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# How has the sustainability of countries changed after COVID-19? Evidence from the pandemics' first year

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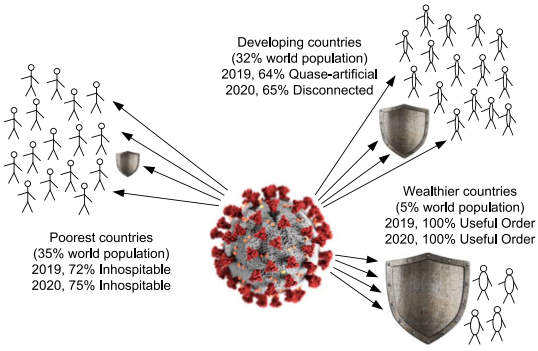
## HIGHLIGHTS

- Covid-19 crisis has affected the sustainability of nations.
- The eight world's model is used to classify nations according to their sustainability performance.
- The wealthier countries were less affected by Covid-19 crisis than poorest countries.
- 169 million people were pushed to the worst-case 'ineffective' world.

## GRAPHICAL ABSTRACT

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## ABSTRACT

The Covid-19 crisis has caused several social-related issues; the sanitary is, perhaps, the most significant one. Lockdowns and vaccination were implemented to fight the Covid-19 virus. From a sustainability perspective, Covid-19 has been considered a meaningful crisis driver that has affected nations' economies and social and natural capitals. The literature presents clues that effects appear to be different among countries. Recognizing its importance as public policies for sustainability, this study aims to assess how the sustainability of countries has changed after Covid-19, focusing on countries' economic power that reflects their capacity to face the crisis. A sample of 89 countries is considered, and 2019–2020 are set as base years for data gathering, which covers the first year of the Covid-19 crisis. Sustainability is conceptually supported and represented by a 3-D cube. The natural environment is expressed by the ecological footprint (EF) method, the economic capital by the gross domestic product (GDP), and the social capital by the happiness index. Results show that sustainability of economies was negatively affected after first year of Covid-19 crisis, but in different magnitudes, according to nations' economic power. While the sustainability of the wealthiest economies was slightly changed during 2019–2020 but maintained within the named 'useful-order' world (environmentally unsustainable, productive, and happy), the poorest economies pushed about 169 million people into the worst performance, reaching the 'ineffective' world (environmentally unsustainable, unproductive, and unhappy). Numbers highlight the inequalities of sustainability performance among countries, according to their capacity to face the Covid-19 crisis. The shield of the richest evaluated countries comprising 5 % of the world population is more powerful than the shield of the poorest evaluated countries carrying 67 % of the world population. Results claims for efforts to make different policies and provide economic support differently for countries, since although we are all under the same storm, but in different boats.

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## 1. Introduction

Global issues such as poverty, hunger, social inequality, and environmental sustainability have worsened after the pandemic caused by the new Coronavirus. The Covid-19 outbreak highlighted the structural fragility of current societies and the urgent need for actions to review production and consumption patterns that are causing enormous environmental impacts on the ecosystems on which human depends (Rume and Islam, 2020; Ranjbari et al., 2021). The Covid-19 crisis has accelerated a global decrease in both human health and on the natural environment that sustain human development, constituting a synergy of epidemics that co-occur in time and space, interact with each other, and generates complex sequels. Understanding the existence of this complex relationship, the most appropriate term to describe the crisis humans are facing is 'syndemic' (Horton, 2020). Since social drivers underline the crisis, facing the Covid-19 exclusively from a biomedical perspective by excluding the ecological dimension may correspond to a shortsighted view, not achieving the needed game-changing policies for a sustainable future.

Because of the magnitude of the syndemic's effects on social, economic, and natural capitals, researches on Covid-19 themes are being conducted by groups that put efforts into halting and reversing the adverse effects of Covid-19s health crisis. In this context, the United Nations (UN), through the document "United Nations Research Roadmap for the Covid-19 Recovery," highlights the fundamental importance of firstly identifying and defining strategies for crisis recovery. The European Union is developing the H2020 HERA project (heraresearcheu.eu) to prioritize relevant research fields related to Covid-19 from a systemic perspective. Other studies focus on the conceptual and practical strategies to better understand the main implications of the Covid-19 syndemic into sustainability, including Praveena and Aris (2021), who examined the impacts of Covid-19 on the Southeast Asian environment, finding that circulation restrictions had positive points, such as reduced noise and air pollution, improved air and water quality, and a reduction of the Earth's surface temperature. However, the same authors also noticed adverse effects such as the increase in the use of plastics and the increased generation of hospital waste. Under a similar focus, Sarfraz et al. (2021) assessed gas emissions in India during the quarantine period at the beginning of syndemics, and a significant reduction in gas emissions (mainly $CO_2$) was observed.

Perkins et al. (2021) discussed sustainable consumption from the perspective of the UN 2030 Agenda, using the supply chain as a potential practice towards SDG #12, and concluded that the Covid-19 outbreak changed the consumption panorama highlighting the importance of more responsible consumption than ever before. Similarly, Severo et al. (2021) studied the behavior changes of people living in Brazil and Portugal, identifying that Covid-19 mainly affected goods consumption, followed by environmental awareness and, finally, social responsibility. In the economic context, Dash et al. (2021) empirically examined the relationship between COVID-19 infection and economic growth for the BRICS economies during Jan./Oct. 2020, identifying a drop in primary exports that make economies financially vulnerable. Vidya and Prabheesh (2020) compared annual data (2018–2020) for a global trade network comprising 15 economies and found that the impact of COVID-19 on world trade was severe regarding trade interconnectedness and density; the latter was reduced from 0.833 to 0.429. However, Bashir et al. (2020) caution that Covid-19 does not affect everyone in the same way since the socio-economic indicators revealed a more significant impact in poorer countries. While initial concerns about Covid-19 were related to public health systems and global economic growth, the crisis also strongly affected social sustainability (Weible et al., 2020; Ranjbari et al., 2021). For Cawthorn et al. (2021), this is partly due to strategists' view that often analyze the syndemic as an autonomous crisis, disregarding the complex nature-society interaction. Leal Filho et al. (2020) warned that mitigation choices and suppressing the Covid outbreak could compromise the SDGs implementation processes, and the progress achieved so far would be threatened.

These studies provide meaningful contributions to shaping an adequate strategy towards an inclusive, resilient, and sustainable planet for all. Romanello et al. (2021) emphasized that the worldwide social inequalities were highlighted during the Covid-19 crisis, exposing the urgent need to collect standardized data to capture these inequities and vulnerabilities for effective actions. The challenge is to acquire knowledge of how to take advantage of this historic opportunity for profound and necessary changes, catalyzing efforts by governments, researchers, and sectors of society to prepare an action plan to achieve the highest possible targets of the Sustainable Development Goals. To accomplish this task, Bashir et al. (2020) emphasize the necessity of diagnoses focusing on sustainability to identify how the countries were differently affected by Covid-19 syndemic, a fundamental piece of information that should be based on a syndemic perspective. In this direction, Giannetti et al. (2021) proposed a framework to assess global sustainability scenarios based on the input-state-output model. Three related dimensions of sustainability called capitals (environmental sustainability, productivity, and happiness) are combined to achieve eight possible worlds according to their performance on these three capitals. From this perspective, the least desirable scenario portrays an environmentally unsustainable and unhappy world where production and consumption patterns are ineffective. In contrast, the ideal scenario is environmentally sustainable, productive, and with happy people.

Recognizing the importance of understanding how the three capitals (natural environment, productivity, and happiness) have changed after the COVID-19 crisis, depending on the economic power of nations, this study aims to assess the dynamics of the world's sustainability after the first year of the Covid-19 syndemic. Data from 89 countries between 2019 and 2020 are considered to feed the framework proposed by Giannetti et al. (2021) for diagnosis purposes and support insights about governmental strategies that might have deepened the crisis's adverse effects.

## 2. Methods

### 2.1. The eight possible worlds model

The Eight Worlds Model (EWM; Fig. 1) is considered in this present study to investigate the sustainable-related characteristics of each country (Giannetti et al., 2021). This model illustrates the functioning of human society as a thermodynamic open system. The environment is the source of energy and materials that sustain the operations of an economy that, by transforming the natural capital, delivers the goods and services necessary for human wellbeing. The EWM is not a "one-way" system like the input-state-output model since there are feedbacks where society provides knowledge and human resources back to the economy compartment, and the economy (representing the functioning of any production systems) generates concentrated by-products that put the natural environment under pressure.

To apply the EWM, each indicator representing the cube's three-axis must be chosen, including one for environmental sustainability, one for productivity, and another for society. For this study, the average ecological footprint (EF) per capita was set to represent the natural environment, where the EF per capita of 1 Planet is the assumed cutoff; the reason is that there is only 1 Planet on which humans must live in. The GDP per capita was set to represent the productivity or economy where the annual GDP per capita of US$ 10,000.00 is the cutoff; this value corresponds to the global average GDP per person as used by Wackernagel et al. (2021). Finally, the average for the individual happiness index was set to represent the social capital. The cutoff is a happiness level of 6 in the World Happiness Report (Helliwell et al., 2021). There are two possible indicator levels: low or high, according to their position on the cutoffs established. According to Giannetti et al. (2021), the combination of these three indicators provides eight sustainable-related characteristics for countries (Fig. 1), including (i) worst-case scenario (red) - ineffective (environmentally unsustainable, unproductive, and unhappy); (ii) lower-intermediate scenarios (yellow) - including quasi-artificial (environmentally unsustainable, unhappy, and productive), (iii) inhospitable (environmentally sustainable, unhappy, and unproductive), and (iv) disconnected (environmentally unsustainable,

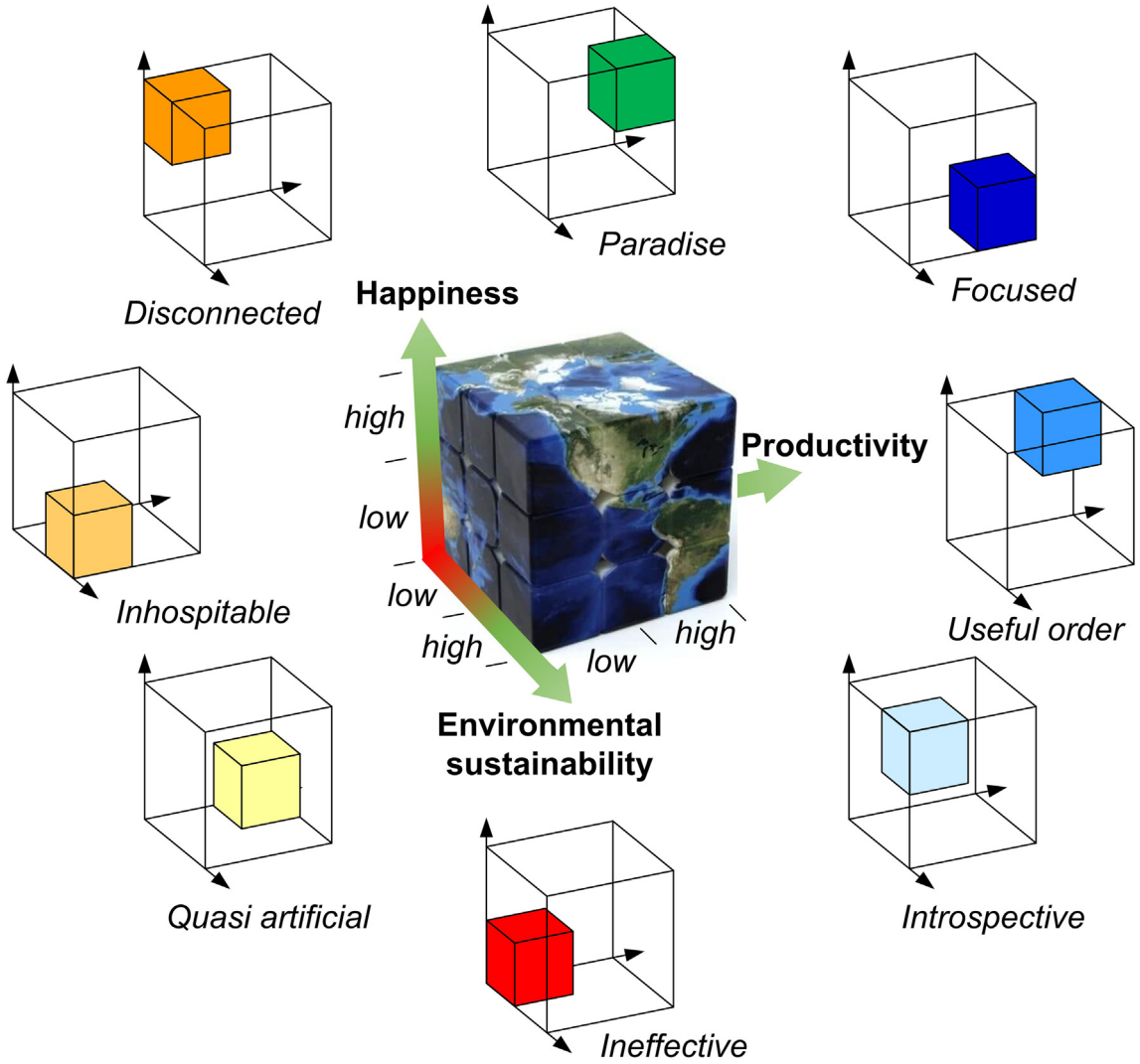


**Fig. 1.** The eight worlds model (EWM). Countries' sustainable-related characteristics according to the combination of environmental (ecological footprint), economic (GDP/capita), and social (happiness index) indicators. Low and/or high performances according to the cutoffs established for each indicator. Details are available in Giannetti et al. (2021).

happy, and unproductive); (v) upper-intermediate scenarios (blue) - including focused (environmentally sustainable, unhappy, and productive), (vi) useful-order (environmentally unsustainable, happy, and productive), and (vii) introspective (environmentally sustainable, happy, and unproductive); (viii) best-case scenario (green) - paradise (environmentally sustainable, happy, and productive). All of them are considered in this study for diagnosis purposes.

### 2.2. Data source and analysis

Data on ecological footprint, GDP, and happiness index were collected for 89 countries for 2019 and 2020 as reference years to encompass the first year of the Covid-19 crisis. The sample of countries was selected exclusively according to data availability. Ecological footprint data were obtained from the Global Footprint Network database (GFN, 2021), while GDP data were obtained from the International Monetary Fund database (IMF, 2021) and happiness index from the World Happiness Report database, precisely the Life Ladder indicator of happiness (Helliwell et al., 2021). Raw data are available in the Appendix.

Data analysis is carried out through four approaches: (i) obtaining indicators and evaluating each country individually; (ii) the entire sample is plotted on a 3-axis graph to identify trends in data distribution; (iii) a cluster analysis for the 89 countries is performed to assess behavioral changes among groups; (iv) inhabitants of each country is considered among the established clusters to assess the number of people in the world that were potentially affected by the changes in the sustainable-related characteristics of countries clusters. For cluster analysis, ecological footprint, GDP, and happiness indicators are used as parameters into the 'R' Software© is considered through the 'K-means' as clustering method; the 'FactoMineR' package (Lê et al., 2008) is considered, and the 'fviz_nbclust' function determines the optimal number of clusters.

Important to emphasize that, although the Covid-19 crisis can be seen as a main driver affecting countries' sustainability, other environmental (e.g. hurricanes, global warming and tsunamis), social (e.g. war and other diseases) and economical (e.g. inflation and geopolitics) issues can also be the causes of changes. As claimed by Kwan (2021), studying causes and consequences relationships by assuming the stationarity of raw data on space and time would result in misleading conclusions, but this stationarity is not considered in this present study, since we advocate the COVID-19 crisis as an aggravating factor/driver for the changes in countries' sustainability rather than the exclusive one. Other authors (e.g., Shakil et al., 2020; Wu et al., 2021; Wang and Su, 2020; Sarkar et al., 2021; Zambrano-Monserrate et al., 2020) that have studied the consequences of COVID-19 in the natural environment, social and economic aspects support this assumption. The

methodological approach applied allows to state that Covid-19 is associated with the changes in countries' sustainability during 2019–2020, but it is not the only responsible cause.

## 3. Results

### 3.1. Clusters characteristics

From the cluster analysis, 89 countries were assigned to three clusters (Table 1). Cluster 1 (C1, with 18 countries) comprises countries with the highest ecological footprint values, GDP, and happiness (Fig. 2a). The average ecological footprint was 3.7 planets in 2019 and 3.8 planets in 2020, indicating an unsustainable environmental scenario. Bahrain, Canada, the United States, and the United Arab Emirates showed the highest EF, with values higher than 5 Planets. These countries also have the highest GDP per capita, with an average of about US$ 52,300 in 2019 and US$ 53,500 in 2020. The happiness index of C1 is also the highest among the three clusters, achieving 7.2 in 2019 and 7.1 in 2020.

Cluster 2 (C2, with 34 countries) presents a high variability in the indicators (Fig. 2b). For instance, while Belgium had the lowest EF (~0.8 planets) and the highest values for both GDP per capita (~US$ 45,000.00) and happiness index (~6.8) in 2019 and 2020, Mongolia presented the highest EF (>4.7 planets), the lowest GDP per capita (<US$ 1300.00), and lowest happiness index (<4.9). For 2019 and 2020, the C2 showed an average EF of 2.7 Planets, a GDP of US$ 18,000 per capita, and a happiness index of 6.0.

Finally, Cluster 3 is the largest cluster containing 37 countries (Table 1) that show better performance for environmental sustainability but the worse performance for economic and well-being performances (Fig. 2c). C3 obtained an average EF of 1.1 Planets for the 2019–2020 period, a GDP per capita of US$ 3400, and a happiness index of 4.9. Countries with the highest performance for EF were Bangladesh, Tajikistan, and Zambia (~0.6 planets). Zambia shows the lowest GDP per capita with an average of US$ 800, and Zimbabwe presents the lowest happiness index with 3.0 on average.

According to the CUBE model, Fig. 3 illustrates a comparative graphical snapshot of the 89 studied countries and their indicators. Differences between the two years evaluated (2019 and 2020) can be seen for all countries, but each cluster's median values show slight changes along the years. The productivity and ecological footprint show an ordered tendency

**Table 1**
Countries distributed in clusters according to their ecological footprint, GDP, and happiness indicators for 2019 and 2020. Pop.: total cluster population (World Bank, 2022).

| Cluster 1 (C1) | Cluster 2 (C2) | | Cluster 3 (C3) | |
|---|---|---|---|---|
| Australia[a] | Argentina[a] | Malta[a] | Albania | Lao P.D.R. |
| Austria | Belgium | Mauritius | Bangladesh[a] | Moldova |
| Bahrain | Benin | Mexico | Bolivia | Morocco |
| Canada | Bosnia-Herzeg. | Mongolia | Cambodia | Myanmar |
| Denmark[a] | Brazil[a] | Montenegro | Cameroon | Namibia[a] |
| Finland[a] | Bulgaria | Poland | Colombia | Nigeria |
| France | Chile | Portugal | Dominican Rep. | Nth. Macedonia |
| Germany[a] | China | Russia | Ecuador | Philippines[a] |
| Ireland | Croatia[a] | Saudi Arabia | Egypt | South Africa |
| Israel | Cyprus | Serbia | El Salvador | Tajikistan |
| Netherlands[a] | Estonia[a] | Slovakia[a] | Ethiopia[a] | Tanzania |
| New Zealand[a] | Greece | Slovenia | Georgia[a] | Tunisia |
| Norway[a] | Hungary | South Korea | Ghana | Turkey |
| Sweden | Italy | Spain | India | Uganda |
| Switzerland | Japan | Thailand[a] | Iran | Ukraine |
| Utd. Arab Emirates | Kazakhstan | Uruguay | Ivory Coast | Venezuela |
| Utd. Kingdom[a] | Latvia | | Jordan | Zambia |
| Utd. States | Lithuania[a] | | Kenya | Zimbabwe |
| | | | Kyrgyzstan | |
| Pop.: 372.6 millions | Pop.: 2489.7 millions | | Pop.: 2702.6 millions | |

[a] Countries with female governmental leadership (Queen, Head of State, Prime Minister, or other) participation during 2010–2020: 44 % for C1, 23 % for C2, and 13 % for C3.

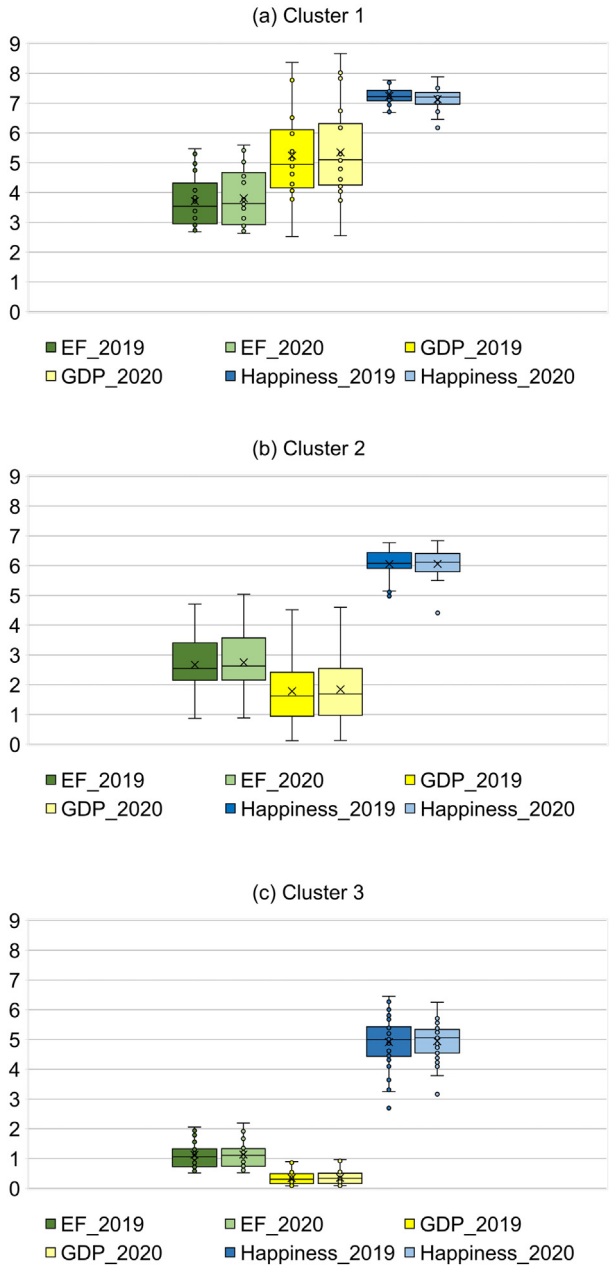


**Fig. 2.** Box-plot results for clusters 1 (a), 2 (b), 3 (c) and their indicators. Legend: EF, ecological footprint (in number of Earths planet); GDP, gross domestic product (in 10,000 US$/capita); Happiness (dimensionless).

only for C3 countries, while C2 and C1 present an apparently random behavior. Data show that the higher the productivity, the higher the ecological footprint, which seems reasonable considering that productivity means GDP increases through the traditional business-as-usual approach (take, use, and dispose of), the linear one-way production thinking for economic growth. This production model puts pressure on the natural environment, which acts as a resources provider and waste diluter, resulting in an environmentally non-sustainable world that demands more than one Planet to sustain its lifestyle.

The relationship between happiness and ecological footprint indicates that the larger the consumption of goods and services, the larger the happiness. This is also evidenced by the happiness with productivity relationship, in which higher economic power indicates more increased happiness. Additional work is needed to investigate the reasons for such connection, including psychological aspects related to human well-being and its happiness

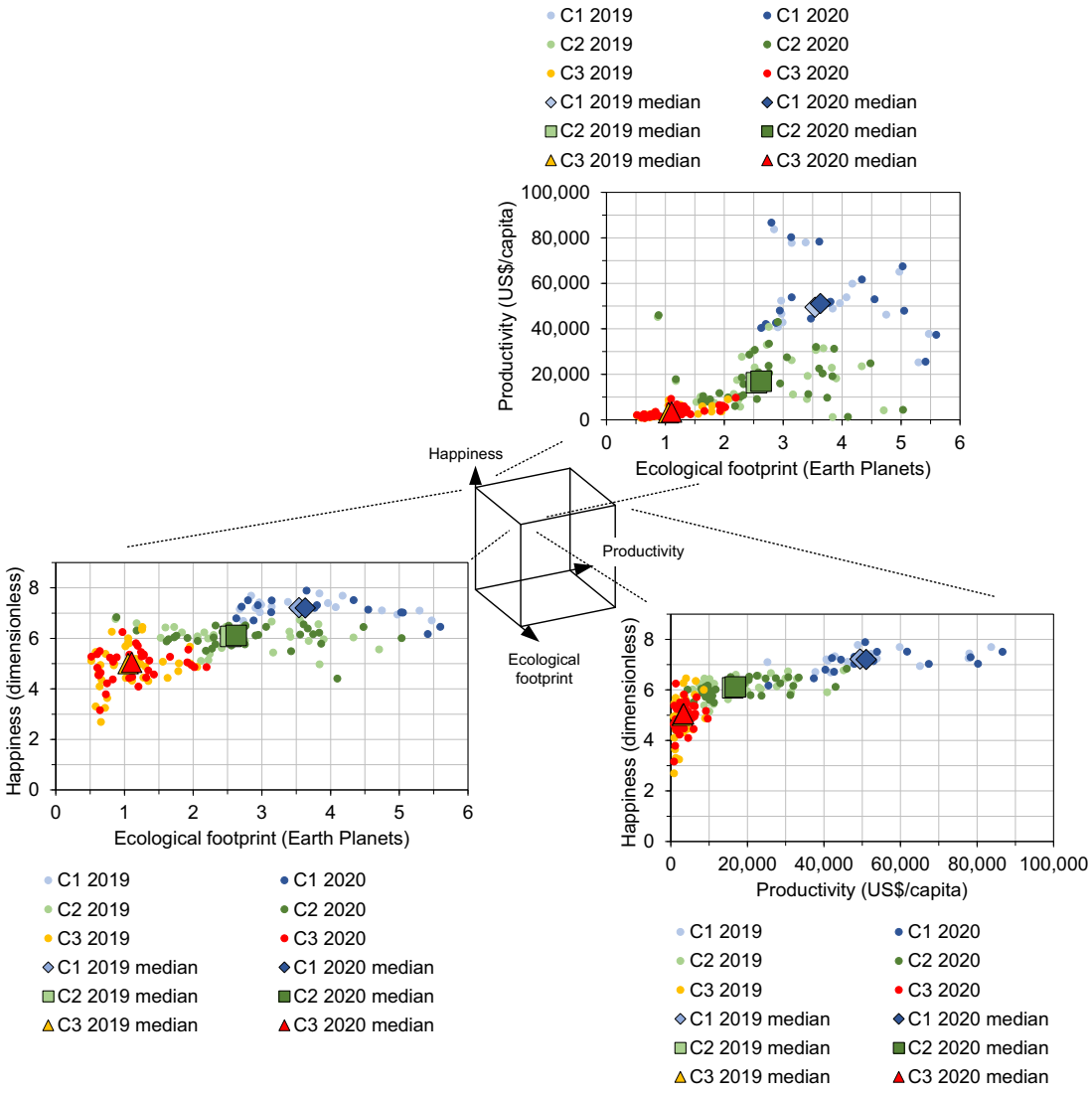


**Fig. 3.** Orthographic projection of the indicators for the word sustainability cube considering the sample of 89 countries.

level and the apparent intrinsic need to buy goods that human appears to have. Anyhow, the observations provided are consistent with the data in Fig. 3.

### *3.2. Clusters' performance according to the EWM model*

In average, all the 89 countries divided into three clusters show a low variation for the three indicators during 2019–2020, before and during the pandemic crisis, as shown in Fig. 2. However, observing from a different perspective, the variations for some countries were sufficient to change their classification of the sustainable-related characteristic. From Fig. 4, C2 shows the highest changes between years, led by China, categorized as a Quasi-artificial world in 2019 and moved to a Disconnected world in 2020. When excluding China (*) with a significant influence on results due to its population, C2 showed that countries' populations characterized as Useful-order and Disconnected sustainable-related characteristics reduced from 2019 to 2020, while Quasi-artificial and Ineffective increased. Cluster 3 countries are mainly categorized and remained almost unchangeable as Inhospitable and Ineffective for both years, with a little increase in Ineffective and reduction in Introspective characteristics. Interesting to note that Cluster 1 is entirely categorized as Useful-order, presenting no changes between 2019 and 2020.

Although C1 showed to be located into an upper-intermediate performance for its sustainable-related characteristic (Useful order), C1 has about 373 million people, which is equivalent to a small fraction of ~5 % of the global population, indicating that although positive, this performance for C1 has low influence for global changes. Differently, C2 encompasses ~32 % of the global population (2490 million people), but 6 % of its population moved from the upper-intermediary Useful-order performance in 2019 to lower-intermediary Disconnected performance (2 %) and Ineffective (4 %) sustainable-related characteristic; remembering that Disconnected means environmentally unsustainable, happy, and unproductive. Similarly, C3 encompasses ~35 % of the global population (2703 million people), of which 4 % migrated from an upper-intermediary Introspective performance to a lower-intermediary Inhospitable (2 %) or Ineffective sustainable-related characteristics (2 %); remembering that Inhospitable means environmentally sustainable, unhappy, and unproductive. In short, C2 and C3 together indicate that 169 million people migrated from better performances in 2019 to the worst-case Ineffective in 2020, an environmentally unsustainable, unproductive, and unhappy sustainable-related characteristic.

## 4. Discussions

As previously mentioned, it is important to remember that Covid-19 crisis is assumed here as an aggravating driver causing changes in the countries' sustainability, but other causes can also exist. This is a plausible premise since Covid-19 was the main world threat during 2019–2020,

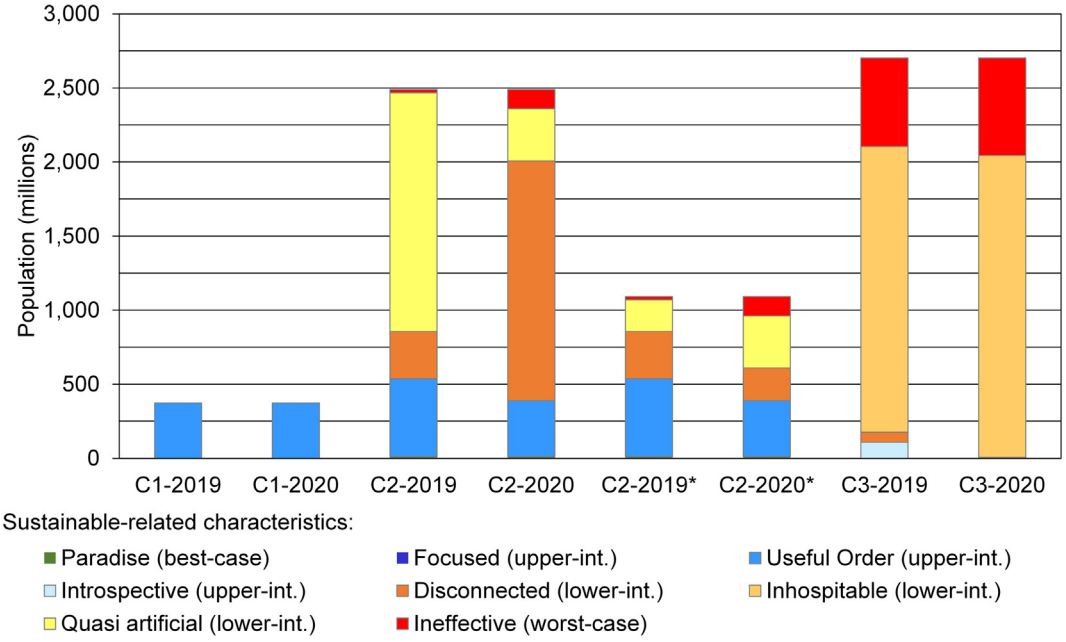


**Fig. 4.** Clusters categorization into eight sustainable-related characteristics and their population. The symbol (*) means data excluding China.

highlighting the weaknesses and strengths of countries when dealing with the crisis. The countries' sustainability has changed in different ways when analyzing before and after Covid-19 syndemics. Overall, underdeveloped and developing countries belonging to C2 and C3 were more affected than the developed (C1) ones. The classification of countries from Latin America, Central, East Asia, and East Europe based on the sustainable-related characteristic of Fig. 1 got worse when comparing 2020 with 2019 (Fig. 4). Besides, 23 countries from Latin America, Africa, and Asia were already classified as Ineffective before the beginning of the Covid-19 crisis. Others joined them in 2020, increasing to 27 the number of countries and their population classified as Ineffective (data available in the Appendix). These results indicate that sustainability of C2 and C3 were more prominent and negatively affected after the Covid-19 crisis than C1, which maintained its classification as Useful Order, increasing existing inequalities among them and pushing C2 and C3 countries towards environmental, economic, and social unsustainability.

The Covid-19 crisis is strongly linked to the natural environment (Kumar et al., 2021). At the beginning of the pandemic, the global environmental sustainability was expected to increase due to the slowdown in the production systems, market closure, and lockdowns (Saadat et al., 2020), which would result in lower demand for resources from nature and generate a lower amount of wastes. Contrariwise, our data about the ecological footprint indicate that the consumption pattern of countries was unchanged during 2019–2020, the first year of the pandemic. Although positive effects were observed during 2020 due to human pressure reduction on nature, such as the increase in air quality and a decrease in individual consumption demand, these positive effects showed to be short-termed. They were overpassed by the further larger negative impacts such as the increase in deforestation, weakening of environmental policies, and biomedical wastes generation (Kumar et al., 2021); all those can be worsened when political ideologies without scientific arguments are considered for decisions (please see an example for the Brazilian case in Rajão et al., 2022).

Moreover, countries have been performing poorly on the environmental-related SGDs, such as climate action, wildlife, and sustainable consumption, even before the pandemic outbreak (Sachs et al., 2021). This emphasizes that humans are losing a great opportunity to rethink and discuss the impact they cause on the biosphere, including the recognition by classical-oriented economists, managers, and all other stakeholders about the Planet's biophysical limits that support human life. As discussed by Almeida et al. (2021), the tripod crises, knowledge, and alternative paradigm usually walk together, and they should be synergically perceived towards strategic transformations of the global consumption and production systems. Precisely, crisis works as a stimulus for people to change for sustainable post-COVID-19 societies, while knowledge and alternative paradigms are proposed to orient humanity towards a promising future that seeks to go beyond inequalities, conflicts, imbalanced development, and ecological deterioration.

Focusing on the population of countries, results show that over 60 % of the global population has a higher than one Planet average per capita ecological footprint (EF), in which higher EF indicates both a higher level of natural resources consumption and a deficit in countries' biocapacity. C1 countries have a key role in this scenario, as their economic power allows the importation of natural resources from abroad, sustaining their consumption pattern while increasing global ecological debt (Wackernagel et al., 2021). There is a large disparity as for EFs among clusters, as countries belonging to C1 have an average EF three times higher than those of the countries belonging to C3, emphasizing that existing socioeconomic inequality among countries is a bottleneck for global sustainability. According to Wackernagel et al. (2021), this inequality becomes even more evident when less developed countries increase their natural capital depletion (biocapacity reduction) as an attempt to escape from poverty by extracting food, materials, and energy without strategic planning. Interesting to point out that, according to Ross (2012), even a country with large reserves of natural resources such as petroleum, natural gas, coal, minerals, fertile soil, potable water, wood, etc., without strategic planning, cannot develop its economy, turning an initial blessing into a curse. Even though the Covid-19 syndemic has not shown to directly and broadly affect the EF average of countries during 2020, the rise in inequalities would probably lead many countries to a post-crisis scenario of increased environmental unsustainability. This is an important subject to be assessed in future studies.

The pandemic affected and was affected by the economic system. Several recently published articles reinforce that low-income countries, as well as socially excluded groups such as women, black and indigenous populations, were the hardest affected ones by the pandemic (Foschiatti and Gasparini, 2020; Decerf et al., 2021; Tavares and Betti, 2021; Bargain and Aminjonov, 2021; Rönkkö et al., 2021; Baqui et al., 2020), and that poverty increase was a major effect in developing countries (Decerf et al., 2021;

Sachs et al., 2021). Our results evidence the existence of a significant inequality in the average GDP per capita of the countries from the different clusters. Countries from C1 are economically wealthier, while countries from C2 and C3 are developing or undeveloped economies. Therefore, wealthier nations suffered less economic impacts and are more likely to have a better economic performance in the recovery process after the Covid-19 crisis than C2 and C3 countries. Even identifying a decrease in the GDP of some C1 nations, none country faced an annual GDP reduction below the US$ 10,000 per capita. On the other hand, a GDP reduction was perceived for C2 and C3 countries, as many nations were already in an economically unsustainable situation (lower than 10,000 US$ per capita year) that was worsened during 2020.

Even though decreases in growth rates were reported worldwide (e.g., China from 5.95 % in 2019 to 2.35 % in 2020; the USA from 2.16 to −3.40 %; Brazil from 1.41 to −4.05 %; data from The International Monetary Fund), the average GDP per capita of the three clusters had a slight increase from 2019 to 2020; this highlights the ambitious behavior for economic growth as a common practice. Nevertheless, in the countries studied, the share of people living in countries with an average GDP per capita lower than US$ 10,000 increased from 55 % in 2019 to 80 % in 2020, indicating the economic impacts and inequalities during Covid-19 syndemics. Rich people have become wealthier, while poor people have become poorer.

In 2020, several policymakers argued that saving the economy was worth the risk of Covid spreading and claimed for the so-called “herd immunity” strategy (Balmford et al., 2020). Among other causes, that strategy was at the expense of hundreds of thousands of lives (6,285,171 cumulative deaths in the world until May 24th, 2022; World Health Organization, https://covid19.who.int). Besides, it generated new virus variants that postponed the pandemic neutralization by creating massive contamination rates in 2021 and consecutive infection waves, further accentuating the economic crisis by the need of several consecutive lockdowns. The effects of the pandemic on global productivity will possibly be reduced after 2021 due to vaccination implementation, stabilization of Covid-19 propagation, and market reopening. Even so, the recovery is likely to be asymmetric since wealthier nations reached high vaccination coverage (~73 % of the population), including access to the new mRNA vaccines, whereas poor countries remain with ~11 % of their population vaccinated (WHO, 2022).

Regarding human welfare, it was affected during the Covid-19 syndemic in several ways: it has changed daily routines, brought several uncertainties, and led many people to experience grief. The restrictive measures to contain the spread of the pandemic caused a decline in happiness, regardless of the country's characteristics or the features of its lockdown regulations (Greyling et al., 2021). Overall, 44 out of the 89 countries studied had a decrease in their happiness evaluation from 2019 to 2020, which was observed regardless of their cluster. Nevertheless, likewise, for GDP and EF, there is a large inequality among clusters. All C1 countries remained happy (happiness >6) regardless of the observed reduction in happiness level. On the other hand, 5 countries from C2 and 3 countries from C3 decreased their indicator towards a level of unhappiness (happiness <6). Moreover, 35 % of the C2 countries and all from C3 (except for Kyrgyzstan) were below the happiness cutoff of 6 in 2020. Therefore, population welfare was affected differently among countries during 2020, in which developing and underdeveloped countries faced larger population happiness reduction.

The life psychological well-being evaluations - such as the happiness ladder indicator used in this study - have shown that Covid-19 led to modest changes in the global rankings although reports of stress, worry, and sadness increased (Helliwell et al., 2021). In fact, our data showed that none of the countries studied decreased their happiness level by >15 % between 2019 and 2020, and some countries even increased their indicator, as is the case of Zambia, which increased its happiness level from 3.31 to 4.84 (but still <6, classified as an unhappy population). According to Helliwell et al. (2021), many factors can influence an individual self-evaluation of welfare, for example, people who are unemployed, in poor health, and with low income are more likely to have a low happiness level, while social trust and benevolence were determinant factors for better self-evaluations in 2020. The same authors emphasize that social trust was generally lower in countries with higher income inequality. All these published data indicates that wellbeing may be more negatively affected in poorer countries, although this aspect was not evidenced by our data.

It is well known that many factors can have an influence on the sustainability performance of countries, despite the pandemic event, including cultural and historical aspects that may interact with each other, increasing or reducing the effects of Covid-19 syndemic. For example, focusing on gender equality in governmental leadership, the obtained data show no significant difference on the population's happiness level in 2019 and 2020 for countries managed by women compared to men, opposite to the findings of Coscieme et al. (n.d.) in which governments led by woman are more prompt to prioritize public health over economic concerns and obtain higher success in eliciting collaboration from the population. Focusing on the political regimes (i.e., democratic versus autocratic governments), results shown no influence on the countries sustainability performance, because the three clusters had countries under both government regimes. Although no differences were observed in this work, future efforts are suggested so as to assess the potential relationship between socio-political variables with countries' sustainability.

The Covid-19 crisis threw light on an inconvenient, yet undeniable truth: our global society is currently unsustainable (Giannetti et al., 2021). Moreover, Horton (2020) states that our unsustainable practices are the deep roots of the Covid-19 crisis and the forthcoming environmental crisis. The results of this work show that world sustainability was reduced between 2019 and 2020, the period with the most intense consequences of the Covid-19 crisis. Still, this reduction occurred differently among countries, in which developing countries faced higher short-term negative impacts than the developed ones. Evidence for such statement can be presented as follows:

- First, environmental sustainability has been neglected or underestimated by most of the world leaders, despite the countless scientific evidences of the risk of an environmental collapse. Such conduct may have undermined our capacity to anticipate, prevent and cope in an environmental rooted crisis, such as the Covid-19. Scientific denialism and misinformation were seen in the strategies to deal with environmental issues (Rajão et al., 2022) and the Covid-19 crisis worldwide, resulting in lower popular acceptance of social distancing measures, use of masks, and vaccination (Sabahelzain et al., 2021; Malta et al., 2021).
- Second, inequality is a significant bottleneck for sustainability (Wackernagel et al., 2021). A popular widespread saying during the Covid-19 crisis stated “we are all under the same storm, but not in the same boat.” The large inequalities found among and within countries led economically vulnerable populations to be more susceptible to the negative impacts of Covid-19 and less capable of recovering from them. Moreover, the current evidence indicates that countries with higher social equality, including gender equality in leadership positions, were more successful in managing the Covid-19 syndemics (Coscieme et al., n.d.). The 2021 report of the Lancet Countdown on health and climate change (Romanello et al., 2021) emphasizes that efforts to build resilience have been slow and unequal, in which countries with low Human Development Index (HDI) appear as the least prepared to respond to the changing health profile of climate change, while funding remains a consistent challenge. Authors claim for the implementation of policies that reduce inequities and improve human health, since nobody is safe until everyone is safe.
- Finally, by prioritizing economic performance – under traditional disciplines' perspective for business as usual – over human welfare, decision-makers postpone solutions for and make both the economic and health crisis worse. The purpose of every production system is, or should be, to generate human welfare. Moreover, the consequences of long periods of lockdown, higher mortality rates, and political instability worsen human welfare. When the economy is considered the ultimate goal, natural and human resources are wasted, decreasing sustainability.

Important to say that the timeframe considered for analysis could be a limitation of this study, since the 1-year statistical analysis may be insufficient to capture the long-term pandemic effects and the potential synergic variables. Additionally, further evidences based on statistics (e.g., stationary studies of data feeding the cube model) to punish the Covid-19 crisis as the main driver of countries' sustainability are still needed. For future efforts, considering a larger timeframe is suggested, besides assessing the cause-effect binomial including diverse variables (socio-economic, environmental, and cultural, among others), all of which based on stationary temporal analysis. Recognizing that the Covid-19 syndemic is a huge, abrupt, and equally world shared event that negatively affected countries in a short time period, we assumed that it was the key-factor that drives countries sustainability performance during the 2019–2020 timeframe. Data for 89 countries (~45 % of worldwide countries) that comprises different cultural, ethnical, historical, and geographical aspects were considered as a sample, which, in principle, is a representative sample that encompasses the most different aspects among countries. As the main goal of diagnosing the changes of countries' sustainability during Covid-10 crisis, these identified limitations would have low influence (if any) on the obtained results of this study.

## 5. Conclusions

The ecological footprint, gross domestic product, and population happiness of all economies around the world were negatively affected during the 2019–2020 Covid-19 crisis, but the magnitude of effects has shown differences according to the nation's economic power.

From an individual analysis approach, the ecological footprint shows no evidence that it was directly and largely impacted for the 89 countries evaluated (C1 with 3.54 and 3.63 Planets for 2019 and 2020, respectively; C2 with 2.55 and 2.63 Planets; C3 with 1.06 and 1.11 Planets), but the high inequalities observed among clusters on their ecological footprint would probably lead many countries to a post-crisis scenario of increased environmental unsustainability. Focusing on the economic aspect, the amount of people living in countries with an average per capita gross domestic product (GDP) lower than US$ 10,000 increased from 55 % in 2019 to 80 % in 2020. Besides the amount of people that moved to an economically unsustainable scenario, the existing inequalities among clusters (C1 with 49,500 and 51,000 US$/capita for 2019 and 2020 respectively; C2 with 16,200 and 16,900 US$/capita; C3 with 3000 and 3300 US$/capita) would result in different effectiveness when facing the problems of the post-Covid-19 crisis. Regarding the population welfare, although the average values for clusters were the same between 2019 and 2020 (C1 with 7.2 for both 2019 and 2020 years; C2 with 6.0 and 6.1; C3 with 5.0 for both years), 18 of the 89 studied countries decreased their happiness levels (all of them belonging to the cluster #3, underdeveloped countries), which corresponds to a population of about 707 million becoming less happy during the 2019–2020 Covid-19 syndemic.

From an overall approach, the sustainability as represented by ecological footprint, GDP, and happiness in the cube framework shows that richer countries (cluster #1) maintained 100 % of their population in the 'useful-order' world during 2019–2020, with characteristics of environmental unsustainability, productive and happy population. On the other hand, clusters #2 and #3 (developing and underdeveloped countries) show that about 169 million people migrated from better sustainability performances in 2019 to the worst-case 'Ineffective' world in 2020, which has characteristics of environmental unsustainability, unproductive, and unhappy population. The sustainability of the entire world was differently affected during the Covid-19 crisis, because while the richer analyzed countries, with 5 % of the world's population, are protected under a larger shield against crisis impacts, the poorest countries with about 67 % of the world's population are partially protected by a tiny and ineffective shield.

## Data availability

All data are available in the manuscript as appendix.

## Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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## Appendix A. Raw data for the sample of countries considered in this study

Legend and data source: EF, ecological footprint (GNF, 2021); GDP/capita, gross domestic product per capita (IMF, 2021), 2020 data estimative obtained in August 2021; Happiness index (Helliwell et al., 2021).

| Cluster | Country | Population (millions) | EF 2019 | EF 2020 | GDP/capita 2019 (US$) | GDP/capita 2020 (US$) | Happiness index 2019 | Happiness index 2020 | Country's 2019 characteristic (Fig. 1) | Country's 2020 characteristic (Fig. 1) |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Australia | 25.4 | 4.07 | 4.55 | 53,825.16 | 52,952.27 | 7.23 | 7.14 | Useful order | Useful order |
| 1 | Austria | 8.9 | 3.70 | 3.77 | 50,022.61 | 51,330.46 | 7.20 | 7.21 | Useful order | Useful order |
| 1 | Bahrain | 1.6 | 5.30 | 5.42 | 25,273.15 | 25,507.49 | 7.10 | 6.17 | Useful order | Useful order |
| 1 | Canada | 37.6 | 4.75 | 5.05 | 46,212.84 | 47,931.46 | 7.11 | 7.02 | Useful order | Useful order |
| 1 | Denmark | 5.8 | 4.18 | 4.34 | 59,795.27 | 61,732.57 | 7.69 | 7.51 | Useful order | Useful order |
| 1 | Finland | 5.5 | 3.84 | 3.65 | 48,868.74 | 50,774.20 | 7.78 | 7.89 | Useful order | Useful order |
| 1 | France | 67.1 | 2.73 | 2.88 | 41,760.61 | 42,643.95 | 6.69 | 6.71 | Useful order | Useful order |
| 1 | Germany | 83.1 | 2.97 | 2.94 | 46,563.99 | 47,992.32 | 7.04 | 7.31 | Useful order | Useful order |
| 1 | Ireland | 4.9 | 3.14 | 3.14 | 77,771.21 | 80,264.84 | 7.25 | 7.03 | Useful order | Useful order |
| 1 | Israel | 9.1 | 2.99 | 3.47 | 42,823.31 | 44,474.07 | 7.33 | 7.19 | Useful order | Useful order |
| 1 | Netherlands | 0.5 | 2.97 | 3.14 | 52,367.85 | 53,873.37 | 7.43 | 7.50 | Useful order | Useful order |
| 1 | New Zealand | 17.3 | 2.91 | 2.70 | 40,634.14 | 42,084.40 | 7.21 | 7.26 | Useful order | Useful order |
| 1 | Norway | 5 | 3.38 | 3.61 | 77,975.43 | 78,333.22 | 7.44 | 7.29 | Useful order | Useful order |
| 1 | Sweden | 5.3 | 3.96 | 3.80 | 51,241.91 | 51,892.08 | 7.40 | 7.31 | Useful order | Useful order |
| 1 | Switzerland | 10.3 | 2.85 | 2.80 | 83,716.81 | 86,673.50 | 7.69 | 7.51 | Useful order | Useful order |
| 1 | Utd. Arab Emirat. | 8.6 | 5.47 | 5.60 | 37,749.88 | 37,375.27 | 6.71 | 6.46 | Useful order | Useful order |
| 1 | Utd. Kingdon | 9.8 | 2.68 | 2.63 | 41,030.23 | 40,391.84 | 7.16 | 6.80 | Useful order | Useful order |
| 1 | United States | 66.8 | 4.97 | 5.03 | 65,111.60 | 67,426.84 | 6.94 | 7.03 | Useful order | Useful order |

(*continued*)

| Cluster | Country | Population (millions) | EF 2019 | EF 2020 | GDP/capita 2019 (US$) | GDP/capita 2020 (US$) | Happiness index 2019 | Happiness index 2020 | Country's 2019 characteristic (Fig. 1) | Country's 2020 characteristic (Fig. 1) |
|---|---|---|---|---|---|---|---|---|---|---|
| 2 | Argentina | 44.9 | 2.06 | 2.07 | 9887.79 | 9730.91 | 6.09 | 5.90 | Disconnected | Ineffective |
| 2 | Belgium | 11.5 | 0.87 | 0.88 | 45,175.59 | 45,979.69 | 6.77 | 6.84 | Paradise | Paradise |
| 2 | Benin | 11.8 | 3.84 | 4.10 | 1216.63 | 1274.28 | 4.98 | 4.41 | Ineffective | Ineffective |
| 2 | Bosnia-Herzegov. | 3.3 | 2.27 | 2.19 | 5741.76 | 6009.57 | 6.02 | 5.52 | Disconnected | Ineffective |
| 2 | Brazil | 211 | 1.73 | 1.76 | 8796.91 | 8955.65 | 6.45 | 6.11 | Disconnected | Disconnected |
| 2 | Bulgaria | 7 | 2.11 | 2.27 | 9518.44 | 10,133.07 | 5.11 | 5.60 | Ineffective | Quasi artificial |
| 2 | Chile | 19 | 2.64 | 2.68 | 15,399.24 | 15,854.65 | 5.94 | 6.15 | Quasi artificial | Useful order |
| 2 | China | 1397.7 | 2.22 | 2.32 | 10,098.87 | 10,872.50 | 5.14 | 5.77 | Quasi artificial | Disconnected |
| 2 | Croatia | 4.1 | 2.42 | 2.33 | 14,949.76 | 15,645.78 | 5.63 | 6.51 | Quasi artificial | Useful order |
| 2 | Cyprus | 1.2 | 2.30 | 2.43 | 27,719.69 | 28,626.57 | 6.14 | 6.26 | Useful order | Useful order |
| 2 | Estonia | 1.3 | 4.33 | 4.48 | 23,523.60 | 24,802.77 | 6.03 | 6.45 | Disconnected | Useful order |
| 2 | Greece | 10.7 | 2.62 | 2.58 | 19,974.37 | 20,845.32 | 5.95 | 5.79 | Useful order | Quasi artificial |
| 2 | Hungary | 9.8 | 2.22 | 2.30 | 17,463.28 | 18,535.15 | 6.00 | 6.04 | Useful order | Useful order |
| 2 | Italy | 60.3 | 2.72 | 2.76 | 32,946.52 | 33,431.25 | 6.45 | 6.49 | Useful order | Useful order |
| 2 | Japan | 126.3 | 2.76 | 2.91 | 40,846.78 | 43,043.42 | 5.91 | 6.12 | Quasi artificial | Useful order |
| 2 | Kazakhstan | 18.5 | 3.40 | 3.75 | 9139.11 | 9672.00 | 6.27 | 6.17 | Disconnected | Useful order |
| 2 | Latvia | 1.9 | 3.90 | 3.84 | 18,171.65 | 19,104.84 | 5.97 | 6.23 | Disconnected | Useful order |
| 2 | Lithuania | 2.8 | 3.42 | 3.67 | 19,266.79 | 20,355.00 | 6.06 | 6.39 | Quasi artificial | Useful order |
| 2 | Malta | 0.5 | 3.55 | 3.56 | 30,650.17 | 32,019.43 | 6.73 | 6.16 | Useful order | Useful order |
| 2 | Mauritius | 1.3 | 2.16 | 1.92 | 11,360.67 | 11,720.62 | 6.24 | 6.02 | Useful order | Useful order |
| 2 | Mexico | 127.6 | 1.60 | 1.64 | 10,118.17 | 10,405.79 | 6.43 | 5.96 | Useful order | Quasi artificial |
| 2 | Mongolia | 3.2 | 4.71 | 5.03 | 4132.66 | 4363.90 | 5.56 | 6.01 | Ineffective | Disconnected |
| 2 | Montenegro | 0.6 | 2.24 | 2.56 | 8703.93 | 9115.79 | 5.39 | 5.72 | Useful order | Ineffective |
| 2 | Poland | 38 | 2.72 | 2.95 | 14,901.55 | 15,988.04 | 6.24 | 6.14 | Useful order | Useful order |
| 2 | Portugal | 10.3 | 2.52 | 2.75 | 23,030.79 | 23,731.13 | 6.10 | 5.77 | Quasi artificial | Quasi artificial |
| 2 | Russia | 144.4 | 3.17 | 3.43 | 11,162.65 | 11,305.12 | 5.44 | 5.50 | Useful order | Quasi artificial |
| 2 | Saudi Arabia | 34.3 | 3.83 | 3.61 | 22,865.18 | 22,533.26 | 6.56 | 6.56 | Disconnected | Useful order |
| 2 | Serbia | 6.9 | 1.84 | 1.72 | 7397.69 | 7991.58 | 6.24 | 6.04 | Useful order | Disconnected |
| 2 | Slovakia | 5.5 | 2.58 | 2.76 | 19,547.66 | 20,494.63 | 6.24 | 6.52 | Useful order | Useful order |
| 2 | Slovenia | 2.1 | 3.14 | 3.06 | 26,170.25 | 27,452.32 | 6.67 | 6.46 | Useful order | Useful order |
| 2 | South Korea | 51.7 | 3.68 | 3.86 | 31,430.60 | 31,246.04 | 5.90 | 5.79 | Quasi artificial | Quasi artificial |
| 2 | Spain | 47.1 | 2.48 | 2.52 | 29,961.11 | 30,734.12 | 6.46 | 6.50 | Useful order | Useful order |
| 2 | Thailand | 69.6 | 1.53 | 1.61 | 7791.95 | 8193.82 | 6.02 | 5.88 | Useful order | Ineffective |
| 2 | Uruguay | 3.5 | 1.18 | 1.18 | 17,029.25 | 17,818.92 | 6.60 | 6.31 | Disconnected | Useful order |
| 3 | Albania | 2.9 | 1.23 | 1.28 | 5372.74 | 5847.06 | 5.00 | 5.36 | Ineffective | Ineffective |
| 3 | Bangladesh | 163 | 0.52 | 0.52 | 1905.72 | 2067.54 | 5.11 | 5.28 | Inhospitable | Inhospitable |
| 3 | Bolivia | 11.5 | 1.95 | 1.93 | 3670.96 | 3860.62 | 5.67 | 5.56 | Ineffective | Ineffective |
| 3 | Cambodia | 16.5 | 0.85 | 0.83 | 1620.64 | 1730.88 | 5.00 | 4.38 | Inhospitable | Inhospitable |
| 3 | Cameroon | 25.9 | 0.85 | 0.79 | 1514.60 | 1553.75 | 4.94 | 5.24 | Inhospitable | Inhospitable |
| 3 | Colombia | 50.3 | 1.26 | 1.20 | 6508.13 | 6744.01 | 6.35 | 5.71 | Disconnected | Ineffective |
| 3 | Dominican Repu. | 10.7 | 1.06 | 1.10 | 8629.25 | 9194.69 | 6.00 | 5.17 | Disconnected | Ineffective |
| 3 | Ecuador | 17.4 | 1.05 | 1.07 | 6249.39 | 6250.12 | 5.81 | 5.35 | Ineffective | Ineffective |
| 3 | Egypt | 100.4 | 1.11 | 1.11 | 3046.59 | 3478.11 | 4.33 | 4.47 | Ineffective | Ineffective |
| 3 | El Salvador | 6.5 | 1.26 | 1.24 | 4008.02 | 4126.15 | 6.45 | 5.46 | Disconnected | Ineffective |
| 3 | Ethiopia | 112.1 | 0.64 | 0.63 | 953.18 | 1066.20 | 4.10 | 4.55 | Inhospitable | Inhospitable |
| 3 | Georgia | 3.7 | 1.30 | 1.36 | 4289.32 | 4626.41 | 4.89 | 5.12 | Ineffective | Ineffective |
| 3 | Ghana | 30.4 | 1.21 | 1.28 | 2223.42 | 2266.41 | 4.97 | 5.32 | Ineffective | Ineffective |
| 3 | India | 1366.4 | 0.72 | 0.75 | 2171.64 | 2338.12 | 3.25 | 4.23 | Inhospitable | Inhospitable |
| 3 | Iran | 82.9 | 1.96 | 2.02 | 5506.23 | 5503.08 | 5.01 | 4.86 | Ineffective | Ineffective |
| 3 | Ivory Coast | 25.7 | 0.73 | 0.89 | 1691.31 | 1793.70 | 5.39 | 5.26 | Inhospitable | Inhospitable |
| 3 | Jordan | 10.1 | 1.28 | 1.21 | 4386.61 | 4541.55 | 4.45 | 4.09 | Ineffective | Ineffective |
| 3 | Kenya | 52.6 | 0.62 | 0.62 | 1997.55 | 2151.50 | 4.62 | 4.55 | Inhospitable | Inhospitable |
| 3 | Kyrgyzstan | 6.5 | 1.02 | 0.97 | 1292.98 | 1337.27 | 5.69 | 6.25 | Ineffective | Introspective |
| 3 | Lao P.D.R. | 7.2 | 1.17 | 1.25 | 2670.21 | 2919.07 | 5.20 | 5.28 | Ineffective | Ineffective |
| 3 | Moldova | 2.7 | 1.07 | 1.17 | 3300.09 | 3470.19 | 5.80 | 5.81 | Ineffective | Ineffective |
| 3 | Morocco | 36.5 | 1.04 | 1.11 | 3345.03 | 3464.02 | 5.06 | 4.80 | Ineffective | Ineffective |
| 3 | Myanmar | 54 | 1.02 | 1.07 | 1244.73 | 1350.83 | 4.43 | 4.43 | Ineffective | Ineffective |
| 3 | Namibia | 2.5 | 1.63 | 1.32 | 5842.06 | 5963.03 | 4.44 | 4.45 | Ineffective | Ineffective |
| 3 | Nigeria | 23.3 | 0.67 | 0.64 | 2222.01 | 2400.45 | 4.36 | 5.50 | Inhospitable | Inhospitable |
| 3 | North Macedonia | 2.1 | 1.79 | 1.92 | 6096.49 | 6414.66 | 5.02 | 5.05 | Ineffective | Ineffective |
| 3 | Philippines | 108.1 | 0.82 | 0.84 | 3294.47 | 3484.90 | 6.27 | 5.08 | Introspective | Inhospitable |
| 3 | South Africa | 58.6 | 1.93 | 1.97 | 6100.35 | 6193.17 | 5.03 | 4.95 | Ineffective | Ineffective |
| 3 | Tajikistan | 9.3 | 0.58 | 0.60 | 877.34 | 910.98 | 5.46 | 5.37 | Inhospitable | Inhospitable |
| 3 | Tanzania | 58 | 0.75 | 0.73 | 1104.79 | 1159.30 | 3.64 | 3.79 | Inhospitable | Inhospitable |
| 3 | Tunisia | 11.7 | 1.35 | 1.35 | 3287.09 | 3327.72 | 4.32 | 4.73 | Ineffective | Ineffective |
| 3 | Turkey | 83.4 | 2.06 | 2.20 | 8957.89 | 9683.57 | 4.87 | 4.86 | Ineffective | Ineffective |
| 3 | Uganda | 44.3 | 0.65 | 0.65 | 770.06 | 823.11 | 4.95 | 4.64 | Inhospitable | Inhospitable |
| 3 | Ukraine | 44.4 | 1.78 | 1.66 | 3592.17 | 3881.66 | 4.70 | 5.27 | Ineffective | Ineffective |
| 3 | Venezuela | 28.5 | 1.56 | 1.43 | 2547.76 | 2427.50 | 5.08 | 4.57 | Ineffective | Ineffective |
| 3 | Zambia | 17.9 | 0.58 | 0.61 | 1307.03 | 1236.19 | 3.31 | 4.84 | Inhospitable | Inhospitable |
| 3 | Zimbabwe | 14.6 | 0.66 | 0.64 | 859.95 | 847.16 | 2.69 | 3.16 | Inhospitable | Inhospitable |

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