	0.57
2004	5709.20	40.90	4193.98	-226.63	-377.40	3079.40	6669.36	9235.29	835.90	251.72	111.26	10434.17	-70.04	-4363.27	-1949.55	-6382.86	10720.67	18312.50	1362550.00	7868.09	13439.87	0.59
2005	6485.90	37.90	5117.30	-261.21	-452.50	3328.92	7732.51	10254.09	1000.78	290.04	111.26	11656.16	-102.70	-4329.82	-1949.04	-6381.56	13007.11	20986.00	1354775.00	9600.93	15490.40	0.62
2006	7591.10	36.30	6217.77	-303.79	-569.90	3953.37	9297.46	11750.00	1176.08	300.11	111.26	13337.44	-119.97	-4230.90	-2211.51	-6562.37	16072.53	23999.60	1346810.00	11933.78	17819.59	0.67
2007	8741.90	36.10	7154.12	-365.88	-689.60	4440.34	10538.97	13820.73	1436.18	310.18	111.26	15678.35	-146.94	-5001.90	-2263.50	-7412.33	18805.00	29034.10	1340680.00	14026.46	21656.25	0.65
2008	8996.60	33.60	8006.77	-346.64	-643.20	4493.45	11510.38	14144.66	1492.07	279.02	111.26	16027.01	-162.66	-4567.79	-2067.16	-6797.61	20739.79	32683.10	1337090.00	15511.14	24443.46	0.63
2009	7753.00	34.30	6818.34	-355.52	-437.10	4275.24	10300.96	13182.29	1182.47	282.56	111.26	14758.57	-112.73	-3812.76	-1792.33	-5717.82	19341.71	26973.50	1334515.00	14493.44	20212.21	0.72
2010	7934.50	35.30	6791.15	-337.25	-462.50	4026.66	10018.07	12150.18	1301.21	281.60	111.26	13844.25	-82.33	-4489.31	-1776.70	-6348.34	17513.98	27663.40	1331475.00	13153.82	20776.51	0.63
2011	8629.40	35.90	7234.52	-382.87	-516.80	4121.96	10456.81	12195.63	1358.96	290.90	111.26	13956.75	-92.45	-4500.71	-1874.63	-6467.79	17945.77	31066.40	1327439.00	13519.09	23403.26	0.58
2012	9496.70	35.90	7946.55	-428.39	-577.80	4431.47	11371.83	12553.57	1392.48	282.76	111.26	14340.07	-105.12	-4636.18	-1742.49	-6483.80	19228.10	33240.40	1322696.00	14537.05	25130.79	0.58
2013	10231.50	36.30	8486.34	-449.83	-613.40	4456.85	11879.96	13163.32	1451.02	267.26	111.26	14992.86	-92.48	-5019.85	-1726.68	-6839.02	20033.81	34874.00	1320932.00	15200.19	26459.85	0.57
2014	10758.20	39.20	8290.29	-468.80	-617.40	4585.48	11789.57	13961.12	1512.70	250.61	111.26	15835.69	-87.12	-4903.93	-1729.17	-6720.22	20905.04	36410.10	1314545.00	15902.87	27697.87	0.57
2015	11150.10	38.10	8787.50	-493.51	-692.20	5002.28	12604.07	15056.12	1615.94	258.02	111.26	17041.34	-55.14	-4271.39	-1686.77	-6013.30	23632.11	37440.70	1315407.00	17965.63	28463.21	0.63
2016	11697.50	36.20	9737.63	-480.87	-725.50	5029.07	13560.33	15629.41	1515.60	252.24	111.26	17508.51	-53.50	-4615.95	-1760.52	-6429.97	24638.87	38820.70	1315790.00	18725.53	29503.72	0.63
2017	12504.20	35.20	10700.96	-498.48	-795.20	5228.86	14636.14	16334.33	1796.03	235.51	111.26	18477.12	-92.20	-4916.42	-1658.11	-6666.73	26446.54	42274.60	1317384.00	20075.04	32089.81	0.63
2018	13433.00	34.10	11881.69	-536.70	-837.80	5778.67	16285.86	18705.10	1680.12	222.99	111.26	20719.47	-59.57	-4798.33	-1854.81	-6712.71	30292.63	45947.40	1321977.00	22914.65	34756.58	0.66
2019	14286.90	34.70	12458.92	-527.50	-892.60	5982.28	17021.11	19528.80	1859.19	221.89	111.26	21721.13	-71.72	-3625.28	-1806.74	-5503.74	33238.50	49239.20	1326898.00	25049.77	37108.50	0.68
2020	13707.30	34.90	11814.51	-582.19	-853.50	6579.52	16958.34	20606.22	2012.77	224.22	111.26	22954.47	-41.74	-2923.69	-2015.90	-4981.32	34931.49	50264.60	1329522.00	26273.72	37806.52	0.69
2021	15252.70	35.10	13072.79	-596.91	-999.40	6919.61	18396.09	21512.12	2209.35	236.47	111.26	24069.19	-36.43	-3232.82	-1958.39	-5227.64	37237.64	56679.70	1330932.00	27978.62	42586.47	0.66
2022	18663.50	35.80	15842.12	-651.50	-1132.60	6344.48	20402.50	19883.69	1968.20	217.26	111.26	22180.42	-34.66	-3327.72	-1880.36	-5242.73	37340.18	67455.50	1348840.00	27683.18	50010.01	0.55
2023	20055.70	35.80	17148.76	-651.50	-1132.60	6715.61	22080.28	19664.89	2036.48	217.21	111.26	22029.85	-37.70	-3352.45	-2050.11	-5440.26	38669.87	73792.80	1366188.00	28304.94	54013.65	0.52

5

6 Latvia

Year	Household final consumption expenditure	GINI (Eurostat)	Income inequality adjustment Eurostat	Total defensive and re-gretable expenditures	Total household investments	Total public goods and services	Market-Based Welfare (Total)	Services from social capital medium wage	Services from built capital	Services from human capital	Services from protected natural capital	Services from Capital Assets (Total)	Depletion of natural capital	Cost of pollution medium SCC	Social costs of economic activity	Environmental and social costs (Total)	GPI medium estimate	GDP	National population	GPI per capita	GDP per capita	GPI/GDP ratio
	Million EUR (2024)		Million EUR (2024)	Million EUR (2024)	Million EUR (2024)	Million EUR (2024)	Million EUR (2024)	Million EUR (2024)	Million EUR (2024)	Million EUR (2024)	Million EUR (2024)	Million EUR (2024)	Million EUR (2024)	Million EUR (2024)	Million EUR (2024)	Million EUR (2024)	Million EUR (2024)	Million EUR (2024)	Individuals	EUR (2024)	EUR (2024)	
1995	2693.30	31.00	2293.99	-151.33	-85.90	1999.30	4056.06	6223.19	884.28	104.63	116.88	7328.99	-128.03	-2897.88	-4652.71	-7678.62	3706.43	5156.90	2485056.00	1491.49	2075.16	0.72
1996	3076.30	31.60	2650.69	-168.63	-69.70	1853.82	4266.18	6093.75	790.83	155.38	116.88	7156.84	-121.34	-2941.36	-4578.65	-7641.35	3781.67	6639.40	2457222.00	1539.00	2701.99	0.57
1997	3727.30	34.40	3141.94	-188.58	-174.80	2180.70	4959.26	6554.96	739.38	206.13	116.88	7617.36	-118.04	-2889.19	-4620.02	-7627.25	4949.37	8966.60	2432851.00	2034.39	3685.63	0.55
1998	3958.70	33.30	3295.26	-250.03	-180.60	2531.04	5395.67	7008.93	785.40	256.88	116.88	8168.09	-97.25	-2824.09	-4655.93	-7577.27	5986.50	10070.00	2410019.00	2484.00	4178.39	0.59
1999	4424.40	34.20	3742.68	-249.10	-168.20	2689.57	6014.95	7616.31	847.43	307.70	116.88	8888.31	-87.11	-2699.53	-4659.53	-7446.16	7457.10	10339.70	2390482.00	3119.50	4325.36	0.72
2000	5221.00	34.20	4388.22	-314.25	-208.50	3066.70	6932.18	8959.11	929.69	375.30	116.88	10380.98	-69.04	-2668.67	-5208.56	-7946.27	9366.89	12503.70	2367550.00	3956.36	5281.28	0.75

2001	5630.20	34.20	4777.61	-303.45	-211.60	3043.32	7305.88	9258.08	956.02	499.45	116.88	10830.44	-87.03	-2839.85	-4835.32	-7762.20	10374.12	13690.70	2337170.00	4438.75	5857.81	0.76
2002	6135.10	35.10	5226.08	-297.69	-242.10	3341.76	8028.06	9400.57	1019.16	465.24	116.88	11001.86	-75.31	-2882.64	-4866.49	-7824.43	11205.48	15177.20	2310173.00	4450.49	5669.72	0.74
2003	6312.10	36.50	5354.42	-304.38	-275.00	3210.60	7985.65	9450.13	1190.87	510.65	116.88	11268.53	-61.93	-2936.40	-4660.75	-7659.08	11595.09	16674.60	2287955.00	5067.89	7287.99	0.70
2004	7068.10	36.40	6024.56	-295.50	-322.40	3686.42	9093.08	10251.10	1311.25	586.62	116.88	12265.84	-83.62	-3003.06	-4607.33	-7694.00	13664.92	18312.50	2263122.00	6038.08	8091.70	0.75
2005	8086.50	39.00	6821.59	-336.75	-446.20	3956.09	9994.73	11478.51	1617.27	642.49	116.88	13855.16	-89.31	-3191.43	-4381.62	-7662.36	16187.53	20986.00	2238799.00	7230.45	9373.78	0.77
2006	10631.70	35.60	8531.94	-374.02	-728.80	4913.26	12342.39	13892.62	2114.63	649.63	116.88	16773.76	-102.35	-3500.17	-4489.32	-8091.84	21024.31	23999.60	2218357.00	9477.42	10818.64	0.88
2007	13189.00	37.50	11450.84	-451.17	-913.60	5657.68	15743.76	17743.08	2439.24	657.94	116.88	20957.13	-120.03	-3947.94	-5000.92	-9068.89	27632.00	29034.10	2200325.00	12558.14	13195.37	0.95
2008	13723.30	37.20	11582.34	-561.29	-698.40	5670.22	15992.88	18957.15	2621.59	594.44	116.88	22290.06	-113.57	-3942.83	-4480.60	-8537.00	29745.94	32683.10	2177322.00	13661.71	15010.69	0.91
2009	11170.00	35.90	9586.55	-488.74	-417.40	4686.74	13367.16	14556.01	2194.50	639.62	116.88	17507.01	-70.83	-3238.32	-3632.15	-6941.30	23932.88	26973.50	2141669.00	11174.87	12594.62	0.89
2010	11133.30	35.00	9531.82	-525.85	-505.80	4230.86	12731.03	12627.36	2155.16	652.85	116.88	15552.25	-90.08	-3521.52	-3347.03	-6958.63	21324.65	27663.40	2097555.00	10166.43	13188.40	0.77
2011	11857.60	35.80	10356.21	-492.48	-530.50	4461.47	13794.70	12423.54	2230.76	611.23	116.88	15382.42	-92.92	-3564.40	-3019.61	-6676.93	22500.18	31066.40	2059709.00	10923.96	15082.91	0.72
2012	13116.70	35.20	11327.36	-528.02	-645.70	4681.93	14835.57	13246.53	2058.58	528.08	116.88	15950.08	-75.02	-3688.84	-3110.98	-6874.84	23910.81	33240.40	2034319.00	11753.72	16339.82	0.72
2013	14028.00	35.50	12228.55	-618.51	-682.50	4766.18	15693.73	14051.03	2153.30	531.48	116.88	16852.69	-58.64	-3698.02	-3218.54	-6975.20	25571.21	34874.00	2012647.00	12705.26	17327.43	0.73
2014	14377.60	35.10	12356.66	-680.12	-770.00	5005.17	15911.71	15049.01	2151.28	426.58	116.88	17743.75	-55.04	-3747.77	-3473.04	-7275.85	26379.61	36410.10	1993782.00	13230.94	18261.83	0.72
2015	14703.50	34.20	12815.78	-696.84	-807.80	5191.38	16502.52	16449.60	2070.20	418.61	116.88	19055.30	-47.17	-3810.11	-3485.58	-7342.86	28214.95	37440.70	1977527.00	14267.80	18933.09	0.75
2016	15328.70	34.30	13717.64	-724.01	-812.50	4969.73	17150.87	17240.75	2121.67	388.49	116.88	19867.79	-40.68	-3834.21	-3412.06	-7286.94	29731.71	38820.70	1959537.00	15172.83	19811.16	0.77
2017	16260.90	35.60	14502.40	-754.48	-925.20	5073.30	17896.03	17935.71	2304.59	358.75	116.88	20715.94	-45.00	-3938.27	-3351.43	-7334.70	31277.27	42274.60	1942248.00	16103.64	21765.81	0.74
2018	17282.20	35.10	14923.49	-858.27	-932.70	5573.84	18706.37	18862.31	2551.03	377.84	116.88	21908.06	-51.82	-4172.74	-3534.38	-7758.93	32855.50	45947.40	1927174.00	17048.54	23841.85	0.72
2019	17852.20	34.50	15540.38	-853.67	-951.40	5635.64	19370.95	19320.57	2364.84	365.17	116.88	22167.47	-42.36	-4231.19	-3496.18	-7769.73	33768.69	49239.20	1913822.00	17644.63	25728.20	0.69
2020	17046.00	35.70	15064.16	-881.70	-936.40	5809.53	19055.60	19676.72	3176.17	357.23	116.88	23327.00	-30.38	-4079.70	-3670.80	-7780.88	34601.72	50264.60	1900449.00	18207.13	26448.80	0.69
2021	18689.50	34.30	15912.37	-934.95	-1107.10	6896.17	20766.49	20304.21	3037.11	361.70	116.88	23819.90	-25.00	-4325.42	-3714.51	-8064.93	36521.46	56679.70	1884490.00	19380.02	30076.94	0.64
2022	22905.20	33.70	20465.19	-1015.26	-1146.70	5952.85	24256.08	19553.25	2829.12	330.10	116.88	22829.35	-19.84	-4554.61	-3436.51	-8010.96	39074.47	67455.50	1879383.00	20791.12	35892.36	0.58
2023	24410.60	34.00	22175.92	-1087.98	-1146.70	6086.00	26027.23	20702.82	2936.51	345.74	116.88	24101.95	-21.82	-4783.38	-3673.62	-8478.82	41650.36	73792.80	1881750.00	22133.85	39214.99	0.56

Lithuania

Year	Household final consumption expenditure	GINI (Eurostat)	Income inequality adjustment Eurostat	Total defence-able and re-gretable ex-penditures	Total house-hold invest-ments	Total public goods and services	Market-Based Welfare (Total)	Services from social capital medium wage	Services from built capital	Services from human capital	Services from protected natural capital	Services from Capital Assets (Total)	Depletion of natural capital	Cost of pollution medium SCC	Social costs of economic activity	Environmental and social costs (Total)	GPI medium estimate	GDP	National population	GPI per capita	GDP per capita	GPI/GDP ratio
	Million EUR (2024)		Million EUR (2024)	Million EUR (2024)	Million EUR (2024)	Million EUR (2024)	Million EUR (2024)	Million EUR (2024)	Million EUR (2024)	Million EUR (2024)	Million EUR (2024)	Million EUR (2024)	Million EUR (2024)	Million EUR (2024)	Million EUR (2024)	Million EUR (2024)	Million EUR (2024)	Million EUR (2024)	Individuals	EUR (2024)	EUR (2024)	
1995	3259.70	39.90	2746.08	-157.58	-116.60	2280.03	4751.93	7798.39	1627.50	247.46	127.29	9800.64	-216.39	-5026.31	-5692.19	-10934.89	3617.68	5156.90	3629102.00	996.85	1420.99	0.70
1996	4285.40	39.90	3586.04	-206.09	-180.60	2715.66	5915.01	7716.61	1367.10	322.45	127.29	9533.45	-198.72	-5294.79	-5677.46	-11170.97	4277.50	6639.40	3601613.00	1187.66	1843.45	0.64
1997	5511.70	39.90	4551.62	-259.31	-303.90	5780.74	9769.15	8437.18	1309.77	397.44	127.29	10271.68	-158.67	-5309.62	-5752.42	-11220.71	8820.12	8966.60	3575137.00	2467.07	2508.04	0.98
1998	6268.70	39.90	5129.79	-275.53	-416.10	3563.33	8001.49	9254.76	1300.94	472.43	127.29	11155.42	-136.91	-5546.11	-5848.27	-11531.28	7625.62	10070.00	3549331.00	2148.47	2837.15	0.76
1999	6846.80	39.90	5686.70	-299.96	-364.30	3786.55	8808.99	10265.77	1201.38	537.53	127.29	12131.96	-111.70	-4973.19	-5987.39	-11072.29	9868.67	10339.70	3524238.00	2800.23	2933.88	0.95
2000	8179.90	39.90	6706.06	-353.02	-536.10	4493.10	10310.05	10923.45	1275.84	620.78	127.29	12947.36	-80.74	-4741.77	-5690.95	-10513.47	12743.94	12503.70	3499536.00	3641.61	3572.96	1.02
2001	9029.50	39.90	7439.62	-336.50	-604.70	4989.45	11487.87	11779.68	1230.26	675.62	127.29	13812.86	-71.10	-4958.41	-5977.18	-11006.69	14294.04	13690.70	3470818.00	4118.35	3944.52	1.04
2002	9897.30	39.90	8125.77	-418.02	-645.00	5077.85	12140.60	13474.16	1399.43	731.75	127.29	15732.62	-120.04	-5103.66	-6127.49	-11351.20	16522.02	15177.20	3443067.00	4798.64	4408.05	1.09
2003	10827.10	39.90	8846.14	-493.24	-716.40	5446.88	13083.39	15833.41	1488.60	847.36	127.29	18296.66	-153.72	-5209.58	-6414.03	-11777.33	19602.72	16674.60	3415213.00	5739.82	4882.45	1.18
2004	11945.00	39.90	9749.81	-531.87	-813.20	5957.53	14362.27	16895.49	1561.73	936.91	127.29	19521.42	-149.42	-5453.32	-6792.20	-12394.93	21488.76	18312.50	3377075.00	6363.13	5422.59	1.17
2005	13649.00	39.90	11066.34	-642.35	-975.40	6786.82	16235.42	18893.37	1679.16	1019.81	127.29	21219.63	-172.90	-5750.41	-7052.11	-12975.42	24479.63	20986.00	3322528.00	7367.77	6316.27	1.17
2006	15476.20	38.30	13001.54	-773.54	-1134.30	6884.49	17978.19	21742.49	1925.14	1065.98	127.29	24860.90	-242.20	-5954.99	-7256.13	-13453.32	29385.78	23999.60	3269909.00	8986.73	7339.53	1.22
2007	18167.80	36.70	15905.34	-903.17	-1359.30	7708.28	21351.15	23648.78	2041.52	1061.30	127.29	26878.89	-222.13	-6603.46	-7343.78	-14169.37	34060.68	29034.10	3231294.00	10540.88	8985.29	1.17
2008	20761.90	37.70	17729.88	-1088.62	-1460.30	8439.20	23620.16	23881.63	2559.07	1046.40	127.29	27614.39	-202.18	-6587.86	-6081.61	-12871.65	38362.91	32683.10	3198231.00	11995.04	10219.12	1.17
2009	17987.10	39.60	14638.38	-1018.21	-1173.80	7626.45	20072.82	20392.05	2079.80	1098.32	127.29	23697.46	-157.23	-5476.71	-4925.63	-10559.57	33210.71	26973.50	3162916.00	10500.03	8528.05	1.23
2010	17896.60	42.40	13693.73	-914.25	-1161.80	7502.09	19119.77	19720.09	2059.91	1107.52	127.29	23014.80	-186.24	-5701.49	-4486.90	-10374.63	31759.94	27663.40	3097282.00	10254.13	8931.51	1.15
2011	19657.00	39.40	16073.99	-1038.76	-1361.70	7820.51	21494.04	20011.01	1914.81	1067.85	127.29	23120.96	-216.76	-5863.49	-4471.75	-10552.00	34063.00	31066.40	3028115.00	11248.91	10259.32	1.10
2012	20857.20	37.70	17819.62	-1072.34	-1479.70	7536.11	22803.69	20451.58	1843.14	1042.27	127.29	23464.28	-215.41	-6034.37	-4560.72	-10810.50	35457.47	33240.40	2987773.00	11867.52	11125.48	1.07
2013	21846.60	40.20	17502.13	-1127.14	-1548.20	7666.39	22493.18	21251.70	1898.19	965.68	127.29	24242.86	-243.38	-5899.14	-4388.00	-10530.53	36205.51	34874.00	2957689.00	12241.15	11790.96	1.04
2014	22650.10	39.40	18511.99	-1198.69	-1577.50	7801.57	23537.37	22444.09	1969.36	814.80	127.29	25355.55	-217.87	-5963.79	-4571.85	-10753.52	38139.40	36410.10	2932367.00	13006.35	12416.62	1.05
2015	23339.50	42.10	17763.11	-1230.45	-1732.30	8100.53	22900.88	23919.15	2211.86	792.05	127.29	27050.35	-170.96	-6059.41	-4604.32	-10834.69	39116.55	37440.70	2904910.00	13465.67	12888.76	1.04
2016	24507.10	41.00	19105.46	-1259.23	-1903.90	8068.93	24011.25	25276.40	2541.64	730.02	127.29	28675.35	-159.98	-6127.19	-4453.80	-10740.97	41945.63	38820.70	2868231.00	14624.22	13534.72	1.08
2017	26253.90	41.30	20301.73	-1276.24	-2131.30	7841.38	24375.58	27024.80	2638.89	686.86	127.29	30471.84	-173.04	-6387.99	-4599.54	-11160.57	44046.85	42274.60	2828403.00	15573.05	14946.46	1.04
2018	27922.40	40.60	21813.76	-1410.46	-2380.10	8191.92	26215.12	28515.36	2872.83	646.33	127.29	32161.80	-195.39	-6482.60	-4669.25	-11347.24	47029.68	45947.40	2801543.00	16787.06	16400.75	1.02
2019	29284.60	39.70	23382.42	-1465.81	-2525.00	8864.66	28526.27	39612.28	3158.22	615.61	127.29	43513.40	-189.49	-6692.20	-5721.78	-12603.47	59166.20	49239.20	2794137.00	21175.13	17622.33	1.20
2020	28641.40	39.50	22829.74	-1542.18	-2527.70	8950.13	28709.99	42439.90	3741.56	601.05	127.29	46909.81	-149.63	-6739.15	-5997.81	-12886.57	62733.23	50264.60	2794885.00	22445.73	17984.50	1.25
2021	32395.30	40.50	25243.87	-1666.82	-2870.60	10055.95	30762.21	44085.90	3719.93	580.91	127.29	48514.02	-178.40	-7062.49	-6168.41	-13409.30	65866.93	56679.70	2800839.00	23516.86	20322.69	1.16
2022	39178.80	41.30	30253.99	-1932.16	-3200.60	9534.98	34656.21	42783.06	3870.33	558.01	127.29	47338.69	-186.83	-7583.31	-5987.18	-13757.31	68237.59	67455.50	2831639.00	24098.27	23827.07	1.01

2023	42061.70	40.40	33193.43	-2151.00	-3370.80	8923.18	36594.81	44664.15	8964.90	558.01	127.29	49314.36	-129.63	7876.36	-6172.80	-14178.78	71730.38	73792.80	2871897.00	24976.66	25694.79	0.97
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Appendix C

The upper bound, medium estimate, and lower bound GPI per capita estimates, in thousand EUR (2024).

Year	Estonia			Latvia			Lithuania		
	Upper bound	Medium estimate	Lower bound	Upper bound	Medium estimate	Lower bound	Upper bound	Medium estimate	Lower bound
1995	6.589540	1.966132	-2.541574	4.172927	1.491486	-1.183962	3.880376	0.996852	-1.548779
1996	6.785640	2.148058	-2.401389	4.203597	1.539003	-1.013129	4.139811	1.187661	-1.307995
1997	7.813240	2.949783	-1.755147	4.728304	2.034390	-0.680472	5.589043	2.467071	-0.067190
1998	8.445843	3.786864	-0.966682	5.347536	2.484003	-0.330845	5.544490	2.148468	-0.526111
1999	8.753455	4.140737	-0.477891	6.099561	3.119497	0.093192	6.340747	2.800228	-0.028311
2000	9.719989	4.769165	-0.079784	7.334893	3.956363	0.510149	7.325887	3.641609	0.731823
2001	10.495509	5.298493	0.219573	7.967755	4.438751	0.821225	8.076425	4.118350	0.957973
2002	11.440054	6.006237	0.913927	8.397901	4.850495	1.110041	9.165030	4.798635	1.257943
2003	13.012761	6.947144	1.132790	8.554751	5.067885	1.232779	10.314960	5.739824	1.452090
2004	14.547378	7.868089	1.899596	9.817788	6.038082	1.936612	11.243406	6.363128	1.709489
2005	16.236723	9.600935	3.040812	11.271724	7.230454	2.673555	12.940664	7.367772	2.436348
2006	18.830481	11.933776	4.533462	14.628920	9.477423	4.519632	15.207077	8.986726	3.244360
2007	22.626637	14.026463	5.778398	18.266774	12.558143	6.132202	16.791397	10.540879	4.157409
2008	23.375039	15.511136	7.276347	19.803452	13.661708	7.665147	17.957075	11.995039	5.858435
2009	22.056088	14.493435	7.139453	16.137958	11.174872	6.426880	15.500669	10.500030	5.406755
2010	20.976569	13.153819	5.917555	15.298322	10.166430	5.668291	16.045658	10.254132	5.845140
2011	21.444415	13.519089	6.399357	15.834739	10.923962	6.347299	17.113255	11.248911	6.502572
2012	22.521510	14.537053	7.348379	17.147447	11.753716	6.983021	17.276008	11.867524	6.411864
2013	23.202467	15.200191	7.446694	18.175119	12.705264	7.532116	18.201786	12.241150	6.965895
2014	24.838792	15.902871	8.480017	19.043385	13.230940	7.902655	18.743329	13.006352	7.050421
2015	27.041542	17.965625	10.494641	20.590139	14.267797	8.536695	20.114794	13.465665	7.606379
2016	28.213103	18.725531	10.818980	21.663238	15.172825	8.896984	21.357195	14.624216	8.149096
2017	29.998944	20.075041	11.923594	22.645052	16.103643	9.531341	22.983851	15.573046	9.005646
2018	32.672487	22.914645	13.938841	24.295116	17.048537	10.623248	24.673273	16.787062	10.134430
2019	34.854575	25.049775	16.407644	25.165414	17.644634	11.378609	30.569943	21.175125	12.960921
2020	36.422492	26.273720	17.694666	25.442968	18.207129	11.661682	31.989504	22.445728	13.934436
2021	38.685465	27.978623	19.019661	26.885250	19.380024	13.262978	33.614194	23.516855	15.073897
2022	37.915147	27.683182	20.550710	27.761540	20.791118	14.985558	34.255987	24.098266	19.152884
2023	39.621905	28.304939	22.385870	29.405257	22.133846	16.528934	35.560817	24.976656	20.642806

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15 **Appendix D**16 *Parameter values and their effects on income inequality adjustment, social capital benefits, and environmental costs in the GPI.*17 **Estonia**

Year	Gini Eurostat	Gini Word Bank	Low hourly wage EUR/hour	Med hourly wage EUR/hour	High hourly wage EUR/hour	Low SCC EUR/tonne CO2 eq	Med SCC EUR/tonne CO2 eq	High SCC EUR/tonne CO2 eq	Ineq. ad-justment low base-line Gini	Ineq. ad-justment Eurostat Gini	Ineq. ad-justment World Bank Gini	KS services low wage rate million EUR	KS services medium wage rate million EUR	KS services high wage rate million EUR	Climate change costs low SCC million EUR	Climate change costs medium SCC million EUR	Climate change costs high SCC million EUR
1995	40.9	30.1	0.54	2.62	4.46	77.04	207.80	317.85	1298.522	1332.339	1621.805	1354.118	5569.129	9313.498	1544.922	4153.232	6380.328
1996	40.9	33.85	0.69	2.63	4.48				1559.377	1799.321	1947.603	1655.391	5523.759	9209.403	1617.596	4348.602	6680.461
1997	40.9	33.85	0.80	2.82	4.80				1861.748	2148.219	2325.254	1894.788	5893.195	9829.236	1595.382	4288.884	6588.721
1998	40.9	37.6	0.91	2.91	4.96				1845.784	2365.744	2305.316	2120.544	6081.624	10131.159	1462.387	3931.353	6039.469
1999	40.9	36.7	0.99	3.07	5.22				1956.871	2448.089	2444.058	2210.488	6161.244	10260.277	1372.852	3690.653	5669.699
2000	40.9	35.8	1.12	3.36	5.73				2213.063	2700.697	2764.033	2489.463	6838.418	11422.375	1343.907	3612.841	5550.162
2001	40.9	36	1.26	3.55	6.02				2494.916	3061.662	3116.057	2815.201	7313.012	12147.234	1377.376	3702.816	5688.384
2002	40.9	35.8	1.34	3.65	6.31				2779.888	3392.417	3471.976	3042.029	7533.269	12699.835	1332.106	3581.116	5501.425
2003	40.9	37.2	1.49	4.05	7.01				2922.893	3706.421	3650.584	3413.342	8464.771	14334.545	1480.962	3981.288	6116.182
2004	40.9	33.6	1.68	4.45	7.61				3661.748	4193.982	4573.386	3784.362	9235.287	15439.655	1490.894	4007.988	6157.199
2005	37.9	33.4	1.94	4.87	8.11				4164.963	5117.298	5201.884	4443.539	10254.087	16671.220	1473.828	3962.109	6086.718
2006	36.3	33.7	2.26	5.44	8.93				4803.849	6217.773	5999.828	5249.503	11749.999	18852.788	1423.734	3827.441	5879.837
2007	36.1	31.2	2.82	6.44	10.56				5937.267	7154.119	7415.424	6426.724	13820.732	22223.471	1697.576	4563.613	7010.768
2008	33.6	31.9	3.22	6.55	10.63				6048.998	8006.765	7554.973	7305.318	14144.662	22518.761	1535.522	4127.961	6341.506
2009	34.3	31.4	3.13	6.49	10.68				5342.206	6818.336	6672.216	6676.835	13182.288	21274.808	1271.136	3417.210	5249.626
2010	35.3	32	3.10	6.29	10.50				5373.362	6791.155	6711.129	6276.455	12150.180	19901.494	1625.593	4370.100	6713.487
2011	35.9	32.5	3.16	6.09	10.20				5731.896	7234.515	7158.924	6587.086	12195.626	20051.240	1623.139	4363.503	6703.353
2012	35.9	32.9	3.33	6.21	10.42				6219.492	7946.550	7767.913	6988.087	12553.573	20698.038	1537.146	4132.326	6348.211
2013	36.3	35.1	3.56	6.44	10.71				6295.026	8486.337	7862.253	7562.565	13163.315	21491.915	1683.611	4526.072	6953.096
2014	39.2	34.6	3.81	6.81	11.34				6736.859	8290.290	8414.085	8092.397	13961.117	22848.692	1620.139	4355.438	6690.963

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2015	38.1	32.7	4.02	7.23	11.85				7343.790	8787.498	9172.119	8667.400	15056.118	24273.586	1383.890	3720.326	5715.284
2016	36.2	31.2	4.23	7.56	12.40				8103.729	9737.628	10121.255	9035.895	15629.410	25181.027	1509.441	4057.848	6233.795
2017	35.2	30.4	4.48	7.78	12.75				8887.291	10700.956	11099.895	9728.873	16334.326	26292.483	1609.001	4325.496	6644.964
2018	34.1	30.3	5.22	8.83	13.84				9591.088	11881.694	11978.911	11353.243	18705.102	28903.614	1542.318	4146.231	6369.573
2019	34.7	30.8	5.52	9.17	14.56				10067.857	12458.924	12574.378	12066.344	19528.802	30533.398	1119.415	3009.335	4623.037
2020	34.9	30.7	5.86	9.79	15.62				9633.418	11814.506	12031.779	12647.455	20606.220	32399.044	878.345	2361.266	3627.452
2021	35.1	31.8	6.34	10.19	16.50				10349.658	13072.788	12926.336	13711.761	21512.115	34268.674	971.368	2611.341	4011.625
2022	35.8	32.3	6.78	9.16	15.05				12594.227	15842.118	15729.720	14911.303	19883.692	32157.401	971.368	2611.341	4011.625
2023	35.8	30.7	7.30	9.10	15.13				14343.504	17148.764	17914.500	15783.878	19664.894	32720.289	971.368	2611.341	4011.625

Latvia

Year	Gini Eurostat	Gini Word Bank	Low hourly wage EUR/hour	Med hourly wage EUR/hour	High hourly wage EUR/hour	Low SCC EUR/tonne CO2 eq	Med SCC EUR/tonne CO2 eq	High SCC EUR/tonne CO2 eq	Ineq. ad-justment low base-line Gini	Ineq. ad-justment Eurostat Gini	Ineq. ad-justment World Bank Gini	KS services low wage rate million EUR	KS services medium wage rate million EUR	KS services high wage rate million EUR	Climate change costs low SCC million EUR	Climate change costs medium SCC million EUR	Climate change costs high SCC million EUR
1995	39.4	31.0	0.38	1.93	3.41	57.44	207.80	317.85	1909.396	2293.994	2456.070	1344.035	6223.193	10829.123	723.160	2618.685	4003.567
1996	39.4	31.6	0.49	1.90	3.34				2164.401	2650.693	2784.084	1699.209	6093.747	10604.877	726.003	2628.981	4019.308
1997	39.4	34.4	0.59	1.99	3.50				2356.700	3141.935	3031.440	2064.192	6554.960	11400.512	693.902	2512.738	3841.590
1998	39.4	33.3	0.63	2.13	3.74				2553.352	3295.258	3284.394	2240.402	7008.933	12178.028	664.946	2407.884	3681.284
1999	39.4	34.2	0.71	2.34	4.12				2823.720	3742.677	3632.171	2487.879	7616.307	13226.000	619.800	2244.403	3431.347
2000	39.4	34.2	0.88	2.81	4.94				3310.759	4388.218	4258.652	2995.940	8959.111	15556.653	584.037	2114.899	3233.355
2001	39.4	34.2	0.92	2.88	5.06				3604.539	4777.607	4636.544	3159.983	9258.084	16027.001	618.056	2238.085	3421.688
2002	39.4	35.1	0.95	2.88	5.06				3841.797	5226.081	4941.731	3323.836	9400.568	16264.835	616.215	2231.421	3411.499
2003	39.4	36.5	1.00	2.91	5.07				3785.169	5354.423	4868.890	3446.166	9450.135	16269.170	627.311	2271.601	3472.928
2004	39.4	36.4	1.14	3.14	5.49				4270.603	6024.557	5493.306	3917.822	10251.096	17700.793	623.954	2259.444	3454.342
2005	39.4	39.0	1.40	3.53	6.20				4513.219	6821.590	5805.386	4797.143	11478.513	19883.079	633.010	2292.238	3504.479
2006	41.1	35.6	1.73	4.07	7.10				6450.731	8531.941	8297.620	6239.519	13892.622	23824.954	659.953	2389.802	3653.639
2007	38.0	37.5	2.41	5.10	8.82				7599.042	11450.838	9774.701	8768.673	17743.076	30182.972	685.604	2482.687	3795.646

2008	39.6	37.2	2.98	5.45	9.29				8074.543	11582.345	10386.342	10670.797	18957.147	31797.972	659.146	2386.879	3649.170
2009	39.4	35.9	2.60	4.69	7.94				6890.227	9586.554	8862.947	8270.675	14556.012	24284.280	619.809	2244.436	3431.397
2010	39.0	35.0	2.33	4.29	7.67				6955.711	9531.818	8947.180	7072.739	12627.358	22191.098	681.117	2466.440	3770.807
2011	38.5	35.8	2.38	4.20	7.53				7293.697	10356.208	9381.934	7276.756	12423.544	21846.444	635.649	2301.795	3519.090
2012	38.8	35.2	2.60	4.49	8.05				8176.870	11327.362	10517.965	7889.184	13246.531	23389.753	625.196	2263.941	3461.218
2013	38.3	35.5	2.74	4.70	8.36				8640.016	12228.549	11113.714	8415.885	14051.026	24548.636	620.376	2246.488	3434.535
2014	38.5	35.1	3.01	5.11	8.97				8876.136	12356.661	11417.437	9084.475	15049.006	25964.091	615.330	2228.216	3406.599
2015	37.9	34.2	3.24	5.57	9.69				9300.951	12815.780	11963.879	9812.950	16449.603	28186.371	617.181	2234.916	3416.842
2016	37.0	34.3	3.43	5.95	10.35				9690.726	13717.643	12465.249	10151.559	17240.752	29594.017	617.027	2234.360	3415.992
2017	37.0	35.6	3.69	6.17	10.77				9870.994	14502.403	12697.130	10987.454	17935.715	30823.577	618.979	2241.429	3426.799
2018	38.2	35.1	4.03	6.47	11.26				10636.432	14923.493	13681.718	12006.674	18862.307	32372.340	647.483	2344.645	3584.601
2019	38.0	34.5	4.37	6.66	11.58				11209.734	15540.379	14419.160	12883.666	19320.575	33159.213	639.414	2315.428	3539.933
2020	37.2	35.7	4.55	6.90	11.95				10279.902	15064.164	13223.111	13174.838	19676.720	33690.774	602.152	2180.494	3333.639
2021	38.5	34.3	5.03	7.31	12.28				11696.896	15912.368	15045.800	14171.953	20304.211	33699.502	616.061	2230.861	3410.643
2022	37.3	33.7	5.46	6.97	11.69				14834.190	20465.185	19081.323	15453.159	19553.253	32422.408	616.061	2230.861	3410.643
2023	36.8	34.0	6.32	7.38	12.51				15718.811	22175.915	20219.217	17792.665	20702.820	34727.696	616.061	2230.861	3410.643

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Lithuania

Year	Gini Eurostat	Gini Word Bank	Low hourly wage EUR/hour	Med hourly wage EUR/hour	High hourly wage EUR/hour	Low SCC EUR/tonne CO2 eq	Med SCC EUR/tonne CO2 eq	High SCC EUR/tonne CO2 eq	Ineq. ad-justment low base-line Gini	Ineq. ad-justment Eurostat Gini	Ineq. ad-justment World Bank Gini	KS services low wage rate million EUR	KS services medium wage rate million EUR	KS services high wage rate million EUR	Climate change costs low SCC million EUR	Climate change costs medium SCC million EUR	Climate change costs high SCC million EUR
1995	39.9	32.3	0.28	1.53	2.82	37.01	207.80	317.85	2227.586	2746.080	2930.061	1551.991	7798.389	14236.144	834.232	4677.096	7150.561
1996	39.9	32.3	0.37	1.51	2.78				2908.948	3586.036	3826.293	1986.913	7716.611	14097.982	870.704	4881.577	7463.180
1997	39.9	32.2	0.50	1.63	3.00				3703.684	4551.619	4871.650	2757.150	8437.180	15344.250	854.098	4788.474	7320.840
1998	39.9	32.1	0.62	1.80	3.32				4187.150	5129.791	5507.579	3334.828	9254.758	16843.897	887.161	4973.840	7604.237
1999	39.9	32	0.70	2.05	3.78				4656.229	5686.702	6124.584	3648.605	10265.770	18699.825	782.746	4388.439	6709.248

2000	39.9	31.7	0.80	2.25	4.15				5542.837	6706.060	7290.785	4048.079	10923.455	19900.530	723.214	4054.678	6198.979
2001	39.9	32	0.90	2.50	4.60				6091.505	7439.619	8012.477	4387.984	11779.685	21481.093	751.875	4215.365	6444.645
2002	39.9	31.9	1.00	2.80	5.11				6674.174	8125.766	8778.893	5003.782	13474.164	24329.831	765.227	4290.222	6559.090
2003	39.9	35.5	1.14	3.21	5.77				6529.040	8846.139	8587.990	5794.211	15833.414	28163.117	771.418	4324.929	6612.151
2004	39.9	37	1.28	3.47	6.29				6904.279	9749.810	9081.562	6400.537	16895.495	30354.611	801.090	4491.285	6866.484
2005	39.9	35.3	1.45	3.75	6.87				8213.973	11066.342	10804.271	7329.319	18393.366	33336.564	832.517	4667.478	7135.856
2006	38.3	34.4	1.78	4.46	8.01				9505.744	13001.540	12503.406	8964.447	21742.494	38691.592	844.251	4733.269	7236.440
2007	36.7	34.8	2.10	4.82	8.45				11014.902	15905.335	14488.480	10632.652	23648.784	41036.538	917.484	5143.847	7864.150
2008	37.7	35.7	2.48	4.93	8.44				12295.040	17729.882	16172.314	12311.763	23881.632	40434.206	884.183	4957.144	7578.711
2009	39.6	37.2	2.30	4.43	7.47				10232.841	14638.379	13459.794	10868.869	20392.054	33998.956	735.549	4123.835	6304.709
2010	42.4	33.6	2.38	4.47	7.53				11347.478	13693.731	14925.936	10692.044	19720.087	32881.102	769.520	4314.288	6595.883
2011	39.4	32.5	2.53	4.60	7.75				12796.388	16073.985	16831.764	11237.643	20011.007	33404.374	782.978	4389.741	6711.239
2012	37.7	35.1	2.64	4.67	7.91				12568.504	17819.617	16532.015	11721.877	20451.580	34294.912	782.290	4385.883	6705.340
2013	40.2	35.3	2.74	4.82	8.19				13088.597	17502.125	17216.122	12257.675	21251.705	35757.173	740.316	4150.560	6345.567
2014	39.4	37.7	2.86	5.04	8.54				12704.542	18511.992	16710.954	12970.868	22444.094	37674.447	736.705	4130.311	6314.610
2015	42.1	37.4	3.01	5.32	9.05				13130.473	17763.105	17271.203	13748.137	23919.149	40281.674	747.753	4192.252	6409.308
2016	41	38.4	3.17	5.57	9.49				13395.565	19105.456	17619.892	14638.371	25276.401	42618.078	750.168	4205.795	6430.013
2017	41.3	37.3	3.52	5.97	10.13				14761.324	20301.734	19416.348	16227.889	27024.800	45393.994	754.794	4231.729	6469.662
2018	40.6	35.7	3.81	6.27	10.58				16290.682	21813.757	21427.992	17602.279	28515.355	47574.374	742.500	4162.805	6364.288
2019	39.7	35.3	5.46	8.75	14.04				17268.565	23382.420	22714.253	25001.430	39612.277	63071.045	751.076	4210.885	6437.795
2020	39.5	36	5.94	9.38	14.91				16449.268	22829.741	21636.588	27250.522	42439.903	66860.490	748.148	4194.471	6412.701
2021	40.5	36.7	6.51	9.79	15.69				18293.463	25243.873	24062.356	29616.607	44085.896	70087.449	751.331	4212.314	6439.981
2022	41.3	36.6	7.16	9.14	14.83				22418.294	30253.987	29487.964	33710.128	42783.064	68851.103	751.331	4212.314	6439.981
2023	40.4	36	7.94	9.45	15.49				24461.436	33193.428	32175.416	37655.647	44664.154	72617.803	751.331	4212.314	6439.981

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