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

An open science infrastructure: Disaster Risk Reduction Knowledge Service in IKCEST

Juanle Wang

International Knowledge Centre for Engineering Sciences and Technology (IKCEST)
under the Auspices of UENSCO

Institute of Geographic Sciences and Natural Resources Research,
Chinese Academy of Sciences

May, 2024


UNESCO Science Centres Coordination Meeting
联合国教科文组织科学中心主任工作会议
May 15-18, 2016
Beijing • China

Signing and Unveiling Ceremony

- **Establishment** of International Knowledge Centre for Engineering Sciences and Technology (IKCEST) under the Auspices of UENSCO was approved by the 37th session of the UNESCO General Conference in 2013. The **Signing and Unveiling Ceremony** of IKCEST was held in Beijing **on June 2, 2014.**

A Bridge for Engineering Communities of UNESCO Member States

VISION

to promote global information and knowledge sharing of engineering, education, and implement technical exchanges and knowledge services for the international community.

MISSION

to construct a knowledge base on which to share expertise and experience on engineering science and technology internationally, thus contributing to UNESCO’ s Engineering Initiative and promoting the dissemination and utilization of engineering knowledge to facilitate the development of a knowledge-based society.


UNESCO
中国工程院
CHINESE ACADEMY OF ENGINEERING
Responsible
United Nations Educational, Scientific and Cultural Organization
联合国教育、科学及文化组织
IKCEST
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
International Knowledge Center for Engineer Science and Technology (IKCEST)
Engineering education
Disaster Risk Reduction
Silk Road Science & Tech
Intelligent City
……
清華大學
Tsinghua University
中国科学院地理科学与资源研究所
Institute of Geographic Sciences and Natural Resources Research, CAS
XI'AN JIAOTONG UNIVERSITY
TONGJI UNIVERSITY

unesco

Explore UNESCO

Disaster Risk Reduction

UNESCO Global Tsunami Early Warning and Mitigation Programme

Provides support in assessing tsunami risk, implementing Tsunami Early Warning Systems (EWS) and in educating communities at risk about preparedness measures.

DesInventar Sendai

Contains systematic collection, documentation and analysis of data about losses caused by disasters associated with natural hazards.

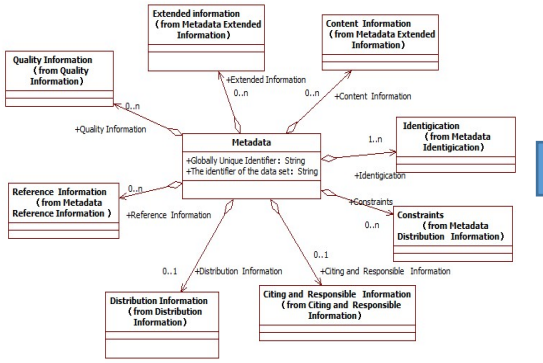
IKEST Disaster Risk Reduction Knowledge Service

Provides pubications, data, information and services related to natural distarets and disaster risk reduction.

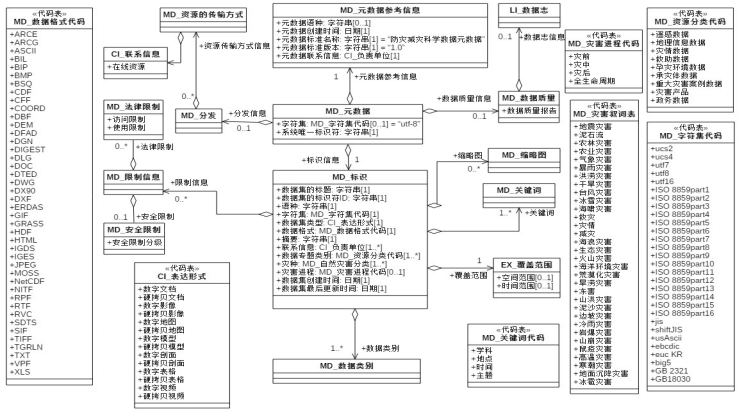
African Flood an Drought Monitor

Allows monitorin forecasting mete agricultural and drought at variou and spatial scale

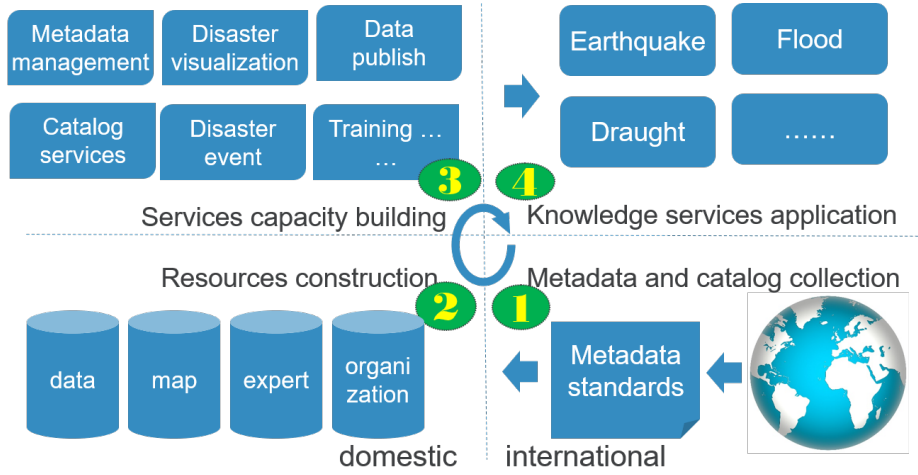
Build UNESCO knowledge service system for Disaster Risk Reduction, and gather more than 1.5 million disaster data resources in 2016-2023



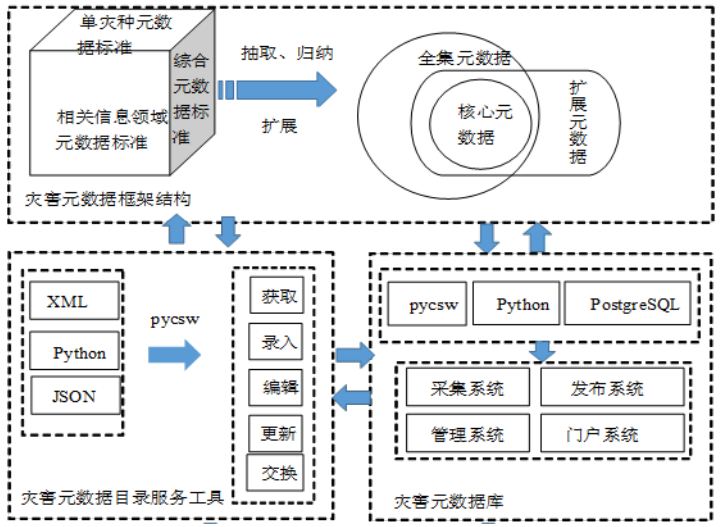
Disaster metadata standard



Disaster resource correlation framework



International Disaster resources convergence



- **disaster data**
- **disaster documents**
- disaster databases
- disaster events
- disaster maps
- knowledge applications
- expert information
- institutional information
- video courseware
- research reports

DRR Knowledge Service of IKCEST (http://drr.ikcest.org)

IKCEST-DRR launched in 2016.

Data

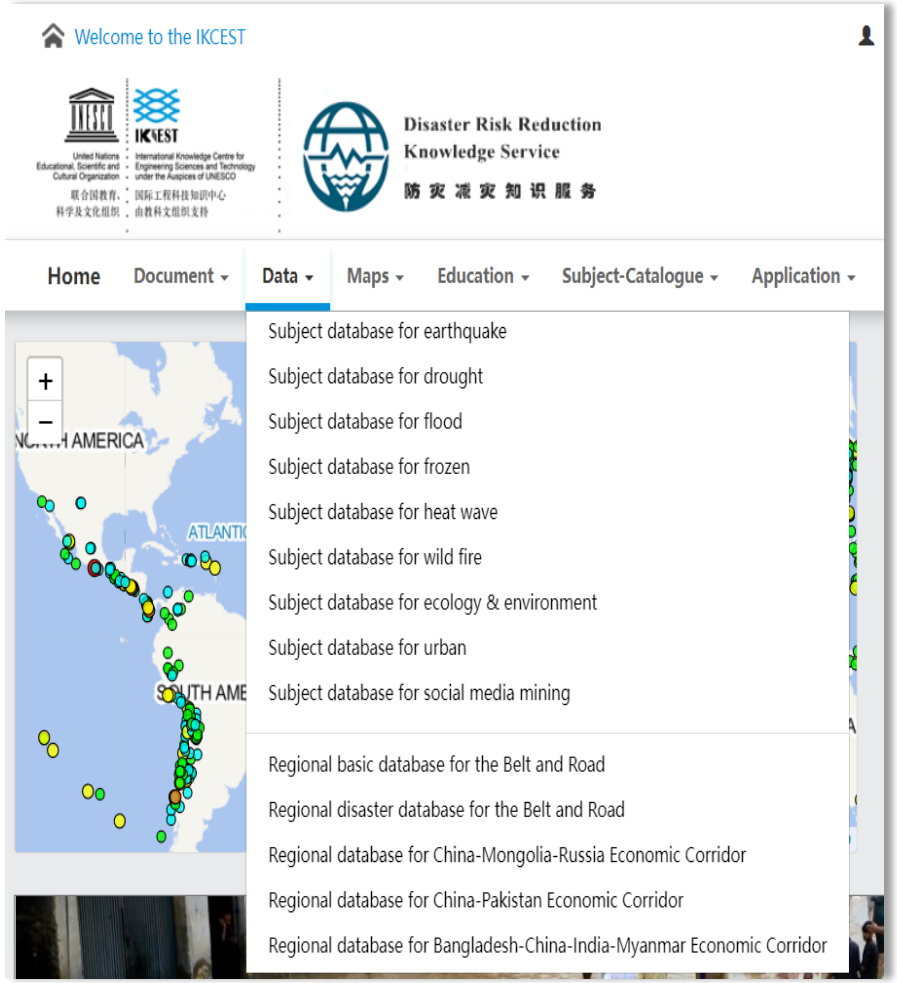
- Data files reach 4600,000+ pieces
- 100,000+ linked meta database
- 370,000+ disaster literature
- 1587 disaster maps
- 381 scientific data sets
- 413 expert metadata
- 404 Institutional metadata
- 23 knowledge applications
- 115 training videos
- 2268 disaster events

Service

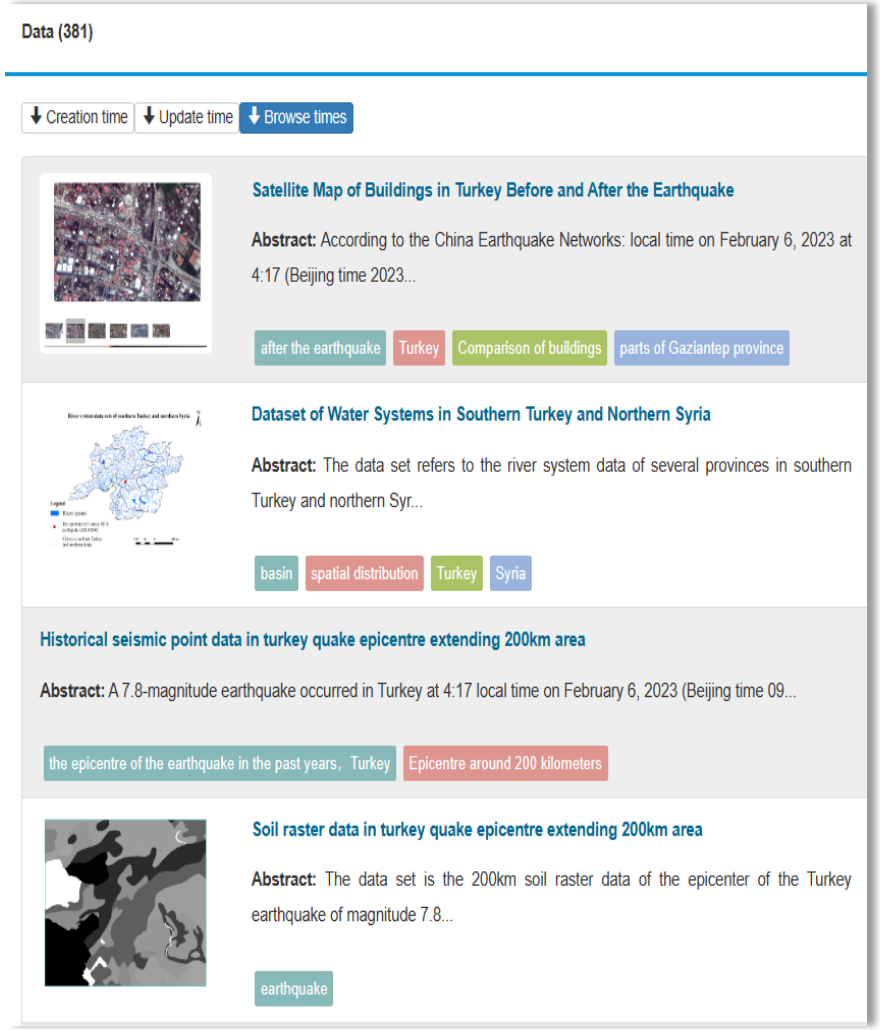
- International training, International workshop,
- The cumulative visits reached 2.25 million.International users accounted for 67.1%+.

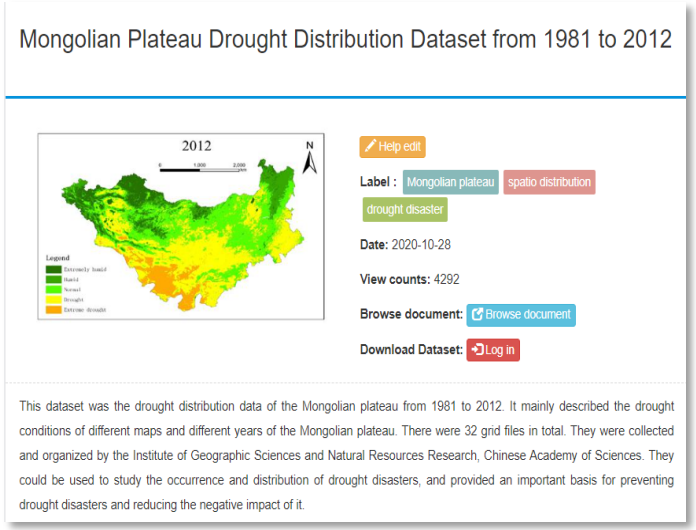
UNESCO United Nations Educational, Scientific and Cultural Organization — Disaster Risk Reduction

➢ DRR scientific data

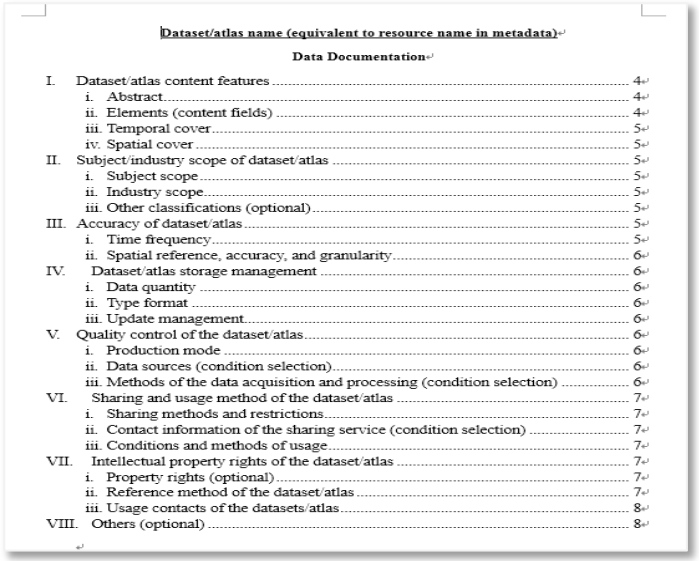


381 datasets



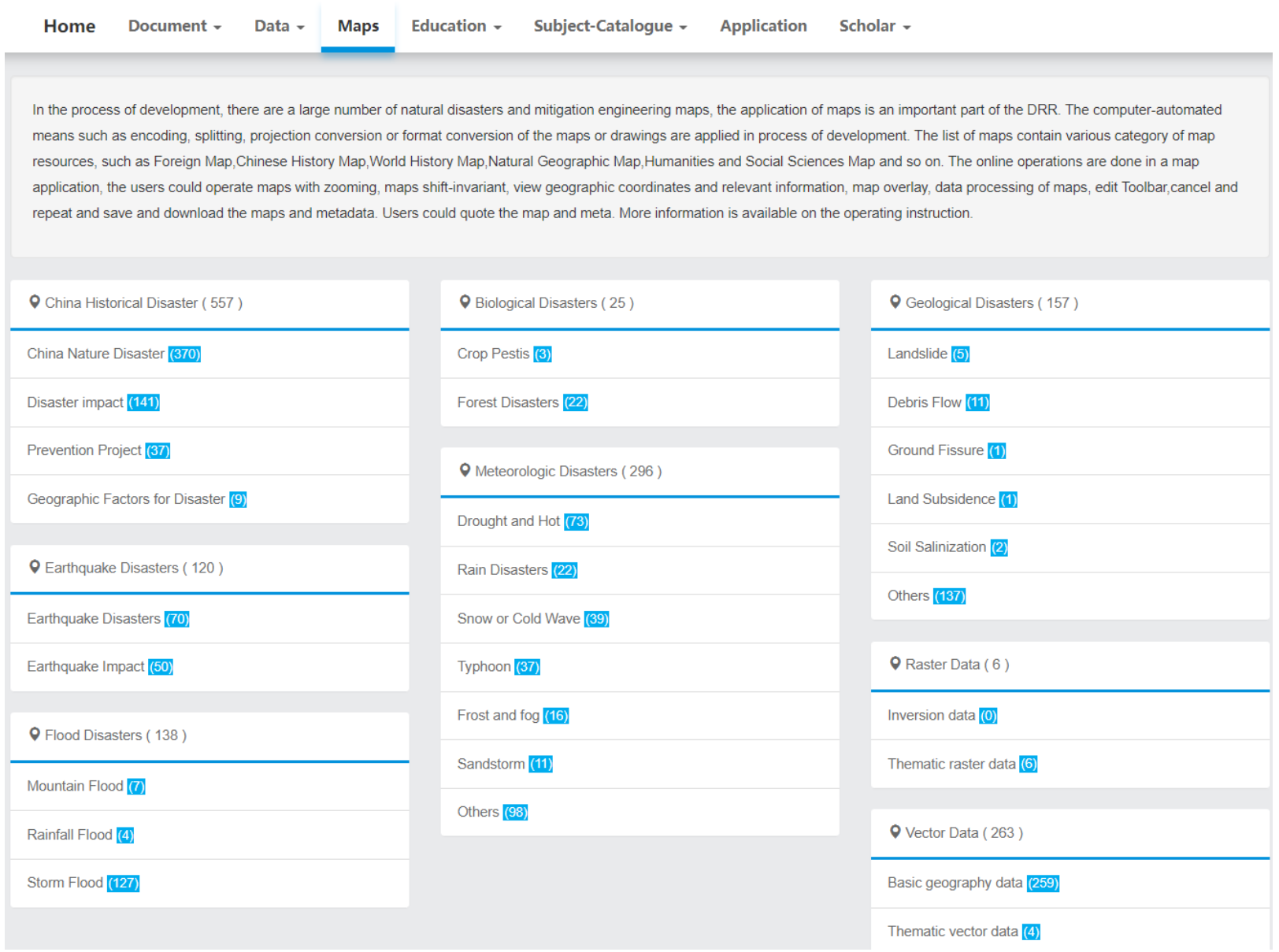


Metadata



Data Documentation

➢ Disaster maps

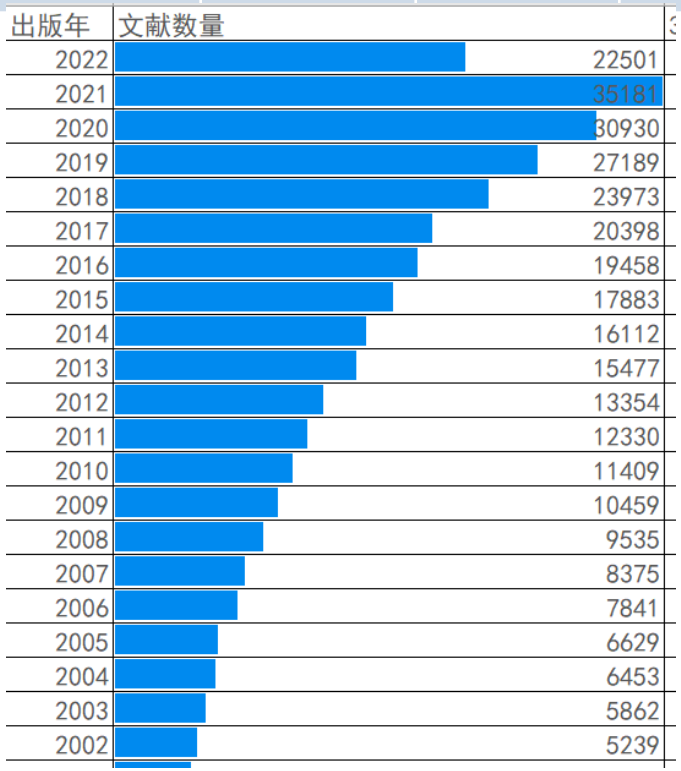


➢DRR released a total of 1587 disaster maps, including geological, flood, earthquake, meteorological and other disaster types.

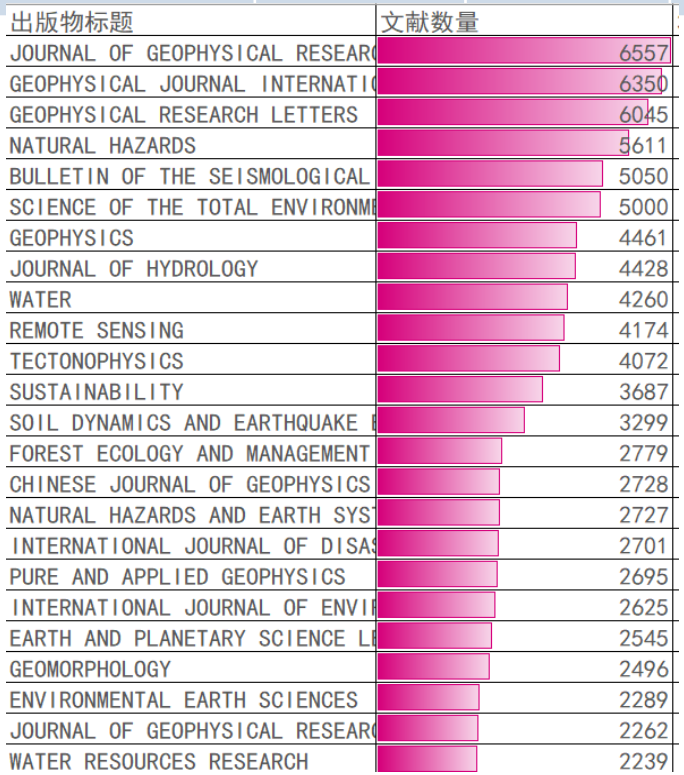
➢ DRR Scholar

DDR Scholar covers **370,789 papers published since 1900**, including typhon, drought, wild fire, heat weaves, tsunami, flood, earthquake, disaster early warning, disaster reduction, et al.

Research Direction	Typhoon Disaster	Drought disaster	Forest Fire Disaster	High Temperature Heatwave	Tsunami Disaster	Flood Disaster	Earthquake Disaster	Geological Hazards	Disaster Mitigation	Disaster Warning
Number of literatures	21274	106683	19314	2104	13267	78907	105879	7016	71834	66287



出版年	文献数量
2022	22501
2021	35181
2020	30930
2019	27189
2018	23973
2017	20398
2016	19458
2015	17883
2014	16112
2013	15477
2012	13354
2011	12330
2010	11409
2009	10459
2008	9535
2007	8375
2006	7841
2005	6629
2004	6453
2003	5862
2002	5239



出版物标题	文献数量
JOURNAL OF GEOPHYSICAL RESEARC	6557
GEOPHYSICAL JOURNAL INTERNATIC	6350
GEOPHYSICAL RESEARCH LETTERS	6045
NATURAL HAZARDS	5611
BULLETIN OF THE SEISMOLOGICAL	5050
SCIENCE OF THE TOTAL ENVIRONME	5000
GEOPHYSICS	4461
JOURNAL OF HYDROLOGY	4428
WATER	4260
REMOTE SENSING	4174
TECTONOPHYSICS	4072
SUSTAINABILITY	3687
SOIL DYNAMICS AND EARTHQUAKE E	3299
FOREST ECOLOGY AND MANAGEMENT	2779
CHINESE JOURNAL OF GEOPHYSICS	2728
NATURAL HAZARDS AND EARTH SYST	2727
INTERNATIONAL JOURNAL OF DISAS	2701
PURE AND APPLIED GEOPHYSICS	2695
INTERNATIONAL JOURNAL OF ENVIR	2625
EARTH AND PLANETARY SCIENCE LE	2545
GEOMORPHOLOGY	2496
ENVIRONMENTAL EARTH SCIENCES	2289
JOURNAL OF GEOPHYSICAL RESEARC	2262
WATER RESOURCES RESEARCH	2239

文献类型	文献数量
Article	353631
Proceeding Paper	13261
Review Article	11939
Early Access	3210
Editorial Material	2370
Meeting Abstract	1206
Note	458
Correction	415
Letter	344
Book Chapters	306
News Item	180
Data Paper	111

➢ Expert database and Institution database

Experts (413)

Creation time | Update time | Browse times

Scott C. Doney Edit

Affiliation : University of Virginia

Introduction : University of California San Diego: La Jolla, CA, US 1982-09 to 1986-06 | BA (Chemistry) Massachusetts Institute of Technology: Cambridge, MA, US 1986-06 to 1991-08 | PhD (Joint Program in Oceanography). National Center for Atmospheric Research: Boulder, CO, US 1991-08 to 1993-09 | Postdocal Fellow (Advanced Studie...

spans oceanography | climate and biogeochemistry

Chris Langdon Edit

Affiliation : University of Miami

Introduction : Lawrence University 1972 to 1976-05-10 | BA (Biology) University of Rhode Island 1988-08-06 | PhD (Graduate School of Oceanography). Columbia University: New York, NY, US 2004-08 (LDEO) Employment; University of Miami: Coral Gables, FL, US 2005-08-01 to present | Professor and Chair (RSMAS).

ocean warming | acidification

Steven M.A.C. van Heuven Edit

Affiliation : University of Groningen

Introduction : 2015-03-01 to 2017-06-30 | Postdoctoral Researcher (Ocean Systems Sciences); 2017-07-01 to 2018-06-30 | Temporary technician, Aerosol lab (Centre for Isotope Research); 2018-07-01 to 2019-03-31 | Postdoctoral Researcher Atmospheric Chemistry (Centre for Isotope Research); 2019-04-01 to present | Scientific Engineer, Atmosp...

Christopher Hunt Edit

Affiliation : University of New Hampshire

Introduction : 1996-09 to 2000-05 | BS (Chemistry) 2000-09 to 2003-05 | MS (Earth Sciences). 2004-05 to present | Research Scientist (Ocean Process Analysis Laboratory) Employment.

Organization (403)

Creation time | Update time | Browse times

French National Institute for Agriculture, Food, and Environment (INRAE) Edit

NRAE is the French National Institute for Agriculture, Food and the Environment, established on January 1, 2020, by the merger of the French National Institute for Agricultural Research INRA and the French National Institute for Environmental Science and Technology IRSTEA and Agriculture. INRAE was formed by the merger of INRA, the French Nationa...

Climatological

World Agroforestry Centre Edit

World Agroforestry (ICRAF) is a scientific and development centre of excellence dedicated to harnessing the benefits of trees for people and the environment. Drawing on the world's largest repository of agroforestry science and information, we develop knowledge practices from the farmer's field to the global scale to ensure food security and envi...

Climatological

The Nature Conservancy Edit

Climate change is the greatest environmental challenge of the 21st century, and its impacts are rapidly intensifying, including prolonged droughts, rising sea levels, record heat, extreme storms, and significant economic losses. The damage caused by climate change could undo the environmental protection work of recent decades and seriously threat...

Climatological

Centre for Environment, Fisheries and Aquaculture Science Edit

Our rivers, seas and the ocean are facing significant global threats. These precious environments regulate our climate, are home to up to 80% of life on earth and provide essential resources that we all rely on. Many are now seriously degraded and communities around the world are facing the devastating consequences of climate change, biodiversity...

➢413 experts metadata and 404 Institutional metadata

➢ DRRKS thematic knowledge application

- **23 knowledge applications**

Knowledge Application

Information Aggregation


Information Retrieval based on World Countries and Regions Map


Global earthquake spatial distribution mapping since 2150 BC


Knowledge Map Service for Major Organizations


Global Earthquake Daily Distribution Map Service


Disaster knowledge application of China Pakistan Economic Corridor


Natural disaster risk assessment on agricultural production over Heilongjiang - Amur Transboundary River Basin


Accurate regulation method and coordination web platform development of animal husbandry in the Selenge River Basin,Mongolia


DRRKS Data Sharing for 2023 Earthquake Disaster Reduction in Turkey and Syria

Application Using Web GIS


Map Visualization Services of China's Historical Disasters


China and International Experience in Natural Disaster Relief

Scientific Data Visulization


Forest freezing, rain and snow disaster prevention and reduction in southern China


Flood Control in Songliao Basin


Spatio-temporal Distribution of Arable Land Drought along the Belt and Road Initiative Area


Suspended Solids Concentration Inversion from 2000 to 2013 in Poyang Lake, China


Annual Spatial Distribution Data for Drought Monitoring in the Mongolian Plateau (1981-2012)


Spatial Distribution of the Seasonal Chlorophyll-a Concentration in Poyang Lake, China (2009-2012)


Total Factor Data of Land Cover in Disaster Pregnancy Environment in Mongolia


Spatio-temporal Distribution of Major Historical Disasters in the China-Mongolia-Russia Economic Corridor


Desertification monitoring in Mongolia section of China-Mongolia railway

Natural Science Research Work


Temporal and Spatial Distribution of Public Sentiment on Shouguang Flood


Grassland yield in China-Mongolia-Russia Economic Corridor


Historical meteorological space mapping in the Belt and Road

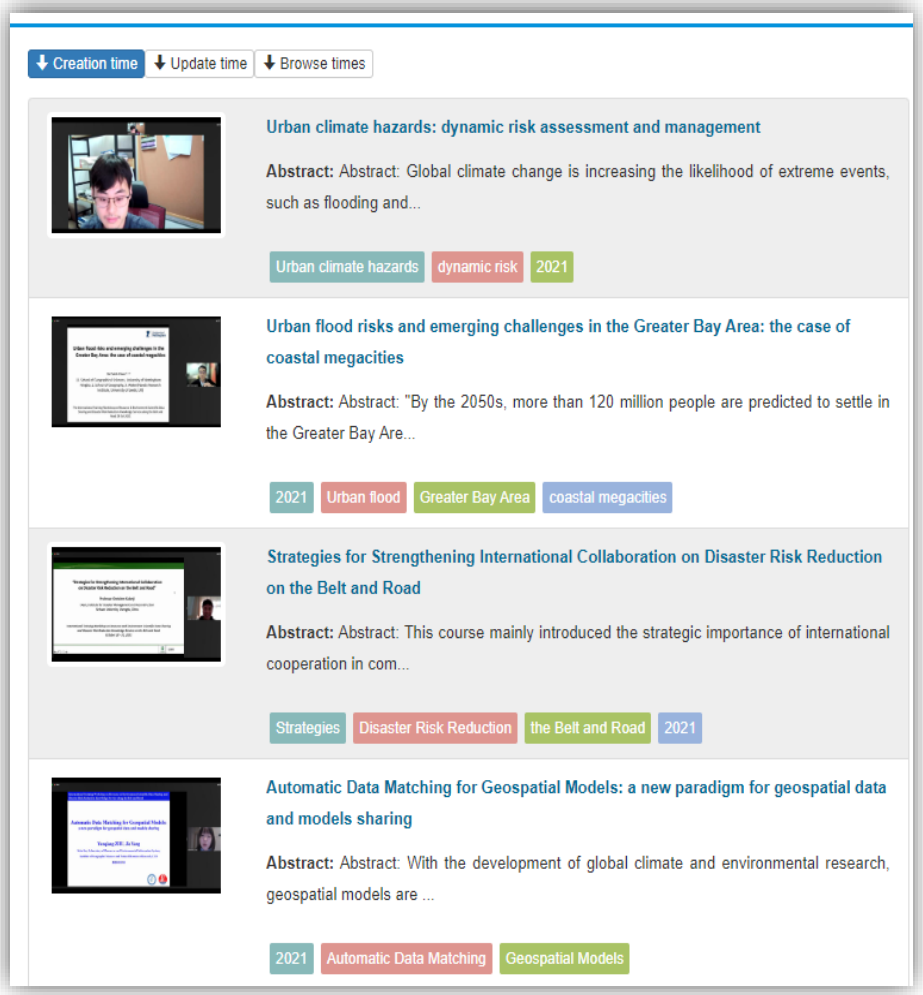

Multi-scale assessment of heat wave disaster risk in typical region-case study in Dhaka, Bangladesh in South Asian

Training video

By 2023, IKCEST DRR has released 115 training videos in various topics.

Link: https://drr.ikcest.org/filter/2102

Number	Title (2023)	Number	Title (2023)
1	Introduction to commission for geoscience information of IUGS and progress of DDE standards	9	Progress in "BRI" and Collaborative Disaster Management in China-Pakistan Economic Corridor
2	Understanding collective responses to urban disasters from human's digital footprints: rhythm, pattern, and perception	10	China Efforts on Earth Observation Data Sharing
3	Heat wave risk and impact assessment	11	Bilateral Cooperation on Science and Technology along CPEC
4	Rapid Assessment of Building Damage Triggered by Earthquakes	12	Global SDGs related products and applications based on Big Earth Observation data
5	Towards an Integrated MHEWS for All in Tackling the Climate Crisis	13	Social-ecological resilience and regional development for the countries along the Belt and Road
6	A Flood and Drought Monitoring and Forecasting System over China	14	Earth Science Data Sharing and Interoperability: Progress and Prospective
7	Geospatial data ontology: the semantic foundation of geospatial data integration and sharing	15	Urban flood risks and emerging challenges in the Greater Bay Area: the case of coastal megacities
8	National Tibetan Plateau Data Center		



GDMD-Disaster Data Hub

What is GDMD

GDMD means Global Disaster Data Master Directory. It is a directory, a hub and a clearinghouse for disaster data in the world**. It is also a tool for disaster data directory presenting, searching, publishing, mining and analyzing.**

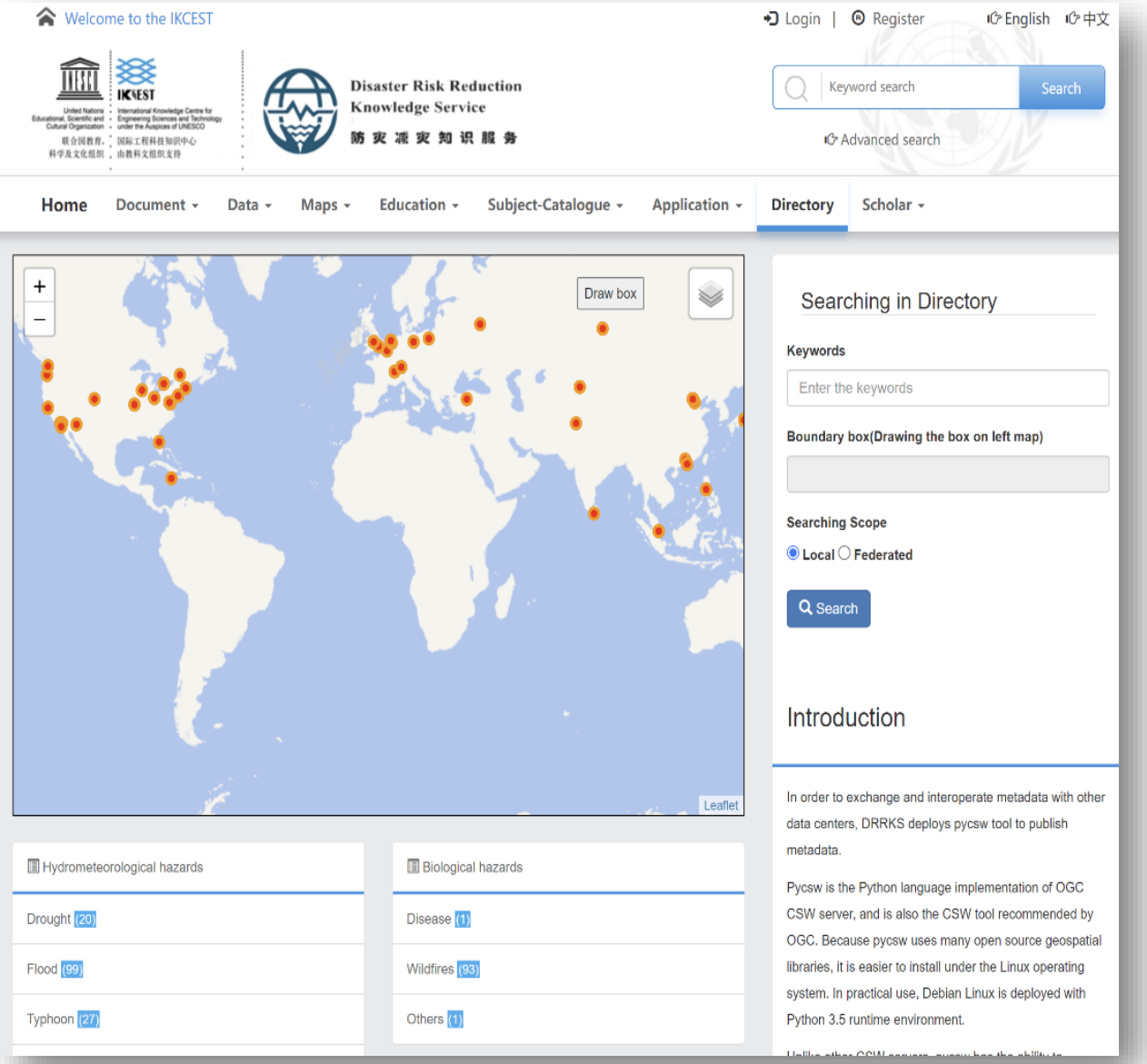
- Presenting: show the directory in same classification system with rich metadata.
- Searching: search the directory in local database, federated database, and spatial map style.
- Publishing: release the metadata in local or harvest the data catalog with same interface.
- Mining: mine the metadata semantic and produce more labels for data discovery.
- Analyzing: analyze the linked data and produce disaster data knowledge graph.

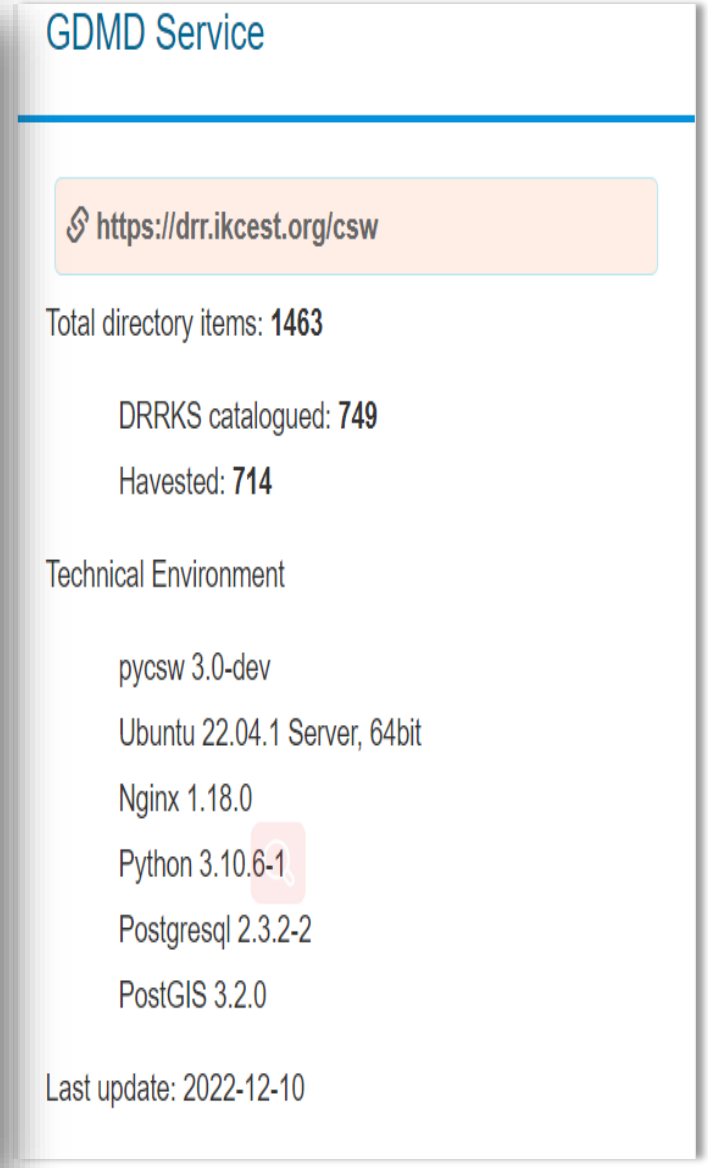
How to create GDMD

Resource → Standard → Coding → Platform

- Resource：
  - ➢Besides the resources in IKCEST-DRR, we collect the resources in 120+ platforms in the world.
  - ➢Harvested resource
  - ➢Federated search resource
- Standard：
  - ➢OGC standard　　XML format
- Coding：
  - ➢PYCSW tool
- Platform：
  - ➢https://drr.ikcest.org/directory/

- GDMD has presented 1463 open datasets for scientific research.

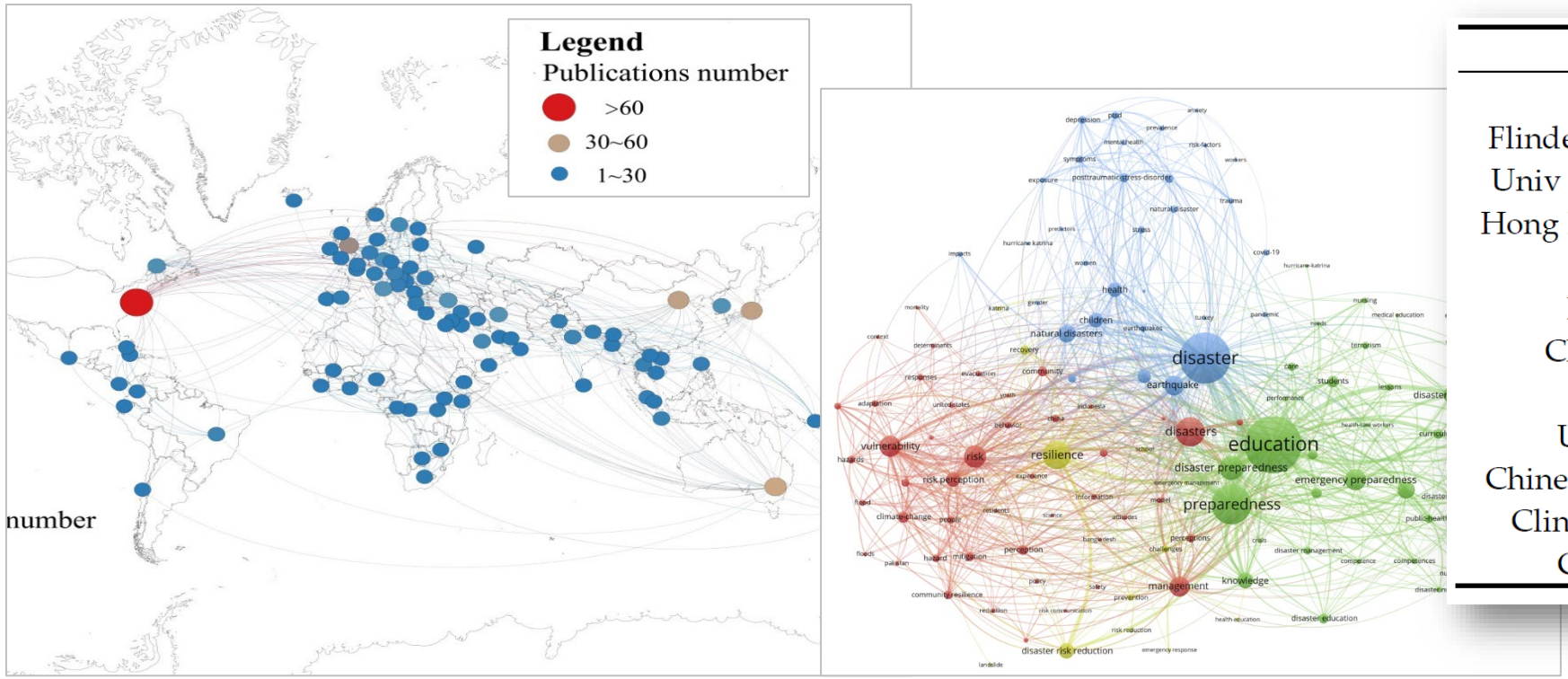




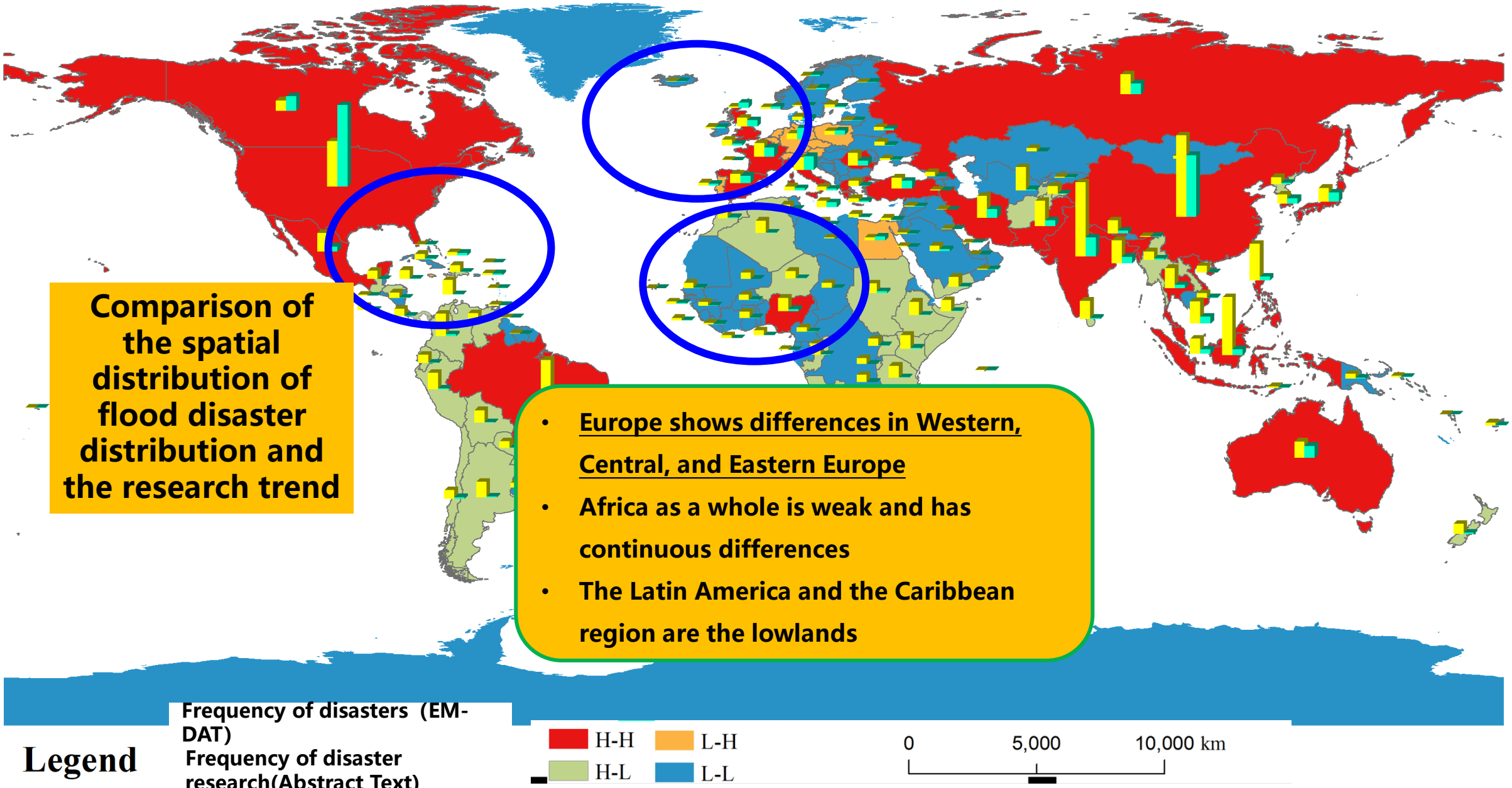
Disaster Knowledge Graph

Trend analysis of global disaster education research

The largest number of publications counties are **the United States, China, Australia, Japan** (183, 72, 59, and 51 respectively). Among the main contributors to disaster education research, **developed countries account for three-quarters**. It also found the top list university on disaster education research.



Institution	Number of Publications
Kyoto Univ	10
Flinders Univ S Australia	10
Univ Piemonte Orientale	9
Hong Kong Polytech Univ	8
Sichuan Univ	7
Harvard Univ	7
Chinese Acad Sci	6
Massey Univ	5
Univ Auckland	5
Chinese Univ Hong Kong	5
Clin Emergency Hosp	5
Columbia Univ	5

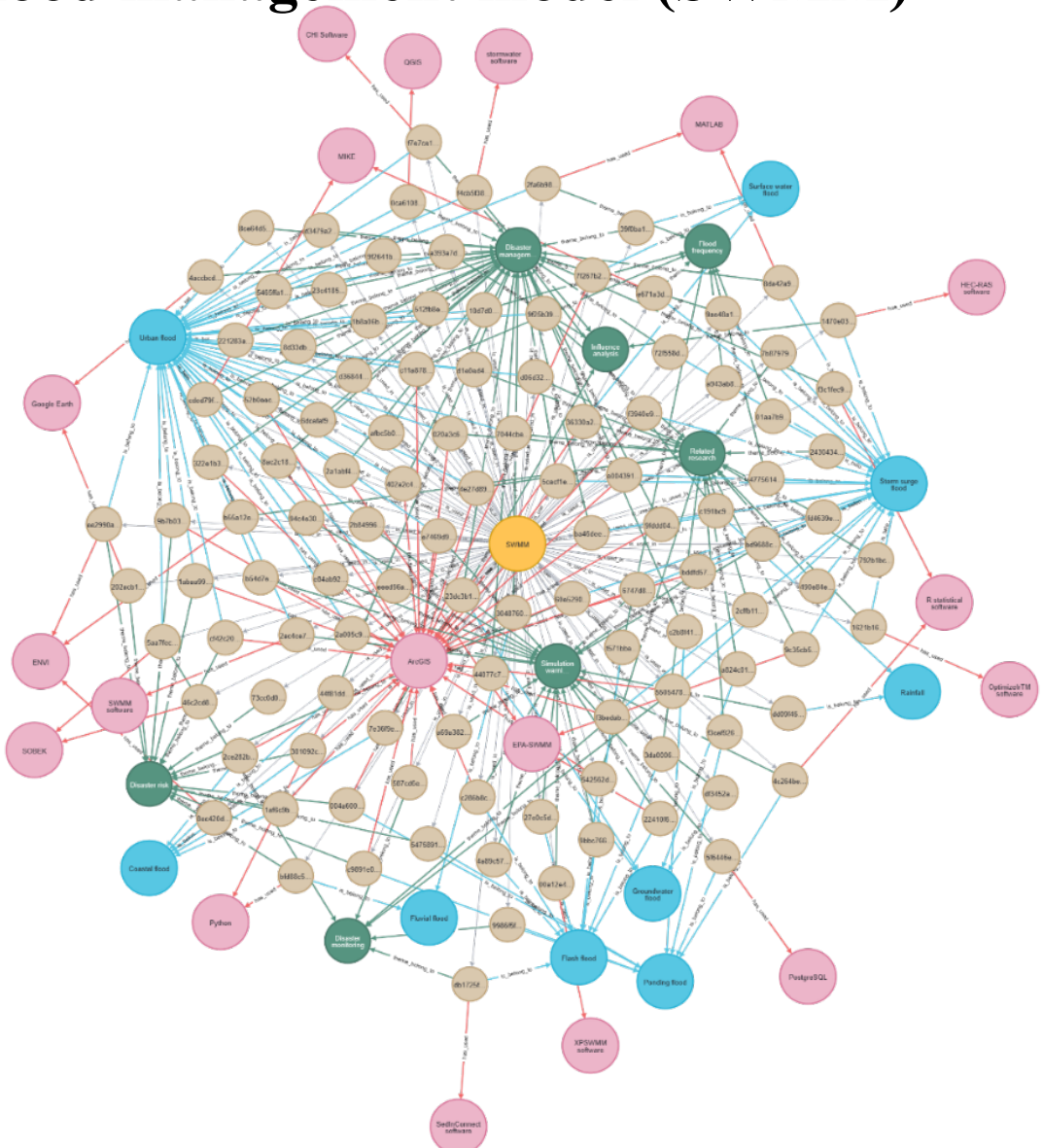


14,000 flood disaster literature abstracts from 1990 to 2020 were excavated to analyze the spatial distribution and research situation of disaster hot spots

Scenario application based on flood disaster knowledge graph

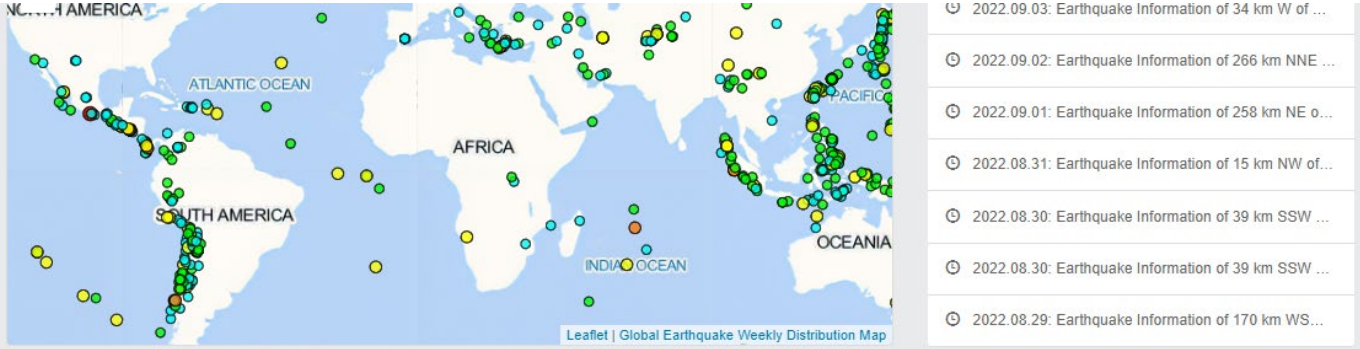
➢ Analysis of applicable scenarios of rainstorm flood management model (SWMM)

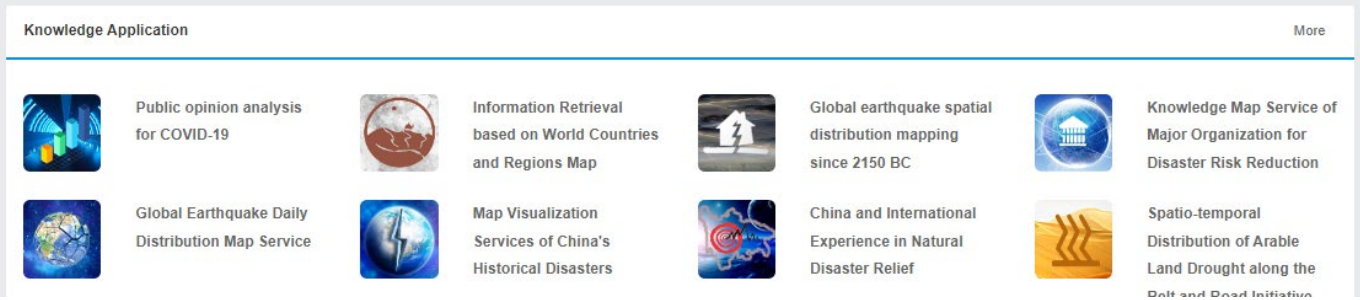
Entities	149
Relationships	398
Documents	114
Types of model methods	18
Types of flood disasters	9（**urban flood, storm surge flood, flash flood, Ponding flood, etc**）
Subjects	6（**disaster management, simulation and warning, disaster risk, etc**）
High frequency software tools	ArcGIS, ENVI, etc



Emergency Disaster Response

Emergency disaster relief service for Pakistan flooding, 2022





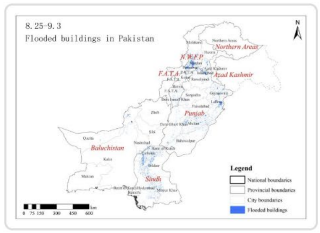
http://drr.ikcest.org

PV:4576, downloads: 282.45GB
(As of December, 2023)

Sentinel synthetic image dataset throughout Pakistan

With the support of the GEE platform, Sentinel 2 images we and synthesized throughout Pakistan f...

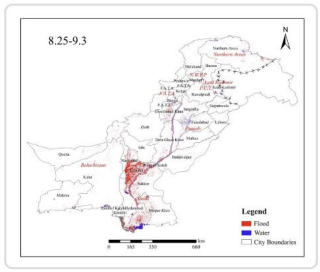
Pakistan | Sentinel2 | Remote Sensing Image



A dataset of flooded buildings across Pakistan (2022)

This data is the distribution data of flooded buildings in Paki September 3, 2022. This data is ob...

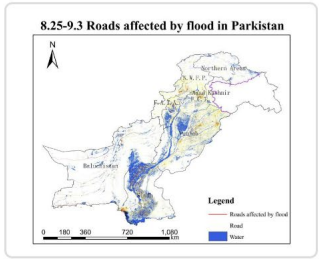
Pakistan | flood | building | construction



Dataset of flood distribution in Pakistan (2022)

This dataset is the spatial distribution map of floods in Pakis engine is used to process senti...

Pakistan | flood | Google Earth Engine

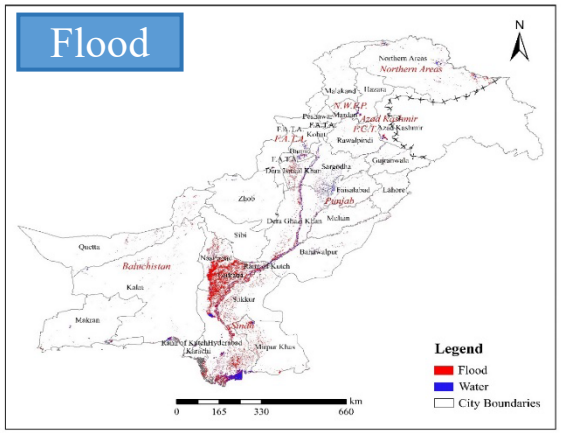


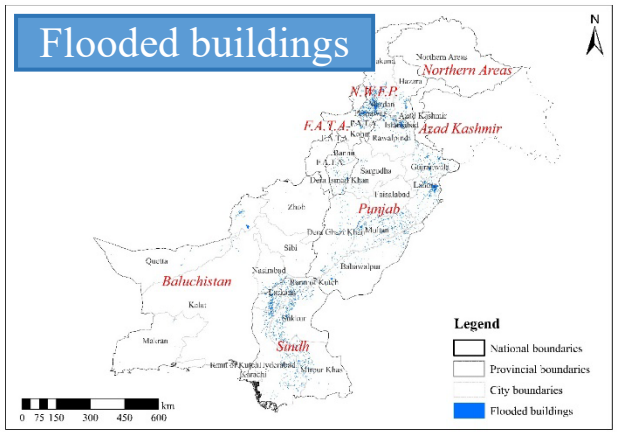
Dataset of flooded roads across Pakistan (2022)

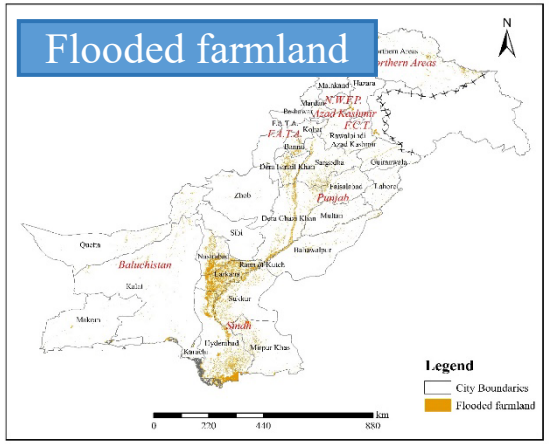
This dataset is a spatial distribution map of flooded roads in 2022 to September 3, 2022. Water...

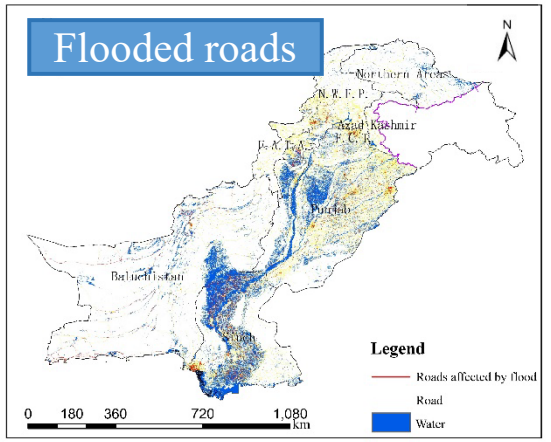
Pakistan | flood | flooded road

Pakistan flooding relief datasets

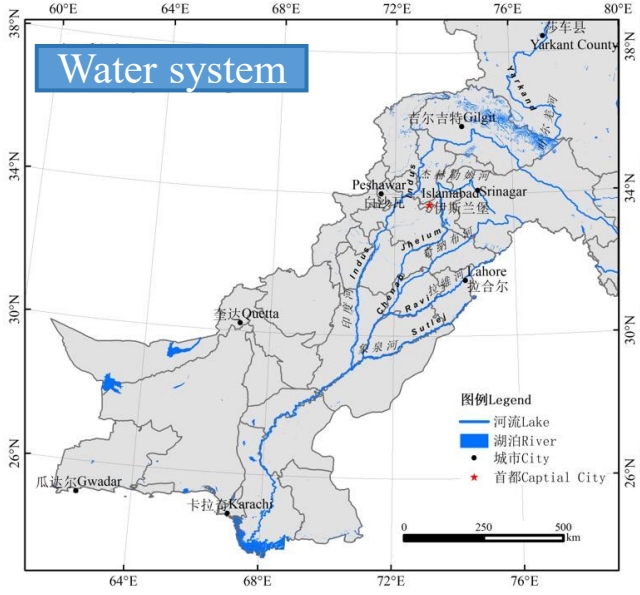


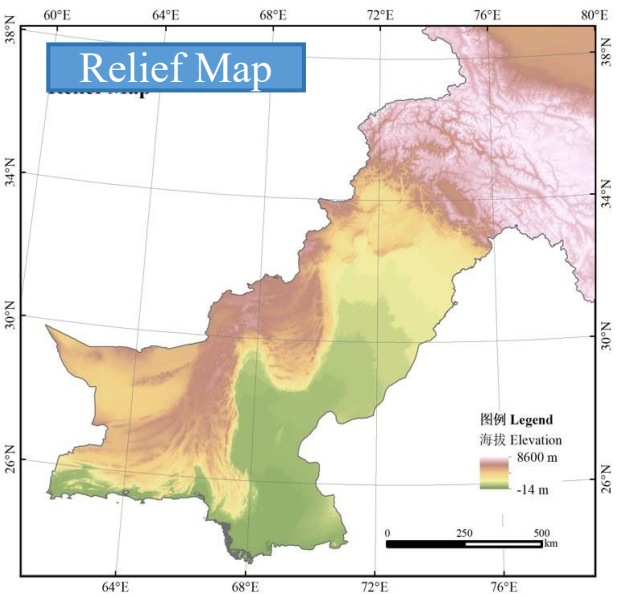


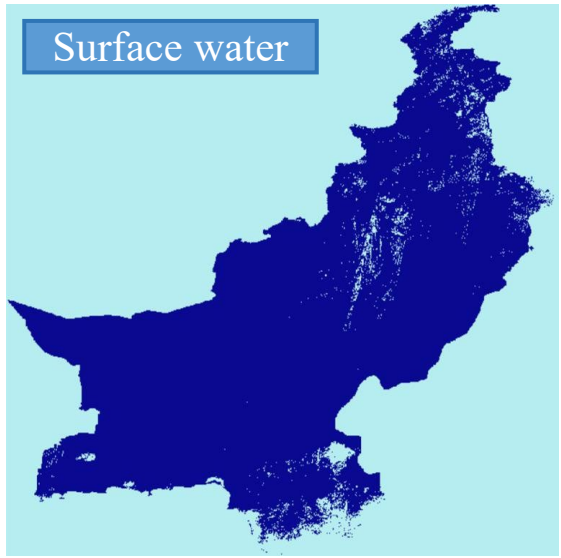




8.25-9.3 Flood Damage in Pakistan

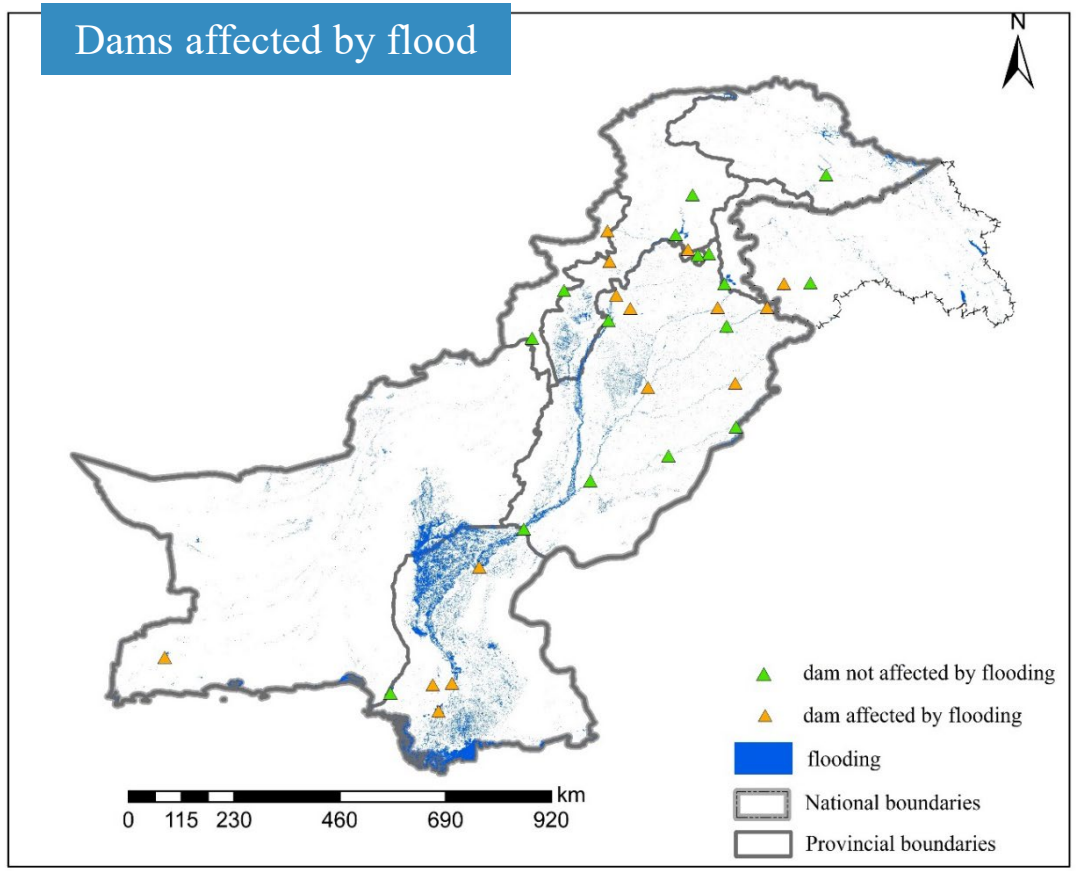






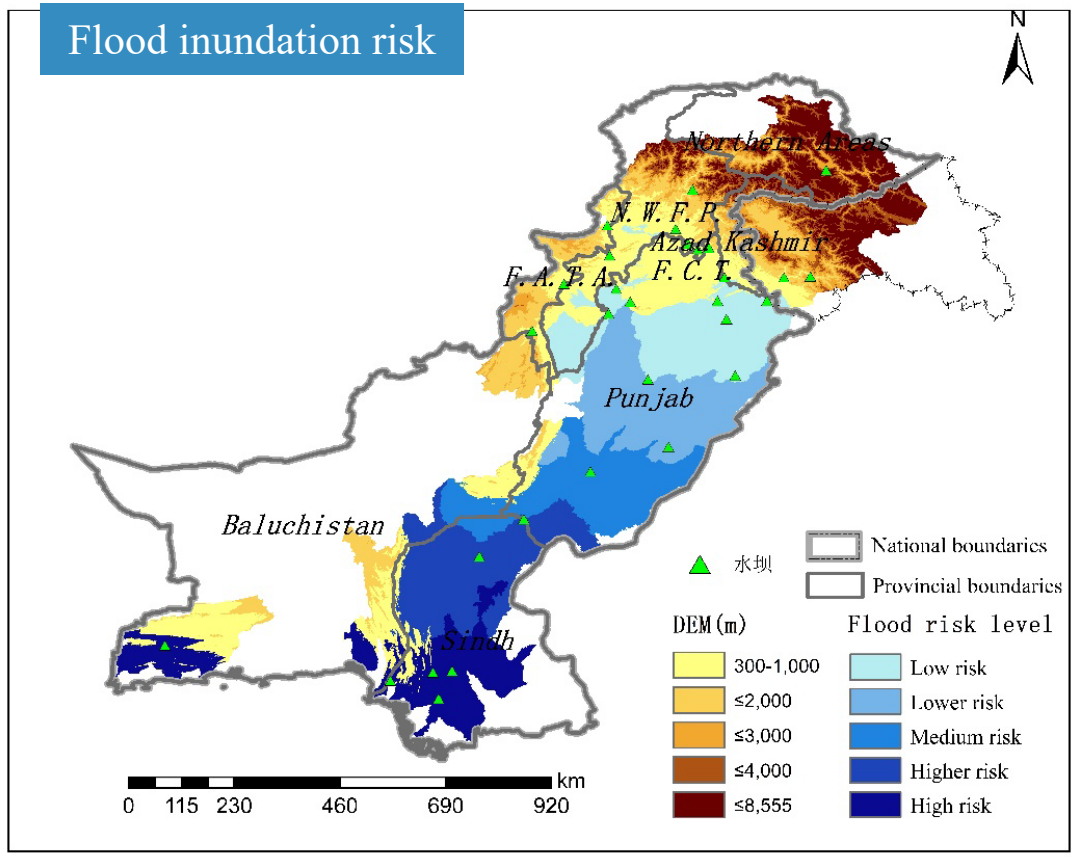
Pakistan Basic Datasets

Dams affected by flood in Pakistan



- Among the total 30 dams in Pakistan, 16 dams were affected in this flooding **(53%)**.

Flood inundation risk in Pakistan



- Risk mapping of the flooding caused by dam damage. It showed that high risk regions cover 71.9 thousands km²; higher risk regions cover 76.2 thousand km²; medium risk regions cover 72.9 thousand km²; low risk regions cover 83.3 thousand km²; lower risk regions cover 84.1 thousand km².

Emergency disaster relief service for Turkey and Syria Earthquake, 2023

DRRKS Data Sharing for 2023 Earthquake Disaster Reduction in Turkey and Syria

Turkey and Syria are located at the key nodes of the ancient Silk Road, and are important bridges for the economic and trade development of contemporary Asia and Europe. The North Anatolian Fault, located between the African and Eurasian plates, runs through Turkey from east to west, making earthquakes the most significant natural disaster in Turkey and its adjacent regions.

According to the China Earthquake Network Center (CENC), a 7.8 magnitude earthquake occurred in Turkey at 4:17 local time on February 6, 2023 (09:17 on February 6, 2023, Beijing time), with a depth of 20 km and an epicenter located at 37.15 degrees north latitude and 36.95 degrees east longitude. The average elevation within 5 km of the epicenter is about 1001 meters; the population density near the epicenter is not low, with 33 large and medium-sized cities within 300 km. The nearest city is Gaziantep, the sixth largest city in Turkey, about 40 km from the epicenter. The largest earthquake in the last 10 years within 200 km of the epicenter is this 7.8 magnitude earthquake, 659 km from the 6.1 magnitude earthquake on November 23, 2022. This earthquake caused many neighboring countries such as Syria, Iraq, Israel and Palestine to be affected to varying degrees. The U.S. Geological Survey (USGS) said that at least 18 aftershocks with magnitude over 4 were recorded after the strong earthquake in southern Turkey, including 7 with magnitude over 5. According to the latest news from the CENC, a 7.8-magnitude earthquake occurred in Turkey (38.00 degrees north latitude, 37.15 degrees east longitude) at 13:24 local time (18:24 Beijing time) on Feb. 06, with a depth of 20 kilometers.As of 07:00 on February 9, Beijing time, the strong earthquake has caused more than 12,000 deaths in both Turkey and Syria.

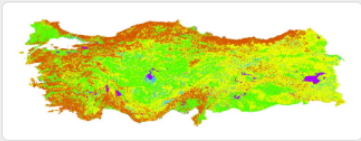
IKCEST-DRR organized data collection and consolidation quickly after the earthquake disaster. And through this data sharing column, IKCEST-DRR provide sharing services to global users to support emergency disaster relief in earthquake-affected areas of Turkey and Syria.

DRRKS Data Sharing for 2023 Earthquake Disaster Reduction in Turkey and Syria

Data More

- Historical seismic point data in turkey quake epicentre...
- Satellite Map of Buildings in Turkey Before and After t...
- Turkey earthquake disaster history table
- Soil raster data in turkey quake epicentre extending 2...
- Hydrological elements data in turkey quake epicentre ...
- River runoff station data in turkey quake epicentre ext...
- Dataset of Water Systems in Southern Turkey and No...
- Watershed data within 200km of Turkey epicenter
- River flow data within 200km of Türkiye seismic region
- Location of Turkey quake epicentre
- Turkey quake epicentre extending 200km
- Turkey quake epicentre sentinel1 image
- Turkey quake epicentre sentinel2 image
- Turkey quake epicentre Landsat8 image
- Location of Turkey quake epicentre GF6 image
- Turkey and Syria DEM data
- Turkey 10 m Resolution Land Cover Product,2021
- Turkey 30 m Resolution Land Cover Product,2020

http://drr.ikcest.org

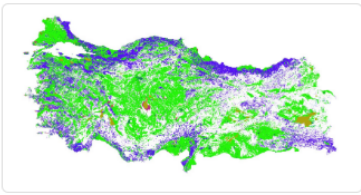


Turkey 10 m Resolution Land Cover Product,2021

Land use | Land cover | Resolution 10 m

2023-02-20

The 10 m land cover data for Turkey in 2021 is a global 10 m resolution land cover data processed according to Sentry data release...

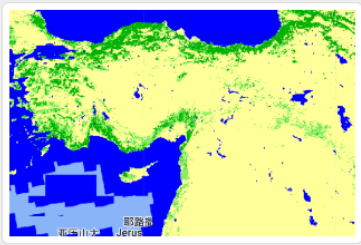


Turkey 30 m Resolution Land Cover Product,2020

Land use | Land cover | Resolution 30 m

2023-02-20

Land cover data for Turkey at 30 m spatial resolution, including ten main land cover types, namely cultivated land, forest, grassl...

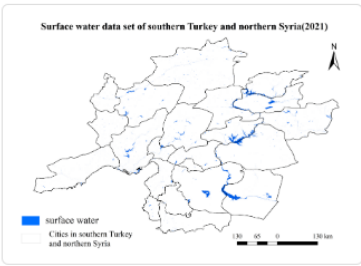


Regional forest distribution data of Türkiye and Syria in 2021

Türkiye | Syria | Forest distribution

2023-02-20

This data set is the data in Türkiye and Syria intercepted in PALSAR-2 Global Forest/Non forest Map "2021" provided by Japan Aeros...

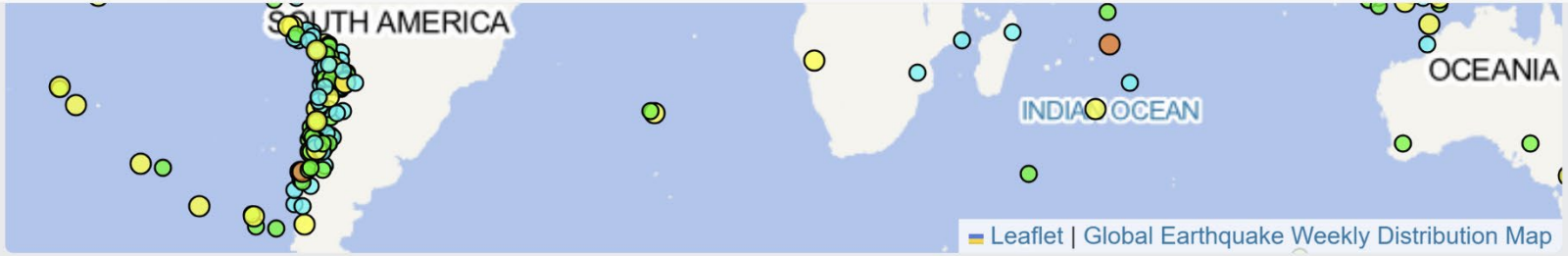


Surface water data set of southern Turkey and northern Syria(2021)

seasonal water | temporal distribution | Turkey | Syria

2023-02-20

This dataset contains maps of the location and temporal distribution of surface water from 2021 and provides statistics on the ext...

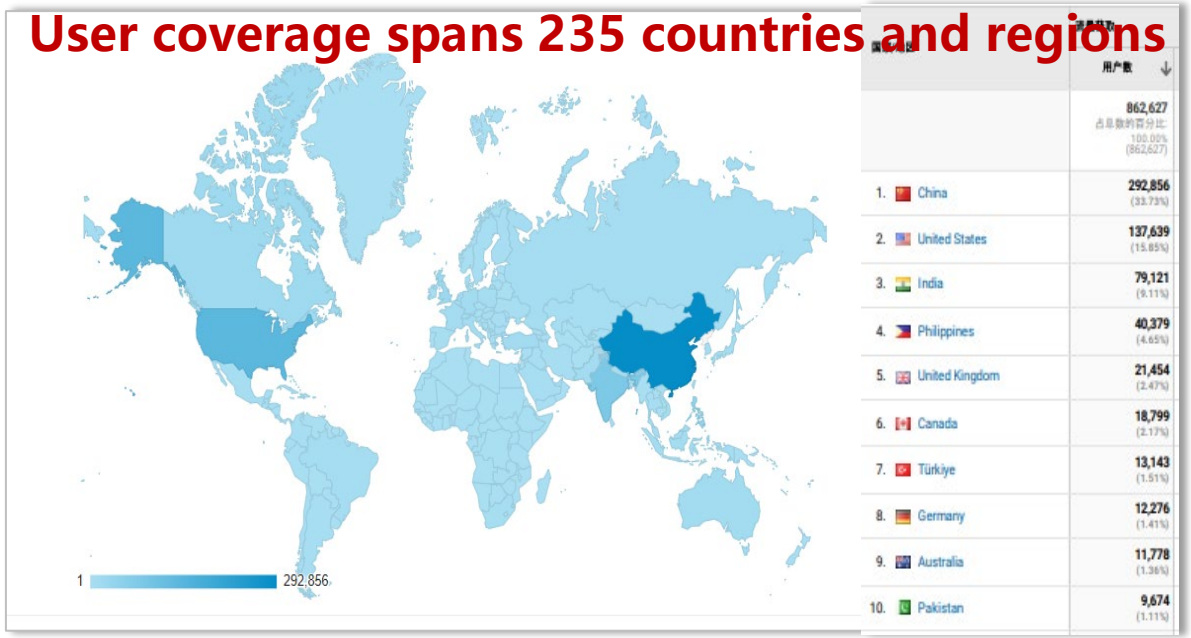


- 2023-07-14:Earthquake Information of Offshore Chia…
- 2023-07-02:Earthquake Information of 132 km NW of …
- 2023-06-15:Earthquake Information of Mindoro, Philip…

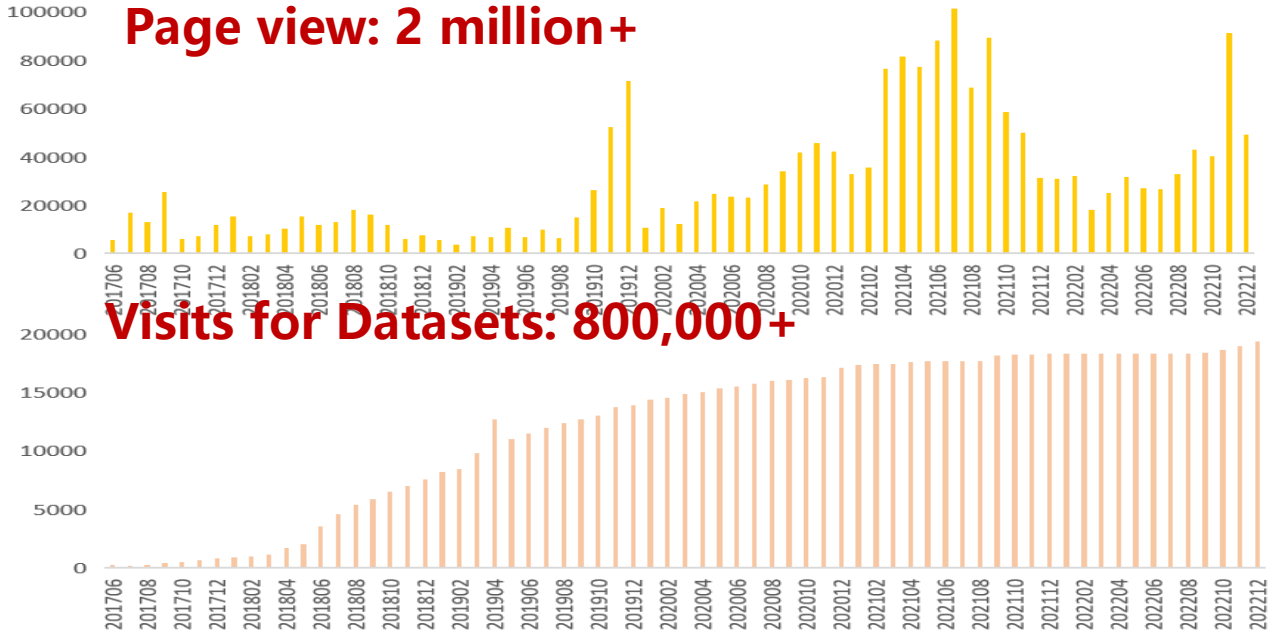
Analysis of the User Log for DRR

As of December 2023, the cumulative visits to the platform have reached 2.248 million, with a cumulative user base of 902,000. Users span 235 countries and regions worldwide, with 605,000 international user visits, accounting for 67.1% of the total. The top 5 countries for overseas visits are the United States, India, the Philippines, the United Kingdom, Canada.

User coverage spans 235 countries and regions

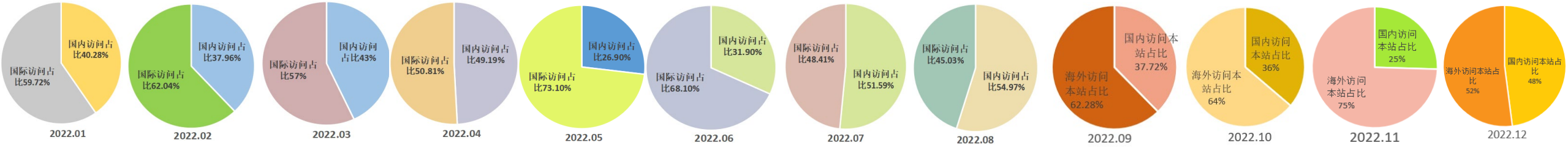


Page view: 2 million+



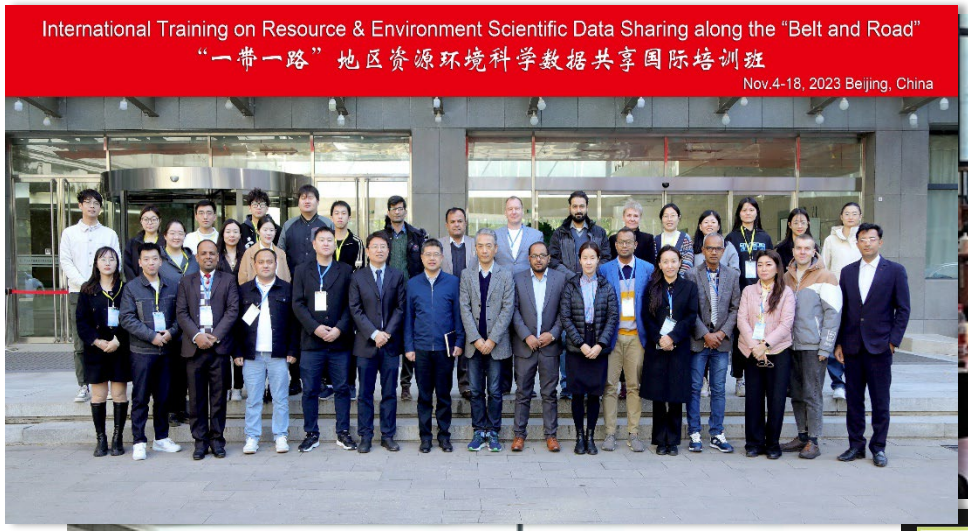
Visits for Datasets: 800,000+

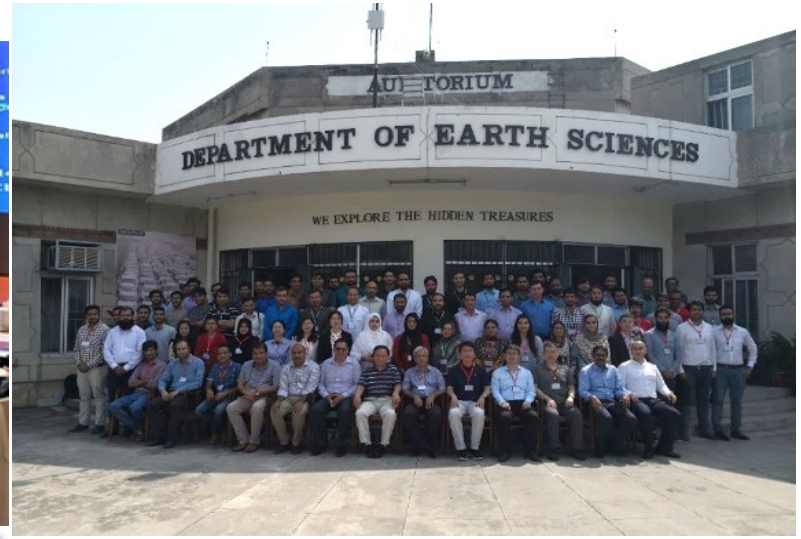
Overseas visits averaged 67%

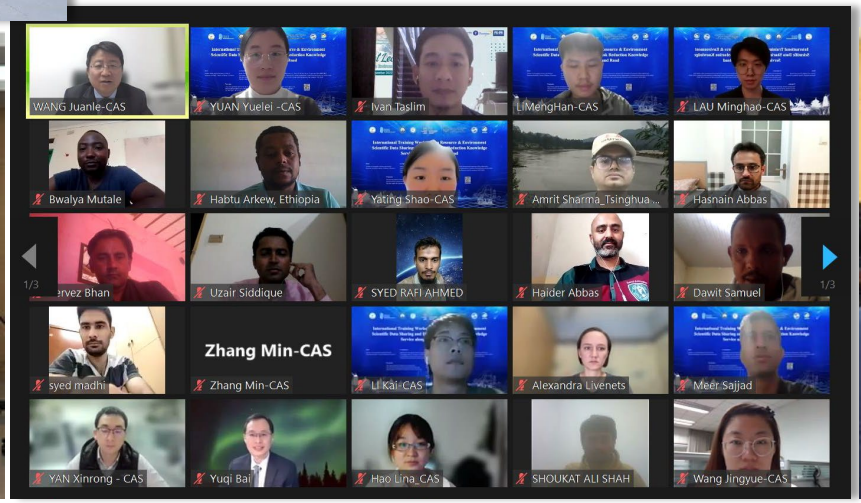


International training: 1600+ trainees

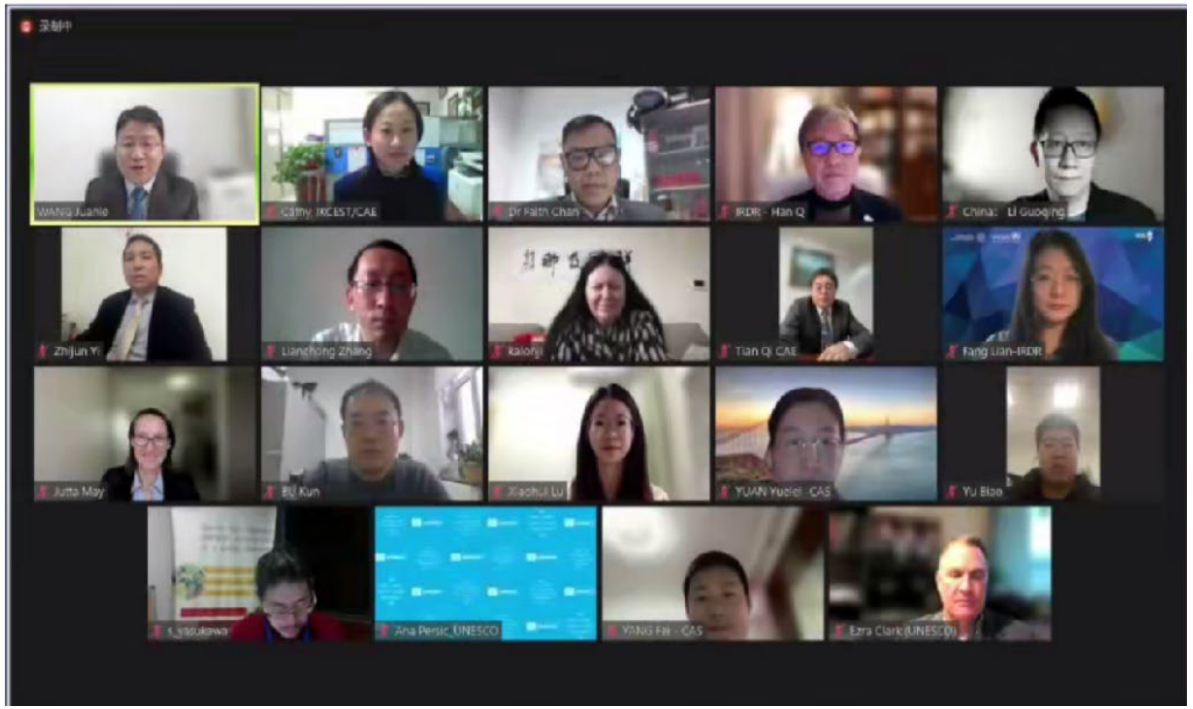
- **International Training Workshop on Resource & Environment Scientific Data Sharing and Disaster Risk Reduction Knowledge Service**
- Host: IKCEST

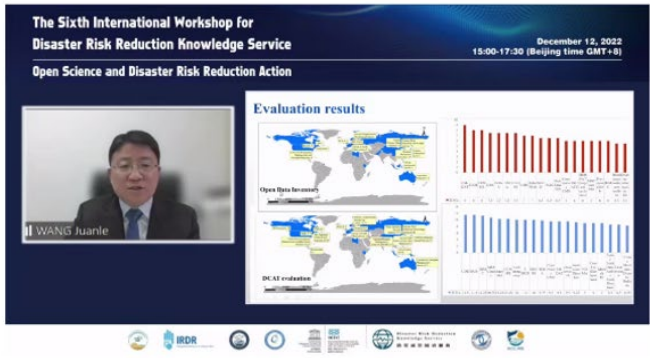


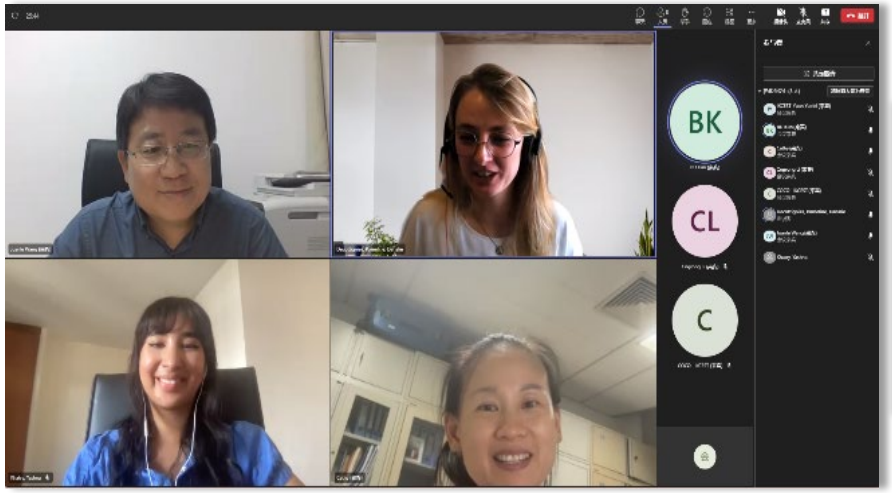


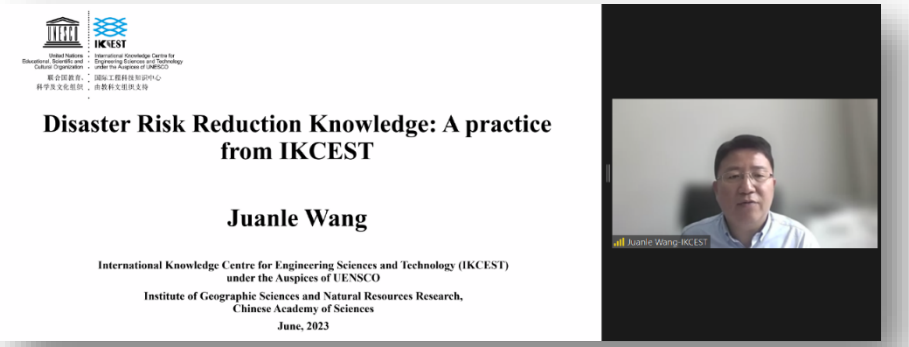


International workshop/dialogue/presentations









STEPAN 3rd Annual Meeting in June

the Seventh International Workshop for Disaster Risk Reduction Knowledge Service

Faduma Hussein Ali gave a speech on "Innovation and Disaster Risk Reduction ".

On February 27, 2024, reported on ADG in IKCEST, Beijing

United Nations
Educational, Scientific and
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联合国教育、
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International Knowledge Centre for
Engineering Sciences and Technology
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由教科文组织支持

Many Thanks !

Juanle Wang, Ph.D, Professor
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Chinese Academy of Sciences
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