Regional Information for Society (RIfS)

Science Plan

Prepared and adopted by the RIfS Interim Coordination Group

Preface

The Regional Information for Society (RIfS) is a WCRP core project focused on research that underpins provision of actionable information for society's response to climate variability and change.

The core project differs from the WCRP lighthouse activities. Core projects are enduring research communities, while the Lighthouse Activities draw on the underlying research of the core projects to in practice advance the science to manage climate risk and meet society's urgent need for robust and actionable climate information. The lighthouse activities represent exceptionally important partnerships for translating RIfS outcomes into regional societal activities.

RIfS is organized around four inter-related and co-dependent clusters. This document describes these clusters and their priority scientific questions, as well as foci for future actions to address these challenges. Further details on the RIfS framework are available in the associated Governance (Appendix A) and Mission and Vision (Appendix B) documents.

The RIfS science plan should be read as a living document that is meant to be flexible and responsive to the rapidly evolving context of societies response to climate change. As such, the "big picture" framing is the important focus, and the implementation of the detailed foci will be adaptable in terms of priority as a function of the region, resources, and societal application.

In reading the document in its current form (April 2022), the reader should bear in mind that RIfS is in its formative stages of its establishment year, that RIfS is currently operating under an Interim Coordinating Group (ICG) and the SSG will be appointed in the coming months. Further, it should be recognized that partnerships and collaborative opportunities, both internal to WCRP and externally, are largely still only potential at present and will evolve through discussions and meetings that have yet to take place. Lastly, it should be noted that the internal relationships and structure within RIfS is likewise in its early formative phase (see Appendix A), and as collaborations mature, will see a shift in how the science plan is approached by the different clusters.

The term "Society" is used here in a limited definition to prioritise the focus on the two key communities of users of climate information: first, those directly involved with policy and decision making and the impact research community; second, the climate services community who are equally users but of more primary climate data, including environment/environmental services.

The SSG will further refine the meaning of key terms used in the document, as needed.

1 Overview

The overarching objective of RIfS is to facilitate and catalyze new targeted research related to the provision of actionable information about climate variability and change in support of adaptation and mitigation that draws on the best available science. RIfS uses the application context to inform research on aspects of understanding the climate system, the collation and/or generation of relevant data, the construction of context relevant actionable information, and the communication and engagement with policy and decision makers and relevant stakeholders. The term "context" is used in this document to refer to the context in which the climate information is used (e.g. a city planners decision context, or a water resource manager's context. This may include the broader aspects of culture, operations, institutions, policy frameworks, governance, etc.

To link climate science and society with context relevant climate information we identify three overarching science challenges:

1) How to optimally identify, understand, and model the relevant climate processes and their interactions which are most critical to manage the socio-ecological risks at the decision scales within regions.
2) How to optimally integrate multiple lines of evidence from observations, understanding of physical climate processes, and data from dynamical and statistical regional and global models to inform society's climate information needs.
3) How to best undertake engagement between stakeholders and the science community in different regional contexts to maximize the information benefit for the stakeholder and ensure that the user context is integrated into the design and execution of relevant climate research.

This science plan is designed to address priority knowledge gaps relevant to achieving the RIfS objectives and explicitly draws on other WCRP activities, including core projects and lighthouse activities (see section 4), and to include knowledge outcomes from relevant external partnerships.

2 Research Objectives

RIfS will promote, design, and implement research activities to enhance the beneficial value of climate science for society. It is explicitly recognised that some objectives have overlap with other core projects, and in some instances with the CORDEX science plan. In such cases RIfS will seek to be complementary and not duplicate other efforts. Through this the science plan seeks to guide the research community toward achieving the following outcomes:

1. Improved understanding of the fundamental mechanisms and drivers of regional climate change and regional climate variability.
2. Improved understanding of the changes in weather and climate extremes (including compound extremes) and their attribution.
3. Improved articulation of the climate relationship between regions and the large-scale climate mechanisms and their interactions across scales.
4. Advanced understanding of predictive skill of drivers of regional climate in the context of regional vulnerability.
5. Assessment and evaluation of the skill, uncertainty and limits of tools for developing regional climate prediction and projection information products, including extreme events.
6. Improved approaches and methodologies for reconciling and integrating multiple lines of evidence for climate change prediction and projections at the relevant societal scales.
7. Construction of regional climate information relevant to the decision context and impacts, including a specific focus on extreme events.
8. Quantification of the temporal and spatial scales of skillful climate prediction and projection and the associated added value of available statistical and dynamical modelling systems contributing toward actionable climate information.

9. Assessment and development of approaches for effective engagement between the research community and society stakeholders and the Climate Services communities.
10. Improved research designs that incorporate stakeholder context to advance the responsible and pragmatic uptake of climate information in a heterogeneous landscape of values and cultural priorities.
11. Enhanced methods for co-production with stakeholders on the context-relevant construction, communication and adoption of actionable information.
12. Develop approaches to better integrate and assess the connections across the pathways linking data production, information construction, knowledge development, and wisdom in adaptation.

3 Research clusters

The RIfS scope spans a broad range of overlapping and mutually informing research themes, that range from core modelling to the social dimensions of information communication and adoption in society. RIfS groups these into four complementary clusters which necessarily overlap with each drawing on the science and expertise of the others. Notably, the understanding that comes from engagement with society is explicitly threaded through all four clusters.

The four clusters are:

I. Regional climate understanding for climate projections (multi-decadal)
II. Regional climate understanding for predictions (seasonal to decadal)
III. Weather and climate extremes
IV. Communication and Societal Engagement

From the perspective of climate information for society, many of the science questions about climate prediction and projection are common across the timescales. Consequently, there is significant overlap in science questions between Clusters 1 and 2, yet also questions unique to each time scale.

Cluster 1 addresses climate change projections that are forced by external drivers (e.g. enhanced greenhouse gas concentrations) contingent on human socio-economic activity. Of special note is that the Coordinated Regional Downscaling Experiment (CORDEX) is a key contributor to activities within cluster 1.

Cluster 2 addresses sub-seasonal to decadal predictability and is largely forced by internal climate processes (e.g. atmospheric ocean, and troposphere-stratosphere coupling). Cluster 2 seeks to advance understanding of the predictability and drivers of regional climate's variability on seasonal to decadal time scales and for this works in collaboration with leadership in other WCRP core projects.

In outlining the science questions for clusters 1 and 2, we recognize the benefits from collaboration between these communities to learn from and contribute to each other's endeavours. Consequently, for clusters 1 and 2 the key science questions are presented first as those common to both clusters, followed by the science questions that are more specific to the time scales of each cluster.

Cluster 3 builds upon and integrates multiple activities on weather and climate extremes across WCRP and contributes to improved understanding of the changes in weather and climate extremes (including compound extremes) and their attribution.

Cluster 4 is explicit about bridging with society and emphasizes the partnership with stakeholders. Necessarily cluster 4 draws upon the knowledge in clusters 1-3, while also informing the activities and knowledge production of clusters 1-3.

4 Priority research questions and actions in each cluster

Clusters 1 and 2: Regional climate understanding for projections and predictions

SCIENCE QUESTIONS IN COMMON TO BOTH PREDICTION AND PROJECTION TIME SCALES

There is significant benefit in research collaboration between the communities focused on climate prediction and those on climate projections and to allow each community to benefit from the insights of the other. From the RIfS perspective the following are the primary questions and actions in common to cluster 1 and cluster 2:

1. <u>What are the knowledge gaps, uncertainties, opportunities for improved regional climate prediction/projection across climate time scales?</u>

Our goal is to evolve improved metrics to evaluate climate model simulations and advance the process understanding of model behaviour in ways that explicitly incorporate stakeholder needs and that can readily be communicated beyond the climate science research community.

- Identify knowledge gaps needed to improve representation of key regional processes and scales in modelling systems.
- Develop new approaches to efficiently identify aspects of regional climate that are most relevant to key socioeconomic sectors and systems, and what are the drivers of regional predictability (e.g., regional climate features, teleconnections, external forcings) of those features
- Advance methods to seamlessly assess and communicate uncertainty across the range of time scales and different model products/ensembles from forecasts of sub-seasonal, seasonal to decadal predictions and projections.
- Assess/qualify the reliability and uncertainty of predictions/projections for derivative parameters relevant to stakeholders, such as compound variable impacts, or of values derived from multiple variables in the models such as heat stress, storm surge, runoff, etc.
- Develop methods to better communicate model skill as time and space scales in a simple/understandable way to stakeholders without using difficult to interpret, overly technical language and metrics.

2. <u>What model complexity is required to usefully represent regional climates and change?</u>
    - Contribute to development of good practice to optimally select for a given application's context which model systems to use in developing regional climate predictions and projections of their future changes.
    - Relate climate system complexity to the key issues of coupling between components of the climate system, the coupling between global and regional models and questions of physical consistency, missing or under-represented components and drivers, and sources of uncertainty.

3. <u>How to reconcile and integrate multiple lines of evidence in providing regional climate information?</u>
    - Assess the current status of guidance and good practice for the selection of models, tools, frameworks, and protocols in constructing climate information across regions and the diversity of application contexts.
    - Evaluate the range of lines of evidence and assess their relative added value in context of applications.
    - Implement new activities to evolve good practice guidance based on evidence from real world experiences.
    - Understand the reasons for differences/similarities/contradictions in climatology, variability, and extremes on local to regional scales among different data sources, and better explain the implications for regional climate information.

- Use the understanding of the regionally relevant multi-scale drivers of climate variability and change to reconcile the differences of data sources and so improve the signal-to-noise ratio of the regional information (including the role of temporal and spatial resolution along the model chain e.g. global, regional to impact model).
- Quantify the limits to regional climate information in geographic regions where observations, monitoring, and modelling infrastructure are limited, and develop strategies to overcome these limitations.

SCIENCE QUESTION PRIMARILY FOR CLUSTER 1: THE CLIMATE PROJECTION TIME SCALE

4. How can the foundations for impact-relevant regional climate projections be enhanced?
    - Develop better approaches to determine the added value from a dynamical or statistical model to provide context relevant actionable information.
    - Develop methods to determine the optimal combination of modelling techniques for a given context.
    - Evaluate and improve bias-adjustment methods for regional applications.
    - Construct new approaches to represent and convey uncertainties inherent in the different data sources to enhance the signal-to-noise ratio and so better inform regional decision-making.
    - Develop new dialogue communities to improve the feedback from new regional understanding into model development and experiment design that improves the representation of critical climate phenomena and processes important to regional impacts and regional climate change.

SCIENCE QUESTION PRIMARILY FOR CLUSTER 2, THE CLIMATE PREDICTION TIME SCALE

5. What are the primary sources and drivers of predictability and predictive skill across climate timescales?
    - Facilitate optimal methods to build multi-model ensembles for sub-seasonal forecasts given the short processing time and very different creation methods
    - Identify what aspects of internal variability need to be reproduced for teleconnections and thus regional information to be valid
    - Advance and optimally reconcile the scales and metrics of greatest predictability with the scales and metrics most relevant for stakeholders.
    - Identify knowledge gaps that need to be closed to separate stochastic internal variability from forced changes at regional scale and to discern the primary natural and anthropogenic drivers of regional climate change and variability.
    - Contribute to advancing observation-based and model-based approaches and work to better integrate these to advance our knowledge and improve confidence for predictions and projections of regional climates.
    - Provide guidance on how to best select prediction models/systems when the constraints of an operational climate service preclude processing of very large ensembles.
    - Enhance stakeholder relevant verification measures of model forecast projections.

Cluster 3: Weather and climate extremes

Weather and climate extremes have a strong impact on society. Extremes are tackled in various ways across different WCRP activities, yet our ability to deliver effective and timely information on extremes at the global and regional level to inform society needs to be improved. Not all tools are equally skillful in representing extreme events. Evaluation of models in terms of extremes is challenging due to sparsity of data in some regions and due to poorer sampling than mean climate in

all, hence evaluation needs to consider multiple approaches. Moreover, different extreme events have different impacts on different sectors and regions. Therefore, there is a clear need to better identify the character of extreme events that are most relevant for different regions and sectors to advance our predictive capability and better project the climate change impact on extremes. This cluster of activities focuses on coordinating efforts to improve the quantification and characterization of a wide range of extreme conditions and understanding the causes. Note the term extremes is used herein as inclusive of compound events, modal shifts in regional climate, exceedance of socio-ecological climate thresholds, and low frequency – high impact events in the contemporary and possible future climate states.

The Global weather and climate Extremes Platform (GEP) is a key contributor to activities within this cluster. It will contribute to improving the ways of delivering science, information, and data concerning extremes in a well-synthesized format and to integrate outputs on extremes across WCRP, therefore, contributing to the scientific objectives of this cluster.

Necessarily the cluster will work in close collaboration with Cluster 4 on stakeholder engagement and bring the specific knowledge about extremes to Cluster 4's foci.

Specific science questions:

6. How can we best communicate the nature of extreme events that most strongly threaten socio-ecological systems in different regions of the world?
    - Develop a web portal to provide a clear picture of the current status of research and attribution capabilities concerning weather and climate extremes.
    - Develop a database of key atmospheric hazards in the contemporary climate.
    - Develop and apply new metrics for the detection and characterization of extreme events in the contemporary climate. This work will leverage past activities (e.g. Expert Teams on Climate Change Detection and indices, and Sector-specific Climate Indices (ETCCDI and ET-SCI) and integrate with the on-going work of WMO's Expert Team on Climate Information for Decision-Making.
    - Evolve scientific understanding of multiple stressors or hazards that occur concurrently or sequentially.
7. How can we best deliver timely and useful information regarding the future evolution of these events?
    - Facilitate structure dialogue around communication on extremes within and external to WCRP.
8. How can we best develop methods to attribute change in probability of observed extreme events?
    - Facilitate systematic evaluation of reliability of extreme event attribution across events and regions; and evaluate methods and tools to do so. This activity connects to the lighthouse activity my climate risk and explaining and predicting earth system change yet with a distinct focus on event attribution for regions.
9. How can we best develop methods for mitigation verification from the perspective of changes in weather and climate extremes?
    - Develop and evaluate improved model approaches to simulation of extremes under global climate change, and develop methods for early detection of impacts of emission reduction on extremes.

Cluster 4: Communication and Societal Engagement

This cluster area centres around understanding and enhancing the communication flows between the climate science community and the breadth of society that has a need for climate information. The activities are dependent on the knowledge from clusters 1-3, and expressly supports and informs their work. Activities within cluster 4 seek to advance the understanding of how societal

context and climate information are best integrated, articulated and disseminated between the communities of climate research, climate services, and society, and so enhance the climate resilience of society. This recognizes there is no singular or static solution due to the global heterogeneity of the regional community's context, risk exposure, cultures and values, and adaptation needs. The cluster works in close partnership with the climate services community to better understand how to assess and integrate the context and information needs, and so enhance the approaches to the construction and communication of relevant regional context and climate information.

The goal is to improve understanding of knowledge exchange between climate scientists and key actors engaged in communication through climate services, and key stakeholders in climate sensitive socio-economic sectors (e.g. agriculture, or energy) and social systems (e.g. cities).

Two key elements frame the research: research on connecting with society (as opposed to RIfS being a climate service) and establishing a dialogue and functional partnerships with those operationally engaged with bridging science and society or representing key decision and policy communities (e.g. city or national government, regional or trans-border water resource management, or transnational organisations such as the World Bank). This component of RIfS focuses on understanding the dialogue with society and does not imply RIfS is engaging as an operational climate service. Rather, RIfS seeks to understand, explore, test, and evolve good practice and so better enable WCRP internal and external interactions.

The specific science goals are:

10. <u>How can we better understand the dynamics and evolving landscape of climate information services, users and usage?</u>

Our goal is to advance methods to optimally design and communicate physical climate information products that are of maximal value to society, and to learn from society the diversity of contextual constraints and needs to better inform climate research. Priority actions within this framing include:

- Understand how to assess user context and incorporate this into the design and communication of information.
- Evaluate the type and attributes of information which are of priority for the range of actors using and/or needing climate information.
- Assess the skill, capacity, and constraints to achieve the desired knowledge products (to be further defined), and develop strategic actions to work past these limitations.
- Learn from how actors in different sectors (e.g. water resource planning, policy development, early warning, etc.) or those managing social systems (e.g city governance) experience the access to, limitations of, and applicability of current knowledge products (resolution, scales, attributes of relevance, etc), and use this knowledge to better evolve the climate information products.
- Understand how actors in society perceive, assess, understand and interpret skill (skill, robustness, trustworthiness) and uncertainty/confidence in the climate information they are able to access.
- Use the evolving understanding of the actors in society and develop strategic plans (including partnerships with relevant Lighthouse activities) to develop capacity in the user communities, and how to better reframe the knowledge products to meet the user understanding and capacity.
- Build a knowledge base of the relation between characteristics of information versus characteristics of perceptions and assessment of information quality and the characteristics of the provider/source (trust and authority), and through this help evolve good practice guidance and identify critical capacity development needs.

11. How can we enable improved understanding of, and advance the dialogue with stakeholders?
    Our goal is to advance and inform approaches to engage with the diversity of actors using climate information noting the heterogeneity of socio-economic, political, cultural, and development contexts. Three core research actions are key to achieving this goal:
    - Develop exemplars from real world actions that demonstrate key lessons of examples of good and bad practices in bridging the gap between climate information and society for different types of actors and contexts and distil the principles to guide further activities.
    - Characterize high value approaches that are most effective and appropriate for engaging with different types of actors, contexts and information needs, including approaches to communication/visualization, co-production, and trans-disciplinary research.
    - Enhance the capacity of the science community to better access, understand, and comprehend user-contexts, and through this facilitate the construction and communication of climate information to be better aligned with the users needs, and deepen the user capacity to assess the fit-for-purpose value of the information products.
    - Develop approaches in monitoring and evaluating adaptation measures, drawing on concepts of the AR6 WG2 report. (SSG to explore potential partnership with the My Climate Risk lighthouse to address this)

5 Implementation

Implementation of activities in support of the science plan will be the responsibility of the SSG. The SSG will engage in ongoing discussions with other components of the WCRP exploring collaboration and how best to complement their activities. Contingent on these discussions further refinements of the science plan may be adopted.

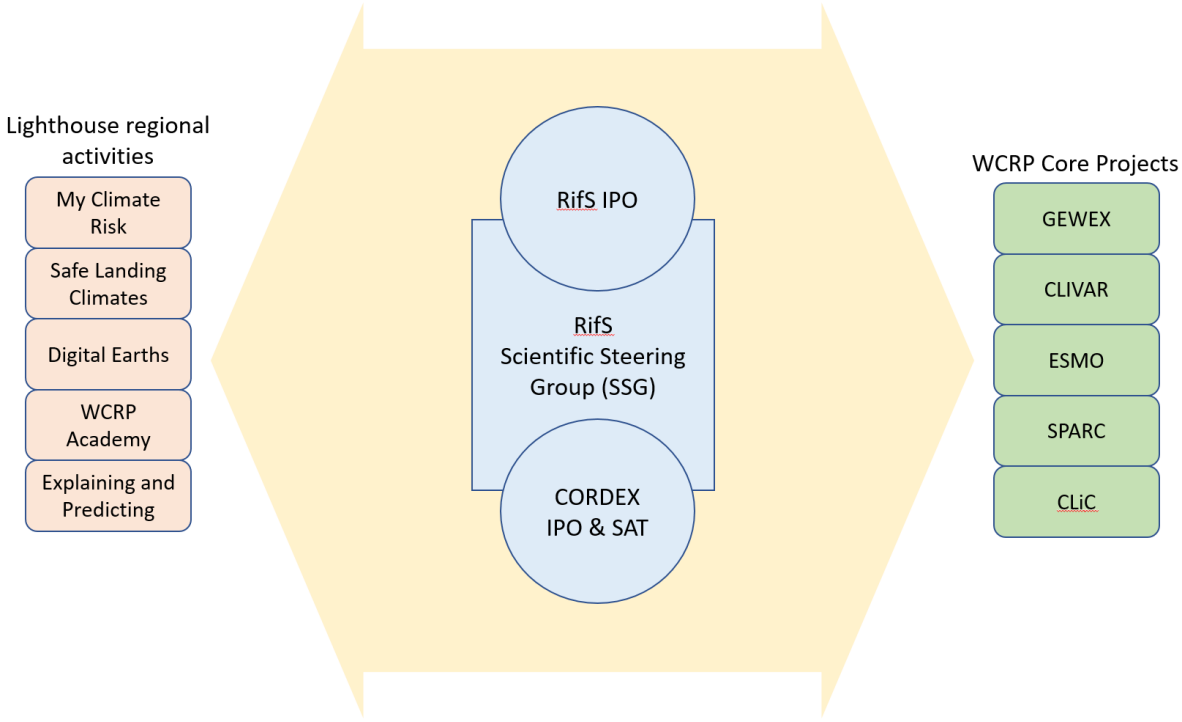


Figure illustrating how the RIfS science profile is positioned for partnerships with both the regional activities of the Lighthouse projects, and complementary and collaborative with the remaining core projects of the WCRP.

6 Indicative key partnerships

Note the descriptions below are not intended to be comprehensive but rather illustrative of the depth and breadth of intended partnerships.

6.1 Within WCRP

The following key partnerships have been identified within WCRP:

Cluster #1: Regional climate and projections

Core projects:

- Earth System Modelling and Observations (ESMO)
- Global Energy and Water Exchanges (GEWEX)

Lighthouse activities:

- Safe Landing Climates
- Digital Earths
- Explaining and Predicting Earth System Change (EPESC)
- My climate Risk

Cluster #2: Sub-seasonal to Decadal predictability

Core projects:

- Stratosphere-troposphere Processes And their Role in Climate (SPARC)
- Climate and Ocean Variability, Predictability and Change (CLIVAR)
- Global Energy and Water Exchanges (GEWEX)
- Earth System Modelling and Observations (ESMO)

Lighthouse activities:

- Digital Earths
- Explaining and Predicting Earth System Change (EPESC)

Cluster #3: Weather and climate extremes

Core projects:

- ESMO
- Climate and Ocean Variability, Predictability and Change (CLIVAR)
- GEWEX

Lighthouse activities:

- My Climate Risk
- Digital Earths
- Explaining and Predicting Earth System Change (EPESC)

Cluster #4: Communication and Societal Engagement

We see the WCRP Academy as a fundamental partner in this activity. This component of RIfS is the component that extends most fully beyond the traditional 'boundary' of WCRP. It is thus highly innovative. The WCRP Academy is envisioned to be closely partnering with the various activities within Clusters 1, 2 and 3.

6.2 External to WCRP

- Climate service providers (GERICS, RISAs (USA), Ouranos, GFCS, etc).
- VIA (vulnerability, impacts, adaption), risk/resilience research community (including commercial services).
- Future Earth (Risk-KAN)
- WMO´s WWRP-SERA & HiWEATHER
- START
- Interamerican Institute for Global Change Research (IAI)
- ECRA, ClimatEurope, Copernicus, ICNet Global (https://theicnet.org/).

Appendix A

Regional Information for Society (RifS)

Management plan

Prepared and adopted by the RIfS Interim Coordination Group

This management and governance document for this core project establishes the operating framework and stands alongside the RifS science plan to oversee activities. This document lays out the structure of the management, and covers the core groupings, their membership, and the lines of reporting.

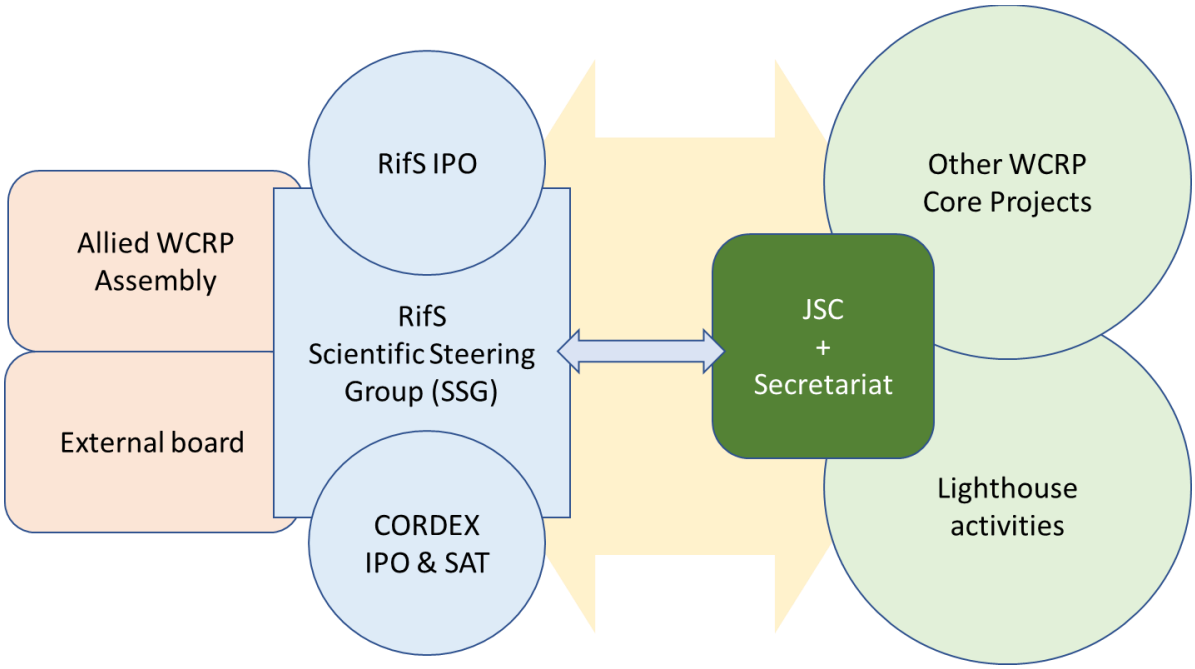
The document derives from the activities of the RifS Interim Coordinating Group (ICG) governance subcommittee as further informed by discussions with the WCRP JSC and secretariat.

1. Purpose

This document establishes:

- The primary reference for the activities of the RifS elements will be embodied in the articulation of the RifS vision, mission, and identity.
- The guiding principle to management is that structure should follow the vision and mission of RifS.

The core elements of the initial management structure are as in the following figure, and subject to evolving as need arises.



2. CORDEX

CORDEX exists as a component of RIfS, with clear recognition that the relationship between CORDEX and RifS are not in a hierarchy, but with comparable yet differentiated responsibilities. To that end RifS serves as a home for CORDEX, but is not an authority over CORDEX. The key management issue of importance is the sharing of the resources and responsibilities, and this will be through a

collaborative process to reach mutually agreed decisions. This arrangement also serves as a model should other comparable situations emerge that require a similar relationship with RifS.

3. RifS Scientific Steering Group

The SSG will oversee and steer RifS activities and represent the wider community involved in these types of activities.

The SSG activities will be guided by the RifS stated vision, and objectives.

- Nomination and Tenure
    - Membership will follow the WCRP guidelines[1] for core projects, and is currently a tenure for 4 years, with a possible 2 year extension.
    - The initial SSG should include appropriate continuity from the Interim Coordinating Group (ICG).
    - SSG selection: The RifS IPO will issue the call for nominations (including self-nomination) in accordance with the WCRP guidelines. The SSG will select 15 members for approval by the JSC (members of the first SSG will be selected by the Interim Coordinating Group's co-chairs). These members should, as far as is practical:
        - Represent parity between developed nations and emerging economies, and equitable representation of gender, age, and region, with care to include emerging career scientists.
        - Collectively span the areas of regional climate science, the use of global and regional information for regional scales including issues of distillation, prediction on sub-seasonal to decadal time scales, climate change, and dialogue with society including communication and climate services.
- Responsibilities and portfolios
    - Members will fulfill different roles as points of contact and/or oversee relevant portfolios as appropriate to experience, expertise, and need.
    - SSG members may be assigned to lead or co-lead specific RifS activities that lie in addition to the core expertise and responsibilities of the co-chairs.
- Co-chairs: The SSG will be chaired by three co-chairs nominated from among the elected members and approved by the JSC approval, with the proviso that the co-chairs include:
    - One of the CORDEX co-chairs (representing regional climate science and modeling)
    - Expertise in the social dimensions of linking climate information and society.
    - Expertise in the construction and development of regional climate information
- Reporting
    - The SSG reports directly to the JSC. CORDEX may submit additional reporting to the JSC as appropriate.
- Meetings
    - The SSG will meet at least bi-annually.

[1] See WCRP guidelines (approved at JSC-39): https://www.wcrp-climate.org/documents/JSC/Guidelines%20on%20membership%20of%20WCRP%20Bodies%20-%20Approved%202018.pdf

- Meetings will be virtual. Where opportunities can be leveraged (e.g. a major conference, a JSC meeting, etc.), or where there is a compelling strategic case, hybrid meetings may be used.

4. International Project Office (IPO)

The RifS IPO will support and provide advice to the SSG and implement SSG decisions. The IPO will work in close cooperation with the RifS co-chairs, SSG members, the WCRP leadership, and the WCRP Secretariat in Geneva.

The call to host the IPO will be designed, issued, and established by the secretariat, with close input from the SSG co-chairs. The IPO will have Ex Officio representation on the RifS SSG.

5. Allied WCRP Assembly

The assembly is designed as a dialogue platform to:

- facilitate collaboration and complementarity among the components of the WCRP,
- help inform on the priority areas where RifS can effectively contribute,
- aid in the development of RifS own research threads.

The emphasis for the assembly is on facilitated discussion to foster awareness and collaboration across the WCRP, especially around cross-cutting issues or where there is a need for sharing or broadening expertise on regional activities.

- Membership:
  - The RifS IPO will manage membership
  - The membership be comprised of:
    - Two representatives of each of the core projects
    - Two representatives of each Lighthouse activity
    - One representative of the Secretariat
    - Any representative of a WCRP IPO who wishes to participate
    - Any JSC member who desires to participate
- Co-chairs
  - The assembly will be chaired by two members of the SSG
- Meetings
  - The assembly will meet bi-annually
  - Meetings will be virtual. Where opportunities can be leveraged (e.g. a major conference, a JSC meeting, etc.), or where there is a compelling strategic case, hybrid meetings may be used.
- Tenure
  - There is no limit on tenure as this is governed by the membership of the participating groups

6. External board

The external board is a meeting platform for users to engage with the WCRP around issues and needs in regional climate information. It is designed to fulfill a function similar to the Allied WCRP

Assembly, but in this case with major external agencies[2], regional representatives, and regional or relevant projects.

The board is designed to both facilitate external understanding of RifS foci and agenda, and equally to learn from the communities desiring regional climate information. To this end the board is a platform for user-WCRP engagement as well as to foster additional activities for engagement as seems fit and practical to the board (for example, developing a virtual platform of some form).

- Membership:
    - The IPO will manage the participation by external agencies and actors.
    - Membership is by invitation to agencies/actors as identified by the SSG and/or the Allied WCRP assembly. In addition, the SSG may choose to issue public calls for self-nomination, with selection from the nominations made by the SSG.
    - All core projects, LHAs, and IPOs will be invited to have representation.
    - Participating organizations should be encouraged to consider age, gender and geographic location of their nominated representatives, and that this offers an experiential learning opportunity for more junior career members.
- Chairing
    - The SSG will delegate two co-chairs for full oversight. On a meeting-by-meeting basis, alternate co-chairs from the SSG and/or other WCRP structures may be used when relevant and appropriate, especially in considering regional meetings.
- Tenure
    - There is no limit on tenure as this is governed by the membership of the participating groups
- Meetings
    - The external board should meet virtually at least once per year. Additional region-specific meetings should be encouraged and fostered where possible.

[2] E.g. Climate Services Partnership (climate-services.org), WMO, START (www.start.org), FAO, Red Cross Red Crescent., etc.

Appendix B

Regional Information for Society (RIfS)

Vision and Mission

Prepared and adopted by the RIfS Interim Coordination Group

[The VISION] The WCRP Regional Information for Society (RIfS) core project seeks to understand, develop, and enhance the effective flow of relevant information among scientists, decision makers and society developing policy-relevant climate research.

[The MISSION] RIfS coordinates, facilitates, and implements targeted research on regional climate information and the internally and externally forced climate variability and change at the regional and sub-regional scale. Our activities integrate with those under other WCRP core projects, Lighthouse activities, and initiatives. Our impact is augmented through partnerships with relevant external research projects and organizations engaged in regional climate research, and with the broader climate services community. Building on this foundation, RIfs develops connections with stakeholder communities to better develop and deliver regional climate information, and to understand the regional information needs. This understanding is used to strategically inform new research foci, and to enhance the construction, communication, and adoption of climate information by society.

[The SCIENCE FRAMEWORK] The research domain of RIfS is broad and focused around four clusters. A cluster refers to a center of focus but does not mean these are isolated silos or have hard boundaries. Rather, a cluster necessarily overlaps with and is mutually dependent on the other clusters, explicitly drawing on and contributing to their activities.

The four clusters collectively form the foundation for the connection to society and are each led by members from the RIfS Scientific Steering Group (SSG), or as mandated by the SSG. (See the RIfS management document for more details on how relationships are structured.)

1. Regional climate information and projections

This cluster of activities focuses on coordinating efforts to develop, apply, and evaluate advanced methods for the generation of regional climate information and projections. Quantifying the credibility of regionalization tools and results are critical research foci. The Coordinated Regional Downscaling Experiment (CORDEX) is at the core of this activity cluster. Activities within this theme are also conducted in collaboration with the ESMO core project and linked with Lighthouse activities.

2. Extremes

This cluster of activities focuses on coordinating efforts to improve the quantification, characterization and attribution of a wide range of extreme conditions. The term extremes is inclusive of compound events, modal shifts in regional climate, exceedance of socio-ecological climate thresholds, and low frequency – high impact events in the contemporary and possible future climate states.

3. Seasonal to Decadal predictability

This cluster of activities focuses on advancing understanding of the predictability and drivers of regional climate's variability on seasonal to decadal time scales. In conjunction with other WCRP activities this cluster facilitates this research, with a focus on how best to use near-term climate forecasts to deliver actionable regional information for adoption in policy and user decision making. Research on the methods to create and present seamless regional climate information across

timescales, from near-term climate predictions to longer-term climate projections, will be another key focus. Activities within this theme are conducted in collaboration with the SPARC and CLIVAR core projects.

4. Communication and societal engagement

Supporting, and drawing on the work of the other RIfS clusters, activities within this theme seek to advance the understanding of how climate information is best developed, articulated and disseminated to benefit a climate resilient society. This theme recognizes the global heterogeneity of the regional community's context, risk exposure, cultures and values, and adaptation needs. The cluster works in close partnership with the climate services community to better understand the context and information needs, and to enhance the approaches to the construction and delivery of relevant regional climate information.