Report

Governance for Transboundary Freshwater Security MOOC: data analysis, progress, and recommendations

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Executive summary

Transboundary basins account for roughly 60% of global freshwater resources, serving 2.8 billion people or 42% of the global population. Around the world, 153 countries share transboundary water resources. These include 310 shared rivers and lakes, and 592 transboundary aquifers. Governing transboundary freshwater resources in a sustainable and equitable way is crucial to ensuring a water secure world, yet many shared water bodies still face challenges. The massive open online course (MOOC) on Governance for Transboundary Freshwater Security was developed to build the capacity of practitioners and stakeholders involved in this challenge. It was launched in August 2020 by GWP and GEF IW:LEARN in collaboration with multiple partners globally (see GWP MOOC page for list of Partners).

In line with the general idea of improving transboundary freshwater governance, the main goals of the MOOC and MOOC-related activities are:

- **capacity building** of practitioners in transboundary water cooperation, management, and governance
- **dissemination of the latest theoretical and practical knowledge** in the field of transboundary water governance
- laying the foundation for and **building a core community of practice (CoP) and network** around the topics discussed in the MOOC.

Since its launch, the MOOC has attracted more than 2,700 learners from 157 countries. Additionally, 1,100 unique participants joined the online session series associated with the MOOC. Both the event participants and MOOC learners have a diverse professional and geographic background. While the highest share of MOOC learners comes from Europe (30.73%), participants joining from Asia and Africa follow closely with shares of 22.23% and 20.97% respectively. Data from online engagement sessions associated with the MOOC show that the biggest group of participants come from Africa (30.08%) followed by Asia (25.76%) and Europe (24.56%). In the MOOC survey, 44.39% of participants indicated that they are professionals in a MOOC-related industry, and 55.75% of the event registrants are practitioners working for governments, NGOs, international organisations, or the private sector. Students account for 22.91% of MOOC learners and 12.14% of event participants.

These data points indicate that the MOOC and the events are reaching a significant number of people (more than 2,700 MOOC learners and 1,100 unique event participants) from all over the world, who are either working as practitioners in the field of transboundary water governance (44.39% and 37.41%) or are students. Hence, the MOOC and its related activities are contributing to dissemination of the latest theoretical and practical knowledge in the field of transboundary water governance and potentially to capacity building of practitioners and professionals.

Satisfaction rates with the MOOC are very high. In the post-course survey, around 96% of respondents indicated they would recommend the course to others, and close to 100% agreed that this course was valuable for them; 77% of the learners responded that the content covered in each module was just right amount, and 84% responded that the course was just the right length. Approximately half of the respondents indicated that they spent 2–4 hours per module. With regard to important considerations for enrolling in the course, organising institutions (88%) and the calibre of lecturers (77%) were important factors.

Additionally, the data show that there is substantial interest in joining and participating in a CoP: 85.71% of all post-course survey submissions indicated an interest in interacting in a CoP. A similar interest has also been voiced in the events. This interest is also backed by data indicating that roughly 40% (444) of all event participants were joining more than one event and 14.73% (162) joined at least four sessions of the event series. These active participants can be considered a 'core' group who could potentially be encouraged to form a CoP.

This report tries to further evaluate whether the MOOC was able to achieve the goals listed above, who joined both the course and the activities, how learners interacted with the course and participated in the online live events, and what could be done better in future online courses and knowledge products.

1 Introduction

The massive open online course (MOOC) in Governance for Transboundary Freshwater Security has been available on the edX platform since August 2020. It is hosted by the SDG Academy and can be audited by anyone for free. A certificate can be obtained by purchasing the verified track of the course through edX. The course consists of six modules, each of which ends with a short quiz. There is also a mid-term exam at the end of Module 3 and a final exam at the end of Module 6.

As one of the creators of the MOOC, the Global Water Partnership (GWP) brings together experts in transboundary water security for online interactive events related to the MOOC themes called 'Transboundary Freshwater Governance Train'. The events are also an opportunity for MOOC participants, professionals and other individuals to come together and delve deeper into the topic of transboundary water security and cooperation. Since the MOOC launch, ten events have been held – a pilot event in October 2020 and nine events between January and November 2021.

This report aims to contribute to the evaluation of the MOOC one year after its launch, and to identify potential improvements and actions to further strengthen the transboundary water professionals' network.

1.1 Data sources and methodology

Several sources of data were used for the creation of the report. The edX platform collects data on the number of daily registrations for the MOOC. Data on the gender, birth year, location, and highest level of completed education are available on the edX platform's user profiles for a significant portion of the registered participants. In addition, the edX platform collects data on the number of submissions per problem for each module and the two exams. The time period covered by the processed edX data is up to and including 14 July 2021.

The MOOC participants are encouraged to complete a voluntary pre-course survey at the start of the MOOC and a post-course survey upon completing the course. The pre-course survey enquires about the individual's educational and professional background, personal and professional interests related to transboundary water, motivation to enrol in and expectations for the MOOC, and personal identifiers such as country of affiliation, gender, age, native language, etc. The post-course survey enquires about the learner's experience while following the MOOC – length, intensity, quality, usefulness, engagement on the discussion forum, etc. As of 14 July 2021, the response rates for the pre- and post-course surveys (as a proportion of the number of registrations) were 18.7% and 3.9%, respectively. Given that the number of data points for the demographic information (gender, age, location, and highest level of completed education) was higher in the edX data than in the pre-course survey, the edX data were used to analyse these variables. The post-course survey was primarily used to extract qualitative conclusions from the answers because the response rate was low, and the cohort of post-course survey respondents may therefore be an unrepresentative sample.

Sign-up for the MOOC-related interactive events was through a registration form collecting information about participants' locations, job titles, and affiliations. Participants had to sign up for each event separately. Some participants who attended several events signed up using different email addresses, which may have skewed parts of the analysis that rely on the email address as an

indicator of an individual participant. The data from this sign-up form were used to compare the demographic composition of the event participants with that of the MOOC learners. Data about the number of attendees were available from the event-hosting plaftorm (Zoom). It was used to track the event attendance rate (relative to the number of registrations) for each of the interactive events.

The interactive events included short real-time surveys about key takeaways and suggestions for future events. These were done using the Poll Everywhere (PollEv) audience participation tool. The responses were manually counted and clustered into themes, which were then used to evaluate the topics of interest for the participants. At the end of Events 5 and 6, short surveys were completed by the attendees. These provided information about the attendees' preferences for post-event engagements.

In cases when the participants' countries were categorised into continents, the ISO 3166 country classification in combination with a continent classification data set[1] was used. According to this classification, North America also encompasses Central and Carribean America. Countries that lie on two continents or whose continent affiliation is disputed were assigned one continent. This was the case with Turkey, Cyprus, Russia, Georgia, Armenia, and Azerbaijan, all of which were considered to be part of Europe.

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[1] As there is no standardised way to link countries to continents, we used an open-source data set to link the ISO 3166 country codes in the Zoom reports to their respective continents. The data set can be accessed here: https://gist.github.com/stevewithington/20a69c0b6d2ff846ea5d35e5fc47f26c

2 Profile of MOOC participants

This section is based on the data from the edX platform up to and including 14 July 2021. For some of the demographic indicators below, the data used are incomplete because not all enrolled participants included them on their edX user profiles. Table 1 summarises the share of participants for whom data on the demographic/geographic indicators were available.

Table 1. Data coverage for demographic/geographic indicators

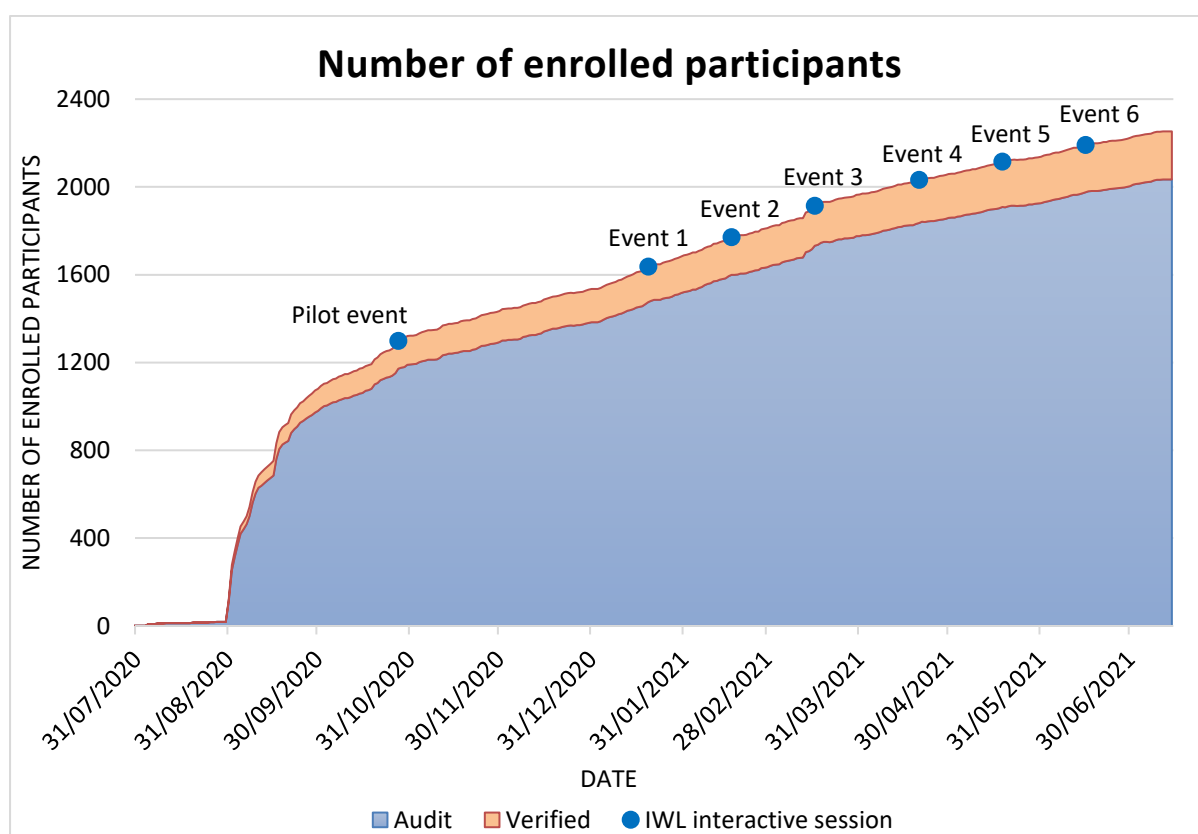| Indicator	Birth year	Gender	Location	Highest attained education level
Response rate	48.6%	49.8%	70.5%	48.2%

Figure 1. Number of enrolled participants from the MOOC launch to 14 July 2021.

The number of enrolments increased rapidly as the MOOC was rolled out (Fig. 1). After the pilot event, the number of participants increased approximately linearly. There were minor spikes in enrolments in the days leading up to some of the MOOC-related international water law (IWL) interactive events. On 14 July 2021, there were 2,253 registered learners, of whom 219 (9.7%) were in the verified track. The three days with the largest numbers of newly enrolled participants coincided with the period when the academic year begins in most countries in the Northern

Hemisphere. These three days were 1 September 2020 (160 enrolments), 31 August 2020 (99 enrolments), and 16 September 2020 (81 enrolments).

Table 2 summarises the number of new enrolments each month as well as the average daily rate of new enrolments per month. The largest increase in enrolments happened in September 2020, with 962 new participants added. After that, there was a slowdown in the sign-up rate from October to December 2020. The sign-up rate then increased between January and March 2021, after which it decreased again between April and July 2021.

Table 2. Monthly variations in enrolments

Year	Month	New enrolments	Daily rate of new enrolments	Percentage change in the daily rate of new enrolments relative to previous month
2020	August	117	3.77	N/A
	September	962	32.07	↑ +749.6%
	October	242	7.81	↓ −75.7%
	November	113	3.77	↓ −51.7%
	December	100	3.23	↓ −14.4%
2021	January	154	4.97	↑ +54.0%
	February	124	4.43	↓ −10.9%
	March	153	4.94	↑ +11.4%
	April	93	3.10	↓ −37.2%
	May	78	2.52	↓ −18.8%
	June	86	2.87	↑ +13.9%
	July (1–14)	30	2.14	↓ −25.2%
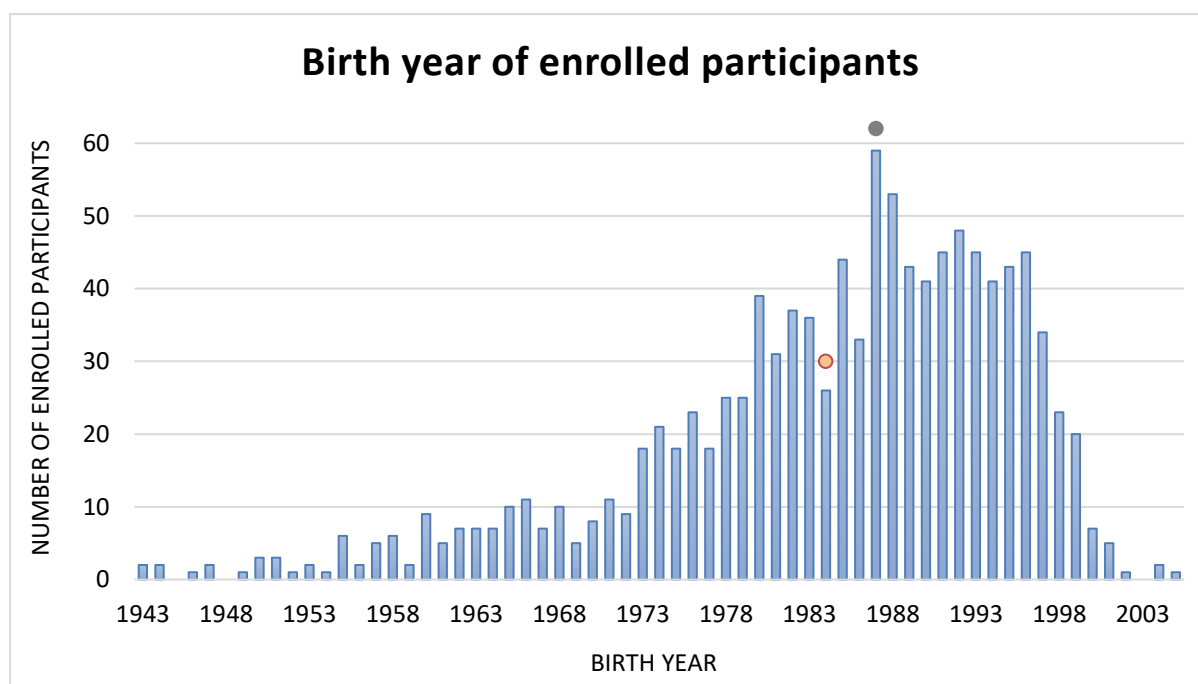
Figure 2. Enrolled participants by birth year (orange = mean, grey = median).

Participants by age

4,8%

12,6%

28,3%

54,2%

- 16–25
- 26–39
- 40–59
- 60+

Participants by gender

0,3%

44,9%

54,8%

- Female
- Male
- Other
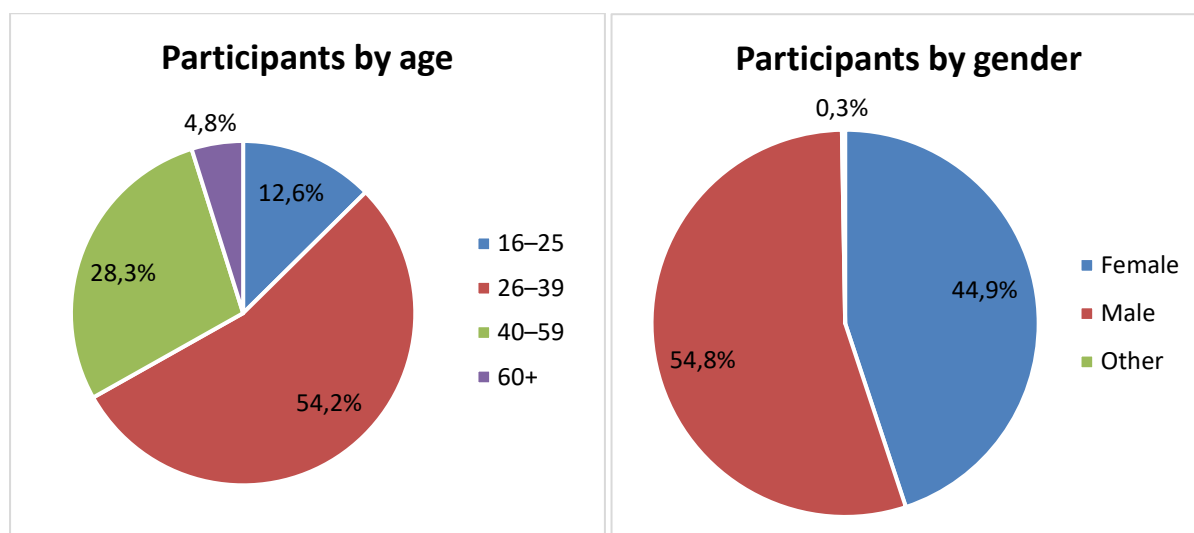
Figures 3 and 4. Enrolled participants by age group (left) and gender (right).

As is evident from Figs 2 and 3, the dominant age group accounting for over half of the enrolled participants was 26–39. The second most represented group was 40–59. The youngest age group (16–25) accounted for about 13% of the enrolments. When it came to gender make-up (Fig. 4), there were slightly more male than female participants enrolled in the MOOC.

Enrolled participants by education level

1,1%

5,8%   2,3%

11,3%

27,8%

51,7%

- Secondary school
- Associate degree
- Bachelor's degree
- Master's degree
- PhD
- Other

Enrolled participants by continent

5,3%   2,6%

18,2%

22,2%

21,0%

30,7%

- Asia
- Europe
- Africa
- North America
- South America
- Oceania
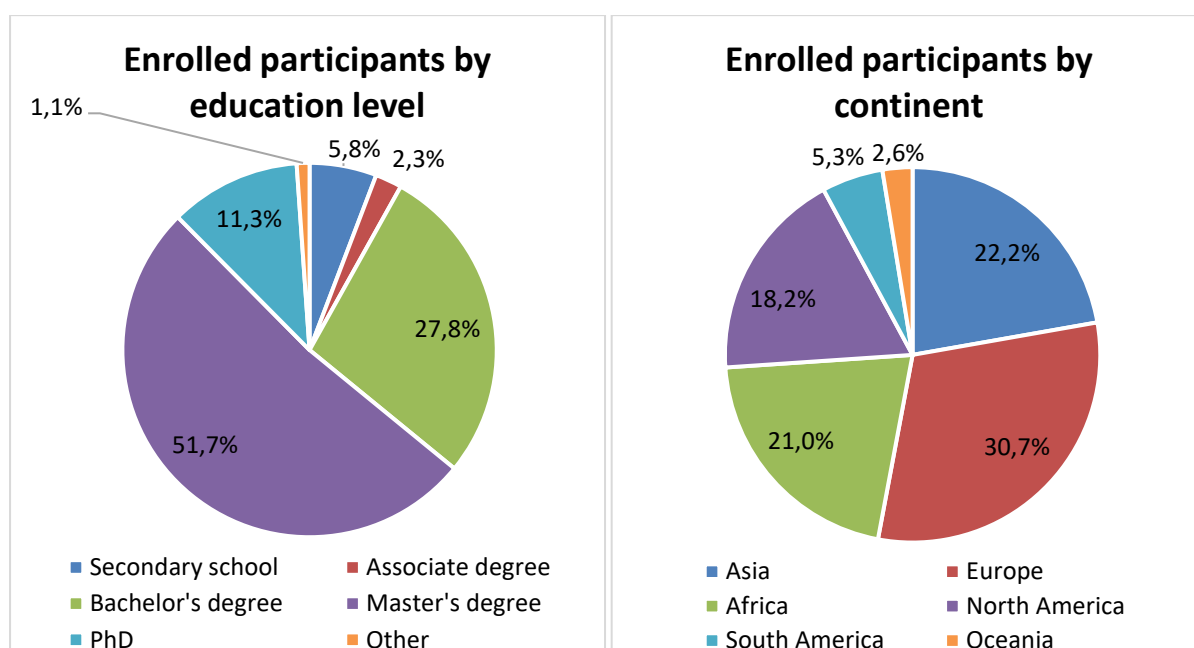
Figures 5 and 6. Enrolled participants by highest attained education level (left) and continent (right).

For slightly over a quarter of the enrolled participants, a bachelor's degree was the highest attained education level. At the same time, close to two thirds of the enrolled participants had a master's or higher level of education. The share of participants with a PhD was approximately 11% (Fig. 5). Close to one third of the enrolments came from Europe, whereas approximately 21–22% each came from Asia and Africa. The Americas accounted for nearly a quarter of the sign-ups (Fig. 6).
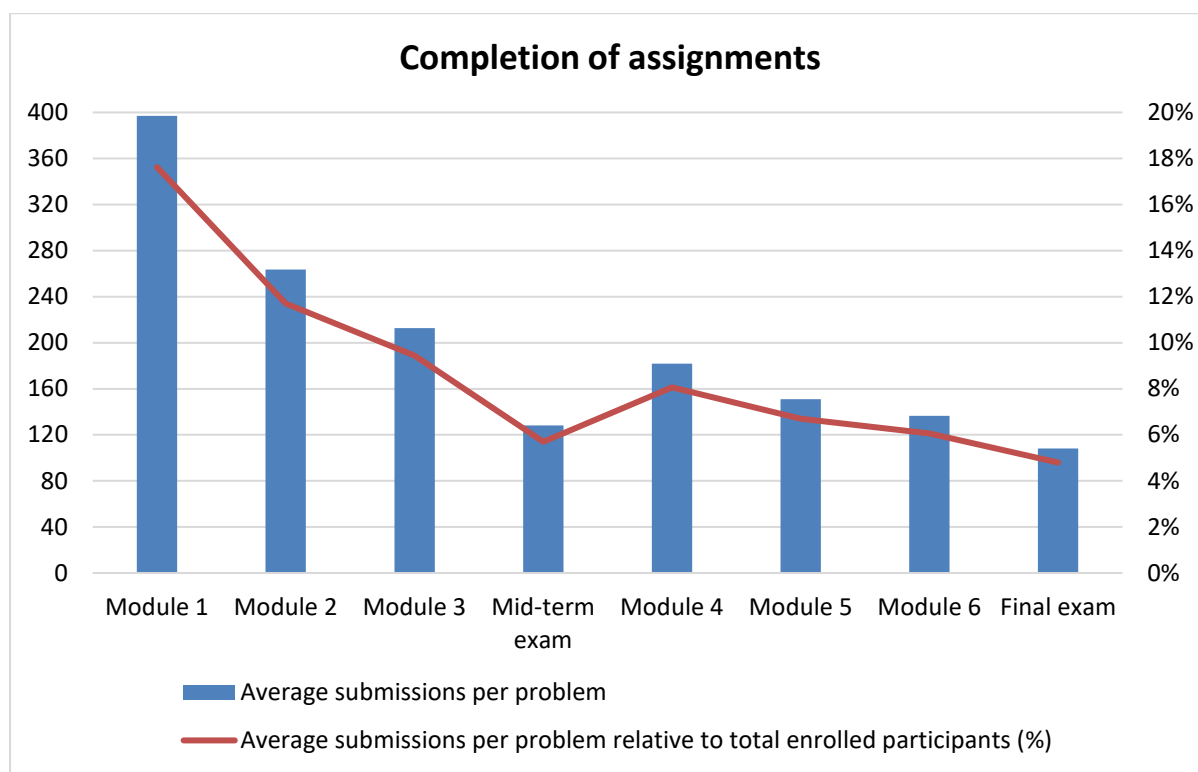
Figure 7. Assignment submission rates for end-of-module quizzes and mid-term and final exams.

The course contains ungraded quiz questions, as well as mid-term and final exams that are only available for learners taking the verified certificate track. The number of submissions per problem[2] decreased with each consecutive module (Fig. 7), which can be explained by the fact that learners typically follow the course starting from Module 1 and moving on to following modules. Learners are not required to submit any quiz questions at the end of each module in order to proceed to the following module in the MOOC.

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[2] edX defines 'problems' as ungraded quizzes, that are, in our case, the end-of-module quizzes. Graded problems are the mid-term and final exams that are only accessible to verified learners.

3 Interest in the MOOC

This section is based on the 422 responses from the pre-course survey received as of 14 July 2021. However, not all respondents answered all the questions.
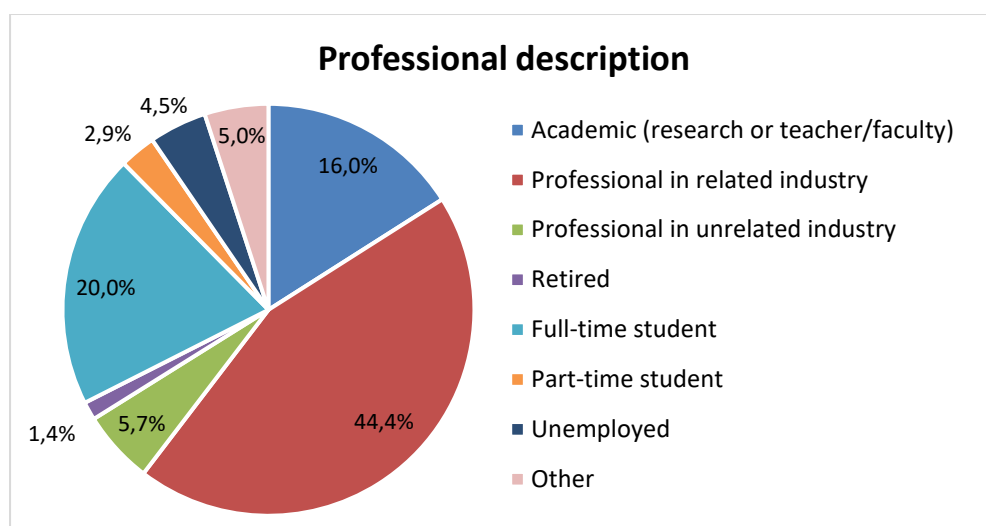

Figure 8. Professional description of the pre-course survey respondents.

The respondents were predominantly professionals in a related industry (Fig. 8). Approximately 44% of them indicated that they worked in a related industry whereas 5.7% were professionals in an unrelated industry. Full- and part-time students combined made up nearly a quarter of the responses whereas academics constituted 16% of the respondents.
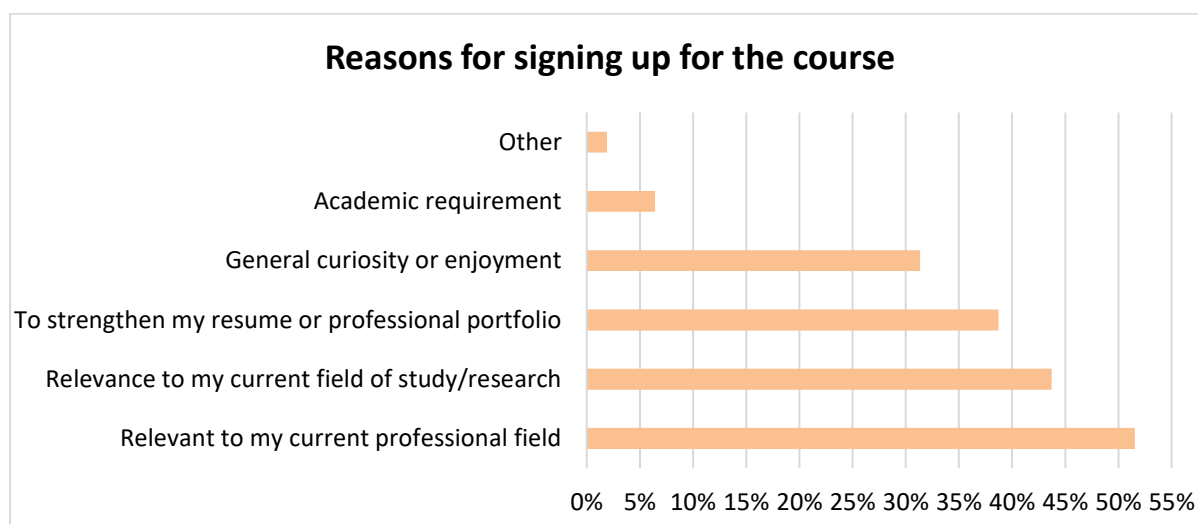

Figure 9. Reasons for signing up for the MOOC among the survey respondents.

Just over half of the respondents indicated that the course was relevant to their current professional field whereas approximately 44% found it relevant to their current field of study or research (Fig. 9). Close to 40% of the respondents signed up to strengthen their resume and professional portfolio.

Approximately 31% signed up because of general curiosity and just over 6% because it was an academic requirement for them. The respondents were able to list several reasons.
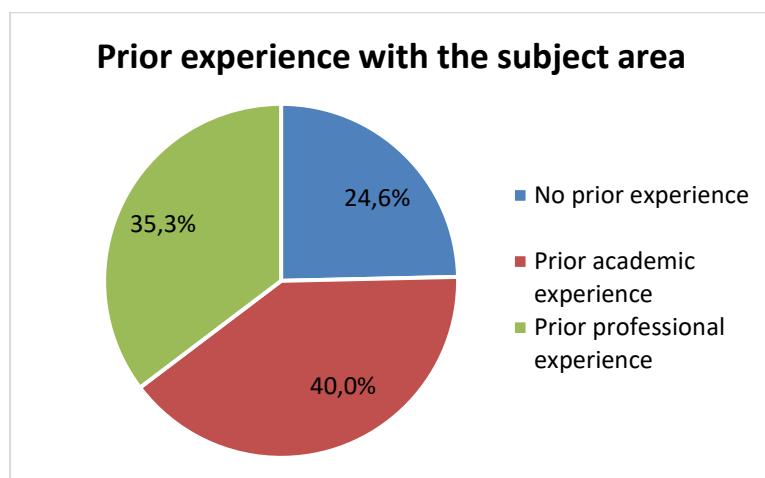
Prior experience with the subject area

- No prior experience
- Prior academic experience
- Prior professional experience

24,6%
40,0%
35,3%

Figure 10. Prior experience with the MOOC's subject area among the survey respondents.

One quarter of the respondents had no prior experience in the subject area. The remaining participants had either academic or professional experience with the course's subject area (Fig. 10). However, this question in the survey did not allow for more than one option to be selected, and it appears from the answers to the subsequent question that many respondents had both prior academic and prior professional experience. Figure 10 also shows that there is no single dominant group in the MOOC community with regards to prior experience. Thus the content, events, and engagement need to be tailored in a way that encompasses all three groups.

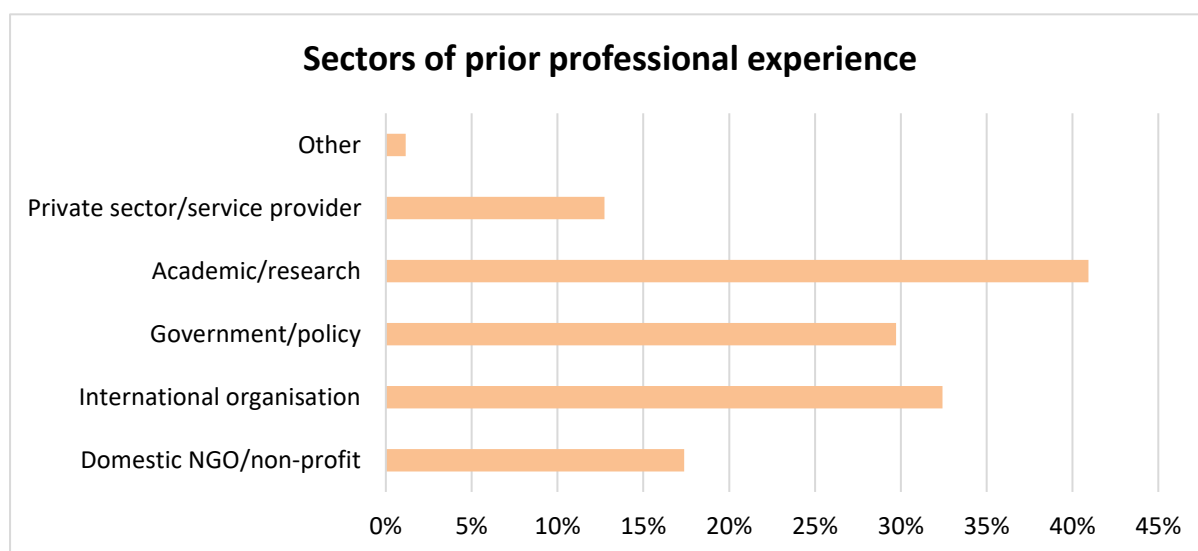**Sectors of prior professional experience**

Figure 11. Sectors of prior professional experience among survey respondents.

From the respondents with prior professional experience in the subject area (259), the dominant sector of prior experience was academic/research, accounting for 41%. Approximately 30% of the respondents had experience in government/policy and just under a third in international

organisations. Smaller numbers have worked in the private sector or the domestic non-profit sector in this subject area (Fig. 11).

When asked about the role they play in transboundary water management, the respondents gave a range of different answers. In total, 150 of them provided an answer with the role they played. The most represented group was that of researchers, accounting for close to 20% of the responses. A significant number also worked as hydrologists and water resource and infrastructure managers. A few of them worked on transboundary water management projects for international organisations or regional institutions. Ten respondents stated that their work focused on hydrodiplomacy, mediation, and negotiations. Several worked directly or as consultants and technical advisers for government ministries. A handful of responses included location-specific roles – Uganda, South Africa, Meuse, Dniester, North Africa, South Asia, La Plata, Ecuador, and Peru. Figure 12 shows a word cloud of the most common words appearing in the responses about the roles played in transboundary water management.

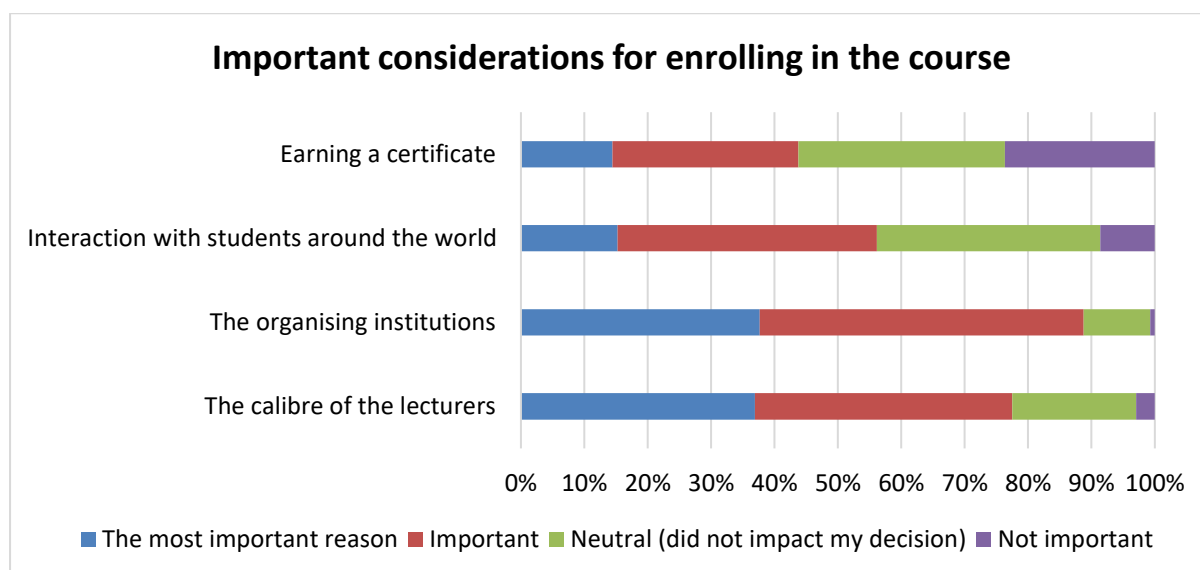Figure 12. Word cloud of responses about the roles played in transboundary water management.

Figure 13. Important considerations among survey respondents for enrolling in the course.

Figure 13 shows that close to 80% of the survey respondents agreed that the calibre of the lecturers was important or the most important reason for enrolling in the course, whereas close to 90% agreed that the organising institutions were important or the most important reason. The responses were more divided when it came to the benefits of earning a certificate and interacting with students around the world. Approximately 56% of the respondents stated that the interaction with students around the world was important or the most important factor in their decision as to whether or not to join the course. Earning a certificate was important or the most important factor for 44% of the respondents.

4 Evaluation of and engagement with the MOOC

This section is based on the 87 responses from the voluntary post-course survey received as of 14 July 2021. Some of the questions were not answered by all respondents. It is also worth mentioning that there is no proof that all survey respondents had actually completed the course as this data is not available. Given the low response rate, the information from this section may be used as guidance for further course improvements rather than for drawing statistically meaningful conclusions about the participants' experience with the MOOC.
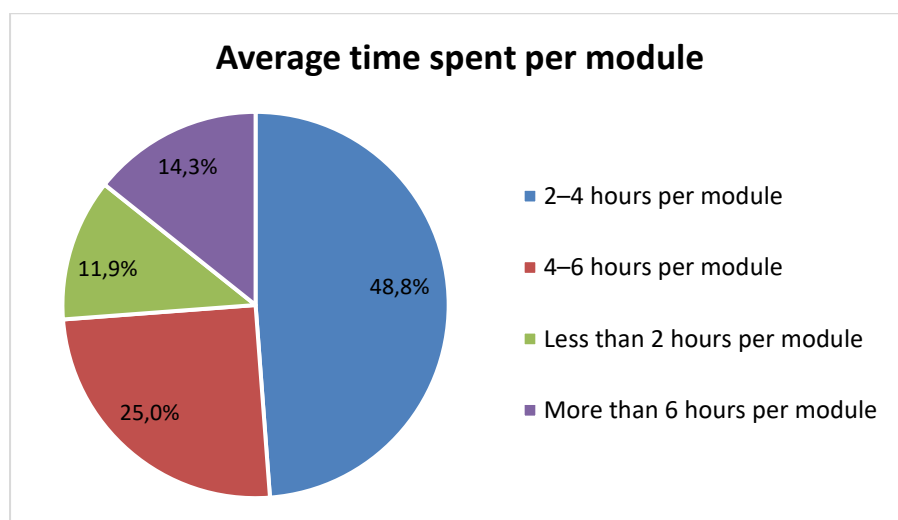
Figure 14. Average time spent per module among post-course survey respondents.

In total, 84 participants answered the question about how much time they spent on each module (Fig. 14). Approximately half of them spent 2–4 hours per module with another quarter spending 4–6 hours per module. The number of respondents spending less than 2 hours per module was similar to the number taking more than 6 hours per module – each group accounted for 10–15% of the total responses. The course description on the edX platform states that the course takes up approximately 4–6 hours per week for a period of six weeks. Thus around 60% of the respondents spent less than the estimated time per module.
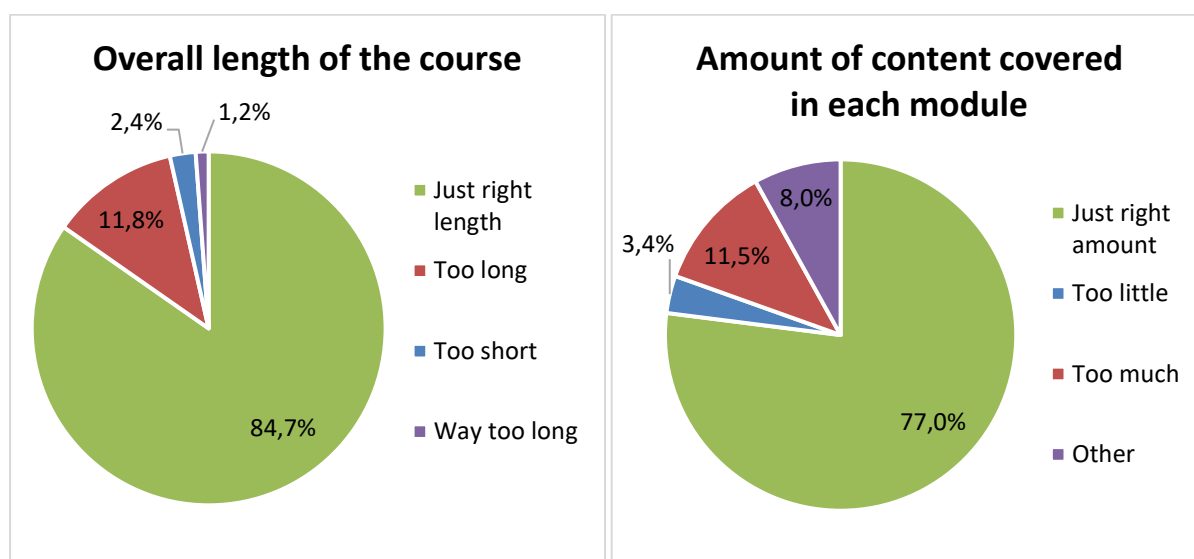
Figures 15 and 16. Overall length of the MOOC (left) and content covered in each module (right) according to the survey respondents.

In total, 85 participants answered two questions on the overall length of the course and the amount of content in each module (Figs 15 and 16). The vast majority of responses (85%) suggested that the length of the course was just right. Around 12% of the respondents indicated that the course was too long. A similar number of respondents indicated that the amount of content covered in each module was too much. Just over three quarters of the respondents agreed that the content covered was just the right amount. A few respondents wrote their own answers to the second question –

three suggested that some modules could be made shorter while one respondent wished the modules went into greater depth.
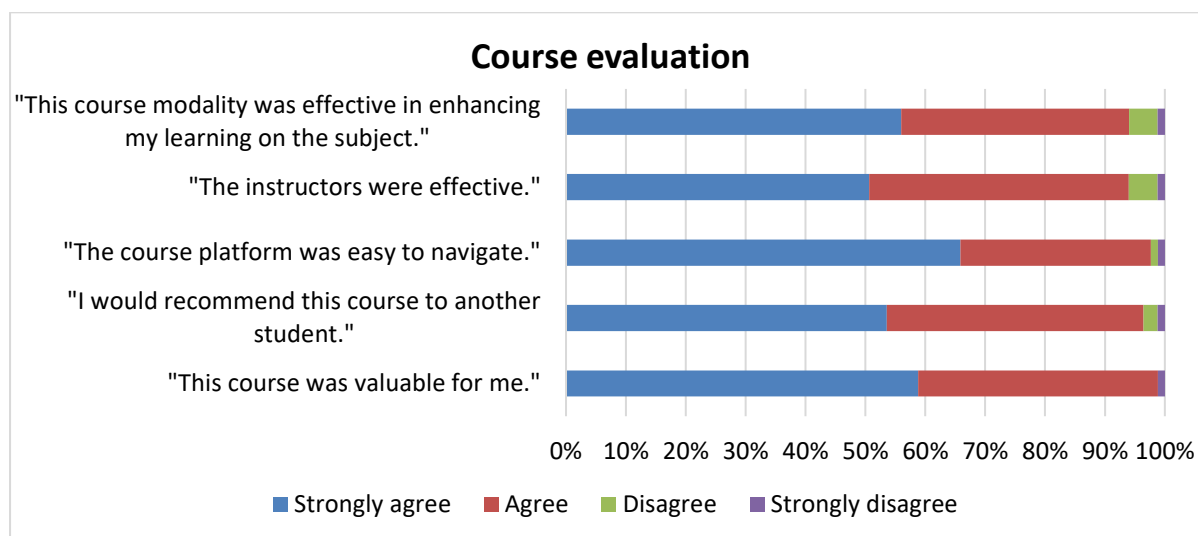

Figure 17. Agreement with the course evaluation statements.

There were 83–85 responses to the course evaluation (Fig. 17), although the number varied between statements. The feedback was overwhelmingly positive given that for each statement over 90% of the respondents expressed agreement or strong agreement.

When asked about what they enjoyed most about the course, 66 respondents answered. The most common theme, present in a third of all responses, was the case studies. Several of them mentioned the good balance between lectures and case studies, theory, and practical experiences. They commented on how the case studies made the learning more tangible, understandable, and practical. A handful of responses mentioned the lecturers' expertise as the thing they enjoyed the most about the course. The IWL interactive sessions, the opportunity for language practice, and the time flexibility, i.e. the ability to follow the course at one's own pace, were also mentioned. Thirty-seven learners replied to the question about what they enjoyed the least about the course. The majority of the comments related to long videos (over 10 minutes) as well as the poor sound quality of some of the videos. The discussion forum was listed by a few respondents as the thing they enjoyed the least. One response suggested that many of the videos about case studies were too short and not very informative.

There were 56 responses to the question about ways in which the participants planned to use what they had learned from the MOOC. Some respondents mentioned they would use the lessons from the course to advance their education (e.g. research, PhD, master's thesis) or pursue new work opportunities. Several of them planned to use what they had learned in their work in transboundary river basins. One respondent that works as a consultant mentioned how, thanks to the course, he could use the right language to better explain concepts to his clients. Another respondent found some of the concepts also applicable in non-transboundary basin management. A few respondents planned to use what they had learned to develop and get funding for new transboundary projects. In terms of the spatial distribution of the respondents who indicated where they would apply their learning, South America was the dominant region with Lake Titicaca, Salí-Dulce, and La Plata River being some of the basins mentioned.
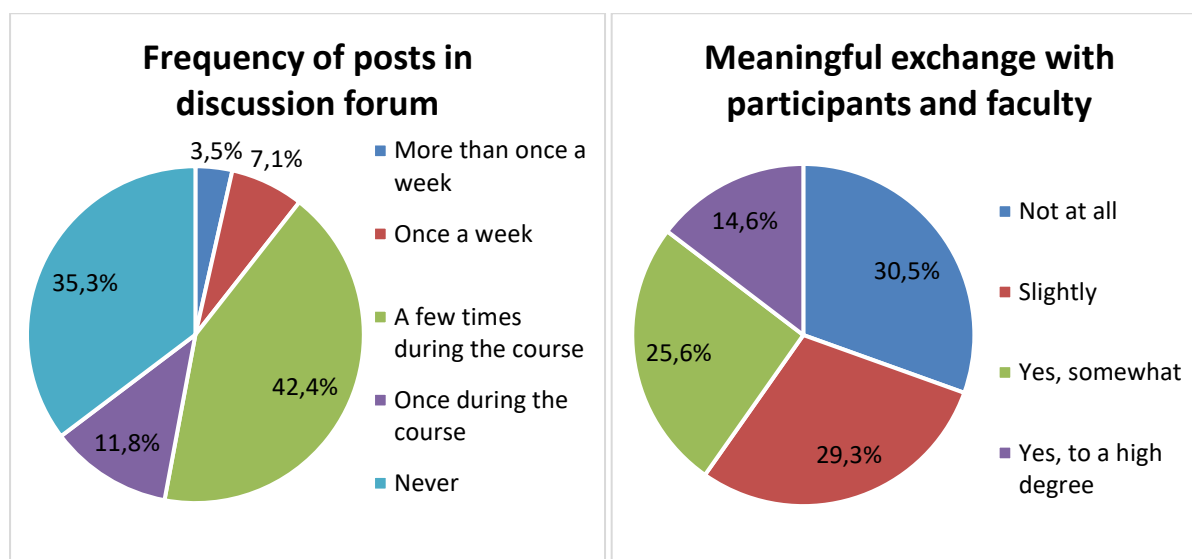
Figures 18 and 19. Frequency of posting in the discussion forum (left) and share of respondents who have (not) had meaningful exchange with other participants and faculty (right).

The low level of engagement in the discussion forum was also evident from the survey responses. Close to half of the respondents posted at most only once in the discussion forum. Just over 10% of the respondents posted once or more than once a week (Fig. 18). At the same time, around 60% of the respondents stated that they had no or only slight meaningful exchange with other course participants and faculty. The share of respondents who had a high degree of meaningful exchange was just under 15% (Fig. 19). The opportunities for exchange were mostly through the discussion forum and during the IWL interactive (online) sessions. When asked to comment on the quality of the interactive features, i.e. the discussion forum and the online live sessions, 48 survey respondents gave an answer. The comments about the IWL interactive sessions were overwhelmingly positive. Several respondents mentioned that it was great that the sessions were recorded in case they could not join live because of the time difference or personal obligations. While some respondents found the discussion forum useful, several commented on its shortcomings, two of which were the lack of personal interaction and the design of the discussion forum by the edX platform. Some of the responses concerning the discussion forum are given below:

- "If edX could somehow make the discussion area more approachable it would be nicer to engage in dialogue."
- "As a stay-at-home parent responsible for educating my child, I was not able to access this course anywhere near the way I wanted to. The discussion prompts were good and interesting but unfortunately real discussion rarely took place."
- "I feel the discussion forum is difficult to use – its usability (I'm using a desktop with very large screen) was a major factor why I did not feel like engaging that much with others. It may be that others felt also so as many of the posts felt superficial."
- "The interactions are good but I noticed it was one-way posting of thought and not iterative interactions and discussion among trainees. This perhaps could be improved if there is a way to organise an event where trainees could discuss among themselves and share experience."

4.1 Engagement after the MOOC

Some of the questions in the post-course survey dealt with the respondents' interest in engaging with the MOOC and the wider transboundary water community through a community of practice (CoP) after completing the course. The goal of such a community would be to facilitate the translation of knowledge into actions for improving transboundary water cooperation and management. This section summarises the answers from the post-course survey questions concerning the CoP.
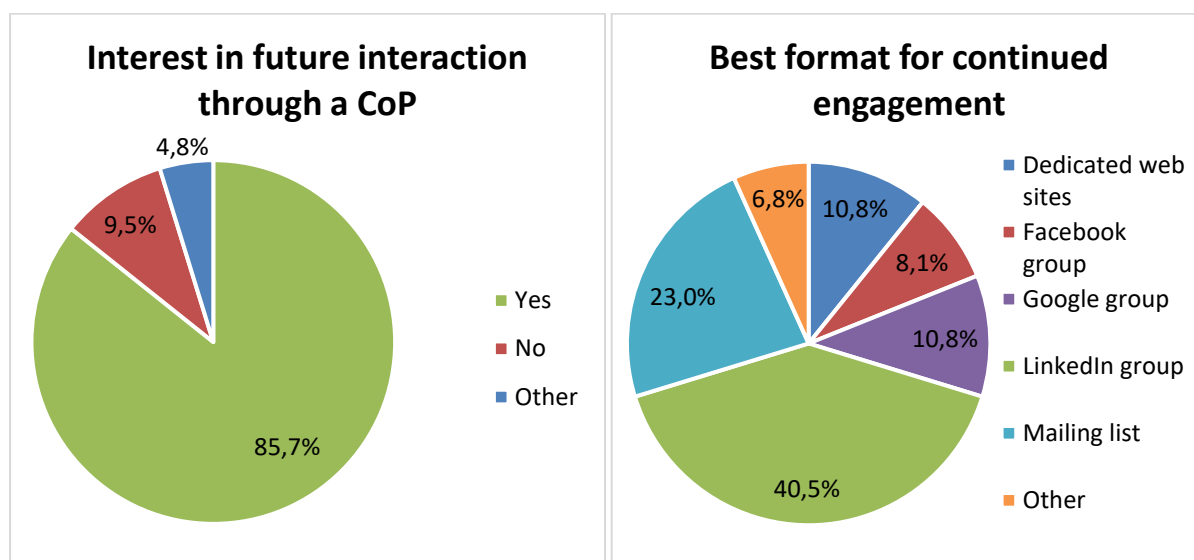
Figures 20 and 21. Respondents' interest in engagement through a community of practice (CoP; left) and preferred format for continued engagement on the topic (right).

In total, there were 84 responses to the first question and 74 responses to the second one on this subject. When asked if they would be interested in interacting with other course participants and professionals in the field through a CoP in the future, almost 86% of the respondents replied affirmatively (Fig. 20). In addition, a couple more said that they might be interested or that it would depend on the specific topic. Most of these respondents (around 40%) opted for a LinkedIn group as the most suitable format for continuing their engagement with the topic (Fig. 21). The most common argument for this was that LinkedIn was already used as a network for professional engagement and networking. The second most popular format for further engagement, with close to a quarter of the responses, was a mailing list. Smaller groups were interested in a Facebook group, Google group, or dedicated websites.

When asked about why they would want to engage with others through a CoP and what topics they would like to engage with, 48 survey respondents gave an answer. Overall, the respondents wanted to engage further in order to network, expand their knowledge, share experiences, and connect with others from the same basin. The dominant topic of interest was water diplomacy and negotiations. In addition, a few responses included financing and groundwater as topics of interest.
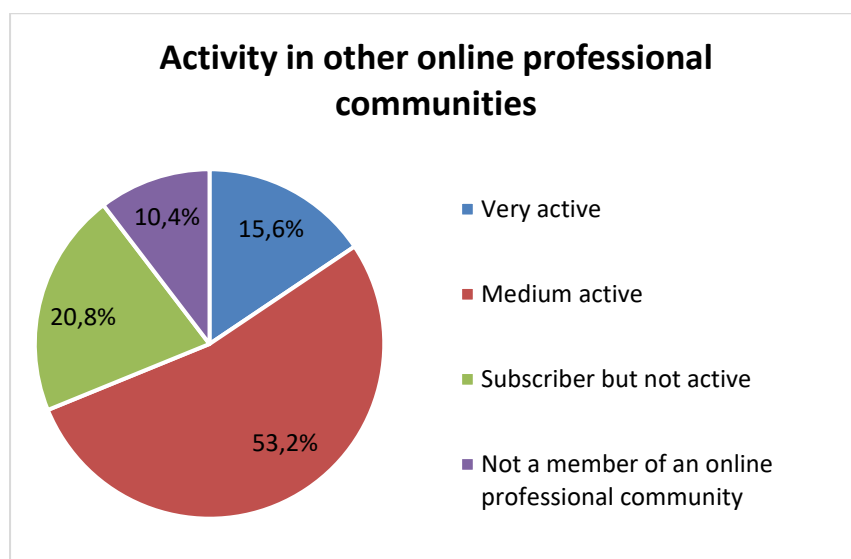
Figure 22. Respondents' activity in other online professional communities.

There were 77 responses to the question about the respondents' activity in other online professional communities that they use for exchanging ideas with others (Fig. 22). Slightly over half of the respondents identified as being medium active. A fifth of them were only subscribers, i.e. passive members, whereas close to 16% were very active in other online professional communities.
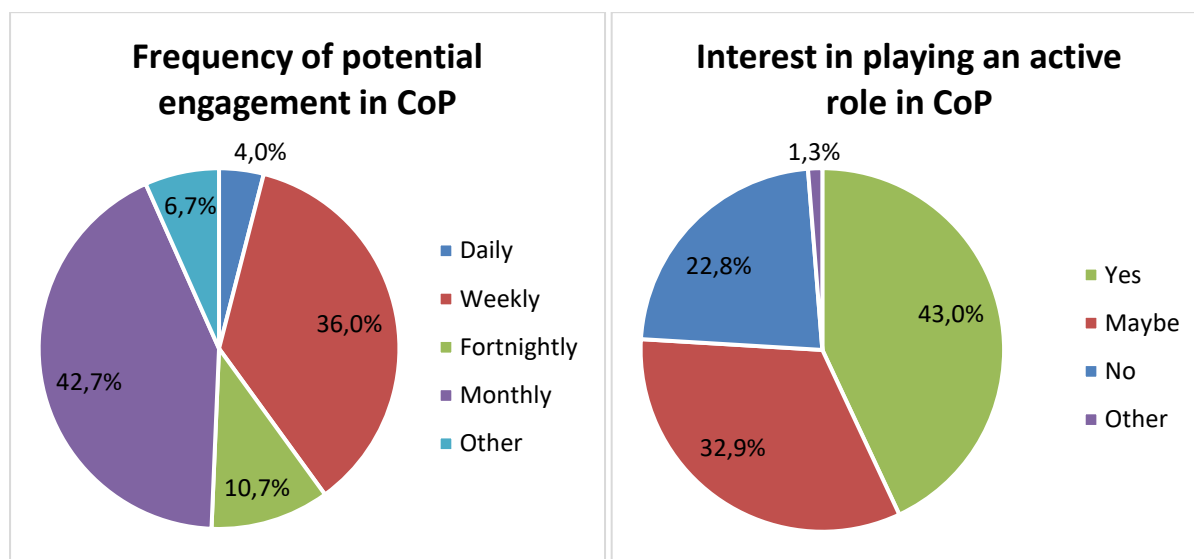
Figures 23 and 24. Respondents' frequency of potential engagement (left) and interest in playing an active role in the community of practice (CoP) for the MOOC alumni (right).

When asked about how frequently they could engage if an online CoP for MOOC alumni was created, 75 survey respondents gave an answer (Fig. 23). Approximately one half of them would be willing to engage at least once every fortnight whereas the other half would engage no more than once a month. Most of the respondents appeared to be able to engage either weekly or monthly. This split could be indicative of the different results that the respondents may want to achieve from any further engagements with the MOOC alumni. Seventy-nine respondents answered the question on whether or not they would be willing to play an active role in the suggested CoP (Fig. 24). Out of these, 43% answered affirmatively whereas approximately one third were unsure.

5 MOOC interactive sessions

This section is based on data from the registration and attendance reports from the MOOC interactive sessions (excluding the pilot session in 2020). In addition, data from the real-time event surveys and PollEv questions asked during the sessions was used to identify the key learning points for the participants as well as the best format for their further engagement.

The MOOC online sessions are interactive online events hosted on Zoom that tackle a wide variety of topics discussed in the MOOC. While the MOOC only allows for indirect interaction among MOOC learners, the live events enable participants to directly engage in discussions with the panellists in Q&A and breakout segments. These live discussions are vital for the MOOC to be able to provide a learning experience that is interactive and engaging. A first pilot MOOC online event was conducted in 2020. Based on the positive feedback received, nine subsequent sessions took place in 2021. The session dates, topics, and co-organisers are listed below including a link to the recordings, session materials, and a short recap of the event:

Event 1: Transboundary Water Agreements (10 a.m. CET on 19 January 2021), co-organised by the Wuhan International Water Law Academy (IWLA)

Event 2: Ecosystems, International Law, and Transboundary Water Cooperation (10 a.m. CET on 16 February 2021), co-organised by the Wuhan International Water Law Academy (IWLA)

Event 3: River Basin Organisations (RBOs) and the Implementation of Treaty Commitments (3 p.m. CET on 16 March 2021), co-organised by the Wuhan International Water Law Academy (IWLA)

Event 4: International Water Law and Climate Change (10 a.m. CEST on 20 April 2021), co-organised by the Wuhan International Water Law Academy (IWLA)

Event 5: International Water Law and Infrastructure (11 a.m. CEST on 18 May 2021), co-organised by the Wuhan International Water Law Academy (IWLA)

Event 6: International Water Law and Transboundary Groundwater (3 p.m. CEST on 15 June 2021), co-organised by the Wuhan International Water Law Academy (IWLA)

Event 7: International Water Law and Dispute Settlement (3 p.m. CEST on 21 September 2021), co-organised by the Wuhan International Water Law Academy (IWLA)

Event 8: The Source-to-Sea Approach in International Water Law (3 p.m. CET on 19 October 2021), co-organised by the Wuhan International Water Law Academy (IWLA)

Event 9: Water Diplomacy and Negotiation (3 p.m. CET on 16 November 2021), co-organised by the Stockholm International Water Institute (SIWI) and the UNESCO International Centre for Water Cooperation (ICWC)

5.1 Registration and attendance patterns

This section analyses the distribution of the registered participants by occupation sector and location as well as the variations in registration and attendance numbers from one session to another. It also looks at the connection between numbers of MOOC learners and event attendees. The data used is from Events 1 to 9. In total, 1,100 different event registrants and 693 different event attendees were identified based on their email addresses. The cases of individuals registering for several events using different email addresses were manually identified by comparing the personal information provided in the registration forms. These were then edited so that each individual corresponds to only one email address. Duplicate registrations for a single event using different email addresses were removed if identified.
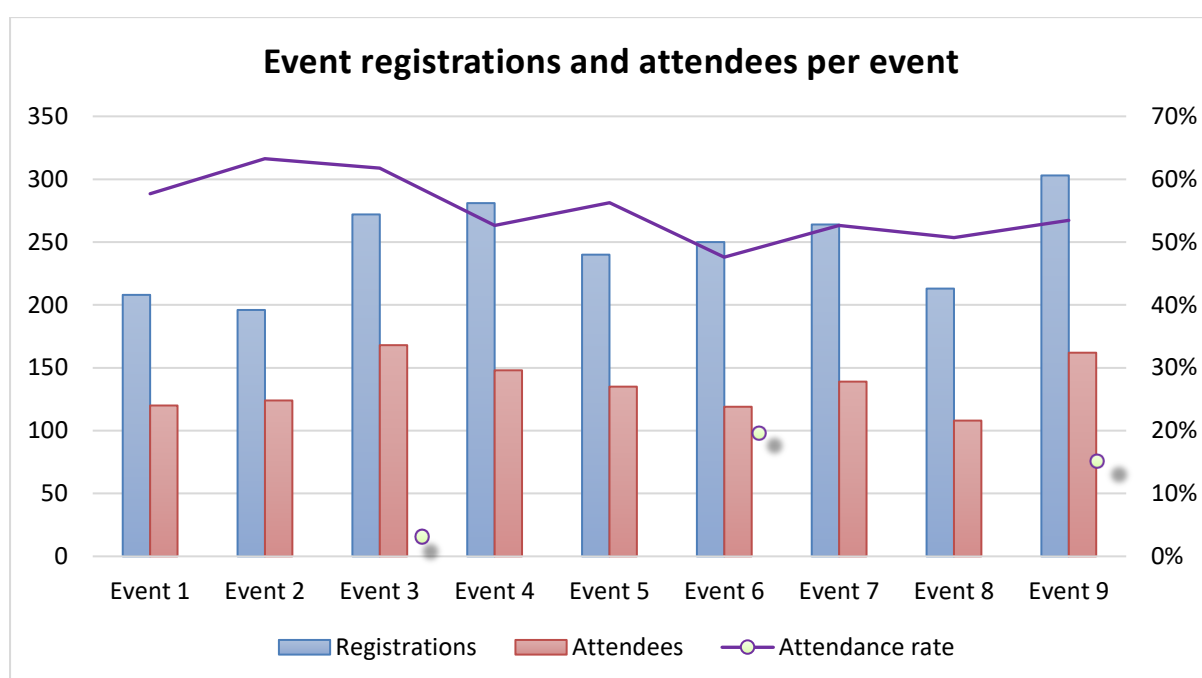

Figure 25. Number of registrations and attendees for Events 1–9.

The number of registrations varied from 196 for Event 2 to 303 for Event 9 (Fig. 25). The largest increase in registrations between two consecutive events was from Event 2 to Event 3, with the number of registrations increasing by nearly 40%. After Event 4, there was a small decrease in registrations, with 240–250 registrants for events 5 and 6. After the summer break, the event series started into its second season and began with 264 registrations, dropped to 213, and then reached an all time high with 303 registrations for the concluding event of the series in 2021.

When it came to the number of attendees, that is registered participants who joined the live event via Zoom, the maximum was observed at Event 3 (168 attendees) and the minimum at Event 6 (119 attendees). The attendance rate, which is the ratio of event attendees to event registrants, ranged from 48% at Event 6 to 63% at Event 2. Over time, attendance rate leveled off and stayed on a constant level at around 50%.
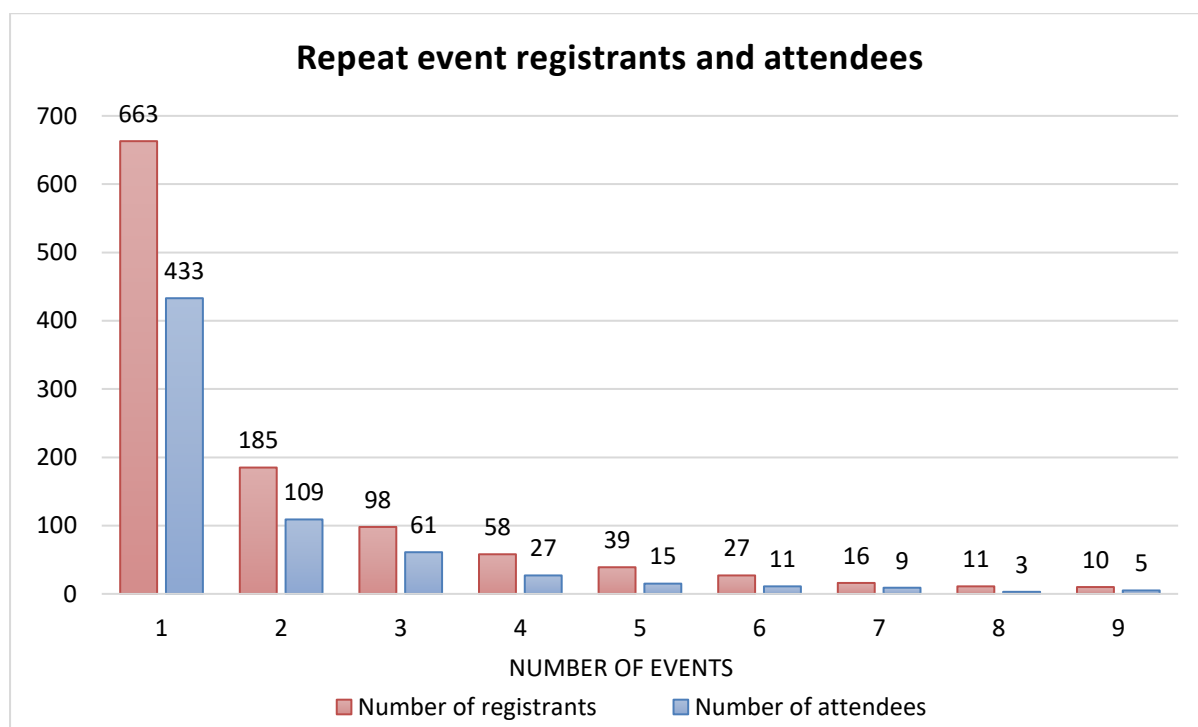
Repeat event registrants and attendees

Figure 26. Number of event registrants and attendees based on how many events they attended.

Out of the 1,100 identified registrants, the majority (~60%) signed up for only one event (Figs 26 to 28). Likewise, the majority (~64%) of the 673 identified attendees attented only one event. Around 40% of the individuals (444 registrants) identified from the registration reports signed up for two events or more whereas around 35% of those identified from the attendance reports attended at least two events. The number of individuals who registered for or attended four or more events comprised 14.73% (162) of all registrants and 10.4% (70) of all attendees. These data potentially indicate that many participants were primarily driven by their interest in a specific event topic or certain panellists when deciding whether or not to register. Still, a considerable number of people regularly attended the MOOC events and could be regarded as a 'core' group, which could be, for instance, further engaged in a CoP. The fact that the number of people who learned of the event series increased after the first event could also have driven up the number of single-event registrants or attendees.
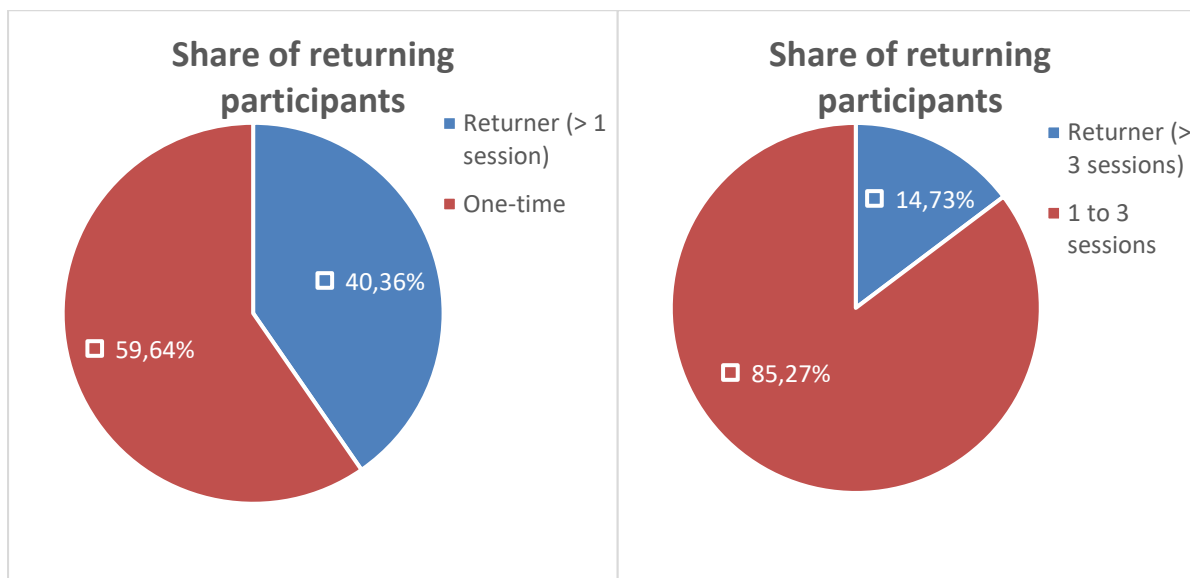
Figures 27 and 28. Share of participants registering for more than one (left) and at least four sessions (right).
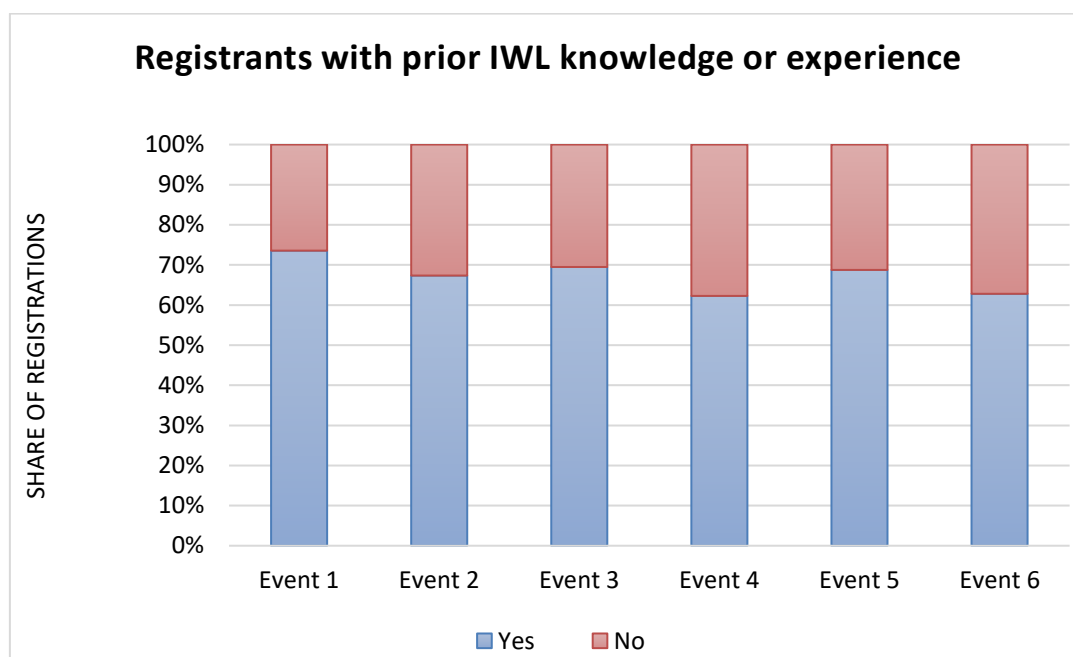

Figure 29. Event registrants based on background in IWL[3].

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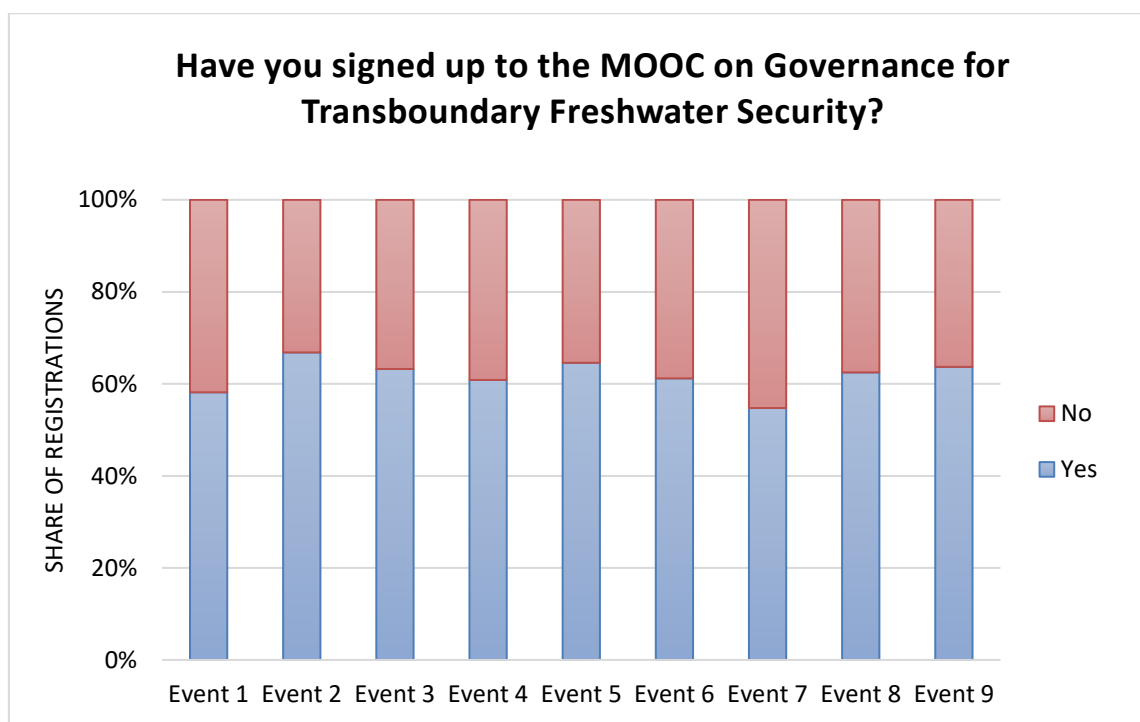[3] The question about IWL background was dropped after the sixth event.

Figure 30. Event registrants based on MOOC participant status.

The share of registered participants with previous knowledge of or experience in international water law was highest at Event 1 (74%) and lowest at Event 4 (62%). The proportion of registrants with prior background in IWL slightly decreased in the later events (Fig. 29). Even though the number decreases in relative terms, it is relatively steady in absolute terms because of the increasing number of total registrations per event.

The share of event registrants who were also MOOC participants averaged 62% across the nine events with no clear trend suggesting a steady increase or decrease over time (Fig. 30). Given the increase in total registrations per event, the absolute numbers of both those enrolled in the MOOC and those who were not also increased over the course of the interactive sessions. Moreover, the significant increase in event registrations from Event 2 to Event 3 corresponds with the increased daily rate of new enrolments in the MOOC that was observed in the days preceding Event 3 (see Figs 1 and 25).
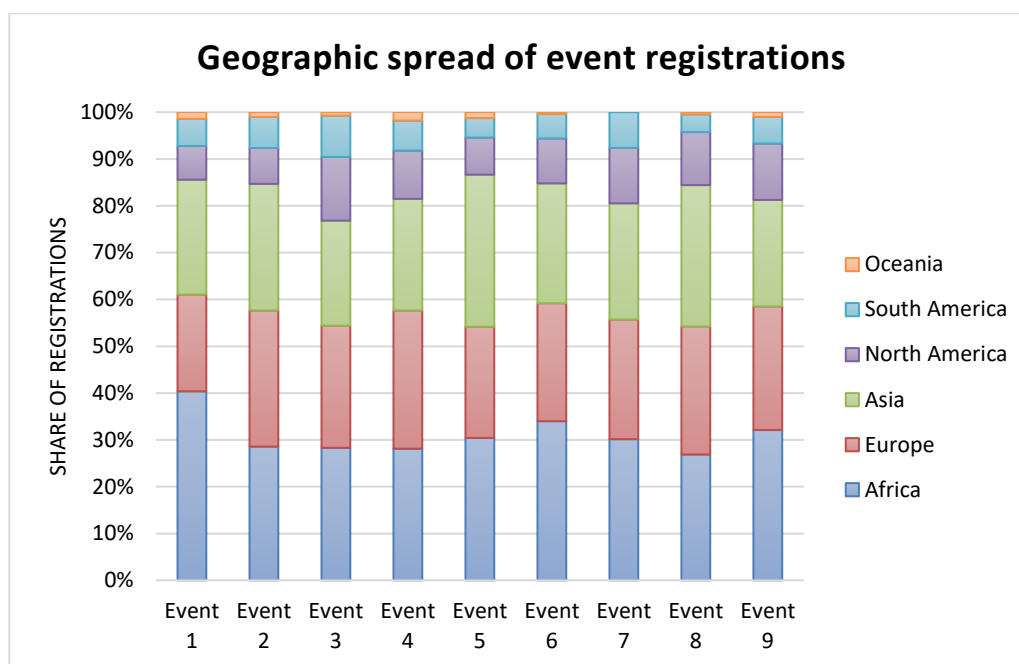
Figure 31. Geographic distribution of registrations for Events 1–9 by continent.

Each of the nine events had registered participants from all six continents (Fig. 31). Among the registrants, the most represented continent was Africa at Events 1, 3, 6, 7, and 9, whereas it was Europe at Events 2 and 4 and Asia at Event 5 and 8. Event 1 had the largest share of registrations from a single continent, with close to 41% of the registered participants listing an African country in the registration form. The time of the day when an event was scheduled might have slightly impacted the geographic distribution of the event registrants. For instance, the largest share of registrations from the Americas was for Event 3 (held at 1 p.m. UTC), which also coincided with the lowest share of registrations from Asia. However, the distribution of registrants from some of the other events does not necessarily support this claim. Instead, the selection of event panellists and case studies may have drawn larger numbers of participants from certain locations at some of the events.
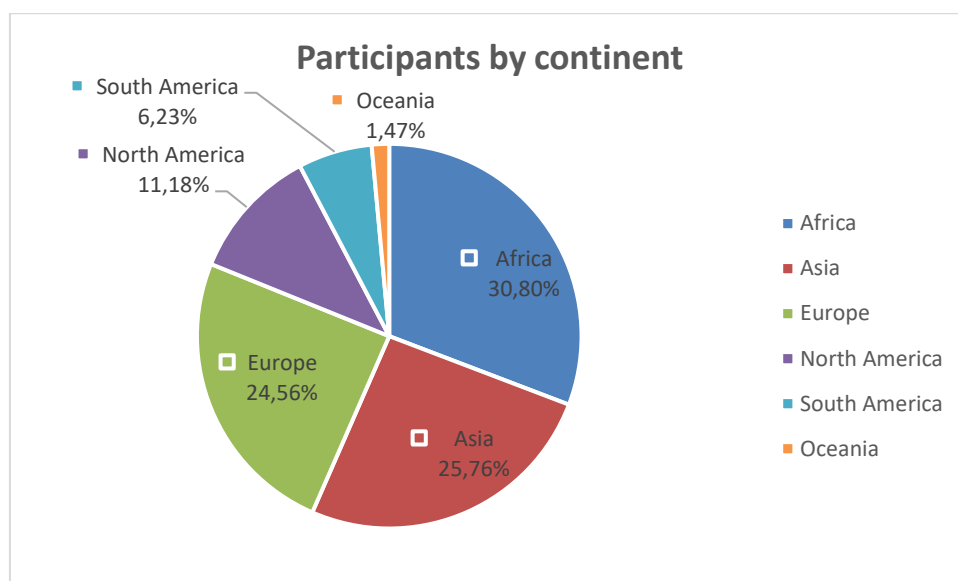
Figure 32. Geographic distribution of individual event registrants by continent.

A little less than one third of the 1,100 identified registrants for all nine events were from Africa (Fig. 32). The second most represented continent was Asia, accounting for 25.76% of the registrants, followed by Europe, with 24.56% of the identified event registrants. Registrants from the Americas made up 17.41% of the total number of those identified. When the geographic distribution of event registrants is compared to that of MOOC learners (see Fig. 6), some differences can be observed. For instance, the share of registered participants from Africa is signicantly higher for the event series than for the MOOC (30.8% as opposed to 22.2%, respectively). On the other hand, the share of registered participants from North America for the event series is only just over half of that for the MOOC (11.18% as opposed to 18.2%, respectively).
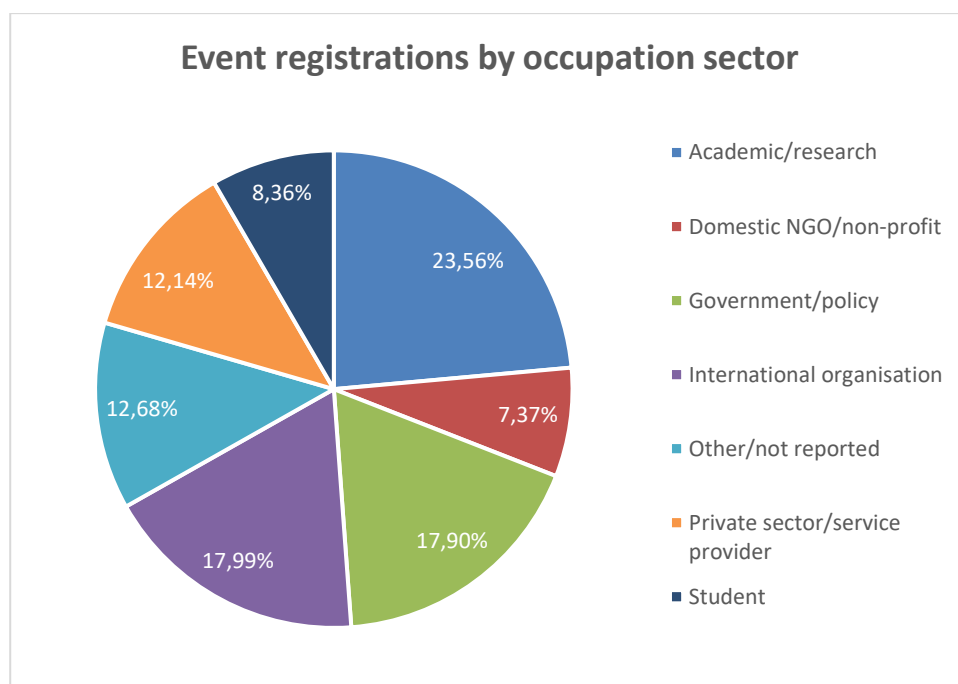

Figure 33. Distribution of individual event registrants by occupation sector.

The most represented occupation sector among the event registrants consisted of researchers and/or lecturers in academia, accounting for 23.56% of the identified registrants (Fig. 33). A further 17.90% of the registered participants had governmental and policy jobs. The share of registrants working in international organisations (17.99%) was approximately the same. Those working in the private sector and/or as service providers represented roughly 12.14% of the registrants. Close to 8.36% of the sign-ups for the events came from students. The smallest share of registrants (7.37%) came from domestic NGOs and the non-profit sector.

5.2 Takeaways and expectations

This section summarises the takeaways and expectations from the online interactive sessions.

At the start of each interactive session, the attendees were invited to vote through PollEv for questions that panelists would be asked. While not all the attendees proposed questions or voted, the most upvoted questions were likely to be indicative of the interests of a significant number of attendees. From each event, the five to six most upvoted questions were selected and then grouped with others if they covered similar themes. Table 3 contains the topics of these questions, with the number alongside corresponding to the number of questions addressing that specific topic. Questions related to examples of transboundary water agreements, climate change in the context of international water law, and river basin organisations (RBOs) were most common.

Table 3. Topics of the most upvoted questions

Question topic	No. of questions
Transboundary water agreements – characteristics, successes, failures	4
International (water) law, climate change, and transboundary water cooperation	4
RBOs – elements of success, sustainable financing, handling political asymmetries	3
Transboundary water management between countries in conflict	2
Equitable resource distribution and IWL enforcement mechanisms	2
Negotiation of transboundary water agreements	2
IWL in the context of transboundary water ecosystem preservation	2
Ways to improve IWL implementation (in developing countries)	1
Advantages of IWL over domestic water law	1
Connection between water diplomacy and IWL	1
IWL as a mechanism for protecting public participation and public interests	1
IWL in the context of hydropower projects (in protected areas)	1
Data sharing as an obstacle for cooperation in river basins	1
Role of Integrated Water Resources Management (IWRM) in transboundary water governance	1
Handling clashes between domestic laws and treaties	1
Types of transboundary basin organisations with respect to their mandates	1
IWL in transboundary freshwater conflicts	1
Principle of equitable and reasonable use in the context of groundwater	1
Flaws in the Draft Articles on the Law of Transboundary Aquifers	1
Rules of international procedural law that emerge as customary law in transboundary (ground)water management	1
Lack of focus of shared water agreements on groundwater	1

The event attendees were also asked about their key learning points from the sessions. This was done at the end of the session using real-time surveys in PollEv or Microsoft Forms in order to motivate as many attendees as possible to fill them out, as the completion rate of post-event surveys had been relatively low in the earlier sessions. Table 4 summarises the attendees' key takeaways grouped by topic, with the number in the right-hand column corresponding to the number of responses addressing that specific topic. The dominant themes among the respondents' takeaways were transboundary water agreements and IWL in the context of transboundary aquifer management. The importance of an ecosystem services approach as well as communication and cooperation in transboundary water management were also mentioned frequently.

Table 4. Participants' takeaways from the sessions

What have you learned from today's session?	No. of responses
Transboundary water agreements – principles, cooperation, infrastructure, case studies	10
IWL in transboundary aquifer management and associated challenges	10
Importance of an ecosystem services approach in transboundary water management	9
Importance of communication and cooperation in transboundary water management	9
Importance of communities and stakeholder engagement in RBOs and IWL	7
Implementation of and obstacles to IWL	5
Role, importance, and determinants of success of RBOs	5
Importance and benefits of IWL for conflict resolution, peacebuilding, resource management	5
Harmonisation of different legislations – water, environmental, investment law	5
Different categories and mandates of RBOs	3
Transboundary water governance – complexity, modelling	3
Importance of local/regional context in relation to IWL	3
Learning and networking opportunities, research projects on IWL and governance	3
Interplay between IWL and domestic laws	2
International Commission for the Protection of the Danube River (ICDPR)	2
Best practices in IWL	1
Data sharing among riparian states for transboundary water management	1
Knowledge gap about transboundary groundwater	1
Differences between surface water and groundwater governance in transboundary contexts	1
Sustainability of groundwater	1
Transboundary water management and politics	1
Relation between science and law	1
Sustainable Development Goal (SDG) 6.5.2	1

Polycentric water governance	1
Wide scope of IWL	1
DRIFT model (model presented by Jackie King in session 2)	1
DRIN basin example	1
Importance of negotiation in IWL	1
Okavango River example	1
Examples from Africa and South America	1

One of the questions in the real-time surveys at the end of each session addressed the participants' expectations from the upcoming sessions. These answers could then be taken into consideration when planning the upcoming sessions. Table 5 summarises the participants' expectations grouped by topic, with the number in the right-hand column corresponding to the number of responses addressing that specific topic. The event attendees were most interested in hearing about case studies related to successful IWL implementation as well as about water disputes, conflict resolution, and water diplomacy. In addition to these, transboundary cooperation models were also mentioned by several of the respondents. Some of the topics listed in Table 5 may have been addressed in sessions subsequent to the one in which a particular expectation was expressed.

Table 5. Expectations from the upcoming sessions

Topic of expectations	No. of responses
Case studies on IWL implementation success stories, stakeholder engagement	16
Water disputes and conflict resolution, water diplomacy, sovereignty, enforcement	16
Transboundary cooperation models, ways to initiate cooperation, power dynamics	10
Transboundary water pollution and prevention, environmental protection in IWL	5
RBO models and youth involvement	5
Civil society involvement, minority inclusion in river management and transboundary water decision-making	4
Promoting international water treaties among riparian states	3
Environmental flows and ecosystem compensation between countries	3
Financing and project policy for transboundary water management	3
Transboundary water and peacebuilding	3
Transboundary water cooperation and climate change threats	3
Groundwater	2
Careers in IWL	2
Data collection, sharing, and usage – opportunities, patterns, and problems	2
Case studies from Americas	1
Water in rural communities	1
Role of states in and methods for developing IWL	1
UNECE Handbook on Allocations in a Transboundary Context	1
Water policy analysis	1
Transboundary water agreements – successes and challenges in Africa	1
Water demand management	1
Interaction between global water cycle and transboundary waters	1
Climate and migration nexus	1
Chinese water law	1

Integrated international cooperation law covering transboundary water, environment, investment, and river basin planning	1
Negotiation skills for transboundary conflicts	1
Technology for effective IWL implementation	1
Irrigation for agriculture – water use, efficiency, storage, conservation	1
Women in water diplomacy	1
How transboundary water processes enhances SDGs	1
Youth in the water sector, especially in transboundary processes	1

5.3 Engagement beyond the interactive sessions

As part of the real-time surveys at the end of Events 5 and 6, the attendees were asked about their interest in engaging with other learners and participants beyond the events as well as about their preferences regarding the engagement format. Out of the 135 attendees at Event 5, a quarter answered the question about willingness to engage with other learners and participants beyond the event or the MOOC – 33 of the responses were affirmative whereas one was negative. At Event 6, just under 23% of the 119 attendees answered the question, with all 27 answers being affirmative. In the subsequent question, the attendees could rank five options for the engagement format based on how beneficial they found them. The five options were: job opportunities, networking, knowledge sharing, showcasing case studies, and other (in case the attendees had other suggestions). There were 26 responses (19% of all attendees) obtained from Event 5 and 22 responses (18% of all attendees) obtained from Event 6.
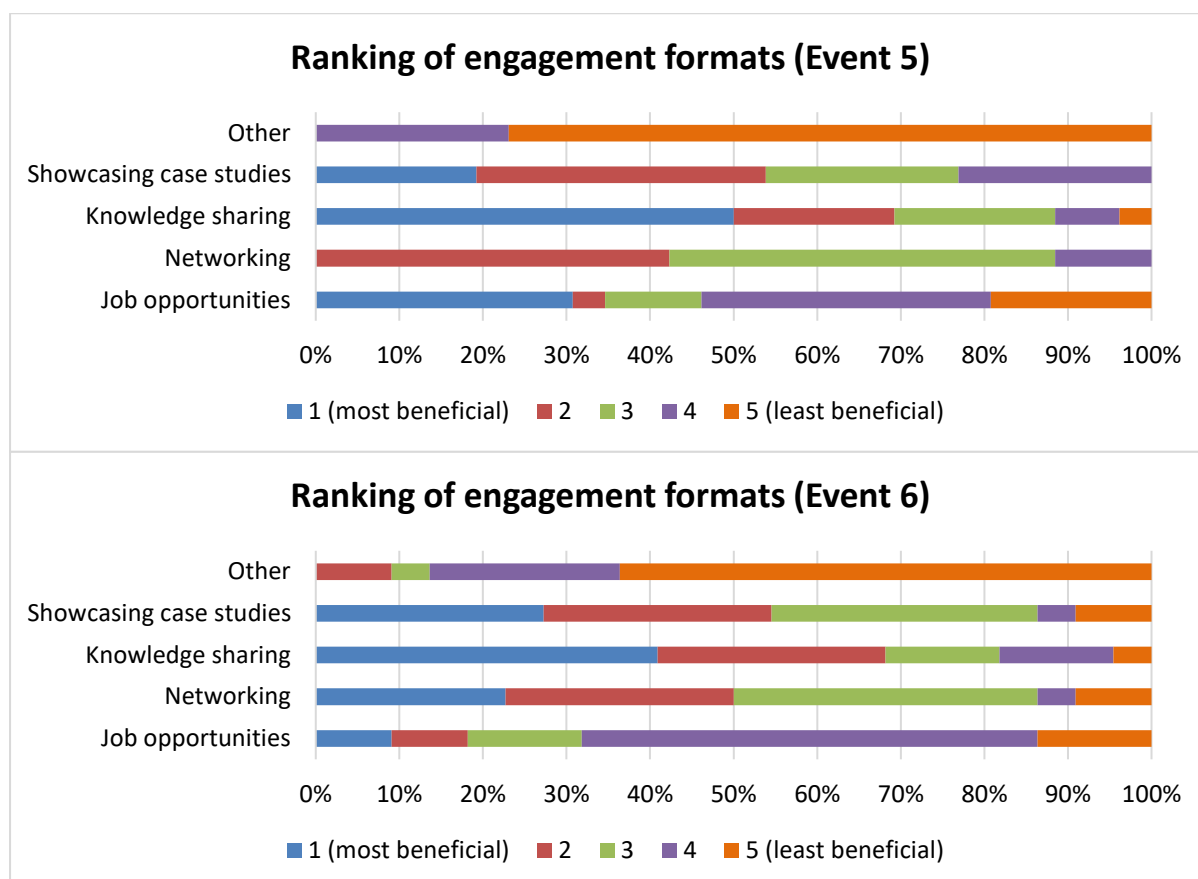
Figures 35 and 36. Ranking of engagement formats from most to least beneficial by the attendees of Event 5 (top) and Event 6 (bottom).

Knowledge sharing was ranked as the most beneficial kind of engagement, with 50% of the respondents from Event 5 and 41% of those from Event 6 ranking it first (Figs 35 and 36). Job opportunities was ranked as most beneficial by 31% of the respondents from Event 5 and 9% of those from Event 6. Over 50% of the respondents from Event 5 and close to 70% of those from Event 6 ranked job opportunities as the least or second-to-least beneficial kind of engagement. Both networking and case studies were ranked as second or third most beneficial by over 50% of the respondents from either event.

When the average ranking of each option is calculated from the combined responses from Events 5 and 6, the following list of engagement formats (from most to least beneficial) is obtained:

1. Knowledge sharing

2. Showcasing case studies

3. Networking

4. Job opportunities

5. Other

The responses provided under 'Other' are summarised in Table 6, with the number in the right-hand column corresponding to the number of times that a particular kind of engagement appeared. A few

of the responses mentioned opportunities for graduates in IWL as well as scholarships for master's and PhD programmes in IWL. Many of the suggestions incorporated networking and knowledge sharing in various forms.

Table 6. Other suggestions for engagement beyond the events or MOOC

Kinds of engagement	No. of responses
Networking opportunities and sessions	3
Opportunities for graduates in IWL, professional development, training	3
Knowledge- and MOOC experience-sharing sessions	3
More sessions like these	3
Technology, software, and data collection tools related to IWL	2
Opportunities and scholarships for master's, LLM, and PhD programmes in IWL	2
Collaboration on research projects	2
Case studies and success stories of how cooperation has been implemented	2
Social platform for knowledge and contact sharing, community of practice	2
Creating and participating in partnerships related to regional and global issues	2
Topic-specific live events, thematic subgroups for meaningful interactions	2
Defining relevant professional vocabulary for avoiding ambiguity in communication	1
Working with limited funding for monitoring in developing countries	1
Engaging in policy-making on transboundary water management issues	1
Learning about regional implementation of transboundary agreements	1
Workshop on influence of power on development of transboundary water cooperation	1

6 Conclusion

Approximately one year after its launch, the MOOC on Governance for Transboundary Freshwater Security had 2,253 registered participants (14 July 2021). At the end of 2021 the number of participants had grown to 2,629 (14 December 2021), indicating that the MOOC is still 'alive' and continues to attract new learners. The median participant was 34 years old, with over half of all learners being in the age group from 26 to 39. The learner gender balance was 55% male and 45% female. The most represented continent was Europe, followed by Asia, Africa, and the Americas, with the latter three constituting similar shares of the total number of learners. When it came to the highest level of education attained, over 60% of all participants had at least a master's degree.

The pre-course survey indicated that approximately one half of the respondents were professionals from a related industry and had signed up for the MOOC because it was relevant to their

professional field. Around three quarters of the survey respondents had either a professional or an academic background in the subject area, with the remaining quarter having neither. This suggests that while the course has primarily attracted professionals in transboundary water management, it has also succeeded in attracting a considerable proportion of participants from outside the community of transboundary water professionals. The response rate to the voluntary post-course survey was nearly five times lower than for the pre-course survey. From the few responses received, the feedback regarding the course modality, platform, and instructors was overwhelmingly positive. The respondents indicated that the course length and the amount of content were good. They pointed out the shortcomings of the edX discussion forum while praising the interactive sessions when asked about the opportunities they had for meaningful interactions.

The nine MOOC interactive sessions of the *Transboundary Freshwater Security Governance Train* conducted from January to November 2021 received registrations from 1,100 different individuals, most of whom signed up for only one or two events. Those most registered for and attended were Events 4 and 9. While the time zone may have slightly impacted the geographic distribution of registrants, the variation in speakers and topics may have also contributed to this. Most participants came from Africa, followed by Asia and then Europe. The most represented occupation sectors were government and policy, academia, and international organisations. An interest in case studies was expressed throughout the event feedback forms. Another issue pointed out numerous times was that of climate change in the context of transboundary water management. Finally, most event attendees selected knowledge sharing as the most beneficial kind of engagement for beyond the events or the course.

Among recommendations of topics that participants would like to see in future, new suggestions have included women in water diplomacy, technology for effective IWL implementation, and linkages between transboundary water management and the fulfilment of sustainable development goals (SDGs). However, participants in the last three online sessions claimed that they would like more events building on more practical perspectives, such as transboundary cooperation models and power dynamics, and they would also like more case studies on IWL implementation and success stories. The ninth session on Water Diplomacy and Negotiation received great feedback, and participants greatly enjoyed learning about effective tools and methods of negotiation, while they were also able to put their new knowledge into practice within the framework of the negotiation simulation. Organising similar, practical sessions, where participants can gain and try out strategies and tools in live cooperation with other participants, holds great potential in itself and enhances networking at the same time.

In conclusion, the MOOC community is diverse, and gender equality is well represented as the ratio of female to male participants is almost 50-50. The MOOC community is also diverse in regard to the professional background of the community members. The MOOC attracted practitioners, students, academics, government officials, and even participants from the private sector.To nurture further engagement of the members of this community, a varied approach should be taken in order to cater to the different groups. Any further engagement should have a strong focus on knowledge sharing, which was indicated to be of great importance for many of the community members. The MOOC interactive sessions are one way of continuing to facilitate knowledge sharing while at the same time providing a platform for networking. MOOC learners and event participants could be included in the

potential development of a CoP, which could also help to further diffuse information about the MOOC – among both existing and aspiring transboundary water professionals.

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