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# Wasted GDP in the USA

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Whether or to what extent Gross Domestic Product (GDP) can measure human development is disputed. This article develops a notion of "wasted GDP", with a case study on the performance of the USA based on analysis of Human Development Index (HDI) data. Like Herman Daly's notion of 'uneconomic growth', the perspective of wasted GDP addresses the benefits and costs of economic growth and favors prioritization of policies that promote genuinely sustainable wellbeing. Over the last three decades, the USA has fallen behind several other highly developed countries in the HDI, despite solid economic growth. More than 20 countries, large and small, now outperform the USA on the Human Development Index, and 27 countries currently do better than the USA by nonincome HDI. 21 countries outperform the USA by this measure despite having a lower GDP per capita. The notion of "wasted GDP" implies that GDP is wasted if it does not support welfare. While a country´s welfare performance is measured by nonincome HDI, a comparison with better-performing countries that have a lower GDP indicates the share of GDP that is wasted from a human development perspective. The results, based on highly conservative estimates, show that the top 5 performers by lowest GDP per capita achieve better outcomes than the USA with an average GDP per capita that is 37.5% lower. All better performers achieve better outcomes with an average GDP per capita that is 26.9% lower. Without any wasted GDP, the annual US $CO_2$ emissions could have been at least 1.268 million tonnes lower (all better performers estimate) and possibly as much as 1.767 million tonnes lower (top 5 performers estimate), accounting for 3.6–5.0% of global emissions. Similarly, the USA´s material footprint could have been between 2.625 million and 3.659 million tonnes lower, accounting for 2.7–3.8% of humanity´s global material footprint.

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## Introduction

Many believe economic growth aims to improve human welfare (for a discussion, see Tønnessen 2020). If this is the case, assessments should be made as to whether economic growth in fact contributes to improved welfare. This article is a contribution to answering that question. The main research question is: How can Human Development Index (HDI) data be used to assess the ways in which income levels correlate with welfare performance, and the extent to which GDP is wasted by not, in fact, improving welfare? HDI data are relevant in this context because they involve income data and nonincome welfare data presented as an aggregate called ´nonincome HDI´ by the United Nations Development Programme (UNDP) which publishes HDI data in Human Development Reports.

In the long run of history, there is little doubt that as countries experience sustained economic growth, human welfare tends to improve, at least at the initial stages of economic development. However, for more than two generations, scholars have questioned whether this is always the case, especially in affluent countries (Easterlin, 1974, 1995, 1998, 2021; Anand and Sen, 2000; Sachs, 2017; Hoekstra, 2019), and called for new ways of measuring welfare (UNDP, 1990; Anand and Sen 2000; Stiglitz et al., (2009); Stiglitz et al., 2018, cf. also e.g., Helliwell et al. (2020)), and Hoekstra, 2019).

Any economic activity has some degree of environmental impact. Higher activity as measured by Gross Domestic Product (GDP) typically involves a more considerable environmental impact (Meadows et al., 1972, Steffen et al., 2011, see also Tønnessen, 2008).

In this article, the concept of "wasted GDP" is developed, with a clear empirical methodology. The underlying idea behind the concept was first described by Jason Hickel (2021: 180):

> Consider this thought experiment: if Portugal has higher levels of human welfare than the United States with $38,000 less GDP per capita, then we can conclude that $38,000 of America's per capita income is effectively 'wasted'. That adds up to $13 trillion per year for the US economy as a whole. That's $13 trillion worth of extraction and production and consumption each year, and $13 trillion worth of ecological pressure, that adds nothing, in and of itself, to the fundamentals of human welfare. It is damage without gain. This means that the US economy could in theory be scaled down by a staggering 65% from its present size while at the same time *improving* the lives of ordinary Americans, if income was distributed more fairly and invested in public goods.

The basic assumption is that GDP is wasted if it does not support welfare. Estimating the portion of a country´s GDP that is wasted provides us with a measure of how effectively the country promotes welfare in a comparative perspective. Furthermore, as indicated by Hickel, analysis of wasted GDP can serve as the basis for exploring a further research question, related to connections between economic activity, welfare, and environmental impact, namely: How much ecological pressures result from the share of GDP that is wasted by not supporting welfare?

The article is focused on a case study assessing the HDI performance of the United States of America (USA). There are at least four compelling reasons for choosing the USA as a case study in this context. First, the average US citizen has an income that is considerably higher than the average income in most other countries, including in most rich countries,[1] and this income is associated with substantial ecological pressures. If the purpose of economic growth is to improve human welfare, then the USA should be expected to do very well in terms of welfare performance. Second, the USA is a major economy and has considerable political clout on the world stage. This makes many other countries look to the USA as a possible model for development. Third, as the most prominent example of a liberal welfare regime, the USA has distinct welfare policies that can informatively be contrasted with those of conservative and social democratic welfare regimes (Esping-Andersen, 1990). And fourth, according to the latest HDI data, the USA ranked number 1 on the Human Development Index in 1990, when the HDI time series data begin (UNDP, 2022a: 277). An assessment of its HDI performance is therefore of special interest.

The United Nations´ Human Development Index has been calculated since 1990 (Human Development Index, 2023; Human Development Data, 2023). In chronological order, the top-ranked country by this measure has *at the time of reporting* been Japan (1990–1991, 1993), Canada (1992, 1994–2000), Norway (2001–2006, 2009–2021), Iceland (2007–2008) and Switzerland (2022).[2] The USA started out as no. 2 in the world in 1990 (UNDP, 1990) (note the difference from the latest HDI data just mentioned) but has since been sliding down the list in terms of ranking, and is currently not among the 20 most developed countries internationally (UNDP, 2022a: 272). The USA currently ranks as no. 21 by HDI.

It is well established that there is a strong correlation between high HDI values and high levels of negative environmental impact (Steinberger et al., 2012, Crabtree, 2012, Otoju et al., 2014, O'Neill et al., 2018, UNDP, 2020). Calls for incorporating environmental impact in human development assessments (e.g., Crabtree, 2012, Jain and Jain, 2013; see also Hickel, 2020) have now been heard, in that the UNDP in its Human Development Report for 2020 made use of the Anthropocene (Steffen et al., 2011) as a framework for discussion of human development and launched an environmentally oriented adjusted HDI index, the Planetary pressures-adjusted Human Development Index (PHDI) (UNDP, 2020). The USA currently ranks as no. 57 by PHDI, i.e., 36 places lower than by HDI (UNDP, 2022a: 299).

The concept of wasted GDP can be seen as a new analytical tool in the HDI toolbox, supplementing the Human Development Index and adjusted versions of the index such as the PHDI. As described above, the choice of the USA as a case study is motivated by the USA´s economic and political prominence, as well as its initially high HDI ranking. It provides an example of how income is correlated with welfare performance in a central affluent country. The fact that the USA is outperformed by several other affluent countries, shows that wasting less GDP is possible in affluent countries, potentially resulting in higher welfare levels and lower planetary pressures. The focus on affluent countries in this article should not be taken to imply that the concept of wasted GDP is only relevant to affluent countries. Given that wasted GDP measures how efficiently GDP is used to attain a high nonincome HDI value, it is also relevant—and equally informative—for middle-income and low-income countries.

The estimates of wasted GDP in the USA presented in this article must be understood to be highly conservative, for two different reasons. First, the methodology applied in the article relies on a comparison with better-performing countries *as of today*, with the current profit-based economic systems that predominate today. It is reasonable to believe that even today´s best-performing countries would have considerable potential for better and more efficient human development outcomes if economic systems were reformed to allow for a stronger prioritization of the promotion of human development and environmental sustainability. If even some of the GDP of the best-performing countries in the world as of today can be considered "wasted" in light of the *potential* for efficient human development, then regarding these

countries´ current performance as an assumed optimal performance results in an underestimation of the wasted GDP in other countries. A second point concerns how GDP is measured. The methodology of this article follows the UNDP in applying a purchasing power parity (PPP) measure of income. If a GDP measure based on market exchange rates (MER) was applied instead, the estimates of wasted GDP would be considerably higher. This is detailed in the Supplementary Information Appendix.

In what remains of the introduction, an outline is given of how the topic of progress is being discussed in a sustainability perspective, of different approaches to the relation between GDP growth and wellbeing, and of Herman Daly's notion of 'uneconomic growth', which resembles the notion of wasted GDP as developed in this article. This is followed by an explanation of how HDI values are calculated, a presentation of previous research on connections between economic growth and human development, and of previous research on how human development relates to sustainability. The methodology section provides a definition of wasted GDP, a summary of how the concept of wasted GDP differs from other, related approaches, and a description of how $CO_2$ emissions and material footprint related to wasted GDP can be estimated. In the next section the HDI performance of the USA is assessed, including its nonincome HDI performance. Better-performing countries by nonincome HDI are identified. The results section presents estimates of current levels of wasted GDP in the USA. It further contains estimates of US $CO_2$ emissions and material footprint related to wasted GDP. This is followed by concluding observations and a brief discussion of policy implications.

**Progress in a sustainability perspective**. Research on happiness is a growing international field of study. Phrase frequency studies show that while 'income' and 'GDP' are on a long-term trend of decreasing use in published books, phrases related to happiness and subjective wellbeing are on the increase (Barrington-Leigh, 2022). This points to an ongoing reframing of what progress amounts to. Over the last few decades, numerous alternative measures of progress and wellbeing have been introduced (Barrington-Leigh and Escande, 2018).

Especially since the 1970s, the economic growth agenda has been criticized regarding the environmental costs of economic expansion (Meadows et al., 1972, Daly, 1974, Wackernagel and Rees, 1998, Steffen et al., 2015, Wiedmann et al., 2020). Over the years Herman Daly (1974, 1991, 2014) developed 'steady-state economics' as an alternative economic model. Daly also contributed to developing indicators intended to replace or supplement GDP, such as Index of Sustainable Economic Welfare (ISEW), which has in turn inspired the Genuine Progress Indicator (GPI), both of which incorporate environmental and social concerns (Daly and Cobb, 1989, 1994).

Jason Hickel (2019a) points out that there is a potential contradiction between some of the UN´s sustainable development goals, in that they call for continued economic growth while also aiming for ecological sustainability, which might require reducing resource use rather than increasing it. As Ian Gough (2017) makes clear, genuinely sustainable wellbeing entails "wellbeing for all current peoples as well as for future generations" (2017: 12), and attaining a sustainable future arguably requires a systemic economic transition from satisfaction of wants to satisfaction of needs.

Recent research suggest that human needs could be met, and decent living conditions achieved, within sustainable levels of energy use (Vogel et al., 2021), but that this would require reductions in demand to sufficiency levels (Millward-Hopkins et al., 2020). Relatedly, Hickel (2019b) argues that achieving a good life for all within planetary boundaries (Rockström et al., 2009) is only attainable if rich countries abandon economic growth as a policy objective. Referring to historical trends in growth and resource use, Hickel is critical of green growth theory, which asserts that continued economic expansion is compatible with achieving ecological sustainability (Hickel and Kallis, 2019).

**Wellbeing and GDP growth**. Almost a decade before the launch of the Human Development Index in 1990, which he would help establish, Amartya Sen (1981) observed that there is a contrast between countries' economic development by traditional measures such as income and by "quality of life" indicators such as life expectancy and literacy. As Sen stresses, policy differences can often explain different outcomes at similar levels of economic development. For example, prioritization of public provisioning systems tends to result in stronger social outcomes. A classical study by Cereseto and Waitzkin (1986) of World Bank data found that socialist countries had generally achieved better physical quality of life outcomes than capitalist countries at equivalent levels of economic development. A study by Easterlin (2009) later observed that developments in life satisfaction in Eastern Europe fell behind and diverged from GDP growth in the transition from socialism to capitalism.

Some scholars have suggested that quality of life tends to peak at a certain level of economic development. This would fit with a pattern conceptualized by Manfred Max-Neef (1995: 117), with his "Threshold Hypothesis" implying that "for every society there seems to be a period in which economic growth (as conventionally measured) brings about an improvement in the quality of life, but only up to a point—the threshold point—beyond which, if there is more economic growth, quality of life may begin to deteriorate." In line with this hypothesis, Kubiszewski et al. (2013: 57) found that global economic welfare per capita, as measured by the Genuine Progress Indicator (GPI), peaked in 1978, and that GPI/capita "does not increase beyond a GDP/capita of around $7000/capita".

Other scholars have argued that high household income contributes to improvements in life satisfaction (Kahneman and Deaton, 2010), and perhaps to improvements in everyday emotional wellbeing too, without any identified upper boundary (Killingsworth, 2021). This could imply that most people are individually better off in terms of subjective wellbeing the richer they are. However, high incomes are faced with the challenge of environmental sustainability, and as long as many people live in relative poverty, these cannot attain a similar quality of life.

Hickel is among the versatile scholars that have concluded that a radical change in our economic system is required if we are to improve wellbeing and achieve ecological sustainability, or in other words achieve genuinely sustainable welfare. He favors Degrowth and post-capitalism (Hickel, 2021). In a similar vein, Tim Jackson (1996) has discussed the necessity of reducing the material impacts of human activities, and of reorienting ourselves regarding the emphasis that has been placed on the material dimensions of human society. Jackson has cultivated a notion of "prosperity without growth" (Jackson, 2017), arguing that humans—and society—can flourish without economic expansion and that there is a need to develop a 'post-growth macroeconomics'. Like Hickel, Jackson, too, favors a post-capitalist society (Jackson, 2021).

Kallis et al. (2018) observe that research on Degrowth, which implies reduced resource and energy use, has "reinvigorated the limits to growth debate with critical examination of the historical, cultural, social, and political forces that have made economic growth a dominant objective" (2018: 291). Degrowth is in their

view incompatible with capitalism and requires social transformation and a radical reorganization of the economy. Kallis et al. (2020) emphasize that Degrowth must be selective in that downscaling of resource and energy use should be applied to most but not all sectors of the economy and to several but not all countries (specifically, not to poor countries). The Degrowth agenda is "on purpose subversive" and can be seen as "an advanced reincarnation of the radical environmentalism of the 1970s" (Kallis and March, 2015: 360). In this respect, Degrowth involves an element of Utopianism (Kallis and March, 2015, see also Kallis, 2018). While some proponents of Degrowth have rejected the 'steady-state economy' proposed by Daly, others argue that the Degrowth agenda is reconcilable with steady-state economics (Kerschner, 2010).

Approaches such as the Genuine Progress Indicator, Degrowth, and steady-state economics all tend to rely on the idea that there is some kind of optimal scale for the economy and that the current economy in rich countries has surpassed this optimum. Daly explicitly states that in his view there is an "optimal scale of the macroeconomy" (2014: 221). The steady-state economy he promotes would be at or close to this scale (2014: 2). In Daly´s analysis "we have overshot the optimal scale of the macroeconomy", and therefore a reduction in aggregate resource throughput is now required (2014: 225), especially in the richest countries. The concept of wasted GDP is compatible with the idea that there is an optimal scale for the economy but does not depend on it, as it can also be applied as an efficiency measure by those with different views on the scale of the economy.

**Daly's notion of uneconomic growth**. Proponents of Degrowth argue that in several rich countries "sustaining growth is no longer economically sound: its social, ecological and personal costs exceed its benefits" (Kallis et al., 2020: 2). A similar observation has been made by Herman Daly and is reflected in his coinage of the term 'uneconomic growth' (Daly, 1999a, b).

While GDP growth is usually equated with 'economic growth', Daly has introduced a distinction between economic growth and 'uneconomic growth'. In this view, GDP growth is uneconomic whenever the marginal disutility of that growth exceeds the marginal utility of growth (1999a: 9). Uneconomic growth implies "producing 'bads' faster than goods" (Daly, 2005: 100), in that the GDP growth "increases social and environmental costs faster than it increases production benefits" (Daly, 2014: 89), thereby reducing net wealth and wellbeing (2014: 221).

While the concept of uneconomic growth is not yet recognized in mainstream economics, it is "an obvious concept" in ecological economics (Daly 1999b: 12), on the premise that the economy should be regarded as a subsystem of nature. Economic growth usually involves transforming natural capital into manmade capital by absorbing natural resources into the economy (Daly 2014: 89). Currently "depletion of natural capital and natural services are counted as income" (2014: 187), while the costs are not measured. Daly argues that alternative measures of progress, such as ISEW and GPI, indicate that the USA and some other rich countries have entered an era of uneconomic growth (Daly 1999a: 11–12, 1999b: 3, 2014: 89, cf. 2005: 100, 105). He nevertheless thinks it is possible to improve welfare in the United States, given the right policy choices (1999a: 11).

There is admittedly a conceptual overlap between the notion of 'wasted GDP' and Daly's notion of 'uneconomic growth'. Both notions address the social benefits and the social and environmental costs of a growing GDP and indicate that not all economic growth is sound. Their use in empirical analysis furthermore indicates that policies that promote wellbeing and reduce environmental impact should be prioritized and that this might have to imply downscaling economic activity. Unlike Daly's notion of 'uneconomic growth', the concept of wasted GDP is focused on GDP rather than on GDP growth and can be used to measure how efficiently GDP is used to support welfare regardless of whether or not GDP is growing.

## The Human Development Index

In this section, an explanation of how the Human Development Index is calculated is provided, and prior findings about connections between economic growth and human development are reviewed.

**How the Human Development Index (HDI) is calculated**. The Human Development Index is calculated from three so-called dimension indices, representing health, education, and income respectively. These three indices are given equal weight, but the math involved is not straightforward, and has changed over time, as has the choice of specific indicators. The focus here will be on the specific indicators and equations that are currently used.

Stanton (2007) and Klugman et al. (2011) both give an overview of how the calculation of the HDI has changed over time (see particularly the informative Fig. 1 in Stanton, 2007, p. 16, and Table 1 in Klugman et al., 2011, p. 4; cf. also Anand and Sen, 2000). Significant changes include a change from measuring adult literacy rate and school enrolment ratios to measuring mean and expected years of schooling, a change from making use of Gross Domestic Product (GDP) per capita to using Gross National Income (GNI) per capita as indicator of income, and a change from calculating the arithmetic mean (average value) to calculating the geometric mean of the dimension indices when stipulating the overall Human Development Index value.[3] The only specific indicator that has remained constant all the time since 1990 is life expectancy at birth, but even this indicator has changed in terms of how values have been capped at minimum and/or maximum values.

The UNDP´s treatment of the income indicator has changed considerably over time, not only by transferring from GDP to GNI per capita values, since 2010, but also by changing thresholds several times. On one extreme, in the very first Human Development Report (UNDP, 1990), a real GDP per capita value comparable to the average poverty line in nine rich, industrialized countries was considered as a desirable or adequate achievement for the income component of HDI and resulted in a maximum value (Anand and Sen, 2000: 87, cf. Klugman et al., 2011: 3–5).

While the income indicator data, currently represented by GNI per capita, is subjected to logarithmical transformation to account for diminishing returns for human welfare from income, no such recalculation is carried out for the education and health indicators. The idea is that income is first and foremost of instrumental value to human welfare—it can serve as a means to achieve high welfare, but unlike health and education it is not in itself a constituent part of the good life. Whereas a good life involves good health and being educated—which is why health and education have intrinsic value—income only contributes to a good life in so far as it helps us to make a good life achievable (UNDP, 1990; Anand and Sen, 2000; Klugman et al., 2011).

In its treatment of the income indicator of the HDI, the UNDP currently caps GNI per capita at $75,000. The assumption is that any income that is higher than this will not contribute further to human development. The UNDP justifies the maximum threshold for GNI per capita by referring to Kahneman and Deaton (2010), which—on a sidenote—is problematic since there are several discrepancies between the UNDP´s application of its income measure and the data and claims of Kahneman and Deaton (Tønnessen, forthcoming).

The UNDP also operates with a minimum of $100 for the GNI per capita indicator (UNDP, 2022b: 2), which is a far lower income than what is registered in any country in current times but might have occurred in earlier human history (DeLong, 1998; cf. also Maddison, 1995, 2003 and Maddison Project Database, 2020 for alternative estimates and views). Currently, there are also minimum and maximum values for life expectancy (20 and 85 years respectively), for expected years of schooling (0 and 18 years respectively), and for mean years of schooling (0 and 15 years respectively) (2022b: 2).

The dimension index values are generally calculated using the following formula:

$$Dimension\ index = \frac{actual\ value - minimum\ value}{maximum\ value - minimum\ value}$$

For the income index, this formula is applied (implied but not explicitly presented in UNDP 2022b: 3), resulting in logarithmical transformation of the values:

$$Income\ dimension\ index = \frac{ln(actual\ value) - ln(minimum\ value)}{ln(maximum\ value) - ln(minimum\ value)}$$

These metrics result in an index value between 0 and 1 for each dimension, with 0 representing the worst possible performance and 1 representing the best possible performance. For the education index, an index value is first calculated for each of the components (expected years of schooling and mean years of schooling), and the dimension index value is then calculated as the arithmetic mean of the two subdimension indices.

The HDI value is defined as the geometric mean of the three dimension index values, calculated by this formula (UNDP, 2022b: 3):

$$\mathrm{HDI} = \left(\mathrm{I}_{\mathrm{Health}} \times \mathrm{I}_{\mathrm{Education}} \times \mathrm{I}_{\mathrm{Income}}\right)^{1/3}$$

**Connections between economic growth and human development**. The notion of nonincome HDI was first introduced in *Human Development Report 2010* (UNDP, 2010) and was also applied in the two next reports (UNDP, 2011; UNDP, 2013).[4] Nonincome HDI is defined as the geometric mean of the two nonincome dimension index values, calculated by the following formula:

$$\mathrm{Nonincome\ HDI} = \left(\mathrm{I}_{\mathrm{Health}} \times \mathrm{I}_{\mathrm{Education}}\right)^{1/2}$$

In training materials (UNDP, 2015), the UNDP Human Development Report Office (HDRO) explains that the "HDI can also be used to identify how achievements in income growth are related to progress in other HDI dimensions" (2015: 26). They observe that since 1990, income growth has not systematically coincided with progress in health and education and conclude that "the forces driving improvements in health and education are different from those driving improvements in income" (2015: 26, cf. also Klugman et al. 2011). These findings "confirm a central contention of the HDRs from the outset: that human development is different from economic growth and that great achievements are possible even without fast economic growth" (2015: 27; see Srinivasan 1994 for criticism of the initial motivation for the HDI). By demonstrating that distinguishing between income growth and nonincome HDI is informative, such findings also plausibly justify the use of a composite index such as the HDI, as an alternative to GDP as a measure of welfare (2015: 27) (cf. also Otoiu et al. 2014).

For the period 1990–2013, HDRO found that there was a weak relationship between economic growth and changes in the nonincome components of HDI, i.e., health and education (2015: 27). On average, nonincome HDI improved by around 1% per year whether income growth was negative, low, or high. On the other hand, there was a clear relationship between income growth and increase in HDI value (2015: 27) – which is not surprising, given that income constitutes one of the three indices of the HDI. Despite of these pertinent observations made by the HDRO, few studies have looked closer into the relations between income and nonincome components of HDI.

Gidwitz et al. 2010, a UNDP research paper that examined long-term trends in HDI components and was composed in preparation of the 2010 edition of the Human Development Reports, also makes use of the notion of nonincome HDI (Gidwitz et al. 2010: 29–30). They found that while health and education outcomes converged between developing and developed countries in the period 1970–2010, income per capita levels diverged (2010: 28). The correlation between economic growth and changes in nonincome HDI is "remarkably weak and statistically insignificant" (2010: 29). In a similar manner, Klugman et al. 2011 observes that "even over relatively long periods of time, there is little correlation between improvements in per capita income and improvements in the non-income dimensions of human development" (2011: 9). With reference to several countries that have seen values for nonincome HDI components improve while undergoing declining GDP, Gidwitz et al. (2010: 30) reject the commonly held hypothesis "that growth is necessary […] for improvements in health and education".

Whereas there is an evident and strong correlation between *levels* of income and levels of health and education outcomes, there is no statistically significant correlation between *changes* in income and in levels of health and education outcomes. "Thus, we have a puzzle", as Gidwitz et al. observe, regarding the existence of any stable structural relationship between income and nonincome HDI (2010: 31). If it exists, such a relationship may or may not involve causality (2010: 28), and even if the relationship is causal, the authors caution that any observed correlation "between growth and changes in human development does not imply causation in a specific direction" (2010: 31–32), as it is both conceivable that growth leads to "broader improvements in the quality of life", and that "improvement in health and education [makes] societies more productive."

**Human development and sustainability**. Barrington-Leigh and Escande (2018: 900) remark that indices such as the Human Development Index can "capture a concept of progress or well-being in a single value, allowing a summary measure to be tracked over time […] and communicated efficiently", and note that the HDI has "had an effect on policy by providing some scalar alternative to measuring development with GDP" (2018: 906). However, as noted earlier in this article, several scholars have addressed the fact that there is a strong correlation between high HDI values and high levels of negative environmental impact.

In-depth analyses underline this. Moran et al. (2008) compared HDI data with Ecological Footprint data. They found that, by 2003, only one of 93 surveyed countries was sustainable by their criteria, which required an HDI of 0.8 or higher and a per capita Ecological Footprint below the globally available biocapacity. They also found that high-income countries tended to see disproportionately larger increases in their Ecological Footprint compared to their advances in HDI. Relatedly, Jain & Jain (2013) combined HDI data with Ecological Footprint data in the construction of a new index called the Sustainable HDI. They found that of the 20 countries with the highest Ecological Footprint by 2008, 10 countries simultaneously ranked among the 20 countries with the highest HDI, while only one of the 20 countries ranked among the 20 countries with the highest Sustainable HDI.

Hickel (2020) claims that the HDI, with its current emphasis on high incomes, "promotes a model of development that is empirically incompatible with ecological stability, and impossible to universalize". In the article, he introduces the Sustainable Development Index (SDI), which makes use of the same data as the UNDP´s Planetary pressures-adjusted Human Development Index (PHDI) (UNDP, 2020), but applies a different methodology for calculating the index value. A crucial difference is that the maximum threshold for GNI per capita is set to $20.000. The SDI also in effect weighs ecological impact, represented by $CO_2$ emissions and material footprint, as much more significant than the UNDP does given its methodological design for PHDI. As a result, the SDI´s ranking of the best-performing countries differs sharply from both HDI and PHDI, with several highly ranked countries by HDI appearing close to the bottom of the SDI ranking. The USA, for example, is ranked as #21 by HDI but ranks only as #159 on the SDI. The SDI performance of the USA is far worse than its performance by any of the HDI indicators (income, life expectancy, mean and expected years of schooling) —the USA ranks among the top 50 countries globally on all four HDI indicators (see the Sections "HDI performance" and "Better-performing countries by nonincome HDI" for details). The SDI performance of the USA is also far worse than its performance on the Planetary pressures-adjusted Human Development Index (PHDI), given its current PHDI ranking at #57. By building on the same data as the PHDI, and yet arriving at a radically different assessment and ranking, the Sustainable Development Index designed by Hickel highlights how changes to index methodology are decisive for a country's performance on the Human Development Index and related indices.

The PHDI incorporates data that, like Ecological Footprint data, are measures of environmental impact per capita, and relates these to more classical HDI measures. Both the concept of wasted GDP and Hickel´s Sustainable Development Index build directly on HDI data including the environmental data of the PHDI. Unlike the SDI, however, applying the concept of wasted GDP does not rely on considerable changes to HDI methodology, but is based on nonincome HDI as an established measure in the context of Human Development Reports.

## Methodology

**Defining wasted GDP**. Assuming that the main purpose of economic activity is to support human welfare, Gross Domestic Product (GDP) can be considered as wasted to the extent that GDP does not support welfare. The extent to which GDP is wasted can be assessed by analysis of Human Development Index (HDI) data supplemented by GDP data.

A country´s welfare performance may be measured by nonincome HDI, which is defined as the geometric mean of the two nonincome HDI dimension index values, calculated by the following formula (UNDP, 2010):

$$\text{Nonincome HDI} = \left(I_{\text{Health}} \times I_{\text{Education}}\right)^{1/2}$$

The Health dimension index is based on one indicator, life expectancy at birth. The Education dimension index is based on two indicators, expected years of schooling and mean years of schooling (UNDP, 2022b: 2). Each dimension index has a value between 0 and 1, and the same holds for the nonincome HDI value. For further details on HDI methodology, see the Section "How the Human Development Index (HDI) is calculated".

A comparison with better-performing countries by nonincome HDI that have a lower GDP per capita than the country in question indicates the share of GDP that is wasted from a human development perspective. By performing similarly well, the country could have improved its nonincome HDI performance with a similarly lower GDP as the better-performing countries.

Mathematically, this can be expressed as follows:

If

$$\textit{Nonincome HDI of country } X < \textit{Nonincome HDI of countries } Y + \ldots + Z$$

and

$$\textit{GDP per capita of country } X > \textit{GDP per capita of countries } Y + \ldots + Z$$

then

$$\textit{Wasted GDP in \%} = \frac{(\textit{GDP per capita of country } X) - (\textit{GDP per capita of countries } Y + \ldots + Z)}{\textit{GDP per capita of country } X} \times 100$$

The nonincome HDI of a group of countries is best expressed as a weighted average, weighted by population. The same applies to the GDP per capita of a group of countries.

Besides comparing a country with all better-performing countries that have a lower GDP, it is also informative to compare the country with a selection of the best-performing countries, e.g., the top 5 performers by the lowest GDP.

**How wasted GDP stands out methodologically compared to other approaches**. Similarities and differences with other, related approaches have been described in the Sections "Wellbeing and GDP Growth", "Daly´s notion of uneconomic growth", and "Human development and sustainability". Here is a summary of how the concept of wasted GDP stands out from related approaches: While several approaches (e.g., the Genuine Progress Indicator, Degrowth, and steady-state economics) assert that there is an optimal scale for the economy and that many rich countries have surpassed this optimum, the concept of wasted GDP is compatible with this understanding but can also be applied as an efficiency measure of welfare performance by those with different views. Unlike Daly´s notion of ´uneconomic growth´, wasted GDP is focused on GDP rather than on GDP growth and can be used to measure how efficiently GDP is used to support welfare regardless of whether or not GDP is growing. The concept is thus applicable in different settings, ranging from the growth economy to degrowth and post-growth perspectives. And finally, unlike Hickel´s Sustainable Development Index, applying the concept of wasted GDP does not rely on considerable changes to HDI methodology, but is based on nonincome HDI as an established measure in the context of Human Development Reports.

**Estimating CO2 emissions and material footprint related to wasted GDP**. By considering a country´s current carbon dioxide emissions and material footprint and the share of its GDP that is currently wasted as seen from a human development perspective, estimates can be made of the ecological pressures that the country causes that are not justified by contributing to human development (or more specifically to nonincome human development). Data on total carbon dioxide emissions and material footprint are drawn from the same sources as the UNDP (2022a: 299–303) makes use of in its calculations of the Planetary Pressures-adjusted Human Development Index (Global Carbon Project, 2022; United Nations Environment Programme, 2022). Estimates of carbon dioxide emissions and material footprint related to wasted GDP are made by multiplying wasted GDP in % with the country´s total carbon dioxide emissions and material footprint.

This methodology in effect relies on the assumption that there is a constant relationship between GDP on one side and carbon dioxide emissions and material footprint on the other side across all economic sectors. This is not actually the case. In consequence, the estimates of $CO_2$ emissions and material footprint related to

**Table 1 USA – Human Development Index (HDI).**

| Country | HDI value (accumulated change) | | | | | HDI ranking (accumulated change) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1990 | 2000 | 2010 | 2019 | 2021 | 1990 | 2000 | 2010 | 2019 | 2021 |
| USA | **0.872** | **0.891** (+0.019) | **0.911** (+0.039) | **0.930** (+0.058) | **0.921** (+0.049) | **#1** | **#5** (−4) | **#12** (−11) | **#18** (−17) | **#21** (−20) |

Sources: UNDP, 2022a: 277; UNDP, 2022c.
The bold values are the HDI values of the USA.

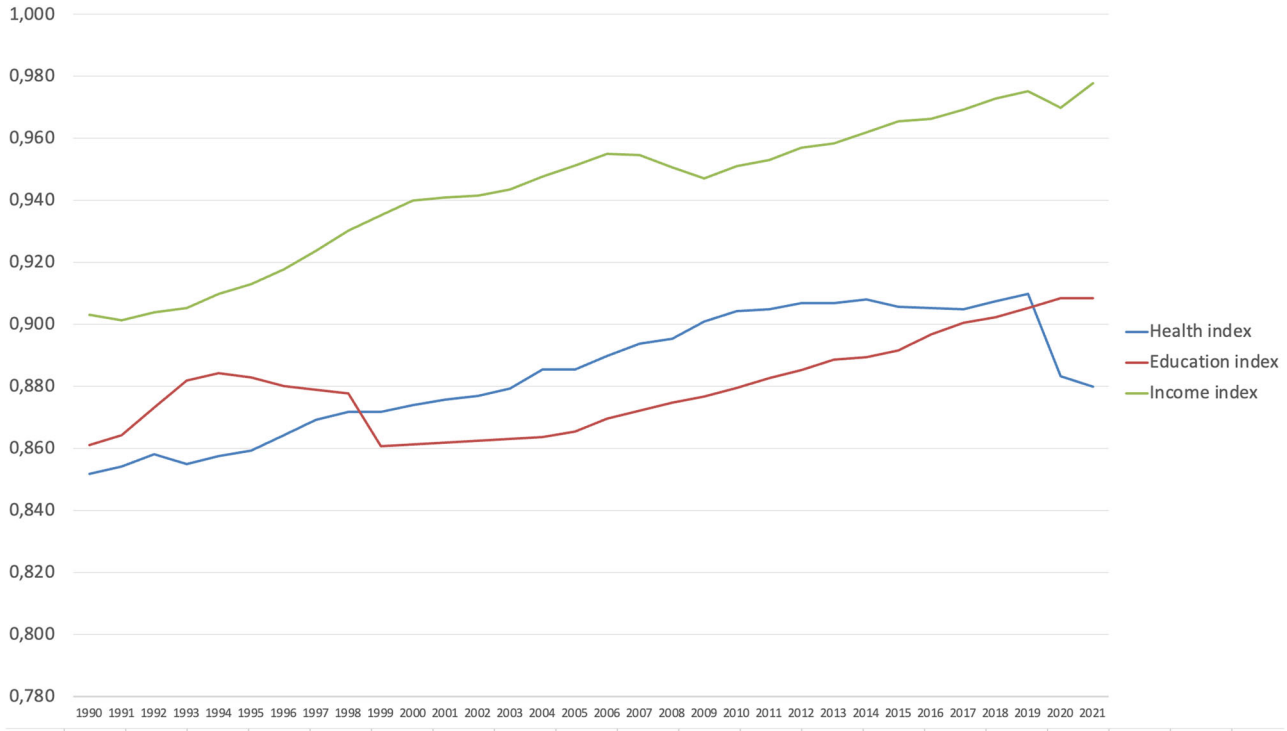


**Fig. 1 The US performance in HDI dimension indices 1990–2021.** The income index had the highest starting point and is also the dimension index that has increased the most, although it suffered a setback in the years following the financial crisis. The Education index suffered a decade-long setback after the middle of the 1990s but has reached new heights over the last decade. The Health Index, which improved over the first two decades of the HDI, has stagnated in the last decade and suffered a setback following the Covid-19 pandemic. Figure by the author. 

wasted GDP must be regarded as rough estimates. It is beyond the scope of this article to assess variation in resource use and carbon intensity across sectors. On a similar note, it is also beyond the scope of this article to investigate what economic sectors contribute the most to human development or human wellbeing more broadly.

## Assessing the HDI performance of the USA

In this section, a summary of the HDI performance of the USA in the period 1990–2021 is provided. The nonincome HDI performance of the USA is compared with the achievements of better-performing countries, including top performers by life expectancy, expected years of schooling, and mean years of schooling.

**HDI performance**. In Table 1, the HDI performance of the USA in the period 1990–2021 is displayed. The HDI value of the USA has increased decade by decade but has fallen since its peak so far in 2019, the last year before the Covid-19 pandemic hit the country in 2020. On the ranking of the countries in the world with the highest HDI value, the USA has according to the latest HDI data fallen from #1 in 1990, to #21 in 2021. While by 2010 the USA was no longer among the world´s 10 most developed countries by this measure, by 2021 it was no longer among the world´s 20 most developed countries. This has occurred despite solid growth in income per capita (cf. Table S1 in Supplementary Information Appendix).

**Nonincome HDI performance**. Measured by its HDI ranking, the USA´s HDI performance has deteriorated over time (cf. Table 1). The country is one of the worst-performing rich countries in terms of average annual HDI growth (cf. Table S2 in Supplementary Information Appendix). This suggests that the explanation for the USA´s poor HDI performance might be found in the nonincome components of HDI.

Table 2 summarizes the nonincome HDI performance of the USA in the period 1990–2021.

As Table 2 shows, life expectancy in the USA has increased from decade to decade up until 2019 but increased only marginally from 2010 to 2019 and has declined from 2019 to 2021. This results in a Health index that increased up until 2019

**Table 2 USA – components of nonincome HDI.**

| Indicator(s) *Dimension index* | Value (in years) (accumulated change in years) *Index value* (*accumulated change in index value*) | | | | |
|---|---|---|---|---|---|
| **Year** | **1990** | **2000** | **2010** | **2019** | **2021** |
| Life expectancy at birth | 75.4 | 76.8 (+1.4) | 78.8 (+3.4) | 79.1 (+3.7) | 77.2 (+1.8) |
| ***Health index*** | ***0.852*** | ***0.874*** *(+0.022)* | ***0.904*** *(+0.052)* | ***0.910*** *(+0.058)* | ***0.880*** *(+0.028)* |
| Expected years of schooling | 15.4 | 15.4 (0.0) | 16.0 (+0.6) | 16.3 (+0.9) | 16.3 (+0.9) |
| Mean years of schooling for ages 25 and above | 13.0 | 13.0 (0.0) | 13.1 (+0.1) | 13.6 (+0.6) | 13.7 (+0.7) |
| ***Education index*** | ***0.861*** | ***0.861*** *(0.000)* | ***0.880*** *(+0.019)* | ***0.905*** *(+0.044)* | ***0.908*** *(+0.047)* |
| **Nonincome HDI** | **0.856** | **0.868** *(+0.012)* | **0.892** *(+0.036)* | **0.908** *(+0.052)* | **0.894** *(+0.038)* |

Source: UNDP, 2022d, UNDP, 2022e.
The values in bold/italic are the HDI dimension index values; the specific dimension indices are presented in the left column. The respective indicators are presented in the left column.

**Table 3 USA vs. better-performing countries by nonincome HDI.**

| Nonincome HDI ranking | Country | Nonincome HDI value | Difference from US nonincome HDI | Difference from US GNI per capita in constant 2017 PPP$ |
|---|---|---|---|---|
| 1 | Iceland | 0.962 | +0.068 | −8.983 |
| 2 | Australia | 0.958 | +0.064 | −15.527 |
| 3 | Norway | 0.953 | +0.059 | −105 |
| 4 | Switzerland | 0.952 | +0.058 | +2.168 |
| 5 | New Zealand | 0.946 | +0.052 | −20.708 |
| 6 | Sweden | 0.944 | +0.050 | −10.276 |
| 7 | Hong Kong, China (SAR) | 0.942 | +0.048 | −2.158 |
| 8 | Finland | 0.942 | +0.048 | −15.313 |
| 9 | Canada | 0.940 | +0.046 | −17.957 |
| 10 | Denmark | 0.938 | +0.044 | −4.400 |
| 11 | Germany | 0.937 | +0.043 | −10.231 |
| 12 | Netherlands | 0.934 | +0.040 | −8.786 |
| 13 | Belgium | 0.932 | +0.038 | −12.472 |
| 14 | United Kingdom | 0.931 | +0.037 | −19.540 |
| 15 | Japan | 0.930 | +0.036 | −22.491 |
| 16 | South Korea | 0.927 | +0.033 | −20.264 |
| 17 | Malta | 0.926 | +0.032 | −25.881 |
| 18 | Slovenia | 0.925 | +0.031 | −25.019 |
| 19 | Israel | 0.924 | +0.030 | −23.241 |
| 20 | Ireland | 0.919 | +0.025 | +11.404 |
| 21 | Singapore | 0.909 | +0.015 | +26.153 |
| 22 | Spain | 0.908 | +0.014 | −26.412 |
| 23 | Liechtenstein | 0.904 | +0.010 | +82.064 |
| 24 | Greece | 0.902 | +0.008 | −35.763 |
| 25 | Austria | 0.899 | +0.005 | −11.147 |
| 26 | Luxembourg | 0.896 | +0.002 | +19.884 |
| 27 | Cyprus | 0.894 | +0.000 | −26.577 |
| **28** | **United States** | **0.894** | **0.000** | **0** |

Sources: UNDP 2022c, UNDP 2022e.
The bold values show US data, which in this table serve as a baseline/lower threshold.

and then declined. The current life expectancy in the USA, and the corresponding Health index value, is lower than it was in 2010, and close to the 2000 values.

The performance of the USA has been better in the education dimension, with neither expected years of schooling nor mean years of schooling experiencing a similar setback in the years referred to in Table 2, although both measures were stagnant from 1990 to 2000. As a result, the Education index of the USA was stable from 1990 to 2000 and has since increased over the two last decades.

The nonincome HDI of the USA has increased from decade to decade but suffered a setback from 2019 to 2021. At 0.894, the current nonincome HDI value of the USA is slightly higher than the 2010 value.

Figure 1 shows the development in the HDI dimension indices year by year for the USA in the period 1990–2021 according to the latest HDI data (UNDP, 2022d, 2022e).

So far, this article has described the US nonincome HDI performance in isolation from the performance of other countries. A comparison with other countries follows in the next section.

**Better-performing countries by nonincome HDI**. As a result of the USA´s strong average income performance over time, an improved income index is the main explanation for the USA´s improved HDI value since 1990. While the USA is world-leading in the context of income per capita, its performance is more mixed in the context of health and education by the HDI measures. In this section, better-performing countries by nonincome HDI are considered.

Table 3 lists the 27 countries that currently have a higher nonincome HDI than the USA.[5] These can be regarded as achieving a higher level of human development than the USA when the income dimension is not considered. Most of them also perform better than the USA when the income dimension *is* included, as reflected by their regular HDI ranking. This applies to 20 countries. These countries perform better than the USA in human development whether the income dimension is included, or only the nonincome dimensions of HDI are considered, even though most of them have a lower GNI per capita than the USA[6]. When only nonincome HDI is considered, 7 more countries outperform the USA. These are Israel, Malta, Slovenia, Austria, Spain, Cyprus, and Greece (ranked as #22, #23, #23, #25, #27, #29, and #33 respectively by HDI).

As of 2021, the USA ranks as #28 globally by nonincome HDI (7 spots lower than by HDI). Of the 27 countries that have a higher nonincome HDI than the USA, 5 countries have a higher income per capita than the USA. These are Switzerland, Ireland, Singapore, Liechtenstein, and Luxembourg (ranked as #4, #20, #21, #23, and #26 respectively by nonincome HDI). Except for Switzerland, these countries have a GNI per capita that exceeds the UNDP´s maximum threshold at $75.000, and thus an income index that reaches the maximum of the scale, at 1.000. The remaining 22 countries outperform the USA by nonincome HDI despite having a lower income per capita than the USA.

Figure 2 shows the development of the nonincome HDI of the USA and the current top 5 performers by this measure year by year in the period 1990–2021 according to the latest HDI data (UNDP, 2022c, d, e).

Table 4 shows the top performers by each nonincome indicator, and how the USA ranks by each indicator.

As detailed in the table, the US performance by nonincome indicators varies considerably. While the USA is ranked as #5 worldwide by mean years of schooling, the country ranks only as

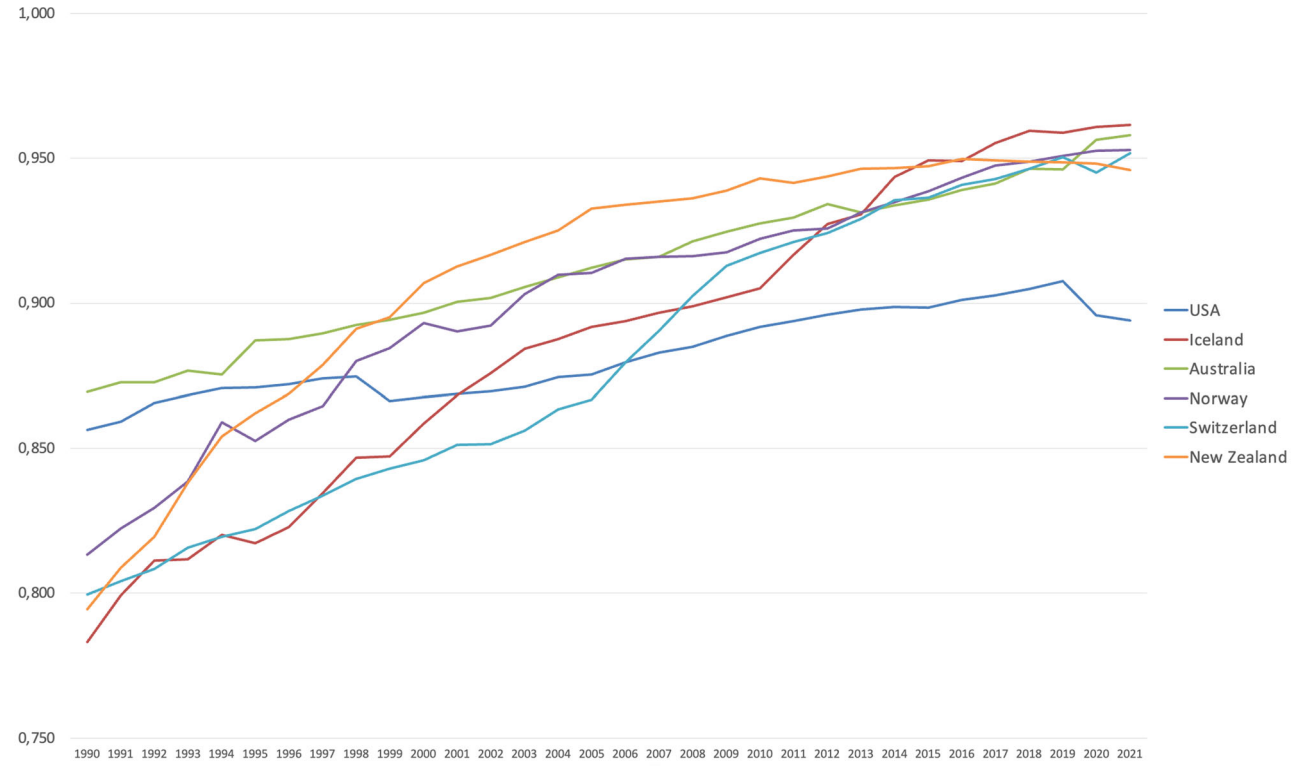


**Fig. 2 The nonincome HDI performance of the USA and top performers 1990–2021.** The US nonincome HDI has generally improved over time, but with setbacks in the years around 2000 and since 2019. The nonincome HDI of the top performers has improved much more, reaching the USA´s current level of development 13–22 years ago and continuing to improve since then. Figure by the author. This figure is covered by the Creative Commons Attribution 4.0 International License.

**Table 4 USA vs. top performers by nonincome indicators.**

| Life expectancy at birth | | | Expected years of schooling | | | Mean years of schooling for ages 25 and above | | |
|---|---|---|---|---|---|---|---|---|
| **Ranking** | **Country** | **Value (in years)** | **Ranking** | **Country** | **Value (in years)** | **Ranking** | **Country** | **Value (in years)** |
| 1 | Hong Kong, China (SAR) | 85.5 | 1 | Australia | 21.1 | 1 | Germany | 14.1 |
| 2 | Japan | 84.8 | 2 | New Zealand | 20.3 | 2 | Switzerland | 13.9 |
| 3 | Australia | 84.5 | 3 | Greece | 20.0 | 3 | Canada | 13.8 |
| 4 | Switzerland | 84.0 | 4 | Belgium | 19.6 | 4 | Iceland | 13.8 |
| 5 | Malta | 83.8 | 5 | Sweden | 19.4 | **5** | **USA** | **13.7** |
| ... | | | ... | | | | | |
| **45** | **USA** | **77.2** | **31** | **USA** | **16.3** | | | |

Sources: UNDP, 2022c, UNDP, 2022e.
The bold values show US data.

#31 by expected years of schooling and only as #45 by life expectancy at birth.

Life expectancy at birth is 8.3 years shorter in the USA than in Hong Kong, the top performer by this measure. At 77.2 years, the US value is lower than the average for the 66 countries classified as having "Very high human development", which is 78.5 years, and lower than the average for OECD countries, which is 79.0 years (UNDP, 2022c). Countries that outperform the USA by life expectancy at birth include middle-income Asian countries such as Thailand and China (life expectancy 78.7 and 78.2 years respectively), and formerly communist countries in Europe such as Slovenia, Chechia and Croatia (life expectancy 80.7, 77.7 and 77.6 years respectively) (UNDP, 2022c).

Expected years of schooling is 4.8 years shorter in the USA than in Australia, the top performer by this measure. At 16.3 years, the US value is lower than the average for the countries classified as having "Very high human development", which is 16.5 years, and lower than the average for OECD countries, which is also 16.5 years (UNDP, 2022c). Countries that outperform the USA by expected years of schooling include the South American countries Argentina, Uruguay, Chile, and Costa Rica (expected years of schooling 17.9, 16.8, 16.7 and 16.5 years respectively) (UNDP, 2022c).

Mean years of schooling for ages 25 and above is only 0.4 years shorter in the USA than in Germany, the top performer by this measure. This reflects the fact that the USA is among the top performers globally by this indicator. At 13.7 years, the US value

**Table 5 Wasted GDP in the USA.**

| Rank by lowest GDP | Country | Non-income HDI | GDP per capita, 2021 (2017 PPP $) | Difference from US GDP per capita (in %) | Population as of 1 July, 2021 (in thousands) | Weighted average Top 5 performers *All better performers* | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Non-income HDI | GDP per capita (2017 PPP $) | Difference from US GDP per capita (in %) |
| 1 | Greece | 0.902 | 29.327 | −53.5% | 10.445 | 0.923 | 39.403 | −37,5% |
| 2 | Spain | 0.908 | 38.083 | −39.6% | 47.487 | | | |
| 3 | Slovenia | 0.925 | 40.112 | −36.3% | 2.119 | | | |
| 4 | Japan | 0.930 | 40.723 | −35.4% | 124.613 | | | |
| 5 | Cyprus | 0.894 | 40.992 | −35.0% | 1.244 | | | |
| 6 | Israel | 0.924 | 41.644 | −33.9% | 8.900 | | | |
| 7 | New Zealand | 0.946 | 42.404 | −32.7% | 5.130 | | | |
| 8 | Korea (Republic of) | 0.927 | 44.218 | −29.8% | 51.830 | | | |
| 9 | Malta | 0.926 | 45.112 | −28.4% | 527 | | | |
| 10 | United Kingdom | 0.931 | 45.866 | −27.2% | 67.281 | | | |
| 11 | Canada | 0.940 | 48.229 | −23.5% | 38.155 | | | |
| 12 | Finland | 0.942 | 48.933 | −22.4% | 5.536 | *0.931* | *46.093* | *−26,9%* |
| 13 | Australia | 0.958 | 51.341 | −18.5% | 25.921 | | | |
| 14 | Belgium | 0.932 | 51.917 | −17.6% | 11.611 | | | |
| 15 | Germany | 0.937 | 53.138 | −15.7% | 83.409 | | | |
| 16 | Sweden | 0.944 | 53.670 | −14.8% | 10.467 | | | |
| 17 | Austria | 0.899 | 54.335 | −13.8% | 8.922 | | | |
| 18 | Iceland | 0.962 | 54.425 | −13.6% | 370 | | | |
| 19 | Netherlands | 0.934 | 57.201 | −9.2% | 17.502 | | | |
| 20 | Denmark | 0.938 | 58.207 | −7.6% | 5.854 | | | |
| 21 | Hong Kong, China (SAR) | 0.942 | 60.133 | −4.6% | 7.495 | | | |

Sources: IMF International Monetary Fund (2022), UNDP 2022c, UNDP 2022e, UNDESA 2022.
The italic values refer to "All better performers".

is higher than the average for the countries classified as having "Very high human development", which is 12.3 years, and higher than the average for OECD countries, which is also 12.3 years (UNDP, 2022c).

With a GNI per capita in the range $29.002–66.933, the top 5 performers by the three nonincome HDI indicators are all among the 50 countries in the world with the highest income per capita (UNDP, 2022c). However, except for Switzerland, which has a slightly higher GNI per capita than the USA, the top performers all outperform the USA on the various nonincome HDI indicators while having a lower income per capita than the USA. Most impressively, Malta has a life expectancy at birth that is 6.6 years higher than that of the USA, despite having an income per capita that is 40% lower than that of the USA; and Greece has 3.7 more years of expected years of schooling than the USA, despite having an income per capita that is 55% lower than that of the USA.

In the next section, wasted GDP in the USA will be considered.

## Results – wasted GDP in the USA

In this section estimates of wasted GDP in the USA are presented.[7] These are calculated by comparing US nonincome HDI performance with all better-performing countries with a lower GDP, and with the top 5 performers by lowest GDP, respectively. Furthermore, estimates are provided for the volume of US $CO_2$ emissions and material footprint that is not justified by contributing to human development.

Table 5 shows wasted GDP in the USA. The GDP of the USA was $63.018 in 2021 (IMF International Monetary Fund 2022). Of the 27 countries that outperform the USA by nonincome HDI, 21 countries have a lower GDP per capita than the USA. Five countries that outperform the USA by nonincome HDI, namely Norway, Switzerland, Ireland, Singapore, and Luxembourg, have a higher GDP per capita than the USA, with a GDP per capita in the range $64.468–120.039. IMF International Monetary Fund (2022) does not provide GDP data for Liechtenstein.

Ranked by lowest GDP per capita, the 5 top performers are Greece, Spain, Slovenia, Japan, and Cyprus. The top performers achieve a weighted average nonincome HDI of 0.923 (+0.029 compared to the US value), with an average GDP per capita of $39.403 (−$23.614 compared to the US value). This is 37,5% lower than the US GDP per capita.

The average nonincome HDI (weighted by population) for all better performers by GDP per capita is 0.931 (+0.037 compared to the US value). The average GDP per capita for better performers is $46.093 (-$16.925 compared to the US value), which is 26,9% lower than the US GDP per capita.

The overall tendency is clear: Several countries, large and small, outperform the USA in terms of nonincome human development despite having a significantly lower GDP per capita. This finding is robust also if the 5 countries that outperform the USA by nonincome HDI while having a higher GDP per capita than the USA are included in the weighted average for all better performers. With all the 26 countries considered, the average nonincome HDI remains 0.931, while the average GDP per capita is $47.884 (+$1.791 compared to the weighted average for the 21 countries), which is 24,0% lower than the US GDP per capita (+2,9%). With all the 26 better-performing countries accounted for, a significantly higher nonincome HDI than the USA currently achieves is accomplished with an average GDP per capita that is $15.134 lower than the current US GDP per capita.

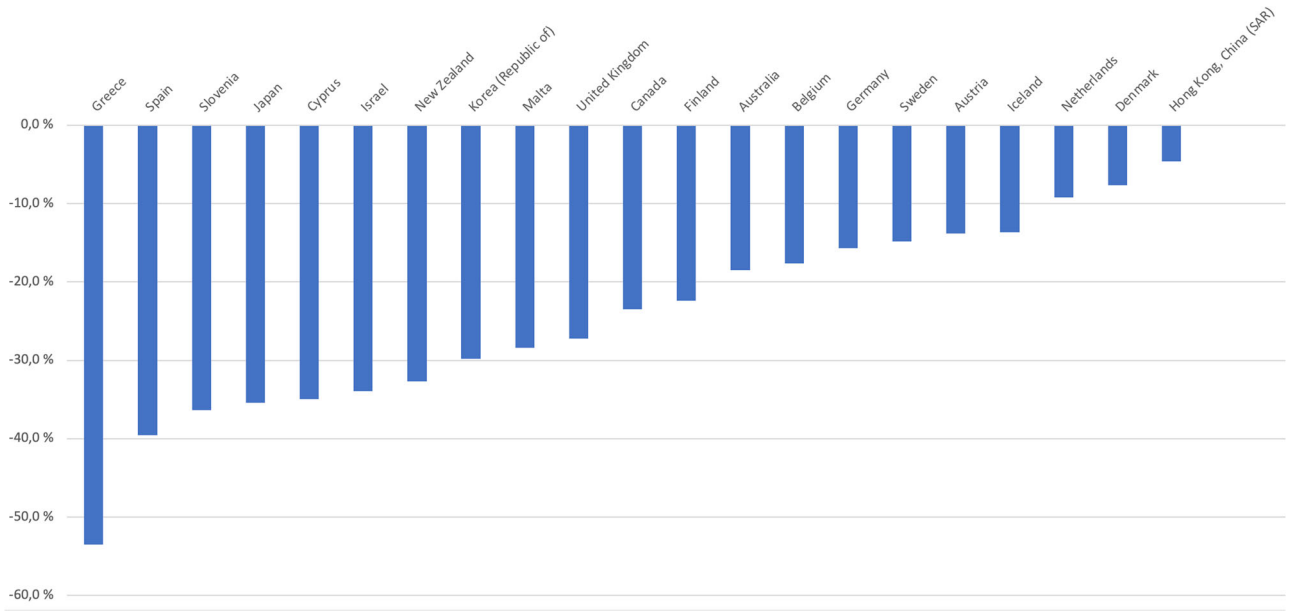


**Fig. 3 Better-performing countries by GDP per capita compared to US GDP per capita.** 21 countries have a lower GDP per capita than the USA while having a higher nonincome HDI. Of these, Greece, Spain, Slovenia, and Japan have the lowest GDP per capita. 12 of the better-performing countries have a GDP per capita that is at least 20% lower than US GDP per capita. Figure by the author. This figure is covered by the Creative Commons Attribution 4.0 International License.

**Table 6 US $CO_2$ emissions and material footprint related to wasted GDP.**

| Country | Carbon dioxide emissions per capita (production) (tonnes, 2020) | Material footprint per capita (tonnes, 2019) | Carbon dioxide emissions (million tonnes, 2020) | Material footprint (million tonnes, 2019) |
|---|---|---|---|---|
| USA | 14.2 | 29.7 | 4.713 | 9.758 |
| **Estimate** | **Wasted GDP (% of GDP)** | | **Carbon dioxide emissions related to wasted GDP (million tonnes)** | **Material footprint related to wasted GDP (million tonnes)** |
| Weighted average: All better performers | 26,9% | | 1.268 | 2.625 |
| Weighted average: Top 5 performers | 37,5% | | 1.767 | 3.659 |

Sources: UNDP, 2022a: 299–303; Global Carbon Project (2022); United Nations Environment Programme (2022).

Figure 3 shows the difference from US GDP per capita (in %) for the 21 countries that have a lower GDP per capita than the USA while having a higher nonincome HDI.

Next, the ecological pressures related to the USA´s suboptimal human development performance will be assessed. This will be done by considering the USA´s current carbon dioxide emissions and material footprint and taking into account the share of GDP that is currently wasted as seen from a human development perspective (cf. methodology section).

Table 6 shows estimates for US $CO_2$ emissions and material footprint related to wasted GDP. Data on total carbon dioxide emissions and material footprint are drawn from the same sources as the UNDP makes use of in its calculations of PHDI (UNDP, 2022a: 303). Combined with results from Table 5 concerning the level of wasted GDP in the USA, these data determine the estimates.

Concerning $CO_2$ emissions, as Table 6 shows, US emissions could have been at least 1.268 million tonnes lower without any wasted GDP (all better performers estimate). At 3,6% of global emissions, this is more than the current $CO_2$ emissions of Japan (the fifth biggest emitter globally) (Global Carbon Project, 2022). According to the highest estimate (top 5 performers estimate), US emissions could have been 1.767 million tonnes lower without any wasted GDP. At 5,0% of global emissions, this is more than the current $CO_2$ emissions of Russia (the fourth biggest emitter globally), or Africa, or Mexico, Central America and South America combined (Global Carbon Project, 2022).

Concerning material footprint, as the table shows, the USA´s footprint could have been at least 2.625 million tonnes lower without any wasted GDP (all better performers estimate). At 2,7% of humanity´s global material footprint, this is more than the material footprint of Brazil, and about as much as the material footprint of Western Asia (United Nations Environment Programme, 2022). According to the highest estimate (top 5 performers estimate), the USA´s material footprint could have been 3.659 million tonnes lower without any wasted GDP. At 3,8% of humanity´s global material footprint, this is more than the material footprint of Japan, and about as much as the material footprint of Africa (United Nations Environment Programme, 2022).

Figure 4 shows wasted GDP per capita (in constant 2017 PPP $) in the USA along with related ecological pressures per capita.

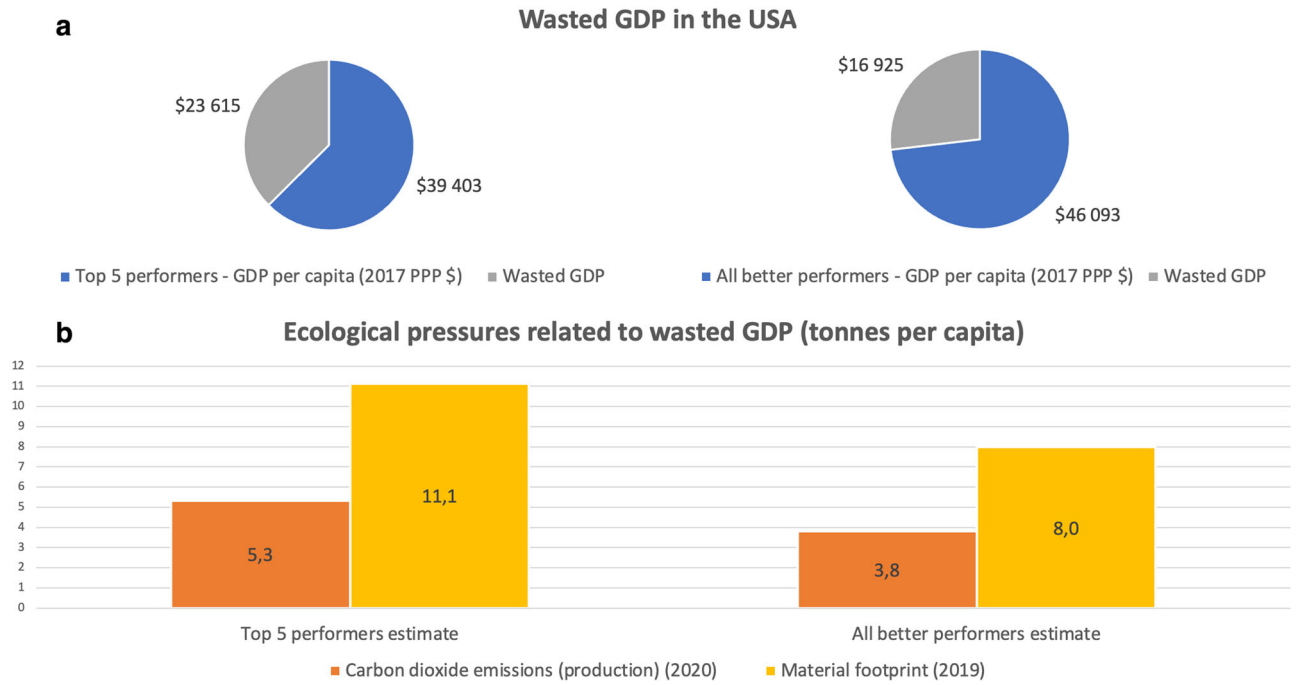


**Fig. 4 Wasted GDP in the USA and related ecological pressures. a** Wasted GDP in the USA in constant 2017 PPP$ per capita, compared with the GDP per capita of the 5 countries with the lowest income but higher nonincome HDI than the USA (left), and compared with the GDP per capita of all countries with lower income but higher nonincome HDI than the USA (right). **b** Ecological pressures related to wasted GDP in the USA in tonnes per capita, specifically carbon dioxide emissions and material footprint, based on the top 5 performers estimate for wasted GDP (left) and the all better performers estimate for wasted GDP (right). Figure by the author. This figure is covered by the Creative Commons Attribution 4.0 International License.

## Concluding observations and policy implications

This article has estimated how much of US GDP that is wasted when measuring the USA against better-performing countries by nonincome HDI. The purpose of making such a comparison is twofold: To indicate how much room the USA has for human development beyond current accomplishments, and to identify the scale of the ecological pressures that derive from economic activity that does not support human development. If the USA had performed as well as the more efficient countries that currently outperform it by nonincome HDI while having a lower GDP per capita, it could have had an equally good or better nonincome HDI performance compared to today while reducing $CO_2$ emissions and its material footprint substantially. This can arguably be achieved by prioritizing human wellbeing and human needs in social and economic policies in some of the ways that better-performing countries do.

While this article has been focused on a case study involving the USA, the relevance of its underlying message is broader: Prioritizing human wellbeing in social and economic policies improves human development performance and is less wasteful in terms of ecological pressures. As Daly (2014: 225) argues, rich countries can improve welfare from today's levels even in steady-state/degrowth scenarios if economic downscaling is combined with "much more equal sharing, frugality, and efficiency", with the latter implying "squeezing more life-support and want-satisfaction from a given throughput". This would mean prioritizing policies that evidently promote wellbeing over policies that are detrimental to social or environmental circumstances.

In this article, wasted GDP has been defined and operationalized as involving a comparison between the HDI performance of a country with better-performing countries by nonincome HDI that have a lower GDP per capita. Such a definition makes the concept of wasted GDP applicable not only in studies of rich countries, but relevant in the study of any country with a suboptimal HDI performance. Wasted GDP should therefore be widely applicable as a measure of how effective countries are in their pursuit of human development.

Conceivably, the findings about suboptimal HDI performance and wasted GDP exemplified by the USA can motivate either optimism or pessimism regarding the prospects for sustainable human development in the 21st century: Optimism, because they indicate that substantial improvements in human development in a rich country such as the USA are possible without increasing ecological pressures. Or pessimism, because the ecological pressures that currently result from the high levels of human development in advanced economies are evidently still far from environmentally sustainable levels. Even doing away with any wasted GDP in all rich countries as defined in this article by optimizing policies that aim for the highest human development attainable under current resource conditions will not result in anything remotely resembling a truly environmentally sustainable society. The truth of the matter is that even today´s best performers will have to improve the efficiency with which they pursue human development substantially. Whether satisfactorily high levels of human development can realistically be achieved with sufficiently low levels of ecological pressures remains open to discussion.

There is, therefore, a strong need for critical discussion about, and further research on, economic growth and its effects on human development seen in context with its effects on ecological pressures. Besides case studies that can be informative regarding exemplary policies or outcomes, there is also a need for a fundamental discussion about the nature and effects of economic growth and different economic models.

## Data availability

All data generated or analysed during this study are included in this published article and its Supplementary Information Appendix.

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## Notes

1 Measured as Gross National Income (GNI), which is what is used in the HDI.
2 Years generally refer to the publication year of the Human Development report in which an update of the Human Development Index was included. Occasionally no annual report has been issued and data has instead been provided in the following report; in 2018 HDI data was released in a "statistical update" (UNDP, 2018). The most recent report, *Human Development Report 2021–22* (UNDP, 2022a), provides HDI data and ranking for two years.
3 See Supplementary Information Appendix for methodological considerations and results related to GNI data.
4 Former Chief statistician at the Human Development Report Office Milorad Kovacevic wrote (in personal correspondence) that he was "not aware of any background papers on this topic. The research is reported in the HDRs directly."
5 Hong Kong is not a country in its own right but a "special administrative region" (SAR) in China.
6 As shown in Tab. S1 in Supplementary Information Appendix, the GNI per capita of the USA was $64.765 in 2021 measured by constant 2017 PPP$ according to the most recent HDI data.
7 Estimates of wasted GNI are provided in Tab. S3 in Supplementary Information Appendix.

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