

A meeting framework for inclusive and sustainable science

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The ABCD conference format (All continents, Balanced gender, low Carbon transport, Diverse backgrounds) mixes live-streamed and pre-recorded talks with in-person ones to reflect a diverse range of viewpoints and reduce the environmental footprint of meetings while also lowering barriers to inclusiveness.

Conferences are, next to publications in scientific journals, the most commonly used format to present and disseminate recent advances in scientific research. Conferences are also important to synthesize knowledge, especially through sessions dedicated to a specific topic, to bring together different views and to explore solutions to shared problems. A wide range of diverse backgrounds of participants is often seen as a key element to facilitate novel insights, promote unconventional solutions and advance science. However, while there are hundreds of conferences and symposia within individual research fields, the examples of those achieving this seem to be relatively few. Scientific culture can also be inward facing with many symposia drawing on participants repetitively from a small sector of the global community both within and beyond disciplines. Think of your own favourite conference and ask yourself what fraction of global cultures are typically represented among the keynotes, speakers and participants. We think this must change in the interest of both science and society. In the context of major global issues that need to be addressed with urgency, this is truer now than ever before.

An area where inclusiveness and novel synthesis is especially urgent are the sustainability sciences linked to global biodiversity loss and climate change^{1,2,3}. It is questionable whether the classical way of organising scientific conferences is most effective for addressing such complex scientific subjects. This may be especially true for finding solutions to environmental problems that also have a strong social science component. Furthermore, the current way of organising conferences involves significant travelling, especially by airplanes, which not only results in large and unwanted carbon footprints⁴, but also perpetuates inequalities in participation due to uneven financial constraints.

Here, we propose a new meeting format as a means to achieve greater inclusivity at reduced carbon footprint, and hence greater benefits relative to the aforementioned costs of international conferences. Our model allows a concerted and integrative approach for disciplinary and interdisciplinary conferences to improve sustainability and to close knowledge gaps and bridge barriers to exchange across cultural backgrounds.

The ABCD format

Scientific evidence shows that diverse and inclusive groups are better at addressing and solving complex problems^{5,6} such as those faced today in sustainability sciences, particular in the context of biodiversity loss. To better achieve this at scientific conferences, we have developed a framework we term the ABCD conference format (#ABCD_conference) (Fig. 1). This format is based on the premise that the speakers invited for a symposium are selected, beyond scientific excellence and relevance, based on the following criteria: From **A**ll continents, gender **B**alance, attendance by low **C**arbon transport, and represent **D**iverse backgrounds. We briefly explain and justify these four criteria.

All continents: representation and dissemination of and exchange between research being carried out throughout the world is of great importance. If we do not bring together scientists from all corners and cultures of the globe, we risk missing important links with our own research, failing to recognise ideas developed and insights obtained elsewhere in the world, and wasting precious time and funding on repeating work already done.

Gender Balance: the lack of gender equity in science is widely recognised⁷. Speakers identifying as male, female or non-binary bring different perspectives. However, male speakers often dominate meetings in numbers and functions⁸. Ensuring equal representation and equity of gender broadens the range of perspectives, insights and experiences that are needed to nourish knowledge, and create role models for early career scientists and future generations⁹.

Low Carbon: carbon emissions created by travelling are a well-founded concern of delegates when attending conferences, especially in the sustainability sciences⁴. However, alternatives are rarely provided. Unfortunately, low carbon emission requirements can be in direct conflict with the desire to increase efforts for bringing scientists together across continents. In the ABCD conference format we promote mixing live-streamed and pre-recorded talks by contributors from afar with live in-person talks by contributors from nearby who travel on low carbon emission means. Low-cost and easily accessible technology allows for active engagement without travel, lowering both costs and carbon emission to attend international conferences. Moreover, rotating the venue for recurrent ABCD conferences between continents has the potential to overcome the all-apparent inequities between scientists from different continents.

Diversity: ensuring inclusivity of diverse cultural backgrounds within a conference agenda is of utmost importance for several reasons. Here, we define cultural diversity as, but not limited to, ethnicity, religion and language. Cultural diversity and equitable representation at scientific meetings facilitate the exchange of ideas and insights grounded in

diverse perspectives. It increases participation, understanding and fosters scientific advance and collaboration⁶ now and even more so in the future through removing inequalities in the visibility of role models.

Case Study at the World Biodiversity Forum 2020

We believe that the ABCD conference format will not only connect people but also create trust within the scientific community, enabling better exchange of ideas and increased impact in working towards solutions, be it the effects of global climate change, regional biodiversity loss, or in any other field of research. We recently tested this format in the session on “Aquatic Biodiversity: state and challenges ahead” organised and held at the World Biodiversity Forum from 22nd to 28th February 2020 in Davos, Switzerland. Prior to the session we gave invited speakers the option of live-streaming, pre-recording or attending via low carbon emission transport to deliver their presentation. On the day we had presentations in all three formats which gave an overview on the state and threats to aquatic biodiversity, discuss the underlying drivers, and outline how this affects the ecological and evolutionary functioning of the ecosystems. Here, we give our first-hand experience of the gains but also challenges we experienced from the organisers’ and speakers’ perspective:

Organisers: As organisers aiming to meet the four criteria set out under the ABCD format, we quickly realized constraints due to the limited reach of our own professional networks. Institutions in the “West” with additional strongholds in Asia and only relatively few researchers elsewhere dominate aquatic biodiversity representation. Not only are our own networks highly biased, but we realized that the relatively isolated researchers in the field outside the stronghold regions are not well networked amongst themselves either. We therefore needed to reach out beyond our own established networks and those of our contacts elsewhere, which led to a number of “dead-ends” with no responses from potential candidates. Our attempts to have gender balance turned out to be especially challenging, and several female speakers invited unfortunately did not respond to our request for unknown reasons. Those who did not respond to our request may not have in part due to our novel request to participate in a session without physical attendance or networking, which is often a key reason to attend conferences. Such constraints may be overcome in the future by increased awareness of the aims of the ABCD format and through “directed growth” of our own professional networks beyond our immediate geographic or scientific vicinity.

Running the session: By using live-streaming and pre-recorded talks, all speakers not attending in person were suitably prepared to present on the day. By using these methods,

additional consideration needs to be taken for timing, particularly with remote talks running over time. This can be addressed by the addition of web cameras faced at both presenter and audience, enabling the chair to communicate the time allowance. In our session we promoted discussion via social media and an online conference question platform. However, we got only a few discussion points from this, which may be due to the novel concept and may likely evolve if this method becomes more common. One way to increase discussion could be to make questions of the audience visible to both speaker and audience in a live ticker, as is already possible in some video conferencing programs.

Speakers: Contributors to the session were introduced to the ABCD format and the goals of the session when being invited to participate. This is key and perhaps cannot be overemphasised when organising a session using the ABCD format. Several participants highlighted the potential for networking and discussion as an area for improvement. This can be addressed with further engagement, such as pre-conference discussion among the speakers, increased engagement with online discussion tools, and an increased familiarity of presenters/attendees with this new format.

Outcomes: By using the ABCD conference format, the session encompassed a nuanced attitude and recognised some new key areas of research across geography. A number of remote and pre-recorded speakers highlighted that they felt comfortable presenting their research using these methods, and that it enabled contributions and opportunities which would not have existed otherwise. (See *Box 1* for further information on ABCD format planning).

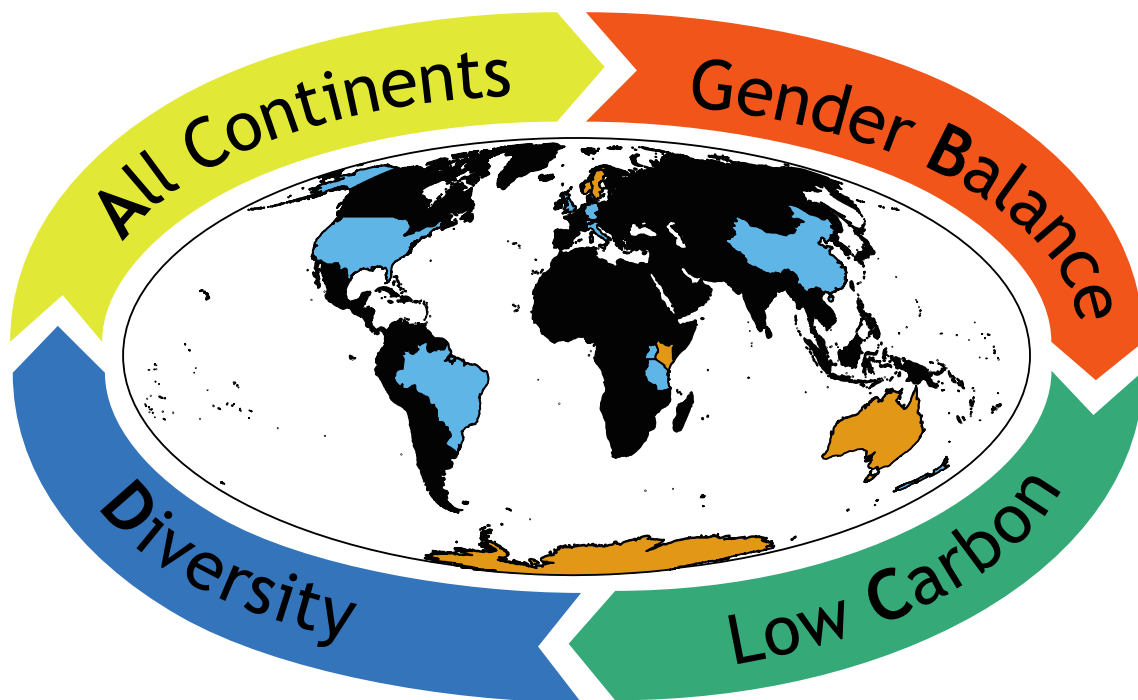
Our session focused on the state and change of freshwater ecosystems in the context of global change. Rivers and lakes are among the most biodiverse ecosystems worldwide and provide essential resources and services for humans, including drinking water, fisheries, transport or recreation. However, they are also globally among the most threatened ecosystems¹⁰. A highlight of our session was the identification of overlapping key findings and hitherto missing links between different initiatives that would likely not have emerged at this point in time without the ABCD approach. As an example, the session identified missing links between biodiversity data mobilisation initiatives in different parts of the world (e.g., FreshwaterBON having a stronghold in Europe, while JRS Biodiversity Foundation and GBiF dominate in Africa) and the respective stakeholders and scientists. It also became obvious that finding solutions to the multiple risks threatening freshwater biodiversity¹¹ is in large parts of the world challenged by lack of basic data (due to a paucity of species identification experts and funding), lack of access to databases, and lack in common

192 protocols. A discrepancy between limiting factors and necessary solutions was matched by
193 backgrounds of attendees, showing that only an inclusive approach allows discussions about
194 possible ways forward that create impact beyond the regional realm.

196 *Beyond the conference*

197 The need for new formats for scientific conferences, and scientific meetings in
198 general, has not only been discussed in the context of sustainability, but has increased
199 relevance now due to the ongoing Covid-19 crisis. With regional and global travel
200 restrictions implemented by many institutions and governments in order to mitigate the
201 SARS-CoV-2 pandemic, attendance of scientific meetings is affected¹². However, at many
202 universities and research institutes this challenge has been met by moving to online teaching
203 and online meetings at very short notice, demonstrating that new formats of interaction and
204 conferencing are realistic and doable.

205 We conclude, and hope, that the ABCD format should not be restricted to
206 conferences, but can also be applied to working groups and research projects. We envision
207 that a more inclusive and sustainable approach will not only reduce the inequities and carbon
208 footprints, but become essential for the finding of solutions to complex multi-faceted
209 challenges in sustainability sciences. These solutions are indeed urgently needed to find rapid
210 science-based solutions for immediate problems, such as the current Covid-19 crisis¹³, but
211 also for more persistent problems, such as to bend the curve in the ongoing biodiversity
212 crisis¹⁴.

214 **Figure legend:**

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216 Figure 1: The ABCD conference format embraces the four criteria “All continents, gender
217 Balance, low Carbon, and Diverse backgrounds” in order to address inclusivity and combat
218 inequity within the science community, while lowering carbon footprint when attending
219 international conferences. The speakers who contributed to the WBF Aquatic Biodiversity
220 session following the ABCD framework came from (blue) or discussed research based on
221 (blue and orange) countries and geographic regions across all continents.

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Author contributions

R.C.B., O.S. and F.A. developed the ABCD format, organised, and hosted a session using the format at the World Biodiversity Forum with R.C.B., A.B., F.J.B., P.C., W.C.F., S.C.J., M.A.K., M.S.M., V.N., J.P., R.S. and X.Z. as speakers. R.C.B., O.S. and F.A. wrote the first draft of the manuscript, and A.B., F.J.B., P.C., W.C.F., S.C.J., M.A.K., M.S.M., V.N., J.P., R.S. and X.Z. contributed to it. R.C.B., O.S. and F.A. wrote the final version of the manuscript. All authors approved this final version. R.C.B. produced the figure.

Competing Interests

The authors declare no competing interests.

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Box 1 Suggestions to consider when using the ABDC conference format.

These are gathered from both organisers and speakers attending the session “Aquatic Biodiversity: state and challenges ahead” at the 2020 World Biodiversity Forum:

- Prior to the event, have a virtual “ice-breaker” with all the speakers to discuss what they will be presenting and how their research may fit together.
- Run through presenting procedures (including technical requirements: microphone, camera) with all speakers using new methods to present (remote or pre-record).
- Ask all presenters to add a photo to all remote or pre-recorded talks on their first slide to make them visible as a person to the audience.
- If facilities allow, have a camera on both the audience and presenter to increase engagement for both parties.
- Ensure pre-recorded presentations are within the time allowance, as time-corrections are not possible.
- Agree on a protocol to ensure remote presenters are aware of the time allowance and if they have exceeded it.
- Local organizers and session chairs may use a flipped classroom for questions - organizers view the pre-recorded talks prior to the session, and bring up discussion points or even questions to the audience, which will then engage in a discussion.
- Engage audience in discussion via Slido.com, Twitter.com or other platforms. Allowing questions to be shared with respective presenters from other time zones when they are available.
- Have a repository where all the talks will be deposited and shared with all those interested.
- Due to the nature of remote and pre-recorded talks, ensure you have sufficient time for discussion/questions and changing of presenters. This may be a bit longer than in classic meeting settings, where there is often a 15 minutes slot for a 13 minutes talk plus two minutes of questions, directly followed by the next talk. Allow an additional 2–5 minutes for discussion and moving to the next speaker (be it live-streamed, pre-recorded or in person).
- Allow sufficient time for discussion at the end of the session.