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Effects of country success on COVID-19 cumulative cases and excess deaths in 169 countries

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ABSTRACT

COVID-19 has caused over 260 million confirmed cases and over 5 million deaths globally. The results of statistical and multiple criteria analyses on the success of 169 countries and on COVID-19 cumulative cases and excess deaths show that the prosperity of a country relates directly to the consequences due to the pandemic. The topic of this article is the Country Success and COVID-19 (CSC) Map of the World. As a country's success grows, this map shows how cumulative cases of COVID-19 increase; at the same time, excess deaths decrease. The indicators in the system of criteria regarding country success and sustainability are interrelated. Conditional country successes remain quite similar, despite changes to the numbers of countries and their indicators. Likewise, the seven clusters of countries under consideration group together independently of which system of indicators had been applied for their analysis. The 2020 Inglehart–Welzel Cultural Map of the World, which is grounded on surveys, and the CSC Map, which is grounded on statistical indicators, have axes that correlate with one another significantly. The CSC Map Model explains over 63% of the dispersions pertinent to COVID-19 cumulative cases, over 52% of COVID-19 excess deaths, and over 95% of country success variables. The layout of the clusters on the CSC Map changes little over time. Upon performance of the correlation analysis, it was established that strong and statistically significant relationships exist between 169 countries success and sustainability linked with their current air quality score ($r = 0.602$, $p < 0.01$) and the environmental performance index (EPI) score ($r = 0.931$, $p < 0.01$). The results obtained show that when a country's EPI score and current air quality improve by 1%, excess deaths decrease, respectively, by 2.33 and 1.55%. Global integrated analysis on country successes, COVID-19 cumulative cases, and excess deaths comprise this study.

1. Introduction

Initially the Introduction discussed the existing alternative cross-cultural theories that are most popular worldwide (Section 1.1), which might potentially be used in our present and future studies. One of the primary areas pertinent to this study involves the spread of the pandemic, culture and the links between them. The globally conducted research analysis of these appears in the second part of the Introduction. The main purpose of this study is to analyse the interrelationships between indicators pertinent to country success, sustainability and COVID-19. Therefore the third part of the Introduction describes the studies performed in this area worldwide.

1.1. Alternative cross-cultural theories

There are ongoing debates (Gouveia and Ros, 2000; Steenkamp and Geyskens, 2012; Dobewall and Strack, 2014; Kaasa, 2021) regarding possible relationships between alternative cross-cultural theories and how these are related (Hofstede, 1986; Schwartz, 1999; Steenkamp, 2001; Inglehart and Welzel, 2005; Chhokar et al., 2007). Dobewall and Strack (2014) look at the relationship between Schwartz's and Inglehart's value dimensions. They examine both the country and the individual levels. The ranking of countries ($N = 47$) based on the Schwartz's paired dimensions of autonomy/embeddedness and self-expression/survival reached a maximum of similarity at $r = 0.82$, after which Inglehart's factor scores were rotated 27 degrees clockwise. Dobewall and Strack (2014) conclude that the two-dimensional value structures originally proposed by Inglehart and Schwartz share one dimension at the country level. Taking a conceptual approach, Kaasa (2021) explains a way to merge Hofstede, Inglehart, and Schwartz's models into a single system. This way, three sets of dimensions can be visualized as one system, and the results confirm several conclusions in the existing

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literature. When the relationships between different models are known, it becomes easier to compare the results of studies based on different cultural dimension sets as explanations of extraneous variables (Kaasa, 2021). Building on research of work-related values in more than 50 countries, Hofstede (1986) developed a 4D model of cultural differences among societies, and listed each difference with reference to the four dimensions of strong versus weak uncertainty avoidance, masculinity versus femininity, large versus small power distance, and individualism versus collectivism.

A set of 44 profiles was compiled, which suggests that nations fall into broad cultural groupings related to their geographical proximity, but are also affected by other factors, such as religion, cultural contact, shared histories, and level of development. These groupings are Western European, East European, English-speaking, Islamic, Far Eastern, and Latin American (Schwartz and Ros, 1995; Schwartz, 1999).

The aim of the World Values Surveys (Inglehart and Welze, 2010) is to serve as a comprehensive measure of all major areas of human activity, from politics and religion to social and economic life. Two dimensions dominate along the vertical and horizontal axes of the surveys, and explain over 70% of the cross-national variance in a ten-indicator factor analysis, namely, secular-rational versus traditional values on the y-axis, and self-expression versus survival values on the X-axis. Each of these dimensions is also strongly correlated with multiple other important aspects (Inglehart and Welze, 2010).

Steenkamp (2001) looked at the two major cultural dimensions proposed by Schwartz and Hofstede and, by examining the cultural ratings of the 24 countries included in both Schwartz's and Hofstede's data sets, created four thorough national–cultural dimensions. While Steenkamp has derived his national cultural dimensions from Schwartz's and Hofstede's data sets alone, his study points out the common features between the two, and thus bears out the relevance of these earlier cultural theories (Hsu et al., 2013).

By looking at unique patterns of organizational and societal characteristics, Chhokar et al. (2007) analyzed 61 countries and grouped them into ten clusters: Anglo, Nordic Europe, Eastern Europe, Germanic Europe, Latin Europe, Latin America, Sub-Saharan Africa, Middle East, Confucian Asia and Southern Asia.

A Google (Google Scholar) search returned about 24,700 (549 search results returned by Google Scholar) results for the keywords "Hofstede's cultural dimensions theory," about 8,620 (229 search results returned by Google Scholar) for the keywords "Inglehart–Welzel Cultural Map of The World," and about 35,700 (235) for the keywords "Schwartz Theory of Basic Human Values." The number of citations in Google Scholar is 210,855 for Hofstede, 138,018 for Inglehart, and 126,253 for Schwartz. Steenkamp (2001) and Chhokar et al. (2007) are far less cited in the area of cross-cultural theories.

1.2. The spread of the pandemic, culture, and links between them

Even before COVID-19, the ways in which response to disease intersects with culture and politics were drawing the interest of researchers. Soper (1919), for instance, published a paper on lessons from the Spanish Flu pandemic in *Science* magazine over a century ago. Soper (1919) put forward three main factors that interfere with prevention: People underestimate the risks they face, by nature they are reluctant to confine themselves to rigid isolation for the sake of the greater good, and they have an unconscious tendency to often act in ways that can pose danger to themselves and others. The regression findings by McIntosh and Thomas (2004) showed a statistically significant contribution of political instability and income inequality with higher HIV/AIDS prevalence, whereas gender equality contributed to lower HIV/AIDS prevalence. Other important predictors were region and religion, with HIV/AIDS less prevalent in predominantly Christian Orthodox and Muslim countries, but more prevalent in Central, West, and Southern Africa. Among the media and public health indicators, none were statistically relevant (McIntosh and Thomas, 2004).

Social distancing seems to be a practice that is more difficult to engage in for people in more collectivistic cultures. Another important point is that there have been few previous attempts to assess the effectiveness of social distancing measures (Solomon et al., 2010). Power distance is an important factor contributing to the growth rate of the outbreak: higher levels of power distance are associated with lesser growth rates, whereas individuals in cultures with low power distance appear less willing to comply with directions without questioning their national authorities on how to change their social behavior (Mulki et al., 2015). Jarynowski et al. (2020) believe that for well-interconnected societies focused on maximizing utilities, the likelihood of being infected with COVID-19 is higher.

The linear regression model implemented by Messner (2020) regresses the exponential growth rate of confirmed COVID-19 cases on cultural, socio-demographic, and institutional variables associated with controlling the outbreak, case testing and reporting, and supporting the pathogen's route. While the effect of a strong institutional context on the outbreak is negative ($B = -0.55 \ldots -0.64$, $p < 0.001$), countries with a quality education system see higher pandemic growth rates ($B = 0.33$, $p < 0.001$). Older populations generally mean grave outcomes for countries ($B = 0.46$, $p < 0.001$). Where individualistic, rather than collectivistic, values prevail, the rate of pathogen proliferation is flatter ($B = -0.31$, $p < 0.001$), and the effect of higher levels of power distance is similar ($B = -0.32$, $p < 0.001$). Outbreaks are more serious in societies with hedonistic values, namely where people seek indulgence, and are not willing to endure restraints ($B = 0.23$, $p = 0.001$) (Messner, 2020).

A positive correlation between the country-level resilience to COVID-19 and trust within society has been determined, as has one between the country-level resilience to COVID-19 and the adaptive increase in the severity of government interventions when outbreak waves occur. Societies, therefore, need to build trust if they want to be resilient to epidemics and other unexpected disruptions like the COVID-19 pandemic, which is unlikely to be the last (Lenton et al., 2021).

Whiteley et al. (2020) indicated that the factors impacting health include the state of the economy, the predominance of economic inequality, a sense of freedom when making life choices, and environmental well-being.

A high score on freedom-orientation for a country usually also means a high score on autonomy, individualism, and self-actualization. Meanwhile a high score on control-orientation also tends to display a high score on collectivism, embeddedness, and survival. This correlation supports the idea that there are statistically significant relationships between cultural factors and disease (Ren and Fang, 2016).

A greater number of outbreaks with COVID-19 cases are discovered, according to Maaravi et al. (2021), in counties with individualistic tendencies as opposed to those with more collectivistic tendencies. They also discovered that more individualistic people were also less likely to follow the rules for preventing disease in epidemics. These findings are pertinent when attempting to identify the reasons for how pandemics spread, when searching for optimal ways to get out of lockdowns, and, especially, when trying to convince people to get vaccinated with newly discovered medications for battling the virus (Maaravi et al., 2021).

The factors that tended to intensify the consequences from the pandemic were the following: high degrees of pre-existing poverty and inequality, a high percentage of informal or micro-firm workers, few jobs that could be feasibly accomplished from home, and a significantly large tourism industry share, along with considerable domestic unrest, violent riots, and/or civil wars. Additional factors proved to be comparatively small public sectors and tax revenue bases, limited fiscal space, and unstable admissions into international financial markets. Therefore, the countries that already had high poverty, informality, and limited fiscal space from the start (generally defined as developing economies) are expected to suffer the worst and the longest-lasting consequences of the pandemic (Djankov and Panizza, 2020).

1.3. Interrelationships between country success, sustainability, and COVID-19 indicators

To predict self-expression values, Inglehart and Welzel (2005) use various independent variables and a series of models. The correlation between differences in the scope of the welfare state and variation in gender equality is $r = 0.77$. Inglehart and Welzel (2005) found a staggeringly strong correlation of $r = 0.90$ across 73 nations, after examining the links between mass self-expression values that emphasize free choice and genuine democracy where societal institutions actually ensure free choice. In the regression analyses, therefore, socioeconomic factors alone (GDP per capita and the share of the workforce employed in the industrial sector) explain a substantial 45% of the variance between given societies on the dimension of traditional/secular-rational values. The culture-zone shift factor alone explains 59% of the variance on this dimension, while the combined effects of historical heritage and socioeconomic factors explain as much as 80% of this variance. Likewise, the socioeconomic factors by themselves explain 61% of the variance on the dimension of survival/self-expression, and historical heritage variables explain 52% of the variance on this dimension, while the combined effects of culture and economics explain 84% of the total variance (Inglehart and Welzel, 2005).

Researchers integrated epidemiological dynamics into a sovereign default model to examine this complex health, debt, and economic crisis and the measures to mitigate it. The global nature of the COVID-19 crisis demands international coordination in science, healthcare, and economic policy, as well as containment and mitigation efforts (Loayza and Pennings, 2020).

To prevent catastrophic consequences for COVID-19, the world needs global, regional, and national public health, as well as geopolitical collaboration (Moti and Ter Goon, 2020).

The political dimension (e.g., indicators that measure government effectiveness, political stability, democratic expression voice and accountability, political corruption, and legislative and judicial constraints) covers risks related to political processes and capacities to mitigate them with strengthened state transparency and accountability (Desai and Forsberg, 2020).

According to Desmet and Wacziarg (2021), the lowest levels of infection during the pandemic were observed in US counties with a large share of college graduates, followed by those with a large proportion of persons who had completed secondary education. They presented the results of an extensive investigation of the role inequality and poverty play, including median household income, for which they found evidence that locations with lower levels of educational attainment have been hit harder by the coronavirus. They also added two inequality and poverty measures—poverty rate and the Gini index within the bottom 99%—and their findings suggest that poverty positively predicts disease severity.

The developing world seems to have lower levels of COVID-19. Different factors have been named as explanations for this, including the various means applied for recording deaths and the overall younger demographic profile in Africa. Other factors include the availability of outdoor spaces, which more people use in their daily lives. People have also possibly developed higher levels of protective antibodies by surviving previously rampaging infections. It is also possible that certain developing countries responded more quickly, and applied more forcible measures in the fight against COVID-19, as a result of the unfortunate legacy of SARS, MERS, and Ebola in the very recent memories of numerous populations. The paradox is that industrialized countries continue to struggle, probably due to their lack of attention to the strategies executed by developing countries, which have in many cases displayed excellent preparedness and creativity during the pandemic (Mormina and Nsofor, 2020).

A strong sense of vigilance in civil East Asian societies was the singular element that resulted in avoiding the spread of COVID-19. People collectively adhered to the norms of wearing masks and socially distancing on a widespread basis as conscious practices to safeguard the safety of other people. This probably constituted the secret weapon that contained the spread of COVID-19 in East Asia (Liu et al., 2020). This highlights the sharp contrast between how East Asian societies behave and how Americans behave in the USA. The responses of US Americans to COVID-19 were highly individualistic, intellectually and affectively autonomous, and highly politicized (Allcott et al., 2020). There were great outcries among many people opposing public health measures that called for social distancing, travel restrictions, and mask wearing. Such measures were considered curtailments to the personal freedoms they felt the US Constitution had guaranteed them (Evans and Hargittai, 2020).

Germany managed to employ broad-based testing and healthcare measures, which held down its death rate significantly better than its neighboring countries did, although their economy has faltered at the same rate as those of other countries (Heath and Jin, 2020).

Desmet and Wacziarg (2021) analyzed the correlates of COVID-19 cases and deaths across US counties to determine factors that could explain the spatial variation in the severity of COVID-19 across the USA, and they found four key aspects. The first important aspect is effective density as a persistent determinant of COVID-19 severity. The second aspect is the disproportionate impact on counties with higher poverty rates, lower income, more nursing home residents, and bigger shares of African Americans and Hispanics, with these effects showing no sign of fading away over time. The third aspect is that certain characteristics—the share of elderly individuals or the distance to major international airports among them—initially make a strong impact but their effect fades over time. The fourth aspect is that, early on, Trump-leaning counties suffered a less severe blow, but then were hit much harder later. The COVID-19 blow suffered by Republican-leaning areas was less severe. This may have driven early development of behavioral and policy preferences related to party affiliation, resulting in less inclination to adhere to social distancing and mask-wearing rules, as well as lockdown measures. This view suggests certain preferences and attitudes had already been firmly lodged in the minds of local populations as the pandemic spread to Trump-leaning counties, and this prevented a more decisive response to deteriorating local conditions. This, therefore, led to greater COVID-19 severity in Trump-leaning areas of the country (Desmet and Wacziarg, 2021).

A region with a high human development index (HDI), as Liu et al. (2020) have observed, tends to have a larger proportion of the population suffering from more than one chronic disease, consuming fewer cigarettes, and earning a higher than average gross annual salary. These three factors, as indicated by a multiple logistic regression analysis, include some of the HDI effects on the rates of infection and death. An explanation might be offered by these factors, at least in part, for the positive correlation noticed between HDI and the risk of COVID-19 infections and deaths in Italy (Liu et al., 2020). The correlation between HDI and COVID-19 illnesses and fatalities continues to show a moderately positive result. However, Western countries tend to inflate this correlation due to living conditions that permit more people to live to an elderly age. The only non-Western country of the 30 oldest countries in the world (i.e., having the highest percentage of residents over 65 years old) is Japan. This means that the primarily Western European countries are more vulnerable to COVID-19 due to their elderly demographic, which is disproportionately affected by this virus (Levin et al., 2020). After accounting for many area-level confounders, Wu et al. (2020) found a positive association between higher historical PM2.5 pollution exposures in the USA and higher COVID-19 mortality rates at the county level, with a slight increase in continuous exposure to PM2.5 leading to a greater increase in COVID-19 death rates. Their results highlight the point that sustained enforcement of existing air pollution regulations is one of essential efforts to protect human health both during the COVID-19 pandemic and beyond. Seeking to identify the influence of precipitation, temperature, and biodiversity, Fernández et al. (2021) applied spatio-temporal models with data from 160 countries. They also used count time series to describe the association between air quality factors and COVID-19 spread. Each analysis was adjusted for government policy intervention, country-income level, and sociodemographic confounders. Their results showed a statistically significant association between coronavirus cases and several country- and city-level factors of interest such as pollutants (PM_{10}, PM2.5, and O_3), air quality, and the national biodiversity index. These links provide valuable input to inform national environmental and health policies as an alternative response strategy to new COVID-19 waves and for the prevention of future crises. Bashir et al. (2020) looked for links between climate indicators and COVID-19 in New York City, USA, and discovered a significant association between the average temperature, the minimum temperature, air quality, and the spread of the COVID-19 pandemic. They noted that other meteorological indicators—humidity and air quality among them—also play a role. Humidity, for instance, contributed to the rapid spread of COVID-19 within New York City (Sajadi et al., 2020). Because air quality is important, Bashir et al. (2020) believe that green environmental policies should be promoted, as they would limit the spread of infectious diseases, including COVID-19.

Developed and developing countries can learn a great deal from one another in their struggles with COVID-19 (Anttiroiko, 2021). For example, East Asian people who adapted to wearing masks and social distancing as standard collective measures was a key reason that ensured their entire community's safety together (Liu et al., 2020). However, developing countries are likely to suffer heavier economic and human costs, because they generally have poorer governance, larger informal sectors, lower health care capacity, shallower financial markets, and less fiscal space (Loayza and Pennings, 2020). Likely impacts from the COVID-19 pandemic include increased extreme poverty rates in developing countries (World Bank, 2020), as well as aggravated political and social divisions and higher inequality (Furceri et al., 2020). It is also necessary to view developing countries by their health conditions (Derakhshandeh-Rishehri et al., 2014), water resource conditions (Ostad-Ali-Askari et al., 2017; Ostad-Ali-Askari and Shayannejad, 2021) and other local conditions. Scientists (Roper, 2020; Schell et al., 2020; Brauner et al., 2021) have analyzed the dynamic effects of the environment pertinent to the economy, culture, ecology, population density, health systems, local and state regulations, and other indicators regarding the scope of the pandemic. The revocation of people's rights by the implementation of social restrictions, including lockdowns, intended to slow the pandemic, have never been instituted in liberal democracies (Grogan, 2020). Social restrictions did demonstrate their effectiveness; unfortunately, however, mental health suffered throughout populations (Brülhart et al., 2021). Studies (Van Dorn et al., 2020; Wade, 2020; Ahmed et al., 2020) also investigated why the infection and mortality rates from COVID-19 are disproportionately high in communities of color in cities of the United States and United Kingdom. The proposal put forward as a result of the existing situation was to analyze alternative strategies and tactics for lessening the effects of COVID-19 (Bedford et al., 2020; Cohen and Kupferschmidt, 2020; Stockmaier et al., 2021).

The systemic analysis conducted for this research covered documents and scholarly literature from international institutions and intergovernmental organizations published during the COVID-19 period and up to one century earlier that included the Spanish Flu and HIV/AIDS pandemics. The studies involved had analyzed interdependencies influencing pandemic spreads and relevant country cultures. Interrelationships between country successes, sustainability, and COVID-19 indicators from different countries were also investigated. Some systemic reviews and *meta*-analyses designated for describing such research were also discovered. However, no studies were found that attempted to summarize the impact of country success across the scope of COVID-19 cumulative cases and excess deaths. Here, the studies conducted developed the CSC Map models and validated worldwide research results claiming interdependencies between the policy responses to COVID-19 enacted by countries and the indicators of a respective country's success and sustainability.

In this study, we analyzed alternative cross-cultural theories, the spread of the pandemic, culture, and links between them and interrelationships between country success, sustainability, and COVID-19 indicators (Chapter 1). This interdisciplinary research integrates various domains into one study. It incorporates knowledge from numerous interconnected fields like medicine, society, culture, economy, politics, and the environment. All of these fields, which are examined in this article in an integrated manner, innovatively enlarge the big picture of COVID-19 pandemic on a global scale. This health policy research involved the development of Country Successes and a COVID-19 (CSC) Map of the World. The map, along with statistical calculations and CSC Map Models, serve as the basis for establishing conclusions. We suggest policy recommendations to improve the micro-, meso-, and macro-level environment during and post the COVID-19 period.

This research consists of foremost statements as presented here. It contains the integrated analysis on countries and their COVID-19 (CSC), which has augmented the information on such sciences globally. This is the first study to appear with an integrated analysis on country successes globally and their COVID-19 cumulative cases and excess deaths. New Country Success and the COVID-19 Map of the World was compiled over the course of this research. This map shows that, as the success of a country grows, cumulative cases increase; however, excess deaths from COVID-19 per 100,000 population decrease in parallel. By the same, it was established that micro-, meso- and macro-environments limit the pursuit of freedom by certain people under pandemic conditions. Four hypotheses were raised during the research and subsequently confirmed that the successes of countries around the world continue increasing over time. Meanwhile the numerous indicators describing such successes continue improving. Consequently many inhabitants turn greater and greater attention on needs involving freedom, liberty and autonomy.

2. Method

This study quantitatively assesses how country success impacted the 2020 spread of COVID-19 cumulative cases and excess deaths in 169 countries. Four fundamental hypotheses were suggested and confirmed for this research.

- The first hypothesis: The dimensions of country successes and COVID-19 can be applied to the existing eight clusters on the abscissa and ordinate axes of the 2020 Inglehart–Welzel Cultural Map of the World (Subchapter 2.2).
- The second hypothesis: The indicators in the system of criteria regarding country success and sustainability are interrelated. Thus, when the numbers of countries and their indicators change, the conditional successes of countries remain quite similar. Likewise, the seven clusters of countries under consideration group together independently of which system of indicators had been applied for their analysis (Subchapter 2.3).
- The third hypothesis: As the success of a country grows, cumulative cases increase, although excess deaths from COVID-19 per 100,000 population decreases in parallel (Subchapter 2.4 and Chapter 3).
- The fourth hypothesis: Micro-, meso-, and macro-environments limit people's pursuit of freedom under pandemic conditions (Subchapter 2.5).

Data from the framework of variables that this research employed came from different databases and websites (the World Bank, Eurostat-OECD, Knoema, Global Data, the World Health Organization, Transparency International, statistics from the global and country economies, Freedom House, Global Finance, Heritage) as well as various publications. Table S1 lists the countries analyzed in this article, and shows the detailed systems of their indicators.

This research optimises the functions by means of correlation analysis aimed at determining interrelationships linking macroeconomic, environmental, political, human development and well-being, values-based and quality of life indicators in various countries. In addition, the linear regression method is used to determine the combined impact of individual factors on the success and priority of specific countries. We also use the qualitative comparison method to compare our research findings with those by other authors. To calculate each country's success, priority, and degree of national competitiveness (Tables S1–S3), we use the first five steps of the INVAR method (Fig. 1).

The development of an integrated system of indicators comprises four steps:

- Countries have been grouped into clusters: based on the literature analysed with the aim to discover which countries belong to which cultural group (Chapter 2), specific country clusters have been selected and each populated with relevant countries analysed in the research;
- Indicators have been selected: based on national sustainable development and success indicator systems presented by various authors, the indicators that are the most common in their studies and reflect national sustainable development and success, as well as the spread of the COVID-19 pandemic in individual countries, have been selected;
- Systems of indicators have been built: two systems of indicators (CS_8 and CS_{15}) have been built with indicators that best reflect national macroeconomic, environmental, political, human development and wellbeing, values-related and quality of life aspects;
- Data have been collected: indicator values have been collected for the research from various statistical databases and websites to be used in further analysis.

The Country Successes and COVID-19 (CSC) Map of the World covering COVID-19 cumulative cases and excess deaths was compiled for this research. The methods for this study include correlation and multiple criteria analyses. IBM SPSS V.26 was applied to complete multiple regressions to develop various regression models on COVID-19 and success in countries. Development of the CSC Map involved an analysis of 169 countries. Meanwhile the 2020 Inglehart–Welzel Cultural Map of the World includes 103 countries. This research validated four major proposed hypotheses. The methods used are described in detail in Chapters 2 and 3.

This study proposes the Country Success and COVID-19 (CSC) Map of the World. Its development involved the use of two dimensions, one reflecting country success and the incidences of COVID-19. The INVAR method (Kaklauskas, 2016) was employed along with various sets of national success and sustainability indicators to measure the success of the 169 countries selected for this research (Tables S2 and S3). The CSC Map uses eight clusters (English-speaking, Protestant Europe, Catholic Europe, Orthodox Europe, Latin America, West and South Asia, Confucian and African-Islamic), as defined by the Inglehart–Welzel 2020 Cultural Map of the World (Inglehart, 2021). The INVAR method of multicriteria analysis was applied to various countries, for instance those in Asia (Kaklauskas et al., 2020) and in the former USSR (Kaklauskas et al., 2018). The Inglehart–Welzel 2020 Cultural Map of the World includes many psychological, institutional, technological, and economic variables that demonstrate strong correlations with each other (Fog, 2020). The analyses contained within the dimension that is the Y-axis, pertinent to COVID-19, consist of cumulative cases (World Health Organization, 2021a) and COVID-19 excess deaths per 100,000 population (*The* Economist, 2021a). The dimension on the CSC Map pertinent to the success of countries can be defined as an entire array of variables within the system of macroeconomic, environmental, political, human development and well-being, values-based, and quality of life criteria (Tables S2 and S3). The presentation here pertains to a statistical comparison between 169 countries on the CSC Map and 103 countries on the Inglehart–Welzel 2020 Cultural Map of the World. It is quite complicated to envision 160 countries on one CSC Map, therefore the map is broken up into two parts—one displaying countries suffering up to 500 COVID-19 cumulative cases per 100,000 (Fig. 5b) and over 500 cases respectively (Fig. 5a).

The INVAR technique (Kaklauskas, 2016, Fig. 1) assumes a straight and comparative dependency on country success, priority, and degree of national country competitiveness, from a system of indicators that defines countries with versatility by the weights and values of indicators under analysis. Stages 1–5 of the INVAR technique are identical to those for the COPRAS technique (Zavadskas, Kaklauskas, and Sarka, 1994).

The criteria constituting definitive evaluation measures are, first, set as a system for use in establishing country success. Then its units and criteria values as well as criteria weights are determined. Finally, the information obtained is tabulated for conducting a multiple criteria analysis and forming decision matrices (Tables S2 and S3). Various databases and websites (the World Bank, Eurostat-OECD, Knoema, Global Data, the World Health Organization, Transparency International, statistics from the global and country economies', Freedom House, Global Finance, Heritage, etc.) form the basis for the established values of these indicators. The weights of all the indicators under consideration are the same, and equal one. The foundation for determining the priority, success, and national competitiveness degree rankings of countries under consideration is the multiple criteria analysis decision matrix (Tables S2 and S3). Consideration of 169 countries was based on the performance of this multicriteria analysis. There were countries that were not included in this analysis due to the unavailability of their official comparable data.

The ranking pertinent to country success (S_j) by country priority (P_j) and by national competitiveness degree for the respective country (N_j) provides a thorough description of the results obtained from the respective country under consideration. The country success of each respective country is ranked by its priority. A more efficient and sustainable country displays a higher ranking with a higher S_j value. The maximum success S_{max} always establishes the country with the greatest efficiency and sustainability. Thereby, any value less than S_{max} indicates the lesser success of that respective country. A comparison of a country to the country with the highest success constitutes the national competitiveness degree for that respective country. All national competitiveness degrees for considered countries N_j will thus be between 0% (least success) and 100% (most success, N_{max}). The national competitiveness degree for some countries considered will be higher depending on the significance of that country's accomplished goals (Fig. 1).

Two clusters, English-speaking and Protestant Europe, were joined to become one due to their closely related common histories, cultural interactions, similar development levels, and religions. Numerous studies (Haller, 2003) validated the similarities between the English-speaking and the Protestant European clusters.

The statistical validation of the CSC Map was confirmed in three directions after establishing the various statistically significant relationships between 15 variables, 169 countries and the dimensions of the Inglehart–Welzel 2020 Cultural Map of the World (hypotheses 1–4).

2.1. Details on the countries under discussion and their comprehensive indicator systems

To report country success, their efforts to mitigate the impact of COVID-19 and the relevant external environment as a whole in quantitative form, data that describe various aspects are presented. This quantitative information, which includes systems of criteria, measuring units, values and weights, is then used in our statistical and multiple criteria analysis (Tables S1–S3).

The CSC Map was created (and their statistical analysis was undertaken) by looking at all 169 countries that have available data on cumulative cases (World Health Organization, 2021a) and excess deaths (*The* Economist, 2021a) per 100,000 of the population. The CSC Map

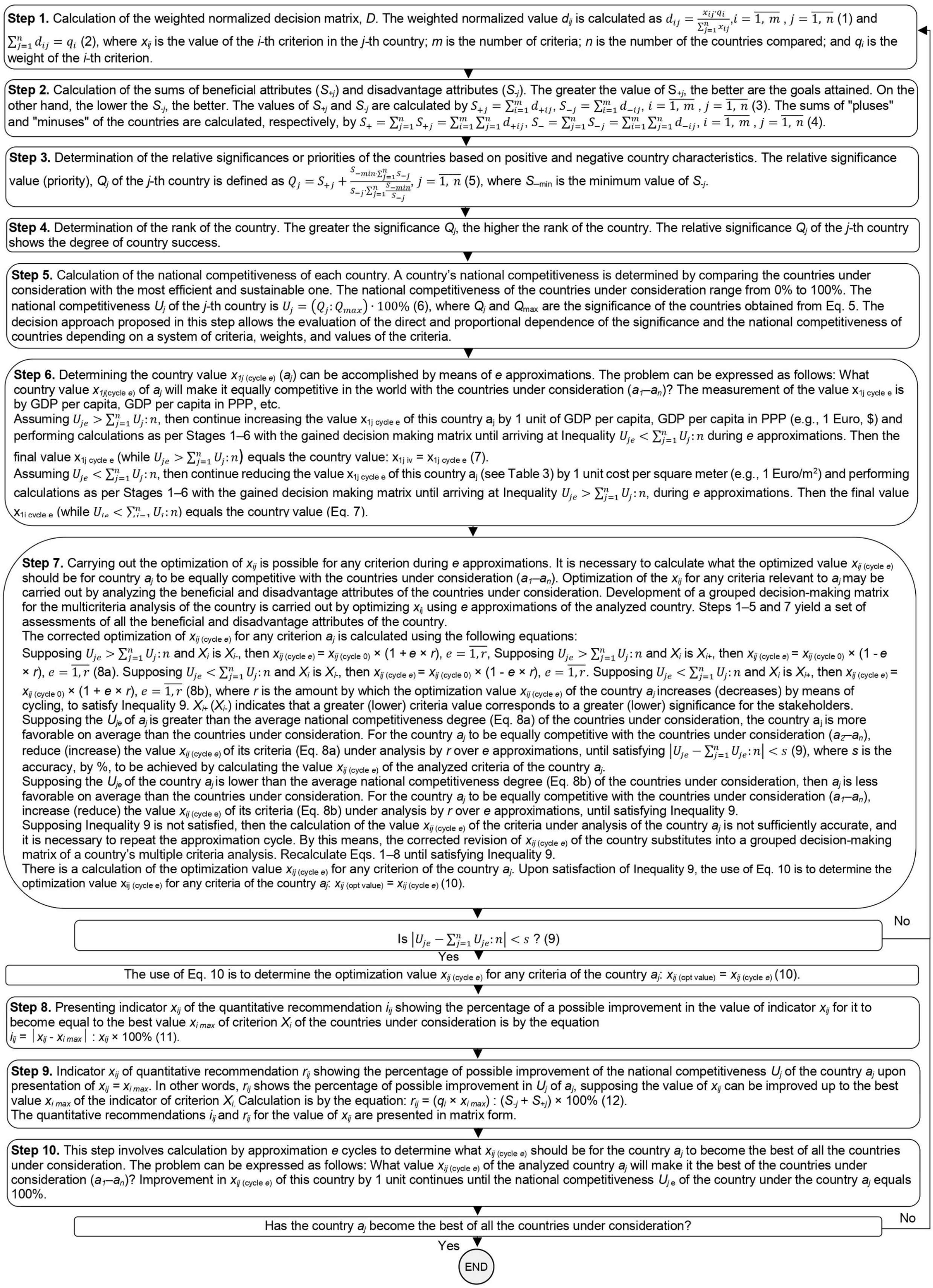

Fig. 1. The structure of the INVAR method used for the multiple criteria analysis of 169 countries.

uses eight clusters, as defined by the Inglehart–Welzel 2020 Cultural Map of the World (Inglehart, 2021). Two clusters from the World Value Survey (WVS) (Inglehart, 2021) were of culturally related countries, and these were comprised of the English-speaking and the Protestant European clusters, which were combined into one CSC Map cluster.

The CSC Map, multiple criteria, and correlation analyses illustrate the relationship between the success of 169 countries and their respective COVID-19 indicators. There are differences between different societies according two predominant dimensions: One is country success on the horizontal X-axis, and the other is the COVID-19 indicators on the vertical Y-axis. These two dimensions determine the location of a country on the CSC Map. Clusters of countries reflect their values in common, which are expressed by the indicators of country success and sustainability.

Furthermore, the various number of different countries can also be analyzed. The goal was to analyze a maximal number of countries with as many indicators as possible. This was not easy to perform, as many countries lacked one or more of the indicators. For example, several countries would be lost in the analysis whenever some indicator was missing. However, the problem of missing data was reduced in the following manner: A compromise was reached among the countries being considered and the number of indicators defining them. This study involved numerous systems of indicators describing countries under analysis in detail. An assessment of countries was accomplished by analyzing them by various aspects according to a system of 7, 8, 15, and 19 indicators.

The dimension of country successes on the CSC Map can be described in terms of an entire array of criteria pertinent to the sustainability and success of an aforementioned country. An effort was made to analyze a maximal number of countries in terms of as many indicators as possible. Several countries fell by the wayside, whenever one of the indicators was missing. A compromise had to be made pertinent to the countries under consideration and the number of indicators describing them. Finally, there were 169 countries examined according to a system of 15 descriptive criteria for this study. The CSC Map was analyzed during the course of this study by various cross-sections, which were required for the meaningfulness of the analysis due to the different numbers of countries.

Certainly, every country has its own specific history along with its predominant culture, traditions, religious, philosophical, and political views, for which additional indicators are required for a more accurate evaluation. The CSC Map does not include variables that would describe each country in much more detail for greater accuracy; thus the map is only approximately accurate. If such additional variables were available, it would be possible to evaluate much more accurately the governments of different countries along with the responses of their respective populations to the ever-fluctuating pandemic situation.

The studies performed by these authors, as well as other researchers, indicate the possibility of successfully performing numerous forecasts of sustainability indicators, because certain indicators in economics, politics, social, and environmental indicator groups usually correlate with one another. Therefore, when compiling different models, there is usually little significance regarding which indicators are under analysis for determining the success and sustainability of a respective country.

A system of country success and sustainability indicators was compiled during this research based on global practices (Hueting and Reijnders, 2004; Van de Kerk and Manuel, 2008; Phillis et al., 2011; Moldan et al., 2012; Ren and Fang, 2016; Tan et al., 2017; Dias et al., 2017; Nilashi et al., 2019) and on the experience of these authors (Kaklauskas et al., 2018; Kaklauskas et al., 2020;). It consists of 15 macroeconomic, environmental, political, human development and well-being, values-based, and quality of life criteria from the year 2020.

A decision was made to equate the countries' single factor (superfactor) dimension on the X-axis of the CSC Map, based on the above analysis of alternative cross-cultural theories. For example, in this case, the country success dimension analyzes the following 15 indicators: GDP per capita (V_1), GDP per capita in PPP (V_2), ease of doing business ranking (V_3), the corruption perception index (V_4), the human development index (V_5), the global gender gap (V_6), the happiness index (V_7), the environmental performance index (V_8), freedom and control (V_9), economic freedom (V_{10}), the democracy index (V_{11}), unemployment rate (V_{12}), the economic growth forecast (V_{13}), the fragile state index (V_{14}), and economic decline index or healthy life expectancy (V_{15}). We examined two COVID-19 indicators (cumulative cases [V_{16}] and excess deaths [V_{17}] per 100,000 population) on the Y-axis of the CSC Map.

Data from the framework of variables that this research employed came from different databases and websites (the World Bank, Eurostat-OECD, Knoema, Global Data, the World Health Organization, Transparency International, statistics from the global and country economies, Freedom House, Global Finance, Heritage), as well as from various publications (Mundial, 2021; Wendling et al., 2020; World Health Organization, 2021b; The Economist, 2020; Inglehart, 2021; Helliwell et al., 2021). The main difficulty was that a number of databases, websites, and publications lacked full data on all 169 countries under investigation, and covered only some of the data. Thus, the other aforementioned databases, websites, and publications were needed to compensate for any missing data. DigitizeIt software was applied to scan the survival versus self-expression and traditional versus secular-rational values data from the original 2020 Inglehart–Welzel Cultural Map of the World.

2.2. Validation of the first hypothesis: Statistical comparison of the CSC Map and the 2020 Inglehart–Welzel Cultural Map of the World

A single factor, found by Inglehart (2018), explains 81% of all cross-national variations. This single factor involves a combination of values: autonomy versus embeddedness, individualism versus collectivism, and survival versus self-expression (Fog, 2021). Welzel's (2013) criticism of the Inglehart–Welzel Cultural Map involves challenges to factor examination. In Welzel's (2013) opinion, the overall background of personal empowerment can combine secular and emancipatory values. A recalculation was performed on the data applied by Inglehart and Welzel for their study on this single factor. Derived from these findings, it was concluded that the single-factor solution was the more appropriate one (Li and Bond, 2010; Beugelsdijk and Welzel, 2018).

Some characteristics of cross-cultural variances, which correlate with one another, can be contained within a superfactor. There are several reasons for this. One reason is development, usually described in economic, technological, and institutional terms. Another reason involves cultural factors relevant to modernization. Yet another reason revolves around the regal versus kungic dimension description as a psychological factor. There is a significance to the numerous correlations of cultural variables within the superfactor (Fog, 2021). The superfactor that the Fog (2021) study identifies is a line that rotates differently from the lines that can be drawn on all of these maps.

The superfactor, which is the name for the strongest factor, contains over 50% of all cultural variables essential to contemporary cultures that correlate significantly with all obtainable, quantitative, and cross-cultural studies (Fog, 2021). The regality theory, a new concept based on evolutionary psychology, is the basis for forecasting the existence of this superfactor. It encapsulates numerous important cultural phenomena that apparently correlate with one another. There are numerous reasons for this. One falls under the category of development, which encompasses physical and economic factors. Then there is modernization involving cultural values and institutions representing them. Additionally, there are social–psychological factors, which represent collectivism, regality, and tightness. Here, the variables are those like individualism versus collectivism, power and distance, egalitarian values, religiosity, tightness, regality, self-expression versus survival values, and secular-rational versus traditional values (Fog, 2021).

The predictions by Inglehart and Welzel (2005) are based on only a few variables, and no attempts are made to include numerous factors (many of them country-specific) that contribute to mass attitudes. Inglehart and Welzel (2005) believe a five-variable model that explains 75% of the variance is more efficient than a ten-variable model that explains 80%, and a model that explains as much variance as possible with as few variables as possible is thus their aim; the complexity of an explanation has to be smaller than that of reality in order to constitute a theory.

The research performed by these authors as well as other scholars, indicate that forecasting country success and sustainability can be successful by applying different economic, political, social, and environmental systems of indicators because these indicators correlate with one another. The detailed use of a single factor (superfactor) in the cross-national variation analysis appears next. The decision was to equate the single factor (superfactor) dimension of countries on the CSC Map with the X-axis, based on the above analysis of alternative cross-cultural theories. In this case, the country success dimension analyzes 7, 8, 15, and 19 indicators (Table S1).

Pitifully, there are numerous reasons why the total number of pandemic-caused fatalities could be even higher. For one, some countries do not include victims in their official statistics when they do not show a positive test for coronavirus prior to death. Such victims could add up to the majority who died in this manner, in those places that have low testing abilities. Another reason may be an undercounting of deaths from diseases other than COVID-19. Doctors had a difficult time treating all needy patients, which probably kept many from seeking hospitalizations for different sorts of conditions, thereby eliminating these illnesses from the fatalities count. Therefore, an easier method, known as "Excess Deaths," can be a means to overcome such methodological problems. This method counts all deaths from any illness or cause in a specific area over a specific period; following this, a comparison is made with a recent, historical baseline (*The* Economist, 2021a). The baselines developed by *The* Economist (2021a) applied statistical models to forecast the number of deaths a selected area would have experienced under more normal conditions during 2020 and 2021. Cumulative deaths per 100,000 population was not included in this analysis due to the reasons previously mentioned.

A correlation analysis was performed on the dimensions (the X and Y axes) of the CSC Map and the 2020 Inglehart–Welzel Cultural Map of the World. The basis for the analysis of 169 countries consisted of comprehensive write-ups on the 8 criteria system (CS_8) and the 15 criteria (CS_{15}) system, along with the indicators of their cumulative cases. As all the necessary data were not available for all countries, the calculation of the excess deaths indicator was based on data pertinent to 71 countries only. Meanwhile, the basis for the analyses on survival versus self-expression and traditional versus secular-rational values consisted of data from 99 countries (Table 1 and Table S1). Different resources often contain differing data on excess deaths per 100,000 population. Therefore countries were taken from only one resource (*The* Economist, 2021a), which contains 2020–2021 data. Only the countries from the Inglehart–Welzel 2020 Cultural Map of the World (Inglehart, 2021) were examined for the analysis of excess deaths per 100,000 population. There were 70 countries considered within these limitations. This analysis was performed by seeking to visually compare the Inglehart–Welzel World Cultural Map 2020 with the CSC Map .

Comparisons of correlations between dimensions were by 15 criteria (CS_{15}) for one and by 8 criteria (CS_8) for the other. Upon completion of the Shapiro–Wilk Test, it was established that the values of all variables were not distributed according to the normal law of distribution ($p < 0.05$). The Spearman correlation coefficient was applied to assess the correlations among the variables. Table 1 displays the results of this correlation analysis. The performed correlation analysis leads to the conclusion that all the selected variables correlate statistically significantly ($p < 0.05$) with one another. The weakest link was established between cumulative cases and excess deaths per 100,000 population ($r = 0.323$). A very strong ($r = 0.985$), positive and statistically significant ($p < 0.01$) relationship exists between country success CS_8 and country success CS_{15}. This indicates that the variables are closely interrelated, making it possible to exchange one for the other.

Nonetheless, out of the 77 countries under consideration that were taken from the 2020 Inglehart–Welzel Cultural Map of the World (Inglehart, 2021), only 51 submitted their data on COVID-19 excess deaths to *The* Economist (2021a).

The pertinent results of the correlation analysis were presented to the 77 countries from the 2020 Inglehart–Welzel Cultural Map of the World, or WVS 2021 (Table 2).

Further, a practical comparison was performed between the dimensions (axes) of the CSC Map and the 2020 Inglehart–Welzel Cultural Map of the World to determine if there were any correlations between them. The correlations calculated between all dimensions excepting excess deaths stemming from the analysis on 77 countries appear in Table 2. There were 51 countries involved in the correlations calculated pertinent to the excess deaths variable (Table S1). There were 15 criteria ($CS1_5$) and 7 criteria (CS_7) used to compare the correlations between dimensions Table S1). The results obtained also substantiate the first hypothesis. Upon performance of the correlation analysis, it was established that strong, positive, and statistically significant relationships exist between CS_{15} and CS_7 ($r = 0.920$, $p < 0.01$), CS_{15} and traditional versus secular-rational values ($r = 0.800$, $p < 0.01$), CS_7 and traditional versus secular-rational values ($r = 0.920$, $p < 0.01$), as well as between CS_7 and traditional versus secular-rational values ($r = 0.720$, $p < 0.01$). Upon performance of the correlation analysis, it was established that there are positive and statistically significant relationships of

Table 1
Correlation between the results pertinent to 169 or fewer countries analyzed in the CSC Map and the 2020 Inglehart–Welzel Cultural Map of the World dimensions, 2020.

	Country Success and COVID-19 (CSC) Map of the World dimensions				2020 Inglehart–Welzel Cultural Map of the World dimensions	
	X axis CS_{15}	CS_8	Y axis Cumulative cases per 100,000 population	Excess deaths per 100,000 population	X axis Traditional vs secular-rational values	Y axis Traditional vs secular-rational values
CS_{15}	1					
CS_8	0.985*	1				
Cumulative cases per 100,000 population	0.588**	0.619**	1			
Excess deaths per 100,000 population	-0.530**	-0.523**	0.323*	1		
Traditional vs. secular-rational values	*0.846***	0.849**	0.399**	-0.454**	1	
Traditional vs. secular-rational values	0.706**	0.686**	0.502**	-0.349*	0.570**	1

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

Table 2
Results of the correlations analyzed between dimensions of the CSC Map and the 2020 Inglehart–Welzel Cultural Map of the World on 77 countries, 2020.

	Country Success and COVID-19 (CSC) Map of the World dimensions				2020 Inglehart–Welzel Cultural Map of the World dimensions	
	X axis CS_{15}	CS_7	Y axis Cumulative cases per 100,000 population	Excess deaths per 100,000 population	X axis Traditional vs secular–rational values	Y axis Traditional vs secular–rational values
CS_{15}	1					
CS_7	0.920**	1				
Cumulative cases per 100,000 population	0.370**	0.488**	1			
Excess deaths per 100,000 population	-0.560**	-0.550**	0.280*	1		
Traditional vs. secular–rational values	0.800**	0.858**	0.377**	-0.482**	1	
Traditional vs. secular–rational values	0.692**	0.720**	0.472**	−0.275*	0.603**	1

* Correlation is significant at the 0.05 level (2-tailed).
** Correlation is significant at the 0.01 level (2-tailed).

average strength between cumulative cases and traditional versus secular-rational values ($r = 0.472$, $p < 0.01$) and between cumulative cases and traditional versus secular-rational values ($r = 0.377$, $p < 0.01$). Meanwhile a negative, weak and statistically significant relationship has been established between excess deaths and traditional vs secular-rational values ($r = -0.275$, $p < 0.05$). Relationships of average strength that are positive and statistically significant exist between CS_{15} and cumulative cases ($r = 0.370$, $p < 0.01$), CS_7 and cumulative cases ($r = 0.488$, $p < 0.01$), cumulative cases and traditional vs secular-rational values ($r = 0.472$, $p < 0.01$), traditional vs secular-rational values and traditional vs secular-rational values ($r = 0.603$, $p < 0.01$). Negative and statistically significant relationships of average strength were established between CS_{15} and excess deaths ($r = -0.560$, $p < 0.01$), CS_7 and excess deaths ($r = -0.550$, $p < 0.01$) and excess deaths and traditional vs secular-rational values ($r = -0.482$, $p < 0.01$). A weak, positive albeit statistically significant relationship was established between cumulative cases and excess deaths ($r = 0.280$, $p < 0.05$). Meanwhile a negative, weak and statistically significant relationship was established between excess deaths and traditional vs secular-rational values ($r = -0.275$, $p < 0.05$) (Table 2).

The medium and strong correlations between the dimensions of the CSC Map and the 2020 Inglehart–Welzel Cultural Map of the World validate the first hypothesis. Table 2 validates the first hypothesis which proposes that the classification of eight-country clusters pertinent to the Inglehart–Welzel Cultural Map of the World can be applied to indicate country successes and COVID-19 on the CSC Map. This is due to the correlation between the dimensions reflecting the selected countries from both models. It must be emphasized that the same countries sustainability and success groups of indicators are applied in these models, even though differing indicators are applied in these groups.

2.3. Validation of second hypothesis

The second hypothesis claims an interrelationship between indicators in the system of criteria on country success and sustainability. Consequently, there is a similarity between the conditional successes of countries, even when the numbers of countries and their indicators change. For this reason, there is generally little significance when compiling various models regarding which indicators are being analyzed to establish the country's successes.

The verification of the second research hypothesis comprises three steps:

- Correlation analysis has been performed: to determine the strength and significance of indicator interrelationships, the way indicators interrelate within the CS_8 and CS_{15} systems built for this research has been identified by country and indicator;
- The distribution of correlation coefficient values has been analysed: the distribution of the correlation coefficient values relevant to the indicators selected for this research has been analysed in the country groups. This analysis has helped determine and show to what extent indicator values are interrelated within specific country groups;
- Dispersion analysis has been performed: this analysis has revealed the difference between the dispersions of the values of country success and priority indicators calculated by means of the INVAR method and the systems of indicators CSP_8 and CSP_{15}.

The dependence of country success and priority on the selected indicators has been verified using the following steps:

1. The distributions of the values of country success and priority variables have been compared: to validate the second hypothesis and determine which set of variables should be used in further analysis, the values of country success and priority variables calculated based on the systems of indicators CS_8 and CS_{15} have been compared;
2. Linear regression CSC Map Models have been built: linear regression models have been built to show the dependence of country success and priority on the set of independent variables selected for our analysis;
3. The suitability of the linear regression CSC Map Models for analysis has been verified: the suitability of the models for analysis has been verified by calculating their statistical significance. Coefficients of determination have also been calculated to determine to what extent changes in the values of the independent variables explain the dispersions of the values of country success and priority variables;
4. The significance of the variables used in the models has been verified: the values of the coefficients of the independent variables in the linear regression models have been established and the statistical significance of the coefficients measured.

These steps have validated the second hypothesis and confirmed that both sets of variables can be used in further analysis.

2.3.1. Cross-country correlation analysis of 169 countries

The endeavor to substantiate the second hypothesis involves a further, integrated, cross-country correlation analysis on 169 countries.

A correlation analysis was performed on 169 countries by eight indicators (Tables S2 and S3 and 3a). It leads to the conclusion that the values of all the applied indicators correlate with one another. The correlations among all the variables show an average strength ($r < 0.3$) or a strong one ($r < 0.7$). It is also noteworthy that all the correlations are statistically significant ($p < 0.01$).

The correlation analysis performed on 169 countries pertinent to the 15 success and sustainability criteria leads to the conclusion that all the criteria correlate statistically and significantly with one another (Tables S2 and S3b). The only exception is the unemployment rate criterion, which only correlates with GDP per capita ($r = -0.161$, $p < 0.05$) and with the economic decline index ($r = -0.240$, $p < 0.01$). The correlation with other criteria under study, such as the unemployment rate, are statistically insignificant. The strongest, positive correlation was established between the GDP per capita and the GDP per capita in PPP criteria ($r = 0.940$, $p < 0.01$). The strongest negative link was established between the corruption perception index and the fragile state index ($r = -0.856$, $p < 0.01$) (Table 3b). The conclusion that can be drawn is that—independently of the numbers of variables used for the study—all the applied variables correlate with one another at statistically significant rates.

Fragments of the correlation coefficient matrix pertinent to the 8 and 15 criteria for each of the 169 countries appear in Table 4.

A distribution of correlation coefficients on the CSC Map was performed for 15 indicators by 169 countries (Table S2). It can be surmised that the correlation coefficients of the selected country indicators are strong, because the overall median of all correlation coefficients is greater than 0.9. A possible presumption is that the developments of the 169 countries, selected for this study, are interrelated. This is indicated by the strong correlation of the development indicators for these countries (Fig. 2). The interrelationship between worldwide indicators can explain this.

Next, a correlation analysis was performed by an integrated examination of 77 countries. The 19 success and sustainability indicators involved in this required analysis would cover these 77 countries (Table S1). These country success and sustainability indicators under consideration (V_1–V_{15}) definitely do not reflect all indicators pertinent to the dimensions of a country success and sustainability and, possibly, not even any fundamental ones. An examination of 77 control group countries from the 2020 Inglehart–Welzel Cultural Map of the World (Inglehart, 2021) in addition to 13 more experimental group countries, involved the 19 indicators that were named previously. A multiple criteria analysis matrix of the 19 criteria describing the 90 countries was created. Its data served as input to determine the correlation coefficients for each country and create a correlation matrix. The present analysis looked at the median values of the correlation coefficients for each cluster of countries as a better way to represent the center-point in the rank orders of the correlation coefficients (Fig. 2).

Using minimal median values of 0.80 pertinent to country criteria correlation coefficients revealed strong correlations between 19 criteria in each cultural cluster of the 90 countries included in the study. The highest median values have been determined in the Protestant European and English-speaking cluster at 0.986 (0.956; 0.980; 0.998) and 0.978 (0.932; 0.966; 0.982), respectively. Another important aspect is a very narrow spread of the values of the country criteria correlation coefficients in these regions. The highest spread of the correlation coefficients is in the West and South Asia cluster, with the median value at 0.902 (0.101; 0.769; 0.994). Presumably, this spread is the result of a greater variation in the economic, social, cultural, environmental, and COVID-19 development levels of the region's countries. The regression coefficients pertinent to the 13 selected experimental group countries have a median that is also over 0.8. According to the applied indicators, this is the same as the median of the regression coefficients among the 90 countries, which were selected in common for this study. The development of the 77 control group countries included in the CSC Map grouped into the eight clusters defined in the Inglehart–Welzel 2020 Cultural Map of the World (Inglehart, 2021) is thus interrelated, as is evident from the strong correlation between the 19 economic, social, cultural, environmental, and COVID-19 cumulative cases per 100,000 population defining the countries grouped into the clusters. The same clustering of countries works well both in the CSC Map and the Inglehart–Welzel 2020 Cultural Map of the World, because the country criteria correlate between the countries in both models. Similar success and sustainability groups of criteria (except COVID-19 cumulative cases) applied to both of the maps employed, which would be important, except that the criteria of each group differ.

The values of the correlation coefficients and the statistical significance of their relationships suggest that all the criteria added to the country groups influence each other.

Thus, an interrelationship of the criteria pertinent to the success and sustainability indicators of countries verifies the second hypothesis. Additionally, as the numbers of countries and their indicators change, the conditional successes of countries remain quite similar.

2.3.2. A comparison of 169 countries' successes and priorities calculated by 8 and 15 criteria

The success and priority of the 169 countries shown on the X-axis and analysed in this chapter depend, directly and proportionally, on the system of adequate criteria that describe the countries, also on the criteria values and criteria weights. These systems of criteria, criteria values and criteria weights are presented in the Tables S1–S3. The first five steps of the INVAR method (Fig. 1) were used to calculate the success and priority of each country (Tables S1–S3).

In the endeavor to validate the second hypothesis, the calculations pertinent to the comparison of the successes and priorities of 169 countries were based on 8 and 15 criteria. Upon comparing the calculations pertinent to the success of 169 countries (CS) by 8 criteria (CS_8) and by 15 criteria (CS_{15}), the average absolute deviance established was 4.97%. The difference established between CS_8 and CS_{15} does not exceed 5% for 111 of 169 countries, or 66.5% of them. The difference in the success of the remaining 33.5% of the countries is greater than 5%. However, it does not exceed 12.3%, which is indicated by the high degree of overlap between CS_8 and CS_{15} (Fig. 3).

It is noticeable that the values of country success priorities calculated according to 8 criteria (CSP_8) are not very far from the values of country success priorities calculated according to 15 criteria (CSP_{15}). The deviation between the CSP_8 and CSP_8 values is 4.81%. It was also established that the difference between the values of CSP_8 and CSP_{15} was<5% in

Table 3
Correlation coefficient values of 8 (a) and 15 (b) criteria under consideration characterizing 169 countries, 2020.

a)

	V_1	V_2	V_3	V_4	V_5	V_6	V_7	V_8
V_1	1							
V_2	0.675**	1						
V_3	0.444**	0.464**	1					
V_4	0.730**	0.827**	0.543**	1				
V_5	0.559**	0.605**	0.382**	0.598**	1			
V_6	0.548**	0.634**	0.254**	0.681**	0.650**	1		
V_7	0.551**	0.746**	0.357**	0.638**	0.433**	0.560**	1	
V_8	-0.729**	-0.826**	-0.433**	-0.841**	-0.713**	-0.800**	-0.678**	1

V_1 - GDP per capita; V_2 - human development index; V_3 - happiness index; V_4 - environmental performance index;
V_5 - economic freedom; V_6 - democracy index; V_7 - healthy life expectancy; V_8 - fragile state index
** Correlation is significant at the 0.01 level (2-tailed).

Table 3b

b)

	V_1	V_2	V_3	V_4	V_5	V_6	V_7	V_8	V_9	V_{10}	V_{11}	V_{12}	V_{13}	V_{14}	V_{15}
V_1	1														
V_2	.940**	1													
V_3	-.572**	-.652**	1												
V_4	.770**	.765**	-.700**	1											
V_5	.675**	.775**	-.763**	.715**	1										
V_6	.417**	.375**	-.442**	.513**	.416**	1									
V_7	.444**	.487**	-.520**	.309**	.464**	.299**	1								
V_8	.730**	.768**	-.690**	.739**	.827**	.505**	.543**	1							
V_9	-.477**	-.458**	.452**	-.677**	-.563**	-.530**	-.108	-.608**	1						
V_{10}	.559**	.603**	-.715**	.761**	.605**	.420**	.382**	.598**	-.456**	1					
V_{11}	.548**	.530**	-.565**	.760**	.634**	.600**	.254**	.681**	-.891**	.650**	1				
V_{12}	-.161*	-.126	.087	-.055	-.006	-.028	-.143	.01	-.041	-.062	.042	1			
V_{13}	.551**	.593**	-.540**	.620**	.746**	.378**	.057	.638**	-.552**	.433**	.560**	-.017	1		
V_{14}	-.729**	-.783**	.719**	-.856**	-.826**	-.588**	-.433**	-.841**	.741**	-.713**	-.800**	.047	-.678**	1	
V_{15}	-.652**	-.738**	.681**	-.726**	-.769**	-.442**	-.478**	-.726**	.502**	-.718**	-.655**	.240**	-.596**	.846**	1

V_1 - GDP per capita; V_2 - GDP per capita in PPP; V_3 - ease of doing business ranking; V_4 - corruption perceptions index; V_5 - human development index; V_6 - global gender gap; V_7 - happiness index; V_8 - environmental performance index; V_9 - freedom and control; V_{10} - economic freedom; V_{11} - democracy index; V_{12} - unemployment rate; V_{13} - healthy life expectancy; V_{14} - fragile state index; V_{15} - economic decline index

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

Table 4

Correlation coefficient matrix fragment of 8 (a) and 15 (b) criteria for 169 countries.

a) see http://176.223.140.136/correlations/

	Algeria	Argentina	Armenia	Australia	Austria	Azerbaijan	Bangladesh	Belgium	Brazil	Bulgaria	Chile	China	Colombia	Croatia	Czech Repı	Denmark	Ecuador	Estonia
Algeria	1																	
Argentina	.99985	1																
Armenia	.99996	.99993	1															
Australia	.99972	.99997	.99983	1														
Austria	.99972	.99998	.99983	1	1													
Azerbaijan	.99997	.99992	1	.99981	.99981	1												
Bangladesh	.99975	.99925	.99959	.99900	.99900	.99964	1											
Belgium	.99972	.99998	.99983	1	1	.99981	.99900	1										
Brazil	.99992	.99999	.99996	.99994	.99994	.99996	.99941	.99994	1									
Bulgaria	.99984	1	.99993	.99998	.99998	.99991	.99923	.99998	.99999	1								
Chile	.99980	1	.99990	.99999	.99999	.99988	.99916	.99999	.99997	1	1							
China	.99985	.99999	.99992	.99998	.99998	.99992	.99928	.99998	.99999	.99999	.99999	1						
Colombia	.99996	.99996	.99999	.99988	.99988	.99999	.99954	.99988	.99999	.99996	.99994	.99996	1					
Croatia	.99980	1	.99989	.99999	.99999	.99988	.99915	.99999	.99998	1	1	.99999	.99993	1				
Czech Repı	.99976	.99999	.99986	1	1	.99984	.99906	1	.99996	.99999	1	.99999	.99991	1	1			
Denmark	.99971	.99997	.99982	1	1	.99981	.99899	1	.99994	.99998	.99999	.99997	.99988	.99999	1	1		
Ecuador	.99994	.99998	.99997	.99991	.99991	.99997	.99947	.99992	1	.99997	.99996	.99998	.99999	.99996	.99993	.9999	1	
Estonia	.99976	.99999	.99986	1	1	.99984	.99907	1	.99996	.99999	1	.99999	.99991	1	1	1	.99993	1
Finland	.99972	.99997	.99983	1	1	.99981	.99899	1	.99994	.99998	.99999	.99998	.99988	.99999	1	1	.99991	1
France	.99973	.99998	.99983	1	1	.99982	.99901	1	.99995	.99998	.99999	.99998	.99989	.99999	1	1	.99992	1
Germany	.99972	.99998	.99983	1	1	.99981	.99900	1	.99994	.99998	.99999	.99998	.99988	.99999	1	1	.99991	1

b) see http://176.223.140.136/8criteria/

	Algeria	Argentina	Armenia	Australia	Austria	Azerbaijan	Bangladesh	Belgium	Brazil	Bulgaria	Chile	China	Colombia	Croatia	Czech Repı	Denmark	Ecuador	Estonia
Algeria	1																	
Argentina	.9944	1																
Armenia	.9996	.9968	1															
Australia	.8652	.9134	.8783	1														
Austria	.8961	.9381	.9077	.9979	1													
Azerbaijan	.9999	.9942	.9996	.8646	.8956	1												
Bangladesh	.9962	.9994	.9979	.9045	.9303	.9958	1											
Belgium	.9001	.9412	.9115	.9972	1	.8997	.9337	1										
Brazil	.9885	.9990	.9922	.9310	.9528	.9883	.9975	.9556	1									
Bulgaria	.9940	1	.9966	.9146	.9391	.9939	.9993	.9422	.9991	1								
Chile	.9777	.9944	.9830	.9512	.9693	.9775	.9916	.9715	.9982	.9947	1							
China	.9624	.9858	.9694	.9688	.9829	.9622	.9817	.9846	.9924	.9863	.9980	1						
Colombia	.9976	.9993	.9991	.8976	.9245	.9975	.9995	.9280	.9966	.9992	.9898	.9789	1					
Croatia	.9846	.9976	.9889	.9395	.9599	.9844	.9955	.9624	.9997	.9978	.9994	.9951	.9943	1				
Czech Repı	.9745	.9928	.9802	.9556	.9728	.9743	.9896	.9749	.9972	.9931	.9999	.9988	.9876	.9987	1			
Denmark	.8592	.9086	.8726	.9999	.9970	.8586	.8994	.9963	.9266	.9097	.9475	.9658	.8924	.9354	.9521	1		
Ecuador	.9802	.9957	.9852	.9473	.9662	.9800	.9933	.9685	.9989	.9959	.9999	.9971	.9915	.9997	.9996	.9434	1	
Estonia	.9622	.9857	.9692	.9690	.9831	.9620	.9815	.9847	.9923	.9862	.9979	1	.9787	.9950	.9988	.9660	.9970	1,0
Finland	.8724	.9193	.8853	.9999	.9987	.8719	.9106	.9982	.9362	.9204	.9556	.9723	.9040	.9444	.9598	.9996	.9519	.9725
France	.9062	.9459	.9172	.9961	.9997	.9057	.9386	.9999	.9597	.9468	.9748	.9869	.9332	.9662	.9780	.9950	.9719	.9871
Germany	.9019	.9426	.9132	.9969	.9999	.9014	.9351	1	.9568	.9435	.9725	.9853	.9295	.9635	.9758	.9959	.9695	.9854

129 of 169 countries or in 77.2% of them. The difference was greater than 5%, albeit<15% for all the other countries, which indicates a sufficiently high correspondence between the values of CSP_8 and CSP_8 (Fig. 4).

2.3.3. *CSC Map models*

CSC Map Models evaluate the relationships between a dependent variable (country success or cumulative cases and excess deaths per 100,000 population) and 15 independent variables (the country success and sustainability indicators). CSC Map Models formally represent the

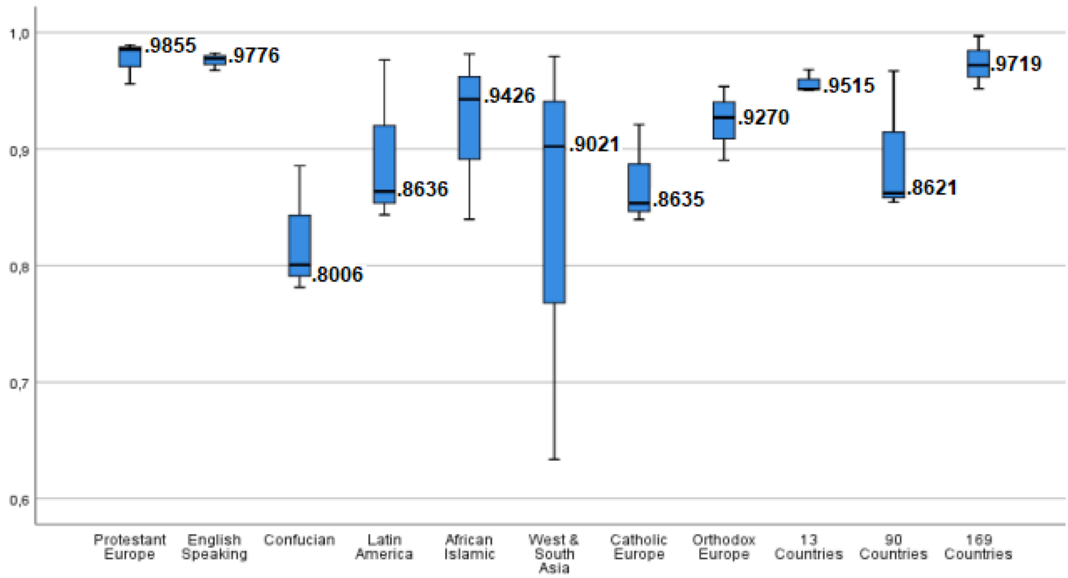

Fig. 2. Distribution of correlation coefficients among 15 indicators by 169 countries on the CSC Map.

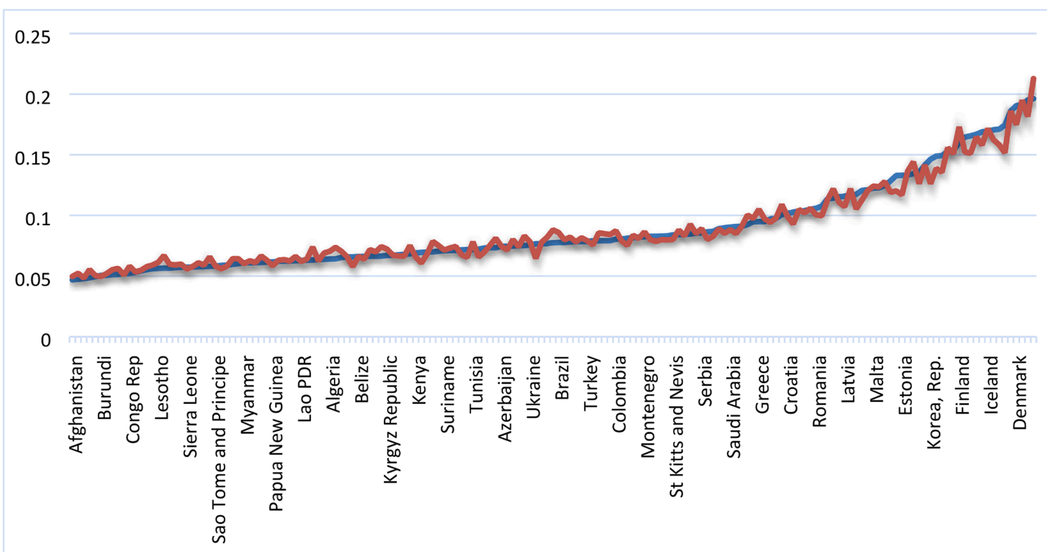

Fig. 3. Country success comparison of 169 countries (calculated by 8 and 15 criteria).

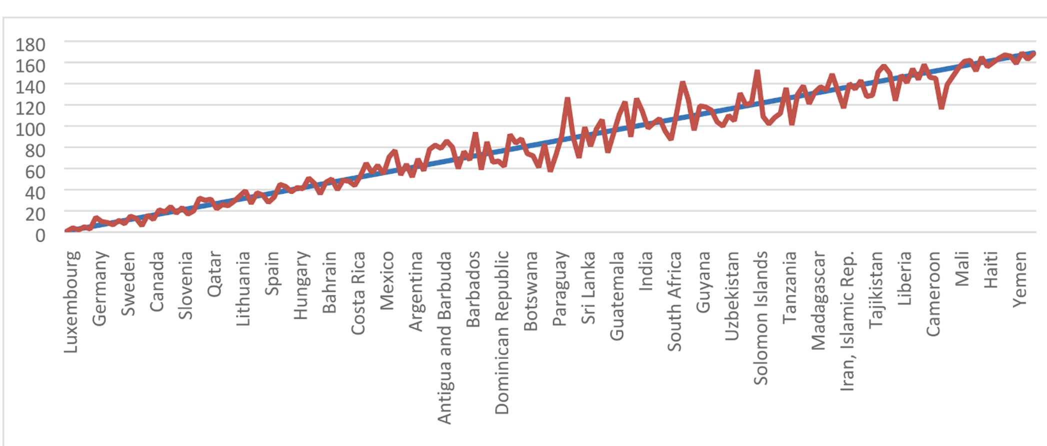

Fig. 4. Priority comparison of 169 country successes (calculated by 8 and 15 criteria).

CSC Map.

The 169-country CSC Map Model suggests that a 1% increase in the values of GDP per capita, the human development index, the global gender gap, the environmental performance index, and the democracy index causes corresponding increases in cumulative cases per 100,000 population by 0.38, 3.45, 3.57, 2.15, and 1.25%, respectively. According to the 78-country CSC Map Model, a 1% increase in the values of GDP per capita, the human development index, the global gender gap, the environmental performance index, and the democracy index causes corresponding decreases in excess deaths per 100,000 population by 0.52, 3.79, 1.76, 1.32, and 1.03%, respectively.

The countries being considered were divided up into a control group and an experimental group. The control group consisted of 77 countries corresponding to the countries employed by the 2020 Inglehart–Welzel Cultural Map of the World. The experimental group consisting of 64 countries was not analyzed by this map. The basis of these analyses of 64 and then 77 countries was the 15 criteria system (V_1–V_{15}). The countries are distributed across the CSC Map according to the values found on the X-axis (country success) and the Y-axis (COVID-19 indicators).

We applied the linear multivariable regression method to determine the influence of the selected criteria on the dispersion of the independent variables.

It was established that GDP per capita explains 80% of the dispersion of the 77 countries' success variable. Thus, the conclusion can be drawn that economic factors have the greatest influence on the dissemination of the success variable of 77 countries. This was not surprising, as various investigations indicate a huge continuum of influence from the GDP indicator. Considerable inertia is characteristic of gradually changing variables, such as socioeconomic development. At any point the stocks accumulated so far are always much greater than the gains achieved, or losses incurred in one year. GDP added in a year is always just a small percentage of the entire GDP of a country. Substantial changes in gradually changing, or accumulating, variables like these only become visible in the long run (Inglehart and Welzel, 2005). GDP per capita along with an economic growth forecast explain 81.2% of the dispersion of the country success variable. The fragile state index variable separately explains 72.1% of the dispersion of the country success variable, of its own accord. It was established, during the course of the study that the compiled model is suitable for deliberation ($p < 0.05$). Meanwhile all the variables used in the model explain 95.5% of the dispersion of the country success variable. The following is an analytical expression of the compiled model:

$$= .164 + .001 \bullet V01 + .0003 \bullet V02 + .00003 \bullet V03 + .0004 \bullet V04 - .054 \bullet V05 + .031 \bullet V06 - .003 \bullet V07 + .001 \bullet\bullet V08 - .002 \bullet V09 - .0002 \bullet V10 + .002 \bullet V11 - .001 \bullet V12 + .002 \bullet V13 - .0003 \bullet V14 - .004 \bullet V15 \quad (1)$$

The conclusion drawn upon completing the analysis of the model is that the greatest influence on the success variable of 77 countries comes from GDP per capita, the corruption perception index, the unemployment rate, and the fragile state index. This means that the variables in the system influencing country success consist of the macroeconomic, environmental, political, human development and well-being, values-based and quality of life criteria.

Although GDP per capita explains the country success variable quite suitably, in this case, it only explains 17.2% of the cumulative cases per 100,000 population (V_{17}) variable in the dispersion of 77 countries. Additional variables are needed when aiming to increase the explanatory power of the regression model. One such variable is freedom and control, which, separately from the rest, explains 34.2% of the dispersion in V_{17}. Of its own accord, though together with GDP per capita, freedom and control explains 35.2% of the dispersion in V_{17}. Based on such regression analysis results, the conclusion can be drawn that it is necessary to include more country success and sustainability indicators in the model being considered. This would permit an increase in the explanatory power of the compiled model. By selecting the system containing macroeconomic, environmental, political, human development and well-being, and values-based and quality of life criteria, and completing the regression analysis, it becomes possible to draw a conclusion that the model is suitable for deliberation ($p < 0.05$). Meanwhile, all the selected variables explain 63.2% of the dispersion of the cumulative cases per 100,000 population variable. The regression equation compiled based on the results of the regression analysis is the following:

$$V17 = -4434.8 - 31.247 \bullet V01 + 50.177 \bullet V02 + 7.459 \bullet V04 + 6300.053 \bullet V05 + 5172.697 \bullet V06 + 322.084 \bullet \bullet V07 + 92.314 \bullet V08 - 2229.705 \bullet V09 + 32.145 \bullet V10 - 1527.857 \bullet V11 + 77.965 \bullet V12 + 73.835 \bullet V13 + 112.949 \bullet\bullet V14 - 245.591 \bullet V15 \quad (2)$$

A significant influence on the dependent, cumulative cases per 100,000 population variable in 77 countries comes from independent variables such as freedom and control, and the democracy and fragile state indices. The other independent variables have some influence on the dependent cumulative cases per 100,000 population variable; however, their influence is insignificant. Furthermore, it was established that the variables used for the seven separate country clusters applied on the CSC Map explain from 39.4% (for the West and South Asia region) to 76.3% (for the Protestant European region) of the dispersion of the cumulative cases per 100,000 population variable.

The model compiled on the success of 64 countries is suitable for consideration ($p < 0.05$). Furthermore, it was established that all the variables in the models being analyzed, which reflect the changes in the selected indicators, explain 97.2% of the dispersion of the country success variable. GDP per capita had the greatest influence on the country success variable. The changes in its value separately explain 73.5% of the dispersion of the country success variable. Additionally, the variable fragile state index has a significant influence on the country success variable. The changes in this variable explain 57.4% of the dispersion of the country success variable. Meanwhile the changes of both these variables explain 76.6% of the dispersion of the country success variable. Separately, changes in the economic decline index variable explain 47.7% of the dispersion of the country success variable. A conclusion can be drawn that GDP per capita, the fragile state index, and economic decline index variables have the greatest influence on the country success variable for the 64 countries under analysis. Changes in the values of these variables explain 78.5% of the dispersion in the country success variable. The other variable used in the model also influences the country success variable. However, its influence is not as great as that of the aforementioned variables.

Upon examining the dependence of the cumulative cases per 100,000 population variable (V_{17}) on the country success and sustainability indicators that have been used to assess 64 countries, it was established that this model is suitable for analysis. Meanwhile the changes in the values of the applied indicators explain 64.8% of the dispersion pertinent to the V_{17} variable. The human development index variable has the greatest influence on the V_{17} variable in the model. Separately, it explains 35.8% of the dispersion of the V_{17} variable. Furthermore, the fragile state index variable also greatly influences the compiled model. Its changes explain 28.9% of the dispersion of variable V_{17}. Together these variables explain 36.6% of the V_{17} dispersion. Changes in the values of the economic decline index variable separately explain 23.9% of the variable V_{17} dispersion. Thus, a conclusion can be drawn that the human development index, fragile state index, and economic decline index variables have the greatest influence on the cumulative cases per 100,000 population variable (V_{17}). Together the changes under assessment explain 38.7% of the V_{17} dispersion.

Next, the variable excess deaths per 100,000 population dispersion was analyzed against the 15-indicator CSC Map Model of 78 countries (Table S1). The correlation analysis only used data on 84 countries pertinent to COVID-19 excess deaths per 100,000 population sourced from *The* Economist (2021a). The necessary 15 indicators under deliberation were not all available for six of the 84 countries that were submitted. Thus, only 78 countries were considered for this study. A conclusion is possible following the analysis on the dependency of excess deaths per 100,000 population from the model of 15 selected variables pertinent to the model of 78 countries. The model of the CSC Map is statistically significant ($p < 0.05$). Meanwhile changes in the values of the selected 15 criteria, accordingly, explain 52.8% pertinent to the dispersion of the excess deaths variable.

Other researchers have also obtained similar results relevant to the use of different numbers of variables (Inglehart, 1997; Inglehart and Welzel, 2005). The correlation is high between the factor scores from the 10 items under this analysis and the factor scores that are based on 22 items (Inglehart, 1997). The five items applied for this study as a basis pertinent to the traditional dimension versus the secular-rational dimension correlate nearly entirely with the factor scores from the dimension under comparison based on 11 variables ($r = 0.95$). Additionally, the survival versus self-expression dimension based on five variables also correlates nearly entirely with the survival versus self-expression dimension based on 11 variables ($r = 0.96$). These robust dimensions reflect a pool of many more items. There were technical reasons for applying five indicators to tap each dimension for a total of ten indicators that appear here (Inglehart and Welzel, 2005).

The second hypothesis is verified by this method, and there is an interrelationship between the indicators from the system of criteria, which thoroughly describe a country's success and sustainability. Additionally, as the numbers of countries and their indicators change, the conditional successes of countries remain quite similar.

a)

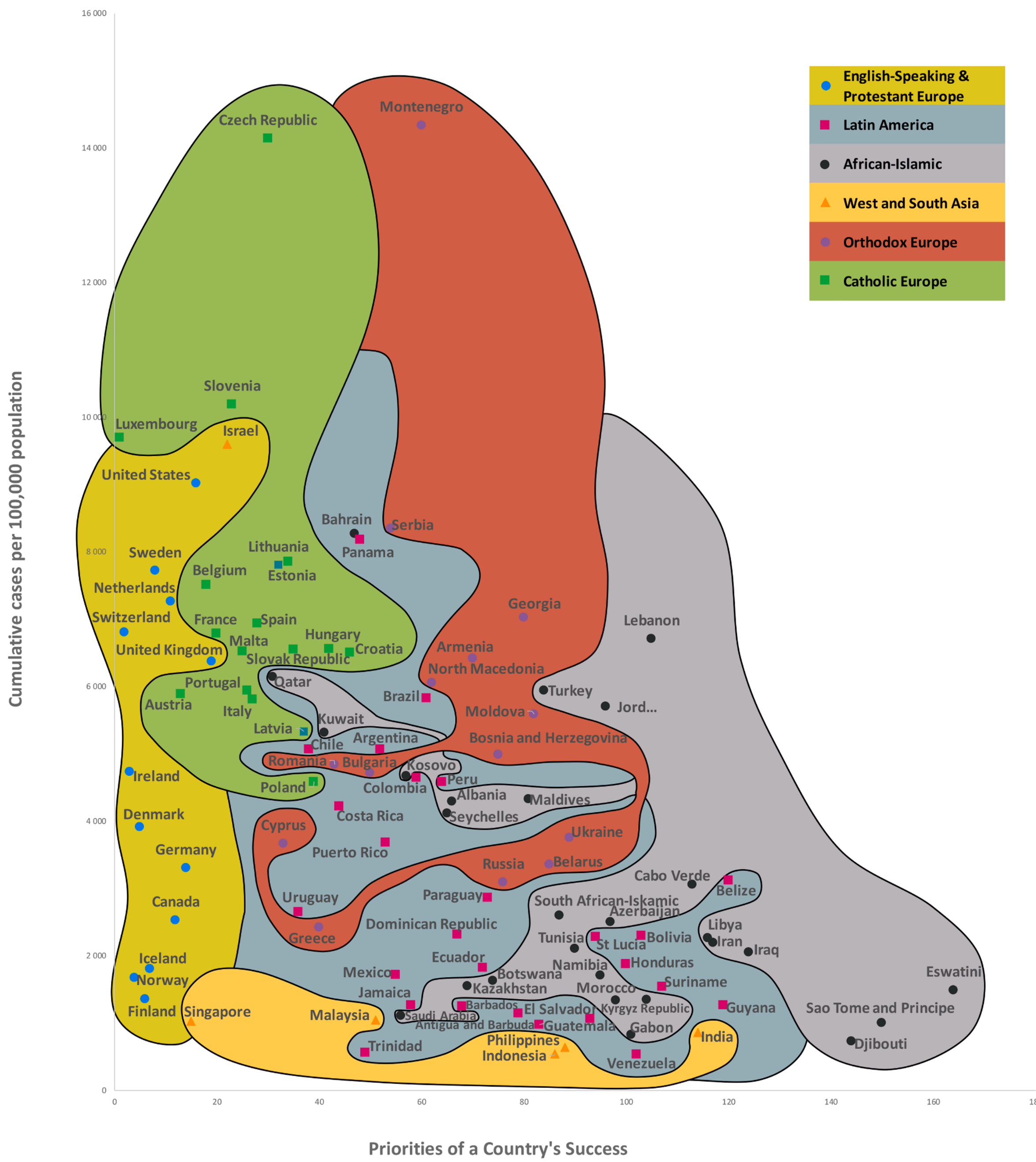

Fig. 5. Country Success and COVID-19 Cumulative Cases World Map.

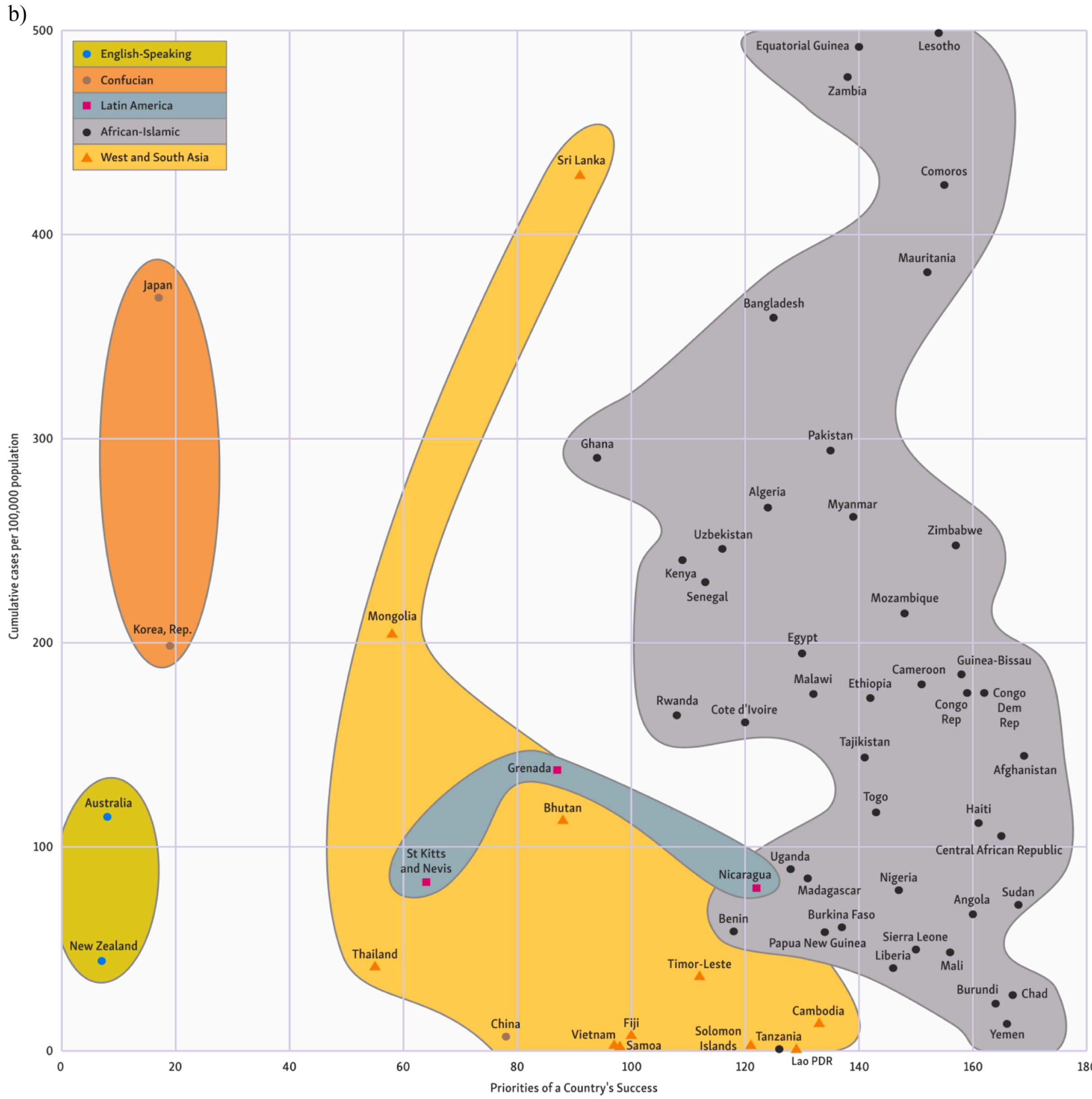

Fig. 5. (*continued*).

2.4. Country success and the COVID-19 Map of the World

The indicators' system, values, and significances equivalently influence the success and priority of the states presented on the axis of abscissas. These systems of indicators, indicators values and significances are obtainable in Tables S1 over S3. We applied the initial five stages of the INVAR technique (Fig. 1) to compute the success and priority of each state (Tables S1–S3). The analyses contained within the dimension that is the Y-axis, pertinent to COVID-19, consist of cumulative cases (World Health Organization, 2021a) and COVID-19 excess deaths per 100,000 population (*The* Economist, 2021a).

The development of Country Successes and COVID-19 Map of the World (CSC Map) was in two parts:

- Country Success and COVID-19 Cumulative Cases World Map (Fig. 5)
- Country Success and COVID-19 Excess Deaths World Map (Fig. 6)

This is a CSC Map displaying priorities for country success and COVID-19 cumulative cases of (a) over 500 and (b) under 500 per 100,000 of the population. Examining 169 world countries and developing CSC Map, we used correlation and multiple criteria analysis methods. The priorities of the Country Success and COVID-19 Cumulative Cases World Map shown in Fig. 5a are outlined next. The data found on the X-axis of the CSC Map displays the priorities of the country's success and, on the Y-axis, the cumulative cases of COVID-19 per 100,000 population. The results from the dimensions of the priorities of a country's success on the CSC Map come from (a) 8 and (b) 15 variables (Tables S2 and S3). Eight country clusters comprise the dimensions of this map; these relate to the classifications from the 2020 World Cultural Map and the 2021 World Values Survey. Two closely related country clusters, the English-speaking group and Protestant Europe, are combined into one, due to their common histories, cultural interactions, comparable developmental levels, and similar religious orientations. Results indicating improvement in the priorities of a country's success appear as movements to the left of the CSC Map. Meanwhile, cases of COVID-19 illness appear as an upward movement. How residents respond to the dynamic situation of COVID-19 illnesses can be forecast by where a country is located on the CSC Map. Evidentially, residents of

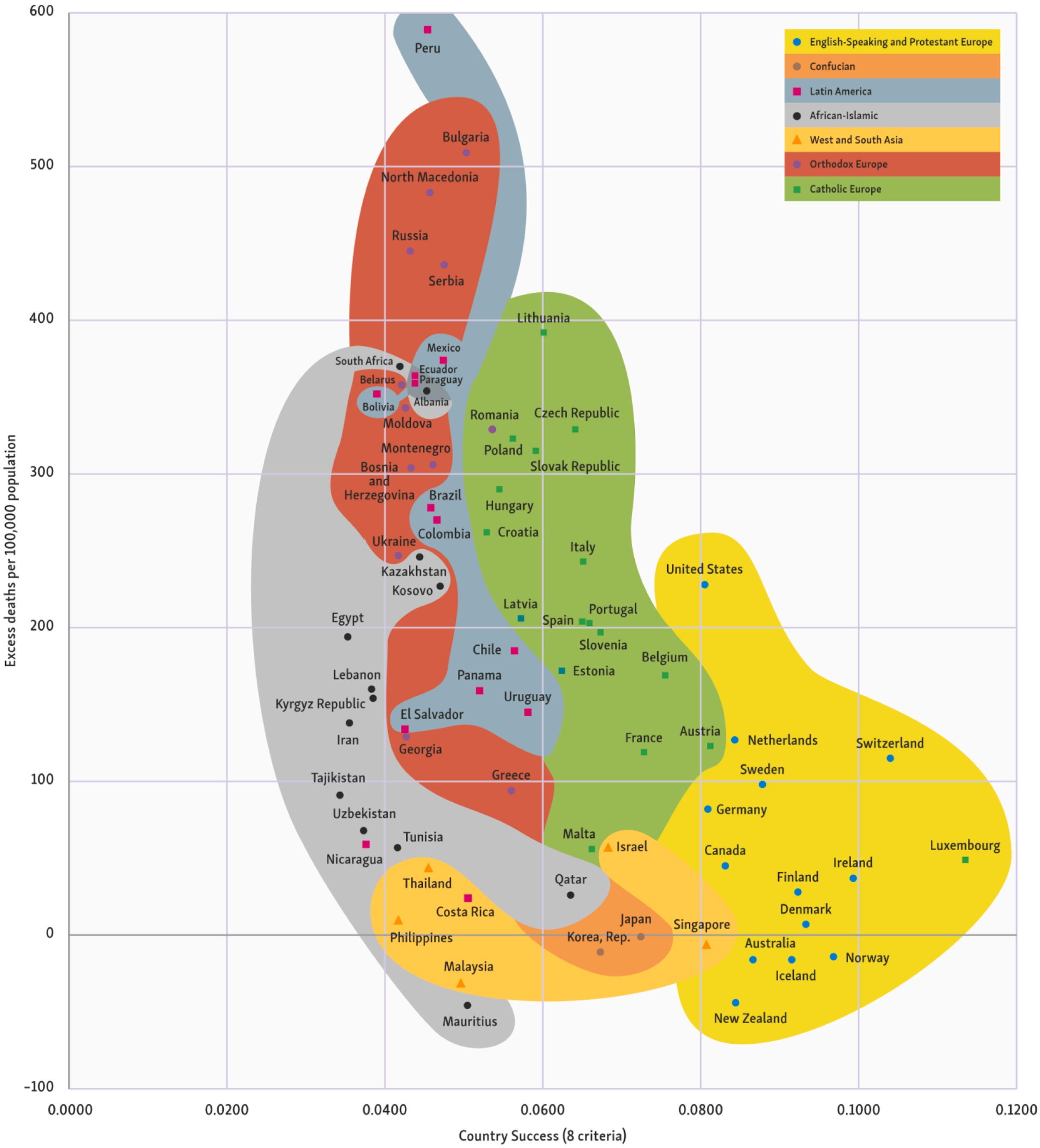

Fig. 6. Country Success and COVID-19 Excess Deaths World Map.

successful countries indicate a greater chance of sickness due to COVID-19. The CSC Map systematically displays concentrated clusters of countries that are polarized and interconnected. These clusters are independent of the countries under investigation. They are also independent of the quantity of their descriptive variables.

The CSC Map displaying priorities for country success and COVID-19 cumulative cases of (a) over 500 and (b) under 500 per 100,000 of the population. The priorities pertinent to the success of countries appear on the X-axis, and cumulative cases per 100,000 of the population appear on the Y-axis of this CSC Map. The priorities pertinent to a country achieving success were established based on the INVAR method for a multiple criteria analysis,[15] as well as on a comprehensive consideration of a system consisting of (a) eight and (b) fifteen variables (Table 4) that describe the priorities leading to a country's success. The CSC Map consists of countries grouped into seven clusters taken from the 2020 World Cultural Map. This CSC Map contains an array of countries that were not analyzed by the 2020 Inglehart–Welzel Cultural Map of the World. The priority group that shows an improvement of a country's success level appears as a movement to the left on the CSC Map. COVID-19 cumulative cases are indicated by an upward movement on this map. Responses to the dynamic changes prompted by the COVID-19 pandemic can be predicted by the location of a country on the CSC Map. The people residing in the more successful countries face an increased chance of becoming sick with COVID-19. Country clusters systematically concentrate in a polarized and interconnected way on the culture map. These clusters are independent of the countries under investigation, as well as of the number of variables descriptive of a country.

The 12 countries included in Protestant Europe and the English-speaking cluster on the CSC Map match those on the 2020 World Cultural Map (Inglehart, 2021). According to the World Factbook (2021), Canada (offical English-speaking population: 58.7%, official French-speaking population: 22%) and Ireland (English is the official language, and it is generally used) are countries where English is a de jure and de facto official language. Therefore, Ireland was also added to the cluster (Fig. 5a). Not all countries, such as Israel, are within their own clusters. However, this can be explained, as follows: The populations of countries also matter. For example, the membership of the top 200 most influential intellectuals in the United States include half who are 100% Jewish by descent (Dershowiz, 1997; Chua and Rubenfeld, 2014). Americans who have won the Nobel Prize include 37% who are ethnically Jewish (Jinfo, 2013). Thus, it might be considered by some to be understandable as to why Israel appears alongside the United States on the CSC Map (Fig. 5a).

Both on the CSC Map and the 2020 World Cultural Map (Inglehart, 2021), the Orthodox European cluster includes the same 13 countries. This European cluster also includes Cyprus because Eastern Orthodox Christians constitute 89% of its population, according to the World Factbook (2021).

On the CSC Map, 15 countries included in the Latin America cluster match those on the 2020 World Cultural Map (Chile is located in the West and South Asia cluster). The two Caribbean countries under analysis from the 2020 Inglehart–Welzel Cultural Map of the World (Inglehart, 2021) are Haiti and Trinidad and Tobago. The 2020 World Cultural Map (Inglehart, 2021) unnecessarily includes the Philippines, an Asian country which belongs to the West and South Asia cluster on the CSC Map. With an additional 15 Latin American and Caribbean countries, the Latin America cluster on the CSC Map includes 30 countries.

The West and South Asia cluster on the 2020 Inglehart–Welzel Cultural Map of the World (Inglehart, 2021) includes seven countries (India and Indonesia are located in the African-Islamic cluster). All of these countries are shown in Fig. 5. In addition, Fig. 5 shows all the countries from the West and South Asia cluster under analysis.

On the Inglehart–Welzel World Cultural Map (Inglehart, 2021), the African-Islamic cluster includes 34 countries. At the time of the creation of the CSC Map, some of Palestine's data for the 15 indicators was not available. All these countries are shown in Fig. 5.

On the CSC Map shown in Figs. 5 and 6, 13 countries in the Catholic European cluster (Andorra has been excluded, because some of its data for the 15 criteria were not available) match those on the Inglehart–Welzel World Cultural Map (Inglehart, 2021). In addition, this cluster includes Malta, where 83% of the population is Roman Catholic, according to the 2019 Eurobarometer. Estonia and Latvia are countries in the Baltic region of northern Europe. In the World Values Survey wave 6 map (2010–2014), Lithuania, Estonia, and Latvia had their own Baltic cluster, which has recently developed very close ties to Scandinavian countries. The latest Inglehart–Welzel World Cultural Map (Inglehart, 2021) no longer includes this Baltic cluster. Most post-Soviet countries belong either to the Catholic or Orthodox European cluster. Among the three clusters, Estonia and Latvia are closer to the Catholic Europe cluster and, therefore, have been included there.

The Confucian cluster on the Inglehart–Welzel World Cultural Map (Inglehart, 2021) includes six countries. At the time of the creation of the CSC Map, some data was not available for Taiwan (China), Hong Kong SAR (China), and Macao SAR (China). The remaining countries are shown in Figs. 5 and 6.

Indications of priorities for countries appearing on the X-axis, and up to 500 cumulative cases per 100,000 of the population due to COVID-19 appearing on the Y-axis, constitute the CSC Map. Fifteen variables determine the priority of a country, which comprises one of the dimensions on the CSC Map (Table S2). The development of the CSC Map involved adapting clusters from the 2020 Inglehart–Welzel Cultural Map of the World (Inglehart, 2021). The countries that do not belong to these clusters are not shown on the CSC Map. These countries include East Asian Mongolia, the Republic of Mauritius (an island in the Indian Ocean) and Oceanian Fiji, Samoa, the Solomon Islands, Mauritius, and Papua New Guinea. The CSC Map indicates the improvement of a country's priority results by moving in parallel to the left and rising cumulative cases due to COVID-19 by moving upward. Here, Australia, China, and New Zealand are exceptions to the rule (Fig. 5b).

The Map of Country Success and COVID-19 Excess Deaths was created with the goal of performing a thorough examination of the interconnections between country success and COVID-19. The successes of countries, along with their excess deaths per 100,000 of the population due to COVID-19, are mapped out to indicate any relationship between them. A system of eight variables comprises the dimensions on the CSC Map indicating the success of countries (Table S3). A growth in a country's success results in a fall of the number of excess deaths due to COVID-19, which the Map clearly illustrates. The excess deaths per 100,000 of the population of the country represented decreases in parallel with its success. The 2020 Inglehart–Welzel Cultural Map of the World provided the eight country clusters for this study. Two culturally related country clusters, which were English-speaking and Protestant European, have been integrated into one cluster in this map. The compilation of this map only used data on 84 countries pertinent to excess deaths per 100,000 of the population due to COVID-19, which was sourced from *The Economist*. The 15 necessary indicators under consideration were not all available for six of the 84 countries that were submitted. Thus, only 78 countries were analyzed for this study. Countries that did not belong to the seven clusters under consideration, for instance, Mongolia in East Asia and Mauritius in Oceania, are not represented on the CSC Map. The two predominant dimensions—country success on the horizontal X-axis and excess deaths on the vertical Y-axis—show the differences between different societies and clusters. The site of the country on the CSC Map is established by these two dimensions. Indicators of country success and sustainability express the common values inherent to a country cluster (Fig. 6).

A thorough investigation of the link between a country's success and COVID-19 excess deaths is represented. The Country Success and COVID-19 Excess Deaths Map was employed to serve this stated objective. It visually displays the link between the successes of countries and their respective COVID-19 excess deaths per 100,000 of the population. A system of criteria consists of eight variables (Table 4). This composite of variables comprises the country success dimensions on the CSC Map. This map shows a decline in COVID-19 excess deaths whenever country success is on an upswing. Heightened success appears in parallel with fewer excess deaths per 100,000 of the population for countries. Two dimensions highlight the predominant differences among countries. The horizontal X-axis on the CSC Map displays the country success dimension. Meanwhile the other vertical Y-axis displays the excess deaths dimension. The location of a country on the CSC Map relates to these two dimensions. Indicators of country success and sustainability reflect the values that country clusters share in common.

Fig. 6, which shows the Country Success and COVID-19 Excess Deaths World Map, is explained next.

On the CSC Map, 11 countries included in the Protestant European and the English-speaking cluster match those on the Inglehart–Welzel World Cultural Map (Inglehart, 2021). The UK has been excluded, because *The* Economist (2021a) does not provide its data on excess deaths per 100,000 of the population. Many indicators analyzed in this research and characterized as a group by a country's success indicators suggest that Luxembourg is much closer to the countries in Protestant Europe and the English-speaking group than to those in the Catholic Europe cluster. For a while, Luxembourg was in a political union with the Netherlands as a result of the Treaty of London. The administrative languages spoken in the country are Luxembourgish, French, and German; the country has borders with Germany, France, and Belgium. Only three countries in Europe allow euthanasia: Belgium (since 2002), Luxembourg (since 2009), and the Netherlands (since 2002) (Coutinho, 2016). No wonder, then, that Luxembourg falls into the Protestant European and English-speaking cluster (Fig. 6).

Both on the CSC Map and the Inglehart–Welzel World Cultural Map

(Inglehart, 2021), the Orthodox Europe cluster includes the same 12 countries, but *The* Economist (2021a) provides no data on excess deaths for Armenia.

The Latin America cluster on the Inglehart–Welzel World Cultural Map (Inglehart, 2021) includes 16 countries. *The* Economist (2021a) provides no data on excess deaths for six countries: Argentina, Guatemala, Venezuela, Haiti, Puerto Rico, and Trinidad. With the addition of El Salvador, Panama, and Paraguay, the Latin America cluster on the CSC Map includes a total of 13 countries.

The West and South Asia cluster on the Inglehart–Welzel World Cultural Map (Inglehart, 2021) includes seven countries (India and Indonesia are located in the African-Islamic cluster). *The* Economist (2021a) provides the data on excess deaths for only five countries in the West and South Asia cluster; they are all shown in Fig. 6.

The African-Islamic cluster on the Inglehart–Welzel World Cultural Map (Inglehart, 2021) includes 34 countries. At the time of the creation of the CSC Map, some of Palestine's data for the 15 indicators was not available. *The* Economist (2021a) provides the data on excess deaths for only 13 countries in the African-Islamic cluster, and they are all shown in Fig. 6.

Therefore, Fig. 6 visually supports the second point of Hypothesis 3 that as the success of a country grows, excess deaths from COVID-19 per 100,000 population decrease in parallel. This figure clearly shows that the increasing priority of country success, from left to right, corresponds to decreasing excess deaths from COVID-19 per 100,000 population

Not all countries, such as China, Israel, Estonia, Latvia, and Tanzania are within their own CSC Map clusters. For example, an oddity on the CSC Map is Tanzania, which is not in its African-Islamic cluster. Nonetheless, it is near the African-Islamic cluster. Another is China, which is near to Vietnam on the CSC Map, as these countries share a border (Fig. 5). An analogous situation exists in other similar studies, which we briefly describe below.

Some boundaries of the cultural zones overlap: The ex-communist zone, for instance, overlaps with the Catholic, Protestant, Orthodox, Confucian, and African-Islamic cultural zones. The situation is similar in Britain, which is both an English-speaking country and historically a Protestant European country. Britain is close to all six of the other English-speaking countries, which puts it in that zone on our map. With a minor adjustment, though, Britain—due to its cultural closeness to Protestant societies—could have ended up in Protestant Europe on the map. Reality is complex. Thus, the empirical position of Britain, a country at the intersection of Protestant Europe and the English-speaking zone, reflects both aspects of reality. Another boundary, even broader, could put Catholic Europe, Ireland, Latin America, and the Philippines in a broad cultural zone of Roman Catholicism. All of these zones can be justified both empirically and conceptually. The two-dimensional cultural maps take into account the similarity of basic values. At the same time, they reflect how these societies are different and distant from each other in many other dimensions, such as their colonial influences, the impact of communist rule, the level of economic development, religion, and the structure of the workforce (Inglehart and Welzel, 2005).

The former and the current world powers form the pool of English-speaking countries; there are more features shared by West Germany with Sweden than with the other countries. New Zealand and Australia share more features with the former and the current world powers than with each other. The social set-up of Canada is close to that of Great Britain, Norway, Sweden, and the USA, and Finland is somewhat different from the other northern countries. These are all instances of various similarities and differences (Haller, 2003). The following dimensions mapping these distances of class profiles are possible (Haller, 2003): common culture, historical connections, the welfare state, and industrial development. In the context of the discussion proposed by Haller (2003), this typology also serves as a warning against thinking that the label "Europe" means the European countries share more similarities with each other than with other countries.

The CSC Map of the world presented here visually validate the hypotheses raised, along with the statistical studies that have been performed using the data.

Fig. 7 compares the Country Success and COVID-19 Cumulative Cases World Maps from (a) March 28, 2021 and (b) December 23, 2021. CSC Map displaying priorities for country success and COVID-19 cumulative cases of (a1) over 500 and (a2) under 500 per 100,000 of the population (Fig. 7a). Also, Fig. 7b shows priorities for country success and COVID-19 cumulative cases of (b1) over 1.5% and (b2) under 1.5% of the population. The priority of a country's success is based on 2020 data, and has been calculated using (a) an eight-citeria system and (b) a 15-criteria system. The y-axis is identical on both maps. The data on cumulative cases per 100,000 population (Fig. 7a) have been transformed and expressed as a percentage (Fig. 7b). One thousand infections per 100,000 population on the CSC Map in 7a1, for instance, correspond to 1% of a country's population infected on the CSC Map in 7b1, and 3,000 infections per 100,000 population in 7a1 correspond to 3% infected in 7b1 (Fig. 7).

The position of country clusters on the CSC Map changes little over time. For instance, the bases for analyzing cumulative cases per 100,000 population were the March 28, 2021 data (Fig. 7a, WHO, 2021a) and the December 23, 2021 data (Fig. 7b, WHO, 2021b). These data show strong, positive and statistically significant dependency ($r = 0.939$, $p < 0.01$). The bases for analyzing excess deaths per 100,000 population were the August 31, 2021 data (Fig. 6, *The* Economist 2021a) and the December 22, 2021 data (Fig. 7, *The* Economist 2021b). These data show strong, positive and statistically significant dependency ($r = 0.942$, $p < 0.01$). The layout of the clusters over time on the CSC Map is very similar, and their correlations are, as well (Fig. 7a and 7b). The percentage of people ill with COVID-19 in 169 countries, as per the December 22, 2021 data, indicates a strong, negative and statistically significant relationship on the priority ranking of a respective country's success, based on 2021 data. These numbers were established according to a 15-criteria system ($r = -0.646$, $p < 0.01$) and according to an 8-criteria system ($r = -0.678$, $p < 0.01$). Almost nine months later, the overall country clusters show little change in their position on the CSC Map. Only two clusters in the middle of the CSC Map (African-Islamic and Latin America) show a noticeable change in their boundaries.

Fig. 8 shows the Country Success and COVID-19 Cumulative Cases World Map with the 2020 World Cultural Map countries. This map is a visual confirmation of the claim stated in the first point of Hypothesis 3 that as the success of a country grows, cumulative cases increase in parallel. This figure makes it evident that an increase in country success priority (from right to left) corresponds to an increase in COVID-19 cumulative cases.

People's values and behaviors are determined by culture (Hofstede, 2001). Therefore, specific manifestations of culture in human behavior can influence the spread of pathogens (Fincher et al., 2008). The CSC Map and models, as well as the statistical analysis, confirm the idea of statistically significant relationships between cultural factors and COVID-19. The CSC Map and models are important tools in attempts to determine reasons behind the spread of pandemics and to find rational ways for successful fight against a pandemic.

The review of world literature in the field, found in Subsection 1, as well as the CSC Map and models showed that both the more and the less successful countries have their strengths and weaknesses, when it comes to battling COVID-19. Furthermore these countries have differing traditions as well as unlike situations in culture, politics and their economy. None of these are exceptionally better at dealing with the threat raised by COVID-19. The Results and Discussion sections, found further in the article, also discuss the Country Success and COVID-19 Map of the World.

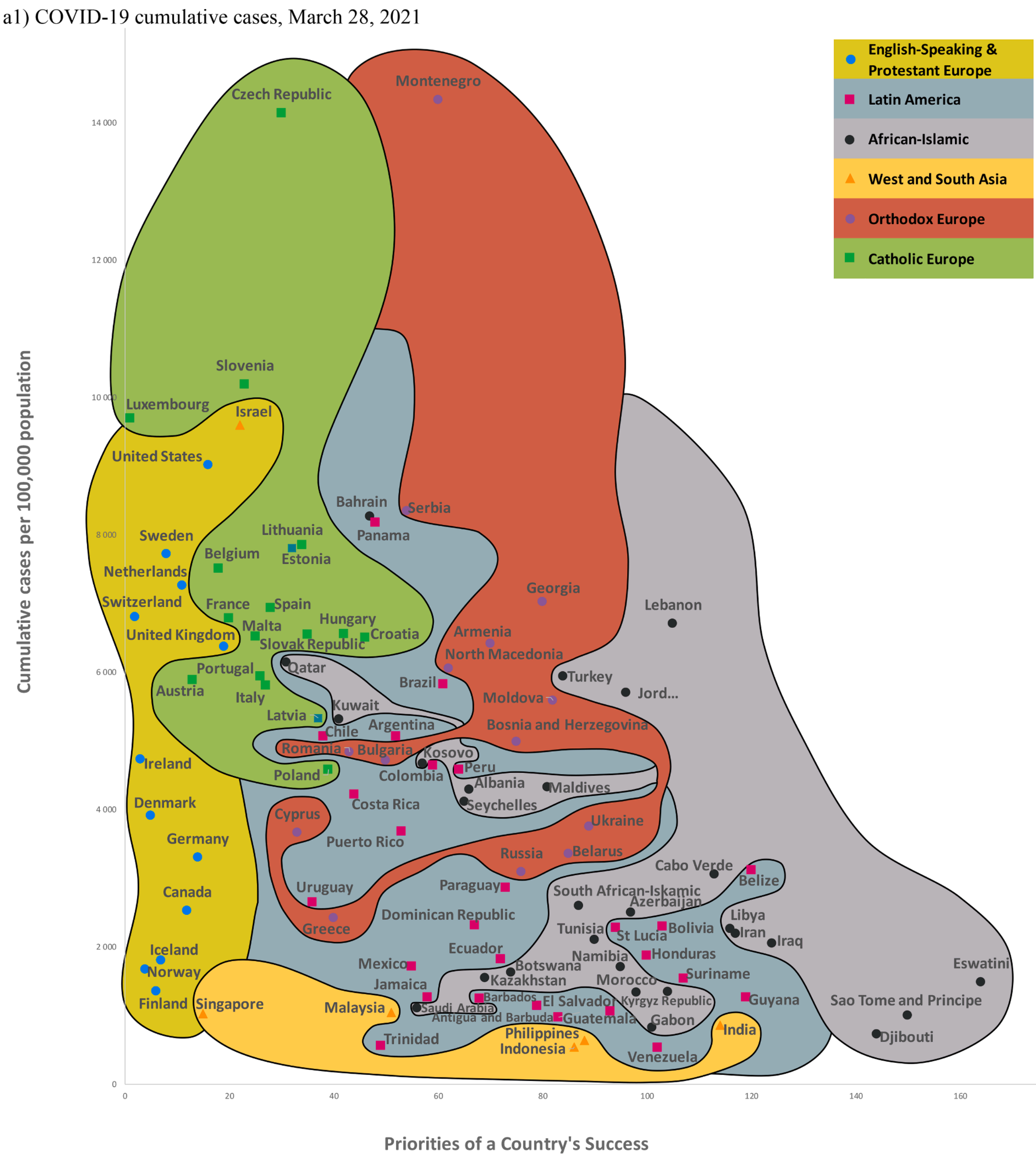

Fig. 7. CSC cumulative cases per 100,000 population, a visual comparison of Country Success and COVID-19 Cumulative Cases World Maps, (a) March 28, 2021 and (b) December 23, 2021.

2.5. Validation of the fourth hypothesis: Changes to the 2019 and 2020 country results

The fourth hypothesis has been verified by means of the method of qualitative comparison. This method compares the values of the variables included in our research set with the values of the variables used in studies by other authors and their changes before and during the pandemic.

The data used for the validation of the fourth hypothesis referencing that micro-, meso- and macro- environments limit people's pursuit of freedom under pandemic conditions, were taken from different databases and websites, including the World Health Organization, Transparency International, World Bank, Eurostat-OECD, Knoema, Global Data, statistics from global and country economies, Freedom House, Global Finance, Heritage as well as from various other publications. For example, Table S1 lists the countries analysed during the validation of the fourth hypothesis and shows detailed systems of their indicators along with their indicator values and weights.

Sustainability relevant to the coronavirus pandemic has again sparked a public debate. Global restrictions on the public regarding their movements and contact with other people, diminished business activities, slumping air travel, and other means of transport have had positive results. Consequently, harmful emissions have declined, and water quality has improved. Unfortunately, greater sustainability may be impeded due to the social and economic disasters which are occurring, and which threaten progress worldwide (Deutsche Bank, 2021).

b1) COVID-19 cumulative cases, December 23, 2021

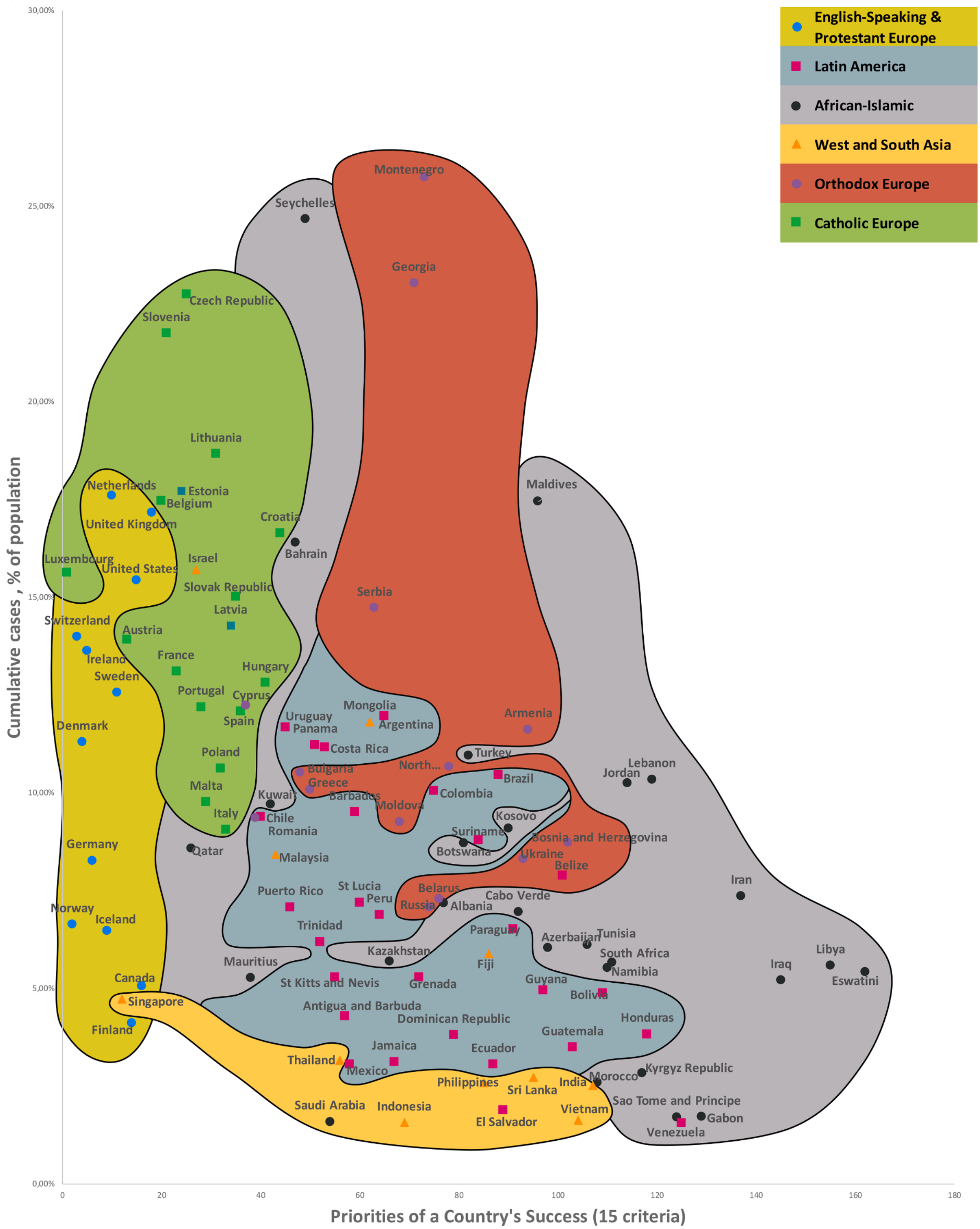

Fig. 7. (*continued*).

Many success and sustainability indicators have steadily improved throughout the twentieth century (excluding periods of crisis) for the 169 countries under analysis. From the perspective proposed by Inglehart and Welzel (2005), existential conditions have been improving more and more, as a result of socioeconomic developments. Furthermore, at the same time, the public have made more autonomous choices because there are fewer external constraints in place. The contributing factor to such increasing existential security prompts the emergence of values of self-expression. This, in turn, prioritizes individuality and liberty over discipline and collectivism, as well as over conformity. As human diversity is viewed as necessary, group mindsets are discounted, resulting in civic autonomy over state authority. The inherent value of self-expression is emancipation, which is also people-centered. Therefore, a different sort of humanistic society unfolds, which encourages people's freedoms and autonomous actions in many ways (Inglehart and Welzel, 2005).

a2)

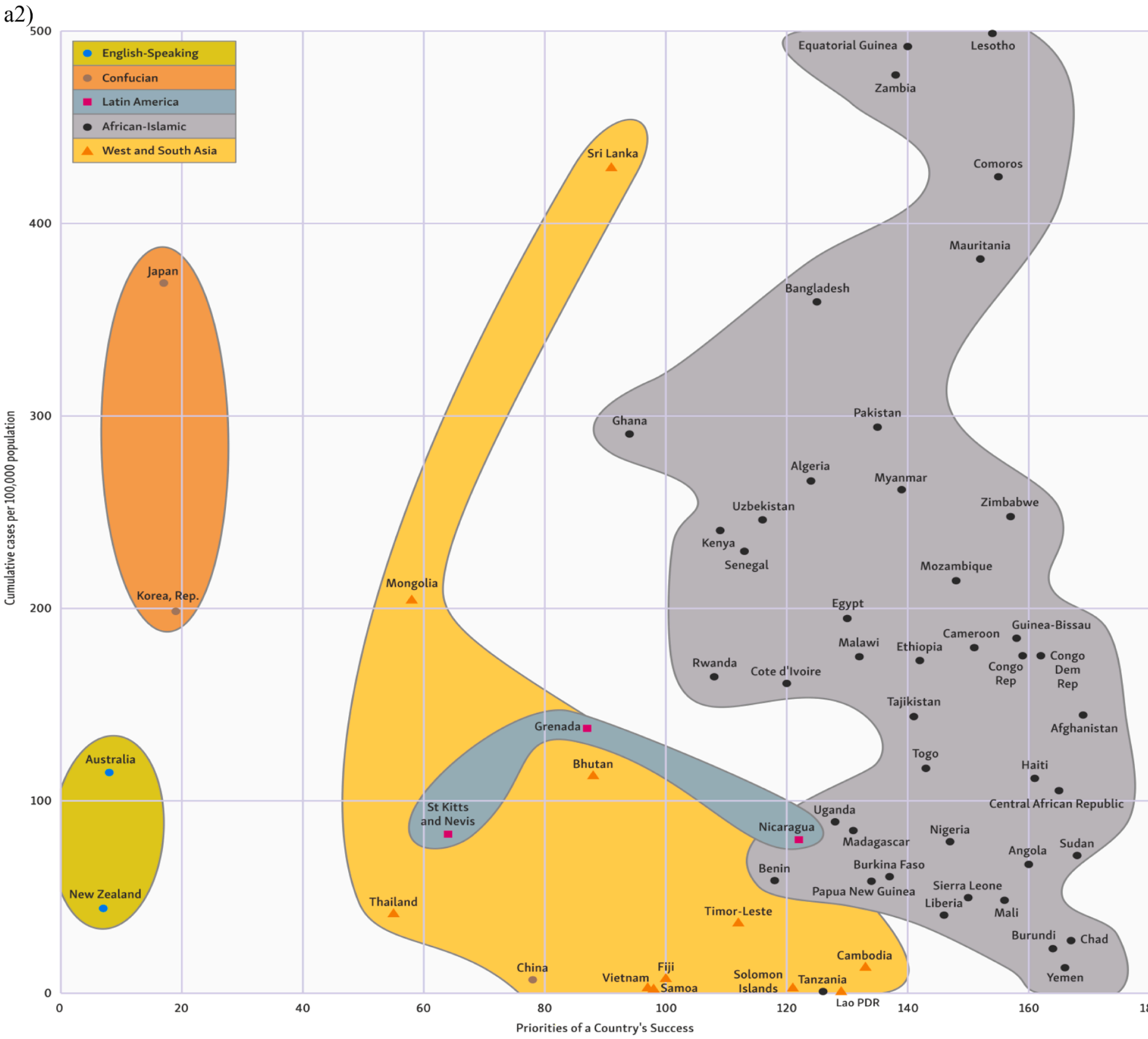

Fig. 7. (*continued*).

The Freedom in the World survey, which reviews the civil liberties and political rights with respect to each country in the world, is administered every year. The data from this survey indicate that the number of free countries in the world dropped from 86 to 82 between 2019 and 2021. *The Economist* Intelligence Unit, publisher of *The Economist*, a weekly journal, compiles the democracy index. The objective of this index, as it self-describes, is to measure countries to assess their respective states of democracy. Between 2019 and 2020, the index experienced a reduction from 5.44 to 5.37 on the global scale. According to Economist Intelligence Unit (2021), democracy was dealt a severe blow in 2020, and nearly 70% of nations documented a deterioration in their total score, as state after state locked down to protect lives from a new coronavirus (*The* Economist, 2021a). Today's conditions are characterized by a sharp and unmatched drop in the human development index, as suggested by the UN Human Development Report (Conceição et al., 2020). This report adjusted the education dimension in the study to account for impacts caused by school closures, improvement measures, and other means.

The survival of humanity is clearly facing a threat from the COVID-19 pandemic. People feel let down by society, are consumed by a growing sense that they have no prospects, and have become more upset, afraid, and hostile. Reported hedonism and positive emotions have plunged, and people see their lives as worse than before in many areas, including finances, the joy of living, their mental and physical health, personal, work, social life, and their trust in humanity (Lampert et al., 2021). Although the coronavirus pandemic has grievously affected the world this year, certain countries, such as Canada, have experienced more sadness than others, as the United Nations confirmed in its 2021 World Happiness Report.

Particularly vulnerable people are facing financial insecurity or are living in poverty, often in unaffordable or overcrowded housing; in addition, they are socially isolated, or experiencing poor psychological well-being. Also among the groups at higher risk are people in precarious jobs, low-income earners, people in need of support for disabilities or mental health care, and people living in households with the threat of violence or domestic abuse. Governments need broad and coordinated policies to support the most vulnerable people with swift and decisive action (Fu et al., 2020).

The 2021 Economic Freedom Index graded 89 of 178 countries in relation to their registrations of economic freedom improvements. The results showed that scores had dropped in 80 countries, with nine remaining stable.

The measures countries introduced in response to the COVID-19 pandemic—including the shut-down of economic activities—resulted in an economic recession and growing unemployment, which will decrease the quality of life and increase all-cause mortality (Harris et al., 2020). Nordt et al. (2015) looked at global public data from 63 countries to model the effect of unemployment on suicide, and noticed a 20–30%

b2)

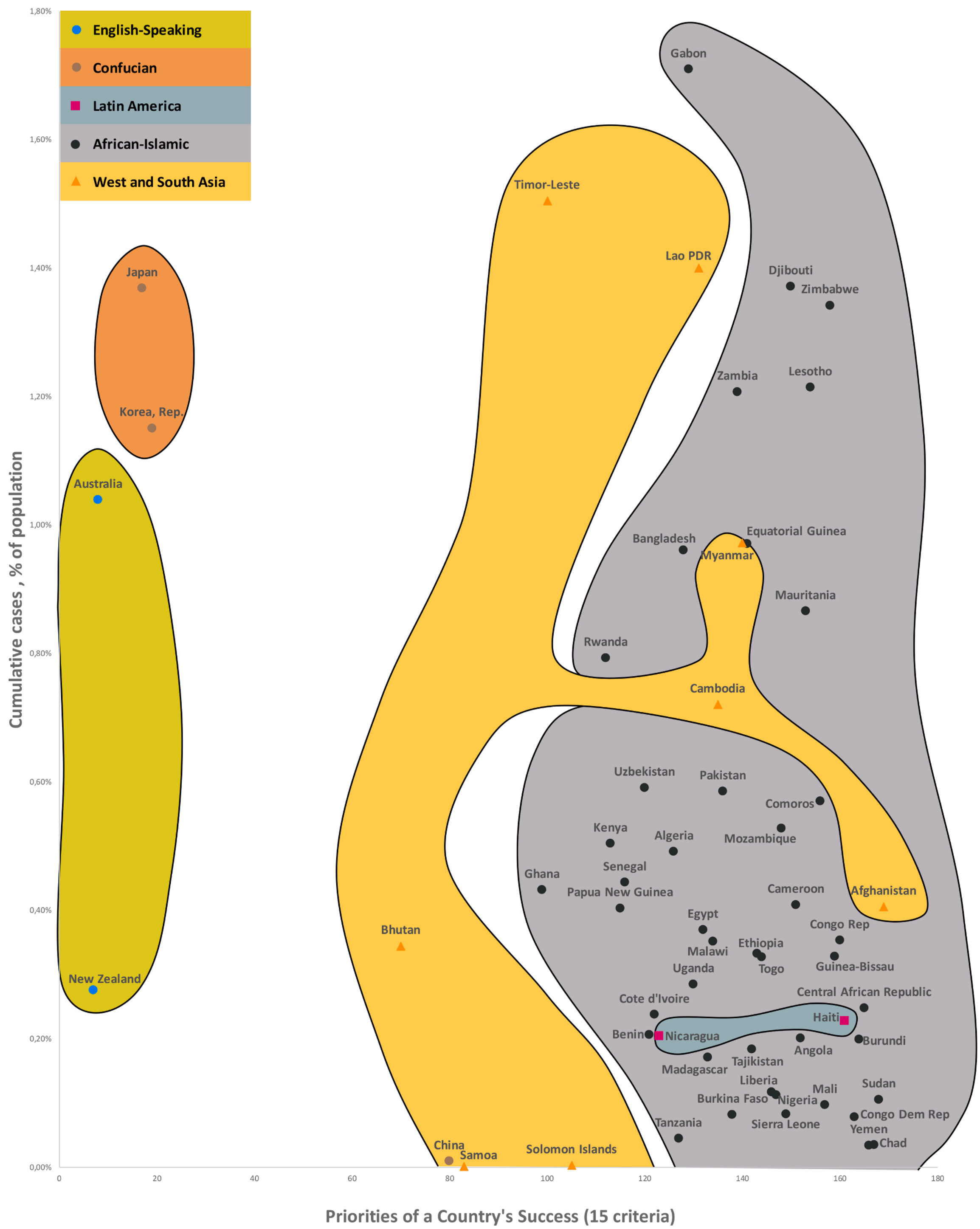

Fig. 7. (*continued*).

higher suicide risk associated with the 2000–2011 unemployment levels (including the 2008–2009 financial crisis). Rosén and Stenbeck's (2020) calculations showed that with an increase of 100,000 people unemployed in Sweden, about 1,800 more premature deaths could be expected during the next nine years. The unemployed are likely to lose, on average, two years of their remaining life expectancy. With unemployment rates that are already (or expected to be) higher (in some cases two or three times) than those in Sweden, many other countries are likely to have hundreds of thousands of unemployment-related excess deaths (Rosén and Stenbeck, 2020).

Governments and investors are struggling to handle the social impacts on health and economies during the COVID-19 crisis. Unfortunately, in 2021 the OECD has issued troubling reports. Apparently there will be a deficit of USD 1.7 trillion in financing for developing countries. Yet, such investments are sorely needed for these countries to achieve the named objectives pertinent to the 2030 Sustainable Development Goals (SDGs). Sustainable development trends have become negative due to the COVID-19 pandemic. Many wasteful practices designed to avoid physical contact have been on the upswing since 2020, such as the vastly increased use of single-use products, and travel in private vehicles

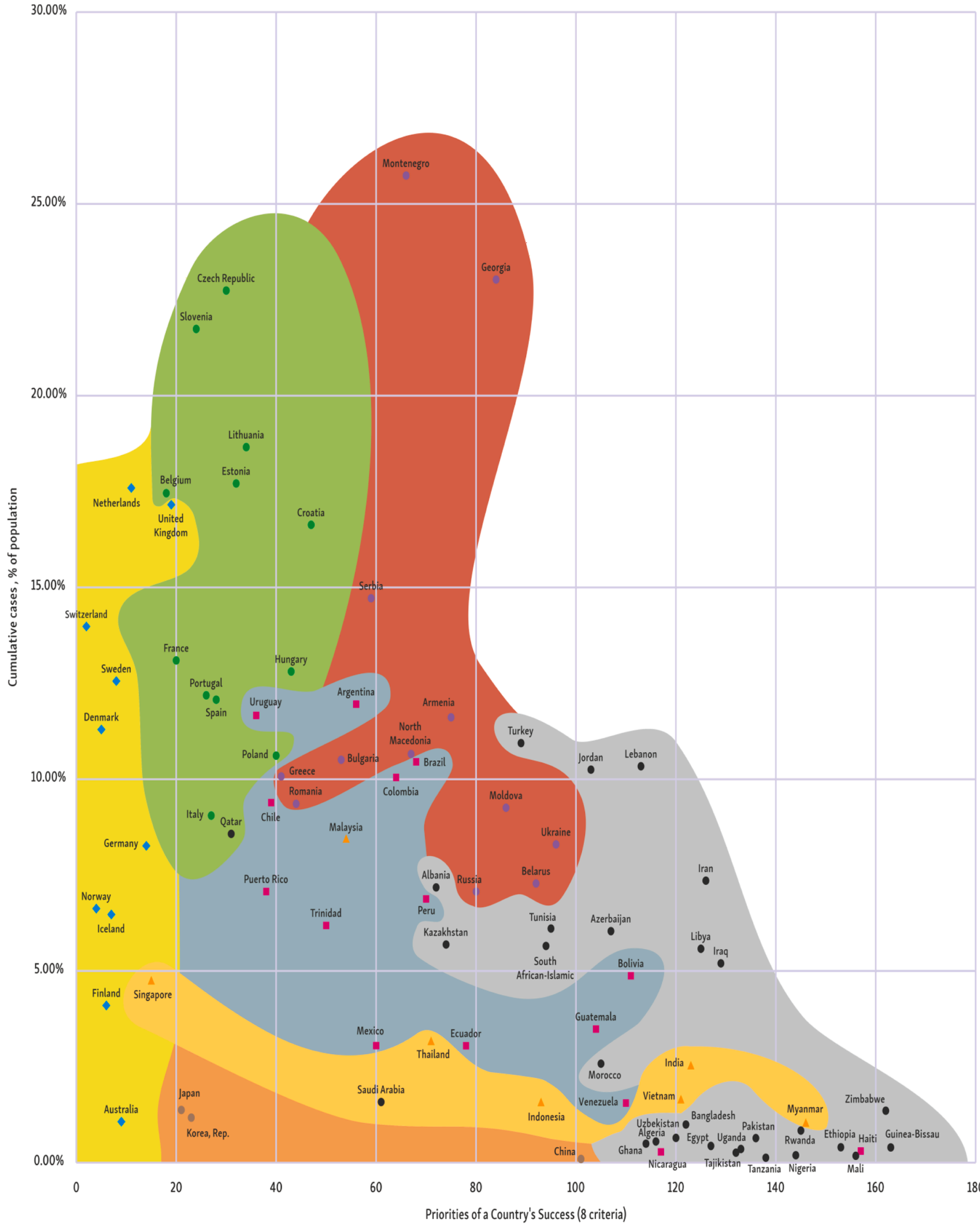

Fig. 8. The Country Success (2020) and COVID-19 Cumulative Cases (December 23, 2021) World Map with the 2020 World Cultural Map countries.

(Ellwanger et al., 2020).

A computational methodology with an enlarged Maslow's hierarchy of needs has been recommended by Suh et al. (2021) This involves a difference-in-differences approach, which corrects variations in seasonality and volume, and provides for a holistic view of society after the pandemic, as its needs will have changed, comparatively. These authors applied this approach in a study involving over 35 billion search interactions across 36,000 ZIP codes over a 14-month period. This provided the basis for the characterization of changes in the physiological, socioeconomic, and psychological needs of people across the USA. They discovered that a focus on basic human needs has been expressed at exponentially greater rates, whereas higher-level ambitions have dropped in comparison to the pre-pandemic period.

The studies presented above show that numerous success and sustainability indicators for many of the 169 countries under analysis constantly improved during the calm periods of the twenty-first century.

Therefore, in 2020, it is possible to assert that numerous indicators of economies, societies, and political actions worldwide worsened over the COVID-19 period, in comparison with 2019. This study also demonstrates that the micro-, meso-, and macro-environments limit people's pursuit of freedom under pandemic conditions. These freedom needs become markedly more important as the threat of the pandemic recedes. Meanwhile they worsened during times of crisis, such as, e.g., during COVID-19. The fourth hypothesis was this way confirmed.

Additionally the later sections on Results and Discussion analyse changes to the 2019 and 2020 country results.

3. Results

3.1. Country success and the COVID-19 Map of the World

A practical comparison was made to establish correlations between the dimensions (axes) of the CSC Map and the Inglehart–Welzel 2020 Cultural Map of the World. Table 1 displays the calculated correlations between all dimensions when analyzing 169 or fewer countries (Table S1). Upon performance of the correlation analysis, it was established that strong, positive, and statistically significant relationships exist between CS_{15} and CS_8 ($r = 0.985$, $p < 0.01$), CS_{15} and traditional versus secular-rational values ($r = 0.846$, $p < 0.01$), CS_8 and traditional versus secular-rational values ($r = 0.849$, $p < 0.01$), as well as between CS_{15} and traditional versus secular-rational values ($r = 0.706$, $p < 0.01$). The dimensions of the 2020 Inglehart–Welzel Cultural Map of the World correlate with one another (0.570**), similarly as its dimensions correlate with the dimensions of the CSC Map. The average correlation with dimensions of the CSC Map and the traditional versus secular-rational values is 0.637**, whereas with the traditional versus secular-rational values — 0.561** (Table 1).

The parallel analysis of 169 and 77 countries yielded comparable results. Once the number of criteria pertinent to country success (CS) was reduced from 15 (CS_{15}) to 7 (CS_7) and 8 (CS_8), the results of the correlations did not change by much. The analysis results pertinent to the correlations between the CSC Map and the 2020 Inglehart–Welzel Cultural Map of the World dimensions substantiated the first hypothesis. Additionally a clear, visual validation of this first hypothesis appears in Figs. 5 and 6, where the seven clusters of countries under deliberation concentrate in groups.

Put simply, the distribution of countries and their movements running diagonally on the X-axis (Country success) and on the Y-axis (cumulative cases per 100,000 population) on the CSC Map reflects the values of clusters and achieved results of success. Put another way, cumulative cases usually increase naturally, whenever the success rate of that respective country is on an upswing (Fig. 5). Meanwhile excess deaths from COVID-19 per 100,000 population decrease in parallel (Fig. 6).

Thus, Fig. 5a and 5b again graphically confirm the second hypothesis that when the numbers of countries indicators change, the conditional successes of countries remain fairly similar.

The CSC Map contains seven zones of country success and COVID-19 clusters, which were obtained by analyzing smaller or larger numbers of countries and the various numbers of variables describing them. Once the locale of a country on the CSC Map is known, a forecast is possible regarding the actions of its residents in response to dynamic changes in the COVID-19 situation. The research results from this study correspond with the research results of several global studies under analysis, listed below. Generally, the countries with the most advanced economies tend to be freedom-oriented, and these tend to suffer more COVID-19 cases. Meanwhile countries that tend to be more control-oriented experience fewer COVID-19 cases (Lampert et al., 2021). Thus, the outcomes of this study coincided with the results obtained by Maaravi et al. (2021), which found that populations that tend to uphold concepts of freedom, self-expression, autonomy and individualism (i.e., those that reflect relatively open societies) suffered the most during the initial nine months of the coronavirus pandemic.

As the success of a country grows, cumulative cases increase, while excess deaths from COVID-19 per 100,000 population decrease in parallel. The visual validation of the third hypothesis also appears in Figs. 5 and 6 of the presented CSC Map of the World, in which the seven clusters of countries under deliberation are concentrated in groups. The statistical studies that have been performed substantiate the third hypothesis, as well as the submitted CSC Map.

Development of the CSC Map involved an analysis of 169 countries. Meanwhile the 2020 Inglehart–Welzel Cultural Map of the World only submits 103 countries.

Moreover, CSC Map Models, which are formal representations of the CSC Map, were developed to confirm hypothesis 3. According to these models, whenever there is a 1% increase in GDP per capita, human development index, global gender gap, environmental performance index and democracy index values, then the cumulative cases will also increase, correspondingly, by 0.38, 3.45, 3.57, 2.15, and 1.25 percent. Meanwhile, excess deaths will also decrease, correspondingly, by 0.52, 3.79, 1.76, 1.32, and 1.03 percent.

3.2. Changes to the 2019 and 2020 country results

The fourth hypothesis concerns meeting basic needs. Accordingly, efforts to avoid severe illness and death during the pandemic are essential to survival, and, for the time being, these constitute fundamental priorities. Thus, people tend to temporarily push the need for freedom into the background. Now, state authority, group conformity, and collective discipline acquire greater meaningfulness in society. Once the threat from the pandemic lessens, the need for freedom becomes markedly more important. Our analysis and existing global statistical data have substantiated the fourth hypothesis. This hypothesis represents the main difference between material needs for safety and non-material human needs for freedom. Society usually ranks safety higher than human freedom, and the COVID-19 threat directly affects safety. On the other hand, once the COVID-19 threat has passed, major concerns will again relate freedom. For the 169 countries under consideration, the average values of the 15 success and sustainability indicators improved consistently during the twentieth century (except in times of crisis). The success and sustainability indicators under analysis decreased during 2020 compared to 2019 (i.e. the pandemic period), as expected (Subchapter 2.5).

Therefore, the conclusions of this research concurred with the following outcomes of Lampert et al. (2021): The COVID-19 pandemic is a clear threat to survival. The coronavirus pandemic has led to an increased focus on health and vitality, and many people are keener on taking precautions (Lampert et al., 2021).

This is a proposal to form a database on best practices in managing the COVID-19 pandemic. It can then serve as a basis for numerous metrics and existing contextual conditions to analyze the most rational application on an ongoing basis.

3.3. Effect of air pollution on country lockdowns

The analysis conducted here was on the success and sustainability of 169 countries as well as on the interdependencies of their environmental performance index (EPI) and current air quality score. Such an interdependency demonstrates that environmental indicators are better as a country's success and sustainability improves. Furthermore, this analysis included an examination of COVID-19 excess deaths in 78 countries and the interdependencies of their EPI score and current air quality score. These independencies demonstrate that, as these environmental indicators deteriorate, the numbers of COVID-19 excess deaths increase. Upon performance of the correlation analysis, it was established that strong and statistically significant relationships exist between 169 countries' success and sustainability linked with their current air quality ($r = 0.602$, $p < 0.01$) and EPI scores ($r = 0.931$, $p < 0.01$). Additionally, it was determined that statistically significant relationships exist between COVID-19 excess deaths per 100,000 population in 78 countries and deaths per 100,000 population attributable to ambient air pollution ($r = 0.5$, $p < 0.01$), current air quality index score ($r = -0.413$, $p < 0.01$), and EPI score ($r = -0.627$, $p < 0.01$). The various restrictions and preventative means, such as lockdowns at home and social distancing policies, which were applied to fight the pandemic, did improve a country's EPI score and current air quality score indicators. The obtained results show that, as a country's EPI score and current air quality improved by 1%, excess deaths decreased, by 2.33 and 1.55 percent, respectively.

Knowledge on the science of integrated analyses pertinent to country successes and COVID-19 (CSC) globally has been augmented by the studies outlined next:

- The very first integrated analysis pertinent to country successes and COVID-19 cumulative cases and excess deaths globally is the study presented here. New Country Success and COVID-19 Map of the World have been compiled for this research on a worldwide scope.
- The four hypotheses raised and confirmed over the course of this research established that, around the world, a many country's success continues to increase over time, while the numerous indicators so describing it continue improving. Consequently the inhabitants of a country pay increased attention to their needs for freedom, liberty and autonomy.
- The 2020 Inglehart–Welzel Cultural Map of the World, which is grounded on surveys, and the CSC Map, which is grounded on statistical indicators, have axes that correlate with one another significantly.
- The indicators in the criteria system regarding country success and sustainability are interrelated. Thus, when the numbers of countries and their indicators change, the conditional successes of countries remain quite similar. Likewise seven clusters of countries under deliberation group together independently of the system of applied indicators for their analysis.
- As the success of a country grows, cumulative COVID-19 cases increase, although excess deaths due to such cases, per 100,000 population, decrease in parallel.
- Micro-, meso- and macro-environments limit certain people's pursuit of freedom under pandemic conditions.
- Possibilities generated for interested groups with the assistance of the INVAR method and the CSC Map and models are the following:
- to compile development perspectives based on a more thorough and deeper picture of COVID-19 control and prevention alternatives
- to develop and analyse COVID-19-related restrictions and preventative measure alternatives more effectively by rationally reducing the negative effects of the COVID-19 pandemic
- to analyse and interpret the existing data quantitatively and qualitatively for deriving the kinds of results prompting automatically submitted recommendations aimed at different stakeholders pertinent to reducing the impact of COVID-19

4. Discussion

These research outcomes provide a scorecard and practical guidelines for countries that desire means for effectively resisting this pandemic, and for transitioning to a sustainable future.

Most countries need to undertake swift actions in their efforts to control the lifecycle of the pandemic more effectively and to strengthen their responses with systemic policies, by applying the best worldwide practices. Moreover, various means must be taken to support developing countries, which face huge difficulties in controlling the pandemic.

This study is the first global and integrated analysis on country successes and COVID-19 cumulative cases and excess deaths. The system of 15 indicators comprehensively defining the success and sustainability of 169 countries served as the basis for the development of the Country Success and COVID-19 (CSC) Map of the World. This research demonstrates the interdependencies between the policy responses that countries aimed at the coronavirus pandemic and their respective success and sustainability indicators. Country success variables taken from those modelled for the CSC Map Model explained more than 63% of the dispersions pertinent to COVID-19 cumulative cases, more than 52% of COVID-19 excess deaths, and over 95% of country success variables. Practical conclusions and recommendations were derived based on the map, the statistical calculations, and the CSC Map models. One such conclusion is that the growing success of a country means its cumulative cases of COVID-19 are also increasing. Concurrently, numbers of excess deaths are falling in parallel. Freedom was one of the main problems experienced globally during the pandemic. This study further shows that, during the pandemic, respective micro-, meso- and macro-environments temporarily limit personal desires for independence. As the pandemic diminishes, such desires for freedom become increasingly important. This research improves understanding of how country responses to the coronavirus pandemic depend on their existing situations (success and sustainability indicators), which should serve as the basis for establishing specific policies. However, certain countries do not do this systematically. Medicine and other traditional means, for instance, do not constitute the only way to curtail excess deaths. It is possible to emphasize areas that have not been explored as much to date. These areas can include a stronger assurance of gender equality, the endorsement of human development, the elimination or reduction of corruption, and the improvement of happiness, education, and social progress.

The entirety of the evidence obtained by this research once more substantiated the interconnection between the ever-changing pandemic situations, namely the micro-, meso- and macro-environments of countries, along with their tailored policy responses to the COVID-19. Research results show that democratic countries usually respond most effectively to the pandemic, as they have sufficient resources and effective health care systems. The available evidence and best world practices also indicate that the most effective policy in response to the pandemic must be implemented while considering the big picture of the existing situation involving preparedness, use of broad-based testing and health care measures, poverty and economic inequality, gender inequalities, remote work possibilities, environmental well-being, human creativity, violent riots, and civil wars.

Upon analyzing the CSC Map (Figs. 5 and 6) along with its relevant statistical calculations, it becomes quite clear as to how well different countries succeed at combating COVID-19, based on the numbers of cumulative cases and excess deaths per 100,000 of the population.

Numerous studies have shown that an improving environmental performance index has a positive effect on GDP per capita (Cracolici et al., 2010; Kapitány-Fövény and Sulyok, 2020) quality of life (Gallego-Álvarez et al., 2014; García-Sánchez et al., 2015), labor productivity (Mazzanti and Zoboli, 2009; Bucher, 2017), health (Lannelongue et al., 2017), ease of doing business (Ansari et al., 2019), corruption reduction (Mavragani et al., 2016), human development (Gallego-Álvarez et al., 2014; Maccari, 2014), gender inequality (Abelinde, 2012), happiness (Kaklauskas et al., 2020), education (Agarwal, 2018), and social progress (Saisana and Philippas, 2012). The results derived by these studies emphasize the necessity of improving environmental indices, namely EPI, even after the the threat of the pandemic recedes. Low EPI scores usually characterize less sustainable and successful countries—the same countries that have been hardest hit by COVID-19 excess deaths per 100,000 population.

Annually the death toll attributable to air pollution worldwide is some seven million people. Unfortunately, nearly the entire population worldwide (99%), as per WHO data, is breathing air with pollutant levels that exceed the limits established by WHO guidelines. The highest exposures are suffered by low- and middle-income countries (World Health Organization, 2020). Air pollution dropped during the pandemic. The results obtained by this study show improvements in environmental indicators (EPI and AQI). These results also indicate that the more successful and sustainable countries tend to show better EPI and AQI indicators. In the meantime, the numbers of excess deaths per 100,000 population prove lower. Obviously, the improvement in environmental indicators during the time of the COVID-19 pandemic is a great benefit to health and to the economy. However, in 2020, many of the other indicators of importance of a country's success and sustainability decreased.

The results of this study indicate that strict policies are not superior to policies of informed choices by residents, in terms of controlling COVID-19 excess deaths per 100,000 population. Both of these policies have advantages and disadvantages. The specific conditions of a country during the pandemic determines the effectiveness of such policies. Nov et al. (2021), who analyzed preferences and patterns of reaction to community health throughout COVID-19, have submitted similar conclusions. Analogically, Haug et al. (2020) made an assessment of how well non-pharmaceutical interventions worked, depending on the local context, by employing country-specific, "what-if" scenarios. By conducting an analysis of self-interest (personal freedom) and prosocial (social-level well-being) framed COVID-19 avoidance policies, it was also established that their effectiveness depends on a specific situation (Jordan et al., 2020). The most positive results were achieved during the pandemic under policies which mostly depended on public trust, hand-in-hand with democratic accountability (Grogan, 2020).

The research results indicate that all the alternatives available for managing the pandemic have an array of advantages and disadvantages. None are ideal; therefore compromises are usually necessary. As curtailments have shown to negatively affect the economy, personal earnings, education, and mental health, the government of the UK, for instance, has announced it will cease almost all restrictions meant to stop the spread of COVID–19. The damage to the country has apparently been too great, so the argument is that relaxation is justified. Currently, the rate of infections is nearly the same as it was in February, a year ago, and hospitalizations and deaths are much lower, up to ten times less (Ball, 2021). Nonetheless, if the current rate of infection in the UK was happening elsewhere, the consequences would likely prove to be much worse (Taylor, 2021). Personal autonomy, independence, socializing, and extensive networking are apparently strong needs in certain countries, including Australia, the USA, the UK, Germany, Sweden, Spain, Switzerland, France, and others. However, resisting governmental rules and restrictions seems to be essential to upholding these highly valued democracies (Kapitány-Fövény and Sulyok, 2020).

The recommendation extended here to governments and other interested country institutions is to compile all possible non-medicinal alternatives for intervention. These then require assessment by numerous criteria, as well as in relation to the local context. Upon establishing rational combinations, it will be possible to react appropriately to the ever-changing COVID-19 situation.

The scope of the pandemic changes constantly as does the surrounding micro-, meso-, and macro-environments. Furthermore it is necessary to consider climatic parameters (Javadinejad et al., 2021; Talebmorad et al., 2021). Therefore it is essential to retain joint sustained learning, competence improvement, and an efficient citizenry. Furthermore, research and policy interaction in decision making must be based on the regional situation. Analogical discussions on the influence of interest groups, namely society, businesses, and others on policymaking are becoming more and more active, and not merely in the area of COVID-19. Increasingly, such discussions are actively transferring into issues of environmental sustainability and softening climate change (Fischer et al., 2011).

5. Practical applications and implications

Tylor (1871) states that culture as a term encompasses the norms and social behaviour characteristic to human societies and also the laws, beliefs, capabilities, habits, knowledge, arts, and customs of their individual members. Jackson (2006) believes a cultural norm serves as a guideline, a template for expectations in a social group and determines what conduct is acceptable in society related to demeanour in a situation, behaviour, language, and dress.

A number of authors have focused on the way national cultures are linked to motivation for adaptation to climate change (Noll et al. 2020), corporate carbon performance (Luo and Tang, 2021), corporate green proactivity (Wang et al., 2021), corporate governance, environmental sustainability performance (Peng and Zhang, 2022), and attitude to ecology (Tetyana et al., 2018). They looked at the link between national cultures and stock market volatility levels (Liu, 2019), individual trading behaviour (Tan, Cheong and Zurbruegg, 2019), corporate financial decisions (Kutan et al., 2021), stock markets' reaction to COVID-19 (Ashraf, 2021; Fernandez-Perez et al., 2021), and financial sector development (Khan et al., 2021). Other researchers have highlighted the impact of national cultures on human development by gender (Falguera et al., 2021), corporate governance and corruption (Boateng et al., 2021), e-government development (Kumar et al., 2021), proactive career behaviours and subjective career success (Smale et al., 2019), employee performance (Udin, 2019), employee engagement (Zheng and Tian, 2019), and social relations (Berrell, 2021). Among other topics of analysis are links between national cultures and construction industry (Teravainen et al., 2018), organic farming industry (Manta and Toma, 2020), infrastructure sustainability (Meng et al., 2018), manufacturing competitiveness (Deif and Van Beek, 2019), SME profitability (Gaganis et al., 2019a), SME efficiency (Abbasi et al., 2021), SME participation in Industry 4.0 (Buchholz, 2020), R&D investments (Choi 2020), risk-taking (Gaganis et al. 2019b), firm characteristics and dividend policy (Chang et al. 2020), international business (Moore, 2020), services (Valtakoski et al., 2019; Liyanaarachchi, 2021), and supply chain integration in multiple countries (Liu et al., 2021).

This article presents the implications related to the big picture of the research of CSC Map. To validate the results of this research, however, many more studies in different research fields are needed. This investigation, therefore, includes certain period-reliant factors and a set of specific criteria with specific weights. Future research to assess other periods and contexts will need descriptions comprising more variables with different weights. In addition to their inclusion in upcoming studies, these research findings would also contain additional research areas to prove the results of this multiple criteria analysis by means of the INVAR method (Kaklauskas, 2016) and CSC Map. In this additional analysis, national culture indicators (i.e. traditional values vs. secular-rational values, survival values vs. self-expression values) would be part of integrated multiple criteria analysis of various objects from different areas. The INVAR method (Kaklauskas, 2016) in this case could be used to perform multiple criteria analysis of various alternatives such as corporate carbon performance, corporate green proactivity and environmental sustainability performance, corporate financial decisions, financial sector development, human development by gender, corporate governance and corruption, e-government development, subjective career success, employee performance and engagement, social relations, industries, manufacturing competitiveness, SME profitability, efficiency and participation in Industry 4.0, R&D investments, international business, and services. Our research findings could thus be compared with similar research findings of the authors mentioned above. Like the CSC Map, it would also be possible to map aspects such as choosing foreign markets, global innovation index, carbon dioxide emissions, healthcare, pollution and others.

6. Limitations of the study

Naturally certain limitations and weaknesses are inherent to this study; thus certain improvements are still in order. Considerations required for ongoing study in this field include those next listed:

1. This research covers 169 countries. The accuracy of the CSC Map would improve by including a greater number of countries in the final analysis. A greater number of included countries would better reflect the situation worldwide. Nonetheless, the larger is the system of indicators under deliberation, the fewer will be the number of countries that will incorporate all pertinent indicators.
2. Statistical data are presented on an annual basis. Therefore it is problematic to analyse variations in the CSC Map over a year's period. The statistical data on the sustainability and success of countries, included in this study, cover the year 2020. The data on COVID-19, however, cover the beginning of 2020 up to 2021 December 23. This analysis, regarding the possibility of changes to the CSC Map and models over time, will be continued henceforth.
3. The significances of all the indicators under deliberation for this study were alike (equal to one). It is foreseen to further evaluate the significances of the indicators in the future, striving to achieve more accurate CSC Map and models. Subjective and objective methodologies will be applied in an integrated manner for this purpose, involving the recalculation of the significances of the indicators.
4. Linear regression was applied for this research. For future compilations of CSC Map and models, which would describe the existing situation even more accurately, machine learning and data mining as well as nonlinear, nonparametric, robust and stepwise regression methods are expected to be used.
5. All indicators for a country were applied in this study. However, as known, different regions of the same country are not equally developed. Furthermore there are diverse cultural ethnic communities existing in an array of multicultural countries and cities. Therefore indicators describing different regions of the same country are valued differently. Thus, in the future, the expectation is to develop CSC Map and models for specific multicultural countries by applying different systems of criteria containing different values and significances of criteria.
6. The 2020 Inglehart–Welzel Cultural Map of the World is grounded on the World Values Survey and the European Values Survey. The CSC Map is compiled based on statistical indicators. However, the axes of these maps correlate with one another significantly (Tables 1 and 2). Therefore, in the future, the expectation is to examine the statistical indicators and questionnaires performed at national levels more broadly to establish dependencies among them.
7. Other COVID-19 related indicators, such as testing, hospitalizations, interrelated illnesses, suicides, overdoses and others, are planned for more thorough examinations in the future.
8. Other, not yet applied aspects of the INVAR method will be executed in future practices, striving to present a more exhaustive CSC big picture (Fig. 1). The expected outcome would involve deriving an entire generation of more efficient and more suitable recommendations applicable in COVID-19-related restrictions and preventative measure alternatives.

Future plans additionally involve investigating other COVID-19 indicators like testing, hospitalizations, related illnesses, suicides, and overdoses, among others. In the future, we plan to practically implement other features of the INVAR method, not yet used in this research (Fig. 1).

7. Data sharing

Summary data tables are obtainable in the manuscript and in the Supplementary Materials. The authors can deliver the applied raw data used for obtaining the conclusions in this paper to others upon request.

CRediT authorship contribution statement

A. Kaklauskas: Conceptualization, Data curation, Investigation, Formal analysis, Methodology, Validation, Supervision, Visualization, Writing – original draft. **V. Milevicius:** Formal analysis, Software. **L. Kaklauskiene:** Data curation, Visualization.

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. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.ecolind.2022.108703.

References

Abbasi, K., Alam, A., Du, M.(., Huynh, T.L.D., 2021. FinTech, SME efficiency and national culture: evidence from OECD countries. Technol. Forecast. Soc. Chang. 163, 120454. https://doi.org/10.1016/j.techfore.2020.120454.

Abelinde, C.B., 2012. Human Development and Country Governance as Determinants of Environmental Performance. International Journal of Information Technology and Business Management 7 (1), 44–52.

Agarwal, B., 2018. Gender inequality, cooperation, and environmental sustainability. In: Baland, J.-M., Bardhan, P., Bowles, S. (Eds.), Inequality, Cooperation, and Environmental Sustainability. Princeton University Press, pp. 274–313. https://doi.org/10.2307/j.ctv301grk.14.

Ahmed, F., Ahmed, N., Pissarides, C., Stiglitz, J., 2020. Why inequality could spread COVID-19. The Lancet Public Health 5 (5), e240. https://doi.org/10.1016/S2468-2667(20)30085-2.

Allcott, H., Boxell, L., Conway, J., Gentzkow, M., Thaler, M., Yang, D., 2020. Polarization and public health: Partisan differences in social distancing during the coronavirus pandemic. Journal of Public Economics 191, 104254. https://doi.org/10.1016/j.jpubeco.2020.104254.

Ansari, M., Ehrampoush, M.H., Farzadkia, M., Ahmadi, E., 2019. Dynamic assessment of economic and environmental performance index and generation, composition, environmental and human health risks of hospital solid waste in developing countries; A state of the art of review. Environ. Int. 132, 105073. https://doi.org/10.1016/j.envint.2019.105073.

Anttiroiko, A.-V., 2021. Successful government responses to the pandemic: Contextualizing national and urban responses to the COVID-19 outbreak in east and west. International Journal of E-Planning Research (IJEPR) 10 (2), 1–17. https://doi.org/10.4018/IJEPR.20210401.oa1.

Ashraf, B.N., 2021. Stock markets' reaction to COVID-19: Moderating role of national culture. Finance Research Letters 41, 101857. https://doi.org/10.1016/j.frl.2020.101857.

Ball, P., 2021. Why England's COVID 'freedom day' alarms researchers. Nature 595 (7868), 479–480. https://doi.org/10.1038/d41586-021-01938-4.

Bashir, M.F., Ma, B., Bilal, Komal, B., Bashir, M.A., Tan, D., Bashir, M., 2020. Correlation between climate indicators and COVID-19 pandemic in New York, USA. Sci. Total Environ. 728, 138835. https://doi.org/10.1016/j.scitotenv.2020.138835.

Bedford, J., Enria, D., Giesecke, J., Heymann, D.L., Ihekweazu, C., Kobinger, G., Lane, H. C., Memish, Z., Oh, M.-don., Sall, A.A., Schuchat, A., Ungchusak, K., Wieler, L.H., 2020. COVID-19: towards controlling of a pandemic. The Lancet 395 (10229), 1015–1018. https://doi.org/10.1016/S0140-6736(20)30673-5.

Berrell, M., 2021. National Culture and the Social Relations of Anywhere Working. In Anywhere Working and the Future of Work, IGI Global, pp. 23–59. 10.4018/978-1-7998-4159-3.ch002.

Beugelsdijk, S., Welzel, C., 2018. Dimensions and dynamics of national culture: Synthesizing Hofstede with Inglehart. J. Cross Cult. Psychol. 49 (10), 1469–1505. https://doi.org/10.1177/0022022118798505.

Boateng, A., Wang, Y., Ntim, C., Glaister, K.W., 2021. National culture, corporate governance and corruption: A cross-country analysis. International Journal of Finance & Economics 26 (3), 3852–3874. https://doi.org/10.1002/ijfe.1991.
Brauner, J.M., Mindermann, S., Sharma, M., Johnston, D., Salvatier, J., Gavenčiak, T., Kulveit, J., 2021. Inferring the effectiveness of government interventions against COVID-19. Science 371 (6531). https://doi.org/10.1126/science.abd9338.
Brülhart, M., Klotzbücher, V., Lalive, R., Reich, S.K., 2021. Mental health concerns during the COVID-19 pandemic as revealed by helpline calls. Nature 600 (7887), 121–126. https://doi.org/10.1038/s41586-021-04099-6.
Bucher, S., 2017. Environmental performance as one of the indicators of sustainable development in Asia. J. Environ. Biol. 38 (1), 67–74.
Buchholz, S., 2020. The impact of national culture on SMEs' participation in Industry 4.0: A cross-country analysis.
Chang, M., Chang, B., Dutta, S., 2020. National culture, firm characteristics, and dividend policy. Emerging Markets Finance and Trade 56 (1), 149–163. https://doi.org/10.1080/1540496X.2019.1627518.
Chhokar, J.S., Brodbeck, F.C., House, R.J., 2007. Culture and Leadership across the World: The GLOBE Book of In-Depth Studies of 25 Societies. Lawrence Erlbaum Associates. Mahwah, New Jersey, NJ. 10.4324/9780203936665.
Choi, K.S., 2020. National culture and R&D investments. The European Journal of Finance 26 (6), 500–531. https://doi.org/10.1080/1351847X.2019.1697324.
Chua, A., Rubenfeld, J., 2014. The Triple Package: How Three Unlikely Traits Explain the Rise and Fall of Cultural Groups in America. Penguin Press HC, pp. 53–54.
Cohen, J., Kupferschmidt, K., 2020. Countries test tactics in 'war' against COVID-19. Science 367 (6484). https://doi.org/10.1126/science.367.6484.1287.
Conceição, P., Hall, J., Jahic, A., Kovačević, M.S., Nayyar, S., Ortubia, A., Tapia, H., 2020. COVID-19 and Human Development: Assessing the Crisis. Envisioning the Recovery, United Nations Development Programme.
Coutinho, J.P., 2016. Religiosity in Europe: an index, factors, and clusters of religiosity. Sociologia, Problemas e Práticas 81, 163–188. https://doi.org/10.7458/SPP2016816251.
Cracolici, M.F., Cuffaro, M., Nijkamp, P., 2010. The measurement of economic, social and environmental performance of countries: A novel approach. Soc. Indic. Res. 95 (2), 339–356. https://doi.org/10.1007/S11205-009-9464-3.
Deif, A., Van Beek, M., 2019. National culture insights on manufacturing competitiveness and talent management relationship. Journal of Manufacturing Technology Management 30 (5), 862–875. https://doi.org/10.1108/JMTM-08-2018-0240.
Derakhshandeh-Rishehri, S.M., Heidari-Beni, M., Feizi, A., Askari, G.R., Entezari, M.H., 2014. Effect of honey vinegar syrup on blood sugar and lipid profile in healthy subjects. International journal of preventive medicine 5 (12), 1608.
Dershowiz, A., 1997. The Vanishing American Jew. In Search of Jewish Identity for the Next Century, Hachette p, p. 11.
Desai, H., Forsberg, E., 2020. Multidimensional fragility in 2020. OECD Development Co-operation Working Papers No. 79. https://doi.org/10.1787/22220518.
Desmet, K., Wacziarg, R., 2021. Understanding spatial variation in COVID-19 across the United States. Journal of urban economics 103332. https://doi.org/10.3386/w27329.
Deutsche Bank, 2021. COVID-19: a threat to sustainable development or an opportunity?.
Dias, J.M.de.A., Salgado, E.G., Barbosa, S., Alvarenga, A.D., Lira, J.M.S., 2017. Assessment of the Sustainability of Countries at Worldwide. J. Mgmt. & Sustainability 7 (4), 51. https://doi.org/10.5539/jms.v7n4p51.
Djankov, S., Panizza, U., 2020. COVID-19 in developing economies. Centre for Economic Policy Research. https://doi.org/10.4000/poldev.3455.
Dobewall, H., Strack, M., 2014. Relationship of Inglehart's and Schwartz's value dimensions revisited. International Journal of Psychology 49 (4), 240–248. https://doi.org/10.1002/ijop.12004.
Economist Intelligence Unit, 2021. Democracy Index 2020: In sickness and in health? EIU.com.
Economist, T., 2020. Tracking COVID-19 excess deaths across countries. The Economist.
Economist, T., 2021a. Tracking COVID-19 excess deaths across countries. The Economist. 31. August 2021.
Economist, T., 2021. Tracking COVID-19 excess deaths across countries. The Economist. 22 December 2021.
Ellwanger, J.H., Lekgoathi, M.D.S., Nemani, K., Tarselli, M.A., Al Harraq, A., Uzonyi, A., Brunet, T.D., 2020. News from a postpandemic world. Science 369 (6499), 26–29. https://doi.org/10.1126/science.abd1320.
Evans, J.H., Hargittai, E., 2020. Who doesn't trust Fauci? The public's belief in the expertise and shared values of scientists in the COVID-19 pandemic. Socius 6, 237802312094733. https://doi.org/10.1177/23780231209473.
Fernández, D., Giné-Vázquez, I., Liu, I., Yucel, R., Nai Ruscone, M., Morena, M., García, Víctor.G., Haro, J.M., Pan, W., Tyrovolas, S., 2021. Are environmental pollution and biodiversity levels associated to the spread and mortality of COVID-19? A four-month global analysis. Environmental Pollution 271, 116326. https://doi.org/10.1016/j.envpol.2020.116326.
Fernandez-Perez, A., Gilbert, A., Indriawan, I., Nguyen, N.H., 2021. COVID-19 pandemic and stock market response: A culture effect. Journal of Behavioral and Experimental Finance 29, 100454. https://doi.org/10.1016/j.jbef.2020.100454.
Fincher, C.L., Thornhill, R., Murray, D.R., Schaller, M., 2008. Pathogen prevalence predicts human cross-cultural variability in individualism/collectivism. Proc. R. Soc. B. 275 (1640), 1279–1285.
Fischer, A., Peters, V., Vávra, J., Neebe, M., Megyesi, B., 2011. Energy use, climate change and folk psychology: Does sustainability have a chance? Results from a qualitative study in five European countries. Global Environ. Change 21 (3), 1025–1034. https://doi.org/10.1016/j.gloenvcha.2011.04.008.
Fog, A., 2020. A Test of the Reproducibility of the Clustering of Cultural Variables. Cross-Cultural Research 55 (1), 29–57. https://doi.org/10.1177/1069397120956948.
Fog, A., 2021. A test of the reproducibility of the clustering of cultural variables. Cross-Cultural Research 55 (1), 29–57. https://doi.org/10.1177/1069397120956948.
Fu, H., Hereward, M., MacFeely, S., Me, A., Wilmoth, J., 2020. How COVID-19 is changing the world: A statistical perspective from the Committee for the Coordination of Statistical activities. Statistical Journal of the IAOS (Preprint) 1–10. https://doi.org/10.3233/SJI-200759.
Furceri, D., Loungani, P., Ostry, J.D., Pizzuto, P., 2020. Will COVID-19 affect inequality? Evidence from past pandemics. Covid Economics 12 (1), 138–157.
Gaganis, C., Hasan, I., Papadimitri, P., Tasiou, M., 2019a. National culture and risk-taking: Evidence from the insurance industry. Journal of Business Research 97, 104–116. https://doi.org/10.1016/j.jbusres.2018.12.037.
Gaganis, C., Pasiouras, F., Voulgari, F., 2019b. Culture, business environment and SMEs' profitability: Evidence from European Countries. Econ. Model. 78, 275–292. https://doi.org/10.1016/j.econmod.2018.09.023.
Gallego-Álvarez, I., Vicente-Galindo, M., Galindo-Villardón, M., Rodríguez-Rosa, M., 2014. Environmental performance in countries worldwide: Determinant factors and multivariate analysis. Sustainability 6 (11), 7807–7832. https://doi.org/10.3390/su6117807.
García-Sánchez, I.M., das Neves Almeida, T.A., de Barros Camara, R.P., 2015. A proposal for a Composite Index of Environmental Performance (CIEP) for countries. Ecol. Ind. 48, 171–188. https://doi.org/10.1016/j.ecolind.2014.08.004.
Gouveia, V.V., Ros, M., 2000. Hofstede and Schwartz s models for classifying individualism at the cultural level: their relation to macro-social and macro-economic variables. Psicothema 12 (Su1), 25–33.
Grogan, J., 2020. States of emergency. European Journal of Law Reform 22 (4), 339. https://doi.org/10.5553/EJLR/138723702021022004002.
Haller, M., 2003. Class structure in Europe. ME Sharpe. United Nations. Department of Economic and Social Affairs. Economic Analysis Vol. 5. https://doi.org/10.4324/9781315489698.
Harris, M., Bhatti, Y., Buckley, J., Sharma, D., 2020. Fast and frugal innovations in response to the COVID-19 pandemic. Nat. Med. 26 (6), 814–817. https://doi.org/10.1038/s41591-020-0889-1.
Haug, N., Geyrhofer, L., Londei, A., Dervic, E., Desvars-Larrive, A., Loreto, V., Klimek, P., 2020. Ranking the effectiveness of worldwide COVID-19 government interventions. Nat. Hum. Behav. 4 (12), 1303–1312. https://doi.org/10.1038/s41562-020-01009-0.
Heath, R., Jin, B., 2020. Ranking the global impact of the coronavirus pandemic, country by country. By RYAN HEATH and BEATRICE JIN (05/21/2020 2:44 PM EDT.
Helliwell, J.F., Layard, R., Sachs, J., De Neve, J.E., 2021. World happiness report 2021.
Hofstede, G., 1986. Cultural differences in teaching and learning. International Journal of intercultural relations 10 (3), 301–320. https://doi.org/10.1016/0147-1767(86)90015-5.
Hofstede, G., 2001. Culture's Consequences: Comparing Values, Behaviors, Institutions, and Organizations across Nations, 2nd ed. Sage, Thousand Oaks, CA, p. 261.
Hsu, S.Y., Woodside, A.G., Marshall, R., 2013. Critical tests of multiple theories of cultures' consequences: Comparing the usefulness of models by Hofstede, Inglehart and Baker, Schwartz, Steenkamp, as well as GDP and distance for explaining overseas tourism behavior. Journal of Travel Research 52 (6), 679–704. https://doi.org/10.1177/0047287512475218.
Hueting, R., Reijnders, L., 2004. Broad sustainability contra sustainability: the proper construction of sustainability indicators. Ecol. Econ. 50 (3–4), 249–260. https://doi.org/10.1016/j.ecolecon.2004.03.031.
Inglehart, R., 1997, Modernization and postmodernization: Cultural, economic and political change in 43 societies. Princeton, NJ: Princeton University Press. 10.2307/j.ctv10vm2ns.
Inglehart, R., 2018. Cultural evolution: Peoples motivations are changing and reshaping the world. Cambridge University Press. https://doi.org/10.1017/9781108613880.
Inglehart, R., 2021. World Cultural Map–World Values Survey.
Inglehart, R., Welze, C., 2010. The WVS cultural map of the world. World Values Survey.
Inglehart, R., Welzel, C., 2005. Modernization, Cultural Change and Democracy: The Human Development Sequence. New York, Cambridge University Press.
Jackson, Y. (Ed.), 2006. Encyclopedia of multicultural psychology. Sage Publications p. 203. 10.4135/9781412952668.
Jarynowski, A., Wójta-Kempa, M., Płatek, D., Belik, V., 2020. Social values are significant factors in control of COVID-19 pandemic–preliminary results.
Javadinejad, S., Eslamian, S., Ostad-Ali-Askari, K., 2021. The analysis of the most important climatic parameters affecting performance of crop variability in a changing climate. International journal of hydrology science and technology 11 (1), 1–25. https://doi.org/10.1504/IJHST.2021.112651.
Jinfo, 2013. Jewish Recipients of the John Bates Clark Medal in Economics. Accessed 21 June 2020. http://www.jinfo.org/Clark_Economics.html.
Jordan, J., Yoeli, E., Rand, D., 2020. Don't get it or don't spread it? Comparing self-interested versus prosocially framed COVID-19 prevention messaging. PsyArXiv 10.
Kaasa, A., 2021. Merging Hofstede, Schwartz, and Inglehart into a Single System. J. Cross Cult. Psychol. 52 (4), 339–353. https://doi.org/10.1177/00220221211011244.
Kaklauskas, A., 2016. Degree of project utility and investment value assessments. International Journal of Computers Communications & Control 11 (5), 666–683. 10.15837/ijccc.2016.5.2679.
Kaklauskas, A., Herrera-Viedma, E., Echenique, V., Zavadskas, E.K., Ubarte, I., Mostert, A., Podviezko, A., 2018. Multiple criteria analysis of environmental sustainability and quality of life in post-Soviet states. Ecol. Ind. 89, 781–807. https://doi.org/10.1016/j.ecolind.2017.12.070.
Kaklauskas, A., Dias, W.P.S., Binkyte-Veliene, A., Abraham, A., Ubarte, I., Randil, O.P.C., Puust, R., 2020. Are environmental sustainability and happiness the keys to

prosperity in Asian nations? Ecol. Ind. 119, 106562 https://doi.org/10.1016/j.ecolind.2020.106562.
Kapitány-Fövény, M., Sulyok, M., 2020. Social markers of a pandemic: modeling the association between cultural norms and COVID-19 spread data. Humanities and Social Sciences Communications 7 (1), 1–9. https://doi.org/10.1057/s41599-020-00590-z.
Khan, M.A., Gu, L., Khan, M.A., Meyer, N., 2021. The effects of national culture on financial sector development: Evidence from emerging and developing economies. Borsa Istanbul Review. https://doi.org/10.1016/j.bir.2021.02.003.
Kumar, S., Baishya, K., Sreen, N., Sadarangani, P.H., Samalia, H.V., 2021. Impact of national culture on E-government development: a longitudinal study. Journal of Global Information Management (JGIM) 29 (2), 1–22. https://doi.org/10.4018/JGIM.2021030101.
Kutan, A., Laique, U., Qureshi, F., Rehman, I.U., Shahzad, F., 2021. A survey on national culture and corporate financial decisions: current status and future research. International Journal of Emerging Markets 16 (7). https://doi.org/10.1108/IJOEM-12-2019-1050.
Lampert, M., Inglehart, R., Metaal, S., Schoemaker, H., Papadongonas, P., 2021. Covid Pandemic Ignites Fear, but Boosts Progressive Ideals and Calls for Inclusive Economic Growth, Measuring the Pandemic's Impact on Social Values, Emotions and Priorities in 24 Countries. Glocalities. 23. February 2021.
Lannelongue, G., Gonzalez-Benito, J., Quiroz, I., 2017. Environmental management and labour productivity: The moderating role of capital intensity. J. Environ. Manage. 190, 158–169. https://doi.org/10.1016/j.jenvman.2016.11.051.
Lenton, T.M., Boulton, C.A., Scheffer, M., 2021. Trust boosts recovery of countries from COVID-19. medRxiv.
Levin, A.T., Hanage, W.P., Owusu-Boaitey, N., Cochran, K.B., Walsh, S.P., Meyerowitz-Katz, G., 2020. Assessing the age specificity of infection fatality rates for COVID-19: Systematic review, meta-analysis, and public policy implications. Eur. J. Epidemiol. 35, 1123–1138. https://doi.org/10.1007/S10654-020-00698-1.
Li, L.M.W., Bond, M.H., 2010. Value change: Analyzing national change in citizen secularism across four time periods in the World Values Survey. The Social Science Journal 47 (2), 294–306. https://doi.org/10.1016/j.soscij.2009.12.004.
Liyanaarachchi, G., 2021. Managing privacy paradox through national culture: Reshaping online retailing strategy. Journal of Retailing and Consumer Services 60, 102500. https://doi.org/10.1016/j.jretconser.2021.102500.
Liu, K., He, M., Zhuang, Z., He, D., Li, H., 2020. Unexpected positive correlation between human development index and risk of infections and deaths of COVID-19 in Italy. One Health 10, 100174. https://doi.org/10.1016/j.onehlt.2020.100174.
Liu, S., Tan, J., Mao, H., Gong, Y., 2021. Does national culture matter? Understanding the impact of supply chain integration in multiple countries. Supply Chain Management: An International Journal. https://doi.org/10.1108/SCM-03-2020-0099.
Liu, W.H., 2019. National culture effects on stock market volatility level. Empirical Economics 57 (4), 1229–1253. https://doi.org/10.1007/s00181-018-1502-z.
Loayza, N.V., Pennings, S., 2020. Macroeconomic policy in the time of COVID-19: A primer for developing countries. World Bank Research and Policy Briefs 147291.
Luo, L., Tang, Q., 2021. National culture and corporate carbon performance. Australian Journal of Management 03128962211038664. https://doi.org/10.1177/03128962211038664.
Maaravi, Y., Levy, A., Gur, T., Confino, D., Segal, S., 2021. The tragedy of the commons: How individualism and collectivism affected the spread of the COVID-19 pandemic. Front. Public Health 9, 37. https://doi.org/10.3389/fpubh.2021.627559.
Maccari, N., 2014. Environmental Sustainability and Human Development: A Greening of Human Development Index. March 15 2014. Available at SSRN: https://ssrn.com/abstract=2426073 or 10.2139/ssrn.2426073.
Mavragani, A., Nikolaou, I.E., Tsagarakis, K.P., 2016. Open economy, institutional quality, and environmental performance: A macroeconomic approach. Sustainability 8 (7), 601. https://doi.org/10.3390/su8070601.
Manta, F., Toma, P., 2020. Sustainability and national culture: evidence from organic farming industry. In: In 10th INTERNATIONAL SYMPOSIUM ON NATURAL RESOURCES MANAGEMENT, pp. 154–161.
Mazzanti, M., Zoboli, R., 2009. Environmental efficiency and labour productivity: Trade-off or joint dynamics? A theoretical investigation and empirical evidence from Italy using NAMEA. Ecol. Econ. 68 (4), 1182–1194. https://doi.org/10.1016/j.ecolecon.2008.08.009.
McIntosh, W.A., Thomas, J.K., 2004. Economic and other societal determinants of the prevalence of HIV: A test of competing hypotheses. Sociological Quarterly 45 (2), 303–324. https://doi.org/10.1111/j.1533-8525.2004.tb00014.x.
Meng, J., Yan, J., Xue, B., 2018. Exploring relationships between national culture and infrastructure sustainability using QCA. Journal of Construction Engineering and Management 144 (9), 04018082. https://doi.org/10.1061/(ASCE)CO.1943-7862.0001463.
Messner, W., 2020.The institutional and cultural context of cross-national variation in COVID-19 outbreaks. medRxiv.
Moldan, B., Janoušková, S., Hák, T., 2012. How to understand and measure environmental sustainability: Indicators and targets. Ecol. Ind. 17, 4–13. https://doi.org/10.1016/j.ecolind.2011.04.033.
Moore, F., 2020. Multiple interpretations of "national culture" and the implications for International business: The case of Taiwan. Journal of World Business 55 (5), 101128. https://doi.org/10.1016/j.jwb.2020.101128.
Mormina, M., Nsofor, I.M., 2020. What developing countries can teach us about how to respond to a pandemic. The Conversation Trust (UK) Limited.
Moti, U.G., Ter Goon D., 2020. Novel Coronavirus Disease: A delicate balancing act between health and the economy. Pakistan journal of medical sciences 36 (COVID19-S4), S134. 10.12669/pjms.36.COVID19-S4.2751.
Mulki, J.P., Caemmerer, B., Heggde, G.S., 2015. Leadership style, salesperson's work effort and job 268 performance: The influence of power distance. J Pers Sell Sales Manag. 35 (1), 3–22. https://doi.org/10.1080/08853134.2014.958157.
Mundial, B., 2021. Doing Business 2020. Washington, DC: World Bank, DOI 10, 978–981.
Nilashi, M., Rupani, P.F., Rupani, M.M., Kamyab, H., Shao, W., Ahmadi, H., Aljojo, N., 2019. Measuring sustainability through ecological sustainability and human sustainability: A machine learning approach. J. Cleaner Prod. 240, 118162 https://doi.org/10.1016/j.jclepro.2019.118162.
Noll, B., Filatova, T., Need, A., 2020. How does private adaptation motivation to climate change vary across cultures? Evidence from a meta-analysis. Int. J. Disaster Risk Reduct. 46, 101615 https://doi.org/10.1016/j.ijdrr.2020.101615.
Nordt, C., Warnke, I., Seifritz, E., Kawohl, W., 2015. Modelling suicide and unemployment: a longitudinal analysis covering 63 countries, 2000–11. The Lancet Psychiatry 2 (3), 239–245. https://doi.org/10.1016/S2215-0366(14)00118-7.
Nov, O., Dove, G., Balestra, M., Lawrence, K., Mann, D., Wiesenfeld, B., 2021. Preferences and patterns of response to public health advice during the COVID-19 pandemic. Sci. Rep. 11 (1), 1–7. https://doi.org/10.1038/s41598-021-01186-6.
Ostad-Ali-Askari, K., Shayannejad, M., Ghorbanizadeh-Kharazi, H., 2017. Artificial Neural Network for Modeling Nitrate Pollution of Groundwater in Marginal Area of Zayandeh-Rood River, Isfahan. Iran. KSCE Journal of Civil Engineering, Korean Society of Civil Engineers 21 (1), 134–140. https://doi.org/10.1007/s12205-016-0572-8.
Ostad-Ali-Askari, K., Shayannejad, M., 2021. Quantity and quality modelling of groundwater to manage water resources in Isfahan-Borkhar Aquifer. Environ. Dev. Sustain. 23 (11), 15943–15959. https://doi.org/10.1007/s10668-021-01323-1.
Peng, X., Zhang, R., 2022. Corporate governance, environmental sustainability performance, and normative isomorphic force of national culture. Environ. Sci. Pollut. Res. 1–31 https://doi.org/10.1007/s11356-022-18603-6.
Pereira Sartori Falguera, F., Lima, M.A., Ferrari, V.A., Barriga, G.D., Mariano, E.B., 2021. Human Development by Gender and National Culture: A Comparative Analysis. The Journal of Development Studies 57 (9), 1549–1570. https://doi.org/10.1080/00220388.2021.1919632.
Phillis, Y.A., Grigoroudis, E., Kouikoglou, V.S., 2011. Sustainability ranking and improvement of countries. Ecol. Econ. 70 (3), 542–553. https://doi.org/10.1016/j.ecolecon.2010.09.037.
Ren, X., Fang, H., 2016. In: A Study on Classification of Sustainable and Unsustainable Countries. Atlantis Press, pp. 79–82. https://doi.org/10.2991/amsm-16.2016.19.
Roper, W., 2020. Science, politics, and public health. Science 370 (6515). https://doi.org/10.1126/science.abf2837.
Rosén, M., Stenbeck, M., 2020. Interventions to suppress the coronavirus pandemic will increase unemployment and lead to many premature deaths. Scandinavian Journal of Public Health 1403494820947974. https://doi.org/10.1177/1403494820947974.
Saisana, M., Philippas, D., 2012. Sustainable Society Index (SSI): Taking societies' pulse along social, environmental and economic issues. Environ. Impact Assess. Rev. 32, 94–106.
Sajadi, M.M., Habibzadeh, P., Vintzileos, A., Shokouhi, S., Miralles-Wilhelm, F., Amoroso, A., 2020. Temperature, humidity, and latitude analysis to estimate potential spread and seasonality of coronavirus disease 2019 (COVID-19). JAMA network open 3 (6), e2011834. https://doi.org/10.1001/jamanetworkopen.2020.11834.
Schell, C.J., Dyson, K., Fuentes, T.L., Des Roches, S., Harris, N.C., Miller, D.S., Lambert, M.R., 2020. The ecological and evolutionary consequences of systemic racism in urban environments. Science 369 (6510). https://doi.org/10.1126/science.aay4497.
Schwartz, S.H., 1999. A theory of cultural values and some implications for work. Appl. Psychol. 48 (1), 23–47. https://doi.org/10.1111/j.1464-0597.1999.tb00047.x.
Schwartz, S.H., Ros, M., 1995. Values in the West: A theoretical and empirical challenge to the individualism-collectivism cultural dimension. World psychology 1 (2), 91–122.
Smale, A., Bagdadli, S., Cotton, R., Dello Russo, S., Dickmann, M., Dysvik, A., Unite, J., 2019. Proactive career behaviors and subjective career success: The moderating role of national culture. Journal of Organizational Behavior 40 (1), 105–122. https://doi.org/10.1002/job.2316.
Solomon, T., Lewthwaite, P., Perera, D., Cardosa, M.J., McMinn, P., Ooi, M.H., 2010. Virology, epidemiology, pathogenesis, and control of enterovirus 71. The Lancet Infectious Diseases 281 10 (11), 778–790. https://doi.org/10.1016/S1473-3099(10)70194-8.
Soper, G.A., 1919. The lessons of the pandemic. Science 49, 501–506. https://doi.org/10.4324/9781315254227-15.
Steenkamp, J.B.E., Geyskens, I., 2012. Transaction cost economics and the roles of national culture: a test of hypotheses based on Inglehart and Hofstede. J. Acad. Mark. Sci. 40 (2), 252–270. https://doi.org/10.1007/S11747-011-0266-1.
Steenkamp, J.B.E.M., 2001. The Role of National Culture in International Marketing Research. International Marketing Review 18 (1), 30–44. https://doi.org/10.1108/02651330110381970.
Stockmaier, S., Stroeymeyt, N., Shattuck, E.C., Hawley, D.M., Meyers, L.A., Bolnick, D.I., 2021. Infectious diseases and social distancing in nature. Science 371 (6533). https://doi.org/10.1126/science.abc8881.
Suh, J., Horvitz, E., White, R.W., Althoff, T., 2021. Population-scale study of human needs during the COVID-19 pandemic: Analysis and implications. In: In Proceedings of the 14th ACM International Conference on Web Search and Data Mining, pp. 4–12. https://doi.org/10.1145/3437963.3441788.
Taylor, L., 2021. Why scientists worldwide are watching UK COVID infections. Nature 599 (7884), 189–190. https://doi.org/10.1038/d41586-021-03003-6.

Tan, G., Cheong, C.S., Zurbruegg, R., 2019. National culture and individual trading behavior. J. Bank. Finance 106, 357–370. https://doi.org/10.1016/j.jbankfin.2019.07.007.
Tan, Y., Shuai, C., Jiao, L., Shen, L., 2017. An adaptive neuro-fuzzy inference system (ANFIS) approach for measuring country sustainability performance. Environ. Impact Assess. Rev. 65, 29–40. https://doi.org/10.1016/j.eiar.2017.04.004.
Talebmorad, H., Abedi-Koupai, J., Eslamian, S., Mousavi, S.F., Akhavan, S., Ostad-Ali-Askari, K., Singh, V.P., 2021. Evaluation of the impact of climate change on reference crop evapotranspiration in Hamedan-Bahar plain. International Journal of Hydrology Science and Technology 11 (3), 333–347. https://doi.org/10.1504/IJHST.2021.114554.
Teravainen, V., Junnonen, J.M., Ali-Loytty, S., 2018. Organizational culture: Case of the Finnish construction industry. Construction Economics and Building 18 (1), 48–69. https://doi.org/10.5130/AJCEB.v18i1.5770.
Tetyana, B., Batkhuu, G., Tetyana, L., 2018. National culture and attitude to ecology: on the example of Ukraine and Mongolia. Int. J. Environ. Technol. Manage. 21 (5–6), 340–353. https://doi.org/10.1504/IJETM.2018.100582.
The World Factbook, 2021. Central Intelligence Agency.
Tylor, E.B., 1871. Primitive culture: Researches into the development of mythology, philosophy, religion, art and custom Vol.2. J. Murray, 426 p.
Udin, U., 2019. National Culture, Affective Commitment, and Employee Performance: An Integrated Review and Call for Future Research Agenda. Journal of Research and Opinion 6 (10), 2502–2509. https://doi.org/10.15520/jro.v6i10.27.
Valtakoski, A., Reynoso, J., Maranto, D., Edvardsson, B., Cabrera, E.M., 2019. Cross-country differences in new service development: The moderating effects of national culture. Journal of Service Management. https://doi.org/10.1108/JOSM-05-2018-0134.
Van de Kerk, G., Manuel, A.R., 2008. A comprehensive index for a sustainable society: The SSI—the Sustainable Society Index. Ecol. Econ. 66 (2–3), 228–242. https://doi.org/10.1016/j.ecolecon.2008.01.029.
Van Dorn, A., Cooney, R.E., Sabin, M.L., 2020. COVID-19 exacerbating inequalities in the US. The Lancet (London, England) 395 (10232), 1243. https://doi.org/10.1016/S0140-6736(20)30893-X.
Wade, L., 2020. From Black Death to fatal flu, past pandemics show why people on the margins suffer most. Science. https://doi.org/10.1126/science.abc7832.
Wang, H., Guo, T., Tang, Q., 2021. The effect of national culture on corporate green proactivity. Journal of Business Research 131, 140–150. https://doi.org/10.1016/j.jbusres.2021.03.023.
Welzel, C., 2013. Freedom Rising. Cambridge University Press, Human Empowerment and the Quest for Emancipation.
Wendling, Z.A., Emerson, J.W., de Sherbinin, A., Esty, D.C., et al., 2020. 2020 Environmental Performance Index. Yale Center for Environmental Law & Policy.epi.yale.edu, New Haven, CT.
Whiteley, P., Clarke, H.D., Stewart, M., 2020. If health equals happiness, will coronavirus make the world an unhappier place? The Conversation Trust (UK) Limited.
World Bank, 2020. The global economic outlook during the COVID-19 pandemic: A changed world. World Bank Feature Story.
World Health Organization, 2020. Air Pollution. Accessed 20 May 2020. https://go.nature.com/38fFWTb.
World Health Organization, 2021. COVID-19 weekly epidemiological update. 28 March 2021.
World Health Organization, 2021. COVID-19 weekly epidemiological update. 23 December 2021.
Wu, X., Nethery, R.C., Sabath, M.B., Braun, D., Dominici, F., 2020. Air pollution and COVID-19 mortality in the United States: Strengths and limitations of an ecological regression analysis. Sci. Adv. 6 (45), p.eabd4049. https://doi.org/10.1126/sciadv.abd4049.
Zavadskas, E.K., Kaklauskas, A., Sarka, V., 1994. The new method of multi-criteria complex proportional assessment of projects. Technol. Econ. Dev. Econ. 3, 131–139.
Zheng, M.M., Tian, V.I., 2019. Empowerment across Cultures: How National Culture Affects Structural and Psychological Empowerment and Employee Engagement. Journal of Marketing Development & Competitiveness 13 (3). https://doi.org/10.33423/jmdc.v13i3.2245.