UKCEH

Our planet. Decoded.

Workshop report on drought risk to vegetation productivity on the MapX geospatial platform

Jan Dick, Vasilis Myrgiotis, Claudia Caporusso, Richard Kwasi Padi, Rosemary Anderson Akolaa

27/03/2026

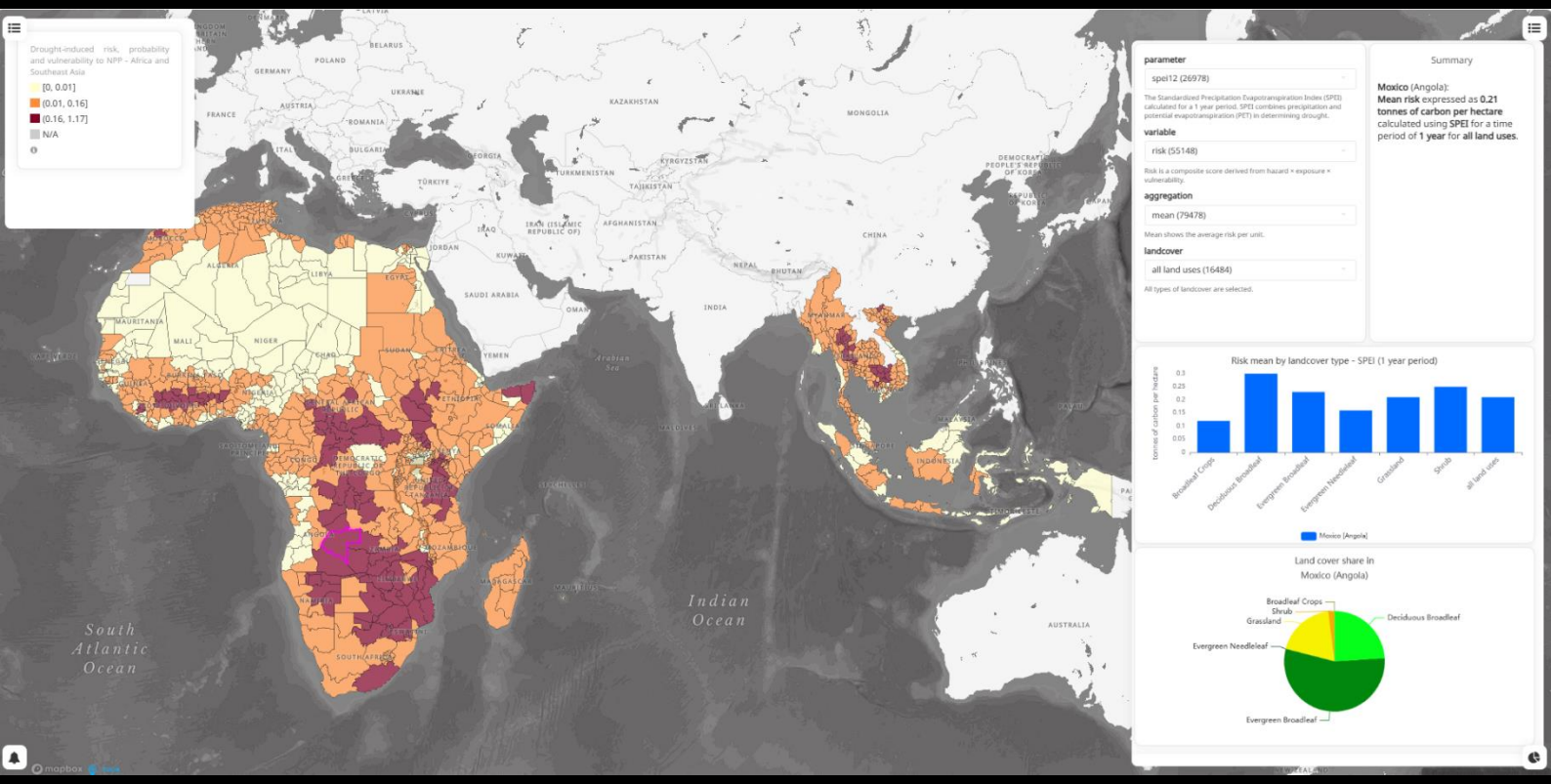

Table of contents

Executive summary

Two regional workshops were held with stakeholders from West Africa and Southeast Asia. The aim of the workshops was to introduce participants to an open, transparent, and reproducible drought–productivity assessment tool developed by UKCEH in the NC-International program. The tool quantifies drought risk to vegetation productivity using 20 years of satellite-derived land cover, net primary productivity (NPP), and drought indices, and is delivered through an open-knowledge pipeline comprising a scientific storyboard, a MapX geospatial dashboard, and openly accessible code.

Both workshops followed a common structure: an introduction to UKCEH's international environmental research, a technical demonstration of the drought–productivity tool, and an interactive discussion. Participants explored its utility for improving land-based greenhouse gas accounting and informing Nationally Determined Contributions (NDCs). West African attendees raised questions about temporal resolution, data uncertainty, code adaptability, dashboard navigation, and mobile accessibility. Southeast Asian participants emphasised the tool's value for national reporting but highlighted limited governmental technical capacity and the need for closer engagement with ministries, technical staff, and private-sector carbon project developers.

Participants across both regions expressed interest in further training, improved dashboard usability, and tailored guidance. Overall, the workshops demonstrated high demand for accessible and scientifically robust tools that support climate reporting, land-use planning, and resilience building, reinforcing the importance of continued development and expanded dissemination.

1.Introduction

Two workshops were held to introduce colleagues from West Africa and Southeast Asia to an environmental tool designed to enabling them to determine the risk of drought on above ground productivity. Computer assisted environmental tools are widely used by governments, organizations, researchers, and individuals to address environmental challenges such as climate change, resource depletion, sustainable agricultural and habitat destruction. Such tools are essential for understanding environmental conditions, predicting potential changes, and implementing strategies to protect ecosystems, biodiversity, and human health.

The focus of these workshops was an open, trustworthy, and reproducible environmental tool suitable to assist countries achieving their Paris Agreement's goals, particularly for nationally determined contributions (NDCs) that depend on credible estimates of land-based greenhouse gas (GHG) fluxes and climate adaptation outcomes (see Annex 1 for details of participating countries NDCs). The land use sector remains a large, uncertain contributor to GHG accounting due to spatial heterogeneity, data gaps, and climate dependence of land-based carbon removals. The focus of these workshops was to (i) raise awareness of the tool and (ii) explore how the current beta version of the tool could be improved.

We implement an open knowledge (OK) pipeline for the open-source, adaptable, and scalable algorithm that estimates drought risk to annual vegetation productivity (a proxy for atmospheric carbon removals) across arbitrary areas of interest. The algorithm currently assimilates 20 years of gridded meteorological drought and satellite-based land cover/productivity data and can ingest other observational/model data. Our OK pipeline deployment strategy includes: (i) a storyboard documenting rationale and methodology (MapX Storyboard); (ii) a public dashboard (MapX geospatial data platform (UNEP/GRID Geneva**).** aggregating indicators for all administrative units in Africa and Southeast Asia with associated tutorial (https://youtu.be/Q_Iv53-zQf8); and (iii) open code distributed via an institutional toolbox (UKCEH Environmental Data Science Toolbox).

This report details the people attending and the issues they raised.

1.1 Workshop format

Both workshops followed the same general structure i.e. an introduction to the institute by UKCEH' International Office, an introduction to the tool by Vasilis Myrgiotis with open dialogue with participants. Claudia Caporusso posted links to the various parts of the tool and sent the recording to the participants after the events. Jan Dick explained the OK pipeline approach and answered questions related to that.

1.1.1 Introduction to UKCEH

UKCEH is a leading independent research institute working across air, land and water. Our key priorities include building resilience in a changing climate, enhancing ecosystem and human health and restoring biodiversity for sustainable futures

We employ over 700 researchers based across the UK (Edinburgh, Lancaster, Wallingford, Bangor), with our first international office in Accra, Ghana. We have long-standing work in Africa, for example over the past six years, UKCEH has delivered 15+ projects with 49 partners. Areas of collaboration including: storm forecasting services; sustainable cocoa/oil palm research; soil and water health; bioeconomy, reducing deforestation and livelihoods.

UKCEH has for many years had an international focus, collaborating with over 90 countries, in fact 67% of UKCEH publications have international co-authors. Our staff include colleagues from 45 different countries, many from West Africa. The International Office introduced the workshop team: Dr. Vasilis Myrgiotis – Environmental modeller (lead presenter); Dr. Jan Dick – Senior social ecologist and Claudia Caporusso – Data scientist.

1.1.2 Introduction to Drought-Productivity Open Knowledge Pipeline

Vasilis presented the open-source tool for estimating drought-induced risk to terrestrial biomass, focusing on concepts, data sources, methodology, and use cases.

He introduced the purpose of the tool i.e. to estimate the risk that drought poses to vegetation productivity (net primary productivity, NPP). It is designed to be open-source, transparent, scalable (from field to continental scale), usable without high-performance computing and based on globally available datasets.

The key datasets used are:

1. Land cover – to understand vegetation type

2. Net Primary Productivity (NPP) – carbon removed or released annually

3. Drought index (SPEI/SPAI) – probability of drought, globally available weekly

The tool stacks 20+ years of these data (approx. 500 m resolution) and applies a simple formula:

Risk = Vulnerability × Probability

where vulnerability is the difference between NPP under drought vs non-drought conditions and probability is the fraction of years classified as drought years.

By showcasing the storyboard explaining the science and then demonstrating the dashboard and finally showcasing the institutional repository with full Python code, he walked the participants through the full OK pipeline and Claudia simultaneously posted the links to the tools in the chat. He again invited questions and

comments from participants but highlighted the feedback form for those who preferred more time to explore the tools before commenting, or suggested they could simply email any of the team instead. When asked he explained that ideally, we would prefer feedback before 20 March 2026 as this phase of the project is ending soon (31 March 2026, and the report must be submitted prior to the end), but feedback after this date is also possible as the tool will continue to be available and the team are keen to improve it.

2. Workshop with West African participants

2.1 Participants

In total 15 people were invited to attend the workshop and nine people from five countries joined the session (60%). They represented policy makers, lecturers and researchers in the field of climate change (Table 1).

Table 1. Participants role, institutions and country attending a workshop on Wednesday, 11th March 2026 10:00-11:00am GMT.

Participant Role	Institution	Country
Development Planning Officer, Environment Directorate-Climate Change and Sustainable Development Unit	Ministry of Environment, Science and Technology	Ghana
Technology and Innovation Officer	Ministry of Environment, Science and Technology	Ghana
Project Manager and Planning Officer	Ministry of Environment, Science and Technology	Ghana
Senior Lecturer, Department of Water Resources and Aquaculture Management	University of Environment and Sustainable Development	Ghana
Lecturer, Department of General Studies	University of Environment and Sustainable Development	Ghana
Lecturer and Climate Change Expert	African Aviation and Aerospace University, Abuja	Nigeria
Climate Modelling Scientist	Centre Régional AGRHYMET/CILSS	Niger Republic
Postdoctoral Researcher, Climate Change, Water and Natural Resources	WASCAL Competence Centre	Burkina Faso
Lecturer, Department of Physics	Université Félix Houphouët-Boigny	Cote d'Ivoire

2.2 Questions, responses and discussion

The participants questioned several aspects which are grouped here in topics and discussion summarised.

2.2.1 Temporal resolution

Participants asked about the use of monthly or daily data, particularly for regions such as the Sahel where intraseasonal variability matters. Vasilis confirmed that the formula in the code book is valid for any temporal resolution and explained that while the dashboard currently uses annual data for scalability, it can be adapted to work with monthly or even daily inputs with some code modifications. He also noted that ESA offers higher resolution NPP products that could replace the annual NASA dataset currently in use. Vasilis added that he is happy to provide support for anyone with specific requirements and can be contacted directly at VasMyr@ceh.ac.uk .

2.2.2 Uncertainty in the data

Participants asked whether the tool accounts for uncertainty in satellite based NPP and landcover inputs. Vasilis explained that uncertainty is not currently included in the algorithm because MODIS NPP does not provide reliable pixel level uncertainty estimates. Incorporating uncertainty would require mechanistic modelling, which is far more computationally intensive, though ongoing work is making this possible. He added that such analyses can be carried out for country or regional level studies if needed and invited participants to contact him directly for support.

2.2.3 Accessing and modifying the code

Participants asked about (i) licensing (fully open-source), (ii) community support, and (iii) whether they can run the model for specific regions or administrative units using specific shapefiles for sub-national areas (e.g. Sahel). Vasilis confirmed the code is open-source and unrestricted. Users can adapt it to regions of interest, input custom shapefiles and modify code to extract sub-regional indicators. He again offered help via email to adjust the code if participants contacted him.

2.2.4 Dashboard and navigation issues

Some participants struggled to navigate between the story map and the dashboard and expressed a preference for a button or link that would allow them to return to the story map menu. The UKCEH team acknowledged this was an issue as each component of the OK pipeline opened automatically in a new tab. They stated they would try and make the navigation more manageable. In addition, it was announced that a short tutorial video of the dashboard was being produced and would shortly be uploaded and the link emailed to all participants. All participants were emailed the link on Mon 16/03/2026 (https://youtu.be/Q_Iv53-zQf8).

2.2.5 Accessing links & tools on mobile devices

It was clarified that the dashboard works best on a desktop or large tablet due to the complexity of the output. All links were posted in the chat, but it was also agreed that that all links would be sent by email to all participants facilitating their viewing of the tools when they had access to a computer (email sent same afternoon Wednesday, March 11, 2026 13:22 PM to all participants). In addition, a follow up email was sent Monday 16 March at 12:17 GMT to inform them that the tutorial was now uploaded (https://youtu.be/Q_Iv53-zQf8).

3. Workshop with South-East Asian participants

3.1 Participants

The British Embassy in Thailand suggested six relevant profiles to invite, and two people joined the session Table 2).

Table 2. Participants role, institutions and country attending a workshop on Thursday 19th March 2026 08:00-09:00am GMT and 16:00-17:00 in Thailand

Participant Role	Institution	Country
Mamta Lama, Climate Change Programme Officer at	RECOFTC- an international nonprofit organization	Thailand
Professor Tossapon Boongoen	Member of the Thailand scientific diaspora, Chair in Computer Science, Computer Science, Aberystwyth University	Thailand / UK

3.2 Questions, responses and discussion

3.2.1 Data Access and Technical Functionality

Participants questioned the input data and use of other more local datasets. Vasilis Myrgiotis clarified that currently the MapX dashboard aggregates indicators, to 500 m resolution using 20-year raw datasets for Thailand (including NPP, drought estimates, drought vulnerability). He offered to share these data on request for independent analysis or integration with other workflows. He encouraged participants to contact him directly for access to the datasets or for assistance in adapting the code.

3.2.2 Participant Reflections on National Reporting Capacity

A participant highlighted the value of the tool in relation to Nationally Determined Contributions (NDC) reporting but noted that capacity within the responsible government ministries for Nationally Determined Contributions (NDC) reporting is limited. It was noted that many agencies lack the technical expertise required to apply the latest science, including the integration of community forestry datasets and geospatial information such as shapefiles. It was further noted that even basic compilation of forestry data remains challenging in some countries.

To support more effective adoption of scientific tools, participants recommended establishing consultation workshops with ministries and technical staff. These would help build understanding of the tool's purpose, improve familiarity with drought and productivity calculations, and support decision-makers in commissioning or evaluating modelling work. The group acknowledged that some governments may need to rely on external consultants but stressed that internal comprehension of the underlying science remains essential and encouraged the team to contact ministries directly.

Beyond government users, participants emphasised the importance of engaging private sector carbon project developers and investors. In countries such as Indonesia, where private-sector contributions to NDCs are being explored, carbon project developers are likely to recognise the value of robust, transparent tools that quantify carbon fluxes and drought related risks. One participant suggested that familiarising them with the dashboard and associated datasets could accelerate uptake and drive consistent reporting approaches across sectors. Vasilis thanked the participants for this suggestion and said this would be followed up.

4. Conclusion

The Drought-Productivity algorithm delivered an open access scalable tool which was well received by participants at the two virtual workshops. One West African participant keen to explore the tool further commented:

OK, yeah, please, please, please send it to our e-mail. I'm joining you using my tablet. I'm on holiday and I just made it a duty to make sure I attend the meeting.

Participants also suggested future dissemination routes focused on governments and the private carbon markets.

So when we're talking about reporting the NDCs and you know reporting the greenhouse gas emissions from my experience …and the conversations around that within the countries, I don't think there is a huge capacity within the government agencies to report,… the capacity of the government agencies has to be increased… they should understand the importance of these type of tools.

5. Acknowledgements

We extend our sincere thanks to all participants from West Africa and Southeast Asia who generously contributed their time, expertise, and thoughtful insights during the drought–productivity workshops. Your questions, reflections, and constructive feedback were invaluable in helping us refine the open-knowledge pipeline, improve the usability of the tool, and better understand regional needs related to drought risk assessment, vegetation productivity, and national reporting capacity. Your engagement and commitment—particularly from those joining across time zones, with limited connectivity, or while travelling—are deeply appreciated.

We also gratefully acknowledge the funders whose support made this work possible. Their investment in open, transparent, and scalable environmental science enabled the development and dissemination of the drought–productivity tool and the delivery of these international workshops. This support plays a crucial role in strengthening global capacity for climate resilience, enhancing evidence-based decision-making, and advancing national and international efforts toward achieving climate and biodiversity goals. This work was supported by the Natural Environment Research Council as part of the NC for Global Challenges programme [NE/X006247/1] delivering National Capability.

6. Annex 1 Nationally Determined Contributions

Table of Country's Nationally Determined Contribution (NDC) reports published by the United Nations Framework Convention on Climate Change (UNFCC) https://unfccc.int/NDCREG

Country	Submission date (version)	
Ghana	04/11/2021 (2)	In English https://unfccc.int/sites/default/files/NDC/2022-06/Ghana%27s%20Updated%20Nationally%20Determined%20Contribution%20to%20the%20UNFCCC_2021.pdf
Nigeria	22/09/2025 (3)	In English https://unfccc.int/sites/default/files/2025-09/Nigeria%20NDC%203.0%20-%20Transimission%20Version%202.pdf
Niger Republic	13/12/2021 (2)	In French https://unfccc.int/sites/default/files/NDC/2022-06/CDN_Niger_R%C3%A9vis%C3%A9e_2021.pdf
Burkina Faso	09/10/2021 (2)	In French https://unfccc.int/sites/default/files/NDC/2022-06/Rapport%20CDN_BKFA.pdf
Cote d'Ivoire	29/10/2025 (3)	In French https://unfccc.int/sites/default/files/2025-10/CDN%203.0%20COTE%20D%27IVOIRE.pdf
Thailand	04/11/2025 (3)	In English NDC 3.0 https://unfccc.int/sites/default/files/2026-01/TH%20NDC%203.0.pdf

UKCEH

Environmental Data Science Toolbox