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The environmental price of socio-economic development: worldwide trends from 1990 to 2016

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Abstract

Plans for achieving sustainable development around the world are based on the assumption that socio-economic progress can be ensured only by staying within the carrying capacity of the environment, which has already been exceeded in a number of areas. In this paper the concepts of human development and ecological footprint have been combined in order to shed light on the current state and trends over time. Using available data for the human development index and the ecological footprint, 175 countries were included in the analysis of the current state (based on data from 2016), while 121 countries were analysed in the study of trends from 1990 to 2016. Based on their degree of success or failure in approaching decoupling targets, the countries were further classified into three types. All countries have shown progress in human development, which has been accompanied on a global scale by a large increase in environmental pressures, and this is still reflected in the high correlation of the human development index and the ecological footprint per capita. However, for only 38% of countries could it be concluded that socio-economic progress in the period 1990-2016 was achieved while reducing the per capita consumption of natural resources and ecosystem services.

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1. INTRODUCTION

Efforts for global, regional, national, and local socio-economic development have been the driving force of human society since the Second World War, in part in the hope that by raising incomes, other development problems will somehow solve themselves. Since this has not happened, the last three decades have witnessed increasing awareness of the need to pursue the kind of (sustainable) development that balances economic, social and environmental goals. It has also become increasingly obvious that human activities have brought progressively higher costs to the environment, as reflected in resource depletion and pollution. Most negative environmental impacts of socio-economic development are not visible to the naked eye, especially when production and consumption locations are spatially remote from one another, or the effects only appear over the long term in the form of gradual degradation of ecosystem services (e.g. due to human interference with biogeochemical cycles, biodiversity loss, habitat destruction, and so on).

In this article we combine the concept of human development and the concept of ecological footprint in order to shed light on the often overlooked aspect of the environmental costs of progress. In so doing, we aim to investigate both the current state as well as long-term trends, and categorize countries into main groups based on the relationship between economic growth and increase in the use of natural resources. For this purpose, we have selected the period 1990–2016, for which we have the most comparable and reliable data for the ecological footprint and the human development index of the world's countries. The research is based on the assumption that socio-economic development in most countries around the world is still closely linked to the depletion of natural resources and that the decoupling promoted by contemporary sustainable development policies has so far been weak.

2. THEORETICAL BACKGROUND AND METHODS

Ever since the 1992 United Nations Conference on Environment and Development in Rio de Janeiro and the adoption of Agenda 21 (1992), world attention has been directed towards achieving sustainable development, which by definition requires pursuing possibilities for socio-economic progress while staying within existing environmental limits and respecting the carrying capacity of the environment (Moran et al., 2008; Kissinger, Rees and Timmer, 2011; Moldan Janouškova and Hak, 2012; Hoekstra and Wiedmann, 2014; Sachs, 2015). Although over the past three decades the principles and goals of sustainable development have been integrated worldwide into the development policies of international organizations, businesses, regions, countries, local communities, etc., the intensification of economic activity and the growth in purchasing power of the population are still largely linked to increasing environmental pressures (Vintar Mally, 2009; Aşici, 2013; Apergis, 2016). The study by O'Neill et al. (2018), based on an analysis of a number of indicators for 150 countries, concluded that no country meets the basic needs of the population within the limits set by a globally sustainable use of resources. Of particular concern are the resulting environmental pressures already exceeding the carrying capacity of the planet as a whole as well as of particular regions (Ecosystems and Human Well-Being, 2005; Hoekstra and Wiedmann, 2014; Shaker, 2015; Sachs, 2015; Global Environment Outlook – GEO 6, 2019; The European environment – state and outlook 2020, 2019). Highly unsustainable practices have also been highlighted in a study by Steffen et al. (2015), according to which humanity is already exceeding the limit of the so-called safe operating space for four of the nine planetary boundaries (climate change, biogeochemical flows – phosphorus and nitrogen, land system change, and biosphere integrity–genetic diversity), while for only three it is within these limits (ocean acidification, freshwater use, and stratospheric ozone depletion). Two of the nine planetary boundaries have not yet been able to be quantified (atmospheric aerosol loading, novel entities), hence the current status remains unevaluated. Ecological footprint calculations also clearly indicate that humans are exceeding the planetary carrying capacity, or so-called biocapacity, caused by the demand for resources and the absorption of waste. These suggest that humanity currently uses up the carrying capacity of the equivalent of about 1.7 planets (Kissinger, Rees and Timmer, 2011; Shaker, 2015; Galli et al., 2016; Global Footprint Network, 2019).

The limitations of planetary carrying capacities on the one hand and the efforts to provide adequate well-being to a growing world population on the other have given rise to the idea of decoupling. "Decoupling environmental pressures from economic growth while continuing to satisfy human needs" was a goal first advanced by the OECD (according to Fischer-Kowalski et al., 2011), in the OECD Environmental Strategy for the First Decade of the 21st Century (2001). Later, the OECD defined decoupling "as breaking the link between 'environmental bads' and 'economic goods'" (Indicators to Measure Decoupling…, 2002, p. 4). The idea of decoupling was later elaborated in the most detailed way by the United Nations Environment Programme (UNEP), which highlighted among other things resource use and environmental impact in relation to economic activity. Thus, resource decoupling was defined as reducing resource use per unit of economic activity, in which fewer resources, such as raw materials, energy, water or land, are used for the same volume of economic output (Fischer-Kowalski et al., 2011, p. 4). In the case of impact decoupling, negative environmental impacts caused by the use of resources in human activities, such as emissions, waste, land degradation, etc., should be reduced per unit of economic activity (Fischer-Kowalski et al., 2011, p. 5). For decoupling, therefore, the rate of growth in both the use of resources and in environmental impacts must be less than that of the economic growth produced. In most such cases, this is relative decoupling: only rarely are the conditions met for the more challenging absolute decoupling, in which resource use and environmental pressures decrease while economic activity increases (Fischer-Kowalski et al., 2011; Oberle et al., 2019). Of course, if resource use is growing at least as fast as economic output, there is no decoupling. From the standpoint of environmental damage and the environmental costs of socio-economic development, this is certainly the least desirable scenario. The concept of decoupling has come in for much criticism over the years, on the grounds that on a planet with limited resources it is misleading and raises false hopes in the possibility of unlimited economic growth, which would require permanent absolute decoupling and is not something we can achieve (Ward et al., 2016).

Decoupling is promoted by many countries around the world as well as by the European Union, which stated in the 7th Environment Action Programme (2013) that "The Union has agreed to stimulate the transition to a green economy and to strive towards an absolute decoupling of economic growth and environmental degradation." This is an extremely ambitious goal, since research shows that in an absolute sense environmental pressures are still growing and that even in the first two decades of the 21st century we have seen only relative decoupling in environmental impacts related to resource use compared to GDP (Oberle et al., 2019).

Among the current international efforts for decoupling should be mentioned first and foremost Agenda 2030, which among 17 Sustainable Development Goals (SDGs) formulated this one in particular: "Ensure sustainable consumption and production patterns" (Goal 12). Additionally, under Goal 8 it highlighted Target 8.4: "Improve progressively, through 2030, global resource efficiency in consumption and production and endeavour to decouple economic growth from environmental degradation, in accordance with the 10-Year Framework of Programmes on Sustainable Consumption and Production, with developed countries taking the lead" (Transforming our World, 2015). In particular, it should be noted that under the same goal it also lists the target of ensuring per capita economic growth, specifically a growth of at least 7% in gross domestic product in the economically least developed countries. Agenda 2030 (ibid.) highlights the inseparable link among all 17 goals and 169 targets of sustainable development as well as their social, economic, and environmental dimensions, thus continuing the legacy of Agenda 21 in this respect. Unfortunately, there is no indication of change in Target 8.4 in the annual reports monitoring progress for individual indicators, while reports on Goal 12 point out that, due to global growth, material consumption is a serious threat to not only achieving this goal, but SDGs more generally. They therefore stress the need to prevent resource overuse and environmental degradation, and improve resource efficiency and sustainable practices in all sectors of the economy (Report of the Secretary-General, 2019; UN Sustainable Development Goals, 2020). For comparison, in the period 1970–2017, annual material consumption, including biomass, fossil fuels, metals and non-metallic minerals, increased from 27 to 92 billion tonnes, or from 7 to 12 tonnes per capita annually (Oberle et al. 2019; UN Sustainable Development Goals, 2020). By continuing the trend of steep growth in resource use beyond 2000, as many as 190 billion tonnes of raw materials per year could be consumed by 2060 (UN Sustainable Development Goals, 2020). The observed trend since 1970 indicates a relative decoupling on a global scale, since during this time the world population has doubled and the gross domestic product has quadrupled (Oberle et al., 2019), but material consumption refers to only one segment of resource use and only a part of all environmental impacts.

Based on an extensive literature review of more than 600 mostly empirical articles on decoupling, Parrique et al. (2019) conclude that there is no empirical evidence for the existence of decoupling economic growth and environmental pressures to the extent necessary to prevent environmental breakdown. In their assessment, there is no evidence for absolute decoupling in the literature, since it occurs only occasionally and for particular resources or environmental impacts in certain areas, and for the most part decoupling is only relative.

In keeping with the theoretical framework presented so far, this article deals with the usually hidden environmental dimensions brought not only by an increase in people's income but also by broader advances in human well-being as defined by the concept of human development. This concept, together with the associated human development index (HDI), was introduced in the 1990s by the United Nations to measure progress in three fundamental areas of human development: health, education and standard of living. Since 1990, HDI has been regularly calculated and published by the United Nations Development Programme (UNDP) for countries and regions (Human Development

Report, 2019). Today, the index is certainly one of the most widely used and accepted alternatives to gross domestic product. In the past, it received criticism mostly due to the choice of indicators taken into account and the high correlation among them, the non-inclusion of some important areas (such as political freedom, security and justice, environmental quality, etc.), the method of normalization or aggregation and weighting, as well as the quality of the data used (Vintar Mally, 2009; Wolff, Chong, Auffhammer, 2010; Kovacevic, 2011). Although the United Nations insists that the indicator be kept simple and the number of socio-economic dimensions it covers be limited, after 2010 they did slightly modify the dimension indices included and the aggregation method. HDI is a synthesized index aggregated from dimension indices for the three major dimensions of human development: access to resources for a decent life (measured by gross national income per capita in PPP terms), access to education (measured by expected years of schooling and mean years of schooling), and a long and healthy life (measured by life expectancy). Due to the method of normalization, the calculated values range from 0 to 1, with the highest possible values of the final and dimension indices being desirable as an indicator of better socio-economic conditions in a country (Technical notes, 2018). For the purposes of our analysis, we used data on the level of HDI for 1990 and 2016 as published in the 2018 UNDP report (Human Development Indices and Indicators, 2018). The latter is particularly important for the comparability of the calculation method, since due to the acquisition of new data and corrections the calculations are often corrected retroactively, and thus data from different annual reports are not necessarily comparable. The calculation of HDI was available for the two years investigated for only 142 countries, although the UNDP calculated HDI in 2016 for 188 countries. The difference is due to the fact that the number of countries involved (e.g. smaller and/or island countries) has increased over the years, and some only appeared on the world map as independent nations after 1990 (for example, the countries of the former Yugoslavia and the Soviet Union).

Discourse on human development, however, has almost completely skipped over its ecological dimension, although in recent decades it has become increasingly apparent that advances in human development are also accompanied by increasing pressures on planetary natural resources and ecosystem services. The latter is at least partly monitored by the ecological footprint (EF) as a synthetic measure. This concept and indicator began to be developed in the 1990s by Rees and Wackernagel (see, for example, Rees, 1992; Wackernagel and Rees, 1996), and after 2003, responsibility for its calculation and improvements in methodology was taken over by the Global Footprint Network (Lin et al., 2018). Its authors define EF as “a measure of the biologically productive land and water area an individual, population or activity requires to produce all the resources it consumes, to accommodate its occupied urban infrastructure, and to absorb the waste it generates, using prevailing technology and resource management practices” (Global Footprint Network, 2019). The components covered by the EF are cropland, forest land, fishing grounds, grazing land and built-up land (ibid.). Over the years, the indicator has received not only great international visibility but also considerable methodological discussion of its limitations and potential for improvement (for a systematic review, see Galli et al., 2016), but among experts the prevailing view is that it serves as a very powerful communication tool that is important in raising awareness (Wiedmann and Barrett, 2010; O'Neill et al., 2018) regarding the extent to which the available biocapacity is sufficient to sustain the metabolism of the economy (Galli et al., 2016). In addition to

EF, biocapacity (BC) is calculated for countries and regions, and the difference between the two is indicated as an ecological deficit (when EF exceeds BC) or an ecological reserve (when BC exceeds EF). The EF and BC calculations are expressed in terms of so-called global hectares (gha), which are defined as units with average productivity on a global scale (Borucke et al., 2013; Global Footprint Network, 2019). Particularly useful and illustrative for the purpose of international comparisons are the per capita EF calculations, which we also used for the purposes of our analysis. We selected the latest published and comparable data for 1990 and 2016 (Global Footprint Network, 2019 and 2019a). The advantage of using EF as an indicator of environmental impact is also the fact that it takes into account the resources or biocapacity needed to maintain the lifestyles of the populations of countries regardless of the country or region whose resources are used to supply them. The ecological footprint of consumption therefore takes into account consumption in the country, reduced by exports and increased by imports. All calculations were available for both years for 151 countries, i.e. all countries for which 1990 calculations were available, while the number of countries with corresponding calculations had increased to 187 by 2016.

In this article, we combine both concepts, human development and ecological footprint, by attempting to analyse on the one hand the latest available data (for 2016, which is the last year with available comparable data for the variables investigated) and on the other, trends in both over the last quarter century (1990–2016) or, indirectly, the trend in the environmental price of socio-economic development over the period considered. The first part of the survey included 175 countries for which we had data for HDI and EF per capita in 2016; however, only 121 countries, for which calculations for both indicators and both years were available, could be included in the study of trends.

In the first step, we analysed the current state of ecological footprint and human development index around the world as well as examined the relationship between the both variables by drawing scatter plots, maps and calculating Pearson correlation coefficient. In the second step, we calculated both the difference in the HDI values and growth index for the EF per capita between 1990 and 2016. In the third step, we introduced the GNI per capita into the analysis of trends and calculated also its growth index. Particular attention was also paid to determining the correlation of variables (by using Pearson correlation coefficient), including the trend of GNI per capita, which in the concept of human development represents an income dimension. In addition to examining the correlation of the variables involved, in the last step we categorized countries into three types based on their degree of success or failure in approaching decoupling targets. To this end, we compared the growth trends of EF per capita and GNI per capita during the study period.

3. RESULTS AND DISCUSSION

According to UNDP (2018), in 2016 the HDI calculated for 188 countries of the world (Fig. 1) averaged 0.726, while in 1990 this average was 0.598. What was the average more than a quarter of a century ago is a modest result for today, with only 51 of the world's worst-performing countries below that level in 2016. Put another way, in 1990 only 37 countries had an HDI higher than the average for the world in 2016, using the same calculation method for both years and all countries. The data thus show that there has been great progress in achieving a higher standard of living and better health and education. It should also be evaluated in light of the fact that the world population has grown from 5.327 billion to 7.464 billion (World Population Prospects 2019, 2019), and that better well-being must be provided for a growing number of people.

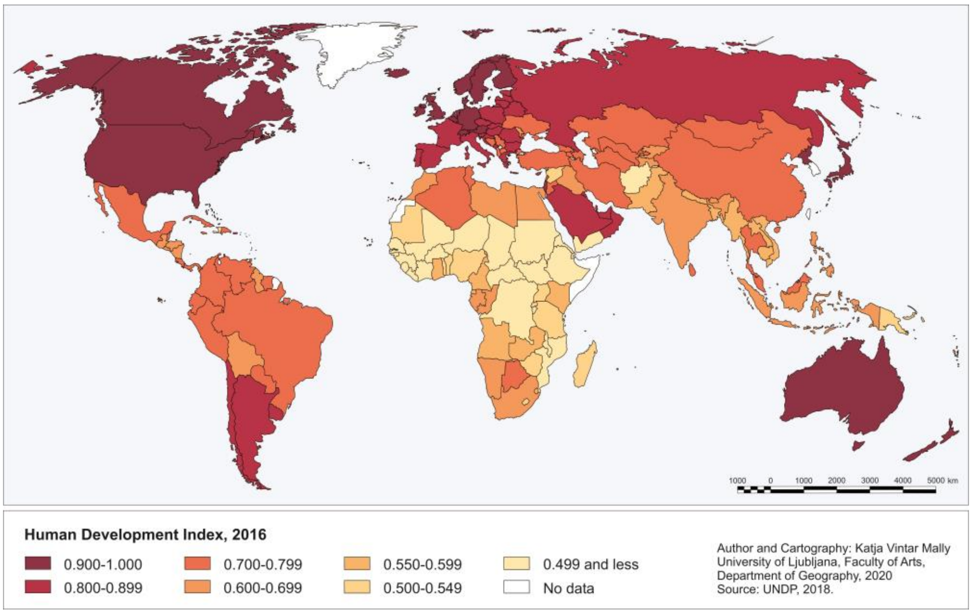

Figure 1. Human development index in 2016 (UNDP, 2018)

On the other hand, data from the Global Footprint Network (2019a) show that in the period 1990-2016, the EF increased globally from 14.190 billion gha to 20.509 billion gha (i.e. a growth index of 144), while the planetary BC grew from 11.027 billion gha to 12.169 billion gha (i.e. a growth index of 110). Due to rapid population growth (i.e. a growth index of 140; Fig. 2), in relative terms the increase in EF per capita was significantly less noticeable, increasing from 2.66 gha to 2.75 gha per capita (i.e. a growth index of 103), while the available biocapacity per capita fell sharply from 2.07 gha to 1.63 gha per capita. As a result, the environmental deficit has also increased dramatically: from 0.59 gha to 1.12 gha per capita. Thus, in the early 1990s, humanity consumed 30% more annually than the biocapacity available annually, and more than a quarter of a century later, it consumed 70% more than the biocapacity available annually, indicating a marked increase in unsustainable practices. In this respect different countries have shown different trends: in some countries the population has continued to grow rapidly and has been, together with the growth of the economy, the main driver of increasing environmental pressures, while in other countries the opposite has occurred. EF calculations per capita for 2016 are available for 187 countries of the world, pointing to large differences between countries and regions, ranging from 0.5 gha per capita in Eritrea and East Timor to 14.4 gha per capita in Qatar (Fig. 3).

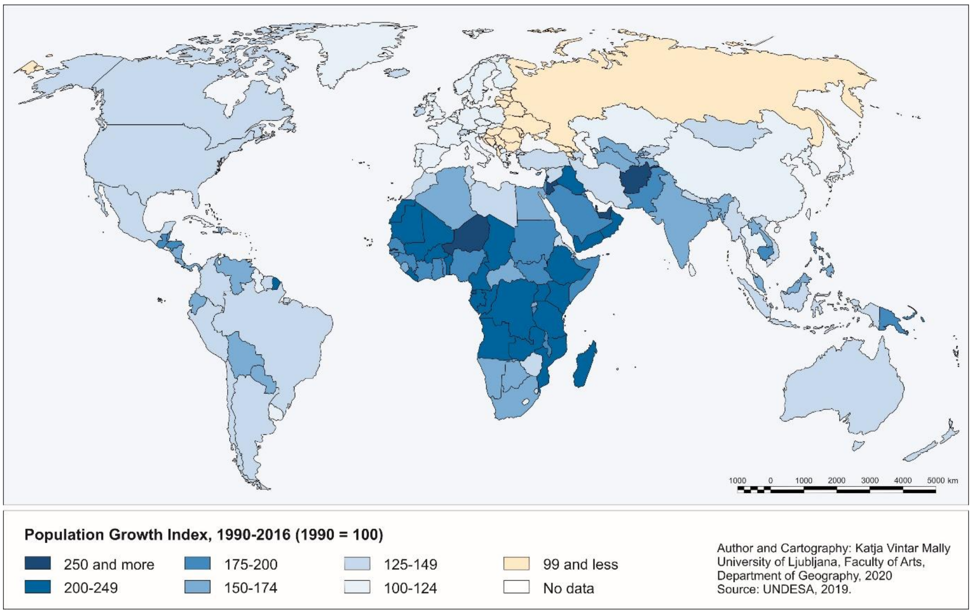

Figure 2. Population growth index in countries of the world in the period 1990–2016 (World Population Prospects, 2019)

The increase in EF through improvement in the area of human development described was also confirmed by the first part of our investigation, in which we analysed EF and HDI calculations for 2016, which were only fully available in 175 countries. The scatter plot (Fig. 4) and the Pearson correlation coefficient calculation thus showed a highly positive correlation between the two variables (r = 0.718; correlation is significant at the 0.01 level).

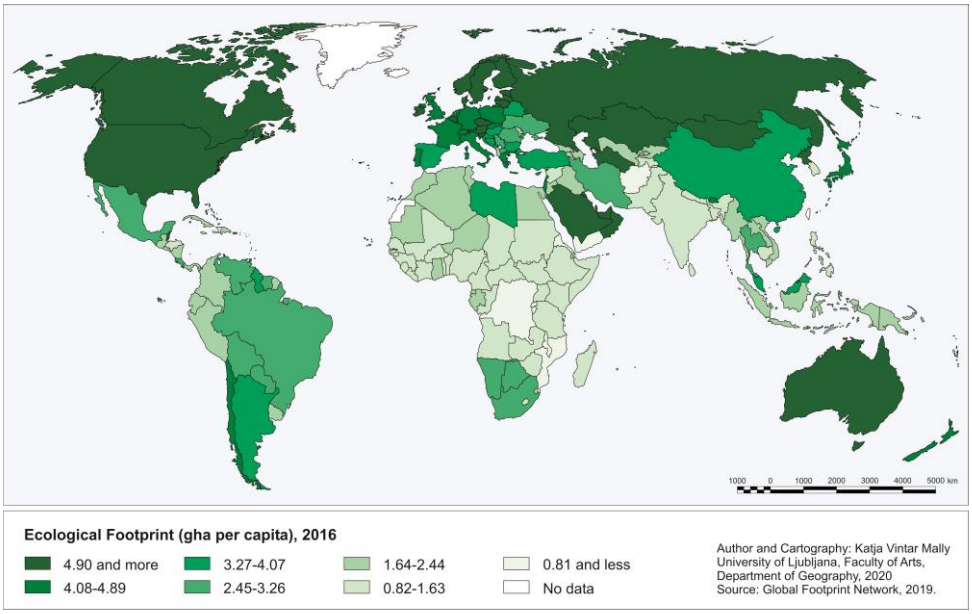

Figure 3. Ecological footprint per capita in 2016 (Global Footprint Network, 2019).

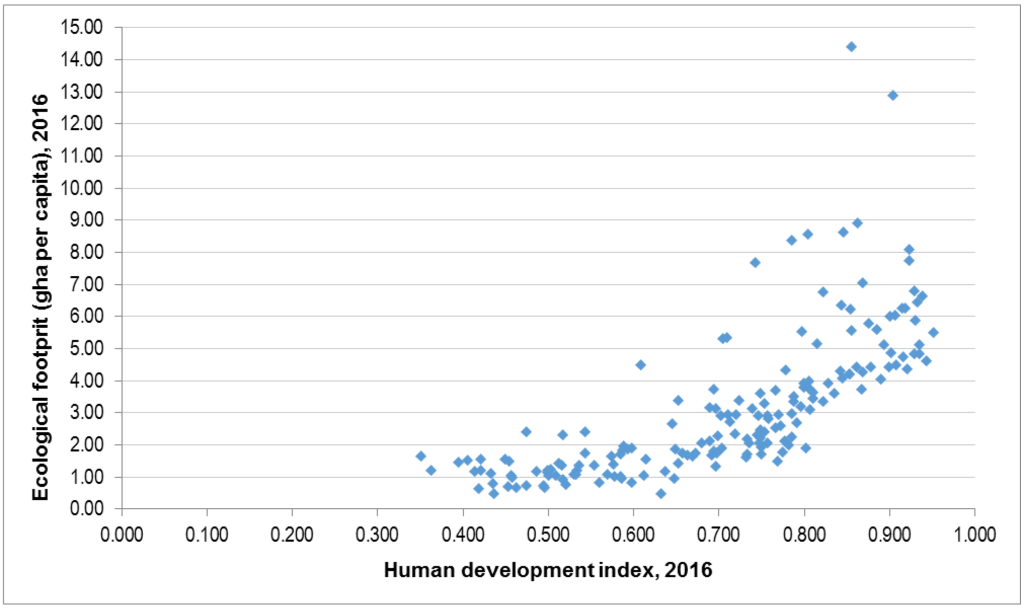

Figure 4. Relationship between the human development index and the ecological footprint per capita in countries of the world in 2016 (UNDP, 2018; Global Footprint Network, 2019)

In the second step, we analysed the changes in EF per capita and HDI between 1990 and 2016. For HDI, calculations for both years are available for 142 countries in the world, all of which had made progress in human development by the end of the quarter century studied, ranging from 0.017 (Lesotho) to 0.271 (Rwanda). In addition to Lesotho, the twelve countries with the least progress are Libya, Tajikistan, Ukraine, Zimbabwe, Central African Republic, Moldova, Eswatini, Kyrgyzstan, Yemen, the USA and Belize. Data from UNDP (Human Development Indices and Indicators, 2018) show that modest progress in these countries (with the exception of Libya, Yemen, the USA and Belize) is due to the decline in their HDI in the 1990s, which can be partly explained by the economic transition in the countries of Eastern and Southeastern Europe and the AIDS epidemic in the countries of Southern Africa, which had a major impact on the life expectancy of the population. In the decade from 2000 to 2010, all the countries analysed recorded growth in HDI, while in the most recent decade, instability and conflicts shook the Middle East after the Arab Spring and caused a significant decline in HDI, particularly in Syria, Libya, Yemen and South Sudan. Despite occasional declines in HDI due to particular conflicts, political instability, economic crises (especially the effects of the post-2008 financial and economic crisis), epidemics, etc., just about all countries in the period under review emerged with higher HDI than reported in 1990. Among them, the most prominent were some African and Asian countries with an increase in the index above 0.200 (Rwanda, China, Mozambique, Iran, Myanmar, Vietnam, Cambodia, Singapore, Bangladesh, India, Turkey and Morocco).

Trends in EF per capita over the period 1990-2016 were analysed using available calculations for 151 countries of the world. Countries have shown very diverse trends, with EFs per capita being smaller in 2016 than in 1990 in 67 countries and larger in 84 countries, including more than doubling in ten countries (Vietnam, Saudi Arabia, Oman, Trinidad and Tobago, China, Djibouti, Guyana, Iran, Qatar and Myanmar). Among countries where EF declined most per capita, of particular note are those with a growth index below 70, such as North Korea (32), Uruguay (53), Burundi (61), Uganda (61), Madagascar (63), Cuba (68), Bahamas (68), Democratic Republic of Congo (68), United Arab Emirates (69) and Zimbabwe (69). The reasons for the decline in the EF of those populations could only be revealed by a more detailed analysis of the individual components of the EF involved, but usually the main causes are either economic problems or crises, high population growth rates that outpace economic growth, or the actual effects of environmental policies in the spirit of decoupling. However, the majority of the countries listed above (Burundi, Madagascar, Bahamas, Democratic Republic of Congo, United Arab Emirates and Zimbabwe) show a decline in per capita income and their population growth rates are higher than the per capita income growth rates, which probably explains a great share of their EF per capita decline.

In the third step, we analysed only the data for the 121 countries in the world for which we have the calculations of both indicators in both years. Compared to 2016, we had to exclude 36 countries from the analysis since they did not have HDI calculations for 1990, and an additional 18 were eliminated due to the absence of 1990 EF calculations. We also looked at the growth of gross national income (GNI) per capita (in USD, PPP), as well as the correlation between HDI and GNI per capita on the one hand and EF on the other for the group of analysed countries (Fig. 5).

As expected from previous analyses, even in the case of this group of countries, the Pearson correlation coefficient showed high positive correlations between the variables in the two years studied (all correlations are significant at the 0.01 level). The correlation between HDI and EF per capita was lower for 2016 (r = 0.713) than for 1990 (r = 0.746), while the correlation between GNI per capita and EF per capita for 2016 was significantly higher (r = 0.859) than for 1990 (r = 0.795). According to this, the connection between HDI and EF per capita is nowadays slightly weaker, while the connection between GNI per capita and EF per capita has intensified. In general, however, these results also indicate a greater correlation between EF and income than other components of human development.

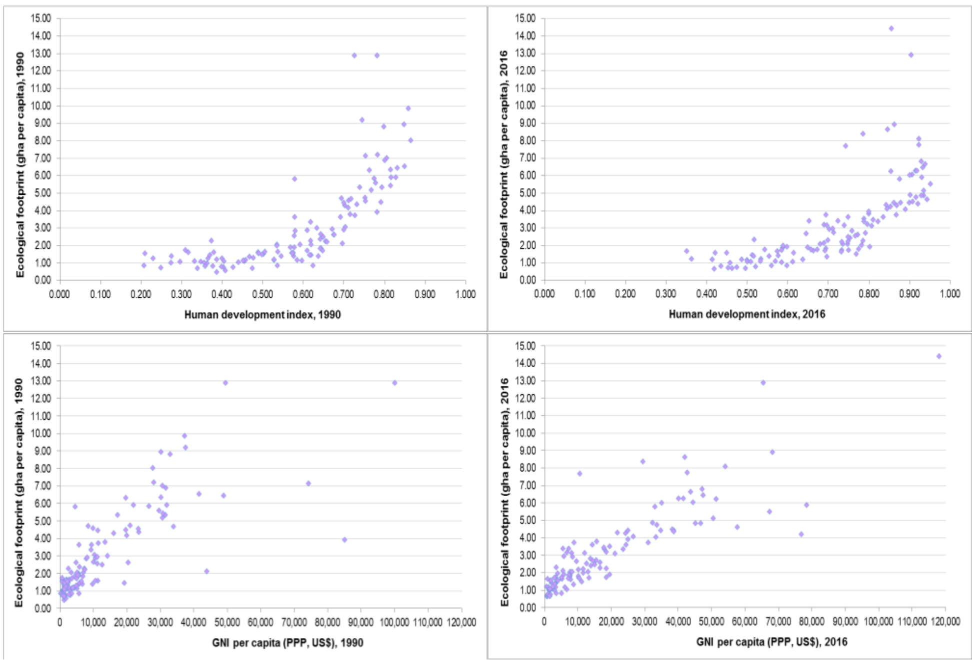

Figure 5. Relationship between ecological footprint per capita and human development index and between ecological footprint and gross national income per capita for countries of the world in 1990 and 2016 (UNDP, 2018; Global Footprint Network, 2019a)

From the sustainability viewpoint, the growth in EF and environmental pressures is particularly disadvantageous for countries that have managed to make only modest progress in human development in the same time period. As mentioned above, in the period 1990–2016, all 121 analysed countries increased their HDI to varying degrees, of which the majority (68 countries) also increased their EF per capita, while 53 countries managed to reduce their EF per capita in that time (Fig. 6). If EF is used as a criterion for assessing resource decoupling, then we could conclude that this has occurred in these 53 countries, but we cannot determine based solely on this criterion whether this is a temporary or lasting phenomenon. A somewhat better insight can be gained by comparing EF growth per capita and GNI per capita, where trends are more differentiated (Fig. 7). Given the theoretical underpinnings for the relationship between economic growth and growth in resource use, we have categorized all 121 countries into three types. The first type consists of countries that did not show decoupling during the study period (i.e. the red group in Fig. 7), the second type are those with signs of relative decoupling (i.e. the blue group in Fig. 7), and the third type are those countries showing signs of absolute decoupling (i.e. the green group in Fig. 7).

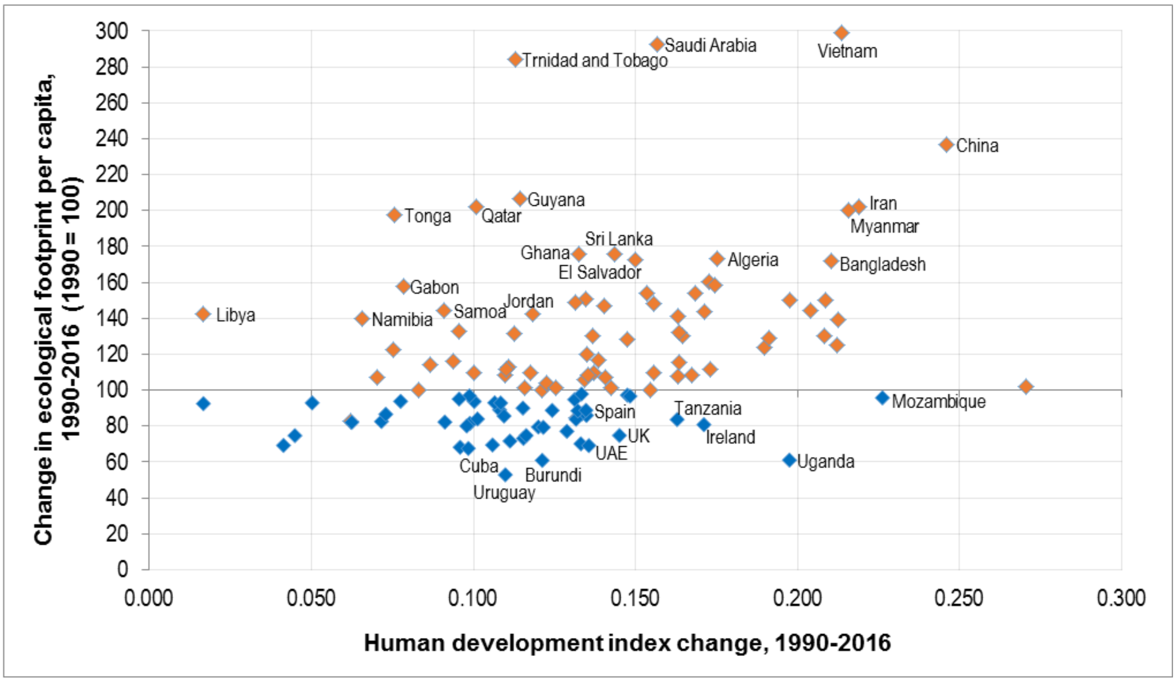

Figure 6: Trends in the human development index and ecological footprint per capita in countries of the world in the period 1990–2016 (UNDP, 2018; Global Footprint Network, 2019a)

Note: Orange squares represent countries with an increase in EF per capita and blue squares represent countries that have managed to reduce EF per capita while increasing their HDI.

In accordance with the classification of countries described, we find that among the 53 countries that had a lower EF per capita in 2016 than in 1990, 46 countries also recorded an increase in GNI per capita in the same period, so we can therefore look for signs of absolute decoupling in these countries. The other seven countries experienced a decline in GNI per capita, which in four countries (Yemen, DR Congo, Central African Republic and United Arab Emirates) was larger than the decline in EF per capita, so we cannot conclude that decoupling occurred in these countries, and in the remaining three countries

(Venezuela, Zimbabwe and Burundi) we can conclude at most that there was relative decoupling. Of the 46 countries that have succeeded in reducing their environmental pressures, there are as many as 20 European countries as well as the United States, Canada, Australia, Japan, New Zealand, eight Latin American countries, twelve African countries and one Asian country. It should be noted that these are countries that are at different stages of human development and have different structures and levels of EF. A more detailed examination of these countries would be required in order to fully confirm or reject absolute decoupling (as, for example, Mattila (2012) rejected it in the case of Finland). Nevertheless, we can take Germany, which has managed to reduce its EF from 6.9 gha to 4.8 gha per capita since 1990, as an example of absolute decoupling. At the same time, the GNI per capita in Germany rose from 31,793 to 45,203 US$ (i.e. a growth index of 142) and HDI reached 0.934 (5th best in the world), while the population number remained rather constant. With the exception of the build-up land, all components of the EF reduced significantly, in particular carbon footprint, which accounts for about two-thirds of the total EF. Decoupling in Germany was not spontaneous, as the country has been pursuing a modern environmental policy throughout the last three decades. However, it should be noted that Germany is still in an ecological deficit and it spends significantly more per capita than its fair share of global biocapacity, which is unacceptable in the long run.

Based on the analysis performed, there is no indication of any form of decoupling in 21 countries, where the growth of EF per capita was higher than the growth of GNI per capita (i.e. the red group, including Saudi Arabia and Trinidad and Tobago). Of these, six countries (Libya, Gabon, Malawi, Sierra Leone, Haiti and Brunei) even recorded a decline in GNI per capita over the period 1990-2016 while still increasing their EF per capita. In none of these countries did the decline in GNI per capita result in a decline in HDI below 1990 levels or a decrease in life expectancy and educational attainment.

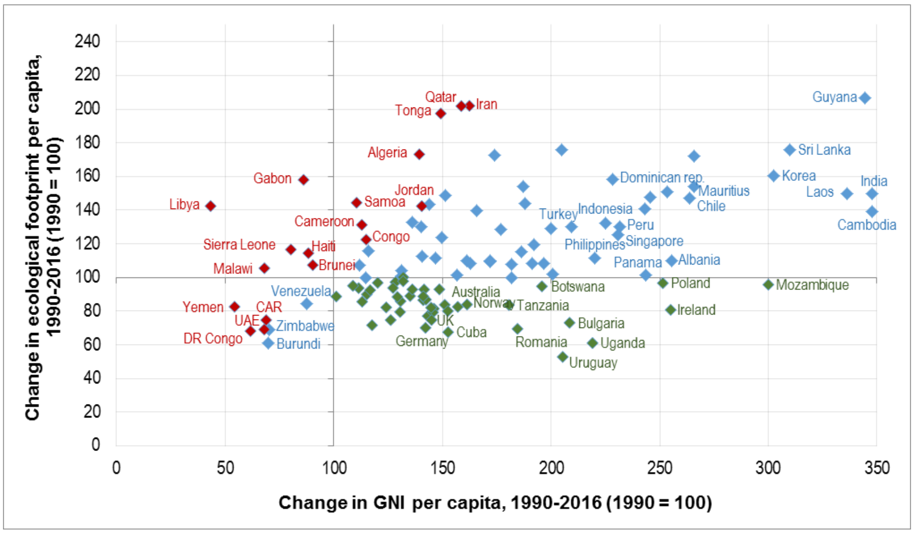

Figure 7. Trends in gross national income per capita and ecological footprint per capita in countries of the world in the period 1990–2016 (UNDP, 2018; Global Footprint Network, 2019a)

Note: Red colour squares represent countries with no signs of decoupling, blue colour squares represent countries with signs of relative decoupling and green colour squares represent countries with signs of absolute decoupling. For the purposes of readability, five countries with exceptionally high values of at least one of the variables are omitted from the chart (China – 939, 237; Myanmar – 686, 200; Saudi Arabia – 117, 293; Trinidad and Tobago – 260, 284; Vietnam – 405, 299)

In the majority of the countries studied (68), EF per capita has increased over the last quarter century, primarily in developing regions, with only four European countries (Albania, Sweden, Austria and Malta) being in this group. Particularly striking are countries where the EF per capita more than doubled (Myanmar, Qatar, Iran, Guyana, China, Trinidad and Tobago, Saudi Arabia and Vietnam). The majority of countries increased their income growth by means of increasing their environmental pressures but, with the exception of those already listed in the red group, still managed to ensure growth in income that was nevertheless greater than the EF growth rate, hence relative decoupling can be detected in these countries. Our findings thus reinforce the repeatedly expressed view of UNEP experts and other researchers (Fischer-Kowalski et al., 2011; Weizsäcker et al., 2014; Oberle et al., 2019; Parrique et al., 2019) that relative decoupling is quite common, whereas it is very difficult to achieve absolute decoupling. The findings on the still positive and close relationship between income and environmental pressures are also consistent with this view (Vintar Mally, 2009; Aşici, 2013; Szigeti, Toth and Szabo, 2017; Kalimeris et al., 2020), and with the conclusion that decoupling will not occur on its own but only through deliberate and planned policy measures (Oberle et al., 2019; Parrique et al., 2019) as well as awareness raising and education (Arrebola and Martínez-Medina, 2018; Brkić-Vejmelka, Pejdo and Segarić, 2018).

In interpreting our results, certain limitations should be noted: two particular years were selected for a cross-section, and that selection could be more or less favourable for a particular country, hence influencing the result. That said, it is our assessment that on a global level these influences cancel out and hence do not mask results to any significant degree.

The current state and trends described cannot be a source of satisfaction, since they also highlight the finding that no country in the world achieves very high human development (i.e. HDI above 0.800) with an EF per capita equal to or lower than the average world biocapacity per capita (i.e. 1.63 gha per capita in 2016) (Global Footprint Network, 2019).

4. CONCLUSIONS

One of the central ideas of sustainable development is the need to break the link between economic growth and environmental impacts, or in other words, ensure that socio-economic development takes place within the limits of the carrying capacity of the environment. Agenda 2030, a key international document on sustainable development, thus assumes there will be continued growth in the size of the global economy but with the expectation that technological advances will reduce environmental impacts and improve the efficiency of resource use.

The results of the analyses presented here represent just a modest contribution to understanding the relationships between environmental pressures as measured by ecological footprint and progress in human development as measured by the human development index. For the period 1990–2016, we find that there is still a high positive correlation between the two for the world as a whole, though it is slightly lower in 2016 than in 1990. The latter, however, is not the case if we look at the connection between ecological footprint per capita and GNI per capita, which has only intensified. At the same time, overshooting of planetary carrying capacities has also increased, while all countries with available data made progress in human development. In the group of 121 countries surveyed, as many as 46 countries (38%) reported a decrease in ecological footprint per capita with varying degrees of growth in GNI per capita, but more detailed investigation would be needed for these countries to determine the true extent of (absolute) decoupling and its implications for the long term. On the other hand, there is no indication of decoupling in 21 countries, where environmental pressures as measured by ecological footprint per capita grew faster than their GNI per capita. The rest of the countries surveyed probably experienced relative decoupling, at least in some areas, but no absolute decoupling, since their environmental pressures mostly grew, although slower than their incomes.

Given the expected continued growth in population and the need to provide for the well-being of all, only absolute decoupling, with the aforementioned strong support for technological advancements in economically advanced countries, would allow more leeway for developing countries to close the gap in development. However, it should be noted that this will not happen spontaneously, but only through the deliberate and committed support of sectoral and horizontal policies, and with the realization that it is only a matter of time before we can no longer avoid the question of sufficiency in the developed world.

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