19. Tackling the Climate Crisis: Interdisciplinary Perspectives on Climate Change Education and Communication

Moritz Gubler, Mike Schäfer, Viktoria Cologna, Matthias Probst, Andreas Linsbauer

Swiss Association for Geographic Education (VGĐch)

TALKS:

19.1 Bättig-Frey P., Jäger M.U.: Using impact orientation for effective climate communication

19.2 Breitenmoser P., Keller-Schneider M.: Why prospective elementary school teachers (don’t) intend to teach Climate Change?

19.3 Chatterjee S., Suess S., Sobecka K., Allen J., Brönnimann S.: Visualizing climate science: the poster between science and politics

19.4 Colberg C.: Climate Scenarios for Switzerland CH2018 as a starting point for knowledge-based learning experiences in teacher training


19.7 Gubler M., Brügger A., Probst M., Eyer M.: About the effectiveness of localized climate change education: Insights from an intervention study

19.8 Mahl D., Hase V., Schäfer M.S., Keller T.: A “societal turn” in climate change coverage? How the media portray climate change as a threat affecting all parts of society

19.9 Perga M.-E., Reynard E., Swaton S., Clivaz C., Schaefti B.: MOUNTAINCRAFT: Gaming the future of mountain environments to foster climate adaptation initiatives

19.10 Van Eck C.W., Mulder B.C., Van der Linden S.: Climate Change Risk Perceptions in the Climate Change Blogosphere

POSTER:

19.1
Using impact orientation for effective climate communication

Petra Bättig-Frey, Monica Ursina Jäger
Forschungsgruppe Nachhaltigkeitskommunikation und Umweltbildung, ZHAW Life Sciences und Facility Management, Grüental, CH-8820 Wädenswil (petra.baettig@zhaw.ch)

Communication on climate change usually goes beyond the mere transfer of factual knowledge: sustainable climate communication motivates the audience to reflect their own lifestyle and to adapt it to make more climate-friendly choices in everyday life. The research group Sustainability Communication and Environmental Education presents a selection of four vivid project examples, which communicate knowledge more effectively, efficiently, and sustainably. Each presented project illustrates an innovative communication strategy to foster an engaged, informed, and long-lasting relationship to climate-related topics such as nutrition, CO₂-footprint, landscape, and soil.

The starting point of each project is a precise impact orientation, defining the key messages and recommendations for action. Based on the impact orientation, an analysis of the relevant target groups is conducted, before defining the means for communication. This method results in specific approaches for targeting different groups. The first example uses a scientainment approach. The 'Zombie Mission', a digital outdoor game, attempts to communicate facts about sustainable nutrition to a young adult target group that is not environmentally aware. The second example is an interactive exhibition which provides personalized tips for reducing the individual footprint based on a lifestyle analysis. The third project uses targeted storytelling and immersion to achieve long-term and reproducible storage of knowledge (Dahlstrom 2014) The educational panorama trail “Zwischenhalt Zukunft”, is a multi-media interpretive environment (Paraizo 2011) where scientific visions of the future are brought to life with images overlaying the existing landscape and with audio installations. The last example is the narrative environment “Erdreich” (Bättig-Frey et al 2018). It operates with the same methodology as “Zwischenhalt Zukunft” but focuses on soil. By using this more tangible subject, information on climate change can be communicated without overwhelming – and putting off - visitors with the complexity of the politically charged debate around climate change.

All these projects are developed in an interdisciplinary team, where natural and social scientists, communication experts, artists, landscape architects and graphic designers work together during the whole project. The team creates outdoor spaces with interactive exhibits and garden elements, that invite visitors to immerse themselves in a landscape of visual impressions, sounds and stories. Instead of a purely factual information transfer, these “narrative environments” tell a story that convey scientific content in a playful, affective way. Facts and complex correlations become meaningful and tangible, and visitors create their individual relationship with the topics. Attractive settings and immersive experiences create positive emotions that make visitors more receptive (Friedman 2013). They absorb information and are more motivated to think about changes in their own lives. Using these tools thus can help improve the transfer of knowledge from scientists to the public, resulting in a more meaningful debate and ultimately help to establish new sustainable habits, leading to a more resilient society.

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19.2
Why prospective elementary school teachers (don’t) intend to teach Climate Change?

Petra Breitenmoser¹ & Manuela Keller-Schneider¹

¹ Abteilung Primarstufe, Zurich University of Teacher Education (PHZH), Lagerstrasse 2, CH-8090 Zürich (petra.breitenmoser@phzh.ch)

Climate change is a defining issue of our time. To achieve the global sustainability goals, a space-related responsible decision-making expertise is fundamental which is based on understanding environmental, economic, and social networks in space and time. It is thus the responsibility of schools to help pupils building up knowledge and basic expertise on climate change (Lüschen 2015). Pizmony-Levy & Pallas (2019) found in an online survey conducted in the year 2017 with 3117 adults, that 77% of the participants believe it is important for primary and secondary school students to learn about climate change. However, climate change education at primary schools in Switzerland is largely omitted even though pupils and student teachers likewise are interested in this topic (Adamina et al. 2018).

It is the aim of this pilot study, to investigate on the expertise and intentions of prospective primary school teachers to implement climate change at primary school level. It is of interest to find out which requirements subjectively perceived as challenges by the students require an intensive consideration during the training and to what extent context factors are important. To do so, different aspects of pedagogical-/ content knowledge on climate change, system competence, and other individual resources such as beliefs are examined. This study evaluates these aspects, explores how they change during an intervention and analyses how they influence the intention of the student teachers to teach climate change. To reach this goal, a mixed-methods approach is used drawing on a pre-/post-intervention questionnaire (N=20) and interviews with student teachers (N=9) after completing an online-based intervention on climate change and system thinking in spring 2020. First results will be presented at the meeting.

REFERENCES
19.3

Visualizing climate science: the poster between science and politics

Sria Chatterjee¹, Karolina Sobecka¹, Jamie Allen¹, Solveig Suess¹ & Stefan Brönnimann²

¹ Institute of Experimental Design and Media Cultures / Critical Media Lab, Basel Academy of Art and Design, FHNW, Freilager-Platz 1, Basel (Jamie.Allen@fhnw.ch)
² Institute of Geography, Climatology, University of Bern, Hallerstrasse 12, CH-3012 Bern (stefan.broennimann@giub.unibe.ch)

The geosciences play a role outside of the natural, research sciences as agents responding to geopolitical crises like climate change and corporate and military interests that seek strategic advantage in planetary repair and control. The notion of the neutrality of science has increasingly eroded with researchers more frequently becoming embroiled in public deliberation and policy. Geoscientists are being asked to project the future of physical earth systems as well as evaluate the performance of policies (Beck and Mahony 2018) contributing to solutions and providing metrics for “climate services” (Daly and Dilling 2019). How the story of the earth, its climate and ecology, are told, is developed in specific ways, evoking different kinds of value and purpose for different communities.

Climate denial think tanks exploit the authority of science by intentionally using the languages and forms of scientific communication to sow confusion by presenting contradictory conclusions and arguing against climate action (Oreskes & Conway 2011). Pointing to colonial and extractive histories of geology and climate science, there are communities who urge scientific communities to acknowledge and counter the apolitical stance of neutrality. Scientists are more explicitly engaging on the representational, ethical and political dimensions of their science, pulling into question the dominant ideology of scientific neutrality which still structures much of its institutions’ protocols.

Research into the ways that discourse can change behaviour is central to the dilemma of the commons, and how the mobilization of nomenclature and information are best transferred to actionable knowledge (Nerlich 2010). In addition to language, the visualization of data, the distribution of images and iconography, and the rendering of time-based media (audio and video) all impact the ways in which we treat ecosystems and imagine their modulation and adjustment. There are even those who pronounce a “spectacle of nature” that has been created through the circulation of overabundant images of destroyed and protected ecologies (Igoe 2010).

Climatology & Climatography of Care, a project by University of Bern’s mLab + Critical Media Lab is interested in histories and futures of climatology and climatography, not only as scientific trajectories and disciplines, but as means of producing and practicing knowledge that are always and increasingly entrenched in economic, political and necessarily public debates. An objective of this project is a critical rethinking of data visualization and communication through the creation of a public poster campaign that references and questions the visual forms that both scientific and political posters take. The overall aim is to further investigate the future of climate change communication.

For the Swiss 18th Geosciences Meeting (2020), we will present a critical history and contemporary analysis of geosciences relevant communications, outlining how such visualization explicitly renders information as both scientific, public and therefore political. Showing examples of histories, stories and impacts of how both scientific and public campaign aesthetics are mobilized in contexts of scientific publication, conferences, public events and debate, we aim to articulate discussion as to the ways in which communications can of this kind can help to make explicit the goals and intentions of the geosciences vis a vis urgent topics like anthropogenic climate change, environmental racism, ecological justice, extractive industries. As an interdisciplinary group we hope to encourage discussion, questions, inconsistencies and unquestioned assumptions at the intersections of exchange within interdisciplinary communities, and with publics.

REFERENCES
19.4
Climate Scenarios for Switzerland CH2018 as a starting point for knowledge-based learning experiences in teacher training

Christina Colberg

Pädagogische Hochschule Thurgau (PHTG), Unterer Schulweg 3, CH-8280 Kreuzlingen 2. (christina.colberg@phtg.ch)

UND

Deparment für Umweltystemwissenschaften, Didaktikzertifikat Umweltlehrer, Universitätsstrasse 16, CH-8006 Zürich.

The idea of this symposium illustrates that interdisciplinary perspectives and approaches for Climate Change Education and Communication are needed to tackle the Climate Crisis. Scientists from the fields of climate change, education and communication as well as teachers need to communicate and cooperate.

The young generation organises itself independently of educational opportunities and makes its voice heard through the worldwide “Fridays for Future” movement. This can and should be explicitly taken up as an educational opportunity in the sense of participation.

Therefore student teachers and in service teachers need to be enabled to implement climate change issues effectively in their classrooms.

As a starting point the Climate Scenarios for Switzerland (NCCS, 2018) are used in different settings at the Teacher Training University of Thurgau (PHTG) as well as at the Swiss Federal Institute of Technology (ETH) in order to address three different target groups. The scenarios address scientific understanding of Climate Change and expected consequences for Switzerland on the basis of the four stories dry summers, heavy precipitation, more hot day and snow-scarce winters (NCCS, 2018). The scientific facts are well communicated, attractively presented and therefore aimed at a broad audience.

Three examples of its educational implementation are described below:

(1) Pedagogical content knowledge (PCK) course Weather Observation and Climate Change (2 ECTS) as a compulsory elective at PHTG for future primary school teachers:
As a warm up the students read the Climate Scenarios for Switzerland (NCCS, 2018) before the course starts. Additionally they focus on one of the four characters/stories and do a content based in-depth preparation. During the course different climate change education aspects like PCK findings and the serious implementation of Education for Sustainable Development (ESD) (e.g. CCESO, 2020) are being discussed. As an action orientated element a two day excursion to the Morteratsch Glacier in Engiadina in the Canton of Grisons is conducted as well. As an outcome a comprehensive study unit for primary school students on the basis of the Climate Scenarios for Switzerland (NCCS, 2018) and taking into account general planning aspects (Colberg, 2019) is designed by the student group and published on an internal platform at PHTG.

(2) International project Teaching and Learning for a Globalized and Sustainable World for teacher students (13 ECTS), teachers and primary school students under the lead of PHTG for primary level.
The PHTG and the University of Hawaii (UHM) offer a joint specialization elective for teacher candidates in the field of ESD. This enables an ongoing intercultural dialogue and a multi-perspective approach to teaching and learning. Mutual study visits are a central element of the project. Due to the actual global pandemic virtual exchanges have developed as the most important tool. Local phenomena which have the same cause (climate change) but different effects are studied, exchanged and compared. The idea is to explore the two phenomena glaciers and coral reefs which are typical for the two regions and ecologically extremely important, to introduce them to each other, to compare and consider the implications for future teaching. The Climate Scenarios for Switzerland (NCCS, 2018) are the essential case study on the Swiss side. With a common (real or virtual) excursion to the alps the melting of the Swiss Glaciers is observed closely and compared to the bleeching of corals in Hawaii. Therefore the students first learn facts about climate change and sustainable development. Afterwards they should be enabled to teach the topic in the context of ESD. As an overall result enduring effects are observed for stakeholders of different levels of both education system, namely teacher trainers, teacher candidates, in-service teachers and school students. Their action competence is increased and thus the main goal of ESD achieved.

(3) Implementation of a scientific case study (Climate and Weather Risks) with a pedagogical focus in a Mentored Assignment (2 ECTS) as a compulsory elective at ETH Zurich within didactical certificate course for environmental scientists:
As a prerequisite the teacher students read the Climate Scenarios for Switzerland (NCCS, 2018). On the basis of an existing curricula a teaching sequence is developed and integrated into a semester plan either for a vocational training school (Berufsfachschule or Höhere Fachschule) or a higher education institution (e.g. Fachhochschule). As an outcome a
A comprehensive study unit in the field of adult education on the basis of the Climate Scenarios for Switzerland (NCCS, 2018) is designed by the student group. This is published on an internal platform at ETH Zurich.

The Climate Scenarios for Switzerland (NCCS, 2018) are the main scientific content of all three examples and show the fruitful cooperation of scientists from the fields of climate change, education and communication. In this context accompanying research projects which examine the options of teaching in general (qualitative) up to the point of effectiveness (quantitative) are reconsidered and planned to be developed. This will be discussed in detail during the symposium.

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19.5
Techno-optimism as a moral hazard and its implications for climate-friendly behaviour

Authors in alphabetical order: Viktoria Cologna*, Anna Lisa Kreissel*, Michael Siegrist*

1 Institute for Environmental Decisions, ETH Zürich, Switzerland

Narratives of “green technologies” as panaceas for mitigating global climate change are dominant in the media. Such narratives can advance and consolidate sociotechnical imaginaries and potentially create moral hazards, whereby increased optimism about green technologies reduces the perceived obligation to act climate-friendly. The impact of optimistic sociotechnical imaginaries on personal mitigation efforts has only recently begun to be studied and findings remain controversial. In this study, we develop a novel scale to measure attitudes towards technologies and analyse the effect of techno-optimism on both private and public climate-friendly behaviours. We further investigate the determinants of techno-optimism. With a survey of N = 552 Swiss respondents, we find that more techno-optimistic individuals engage in significantly fewer private climate-friendly behaviours, while we find no effect for public climate-friendly behaviours. Techno-optimism is significantly predicted by being male, less religious, less worried about climate change and by trusting stakeholders to effectively manage technologies. We thus confirm previous results that techno-optimism poses a moral hazard. Our findings indicate that optimistic narratives about green technologies can potentially have negative effects on the uptake of climate-friendly behaviours.
19.6
Youth and Behavioural Spillover: Fundamentals, Competencies and Learning Programme for Lowering the Personal Carbon Footprint

Lukas Fritz1, Michael Brenner-Fliesser2, Annemarie Schneeberger1 & Sebastian Seebauer2

1 Department of Geography, University of Innsbruck, Innrain 52f, A-6020 Innsbruck (lukas.fritz@uibk.ac.at)
2 Joanneum Research, Institute for Climate, Energy & Society, Waagner-Biro-Straße 100, A-8020 Graz

Despite the fact that worldwide greenhouse gas emissions increased more than fifteen-fold in the last century (Ritchie & Roser 2017), the global assessment report on biodiversity and ecosystem services stated that nature still “can be conserved, restored and used sustainably [...] through urgent and concentrated efforts fostering transformative change” (IPBES 2019). Therefore, academia and political decision makers should firmly go from observing and setting targets to initiating individual and collective climate action. But pro-environmental behaviours are not independent but interact, influence, trade off against and give rise to each other, which is called spillover.

Positive or negative spillover effects can occur within and between different consumption domains (Nilsson et al. 2017). Thus, consumers and learners need to acquire the awareness and skill sets to put cross-domain considerations into everyday practice in order to allow today’s society to still meet the 1.5°C (or 2°C) target. Accordingly, in SPILOVER, an interdisciplinary research project funded by the Austrian Climate Research Programme 2019-2021, the main research questions are:

- What are scientifically acceptable conceptions of spillover effects, and of climate-friendly behaviours, which may significantly lower the individual carbon footprint?
- How has a learning programme to be designed in order to increase climate-relevant competencies among students?

By applying a learning programme which consists of three self-chosen, problem- and/or inquiry-based (Pascal & Stanszus 2019) learning modules, students are enabled to develop key competencies for realising climate-friendly behaviour. The learning modules target consumption choices in settings under the students’ decision and control, e.g. concerning sustainable fashion or mobility. It is assumed that positive spillover may stem from acquiring factual knowledge, practical skills and self-efficacy beliefs during engaging in a particular consumption activity, and then transferring these insights to other activities (Crompton & Thogersen 2009).

Given the fact that self-efficacy is a key component for pro-environmental engagement among young people (Corner et al. 2015), a critical constructivist learning setting is applied, which provides an autonomous learning environment (Ahmad et al. 2015). Furthermore, participation encourages young people to develop action-related knowledge about concrete options in climate protection and to reflect upon these options (Mochizuki & Bryan 2015). The urgent call for youth participation is underlined by the creation and implementation of so-called real-world projects which facilitate not only the vital significant behavioural change but also the development and integration of knowledge, ideas and perspectives (Rieckmann & Stoltenberg 2011).

At the conference, the learning programme will be presented in detail, and experiences and difficulties encountered will be discussed.

REFERENCES
19.7
About the effectiveness of localized climate change education: Insights from an intervention study

Moritz Gubler¹,²,³ Adrian Brügger⁴, Matthias Probst²,³,⁵ & Marc Eyer⁵

¹ Institut für Forschung, Entwicklung und Evaluation, Pädagogische Hochschule Bern, Fabrikstrasse 8, CH-3012 Bern
² Oeschger-Zentrum für Klimaforschung, Universität Bern, Hochschulstrasse 4, CH-3012 Bern
³ Geographisches Institut, Universität Bern, Hallerstrasse 12, CH-3012 Bern
⁴ Institut für Marketing und Unternehmensführung, Universität Bern, Engehaldestrasse 4, CH-3012 Bern
⁵ Institut Sekundarstufe II, Pädagogische Hochschule Bern, Fabrikstrasse 8, CH-3012 Bern

Education about local, present, and perceptible impacts of anthropogenic climate change is often promoted as an effective strategy to increase students' willingness to act against global change (e.g. Monroe et al. 2017). Although the hereby intended reduction of perceived psychological distance to climate change and its effect on risk perceptions, concerns, and behavioural intentions have been intensively studied in social and environmental psychology (McDonald et al. 2015; Brügger 2020), the hypothesis of a closer perception of climate change risks leading to increased levels of concerns and even stronger willingness to do something about it lacks of empirical evidence from educational contexts.

Here, we report the findings of a recent educational intervention (pre-post-post-design) that evaluated the short- and long-term effects of proximising climate change on personal risk perceptions, worry about climate change, and intentions to act in a climate-friendly manner. We tested the hypothesis of localized education about climate change leading to increased levels of worry and motivation for climate action by using a sample of 630 high-school students aged between 14 – 18 years and originating from the city and surroundings of Bern, Switzerland. The two experimental groups were either taught about climate change impacts on (urban) heat stress and human health within the city of Bern in record summer 2018, or within the city of Singapore by the end of the century. In order to get a more differentiated picture of the study’s outcome, the currently on-going analysis of the data aims at revealing potential interaction effects of the intervention with socio-demographic variables, pre-knowledge about climate change, and value orientations.

REFERENCES
19.8
A “societal turn” in climate change coverage?

How the media portray climate change as a threat affecting all parts of society

Daniela Mahl¹, Valerie Hase², Mike S. Schäfer² & Tobias Keller³

¹ Institute for Journalism and Communication Studies, University of Hamburg, Allende-Platz 1, D-20146 Hamburg (daniela.mahl@uni-hamburg.de)
² Department of Communication and Media Research, University of Zurich, Andreasstrasse 15, CH-8050 Zurich
³ Digital Media Research Centre, Queensland University of Technology, 2 George St, AUS-4000 Brisbane City QLD

Climate change is considered a global crisis affecting people across the world. Underlining the issue’s imminence, studies indicate that the media discuss climate change not only in terms of scientific knowledge (e.g., Boykoff 2008; Kirilenko & Stepchenkova 2014), but that there might be what this study introduces as the concept of a “societal turn” in media coverage on climate change. This “societal turn” implies a shift characterized by (a) increased media attention towards climate change and (b) an increased focus on societal topics in coverage (e.g., problem awareness, climate politics, economic impacts, impacts on humans). However, content analyses of climate change coverage often neglect countries most affected by climate change, for example in Africa or Asia, and temporal patterns (Schäfer & Schlichting 2014). To analyze a potential “societal turn” in media coverage, we conducted a longitudinal, cross-national content analysis guided by two main research questions:

RQ1: How prevalent is climate change coverage compared to other news issues?
RQ2: Which topics contribute to a “societal turn” in media coverage on climate change?

Method.
The study analyzes coverage from 20 news outlets in ten countries (Australia, Canada, Germany, India, Namibia, New Zealand, South Africa, Thailand, UK, United States) over 13 years (2006-2018). Our manually validated sample of climate change coverage (F1 = .91) consists of N = 71,674 articles. We use a combination of manual and automated content analysis, primarily structural topic modeling estimating K = 85 topics. We use time as an independent variable and vulnerability to climate change according to the Climate Risk Index (Eckstein et al., 2020) as a control variable to estimate the prevalence of topics in coverage.

Results.
The analysis indicates that issue attention towards climate change varies strongly by national context: While focusing events such as the United Nations Climate Change Conferences (COPs) explain cross-national peaks in coverage, both the baseline of issue prevalence as well as changes over time differ by country. While issue attention rose in some countries (e.g., the UK), it decreased in others (e.g., Australia). According to RQ1, we thus replicate findings from previous studies arguing that issue attention is bound to focusing events, but also national contexts (Schmidt et al. 2013). Turning towards the content of coverage, the study finds seven overarching themes, including frequently analyzed themes in the news, such as “Climate Science” and “Climate Change & Environmental Impacts”. However, news also discusses the societal impacts of and responses to climate change based on the themes “Awareness & Education”, “Causes of and Solutions to Climate Change”, “Climate Politics”, “Economic Impact & Energy Industry” and “Impacts of Climate Change on Humans”. Themes for example illuminate shared societal consciousness about climate change and report on events where one may get further educated (“Awareness & Education”). News also sheds light on human-made causes for and solutions to climate change, for example in eating habits or efficient energy use (“Causes of and Solutions to Climate Change”). As a more threatening example, coverage underlines how climate change affects humankind, for example through diseases or water scarcity (“Impacts of Climate Change on Humans”). Societal themes did not increase over time. However, we find strong differences in themes’ prevalence between countries (see Figure 1). According to RQ2, the study indicates support for a “societal turn” in climate change coverage. However, the prevalence of this societal perspective is less a product of temporal patterns but more a consequence of national contexts.
Figure 1. Changes in themes’ prevalence between countries.

REFERENCES
19.9

MOUNTAINCRAFT: Gaming the future of mountain environments to foster climate adaptation initiatives

Marie-Elodie Perga¹, Emmanuel Reynard¹, Sophie Swaton¹, Christophe Clivaz¹ & Bettina Schaefli²

¹ Faculté des Géosciences et Environnement, Université de Lausanne, Quartier Mouline, CH-1015 Lausanne (marie-elodie.perga@unil.ch)
² Universität Bern, Geographisches Institut, Hallerstrasse 12, CH-3012 Bern

Environmental consequences of climate change (CC) challenge the business-as-usual operations of many mountain-dependent sectors for an expected total cost over 1 billion CHF/year by 2050 for Switzerland. Undertaking actions and developing policies to minimize the adverse consequences and to make the most of the opportunities that arise from CC, i.e. adaptation, has been raised as a national concern. Yet, in Switzerland, as in most countries, implementations of adaptive strategies have been limited.

Engaging in effective adaptation poses a huge challenge for our mental models. Proactive adaptation involves decision making in a changing world with many intertwined ecological and societal stakes, with continuing uncertainties about the severity, magnitudes and manifestations of climate change. There are pressing calls to develop scientific approaches to foster the engagement of decision-makers in adaptation, and guide them within alternative policy and management options. Designing adaptation actions requires a holistic view of complex socio-ecological systems, which can be embraced through modelling. Yet, if models are at the core of adaptation science, their direct outcomes might be hardly palatable by and transferable to the stakeholders. Improvements of adaptation modelling would be of low impacts on adaptation initiative without the implementation of innovative communication means to make them available to the stakeholders' community. However, serious gaming, especially when supported by digital interfaces, is regarded as an emerging way to bring complex systems and models to a hands-on level.

MOUNTAINCRAFT’s objective is to develop serious video-game grounded in scientific models to foster adaptation initiatives for Swiss mountain territories. The project considers that:

(i) There is a wealth of data and predictive models on the different typical features of Swiss mountain environment that allows a landscape-wide social-ecological modelling, acting at time and space scales that are relevant for local management (valley scale, <30 years)

(ii) Such a social-ecological model could be used for testing how different climate and social-economic adaptation scenarios will affect both the environmental and human futures at the local scale (watershed, commune).

(iii) The digital interface of video games is a media by which those models could be exported out of academia, and handled by a larger public.

(iv) If rooted in scientific modelling, digital interfaces can allow the gamer to make an empirical but realistic experience of potential futures, while fostering empowerment.
19.10
Climate Change Risk Perceptions of Audiences in the Climate Change Blogosphere

Christel W. van Eck1, Bob C. Mulder1, Sander van der Linden2

1 Strategic Communication Group, Wageningen University & Research, Hollandseweg 1, 6700 EW, Wageningen
  (christel1.vaneck@wur.nl, bob.mulder@wur.nl)
2 Social Decision-Making Lab, Cambridge University, Free School Lange, CB2 3RQ, Cambridge
  (sander.vanderlinden@psychol.cam.ac.uk)

The Climate Change Risk Perception Model (CCRPM, Van der Linden, 2015) has been used to characterize public risk perceptions; however, little is known about the model’s explanatory power in (other) online contexts. In this study, we extend the model and investigate the risk perceptions of a unique audience: the polarized climate change blogosphere. In total, our model explained 84% of the variance in risk perceptions by integrating socio-demographic characteristics, cognitive factors, experiential processes, socio-cultural influences and an additional dimension: trust in scientists and blogs. Although trust and the scientific consensus are useful additions to the model, affect remains the most important predictor of climate change risk perceptions. Surprisingly, the relative importance of social norms and value orientations is minimal. Implications for risk and science communication are discussed.

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P 9.1
PhilTheGap: Feel the Gap to Fill the Gap – Philosophy to Trigger Climate Action

Sophie Barathieu¹, Martin Clerc², Samuel Heinzen³, Patrick Scherrer¹,4, Sophie Varone⁵, Jonathan Vouillamoz² & Naomi Vouillamoz⁴

¹ Fondation ValAct, Case postale 6577, CH-1211 Genève
² CSGE Sàrl, Rue des Voisins 8, CH-1205 Genève
³ Haute École Pédagogique Fribourg, Rue de Morat 36, CH-1700 Fribourg
⁴ Seismo Earth SA, Schwadernauweg 33, CH-2504 Biel/Bienne
⁵ Metamorphe, Rue des Pierres du Niton 7, CH-1207 Genève

Corresponding author: naomi.vouillamoz@seismo-earth.com

97% of climate scientists agree about the basics of anthropogenic climate change (Cook et al. 2016). There is a general understanding that climate change will have dramatic consequences on our environment, which are in turn expected to contribute to major social problems such as resources conflicts, migration and health issues and political instability in the 21st century. At current emission rates, the remaining carbon budget for a global warming of 1.5-2°C ranges within one or two decades from now (CarbonBrief, 2018) and fossil fuels are consumed in such quantities that replacing oil, gas and coal with nuclear (i.e. the highest-density low-carbon known energy solution) would take some 42 years by building each day a 1 GW reactor (based on BP 2019)! On the renewable side, the largest solar farm ever built in the world spreads over 57 km² in the Rajasthan desert for a capacity of about 2.2 GW.

Hence, it appears that the currently proposed energy transition by most governments as the way towards carbon neutrality simply cannot be a substitution of the current fossil fuel-based system by a renewable-based one. What is required is a paradigm shift and democracy will be at risk in the transformation process! Moreover, the necessary behavioral changes towards sustainable lifestyle are occurring far too slowly in the population. This might be explained by the abstract nature of climate change which poses a significant challenge to human perceptual, cognitive and affective processing mechanisms (Brosch 2020).

New educational and pedagogical avenues are needed (Heinzen 2017). The practices of philosophy (PP) implement a pedagogy using co-inquiry focused on oral discussion. PP are recognized by UNESCO as contributing to strengthen democracy. PP provide tools to educate individuals in critical and autonomous thinking, to empower their own-opinion formation and to reinforce self-determination in a collaborative manner. As such, PP can be used to develop integrative ‘transition’ proposals based on a common shared argumentation, to trigger and motivate climate action and behavioral change at the individual and community levels.

We launch a consortium, PhilTheGap, aiming at (1) developing a database of scientific factsheets, addressing Swiss specific thematic at the energy-climate nexus that will provide (2) triggering resources for PP workshops, animated by PP trainers and supported by an interactive digital application (abb - around the ballot box, developed by ValAct Foundation) to monitor and handle discussions outputs; and (3) the conception of a serious game (role-playing game, RPG) implementing methodologies of PP in an attractive environment emphasizing contextualized effectiveness of selected ‘transition’ scenarios.
Symposium 19: Tackling the Climate Crisis
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Figure 1. PhilTheGap avenues. SCI: Scientific resources; PP: Practices of Philosophy workshops; EdT: Educational Technologies.

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