



Citation for published version:

Bain, P, Kroonenberg, PM, Johansson, L-O, Milfont, T, Crimston, C, Kurz, TR, Bushina, E, Calligaro, C, Demarque, C, Guan, Y & Park, J 2019, 'Public views of the Sustainable Development Goals across countries', *Nature Sustainability*, vol. 2, no. 9, pp. 819-825. <https://doi.org/10.1038/s41893-019-0365-4>

DOI:

[10.1038/s41893-019-0365-4](https://doi.org/10.1038/s41893-019-0365-4)

Publication date:

2019

Document Version

Peer reviewed version

[Link to publication](#)

This is a post-peer-review, pre-copyedit version of an article published in *Nature Sustainability*. The final authenticated version is available online at: <https://doi.org/10.1038/s41893-019-0365-4>

University of Bath

Alternative formats

If you require this document in an alternative format, please contact:
openaccess@bath.ac.uk

General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

Take down policy

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

Public views of the Sustainable Development Goals across countries

Paul G. Bain¹, Pieter M. Kroonenberg², Lars-Olof Johansson³, Taciano L. Milfont⁴, Charlie R. Crimston⁵, Tim Kurz¹, Ekaterina Bushina⁶, Carolina Calligaro⁷, Christophe Demarque⁸, Yanjun Guan⁹, Joonha Park¹⁰

1 Department of Psychology, University of Bath, United Kingdom

2 Department of Education and Child Studies, Leiden University & The Three-Mode Company, Leiden, The Netherlands

3 Department of Psychology, University of Gothenburg, Sweden

4 Centre for Applied Cross-Cultural Research, School of Psychology, Victoria University of Wellington, New Zealand

5 School of Psychology, University of Queensland, Australia

6 International Scientific-Educational Laboratory for Sociocultural Research, NRU Higher School of Economics, Moscow, Russia

7 Escuela Sistémica Argentina, Buenos Aires, Argentina

8 Aix Marseille Univ, LPS, Aix-en-Provence, France

9 Durham University Business School, Durham, United Kingdom

10 NUCB Business School, Nagoya, Japan

To appear in *Nature Sustainability*.

Public views of the Sustainable Development Goals across countries

The United Nation’s 17 Sustainable Development Goals (SDGs) offer an extensive framework for coordinating and shaping government policies, and for engaging the public with sustainability. Public understandings of the SDGs and sustainability can influence this engagement, as people are more likely to accept and share information consistent with their own understanding. We identify public understandings of SDGs through the mental maps of how people relate the SDGs to the three elements of environmental, social, and economic sustainability. Using responses from 12 developed/developing countries (N=2134), we identified four mental maps that varied mainly on two dimensions that diverged from some expert models. First, some people’s mental maps identified a tension between achieving environmental v. social sustainability, whereas for others the main tension was between economic and the other two sustainability elements. Second, some people related different SDGs to each element of sustainability, whereas others saw all SDGs as targeting the same sustainability element(s). These findings highlight opportunities and challenges to engage the public with sustainability more effectively, especially with wide-ranging initiatives such as a “Green New Deal”. We observed cultural differences, but we also identified a dominant mental map across countries that could serve as a default model for communicating sustainability internationally.

A critical global challenge is to ensure that current and future generations experience the social and economic conditions that allow them to lead fulfilling lives without degrading the natural environment. Combining the social/economic concept of development with the more ecological concept of sustainability¹, the United Nations developed the 17 Sustainable Development Goals (SDGs)² to coordinate national and international policies and agreements to achieve an environmentally, socially, and economically sustainable world^{3, 4, 5}.

The SDGs are not just for policymaking – they are also intended as a framework for public communication, stakeholder engagement, and outreach to promote sustainability⁶. Increasing public engagement and support are important to increase adoption of sustainable technologies and initiatives⁷, support for sustainability programs, and to increase public pressure to hold authorities and businesses to account for delivering sustainable outcomes⁸.

Substantial efforts have been devoted to how policymakers should understand and use the SDGs to improve policy development^{9, 10, 11, 12, 13, 14, 15}. Yet we know little about how the public perceives sustainability, at least beyond specific issues such as climate change¹⁶. Understanding public views about the SDGs can inform sustainability communication, showing which messages are more likely to be accepted by the public and shared with others. This is because people view information consistent with their own beliefs as more appealing and credible^{17, 18}, and such information is more likely to spread through social networks^{19, 20}.

While we have some information about the priorities assigned to SDGs on average²¹, we lack a deeper understanding of people’s “mental maps” of sustainability. We use mental map to denote a visual representation of cognitive associations between constructs, in this case how people relate each SDG to the achievement of environmental, social, and economic sustainability. For example, SDG7 (Affordable and Clean Energy) might be seen as primarily targeting people’s wellbeing (social), financial security (economic), or the health of the

natural world (environmental); or all three equally. Knowing what people think about what the SDGs are supposed to achieve can help practitioners promote sustainable energy policies and initiatives, by framing them in ways consistent with public views.

People's mental maps of sustainability reveal which SDGs are seen to be in tension, where pursuing some SDGs competes with attention to others. For example, if people believe pursuing SDG13 (Climate Action) is in tension with SDG8 (Decent Work and Economic Growth), this can be a hurdle for convincing the public to accept green industries. Those who see them as aligned, however, may respond positively to green industry initiatives. This knowledge about the relations between SDGs can highlight where to refine sustainability communication to highlight alignments and downplay/address tensions.

Some models in the literature on sustainability emphasise alignment between social and environmental elements, with one or both contrasted with economic productivity^{12, 22, 23}. However, it is unclear whether this distinction is common among people or whether they view the relations of these sustainability elements differently. For instance, it may be more common to see social and economic sustainability as aligned, and in competition with sustainable environmental outcomes. Identifying mental maps offers these insights into these broader public perceptions of sustainability.

Hence, our goal was to understand these “mental maps” of sustainability and how they vary across people. Some people's mental maps may be quite straightforward, believing all SDGs are focused only on environmental (or social, or economic) sustainability. Other people may draw clear distinctions between SDGs, where some are focused on the environment, others on people's wellbeing, and others on the economy.

Mental maps may also vary across countries with differing socio-economic conditions. Some argue that environmental sustainability may be less prominent in developing economies than in developed economies²⁴, instead placing more emphasis on social or economic sustainability. Therefore, we aimed to identify the mental maps held in both economically developed and developing countries.

To identify mental maps, we used a survey company to obtain participants from their national panels in 12 developed and developing countries (final N=2134). On separate survey pages, participants read definitions of environmental, economic, or social sustainability (also called three “pillars” of sustainability⁵; see Table 1 for descriptions used) followed by descriptions of each SDG without labels (Table 2). They rated the extent to which each SDG was targeted at achieving each sustainability element on a 7-point scale (1, *Not at all*; 4, *Moderately*; 7, *Very much*). Presentation order of sustainability elements and SDG descriptions was randomised.

To understand who holds different views we also obtained information about their demographics and their life-guiding principles (“values”²⁵), which are known to influence attitudes to environmental sustainability issues such as climate change²⁶. To identify if some mental maps were more pro- or anti-sustainability, we also measured the priority they thought should be given to sustainability in their country.

Identifying these mental maps requires simultaneous analysis across three dimensions (or modes): SDGs, the three sustainability elements, and participants. For this we used three-mode principal component analysis^{27, 28} (described in Supplementary Information, S2). This version of principal component analysis aims to identify systematic patterns in how SDGs

and sustainability elements are related, while allowing these relations to differ across participants. We focused on patterns of relationships between SDGs and sustainability elements, rather than on people overall degree of endorsement about whether SDGs target sustainability. Accordingly, we removed each person's average rating of the goals across sustainability elements ("centering").

RESULTS

A model with four components for participants (mental maps) provided the best trade-off between model simplicity and model fit, explaining 42% of the variation in ratings (model selection is explained in Supplementary Information, S2). Each mental map could be represented using two dimensions.

The existence of four mental maps clearly indicates that there was no single "public" view of sustainability. However, one mental map was dominant, accounting for over half (52%) of the explained variation, and endorsed by the majority of participants in every country. Shown in Fig. 1, the arrows represent the three sustainability elements – for interpretation their direction is most important (their length indicates the relative amount of variance explained), and the SDGs are represented by points. Relations between SDGs and sustainability elements are determined by projecting the point for an SDG orthogonally onto the line for a sustainability element – the further from the origin (0,0) this projection is on the positive side (solid arrow), the stronger the SDG is seen to target that sustainability element. An orthogonal projection on the negative side (represented by dashed arrows in Fig. 1), means the SDG is seen to target a sustainability element relatively weakly.

These relationships are illustrated for SDG14 (Oceans) in Fig. 1. Projections are shown using dashed line from the point representing Oceans to the arrows for each sustainability element. These show that Oceans was seen to target environmental sustainability more strongly than all other SDGs (intersecting with the solid green arrow furthest from the origin), and was least relevant to achieving both social sustainability (dashed blue arrow) and economic sustainability (dashed red arrow). Using the same approach, it can be seen that SDG5 (Gender) was targeted more than other SDGs at economic and social sustainability, and least at environmental sustainability. To aid interpretation, coloured ellipses show the SDGs that targeted each sustainability element more strongly than average. For all mental maps, most variance was explained by the first dimension (horizontal axis) and this axis is the most important for interpretation.

Fig. 1 shows that the dominant mental map reflects a primary tension between environmental and social sustainability, as shown by their arrows pointing in opposing directions. That is, SDGs seen to focus more on improving the viability of the natural world were seen to be less targeted at improving people's wellbeing/quality of life (and vice versa). Economic sustainability was a largely independent consideration (orthogonal to the other two elements), consistent with some economic analyses demonstrating that environmental and economic sustainability can be achieved independently¹².

In this mental map, most SDGs were seen to target either environmental or social sustainability, with only SDG7 (Energy) targeting both. Most SDGs were seen as less relevant to achieving economic sustainability (negative loadings), even those ostensibly with an economic focus such as SDG9 (Infrastructure), for which social sustainability was more relevant. This suggests that achieving most SDGs is seen to come at some cost to economic

sustainability, except for a small set where social and economic sustainability are aligned (including equality, growth, education, peace, and reducing poverty).

Although the dominant mental map in Fig. 1 was common across countries, it was held more strongly in Russia than in all other countries, consistent with a view identified in economic and qualitative research that Russians view environmental protection and social wellbeing as conflicting^{29, 30}. This mental map was also more prominent in the Americas (USA, Brazil, Argentina) than in China and France, and stronger in Brazil than in India. These differences did not correspond to established dimensions of cultural variability³¹ (e.g., individualism-collectivism) or economic development, suggesting that these effects are specific to each country rather than reflecting broader cultural dimensions.

There were also demographic and value differences (for detailed analyses see Supplementary Information, S4). Overall, meta-analyses of relationships across countries showed that this dominant mental map was held more strongly by younger participants, females, and the less religious. It was not related to political orientation overall (despite the political divide on sustainability issues such as climate change^{32, 33}), although cross-cultural variation was identified – this mental map was held by more left-wing participants in the UK/France but by more right-wing participants in Russia. On values, this mental map was held more strongly by those with higher concern for others' welfare (Benevolence) and who value novelty and challenge (Self-direction), but was less prevalent for those who value control and dominance (Power), stability and the status quo (Tradition, Conformity), and excitement and pleasure (Hedonism, Stimulation).

This dominant mental map is shown with the other mental maps in Fig. 2. While there were only four participant components, this figure has eight panels to show the patterns for those with positive or negative scores for each component. For participants with negative component scores the associations between SDGs and sustainability elements are reversed, achieved in Fig. 2 by reversing the direction of the arrows for sustainability elements.

While each mental map tells an informative story, here we focus on the two simpler distinctions that differentiate these maps (for more detail on each mental map, see Supplementary Information, S3). The first distinction, which we label “primary contrast” in Fig. 2, involves how sustainability elements were contrasted (indicated by arrow directions). On the left side of Fig. 2 (Mental maps 1 and 3; accounting for almost 70% of explained variation), participants saw a tension between environmental and social sustainability – more focus on the health of the natural world means less focus on human wellbeing (and vice versa), with economic sustainability not strongly related to either of the other elements.

In contrast, the right side of Fig. 2 (Mental maps 2 and 4, accounting for about 30% of explained variation) shows a primary contrast between economic and social/environmental sustainability – more focus on sustained economic productivity means less focus on achieving a healthy natural world or human wellbeing. This minority view fits more closely with some expert models of sustainability that contrast the economy and the environment^{12, 22, 23}.

The second distinction is in how the SDGs were aligned with sustainability elements. In the top half of Fig. 2 (Mental maps 1 and 4; 60% of explained variation), different SDGs were seen to target different sustainability elements, but differ in which element is targeted. For example, in these mental maps SDG13 (Climate) was seen to target environmental

sustainability (Fig. 2a), economic sustainability (Fig. 2c), both social and economic sustainability (Fig. 2b), or both environmental and social sustainability (Fig. 2d).

In the bottom half of Fig. 2 (Mental maps 3 and 2, 40% of explained variation) all SDGs targeted the same element(s). Participants used one or two sustainability elements as a “lens” for all SDGs, but differed in the lens(es) used. These lenses showed a socio-centric focus, with all SDGs seen to target only social sustainability (Fig. 2e) or economic sustainability (Fig. 2h), but using environmental sustainability as a lens only in conjunction with social (Fig. 2g) or economic (Fig. 2f) sustainability. This is notable because there is a tendency to see sustainability issues mainly through an environmental lens^{22, 34, 35} (illustrated by the title of a prominent journal “Environment: Science and Policy for Sustainable Development”), especially for climate change^{32, 36, 37}.

Mental maps 2-4 showed no reliable demographic or value associations, and only one country difference. For Mental map 2, scores were more negative in Russia than in Brazil or the UK, indicating that Russians saw all SDGs as more focused on economic sustainability (reflecting a high priority on economic issues in sustainability noted by others³⁰) and Brazilians/British saw all SDGs as more focused on social/environmental sustainability. While this study provided few indications about the characteristics associated with these mental maps, other demographics (e.g., education) or psychological factors (e.g., worldviews³⁸) may be relevant.

Participants could have high scores on more than one component, for whom the mental maps are building blocks for understanding these more complex beliefs. To illustrate, participants with high positive scores only on Mental map 1 (Fig. 2a) primarily distinguished SDGs on environmental or social sustainability and saw economic sustainability as less relevant, but those who also had high positive scores on Mental map 2 (Fig. 2h) showed the economic-social sustainability distinction but also believed the SDGs targeted economic sustainability.

To understand if these mental models were associated with the priority people give to achieving sustainable development, we introduced participants to the concept of Gross Domestic Product (GDP) as an indicator of national priorities, and asked participants to specify the percentage of their country’s GDP that should be devoted to achieving the SDGs. Responses ranged from 0-100%, and were lowest in Russia ($M=27$, $SD=22$) and highest in South Korea ($M=45$, $SD=19$). Meta-analyses showed no overall relationship between this measure and any mental map, with cross-country variation observed only for Mental map 2 (see Supplementary Information, S5). While this broad measure assesses only one aspect of sustainability support, it suggests that these mental maps are alternative perspectives on sustainability rather than reflecting “pro-” or “anti-” sustainability views.

DISCUSSION

This mapping of cultural views of the SDGs and sustainability provides knowledge to improve public engagement with sustainability. Based on these findings we make the following recommendations, with the caveat that samples in each country were relatively small and would benefit from expanding the research to larger representative samples in these and other countries.

Our findings indicate a multifaceted strategy could engage people with a broader range of sustainability issues. For a substantial proportion of participants, each SDG targeted

environmental, social or economic sustainability. Because people are more receptive of communication that fits their beliefs, sustainability communication could improve by moving beyond targeting the “obvious” elements (e.g., environmental sustainability for climate change, social sustainability for equality). For example, communication about SDG4 (Education) could highlight how it improves people’s quality of life (social), increases economic productivity (economic), and helps people understand the importance of preserving the natural world (environmental). This study complements evidence from climate change communication demonstrating that a focus on social or economic outcomes can be as effective as focusing on its environmental effects^{39,40}.

The findings also suggest which SDGs will work well together in public communication because they are both directed towards the same sustainability goals. For example, in the dominant mental map both SDG8 (Growth) and SDG5 (Gender) target social and economic sustainability, suggesting most people would accept the International Monetary Fund’s recent framing that links increased gender equality with stable economic growth⁴¹. However, it is important that policies and initiatives actually deliver on these outcomes (in this example policy success is equivocal⁴²), to ensure policies do not undermine future communication efforts. Other political considerations are also important, such as how the political alignment of communicators could influence reactions (e.g. whether messages come from the political left or right).

Close consideration is needed when communicating environmental, social, and economic sustainability elements in combination⁴³. One consideration is whether to present these elements with equal status and emphasis, or with the more obvious element as dominant and others as supplementary. The latter approach is common when communicating climate change, where social/economic outcomes are typically framed as “co-benefits”^{44, 45, 46}. Yet this might be a less effective frame for people who see the primary outcomes of addressing climate change as social or economic rather than environmental.

A further consideration involves how using multiple elements could enhance or undermine persuasiveness. Communicating benefits for multiple sustainability elements could have additive effects through providing extra justifications to support policies. However, where people see these outcomes as in tension, the overall effect may be to undermine support by claiming they will achieve outcomes people view as incompatible. Some evidence from climate change communication suggests such undermining effects may be minimal because people tend to remember and pass on information familiar to them and filter out the rest²⁰. Others have found that individual differences such as open-mindedness influence the persuasiveness of these types of messages⁴⁷. The findings contribute to understanding both considerations through identifying public beliefs about which SDGs are seen as compatible or conflicting in achieving sustainability.

The findings highlight a particular challenge for explicitly “all-encompassing” sustainability programs such as the USA’s proposed “Green New Deal”⁴⁸. While its political opponents have claimed it will have devastating consequences for the economy⁴⁹, from our findings it appears that the largest challenge in public communication is not a proposal’s economic sustainability, but to persuade people that it can deliver on both environmental and social outcomes (e.g., addressing climate change *and* health or poverty).

Two approaches for overcoming this challenge warrant investigation. The first separates the communication of policies to diminish the salience of the tension. For example, policies to address SDG13 (Climate) and SDG1 (Poverty) could be communicated as separate programs even though they could be linked in policy development^{13, 50}. A second approach is to ensure communication (and policies themselves) explicitly addresses this tension, e.g., explaining how addressing climate change will help reduce poverty or create other social co-benefits^{44, 45}, or how policies to address poverty will have minimal negative (or even positive) impacts on the environment.

For communication within specific countries, we recommend close consideration of the dominant beliefs within each country (see Supplementary Information, S4). However, to communicate SDGs to international audiences (where consistency and simplicity of communication may be higher priorities), we recommend working with the dominant model (Fig. 1). This means placing most emphasis on the environmental benefits of healthy ecosystems, the social benefits of infrastructure/innovation, improving health and reducing hunger, and the social and economic benefits of equality and peace.

While there are many considerations for what and how to communicate sustainability beyond audience reactions, understanding people's mental maps provides insights into what is most likely to resonate with the public in diverse societies. This informs efforts to improve public engagement with sustainability to gain the widest public support to address this crucial global issue.

Methods

This research was approved by the Psychology Research Ethics Committee at the Queensland University of Technology (QUT), Ethics Approval Number 160000223.

An online survey was completed by 2671 community participants between February 28 and March 19, 2018, using an online panel administered by Survey Sampling International (SSI) to its panel database in each country. We sampled from 12 countries (the maximum available within our budget), selected to include developing countries (“BRICS” countries: Brazil, Russia, India, China, South Africa; adding South Korea and Argentina to extend Asian/South American samples), developed anglophone countries (Australia, UK, USA), and developed non-anglophone countries (France, Sweden). SSI uses diverse methods to source their national panels, but the sample was self-selected by participants who chose to do the study (approx. 200 per country) and cannot be assumed to be fully representative of each country’s population. However, using a panel from a single company can reduce biases compared to using different recruitment methods. Surveys were in English for Australia, India, South Africa, UK, and USA, and for all other countries were translated into their major language using parallel or back-translation.

Participants read short definitions of environmental, social, and economic sustainability on separate pages (randomised order), and under each definition provided with short descriptions of the 17 SDGs (without the labels). Participants rated the extent to which each SDG was targeted at achieving that form of sustainability (see Table 1).

We also asked participants about the priority sustainability should be given in their country, introducing Gross Domestic Product (GDP) as a proxy measure of the resources in a country that can be used for different purposes. Participants indicated the percentage of their country’s GDP that should be directed towards achieving sustainability as a whole. They also were asked to indicate the proportion of their government’s budget to achieve the SDGs that should be allocated to each of the 17 SDGs (analyses for this measure is reported in Supplementary Information only, S5).

We also obtained ratings of values using the Short Schwartz Value Survey⁵¹, which is based on the most widely-used and cross-culturally validated psychological model of values²⁵. Demographic information collected included age, gender, relative income, political orientation, religiosity, and rural/urban location. Additional measures not related to the study were included for a cross-cultural validation study (i.e., people’s worldviews about social change, ideal prize to win in a lottery).

For analyses, we excluded participants who showed clear evidence of “flatline” pattern responding – giving an identical rating for the relevance of all 17 SDGs in one or more sustainability elements (n=504). While it is possible that some participants could see all 17 SDGs as relevant to a sustainability element to an identical degree, we took a cautious approach and reasoned that showing no variation at all across 17 SDGs was more likely to indicate inattention or disengagement with the task (further analyses of these responses is reported in Supplementary Information, S1). As the analyses requires a complete dataset with no missing values, participants with missing values for any SDG on any element were excluded (n=33). This resulted in a final sample of 2134. Demographic information by country is contained in Supplementary Information, S1.

Data availability

Materials and data are publicly available on the Open Science Framework repository at <https://osf.io/c365a/>.

References

1. Baker S. *Sustainable development*, 2nd edn. Routledge: Abingdon, UK, 2016.
2. United Nations. Sustainable Development Goals. <https://sustainabledevelopment.un.org/sdgs>. 2019.
3. World Commission on Environment and Development (WCED). *Our Common Future*. New York, NY: Oxford University Press; 1987.
4. Kates RW, Parris TM, Leiserowitz AA. What is sustainable development? Goals, indicators, values, and practice. *Environment* 2005, **47**(3): 9-21.
5. Munasinghe M. *Sustainable development in practice: Sustainomics methodology and applications*. Cambridge University Press: Cambridge, UK, 2009.
6. United Nations. Division for Sustainable Development Goals. <https://sustainabledevelopment.un.org/sdgs>. 2019.
7. Smith K. The wisdom of crowds. *Nature Reports* 2009, **3**: 89-91.
8. Hsu A, Malik O, Johnson L, Esty DC. Development: Mobilize citizens to track sustainability. *Nature* 2014, **508**: 33-35.
9. Le Blanc D. Towards integration at last? The Sustainable Development Goals as a network of targets. *Sustainable Development* 2015, **23**: 176-187.
10. Nilsson M, Griggs D, Visbeck M. Map the interactions between Sustainable Development Goals. *Nature* 2016, **534**: 320-322.
11. Griggs D, Stafford-Smith M, Gaffney O, Rockström J, Öhman MC, Shyamsundar P, *et al.* Sustainable development goals for people and planet. *Nature* 2013, **495**: 305-307.
12. Hatfield-Dodds S, Schandl H, Adams PD, Baynes TM, Brinsmead TS, Bryan BA, *et al.* Australia is 'free to choose' economic growth and falling environmental pressures. *Nature* 2015, **527**(7576): 49-53.
13. Liu J, Hull V, Godfray HCJ, Tilman D, Gleick P, Hoff H, *et al.* Nexus approaches to global sustainable development. *Nature Sustainability* 2018, **1**(9): 466-476.

14. McGowan PJK, Stewart GB, Long G, Grainger MJ. An imperfect vision of indivisibility in the Sustainable Development Goals. *Nature Sustainability* 2018, **2**(1): 43-45.
15. Lusseau D, Mancini F. Income-based variation in Sustainable Development Goal interaction networks. *Nature Sustainability* 2019, **2**(3): 242-247.
16. Moser SC. Reflections on climate change communication research and practice in the second decade of the 21st century: What more is there to say? *Wiley Interdisciplinary Reviews: Climate Change* 2016.
17. Benford RD, Snow DA. Framing processes and social movements: An overview and assessment. *Annual Review of Sociology* 2000, **26**: 611-639.
18. Kahan DM, Braman D. Cultural cognition and public policy. *Yale Law & Policy Review* 2006, **24**(1): 149-172.
19. Kashima Y, Bain P, Perfors A. The psychology of cultural dynamics: What is it, what do we know, and what is yet to be known? *Annual Review of Psychology* 2019, **70**: 499-529.
20. Connor P, Harris E, Guy S, Fernando J, Burton-Shank D, Kurz T, *et al.* Interpersonal communication about climate change: How messages change when communicated through simulated online social networks. *Climatic Change* 2016, **136**(3): 463-476.
21. United Nations. My world: The United Nations global survey for a better world. 2018 [cited December 20, 2018] Available from: <http://about.myworld2030.org/>
22. Poortinga W, Darnton A. Segmenting for sustainability: The development of a sustainability segmentation model from a Welsh sample. *Journal of Environmental Psychology* 2016, **45**: 221-232.
23. Waas T, Hugé J, Verbruggen A, Wright T. Sustainable development: A bird's eye view. *Sustainability* 2011, **3**(10): 1637-1661.
24. Inglehart R. Public support for environmental protection: Objective problems and subjective values in 43 societies. *PS: Political Science and Politics* 1995, **15**: 57-71.
25. Schwartz SH. Universals in the content and structure of values: Theoretical advances and empirical tests in 20 countries. In: Zanna MP (ed). *Advances in experimental social psychology*, Vol. 25. Academic Press: San Diego, CA, 1992, pp 1-65.

26. Corner A, Markowitz E, Pidgeon N. Public engagement with climate change: The role of human values. *Wiley Interdisciplinary Reviews: Climate Change* 2014, **5**: 411-422.
27. Kroonenberg PM. *Applied multiway data analysis*. John Wiley & Sons: Hoboken, NJ, 2008.
28. Kiers HAL, Van Mechelen I. Three-way component analysis: Principles and illustrative application. *Psychological Methods* 2001, **6**(1): 84-110.
29. Oldfield JD. Russia, systemic transformation and the concept of sustainable development. *Environmental Politics* 2001, **10**(3): 94-110.
30. Crotty J, Hall SM. Environmental awareness and sustainable development in the Russian Federation. *Sustainable Development* 2014, **22**: 311-320.
31. Hofstede G, Hofstede GJ, Minkov M. *Cultures and organizations: Software of the mind*. McGraw-Hill: New York 2010.
32. Hornsey MJ, Harris EA, Bain PG, Fielding KS. Meta-analyses of the determinants and outcomes of belief in climate change. *Nature Climate Change* 2016, **6**: 622-626.
33. McCright AM, Dunlap RE, Marquart-Pyatt ST. Political ideology and views about climate change in the European Union. *Environmental Politics* 2015, **25**(2): 338-358.
34. Roy D, Verplanken B, Griffin C. Making sense of sustainability: Exploring the subjective meaning of sustainable consumption. *Applied Environmental Education & Communication* 2015, **14**(3): 187-195.
35. Kennedy D. Sustainability. *Science* 2007, **315**: 573.
36. Lorenzoni I, Pidgeon NF. Public views on climate change: European and USA perspectives *Climatic Change* 2006, **77**: 73-95.
37. Weber EU, Stern PC. Public understanding of climate change in the United States. *American Psychologist* 2011, **66**(4): 315-328.
38. Hedlund-de Witt A. Rethinking sustainable development: Considering how different worldviews envision “development” and “quality of life”. *Sustainability* 2014, **6**(11): 8310-8328.
39. Bain PG, Hornsey MJ, Bongiorno R, Jeffries C. Promoting pro-environmental action in climate change deniers. *Nature Climate Change* 2012, **2**(8): 600-603.

40. Bernauer T, McGrath LF. Simple reframing unlikely to boost public support for climate policy. *Nature Climate Change* 2016, **6**: 680-683.
41. Lagarde C, Ostry JD. Economic gains from gender inclusion: Even greater than you thought. [Blog] 2018 [cited 2019 March 2] Available from: <https://blogs.imf.org/2018/11/28/economic-gains-from-gender-inclusion-even-greater-than-you-thought/>
42. Eagly AH. When passionate advocates meet research on diversity, does the honest broker stand a chance? *Journal of Social Issues* 2016, **72**(1): 199-222.
43. Marston G, Stark A, Matthews T, Baker D. Connecting social and environmental policy in Australia: Collateral gains or collateral damage? *Australian Journal of Public Administration* 2019, **78**(1): 3-16.
44. IPCC. *Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, R.K. Pachauri and L.A. Meyer (eds.)]*. IPCC: Geneva, Switzerland, 2014.
45. Bain PG, Milfont TL, Kashima Y, et al. Co-benefits of addressing climate change can motivate action around the world. *Nature Climate Change* 2016, **6**: 154-157.
46. Walker BJA, Kurz T, Russel D. Towards an understanding of when non-climate frames can generate public support for climate change policy. *Environment and Behavior* 2018, **50**(7): 781-806.
47. Nisbet EC, Hart PS, Myers T, Ellithorpe M. Attitude change in competitive framing environments? Open-/closed-mindedness, framing effects, and climate change. *Journal of Communication* 2013, **63**(4): 766-785.
48. Ocasio-Cortez A. H.Res.109 - Recognizing the duty of the Federal Government to create a Green New Deal. 2019 [cited 2019 March 1] Available from: <https://www.congress.gov/bill/116th-congress/house-resolution/109/>
49. Sullivan K. Trump's top economic adviser: 'The Green New Deal will literally destroy the economy'. 2019 [cited 2019 February 28] Available from: <https://edition.cnn.com/2019/02/28/politics/larry-kudlow-green-new-deal-destroy-economy/index.html>
50. Sterner T, Barbier EB, Bateman I, van den Bijgaart I, Crépin A-S, Edenhofer O, et al. Policy design for the Anthropocene. *Nature Sustainability* 2019, **2**(1): 14-21.

51. Lindeman M, Verkasalo M. Measuring values with the short Schwartz's Value Survey. *Journal of Personality Assessment* 2005, **85**(2): 170-178.

Please direct correspondence to the first author at p.bain@bath.ac.uk

Acknowledgements

E.B.'s contribution was supported by the framework of the Basic Research Program at the National Research University Higher School of Economics (HSE) and a subsidy by the Russian Academic Excellence Project '5-100'. We thank Renata Bongiorno and Andrew Mackintosh for their comments on manuscript drafts.

Author contributions

P.G.B. conceived and designed the study, developed the new measures, coordinated data collection, analysed the data in conjunction with P.M.K, wrote the manuscript, and wrote most of the Supplementary Information. P.M.K., L.J., T.L.M, C.R.C., and T.K. provided input to the basic study design and measures. L.J., T.L.M, E.B., C.C, C.D., Y.G., and J.P provided input into cultural considerations of the study and measures, and provided translations of the survey. P.M.K. wrote part of the Supplementary Information. All authors provided feedback on the results and the manuscript.

Competing Financial Interests

The authors declare no competing financial interests.

Table 1. Definitions of sustainability elements used in the study (boldfaced parts of descriptions were boldfaced in the survey).

Sustainability element	Description
Environmental	Environmental sustainability refers to maintaining the viability and health of the natural world (including animals and plants) in wilderness, rural, and urban areas over time. This includes using renewable environmental resources, using non-renewable resources in ways that their use can continue until renewable substitutes are found, and controlling pollution to levels that the Earth can process.
Social	Social sustainability refers to providing an acceptable level of wellbeing and quality of life for all people in society over time. This includes governments and institutions acting to minimize destructive conflicts, to ensure there are acceptable levels of fairness, opportunity, and diversity in society, and providing support to meet people's basic needs for health and wellbeing.
Economic	Economic sustainability refers to governments, businesses, and individuals managing finances efficiently and responsibly to promote productive economic activity now and into the future. This includes investing in activities likely to produce enduring positive results, avoiding activities that are likely to hamper long-term productivity (e.g., avoiding excessive debt and interest payments), and making optimal use of available resources.

Table 2. Descriptions of the Sustainable Development Goals used in the study (with short labels used in the figures and text).

SDG	UN label	Short label	Description used in study
1	No Poverty	Poverty	End poverty in all its forms everywhere
2	Zero Hunger	Hunger	End hunger, achieve food security and improved nutrition, and promote sustainable agriculture
3	Good health and well-being	Health	Ensure healthy lives and promote well-being for all, at all ages
4	Quality Education	Education	Ensure inclusive and equitable quality education and lifelong learning opportunities for all
5	Gender Equality	Gender	Achieve gender equality and empower all women and girls
6	Clean Water and Sanitation	Water	Ensure availability and sustainable management of water and sanitation for all
7	Affordable and Clean Energy	Energy	Ensure access to affordable, reliable, sustainable and modern energy for all
8	Decent Work and Economic Growth	Growth	Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all
9	Industry, Innovation and Infrastructure	Infrastructure	Build resilient infrastructure, promote inclusive and sustainable industrialization, and foster innovation
10	Reduced Inequalities	Equality	Reduce inequality within and among countries
11	Sustainable Cities and Communities	Cities	Make cities and human settlements inclusive, safe, resilient and sustainable
12	Responsible Consumption and Production	Consumption	Ensure sustainable consumption and production patterns
13	Climate Action	Climate	Take urgent action to combat climate change and its impacts
14	Life Below Water	Oceans	Conserve and sustainably use the oceans, seas and marine resources
15	Life on Land	Land	Protect, restore and promote sustainable use of ecosystems, including manage forests, combat desertification, reverse land degradation, and halt biodiversity loss
16	Peace, Justice and Strong Institutions	Peace	Promote peaceful and inclusive societies, including providing access to justice for all and building effective, accountable institutions
17	Partnerships for the Goals	Partnerships	Strengthen global efforts and partnerships for achieving sustainable development

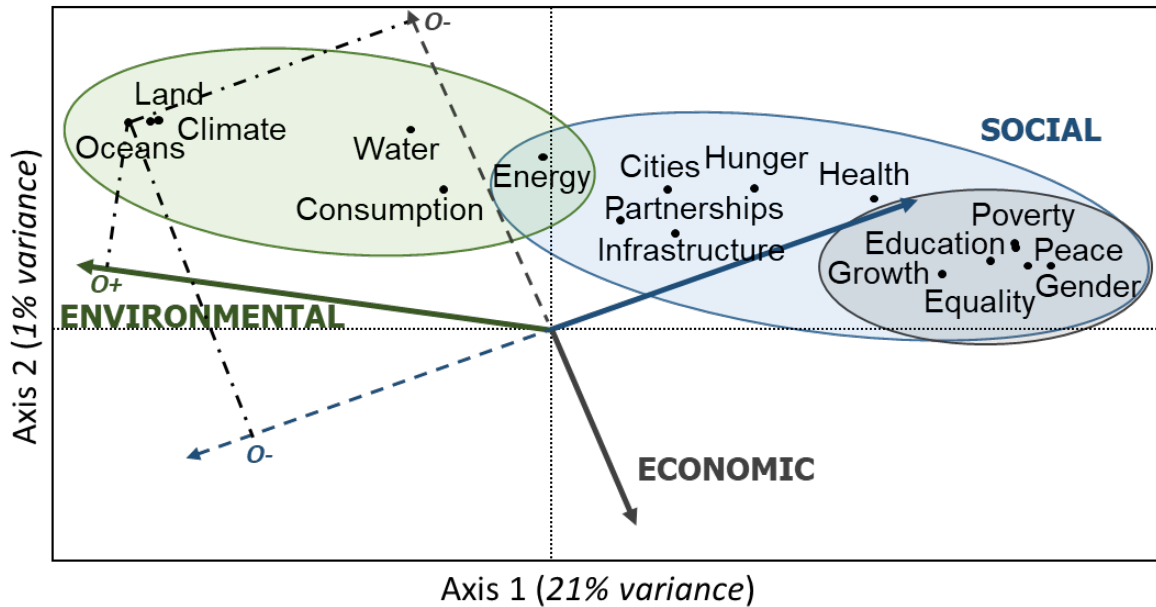


Figure 1. The dominant mental map relating SDGs to Sustainability elements.

The plot is rotated so the maximum variance is explained on the horizontal axis. SDGs and sustainability elements were transformed to have similar scales (symmetric scaling) so their relationships can be seen more easily; hence axis values are not inherently meaningful and were omitted. SDGs are shown as points and Sustainability elements as arrows (positive direction: solid lines; negative direction: dotted lines). Projecting SDG points orthogonally onto Sustainability element arrows shows their correspondence – intersecting with the solid line means they are associated with a Sustainability element more strongly than average, and with a dotted line more weakly than average (negative direction). This is illustrated for SDG14: Oceans, which had the strongest association with environmental sustainability of all SDGs and the weakest associations with social and economic sustainability. To help interpretation, ellipses show where SDGs target a sustainability element more strongly than average.

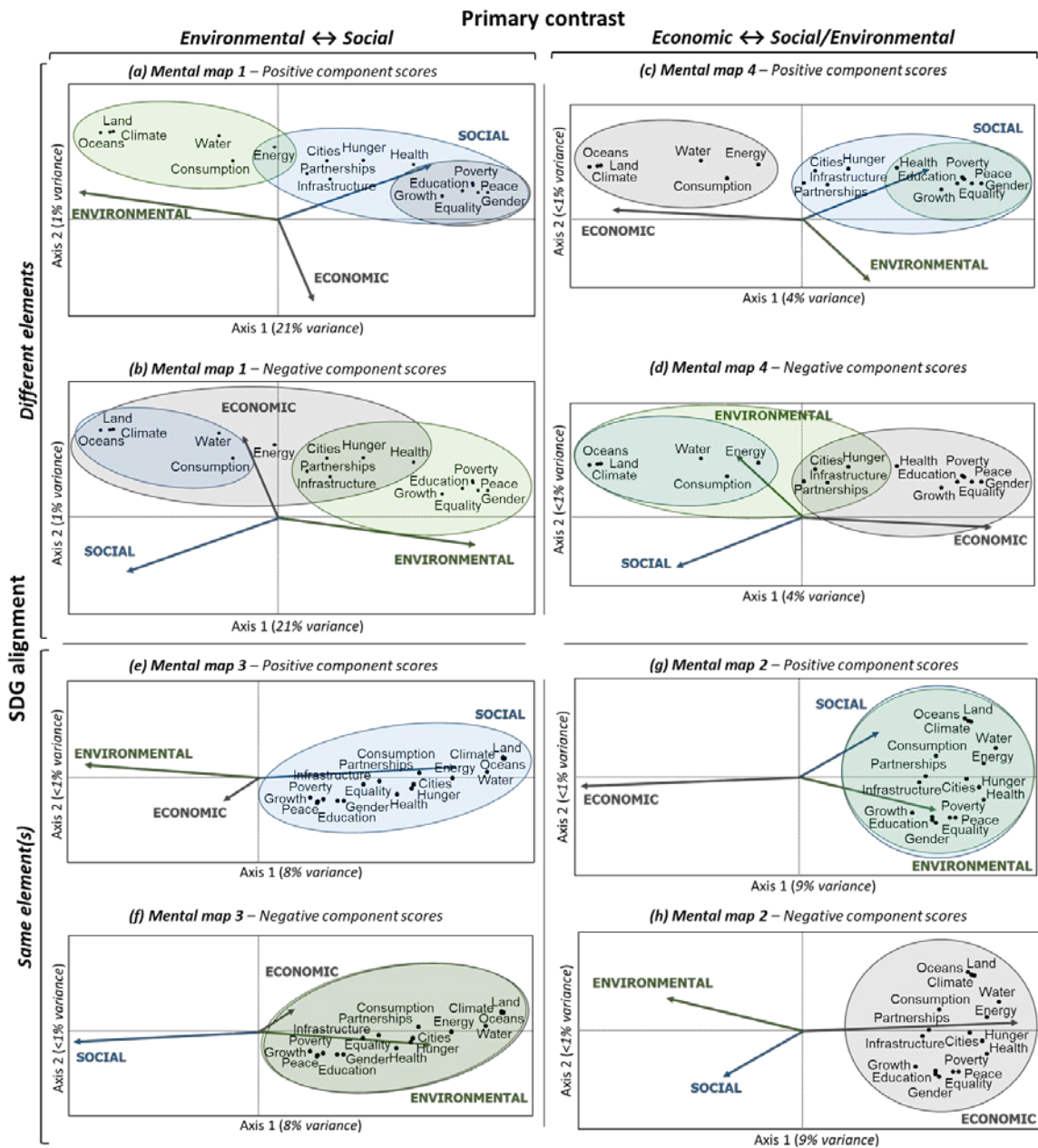


Figure 2. Mental maps relating SDGs to sustainability elements, showing relationships for those with positive and negative scores for each of the four participant components.

Mental maps have been arranged to highlight commonalities and differences. Maps on the left and right reflect the primary contrast people made between sustainability elements – for mental maps on the left (Panels (a), (b), (e) & (f)) the primary contrast was between environmental and social sustainability, and for those on the right (Panels (c), (d), (g) & (h)) the primary contrast was between economic and environmental/social sustainability. Maps in the top and bottom halves differed in how SDGs were aligned with sustainability elements (“SDG alignment”). In the top half (Panels (a), (b), (c) & (d)), different SDGs were seen to target different sustainability elements, e.g., in Fig. 2(a) SDG14: Oceans targets environmental sustainability and SDG3: Health targets social sustainability. In the bottom half (Panels (e), (f), (g) & (h)), all SDGs were seen to target the same element(s) but differed in which element(s) they targeted. Ellipses show where SDGs target a Sustainability element more strongly than average.