

# WCRP Climate Research Forums

*Feedback and recommendations for regional consultation activities in the new WCRP*



<https://www.wcrp-climate.org/climate-research-forums>



*Promotional Flyers for the Climate Research Forums held in 2021*

## Version Control

<b>Version</b>	<b>Date</b>	<b>Author</b>	<b>Comments</b>
V1	August 25	Helen Cleugh	Early draft
V2	January 25	Helen Cleugh	Draft for Discussion with Narelle
V3	February 28	Helen Cleugh	Updated Draft for Discussion with Narelle and Beatriz
V4	April 18	Beatriz Balino	Addition of data from South America and Southern Asia CRF
V5 Final Draft	May 31	Helen Cleugh	Refined based on Beatriz's extra input.
V6	June 10	Helen Cleugh	Version for sharing with Detlef

## Table of Contents

Acknowledgements:.....	3
1. Introduction .....	4
2. Summary of Forums held in 2021 .....	4
3. Feedback: WCRP Profile, Science Priorities and Engagement in the Regions .....	8
4. SWOT Assessment of the Climate Research Forums .....	16
5. Follow-up with 2020-2021 Regional Focal Point Groups.....	17
6. Options for Future Climate Research Forums.....	18
7. Draft Recommendations to JSC .....	19
Appendix 1: Repository for all Climate Research Forum Information .....	20
Appendix 2: Regional Knowledge/Research gaps and/or needs .....	21
Appendix 3: Barriers to diversity.....	23

### Acknowledgements:

The expert knowledge, input and support from the WCRP Secretariat (Beatriz Balino, Narelle van der Wel and Hindumathi Palanisamy) is gratefully acknowledged. They provided much of the data analysis used in this Report and, together with Nico Caltabiano, they also organised all the Forums in 2021.

The Regional Focal Points are also gratefully acknowledged for their energy, expert advice in designing and running each of the Forums.

## 1. Introduction

As part of the implementation of the WCRP Strategic Plan, a series of regionally based online Forums, called Climate Research Forums (CRFs or Forums hereafter), were initiated in 2020 in response to feedback that WCRP's broader scientific community were not that familiar with the new strategy and new science initiatives.

They were also intended to support other WCRP activities in strengthening engagement, diversity and building our mutual understanding of research activities and priorities in the regions around the world. For this reason, they were developed and delivered jointly with the WCRP's Secretariat and International Project Offices.

The goals were to:

- a) Inform the WCRP community about the new WCRP and seek their feedback, especially on the Lighthouse activities, the new Core Projects, and other new science initiatives.
- b) Exchange ideas and discuss new activities and opportunities.
- c) Explore ways that our community of scientists, partner programs, funders and end-users of climate science can better engage and more effectively contribute to the regional needs.

Teams of Regional Focal Points (RFPs) were nominated from WCRP's core activities and tasked with designing a Forum that was relevant and interesting to researchers and stakeholders in each region (see Appendix 1 for links to all background information for these Forums, including RFPs, Programs and Surveys for each of the Forums held in 2021).

## 2. Summary of Forums held in 2021

A total of seven CRFs were organized and held in the regions listed in Table 1<sup>1</sup>, engaging an audience of almost 1900 people from around the world. The percentage of registrants attending ranged from 46% to 93% (Table 1). In Eastern Asia, the Forum attracted participants from 40 countries but 70% were from China (including Taiwan and Hong Kong), Republic of Korea and Japan. Other Asian nations present were: Mongolia, Myanmar, Russian Federation, Thailand, Malaysia, Philippines, Singapore, Bangladesh, India, Sri Lanka, Vietnam, Indonesia and Pakistan.

The program for each Forum was tailored to be relevant to the needs and interests of scientists and stakeholders in the region. Each Forum varied in duration, from 1.5 hrs to 3.5 hours (Table 1).

Through surveys at the time of registration and after each Forum, we could paint a picture of our audience for some of the Forums as well as receiving feedback on the mode of delivery. [Sli.do](#) was used during the Forums to learn more about where our audience was from (Figure 1), their feedback on WCRP and their needs for climate information. There was a higher response with surveys performed at the time of registration and during the Forums (with Sli.do), than with the surveys carried out after the events.

---

<sup>1</sup> CRFs in Africa and Oceania (Pacific Islands and New Zealand) are pending. Discussions continue about delivering a relevant and meaningful CRF in these regions in 2022.

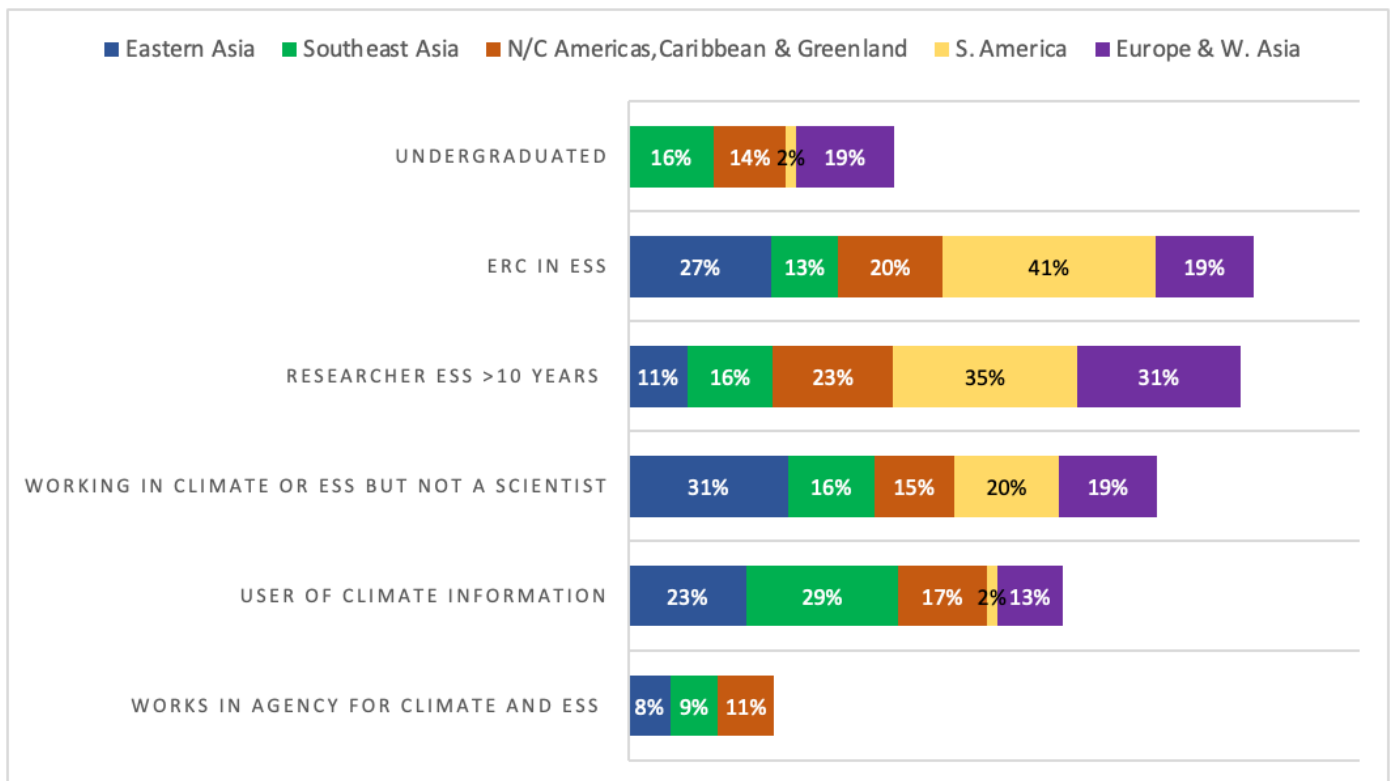
Table 1: Information for first series of WCRP Climate Research Forums.

<b>Region</b>	<b>Australia</b>	<b>Eastern Asia</b>	<b>North &amp; Central America, Caribbean &amp; Greenland</b>	<b>Southeast Asia</b>	<b>Europe &amp; Western Asia</b>	<b>South America</b>	<b>Southern Asia</b>	<b>Sum</b>
<b>Registered</b>	Unknown	401	434	404	232	537	403	2411
<b>Attended</b>	204	268	200	277	170	501	278	1898
<b>Percentage of registrants attending</b>	Unknown	67%	46%	69%	73%	93%	69%	
<b>Duration (hrs)</b>	1.5	2.0	2.5	2.0	3.5	2.5 per day	3.5	
<b>Dates (in 2021)</b>	Feb 10	Apr 7	May 11	May 25	Jun 9	Sep 8 & 9	Nov 30	



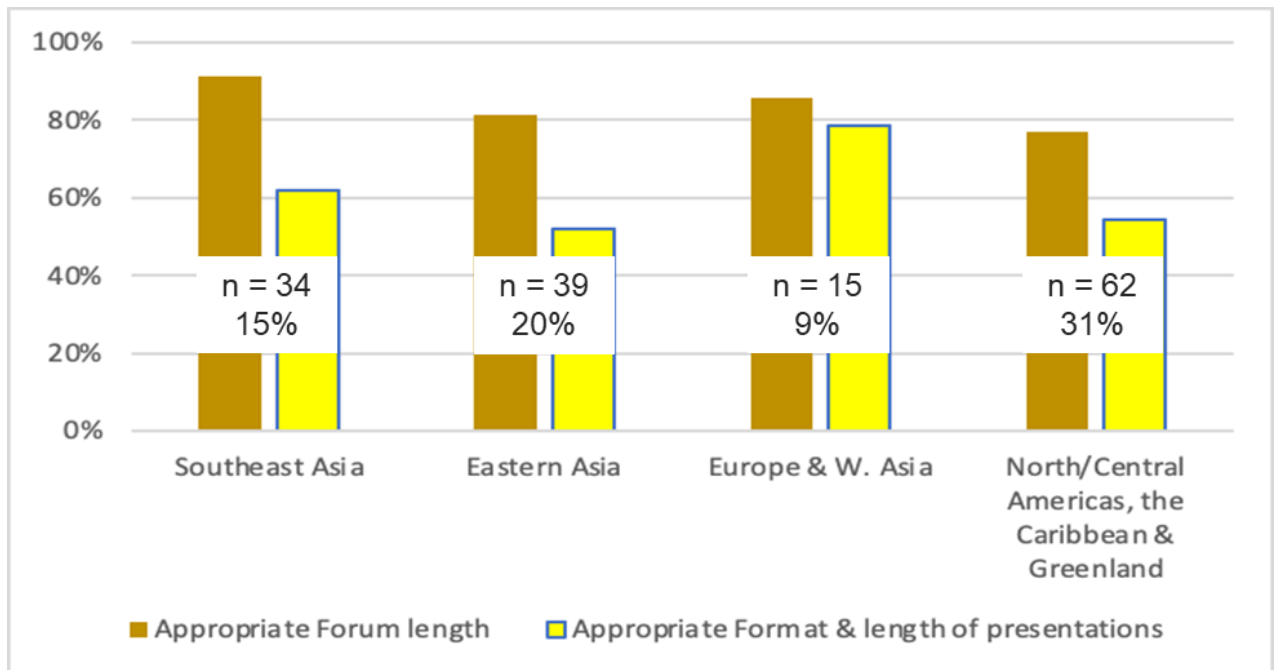
For most regions, at least 40% of the audience were female. While based on a small sample size, Figure 2 shows the audience comprised academics at different career stages, including students and Early Career Researchers, as well as stakeholders and users of climate information. From these limited data, it appears that the Forums were popular with Early Career Researchers, especially in the Asian and South American Forums. 93% of the audience at the Southern Asia Forum were from academia (researchers, scientists, students or faculty), while 33% identified as “users of climate information” (these data are not shown but are consistent with Figure 2).

Figure 2: Career and career stage of the audience based on the limited sample. ESS = Earth System Science and ERC = Early Career Researchers.



In terms of feedback regarding the Forums themselves, Figure 3 shows that the audiences were happy with their length, format and content, and that this feedback did not depend on the overall duration of each Forum. These results are from surveys performed after the event and although the number of respondents was very low, they are consistent with the qualitative feedback received from our audience.

Figure 3: Participants' views on the Forum length/duration, format and length of presentations (where n = number of respondents).



### 3. Feedback: WCRP Profile, Science Priorities and Engagement in the Regions

Our goals for these Forums included informing a broader audience about WCRP's Strategic Plan and new science initiatives, seeking feedback, and exploring further how WCRP can make a difference in the regions around the world.

Most Forum participants across the regions were aware of WCRP (Figure 4). In the Asia regions the lack of knowledge of WCRP was slightly higher than in the Americas and Europe, demonstrating the opportunities for better engagement and awareness in Asia (and likely Oceania).

In all regions, over 80% of the audience indicated that WCRP addresses critical science questions – broadly through our science goals and specifically via the new Lighthouse activities (Figure 5). Despite this strong support, up to 20% of the audience responded that they wanted to await the implementation of the new initiatives while others commented that there should have been more co-design earlier on in the formation of the goals and initiatives (demonstrating the value of holding these online Forums). Around one fifth of the audience across all three regions said they “don't know” in answer whether WCRP is addressing critical science questions.



Figure 4: Responses to the Sli.do question “Are you aware of the WCRP?": a) by region (top panel, where n= number of respondents) and b) for the Forums as a whole (lower panel).

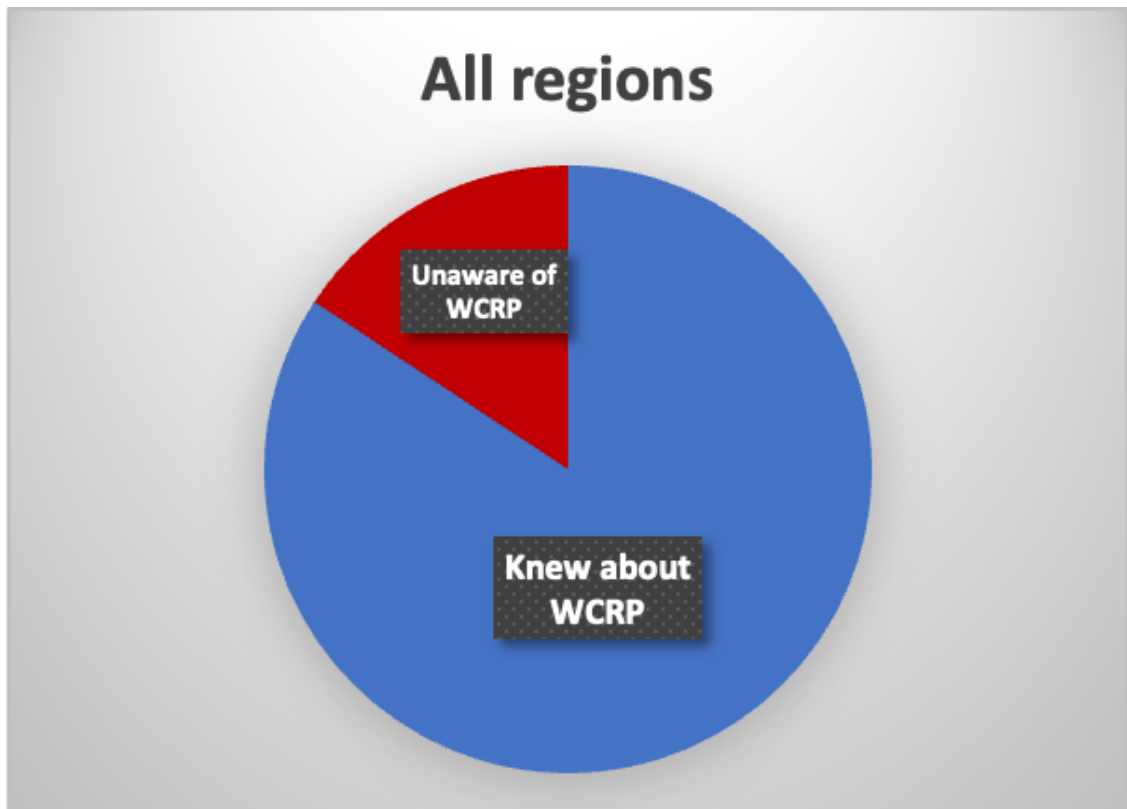
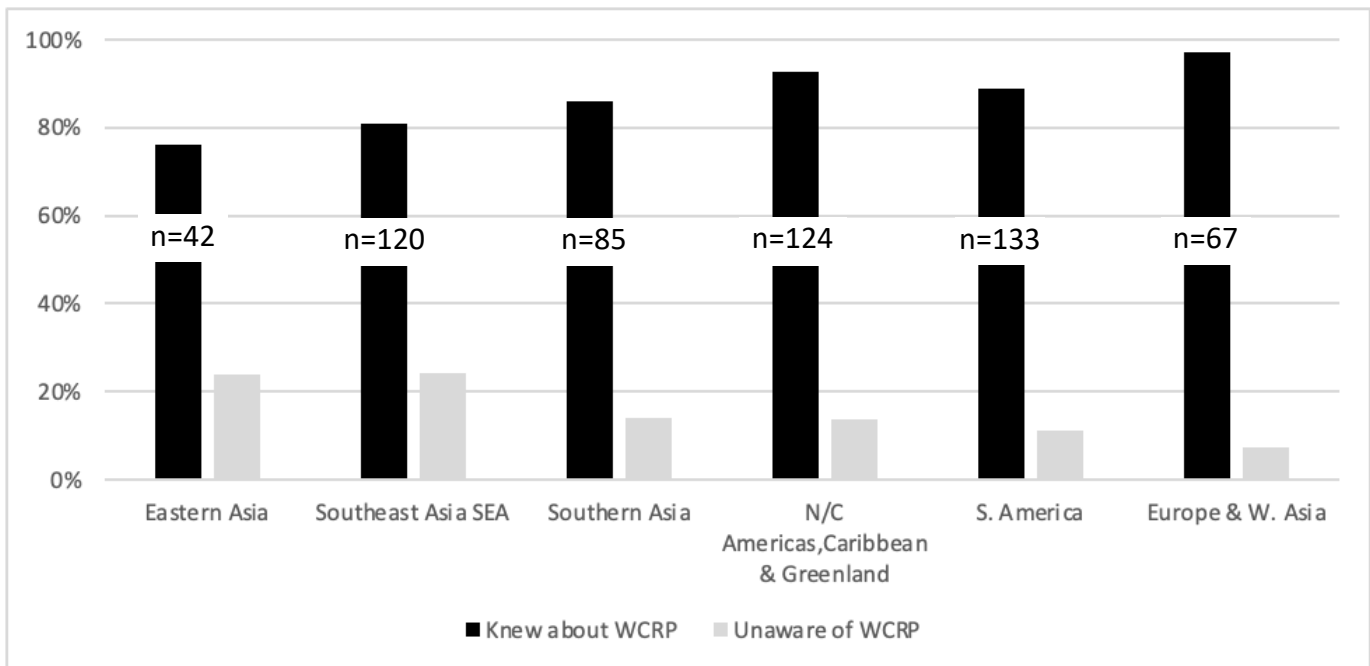
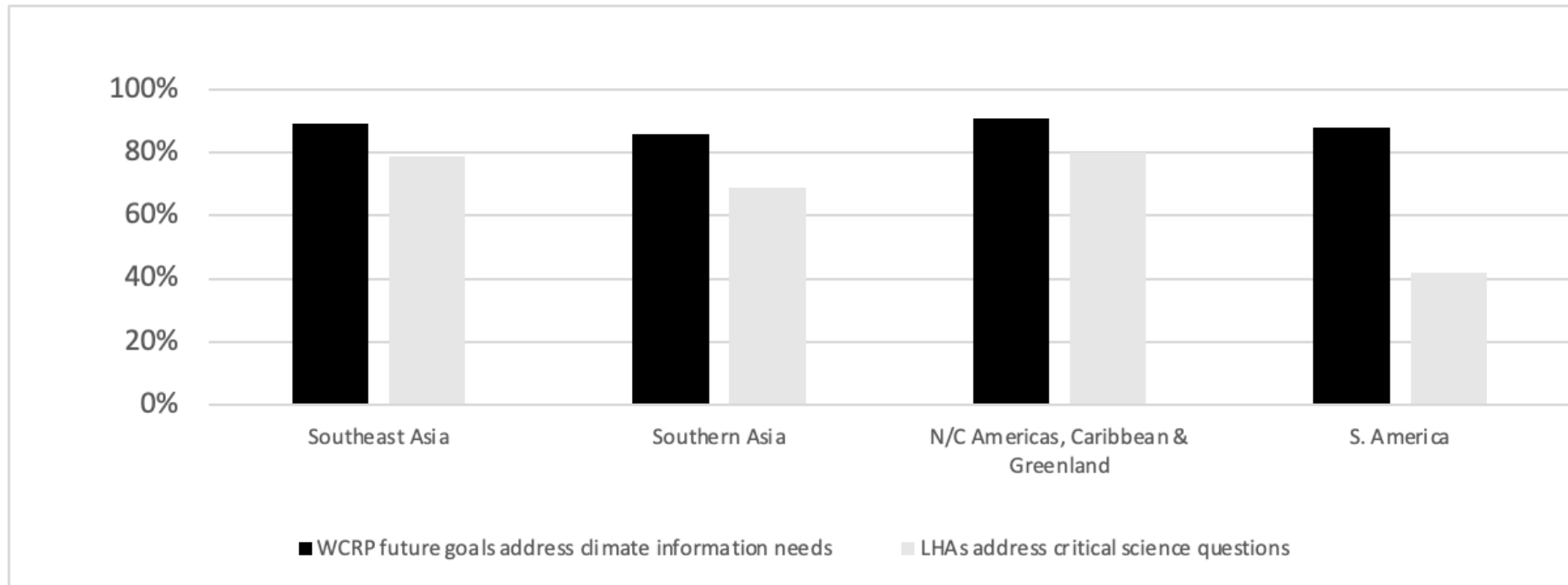
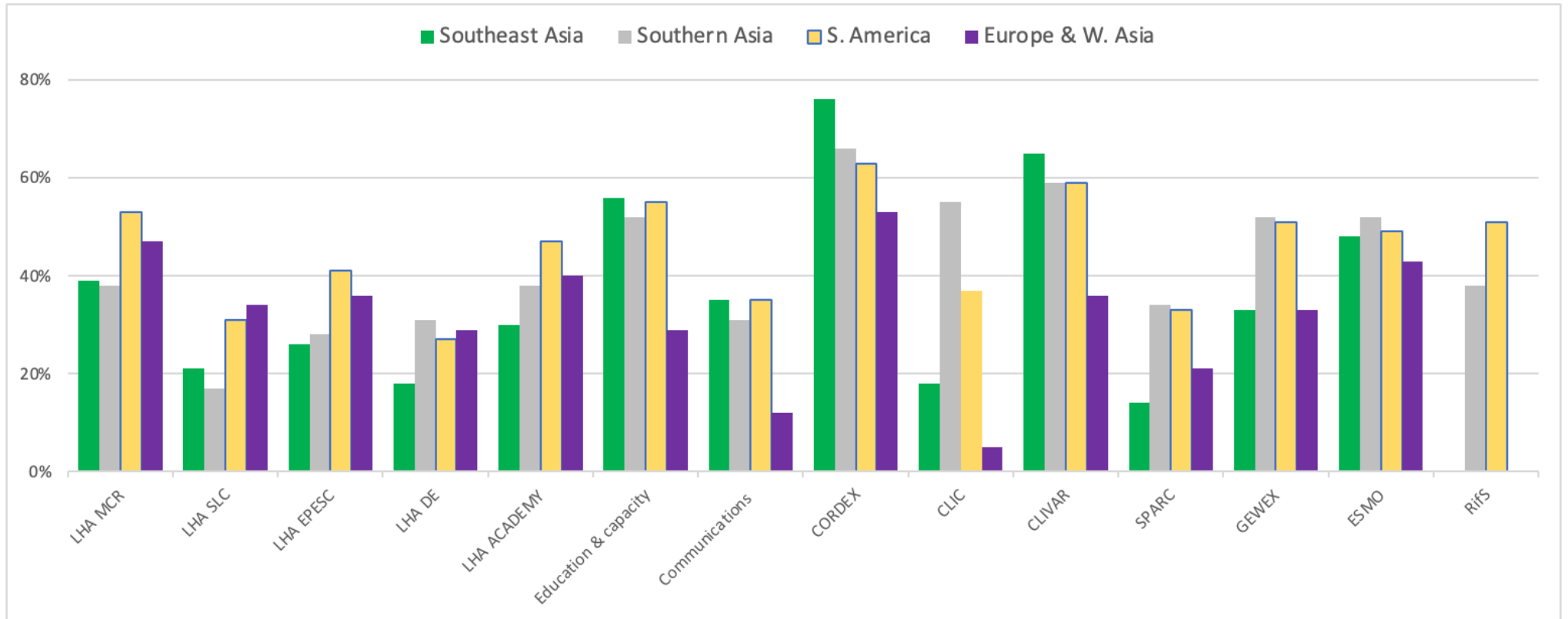


Figure 5: Responses to the Sli.do question “Is WCRP addressing critical science questions?” by region.



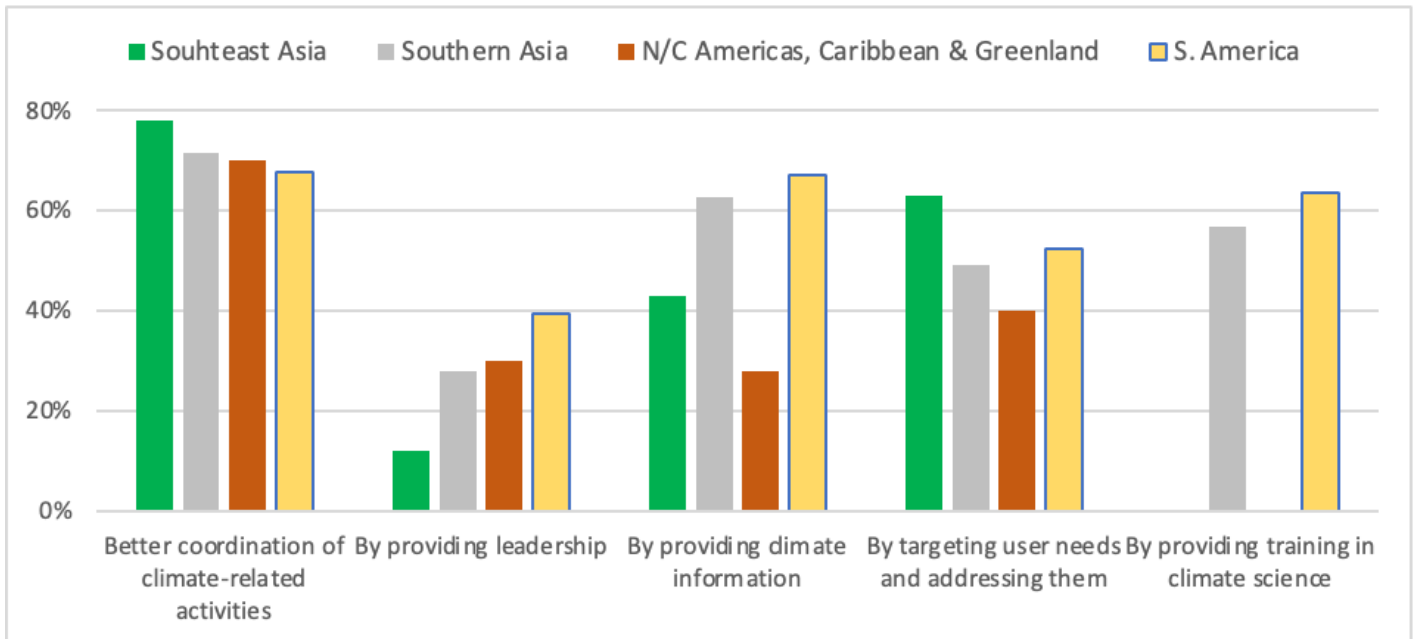
At several Forums, the audience were asked “*what areas of WCRP science would you like to engage in?*”. Figure 6 shows a strong interest in regional climate modelling (CORDEX), ocean science (CLIVAR), and education and capacity-building notably in the Asia region and South America, followed by water and energy exchanges (GEWEX), ES modelling (ESMO) and Regional information (RifS). The Lighthouse Activities were generally more popular across Europe and Western Asia and in South America. Of the new activities, over 40% of the audience across these regions were interested in being engaged in the My Climate Risk Lighthouse, and the new ESMO and RifS Core Projects. 69% of the respondents attending the South America Forum indicated RifS as beneficial for the climate research in the region.

Figure 6: Responses to the Sli.do question “What areas of WCRP science are important to you?” by region.



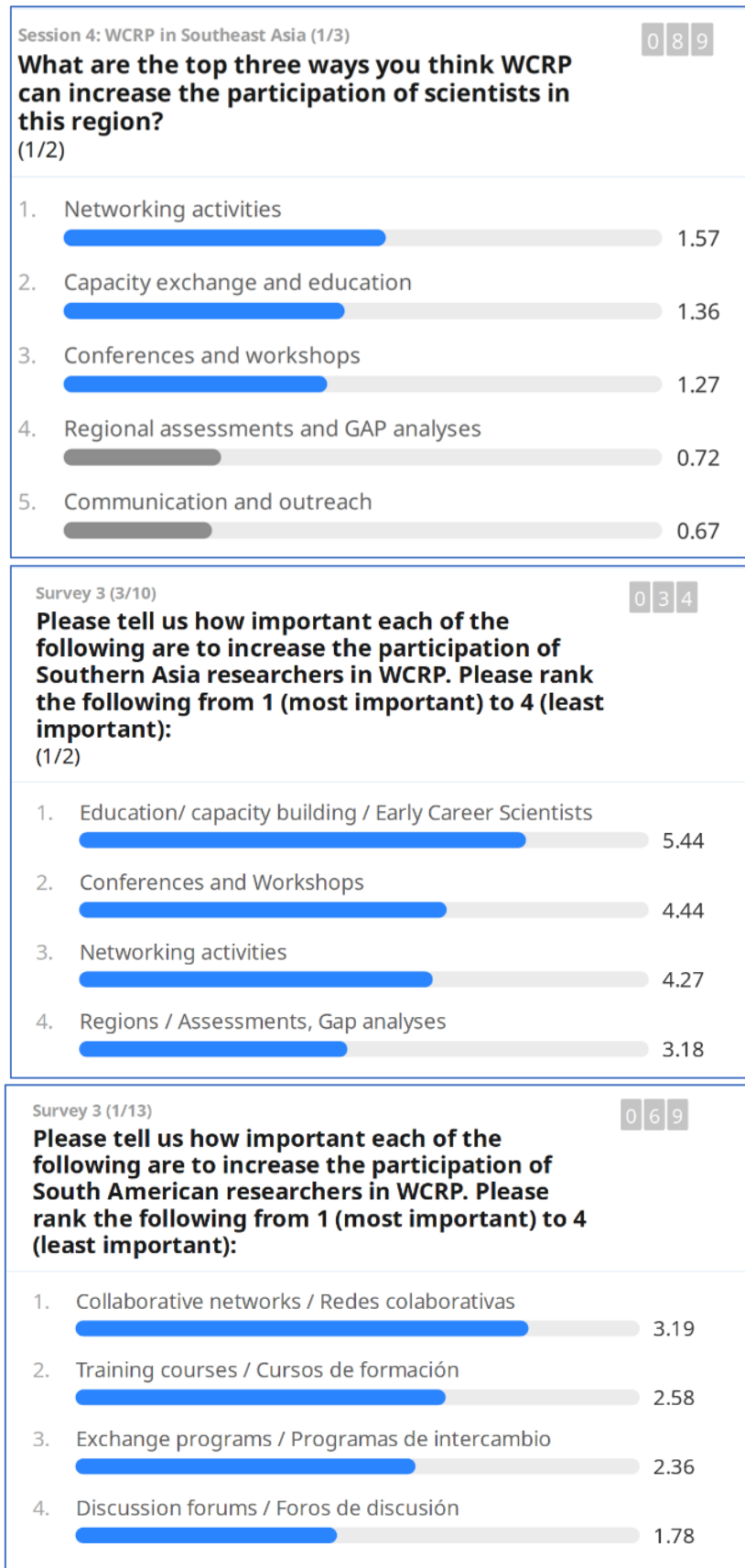
When asked how WCRP can make a difference to climate research in their region (Figure 7), the audience responded with clear messages regarding the need for “better coordination of climate-related activities” followed by “targeting user needs”. Clear messages from the Southern Asia and South America Forums included “providing climate information” and “training in climate science”.

Figure 7: Responses to the Sli.do question “Where can WCRP make a difference to climate research in your region?”. Note that “training in climate science” was an option only in the South America and Southern Asia Forums.



The audiences at the Forums in South America and Asia were asked about ways to increase participation of scientists from their regions in the WCRP and to improve engagement with the WCRP. Their responses, shown in Figure 8 (note that this question was not asked at the Eastern Asia Forum and the modest sample size, which is shown in the top right-hand corner), illustrate the common themes and importance of “Education/training/capacity exchange” and “Collaborative networks”, along with “Conferences and Workshops”, “Regional assessments and gap analyses”, and other forms of communication and outreach. These complement those areas identified and explained above (Figure 7), especially coordination of climate-related activities, providing training in climate science and providing leadership.

Figure 8: Ways to increase the participation of regional scientists in WCRP – responses from audiences at the Southeast Asia (top); Southern Asia (middle) and South America (bottom) Forums. The scores shown on the right-hand side are ranked from 1 (least important) to 5 (most important).



Sli.do was also used to elicit more detailed, written feedback on WCRP science and directions, and ideas and suggestions for new opportunities. The following summarises the written feedback from all Forums except Eastern Asia (quotes are examples to illustrate the general points in boldface):

#### Specific Feedback on Lighthouse Activities:

a) **The importance of links with other WCRP core activities:**

- *“Clear interactions, interfaces and sharing platforms between LHAs and other activities”.*
- *“Make sure there are connections between all the LHAs, WCRP Core Projects and WCRP’s “unifying themes” (modelling and observations) AND connecting to WWRP.”*

b) **LHA design and engagement:**

- *Scientists, especially ECRs, still [do not feel] adequately engaged – where can they “sign-up” to be involved? They sense that the LHAs are dominated by senior colleagues.*
- *“By collaborating with more institutions and activities and having a more interactive forum, with everyone getting a chance to talk and be more inclusive”.*

c) **General comments on Lighthouse Activities (LHAs):**

- *Be good for LHAs to focus on practical issues faced by e.g. small producers in agriculture, and partnerships with civil society organisation that facilitates [working with] the community to address the climate risk of their livelihood”.*
- *“Focus on needs of user application at multiple timescales; how they integrate into Decision Support Systems”.*
- *“Linking LHAs with improved understanding of climate and improved understanding of climate and how research improves decisions made by different sectors of society”.*
- *“Developing demonstration projects in a variety of contexts, regions, countries, including those where climate science is not fully developed”.*
- *“An emphasis on implementation science (i.e. how to effectively implement climate services for different sectors)”.*
- *“Get parts of it embedded in funding programs e.g. GCF, Banks [World Bank, Asia Development Bank], Space Agencies and other funding mechanisms”.*
- *LHAs to interact with the WMO Regional Training Centres (RTCs) and WMO Capacity building programs on training needs and training provision (e.g., Academy), WMO Regional Climate Centers (RCCs) and National Hydrological and Meteorological Services (NHMS).*
- *“The activities are good, but more attention has to be concentrated in the mountainous region especially in the climate modelling”.*

#### Feedback on WCRP more broadly, with a focus on ideas and opportunities:

a) **Profile:** *“No-one knows what WCRP is. ... Your work is solid and I’m involved but there is an issue of brand recognition... More connections with funding agencies.”*

b) **Making a difference - WCRP needs to be ...**

- *“Providing an authoritative voice to make sure scientifically sound climate information is being disseminated to users.”*
- *“Providing incentives and recognition such as an award for best climate researcher or best climate research project and selecting a local ambassador from the communities.”*

- *Advancing “More accurate prediction of extreme events (e.g. tropical cyclones) and their impact on agriculture and disaster risk management”*

c) **Funding and Research Priorities:**

- *EU funders soke of the ongoing need for fundamental climate science. It is therefore important to ensure follow-up with Funders across the regions – a regular “round-table” (possibly in regions).*
- *We received a range of suggestions and opportunities for future activities. The North American Forum recommended a follow-up activity focusing on water in North America that includes key Agencies (IAI, Water Futures [Canada], NOAA, USGCRP et al); this has since evolved into concrete proposal called GPEX.*

**Feedback on Ideas and Opportunities relating to Engagement:**

a) **Better engagement with low income, less developed, global south nations and regions:** We received strong feedback regarding this point, as well as the need for more direct pathways for input and engagement:

- *“Invite people to Forum(s) from the Middle Americas to share regional needs from a developing country perspective.”*
- *“More interaction with regional organizations; WMO Regional Offices to engage more regional experts.”*
- *“Ensure representativity from tropical countries from a more local perspective (local lead researcher rather than focusing on US and European-led research on the tropics).”*
- *Training in preparation of research grant proposals with funding agencies.*

b) **Early Career Researchers (ECRs)** told us that we can do better, including:

- *ECR presence and engagement in Eastern Asia (need for an ECR network).*
- *Understanding of how to get involved in WCRP activities (including concrete examples).*
- *Clarity on how positions on various committees are renewed / filled.*

c) **Broader community engagement:**

- *“Include new voices.” “Intense collaboration.” “Gather feedback from non-climate scientists.”*
- *“More continuous communication with non-academic knowledge and stakeholder groups.”*
- *“Reach more of the public (students and policymakers); make [material] available in other languages to be more inclusive.”*
- *“More publicity of things like My Climate Risk in media.”*
- *Establishment of communication channels such as dedicated regional email lists, use of social media, and hold stands and sessions in conferences.*

d) **Leverage engagement with the Forums:** Ensure we utilise the breadth and diversity of the community who have engaged with us through the Forums, e.g. to augment or renew the membership in key Committees; involve in OSC 23; etc.

**By what metrics should WCRP measure its success in the future?** We asked this question at the North & Central America, Caribbean and Greenland Forum, and here are some of the ideas provided by the audience:

- *User satisfaction, Citizen science, Number of successful pilots or demonstration projects.*
- *Number of regional institutions collaborating with WCRP.*
- *Number of accords with policy-making influence, and/or policies made because of WCRP research.*
- *Measure how much research is transitioned into services that aid better decision-making; uptake and use of climate information for decision-making in non-climate sectors e.g. health.*

#### 4. SWOT Assessment of the Climate Research Forums

A self-assessment based on the evaluation and feedback from the Forum participants, the RFPs and organisers, using a SWOT (Strengths – Weakness – Opportunities – Threats) Framework (Figure 9) demonstrates that the Forums (CRFs) achieved the first two of the stated goals, viz:

1. Inform the WCRP community about the new WCRP and seek their feedback, especially on the Lighthouse activities and other new science initiatives.
2. Exchange ideas and discuss new activities and opportunities.

This first round of CRFs also fulfils the Action identified at JSC 41 (Figure 10).

The third goal, to “explore ways that our community of scientists, partner programs, funders and end-users of climate science can better engage and more effectively contribute to the regional needs” has only been partially achieved – for the reasons described in the SWOT assessment that relate to resources and ongoing strategic purpose.

*Figure 9: Self-assessed SWOT Analysis*

<p><b>Strengths</b></p> <ul style="list-style-type: none"> <li>• <b>Enabled engagement</b> with over 1800 members of our WCRP community around the world.</li> <li>• Generally <b>strong support for new WCRP</b>.</li> <li>• Useful feedback from scientists; as well as partners, stakeholders and funders.</li> <li>• <b>RFPs worked well</b>: a) they helped develop content of relevance to each region and identified good speakers; and b) they have helped to grow an understanding of WCRP and the size of our WCRP family.</li> <li>• <b>Support from IPOs</b> (CLIVAR, GEWEX, SPARC, CORDEX, S2S, CORA), plus <b>WCRP Secretariat</b> (Narelle, Beatriz, Hindumathi and Nico) was critically important.</li> <li>• A <b>template format</b> for subsequent Forums [positive feedback about length and content].</li> <li>• <b>Technology</b>:             <ul style="list-style-type: none"> <li>- <b>Sli.do</b> best for engagement and feedback.</li> <li>- <b>Zoom</b> best videoconference platform.</li> </ul> </li> </ul>	<p><b>Weaknesses</b></p> <ul style="list-style-type: none"> <li>• <b>Significant workload and resource intensive</b> across aspects of organisation, logistics, analyses and follow-up. This means that dedicated, additional resources are needed for future Forums or if CRFs are to be regular events (e.g. annual). Alternatively, move to a different delivery mode, or hold infrequently.</li> <li>• <b>Sustaining the engagement of the excellent RFPs</b>, in a mutually beneficial way, for WCRP activities broadly, and future Forums?</li> <li>• Absence of a way to undertake and sustain the <b>necessary follow-up</b> with stakeholders in the region.</li> </ul>
<p><b>Opportunities</b></p> <ul style="list-style-type: none"> <li>• <b>Expanded WCRP’s contact database</b>.</li> <li>• RFPs provide a <b>larger, more diverse pool of researchers</b> for WCRP’s Core activities.</li> <li>• <b>Interest from Early Career Researchers</b>.</li> <li>• <b>Ongoing engagement</b> with partners and funders; and consultation with researchers.</li> <li>• <b>Interests and needs in regions</b> better understood.</li> </ul>	<p><b>Threats</b></p> <ul style="list-style-type: none"> <li>• <b>Funding and resources</b> need to be identified to sustain the Forums, undertake the follow-up and ongoing engagement.</li> <li>• <b>Strategic purpose</b>: clarity about the ongoing purpose and need for these Forums.</li> <li>• <b>Identifying an appropriate “home”</b> within one of WCRP’s core activities as both a repository for the “know-how” and to roll-our additional Forums.</li> </ul>



Figure 10: JSC-41 Action, July 2020.

**JSC-41 ACTION: Put necessary steps in place to “roll out” regional consultations on WCRP evolution.**

- There needs to be an identified regional “lead” to make it happen; i.e. establish the process, establish a team from across the JSC/WCRP family to be the local leads, etc.
  - It is intended to draw upon the networks of JSC members, current WCRP Core Projects and core activities, and also YESS
- Chair and Vice Chair to attend these regional consultations to provide a consistent message
  - A package of materials will be developed to support these consultations
- Outcome: consultation outcomes will refine the Lighthouse Activities, their research program as well as the thinking process about WCRPs future structure.

5. Follow-up with 2020-2021 Regional Focal Point Groups

An important and immediate action is to follow-up with each of the Regional Focal point groups in 2021. The following proposes an approach for this follow-up, noting that it will require some modest resources, probably from the WCRP Secretariat.

- a) **Eastern, Southeast and Southern Asia; North and Central America, Caribbean and Greenland; Europe and Western Asia and South America:** Once this Report draft is finalised, especially with the “lessons learned” sections completed, then a copy should be sent to all RFPs from these regions along with an invitation for a follow-up videoconference meeting (ideally with the JSC Chairs in attendance) to: i) review the feedback received from their respective Forums; ii) discuss the findings and recommendations in this Report; and iii) discuss what requirements might exist from WCRP’s core activities and the regions for follow-up activities.
- b) **Oceania – NZ and Pacific:** There has been some good interest after the WCRP Keynote Lecture at ISHCOMO and it seems that we could explore doing an event jointly with the MCR Lighthouse Activity, noting also that the Ocean Decade and possibly the Academy also have aligned interests.

The Action is for the JSC Vice Chair to follow-up with the RFPs, along with the relevant interested parties from the Lighthouse Activities and in NZ and plan an event in 2022 that is relevant and meaningful for both WCRP and scientists and agencies in the region.

- c) **Africa:** Our engagement with the RFPs needs to be re-activated, ideally with a draft but concrete plan for what type of Forum would be of value in Africa. Given the interest and traction around water and GPEX, I recommend we develop an engagement with that focus (unfortunately the opportunity for a Session at SRI 2022 has been missed). The organisation of a CRF back-to-back or as part of the program of the WCRP OSC in Rwanda in 2023 should be explored.
- d) **For all Regions and RFPs,** we should work with the 2023 Open Science Conference Science Organising Committee (OSC-SOC) to explore whether the RFPs could provide some form of regional input to, support of and involvement in, the 2023 Conference (see also the next section).

## 6. Options for Future Climate Research Forums

Given the evaluation discussion, what are the options for future CRFs? Some salient points to be considered in deciding the best way forward include:

- a) Pause or continue?** Should these Forums continue, in whatever format and frequency? Given that their initial purpose has been largely (but not completely) met, and their large resource requirement, perhaps they should be paused until another occasion arises that needs global engagement. JSC may decide to pause these until there is a clear need for them in the future.
- b) Format for future Forums, or equivalent:** With the experience gained during this first round of Forums, WCRP now have a “template” that could be used for any future forums of this nature – either regularly (e.g. annually) or on an “as needed” basis. Some refinements, based on this first round of Forums, could include:
- Hold the Forums almost simultaneously, i.e. over a 24-hr day that follows the earth’s rotation and involves different groups presenting and organizing, with some generic WCRP content that is consistent across all Forums.
  - Each round of Forums could have a different theme.
  - Consider partnering with an organisation whose expertise lies in running virtual videoconferences and have them do the organization and delivery.

There is also the option for “spin-off” Forums that use the same branding but are done for a specific region on a topic of interest. For example, Core Projects and LHAs may wish to use this approach for Forums that are crosscutting across WCRP with a regional focus. The CRF template could be used for future Workshops such as the forthcoming IPCC-WCRP Joint Workshop.

- c) Alignment to WCRP Strategic Plan and Implementation:** If they continue then these regionally based forums should reside within a Core Project – most likely RfS. The alignment with the My Climate Risk (MCR) and Academy Lighthouses is also noted – especially the regional labs or hubs that MCR established in 2022.

Wherever future CRFs are structurally housed, there will always be a need for close liaison with the WCRP Secretariat, IPOs and other Core Projects/LHAs. Indeed the Core Projects / LHAs may wish to use this platform and format to run events where relevant, as noted above.

Finally, these Forums should be included in the Communications, Coordination and Engagement part of the WCRP Implementation Plan.

- d) Resourcing:** Organising, and realising actual benefit from, these Forums requires resources – especially staff with the time and skills. Maintaining a series of Forums in the future requires a dedicated staff allocation between 0.5 and 1 FTE – ideally from the WCRP Secretariat and/or a RfS IPO. A dedicated fund-raising and sponsorship effort to grow the funding base in the WCRP Secretariat and /or the IPOs is likely needed to provide such a dedicated staff allocation.

The JSC and Secretariat may wish to consider appointing an “Engagement and Relationship Manager” if further resources were found. The Forums would be one of their tasks in close cooperation with the IPOs. Regardless, any plans to continue these Forums must include consideration for sustained funding, at approximately 0.5 FTE. This would enable the WCRP to enhance its global engagement as identified in the WCRP Strategic Plan.

## 7. Draft Recommendations to JSC

Broadly, JSC are encouraged to note: a) that this first phase of regional consultations did mostly achieve the initial aims identified in the JSC41 Action; b) that the approach taken is an effective, and relatively cost-effective way, to conduct engagement in the regions around the world; and c) the feedback and important lessons learned, as captured in Sections 2 and 3 of this Report.

The following are the main recommendations:

- 6.1 WCRP retain the RFPs, at least through to the end of 2023, to provide support to the activities in the lead-up to and delivery of WCRP's 2023 Open Science Conference. The JSC Chairs write to the RFPs thanking them for their time (on behalf of the JSC and WCRP), confirming this commitment and explaining the follow-up actions over this time.
- 6.2 The JSC Chairs to facilitate a discussion with the leadership of the RfS Core Project to discuss their interest in jointly "owning" these Forums with the WCRP Secretariat. This would include the RFPs, the approach to regional engagement using the CRF format, and the CRF "template". A similar discussion may be appropriate with the My Climate Risk and Academy LHAs to identify synergies and joint activities.
- 6.3 As part of the budget strategy discussions, and JSC Action on communication, coordination and engagement, explore the benefits and need for an "Engagement and Relationship Manager" within the WCRP Secretariat including the role purpose, accountability, and an appropriate time allocation. The feedback from the Forums demonstrates that the role itself would have external (funders and partners in the region) and internal (liaising with the core activities) dimensions and would need to be closely overseen by the JSC Chair and Head of the WCRP Secretariat.
- 6.4 The JSC Vice Chair work with the WCRP Secretariat to complete the Actions identified in Section 5. This includes the WCRP Secretariat and JSC Vice Chair holding an event in the two remaining regions (Oceania – NZ and Pacific) and Africa.
- 6.5 WCRP Secretariat to ensure that there is adequate communication with all WCRP core activities about the final recommendations and actions.

## Appendix 1: Repository for all Climate Research Forum Information

This link (still under construction) to the WMO SharePoint site contains the following information:

- Survey Questions
- Regional Focal points
- PDFs of Data Analysis for each Forum

[This link](#) contains the RFPs and programs for each of the Forums held in 2021.

Appendix 2: Regional Knowledge/Research gaps and/or needs<sup>2</sup>

All regions included except Europe & Western Asia and Australia (no data). Colour emphasises topics common to several regions.

Region	Topics
<b>South America</b>	<ul style="list-style-type: none"> <li>• Observations: (i) Lack of data/ long-time series, (ii) Development of capacities in observational data collection, construction of datasets and analyses, (iii) access to data (Open data) &amp; data sharing</li> <li>• Extreme events: Modelling, Prediction, Early warning, e.g., precipitation and temperature</li> <li>• Modelling/time scales: Model development; high-resolution modelling (time and space)</li> <li>• Atmosphere-ocean interactions impacts on the coastal zone</li> <li>• Forecast/Prediction systems</li> <li>• Lack of human resources and expertise at National Meteorological and Hydrological Services (NMHS) to provide information the stakeholders</li> <li>• Interdisciplinary regional information for decision making through co-design with stakeholders and impacted communities</li> <li>• Training in climate science at senior and ECR levels</li> <li>• Help connect researcher with operations climate centres</li> </ul>
<b>Southern Asia Southeast Asia Eastern Asia</b>	<ul style="list-style-type: none"> <li>• Predictions of extremes (droughts/floods), risk assessment, detection and attribution, dealing with uncertainties</li> <li>• High-resolution data and predictions</li> <li>• Lack of data/observations in mountainous regions</li> <li>• Regional partnerships are needed in this geopolitical sensitive region</li> <li>• Co-production of knowledge with users and stakeholders</li> <li>• Urban climates</li> <li>• Training: (i) in climate science at senior and ECR level on climate change, models and solutions; (ii) Training in writing research grant proposals; (iii) Capacity building; fellowships to ECRs</li> <li>• Climatology and agroclimatology</li> <li>• Regional assessments; Gap analyses; Integration of different sectors</li> <li>• Applications/use of climate information for decision and policy making</li> <li>• Impact of climate change on water resources</li> </ul>

<sup>2</sup> Tables in Appendix 2 were compiled by Beatriz Balino, from the WCRP Secretariat.

	<ul style="list-style-type: none"> <li>• Linking scientists with governmental institutions</li> <li>• Climate change impact on tourism</li> </ul>
<b>North &amp; Central America, Caribbean and Greenland</b>	<ul style="list-style-type: none"> <li>• <b>Observations: in Central America &amp; the Caribbean</b> scarcity of data and modelling facilities are major issues. Need of a regional observational data collection network and modelling infrastructures</li> <li>• Climate observing, past, present, future, needs a close working relationship with WMO and its Member's observing programmes.</li> <li>• How to involve ECR in WCRP activities</li> <li>• Agricultural systems resilience to climate change and biotechnology</li> <li>• Citizen science</li> <li>• Long-term research funding/grant opportunities for regional studies in developing countries</li> <li>• Support the development of climate research capabilities in National Meteorological and Hydrological Services (NMHS). Diagnosis of operational climate predictions of NMHSs in developing countries</li> <li>• <b>Training in writing research grant proposals</b></li> </ul>

### Appendix 3: Barriers to diversity<sup>3</sup>

Data only available for Central and South America and the Caribbean and Southern Asia. Colour emphasises topics common to several regions

Region	Topics
<b>South America</b>	Language/ political will/ public engagement
<b>Southern Asia</b>	<ul style="list-style-type: none"> <li>• Lack of communication</li> <li>• Training and capacity building</li> <li>• Gap between career and employment. (In India: age, cast &amp; skills play major roles)</li> <li>• Lack of computational capacity and research facilities</li> <li>• Open/Sharing of data</li> <li>• Integration of sectors</li> <li>• Forums in local language to connect better with stakeholders and audiences</li> </ul>
<b>Central America and the Caribbean</b>	<ul style="list-style-type: none"> <li>• Support locally-lead research and local initiatives to improve observational facilities. The region has now a fair number of young researchers developing high-end research but there is still a colonial effect in the sense that while the work is done in these countries the projects (and budgets) are led by US-European researchers which limits the development of this new generation of regional scientists.</li> <li>• Promote specific activities of topics relevant to the region (e.g., vector-borne diseases; Sargassum blooms, ocean acidification). Provide more freely available web-tools to help scientists in Small Island Developing States (SIDS) do scientific analysis and downscaling. For instance, the NCAR/NCEP Reanalysis was key to scientists with scarce research funds being able to conduct research of importance to the region.</li> <li>• Reach out, integrate and communicate relevant findings to the most vulnerable communities, notably low income BIPOC (Black, Indigenous, and people of color)</li> <li>• Forge connections with new and non-traditional institutions to seek a transversal impact of the information from WCRP activities.</li> <li>• Information/hosting of events in the languages of the region</li> <li>• Increase PI participation in committees and leadership from underrepresented regions/countries. Reach out to underrepresented groups and users</li> <li>• Training/Capacity development: (i) Open/increase educational programs for students and ECRs; (ii) financial support for minorities to join projects and adaptation/mitigation activities</li> <li>• Open/sharing data</li> <li>• Welcome climate services specialists from well-respected institutions</li> <li>• Funding: Mobilize research funds in underrepresented regions/countries</li> </ul>

<sup>3</sup> Tables in Appendix 3 were compiled by Beatriz Balino, from the WCRP Secretariat.

