United Nations Educational, Scientific and Cultural Organization
联合国教育、科学及文化组织

International Knowledge Centre for Engineering Sciences and Technology under the Auspices of UNESCO
国际工程科技知识中心 由教科文组织支持

Best Practices of SDGs and its Impact on Post-2030 Vision from the IKCEST

Prof. Juanle Wang

May 16th , 2024

IKCEST has preliminarily formed a 1+N engineering value chain through an extensible framework, loose coupling and unified data standards.

- **Open data**
- **Open educational resources**
- **Open platform**
- **Open community**
- **Open service**
- **Open training**

UNESCO

International Knowledge Center for Engineer Science and Technology (IKCEST)

- **Collaboration**
- **Participation**
- **Equal opportunities and access**
- **Diversity**
- **Collective benefit**

Engineering education | Disaster Risk Reduction | Silk Road Science & Tech | Intelligent City | ... ...





Data Resource

The total	Total volume	Specialised datasets	Knowledge services
240 Mil.pcs	373G	455 types	58 items

Literature	Patent	News	Book	Expert	Institution
12M pcs	66.2M pcs	1750K pcs	170K pcs	850K ppl	100K pcs

Technology Trends

183K papers

AI Ethics

13462 papers

Public Health Security

241,719 papers

Cultural Heritage Protection

25,865 papers

Belt and Road Index

2110K papers

IKCEST Solutions to SDGs

67,959 papers

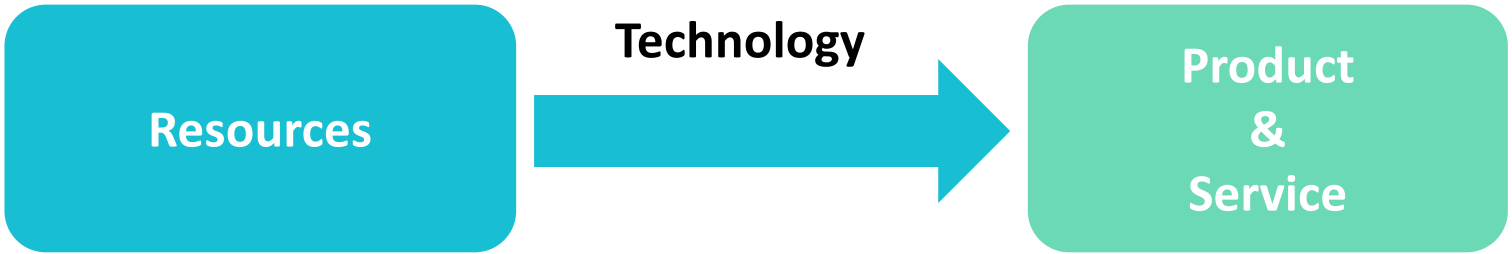
Global Engineering Projects

250 projects

Women Scientists

398 experts

IKCEST turns resources into products and services through various technologies. www.ikcest.org



SDGs Knowledge Service

- **Supporting UN SDGs by providing IKCEST solutions to SDGs.**

The column of SDG.2 Zero Hunger has been established by collecting data resources on agriculture and poverty alleviation to provide technical and case support for SDG.2.

The column of SDG.4 Quality Education has been established by collecting and displaying data resources on educational theories, coursewares, training materials, and academic conference videos, etc. to promote education equity, supporting SDG.4.

The column of SDG.6 Clean Water and Sanitation has been established by collecting technical materials on clean water and renewable energy, to provide the knowledge services for developing countries and African regions.

The column of SDG.9 Innovation and Infrastructure has been established by collecting related excellent practices of cities to provide case & technical support for SDG. 9.

The column of SDG.11 Sustainable City has been established by collecting cases on smart transportation and sewage treatment to provide support for SDG.11.

The column of SDG.13 Climate Action column has been established by collecting data resouces on the educational videos, PPT coursewares of geological disasters, and datasets, etc. to provide support for SDG.13.

The column of SDG.15 has been established by collecting related materials on forest planting, vegetation restoration and afforestation, wetlands, and land and soil restoration to protect and improve a sustainable land ecosystem.

- COVID-19 Epidemic Prevention and Control Column

- Creative Cities Network

- Training for Engineering Science and Technology Talents
- “Belt and Road” International Big Data Competition
- Urban Education

- Spatial - temporal distribution of forest types in the Yangtze River Basin, China
- land degradation and restoration and prevention measures in Mongolia
- Dynamics, attribution and coping strategies of sandstorms in Mongolian plateau

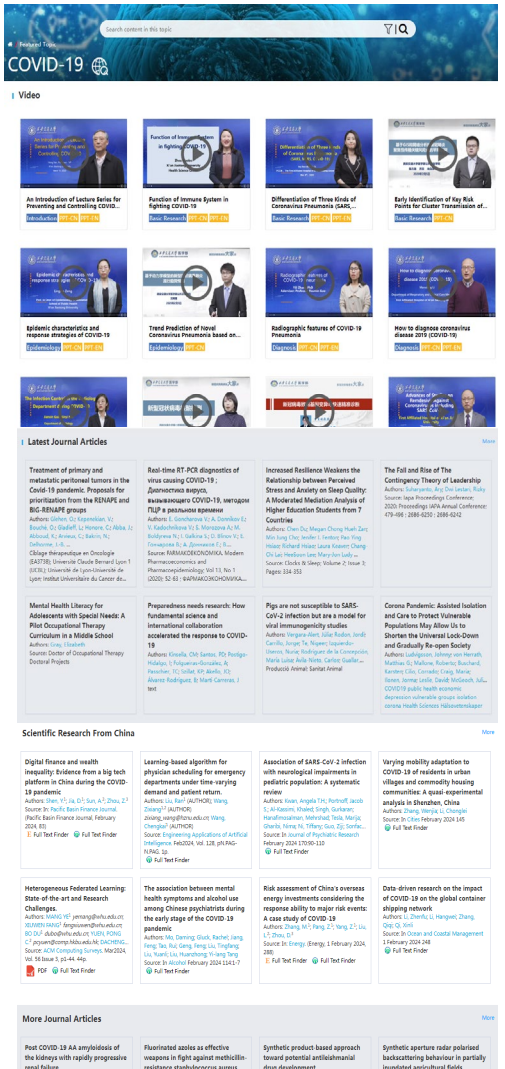
COVID-19 Epidemic Prevention and Control Column

Data:

videos(103), academic articles(35085), journals(5014),books(800), conferences(1834), reports(2165) and more, with over 100,000 pieces of data available for users to access.

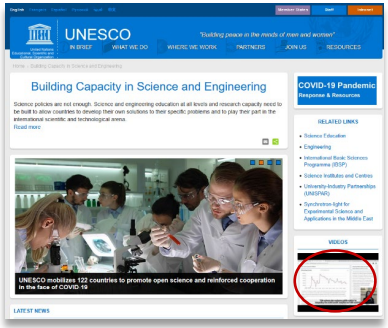
Method:

We analyze user requirements, clarify target users and information needs, plan and design the portal's architecture and modules, select a technology stack, collect and process data according to Metadata specification, and introduce custom fields, re-indexing and clustering based on various factors



COVID-19 Epidemic Prevention and Control Column

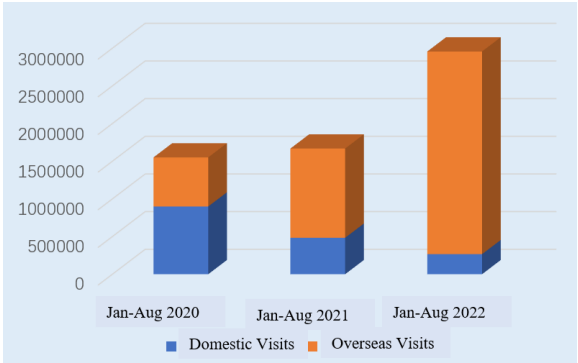
- **Role and Effect：**



- **Refined version:**

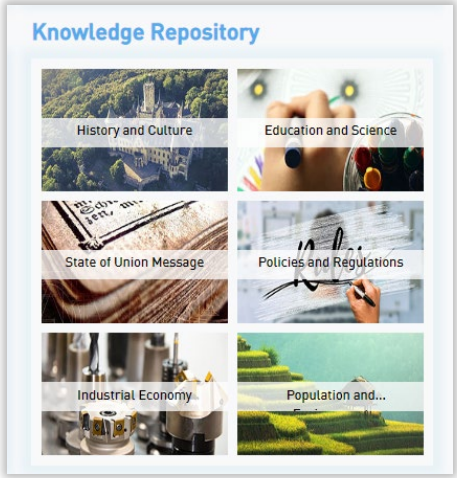
➢ In April 2020, a video introducing the COVID-19 Thematic Portal was released on UNESCO's official websites and YouTube channel.

➢ On May 20, UNESCO promoted the portal through its official WeChat account, further increasing its visibility and accessibility to the public.



Thematic Portal Visits Chart

Training for Engineering Science and Technology Talents

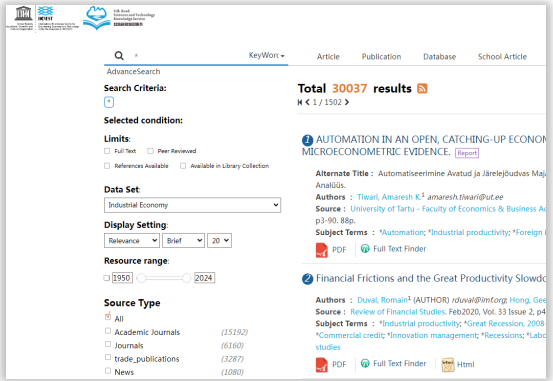


Data:

journals (869,375), books (31,210), conferences (53,669), reports (72,305), patents (130,698), dissertations (816,322), and more. We have over 3 million pieces of data available to users for access.

Method:

We analyze user needs, standardize data according to Metadata specs for the International Knowledge Centre for Engineering Sciences and Technology, introduce custom fields, and re-index data by topics and disciplines to enhance accessibility and knowledge sharing.



- The Chinese Ministry of Education has proactively developed the "**Action Plan for Promoting Educational Cooperation for the Belt and Road Countries**" to address these challenges.

Training for Engineering Science and Technology Talents

Results and Achievements:

Since 2015, we've diligently curated our educational technology dataset, ensuring its relevance and impact. With **130** training sessions held, applicants from **115** countries, and **21,216** sign-ups, our program has graduated **10,300** students, fostering pedagogical advancement and educational quality.

As of November 2023

Лекции о Китае по программе ЮНЕСКО в НГУ... - Китайский язык в Новосибирске | Facebook

facebook.com/nsk.china/posts/...

Лекции о Китае по программе ЮНЕСКО в НГУ Институт Конфуция **НГУ** приглашает на курс **лекций**, посвященный истории внешних контактов **Китая** (объем 12 часов)....

ФФ НГУ

вконтакте24.рф/group-1950.html

Лекции о Китае по программе ЮНЕСКО стартовали в НГУ. На **лекциях** рассказывают историю **Китая**, геополитическую роль России и КНР, урбанизм и городское пространство на примере крупных городов **Китая** в рамках инициативы «Один пояс, один путь». Инициатива состоит в том... Читать ещё ›

Reported by overseas media

Training for Engineering Science and Technology Talents

Role and Effect: **Outstanding trainees come from universities and institutes**

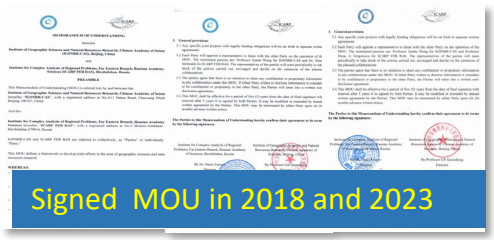
Prof. Shaikh Shamim Hasan

Bangabandhu Sheikh Mujibur Rahman Agricultural University (BSMRAU)

Present IKCEST at BSMRAU

Director Denis Fetisov

Institute for Complex Analysis of RegionalProblems, Far Eastern Branch, Russian Academyof Sciences



Signed MOU in 2018 and 2023

Associate Prof. Davaasuren Davaadorj

National University of Mongolia

Signed a MOU in 2018

“Belt and Road” International Big Data Competition

Target 4.7:

By 2030, substantially increase the number of youth and adults who have relevant skills, including technical and vocational skills, for employment, decent jobs and entrepreneurship。

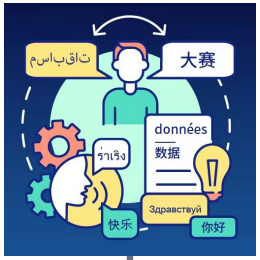
Background:

- Goal：strengthen the theoretical and practical foundations of the competition and discover top global talents in big data and artificial intelligence through a competitive format.
- **2019-2023, jointly organized by Baidu, Xi‘an Jiaotong University， IKCEST, and CKCEST.**

“Belt and Road” International Big Data Competition

Prediction of the transmission trend of highly pathogenic infectious diseases

Mutual Translation Between French, Russian, Thai, Arabic and Chinese, Major Languages of the Belt and Road Initiative



2019 → 2020 → 2021 → 2022 → 2023

Classification of Urban Regional Functions Based on Remote Sensing Images and User Behavior

Real-time Environment Perception Based on On-board Image

How to Spot Multi-modal Misinformation in Social Networks

“Belt and Road” International Big Data Competition

Role and Effect:

Our program has achieved significant global reach, with **580 universities** from **22 countries** across 5 continents participating. This amounts to **over 18,000 teams**, resulting in a substantial impact on a global scale.

Urban Education

2128 Urban Lectures

The database gathers global best urban courses

37972 Scientific Papers

The database collects urban research papers

15138 Scientific Reoprts

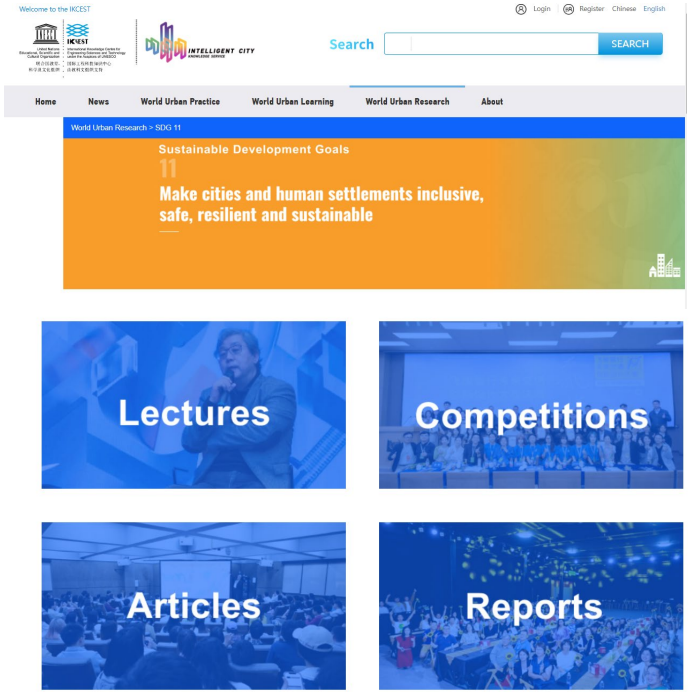
The database gathers urban research reports

- **The UNESCO Creative Cities Network** was established in 2004 with the aim of promoting global cooperation between cities, using culture and creativity as carriers to promote sustainable development.
- **Intelligent city knowledge service provides live streaming of online courses**, publishes urban lectures, holds urban creative competitions for researchers and the public to have a better education.

Urban Education

Establish the Online Column

http://ikcest-icity.org/research/sdg11/



iCity Held Urban Research Conference Annually at World Artificial Intelligent Conference 2022-2024 Shanghai, China

Creative Cities Network

350 Creative Cities Network Data

The database contains all of Creative Cities Network city data

9256 Scientific Papers

The database gathers Creative Cities Network research papers

5233 Scientific Reoprts

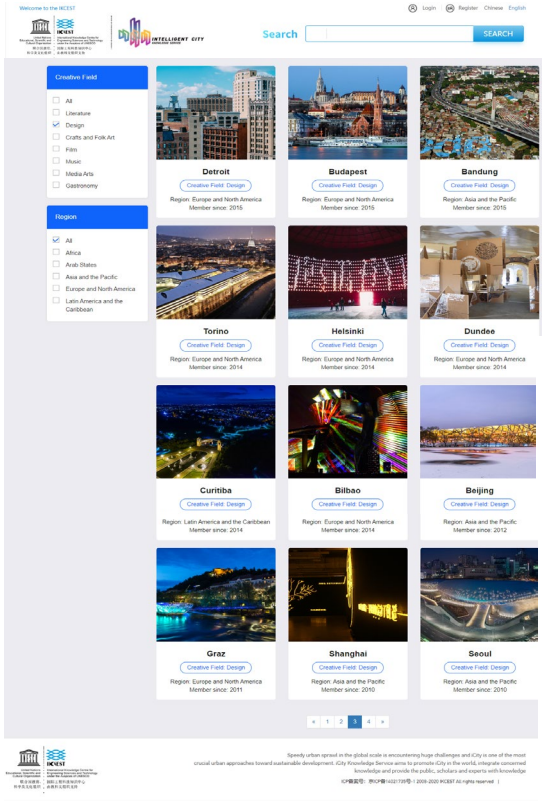
The database gathers Creative Cities Network research reports

- **Intelligent city knowledge service gathers research data from 350 UNESCO Creative Cities Network**, and provides resources for researchers and the public to better understand Creative Cities Network research.

Creative Cities Network

Establish the Online Column

http://ikcest-icity.org/practice/creative

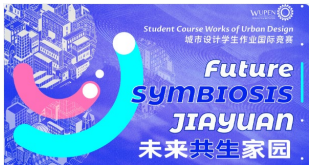


iCity Joined World Design Cities Conference

2023.9.27 Shanghai, China

Academician WU Zhiqiang delivered keynote speech

316 attendees



iCity Held Urban Design Competitions

2020-2024 online annual contests

157 Global Excellent Design Awarded

500+ teams from around the world participated in

Spatial - temporal distribution of forest types in the Yangtze River Basin, China

Target SDG15.1.1:

By 2020, protect, restore and sustainably utilize terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, foothills and drylands, in accordance with obligations under international agreements.

Background:

- The Yangtze River Basin is rich in forest resources and is an important safeguard for China's forest resources. Ecological resources such as forests in the Yangtze River Basin are threatened.
- There is an urgent need to carry out monitoring of forest types in the Yangtze River Basin and to grasp the spatial-temporal distribution characteristics, so as to carry out accurate and sustainable management of them.

Spatial - temporal distribution of forest types in the Yangtze River Basin, China

Data Resource:

- Landsat TM/ETM+/OLI(2015~2019，30m)；
- Digital Elevation Model (DEM)；
- Sentinel (2015~2019，10m)
- Field trip data from 2014, 2015, 2018, etc.

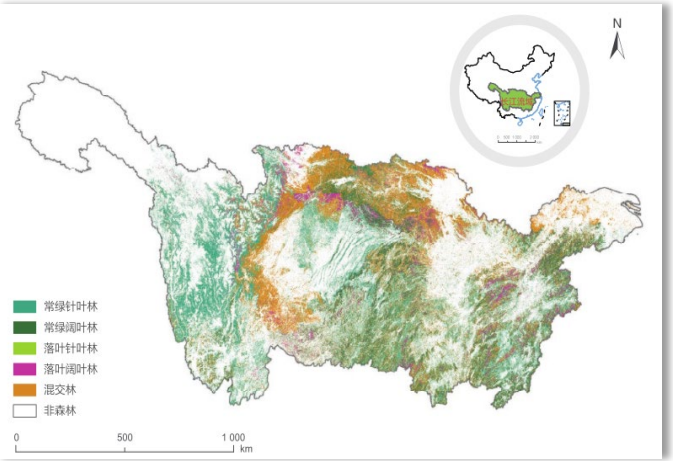
Method:

- Multi-rule based multi-spectral time series remote sensing image synthesis method to synthesize high quality, cloud-free remote sensing images.
- Combining Landsat and Sentinel image features to establish a spectral-spatial-temporal feature set for forest remote sensing classification
- Based on the cloud computing platform and machine learning algorithms, obtain the forest type coverage products of the Yangtze River Basin in China at 10 m spatial resolution.

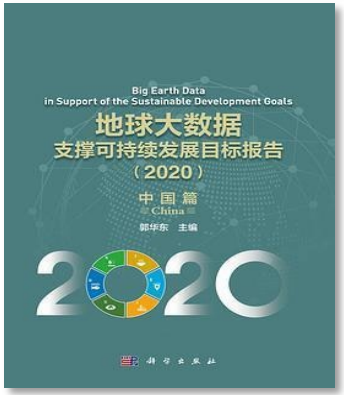
Spatial - temporal distribution of forest types in the Yangtze River Basin, China

Results and analysis:

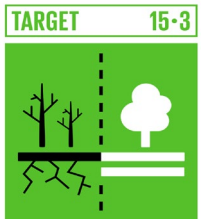
- **The forest types in the Yangtze River Basin are mainly evergreen coniferous forests, mixed forests and evergreen broad-leaved forests.**
- Evergreen coniferous forests are concentrated in the upper reaches of the Yangtze River Basin, accounting for about 15.76% of the total area.
- Mixed forests are mainly located in the central-northern part of the region, accounting for 14.15% of the total area.
- The proportion of deciduous broad-leaved forests and coniferous forests is relatively small.



This case was successfully selected for the "Earth big data support and sustainable goals development report (2020)".



Dynamic monitoring of land degradation and restoration and prevention measures in Mongolia (1990-2015)

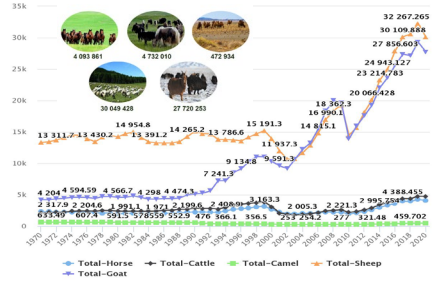


Target SDG15.3.1:

By 2030, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive for a land-degradation-neutral world

Background：

- Mongolia is a global hotspot for land degradation issues, where grassland degradation and land desertification are becoming increasingly serious under the combined effects of climate change and human activities.
- There is an urgent need to realize land degradation monitoring over a long time-series in order to promote quantitative and precise land degradation research in Mongolia.



Dynamic monitoring of land degradation and restoration and prevention measures in Mongolia (1990-2020)

Data Resource：

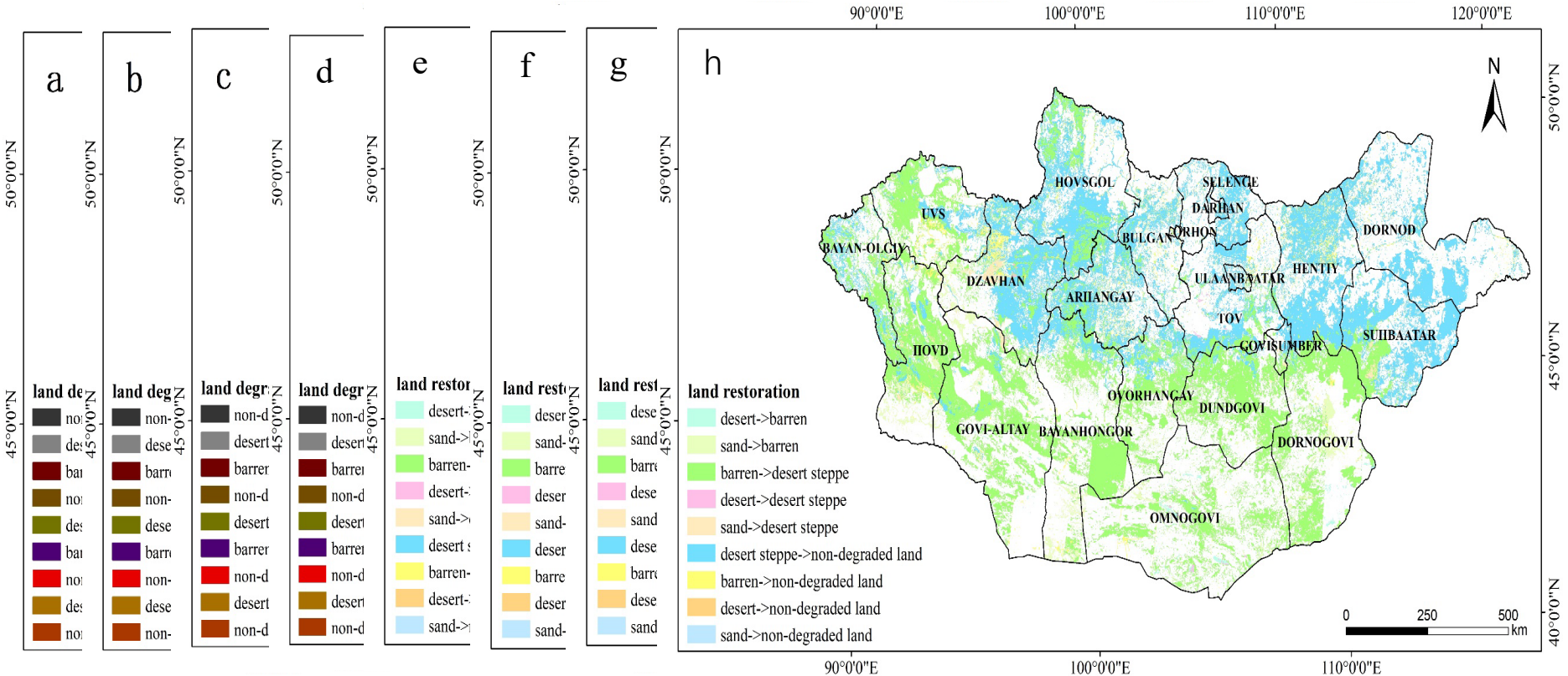
Landsat TM/ETM+/OLI(1990-2020，30m)

Method：

- Obtaining land cover data products for Mongolia at 30-meter spatial resolution based on Landsat data using object-oriented classification methodology.
- Constructing a land cover transfer matrix for Mongolia and obtaining land degradation and land restoration data for Mongolia for the years 1990-2000, 2000-2010, 2010-2015 and 2015-2020 at 30-meter spatial resolution.
- Complete the identification of key areas in the process of land degradation and land restoration in Mongolia, complete the analysis of driving forces, and propose countermeasures for land degradation prevention and control.

Dynamic monitoring of land degradation and restoration and prevention measures in Mongolia (1990-2020)

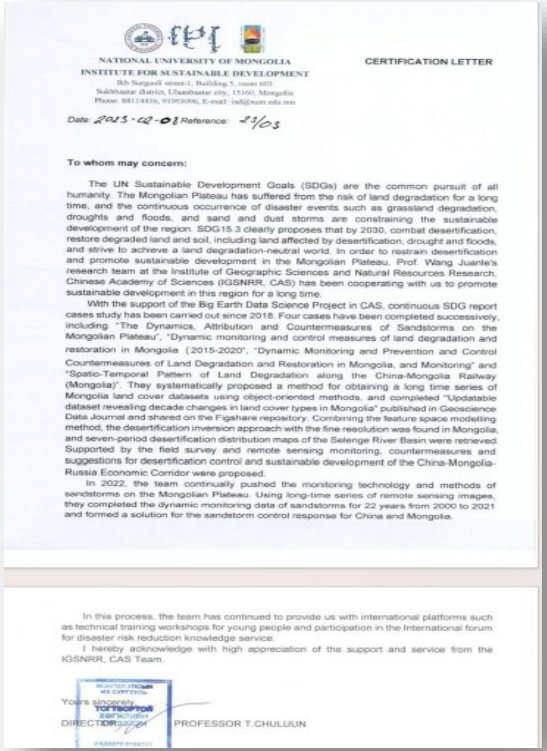
Distribution map of land degradation and restoration in Mongolia (a: land degradation (1990-2000); b: (2000-2010); c: (2010-2015); d: (2015-2020); e: land restoration (1990-2000); f: (2000-2010); g: (2010-2015); h: (2015-2020))



Dynamic monitoring of land degradation and restoration and prevention measures in Mongolia (1990-2020)

Results and analysis

- **The land degradation** area is mainly distributed in the northwestern part of Mongolia in a belt shape, and in the central and northeastern part of Mongolia in a fragmented block shape, and the land degradation area **showed an increase and then a slight decrease and stabilized during 1990-2020.**
- **The land restoration** area is mainly distributed in the western, central and northeastern parts of Mongolia in the form of bands, and the land restoration area **showed a decrease and then a rapid increase during the period of 1990-2020.**



NATIONAL UNIVERSITY OF MONGOLIA
INSTITUTE FOR SUSTAINABLE DEVELOPMENT

CERTIFICATION LETTER

Date: 2023-12-03 Reference: 23/03

To whom may concern:

The UN Sustainable Development Goals (SDGs) are the common pursuit of all humanity. The Mongolian Plateau has suffered from the risk of land degradation for a long time, and the continuous occurrence of disaster events such as grassland degradation, droughts and floods, and sand and dust storms are constraining the sustainable development of the region. SDG15.3 clearly proposes that by 2030, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land degradation-neutral world. In order to restrain desertification and promote sustainable development in the Mongolian Plateau, Prof. Wang Juanle's research team at the Institute of Geographic Sciences and Natural Resources Research, Chinese Academy of Sciences (IGSNRR, CAS) has been cooperating with us to promote sustainable development in this region for a long time.

With the support of the Big Earth Data Science Project in CAS, continuous SDG report cases study has been carried out since 2018. Four cases have been completed successively, including "The Dynamics, Attribution and Countermeasures of Sandstorms on the Mongolian Plateau", "Dynamic monitoring and control measures of land degradation and restoration in Mongolia (2015-2020)", "Dynamic Monitoring and Prevention and Control Countermeasures of Land Degradation and Restoration in Mongolia, and Monitoring" and "Spatio-Temporal Pattern of Land Degradation along the China-Mongolia Railway (Mongolia)". They systematically proposed a method for obtaining a long time series of Mongolia land cover datasets using object-oriented methods, and completed "Updatable dataset revealing decade changes in land cover types in Mongolia" published in Geoscience Data Journal and shared on the Figshare repository. Combining the feature space modelling method, the desertification inversion approach with the fine resolution was found in Mongolia, and seven-period desertification distribution maps of the Selenge River Basin were retrieved. Supported by the field survey and remote sensing monitoring, countermeasures and suggestions for desertification control and sustainable development of the China-Mongolia-Russia Economic Corridor were proposed.

In 2022, the team continually pushed the monitoring technology and methods of sandstorms on the Mongolian Plateau. Using long-time series of remote sensing images, they completed the dynamic monitoring data of sandstorms for 22 years from 2000 to 2021 and formed a solution for the sandstorm control response for China and Mongolia.

In this process, the team has continued to provide us with international platforms such as technical training workshops for young people and participation in the International forum for disaster risk reduction knowledge service.

I hereby acknowledge with high appreciation of the support and service from the IGSNRR, CAS Team.

Yours sincerely,

DIRECTOR PROFESSOR T.CHULUUN

Successfully selected in the "Earth Big Data Support Sustainable Development Goals Report (2022) "

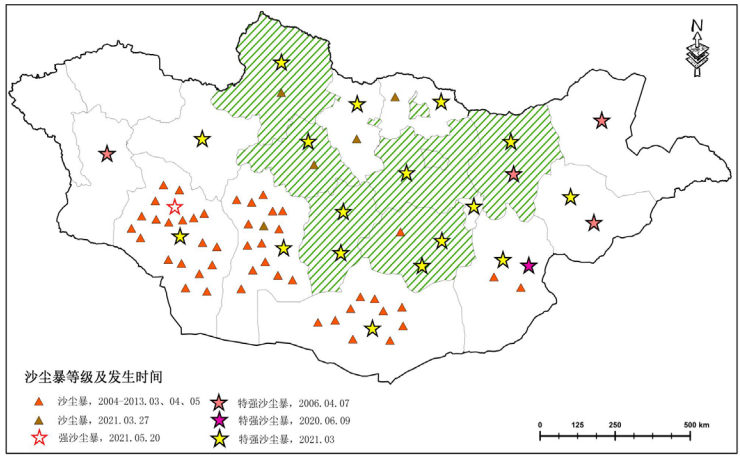
Dynamics, attribution and coping strategies of sandstorms in Mongolian plateau

Target SDG15.3:

By 2030, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land degradation-neutral world.

Background:

- Sandstorms, land degradation, desertification and other ecological and environmental problems restrict the sustainable development of this region.
- the Government of China and Mongolia jointly declared that China and Mongolia should strengthen cooperation on ecological environment and prevention and control of desertification.



Dynamics, attribution and coping strategies of sandstorms in Mongolian plateau

Data:

MODIS L1B（about 1500 scenes）、Landsat TM（about1000 scenes）、Aerosol monitoring data、Meteorological data such as temperature inversion data (yearly)；

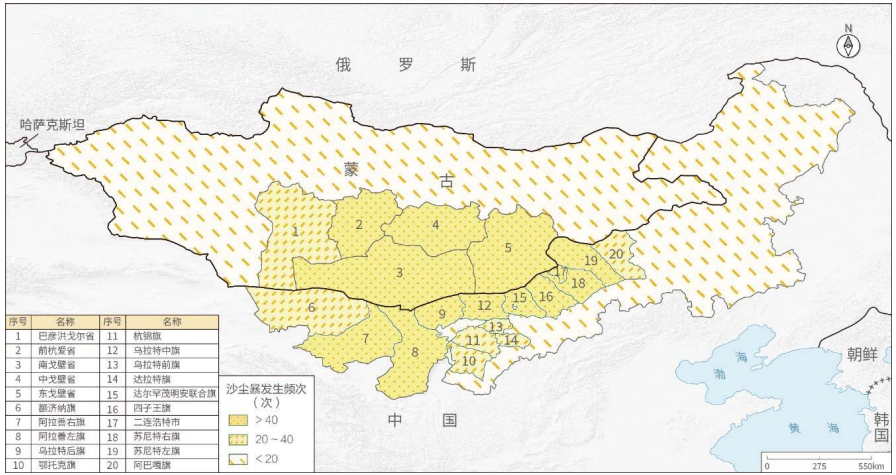
Method:

- Based on MODIS LIB data, **DSI index, NDDI index and SVI model** are used to retrieve dust information year by year. Based on Landsat TM data, the SEI model was used to extract sandy land, and **the dynamic distribution of dust storms in Mongolia Plateau from 2000 to 2021** was obtained；
- Combining text mining data, station records, AERONET level 2.0 data and temperature inversion data, the remote sensing interpretation **results were verified**, and the spatio-temporal distribution of dust storms over the Mongolian Plateau from 2000 to 2021 was **analyzed**.

Dynamics, attribution and coping strategies of sandstorms in Mongolian plateau

Results and analysis：

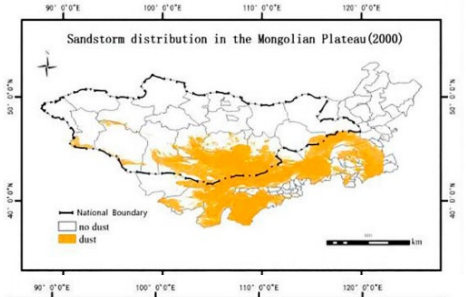
- From 2000 to 2021, the spatial distribution of spring dust storms on the Mongolian Plateau was **more in the south than in the north**, and **more in the west than in the east**.
- The frequency and area of sandstorms in Mongolia Plateau vary from year to year, and their frequency and intensity are related to natural and human activities.

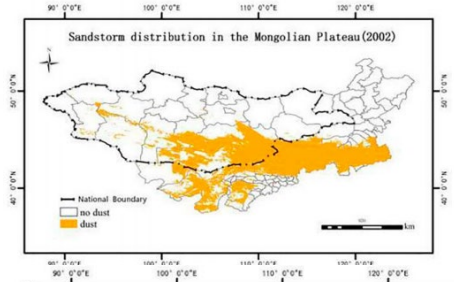


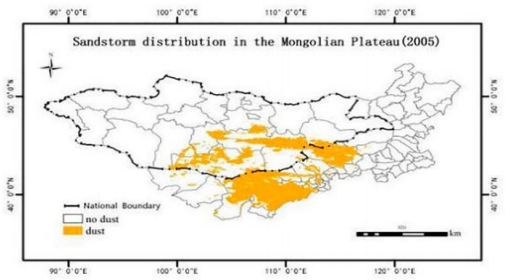
序号	名称	序号	名称
1	巴彦淖尔市	11	杭锦旗
2	前杭爱省	12	乌拉特中旗
3	南戈壁省	13	乌拉特前旗
4	中戈壁省	14	达拉特旗
5	东戈壁省	15	达尔罕茂明安联合旗
6	额济纳旗	16	四子王旗
7	阿拉善右旗	17	二连浩特市
8	阿拉善左旗	18	苏尼特右旗
9	乌拉特后旗	19	苏尼特左旗
10	鄂托克旗	20	阿巴嘎旗

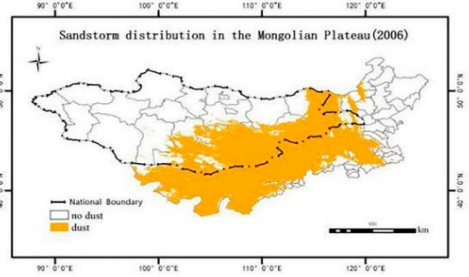
Figure 3. Frequency of typical spring SDSs on Mongolian plateau.

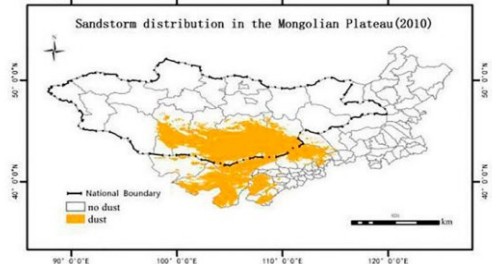
Dynamics, attribution and coping strategies of sandstorms in Mongolian plateau

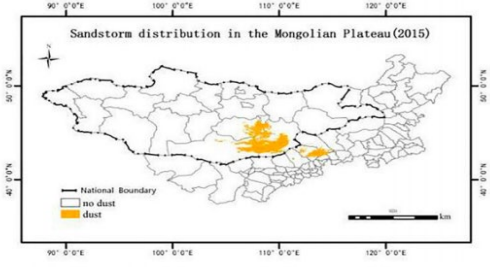


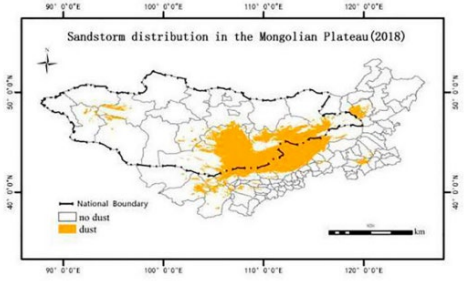


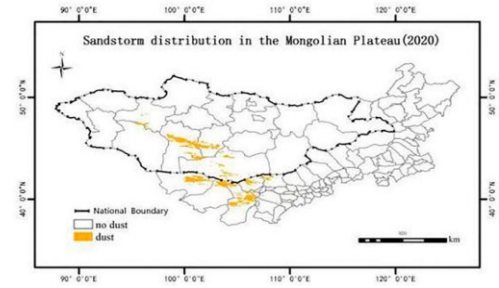


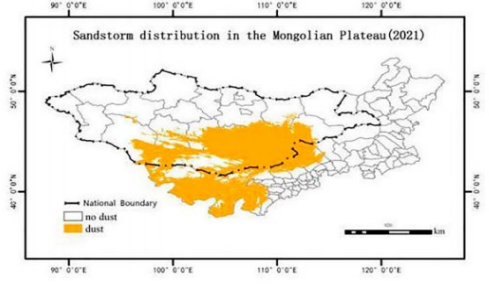












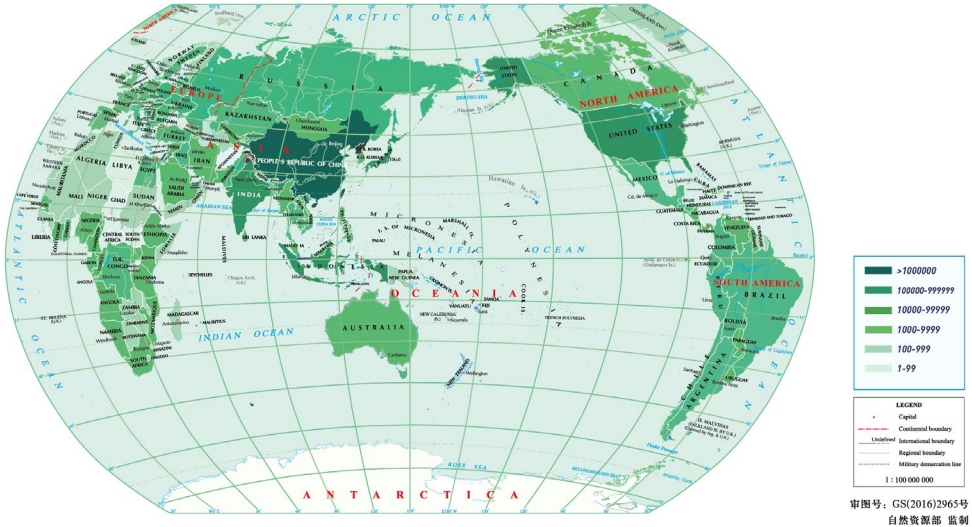
Application and effect

This case was success fully selected in the " Earth Big Data Suppo rt Sustainable Develo pment Goals Report (2023)"

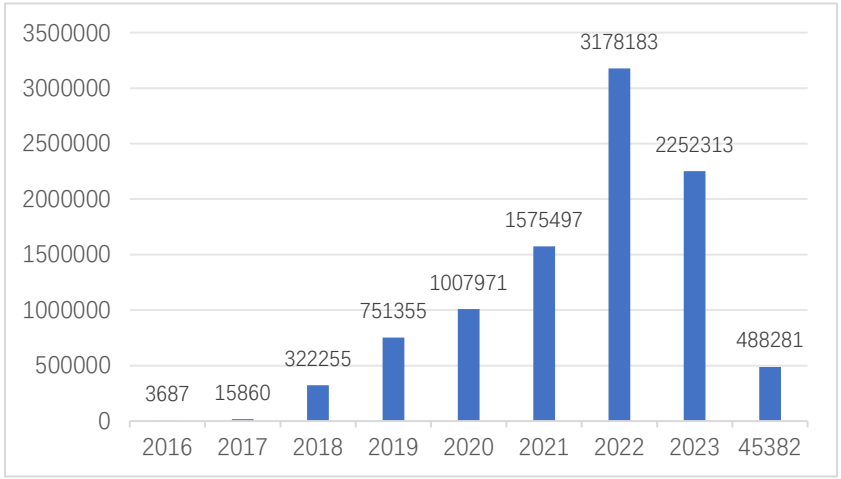
IKCEST USERS

Page Views	User Views	Countries and regions	Registered Users
23,869,066	9,595,402	228	30,415

(Jun.2016- Mar. 2024)



Global PV Distribution of IKCEST Platform



Annual UV (2016-2024)

Vision from IKCEST

Enhance natural disaster risk assessment on agricultural production over transboundary basin regions to support SDG2.

Strengthen the integration and disclosure of relevant high-quality resources, and continue to serve SDG3 and SDG4.

In order to support SDG4, the platform continuously gathers courses, papers, projects, reports, and data resources in the field of intelligent cities.

Strengthen the construction of SDG6 resources, update resources and promote the integration of resources and knowledge application .

In order to support SDG11, the platform continuously holds conferences, competitions, workshops of intelligent cities development.

Improve land degradation and restoration monitoring methods, and apply this method to the ecologically fragile areas to support SDG15.

Thanks!

www.ikcest.org Check it out! ^_^

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Open for cooperation