



Virtual event

Sustainable Conference Design of the Future

Online, January 26–27, 2023

Organized by the Department of Environmental Psychology, Otto von Guericke University Magdeburg, Germany

Conference Report

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Introduction

As part of the project "[TraMocee](#) - Transformation of mobility behavior through corona-related restrictions and new experiences" (funded by the DBU [Deutsche Bundesstiftung Umwelt; German Federal Environmental Foundation]), the Department of Environmental Psychology at Otto von Guericke University Magdeburg, Germany hosted a virtual conference on "Sustainable Conference Design of the Future" on January 26 and 27 2023.

The TraMocee project examines how the COVID-19 pandemic is seen as a window of opportunity for a change in the conference culture toward more sustainable scientific conferencing. The focus is on gaining knowledge and initiating a transformative process in academia. This conference marked the beginning of the final phase of the project and sought to bring together different actors relevant to conferences and to advance the exchange on sustainable conference design based on the project results.

Background

Many researchers view scientific conferences as an integral part of their work, as they serve various functions such as knowledge exchange, networking, and inspiration. After several voices were raised in the past calling for a change in conference culture (primarily due to high CO₂ emissions of traditional in-person conferences and the associated travel), the COVID-19 pandemic has led to a shift in conference culture. Large in-person gatherings were no longer possible and conferences were held more and more virtually or hybrid.

The focus of this virtual conference was to share knowledge, discuss ideas, enable own experiences with virtual conference tools and enhance a transformative process toward more sustainable conferencing. We presented and discussed scientific input, but also offered the opportunity to get to know new formats and platforms and to reflect on them afterwards. To stimulate exchange between different actors, we brought together initiatives and researchers in the field of conference mobility, conference organizers, and conference service providers, and together explored the possibility space for change.

Conference Program

Time (CET)	Thursday, 26.01.2023	Platform
From 1:45 pm	Platform is open	Zoom
2:00 - 2:20	Arrival · Welcome · Organizational matters	Zoom
2:20 - 2:30	Getting to know each other	Zoom
2:30 - 4:00	Scientific input <ul style="list-style-type: none"> • Rhetoric, expectations and performance – The cost-benefit ratio of conference activities (Nicholas Rowe) • How sustainable are sustainability conferences? – Comprehensive Life Cycle Assessment of an international on-site conference series in Europe (Sabrina Neugebauer) • Emission reduction potentials for academic conference travel (Stijn van Ewijk) • Why virtual conferencing matters and what needs to be improved: Some insights from a recent survey (Anna Schreuer) 	Zoom
4:00 - 4:30	Arriving in Gather Town (hosted by Virtual Chair) and break with optional virtual coffee hour	Gather Town
4:30 - 6:00	Panel discussion: "Is a change in conference culture necessary and how can it be achieved?" <ul style="list-style-type: none"> • Holger Finken • Susann Görlinger • Jason Hartline • Dylan Ruediger • Lorraine Whitmarsh 	Gather Town
6:00 - 6:30	Break and option to get to know Magdeburg through videos	Gather Town
6:30 - 7:30	Social event <ul style="list-style-type: none"> • Meet in Gather Town and choose between three different activities 	Gather Town

Time (CET)	Friday, 27.01.2023	Platform
From 8:15 am	Platform is open	Zoom
8:30 - 9:00	Exchange and discussion on the social event	Zoom
9:00 - 10:00	Scientific Input <ul style="list-style-type: none"> • The Future of Events is Virtual (Eric Sodomka) • Virtual Unconferences (Tracey Weissgerber) • The Future of Meetings: Going Beyond "Being There" (The Future of Meetings Community) 	Zoom
10:00 - 10:15	Arriving in sci-an	
10:15 - 11:00	Exhibition of conference service providers and innovative ideas for the design of virtual conferences Sci-an · VirtualChair · Welo · Cozy Juicy Real Parallel for some participants: Focus group	Sci-an Zoom
11:00 - 11:15	Break with optional virtual coffee hour	Sci-an
11:15 - 12:45	World Café More sustainable conferencing: What are the options? Which actors can drive change? What systemic changes are needed? How do we overcome different hurdles? A potpourri of questions and the joint search for answers.	Zoom
12:45 - 1:00	Wrap-up and Goodbye	Zoom

Sessions

Scientific inputs

Rhetoric, expectations and performance: The cost-benefit ratio of conference activities (Dr. Nicholas Rowe; independent academic)

Nicholas Rowe, an independent academic and dual fellow of the UK's Higher Education Academy and Society for Education and Training (Finland), gave an input about the cost-benefit ratio of academic conferences. He opened with facts about the history and the current role of academic conferences. After reflecting the functions of conferences, he questioned the sustainable impact of conferences, e.g. due to the lack of evaluation research. Rowe enumerated expectations and supposed advantages of on-site conferences, such as networking with peers, and put them into perspective partly on the basis of his paper 'The Economic Cost of Attending Educational Conferences'. Based on the arguments and data presented, he concluded that while research institutions and researchers themselves commit vast amounts of resources to conferences, their impact, efficiency, and cost-effectiveness are not sufficiently confirmed, and may even be refuted. Taking into account the climate impact of conferences demonstrated in his paper, he said, there are plenty of reasons to change the conference culture in the future.

Narrated presentation: [Download](#)

Rowe, N. E. (2019). The Economic Cost of Attending Educational Conferences. *International Journal on Social and Education Sciences*, 1(1), 30-42.

How sustainable are sustainability conferences?: Comprehensive Life Cycle Assessment of an international on-site conference series in Europe (Dr. Sabrina Neugebauer; iPoint-systems GmbH)

Sabrina Neugebauer from iPoint systems GmbH (Germany) presented a paper on the life cycle assessment of the Life Cycle Management Conference Series, an on-site conference series in Europe. The initial issue of the paper were the high emissions caused by international conferences even before COVID-19 and now rising rapidly again after the pandemic. Based on the prior conferences in this conference series, Neugebauer and her colleagues conducted a life cycle assessment of a fictional conference taking place in the future regarding different aspects of conference preparation, execution, and travel. As expected, the travel behavior of the participants, especially air travel, was clearly the biggest contributor to the environmental impact in many categories. Building different scenarios, the authors calculated the saving potentials under different conditions. They saw the greatest potential for savings in travel behavior, but also, for example, in catering, the number of conferences per person per year, and in offering virtual or hybrid conferences.

Neugebauer, S., Bolz, M., Mankaa, R., & Traverso, M. (2020). How sustainable are sustainability conferences?—Comprehensive Life Cycle Assessment of an international conference series in Europe. *Journal of cleaner production*, 242, 118516.

Emission reduction potentials for academic conference travel (Dr. Stijn van Ewijk; University College London)

Stijn van Ewijk from University College London (UK) gave input about a paper written by him and Paul Hoekman. The paper addresses the problem of high emissions caused by air travel of researchers and shows different approaches to solve it. The colleagues analyzed data from three past conferences in different countries. Travel emissions could have been reduced primarily by letting the people with the longest journeys attend online or by holding the conference simultaneously at different locations, possibly in combination with a shift to land-based transport. In the case of completely virtual conferences, travel CO₂ emissions would have been reduced by 100 %. In contrast, simply switching to land transport or implementing a CO₂ tax, would have had at most a small effect. The conclusion of the study was that it is essential to consider long-haul flights as the largest source of travel emissions when planning conferences and that multi-site conferences might be a promising solution because they keep the benefits of on-site conferences whilst reducing travel emissions. Van Ewijk also stressed the relevance of increasing the inclusivity of conferences, which is demonstrated by a very unequal distribution of participation of researchers from high-income countries compared to those from lower income countries.

Van Ewijk, S., & Hoekman, P. (2021). Emission reduction potentials for academic conference travel. *Journal of Industrial Ecology*, 25(3), 778-788.

Why virtual conferencing matters and what needs to be improved: Some insights from a recent survey (Dr. Anna Schreuer; University of Graz)

Anna Schreuer from University of Graz (Austria) works in the project [Transflight](#), whose purpose is to analyse the potentials and challenges of reducing emissions from air travel through changes at behavioral and institutional levels. In this context, academic travel is investigated, e.g. with the help of a survey at three Austrian universities, of which Schreuer presented the results. While the willingness to use virtual solutions in academia has risen sharply during the pandemic, a large share of respondents remains skeptical towards the suitability of virtual solutions for academic conferences – the most frequently named reason for academic air travel. Survey results showed that participants were very satisfied with several features of virtual conferences, e.g. climate friendliness and the elimination of travel time. However, they were less satisfied with the aspects most important to them: scholarly

exchange, building networks, and full immersion. Ideas for improvement include the introduction of new formats for networking and socializing, the use of specific platforms for conferences, and new combinations of virtual and on-site exchanges at and between conferences.

Virtual brainstorming events: Using constructive chaos to enhance your conference (Dr. Tracey Weissgerber; QUEST Center, Berlin Institute of Health at Charité)

Tracey Weissgerber is a meta researcher at QUEST Center for Responsible Research within the Berlin Institute of Health at Charité and gave an input about virtual brainstorming events and using constructive chaos to enhance conferences. She started by highlighting the limitations of traditional meetings and conferences, such as arranging appropriate time slots and a lack of time for deeper discussions. On-site UNconferences could remove these limitations and instead encourage networking and informal conversations. The formats of UNconferences can vary and are mostly arranged by the participants themselves, e.g. in the form of discussions and workshops. However, participation is limited by travel and time is still limited. That is why she and her team have developed the concept of virtual brainstorming events. These events take place asynchronously and consist of several components that can be flexibly arranged over several days and time zones. Participants can enter into discussions on the relevant topic online via a communication platform. Online networking sessions in rotating small groups serve to get to know each other. Webinars allow participants to delve deeper into the topic and discuss selected aspects among themselves in small groups in moderated open spaces. Such events have the advantage that there are few individual presentations and participation is therefore very active. This concept can be very successful and perceived as very efficient by the participants if certain things are taken into account during the planning, such as the high non-participation rate in online events, the need to schedule many breaks, and the collection of feedback.

Holman, C., Kent, B. A., & Weissgerber, T. L. (2021). How to connect academics around the globe by organizing an asynchronous virtual unconference. Wellcome Open Research, 6.

Using Matchmaking to Promote Attendee Engagement: A Case Study (Dr. Eric Sodomka; Virtual Chair)

Eric Sodomka is the CEO of [Virtual Chair](#) and has been researching the characteristics of and opportunities to improve virtual meetings and conferences. He presented a case study on using matchmaking to promote attendee engagement. The starting point of the study was the question of whether and how algorithms could facilitate networking at virtual events. Sodomka and his colleagues investigated various data collection methods and possible uses of algorithms at a virtual research conference that took place in 2022. They monitored the participants' behavior during the social events, which took place in a virtual room with topic tables, and e.g. used a chat bot to bring together people

with similar interests. They also conducted a survey on the participants' individual preferences and expectations for social interaction at the event. Furthermore, they tried to mathematically optimize the allocation of people with similar interests to tables in the virtual space. The evaluation of the efficiency and effectiveness of the different methods used in this research should contribute to the future development of the use of algorithms in virtual events.

The Future of Meetings: Going Beyond “Being There” (The Future of Meetings Community)

The Future of Meetings (TFOM) is a community of practice whose vision is a world that is increasingly accessible, inclusive and sustainable thanks to technological advances. In their presentation, they introduced the platform of the original CSIRO TFOM Symposium in 2020 [2], which allowed participants not only to access live sessions and video recordings, but also to connect easily with speakers and other participants. In addition, the platform had a multifunctional interface for the organising team, which facilitated efficient monitoring. Afterwards, various platforms that TFOM have also used for virtual events were presented. For example, they used Gather for virtual events such as poster sessions and social sessions. Mozilla Hubs is an immersive platform that has the advantage of not requiring a separate download or special technical requirements for its use. TFOM has also made use of GlueVR, a virtual 3D space that is very realistically animated and therefore well suited for natural and immersive interaction. TFOM is convinced that by selecting the appropriate platform based on the organisers' goals and attendee needs, virtual meetings will have increasingly fewer perceived disadvantages compared to on-site meetings in the future.

YouTube Video: [YouTube](#)

Moss, V. A., Hotan, A. W., Kobayashi, R., Rees, G. A., Siegel, C., Tremblay, C. D., ... & Roos, G. (2020). The future of meetings: outcomes and recommendations. In *The Future of Meetings: Outcomes and Recommendations. The Future of Meetings Symposium (TFOM), Virtual*.

Panel discussion

The topic of the panel discussion was "Is a change in conference culture necessary and how can it be achieved?". The panel included Dr. Dylan Ruediger from Ithaka S+R (USA), Dr. Holger Finken from the German Academic Exchange Service (DAAD, Germany), Prof. Jason Hartline from Virtual Chair (USA), Prof. Lorraine Whitmarsh from the Centre for Climate Change & Social Transformations (CAST, UK), and Dr. Susann Görlinger from the ifeu Institute in the FlyingLess project (Germany). Prof. Ellen Matthies (OVGU, Germany) moderated the discussion.

[Dylan Ruediger](#) is a program manager with Ithaka S+R's Libraries, Scholarly Communication, and Museums program. Ithaka S+R helps academic and cultural communities serve the public good and navigate economic, technological, and demographic change. At the beginning of the panel discussion, Ruediger introduced the research project "The Future of Scholarly Meetings" and emphasized that reducing emissions is not the only goal when it comes to changing conference and meeting culture. Creating a healthy and vibrant research infrastructure and conference culture along with this process of change is important, too.

[Holger Finken](#) has been head of the Research Fellowship Programs unit at the DAAD since 2015. The DAAD is an independent organization that supports higher education institutions in fostering their international relations. Finken shared DAAD's experiences with online meetings and conferences during the COVID-19 pandemic with the audience. He mentioned the high demand for and the positive experiences with online formats among researchers during the pandemic, but also the shift back to on-site conferences after restrictions due to the pandemic were lifted. His and DAAD's aim is to develop online formats that integrate the advantages of on-site conferences, such as informal conversations.

[Jason Hartline](#) is a Professor of Computer Science at Northwestern University. His research covers the foundations of online markets. He also is founder and president of Virtual Chair and was the Virtual General Chair of the 2020 ACM Conference of Economics and Computation. He gave a short input about the general aim of Virtual Chair, which is offering a virtual platform where people have the autonomy to have informal conversation with other participants during conferences. Virtual Chair should bring people together and overcome the weaknesses of other platforms that do not focus on this goal.

[Professor Lorraine Whitmarsh](#) is an environmental psychologist, specializing in perceptions and behavior in relation to climate change, energy, and transport. She is based at the University of Bath and is Director of CAST. She is also a lead author for the Intergovernmental Panel on Climate Change (IPCC) in Working Group II. Whitmarsh provided insight into the characteristics of academic conferences and pointed out some central problems, for example that most academic conferences are only open for privileged researchers who have access to funding, travel options, and enough time to attend conferences. She opened the discussion on possible ways to change the culture of academic conferences in the future and pointed out the responsibility of academic institutions to take climate change seriously.

[Susann Görlinger](#) has been working on the topic of reducing flight emissions in academia, which account for a significant share of universities' total greenhouse gas emissions, since 2016. She

developed and led ETH Zurich's air travel project "Stay grounded, keep connected" until September 2021. Since October 2021, she has been leading the "FlyingLess" project at the ifeu Institute Heidelberg, which supports universities and research organizations in reducing their flight emissions. FlyingLess developed a toolbox for reducing flight emissions and conducted a survey amongst eight scientific institutions in Germany. Görlinger showed one of the results of this survey, which is that conferences are the most common reason for air travel. In her opinion, researchers should use their creativity to transform the scientific system in general, and conferences specifically, towards low carbon emissions without jeopardizing excellence in research and teaching and the career opportunities of young researchers.

The panelists exchanged thoughts and arguments on different topics and added their expertise to the discussion. They addressed the challenges, benefits, and losses for researchers that would come along with changing the current conference culture. One of the topics was the different meaning of conferences for early career and senior researchers. Moreover, the panelists as well as some speakers from the audience had a vivid conversation about changes in evaluation criteria, structural changes, the selection of tools, different kinds of interactions and useful incentives for researchers. One of the main thoughts during the discussion was that "we need to learn how to do science in a low carbon way." One of the conclusions was that organizing events on this topic and coming together in discussions like this is a great way to change the conference culture in a sustainable and low-carbon way.

Social event

For the social program on the evening of the first day of the conference, several platforms were offered, which the participants could try out, in groups or individually. Following a break after the panel discussion, all participants met again in the social area of [Gather Town](#) (hosted by Virtual Chair). There, they could sit together at the virtual tables and benches and interact freely with each other, discuss the topics of the conference, or use the prepared conversation starters to get a conversation started.

After some time, two other platforms were introduced. One of the options was to play [Cozy Juicy Real](#), a virtual board game that can be played with 10-500 people and lasts around 60-120 minutes. The game is ideal for groups that do not yet know each other well, and players do not need an account or any prior knowledge. The other option was to visit the platform [Welo](#), which, like Gather Town, allows users to talk and play games with each other.

Exhibition

An exhibition of conference service providers combined with a poster presentation was held in [sci-an](#). Four exhibitors (Virtual chair, sci-an, Welo, and Cozy Juicy Real) presented posters and information materials in their booths and engaged in exchange with conference participants. In addition, there were other posters on display that presented papers with innovative ideas for alternative conference formats as well as further resources on the topic (blogs, podcasts, videos, etc.). Conference participants could also use sci-an to talk to each other and make new contacts.

Focus groups

Two focus groups were held as part of the conference, for which participants could register voluntarily in advance. Participants discussed different conference formats – in-person, hybrid, and virtual – in terms of their opportunities and challenges, and their (un-)suitability for different conference purposes (e.g., knowledge exchange, networking, career opportunities, socializing, conference tourism). Participants reflected that all conference formats have certain advantages and disadvantages, and some believed that all conference formats could fulfill the conference purposes discussed, if done right. Using appropriate technology, platforms specifically designed for interaction/networking, providing training and preparation time for speakers/attendees, and conference organizers' motivation, enthusiasm and efforts to reflect on the conference aims and how best to achieve them were seen as key factors in positive conference experiences.

World Café

The World Café is a simple and flexible dialogue format for large groups. A World Café usually takes place in a comfortable room and has a number of tables, but can also be organized virtually. Each table is equipped with (virtual) pens and notes and is assigned a topic of discussion and a host. After an introduction by the moderator, participants assign themselves to the tables, where they each sit for one round and openly discuss the topic with the other participants at the table. The hosts should moderate the conversations and make sure that the results are documented in some form. After a set time, the participants switch tables. In the end, the results of several rounds can be presented at each table.

We used the World Café as a method to discuss several questions about sustainable conferencing. Five tables were virtually mapped on a Miro Board. Table assignment and discussions took place in Zoom breakout rooms.

Figure 1 shows the results of the five tables of the World Café, a short summary and an overview of all the results for each table is given afterwards.



Figure 1. Results of the five tables of the World Café

Discussion table 1: Who are the actors that can drive change towards more sustainable conferencing?

The groups discussed different actors that could drive change towards more sustainable conferencing and concluded that the answer to this question really depends on the national context. In general, they saw academic institutions and conference organizers as responsible for implementing structural measures, such as travel policies. However, researchers or conference participants should also contribute to change in a bottom-up process by promoting research in the field and standing up for the implementation of their demands and ideas.

Table 1

Results of discussion table 1 „Who are the actors that can drive change towards more sustainable conferencing?“

Round 1	<ul style="list-style-type: none"> - Neutral third party who can govern general regulations/guidelines for travel - Universities have to set guidelines for conference travel - Funding agencies (e.g. science foundations) as funders of conferences and conference travel - Organizers of conferences (researchers) - Participants of conferences
Essence round 1: Different rules in different countries	
Round 2	<ul style="list-style-type: none"> - Relevant actors vary depending on disciplines - Bottom up changes necessary - Initiatives/NGOs that reach into science foundations and societies - Network of sustainable research/scientific communities (e. g. scientists for future, astronomers for future) - All actors could share best practices and help drive change - We all could talk more about our virtual activities - More research and publication/communication on sustainable conferences is needed - Scientific community as a barrier itself? - Seems to require in-person conferences? - Framework conditions and incentives for participating in virtual conferences have to be changed - Publishing of conference papers as publications stands in the way of driving change
Essence round 2: Bottom up processes – who could be a lever?	
Round 3	<ul style="list-style-type: none"> - Supply chains associated with in-person events have to be adapted as well - Guidelines for sustainable conferencing are needed - Support for institutions in the organization of sustainable conferences may be helpful
Essence round 3: Also think about sustainability in in-person conferences	

Discussion table 2: What has to change in academic institutions/system to facilitate and foster sustainable conferencing?

At this table, groups discussed what needs to change in the academic system to foster sustainable conferencing. The groups agreed that most important would be a general attitude change in the academic system towards virtual and hybrid conferencing. Other important changes would be technical improvements, better spacial conditions, and more cooperations of academic institutions with providers of virtual tools and platforms. In general, academic institutions should also foster the motivation to find virtual solutions and enable the wide distribution of technical knowledge within all parts of their institutions.

Table 2

Results of discussion table 2 „What has to change in academic institutions/system to facilitate and foster sustainable conferencing?“

Round 1	<ul style="list-style-type: none"> - Systemic change in the way we judge about the success of research - Start disconnecting success with traveling (change attitude and metrics of success) - Change of judgement for virtual format conferences (often considered less import compared to in-person conferences) - Recognizing that the inclusivity that a hybrid/online conference fosters can also be a benefit to institutions - Significant innovation of technology for the connection part of conferences needed - Regulations – University polices for traveling etc. (at the same time: maintaining the job as researcher interesting by not restricting on everything) - Initiatives to integrate sustainability into the conference sector (e.g. sustainability coordinators or mandatory reports) - Problem: Early career researchers could bring changes but are often not in the position to make changes - Make science more „open“
Essence round 1: The most important parts are the attitude change towards online conferences, the judgement of online formats and some technological improvements	
Round 2	<ul style="list-style-type: none"> - Spacial conditions need to improve (space in offices for participating in virtual conferences) - Better cooperation between platform providers and university/IT structures - More visibility for virtual events (better marketing, recognizing the importance)
Essence round 2: The framework conditions have to be supported by the university (spacial conditions, platform cooperations etc.)	
Round 3	<ul style="list-style-type: none"> - Improvement of institutional cyber security (better access to innovative technologies) - Solution for current lack of effort in digital upscaling - Making clear which platforms fit which purpose - Better instructions (e.g. workshops) for platforms beforhand (= increasing popularity as well) - More acceptance of virtual formats through giving more information (e.g. making the advantages clear) - Accountability
Essence round 3: Motivation for virtual solutions and the enabling of technical knowledge have to increase	

Discussion table 3: What kind of support do conference organizers need to plan and run a virtual conference?

The topic of this table was the kind of support conference organizers need to plan and run virtual conferences. One important aspect of the discussion was the amount of time that is needed to prepare a virtual conference. Sufficient time should be scheduled and made available before, during, and after the conference so that the conference team can prepare the conference adequately. Another group highlighted the importance of the collection of experiences before running a virtual conference, e.g. through training courses and the evaluation of past conferences. Moreover, conference organizers expressed the desire to have a better overview of the characteristics of the different platforms in order to be able to select suitable tools for the target group of their conference. Here, they also expressed the need for an overview or recommendations of tools.

Table 3

Results of discussion table 3 „What kind of support do conference organizers need to plan and run a virtual conference?“

Round 1	<ul style="list-style-type: none"> - More knowlegde about data protection regulations - More preparation and support with preparation before conference (tools, instructions, trainings, rehearsals etc.) - More time for planning - Training for virtual moderation - Option to be in the shoes of participants
Essence round 1: More preparation before the conference	
Round 2	<ul style="list-style-type: none"> - Creativity and willingness - Volunteer groups - More friendly commercial platforms for organisers - Prototype of a virtual conference - Catalogue of ideas for going beyond your great, great grandfathers conference - Professional technical support - Training course „How to organise a virtual conference“
Essence round 2: Collect experiences to improve own conference	
Round 3	<ul style="list-style-type: none"> - Overview and review of virtual platforms - Networking toolkit
Essence round 3: Targeting a networking toolkit	

Discussion table 4: How could the functions that conferences offer be fulfilled more sustainably/in other ways?

The task of table 4 was to think of different and more sustainable ways to fulfill the functions of conferences. One group suggested different virtual formats that could be used during or instead of conferences such as podcast series, poster scrolls on Twitter, and virtual brainstorming sessions. Another group came up with several ideas to foster conversations during virtual events or in the time between conferences, e.g. more regular catch-ups, meeting times with the authors of the presented work or new papers, and a more pro-active way to introduce people to each other. The conclusion of the third group was that “slowing down academia” would be a way to enable more in-depth exchange during events in general.

Table 4

Results of discussion table 4 „How could the functions that conferences offer be fulfilled more sustainably/in other ways?“

Round 1	<ul style="list-style-type: none"> - Podcast series to present posters or research -> presenting scientific knowledge - Poster scroll format on Twitter and other social media -> presenting scientific knowledge + making connections - Asynchronous formats and virtual collaboration documents etc. (= online discussion board) -> discussion of scientific content - Virtual escape room / room with common task / online games -> socializing/professional development - Permanent Gather room or other virtual space with virtual office hours to be available for chats -> mentoring / networking / socializing - Virtual brainstorming sessions / discussion rounds -> knowledge synthesis / group problem solving - Notifications on social media about new publications or finished projects - Short lightning talks/presentations + long discussion time/interaction (or short video up-front) for better virtual conferences
Essence round 1: Various opportunities: podcast series, poster scrolls on Twitter, online discussion board, virtual brainstorming session...	
Round 2	<ul style="list-style-type: none"> - Regular catch-ups, one-on-one 15 min chats, random groups (speed dating) -> networking / socializing - Slack channels, LinkedIn for job applications - Pre-recording presentation and making it public on a platform (e.g. YouTube channel) -> discussion time with speaker - Introducing people more pro-actively to each other (people from other networks to people in our own network) - More frequent conferences with shorter time periods (multiple events that last a couple of hours spread throughout the year) for better virtual experience - Creating spaces for conversations to happen in virtual formats - Having information about someone when seeing them in a virtual space (as in sci-an)
Essence round 2: More regular catch-ups, meeting time with authors of work posted online and introducing people more pro-actively to each other	
Round 3	<ul style="list-style-type: none"> - Smaller events and meetings with less people
Essence round 3: Slowing down academia for more in-depth exchange	

Discussion table 5: Which hurdles stand in the way of switching to more sustainable conferences?

The topic of table 5 was the hurdles that stand in the way of switching to more sustainable conferences. One conclusion was that there are hurdles on different levels, e.g. institutional and psychological levels, which require different kinds of solutions. One of the groups discussed the problem that conferences are often planned by senior researchers who are less likely to be open for change. This hurdle could be overcome e.g. by the inclusion of younger researchers in the organization of conferences. Another group concluded that all the hurdles, e.g. the amount of incentives for taking part in on-site conferences (vs. virtual conferences) and outdated models of networking, fit into a “bigger picture” of the fact that the current conference model needs to be updated driven by evidence.

Table 5

Results of discussion table 5 „Which hurdles stand in the way of switching to more sustainable conferences?“

Round 1	<ul style="list-style-type: none">- There seem to be a gap between people who like virtual events and people who do not -> we need more bridges to connect people with different preferences- There is no simple answer, but many hurdles seem to be psychological ones- Academic conferences are a big business that is influenced by different factors -> big changes are needed- Lack of personal contact – especially for early career researchers (however, the younger generation is also more open for new habits and methods)- Lack of direct feedback- Networking is more difficult
	Essence round 1: There are hurdles on different levels, e.g. the institutional and psychological level, so solutions should consider all these levels
Round 2	<ul style="list-style-type: none">- Lack of personal interest- The reward system in academia -> incentive to travel and incentives for taking part in in-person conferences- Lack of evidence on the subject of conferences in general- Psychology of conferences -> more research and experience needed -> bias in personality types (extroverts vs. introverts)- Decision making lies with senior people/people who are not open for change- Incentives to organize in-person conferences- Outdated model of what a conference looks like- Outdated model of networking
	Essence round 2: All hurdles identified on all scales fit into a bigger picture of the fact that conferences as we know them are outdated, and the model of what is acceptable needs to be updated driven by evidence
Round 3	<ul style="list-style-type: none">- There is no explicit way for networking or finding new job opportunities- Expectation of passive formats are often responsible for a lack of interaction- There are many tools and options -> conference organizers need more information and skills and participants need time to get used to new platforms- Conference organizers tend to be senior people -> lack of communication with younger people
	Essence round 3: We should all be open for new ways of organizing and experiencing conferences, and young people should be included more in the organizational process

Technical aspects and tools

As one of the aims of the conference was to give participants a chance to try out different platforms for virtual conferencing, we embedded a wide variety of tool and used them for different program points. We used well-established programs (such as Zoom) as well as programs from start-ups (such as sci-an) and were able to test and present possibilities for different use cases.

Zoom

[Zoom](#) is a video conferencing tool, which has become popular during the COVID-19 pandemic and is used by many universities and other educational institutions. The platform can be used for group meetings and has various features, such as breakout rooms and virtual whiteboards.

We used Zoom as the main tool for the conference. The opening and closing, the scientific input, and parts of the World Café took place in Zoom. In addition, we used Zoom as a support channel, and one of the members of the organizing team was in the Zoom room at all times to answer questions and provide support.

Gather Town (hosted by Virtual Chair)

[Gather Town](#) is a social networking website designed to encourage virtual interaction. It offers different types of customizable virtual rooms with various elements where participants can move around freely as small avatars. Avatars standing nearby can talk to each other via audio or video chat. We had our conference rooms built by [Virtual Chair](#), a company that also helps with organization and support for virtual and hybrid events.

We used Gather Town for the panel discussion and the social program on the first day. For this purpose, Virtual Chair had prepared a social area and a plenary room (Figure 6).



Figure 2. Social area (left) and plenary room (right) in Gather Town

The social area was equipped with tables and benches that should invite people to interact. The plenary room had numerous chairs, several microphones, and a stage, and allowed panelists to use a broadcast feature to be heard by everyone in the room.

Welo

[Welo](#) is a platform that can be used as a virtual workspace and for social networking. Different designs are available, so that Welo can be used for different types of meetings and a varying number of participants. Users can move between the different areas and talk to each other via video chat. Other tools (e.g. Zoom) can also be integrated.

During the social program of the conference, Welo was one of the tools we offered to try out. We used the pre-built "Reconnect & Play" room, which has built-in games that guests can play (Figure 7).

Cozy Juicy Real

[Cozy Juicy Real](#) is a virtual board game that can be played with 10 to 500 players in Zoom breakout rooms. It typically takes 60 to 120 minutes to play and requires no preparation or prior knowledge. For companies and organizations, the usage is based on a "pay what you can" model.

The game was part of the social program on the first day of the conference (Figure 8). It was a way for people to get to know each other and engage in casual conversation. It was also designed to break up the atmosphere after the first half of the conference program and to bring the evening to a comfortable close.



Figure 3. Welo space.



Figure 4. Cozy Juicy Real

Sci-an

[Sci-an](#) is a virtual exhibition tool created by an international team of astrophysicists. The project is based in Heidelberg, Germany, and is part of the MAX!mize program of the Max Planck Society. Sci-an was created to reduce the climate impact of scientific conferences by providing an accessible and affordable virtual space specifically tailored to the needs of researchers and conference organizers. The virtual space is designed to look like a large exhibition hall and provides ample space for the presentation of posters or scientific papers. It is possible to create a research profile where you can write about yourself and your interests and upload papers or presentations for others to look at and comment on.

We used Sci-an for the exhibition of conference service providers and exhibited some additional posters as well (Figure 9).

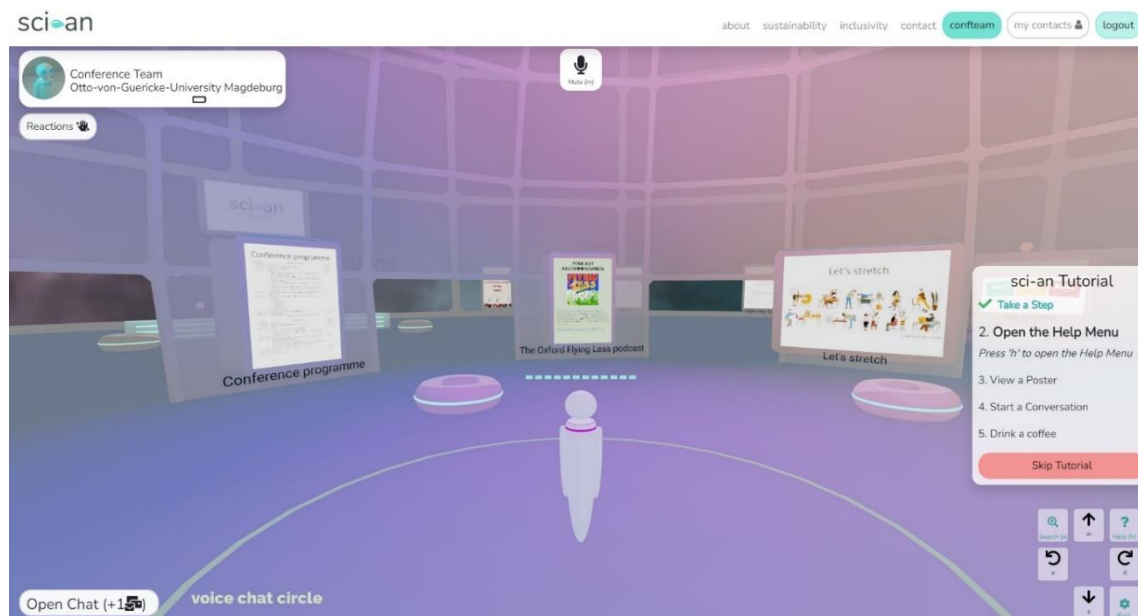


Figure 5. Sci-an exhibition room

Miro

[Miro](#) is a feature-rich virtual whiteboard that provides many opportunities for creative collaboration, such as templates for different ways of working. The whole team can work on the whiteboard at the same time.

We used the platform and a specially therefore designed template for the World Café (Figure 10). The results of the discussions were captured on sticky notes at each table. Participants could add more sticky notes, change them, or restructure them at any time and view the results even after the conference.

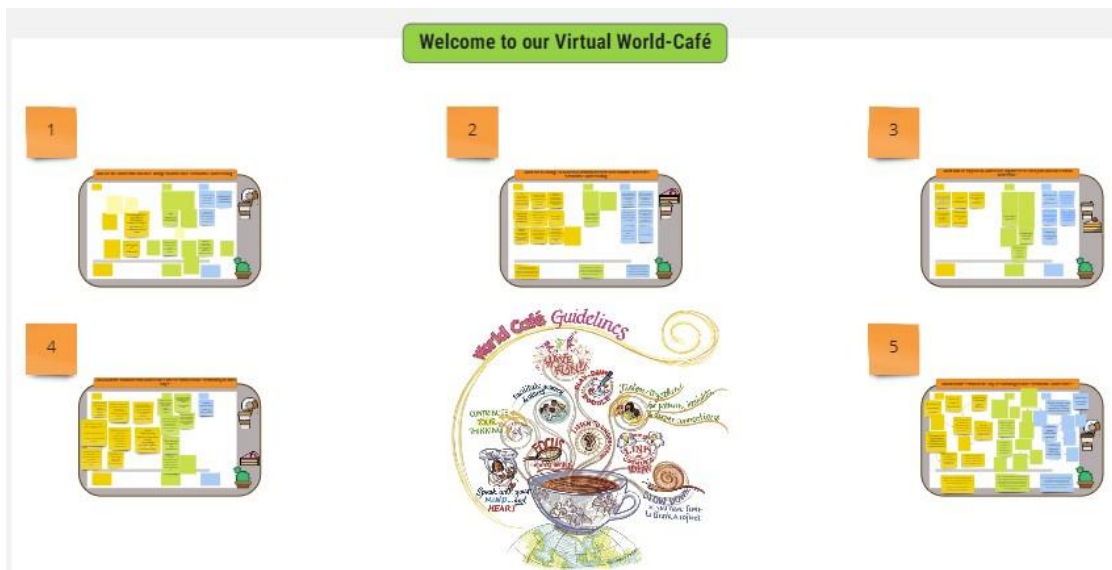


Figure 6. Set-up of the virtual world café in Miro

Slack

[Slack](#) is an instant messaging program with numerous communication features. A Slack workspace is divided into different communication channels that can be customized, e.g. in terms of design and access rights. Other tools such as Miro and Zoom can be integrated as needed.

Slack was our main communication tool for sharing messages and documents. In different channels, participants could find all relevant information, e.g. recordings of the scientific input, related papers, and guides for the tools we used during the conference. We also had a channel for informal exchanges. In the support channel, someone from the conference team was always available to provide technical support during the conference.

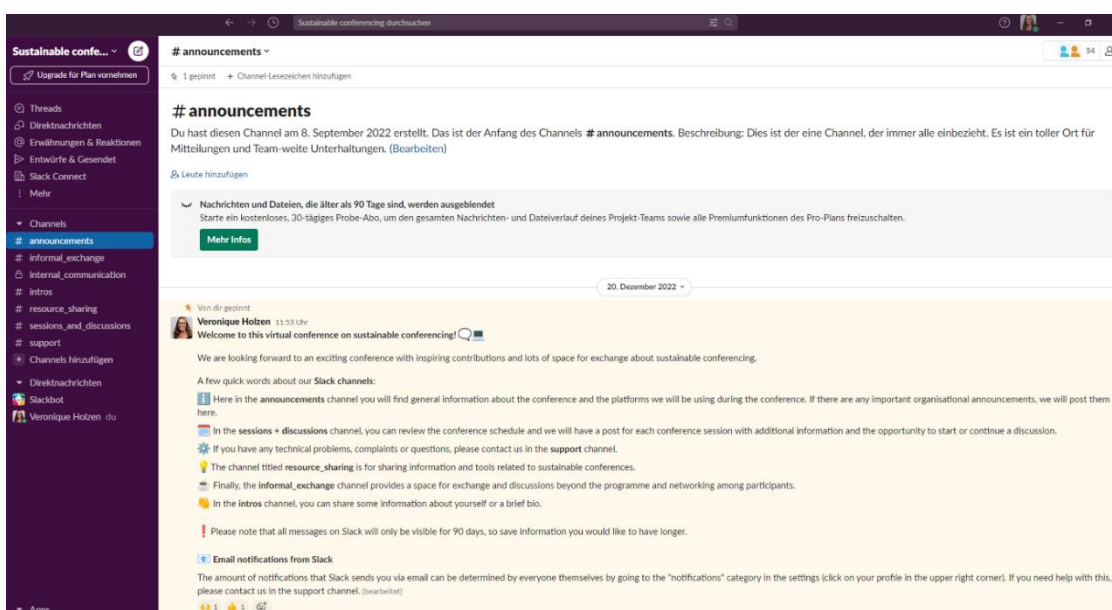


Figure 7. Announcements channel in Slack

Table 6*List of tools used for the virtual conference*

Tool	Purpose	Usage during the conference	Benefits and features (as we have experienced them)
Zoom	Video conferences	<ul style="list-style-type: none"> - Arrival - Scientific input - World Café - Wrap-up - Support 	<ul style="list-style-type: none"> - Various features for video conferences - Well established and therefore little technical support needed - Many universities have a subscription to Zoom, so use is free for university employees and authorized by the institution
Gather Town (hosted by Virtual Chair)	Virtual space	<ul style="list-style-type: none"> - Coffee break - Panel discussion - Social program 	<ul style="list-style-type: none"> - Customizable spaces and individual design options (for virtual and hybrid events) - Comprehensive support options (by Virtual Chair)
Welo	Virtual space	<ul style="list-style-type: none"> - Social program 	<ul style="list-style-type: none"> - Wide range of pre-build designs available - Integration with other tools possible, e.g. Zoom - Free (but limited) plan available
Cozy Juicy Real	Virtual game	<ul style="list-style-type: none"> - Social program 	<ul style="list-style-type: none"> - Good option to get to know people (no matter if you knew each other before or not) - No preparation necessary (hosted by skilled facilitators) - ‘Pay what you can’ model
Sci-an	Virtual (exhibition) space	<ul style="list-style-type: none"> - Exhibition - Poster presentation - Coffee break 	<ul style="list-style-type: none"> - Possibility of creating a permanently existing research profile - Free plan for small groups available
Miro	Virtual white board	<ul style="list-style-type: none"> - World Café 	<ul style="list-style-type: none"> - Suitable for working in groups - Free (but limited) plan available
Slack	Instant messaging program	<ul style="list-style-type: none"> - Communication - Exchange of materials - Support 	<ul style="list-style-type: none"> - Many communication features - Integration with other tools possible, e.g. Zoom - Free (but limited) plan available

Feedback from participants and learnings

Participants' feedback on the conference was very positive; with many stating that they enjoyed the event and discussions and took much "food for thought" with them. Some insight into the feedback is provided by participants' quotes listed below:

- "Impressive to see how well interactions work on various platforms."
- "This was very interesting, thank you so much!"
- "I think the conference was a success in terms of bringing together different stakeholders and people from different communities."
- "It has been a pleasure meeting people with an active interest in conferences, and I hope you will stay in touch. Thank you!"
- "Actually, this last morning made me believe that virtual conferences can bring people together!"
- "Great to discuss with people from a variety of contexts that we haven't (and have!) crossed paths with before - look forward to meeting again and possibly collaborating in the future."

In the process of planning, preparing, and implementing the conference, we gained much experience and many learnings, which we have described in an experience report. There, we also share helpful resources, which may help others to organize a virtual conference. The report can be found in the [materials section](#) on the conference homepage.

Open questions

The conference aimed to bring together different actors and to stimulate and advance the exchange on more sustainable future conferencing.

Many interested and committed people came together during the two conference days and had a lively exchange, discussed different possibilities, and developed new ideas. There is no one perfect solution for designing sustainable conferences, but there is a broad potpourri of possibilities to draw from. From a more sustainable design of smaller regional on-site conferences without long travel distances, to hybrid conferences or multi-hub models, to fully virtual conferences in various designs. For each individual conference, the needs of the community should be considered and taken into account in the conference design. In this way, conferences can not only be made more sustainable in an environmental sense, but also promote a more inclusive, diverse, connecting, effective, and memorable conference experience.