# ipcc
## INTERGOVERNMENTAL PANEL ON climate change

**FIFTY-SECOND SESSION OF THE IPCC**
**Paris, France, 24 – 28 February 2020**

IPCC-LII/Doc. 8, Rev. 1
(20.II.2020)
Agenda Item: 4
ENGLISH ONLY

## TASK GROUP ON DATA SUPPORT FOR CLIMATE CHANGE ASSESSMENTS

(Prepared by the Co-Chairs of the TG-Data)

(Submitted by the Secretary of the IPCC)

**TASK GROUP ON DATA SUPPORT FOR CLIMATE CHANGE ASSESSMENTS**

## 1.  Background

The Task Group on Data Support for Climate Change Assessments (TG-Data) was established in April 2019, and formally announced by the IPCC through a press release on 16 April 2019. The establishment of the TG-Data was reported in Document IPCC-XLIX/Doc. 7 Corr. 1 to the IPCC Panel at the 49th Session of the IPCC (Kyoto, Japan, 8 – 12 May 2019). The Terms of Reference for the Task Group and the Data Distribution Center (DDC) are presented in Annexes 1 and 2 of Document IPCC-XLIX/Doc. 7 Corr. 1, respectively.

The Panel was informed that one TG-Data member who had been selected stepped down. A replacement was identified. On 27 September 2019, another TG-Data member submitted her resignation letter.

Following the Panel's decision to increase the maximum number of TG-Data members to 20, four additional members were invited to join the group. Three members accepted to serve in the Task Group and were officially elected by the IPCC Bureau at its 57th Session (Singapore, 24–25 October 2019).

The Data Distribution Center (DDC) Managers and Working Co-Chairs were requested to designate TG-Data Ex-officio members. The current membership of the TG-Data including the Ex-officio members is presented in the Table 1 below. Former members who stepped down are shown in Table 2.

In consultation with the Co-Chairs, TG-Data and Ex-Officio members are allowed to invite their colleagues and peers to contribute to the work of the Task Group.

**Table 1: TG-Data and Ex-officio Members**

| TG-Data Members | | | | |
|---|---|---|---|---|
| No. | Name | Country | Gender | Role |
| 1 | David HUARD | Canada | Male | Co-Chair |
| 2 | Sebastian VICUNA | Chile | Male | Co-Chair |
| 3 | Kornelis BLOK | Netherlands | Male | Member |
| 4 | Winston CHOW | Singapore | Male | Member |
| 5 | Steven CRIMP | Australia | Male | Member |
| 6 | Wawan GUNAWAN | Indonesia | Male | Member |
| 7 | José Manuel GUTIÉRREZ | Spain | Male | Member |
| 8 | Kirstin HOLSMAN | United States of America | Female | Member |
| 9 | Michio KAWAMIYA | Japan | Male | Member |
| 10 | Nana Ama Browne KLUTSE | Ghana | Female | Member |
| 11 | Volker KREY | Germany | Male | Member |

| 12 | Silvina SOLMAN | Argentina | Female | Member |
|----|----------------|-----------|--------|--------|
| 13 | Gerard VAN DER SCHRIER | Netherlands | Male | Member |
| 14 | Rachel WARREN | United Kingdom | Female | Member |
| 15 | Songli ZHU | China | Female | Member |
| **Ex-officio Members (WG and TSU Representatives)** | | | | |
| 1 | Andrés ALEGRIA | Germany | Male | WGII TSU |
| 2 | Alaa AL KHOURDAJIE | United Kingdom | Male | WGIII TSU |
| 3 | Gregory FLATO | Canada | Male | WGI Nominee |
| 4 | Robin MATTHEWS | UK | Male | WGI TSU |
| 5 | Anna PIRANI | Italy | Female | WGI TSU |
| 6 | Elvira POLOCZANSKA | Germany | Female | WGII TSU |
| 7 | Karl TAYLOR | United States of America | Male | WGI Nominee |
| 8 | Ozge YELECKI | Turkey | Female | WGI TSU |
| **Ex-officio Members (DDC Managers/DDC Representatives)** | | | | |
| 6 | Robert CHEN | United States of America | Male | DDC Manager |
| 7 | Martin JUCKES | United Kingdom | Male | DDC Manager |
| 8 | Martina STOCKHAUSE | Germany | Female | DDC Manager |
| 9 | Charlotte PASCOE | United Kingdom | Female | DDC Staff |
| 10 | Xiaoshi XING | United States of America | Male | DDC Staff |

**Table 2: TG-Data members who stepped down**

| *TG-Data Members who resigned* | | | | |
|----|------|---------|--------|------|
| *No.* | *Name* | *Country* | *Gender* | *Role* |
| 1 | Sha FU | China | Female | Member |
| 2 | Michele WARBURTON-TOUCHER | South Africa | Female | Member |

## 2. Salient Activities since establishment

A number of meetings and discussions took place within TG-Data, IPCC authors, IPCC Bureau members and external stakeholders. An overview of these interactions and their outcomes can be found in Annex 1.

The Spanish government has offered as an in-kind contribution the development, maintenance and hosting of the Sixth Assessment Report (AR6) Atlas for the duration of the AR6 cycle. TG-Data recommends accepting this proposal and start planning the long-term maintenance of this type of interactive web product.

Guidelines to support IPCC authors and Technical Support Units in following FAIR (findable, accessible, interoperable, reusable) principles for IPCC data and material are at an advanced stage of preparation.

Working Group I Technical Support Unit (TSU) has worked with DDC managers to provide access to IPCC authors to work environments on the Jasmin (CEDA), Mistral (DKRZ) and IPCC-Hub (IFCA) HPC facilities. These servers provide direct and convenient access to CMIP6[1], CORDEX[2] and other modeling data, reanalysis and observations datasets, in order to facilitate their analysis and preparation of figures for the report.

## 3.    Workplan

Article 5.1 of the TG-Data TORs states that "Within the framework of the purpose and the roles and responsibilities, the TG-Data, in consultation with the Working Group (WG) Co-Chairs, will prepare its draft workplan for duration of its term, including a list of activities and meetings, associated deliverables and respective timelines. The workplan is subject to review by the IPCC Bureau and presented to the Panel for approval, contingent on the availability of funds."

Accordingly, the TG-Data Co-Chairs present in Annex 2 a workplan for the approval of the Panel. The workplan is structured around five broad categories of activities: AR6 cycle author support, DDC oversight, DDC support, outreach and TG-Data activities.

## 4.    TG-Data recommendations

### Curation of datasets

For all AR6 Working Groups, expectations are that the data underlying all key material (figures, tables and key results) from the AR6 Summary for Policy Makers (SPM), the Technical Summaries (TS) and the Synthesis Report (SR) follow FAIR practices as outlined in FAIR guidelines and are curated by DDCs or other trusted digital repositories. This implies that authors or TSU staff submit data files and a description of the methods used to generate those data and figures. This provenance[3] information should be sufficiently complete to allow for reproducibility by external reviewers and eventually the application of the IPCC's Error Protocol.

The reproducibility of IPCC results also requires that source datasets are curated. The traceability and reuse of the IPCC results / data thus depends on the long-term archiving by DDCs and other trusted digital repositories that provide sustainable data preservation and data services.

WGs are very supportive of the work done by TG-Data and all three TSUs are investing time and resources putting in place the infrastructure to make IPCC data FAIR. It is important to be mindful of the high workload already expected of authors and of the heterogeneous chapter contexts they evolve in. For example, while some chapters use a common framework to produce all their figures, other chapters rely on individual authors and contributing authors, each one using independent programming environments. It is likely that the implementation of these best practices will require dedicated support from TSUs.

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[1] Coupled Model Intercomparison Project Phase6
[2] Coordinated Regional Downscaling Experiment
[3] Provenance refers to metadata embedded into a figure describing the process by which the figure was created (source data, operations), whereas reproducibility implies that the original material can be reproduced, which requires being able to access or replicate the data, code and software environment used to produce the figure.

WGI has started preparing to implement these objectives, providing guidance for chapters to develop community software, including provenance information, defining key information on visuals for archival. The development of the Interactive Atlas fulfills the implementation of FAIR data principles. We recommend that specific training workshops be held during (or at beginning or end of) WG Lead Author meetings (LAM). These workshops are not needed for WGI meetings considering the work already underway by WGI TSU and authors in this regard and the timeline for their SPM and TS production. These workshops are very much recommended to be included in the planning of Working Group III (WGIII) LAM3 and Working Group II (WGII) LAM4 meetings.

**Public code access**

It is desirable that code used to produce figures from the SPM, TS and SR be archived, and eventually made publicly available and citable. However, if AR6 code is made public, bugs will inevitably be found. In a typical software development environment, bugs reports simply trigger a review process, corrections and a bug-fix release. In the IPCC context, there is a concern that bad faith actors could identify bugs and disclose them at inopportune moments or blow them out of proportion in order to inflict reputational damage. This risk of bugs creeping into the code can be mitigated by a review process, but not removed entirely. In any case, TG-Data would recommend against publicly releasing code that has not been reviewed by other authors within each chapter.

**DDC resourcing**

The implementation of the FAIR guidelines rely heavily on DDC resources, and there is a need for more countries and organizations to play a role in the technical support to IPCC activities. TG-Data is already discussing potential partnerships and will continue to do so during this cycle to strengthen the data curation and dissemination capability of DDCs. Countries and institutions interested in contributing to the curation, dissemination and reusability of IPCC products are invited to contact TG-Data Co-Chairs.

In terms of DDC support and long-term stability of DDC activities we recommend to initiate a process to update DDC webpages and moving old TGICA web page into the main new IPCC web site.

**Outreach**

We recommend that outreach activities be carried out later in the AR6 cycle, including expert meetings and guidance documentation on the use of data and scenarios in climate research. These activities will be able to leverage material curated by DDCs and improve access to the data assessed by IPCC authors.

**5. Expected Outcomes/Panel Decisions**

The Panel is invited to
- review the draft workplan and approve it or provide guidance for amendments; and
- review the TG-Data recommendations and approve them or provide guidance for amendments

TG-Data Co-Chairs had a number of informal discussions with DDC managers, former TGICA Co-chairs, WGI Sixth Assessment Report (AR6) Coordinating Lead Authors (CLAs), WGI Technical Support Unit (TSU) staff and some WGI and WGII Bureau members. Discussions with the WGI Bureau clarified the expectations towards TG-Data. The Task Group is seeking a similar level of understanding for WGII and WGIII.

The Task Group held two teleconferences. The first one was held on 3 June 2019, the second one on 7 October 2019 and a third on 11 February 2020 just prior to the IPCC 52nd Panel Session. Additionally, the Co-chairs held teleconferences with relevant stakeholders. Some Task Group members participated in the WGI Third Lead Author Meeting (WGI LAM3) which was held in Toulouse, France from 26 to 30 August 2019. Some Task Group members participated in the WGII Third Lead Author Meeting (WGII LAM3) which was held in Faro, Portugal from 27 to 31 January 2020.

The first face-to-face meeting was held in Montreal, Canada from 6 to 8 November 2019. All TG-Data and Ex-officio members were invited to attend the meeting.

**Teleconference with DDC Representatives**

A teleconference with DDC managers and representatives was held on 16 May 2019. It was suggested that alignment between DDC funding and the assessment report cycles would facilitate planning. The potential addition of new DDCs to share the workload was welcomed. There was resourcing uncertainty regarding:
1. the curation of data underlying figures and tables; and
2. the curation of datasets other than CMIP6 being archived.

Discussions are ongoing to evaluate existing curation capacity and constraints this may impose, and potential solutions.

**First TG-Data Teleconference**

The first TG-Data teleconference was held on 3 June 2019. Twelve TG-Data members and 6 Ex-officio members participated.

Participants informed TG-Data that WGI Chapter 3 and the Atlas have already put in place an infrastructure to archive code and generate provenance information. The IPCC Special Report on Global Warming of 1.5°C (SR1.5) code has already been made publicly available through the International Institute for Applied Systems Analysis (IIASA). There is an ongoing process to collect scenarios across multiple WGIII chapters.

DDCs provide virtual workspaces including direct access to some key datasets, as well as computational resources. This could be leveraged to support TG-Data's objectives.

**WGI Third Lead Author Meeting (LAM3)**

TG-Data Co-chair and some members were invited to attend the WGI LAM3. At the LAM3, a brief presentation on TG-Data and DDCs was given during a plenary session to sensitize the author team about the existence of the Task Group and the DDC, their mandate and activities, and to solicit suggestions and support to effectively collaborate with the authors to deliver on the Task Group's mandate. TG-Data members had discussions with Bureau Members, WGI TSU staff, Chapter Scientists and individual authors.

**Second TG-Data Teleconference**

The second TG-Data teleconference was held on 7 October 2019. Thirteen TG-Data members and six Ex-officio members participated.

The Task Group discussed pertinent outcomes of the Lead Author Meetings (LAMs) across the three IPCC Working Groups which were held a few weeks/months before the teleconference, draft guidelines for authors which were prepared by WGI, the work plan and the draft agenda for the first face-to-face meeting.

**First TG-Data Face to Face meeting**

The first TG-Data face to face meeting was held on 6 - 8 November 2019 in Montreal, Canada. Eleven TG-Data members and nine Ex-officio members participated. In addition, six experts with expertise relevant for the work of the TG-Data were invited to contribute to the discussions either in person or remotely.

The TG-Data at its First Face-to-Face meeting adopted the following decisions:

1. Adopt DDC Memorandum of Understanding

   ● TG-Data adopted the DDC MoU as proposed by the DDC Manager.

2. Contribution from Spain to IPCC

   ● TG-Data welcomed the significant contribution from Spain related to the development, maintenance and hosting of the AR6 Atlas for the duration of the AR6 cycle.

3. Integrate the DDC web site into the IPCC web site

   ● TG-Data will craft a proposal to the panel to request resources for the integration of DDC content (general pages, guidance pages, thematic pages) into the main IPCC web site (exclusion of dataset pages). Will follow a triage of material (retired / maintained).

 4: Legacy material from TGICA

   ● Guidelines on scenarios: will be submitted to a peer-reviewed journal. TG-Data will link to this document through the guidance material web page.

   ● Factsheet on downscaling: Encourage authors to complete the factsheet, submit to TG-Data for endorsement and hosting.

5. Adopt TGICA procedures for reviews

   ● Reviewing documents / linking to external datasets

   ● Review and propose their adoption at the next teleconference. Action item for the Outreach Subgroup.

6. Create TG-Data Subgroups and adopt their TORs

   ● Executive Subgroup

   ● Data Prioritization Subgroup

   ● DDC Subgroup

   ● External Partnerships Subgroup

   ● FAIR Subgroup

   ● Outreach Subgroup

   ● Webpages Subgroup

**Annex 2**

| Activities | Sub-activities | Start date | End date | Deliverables |
|---|---|---|---|---|
| Administrative | Refining the draft work plan | 2019-12 | 2020-01 | Finished workplan |
| | Preparation of the TG-Data document for IPCC-52 | 2019-12 | 2020-01 | Updated report on activities |
| | | | | |
| Author support | Draft author guidelines on source data curation (to streamline DDC work) | 2019-11 | 2020-02 | Source data curation instructions |
| | Draft FAIR guidelines for WGI | 2019-11 | 2020-02 | WGI FAIR guidelines |
| | Update FAIR guidelines for WGII | 2020-02 | 2020-05 | Updated FAIR guidelines |
| | Update FAIR guidelines for WGIII | 2020-05 | 2020-07 | Updated FAIR guidelines, reviewed by TG-Data, endorsed by bureau and published |
| | Organize training workshops at LAM3 (WGIII) and LAM4 (WGII) for authors and chapter scientists on DDC services and FAIR guidelines | 2020-04 | 2020-11 | Training workshops |
| | Harmonize practices and standards used across WGs and chapters | 2019-11 | 2020-12 | Consolidated FAIR guidelines |
| | | | | |
| DDC Oversight | Discuss DDC annual report and provide recommendations | Every year | | Recommendations to DDC |
| | Collaborate on finalizing revised DDC MOU | 2019-10 | 2020-04 | DDC MoU |
| | | | | |
| DDC Support | In collaboration with WG TSU identify datasets to be curated and relay to DDCs | 2020-01 | Tuned to WG cycle | Live queue of datasets to be archived by DDC |
| | Liaise between IPCC TSUs and DDC to assist authors in curation of their data and metadata | 2020-01 | Tuned to WG cycle | Improved efficiency in data curation |
| | Revise and make suggestions on TGICA legacy web pages | 2020-02 | 2020-05 | Updated web pages |
| | Move the TG-Data web site to the new IPCC visual | 2021-01 | 2021-12 | Updated web site |
| | Keep TG-Data and DDC web pages up to date | 2020-01 | End of cycle | Updated web sites |
| | Identify potential sources of funding for DDC work, in kind contributions and potential new DDC nodes and prepare proposals to mobilize resources | 2020-01 | 2020-12 | Proposals for new DDCs and in-kind contributions |
| | Seek external support from institutions with experience in data curation (e.g. GCIS) | 2020-01 | 2020-12 | Participation of external institutions to TG-Data activities |
| | | | | |

| Activities | Sub-activities | Start date | End date | Deliverables |
|---|---|---|---|---|
| Outreach | Prepare proposals for establishment of partnerships with external organization for outreach activities | 2021-01 | 2022-01 | MoU with external organizations |
| | Prepare proposals for expert meetings on the use of data and scenarios in climate research | 2021-06 | 2021-12 | Expert meeting proposal (e.g. Atlas) |
| | Finish and publish TGICA material | 2020-01 | 2021-01 | TGICA drafts completed and published |
| | Identifying and producing guidance documents and factsheets | 2021-04 | 2022-12 | Guidance documents and factsheets |
| | Seek feedback from potential consumers of IPCC curated material (e.g. WMO) | 2022-01 | 2023-01 | Minutes |
| | | | | |
| TG Data Activities | Strengthening WGII and WGIII engagement | 2020-01 | 2023-01 | Minutes |
| | F2F | Every year | | Report |
| | TelCon | 2-3 per year | | Minutes |
| | Reflections of TG Data during AR6 cycle and recommendations for AR7 cycle (including new digital formats) | 2022-01 | 2023-01 | Minutes |