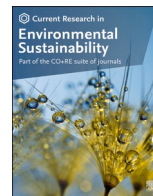




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The development of global environmental concern during the last three decades

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ABSTRACT

The environmental concern of a country's population is an important prerequisite for addressing environmental problems, foremost reducing CO₂ emissions and limiting global warming. In this paper, we analyze the development of environmental concern by using the newest wave of the environmental module of the International Social Survey Programme (ISSP) for 29 countries. First, we discuss the measurement of environmental concern and construct a ranking of countries according to the 2020 survey results. Second, we analyze the determinants of environmental concern by employing multilevel models that take individual effects as well as context effects into account. The results show that environmental concern has increased in almost all nations since the last measurement in 2010. The country ranking is headed by European nations such as Switzerland, France and Germany. The USA takes a middle position and China ranks number 20. We observe more variance within countries at the individual level as compared to the differences between countries. At the individual level, environmental concern is closely related to education, post-materialistic values, political attitudes, and individuals' trust in the news media and in science. At the country level, the average environmental concern increases with the wealth of nations.

1. Introduction

Environmental problems, particularly global warming but also biodiversity loss, have dramatically increased during recent decades (IPCC, 2022; Cowie et al., 2020; Tilman et al., 2017). Given this environmental decline, an interesting question is how this development is reflected in people's concern about the environment. This paper provides the first analysis of a survey on environmental concern that spans a quarter of a century. We analyze all four waves of the International Social Survey Programme's (ISSP) environmental modules which started in 1993 and were repeated in 2000, 2010 and 2020. The latest wave covers 29 countries, including the world's most populous nations (China, India, the USA, Japan), as well as many European countries. Together, the 29 countries represent 53% of the world population and are responsible for 71% of global CO₂ emissions.

According to a widely used definition, environmental concern refers to the belief that the natural environment is in danger and that environmental degradation is caused by human activity. Furthermore, this belief must be combined with a willingness to contribute to environmental protection (Diekmann and Preisendörfer, 2001; Dunlap and

Jones, 2002; Franzen and Vogl, 2013a). Sociologists and psychologists often add a third dimension, namely that environmental destruction worries people. Hence, environmental concern can be conceptualized as consisting of three dimensions: the insight that the environment is endangered by human activities (cognitive component); the emotional reaction that finds environmental destruction threatening (affective component); and the willingness to do something about it (conative component).

Environmental concern is an important element of public opinion for two distinct reasons. First, it is an important prerequisite for supporting environmentally friendly policies to protect the environment and for voting in favor of pro-environmental political parties (e.g. Franzen and Vogl, 2013b; Vandeweerd et al., 2016; Anderson et al., 2017; Bakaki et al., 2020). Second, much research has shown that pro-environmental attitudes increase everyday environmentally friendly behaviors, such as saving energy, participating in recycling programs, driving less and using public transportation (e.g., Hines et al., 1986/87; Preisendörfer and Franzen, 1996; Preisendörfer, 1999; Diekmann and Preisendörfer, 2003; Bamberg and Möser, 2007; Steg and Vlek, 2009; Kollmuss and Agyeman, 2010; Gifford and Sussman, 2012; Bruderer Enzler and

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Diekmann, 2019, Bouman et al., 2020). Given that environmental concern is a necessary (but certainly not sufficient) condition for voluntary pro-environmental behavior, as well as for supporting pro-environmental policies, observing its development is important, and this can inform decision makers on the amount of support they can expect for pro-environmental initiatives.

In this paper, we utilize the environmental module of the ISSP 2020 to describe and analyze changes in levels of environmental concern. In section two, we briefly summarize previous research and outline the research hypotheses. Section three describes how the data were collected and how the variables were measured. Section four presents the results of the measurement of environmental concern and provides a country ranking according to the new results. Moreover, we describe the development of environmental concern by comparing the new findings to the earlier results of the ISSP 1993, 2000 and 2010. Section four also investigates individual characteristics and country-level features that are correlated with environmental concern. In particular, previous research has demonstrated that environmental concern depends on individuals' age, gender, education and income, but also on post-materialistic values and trust in various institutions (Franzen and Meyer, 2010; Franzen and Vogl, 2013a). Furthermore, we incorporate some key country level differences, such as GDP per capital, and investigate how these micro- and macro-level differences are related to environmental concern. Finally, section five summarizes and discusses the results.

2. Previous research findings

Since its first wave in 1993 the ISSP has applied a three-dimensional definition of environmental concern and it contains nine items that measure the conative, affective and cognitive components of environmental concern. The questions referring to the conative component read "How willing would you be to accept cuts in your standard of living in order to protect the environment?", "How willing would you be to pay much higher prices in order to protect the environment?", and "How willing would you be to pay much higher taxes in order to protect the environment?" All three items are accompanied by a five-point Likert-type answer scale: "very willing", "fairly willing", "neither willing nor unwilling", "fairly unwilling", and "very unwilling". The affective component is covered by the following three items: "We worry too much about the future of the environment and not enough about prices and jobs", "People worry too much about human progress harming the environment", and "It is just too difficult for someone like me to do much about the environment". These three items have a five-point answer scale: "strongly agree", "fairly agree", "neither agree nor disagree", "fairly disagree", and "disagree strongly". Finally, the cognitive component is covered by the following three items: "In order to protect the environment, the country needs economic growth", "Modern science will solve our environmental problems with little change to our way of living", and "I do what is right for the environment, even when it costs more money or takes more time". These three items are also accompanied by a five-point answer scale, ranging from "agree strongly" to "disagree strongly".

Previous research has revealed that a factor analysis does not separate the three dimensions of environmental concern in the manner that was originally intended. Explorative principal component analysis extracts two components: one for the conative items and a second for the rest of the items. Hence, factor analysis does not separate the cognitive and affective components (Franzen and Vogl, 2013a). However, thorough tests of the scale suggest that the composite index has higher test-retest reliability as compared with a single item with five answer categories (0.80 vs 0.69), or a single item with 11 answer categories (0.80 vs 0.72). Moreover, the composite index is also more strongly related to donation behavior toward pro-environmental organizations than any of the single items, suggesting better external validity than a single item measurement (Franzen and Mader, 2021a).

In addition to describing the development of environmental concern, we also seek to identify the characteristics that determine – or are at least associated with – the level of environmental concern. Previous research has shown that socio-demographic variables, such as gender, age and education, are linked to environmental concern. With respect to gender, most studies have found that women display slightly higher levels of environmental concern than men (e.g., Zelezny et al., 2000; McCright and Xiao, 2014; Hartmann and Preisendörfer, 2021). This difference between the sexes is assumed to be due to different forms of socialization, and different social roles of women in many societies.

Previous findings regarding the effect of age on environmental concern are more mixed. Hartmann and Preisendörfer (2021) report that respondents over the age of 30 reported lower levels of environmental concern in the 1980s and 1990s, but the effect has changed – at least for Germany – in the last decade, with age having a positive effect on environmental concern. Recently, a number of environmental youth movements (e.g. "Fridays for Future", "Last Generation") have received public attention, suggesting that environmental concern once again might be stronger in younger generations as compared to older people. Hence, the effect of age on environmental concern in international comparisons is unclear. The effect may be positive, negative or u-shaped. However, we assume that it is a cohort effect, rather than an age effect.

Previous studies have often found strong effects of education on environmental concern (Combes et al., 2018; Franzen and Vogl, 2013a; Post and Meng, 2018). On the one hand, environmental topics and issues have found their way into the curricula of schools and universities, and the study of environmental issues also highlights concern about, and awareness of, environmental problems. On the other hand, education generally increases the level of interest in political issues. Those who are better educated are more interested in the news and read more newspapers, which are increasingly reporting environmental problems.

Higher incomes are also often found to correlate with environmental concern (Franzen and Vogl, 2013a; Hartmann and Preisendörfer, 2023). The reason for this is that economic concerns are often in competition with environmental concerns, and individuals under economic constraints tend to prioritize the former over the latter. In particular, the conative component of the environmental concern index, which addresses willingness to pay higher prices in order to protect the environment, is easier to accept for wealthier respondents.

In addition to socio-demographic variables, environmental concern is also found to correlate strongly with other values and political orientations (Franzen and Meyer, 2010; Franzen and Vogl, 2013a). Most importantly, past research has found that socialization in materially wealthy circumstances is closely related to environmental concern. The rationale for this correlation is that socialization shifts individuals' attention away from materialistic values toward post-materialistic values as defined by Inglehart (1990, 1995, 1997).

In most countries, conservative parties put more emphasis on economic development and less on environmental protection. Hence, individuals who lean further to the right on the political spectrum are expected to show less environmental concern than those leaning further to the left. Following previous research, we also incorporate different measures of trust in others and in political institutions into the analyses. Information about environmental changes and threats are usually communicated through governmental agencies and news media, and by scientists. Hence, individuals who have more trust in these institutions are also expected to show higher levels of environmental concern (Meyer and Liebe, 2010; Smith and Mayer, 2018). Moreover, trusting others should also be positively related to general concern for the social welfare of society, and should highlight concern for the maintenance of public goods, including the environment.

Finally, previous research has shown that there is also variation between countries. More specifically, earlier findings suggest that individuals living in affluent countries have a higher preference for environmental protection (Franzen and Vogl, 2013a; Franzen and Vogl,

2013c). The reason behind this finding is that populations in more wealthy countries can more easily focus on improving the environment compared to populations in less wealthy countries, where improvement of the economy is often the priority. Furthermore, we also consider population density, inequality and the proportion of the population living in cities compared to rural areas. Environmental problems (e.g. relating to air and water quality) should be more severe in more densely populated countries, and this might increase environmental concern. Similarly, the population in rural areas usually faces fewer environmental problems and therefore is likely to have a lower level of environmental concern. Next to nations' wealth, which is measured by GDP per capita, the distribution of that wealth might also affect environmental concern. Countries with high inequality might be more concerned with economic topics and redistribution than with environmental issues.

3. Data and methods

The core questionnaire of the ISSP 2020 contains 60 questions which are suggested by expert teams of the ISSP member countries. For the purpose of comparison 40 questions were taken from the survey in 2010, and 20 questions were newly integrated into the 2020 survey. All questions and the final questionnaire must be agreed upon by all ISSP member countries (see [Hadler and Schweighardt, 2023](#)). The ISSP puts a very strong emphasis on random sampling. The data collection was based on simple random sampling in Australia, Denmark, Iceland, Norway, Sweden, Thailand and the USA. All other countries included in the ISSP 2020 (Austria, China, Croatia, Finland, France, Germany, Hungary, India, Italy, Japan, Lithuania, New Zealand, Philippines, the Russian Federation, Slovakia, Slovenia, South Africa, South Korea, Spain, Switzerland, Taiwan, and the UK) used multistage random sampling. In some countries, the samples were restricted to citizens (Australia, China, India, Italy, Philippines, Sweden, Thailand and South Africa). All other countries included respondents who permanently live in the specific country. All samples only included individuals aged 18 and above. The data collection took place between February 2020 and May 2023 and lasted between one and seven months in most countries. The exceptions were Russia and the Philippines, where the data collection lasted for seven and four days, respectively. Most countries used mixed methods for the data collection. 41% of data collection was conducted via face-to-face interviews (CAPI and PAPI) (e.g. in China, India), 37% of the interviews were collected via self-administered online-questionnaires (CAWI) (e.g. in the USA and Switzerland), 19% took the form of self-administered paper and pencil questionnaires (e.g. Japan, Germany), and 3% of the interviews were conducted via telephone interviews. The response rates range from 12% in the UK to 81% in South Africa with a median of 42% ([ISSP Research Group, 2023](#)).

The measurement of the socio-demographic variables of gender and age is straightforward (see Table S1 in the appendix for the description of all variables). Education is measured in nine categories in the ISSP, which we collapsed into four groups: primary schooling, secondary schooling, lower tertiary degrees, and higher tertiary degrees. We measure income by calculating individuals' household equivalence income. For this we divided the sum of household members' incomes by the square root of the number of household members (see [OECD, 2013](#)). For comparative purposes we calculate the individuals' standard deviations from the specific country mean.

Post-materialism is measured in the ISSP by asking respondents what the highest priority and second highest priority should be of the country they live in. Respondents prioritizing "Give people more say in government decisions" and "Protect freedom of speech" over "fight rising prices" and "maintain order in the nation" rank higher on post-materialistic values and are expected to also assign more importance to environmental protection. Hence, the variable runs from 0 (no post-materialistic goals named) to 2 (naming two post-materialistic goals). Political orientation is measured in the ISSP on an 11-point scale ranging

from left to right.

The ISSP 2020 measures trust in others and in different institutions in a more detailed way than in former rounds. For general trust in other people, the question reads: "Generally speaking, would you say that most people can be trusted, or that you can't be too careful in dealing with people?" which is followed by a five-point scale running from (1) "You can't be too careful" to (5) "Most people can be trusted". This item is an exact repetition of former rounds.

Trust in institutions is measured by the question: "On a scale of 0 to 10, how much do you personally trust each of the following institutions?" Four institutions are named: the national parliament, the news media, university research centers, business and industry. The measurement of trust in these institutions (besides national parliaments) is new in the ISSP 2020.

Since the ISSP collects individual data in different countries it has a two-level data structure of individuals (level one) in different countries (level two). For this type of data, hierarchical linear regression analysis (or multilevel analysis) is a suitable statistical tool. Such models allow the simultaneous estimation of the effect of individual characteristics and of country characteristics ([Gelman and Hill, 2007](#); [Rabe-Hesketh and Skrondal, 2008](#); [Snijders and Bosker, 1999](#)). Following former research, we take four variables at the country level into consideration: GDP per capita, adjusted for purchasing power, which is the standard indicator of countries' wealth; income inequality, in the form of the Gini coefficient; countries' population density; and the proportion living in urban areas. These four macro indicators are taken from the World Bank. We apply a varying-intercept model and estimate the coefficients via restricted maximum likelihood because of the small number of countries ([Kenward and Roger, 1997](#)). We used the statistical software R 4.2.2.

4. Results

[Table 1](#) presents the results of the nine-item composite index of environmental concern for the three largest economies that have participated in the ISSP since 1993. These are the USA, Japan and Germany. An explorative principal component analysis (PCA) extracts two factors for the three countries in every year. Factor 1 consists of Items 1–3, and 8, and explains 36% of the variance for the USA in 2020, 29% of the variance for Japan and 28% of the variance for Germany. Factor 2 consists of Items 4–7, and 9, and explains 20%, 24%, and 25% of the variance for the USA, Japan and Germany, respectively. Factor 1 clearly mirrors the conative component of environmental concern. Factor 2 is a mixture of the affective component (Items 4, 5 and 6) and the cognitive component (items 7 and 9). Hence, the index in [Table 1](#) does not exactly mirror all three dimensions of the definition of environmental concern. However, the index has the same factor results for 25 of the 29 countries in the ISSP 2020 (the exceptions are Hungary, India, Thailand and the Philippines), which demonstrates its comparability across different countries. Furthermore, the same factor structure can also be replicated using confirmatory factor analysis (see Fig. S1 in the supplement). Moreover, the index displays high reliability, as shown by a Cronbach's alpha of 0.82, 0.74 and 0.79 for the USA, Japan and Germany, respectively. Overall, the analysis using the new ISSP 2020 data replicates former ISSP results ([Franzen and Vogl, 2013a](#)).

The proportion of inhabitants agreeing and disagreeing with statements has not changed much in the USA over the last 30 years ([Table 1](#)). The overall change in environmental concern can best be assessed when the values of the additive index (originally ranging from 9 to 45) are standardized to range from 0 to 100. For the USA, the standardized mean was 54.7 in 1993, dropped to 50.3 in 2010 but rose back to 54.2 in 2020. Similar observations apply to Japan. The index started in 1993 with a value of 58.5, dropped in 2010 to 53.9 but recovered to 57.1 in 2020. The story is similar in Germany: the index started at 56.5 in 1993, dropped in 2000 and 2010, but rose back to 58.2 in 2020.

[Table 2](#) displays the standardized index for all countries in all four years and ranks countries according to the 2020 results. The ranking of

Table 1
Environmental concern in the USA, Japan and Germany (percentage agreement/disagreement).

Questions	USA				Japan				Germany			
	1993	2000	2010	2020	1993	2000	2010	2020	1993	2000	2010	2020
1) How willing would you be to accept cuts in your standard of living in order to protect the environment? (% fairly and very willing)	34	29	36	35	44	41	28	33	52	40	41	59
2) How willing would you be to pay much higher prices in order to protect the environment? (% fairly and very willing)	52	45	46	42	53	53	40	48	46	34	38	48
3) How willing would you be to pay much higher taxes in order to protect the environment? (% fairly and very willing)	40	32	32	34	44	37	23	27	31	19	23	25
4) We worry too much about the future of the environment and not enough about prices and jobs (% disagree fairly and strongly)	44	44	39	49	47	47	35	53	50	50	51	57
5) People worry too much about human progress harming the environment (% disagree fairly and strongly)	50	49	41	50	48	51	41	53	57	48	47	57
6) It is just too difficult for someone like me to do much about the environment (% disagree fairly and strongly)	60	51	54	50	56	56	50	47	54	55	48	69
7) Modern science will solve our environmental problems with little change to our way of living (% disagree fairly and strongly)	59	48	48	51	75	76	65	74	43	45	44	61
8) I do what is right for the environment, even when it costs more money or takes more time (% fairly and very willing)	57	51	54	53	59	53	40	47	60	55	52	61
9) In order to protect the environment, the country needs economic growth (% disagree fairly and strongly)	26	25	20	20	17	18	7	10	32	28	28	40
Cronbach's alpha	0.76	0.74	0.73	0.82	0.71	0.68	0.71	0.74	0.75	0.65	0.70	0.79

Note: Data source is the ISSP 2020. All items have five-point Likert-type answer categories ranging from 1 = not all willing to 5 = very willing (Items 1–3, and Item 8) and 1 = strongly disagree to 5 = agree strongly (Items 4–7, and Item 9). For descriptive purposes, the table shows the percentage of respondents who answered very or fairly willing and agree fairly and strongly.

countries according to the level of environmental concern in 2020 is also shown in Fig. 1

As can be seen, the index varies from 61.8 in Switzerland, which has consistently received the first rank since 1993, to 40.4 in Slovakia. Most of the countries that participated in the 2020 survey reported a higher mean environmental concern compared to 2010. There are only three exceptions: in Russia, the mean dropped slightly from 41.4 to 40.7 (n.s.); in Slovakia, the mean dropped substantially from 45.5 to 40.4; and in South Korea, the mean decreased slightly from 53.9 to 52.5 (n.s.). However, overall, the measure indicates that environmental concern has increased on average from 49.5 in 2010 to 52.8 in 2020 for the 29 participating countries.

The development of environmental concern since 1993, separately for OECD countries and non-OECD countries, is depicted in Fig. 2. Since 1993, OECD countries show consistently higher levels of environmental concern as compared to non-OECD countries. However, the trend of a slight decrease in 2000 and 2010 and a recovery in 2020 to the level of 1993 can be observed for both groups of countries. Fig. 2 also contains the trend for global CO₂ emissions. Global CO₂ emissions were at about 22 Gt at the start of the observation period in 1993 and doubled to almost 40 Gt in 2020. Furthermore, Fig. 2 contains the Living Planet Index (LPI) which measures biodiversity (WWF, 2022). The Index varies between 1 (highest biodiversity) and 0 (lowest biodiversity) and dropped during the observation period by half, from 0.58 to 0.31. Hence, both trends demonstrate the degradation of the environment. At the same time the social reflection in terms of environmental concern did not increase accordingly but remained basically stable over the whole observation period. There are different interpretations for this paradox. One possibility is that environmental concern reached the maximum possible level in 1993 in most countries, and there is little potential for further increases. Another interpretation is that the economic recession in the aftermath of the banking crisis in 2008 shifted attention away from environmental problems toward economic issues. A similar shift of attention might have happened in 2020. Here, the COVID-19 pandemic might have shifted attention from environmental issues toward concern for public health. Hence, the occurrence of other global crises around the last two rounds of the ISSP might have influenced the results, preventing further increases in environmental concern.

Next, we analyze the variance of environmental concern via ordinary least squares (OLS) regressions. We do this in various steps by first analyzing the data for the USA and then for all ISSP countries via

multilevel models. We chose the USA because it is the largest economy of the world with a large share (13%) of global CO₂ emissions. Model 1 in Table 3 presents the standardized regression results of the standardized environmental concern index for the USA. Gender, age and income are not statistically significantly related to environmental concern in the USA. Surprisingly, this also applies to education. What matters in the USA are post-materialistic values (Inglehart, 1990, 1995, 1997), trust in science, trust in news media, trust in business and industry, and, most importantly, party affiliation. A standard deviation of increase in trust in science increases environmental concern by almost 0.3 standard deviations, trust in news media increases environmental concern by 0.27 standard deviations, and respondents who said they trust business and industry have a lower environmental concern of 0.25 standard deviations.

These effects are all moderately strong and in the expected direction. Respondents who affiliate with the Republican Party report on average a lower level of environmental concern, by 0.61 standard deviations, as compared to respondents who affiliate with the Democrats. This latter result mirrors previous findings that environmental attitudes in the USA are very much polarized and dominated by affiliation with either the Republican or the Democratic Party (McCright et al., 2014; Clark et al., 2019). The effect of party affiliation overrides socio-demographic differences in the USA. Different trust variables and party affiliations explain almost 50% of the observed variance in environmental concern.

Next, we analyze the data for all 29 countries via multilevel regression models that take country differences in addition to individual variables into account (Snijders and Bosker, 1999; Gelman and Hill, 2007; Hox et al., 2017). Since the reliability of the measurement of environmental concern (Cronbach's alpha) is extremely low for India ($\alpha = 0.16$) it is excluded from the multilevel analysis. Most importantly, at the country level we add GDP per capita, the Gini index, population density, as well as the percentage of respondents living in urban areas. We calculated two multilevel-models, Model 2 and 3. The variable political party affiliation contains many missing values in the data. Particularly, the question about left-right orientation was not asked in China and Taiwan. Hence, to keep these countries in the analysis, Model 2 does not include party affiliation. However, since party affiliation is important and has a large effect in the USA, we ran Model 3 including party affiliation and using a lower number of countries and observations within countries. First, the ICC coefficient of the models indicates that most of the observed variance lies within countries and between

Table 2
Mean environmental concern per country and per year.

Country	1993		2000		2010		2020	
	N	Concern	N	Concern	N	Concern	N	Concern
Switzerland (CH)	3019	60.9	1006	61.0	1212	60.2	4280	61.8 ^c
France (FR)					2253	50.8	1520	58.6 ^c
Germany (DE)	2106	56.5	1501	51.6	1407	51.9	1702	58.2 ^{b,c}
Norway (NO)	1414	58.0	1452	54.4	1382	52.1	1131	58.0 ^{b,c}
Great Britain (GB)	1261	53.9	972	52.5	928	46.6	2344	57.6 ^{a,b,c}
Sweden (SE)			1067	54.9	1181	54.1	1921	57.3 ^{b,c}
Finland (FI)			1528	57.0	1211	54.8	1137	57.2 ^c
Japan (JP)	1305	58.5	1180	59.3	1307	53.9	1491	57.1 ^{b,c}
Iceland (IS)					798	50.8	1150	56.8 ^c
Australia (AU)	1779	57.1			1946	50.1	1147	56.6 ^c
Denmark (DK)			1069	57.9	1305	55.3	1198	55.9
Austria (AT)			1011	54.8	1019	50.8	1261	55.9 ^c
Slovenia (SI)	1032	52.0	1077	52.0	1082	50.0	1102	55.1 ^{a,b,c}
New Zealand (NZ)	1271	57.7	1112	54.7	1172	51.7	993	54.9 ^{a,c}
United States (US)	1557	54.7	1276	52.6	1430	50.3	1847	54.2 ^c
Taiwan (TW)					2209	52.6	1822	54.1
South Korea (KR)					1576	53.9	1205	52.5
Spain (ES)	1208	52.6	958	52.6	2560	50.4	2254	51.3
India (IN)							1421	51.2
China (CN)							2741	50.8
Italy (IT)	1000	55.2					1138	49.3 ^a
Croatia (HR)					1210	42.0	1000	45.4 ^c
Lithuania (LT)					1023	40.4	1200	44.8 ^c
Hungary (HU)	1167	40.7					1001	44.3 ^a
South Africa (ZA)					3112	38.5	2844	42.9 ^c
Philippines (PH)	1200	43.1	1200	42.9	1200	39.3	1500	41.2 ^{a,b,c}
Russia (RU)	1931	48.5	1705	44.0	1619	41.4	1583	40.7 ^{a,b}
Thailand (TH)							1498	40.4
Slovakia (SK)					1159	45.5	1013	40.4 ^c
Canada (CA)	1467	59.8	1115	55.9	985	56.5		
Netherlands (NL)	1852	60.2	1609	58.0	1472	53.1		
Chile (CL)			1503	45.4	1436	50.6		
Belgium (BE)					1142	49.4		
Israel (IL)	1198	51.7	1205	49.0	1216	47.4		
Portugal (PT)			1000	38.5	1022	47.0		
Mexico (MX)			1262	48.7	1637	46.4		
Argentina (AR)					1130	44.8		
Turkey (TR)					1665	44.1		
Czech Republic (CZ)	1005	45.6	1244	44.7	1428	42.9		
Latvia (LV)			1000	42.3	1000	39.8		
Bulgaria (BG)	1183	42.0	1013	38.7	1003	38.7		
Ireland (IE)	957	46.7	1232	52.3				
Poland (PL)	1641	48.3						

Note: The second, fourth, sixth and eighth columns report the number of cases per country in the dataset. We report the standardized mean (between 0 and 100) of the environmental concern index.

- ^a Significant difference between 1993 and 2020.
- ^b Significant difference between 2000 and 2020.
- ^c Significant difference between 2010 and 2020.

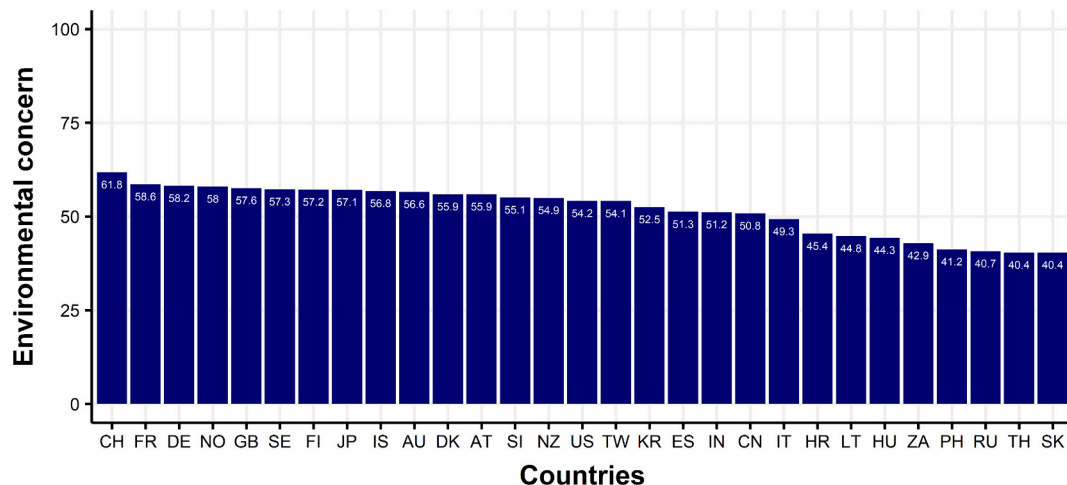


Fig. 1. Country ranking according to environmental concern 2020.

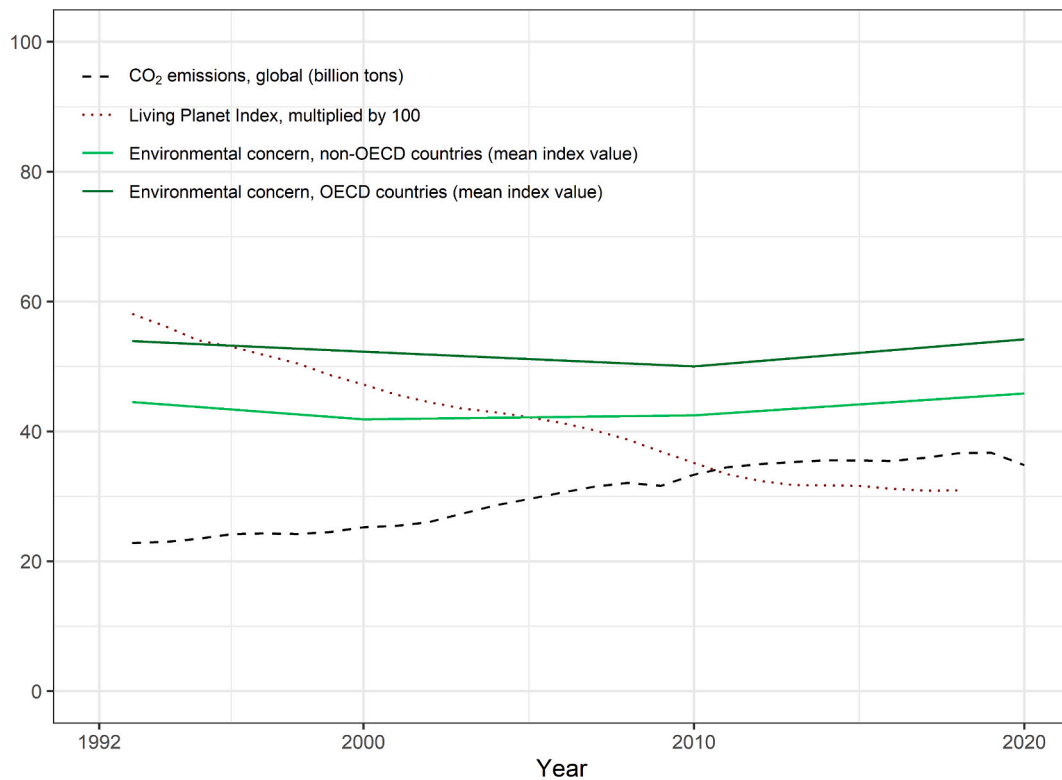


Fig. 2. CO₂ emissions, biodiversity and environmental concern.

Note: The dark green line presents the mean environmental concern of the OECD countries that participated in the ISSP at least once. Three countries are observed at only one point in time, 12 at two points in time, nine at three points in time and nine at four points in time. The depicted trend does not change if only countries with all four observation points are analyzed. The light green line depicts the mean environmental concern of non-OECD countries. Four countries are observed once, three twice, one three times and two four times. In tendency, this trend remains the same if we only consider the two countries observed four times. The other two lines depict the development of global CO₂ emissions and the Living Planet Index (LPI) which shows the decrease in biological diversity.

individuals. Only 18% ($ICC = 0.18$) of the total variance can be observed between countries. Looking first at individual differences, the results show in both models that, in the international context, female respondents show a slightly higher level of environmental concern than men. The age effect is also statistically significant. Environmental concern first increases with age, reaches a maximum at the age of 50 and decreases thereafter. Moreover, education has a strong effect on environmental concern. Respondents show more environmental concern the higher their educational degree. Furthermore, post-materialistic values, as well as an individual's trust in other people, the national parliament, science, news media, and business and industry, are all associated with environmental concern. Hence, there are profound differences between the USA and the international context, particular with respect to socio-demographic variables and education. Trust in science and the media are also internationally importantly associated with environmental concern, but less strongly than in the US. The importance of trust in others and in various institutions is in line with previous studies showing that trust in others increases pro-social attitudes and cooperative behavior (Yamagishi et al., 1999; Sonderskov, 2009; Balliet and Van Lange, 2013). Generally, a more conservative political orientation is also relevant in international comparisons, but the effect is much smaller compared to the effect of party affiliation in the USA (see Model 3).

At the macro level of country differences, GDP per capita is strongly related with environmental concern. For every percent increase in GDP, environmental concern increases by 0.34 standard deviation (Model 2). In Model 3, where China and Taiwan are excluded from the sample, the effect doubles in size. Population density increases environmental concern by 0.09 respectively by 0.15 standard deviations. None of the other macro variables (inequality, as measured by the Gini index, and the percentage of urban population) show any significant relation with

environmental concern. The strong effect of GDP is depicted in Fig. 3, which shows the bivariate relation between GDP and environmental concern for the 29 countries that participated in the ISSP 2020. The bivariate correlation is 0.75, suggesting that wealth makes it easier for respondents to shift attention to environmental problems.

The results reported in Table 3 were extensively checked for robustness. First, we tested for potential interviewing mode effects. For the USA (Model 1) the mode effect is statistically significant (-0.25) for conducting the interviews per telephone instead of self-administered web-surveys. However, excluding the mode effect does not bias any of the other estimates. Thus, to keep the model concise and since there is no obvious reason for the mode effect, we decided not to include it in Model 1. Moreover, we did not find any mode effects for models 2 and 3. Second, the results reported in models 2 and 3 are robust with respect to excluding one country at a time. Hence, the results are not driven by any one single country. The results also remain stable if all four countries in which the measurement of environmental concern does not closely fit a two-factorial structure (Philippines, Hungary, South Africa, and Thailand) are excluded from the analysis. Third, the results do not depend on whether the independent variables are regressed only on the first factor of environmental concern (the conative component of Items 1–3, and 8, see Table S2 in the supplement). Fourth, since many respondents did not report their income, we also imputed the income variable using a machine learning approach suggested by Chen and Guestrin (2016). The results of the model using the imputed data do not differ from the results of the models that listwise exclude those observations with missing data (see Table S3 in the supplement). Fifth, the multilevel Models 2 and 3 reported in Table 3 are random intercept models, assuming that the effects for the macro-level variables have different intercepts but the same slope. We also calculated all models

Table 3
Determinants of environmental concern.

	Model 1 USA	Model 2 all countries	Model 3 all countries
Individual-level variables			
Sex (1 = female)	0.078 (0.057)	0.132*** (0.025)	0.134*** (0.022)
Age in years (18–80)	−0.004 (0.013)	0.008* (0.003)	0.010* (0.004)
Squared age	0.00004 (0.0001)	−0.0001** (0.00003)	−0.0001** (0.00004)
Reference: Primary degree			
Secondary degree	0.223 (0.161)	0.120*** (0.031)	0.096** (0.033)
Low tertiary degree	0.199 (0.179)	0.275*** (0.040)	0.229*** (0.038)
Tertiary degree	0.265 (0.162)	0.412*** (0.039)	0.366*** (0.039)
Relative income within country ^a	0.053 (0.034)	0.018* (0.009)	0.012 (0.012)
Post-materialism	0.059* (0.029)	0.116*** (0.012)	0.103*** (0.009)
Trust in others	0.019 (0.033)	0.103*** (0.011)	0.102*** (0.012)
Trust in parliament	0.033 (0.034)	0.109*** (0.021)	0.115*** (0.021)
Trust in science	0.286*** (0.038)	0.144*** (0.027)	0.152*** (0.035)
Trust in news media	0.172*** (0.044)	0.063*** (0.019)	0.066** (0.022)
Trust in industry	−0.252*** (0.034)	−0.164*** (0.032)	−0.187*** (0.025)
Party affiliation ^b	−0.615*** (0.085)		−0.175*** (0.026)
Country-level variables			
Log GDP per capita (PPP)		0.341*** (0.099)	0.622*** (0.094)
Proportion urban population		0.071 (0.053)	0.008 (0.046)
Population density		0.090** (0.032)	0.150** (0.054)
Gini index		−0.039 (0.041)	0.074 (0.041)
Explained variance			
Country level		0.04	0.04
Individual level		0.70	0.69
Intraclass correlation (ICC)			
Null model		0.18	0.18
Model with covariates		0.06	0.06
R ² adjusted	0.49		
Number of countries	1	28	26
Number of observations	753	24,436	13,496

Note: ⁺ = $p < 0.10$, * = $p < 0.05$, ** = $p < 0.01$, *** = $p < 0.001$. Standardized regression coefficients with heteroscedasticity and cluster-robust standard errors in parentheses. Dependent variable is the standardized composite index of environmental concern as presented in Table 1. ^a = absolute household equivalence income in Model 1. ^b = dummy for affiliating with the Republican Party for the USA in Model 1. In Model 3, political affiliation is measured on a five-point Likert scale ranging from 1 = far left to 5 = far right. In Models 2 and 3, India is excluded due to the low reliability of the environmental concern index (Cronbach’s alpha = 0.16). Model 3 also excludes China and Taiwan because the left–right scale was not included in the questionnaire.

using random slopes for all macro-level variables. This variation did not change the results.

5. Discussion

The results of the fourth environmental module of the ISSP 2020 reveal that environmental concern had increased in most of the 29 participating countries as compared to 2010. However, the increase in environmental concern was small. The measurement started in 1993 with a standardized value of 52.7 and returned in 2020 to 51.9, after a decrease in 2000 to 51.0 and to 48.5 in 2010. Thus, environmental

concern has not changed much on average over the last three decades. These small changes in environmental concern are surprising, since many environmental problems have increased in intensity during this period, particularly greenhouse gas emissions. One reason for the small increase might be the COVID-19 pandemic. Data collection in most countries took place in 2020 or 2021, during or shortly after the pandemic, which might have distracted attention from environmental issues. This interpretation is also supported by respondents’ answers to the question of the nation’s biggest problem at the time. Respondents in most countries answered “health”. The exceptions were Australia, where most respondents named “the environment”, and Japan, Spain, Croatia, South Korea, and Thailand, where respondents mentioned “the economy”. In India, participants named “poverty” as the nation’s biggest problem.

At the individual level, the analysis confirms former findings regarding the relation of gender, age and education with environmental concern. Females show slightly higher values of environmental concern. Moreover, environmental concern increases with age until the age of 50 and decreases thereafter. The more respondents lean toward the right of the political spectrum, the lower their level of environmental concern. Trust in others, the national parliament, news media and science increases environmental concern. At the macro level, environmental concern is strongly related to GDP, explaining 65% of the between country variance. This result is in strong contrast to the higher levels of CO₂ emissions of more wealthy countries (Franzen and Mader, 2021b). The finding contains a paradoxical twist: those who pollute the most are also the ones who are the most concerned about protecting the environment. Overall, the analysis of the 2020 ISSP data essentially confirms the results found using the data from former waves (Franzen and Meyer, 2010; Franzen and Vogl, 2013a). In addition, the ISSP 2020 contains more detailed information on trust in institutions than former rounds. Trust in institutions, and particularly in science, matters and has a strong impact on environmental concern in the US, and a moderate influence internationally.

The ISSP 2020 environmental module has some strength but also some weaknesses. The biggest strength is certainly that it enables international comparative research for almost three decades. It started data collection in 1993 in 21 countries. 25 countries participated in 2000, and the number of participating nations increased to 36 in 2010. Unfortunately, the survey in 2020 suffered from the COVID-19 pandemic which reduced the number of the participating countries to 29. Another strength of the ISSP is also the thorough design of the questionnaire keeping many key questions unchanged for the whole observation period. Moreover, the ISSP encourages strict random sampling for the participating countries, enabling the inference from the samples to populations. Furthermore, the ISSP invests great care ensuring accurate translations of the original English questionnaire into the different languages of the participating nations.

One of the weaknesses of the ISSP 2020 is the reduced number countries and delay of the data provision due to the COVID-19 pandemic. Another drawback is that countries do not participate continuously in each wave but interrupt participation for various reasons in certain years. Furthermore, the ISSP contains many more OECD countries as compared to non-OECD countries. Together, the relatively small number of participating nations, the dominance of the data from OECD countries, and the interrupted trend for many countries compromise the generalizability of the results. Moreover, it should be kept in mind that surveys contain naturally self-reported data. Such self-reports might be influenced by socially desirable answering behavior. This problem might be particularly pronounced in countries with stronger restrictions on the freedom of speech than in other countries. Another characteristic of the ISSP is that the questionnaires are short and contain about 60 questions. The rules of the ISSP stipulate that a new wave can only contain 20 new questions in exchange for 20 old ones. The advantage of this is that it ensures comparability of some survey questions over a long time period. However, it also limits the

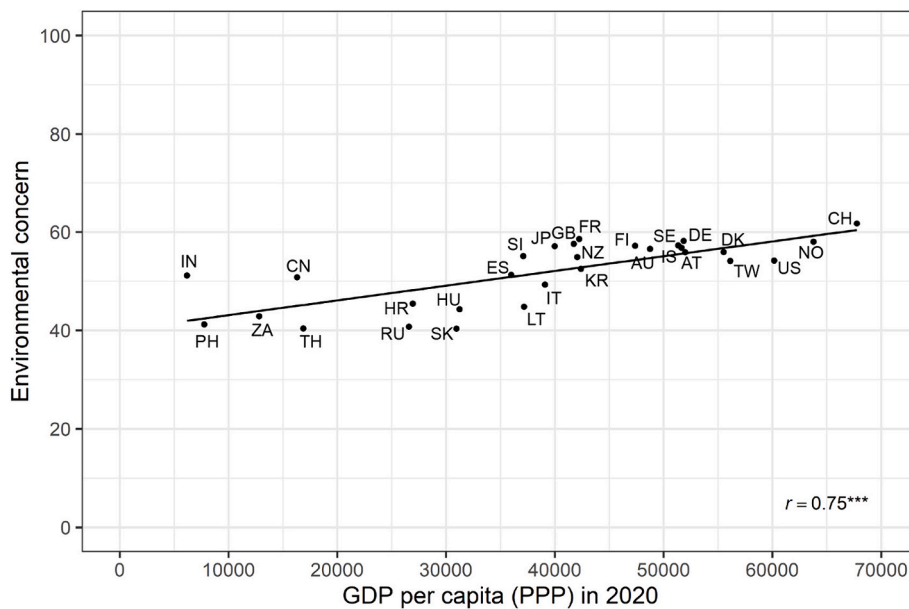


Fig. 3. Bivariate correlation between GDP and environmental concern.

possibility to incorporate new questions into the surveys and to acquire new trend data. Fortunately, this problem does not apply to our analysis of environmental concern since these items are contained in the surveys since 1993.

Possible avenues for future research analyzing the determinants of environmental concern should pay more attention on the interplay of education, political attitudes, and trust in science and media. These concepts are measured rather rudimentarily in the ISSP. For instance, the concept “trust in science” refers to science in general but does not differentiate between different scientific institutions or subjects. Similarly, “trust in media” does not differentiate between different types of media such as print media or television. Furthermore, it might be advisable to consider the role of social media for the development of environmental concern. Similar considerations apply to the measurement of education which is very general in our analysis and does not separate between different contents of school curricula.

6. Conclusion

This paper describes and analyses the trend of environmental concern in the countries that participated in the ISSP environmental module which started in 1993. The repeated measure of environmental concern in 2000, 2010 and 2020 reveals that the average level of countries’ environmental concern first decreased until 2010 but recovered in 2020 to the level observed in 1993. Thus, the increasing environmental degradation did not have much impact on individuals’ environmental attitudes. Reasons for this might be that survey participants were predominately concerned about the economic condition in the aftermath of the banking crisis in 2008. The survey in 2020 might have been influenced by the COVID-19 pandemic, giving health issues high priority. Both events were global affecting every country and might have prevented a stronger increase in environmental concern. Comparing countries environmental concern depends on the wealth of nations. Countries with higher GDP per capita tend to rank higher in terms of environmental concern. At the individual level, environmental concern is closely related to education, post-materialistic values, political attitudes, and individuals’ trust in the news media and in science.

Declaration of competing interest

The authors declare that they have no known competing financial

interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

The authors do not have permission to share data.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.crsust.2024.100260>.

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