Segmentace evropské veřejnosti dle klimatických postojů

Analýza latentních tříd na základě dat z ESS Round 8

Seminář - 20 let projektu European Social Survey
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Jsme výzkumná nezisková organizace sociálních psychologů, datových analytiků a designérů služeb. Naším cílem je pomáhat environmentálním iniciativám aplikovat poznatky z behaviorálních věd a vytvářet s nimi společnost, která přemýšlí a jedná udržitelně.

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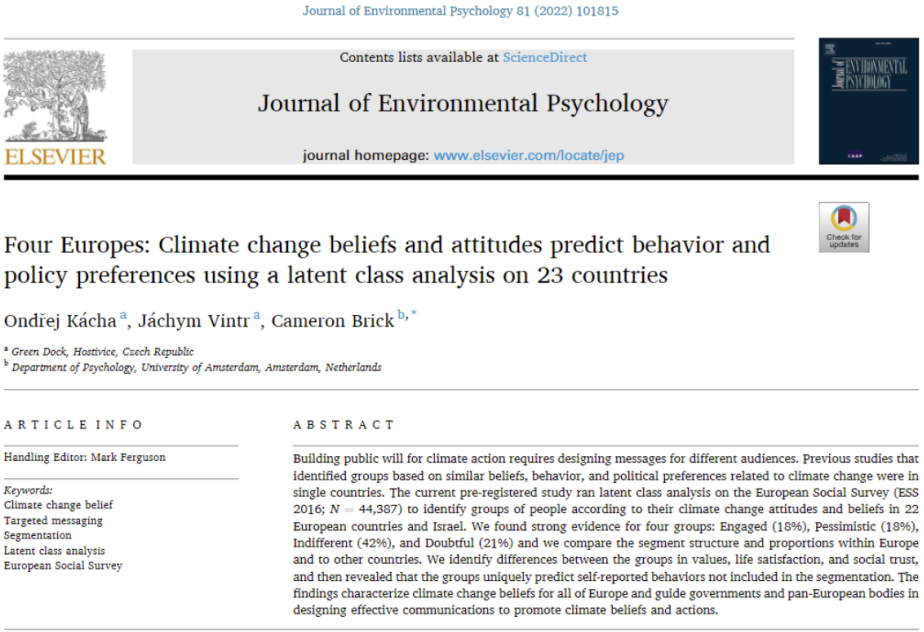
Publikovali jsme LCA klimatických postojů



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Four Europes: Climate change beliefs and attitudes predict behavior and policy preferences using a latent class analysis on 23 countries

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ABSTRACT

Building public will for climate action requires designing messages for different audiences. Previous studies that identified groups based on similar beliefs, behavior, and political preferences related to climate change were in single countries. The current pre-registered study ran latent class analysis on the European Social Survey (ESS 2016; $N = 44{,}387$) to identify groups of people according to their climate change attitudes and beliefs in 22 European countries and Israel. We found strong evidence for four groups: Engaged (18%), Pessimistic (18%), Indifferent (42%), and Doubtful (21%) and we compare the segment structure and proportions within Europe and to other countries. We identify differences between the groups in values, life satisfaction, and social trust, and then revealed that the groups uniquely predict self-reported behaviors not included in the segmentation. The findings characterize climate change beliefs for all of Europe and guide governments and pan-European bodies in designing effective communications to promote climate beliefs and actions.

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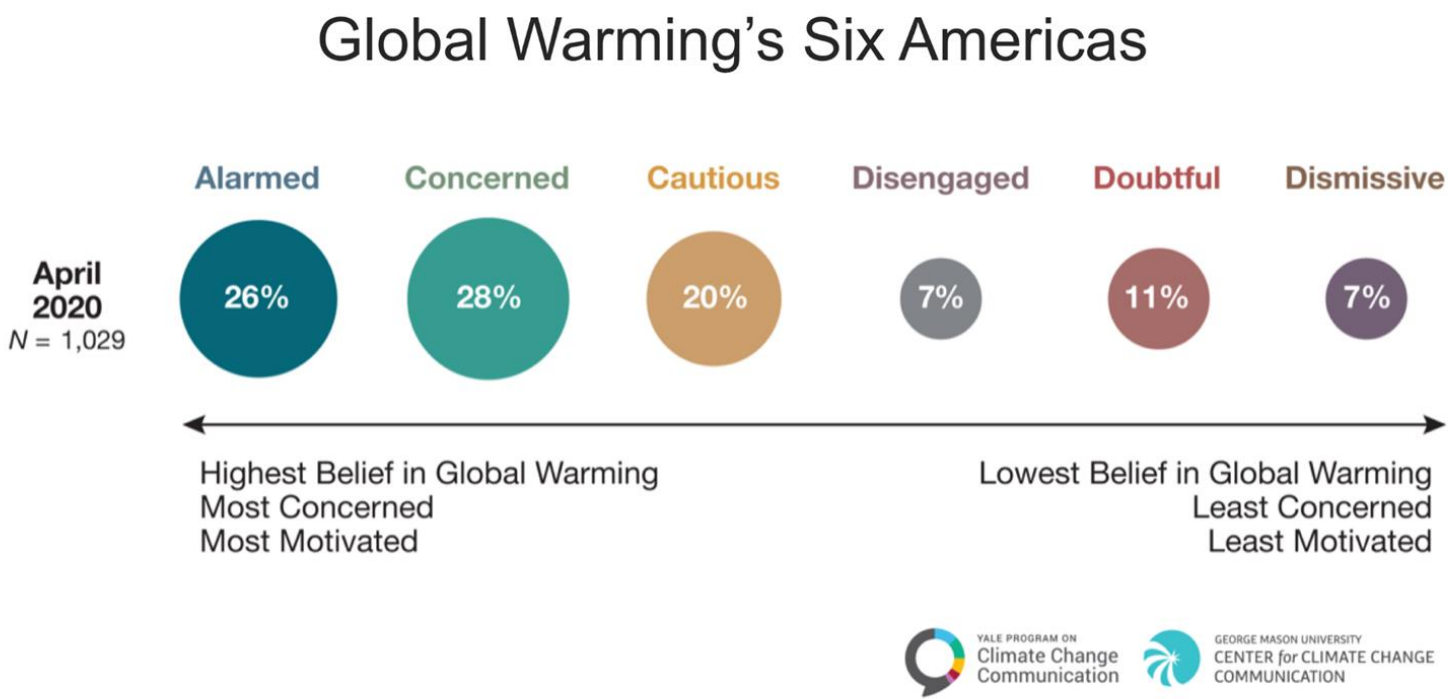
Motivace k segmentační analýze



https://climatecommunication.yale.edu/

Proč ESS?

European Social Survey Round 8 (2016) obsahuje rotating module **European Attitudes to Climate Change and Energy**.

- Nejnovější dostupná data v potřebném rozsahu (23 zemí, 12 položek).
- Modul obsahuje postojové i behaviorální položky.
- Možnost zjistit souvislost s dalšími ESS moduly.
- Dále zvažovány datasety: European Values Study 2017, Eurobarometer 2017, Eurobarometer 2018, International Social Survey Programme

https://www.europeansocialsurvey.org/docs/findings/ESS8_toplines_issue_9_climatechange.pdf

Využili jsme 12 položek

impenv*	Important to care for nature and environment (1: like me)	1–6	Personal values
clmchng*	Think world's climate is changing (1: definitely changing)	1–4	Climate change beliefs
clmthgt*	Thought about climate change before today (5: great deal)	1–5	Climate change beliefs
ccnthum*	Climate change caused by natural processes, human activity, or both (5: humans; 6: not happening)	1-5; 6 (not happening)	Climate change beliefs
ccgdbd	Climate change good or bad impact across world (11: extremely good)	1–11	Climate change beliefs
wrclmch*	Worried about climate change (5: worried)	1–5	Climate concern

Využili jsme 12 položek

ccrdprs	Feel personal responsibility to reduce climate change (11: great deal)	1–11	Pro-environmental personal norms
cflsenr	Confident you could use less energy than now (11: confident)	1–11	Efficacy beliefs
lkredcc	Imagine large numbers of people limit energy use: how likely to reduce climate change (11: likely)	1–11	Efficacy beliefs
lklmten	How likely large numbers of people limit energy use (11: likely)	1–11	Efficacy beliefs
gvsrdcc	How likely governments take action to reduce climate change (11: likely)	1–11	Efficacy beliefs
ownrdcc	How likely limiting own energy use to reduce climate change (11: likely)	1–11	Efficacy beliefs

Analytická strategie

1. Předregistrace - fáze 1 (OSF)

2. Zpracování a čištění dat (R)
3. Rozdělení datasetu na trénovací a testovací subsets (R)

4. Odhad LCA modelů v tréninkovém datasetu (Mplus)
5. Regresní analýza v tréninkovém datasetu (R)

6. Předregistrace - fáze 2 (OSF)
7. Odhad LCA modelů v testovacím datasetu (Mplus)
8. Regresní analýza v testovacím datasetu (R)

Zpracování a čištění dat

Pro zpracování dat za účelem LCA v programu Mplus je nutné provést řadu úkonů.

1. Stažení dat z ESS portálu pomocí knihovny esssurvey v R (v R10 již nefunguje!)
2. Nahradit NAs za arbitrátní hodnotu (např. -99)
3. Překódovat škály obsahující 0 (např. přičíst +1)
4. Překódovat škály obsahující nevím na nižší hodnoty (např. 55 -> 6)
5. Vypočítat korektní váhy na základě ESS weighting manual (v R10 již vypočítáno)

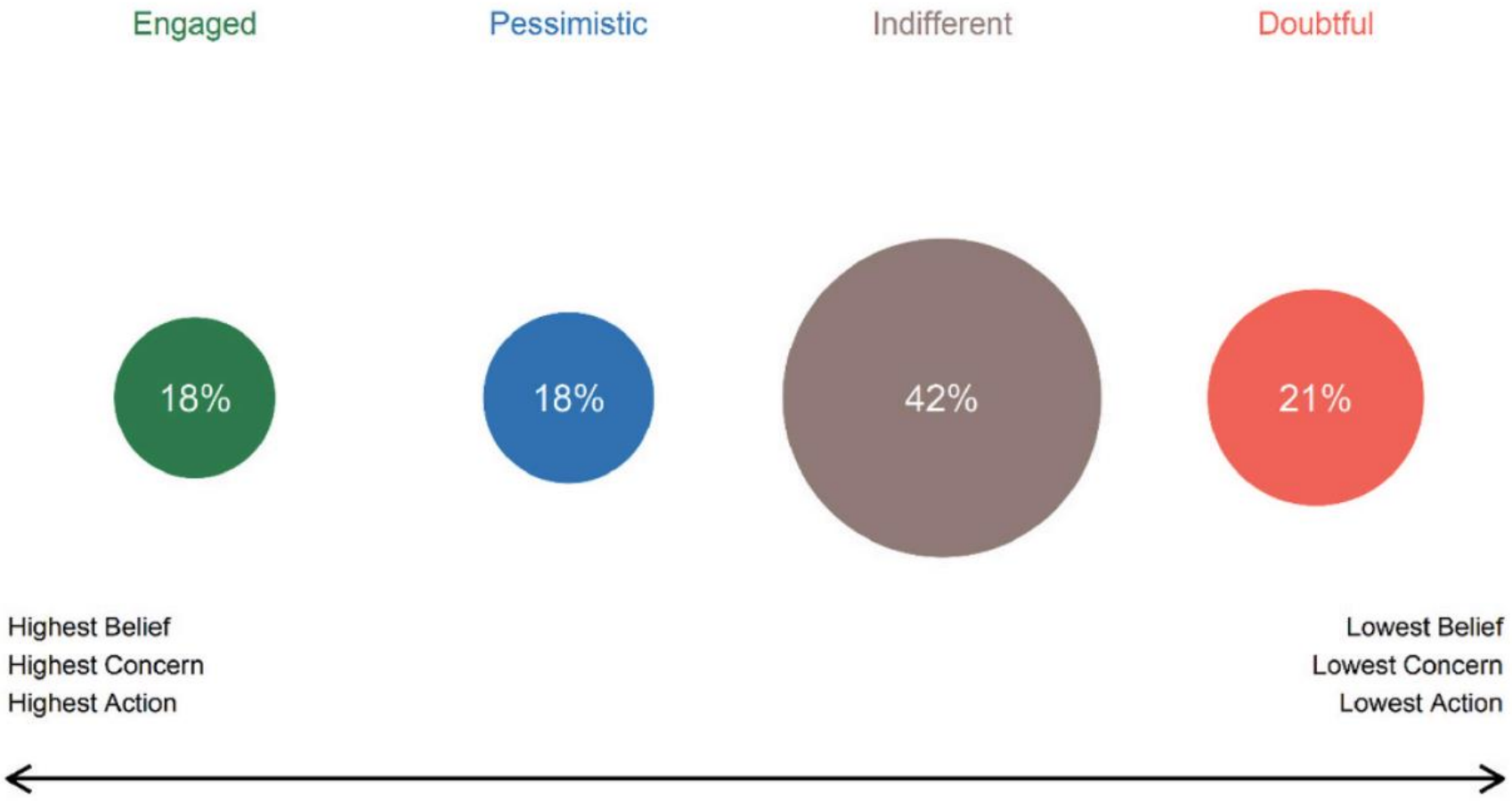
Analýza latentních tříd

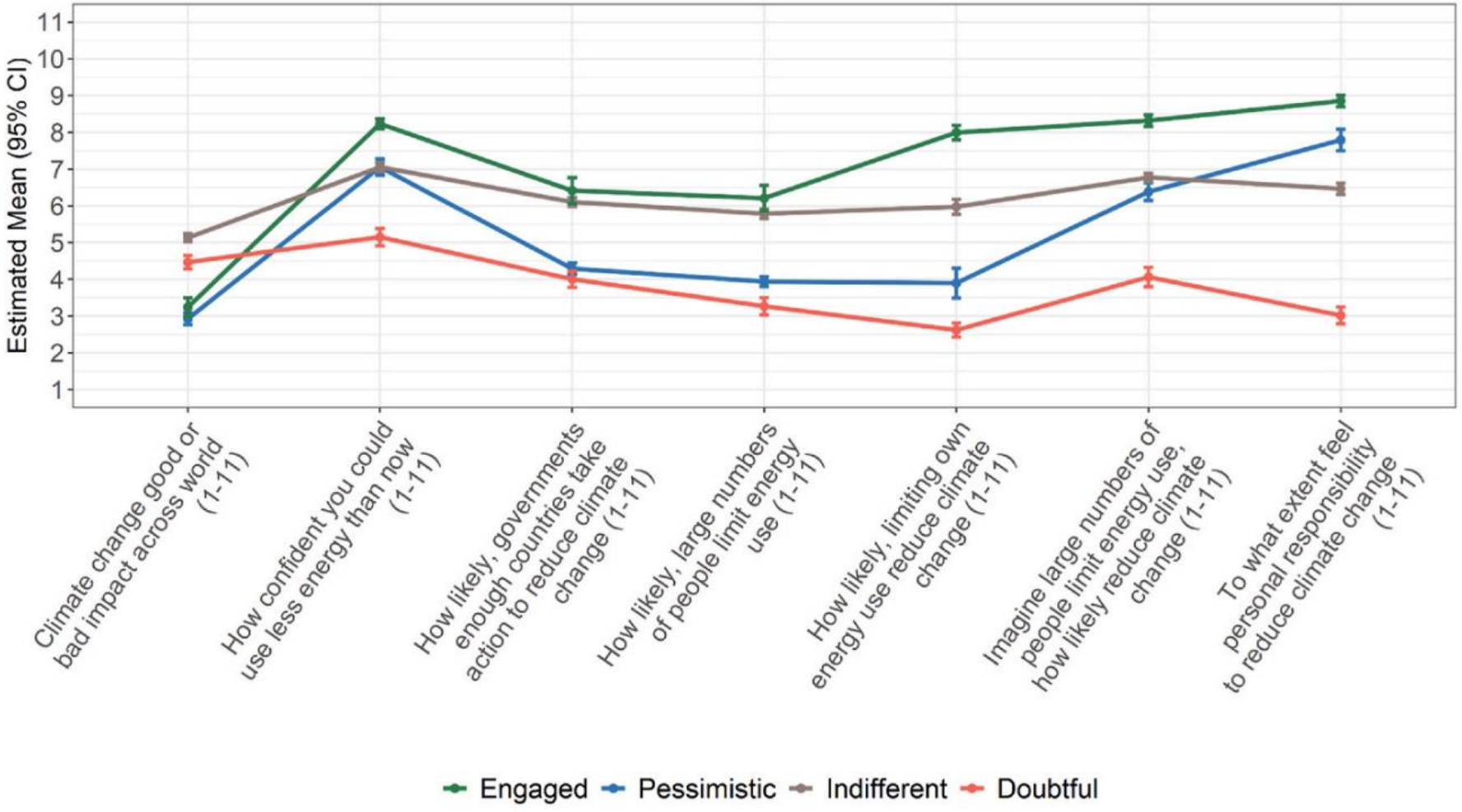
1. Kombinace kategorických (5) a spojitých (7) proměnných
2. Celoevropský “pooled” model bez zohlednění příslušností do zemí
3. Vážení dat za použití robustního algoritmu
4. Odhad modelů obsahujících 1 (baseline) až 9 tříd
5. Vyhodnocení pomocí tří kritérií:
    a. ΔBIC
    b. Entropy
    c. LMR-LRT test

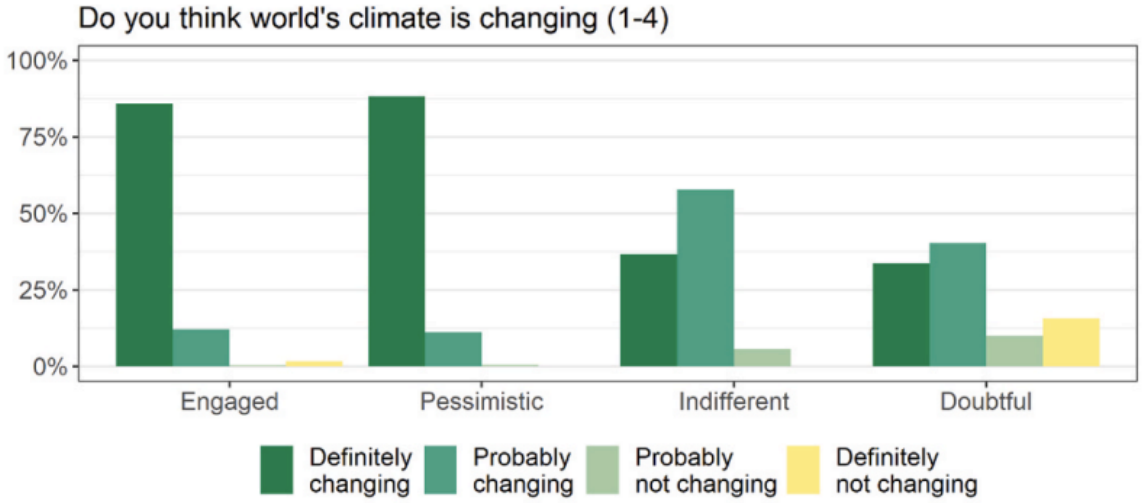
Table 3
LCA models and fit indices.

Classes	Param.	Entropy	logLik	AIC	BIC	ΔBIC	LMR	*p*
Exploratory dataset (n = 22,183)								
1	35	1.000	−463843	927756	928037	–	–	–
2	64	0.748	−450748	901625	902137	−25899	26096	.763
3	93	0.779	−444163	888512	889257	−12880	13125	.016
4	**122**	**0.773**	**−441377**	**882999**	**883976**	**−5281**	**5552**	**.013**
5	151	0.741	−439610	879524	880733	−3243	3521	.396
6	180	0.742	−438303	876968	878409	−2324	2605	.685
7	209	0.759	−437281	874981	876655	−1753	2037	.273
8	238	0.770	−436380	873237	875142	−1513	1797	.829
9	267	0.780	−435469	871474	873611	−1531	1815	.802
Confirmatory dataset (n = 22,189)								
1	35	1.000	−464950	929969	930250	–	–	–
2	64	0.733	−452218	904565	905077	−25173	25375	.016
3	93	0.776	−445534	891253	891998	−13079	13323	.020
4	**122**	**0.777**	**−442535**	**885314**	**886291**	**−5707**	**5976**	**.003**
5	151	0.732	−441008	882317	883526	−2765	3044	.474
6	180	0.725	−439809	879978	881419	−2107	2389	.762
7	209	0.745	−438762	877942	879616	−1803	2086	.793
8	238	0.756	−437949	876373	878279	−1337	1621	.692
9	267	0.745	−437106	874746	876883	−1396	1673	.796

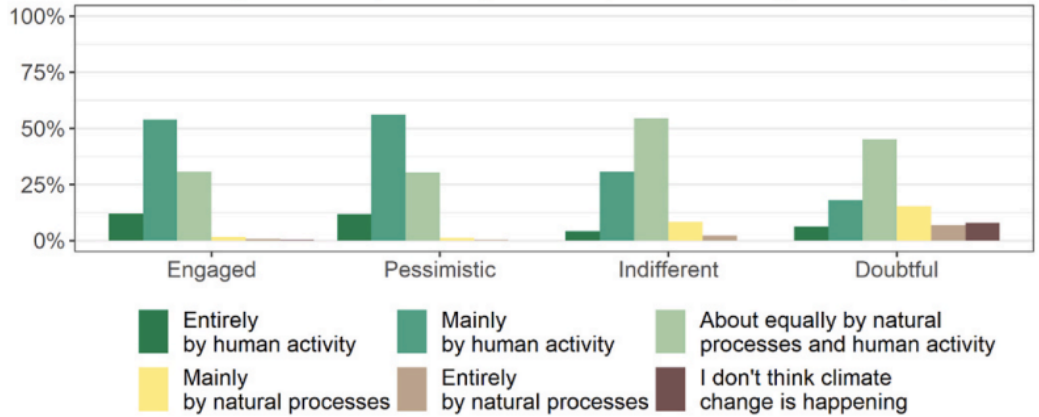
Note. logLik = Log-likelihood, AIC = Akaike's information criterion, BIC = Bayesian information criterion, ΔBIC = BIC difference from a model with k-1 classes, LMR-LRT = Lo-Mendell-Rubin likelihood ratio test statistic, *p* = LMR-LRT *p*-value. Bold indicates the selected model.


Engaged
Pessimistic
Indifferent
Doubtful
18%
18%
42%
21%
Highest Belief
Highest Concern
Highest Action
Lowest Belief
Lowest Concern
Lowest Action
Confirmatory Sample N = 22,189

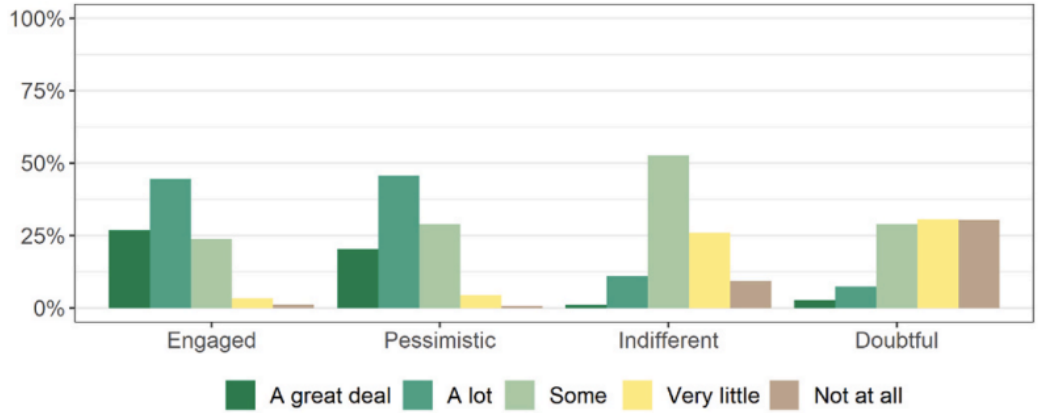

Estimated Mean (95% CI)
11
10
9
8
7
6
5
4
3
2
1
Climate change good or bad impact across world (1-11)
How confident you could use less energy than now (1-11)
How likely, governments enough countries take action to reduce climate change (1-11)
How likely, large numbers of people limit energy use (1-11)
How likely, limiting own energy use reduce climate change (1-11)
Imagine large numbers of people limit energy use, how likely reduce climate change (1-11)
To what extent feel personal responsibility to reduce climate change (1-11)
Engaged
Pessimistic
Indifferent
Doubtful


Do you think world's climate is changing (1-4)
100%
75%
50%
25%
0%
Engaged
Pessimistic
Indifferent
Doubtful
Definitely changing
Probably changing
Probably not changing
Definitely not changing

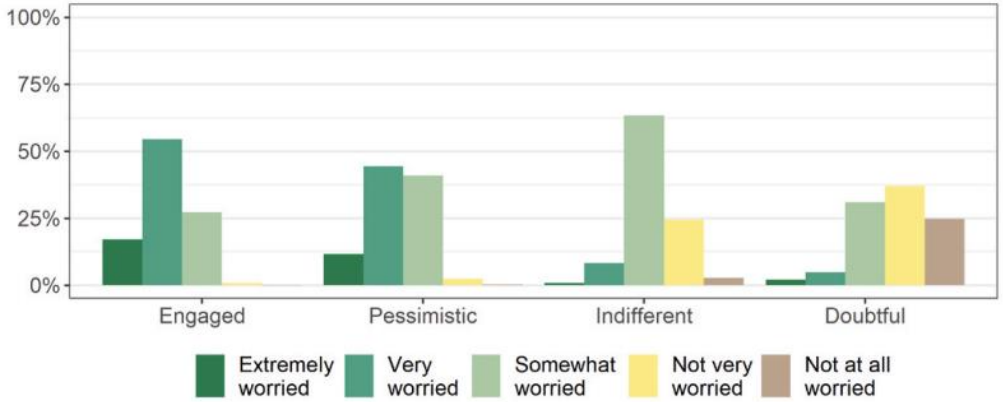
Climate change caused by natural processes, human activity, or both (1-5)



How much thought about climate change before today (1-5)



How worried about climate change (1-5)



Important to care for nature and environment (1-6)

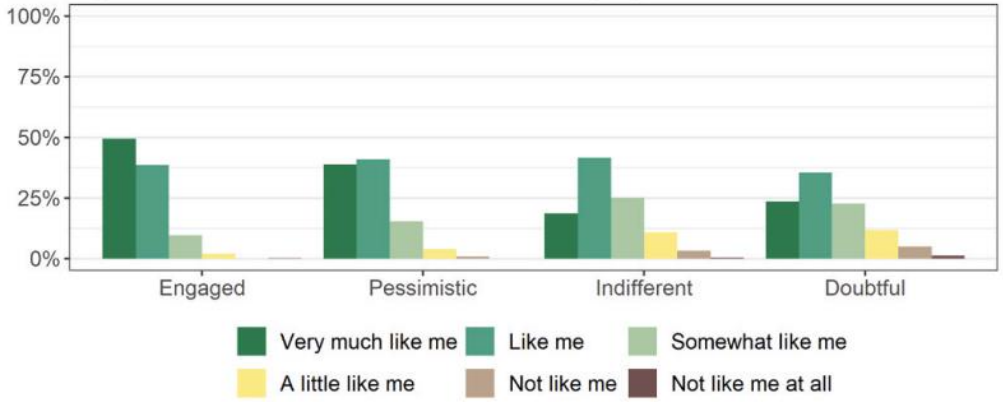


Table 5
Regression coefficients for all multilevel models.

Variables	Activist behavior (composite score)		Support increase taxes on fossil fuels		Support subsidized renewable energy		Support ban of energy inefficient appliances		How likely to buy most energy efficient home appliance		How often do things to reduce energy use	
Model	1	2	1	2	1	2	1	2	1	2	1	2
Age	−0.05[c]	−0.04[c]	−0.05[c]	−0.04[c]	−0.04[c]	−0.03[c]	0.04[c]	0.05[c]	0.14[c]	0.15[c]	0.14[c]	0.15[c]
Household income	0.03[c]	0.03[c]	0.06[c]	0.04[c]	0.03[c]	0.02	0.06[c]	0.04[c]	0.07[c]	0.06[c]	−0.04[c]	−0.05[c]
Gender – Female	−0.05[b]	−0.05[c]	0.05[b]	0.03	0.06[c]	0.04[b]	0.10[c]	0.08[c]	0.08[c]	0.07[c]	0.09[c]	0.07[c]
Edu – ISCED 2	0.20[c]	0.18[c]	0.05	0.02	0.15[c]	0.12[c]	0.11[b]	0.08	0.13[c]	0.10[b]	0.19[c]	0.16[c]
Edu – ISCED 3	0.25[c]	0.22[c]	0.02	−0.02	0.16[c]	0.12[c]	0.16[c]	0.12[c]	0.29[c]	0.26.	0.23[c]	0.19[c]
Edu – ISCED 4	0.43[c]	0.39[c]	0.13[c]	0.09[a]	0.26[c]	0.21[c]	0.13[c]	0.08[a]	0.27[c]	0.22[c]	0.28[c]	0.22[c]
Edu – ISCED 5	0.50[c]	0.45[c]	0.09[b]	0.04	0.25[c]	0.19[c]	0.20[c]	0.14[c]	0.37[c]	0.31[c]	0.33[c]	0.26[c]
Edu – ISCED 6	0.62[c]	0.56[c]	0.29[c]	0.21[c]	0.33[c]	0.24[c]	0.22[c]	0.13[c]	0.33[c]	0.25[c]	0.38[c]	0.29[c]
Edu – ISCED 7	0.80[c]	0.72[c]	0.38[c]	0.29[c]	0.33[c]	0.23[c]	0.22[c]	0.11[b]	0.37[c]	0.27	0.38[c]	0.27[c]
Left-right ideology	−0.11[c]	−0.09[c]	−0.09[c]	−0.08[c]	−0.08[c]	−0.06[c]	−0.07[c]	−0.04[c]	−0.02[b]	0	−0.05[c]	−0.02[b]
Class – Pessimistic		−0.06[a]		−0.27[c]		−0.08[c]		−0.14[c]		−0.16[c]		−0.20[c]
Class – Indifferent		−0.35[c]		−0.33[c]		−0.36[c]		−0.40[c]		−0.36[c]		−0.49[c]
Class – Doubtful		−0.33[c]		−0.72[c]		−0.60[c]		−0.67[c]		−0.61[c]		−0.61[c]
$ICC_{country}$	0.15	0.13	0.06	0.06	0.06	0.05	0.03	0.03	0.06	0.05	0.04	0.03
AIC	43225	42789	49821	49047	45410	44474	49135	48400	69740	69119	50038	49283
BIC	43325	42912	49920	49170	45510	44887	49235	48523	69840	69242	50138	49406
$\chi 2$	43199	42757	49795	49015	45384	44732	49109	38368	69714	69087	50012	49251
$\Delta\ \chi 2$		441.85		779.43		651.56		740.65		627.2		761.87
p		<.001		<.001		<.001		<.001		<.001		<.001
Pseudo R^2	0.22	0.22	0.10	0.14	0.08	0.11	0.05	0.09	0.09	0.12	0.07	0.11
Δ Pseudo R^2		0.01		0.04		0.03		0.04		0.03		0.04

Note. The superscript letters indicate statistical significance: [a] $p < .05$, [b] $p < .01$, [c] $p < .001$.Age, Household income and Left-right ideology were standardized using the refit standardization method (Neter et al., 1989). *P*-values were obtained using Satterthwaite (1941) approximation. Edu = Education. ISCED = International Standard Classification of Education. Reference categories: Gender = male, Education = ISCED 1, Class = Engaged); $ICC_{country}$ = adjusted intraclass correlation for the random effects of country, AIC = Akaike's information criterion, BIC = Bayesian information criterion, $\chi 2$ = Chi-square statistic, p = p-value for Likelihood-ratio test, Pseudo R^2 = Nakagawa's conditional *r*-squared (includes variance of both fixed and random effects).

Hledali jsme novější data, ale...

European Social Survey Round 10 (2022) obsahuje také několik klimatických položek. Zvažovali jsme tedy realizaci navazující studie. Segmentaci pomocí LCA ovšem nejde provést z několika důvodů.

- Z 12 položek zůstalo 6
- Z těchto 6 položek jsou 3 položky z důvodu metodologického experimentu měřené na různých škálách (4, 7 a 11 stupňů).
- Data nejsou úplná, některé položky v některých zemích chybí

Otázky?

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