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REGIONAL SCIENCE PERSPECTIVES ON GLOBAL SUSTAINABLE DEVELOPMENT – AN EXPLORATION OF MULTIDIMENSIONAL EXPERT VIEWS BY MEANS OF Q ANALYSIS

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Abstract

The aim of the paper is to explore and map out regional science perspectives on global development, assessed on the basis of the Sustainable Development Goals (SDGs) proposed by the United Nations (UN). The issue is important, since in general the methodological glue that unites interdisciplinary approaches – like regional science – may not work without a uniform or shared view on the reality and the mutual consistency of societal aims. The question whether the hierarchy of UN Development Goals is supported by regional science approaches related to geographical space, disciplinary expertise, and sustainability viewpoints is addressed in the present study, using a Q- method technique. To that end, a survey questionnaire among a group of internationally renowned regional scientists from all over the world was systematically administered and analyzed. The results are related to characteristic features of the respondents (regional scientists) examined. Our findings indicate that location, disciplinary field, and cognitive mindset do influence the ranking by regional scientists of the sustainability goals concerned. The lessons are that it is important to specify explicitly the assumptions of each sustainable development study and to understand whether the researcher's attitudes regarding sustainable development require a 'complementary' perspective.
Keywords: UN Sustainable Development Goals (SDGs), sustainability, regional science, Q-method
JEL Classification: Q01, R11, B4

1. Aims and Scope

Regional science is the multidisciplinary study of the structure, development, and organisation of regions or cities in an interdependent and complex space-economy (Isard, 1956; 1960). It captures mainly analytical – often quantitative – approaches rooted in regional and urban economics, economic and social geography, transportation science, demography, environmental science, and planning and administrative science (Isard, 1956; 1979). It addresses a wide range of pressing socioeconomic issues, such as regional growth and inequalities, urban poverty and well-being, housing and labour market disparities, congestion and infrastructure capacity, migration and tourism flows, urban and regional sustainability, disaster management and climate change, or political science and spatial

management (see for a review, Paelinck and Nijkamp, 1980; Ponsard, 1983; Gorter and Nijkamp, 2001). Consequently, regional scientists can be found among economists, urbanists, agronomists, geographers, demographers, planners, engineers, environmental scientists, sociologists and political scientists. Their analytical interest in spatial issues – often based on advanced research techniques and novel conceptualisations – leads to an original and coherent amalgam of quantitative and analytical insights into the territorial organisation and spatial economic evolution of our world (see also Thrift, 1996; Boureille, 1998; O'Sullivan, 1981; Knox and Marston, 2001; Clark et al., 2003; Coffey, 2003; Isard, 2003; Mulligan, 2003; McCann, 2005; Barnes, 2004; Warf, 2006; Brakman et al., 2009; Capello and Nijkamp, 2009; Leroux and Hart, 2012; Dentinho et al., 2017; Suzuki and Patuelli 2021; Postiglione, 2021). The inherent spatial orientation of regional science leads a coverage of scientific concerns ranging from local to global development (Kourtit et al. ,2016).

The aim of this paper is to identify, interpret and analyse regional science perspectives on global sustainable development. The study finds its orientation in two major strands of science-based approaches, viz. (i) the spatial perspectives developed and articulated in the rich history of regional science, and (ii) the pressing research and policy challenges related to the UN Sustainable Development Goals (SDGs). The challenging storyline of the present study is the question in how far leading regional scientists are aware of the new research frameworks that are needed for a vital contribution of regional science to the fulfilment of the SDGs and which sustainability-oriented perspectives can fruitfully be encapsulated by regional science.

Our research will be based on a stated preference experiment in which a diverse, multidisciplinary and broad group of internationally well-known regional scientists was asked to express their professional opinion on the role of regional science in the global SDG debate and implementation. To digest these views, a systematic survey was organised containing a varied range of important questions addressing specifically the spatial framing of SDGs.

The analysis of these individual experts' opinions was next based on a so-called Q-method approach which originated from Stephenson (1935), and was followed by many others (e.g., Van Exel and de Graaf, 2005; Webler et al., 2009; Watts and Stenner, 2012; McKeown and Thomas, 2013; Kamal et al., 2014; Moon and Blackman, 2014; Fuentes-Sanchez et al., 2021). It involves essentially a Principal Component Analysis where the relevant variables are the experts' rankings of selected statements that are regarded as the observations. For the present paper 38 experts made, each individually, 435 comparisons of 30 statements. This method allowed us to extract systematic information on expressed regional science views regarding SDG-relevant topics, in relation to their region of origin, their scientific discipline and the declared attitude of the regional scientists in question.

The paper is organised as follows. Section 2 will sketch the position of regional science in a global sustainable development context. Next, in Section 3, the survey experiment – based on views of several experts – will be described, and subsequently the empirical results will be presented and interpreted. Finally, Section 4 will be devoted to a strategic exploration of future opportunities for a strengthening of the interface between regional science and global development strategies, followed by a conclusion.

2. Regional Science in a Global Perspective

Envisioning future developments and trends – not only in society, but also in science – has over the past decades been an ongoing concern in both academia and policy-making (Nijkamp, 2008; Kourtit and Nijkamp, 2015). Earlier studies have used scenario experiments (Kahn and Wiener, 1962; Torrieri and Nijkamp, 2009; Nijkamp et al., 1997), trend exploration analysis (Naisbitt, 1982; Slaughter, 1995; Bell, 1997) or information content analysis (Toffler, 1981). In more recent decades, the focus has shifted to more quantitative social- and human-centered future scenario studies (Nijkamp et al., 1998), while systemic future orientation studies based on expert opinion are increasingly coming to the fore. The present study is inspired by the latter strand of future-oriented scientific research.

Regional science as a multidisciplinary study of the space-economy (Isard, 1956) calls for an involvement of different kinds of scientific expertise, with a challenging focus on commonalities in methodology, conceptual framing, policy orientation and applied analytical work. Isard (1961) rightly emphasises the need for a common basis for regional science in creating, disseminating, using and testing replicable advanced methods to analyse socio-economic and human interactions in space (Isard 1956, 1960; Bailly et al. 2015).

From the outset onwards, regional science has had a deep interest in socio-economic and regional development, with a particular view to spatial inequalities (Hirschman, 1970), not only in terms of poverty or underdevelopment, but also in terms of quality of life, environmental conditions, access to public and private amenities, or human health conditions (Davidson, 1976; Knox, 1982; Barke, 1989; Smith, 1994; Broadway and Jesty, 1998; Couclelis, 1999; Kitchen, 2001; Sirgy et al., 2006). The space-economy is a complex and unstable system that is not only affected by internal mechanisms (e.g. competition, labour market developments, housing demand), but also by external drivers (e.g. new technology, cross-border migration) (see e.g., The World Bank, 1996; European Commission, 2000; UNCHS, 2001; UNDP, 2001). Irrespective of the scope, scale and policy focus of the analysis concerned, there is always a need for advanced, applicable and replicable research methods addressing common conceptualisations, characteristics, diagnoses, designs, evaluations and

forecasts. Clearly, given the methodological variety in disciplines constituting regional science, the development of uniform regional (or urban) development criteria is fraught with many, sometimes, almost unsurmountable problems (Sen, 1999). It is noteworthy however, that in recent times operational concepts like the UN-inspired Human Development Index (HDI) have enjoyed much popularity in many social sciences including regional science, even though the direction of growth of the constituents of the HDI is often not certain (Piketty 2014; Gallardo et al. 2019).

For example, Batabyal and Nijkamp (2004) surveyed the contribution of regional scientists to deal with environmental issues acknowledging that regional development is constrained by spatialized natural resources leading implicitly to the idea that sustainable development (Brundtland, 1987) is regional sustainable development. Nevertheless, the authors recognize that, to date, there are also several research questions that received little or no attention from regional scientists. More recently, the issue of sustainable regional development has received more attention from regional scientists who worried about sustainable growth and focused attention on lower income countries (Tripathi,2021), in rural areas (Losada et. al., 2019) or in urban environments (Echebarria et. al., 2016).

The UN Sustainable Development Goals (SDGs) – a reasonable and broadly accepted collection of 17 goals (subdivided into a multiplicity of subgoals) – is nowadays often used as a frame of thinking on sustainable development of nations, regions or cities; including emphasis on inequalities (Lang and Lingnau, 2015). And several regional science publications can be found that take the SDG framework as a point of departure. It is, therefore, an interesting question what the general views of regional scientists are on spatial development – and diversity therein – in the UN SDG context, and whether regional scientists share a great deal of common operational approaches to sustainability in addressing the manifold issues in analysing and governing the complex and multi-scale space-economy. A more comprehensive look at the rich regional science literature in this field prompts three fascinating questions:

- Will there be a heterogeneity in the ranking of different regions, based on the use of the UN SDGs?
- Will different disciplinary orientations in regional science lead to different SDG rankings of regions?
- Will different interpretations and perceptions of sustainable development lead to different SDG rank orders of regions?

These questions will in the remaining part of the paper be addressed from a global perspective so as to frame and synthesise SDG indicators in the context of regional science research. Given the heterogeneity in regional science, we will adopt here an expert opinion approach, to be further

examined by a multivariate Q-method (Stephenson, 1953). In this way, our research will be able to map out contextual reasons for differences in findings, to identify challenges for disciplinary changes on ex-ante propositions and assumptions, and to articulate the needs and benefits of interdisciplinary dialogues on perhaps the most daring task: to create better places and even more happy people.

We will start our analysis with a systemic representation of SDGs. The UN SDGs represent the most significant global effort so far to advance global sustainable development at all relevant spatial scales. Given the significance of the SDGs for guiding development, a rigorous accounting is essential for making them consistent with the multi-layered goals of sustainable development, viz. thriving within the limited means provided by Planet Earth (Wackernagel et al., 2017). The UN Sustainability goals (UN 2015) involve seventeen items, unfoldable into thirty aims and comprising seven vectors of the development cycle (see Figure 1).

1. *Territorial capital.* Build resilient infrastructure (G9.1). Make cities and human settlements inclusive, safe, resilient and sustainable (G11). Take urgent action to combat climate change and its impacts (G13). Conserve and sustainably use the oceans and seas for sustainable development (G14). Protect, restore and promote sustainable use of terrestrial ecosystems (G15.1). Halt and reverse land degradation (G15.3). Finally, halt biodiversity loss (G15.4).

2. *Productivity*. Improved nutrition and promote sustainable agriculture (G2.2). Ensure access to affordable, reliable, sustainable and modern energy for all (G7). Promote full and productive employment and decent work for all (G8.1). Promote sustained, inclusive and sustainable economic growth (G8.2). Promote inclusive and sustainable industrialization (G.9.2). Moreover, ensure sustainable consumption and production patterns (G12).

3. *Income*. End poverty in all its forms everywhere (G1). Achieve gender equality and empower all women and girls (G5). Reduce inequality within and among countries (G10).

4. *Consumption, private and public*. End hunger and achieve food security everywhere (2.1). Ensure healthy lives for all ages (3.1). Ensure inclusive and equitable quality education (G 4.1). Ensure availability and sustainable management of water and sanitation for all (G 6). Provide access to justice for all (G 16.3).

5. *Financing*. Strengthen the means of implementation for sustainable development (G17.1)

6. Investment. Foster innovation (G9.3). Promote lifelong learning opportunities for all (G4.2). Promote the sustainable management of forests (G15.2). Combat desertification (G15.3). Build effective, accountable and inclusive institutions at all levels (G16.1). Revitalize the Global Partnership for Sustainable Development (G17.2).

7. Well-being. Promote well-being for all at all ages (G3.1). Promote peaceful and inclusive societies for sustainable development (G16.1).

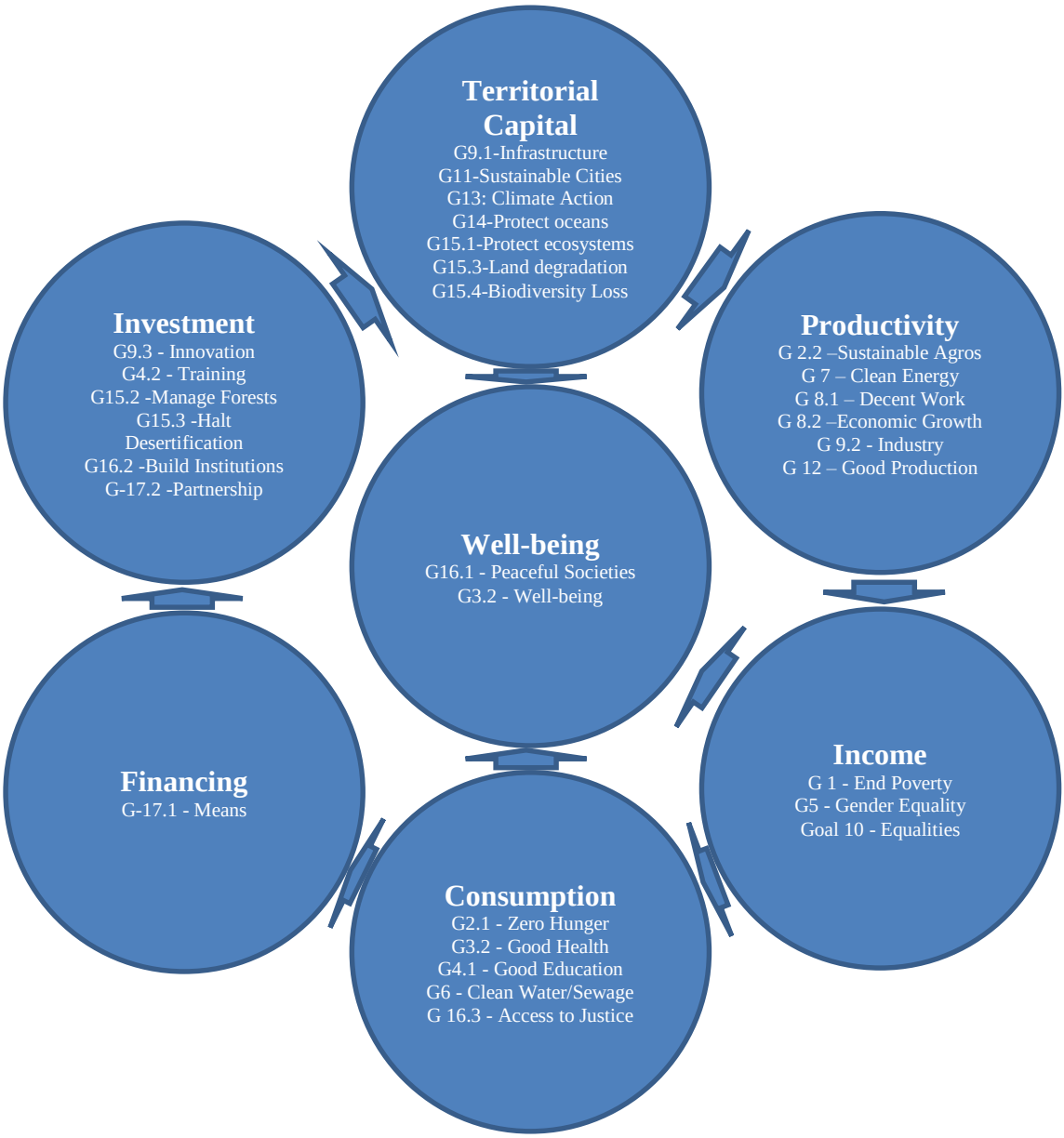


Figure 1. UN Sustainable Goals in a Regional Development Context

Source: authors.

In the light of these goals and aspirations, the World Bank has produced a specific multivariate database with several indicators for the UN SDGs. Based on this dataset, we employed a standard Principal Component Analysis to synthesise the various indicators of the UN SDGs and next a Cluster Analysis to aggregate similar countries for different periods of time. It turned out that four types of countries emerged that are related to their rank situation regarding the UN SDGs from 2000 until 2015. This information can be found in the map in Figure 2. Looking at Figure 2, it is clear that there is some path dependency and resilience in the situation of the various countries typologies: (i) *Rich countries* continue to have the same robust sustainability features over 20 years, although Brazil managed to join the group in 2015; (ii) *Dependent countries* have similar sustainability features in

ex-socialist countries and in Chile and Guianas in Latin America; (iii) *Emerging countries* in Andean Latin America, Southern Africa, North Africa, Middle East and East Asia have analogous sustainability indicators, although from very different parts of the world; Vietnam joined this group in 2015, when it ceased to be a Poor country; finally, (iv) *Poor countries* appear to persist in South Asia and in Sub-Saharan Africa.

If we select the more relevant sustainable development indicators based on the World Bank database from the first principal components (see Figure 2) and if we organise these by type of country and by year (see Figure 3), we get a clearer picture of sustainable development around the world. These findings for the four classes of countries distinguished are:

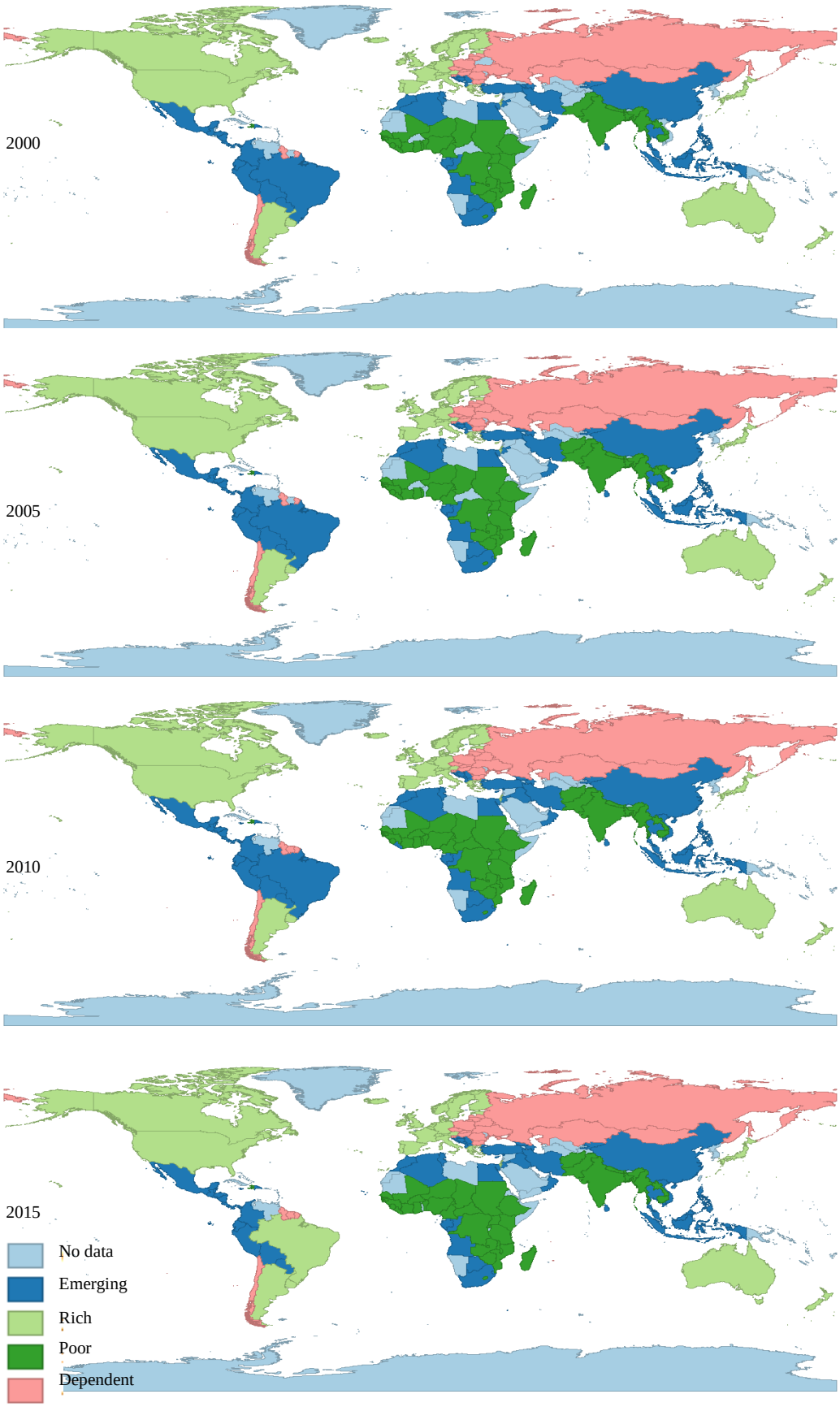
1. *Rich countries* show a much higher product per capita, stronger currencies, a decreasing industrial sector and a reduced weight of their income from natural resources. Unemployment is relatively low, but is increasingly associated with the challenges of the knowledge society. Urban population is comparatively high and still increasing while the suicide rate, although revealing unhappiness is decreasing. Environmental indicators reflect the Kuznets Curve phenomenon, with an increase in renewable energies and a decrease in environment-related diseases.

2. *Dependent countries* have a much lower product per capita, controlled currencies, a rigid industrial sector and a high dependence on the volatile income from natural resources. Unemployment is very high, but decreasing. Urban population is high and stagnant, while the suicide rate, being incredibly high, is decreasing. Environmental indicators demonstrate a very low uptake of renewable energies and a very high mortality related to environmental illnesses.

3. *Emerging countries* have a low product per capita, unstable currencies, a volatile industrial sector, and a strong dependence on and unpredictable revenues from natural resources. Unemployment is high and changeable. Urban population is high and increasing, and the suicide rate is relatively low and decreasing. Environment indicators exhibit a reduction in the use of renewable energies and a reduction in mortality associated with environmental illnesses.

4. Finally, *Poor countries* have a very low product per capita, increasingly unstable currencies, a very low industrial sector and a persistent dependence on the income from natural resources. Unemployment is low, but probably not registered. Urban population is very low, but is increasing, and the suicide rate is low and decreasing. Environment indicators exhibit a very high, but harmful use of renewable energies, because it is associated with very high air pollution and a high incidence of tuberculosis. These are mainly the countries of Sub-Saharan Africa and South Asia. Only Vietnam was able to escape from this class in 2015.

Figure 2. Global Country Typologies regarding the UN SDGs



Source: authors, based on the World Bank Database.

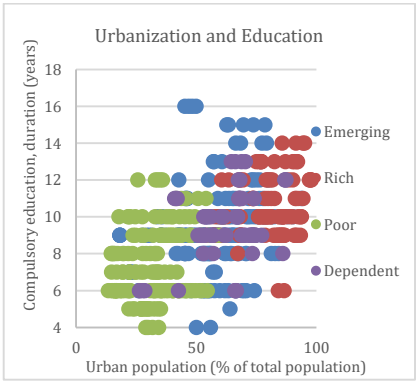
Figure 3. Indicators of Sustainable Development by Type of Country, 2000-2015

Source: authors, based on the World Bank Database.

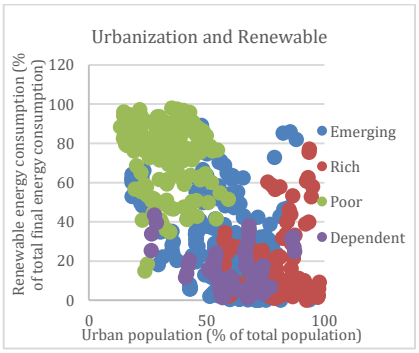
Figure 4. Relation between Urbanization and Sustainability Indicators by Country Type, 2000-2015

Statistics **Graphs**

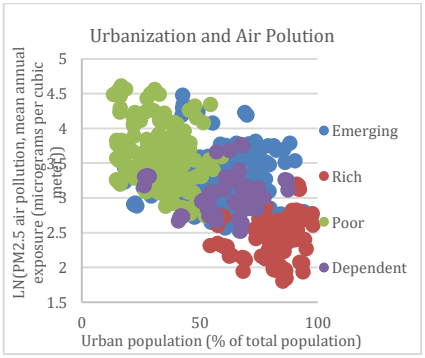
Education	R2	Slope	p
Emerging	0,05	0,0336	0,001
Rich	0,05	0,0333	0,019
Poor	0,06	0,0432	0,003
Dependent	0,17	0,0561	0,000
ALL	0,28	0,0550	0,000



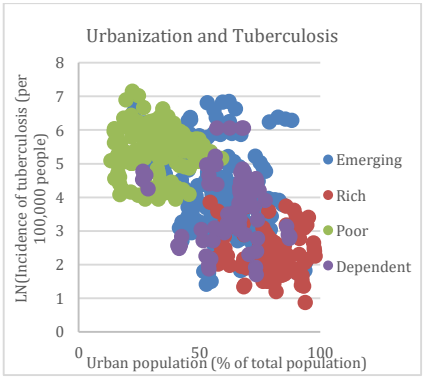
Renewable	R2	Slope	p
Emerging	0,08	-0,3816	0,000
Rich	0,02	0,2117	0,194
Poor	0,06	-0,3783	0,003
Dependent	0,05	-0,1785	0,071
ALL	0,43	-0,9068	0,000



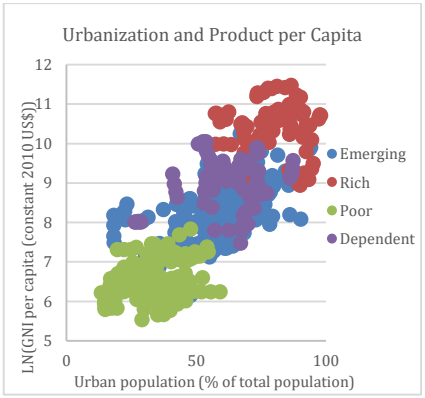
Ln(Air Pollution)	R2	Slope	p
Emerging	0,00	-0,0009	0,613
Rich	0,00	-0,0006	0,834
Poor	0,06	-0,0104	0,002
Dependent	0,01	0,0018	0,467
ALL	0,36	-0,0156	0,000



Ln(Tuberculosis)	R2	Slope	p
Emerging	0,12	-0,0292	0,000
Rich	0,02	-0,0097	0,096
Poor	0,00	-0,0036	0,462
Dependent	0,00	-0,0056	0,564
ALL	0,46	-0,0468	0,000



Ln(Product per Capita)	R2	Slope	p
Emerging	0,31	0,0252	0,000
Rich	0,00	-0,0030	0,561
Poor	0,12	0,0154	0,000
Dependent	0,04	0,0100	0,080
ALL	0,67	0,0577	0,000



Source: authors, based on the World Bank Database.

Next, Figure 4 shows the graphs and linear regressions that relate of the degree of urbanization by country with selected sustainability indicators, which show a higher correlation with urbanization (Education, Renewable Energies, Air Pollution, Tuberculosis and Product per capita). The first observation is that there is a global correlation between the level of urbanization and the sustainability indicators.

Globally, an increase in 1 point in urbanization associates with 0,06 years of compulsory education and with a reduction of 0,9 points in the use of renewable energies. The same 1 extra point in urbanization appears to associate with a pollution reduction of 1 milligram of PM2.5 per cubic meter of air, with a decrease in tuberculosis of 1 per 100000 inhabitants, and with an increase of 1 US$ (2010) in the product per capita.

Notwithstanding this, the analysis per group of country does not show identical results. The relation between urbanization and compulsory education is lower in Rich countries. Contrary to Poor, Emerging and Dependent countries, Rich countries show a clear indication that higher urbanization associates with higher adoption of renewable energies. The relation of urbanization with a reduction of air pollution is robust only in Poor countries, and with the incidence of tuberculosis in Emerging countries. Finally, urbanization associates strongly with product per capita in Emerging countries and, to some extent, in Poor countries, but this relationship is lower in Dependent countries and non-existent in Rich countries.

3. Regional Science Perspectives on UN Sustainable Development Goals

To approach the question whether regional scientists share commonalities in the great diversity of the UN sustainable goals, a group of regional scientists around the world, with different scientific backgrounds, were asked to prioritize, on a scale from (-4) to (+4), the 17 UN goals extended to 30 derived goals, so as to obtain more clear statements (see Table A.1in Annex A). The use of the Q-method allowed us to identify several core perspectives on the (extended list of) development goals.

The questionnaire in Annex A was sent on February 7, 2020 to 65 regional scientists around the world from North America (8), Latin America (7), Western Europe (24), Africa (6), Eastern Europe (6) and Asia (14). The selection of these people involved the members of the Council of the Regional Science Association International, the Long Range Planning Committee, and the members of the editorial team and editorial board of the journal Regional Science Policy and Practice. Annex B displays the 38 responses that had arrived until February 9, 2020, North America (8; 100 %), Latin America (3; 43%), Western Europe (9; 38%), Africa (4; 67%), Eastern Europe (5; 83%) and Asia (5; 36%) – a very good rate of response all over the world that signifies a major and global interest on the topic. Despite the relatively small sample size, this size is sufficient because each of the 38 persons questioned had to make {435 = [30 statements x (30-1) statements] /2} comparisons in prioritizing the UN (extended) SDGs. The 38 responses are numerically more than adequate, since the Q-method involves the estimation of the principal components where the questioned persons are essentially the 'variables', and where the observations in terms of comparisons are the 30 goals. Eleven principal components with eigenvalues higher than 1 were extracted and rotated with a Varimax technique using SPSS software.

Table 1: Regression Coefficients of Vector Scores by Statement related to average standardized score of each statement (Data in Annex D) and Statement Groups (Figure 1)

	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11
Significance	,000[b]	,111[b]	,143[b]	,148[b]	,141[b]	,225[b]	,260[b]	,346[b]	,400[b]	,911[b]	,856[b]
Intercept	1,286	0,042	-0,483	0,466	-0,063	0,181	-0,816	-0,127	-0,569	-0,173	0,356
Average Standardized Score of statements	-0,081	-0,014	0,025	-0,020	0,016	-0,008	0,049	0,007	0,016	0,006	-0,022
Average Standardized Score of statements x Dummy Income	1,552	-0,590	2,055	3,312	2,314	-3,869	0,641	3,086	1,160	1,854	0,792
Average Standardized Score of statements x Dummy Productivity	-0,778	2,235	1,579	-0,227	1,363	1,052	0,352	2,060	-0,073	0,091	0,635
Average Standardized Score of statements x Dummy Capital	-0,960	1,109	0,703	2,343	0,284	2,532	0,440	0,392	-0,007	1,238	1,520
Average Standardized Score of statements x Dummy Investment	1,967	-1,327	1,772	2,771	4,231	1,253	1,257	-1,362	-3,096	-1,550	-1,069
Average Standardized Score of statements x Dummy Wellbeing	-1,353	4,764	10,787	-4,894	6,582	-0,486	-5,599	-5,782	11,274	-0,994	-2,892
Average Standardized Score of statements x Dummy Consumption	0,879	2,359	2,378	-0,372	-0,467	-0,241	2,463	1,246	2,090	0,575	-0,413

P<0,05		p<0,10	

The scores are presented in Annex C and the regression estimates in Annex D. The related principal components appear to explain 82% of the variance of the data (Annex C). As often happens

with Q exercises applied to experts (and not to stakeholders), there are many components, which is an interesting signal that experts' views tend to be biased regarding their expertise and that is also what we are testing.

Before moving to the analysis and the naming of each of the main components, it is important to see how the scores relate to the grouping of goals proposed in Figure 1. Table 1 presents the results of the regression estimates per component factors, relating to the average standardized score of each phrase and to the sets of goals proposed in Figure 1 (Income, Productivity, Capital, Investment, Wellbeing and Consumption), with the Financial set also represented in the Intercept and the others represented by relevant variables (Goal Dummy x Standardized Score of the Statement). Data on dependent variables used for the regressions contained in Annex D, while the others are dummies on the values of the average scores of the statements based on the 38 standardized scores.

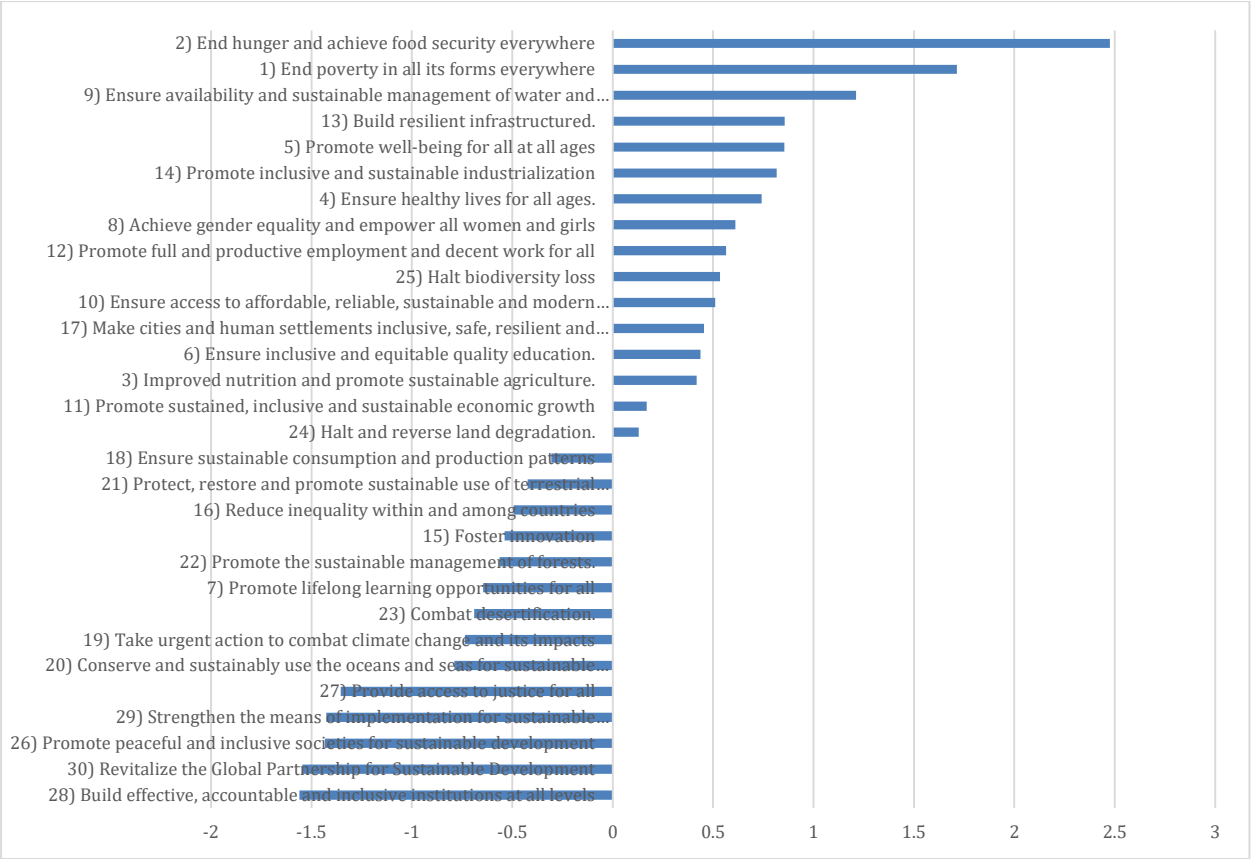
Goals associated with the Investment circle (Figure 1) explain well Component 1. Goals in the Productivity circle appear to associate with Component 2, jointly with the Consumption circle. Wellbeing and Consumption goals relate to Component 3, Capital and Investment Goals go with Component 4, Investment also associates with Component 5, Component 6 relates directly with Capital and indirectly with the goals of the Income circle. Component 7 associates positively with the order of the goals. We also note that the systematization proposed in Figure 1 does not explain well the components higher than Component 7.

The names given to the various principal components take into account the higher goals declared by the experts and the main tools that the respondents chose to be adequate. Some of them point out the End of Poverty as their main Goal (1, 2), others prefer Wellbeing (3), and a few others Good environment (4) or Economic growth (5). From Annex D it is possible to get more quantitative insight into the profile of the eleven components. Our comments here apply mainly to the first five components.

Component 1: End of Poverty with Infrastructures

The first rotated component explains 11% of the total variance. It favours the reduction of hunger (Statement 2) and poverty (Statement 1) with the deployment of public infrastructures (Statement 9). From the data in Annex C we infer that this component is mainly related to men older than 55, non-economists but with a favourable socioeconomic attitude regarding sustainable development. We refer to Figure 5 for more details on the structure of indicators shaping this component.

Figure 5. Component 1: End of Poverty with Infrastructures



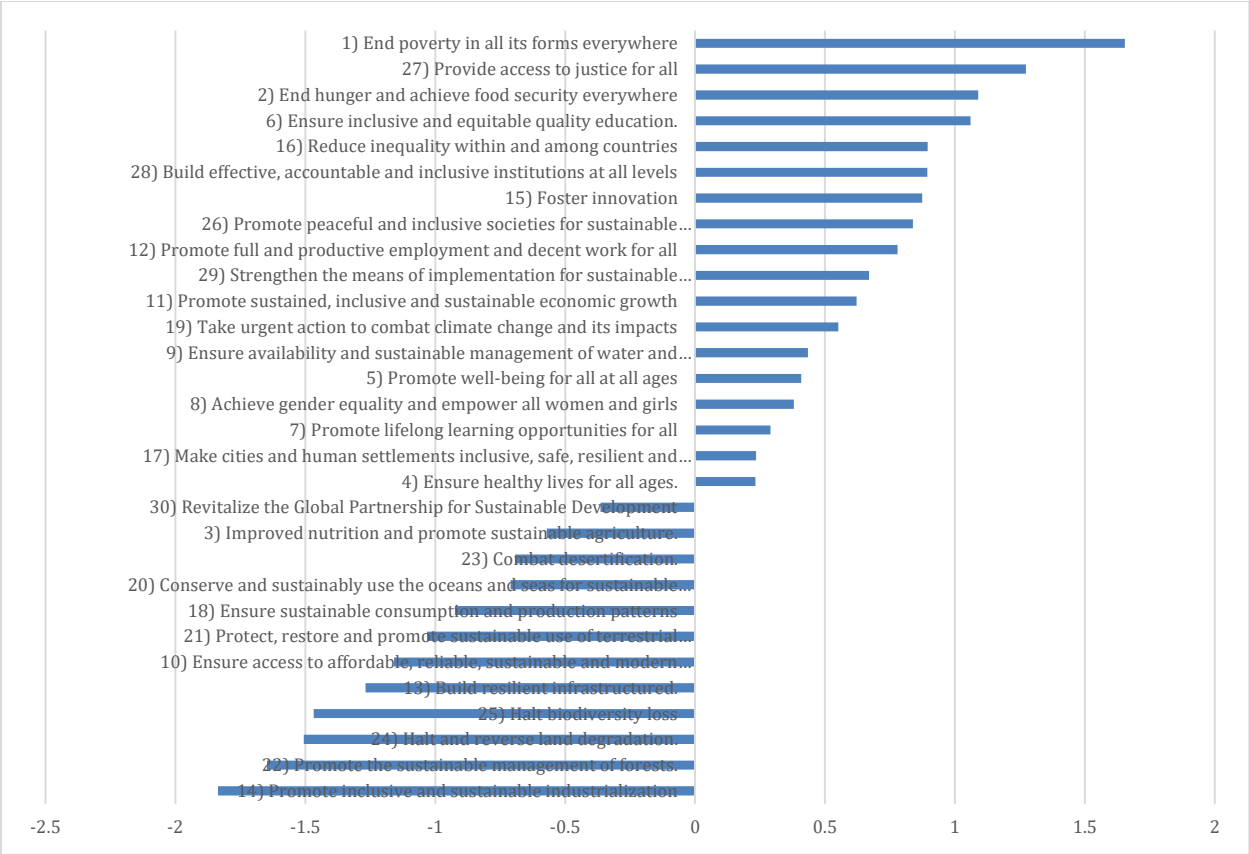
From our sample, it also appears that two female respondents from completely different parts of the world and backgrounds are more in tune with Component 3 (Wellbeing with the environment), oppose this view. Furthermore, looking at Table 1, it is clear that this perspective relates strongly to the Investment Set of the Development circle (Figure 1), to the average standardized scores of the presented goals and to the Intercept, that integrate the Financial Set of the Development circle. Authors with applied research on regional development seem to fit well in this perspective. Based on the literature, we refer here to the work of Kaygalak and Reid (2016), who address regional development in Turkey, and Rihane et al. (2018) who focus on the effects of land use in a hydrological regime of rivers. We also note here that Nicolini and Roig (2019) study the role of the informal sector on local development in Latin America, while Sarkar (2019) tries to understand urbanization in remote regions of India. The question addressed in Section 4, is whether the contextual reality influences their rankings or what are the assumptions they take ex-ante.

Component 2: End of Poverty with Justice, Education and Institutions

A younger generation composed mainly of economists favour the hierarchy of Component 2 that defends the End of Poverty (Statement 1) in combination with Justice (Statement 27), Education and Institution (Statement 6), somehow neglecting environmental capital (Statements 22, 24 and 25).

Once more looking at Table 1, it seems that those goals are strongly associated with increasing productivity and enhancing consumption of public goods. More details on the successive elements of Component 2 are contained in Figure 6.

Figure 6. Component 2: End of Poverty with Justice, Education and Institutions



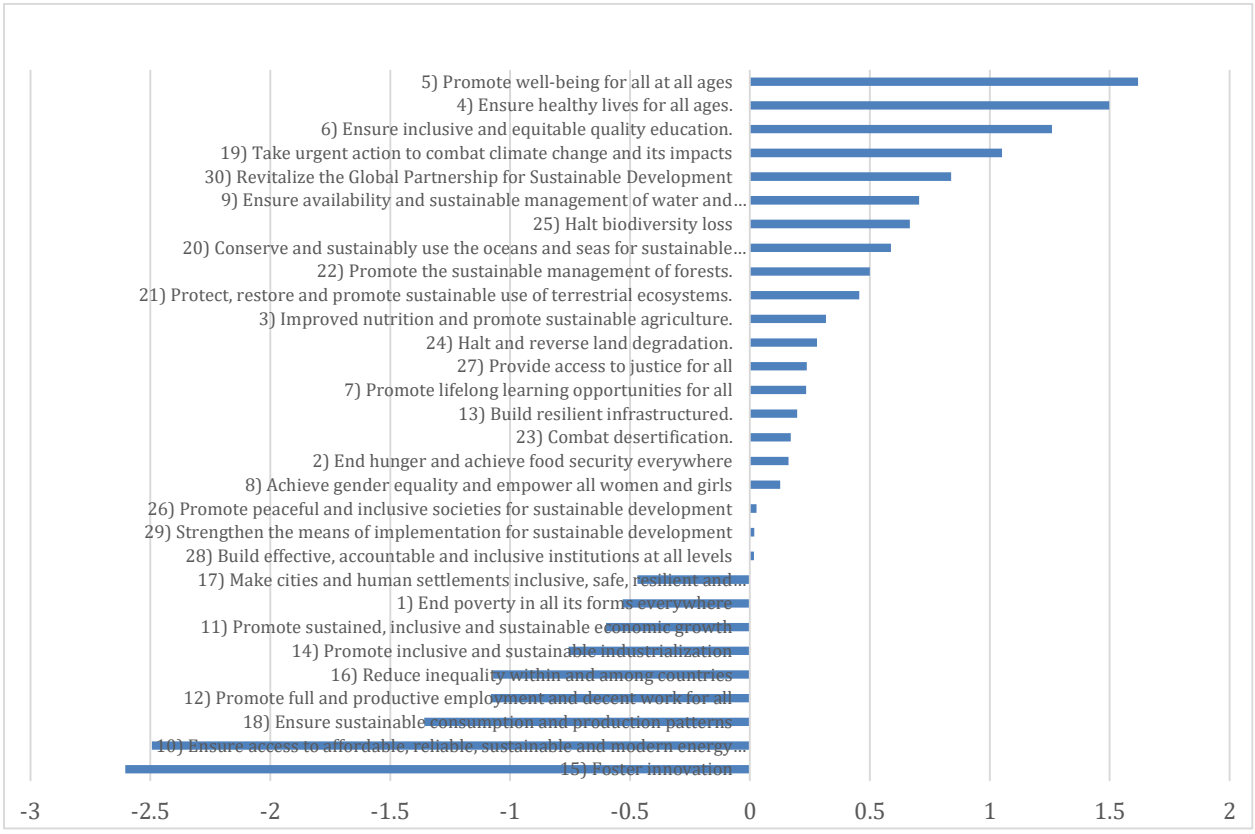
We note here that regional scientists who published work on the role of institutions on regional development (Rodríguez-Pose 2013), on labour markets (Van Dijk et al. 2019; Kourtit et al. 2020) and on interregional justice (Castells-Quintana et al. 2015; Goetz et al. 2018) relate naturally with this profile. Interestingly, the profile does not have good features for researchers that lived for long periods in socialism, as there may eventually be distrust in institutional changes.

Component 3: Wellbeing with Environmental Protection

Next we address well-being in combination with environmental protection. Seven respondents, five of them women, appear to relate to the perspective “Wellbeing with Environmental Protection”. It fits very well the message of the United Nations that it is possible to promote wellbeing for all combined with international cooperation and with inclusive education, so as to urgently combat climate change, to realise a protection of the oceans and to halt biodiversity loss, conditions that are

consistent with the results of Table 1 that associate this component with the goals sets by the Wellbeing and Consumption indication. Some distrust appears to come from researchers who lived for a long period in socialist countries. Nevertheless, albeit trendy topics, quite a few regional scientists appear to work on these issues, in particular on concrete topics such as Smart Cities (see e.g. Caragliu et al. 2008), Smart Specialization (see e.g. McCann and Ortega-Argilés 2015) or Climate Change Adaptation (see e.g. Nijkamp 1999). The reader is referred to Figure 7 for more details on the hierarchical structure of this component.

Figure 7. Component 3: Wellbeing with Environmental Protection

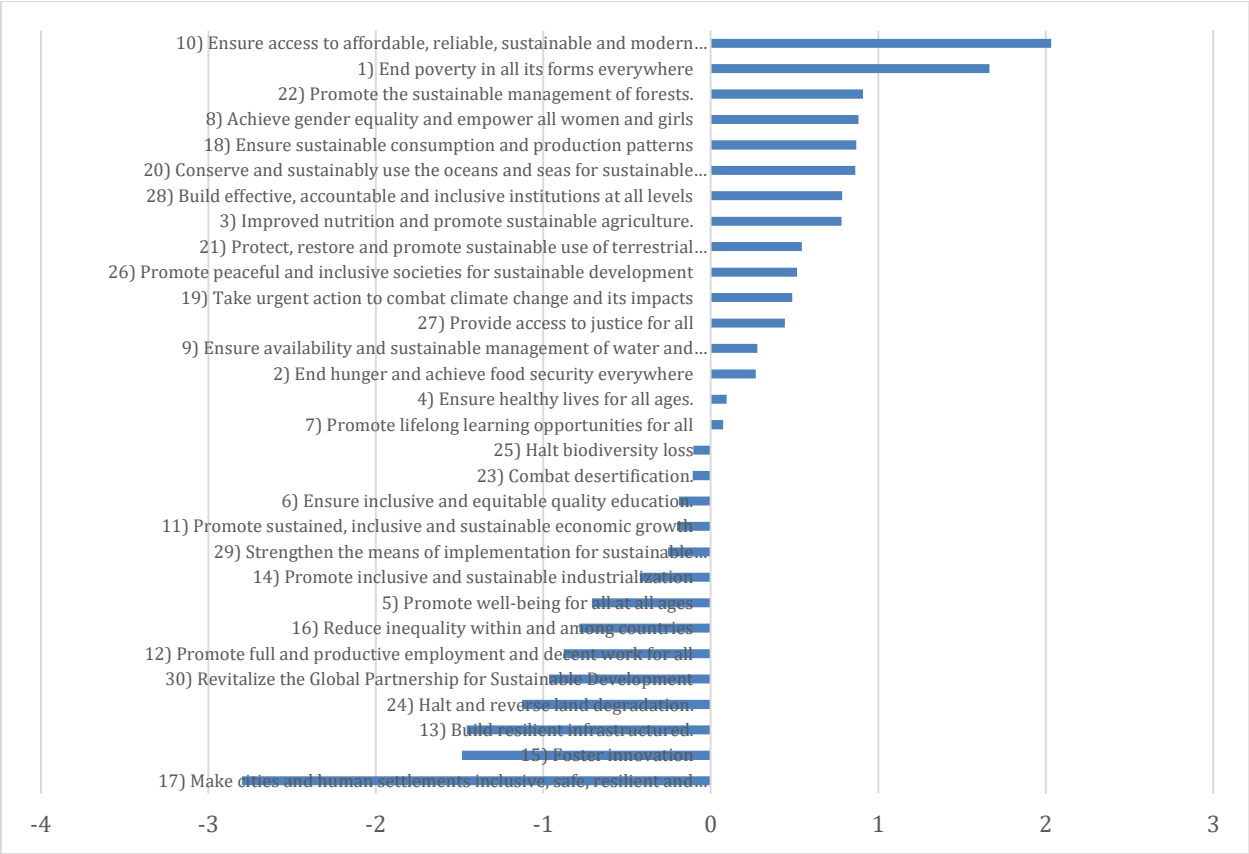


Component 4: Good Environment and Fair Society

Experts on data treatment appears to present a balanced perspective on the three domains of sustainable development in terms of "End poverty, promote good environment and create a fair society". Looking at Table 1, the profile of Component 4 favours Capital and the Investment that supports it. Investment in renewable energies, in forests and in the circular economy plus the promotion of equal rights between men and women are also important. Actually, several methods are suitable for any research agenda, and regional scientists can target many of them; examples can be found in tourism (Ferrante et al. 2018), wellbeing (Abreu et al. 2019), transport (Pourebrahim et al. 2019) and land use (Kii et al. 2019). Note that the perspective of Component 4 opposes strongly the

perspective of Component 5, which concerns the promotion of inclusive and sustainable cities. It seems that the methods they manage can address individual goals taken separately, but they are less appropriate when addressing integrated systems like cities or regions. See Figure 8.

Figure 8. Component 4: Good Environment and Fair Society



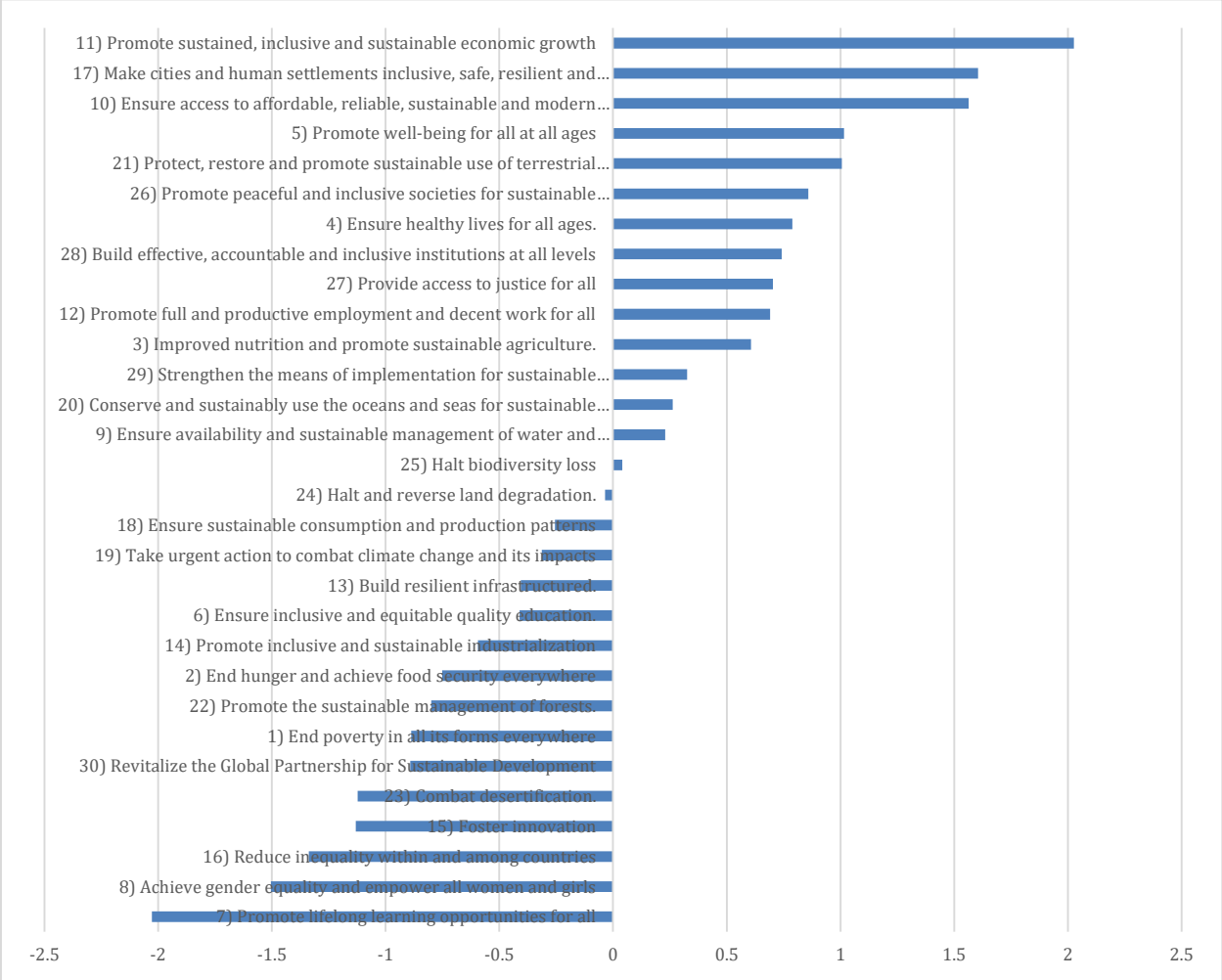
Component 5: Better Cities with Economic Growth

Experts dealing with urban issues from an interdisciplinary perspective gather around this perspective that favours investment to promote sustainable cities (see e.g. studies by Mulligan et al. 2017; Anantsuksomsri and Tontisirin 2015). From this perspective, the hierarchy of the first components related to the End of Hunger or the Promotion of Equity are less relevant, maybe because they focus more on the cause (such as better cities and economic growth) rather than directly on the aims as defended in Component 3. We refer for more details to the visualisation given in Figure 9.

We note finally that there are more than six components that would deserve some attention, because they appear as the expression of the rankings proposed to the questioned experts. For example, Component 6 associates with Capital and Income (Table 1) and is defended by middle-aged economists and very much focused on Climate Change. Component 7 appears to relate to Consumption and is also concerned with Hunger and Poverty. However, we will not discuss these

linkages in greater detail due to lack of space. As said, the Q methodology applied to views of experts-scientists – instead of to stakeholders – tends to have many components for explaining the same degree of variance. In the next section we will address specifically the factors that shape regional science perspectives from different parts of the world.

Figure 9. Component 5: Better Cities with Economic Growth



4. Factors influencing Regional Science perspectives

After the characterization of the SDGs for most countries and the analysis of the rankings of regional scientists regarding those goals, we will now address the three questions introduced in Section 2. To address these questions with the information available, we will employ a regression analysis. The 11 regressions shown in Table 2 try to relate the component scores with the characteristics of the experts concerned. The significance of the regression is not always convincing, although the significance of some of the regression coefficients allows us to provide some clear and informed interpretation of the three questions above. Rich countries are here not highlighted, because we use dummies to

differentiate the others from the Rich Countries. Rich countries are represented by the intercept and the others by the difference to the intercept.

Table 2: Regression Coefficients of Component Scores per Respondent (data in Annex C), related to the Respondents' Characteristics

	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11
Significance	,365[b]	,342[b]	,934[b]	,357[b]	,772[b]	,993[b]	,152[b]	,030[b]	,036[b]	,174[b]	,231[b]
Intercept*	-0,336	-0,130	0,528	0,680	-0,525	-0,032	0,260	0,122	0,024	0,269	-0,042
Age	0,005	0,007	-0,006	-0,013	0,013	0,004	-0,002	-0,001	-0,005	-0,005	0,003
Gender	0,364	0,108	-0,078	0,097	-0,013	-0,113	-0,111	-0,079	0,212	-0,024	-0,160
Poor	-0,05	-0,060	-0,040	-0,297	0,092	-0,032	-0,064	-0,197	0,009	0,141	0,154
Dependent	-0,152	-0,308	0,070	-0,064	-0,018	-0,006	0,070	0,012	0,212	-0,004	-0,031
Emergent	-0,149	0,214	0,097	0,117	-0,183	0,110	0,441	0,047	-0,167	0,014	-0,142
Geographer	0,02	-0,017	-0,097	0,083	0,044	-0,062	-0,057	0,090	0,215	0,009	-0,110
Engineer	0,069	-0,041	0,016	-0,034	0,035	0,037	0,286	0,626	-0,266	0,144	-0,061
Data Scientist	0,169	-0,193	0,116	0,282	0,022	0,048	-0,253	-0,080	-0,120	-0,036	0,196
Natural Scientist	0,15	-0,015	-0,016	0,338	-0,364	-0,094	-0,037	0,050	0,009	0,444	-0,197
Socio environmental	0,02	-0,185	-0,083	0,176	-0,011	0,087	-0,223	0,153	0,047	-0,358	0,204
Econ -environmental	-0,233	-0,306	0,036	0,126	-0,061	0,039	0,144	0,167	0,140	0,064	0,192

P<0,05		p<0,10	

Researchers from *Poor Countries* appear to be clearly against Component 4 whose main defenders are experts on data treatment that want to end poverty, promote a good environment and create fair societies. Strangely, regional scientists from poor countries are also against Component 8 whose main aim is to improve nutrition and to promote sustainable agriculture. Actually, the industrial sector that fails in these countries cannot be developed without increasing agriculture productivity and without better nutrition.

Regional scientists from *Dependent countries* turn out to be in favour of Component 9 which highlight the combat against desertification, the mobilization of means, and the supply of water and sanitation. Nevertheless, strangely, they are against Component 2 that defends the End of Poverty with Justice, Education and Institutions. Academics from dependent countries seem to forget that wellbeing and environmental goods and services need institutional changes.

Scholars from *Emergent countries* associated themselves with Component 7 which defends the end of hunger and poverty, and urgent actions to combat climate change and reverse land degradation. Peculiarly, they attach lower importance to the promotion of life-long learning opportunities, in achieving gender equality and in promoting well-being for all at all ages. In fact, issues like low product per capita and volatile industrial structure are not addressable without increasing gender equality and life-long learning opportunities.

Finally, experts from *Rich countries* – as mentioned, represented partially in the Intercept of the regression – are apparently in favour of the perspectives of components 3 (wellbeing through environmental protection) and 4 (good environment and fair society), and are against the profiles of

component 5 (better cities with economic growth). Understandably, they assume that it is possible just to highlight the big goals (wellbeing, good environment and fair society) without paying too much attention to the intermediate results (better cities with economic growth). Researchers from rich countries seem to believe in an easy going Kuznets curve phenomenon, where money is available for more justice and better environment.

Summing up the findings on the *first* question leads to the following concise results. Different regions imply different rankings of the UN goals. Nevertheless, some of these differences are denials of the problems of their surroundings. Researchers from *Dependent countries* deny the need for institutional changes. Scientists from *Poor countries* do not prioritize better nutrition and sustainable agriculture. Regional scientists from *Emerging countries* do not consider gender equality a top issue. Finally, scholars from *Rich countries* seem to think that aims come easily without better cities and more growth.

In regard to the *second* research question, we find the following results. Looking at the scientific backgrounds of the regional experts involved, there seems to be also some bias on the approach to the UN sustainable goals. Engineers seem to like very much Component 8, whose main aim is to improve nutrition and to promote sustainable agriculture. Geographers prefer Component 9 which highlights the combat against to desertification, the mobilization of means, and the supply of water and sanitation. Natural scientists seem to favour Component 10 which considers that the revitalisation of the Global Partnership for Sustainable Development plays a crucial role, somehow also taken into account by economists. From our analysis, it is clear that the answer to the second question is also affirmative: different scientific backgrounds influence different rankings of UN SDGs. Therefore, for a balanced analysis it is important to have interdisciplinary teams looking at the same reality.

The answer to the *third* question regarding different attitudes related to sustainability and to different rankings is also affirmative. Economic-Environmental attitudes show a difference with the perspective of Component 2, which advocates the End of Poverty together with Justice, Education and Institutions, but favour the profile of Component 11, which defends the Promotion of Peaceful and Inclusive Societies for Sustainable Development. On the other hand, the socio-environmental attitude shows a strong disagreement with Component 10, which attaches much importance to the revitalization of the Global Partnership for Sustainable Development.

5. Conclusion

The aim of the paper was to understand and identify regional science perspectives on Global Development. The challenge was to know whether regional scientists have uniform views on

sustainable development in the great diversity of the UN SDGs. After the clustering of countries based on their performance regarding the UN development goals, a group of regional scientists from all over the world was asked to prioritise the goals (extended to 30). The use of a Q-method allowed the identification of the main perspectives which – confronted with their geographical origin, their geographical background and their attitude regarding sustainability – provided very informative answers to three relevant research questions. Clearly, different regions present different rankings of the UN goals, but sometimes with denial postures. Also, different scientific backgrounds capture different priorities which may lead to biased approaches to reality. And, though with lower evidence, different views of regional scientists related to sustainability may imply different objectives for sustainable outcomes.

Some indicative lessons are in order here. On the one hand, it is important to complement the perspective of local or regional researchers with the point of view of relative outsiders. On the other hand, it is crucial to specify the assumptions of each sustainable development study in terms of the systemic effects on the various SDG dimensions; in general, data-analytical methods are not neutral on the assumptions made. Finally, it is helpful to understand whether different views on sustainable development may prompt the need for a reality-check based from a complementary perspective, both empirically and methodologically.

We may thus conclude that regional science has shown a well anchored interest in SDG issues, from both a global and local perspective. Given the multidisciplinary nature of regional science, no unambiguous and commonly shared research framing could be distilled. The multi-dimensionally of SDGs is apparently approached with heterogeneous viewpoints/research foci of the regional science community.

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Appendix

Annex A: Questionnaire on UN Sustainable Goals for Regional Science

Table A1. List of questions to regional science respondents (using a -4 to +4 scale)

Extended UN Sustainable Goals	-4	-3	-2	-1	0	1	2	3	4
1) End poverty in all its forms everywhere (Goal 1)									
2) End hunger and achieve food security everywhere (Goal 2.1)									
3) Improved nutrition and promote sustainable agriculture (Goal 2.2)									
4) Ensure healthy lives for all ages. (Goal 3.1)									
5) Promote well-being for all at all ages (Gola 3.2)									
6) Ensure inclusive and equitable quality education. (Goal 4.1)									
7) Promote lifelong learning opportunities for all (Goal 4.2)									
8) Achieve gender equality and empower all women and girls (Goal 5)									
9) Ensure availability and sustainable management of water and sanitation for all (Goal 6)									
10) Ensure access to affordable, reliable, sustainable and modern energy for all (Goal 7)									
11) Promote sustained, inclusive and sustainable economic growth (Goal 8.1)									
12) Promote full and productive employment and decent work for all (Gola 8.2)									
13) Build resilient infrastructured. (Goal 9.1)									
14) Promote inclusive and sustainable industrialization (Goal 9.2)									
15) Foster innovation (Goal 9.3)									
16) Reduce inequality within and among countries (Goal 10)									
17) Make cities and human settlements inclusive, safe, resilient and sustainable (Goal 11)									
18) Ensure sustainable consumption and production patterns (Goal 12)									
19) Take urgent action to combat climate change and its impacts (Goal 13)									
20) Conserve and sustainably use oceans and seas for sustainable development (Goal 14)									
21) Protect, restore and promote sustainable use of terrestrial ecosystems. (Goal 15.1)									
22) Promote the sustainable management of forests.(Goal 15.2)									
23) Combat desertification.(Goal 15.3)									
24) Halt and reverse land degradation.(Goal 15.4)									
25) Halt biodiversity loss (Goal 15.5)									
26) Promote peaceful and inclusive societies for sustainable development (Goal 16.1)									
27) Provide access to justice for all (Goal 16.2)									
28) Build effective, accountable and inclusive institutions at all levels (Goal 16.3)									
29) Strengthen the means of implementation for sustainable development (Goal 17.1)									
30) Revitalize the Global Partnership for Sustainable Development (Goal 17.2)									

Information on the respondents

Country of Residence	
Gender	
Age	
Academic (Economist, Geographer, Engineer, Natural Scientist, other…what)	
Occupation (academic, consultant, entrepreneur, politician,…what)	
Attitude (socio-economic, socio-environmental, economic-environmental)	

Annex B: Responses to the Questionnaire on UN Sustainable Goals for Regional Scientists

Table B1. Numerical responses of respondents (experts-regional scientists)

	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16	P17	P18	P19	P20	P21	P22	P23	P24	P25	P26	P27	P28	P29	P30	Cou	Gen	Age	Dis	Att
R1	0	2	2	1	0	-1	-2	-1	3	2	3	4	0	-2	-3	-3	2	0	-3	1	1	-2	-3	0	-1	1	2	2	0	-1	OR	M	61	E	EV
R2	2	3	3	2	2	2	3	3	4	3	3	2	2	3	4	2	3	3	4	4	3	2	2	2	2	3	2	2	3	4	VE	M	62	N	EV
R3	4	4	4	4	2	4	1	1	4	4	3	4	3	2	4	4	4	4	4	4	4	4	4	4	4	4	4	2	4	4	OM	F	52	E	SE
R4	4	4	0	0	-1	1	-2	-1	1	1	0	-2	-2	-3	-1	1	0	0	4	3	2	2	0	0	0	1	1	1	1	1	MEX	M	45	E	SE
R5	3	4	1	3	3	2	0	0	2	0	0	0	0	0	-1	-1	0	-1	2	2	2	2	2	2	1	1	2	0	0	0	TA	M	41	E	SE
R6	2	0	2	2	2	2	3	2	2	2	2	2	2	2	2	3	2	2	3	3	3	3	3	2	2	4	4	4	3	4	PA	F	49	E	SE
R7	2	4	3	2	2	3	1	2	3	2	1	0	1	0	0	-1	-1	3	4	3	3	3	3	2	3	0	2	1	1	1	SA	F	34	G	SE
R8	4	4	1	4	2	4	2	2	4	1	1	4	1	0	2	4	4	2	4	2	2	2	3	3	2	2	4	4	2	2	RA	M	70	E	EV
R9	1	3	1	0	1	1	1	2	1	1	2	2	1	1	1	2	2	1	4	2	2	2	2	2	2	1	2	1	0	0	SA	M	54	E	EV
R10	0	2	2	2	3	3	0	0	2	3	3	2	2	1	2	1	2	1	2	2	3	2	2	3	2	2	2	2	2	0	AN	M	72	G	EV
R11	2	1	3	-1	-1	0	-1	-2	0	0	0	-1	-1	-1	-1	-4	-1	0	0	0	1	1	1	1	4	-4	0	0	-4	-4	US	M	45	R	SV
R12	4	4	3	4	3	3	2	4	3	2	4	3	3	2	2	3	4	2	4	2	2	2	2	2	3	4	3	2	2	2	ND	F	48	G	SE
R13	1	2	3	3	3	4	2	3	2	-4	0	1	2	0	-4	-4	0	1	1	2	2	2	2	1	2	3	3	2	2	2	RL	F	29	E	SE
R14	4	3	4	3	2	3	3	4	3	4	3	2	1	3	1	3	1	4	3	3	3	4	2	2	3	3	3	3	2	2	TA	M	39	M	SE
R15	4	4	3	3	3	4	3	3	3	2	2	4	4	3	3	3	3	3	2	2	2	2	2	3	3	2	3	3	4	4	CHI	M	45	E	SE
R16	3	4	3	4	4	4	1	4	4	4	4	4	2	2	1	4	4	2	4	3	4	3	2	3	4	4	4	2	2	2	IET	M	64	E	SE
R17	2	2	4	4	4	4	3	3	4	3	4	2	3	2	2	3	4	3	4	4	4	4	4	4	4	3	4	4	3	4	OM	F	52	E	SE
R18	4	4	4	4	3	4	4	4	3	4	4	4	3	3	3	3	4	4	4	4	4	4	4	3	4	4	4	3	3	3	IET	F	42	E	SV
R19	4	3	2	4	4	3	2	3	3	2	2	1	1	1	0	1	0	0	0	0	1	0	-1	-1	0	-2	-1	-1	-2	-3	IOR	M	65	N	SV
R20	4	4	1	4	4	3	1	3	3	3	4	4	1	4	4	4	4	3	4	0	3	2	1	2	1	4	3	4	4	2	SA	M	67	E	SE
R21	4	4	4	4	4	4	1	4	4	4	2	3	1	2	2	0	1	1	0	2	2	1	3	2	3	0	2	3	2	1	SA	M	66	G	SE
R22	3	2	3	4	4	2	1	1	2	3	4	3	2	2	2	2	4	3	4	4	4	2	1	2	3	4	4	4	4	2	HA	F	39	G	SE
R23	-4	4	4	-4	0	0	4	0	3	1	4	2	0	3	4	0	2	-4	-3	-3	-2	-1	4	1	-1	1	-2	1	3	3	US	M	67	G	SE
R24	3,5	3	3	4	3	4	3	2	3	2	3	2	2	2	1	3	0,5	0	4	3	3	4	3	3	3	3	3	4	3	3	RO	M	36	E	SE
R25	3	4	4	3	3	4	2	3	1	1	4	4	0	-1	4	0	4	4	3	3	4	3,5	4	4	4	0	2	4	2	3	IOR	M	45	R	SV
R26	4	3	3	2	1	4	2	4	2	1	3	2	3	1	4	4	3	3	4	3	2	2	1	1	2	3	3	3	2	2	ER	F	42	E	SE
R27	-4	-2	1,5	0	1,5	1,5	2,5	1	-3	1,5	1	0,5	-1	1	2	1	0	1	2	1	2	2,5	2	1,5	0,5	0,5	1,5	2,5	3,5	3,5	ND	F	37	G	SV
R28	-4	4	4	3	1	3	1	3	3	-4	-4	3	0	-2	2	2	-4	4	4	4	4	4	4	4	4	2	2	3	2	2	PA	F	47	E	SE
R29	1	1	-3	-3	-1	1	1	2	3	3	4	2	2	3	4	3	3	1	3	3	3	3	3	3	3	4	3	3	3	3	RA	F	48	G	SE
R30	3	4	4	4	3	4	4	4	4	3	3	3	3	3	4	3	4	4	3	4	4	4	4	3	4	4	3	2	4	3	AI	M	59	E	EV
R31	3	4	3	3	2	3	1	4	4	4	2	2	1	0	-1	-1	-1	3	4	3	3	2	3	1	3	4	3	4	4	0	SA	M	59	G	EV
R32	3	0	0	2	3	2	0	-2	2	0	4	2	-1	-3	0	3	1	-4	1	-2	-2	-3	-2	-3	-4	2	4	3	1	-4	PA	M	49	E	SE
R33	3	4	3	2	4	3	3	4	4	4	4	3	4	4	2	3	4	3	4	4	4	4	2	3	3	3	1	3	3	4	CHI	M	36	E	SE
R34	4	3	1	0	3	2	1	0	1,5	-1	1	0,5	-1	-3	1	0	0	0	0	0	-1	-3	0	-2	0	2	2	1	0	0	PA	M	53	G	SE
R35	3	3	2	2	4	4	4	4	3	3	4	3	2	2	3	4	3	2	4	4	3	3	3	3	2	2	4	3	3	2	TA	F	47	E	SE
R36	3	3	3	4	4	4	3	3	3	1	4	2	2	3	1	2	4	2	4	3	3	2	2	2	4	2	3	2	2	2	SA	F	53	M	SE
R37	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	RA	M	49	E	SV
R38	2	3	0	3	4	1	4	0	4	2	3	4	1	2	4	0	-1	1	1	0	3	4	4	1	3	4	1	0	4	4	NG	M	38	G	EV

Annex C: Principal Component Factor Scores per Respondent

					C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11
Morocco	M	65	NaSc	So En	0,794	0,221	0,118	0,231	0,001	0,081	-0,326	-0,036	-0,002	-0,127	0,062
USA	M	56	Geo	So Ec	0,6	0,143	0,129	0,322	0,151	-0,204	-0,18	0,393	0,238	-0,149	-0,122
Brazil	M	70	Econ	Ec En	0,078	0,623	0,229	-0,079	-0,046	0,16	0,44	0,148	-0,157	-0,254	-0,103
USA	M	57	Econ	So Ec	0,137	0,575	-0,254	-0,096	0,268	0,064	0,062	-0,34	0,054	-0,026	-0,113
Germany	F	42	Econ	So Ec	-0,024	0,586	-0,111	0,053	-0,226	0,095	0,107	0,043	-0,58	0,171	0,172
Spain	M	49	Econ	So Ec	0,055	0,806	0,007	0,01	0,375	0,113	-0,136	-0,162	0,044	-0,222	-0,152
Spain	M	53	Geo	So Ec	0,219	0,812	0,134	0,14	0,055	-0,154	0,002	0,158	0,06	0,032	0,061
China	M	45	Econ	So Ec	0,338	0,329	0,056	-0,329	-0,279	-0,578	0,07	0,098	-0,086	-0,025	-0,272
Italy	M	41	Econ	So Ec	0,386	0,119	0,636	0,281	0,077	0,178	0,337	0,096	0,21	-0,127	-0,015
Sri Lanka	F	29	Econ	So Ec	-0,007	0,041	0,824	0,15	0,031	-0,293	-0,072	0,145	-0,005	0	0,163
Romania	F	62	Econ	So Ec	-0,347	-0,217	0,624	-0,007	0,364	0,219	-0,035	0,225	-0,12	-0,048	0,009
Croatia	M	36	Econ	So Ec	-0,117	0,192	0,652	0,356	-0,041	0,206	0,086	-0,066	0,198	-0,196	-0,292
Spain	F	47	Econ	So Ec	-0,258	-0,115	0,429	0,113	-0,305	-0,023	0,324	0,402	0,082	-0,038	0,116
Nether	M	64	Econ	So Ec	0,35	0,214	0,261	0,144	0,498	0,401	0,184	-0,188	-0,121	-0,064	0,147
USA	F	53	Da Sci	So Ec	0,341	0,172	0,634	-0,077	0,233	0,24	-0,217	-0,022	-0,252	0,017	0,271
India	F	48	Geo	So Ec	0,456	0,527	0,222	-0,033	0,198	0,148	0,057	-0,284	-0,273	0,039	0,313
Italy	M	39	Da Sci	So Ec	0,115	-0,048	0,018	0,882	-0,054	0,051	-0,104	-0,076	-0,187	-0,042	0,123
USA	M	59	Geo	Ec En	0,052	0,15	0,299	0,75	0,235	-0,059	0,121	0,151	0,125	0,098	0,047
Portugal	M	61	Econ	Ec En	0,253	0,192	-0,024	0,117	0,745	-0,255	0,016	0,144	-0,002	0,123	-0,062
Canada	M	72	Geo	Ec En	0,053	-0,138	0,089	-0,099	0,679	0,33	0,164	0,261	0,283	-0,141	-0,098
Thailand	F	39	Geo	So Ec	-0,224	0,206	0,127	0,1	0,801	-0,024	0,151	-0,097	-0,205	0,005	0,032
USA	M	54	Econ	Ec En	0,125	0,017	0,037	0,031	-0,045	0,801	0,237	0,167	-0,234	0,105	0,082
Italy	F	47	Econ	So Ec	-0,092	0,457	0,091	0,07	-0,078	0,675	-0,315	0,146	-0,042	0,028	-0,126
Romania	F	52	Econ	So Ec	-0,042	-0,011	-0,09	-0,019	0,245	-0,005	0,856	0,122	0,039	-0,066	0,162
México	M	45	Econ	So Ec	-0,022	0,284	0,203	0,474	0,041	0,275	0,604	0,07	-0,139	0,251	-0,086
Morocco	M	45	Eng	So En	0,03	0,085	0,14	-0,027	0,116	0,109	0,097	0,811	-0,085	-0,043	0,19
USA	F	34	Geo	So Ec	0,219	-0,195	0,461	0,566	-0,07	0,158	0,251	0,432	0,048	0,114	0,078
Russia	M	45	Engi	So En	0,417	-0,302	0,108	0,317	0,104	0,176	0,115	0,546	-0,107	-0,214	0,057
Russia	M	57	Geo	So Ec	0,015	0,045	-0,233	-0,378	-0,074	-0,043	-0,309	0,191	0,546	0,292	-0,072
Angola	M	38	Geo	Ec En	-0,035	0,02	0,059	-0,007	-0,089	-0,113	0,086	-0,126	0,866	0,013	0,138
C. Verde	M	62	NaSc	Ec En	-0,166	0,008	-0,148	0,03	-0,038	0,018	0,035	0,005	0,064	0,848	0,185
France	F	48	Geo	So Ec	-0,419	-0,068	-0,375	-0,146	-0,016	0,409	0,219	-0,155	0,101	0,299	-0,178
China	M	36	Geo	So Ec	0,308	-0,315	0,103	0,014	0,109	0,217	-0,144	-0,235	-0,095	0,687	-0,2
Nether	F	42	Econ	So En	0,122	0,058	0,055	0,442	0,15	0,238	0,041	0,166	-0,177	-0,118	0,674
Taiwan	M	59	Econ	Ec En	0,099	-0,111	0,137	0,021	-0,182	-0,072	0,132	0,173	0,208	0,175	0,793
Spain	F	49	Econ	So Ec	-0,902	0,057	0,155	0,11	0,013	-0,031	-0,008	-0,213	-0,046	-0,082	-0,113
India	F	37	Geo	So En	-0,767	-0,232	0,017	-0,083	-0,03	0,097	-0,287	0,2	0,128	-0,042	-0,022

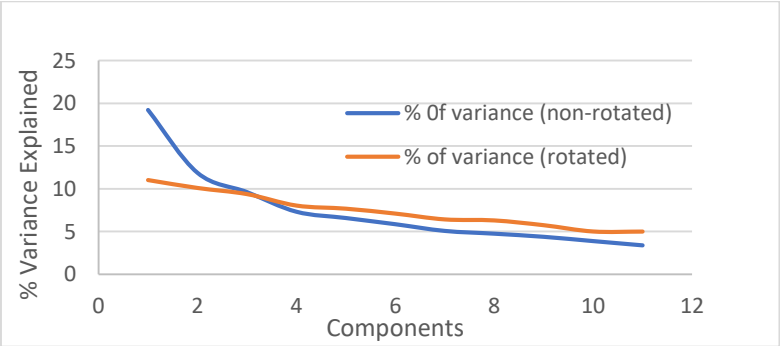

Figure C.1 Total Variance Explained

Annex D: Principal Components Vector Scores per Statement

Extended UN Sustainable Goals	1	2	3	4	5	6	7	8	9	10	11
1) End poverty in all its forms everywhere	1,71	1,65	-0,53	1,66	-0,89	-0,82	0,92	-0,74	-1,02	-0,75	-0,71
2) End hunger and achieve food security everywhere	2,48	1,09	0,16	0,27	-0,75	0,35	1,51	0,95	0,92	1,39	-0,09
3) Improved nutrition and promote sustainable agriculture.	0,42	-0,57	0,32	0,78	0,61	-1,46	-0,86	1,7	-0,71	0,08	0,83
4) Ensure healthy lives for all ages.	0,74	0,23	1,5	0,09	0,79	-1,31	0,3	-1,02	0,14	-2,1	1,29
5) Promote well-being for all at all ages	0,85	0,41	1,62	-0,71	1,02	0,28	-1,72	-0,22	1,14	-0,47	-0,96
6) Ensure inclusive and equitable quality education.	0,44	1,06	1,26	-0,19	-0,41	0,24	-0,26	1,08	-0,21	-0,67	0,1
7) Promote lifelong learning opportunities for all	-0,64	0,29	0,23	0,07	-2,03	0,05	-2,58	0,01	0,81	-0,1	0,95
8) Achieve gender equality and empower all women and girls	0,61	0,38	0,13	0,88	-1,5	0,34	-2,11	-0,05	-1,23	0,95	0,86
9) Ensure availability and sustainable management of water and sanitation for all	1,21	0,43	0,71	0,28	0,23	-0,32	0,69	-0,36	1,45	1,65	-0,63
10) Ensure access to affordable, reliable, sustainable and modern energy for all	0,51	-1,16	-2,49	2,03	1,56	0,51	-0,36	-0,42	0,86	-0,05	-0,84
11) Promote sustained, inclusive and sustainable economic growth	0,17	0,62	-0,6	-0,2	2,03	1,54	-1,68	-0,04	0,32	0,77	0,33
12) Promote full and productive employment and decent work for all	0,57	0,78	-1,08	-0,88	0,69	-0,42	0,3	0,53	0,59	-0,9	-0,01
13) Build resilient infrastructured.	0,86	-1,27	0,2	-1,46	-0,41	-1,14	0,04	-0,95	-1,04	0,02	-1,09
14) Promote inclusive and sustainable industrialization	0,82	-1,84	-0,76	-0,42	-0,59	-0,31	-1,25	-2,06	0,24	0,09	-0,76
15) Foster innovation	-0,54	0,87	-2,61	-1,49	-1,13	0,01	0,35	1,32	1,12	0,25	0,63
16) Reduce inequality within and among countries	-0,49	0,89	-1,07	-0,79	-1,34	1,38	0,44	-1,75	-1,1	-1,19	-0,85
17) Make cities and human settlements inclusive, safe, resilient and sustainable	0,45	0,24	-0,47	-2,8	1,61	0,5	0,04	-0,02	-1,8	0,64	1,31
18) Ensure sustainable consumption and production patterns	-0,31	-0,92	-1,36	0,87	-0,26	-1,56	0,52	0,74	-1,63	0,12	1,32
19) Take urgent action to combat climate change and its impacts	-0,74	0,55	1,05	0,49	-0,31	2,4	1,04	-0,48	-1,19	1,17	-0,08
20) Conserve and sustainably use the oceans and seas for sustainable development	-0,79	-0,71	0,59	0,86	0,26	0,51	0,34	0,68	-1,06	1,52	0,14
21) Protect, restore and promote sustainable use of terrestrial ecosystems.	-0,42	-1,03	0,46	0,54	1,01	0,76	0,57	0,22	0,3	0,37	0,44
22) Promote the sustainable management of forests.	-0,56	-1,65	0,5	0,91	-0,8	1,2	0,7	-0,4	0,58	-0,64	0,24
23) Combat desertification.	-0,69	-0,69	0,17	-0,11	-1,12	0,83	0,35	1,23	1,8	-1,35	0,66
24) Halt and reverse land degradation.	0,13	-1,51	0,28	-1,13	-0,04	0,65	0,91	1	0,04	-0,9	-1,61
25) Halt biodiversity loss	0,53	-1,47	0,67	-0,1	0,04	0,11	0,66	0,57	-0,28	-0,76	0,93
26) Promote peaceful and inclusive societies for sustainable development	-1,43	0,84	0,03	0,51	0,86	-0,66	0,87	-2,45	0,94	0,39	1,69
27) Provide access to justice for all	-1,35	1,27	0,24	0,44	0,7	0,2	0,3	0,21	-0,61	-1,71	0
28) Build effective, accountable and inclusive institutions at all levels	-1,56	0,89	0,02	0,79	0,74	-0,69	-0,81	1,18	-0,92	-0,39	-2,83
29) Strengthen the means of implementation for sustainable development	-1,43	0,67	0,02	-0,26	0,33	-1,47	0,28	-0,16	1,38	0,78	-0,38
30) Revitalize the Global Partnership for Sustainable Development	-1,54	-0,36	0,84	-0,97	-0,89	-1,71	0,48	-0,33	0,16	1,8	-0,92