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Global Oasis Distribution Dataset and Cataloguing System Officially Unveiled at the 5th World Congress of Biosphere Reserves in Hangzhou, China

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The Global oasis distribution dataset and cataloguing system, which was jointly developed by the Xinjiang Institute of Ecology and Geography, Chinese Academy of Sciences (XIEG-CAS), Agricultural and Biological Research Institute of the National Research Centre of Egypt and World Data System for Global Change Research Data Publishing & Repository (GCdataPR) of the Institute of Geographic Sciences and Natural Resources Research, Chinese Academy of Sciences (IGSNRR, CAS), was officially published, released and distributed on 24 September 2025 during the 5th World Congress of Biosphere Reserves took place in Hangzhou, China.

The congress, which was hosted by UNESCO and organized by the Chinese Academy of Sciences and the People's Government of Zhejiang Province, took place in Hangzhou from 22 to 27 September 2025 (Figure 1). This was the first time the conference had been convened in China or the Asia-Pacific region. Over 4,000 delegates from 150 countries participated in the conference. During the conference, XIEG-CAS hosted the side event entitled "Oasis Biosphere Reserves Empower the Sustainable Development in Arid Lands", which was co-organized by IGSNRR, CAS, World Data System for GCdataPR, and the State Key Laboratory of Ecological Security and Sustainable Development in Arid Regions (Figure 2).

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Figure 1 The 5th World Congress of Biosphere Reserves

Figure 2 Oasis Biosphere Reserves Empower the Sustainable Development in Arid Lands (Side event)

The event was chaired by Professor Zhang, Yuanming, Director of XIEG-CAS (Figure 3). The opening remarks were delivered by Wang, Ding, Secretary-General of the Chinese National Committee for the Man and the Biosphere Program (MAB China) (Figure 4); Antonio Abreu, Director of the Division of Ecological and Earth Sciences in UNESCO's Natural Sciences Sector, and Secretary of the MAB Program (Figure 5); and Liu, Weidong, Director-General of the Bureau of International Cooperation at the Chinese Academy of Sciences (Figure 6).

Figure 3 Professor Zhang, Yuanming, hosted the meeting

Figure 4 Wang, Ding congratulated on convening the side event

Figure 5 Mr. Antonio Abreu addressed and highly appreciated the convening of the conference

Figure 6 Liu, Weidong addressed on the conference

Wang, Ding highlighted the Global oasis distribution dataset and cataloguing system as a landmark achievement in China's contribution to the MAB Program of UNESCO. He stated that the project provides a unified global framework for identifying oasis types, distributions,

and boundaries and offers foundational maps and a universal language for future environmental research and sustainable development. Liu, Weidong emphasized the project's theoretical and practical significance, describing it as the world's first comprehensive, multidimensional, and interdisciplinary catalogue of oasis ecosystems. He said that the project affirms the ecological and cultural value of oases, while also creating a new platform for promoting sustainable development in arid and semi-arid regions.

The Principal Investigator Professor Gui, Dongwei announced the publication of the Global oasis distribution dataset and cataloguing system (Figure 7). The dataset, data paper, and video are published bilingually (Chinese & English) by GCdataPR. Among them, the dataset is published as entries in the data encyclopedia, and the video as digital data, in the *Digital Journal of Global Change Data Repository*, while the data paper is published in the *Journal of Global Change Data & Discovery* (Figure 8, 9).

Figure 7 Professor Gui, Dongwei, the first author and co-corresponding author of the Global oasis distribution dataset and cataloguing system announced that the project's outcomes

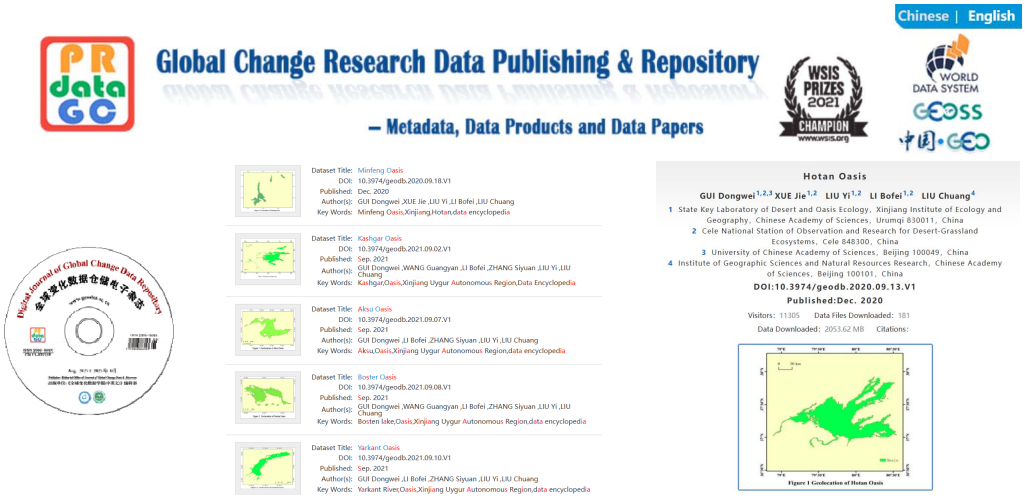


Figure 8 Publication of the Global oasis distribution dataset and cataloguing system dataset

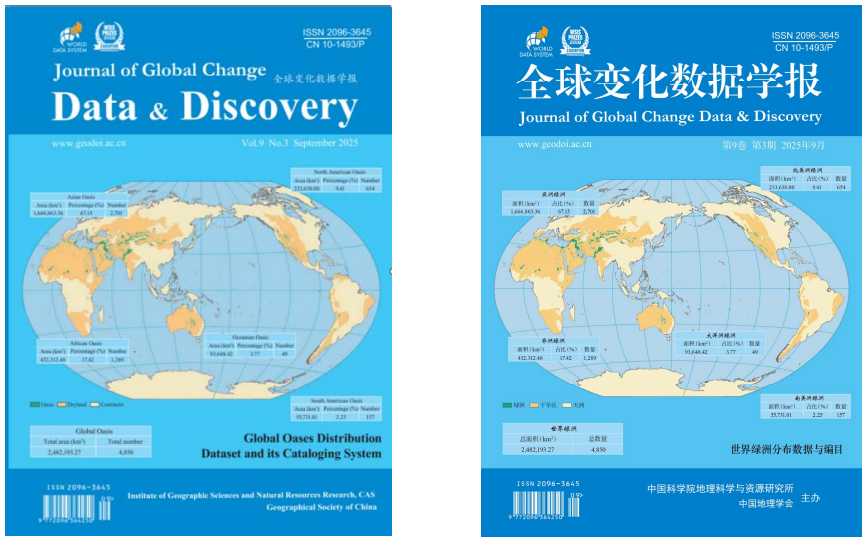


Figure 9 Publication of the Global oasis distribution dataset and cataloguing system data paper

According to Professor Gui, the project began in 2020 under the guidance of the Man and the Biosphere Program of the Chinese Academy of Sciences and the World Data System for GCdataPR. Despite the disruptions caused by the COVID-19 pandemic, the multidisciplinary and multinational research team persevered and completed the work after 5 years. Using high-resolution satellite imagery from Google Earth Pro, the team manually identified and delineated the global distribution of oases through visual interpretation. The resultant comprehensive dataset used 2020 as the base year. This data reveals that oases exist on every inhabited continent, spanning 54 countries and covering a total area of 2,482,193.27 km^2. The researchers identified 4,850 distinct oasis zones. China has the largest oasis area in the world, spanning 275,535.39 km^2 and comprising 1,398 individual oases. Other countries with significant oasis coverage include Pakistan, Iran, the United States, Kazakhstan, Iraq, Uzbekistan, Australia, Egypt, and Saudi Arabia. Each oasis larger than 1 km^2 was assigned a unique identification code incorporating 4 key attributes: continent, country, river and area. This system gives each oasis a digital identity, enabling scientists to track changes in size and condition over time. The catalogue will be updated periodically to monitor processes such as oasis expansion and contraction, providing evidence with which to evaluate ecosystem health and long-term sustainability.

The project's significance extends far beyond data collection. Over the past 5 years, the research team has organized a series of academic and public engagement activities linking digital science with local knowledge and fieldwork. These activities included community discussions with farmers (Figure 10), fieldwork data verification (Figure 11), and participation in international conferences.

The project team hosted the annual meetings of the Geographic Big Data Working Committee of Geographical Society of China in Yanchi County, Ningxia, in 2021 and in Korla City, Xinjiang, in 2023. Both meetings focused on integrating digital technologies with sustainable development in arid environments. The team also launched the "Capacity Building Workshop on Big Data Applications in 100 Universities/Towns" program, which included events at Ningxia University and the Tarim and Hotan River Basin Water Resources Management Centers.

Figure 10 Field meeting with local farmers in Yanchi County, Ningxia (Jan. 2021)

Through field verification in key regions, workshops, and engagements with local experts, governments, and communities, the team systematically completed the global oasis digital catalog. This work precisely quantifies the global number and area of oases, filling a critical data gap. It also embeds the concept of digital transformation into oasis communities, providing a scientific foundation for their sustainable and high-quality development.

Members of the research group presented their findings at the 2023 FAO Oasis Symposium in Morocco (Figure 12) and exhibited their work at the 2024 United Nations Internet Governance Forum. Through these activities, the team sought to validate the dataset, exchange experiences with local scientists and governments, and raise global awareness of the importance of oases as ecological and cultural lifelines.

Figure 11 Field Surveys and Data Verification at the Kongque River Oasis, Korla, Xinjiang by Gui, Dongwei, Liu, Chuang, and Hou, Jianzhu (then Director of the Science and Technology Bureau of Korla City) (Apr.–Sep. 2021)

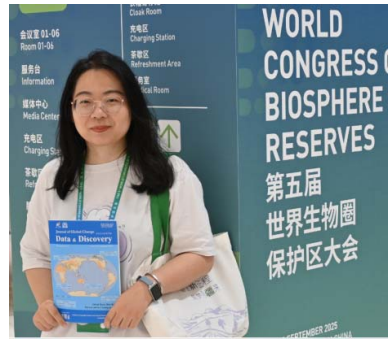
Figure 12 Professor Gui, Dongwei delivered a keynote speech at the FAO/UNESCO Oasis Sustainability Symposium, Morocco (Sep. 2023)

The Global oasis distribution dataset and cataloguing system project also provided a platform for training young researchers. Lin, Jingwu, a doctoral student at XIEG-CAS, was recognized for his meticulous approach to data verification and his commitment to accuracy. 2 other young scientists, Dr. Liu, Yunfei and Dr. Liu, Qi, were appreciated for their tenacity and innovative method (Figure 13). Their persistence during the most challenging stages of data integration was crucial to the project's success. Senior members of the team said that their work represents a new generation of scientific talent committed to advancing

environmental data science and sustainable development in arid regions.

PhD student, Lin, Jingwu

Dr. Liu, Yunfei



Dr. Liu, Qi

Figure 13 Core authors of the global oasis dataset project

At the conference, Professor Liu, Chuang from IGSNRR, CAS presented the team's future. She explained that the next stage would focus on developing intelligent analyses of global oasis dynamics and creating replicable models for sustainable oasis development around the world. She also mentioned that the "Geographical Indications Environment & Sustainability (GIES)" methodology and the data framework proposed by the World Data Center for GCdataPR are already supporting the FAO's "One Country One Priority Product" initiative. Pilot projects are underway in Uzbekistan and Egypt, where oases play a crucial role in supporting communities and ecosystems (Figure 14). On behalf of Chinese National Committee for the MAB Program, Han, Qunli announced the official launch of the "Oasis Biosphere Reserve Initiative". This marks the commencement of a new, in-depth phase of global oasis research, building directly upon the findings of the Global oasis distribution dataset and cataloguing system project.

Figure 14 Group photo of the co-authors Professor Gui, Dongwei, Professor Liu, Chuang, Dr. Sameh Kotb Abd-Elkader, and Dr. Seeshan Ahmed