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FORGING AHEAD AND ADAPTING TO CHANGE: A REVIEW OF THE INITIATIVES OF THE ISPRS STUDENT CONSORTIUM

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ABSTRACT:

The International Society for Photogrammetry and Remote Sensing Student Consortium (ISPRS SC) is an international organization that represents a constituency of the students and the young professionals with common interests and goals within ISPRS in the areas of photogrammetry, remote sensing and spatial information science. The ISPRS SC Board of Directors strengthened the organization's foundations and increased its engagement in the Society from 2016 to 2022. Given the current global health crisis, selected members of the Board of Directors continued to serve in the ISPRS SC for a two-year extension and developed creative strategies in navigating the new normal. Building on the strengths of the organization and motivated by the incredible ideas of connecting and engaging the scientific community that emerged during the pandemic, we were able to transform challenges into opportunities through collaborations and sustained participation of our members. In this paper, we summarize all the activities of the Consortium from 2016 to 2022 and provide insights on the impacts and values of these initiatives to the organization and its members. We also elaborated on hosting the GeoMixers as virtual networking events with our partner organizations as well as organizing the virtual Google Earth Engine meetup in the Singapore Geospatial Festival, which was given the short title, EarthEngine@SG. Outcomes of the Leadership and Service Mentoring Programme, the Consortium's first mentorship and training programme for potential nominees for the incoming Board of Directors, demonstrated the remarkable potential of the youth in leading and engaging in relevant social and global issues and contributing to the scientific community. Sustaining our relevance to ISPRS, experiencing growth during the pandemic and understanding our roles as an international organization, the Consortium will continue to forge ahead and adapt to change to support the youth and contribute to building resilience and adaptability in our scientific community.

1. INTRODUCTION

The International Society for Photogrammetry and Remote Sensing Student Consortium (ISPRS SC), also known as the Consortium, is the primary organization representing students and young professionals in the Society. Since 2008, the Consortium has been providing an avenue for the youth and professionals all around the world who share the same interests in photogrammetry, remote sensing and spatial information science. Furthermore, the organization has been developing and hosting a number of activities focused on education, capacity building, professional networking and mentoring for its members.

In this paper, we provide a summary of the outcomes of the activities of the Consortium from 2016 to 2022, and share insights about the future of the organization. We highlight the importance of continuity and activities that foster and strengthen the future of the Consortium.

2. SUMMARY OF THE MAIN ACTIVITIES OF THE ISPRS SC FROM 2016 – 2022

2.1 The Board of Directors

Since August 2019, the ISPRS SC Board of Directors directly reports to the Council through the Advisory Council. A total of five elective officers comprises the current Board of Directors, namely, Sheryl Rose Reyes (President), Charles Jjuuko (Vice President), Charmaine Cruz (Newsletter Editor-in-Chief), Mustafa Ustuner (Social Media Coordinator) and Sona Guliyeva (Website Administrator).

The leadership in the Consortium has changed since 2016. The elected Vice President and Newsletter Editor-in-Chief in 2016 resigned in 2018, while the elected Board Member was chosen to replace the Website Administrator. In 2019, the Website Administrator was recommended to take the place of the Vice President given his contributions to the Consortium. Calls for the new Newsletter Editor-in-Chief and the Website Administrator were posted, and they completed the current members of Board of Directors.

Important changes to the Statutes include the nomination and election processes as well as the diversity of the incoming Board of Directors, which limits the number of elective officers coming from the same country to two.

2.2 Membership

The membership registration of the ISPRS SC was revised in 2020 and at present, we currently have a total of 517 members from 72 countries with the new system for individual membership registration, which follows the ISPRS individual membership process (Figure 1).

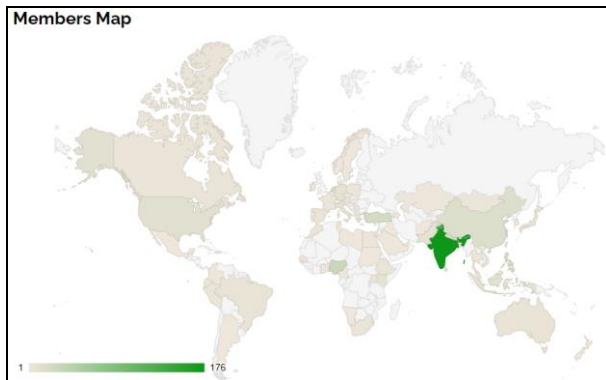


Figure 1. The members map of the ISPRS SC as of March 2022.

The individual members are mostly from Asia and the Pacific, with India leading with a total of 176 members. A significant number of Consortium individual members also come from Nigeria (31), Turkey (22), Philippines (20) and China (16).

2.3 Social Media

Our social media following also continued to increase in our most active accounts. As of March 2022, our Facebook group has about 7,065 members (<https://www.facebook.com/groups/isprssc>), 1,582 Twitter followers (@ISPRS_SC), and 769 subscribers on our YouTube channel (<https://www.youtube.com/c/ISPRSSC>). The Consortium also started an Instagram account but is currently inactive.

Table 1. The top five most popular videos in the ISPRS SC's YouTube channel as of March 2022.

Title	Number of Views
The Role of Geosciences in Achieving Deforestation-Free Supply Chains in Brazil (The 6 th IEEE-GRSS Young Professionals and the ISPRS Student Consortium Summer School 2020)	2,923
Deep Learning for Photogrammetric Analysis and Remote Sensing (ISPRS SC Webinar Series 2020)	1,241
Introduction to Google Earth Engine with R language (The 7 th IEEE-GRSS Young Professionals and the ISPRS Student Consortium Summer School 2021)	1,241
Digital Animal Conservation (ISPRS SC Webinar	934

Series 2020)	
Classification of Land Cover and Land Use Based on Deep Learning (The 6 th IEEE-GRSS Young Professionals and the ISPRS Student Consortium Summer School 2020)	714

Our YouTube channel has gained popularity because of the livestreams of the virtual summer schools, the ISPRS Virtual Keynote Speaker Series, and the Technical Commission IV's State-of-the-art in Spatial Information Science webinar series. It is also worth noting that the local organizers from Brazil, who have successfully organized two virtual summer schools, have contributed immensely in the growth of our YouTube channel. Our efforts in the Consortium in identifying the most interesting topics for our members are also evident with two of the ISPRS SC Webinar Series videos taking the second and fourth spots in the top five most popular videos.

2.4 Newsletters

Table 2 summarizes all the issues we published under the repackaged Newsletter – SpeCtrum, which expands the scope of the Consortium's quarterly publication. The themes that were developed for the issues of the SpeCtrum cover multidisciplinary, interdisciplinary, and even transdisciplinary research.

Table 2. The SpeCtrum issues published since 2017 and their corresponding number of reads.

Title	Vol no.	Issue no.	Date	No. of reads
Remote Sensing of Coastal Environments	15	2	Dec 2021	505
Geospatial Technologies for the Conservation and Promotion of Cultural Heritage in support of the UN Sustainable Development Goals	15	1	Aug 2021	182
UAS for Environmental Monitoring	14	4	Apr 2021	924
SAR Remote Sensing	14	3	Dec 2020	959
3D GIS	14	2	Sep 2020	557
The Roles of Geospatial Information During the COVID-19 Pandemic	14	1	Jul 2020	1229
Applications of Remote Sensing and Geospatial Information to Climate Change	13	4	Feb 2020	846
Advances in Remote Sensing and Spatial Information Science in Africa	13	3	Dec 2019	529
Remote Sensing of Blue Carbon Ecosystems	13	2	Aug 2019	190
Women in Remote Sensing and Geospatial Information	13	1	Apr 2019	1348

Citizen Science and Geoinformatics	12	4	Jan 2019	
Ecology and Conservation	12	3	Sep 2018	274
Photogrammetry and Computer Vision	12	2	Jun 2018	421
The ISPRS Midterm Symposia Special Issue	12	1	Jun 2018	71
RS and GIS in Forest Management	11	4	Mar 2018	
The ISPRS Student Consoertium: 2017 in Review	11	3	Dec 2017	363
The Technical Commissions: An Overview	11	2	Oct 2017	363
The Leaders Behind the Society: The ISPRS Council	11	1	Sep 2017	422

The criteria for selecting the upcoming themes of the SpeCtrum was based on two criteria: (1) current issues or emerging topics in the fields of remote sensing, photogrammetry and spatial information science, and (2) availability of experts from ISPRS that can contribute to the theme. The most read issues were Women in Remote Sensing and Geospatial Information, and The Roles of Geospatial Information During the COVID-19 Pandemic.

2.5 Summer Schools

One of the major activities of the Consortium is the summer school (Table 3), which aims to provide opportunities for students and young researchers to participate in a series of lectures, practical sessions, technical tours, and social events at a minimum cost. It also provides a venue to build relationships and strengthen the network among participants, resource speakers, professors and experts from the host country, which can potentially stimulate future collaborations and introduce the youth to the international scientific community (Gong et al., 2017).

A total of 12 summer schools was organized by the ISPRS SC from 2016 to 2019. Four of these summer schools were organized in partnership with the Asian Association on Remote Sensing (AARS) and the local organizers of the annual Asian Conference on Remote Sensing (ACRS). Three summer schools were hosted in Brazil, in partnership with the IEEE-GRSS Brazil Chapter and the IEEE-GRSS Young Professionals.

The summer schools scheduled for 2020 were postponed due to the global health crisis and the subsequent travel restrictions to many countries. As we transitioned to digital events, the ISPRS SC welcomed organizers who were willing to host the summers schools online. The first virtual summer school was organized by Universidade Federal de Minas Gerais (UFMG) and the IEEE Geoscience and Remote Sensing Society (IEEE-GRSS) Brazil Chapter in 2020, which continued the summer schools in Brazil that were hosted in person annually. The online summer schools continued in 2021, which started with the virtual summer school on Smart Cities that was organized by the

Beijing University of Civil Engineering and Architecture, China and followed by the second edition of the virtual summer school hosted by IEEE-GRSS Brazil Chapter and Université de l'État de Santa Catarina.

Table 3. The summer schools organized by the ISPRS SC in collaboration with local organizers across the globe from 2017 to 2021.

Event Name and Dates	Theme
16th ISPRS SC and WG V/5 Summer School: Lages, Brazil (2 – 6 October 2017)	Multivariate Statistics, Introduction to Laser Scanning, and Image Processing with Google Earth Engine
38th Asian Conference on Remote Sensing ISPRS SC Summer School (30 October – 3 November 2017)	Geo-processing Tools and Technologies in Citizen Science
18th ISPRS SC and WG V/5 Summer School: Santiago, Chile (13 – 17 November 2017)	Land Cover Assessment and Monitoring Using Google Earth Engine
ISPRS Technical Commission III Midterm Symposium Summer School – Beijing, China (4 – 6 May 2018)	Innovative methods, theory and practice of earth observation and remote sensing technology for the measurement and mapping of complex urban environments
39th Asian Conference on Remote Sensing ISPRS SC Summer School (20 – 24 October 2018)	Big Geo-Sensing Data Ecosystem: Theory, Processing & Application
IEEE GRSS YP and ISPRS SC Summer School (29 October – 1 November 2018)	UAV Photogrammetry and Machine Learning Applications: Emerging Trends and Challenges for Earth Observation
ISPRS SC Summer School in Makerere University, Kampala, Uganda (22 – 24 July 2019)	Synthetic Aperture Radar (SAR) Remote Sensing Workshop
ISPRS SC Summer School in Wroclaw, Poland (26 – 30 August 2019)	Geospatial technologies for natural environment management and monitoring
40th Asian Conference on Remote Sensing ISPRS SC Summer School, Seoul, South Korea (21 – 25 October 2019)	New Remote Sensing Technology for Smart Future
5th ISPRS Student Consortium Summer School & IEEE GRSS Young Professionals, Sao Paulo, Brazil (10 – 14 November 2019)	Space Technology, Markets and Building the New Brazilian Space Age
6th ISPRS Student Consortium Summer	Trends in Remote Sensing Science and Applied Machine

School & IEEE GRSS Young Professionals (16 Oct – 11 Dec 2020, online)	Learning
Beijing University of Civil Engineering and Architecture (BUCEA), Beijing, China (19 – 23 July 2021, online)	Virtual Summer School on Smart City
7th ISPRS Student Consortium Summer School & IEEE GRSS Young Professionals (12 Aug – 16 Dec 2021, online)	Application of GIS, Remote Sensing and Artificial Intelligence in Agricultural Applications

2.6 Webinars

Table 4 summarizes all the lectures, registrations and number of actual participants for the ISPRS SC Webinar Series. The first two webinars have been discussed in our previous papers (Reyes et al., 2021).

Table 4. The lectures presented in the ISPRS SC Webinar Series.

Title	Speaker(s)	Registration	Participants
Deep Learning for Photogrammetric Analysis and Remote Sensing	Dr. Konrad Schindler, ETH Zurich	361	91
Digital Animal Conservation - From Flying UAVs to Mapping with Deep Learning	Dr. Devis Tuia, University of Wageningen	414	94
Collaborative Humanitarian Mapping with PoliMappers and UN Mappers	Dr. Maria Brovelli, Politecnico di Milano, UN Mappers and PoliMappers	119	52
Deep ensembles for global vegetation analysis	Dr. Jan Dirk Wegner, University of Zurich/ETH Zurich	93	32

Two webinars were organized in 2021. The webinar entitled “Collaborative Humanitarian Mapping with PoliMappers and UN Mappers” was organized on September 16, 2021 with Professor Maria Antonia Brovelli from Politecnico di Milano, Chiara Ponti from PoliMappers and Michael Montani from UN Mappers as the guest speakers. This webinar highlighted how an individual or a team can contribute and offer theoretical insights

on the collaborative humanitarian mapping and OpenStreetMap (OSM). A practical session in the form of a mapathon was conducted, which involved the step-by-step procedure on how to edit data in OSM. Another webinar on “Deep ensembles for global vegetation analysis” was conducted on November 19, 2021; the guest speaker was Dr. Jan Dirk Wegner, an Associate Professor and the Head of the EcoVision Lab at ETH Zurich. During this webinar, Dr. Wegner lectured on the application of satellite images for the vegetation canopy analysis, the development of the global reference vegetation dataset for supervised machine learning techniques. He also presented the research about integration of probabilistic approaches and deep ensembles techniques for the global determination of vegetation height.

The webinar video recordings and presentations are uploaded to the ISPRS SC website and can be viewed by accessing the following link: http://sc.isprs.org/isprs_sc_webinars.html.

2.7 ISPRS Congress

2.7.1 Youth Forum Track

The ISPRS Virtual Event was held from August 31 to September 2, 2020. The ISPRS Student Consortium’s Youth Forum was hosted as a joint session with the Technical Commission V – Education and Outreach on September 1. The Youth Forum sessions were moderated by Sheryl Rose Reyes, President of the ISPRS SC, and Dr. P. N. L. Raju of Technical Commission V. Three presentations were delivered in the Youth Forum, including one live talk and two pre-recorded videos (Figure 8). The Youth Forum contributed a total 12 papers, three for the ISPRS Annals and nine for the ISPRS Archives for this edition of the ISPRS Congress.

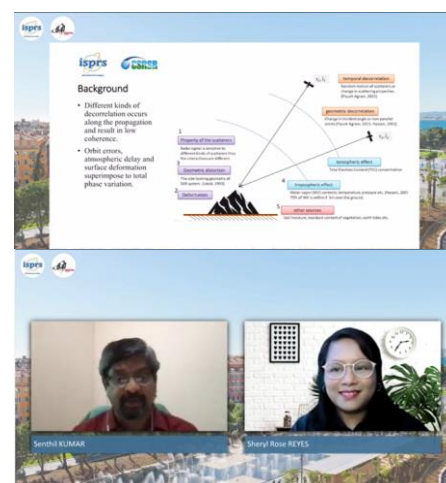


Figure 2. The presentation by Yen Yi Wu of the National Central University and the session chairs, Dr. Senthil Kumar, President of Technical Commission V and Sheryl Rose Reyes, President of the ISPRS SC.

We again joined Technical Commission V in the joint session of the Education and Outreach track in 2021, which included the presentations for the Youth Forum (Figure 2). Our

President, Sheryl Rose Reyes, presented the paper entitled, “Creative strategies in navigating the new normal: advancing the contributions of the ISPRS Student Consortium as an international organization.” She shared the activities and development in the Consortium and how the organization adapted and advanced during this challenging time. Also, presented in this live session was the paper entitled, “Regression analysis of errors of SAR-based DEMs and controlling factors” by Yen Wi Wu and Hsuan Ren of the National Central University in Taiwan. The authors used InSAR for topographic mapping, to provide a formal description that attempts to explain the relationship between SAR-measured elevation height and controlling factors.

2.7.2 Forum

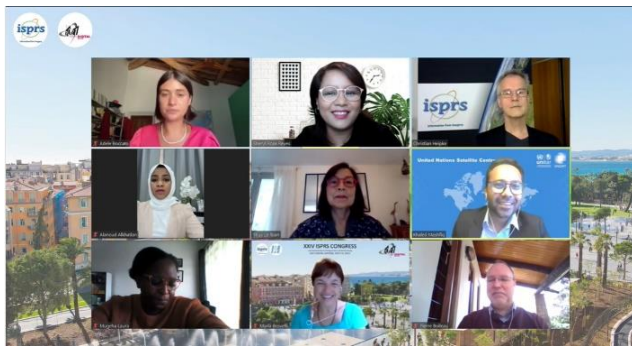


Figure 3. Our special guests for the panel discussion in the forum, which was moderated by the ISPRS SC President, together with Adele Roccatto of UNEP.

Finally, the main highlight of this year’s Youth Forum track is the forum entitled, “Towards Transformational Change: Potential Contributions of ISPRS and the Role of the Youth in Sustainable Development.” This forum was organized in partnership with the United Nations Environment Programme (UNEP). The main objectives of this forum were to promote the recently released Global Environment Outlook 6 for Youth report (UNEP, 2021) and to engage the youth and experts in ISPRS in a discussion about the linkages between sustainable development and the fields of remote sensing, photogrammetry and spatial information science (Figure 10). We had the privilege of having the GEO for Youth Authors, AlAnoud Al-Khatlan and our President, Sheryl Rose Reyes, sharing the valuable information from UNEP’s first fully interactive epublication. This presentation was followed by Dr. Christian Heipke’s discussion on the roles of remote sensing, photogrammetry and spatial information science in sustainable development. This was followed by a panel discussion with our special guests, Maria Antonia Brovelli (Politecnico di Milano), Khaled Mashfiq (UNOSAT), Laura Mugeha (Sanergy/Youth Mappers), Thuy Le Toan (CESBIO) and Pierre Boileau (UNEP). The discussion was driven by questions that would help identify the roles of ISPRS and the contributions of the youth towards a more sustainable society. We also requested audience participation through questions we posted via Mentimeter.

2.8 Other Activities

2.8.1 GeoMixers

The ISPRS SC continued its collaboration with the Ladies of Landsat, Sisters of SAR, American Society for Photogrammetry and Remote Sensing (ASPRS) Student Advisory Council, Mato Grosso do Sul IEEE-GRSS Student Branch Chapter, and the Asian Association on Remote Sensing (AARS) for the GeoMixers. From a monthly virtual networking event, the GeoMixers organized in late 2021 were hosted in specific events.



Figure 4. The participants of the GeoMixer hosted in the Geo for Good Summit 2021.

The GeoMixer was hosted in the virtual edition of the ISPRS Congress in 2021. We had the honor of having several White Elephant Club members joining the GeoMixer and the current ISPRS President, Dr. Christian Heipke. We had about 38 participants who joined us in this virtual networking event. In November 2021, the event was part of the Asian Conference on Remote Sensing, which served as the official networking event of the conference. Finally, the last GeoMixer for the year was hosted in the Geo for Good Summit, organized by Google.

2.8.2 EarthEngine@SG

The Google Earth Engine Singapore (EarthEngine@SG) is a virtual meetup that took place on 13th September 2021, as part of the Singapore Geospatial Festival 2021. Lead by the Nanyang Technological University Singapore – Asian School of the Environment, the ISPRS SC is one of the co-organizers of the event, together with National University of Singapore – Centre for Nature-Based Climate Solutions, Imperial College London, Earth Observatory of Singapore and Sabrina Szeto Consulting (Figure 5).



Figure 5. The ISPRS SC together with the organizers of the EarthEngine@SG in the Singapore Geospatial Festival.

Dr. Nicholas Clinton, Developer Advocate at Google, presented the keynote lecture focusing on the current and future capabilities of Google Earth Engine (GEE). The following topics were also covered in the parallel sessions that followed: (1) Keiko Nomura, Director of Product Development at Climate Engine - “Fate of forests at your fingertips”, (2) Nicholas Murray, Senior Research Fellow at James Cook University - “Losses and gains of Earth’s intertidal ecosystems,” (3) Jakrapong Tawala, Satellite Analyst at the United Nations Satellite Centre - “GEE for the United Nations humanitarian assistance missions” and (5) Mong Suan Yee, Director of Engineering at Kumi Analytics - “Machine Learning with Google Earth Engine.”

A virtual networking session followed, which engaged the participants in discussions on the various applications of GEE. In addition, participants were also asked what capabilities they look forward to in the future development of the platform. Workshops were scheduled in the afternoon, which accommodated GEE users from beginner to intermediate levels: (1) Minerva Singh, Research Fellow at Imperial College London, provided an introduction to GEE for beginners, (2) Keiko Nomura presented tips and tricks for the intermediate audience, and (3) Yvonne Fong, Data Scientist at EO Data Science, provided an intermediate to advanced level overview of the Google Earth Engine Apps. This virtual meetup is one of the online activities that the ISPRS SC co-hosted that provided online practical sessions. A follow-up in person meeting is scheduled on April 25, 2022 in Singapore.

3. FORGING AHEAD: BUILDING THE FUTURE OF THE ISPRS SC

3.1 The Leadership and Service Mentoring Programme

The Leadership and Service Mentoring Programme commenced in February 2021, with a total of seven mentees were accepted to the programme. By the conclusion of the programme last October 2021, six mentees remained for the final evaluation and nomination to the upcoming ISPRS SC elections.

The mentees were engaged in the various activities of the ISPRS SC, including online summer schools, the ISPRS Virtual Keynote Speaker Series, the ISPRS Technical Commission IV State-of-the-art in Spatial Information Science, EarthEngine@SG and the Webinar Series.

3.2 Nominations and Elections

The five mentees from the Leadership and Service Mentoring Programme were nominated to the Board of Directors for the term 2022 – 2026. Additional nominations were received during the call in February 2022 and two more qualified candidates were identified for the open positions, specifically for the Social Media Administrator and Board Member. The elections were

held in March 2022 using the online platform, Election Runner. The newly elected Board of Directors are listed in Table 5.

Table 1. The elected Board of Directors for the term 2022 - 2026.

Name	Country	Position
Laxmi Thapa	Nepal	President
Nicolas Pucino	Australia	Vice President
Sunni Kushwaha	India	Newsletter Editor-in-Chief
Miguel Luis Lagahit	Philippines	Social Media Administrator
Yogender Yadav	India	Website Administrator
Chukwuma Okolie	Nigeria	Board Member

Out of the 500 individual members, 149 (29%) voted in this election while 27 email accounts that were previously registered were inactive. The period after the elections until the ISPRS Congress 2022 will be the transition period for the current and incoming Board of Directors.

3.3 Lessons Learned

The service extension of four years to six years, has been quite challenging for the current Board of Directors. But this also provided us with the opportunity to realize the scope of the work we have done prior to the pandemic, as well as the partnerships that we were able to explore and strengthen as we navigated the new normal.

In terms of engaging our members, understanding their needs and increasing the Consortium’s reach remain as the main challenges in increasing the number of individual members. Summer schools and webinars prove to be the most effective activities in inviting more students and young professionals to be involved in the organization. Other activities, particularly those that are more focused on social and professional networking, do not attract as many attendees compared to events that focus on education and capacity building. This is further supported by the attendance in the webinars hosted under the ISPRS Virtual Keynote Speaker Series and the Technical Commission IV State-of-the-art Webinar Series.

The Newsletter has immensely gained attention over the last two years, which is clearly demonstrated in the number of reads per issue. The timeliness of the themes and their relevance have contributed significantly in the viewership of the online Newsletters. In addition, by engaging researchers outside ISPRS, we have been able to extend the reach of this publication, which also helped in promoting ISPRS and the Consortium. By taking a broader viewpoint, identifying important and socially relevant themes, and finding good contributors for every issue of the Newsletter have been effective in increasing the number of its readers (Dorsheimer, 1994).

In the last two years of the pandemic, connections and collaborations that we were able to establish in the first four years of the term have sustained the Consortium. New activities, such as the online summer schools, GeoMixers and the

EarthEngine@SG, were the results of previous collaborations or invitations to take part in the ISPRS SC activities. The Consortium has greatly benefitted from the external partnerships, which provided insights on how the organization should move forward, as indicated in the ISPRS SC's Congress publication in 2021.

Finally, as we slowly return to in person meetings and activities, the potential for the hybrid structure of our future events should be considered. In the last two years, we have engaged more students and young researchers from all over the world virtually. Hybrid events can attract a wider, more inclusive and diversified audience, although the design and implementation of these events must be carefully defined (Moss et al., 2021).

ACKNOWLEDGEMENTS

The authors would like to express their sincerest thanks for the continued contributions of the other members of the Board of Directors, namely, Charles, Jjuuko, Mustafa Ustuner and Sona Guliyeva. We would also like to acknowledge the hard work of our mentees under the Leadership and Service Mentoring Programme: Laxmi Thapa, Nicolas Pucino, Sunni Kushwaha, Nimisha Wagle, Yogender Yadav and Saicharan Vasala. We also acknowledge the continued support of the ISPRS 2nd Vice President and Technical Commission President as well as the Council's Secretary General. Finally, we recognize all the efforts and initiatives of our local and global partners, who tirelessly develops new ideas, collaborates with us and continues to believe in what the Consortium stands for. As we end our six-year term, we would like to say our deepest thanks to everyone we met and worked with, and for the lifelong friends we met along the way.

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