

1 Life before COVID-19: how was the World actually performing?

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The COVID-19 pandemic has suddenly and deeply changed our lives in a way comparable with the most traumatic events in history, such as a World war. With millions of people infected around the World and already thousands of deaths, there is still a great uncertainty on the actual evolution of the crisis, as well as on the possible post-crisis scenarios, which depend on a number of key variables and factors (e.g. a treatment, a vaccine or some kind of immunity). Despite the optimism enforced by the positive results recently achieved to produce a vaccine, uncertainty is probably still somehow the predominant feeling. From a more philosophical perspective, the COVID-19 drama is also a kind of stress-test for our global system and, probably, an opportunity to reconsider some aspects underpinning it, as well as its sustainability. In this article we focus on the pre-crisis situation by combining a number of selected global indicators that are likely to represent measures of different aspects of life. How was the World actually performing? We have defined 6 macro-categories and inferred their relevance from different sources. Results show that economic-oriented priorities correspond to positive performances, while all other distributions point to a negative performance. Additionally, balanced and economy-focused distributions of weights propose an optimistic interpretation of performance regardless of the absolute score.

Keywords: Sustainability, Global Indicators, Multi-Criteria Decision Analysis

1 Introduction

The unpredictable and overwhelming COVID-19 pandemic has completely and radically changed our lives and lifestyle in a way comparable with the most traumatic events in history, such as a World war. With millions of people infected around the World and already thousands of deaths [18], there is still a great uncertainty on the actual evolving of the crisis, as well as on the possible post-crisis scenarios, which depend on a number of key variables and factors (e.g. a treatment [20], a vaccine [29] or some kind of immunity [43]). Despite the optimism enforced by the positive results recently achieved to produce a vaccine, uncertainty is probably still somehow the predominant feeling [15].

The whole scientific community is currently committed to face the challenging situation and to provide solutions and mitigation plans as a response to the complex dynamics at different levels. Indeed, the actual impact of COVID-19 on the different aspects of life (e.g. socio-economic [13], environmental [16] and psychological [21]) is still not completely clear. Even relatively obvious or largely predictable macro-effects, such as a huge economic recession, present great elements of uncertainty at the moment [11]. Additionally, a large number of studies have been conducted to explore the role of different factors (e.g. temperature [27] and air pollution [19]).

From a more philosophical perspective, the COVID-19 drama is also a kind of stress-test for our system and, probably, an opportunity to reconsider some aspects underpinning it, as well as its sustainability [32]. However, in order to re-design the World and our lives accordingly, we should first of all fully understand them. We definitely recognise the importance of cultural factors, opinions, personal values and beliefs. At the same time, we believe that it would be valuable to understand global performance in a data-driven and relatively systematic way.

In this article we focus on the pre-crisis situation by combining a number of selected global indicators to represent macro-categories that are likely to represent measures of different aspects of life: *how was the World actually performing before pandemic?*

We believe that answering the previously stated research question by adopting a relatively unbiased and customizable analysis framework can first of all (i) contribute to have a concise understanding of global development evolution and its priorities in the pre-pandemic period; additionally, it should (ii) facilitate a better holistic understanding of the post-pandemic scenario; last but not least, (iii) a similar approach can be adopted to estimate and analyse more specific aspects (e.g. global or country resilience to pandemic).

Previous work and background This paper is based on the method proposed in [33] which adopts a Multi-Criteria Decision Analysis (MCDA) philosophy [26] [42]. That paper focuses on the method in itself, which is explained in detail and applied to a number of examples using real data. This work is conceptually different and addresses the result, as the method previously defined has been applied to concretely measure global performance from heterogeneous criteria with emphasis on sustainable development [25]. The idea of indices in such an area (e.g. [14] [41] [12]) is a well consolidated concept. Furthermore, many studies explicitly focus on underlying correlations (e.g. [41] [40]).

As discussed later on in the paper, the original method has been slightly modified for this concrete application: on one side, the definition of the categories and their relation with numerical indicators has been

59 simplified (see section 3.1); on the other side, some extension has been provided in the weighting phase to
 60 better model the trade-offs existing among the different aspects considered (see section 4.1). Last but not
 61 least, the interpretation of computations has been better formalised (see section 5).

62 **Structure of the paper** This introductory part is followed by a detailed description of the research method-
 63 ology. Each of the three phases identified in the methodological section is object of one of the core sections
 64 which deal, respectively, with the selection of criteria (Section 3), the weighting of such criteria (Section 4) and
 65 the performance analysis based on the resulting computations (Section 5). The paper finishes with a typical
 66 conclusions and future work section.

67 2 Methodology and approach

68 The methodology adopted in this study is summarised in concept in Figure 1. The target system is modelled
 69 by selecting a number of categorised indicators, which are global indicators in this study. The model also
 70 assumes weights and semantics associated with indicators and it's the input for the computational method [33].
 71 Interpretations are based on both qualitative and quantitative metrics. The three main seamless phases are
 72 briefly discussed in this section both with key design decisions, possible biases and uncertainties.

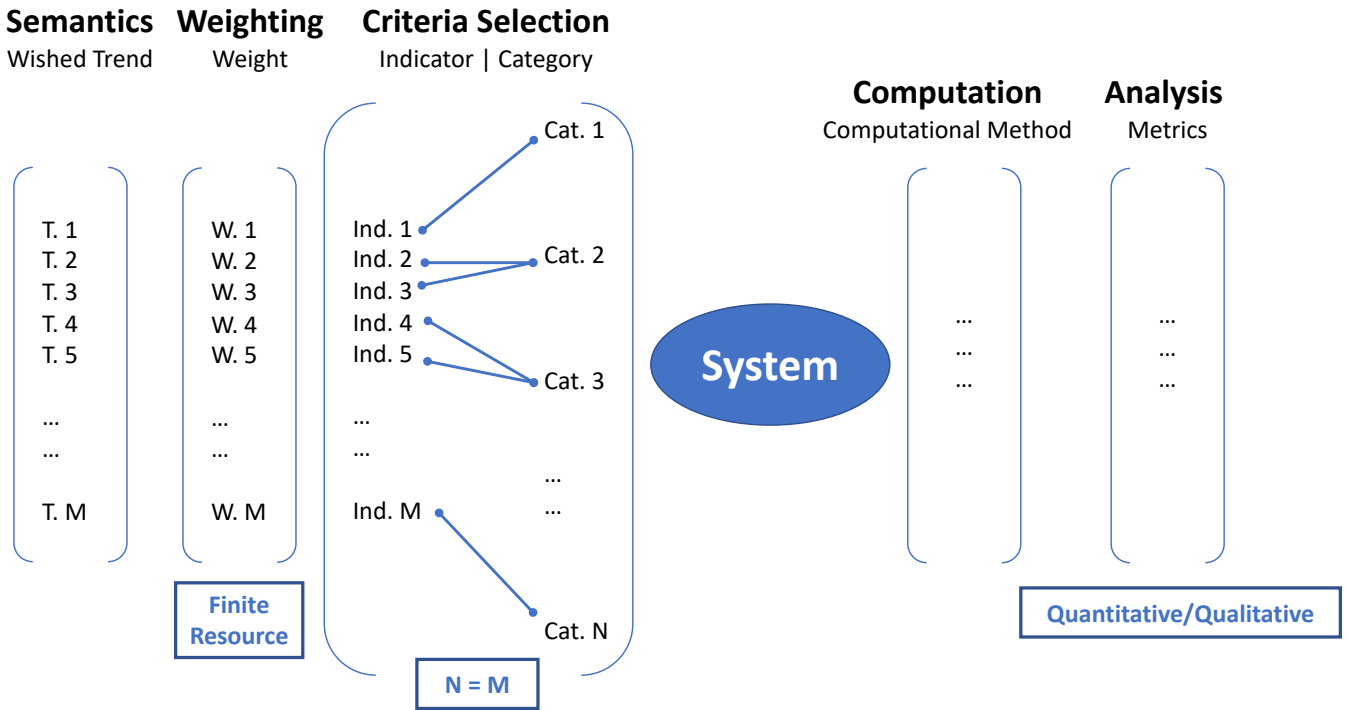


Figure 1: Method in concept. The target system is modelled by a number of categorised indicators and by the weights and the semantics associated. Such a model is the input for the computational method. Results are analysed by adopting qualitative and quantitative metrics.

73 **Criteria selection: macro-categories and representative indicators** The normal approach (adopted
 74 also in previous work [33] as well as by many reputable studies and publications, such as *Our World in Data* [2])
 75 is to group the different indicators in classes which represent, therefore, an abstracted categorization of the
 76 considered indicators. It is very useful, especially considering the great availability of data, dependencies and
 77 the need to consider multiple aspects together.

78 In the context of this work, we have defined a number of categories of interest, each one represented by
 79 one single indicator that should be chosen to effectively characterise the target category. In terms of model
 80 (Figure 1), given M categories and N indicators, we are assuming $N = M$ and cardinality $1 : 1$. Such a
 81 simplification allows an easier weighting and modelling within the method adopted [33]. We are assuming the
 82 definition of categories and the selection of representative indicators as an intrinsic bias, which is referred to as
 83 *selection bias*. Additionally, as the different indicators are expressed by different units and scales which don't

84 necessarily reflect their relevance in the resulting system or model, we assume a second kind of bias called
85 *numerical bias*. The latter will be further discussed in Section 3.1.

86 **Weighting** Weighting the target categories or indicators is a critical step. Indeed, while indicators themselves
87 may be considered objective measures, their weighting should reflect the different relevance/importance of the
88 various criteria in the context of the considered system or model. Weights may be estimated in different ways.
89 For instance, they may reflect the opinions within a given group or community, normally elicited by surveys
90 or interviews. Alternatively, weights may be inferred by capturing input parameters by the users of tools that
91 adopt the method [33]. Either ways, to be relevant, the weighting should be based on a significant number of
92 samples. Moreover, in general, survey/interview defines a static approach as it is based on a concrete selection
93 of indicators. Changing indicators implies the need to re-estimate weights. Such a process is very demanding
94 and definitely it is not agile.

95 In this study we have adopted a more pragmatic and, at the same time, flexible approach to establish
96 weights that are inferred by analysing reports on global priorities, issues or challenges. Although, due to the
97 different intent and extent of the selected reports, it is not possible to define a systematic method to infer
98 weights, this approach assures weighting according to different foci and perspectives. As proposed later on in
99 the paper, the analysis of different reports leads to weight configurations that may vary very much from each
100 other.

101 Last but not least, unlike in the original method, in this work we assume *finite resource* for weighting to
102 better model the trade-offs raising in a limited resource world (see Section 4).

103 **Computation and analysis** The final step is the computation of the results based on the input as defined in
104 the two previous phases. The computational method should support the systematic combination of heteroge-
105 neous indicators and associated semantics, measure uncertainty and biases, as well as provide a framework for
106 the interpretation of results. Results based on the application of the original method [33] with the modifications
107 previously explained are discussed in Section 5.

108 3 Categories and indicators

109 The very first logical step of the study assumes the definition of macro-categories and the consequent selection
110 of representative indicators. Such a step is described in the following subsection, while section 3.2 deals with
111 numerical bias and its minimization.

112 3.1 Categories

113 Inspired by *Our World in Data* [2], we have defined our own marco-categories (summary in Table 1) reflecting
114 different aspects of life as follows:

- 115 • **Environment/Sustainability.** Several indicators might represent this macro-category as either global
116 environmental measures (e.g. temperature anomaly or CO2 emissions) or indicators in sub-categories (e.g.
117 energy) potentially express the performance trend. In the context of this work, we consider *temperature*
118 *anomaly* [4] [31] [36] as a representative indicator which we want, evidently, to decrease.
- 119 • **Health / Demographic Change.** *Life expectancy* [35] [10] [30] has been selected to represent this
120 macro-category. Indeed, an increasing life expectancy reflects, normally, an improved healthcare, as
121 well as it implies population increasing. In terms of wished trend, we want life expectancy to increase,
122 although an higher population may have negative implications in terms of global sustainability.
- 123 • **Economy.** It is represented by the classic *GDP per capita* [7] [38], as more sophisticated indicators
124 (e.g. Economic Complexity Index [24]) are normally understood at a country level and might be not very
125 indicative if considered globally. The GDP represents somehow an economical model that assumes never
126 ending growing. The impact of the COVID-19 pandemic on global economy is expected to be much more
127 consistent than in recent crisis [28] and to be comparable with the second World war.
- 128 • **Poverty / Inequality.** We consider that the number of *people living in extreme poverty* [39] [34] is
129 the ideal measure to properly integrate economic indicators that express a generic increasing well-being
130 by introducing the concept of inequality. Although we recognise an intrinsic interdependency, we prefer
131 to keep this category separated from the previous one as we want to be able to differentiate ideas and

concerns related to the economic growth in itself from the others that explicitly address poverty and inequality.

- **Human Rights / Freedom.** By considering democracy as one of the most relevant achievements of all times, we believe that the *number of people living in democracy* [37] may be an effective representative for human rights and, more in general, freedom. Indeed, we consider democracy as a condition necessary (although not always sufficient) to create a socio-political environment in which individual freedom and human rights are likely to be fully respected.
- **Violence / Instability.** The selection of a single indicator to express violence and instability in general terms is not easy. Looking at recent happenings, we consider that measures related to *terrorism* [1] [23] may be a very reasonable choice. From one side, it's not always easy to understand terrorism and classify terrorist attacks according to the same criteria worldwide. However, a clear definition for terrorism and a number of unanimously recognised principles currently exist [23]. Terrorism is normally generated by situations of war or local conflict and it definitely causes uncertainty, violence and instability.

Category	Representative Indicator	Wished Trend (indicator)
<i>Environment/Sustainability</i>	Temperature Anomaly	DECREASING
<i>Health/Demographic Change</i>	Life Expectancy	INCREASING
<i>Economy</i>	GDP x capita	INCREASING
<i>Poverty/Inequality</i>	People living in extreme poverty	DECREASING
<i>Human Rights/Freedom</i>	People living in democracy	INCREASING
<i>Violence/Instability</i>	Deaths from terrorism	DECREASING

Table 1: Summary of the criteria considered in this study. Each criterion is understood as a macro-category associated with a representative indicator adopted in computations and with an associated wished trend.

All indicators selected are based on objective measures, while others that result from perceptions or opinions (e.g. happiness [22]) have not been included.

For the numerical analysis proposed in the paper, we are considering recent years and, more concretely, the time range 2000-2015. Unfortunately, it is not possible to include in the study later years as the indicator measuring people currently living in democracy is available only up to 2015. As per previous explanations, we consider such an indicator as very relevant for the extent and the intent of this research, so we prefer to keep it and reduce the target time range. Additionally, the indicator on people living in extreme poverty is measured at a different granularity of all others, which are available by year. We have indeed adopted approximations considering the available values for the years 2002, 2005, 2008, 2010, 2011, 2012, 2013 and 2015.

In terms of wished trends (Table 1), we want the temperature anomaly, people living in poverty and deaths caused by terrorism to decrease, while an increasing trend is wanted for life expectancy, people living in democracy and GDP. The actual trends in the considered time range is shown in Figure 2 on the left. In the same figure, the contribution to global performance by considering the wished trends [33] is shown on the right. According to this view, positive trends in the chart contributes positively to global performance. Likewise, negative trends have a negative impact on the performance.

Looking at the data reported, health/demographics, economy, poverty/inequality and freedom/human rights are positively performing. On the other side, environment/sustainability and violence/instability present strongly negative performance.

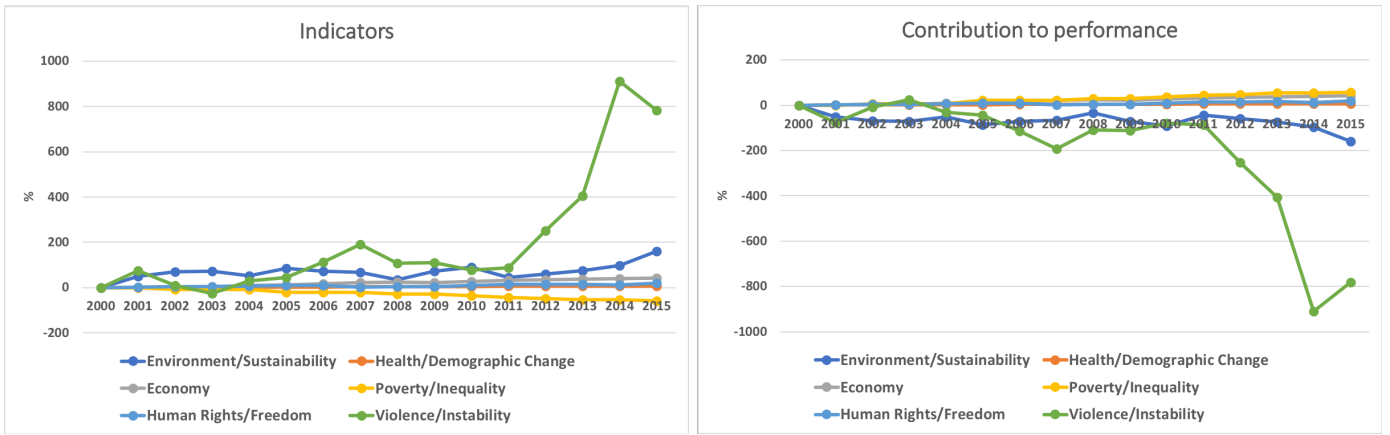


Figure 2: Selected indicators expressed as the percentage of variation with respect to the initial state (left). The contribution of the different indicators to performance as the function of the associated wished trend is reported on the right.

163 **3.2 Dealing with numerical bias**

164 At a more theoretical level, the definition of a restricted number of meaningful categories in the extent and
 165 intent of the current study can be considered a kind of bias in itself. It's somehow inherent in study design.

166 At a practical level, it is almost impossible to provide a numerically balanced set of indicators. Indeed,
 167 indicators are normally very heterogeneous, adopts their own units of measure and may present very different
 168 numerical variations. In general, the variation of a given indicator is not comparable in terms of relevance
 169 with the variation of another indicators. Therefore, numerical proportions are not semantically relevant for
 170 the purpose of the considered study, meaning that numerical variations are not necessarily proportional with
 171 the relevance in the system or model.

172 We have represented all indicators uniformly as the percentage variation with respect to the initial state.
 173 As shown in Figure 2, for the considered set of indicators, the variation of deaths by terrorism is numerically
 174 much more relevant than any other. Also the temperature anomaly presents a strong pattern in this sense.
 175 However, it is not numerically comparable with the previous. As both indicators contribute potentially in a
 176 negative way on global performance, the resulting indicator framework is strongly biased (numerically) in this
 177 case and may affect the fairness of the computation.

178 The numerical differences among the considered indicators imply the need to deal with different scales when
 179 computing the different aspects together. In order to minimise numerical biases, we adopt the mechanism
 180 described in [33] in addition to weighting. A detailed description of such an adaptive mechanism is out of
 181 the scope of the paper. An example of the numerical bias using and not using the mechanism is reported in
 182 Figure 3.

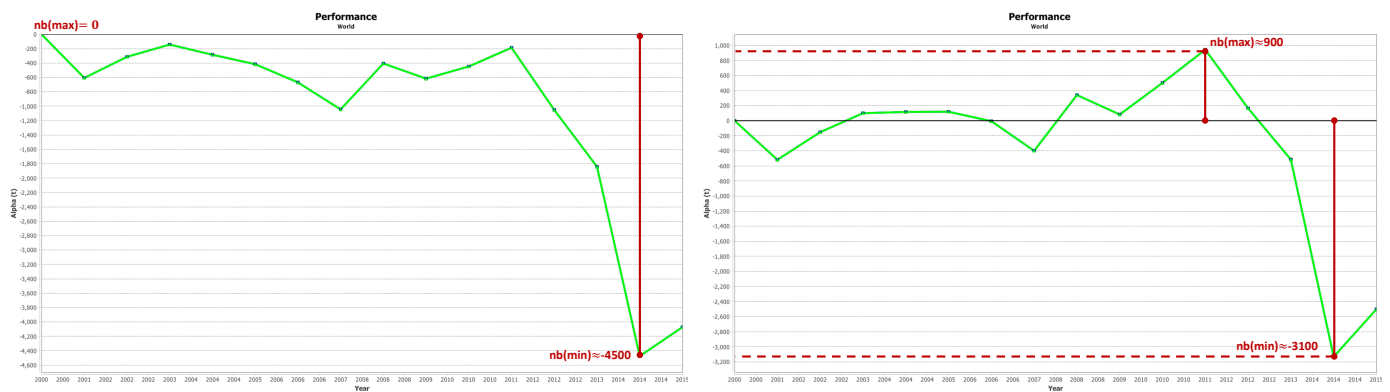


Figure 3: Visualization of numerical bias by considering a linear combination of the different criteria by adopting the reference computational method [33] (left). Such numerical bias can be reduced by applying adaptive tuning as per reference method [33] (right).

183 4 Weighting

184 Once target criteria are defined, the weighting stage may result extremely subjective. The most natural way
185 to weight criteria is probably by survey, as it is relatively simple to map weights into an opinion-based survey.
186 In such a way, opinions from a generic public as well as opinions within defined communities may be captured
187 and converted in a corresponding set of weights.

188 However, capturing people’s opinions in a meaningful way requires a large number of samples. Therefore,
189 we have preferred to adopt a completely different and more pragmatic approach that aims to infer weights
190 from the analysis of popular reports (e.g. from United Nations¹ and Global Economic Forum²). On one side,
191 the simplified approach adopted in the selection phase allows to weight categories rather than single indicators.
192 It makes the mapping much easier. On the other side, the interpretation of certain kind of report may be
193 subjective.

194 In the following subsections, we first describe an extension to the reference method to better model existing
195 trade-offs and, then, we discuss the inference of weight sets from different sources of information.

196 4.1 Finite-resource assumption to model trade-offs

197 The original method [33] doesn’t assume specific constraints for weights: the different indicators are weighted
198 independently within a minimum value W_{min} and a maximum value W_{max} . Thus, any indicator i is associated
199 with the corresponding weight $W_{min} \leq w_i \leq W_{max}$, for instance in a range $[0,10]$.

200 That independent weighting intrinsically assumes an infinite resource model. For instance, it is possible
201 to associate the maximum weight with all indicators ($w_i = W_{max}, \forall i$). It doesn’t force decisions which should
202 model the trade-offs existing among the different aspects of life. In order to model such trade-offs in a more
203 effective way, we introduce a constraint for the overall weighting value, $W_{tot} = \sum_{i=1}^n w_i \leq nk$, where n is the
204 number of considered criteria and k is a value between W_{min} and W_{max} . In the context of this work we are
205 using six different criteria ($n = 6$) and weighting in the range $[1,10]$ ($1 \leq w_i \leq 10, \forall i$) rather than $[0,10]$ as
206 we want all criteria to contribute to overall performance. We consider $k = 5$, which implies $W_{tot} = 30$.

207 4.2 Weighting based on report analysis

208 In this sub-section we propose different weightings based on the analysis of different sources of information.
209 As previously explained, probably such an inference cannot be completely objective. In order to minimise the
210 impact of interpretations and biases in the analysis, for each case considered, the criteria and conclusions are
211 explained and briefly discussed. Additionally, we have restricted the analysis to sources of information that
212 allow a relative easy mapping. We have excluded those sources that potentially provide very good insight but
213 are objectively hard to be converted in a clear weight set to the target criteria.

214 A summary of the weights produced by analysing the different reports is proposed in Figure. 4. Each case
215 is separately analysed and explained in the remaining part of this sub-section.

¹United Nations - <https://www.un.org/en/>

²World Economic Forum - <https://www.weforum.org>

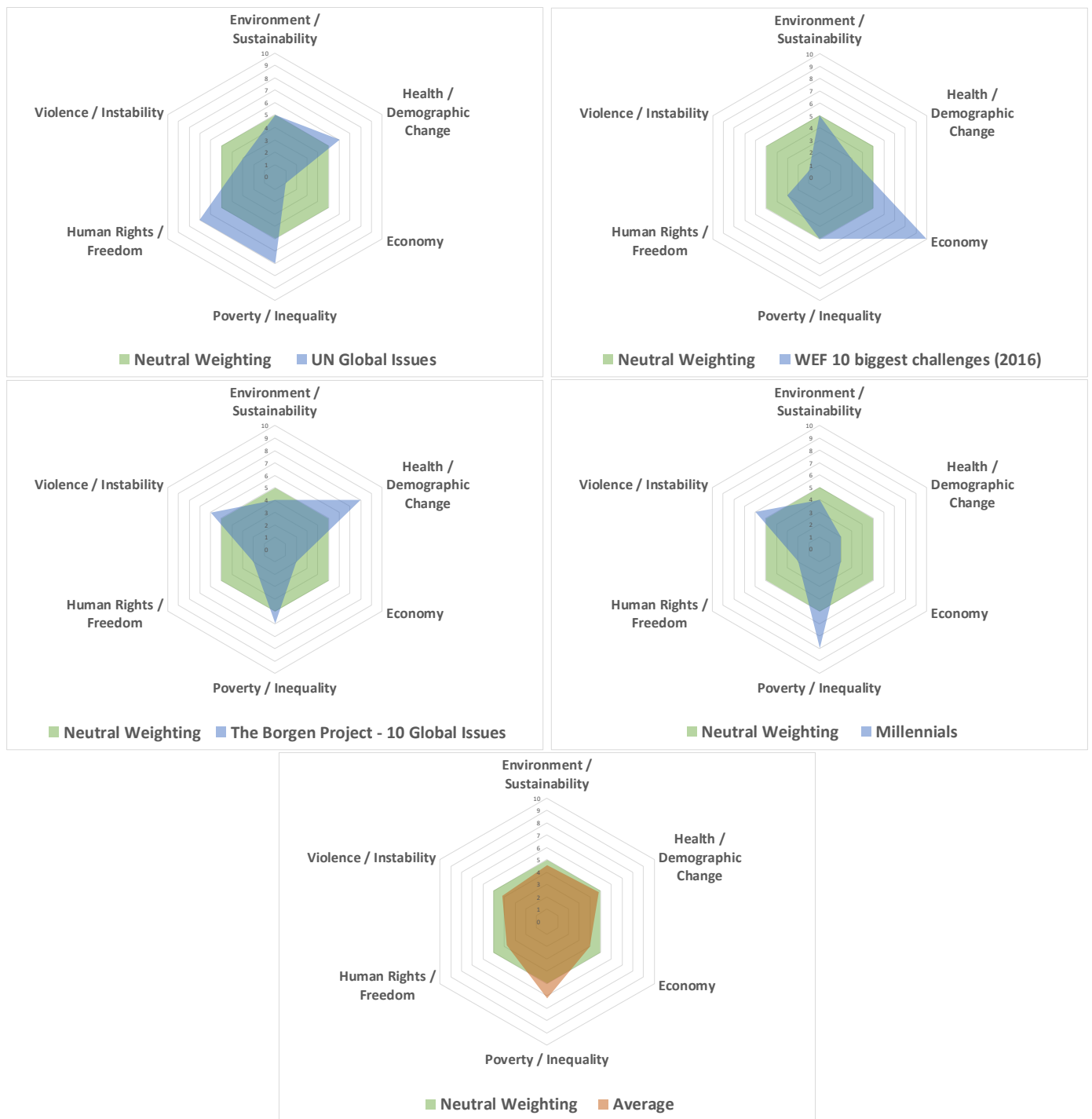


Figure 4: Weighting based on the analysis of different sources. Each weights set is compared with an homogeneous distribution of the resources - i.e. *Neutral Weighting*.

216 **Weighting based on the analysis of UN Global Issues** The UN Global Issues report [6] proposes 22
 217 different global issues. Each issue in the report can be associated to no-one, one or more than one of the
 218 categories identified in this study.

219 According to our analysis, the category Environment/Sustainability is associated with 5 issues from the
 220 report (Atomic Energy, Climate Change, Food, Water), Health/Demography with 5 issues (Africa, Ageing,
 221 AIDS, Health, Population), Economy with no issue directly, Poverty/Inequality with 6 issues (Africa, Children,
 222 Decolonization, Ending Poverty, Food, Water), Human Rights/Freedom with 6 issues (Africa, Democracy,
 223 Gender Equality, Human Rights, International Law & Justice, Refugees) and Violence/Instability with 2 issues
 224 (Africa, Peace&Security). Resulting weights are reported in Table 2. As previously discussed, the minimum
 225 weight assumed is 1.

226 **Weighting based on the analysis of WEF 10 biggest global challenges (2016)** The WEF 10 biggest
 227 global challenges [8] is a report with a much more economic focus. The criteria to map the 10 challenges in

Source	Env./Sust.	Health/D.C.	Economy	Pov./Ineq.	H.R./Freedom	Violence/Inst.
UN Global Issues	4/22	5/22	0/22	6/22	6/22	2/22
Weights	5	6	1	7	7	3

Table 2: Weighting based on *UN Global Issues* [6].

the report into weights are the same as in the previous case.

From our analysis, Environment/Sustainability is directly related to 2 challenges (Food Security, Climate Change), Health/Demographics to 1 challenge (Healthcare), Economy to 5 challenges (Inclusive Growth, Unemployment, Financial Crisis, Global Trade, Investment Strategy), Poverty/Inequality to 2 challenges (Food Security, Inclusive Growth), Human Rights/Freedom to 1 challenge (Gender Equality) and Violence/Instability to no challenge. The resulting weighing is reported in Table 3.

Source	Env./Sust.	Health/D.C.	Economy	Pov./Ineq.	H.R./Freedom	Violence/Inst.
10 global challenges	2/10	1/10	5/10	2/10	1/10	0/10
Weights	5	3	10	5	3	1

Table 3: Weighting based on *WEF - 10 biggest global challenges* [8].

Weighting based on the analysis of 10 most important global issues from The Borgen Project The Borgen Project, a nonprofit organization that is addressing poverty and hunger, has provided a list of 10 most important global issues [5].

According to our analysis of such a source, Environment/Sustainability is directly associated with 3 of the 10 issues (Climate Change, Pollution), Health/Demographics with 4 (Pollution, Security & Wellbeing, Malnourishment & Hunger, Substance Abuse), Economy with 1 (Unemployment), Poverty/Inequality with 3 (Lack of Education, Malnourishment & Hunger, Security & Wellbeing), Human Rights/Freedom with 1 (Government Corruption) and Violence/Instability with 3 (Violence, Security & Wellbeing, Terrorism). The resulting weights are reported in Table 4.

Source	Env./Sust.	Health/D.C.	Economy	Pov./Ineq.	H.R./Freedom	Violence/Inst.
10 global challenges	2/10	4/10	1/10	3/10	1/10	3/10
Weights	4	8	2	6	2	6

Table 4: Weighting based on *The Borgen Project - Top 10 most important current Global Issues* [5].

Weighting based on the analysis of Global Shapers Survey 2017 Global Shapers Survey 2017 by WEF [9] reflects opinion of millennials. Business Insider Australia has recently provided a list of the 10 most critical problems in the World according to millennials based on the Global Shapers Survey [3]. In order to assure uniformity and consistency with previous cases, we have considered the list of problems provided but not the relevance associated with each of them.

According to our analysis, Environment/Sustainability matches with 2 problems (Food & water security, Climate change/Destruction of nature), Health/Demographics with 1 (Safety/Security/Wellbeing), Economy with 1 (Lack of economic opportunity & unemployment), Poverty/Inequality with 4 (Lack of education, Food & water security, Poverty, Inequality), Human Rights/Freedom with 1 (Government accountability and transparency/Corruption) and Violence/Instability with 3 (Safety/Security/Wellbeing, Religious conflicts, Large scale conflict/Wars). Weights are reported in Table 5.

Source	Env./Sust.	Health/D.C.	Economy	Pov./Ineq.	H.R./Freedom	Violence/Inst.
Millennials	2/10	1/10	1/10	4/10	1/10	3/10
Weights	4	2	2	8	2	6

Table 5: Weighting based on *Global Shapers Survey 2017* [9] and its analysis [3].

254 **5 Performance Analysis**

255 Performance analysis is based on two main metrics as follows:

- 256 • *Score*. This is the primary metric for analysis and it is based uniquely on the absolute performance
 257 according to computations [33]: positive scores are associated with positive performance, as well as
 258 negative scores correspond to negative performance.
- 259 • *Interpretation*. It is a relative metric defined by comparing the score of a given computation with the
 260 corresponding neutral computation, which assumes fair weighting [33]. In qualitative terms, scores higher
 261 than neutral computation correspond to an optimistic interpretation, while lower scores are associated
 262 with a pessimistic interpretation.

263 The two metrics as defined are completely independent as all qualitative combinations of the two metrics
 264 (positive/optimistic, positive/pessimistic, negative/optimistic and negative/pessimistic) are possible.

265 Looking at the analysis framework more holistically, two additional analysis factors may be considered:

- 266 • *Uncertainty*. In the context of this study, rather than a proper uncertainty, such a metric defines higher
 267 and lower bounds based on the potential weighting variance. Such an estimation provides a more consist-
 268 tent support for analysis in context.
- 269 • *Numerical bias*. Even though it is limited by the method adopted, numerical bias directly affects the
 270 absolute result. It is expressed by the neutral computation and can play a relevant role not only in the
 271 analysis phase but also when selecting criteria, as it can drive the selection of balanced set of indicators.

272 Computations for the different weight sets are presented in Figure 5, while a qualitative summary of results
 273 is presented in Table 6.

Weighting	Score	Interpretation
UN Global Issues	NEGATIVE	OPTIMISTIC
WEF 10 biggest global challenges	POSITIVE	OPTIMISTIC
The Borgen Project - 10 Global Issues	NEGATIVE	PESSIMISTIC
Millennials (Global Shapers Survey)	NEGATIVE	PESSIMISTIC
Average	NEGATIVE	OPTIMISTIC

Table 6: Summary of results (qualitative). For each computation, the qualitative score - i.e. *POSITIVE/NEGATIVE* - and the qualitative interpretation - i.e. *OPTIMISTIC/PESSIMISTIC* - is reported.

274 Looking at Figure 5, the score associated with the different weight sets is represented by the blue line.
 275 Such a score is compared with the corresponding neutral computations in the charts on the left, while it is
 276 represented both with extreme computations in the charts on the right.

277 Weights from the analysis of UN Global Issues propose a relatively balanced distribution with a priori-
 278 ty on Poverty/Inequality, Human Rights/Freedom, Health/Demographics and Environment/Sustainability.
 279 Additionally, there is a relative low priority for Violence/Instability and no economical focus. The resulting
 280 computation shows contrasting results, including a negative performance but also an optimistic interpretation.
 281 The weight set resulting from the analysis of the 10 biggest global challenges by WEF presents a much more eco-
 282 nomic oriented focus with a significant attention also for Environment/Sustainability and Poverty/Inequality.
 283 Human Rights/Freedom is still considered a kind of priority, while there is no explicit attention for Vio-
 284 lence/Instability. Such a distribution of weights result in a very positive understanding of global performance.
 285 By focusing explicitly on addressing poverty, the weights from The Borgen Project proposes an interesting case
 286 study. The priority is clearly on 3 criteria, Health/Demographics, Poverty/Inequality and Violence/Instability.
 287 The computations associated show a clear negative trend in terms of either performance and interpretation
 288 (pessimistic). The analysis based on opinions of Millennials proposes a much more radical distribution with
 289 a clear priority on Poverty/Inequality and a significant attention on Environment/Sustainability and Vio-
 290 lence/Instability. Final results are very similar to the ones related to the previous case (negative/pessimistic).

291 Average weights are reported in the last chart in Figure 4. As shown, the different case studies considered
 292 seem to balance each other. The average case proposes however a priority on Poverty/Inequality. Computations
 293 for the average case point out negative performance and optimistic interpretation.

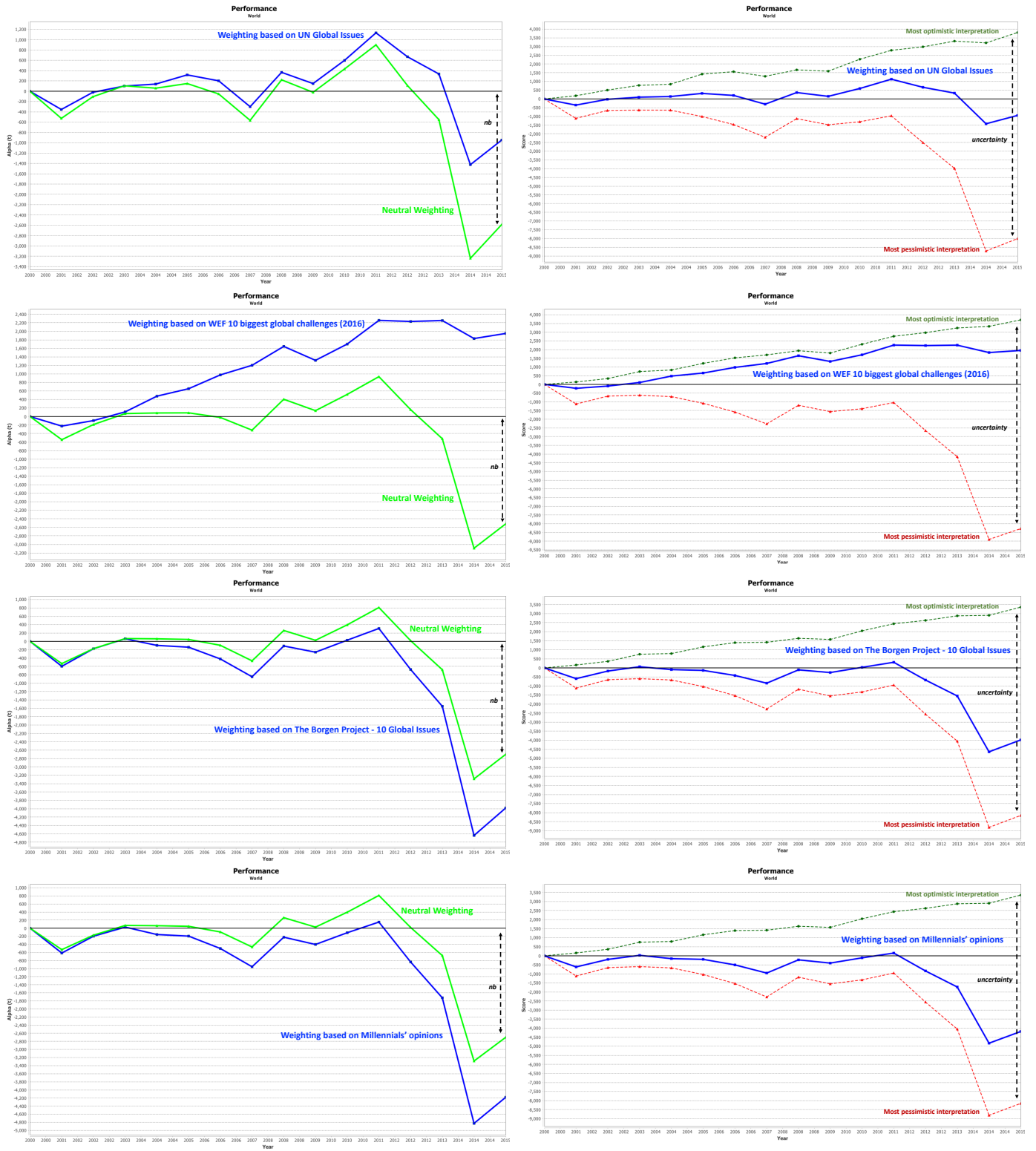


Figure 5: Computations based on the different weight sets. On the left, computed results assuming a given weights set are compared with the corresponding assuming homogeneous weighting (*Neutral Weighting*). On the right, results are considered looking at the extreme possible computations.



Figure 6: Computation based on average weights. On the left, the computed result adopting average weights is compared with the corresponding assuming homogeneous weighting (*Neutral Weighting*). On the right, that same result is considered looking at the extreme possible computations.

294 As expected, the priorities defined by the different weight sets play a key role in the final assessment of
 295 performance from a quantitative perspective. However, as shown, it's the contextual interpretation of such
 296 metrics that is considered the final assessment. We believe that the research framework proposed can be simple
 297 and effective to assess holistically the post-pandemic scenario, as well as to properly assess and reflect mindset
 298 and priorities changes behind the numerical estimations or measures.

299 Looking at possible interpretations of the results, we would like to remark that the method adopted works
 300 in terms of dynamic trend rather than of static snapshot, according to a philosophy of continuous evolution
 301 of the World. Such an approach is reflected in the computation of metrics. Therefore, a positive score in a
 302 given time-frame should be understood like *the World is becoming a better place* rather than *the World is a*
 303 *good place* [33].

304 6 Conclusions and Future Work

305 By adopting a MCDA-based method, we considered 6 different macro-categories to measure global perfor-
 306 mance. The method provides a relatively fair analysis framework which allows the systematic combination of
 307 heterogeneous criteria. The weights associated with the different criteria play a key role in terms of final result.
 308 We have adopted a model that assumes finite resource in order to empathize the trade-offs existing among the
 309 different aspects considered.

310 In order to assess global performance and, more in general, global development trends, we have considered
 311 four different case studies with a very different focus. Results show that economic-oriented priorities correspond
 312 to positive performances, while all other distributions point to a negative performance. Additionally, balanced
 313 and economy-focused distributions of weights propose an optimistic interpretation of performance regardless
 314 of the absolute score.

315 Future work is expected to be developed in different directions. In line with the current focus, we will
 316 aim more fine grained studies at a country level. We will explore further secondary data sources to infer
 317 priorities accordingly (e.g. *World Values Survey* - <http://www.worldvaluessurvey.org/>). We will also propose
 318 and analyse in context additional case studies with a more community-oriented focus to be established by
 319 survey (e.g. [17]).

320 The results obtained contribute to provide a concise understanding in context of the global development
 321 evolution and its underpinning priorities in the pre-pandemic period. We believe that such a dynamic snapshot
 322 can be useful to facilitate a better holistic understanding of the post-pandemic scenario that will be object
 323 of our future research. Indeed, we expect a significant mindset change triggered by the pandemic that will
 324 probably have an impact in setting priorities for a sustainable development. Last but not least, we will adopt a
 325 similar approach to estimate and analyse more specific aspects (e.g. global or country resilience to pandemic).

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