



## TERMS OF REFERENCE

### **Consultancy to support UNCCD SPI provision of science-based evidence on historical regional and global aridity trends and future projections and biophysical impacts**

**Consultancy reference number: CCD/23/C/18**

#### **Background**

Established in 1994, the United Nations Convention to Combat Desertification (UNCCD)<sup>1</sup> is the sole legally binding international agreement linking environment and development to sustainable land management. In the first line of text of the Convention, Parties affirm that human beings in affected or threatened areas are at the centre of concerns to combat desertification and mitigate the effects of drought.<sup>2</sup> Projections the expansion of global drylands will influence the size of the affected areas referenced in article 2 of the Convention, as well as the affected populations referenced in article 4.

In this context, the IPCC has reported that drylands have expanded and currently cover around 46.2 per cent ( $\pm 0.8\%$ ) of the global land area, providing a home to 3 billion people.<sup>3</sup> Warming rates have been stronger in drylands as compared to humid lands as the sparse vegetation cover and lower soil moisture of dryland ecosystems amplify temperature given land atmosphere feedbacks<sup>4</sup>, increasing air aridity. Globally, soil moisture declined over the 20th century in large semiarid and sub-humid regions<sup>5</sup>, a trend that is projected to continue under all emission scenarios<sup>6</sup>. A warmer climate will also intensify drought events<sup>7</sup>, with implications for stronger water deficits, particularly in global drylands in which aridity will worsen under rising temperatures. The land area affected by increasing aridity will expand with increasing global warming<sup>8</sup> and be further exacerbated by poor land management. These effects will be felt most strongly in drylands through extreme heat events, drought and sand/dust storms, with large-scale aridity trends contributing to expanding drylands and expanding affected populations in some regions<sup>9</sup>.

The IPCC projects that further warming will result in increased risk of dryland water scarcity, soil erosion, vegetation loss, wildfire damage and food supply disruptions<sup>10</sup>. The increases in water demand and water scarcity, and associated risks, with impacts on multiple systems and sectors, including cascading risks, are projected to become increasingly severe with increasing temperatures, but will vary across regions.

For many countries and regions around the world, the prospect of expanding global drylands and affected populations is of major concern, as are the related risks of short- or long-term water shortage. However, the different perspectives to quantify aridity, the magnitude of the projected aridity trends

<sup>1</sup> UNCCD website: <https://www.unccd.int/>

<sup>2</sup> Convention text [https://www.unccd.int/sites/default/files/relevant-links/2017-01/UNCCD\\_Convention\\_ENG\\_0.pdf](https://www.unccd.int/sites/default/files/relevant-links/2017-01/UNCCD_Convention_ENG_0.pdf)

<sup>3</sup> IPCC Special Report on Climate Change and Land: <https://www.ipcc.ch/srccl/>

<sup>4</sup> Earth Science Reviews: <https://doi.org/10.1016/j.earscirev.2010.02.004>.

<sup>5</sup> Nature Geoscience, 13(7): 477–481. <https://doi.org/10.1038/s41561-020-0594-1>.

<sup>6</sup> Water cycle changes. Climate Change 2021: The Physical Climate, Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. <https://www.ipcc.ch/report/ar6/wg1/>

<sup>7</sup> Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences. Royal Society, 380(2238): 20210285. <https://doi.org/10.1098/rsta.2021.0285>.

<sup>8</sup> Reviews of Geophysics, 55(3): 719–778. <https://doi.org/https://doi.org/10.1002/2016RG000550>.

<sup>9</sup> Nature Reviews Earth & Environment, 2: 232–250. <https://doi.org/10.1038/s43017-021-00144-0>.

<sup>10</sup> Climate Change 2022: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press: Cambridge, UK and New York, USA, 713–906. <https://www.ipcc.ch/report/sixth-assessment-report-working-group-ii/>



and the regional variations documented in the scientific literature must be assessed. As the dimension of water stress can stretch from local to national or river basin level, a clearer understanding is necessary of what the changes in aridity will mean for impact risks. In addition, an evaluation of adaptation approaches to reduce associated risk can provide Parties with guidance on how to respond to these increased impact risks.

Against this backdrop, UNCCD decision 18/COP.15<sup>11</sup> established the work programme of the Science-Policy Interface (SPI)<sup>12</sup> for the triennium 2022–2024, including the provision of science-based evidence on the historical regional and global aridity trends and future projections that may contribute to expanding drylands and affected populations and the adaptation approaches that reduce risks to environmental, social and economic systems.

To meet this mandate, Parties have requested the SPI to produce a technical report, based on a review of existing synthesis reports and the primary literature, which provides

- (a) science-based evidence on the existing approaches for the quantification and assessment of hydro-climate aridity;
- (b) the determination of its regional and global changes and future projections;
- (c) the resulting historical changes and future projections in impact risk, including from extreme heat events, drought and sand and dust storms as well as higher risk of desertification, water scarcity, soil erosion, vegetation loss, wildfire damage and food supply disruptions; and
- (d) an evaluation of adaptation approaches that can reduce associated risk.

### **Objective of consultancy**

The development of three sections of a technical report which provides science-based evidence on the historical regional and global aridity trends and future projections, specifically focusing on: I. Science-based evidence on the existing approaches for the quantification and assessment of hydro-climate aridity, II. Determination of regional and global changes and future projections, and III. Assessment of environmental impacts related to changes in aridity.

### **Duties and Responsibilities:**

Under the overall management of the Unit Chief, Science, Technology, and Innovation (STI) the scientific oversight of the Chief Scientist, and the direct supervision of an assigned Officer, the consultant the consultant will support the SPI members working to deliver on SPI Work Programme Objective 2 by developing three sections of the aforementioned technical report, focusing on:

- I. Science-based evidence on the existing approaches for the quantification and assessment of hydro-climate aridity,
- II. Determination of regional and global recent changes and projections in aridity under future scenarios, and
- III. Assessment of biophysical impacts related to changes in aridity.

The following duties and deliverables are expected from the consultant:

- Develop an inception report in consultation with members of the UNCCD Science-Policy Interface (SPI) to include (a) a conceptual framework and methodological approach, and (b) confirmation of the schedule of work and presentation of deliverables. This would also include a conceptual diagram incorporating UNCCD framework on drought, land degradation and dry lands extent changes along with aridity can be connected and inter linkages between aridity trends and integrated land use planning and sustainable land use systems. (April – May 2023)
- Undertake a scientific and grey literature review of key papers, reports and other documents, related to the topic of the report. (April – June 2023)
- Establish types, definitions, components and uncertainties of aridity. (April – August 2023)
- Provide a review of existing aridity metrics based on the existing literature. (April – August 2023)
- Generate a summary map of aridity conditions for the last WMO reference period. (May – August 2023).

<sup>11</sup> UNCCD decision 18/COP.15 (Annex, Table 1, Objective 2): [https://www.unccd.int/sites/default/files/2022-10/18\\_cop15.pdf](https://www.unccd.int/sites/default/files/2022-10/18_cop15.pdf)

<sup>12</sup> UNCCD Science-Policy Interface: <https://www.unccd.int/science/overview>



- Assess long-term global/regional aridity trends over the last decades, including the use of different metrics and an assessment of the existing uncertainties. (May – August 2023).
- Project regional and global changes in future projections of aridity, including uncertainties based on different metrics, models and scenarios. (May – August 2023).
- Conduct an assessment of environmental impacts related to changes in aridity based on literature review. This assessment will cover different topics including, but not limited to a) relevant dimensions of land degradation including i) vegetation changes, including forests and grasslands, ii) water and wind erosion, iii) wildfire, iv) wetlands and v) sand and dust storms, b) relevant dimensions of water scarcity and c) agricultural impacts. (May – August 2023)
- Coordination with the consultant corresponding to the TOR2 of the Objective 2 of SPI for the assessment of aridity impacts. (May – September 2023)
- Produce a substantial part of the zero draft technical report on science-based evidence on the historical regional and global aridity trends and future projections, specifically sections I-II-III cited above. (September - October 2023).
- Produce a first order draft. (November – December 2023).
- Produce the final draft. (January – February 2024).
- Respond to reviewer comments on the final draft of the SPI's technical report (February - March 2024)

### Deliverables

#### Key deliverables:

- ✓ Inception report designed to conceptually frame and set out the methodology and work plan for the execution of the assignment as described in these Terms of Reference and be prepared within four weeks of signing the contract. The inception report will be further informed by discussions with the UNCCD secretariat and relevant members of the SPI and shall address the following: (a) the approaches/methods to be employed, and (b) confirmation of the schedule of work and presentation of deliverables. Draft inception report should be presented at the SPI Meeting of 2-4 May 2023. Inception report to then be finalized by 15 May 2023.
- ✓ A zero draft of three sections of a technical report as described in these Terms of Reference which provides science-based evidence on the historical regional and global aridity trends and future projections, specifically focusing on: I. Science-based evidence on the existing approaches for the quantification and assessment of hydro-climate aridity, II. Determination of regional and global changes and future projections, and III. Assessment of environmental and socioeconomic impacts related to changes in aridity. Penultimate version of the zero draft to be presented at the SPI Meeting of 12-14 September 2023 and then finalized by 30 September 2023.
- ✓ A first order draft of the three sections of the technical report which incorporates and responds to reviewer comments as deemed appropriate following consultation with the SPI, to be finalized by 15 December 2023.
- ✓ Final draft of the three sections of the technical report which incorporates and responds to reviewer comments as deemed appropriate following consultation with the SPI, to be finalized by 15 February 2024.
- ✓ Response to any feedback provided by the SPI and assistance in integrated this work into the SPIs technical report, to be finalized by 15 March 2024.

### Contractual terms

The service of the selected consultant is estimated to be for a period of 11 months (part-time). This contract is based on deliverables and payment is defined by outputs whereby the first instalment covers outputs 1-2, the second instalment outputs 3, and the third instalment outputs 4-5.

Start date is planned 15 April 2023 until 15 March 2024. The consultancy is home based. Travel is planned under this consultancy and will be organize and paid separately. Incumbent will need to travel to SPI meetings scheduled for May 2023 and September 2023, however this travel will be funded under the core budget funds allocated for organization of SPI meetings and will be organized and paid for



separately. The incumbent will also be expected to participate in relevant SPI Objective 2 virtual meetings. Contract is based on deliverables and payment is defined by outputs and deadlines.

All products developed and delivered through this consultancy shall remain the exclusive property of the UNCCD secretariat and shall not be divulged and/or used without prior written authorization. Participation by the consultant in authorship of publications derived from this work, including the technical report and any other publications, is encouraged, under agreement of any co-authors as well as the UNCCD Lead Scientist, and if the contribution of the consultant and any other co-authors meets the criteria of ICMJE Role of Authors and Contributors<sup>13</sup>.

### Requirements

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- PhD degree in a relevant field (e.g., Environmental Sciences, Environmental Management, Natural Resource Management, Land and Water Management, Earth Science, Geography, Social Sciences, Global Change, Climate Change Adaptation).
- A minimum of ten (10) years' demonstrable experience in climatological research.
- A minimum of five (5) years' demonstrable experience in spatial and multi-temporal analysis and modelling.
- Excellent conceptual understanding of interactions among climate change and physical processes, with special focus on aridity and drought.
- Demonstrable experience in working with large-scale aridity and drought metrics as well as ground-based hydrologic data sets for assessing trends and making projections.
- Demonstrable experience in assessing the biophysical impacts of climate change in different regions using large data.
- Outstanding publication record related to the experience areas listed above in peer-reviewed scientific journals.
- Proven experience using collaborative work environments such as MS Teams and MS SharePoint.
- Strong research and analytical skills and the ability to synthesize and present complex information in an understandable, systematic manner.
- Demonstrated experience in technical writing for non-experts and/or science journalism in English (please provide a link in your cover letter to a published example of a product where you effectively translated a highly technical topic into language accessible to non-expert).
- Excellent and demonstrated writing skills and fluency in English is required.

### Special notice

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Only individuals who can act as independent, individual economical operators are qualified to apply. Individuals who can provide their services only on account of an institution or enterprise not in their individual capacity are not eligible under this procedure.

Individuals engaged under a consultancy or individual contract will not be considered "staff members" under the Staff Regulations and Rules of the United Nations Secretariat and will not be entitled to benefits provided therein (such as leave entitlements and medical insurance coverage). Their conditions of service will be governed by their contract and the General Conditions of Contracts for the Services of Consultants and Individual Contractors. Consultant and individual contractor is responsible for determining tax liabilities and for the payment of any taxes and/or duties, in accordance with local or other applicable laws.

### Submission of application

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<sup>13</sup> ICMJE Defining the Role of Authors and Contributors <http://www.icmje.org/recommendations/browse/roles-and-responsibilities/defining-the-role-of-authors-and-contributors.html>



The following documents should be sent to [staffing@unccd.int](mailto:staffing@unccd.int) as **one document**: UNCCD Personal History Form<sup>14</sup> /CV and cover letter, specifying the following in the email subject line: **CCD/23/C/18**.

The deadline for applications is **07 April 2023**. Only applications submitted by the deadline and with complete documentation will be taken into consideration.

Due to the volume of applications received, receipt of applications cannot be acknowledged individually. Please address your application as indicated above and please do not address or copy your application to an individual at the Secretariat or Global Mechanism. Candidates who do not receive any feedback within three months of the deadline should consider their application as unsuccessful.

Date of issuance: 27 March 2023

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<sup>14</sup> UNCCD P-11 form in electronic fill-in .pdf OR .docx format available: <https://www.unccd.int/about-us/secretariat/vacancies/applying-unccd>