

Report to the WCRP Joint Scientific Committee

Safe Landing Climates

1. Highlights achieved since JSC-43

- *Submission of LHA position paper to Nature Climate Change, January 2023.* This paper describes in accessible language the motivation, purpose, and aims of the lighthouse. In particular, it articulates two key questions that we aim to answer:
 - Q1: what potential high-impact climate hazards, surprises, or irreversible changes should we be genuinely worried about and how do we usefully quantify and communicate the associated risks?
 - Q2: what do achievable, internally consistent, and safe pathways to a future climate to meet broader human needs look like?
- *Continuation of Tipping Point Discussion Series and initiation of Safe Landing Pathways webinar series.*
- *In-person meeting in London, March 2023.* This invitation-only workshop brought together most of the Working Group members including all but one of the Steering Group, plus a few other invitees. The workshop included scientific presentations by attendees, extensive plenary and breakout discussions of planned LHA activities, and one hybrid day where external experts were invited to give talks to update those present on relevant topics and activities by other organisations. Finally, the meeting included a breakfast with members of the local finance community organised by S&P Global Sustainable 1. The chief outcome of the workshop was a better-defined set of LHA activities to be pursued in the coming years, which are outlined in Section 2 below. The agenda and participants list (and soon the report) can be found at <https://www.wcrp-climate.org/lighthouse-activities/SLC/SLC-London-Meeting-Agenda-v7.pdf>

2. Planned science initiatives and major events (next 3 to 5 years)

- *A CMIP-focused project with several components.* Objectives are to promote highly-coupled model runs in CMIP7 to better capture threshold crossing and tipping elements across the Earth System; include new scenarios to represent different pathways than previous RCPs (in particular overshoot scenarios with strong but late mitigation and CDR); and evaluate selected tipping impacts. Leads: Bette Otto-Bliesner, Pierre Friedlingstein & Gabi Hegerl
- *Gaming and decisions/scenario exploration.* The objective is to develop future scenarios that are more relevant outside the climate sphere. Leads: Kevin Reed, Neil Harris
- *Water variability impacts.* Activity addressing resilience of water-use sectors, valuation and optimal allocation of water, and 'green finance' in various future scenarios of (greater) water variability. Leads: Hyungjun Kim, Paulo Nobre
- *Signposts for sea level rise.* Identify indicators of change and their implications for the future, and integrate them with communication strategies. Leads: Beth Holland, Molly Mitchell
- *High-risk cascading shocks, including impacts on the carbon cycle and quantification of costs.* Interesting examples are multiyear drought and heat waves. Leads: Laura Saurez-Gutierrez, Gabi Hegerl
- *Connecting across the IAM-GCM-impact hierarchy.* The objective is to discover unexpected climate hazards possible in a fully coupled Earth/Human system, to enable a two-way flow of information across model hierarchies, and to enable error framing. Possible joint project with ESMO. Leads: Hannah Liddy, Steve Sherwood
- *TCRE Assessment.* Assess the pdf of Transient Climate Response to cumulative Emissions (TCRE) using an approach similar to Sherwood et al. (2020) for ECS. Leads: Chris Jones, Pierre Friedlingstein, Tatiana Ilyina & Roland Séférian

In addition to the above initiatives, we plan a second, pan-LHA in-person meeting in 2025, and we plan to get some of the Working Groups together in Kigali at the WCRP OSC.

3. Active or planned collaborations with other Core Projects, Lighthouse Activities, etc.

We have several current and planned collaborative activities.

- Our Water Variability and Impacts initiative will be conducted with GEWEX involvement.
- We have begun discussions with the EPESC LHA toward a joint activity on heat waves as part of our cascading-shock initiative.
- We intend to propose our connecting-across-model-hierarchy initiative as a possible joint initiative with AIMES and/or ESMO.

3a. Requests for the WCRP Academy to support your training activities?

- *Connecting across the IAM-GCM-impact hierarchy.* The first challenge in this initiative will be to educate across the sectors that need to work together. Physical scientists need to understand social sciences (including jargon and concepts) and vice versa. An Academy resource to facilitate education along these lines prior to holding any workshops, that workshop attendees could engage with prior to any workshop itself, would make such workshops more productive. This might also help other initiatives such as our Gaming and Signposts initiatives. We also suggest that the Academy talks to AIMES about possible training content.

4. Partnerships with projects outside WCRP

- Our London workshop was co-sponsored by S&P Global Sustainable 1 and we will continue to liaise with them, including via Affiliate memberships in our LHA. They have offered to help us link with risk assessment current practice in the financial sector.
- Our Tipping Point Discussion series has been done collaboratively with AIMES and Earth Commission (Future Earth) and generally attracted large (100 and up) audiences.
- Above-noted initiatives on *Connecting across the IAM-GCM-impact hierarchy* with AIMES
- Our *Gaming and decisions/scenario exploration* initiative is intended to be undertaken in collaboration with the Rand Corporation and possibly other external partners.

5. Issues and challenges:

- Recommendations or proposals, including any proposed changes to the structure of the Core Project, Lighthouse, or other activity.
 - We are in the process of recruiting additional Working Group members for our Pathways and Perturbed Carbon Cycle working groups.
 - We are now forming our Advisory Committee, which will be composed of external people interested in the LHA or who can provide ongoing guidance and representatives of other WCRP activities as needed.
- How do you see your community evolving, e.g., activities coming to an end or new ones starting?
 - We will periodically survey current members to see if they want to continue and anticipate that Affiliate Members (the wider SLC network) will have some turnover.
 - We are continually adding new Affiliate Members as interest in the LHA grows.
 - We anticipate that some activities or Working Groups might not make significant progress and if not will be wound down, which will be initiated by the Steering Group after consultation.
- List any advice you request from or questions that you have for, the JSC (including any additional funding requests you might have at this stage)
 - We know that the JSC will be considering a new WCRP activity on climate intervention. We request to know more as this activity evolves as there may be synergies with SLC.