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3 **The (CR)2 Symposium on Climate and Resilience: dialogues in times of changes**

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8 **Key Points:**

- 9 • A four-day symposium consisted of open plenary conferences and topical sessions
10 addressing climate and socio-environmental resilience.
- 11 • The event brought together biophysical and social scientist as well as professionals and
12 stakeholder beyond the academia.
- 13 • It filled a (national) void of events addressing climate and resilience research and its
14 bi-directional links with society

Abstract

In celebrating its first decade of existence, a Chilean research center organized an open forum on climate and socio-environmental resilience engaging participants -both speakers and audience- from within and outside the academic community. Held the first week of September 2023, the symposium filled a void of events addressing climate and resilience research and its bi-directional links with society.

Full text

The Center for Climate and Resilience Research (CR2) is a group of about 60 scientist -from various disciplines and Universities- and 20 operational staff, funded since 2013 by the Chilean Research & Development Agency. Over time (CR)2 has become a well-recognized national leader in climate and resilience research by producing high-quality disciplinary studies and developing novel interdisciplinary modes of research (Morales and Muñoz 2021). Researchers and staff at (CR)2 have organized several scientific conferences on specific themes (e.g., the 4th International Atmospheric River Conference (Garreaud *et al.* 2020) and the [2019 Transformation Conference](#)) involving a subset of the disciplines encompassed by the center. A more interdisciplinary forum is provided by yearly (CR)2 science/strategic meetings but these are limited to the center's affiliated. As the center reached its first decade of existence in late 2022, it was suggested to conduct an Open Science Conference to synthesize and outlook disciplinary and interdisciplinary research within and beyond (CR)2. Another seal of the center is to provide timely and rigorous information, as well as climate services, for public policy, stakeholders and society at large, so the concept evolved from a purely scientific conference to a broader event, engaging participants -both speakers and audience- from outside the academic community.

The idea crystallized in the International Symposium on Climate and Resilience in times of changes (SICyR for its abbreviation in Spanish), to be held the first week of September 2023. To meet its objectives, the planned four-day event was divided into two parts: open plenary conferences and topical sessions, both addressing climate and resilience but oriented to diverse audiences and using different formats. Originally, we considered mingling both components, but the event organization was eased by conducting all the plenaries on Monday-Tuesday (4-5 September) and the topical sessions on Wednesday-Thursday (6-7 September 2023).

The *plenary conferences* were intended to provide an open forum -beyond academia- with perspectives and thoughts on cross-cutting issues of high national and global relevance. These issues are listed in Table 1 and broadly coincide with integrative themes explored by the center over the last decade, such as the changing forest fires regime and governance of the elements (water, fire, air and soil), plus ongoing themes, such as climate risk, climate action and transformation. Each of the eight plenaries lasted 90 minutes and was convened by a member of CR2 that invited a group of 3-5 panelists from the academic community, civil society, government agencies and private companies. Some plenaries consisted of a sequence of talks in which the panelist presented their understanding and insights on the topic. Others were organized as a round table in which the panelist commented on specific questions raised by the convener. In both cases the last part of the plenaries were allocated to questions by the public, leading to a conversation that vividly continued during the conference' breaks.

To facilitate the participation of the general public and panelist, the plenaries were held in downtown Santiago -at the FCFM Campus of the Universidad de Chile-, attendance was free of

charge and live transmission was provided. All presentations were recorded and are available at the symposium [web site](#). Given the venue' capacity, the in-person registration was limited to 280 participants, 190 of them attended the event at some moment. Another 130 people registered for the on-line participation, half of them from outside Santiago. Nearly 60% of the participants were from Universities and Research Centers, with the rest of them splitting similarly among the public sector (state agencies, municipalities), NGOs and private sector.

The overall view arising from the plenaries is that local and regional manifestations of climate change became tangible in the past decade, altering mean conditions and contributing to augmenting the extent, intensity and recurrence of environmental extremes. They have major and widespread detrimental impacts, including the central Chile megadrought (Garreaud et al. 2017), record-size rural fires (González *et al.* 2020) and extensive harmful algal blooms in western Patagonia (Ugarte *et al.* 2022). National and local organizations have faced these events as momentary and isolated emergencies, and there is an urgent need to consider them as part of the “new normal” using the principles presented in our report on integrated governance of the elements (Billi *et al.* 2021). These events have also increased awareness on climate change among the general public and authorities at all levels, a necessary first step to move towards a climate-resilient nation and to adopt a low-carbon, sustainable economy. Nonetheless, attributing extreme environmental events solely to climate change is misleading and obscure local factors that are potentially more readily to amend or mitigate.

The *topical sessions* aimed at presenting knowledge progress, gaps and ways forward in climate and resilience sciences, with emphasis on work focused on Chile and South America. In early 2023, (CR)2 researchers eagerly proposed 22 sessions clustered in 6 broad themes (Table 2). The sessions aimed at specific but highly diverse topics -from remote sensing to climate change economy- reflecting the wide arc of research conducted in the center. An international open call to submit abstracts to topical sessions was then advertised using the center's web page and social media as well as more targeted communications from the conveners to their communities. By the end of May (abstract submission deadline) nearly 400 works were received -twice larger than expected- which are now available at the SICyR web page. As shown in Figure 1, 30% of the abstracts were directed to sessions related to changes in climate, hydrology and extreme events, and 20% were directed to sessions dealing with climate action and transformation. The remaining half divided similarly among modeling and observations, governance and economy of climate change, resilient cities, and the impact of climate change upon socio-environmental systems. Overall, there was a balance between biophysical and social works, fulfilling one of the key goals of the symposium. Most of the abstracts were submitted by Chilean researchers but 10% of them came from abroad.

Allowing for two parallel oral sessions we could only accommodate about 100 talks (10 min each) in this two-day conference, against the 260 authors that asked for this form of presentation. We then use an allocation scheme in which the fraction of accepted talks was nearly the same among sessions (~40%), asking the conveners to select works to be presented in oral format based on their own criteria (e.g., pertinence and novelty of the works). The rest of the accepted works should be presented in poster format, for which we allocated four 2-hr sessions during the symposium. Only three sessions (HC1, HC2 and HC3) had 9 talks filling completely a 1.5-hour oral presentation blocks. Smaller sessions (with 3-6 talks) were merged to complete 9 talks considering thematic affinity. This “Conference Tetris” was performed by a small committee seeking a balanced program. Considering the registered authors, the [final program](#) was released a

few weeks before SICyR and included 280 works: 99 in oral format and 181 in poster format. The topical distribution of the actually presented works was similar to that shown in Figure 1.

The *topical sessions* were held in Viña del Mar and attracted 255 participants, 210 of them presenting one or more works, many of which had attended the plenary sessions earlier. Recording of all oral presentations is also available at SICyR web page. Although the parallel sessions somehow separate the biophysical- and social-science themes, the extended poster sessions provide a great opportunity to unite the audience. Participants manifested satisfaction by the connections established among colleagues outside their disciplines, scientists from other research centers and professionals beyond academia. The overall feeling from is that plenty of relevant, timely and exciting research was packed in the two days of the topical sessions. Some works were interdisciplinary and transdisciplinary in their own (as those devoted to merging scientific and indigenous knowledges) but most of them came from disparate individual disciplines. This diversity, however, was neatly framed within the symposium's overarching themes: regional-scale, socio-environmental impacts of climate change and ways forward to create a more sustainable and resilient society.

Nowadays scientific advice is frequently requested by government agencies and NGOs, while scientists often address topics emerging from social demands. Nevertheless, lining up researcher, stakeholders and social actors to address highly relevant, specific issues in times of climate and social changes was a major achievement of SICyR first half. The large and diverse audience to the plenaries reveals that our symposium was timely and relevant, filling a national void of events addressing climate and resilience research and its bi-directional links with society. On the other hand, interdisciplinary approaches are sought by many scientists, research centers and funding institutions as a way to understand complex problems. Yet, many barriers remain for collaborative work (e.g., Siedlok and Hibbert 2014; Hein *et al.* 2018; Undurraga *et al.* 2023); putting together scientist from different fields but aiming at the same grand challenges is an often-overlooked condition for interdisciplinary research that has been cultivated in (CR)2 (Morales and Muñoz 2018) and inspired the topical sessions of SICyR. We were delighted by the large number and diversity of abstracts submitted to the topical sessions. Most participants acknowledged this opportunity, rarely seen in the Chilean context and abroad, several of them asking for the next version. Although SICyR was conceived as a single event, we now realize the big impact and tremendous opportunities brought by an event grounded in science and focused on specific themes, but open to society and diverse in disciplines. Lesson learnt in SICyR 2023 will certainly help to organize future events in which we hope to escalate from a mostly national to a Latin-American to a fully international symposium. As geographical span broadens, so does the themes and actors, calling for an expanded cooperation among centers and other institutions.

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Open Research

Data Availability Statement:

Given the nature of this contribution (commentary) no new data has been used in its preparation.

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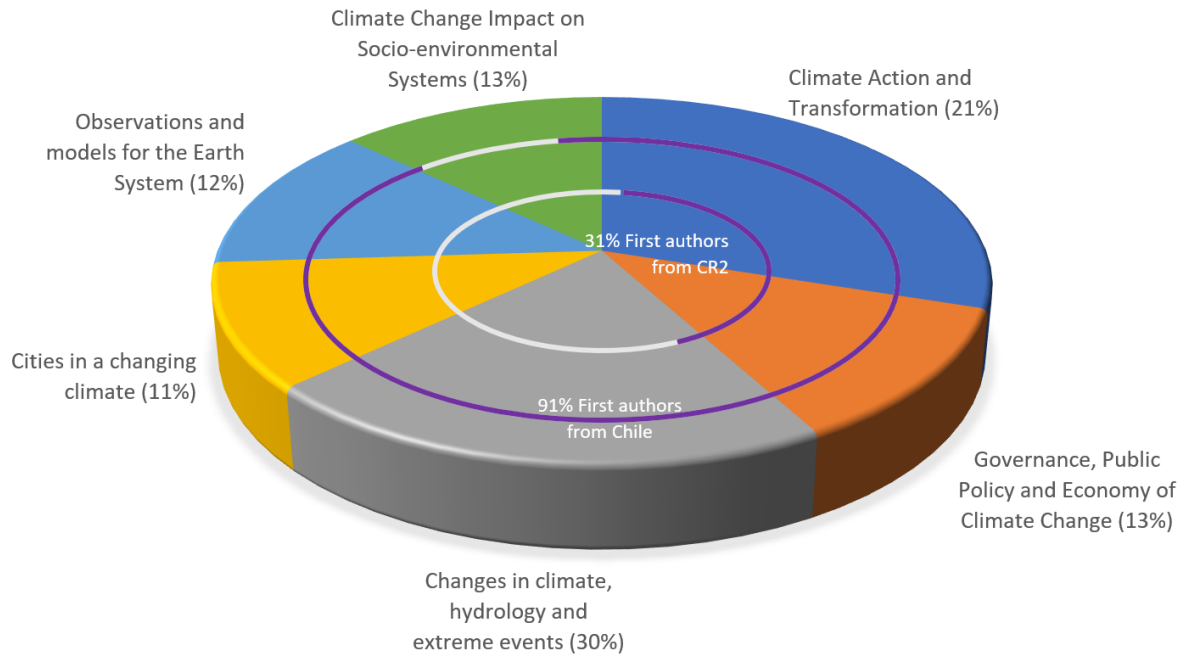


Figure 1. Distribution of the abstract submitted to SICyR (397 in total) according to main themes of the topical sessions. Also indicated percentage of first authors from CR2 and Chile.

Table 1. List of plenaries during SICyR (first two days). Panelists are classified according to their primary affiliation. ●: Research Center/University; ◆: Private Company; ★ Governmental Institution; ▣: Non-governmental Organization.

Theme	Convener (CR2)	Panelists
Drought and Water Security	Juan Pablo Boisier & Camila Álvarez-Garretón	● René Garreaud, CR2 ● Camila Álvarez-Garretón, CR2 ◆ Edson Landeros, Aguas Andinas ◆ Ulrike Broschek, Fundación Chile
Forest fires	Mauricio Galleguillos	● Mauro González, CR2 ★ Christian Little, National Forest Corporation ▣ Luis Otero, Forest Stewardship Council ● Gabriela Azocar, CR2
Anthropocene manifestations	Eugenia Gayó & José Barraza	● Beatriz Cid, UdeC ● Laura Gallardo, CR2 ▣ Pamela Poo, Ecosur
Climate Action and Transformation	Paulina Aldunce & Pilar Moraga	★ Maisa Rojas, Ministry of Environment ▣ Sara Larraín, Chile Sustentable ▣ Julieta Martínez, Tremendas
Climate Risk and responses	Laura Ramajo	★ Maritza Jadrijevic, Ministry of Environment ● Carolina Martínez, CIGIDEN ▣ Camila Wirsching, Fundación Proyecta Memoria
Governance of the elements	Cecilia Ibarra	● Roxana Bórquez, CR2 ▣ María Paz Aedo, Centro de Análisis Socioambiental ★ Claudio Castro, Renca Municipality ★ Gloria Lillo, Ministry of Environment ★ Sofía Valenzuela, Metropolitan government
Climate and air quality	Rodrigo Seguel	● Nicolás Huneeus, CR2 ★ Jenny Mager, Ministry of Environment ● Helen Worden, NCAR
Red tides: A multidisciplinary approach	Italo Massoti	★ Jorge Mardones, CREAN IFOP ★ Andrea Rivera, Ministry of Health ● Ana María Ugarte, CR2

Table 2. Topical sessions and main themes during SICyR (last two days). Conveners are from CR2 except in cases indicated by •

Main theme	Topical session	Conveners
Changes in climate, hydrology and extreme events	HC1 Climate and Hydrological changes in the Andes	J. Boisier; C. Alvarez-Garretón, M. Zambrano, M. Galleguillos
	HC2 Extreme climate events: drivers, impacts, and predictability	D. Bozkurt; R. Valenzuela; M. Jacques
	HC3 Drought and Water Security under Climate Change	M. Zambrano-Bigiarini; C. Álvarez-Garretón; O. Baez-Villanueva •; K. Verbist •
	HC4 Atmospheric composition: trends and impacts	R. Seguel; N. Huneus
Cities in a changing climate	CR1 Urban climate, wellbeing and health	E. Blanco; P. Sarricolea
	CR3 Climate-resilient cities	P. Smith; A. Osses
Governance, Public Policy and Economy of Climate Change	GP1 Indigenous Peoples and Climate Governance: Contributions, Barriers and Partnerships	R. Carmona; J. Rupayan •
	GP2 The Challenges climate change raises for energy policy.	A. Maillet; C. Ibarra
	GP3 Climate governance to move towards climate resilient development pathways.	R. Bórquez; C. Alonso
	GP4 Climate Change Economics	F. Vásquez Lavín; R. Oryan
Climate Action and Transformation	AC1 Transformations from the south: the time is now.	G. Guevara Cué; P. Aldunce
	AC2 Art as an inspiration and facilitator for climate action	P. Aldunce; C. Castro •
	AC3 Climate crisis and co-construction of knowledge	B. Morales; M. Silva; M. Salinas
	AC4 Climate change communication: lessons learned and challenges for a world in crisis.	N. Carrasco; M. Escalona •
Observations and models for the Earth System	MO1 Measurement of climate and pollution parameters in the varied geographies of Chile	Z. Fleming; M. Troncoso •
	MO2 Remote sensing and resilience	J. Lopatin; M. Galleguillos

	MO3 Evolution and Impact of Climate Services	F. Muñoz; D. Campos •
Climate Change Impact on Socio- environmental Systems	EV1 Impacts, vulnerability and resilience of terrestrial ecosystems to global change	C. Zamorano; R. Urrutia
	EV2 Forest ecosystem collapse and recovery	A. Miranda; C. Rojas •
	EV3. Socio-environmental processes in coastal zones	N. Carrasco; C. Aguirre
	EV4 Causes and impacts of forest fires: Advances and challenges for socio-ecological resilience	M. González; G. Azocar, P. Sarricolea
	EV5 Marine Protected Areas in the climate change context	L. Ramajo; M. Jacques; E. Alcamán