Culture as a fourth dimension of sustainable development? A statistical analysis.

Andrej Srakar, PhD
Research Associate, Assistant Professor
Institute for Economic Research, and University of Ljubljana
Slovenia
srakara@ier.si

Marilena Vecco, PhD
Assistant Professor
Erasmus University Rotterdam
The Netherlands
vecco@eshcc.eur.nl

Abstract

In recent years, many discussions have been led over the role of culture as a fourth dimension of sustainable development. Yet, most of the discussions have been developed only on theoretical and descriptive level. In our article we firstly present an overview of the concept and then use the dataset of Eurostat Sustainable Development Indicators which includes data on sustainable development indicators regarding 130 indicators for EU-28 countries in the period 1990-2014. On the basis of the dataset and recently published methodology we construct an index of sustainable development, based on high-dimensionally adjusted (Metropolis-Hastings Robbins-Monro algorithm) factor analysis which allows us to include a full set of indicators into the statistically supported weighting scheme for the index calculation. We show that inclusion of cultural indicators in the index has relevant influence on the concept of sustainable development, resulting in a separate dimension and being strongly related to the wealth of the country as shown mostly in poverty and social inclusion indicators. Finally, we discuss the research and political relevance of the article findings.

Keywords: sustainable development, culture, fourth dimension, statistics, composite indicators, multivariate analysis.

After four decades of development, how far have we got?

The paradigm of "sustainable development" has experienced several shifts over time. Although it dated back to the 1970's with a focus on the environmental consequences of rapid economic growth, this concept did not take more substantial shape until the publication in 1987 of *Our Common Future*, from the United Nations World Commission on Environment and Development. To cope with the environmental, social and economic challenges raised by the industrialised economic system, the awareness of the ecological destruction and retreat from social challenges – poverty, deprivation and urban dereliction that blight many countries worldwide - , the Commission advocated the adoption of policies aimed at achieving sustainable development, defined as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (see e.g. Langhelle, 1999; Nurse, 2006). During the 1980s the debate about environmental sustainability received more attention and generated a first relevant shift in the paradigm: from a commodity-centred to a human-centred process. This shift was relevant as it implied a revision of the centrality of economic growth in development policy. As reported by Throsby (2008), some international reports such as the *UNDP's Human Development* (1991) and *Our Creative Diversity* (1995), and the seminal works by Amartya Sen, highlighted the centrality of culture which advocated for a human-centred development perspective.

The centrality of culture had been reaffirmed by UNESCO in the World Culture Report (1998, 2000) and by the World Bank's international conference *Culture counts. Financing, Resources and the Economics of Culture in Sustainable Development* (1999). Moreover, this conference provided room to develop the concept of culture as as a driver and enabler of sustainable development worldwide with a multidisciplinary approach. In this vein, Throsby (1995, 2003; 2008), and Greffe et al. (2005) among others, opened up the research stream by providing some evidence of this role of culture in the sustainability framework.

Despite the international awareness of the relevance of this shift in the paradigm of sustainable development and the inclusion of economic, social and environmental sustainability[1] into the policy debate, the reference and the inclusion of the cultural dimension of sustainability into policy narratives was very limited. To fill in this gap, a specific emphasis had been put on the need to adopt a holistic approach of the development process (UNESCO Convention 2005, art. 13). The main goal was to combine the cultural dimension of sustainable development with its economic, environmental and social[2] dimensions[3].

Recently, an increasingly high attention has been paid to the role of culture as a fourth pillar of sustainable development from an institutional international perspective (UNESCO, 2005, 2013; KEA, 2006; UCLG, 2010) and from an academic perspective as well (e.g. Leach 1998; Langhelle, 1999; Nurse 2006; Seghezzo 2009; Dessein et al. 2015). In parallel to the emergence of this concept, the concept of ecology of culture - which is strictly related to thesustainability – has been firmly established in the academic field (Holden 2015, Markusen et al., 2011). The Secretary General of the United Nations Organization Ban Ki-moon in a General Assembly debate on culture and development organised in June 2013 stated in his opening remarks: "Most of the development programs that are well-intended have failed as there were no cultural considerations into account. Development has not been focused on people. We must need to understand people and their culture. (UNESCO, 2013). The paradigm shift had been recently summarised as a transition from the Millennium Development Goals (MDG, 2000 to 2015) to the Sustainable Development Goals (SDG, 2015 to 2030) by Griggs (2013). However, no mention is directly done to the role of culture within the sustainable development in the "Anthropocene": "Development that meets the needs of the present while safeguarding Earth's life-support system, on which the welfare of current and future generations depends." (p. 306). A significant step forward within the acknowledgement process of the role of culture in development processes and sustainability is represented by *Transforming Our World*: *the 2030 Agenda for Sustainable Development*. This document sums up some relevant key concepts, raised in the last decade debates. Concepts like cultural diversity, creativity and innovation, resilience, inclusiveness, sustainability, policy to sustainability, protection and safeguard of world's cultural and natural heritage, among others, can be considered as adequate substrate to support the growth of creative economy. The *fil rouge* of all the mentioned documents and publications is the relevance and potential of culture to the sustainable development. Culture has to be assumed as one of the four dimensions of sustainable development asit is as essential as its economic, social and environmental dimensions. This has a clear implication: only by adopting a holistic approach – in which all values previously mentioned are integrated, the potential of the sustainable development may be fully achieved.

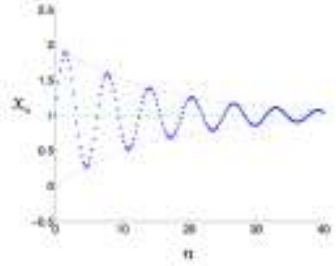
[1] The Rio de Janeiro Earth Summit of 1992 consolidated these three pillars as the paradigm of sustainable development.

[2] We decided to include tout court the social dimension as it commonly attributed to the concept of sustainable development but as Dempsy at al. (2009) noticed "Despite the anthropocentric focus of the definition of sustainability (Hopwood et al., 2005), surprisingly little attention has been given to the definition of social sustainability in built environment disciplines. Related concepts are more readily discussed and examined within a physical context, such as 'social capital', which has a focus on strengthening civic participation and localized empowerment via social interaction and sense of community among all members/residents (Putnam, 2000; Mitlin and Satterwaite, 1996)" (Dempsy et al., 2009: 2).

[3] For a detailed review of the concept of sustainability please refer to Keiner 2005 and Elliot 2013.

As it has been pointed out in the campaign to promote the *Transforming Our World* (2015), the "narrative on culture and sustainable development must be strengthened with evidence-based research and indicators. There is a need for reliable and inclusive indicators to measure the implementation of the culture related targets. We aim to contribute to the design of cultural indicators and a suitable information infrastructure which allows for a better quantitative and qualitative understanding and measurement of the place of culture in sustainable development." (p. 3). Moreover, from an academic/research perspective, for a long time, culture has been considered and handled as a sensitive topic in economic literature, because of theoretical, methodological and empirical limitations. This concept – as latent construct - could not be framed and was incompatible and "incompossible" with neoclassical growth theory and its orientation towards quantitative evidence. Presently, we assist to another relevant shift in the paradigm of sustainable development: from the human-centred to a reflexive culture-centred process: culture becomes a reflexive space in mathematical terms, a vector space that embrace the three-dimensional space – represented by the already three accepted dimensions (environmental, economic and social). This vector space implies metric of, one side, combining, merging and, on the other, impacting the three dimensions. It is assumed to be a Cauchy sequence whose elements become arbitrarily close to each other as the sequence progresses to finally converge.

Figure 1: Culture in relation with the other dimensions of sustainable development



So far the discussion has been to include and reshape the role of culture within the sustainable development, but which are the motivations to justify the validity of that?

- To develop a holistic view of development: so far, culture is the only concept which enables to understand the interconnections between the different dimensions of sustainability: the reduction of poverty is not just about increasing productivity and income, rather than a way to enable people to enjoy a sense of well-being and opportunities to develop and take decisions about their lives. Culture is one of the core areas in the Comprehensive Development Framework of the World Bank (1999) and the 2030 agenda. It has the same relevance as education, water, transport and communications, sanitation, infrastructures and justice system.
- To achieve more resilience in all human sectors as tool to empower people as culture is a driver and an enabler of sustainable development. As the Nigerian writer Wole Soyinka (1999) stated: "Culture is a matrix of infinite possibilities and choices. From within the same culture matrix we can extract arguments and strategies for the degradation and ennoblement of our species, for its enslavement or liberation, for the suppression of its productive potential or its enhancement."
- Culture – in its tangible and intangible nature - is a relational and non-positional goodwhich produces many positive acts as resources for sustainable development. Although culture is commonly defined as "the whole complex of distinctive spiritual, material, intellectual and emotional features, that characterize a society or social group, which includes not only arts and letters, but also modes of life, the fundamental rights of the human being, value systems, traditions and beliefs." (UNESCO, 1982), within this context we mainly refer to culture in a traditional sense as "culture and the arts" (including cultural heritage and cultural and creative industries).

- Culture is the link between the different dimensions of the sustainable development (social, economic and environmental one) as it affects directly and indirectly the three already accepted dimensions in the Triple Helix model (University-Industry-Government; see e.g. Leydesdorff 1997). Throsby (2008) introduced the concept of "interconnectedness" as the economic, social, cultural and environmental systems should not be seen in isolation; rather, a systemic approach is expected. The interdependence of culture impacts all dimensions of sustainability.
- Culture may allow the establishment of a resource resilience society which will culture as main asset to produce new cultural and knowledge capital that will invest to gain more resilience and sustainability.
- Culture as blueprint of the circular economy: through the deployment of the cultural potential the society may become more and more sustainable. This resilience is the main feature of the circular economy which is the third step in the economy paradigm evolution (from the knowledge to the innovation to the circular economy).
- Applicability and transferability of the eco-systemic approach: the inter-, intragenerational equity principles – charactering the ecosystem notion and processes – should be extended from the environmental dimension to the cultural dimension according to the existing similarities between natural and cultural capital.

An empirical analysis

To provide evidence on the relevance of culture within the sustainability frame and substantiate the paradigm shift we previously described/introduced, we decided to analyse the consequences of including cultural indicators among the indicators of sustainable development. To this end, we use the dataset of Eurostat Sustainable Development Indicators which includes data on sustainable development indicators regarding 130 indicators for EU-28 countries in the period 1990-2014. In our study[4] we include 81 indicators – we exclude other indicators due to missing data for more than 5 countries, for those that have data missing for 5 countries or less we implement a fully-conditional specification (FCS) method multiple imputation – see e.g. van Buuren et al., 2006). We, next, include in the analysis the indicators for culture as documented in the latest Eurostat Cultural Statistics Pocketbook with data for 2009 (following Srakar et al., 2015), which allows us to explore the statistical consequences of including culture as a sustainable development dimension. Below is the full list of used indicators.
On this list of indicators we perform a high-dimensional factor analysis, using Metropolis-Hastings Robbins-Monro (MHRM) algorithm (as explained in e.g. Cai, 2010; Asparouhov and Muthén, 2012). The usage of MHRM algorithm is justified by small sample problems and can be transferred to any similar problem for macro-level data when only a handful of countries are present in the dataset.

The results of the analysis show that we can extract five factors from the dataset:
Factor 1: Environment and energy – includes also indicator/s on cultural heritage;
Factor 2: Employment and education – includes also indicators on employment and education in culture;
Factor 3: General development, governance and public funding – includes also indicators on public funding of culture;
Factor 4: Poverty and social exclusion;

[4] For a comprehensive overview of the study see Srakar and Vecco: (forthcoming).

Factor 5: Private expenditure for culture/cultural industries – includes mainly indicators on cultural industries[5] and private expenditure for culture[6].

Furthermore, Factor 5 includes also several general poverty indicators, although reversely signed (e.g. People at risk of poverty or social exclusion; Relative median at-risk-of-poverty gap; Inequality of income distribution; Severely materially deprived people; People at risk of poverty after social transfers). Interestingly, participation in culture' variables cluster in several different factors and do not have a clear place in the classification, confirming results of Srakar et al. (2015).

This analysis leads to several important findings:

- Including culture among other sustainable development indicators does result in a new factor/dimension[7];
- This factor is mainly related to private expenditure for culture and the development of cultural and creative industries, which are the dimensions of culture and the arts which would best distinct the culture among the development indicators;
- Furthermore, in relationship to other four factors, the "cultural factor" (Factor 5) is strongly and negatively related to poverty and social exclusion, which shows that including culture in the set of development dimensions has mostly relationship to reduced poverty and social conditions (and much less to the economic and environmental dimensions).

[5] e.g. Share of publish turnov in manufacturing; Share of publishing value in manufacturing; Val Add in Publishing Sector per 1000 capita; Nr enterprises sound recording per mill. Capita; Nr persons empl sound rec per mill capita; Turnover sound recording per mill capita; Val Add in Sound Rec Sector per 1000 capita.

[6] e.g. Expenditure for the consumption of culture per household; Expenditure: Television and radio taxes and hire of equipment; Expenditure: Newspapers; Expenditure: Information processing equipment; Expenditure: Television sets, videocassette players; Expenditure: Photographic and cinematographic equipment; Expenditure: Equipment for reception, recording and reproduction of sound; Expenditure: Musical instruments; Expenditure: Repair of audio-visual, photographic and information processing.

[7] This is the key finding of our analysis and shows that cultural indicators in this factor really form a new dimension to the existing concept of sustainable development, which should be the one of the main arguments when deciign on the appropriateness of including culture as a new, fourth dimension in the concept of sustainable development.

Table 1: Included indicators of sustainable development and culture

Category	Indicators	Cultural indicators
	Real adjusted gross disposable income of households per capita	Cultural heritage objects per mill capita
	Nominal unit labour cost - 3 years % change	Humanities tertiary students %
	Young people neither in employment nor in education and training (15-24 years) - % of the total population in the same age group	Arts tertiary students %
	Real GDP per capita, growth rate and totals	Journalism tertiary students %
	Investment by institutional sectors	Architecture tertiary students %
	Net national income	Employment in culture in total economy %
	Household saving rate	Publishing nr of employed per mill. capita
	Labour productivity per hour worked (ESA95)	Film, video, TV, music nr of employed pc
	Total R&D expenditure	Programming broadcasting nr of empl pc
	Energy intensity of the economy	Creative arts entertainment nr of employ pc
Socioeconomic development	Total employment rate	Libraries, archives, museums nr of employ pc
	Employment rate by educational attainment level	Writers & creative artists %
	Resource productivity	Writers & creative artists in cultural sector %
	Components of domestic material consumption	Of which creative arts & entertainment %
	Domestic material consumption by material - 1 000 t	Books nr of employed per enterprise
	Municipal waste generation and treatment, by type of treatment method	Newspapers nr of employed per enterprise
	Emissions of sulphur oxides (SOx) by source sector	Journ&period nr of empl per enterprise
	Emissions of nitrogen oxides (NOx) by source sector	Share of publish turnov in manufacturing
	Emissions of non-methane volatile organic compounds (NMVOC) by source sector	Share of publishing value in manufacturing
	Emissions of ammonia (NH3), by source sector	Val Add in Publishing Sector per 1000 capita
	Electricity consumption by households	Nr enterprises sound recording per mill. capita
	Final energy consumption by sector	Nr persons empl sound rec per mill capita
	Motorisation rate	Turnover sound recording per mill capita
	Area under organic farming	Val Add in Sound Rec Sector per 1000 capita
Sustainable consumption and production	Final consumption expenditure of households, by consumption purpose	% attended cinema at least 1, last 12 months
	People at risk of poverty or social exclusion	% have attend. live perform. last 12 months
	Relative median at-risk-of-poverty gap	% visited a cultural site last 12 months
	Inequality of income distribution	% taken part in a public performance, last 12 months
	Severely materially deprived people	% taken part in arts activities, last 12 months
	People at risk of poverty after social transfers	Downloading/listening to/watching: music
	People living in households with very low work intensity	Downloading/listening to/watching: movies
	In work at-risk-of-poverty rate	Items purch. by Internet users: films, music, books
	Long-term unemployment rate, by sex	Items purch. by Internet users: Books, mag., e-lear. mat.
	Early leavers from education and training	Items purch. by Internet users: films and/or music
	At-risk-of-poverty-rate, by highest level of education attained	Items purch. by Internet users: tickets for events
	At most lower secondary educational attainment by age	Expenditure for the consumption of culture per househ.
	Lifelong learning	Expenditure: Telev. and radio taxes and hire of equip.
Social inclusion	Tertiary educational attainment by sex, age group 30-34	Expenditure: Newspapers
	Crude rate of population change	Expenditure: Information processing equipment
	Employment rate of older workers	Expenditure: Books
	Total fertility rate	Expenditure: Television sets, videocassette players
	Crude rate of population change	Expenditure: Cinema, theatres, concerts
	Aggregate replacement ratio	Expenditure: Recording media for pictures and sound
	General government gross debt	Expenditure: Stationery and drawing materials
	Duration of working life	Expenditure: Photographic and cinematographic equip.
	Old-age-dependency ratio	Expenditure: Other services
Demographic changes	Healthy life years and life expectancy at age 65, by sex	Expenditure: Equip. for rec., record.&reprod. of sound
	Healthy life years and life expectancy at birth, by sex	Expenditure: Museums, zoological gardens and the like
	Self-reported unmet needs for medical care due to being too expensive, by income quintile	Expenditure: Musical instruments
	People having a long-standing illness or health problem, by income quintile	Expenditure: Repair of aud.-vis., phot. & inform. proc.
	Urban population exposure to air pollution by ozone	General government expenditure for culture per capita
	Proportion of population living in households considering that they suffer from noise	Central government expenditure for culture per capita
	Energy consumption of transport relative to GDP	Local government expenditure for culture per capita
	Modal split of passenger transport	General government expenditure per capita
	Modal split of freight transport	Central government expenditure per capita
	Volume of freight transport relative to GDP	Local government expenditure per capita
	Volume of passenger transport relative to GDP	
	Energy consumption of transport, by mode	
	Greenhouse gas emissions from transport	
	People killed in road accidents	
	Emissions of nitrogen oxides (NOx) from transport	
	Emissions of particulate matter from transport	
Sustainable transport	Average carbon dioxide emissions per km from new passenger cars	
Natural resources	Gross nutrient balance on agricultural land	
	EU Imports from developing countries by income group	
	EU Imports from developing countries by group of products	
	EU imports from least-developed countries by group of products	
Global partnership	CO2 emissions per inhabitant in the EU and in developing countries	
	Implicit tax rate on energy	
	Shares of environmental and labour taxes in total tax revenues from taxes and social contributions	
Good governance	Level of citizens' confidence in EU institutions	

Source: own elaboration on Eurostat data.

If we calculate a unique index from the five factors (using as weights the coefficients in the first-order structural equation model) and compare it to the index when including only indicators of sustainable development we get the results in Table 2. We can see that the Baltic countries, particularly Estonia

(noted for its prominent position of culture), gain positions; Netherlands and United Kingdom lose their positions, which is reflected also in their cuts in public cultural budgets; Slovenia (again a country noted for its prominent position of culture) significantly rises in its position; and Scandinavian countries and Austria significantly gain in their position.

Table 2: Calculation of the joint index

only SDI	index	rank	SDI+cult	index	rank
Netherlands	145.30	1	Sweden	124.34	1
Cyprus	91.01	2	Finland	109.73	2
Luxembourg	66.24	3	Austria	97.42	3
Malta	65.84	4	Estonia	61.68	4
Sweden	56.35	5	Cyprus	57.38	5
Denmark	54.44	6	Latvia	53.95	6
United Kingdom	51.97	7	Lithuania	38.96	7
Germany	50.97	8	Denmark	33.11	8
Portugal	30.15	9	Slovenia	29.95	9
Ireland	23.77	10	Slovakia	19.01	10
France	18.19	11	Netherlands	5.07	11
Spain	16.70	12	Luxembourg	-7.92	12
Italy	14.81	13	Hungary	-16.98	13
Greece	11.30	14	Germany	-18.10	14
Slovenia	6.45	15	Ireland	-20.10	15
Finland	2.33	16	United Kingdom	-23.52	16
Austria	2.17	17	Bulgaria	-23.56	17
Bulgaria	-28.06	18	Malta	-29.50	18
Poland	-28.46	19	Portugal	-39.07	19
Lithuania	-45.38	20	Poland	-46.17	20
Estonia	-51.76	21	France	-48.94	21
Latvia	-53.22	22	Spain	-82.76	22
Romania	-78.44	23	Italy	-132.33	23
Czech Republic	-93.98	24	Romania	-141.66	24
Hungary	-98.23	25			
Slovakia	-165.59	26			

Note: SDI – sustainable development indicators; cult – cultural indicators.
Source: Own calculations.

Finally, we explore the clustering of countries. Here, some small-country "outliers" (e.g. Cyprus, Estonia, Malta, Luxembourg and Slovenia, see Srakar et al., 2015) cluster separately, but closely to the Western countries. Western countries have a much more unique cluster than with only sustainable development indicators; and there appear to be quite clear clusters for Western and Eastern European countries, but with no separate Baltic and/or Mediterranean model.

Table 3: Clustering of countries

Only sustainable development indicators:	Sustainable development and cultural indicators:
(1) Eastern European countries: Bulgaria, Hungary, Poland, Romania, Slovakia, Croatia	(1) Low developed countries: Bulgaria, Hungary, Italy, Latvia, Lithuania, Poland, Portugal, Romania, Slovakia
(2) Baltic countries: Estonia, Latvia, Lithuania	(2) Countries, scoring well particularly in environmental dimension: Cyprus, Estonia, Malta
(3) „Mediterranean" countries: Greece, Portugal	(3) Well developed countries: Denmark, Finland, France, Germany, Netherlands, Spain, Sweden, United Kingdom
(4) „Medium developed" Western countries: Belgium, Ireland, Austria	(4) Smaller, high achieving countries: Austria, Ireland, Luxembourg, Slovenia
(5) Large Western countries: Germany, Spain, France, Italy, United Kingdom	
(6) Best achievers: Denmark, Luxembourg, Netherlands, Finland, Sweden	
(7) Outliers: Czech Republic, Cyprus, Malta, Slovenia	

Source: Own calculations.

From this review of the paradigm shift of the sustainable development and empirical analysis, it is clear that culture is called to have a more and more relevant role. This is assumed on the basis of several different elements: first, awareness of stakeholders involved in the sustainability frame of the relevance and need of culture to achieve a better, resilient and human equality based future in all parts of the world. The establishment of concepts such as ecosystem and ecology within the cultural sphere represents a significant step forward within this acknowledgement process and adoption of a systemic and holistic approach of sustainable development.

In the last shift culture acts as a glue of the different dimensions of sustainable development and its inclusion – as it has been demonstrated – represented an added value to reduce poverty and social conditions inequalities. Moreover, thanks to a statistical technique used here, the "incompossibility" of studying culture positively has been overcome and we have clearly shown that (under which conditions and with which indicators) culture deserves a separate place in the sustainable development concept. New methodological research avenues has recently been opened up which allow to analyse culture as latent concept in depth. Our responsibility to the present and future generations is to create the best conditions in order to let deploy the infinite possibilities and choices of the culture matrix within the sustainability framework.

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Appendix – Table A: Results of MHRM factor analysis

	F1	F2	F3	F4	F5
Real adjusted gross disposable income of households per capita			-0.772		
Nominal unit labour cost - 3 years % change			0.411		
Young people neither in employment nor in education and training (15-24 years) - % of the total population in the same age group					0.409
Real GDP per capita, growth rate and totals			-0.973		
Investment by institutional sectors					
Net national income				-0.556	
Household saving rate			-0.540		
Labour productivity per hour worked (ESA95)			-0.940		
Total R&D expenditure		0.528			-0.448
Real effective exchange rate - 37 trading partners					
Turnover from innovation		0.563			
Energy intensity of the economy			0.693		
Total employment rate		0.587			-0.474
Employment rate by educational attainment level			-0.607		
Dispersion of regional employment rates, by sex					
Total unemployment rate		0.517			
Resource productivity		-0.618	-0.612		
Components of domestic material consumption	-0.801	0.538			
Domestic material consumption by material - 1 000 t	-0.916				
Municipal waste generation and treatment, by type of treatment method		-0.635			
Emissions of sulphur oxides (SOx) by source sector	-0.736				
Emissions of nitrogen oxides (NOx) by source sector	-0.986				
Emissions of non-methane volatile organic compounds (NMVOC) by source sector	-0.950				
Emissions of ammonia (NH3), by source sector	-0.935				
Electricity consumption by households	-0.920				
Final energy consumption by sector	-0.972				
Motorisation rate			-0.435		
Organisations and sites with eco-managemt and audit scheme (EMAS) registration	-0.677	0.542			
Ecolabel licenses	-0.729				
Area under organic farming		0.807			
Number of persons in households					0.492
Final consumption expenditure of househ., by consumption purpose			0.755		
People at risk of poverty or social exclusion			0.560		0.547
Relative median at-risk-of-poverty gap			0.406		
Inequality of income distribution				-0.706	
Severely materially deprived people			0.717		0.515
People at risk of poverty after social transfers				-0.721	0.402
People living in households with very low work intensity		-0.478		-0.450	
In work at-risk-of-poverty rate				-0.432	
Long-term unemployment rate, by sex					0.473
Gender pay gap in unadjusted form		0.854			
Early leavers from education and training				-0.694	
At-risk-of-poverty-rate, by highest level of education attained		0.651			
At most lower secondary educational attainment by age		-0.710	-0.428		
Lifelong learning					-0.653
Low reading literacy performance of pupils					
Individuals' level of computer skills					
Individuals' level of internet skills					
Tertiary educational attainment by sex, age group 30-34		0.488			
Public expenditure on education	0.435	0.457	-0.583		
Crude rate of population change		-0.750			
Employment rate of older workers		0.802			
Total fertility rate					
Crude rate of net migration plus adjustment		-0.814			
Aggregate replacement ratio				0.431	
General government gross debt			-0.479		0.420
Duration of working life		0.638			
Old-age-dependency ratio		0.633			
Expenditure on care for elderly					-0.698
Healthy life years and life expectancy at age 65, by sex		-0.725			
Healthy life years and life expectancy at birth, by sex		-0.763			
Death rate due to chronic diseases			0.805		
Self-reported unmet needs for medical care due to being too expensive, by inc. quint.					0.640
People having a long-standing illness or health problem, by income quintile		0.533			
Urban population exposure to air pollution by particulate matter		-0.629			
Urban population exposure to air pollution by ozone	-0.469	-0.474		0.518	
Proportion of population living in househ. considering that they suffer from noise		-0.593			
Share of renewable energy in gross final energy consumption		0.765			
Greenhouse gas emissions			-0.663		
Primary energy consumption	-0.972				
Greenhouse gas emissions by sector (source: EEA)	-0.980				
Greenhouse gas emissions intensity of energy consumption		-0.574			
Energy dependence			-0.453		0.595
Gross inland energy consumption by fuel type	-0.972				
Electricity generated from renewable sources	-0.418	0.421			
Share of renewable energy in fuel consumption of transport				0.447	
Combined heat and power generation				0.402	-0.410
Energy consumption of transport relative to GDP				0.925	
Modal split of passenger transport	-0.571				-0.596
Modal split of freight transport		0.510			
Volume of freight transport relative to GDP		-0.433	0.454		
Volume of passenger transport relative to GDP				0.413	-0.539
Energy consumption of transport, by mode	-0.966				
HICP - annual average indices for transport prices	-0.642				
Greenhouse gas emissions from transport	-0.987				
People killed in road accidents	-0.892				
Emissions of nitrogen oxides (NOx) from transport	-0.987				
Emissions of particulate matter from transport	-0.949				
Average carbon dioxide emissions per km from new passenger cars		0.668			
Gross nutrient balance on agricultural land		-0.682			
Sufficiency of sites designated under the EU Habitats directive				-0.453	
Water exploitation index					
Population connect. to urban wastewater treatment with at least secondary treatment		0.755			
Common bird index					
Sufficiency of sites designated under the EU Habitats directive				-0.449	
Water exploitation index					
Population connect. to urban wastewater treatment with at least secondary treatment	-0.435	0.666			
Biochemical oxygen demand in rivers		-0.779			
Fishing fleet, total engine power	-0.410		-0.536		
Official development assistance as share of gross national income			-0.837		
EU imports from developing countries by income group	-0.722	-0.573			
EU imports from developing countries by group of products	-0.794				
EU imports from least-developed countries by group of products	-0.751	-0.485			
EU financing for developing countries, by type	-0.403			-0.508	
Foreign direct investment in developing countries, by income group		-0.480			
Official development assistance, by income group	-0.471			-0.653	
Untied official development assistance			-0.401	-0.577	
Bilateral official development assistance, by category				-0.749	
CO2 emissions per inhabitant in the EU and in developing countries			-0.495		
Official Development Assistance per capita in donor and recipient countries			-0.999		
Foreign direct investment in developing countries, by income group		-0.412			
Official development assistance, by income group	-0.600			-0.539	
Untied official development assistance			-0.775		
Bilateral official development assistance, by category	-0.405			-0.574	
CO2 emissions per inhabitant in the EU and in developing countries			-0.495		
Official Development Assistance per capita in donor and recipient countries			-1.001		
Implicit tax rate on energy			-0.522		
New infringement cases			-0.511		0.698
Transposition deficit			-0.474		0.556
Voter turnout in national and EU parliamentary elections			-0.725		
E-government usage by individuals			-0.440		-0.685
Shares of environmental and labour taxes in total tax revenues from taxes and social contributions		-0.508			
Level of citizens' confidence in EU institutions					

Cultural heritage objects per mill capita	0.585				
Humanities tertiary students %		-0.459			
Arts tertiary students %		0.495	-0.426	-0.476	
Journalism tertiary students %					
Architecture tertiary students %		0.531			
Employment in culture in total economy %					-0.903
Publishing nr of employed per mill. capita					-0.858
Film, video, TV, music nr of employed pc				-0.435	-0.629
Programming broadcasting nr of empl pc	0.518				
Creative arts entertainment nr of employ pc					-0.675
Libraries, archives, museums nr of employ pc			0.467		-0.840
Writers & creative artists %					-0.820
Writers & creative artists in cultural sector %		-0.655			
Of which creative arts & entertainment %					
Books nr of employed per enterprise				-0.402	
Newspapers nr of employed per enterprise				-0.415	
Journ&period nr of empl per enterprise				-0.728	
Share of publish turnov in manufacturing				-0.628	-0.406
Share of publishing value in manufacturing		-0.400		-0.675	
Val Add in Publishing Sector per 1000 capita			-0.819		
Nr enterprises sound recording per mill. capita		-0.564			-0.622
Nr persons empl sound rec per mill capita	0.760	0.480			
Turnover sound recording per mill capita					-0.616
Val Add in Sound Rec Sector per 1000 capita					-0.518
% attended cinema at least 1, last 12 months	-0.508				-0.469
% have attend. live perform. last 12 months		0.957			
% visited a cultural site last 12 months					-0.840
% taken part in a public performance, last 12 months		0.680			
% taken part in arts activities, last 12 months		0.660			
Downloading/listening to/watching: music		-0.748			
Downloading/listening to/watching: movies			0.569		
Items purch. by Internet users: films, music, books		-0.435	-0.443		-0.563
Items purch. by Internet users: Books, magazines, e-learn. mat.					-0.716
Items purch. by Internet users: films and/or music			-0.488		-0.636
Items purch. by Internet users: tickets for events					-0.648
Expenditure for the consumption of culture per household					-0.737
Expenditure: Television and radio taxes and hire of equipment		-0.513			-0.511
Expenditure: Newspapers					-0.573
Expenditure: Information processing equipment					-0.826
Expenditure: Books		-0.469			
Expenditure: Television sets, videocassette players					-0.768
Expenditure: Cinema, theatres, concerts				-0.417	
Expenditure: Recording media for pictures and sound		0.404	-0.542		
Expenditure: Stationery and drawing materials					
Expenditure: Photographic and cinematographic equipment					-0.536
Expenditure: Other services		0.492			
Expenditure: Equipment for reception, recording and reproduction of sound					-0.747
Expenditure: Museums, zoological gardens and the like					
Expenditure: Musical instruments			-0.411		-0.422
Expenditure: Repair of audio-visual, photographic and information processing		-0.466			-0.409
General government expenditure for culture per capita			-0.981		
Central government expenditure for culture per capita			-0.955		
Local government expenditure for culture per capita			-0.591		
General government expenditure per capita			-0.533		
Central government expenditure per capita					
Local government expenditure per capita			-0.465		

Source: Own calculations