Topic modelling on climate change scepticism: machine learning approach

Mariusz Baranowski

Adam Mickiewicz University, Poznan

Research project ***Determinants of populist opposition to climate policy***
financed by Polish National Science Centre [2020/37/B/HS6/02998]
PI: Prof. Piotr Matczak

Why is it important to investigate climate change scepticism?

https://www.nytimes.com/2015/02/17/science/earth/in-climate-change-whats-in-a-name.html

Critical analysis:

Climate change scepticism challenges the prevailing scientific consensus on the causes and impacts of climate change. By engaging with sceptical arguments, researchers can critically examine the evidence, methodologies, and assumptions underlying climate science. This analysis helps strengthen scientific understanding by identifying potential gaps, weaknesses, or areas that require further investigation.

Robustness of scientific knowledge:

Engaging with scepticism allows scientists to refine and improve their arguments, theories, and models. By addressing sceptical viewpoints, researchers can strengthen the robustness of scientific knowledge and enhance the credibility of their findings. It helps identify areas of uncertainty or disagreement, driving further research and refinement of climate science.

Public perception and policy-making:

Climate change scepticism can have significant implications for public perception and policy-making. Understanding the roots, drivers, and spread of scepticism is crucial for developing effective communication strategies to counter misinformation and promote accurate information about climate change. It also helps policymakers to better understand the challenges and resistance they may encounter when implementing climate policies.

Socio-political dynamics:

Climate change scepticism is often influenced by socio-political factors, including ideology, economic interests, and cultural beliefs. Academic discourse on scepticism sheds light on the societal factors that shape climate change attitudes and how these attitudes interact with policy debates, public opinion, and societal responses to climate change. This understanding is vital for devising inclusive and effective strategies to address scepticism and build societal consensus on climate action.

Interdisciplinary perspectives:

Climate change scepticism spans multiple disciplines, including climate science, psychology, sociology, political science, and communication studies. Academic discourse on scepticism fosters interdisciplinary collaborations, allowing researchers from diverse fields to contribute their expertise and insights. This interdisciplinary approach enriches the understanding of scepticism, enhances the effectiveness of climate communication, and supports evidence-based policy-making.

To conclude:

examining climate change scepticism in academic discourse helps ***strengthen scientific knowledge***, ***informs communication strategies***, ***facilitates evidence-based policy-making***, and ***fosters interdisciplinary collaboration***.

By engaging with sceptical arguments, researchers can enhance the understanding of climate change and work towards addressing societal challenges associated with climate change denial.

Topic labels, top-9 FREX tokens	Manual labels	Topic size
T.1.1 earth, human, anthropocene, planet, planetary, animal, species, geological, health, life, biodiversity, nonhuman, nature, biological, survival	Planetary boundaries	795
T.1.2 urban, city, infrastructure, plan, cosmopolitan, transition, vision, space, imaginaries, smart, house, architecture, spatial, build, low_carbon		466
T.1.3 security, migration, discourse, conflict, discursive, international, refugee, geopolitical, policy, migrant, peace, mobility, gender, actor, displacement		821
T.1.4 crisis, capitalism, corporate, economy, capitalist, growth, economic, economic_growth, welfare, class, green, financial, oil, inequality, union		656
T.2.1 skepticism, trust, polarization, belief, global_warm, party, scientific_consensus, support, ideology, opinion, public_opinion, partisan, republican, denial, survey		772
T.2.2 energy, transport, behavior, intention, renewable_energy, household, acceptance, adoption, electricity, energy_transition, attitude, willingness, nuclear, benefit, vehicle		597
T.2.3 communication, ipcc, scientific, expert, scientist, climate_science, science, video, social_medium, science_communication, comment, user, credibility, information, expertise		835
T.3.1 religious, religion, environmental, eco, christian, environmental_issue, environment, spiritual, theology, church, faith, consciousness, social_work, god, leadership	Religion & environment	294
T.3.2 colonial, fiction, essay, history, african, book, century, literary, war, black, read, settler, indigenous, late, novel		714
T.4.1 geographical, geography, tourism, scholarship, resilience, discipline, anthropology, review, special_issue, field, scholar, knowledge, contribution, introduction, political_ecological		570
T.4.2 student, emotion, efficacy, psychological, food, consumption, self, message, personal, hope, lifestyle, cognitive, meat, fear, motivation		604
T.4.3 change, transformation, adaptation, temporal, dynamic, societal, system, social_science, point, past, pathway, social_ecological, archeology, uncertainty, environmental_change		697
T.5.1 news, newspaper, coverage, medium, journalist, frame, medium_coverage, content_analysis, news_medium, press, outlet, linguistic, metaphor, language, source		591
T.6.1 climate_justice, movement, activist, protest, justice, social_movement, youth, injustice, climate_action, environmental_justice, young_people, resistance, law, right, organization		560
T.6.2 carbon, trade, emission, forest, market, industry, carbon_dioxide, carbon_market, greenhouse_gas, coal, storage, fossil_fuel, forestry, offset, sector		463
T.6.3 water, island, agricultural, pacific, rural, land, farm, region, farmer, arctic, sea, livelihood, ocean, marine, soil		756
T.7.1 risk, flood, disaster, weather, hazard, extreme, heat, risk_perception, perception, wildfire, event, hurricane, vulnerability, temperature, climate_change_risk		612
T.7.2 art, learn, creative, education, child, story, image, narrative, visual, game, artist, documentary, film, pedagogy, reef		516
T.8.1 problem, ethical, solution, engineer, business, moral, principle, covid, geoengineering, pandemic, sustainability_development, challenge, normative, sustainability, proposal		719
T.8.2 citizen, democracy, citizenship, democratic, deliberation, deliberative, governance, public, civic, participant, initiative, member, institution, engagement, politician		243

Americas	United States	5,694
	Canada	1,051
	Brazil	205
	Chile	99
	Colombia	68
	Mexico	50
	Argentina	23
	Peru	20
	Ecuador	16
	Cuba	8
	Jamaica	8
	Trinidad and Tobago	8
	Antigua and Barbuda	6
	Bahamas	4
	Bolivia	3
	USA	3
	Barbados	2
	Costa Rica	2
	Dominican Republic	2
	Grenada	2
	Panama	2
	Uruguay	2
	Bahamas Red Cross	1
	Dominica	1
	El Salvador	1
	Haiti	1
	Martinique	1
	Puerto Rico	1
	Suriname	1
	Venezuela	1

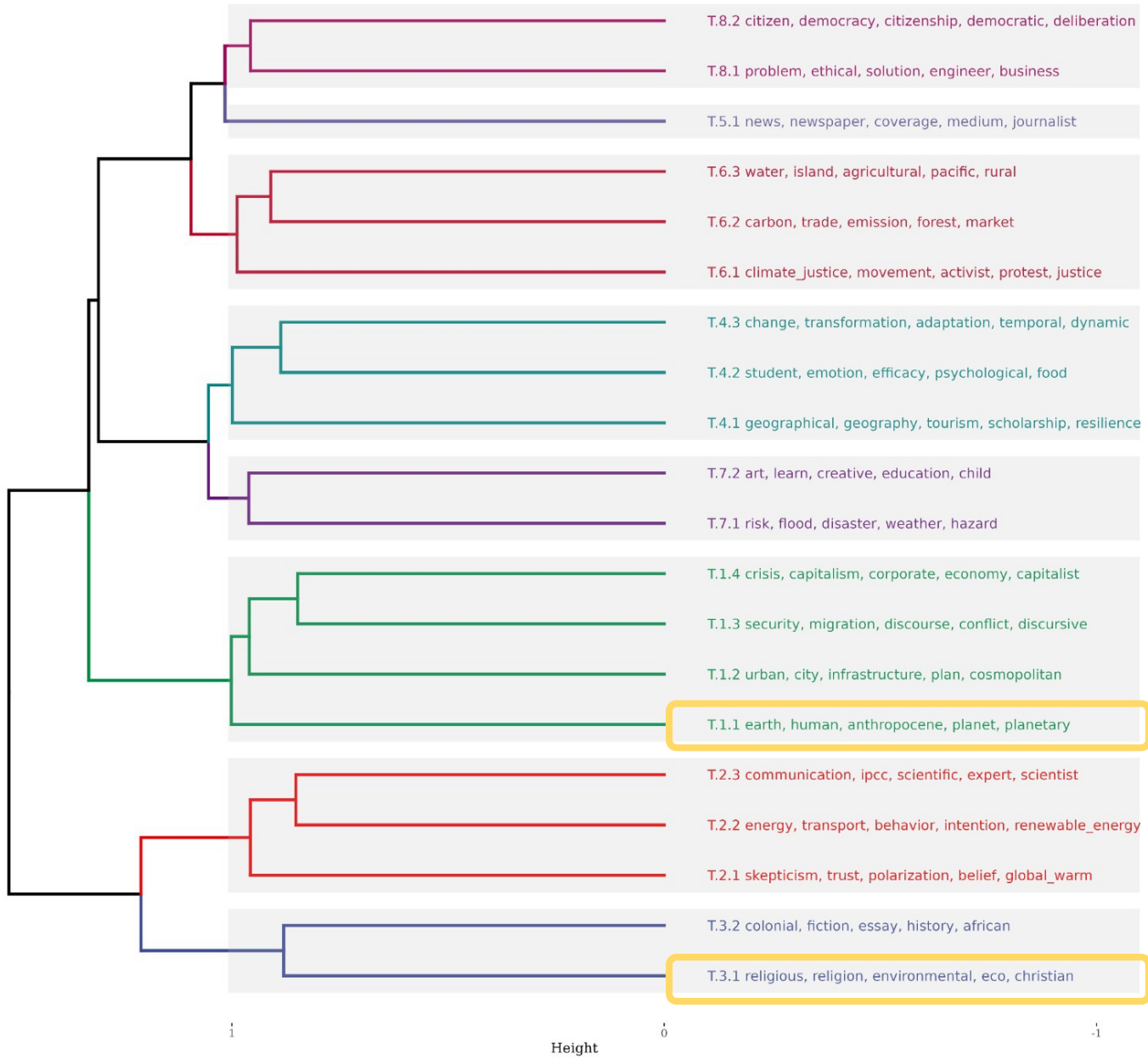
Europe	United Kingdom	3,178
	Germany	998
	Sweden	674
	Netherlands	587
	Norway	445
	Spain	375
	France	310
	Italy	305
	Finland	270
	Switzerland	270
	Denmark	240
	Austria	220
	Belgium	160
	Ireland	142
	Portugal	142
	Hungary	76
	Greece	75
	Russia	70
	Poland	67
	Czechia	51
	Romania	47
	Croatia	26
	Lithuania	26
	Slovenia	18
	Slovakia	17
	Iceland	13
	Serbia	11
	Estonia	9
	Luxembourg	7
	Bulgaria	5
	North Macedonia	4
	Belarus	3
	Latvia	3
	Malta	3
	Albania	1
	Bosnia and Herzegovina	1

Asia	China	346
	India	183
	Japan	163
	Malaysia	146
	South Korea	143
	Taiwan	134
	Turkey	108
	Singapore	88
	Indonesia	81
	Iran	66
	Hong Kong	63
	Thailand	53
	Pakistan	52
	Israel	49
	Vietnam	47
	Bangladesh	29
	Nepal	21
	Philippines	17
	Cyprus	12
	United Arab Emirates	11
	Jordan	6
	Saudi Arabia	6
	Kuwait	5
	Oman	5
	Cambodia	4
	Georgia	4
	Iraq	4
	Lebanon	3
	Myanmar	3
	Sri Lanka	3
	Mongolia	2
	Qatar	2

Africa	South Africa	269
	Nigeria	40
	Kenya	38
	Ghana	29
	Tanzania	22
	Zimbabwe	13
	Egypt	9
	Ethiopia	9
	Uganda	6
	Botswana	5
	Morocco	5
	Mozambique	4
	Namibia	4
	Malawi	3
	Mali	3
	Mauritius	3
	Tunisia	3
	Benin	2
	Cameroon	2
	Rwanda	2
	Algeria	1
	Lesotho	1
	Madagascar	1
	Senegal	1
	Sudan	1
	Zambia	1

Oceania	Australia	1,946
	New Zealand	336
	Fiji	16
	French Polynesia	2
	Solomon Islands	2
	Cook Islands	1
	Marshall Islands	1
	New Caledonia	1
	Vanuatu	1

Hierarchical clustering of topics

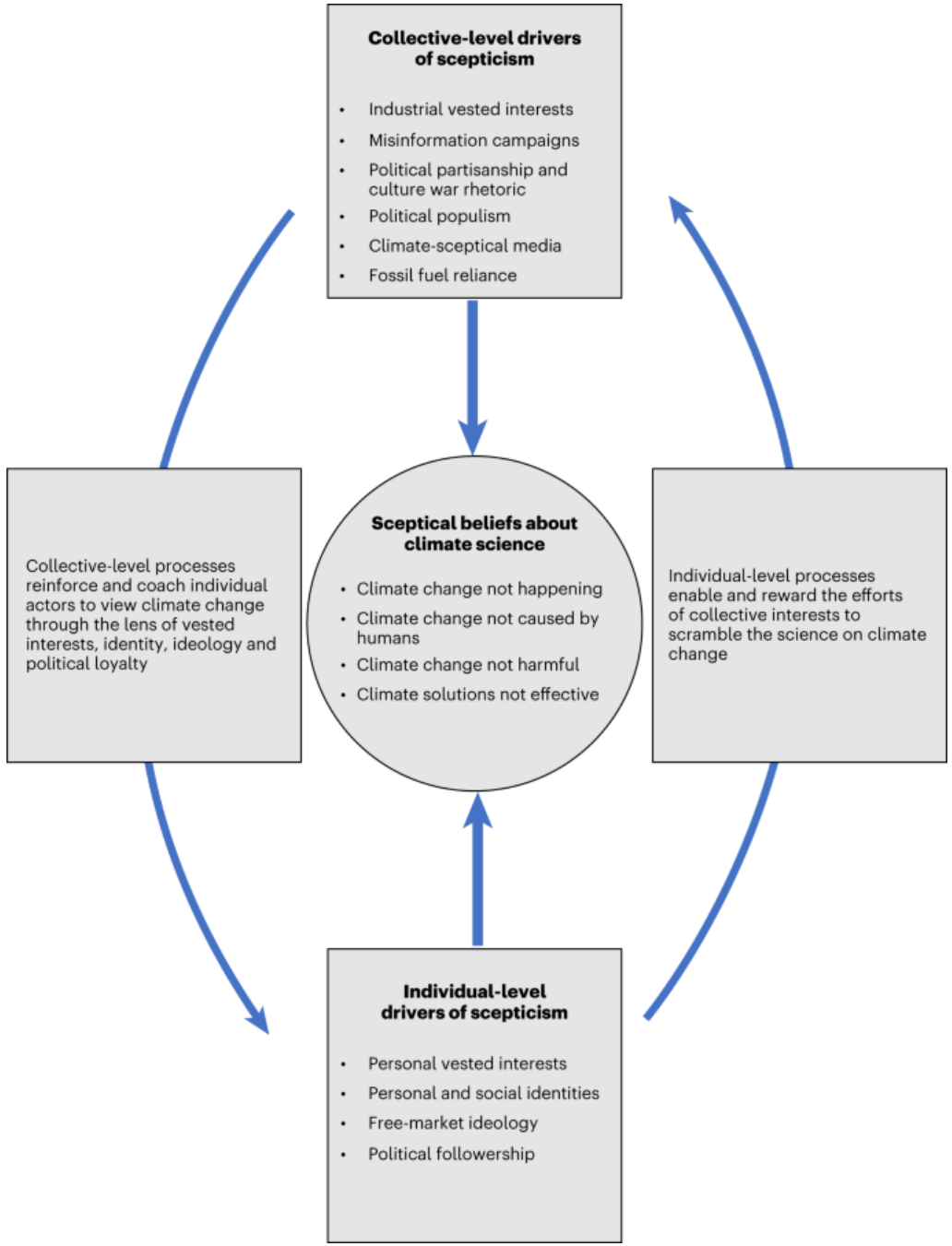


Topics	Gamma coeff	Title	Authors	Year
T.1.1 earth, human, anthropocene, planet, planetary, animal, species, geological, health, life, biodiversity, nonhuman, nature, biological, survival	0.82	TOWARDS A FIFTH ONTOLOGY FOR THE ANTHROPOCENE	Hamilton C.	2,020
	0.82	Contact with Nature as Essential to the Human Experience Reflections on Pandemic Confinement	Kazdin A.E.; Vidal González P.	2,021
	0.79	Intergenerational occupational justice: Ethically reflecting on climate crisis	Drolet M.-J.; Désormeaux-Moreau M.; Soubeyran M.; Thiébaut S.	2,020
	0.78	Geologic life: Prehistory, climate, futures in the Anthropocene	Yusoff K.	2,013
	0.78	Human occupations as determinants of population health: Linking perspectives on people, places and planet	Capon A.G.	2,014
	0.74	Spatiotemporality in the Anthropocene: Deleuzoguattarian philosophy, quantum physics, and the German Netflix series dark	Fraunhofer H.	2,021
	0.73	Uncanny Ecologies: More-than-Natural, More-than-Human, More-than-Secular	Fernando M.	2,022
	0.72	Animism in the Anthropocene	Conty A.	2,022
	0.70	Rethinking Species-Being in the Anthropocene	Roelvink G.	2,013
	0.69	The anthropocene (and) (in) the humanities: Possibilities for literary studies	Savi M.P.	2,017
	0.69	Perspectives 'at home on the earth': Toward a theology of human non-exceptionalism	Dean D.	2,020
	0.69	Earth Power in the New Geopolitics	Mações B.	2,022
	0.68	CLIMATE CHANGE IN CONTEXT: STRESS, SHOCK, AND THE CRUCIBLE OF LIVINGKIND	van Pelt J.C.	2,018
	0.68	Biodiversity arks in the Anthropocene	Meng H.; Gao X.; Song Y.; Cao G.; Li J.	2,021
	0.66	Shrunken Life: Discourses of the Cryptic and the Miniature in Madagascar	Sodikoff G.M.	2,021

T.3.1 religious, religion, environmental, eco, christian, environmental_issue, environment, spiritual, theology, church, faith, consciousness, social_work, god, leadership	0.78	Surveying Environmental Perspectives among Faculty at an Institution of Christian Higher Education	Anthony B.M.; Billock W.L.; Bishop G.M.; Anthony M.J.; Bishop C.A.	2,020
	0.77	The Burden of Guilt and the Imperative of Reform: Pope Francis and Patriarch Bartholomew Take Up the Challenge of Re-Spiritualizing Christianity in the Anthropocene Age	Mongrain K.	2,017
	0.76	The religion-environment (climate change) connection: Evidence from Nigeria	Nche G.C.	2,020
	0.75	From Stewardship to Creation Spirituality: The Evolving Ecological Ethos of Catholic Doctrine	Szrot L.	2,020
	0.72	Catholic clerical responses to climate change and Pope Francis's Laudato Si'	Wilkins D.	2,022
	0.67	Reading Laudato Si' in the Verapaz: A Case of Localizing Catholic Teachings	Hoenes Del Pinal E.	2,019
	0.65	Anxiety and the ecological crisis: An analysis of eco-anxiety and climate anxiety	Pihkala P.	2,020
	0.64	Sociological ambivalence and climate change	Carolan M.	2,010
	0.61	Environmental Stewardship: Confluence of Law and Religion? F VENTER	Venter F.	2,022
	0.61	Reflections, analysis, and significance for human ecology of pope Francis's encyclical letter laudato si': On care for our common home	van Tine R.	2,017
	0.60	Gumboot religion: Religious responses to an Australian natural disaster	Ghiloni A.J.; Shaw S.	2,013
	0.60	SYMPOSIUM: The POPE'S ENCYCLICAL and CLIMATE CHANGE POLICYLAUDATO SI',POPE FRANCIS' CALL to ECOLOGICAL CONVERSION: Responding to the cry of the earth and the poor-towards an integral ecology	Porras I.M.	2,015
	0.59	Religion and Environment	Öhlmann P.; Swart I.	2,022
	0.59	Three religious-cultural worldviews in noah (2014)-hedonism, fundamentalism, and ecofeminism	Shapiro M.R.-M.; Moore L.	2,020
	0.58	Exploring the Muslim Canadian Environmental Philanthropy Narrative	Hossain M.	2,022

Topics	Author's Name	Country	N-Articles	N-Citations
T.1.1 earth, human, anthropocene, planet, planetary	Yusoff K.	United Kingdom	6	604
	Rockström J.	Sweden	2	602
	Bird J.	Sri Lanka	1	543
	Daily G.	United States	1	543
	DeClerck F.	France	1	543
	Gordon L.	Sweden	1	543
	Hatibu N.	Uganda	1	543
	Matthews N.	Sri Lanka	1	543
	Noble A.	Jordan	1	543
	Shah M.	India	1	543
	Sibanda L.	South Africa	1	543
	Smith J.	Kenya	1	543
	Steduto P.	Italy	1	543
	Unver O.	Italy	1	543
	Wetterstrand H.	Sweden	1	543
	Williams J.	Australia	1	543
	de Fraiture C.	Netherlands	1	543
	Dalby S.	Canada	7	479
	Dumyahn S.L.	United States	1	404
	Farina A.	Italy	1	404
	Gage S.H.	United States	1	404
	Krause B.L.	United States	1	404
	Pijanowski B.C.	United States	1	404
	Clark N.	United Kingdom	6	283
	Gibson C.	Australia	2	183

T.3.1 religious, religion, environmental, eco, christian	Barling J.	Canada	1	485
	Robertson J.L.	Canada	1	485
	Beck U.	Germany	1	284
	Corner A.	United Kingdom	1	241
	Markowitz E.	United States	1	241
	Pidgeon N.	United Kingdom	1	241
	Pihkala P.	Finland	3	167
	Piguet E.	Switzerland	1	141
	Coates J.	Canada	3	139
	Gray M.	Australia	3	139
	Tourish D.	United Kingdom	1	122
	Allice I.	Canada	1	117
	Bell T.	Canada	1	117
	Wolf J.	Canada	1	117
	Petersen A.C.	Netherlands	1	106
	Wardekker J.A.	Netherlands	1	106
	van der Sluijs J.P.	Netherlands	1	106
	McKinnon J.	Australia	1	103
	Hope A.L.B.	United Kingdom	1	96
	Jones C.R.	United Kingdom	1	96
	Barr S.	United Kingdom	1	94
	Gilg A.	United Kingdom	1	94
	Shaw G.	United Kingdom	1	94
	Connidis I.A.	Canada	1	93
	Jameton A.	United States	1	90



Hornsey, M.J., Lewandowsky, S. A toolkit for understanding and addressing climate scepticism. *Nat Hum Behav* **6**, 1454–1464 (2022). https://doi.org/10.1038/s41562-022-01463-y

Mariusz Baranowski, Ph.D.

Adam Mickiewicz University, Poznan

Faculty of Sociology

Email: mariusz.baranowski@amu.edu.pl