



Experiences of Drought Monitoring and Risk Assessment in China

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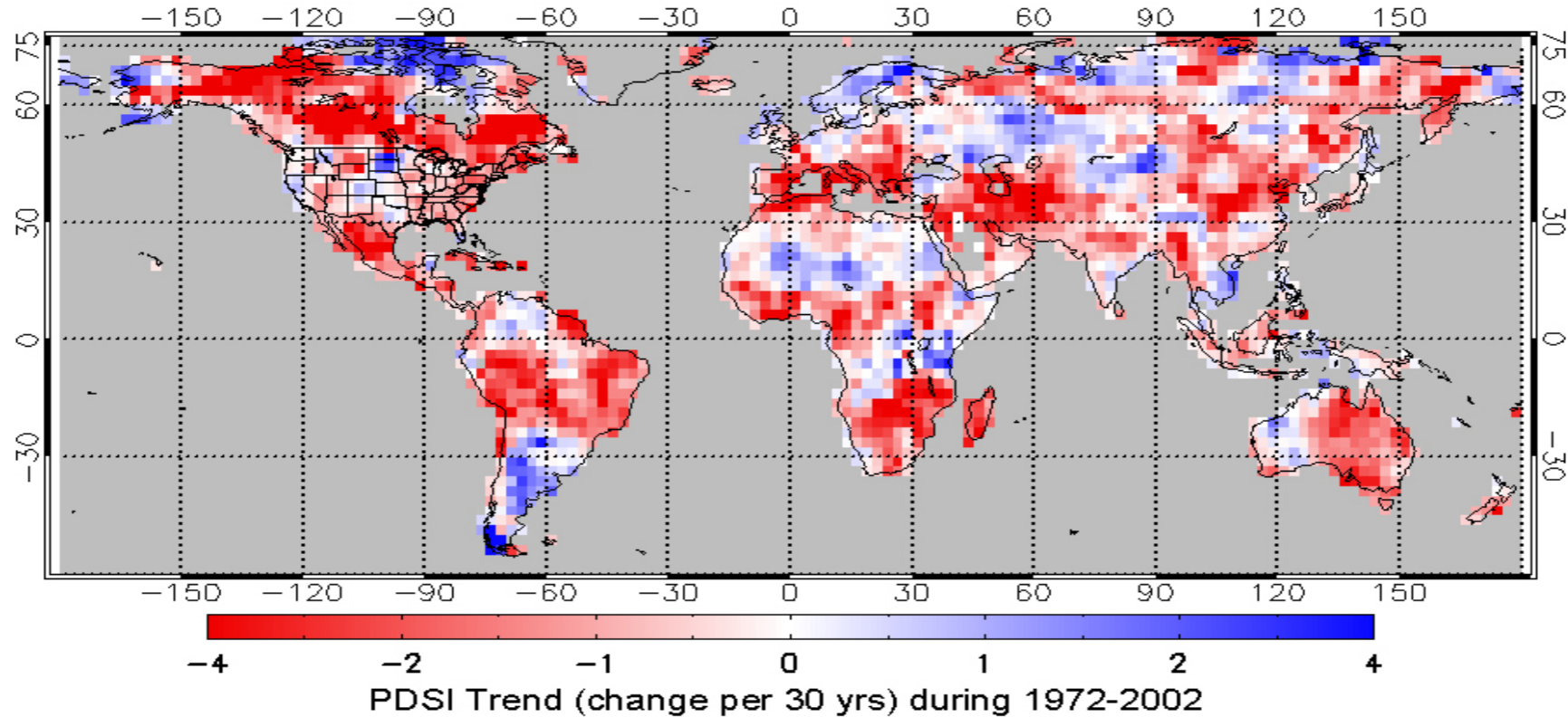
1. BACKGROUND



Background

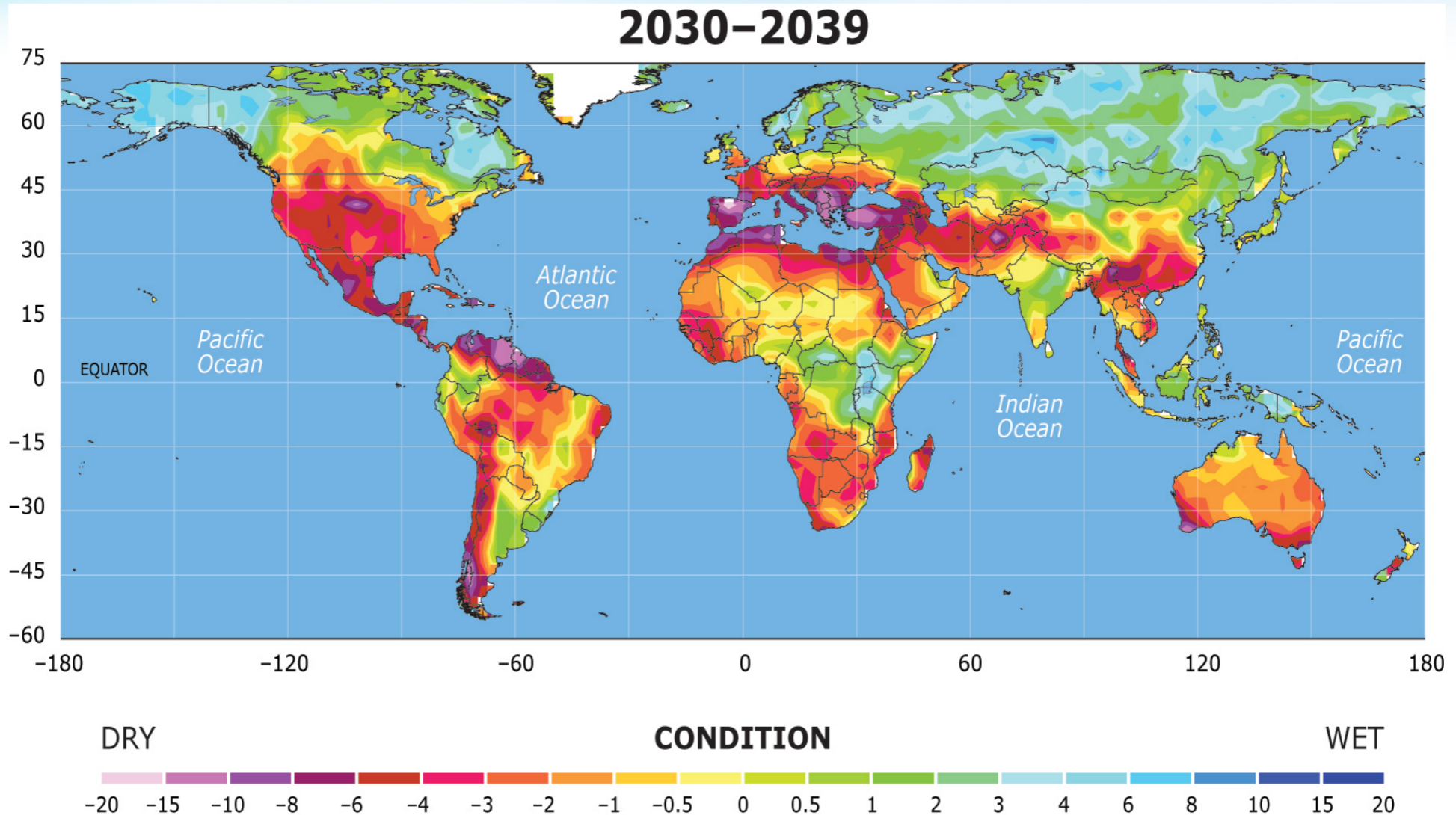


Climate Change and Drought



There were obvious drying trends in the semi-arid region of the global. Drought is the disaster that affects the most extensive scope and the largest population.

Background

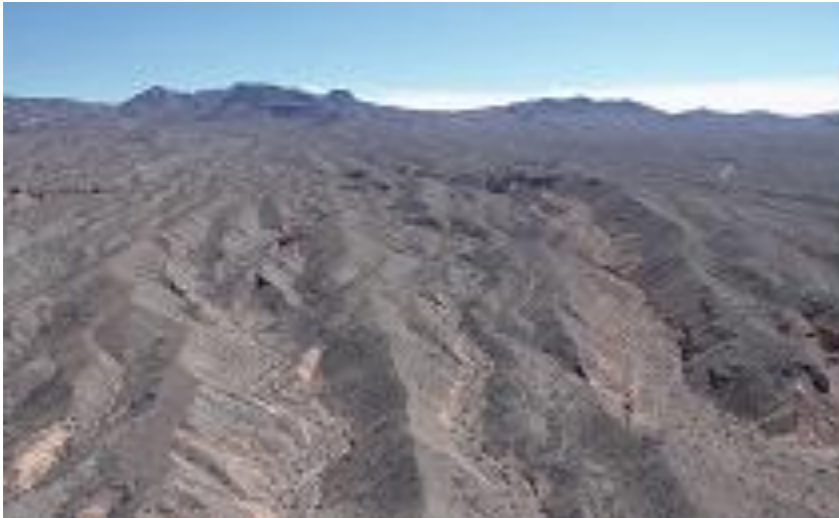


Drought Concepts



Dry

干



Drought

旱



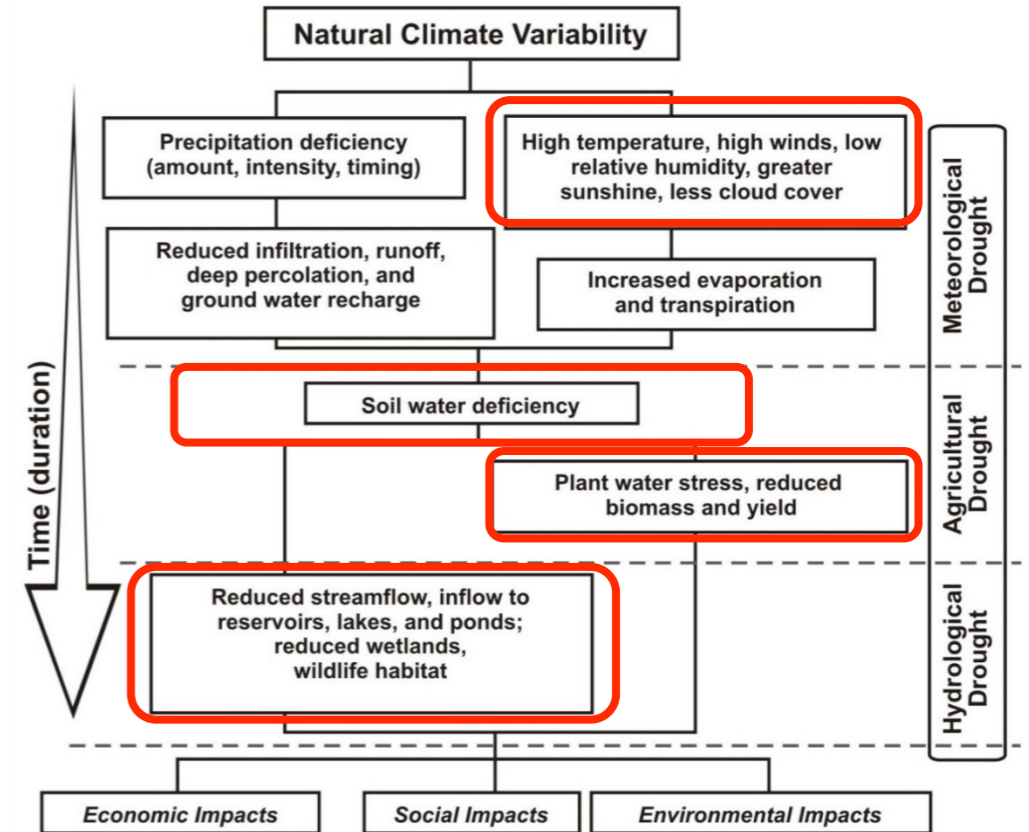
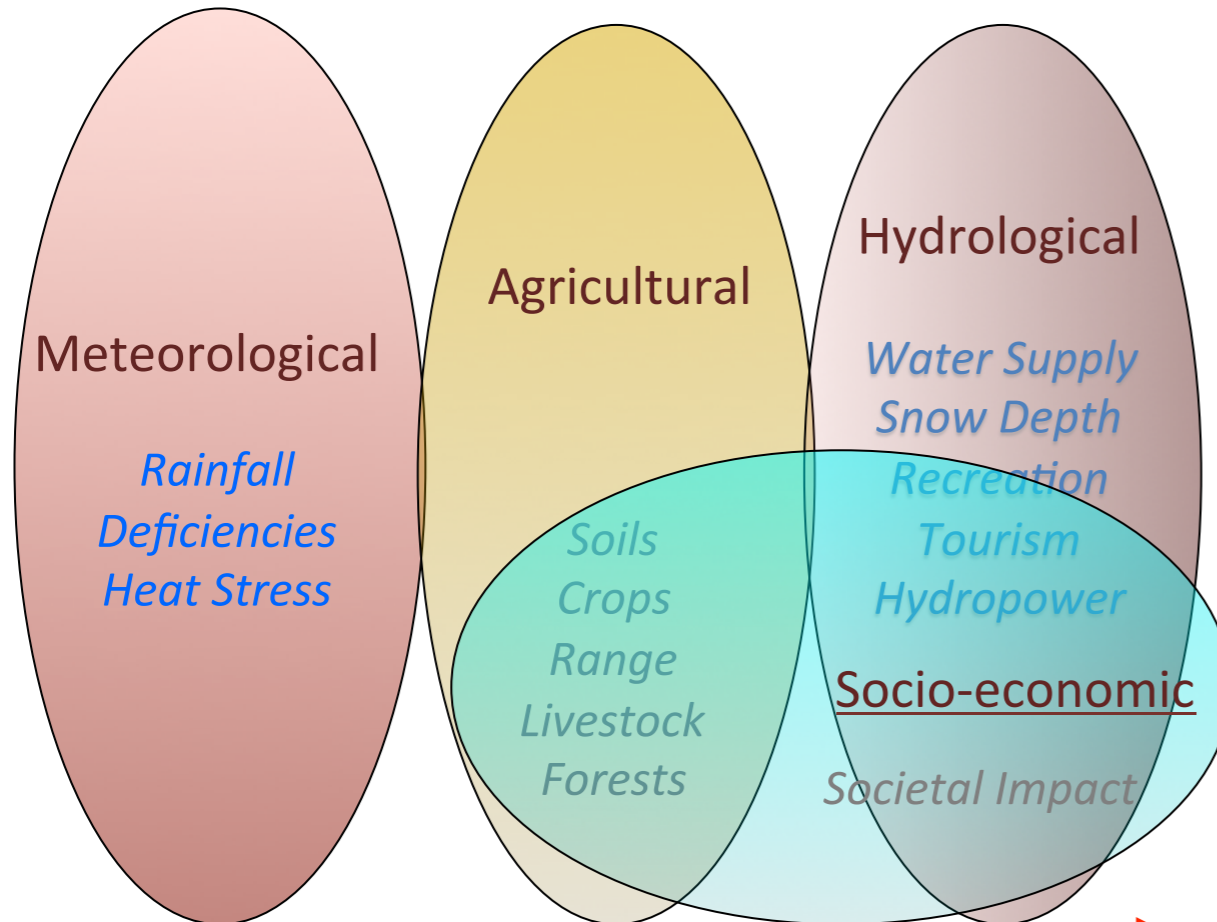
Its impacts vary from region to region, Referred to as a "creeping phenomenon"

Drought concepts



Decreasing emphasis on the natural event (precipitation deficiencies) →

Increasing emphasis on water/natural resource management
Increasing complexity of impacts and conflicts



Time/Duration of the event →

2. DROUGHT MANAGEMENT IN CHINA



Disaster Management system in China



National Commission for Disaster Reduction (NCDR) is the highest coordination agency for disaster relief. NCDR is composed of 35 disaster-related ministries or agencies in China. The general office of NCDR is set up under the Ministry of Civil Affairs.

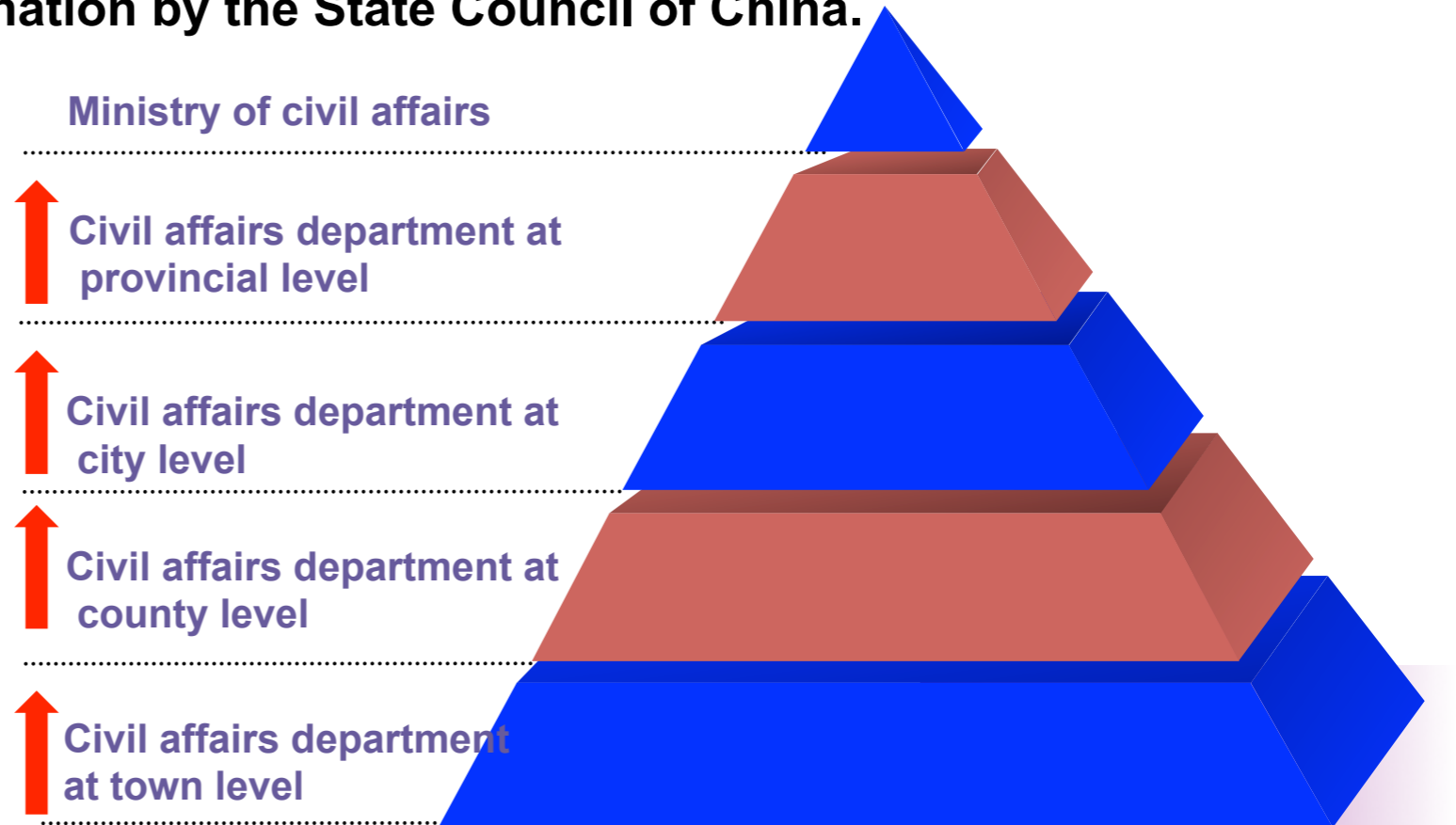


Disaster Management system in China



■ **Ministry of Civil Affairs is one of the main functional department engaged in disaster management in China**, which is responsible for organizing disaster information verification and releasing based on the designation by the State Council of China.

■ **Forming a five-level disaster information reporting and statistical system at central government level, provincial level, city level, county level and town level.**



Disaster Management system in China



Response Level	Death Toll (×1 person)	Evacuated Population (×10000 persons)	Collapsed Houses (×10000 houses)	Drought	
				Hydroponic Population (%)	Relief Population (×10000 persons)
I - Level	> 200	> 100	> 20	30%	> 250
II -Level	100-200	80-100	15-20	25%	200-250
III -Level	50-100	30-80	10-15	20%	150-200
IV -Level	30-50	10-30	1-10	15%	100-150

Four-grades system of emergency response for disaster relief

Since 2004, the emergency plan system of disaster relief has been established in China. The State Council promulgated the National Emergency Relief Plan on Natural Disasters in 2005. So far, all of the provincial governments and most of county governments have promulgated the emergency plans of disaster relief.

Disaster Management system in China



China Meteorological Administration (CMA)

- Managing the national **weather forecast and warning**

Ministry of Water Resources

- Organize and guide the construction, operation, management of **drought infrastructure**
- Organize and implement the water dispatch of major rivers and important **water projects** to cope with drought

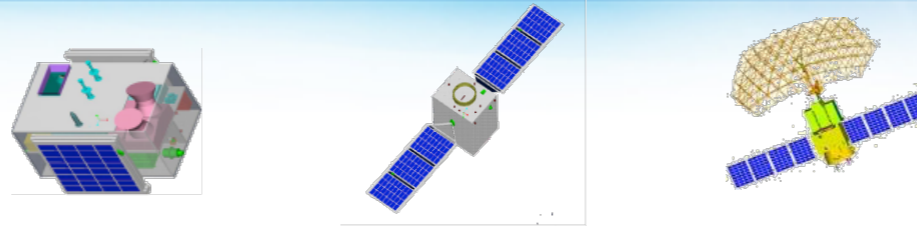
Ministry of Agriculture

- To promote the scientific drought, strengthen the field crop field management, the effect of drought on agriculture and food production to a minimum.

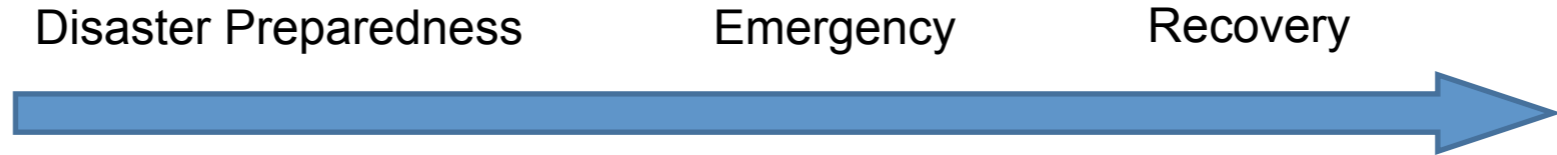
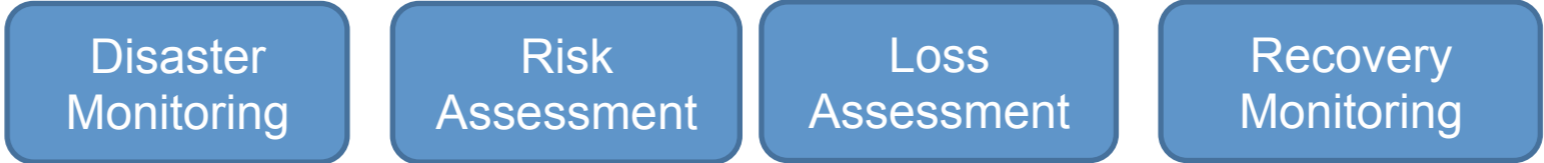
3. SPATIAL TECHNOLOGY APPLICATION IN DROUGHT MANAGEMENT



Working flow



Multi-Scale RS Data

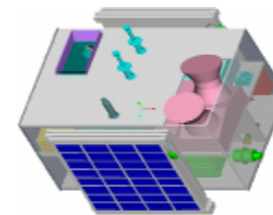


China Space Infrastructure for Drought Monitoring

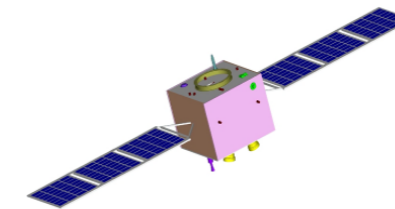


ID	Sat. Name	Type	Starting Time to Receive
1	FY-3C	Leo. Mete. Sat.	2013.09
2	FY-3B	Leo. Mete. Sat.	2010.11
3	FY-3A	Leo. Mete. Sat.	2008.05
4	FY-2F	Geo. Mete. Sat.	2012.1
5	FY-2E	Geo. Mete. Sat.	2008.12
6	FY-2D	Geo. Mete. Sat.	2006.12

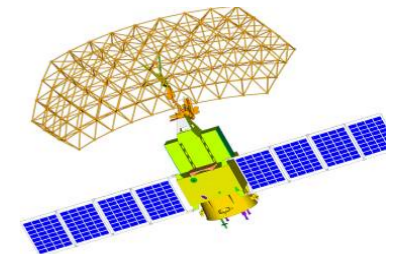
Satellite	Payload	Resolution (m)	Swath (km)	Band
HJ-1-A	CCD	30	360	4 bands
	HSI	100	50	115bands
HJ-1-B	CCD	30	360	4 bands
	IRS	B1、 B2、 B3 : 150 B4: 300	720	4 bands



HJ-1-A



HJ-1-B



HJ-1-C

Drought Monitoring



Disaster Parameter Extraction

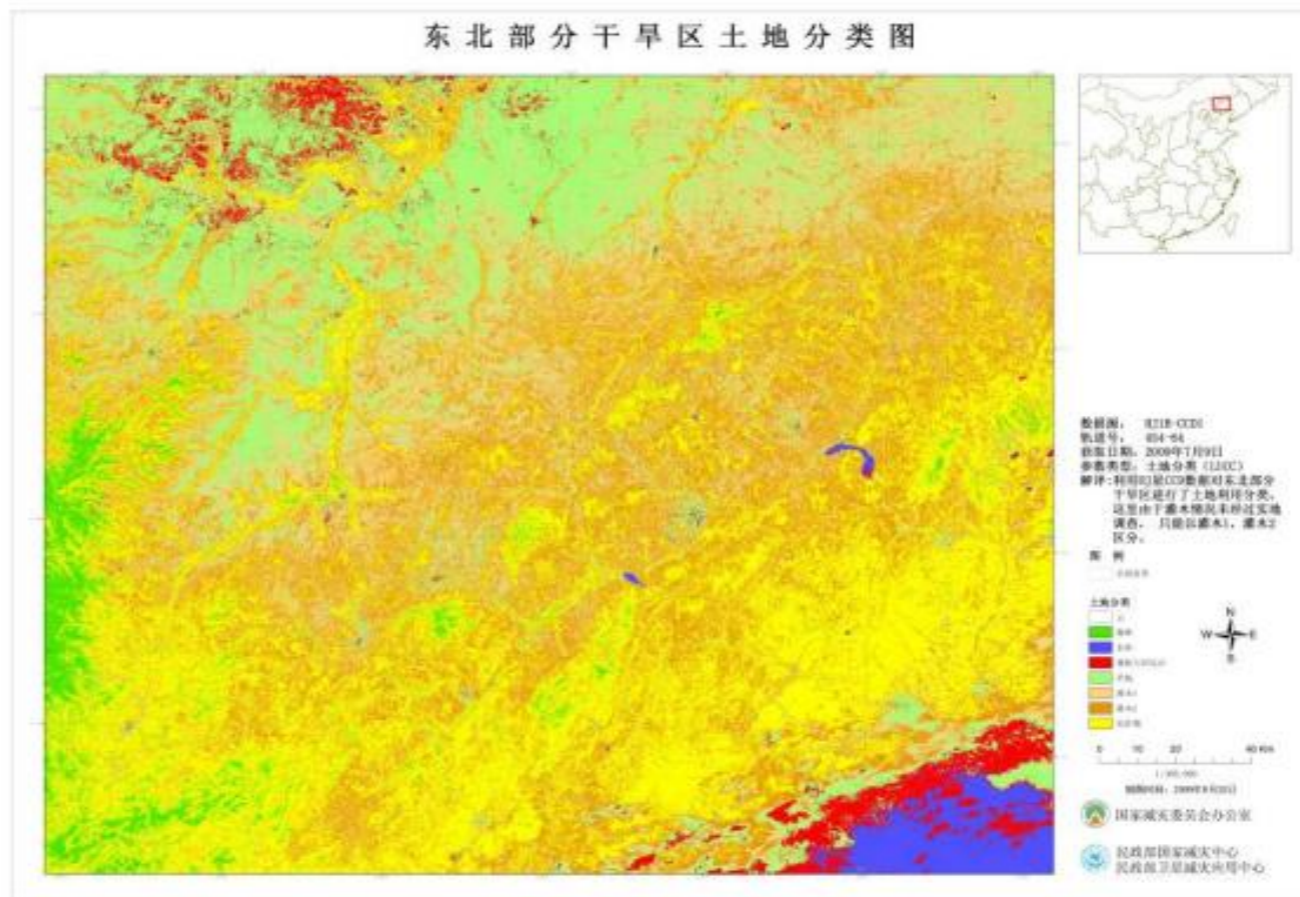
Parameter Extraction

Land Cover/Land Use

Vegetation

Water

Temperature



Drought Monitoring

Disaster Parameter Extraction



Parameter Extraction

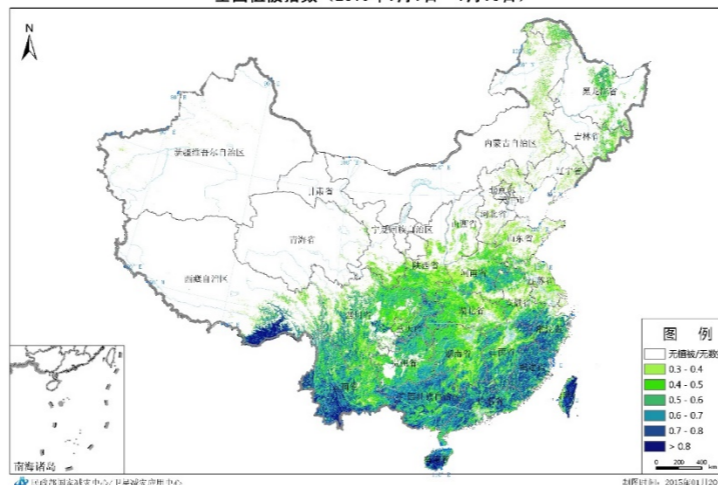
Land Cover/Land Use

Vegetation

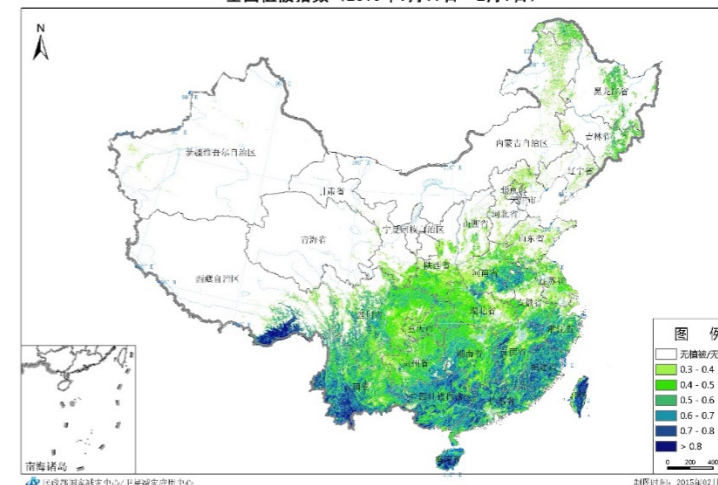
Water

Temperature

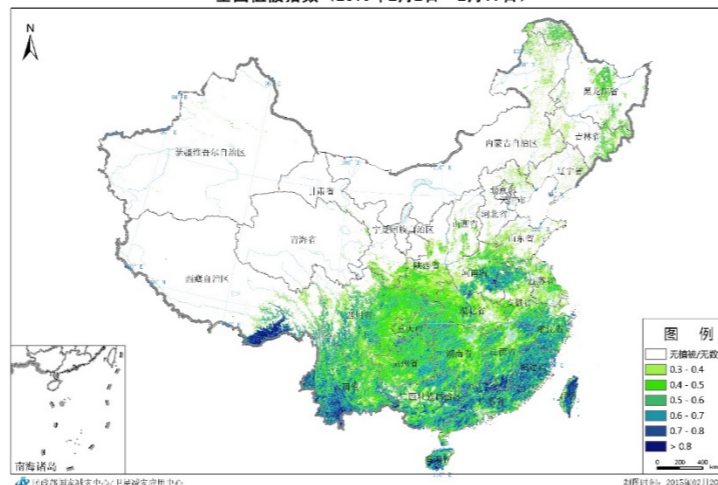
全国植被指数 (2015年1月1日—1月16日)



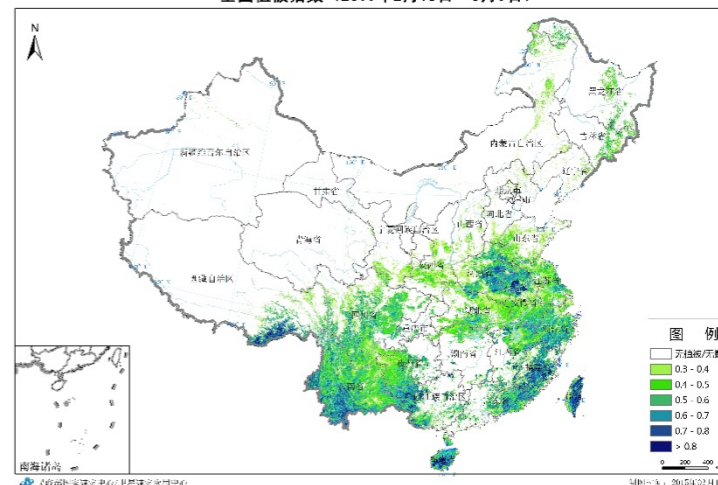
全国植被指数 (2015年1月17日—2月1日)



全国植被指数 (2015年2月2日—2月17日)



全国植被指数 (2015年2月18日—3月5日)



Drought Monitoring



Disaster Parameter Extraction

Parameter Extraction

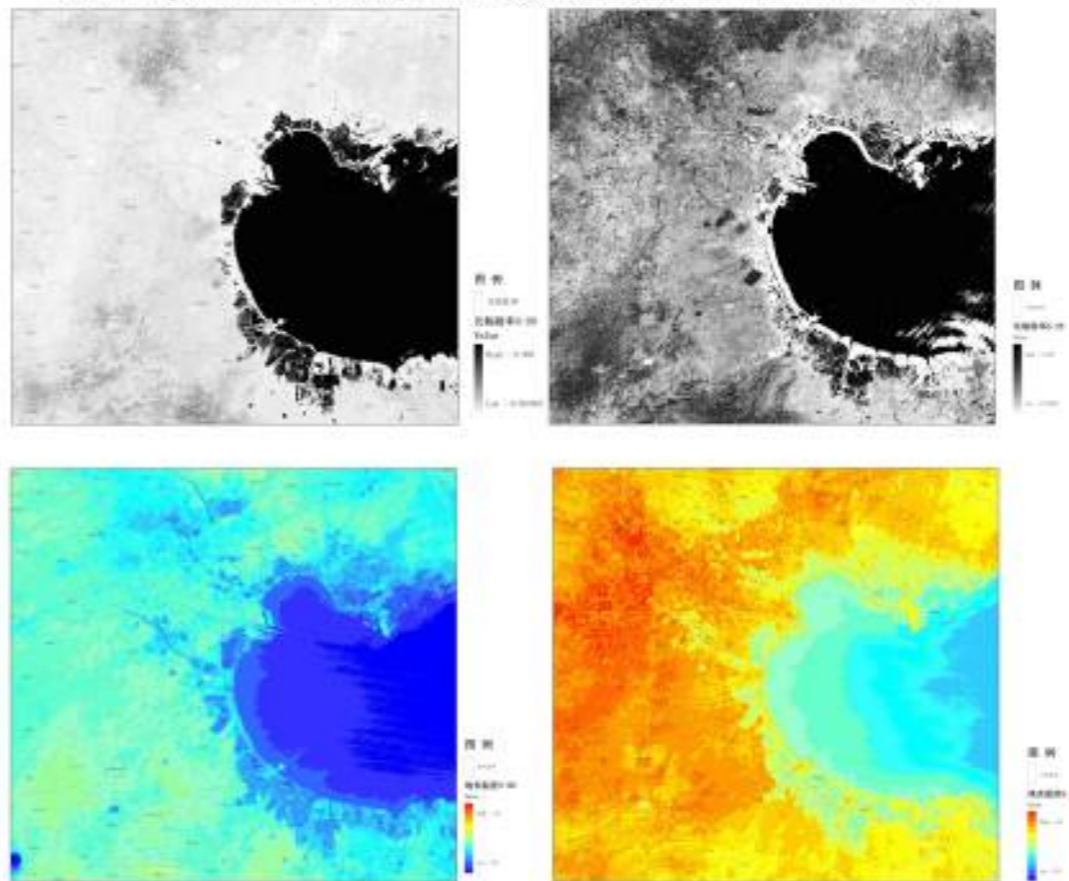
Land Cover/Land Use

Vegetation

Water

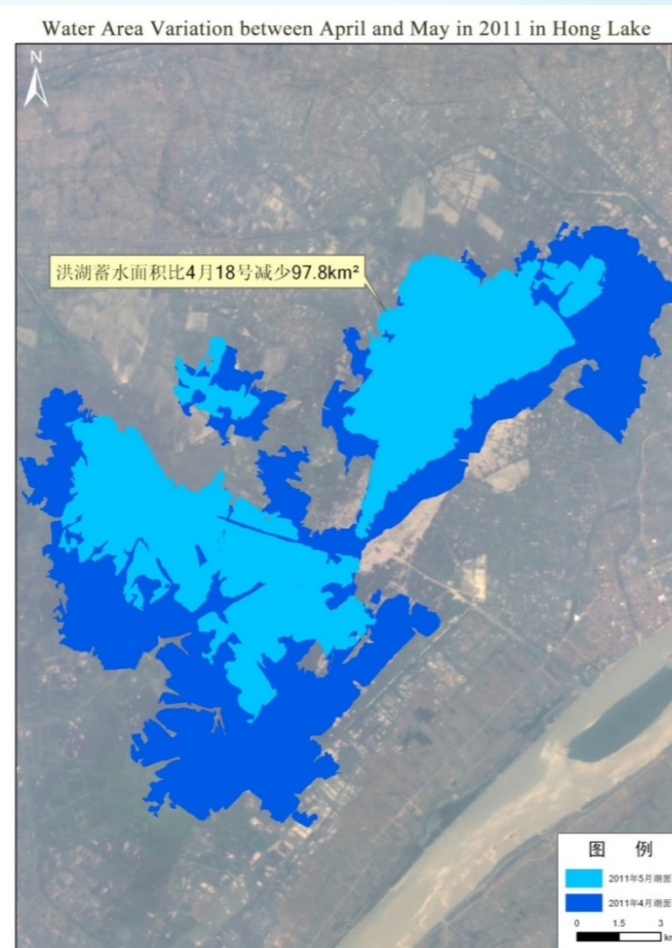
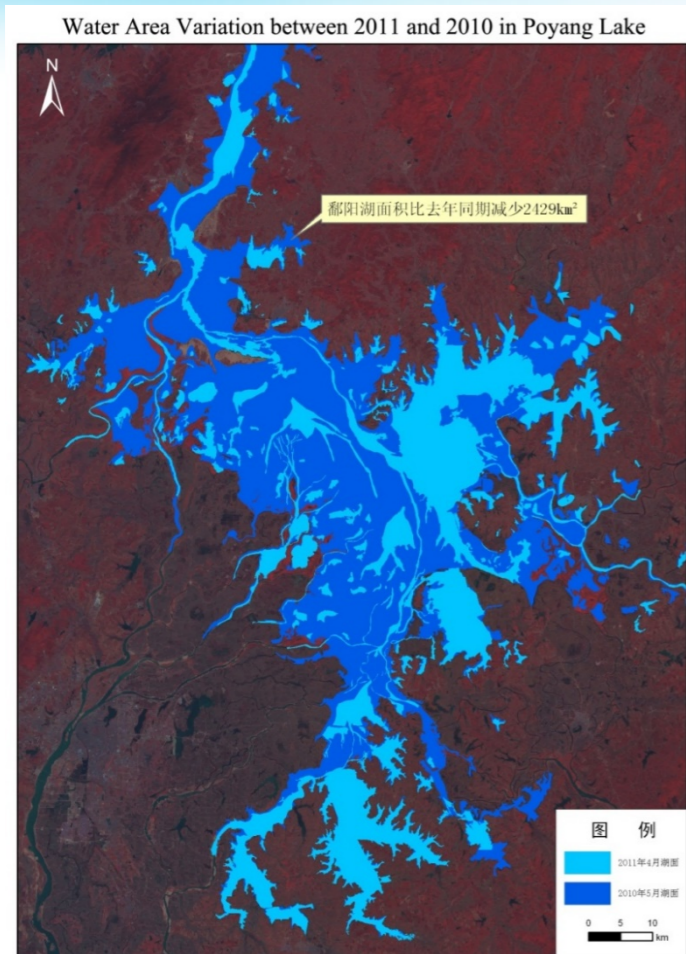
Temperature

Surface Temperature Parameters Comparison Images Between March and May in Bohaiwun Areas



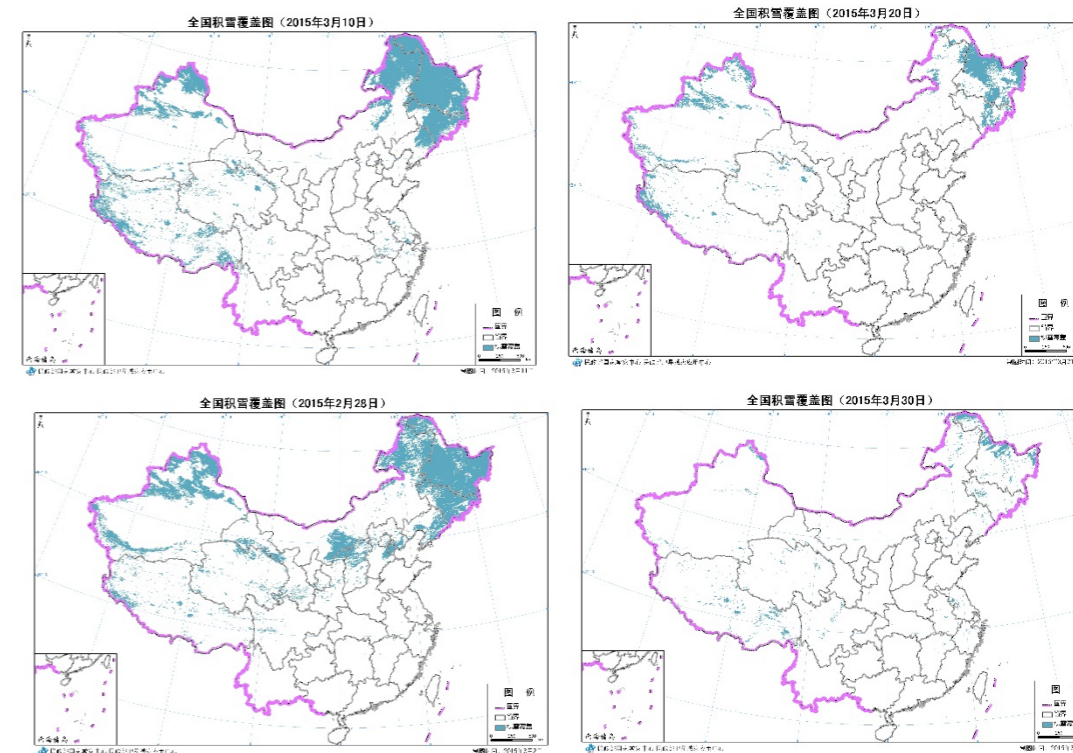
数据源: HJ1B-IRS 获取日期: 2009年5月22日 2009年6月29日

Drought Monitoring



Ground Water shortage

Disaster Parameter Extraction



Snow Coverage

Drought Monitoring



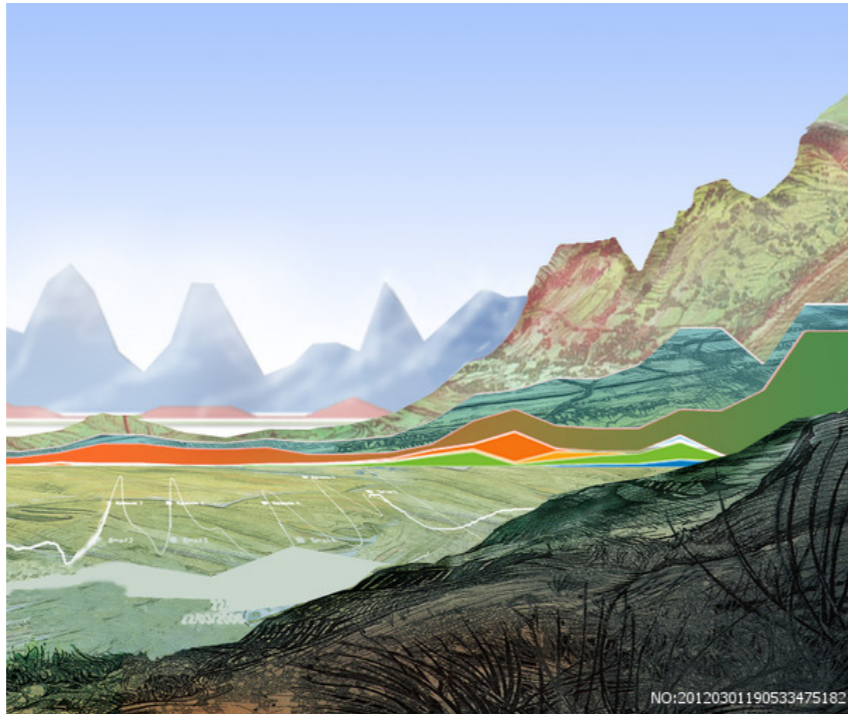
Drought Index

Meteorology

Water

Vegetation

Soil



Soil Moisture Detection

- Perpendicular Drought Index
- Modified PDI
- Apparent Thermal Inertia

Vegetation Growth Dynamic

- Anomaly of NDVI
- Vegetation Condition Index
- Standardized Vegetation index
-

Temperature

- Temperature Condition Index
- Crop Water Stress Index
-

Comprehensive

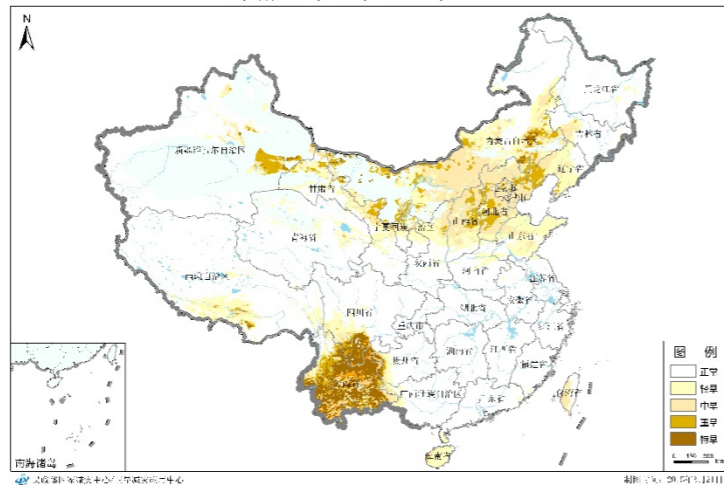
- Vegetation Health Index
- Vegetation Supply Water Index
- Temperature Vegetation Drought Index
-

Drought Monitoring



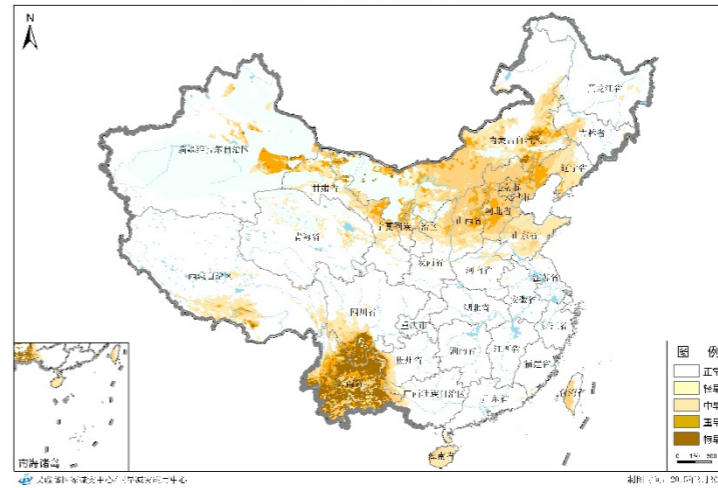
Cloud Parameter Drought Index

云参数法干旱监测图（2015年3月20日）

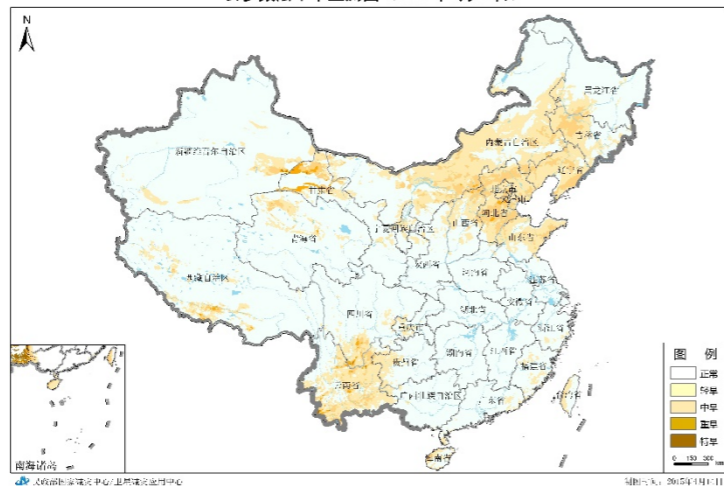


云参数法干旱监测图（2015年3月30日）

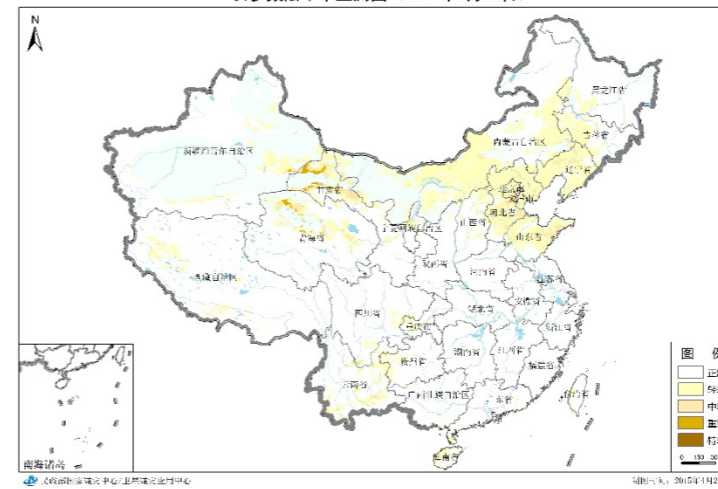
云参数法干旱监测图（2015年3月30日）



云参数法干旱监测图（2015年4月10日）



云参数法干旱监测图（2015年4月20日）

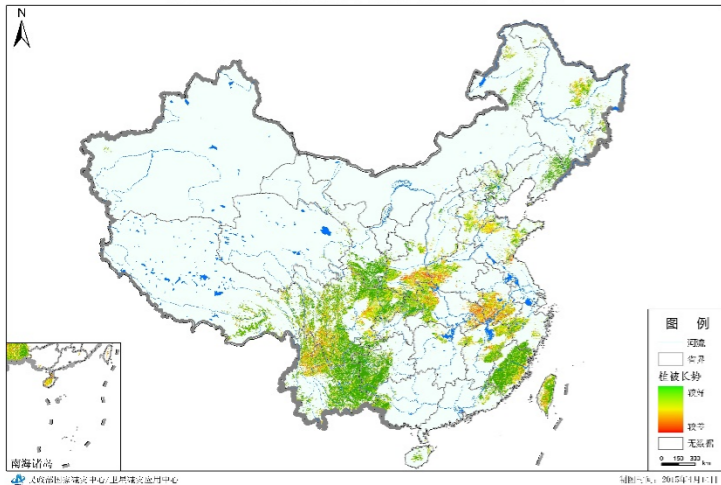


Drought Monitoring

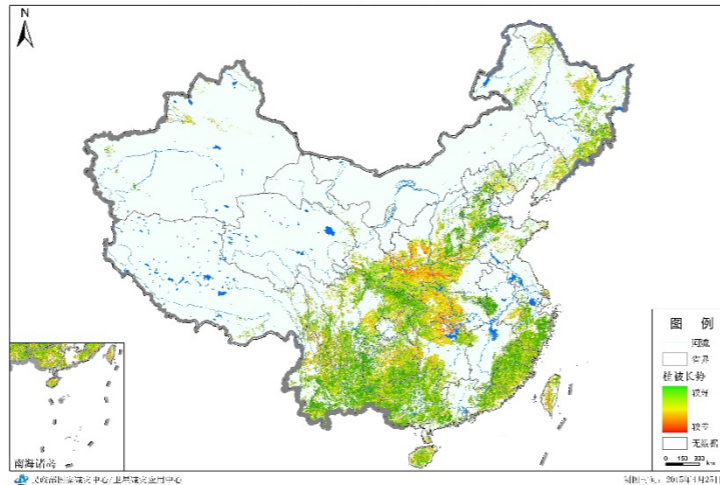
Vegetation Drought Index



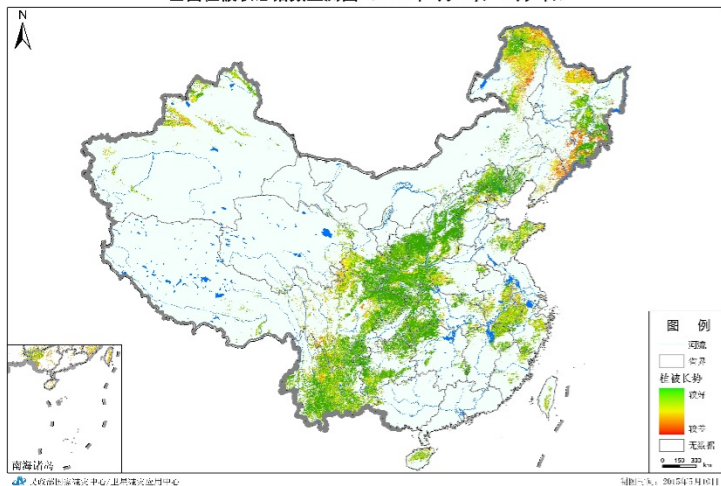
全国植被状态指数监测图 (2015年3月22日—4月6日)



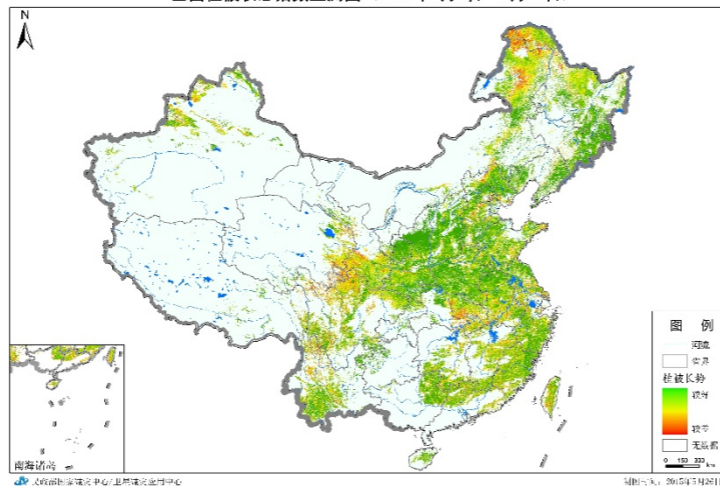
全国植被状态指数监测图 (2015年4月7日—4月22日)



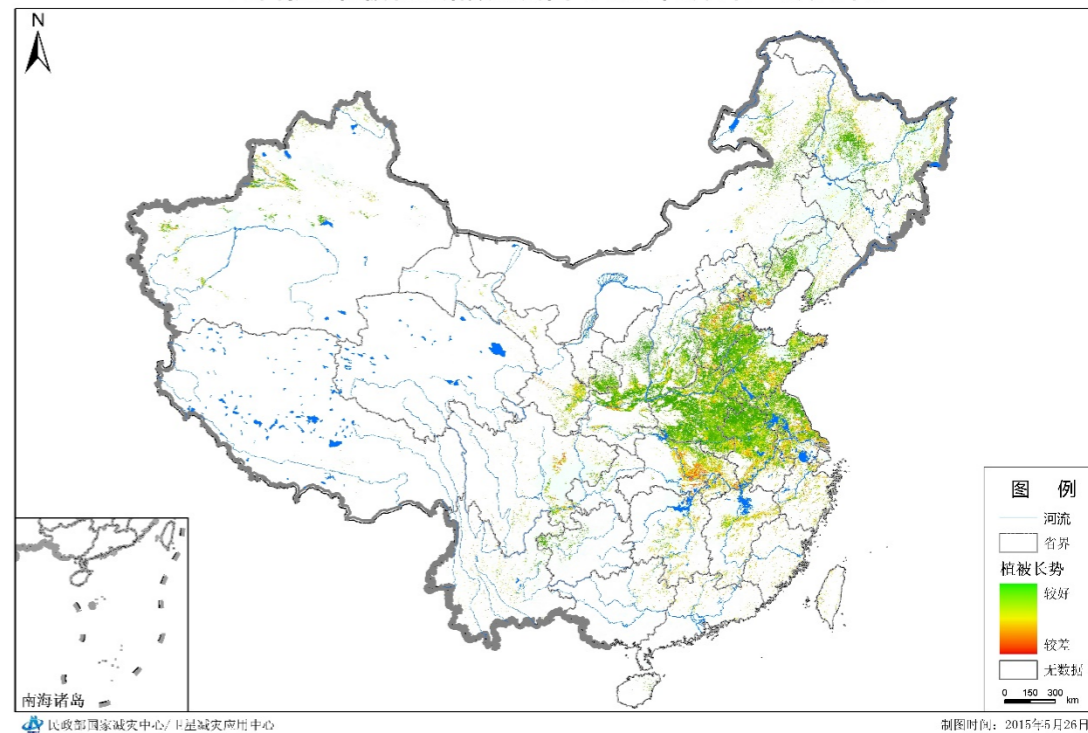
全国植被状态指数监测图 (2015年4月23日—5月8日)



全国植被状态指数监测图 (2015年5月9日—5月24日)



全国耕地植被状态指数监测图 (2015年5月9日—5月24日)



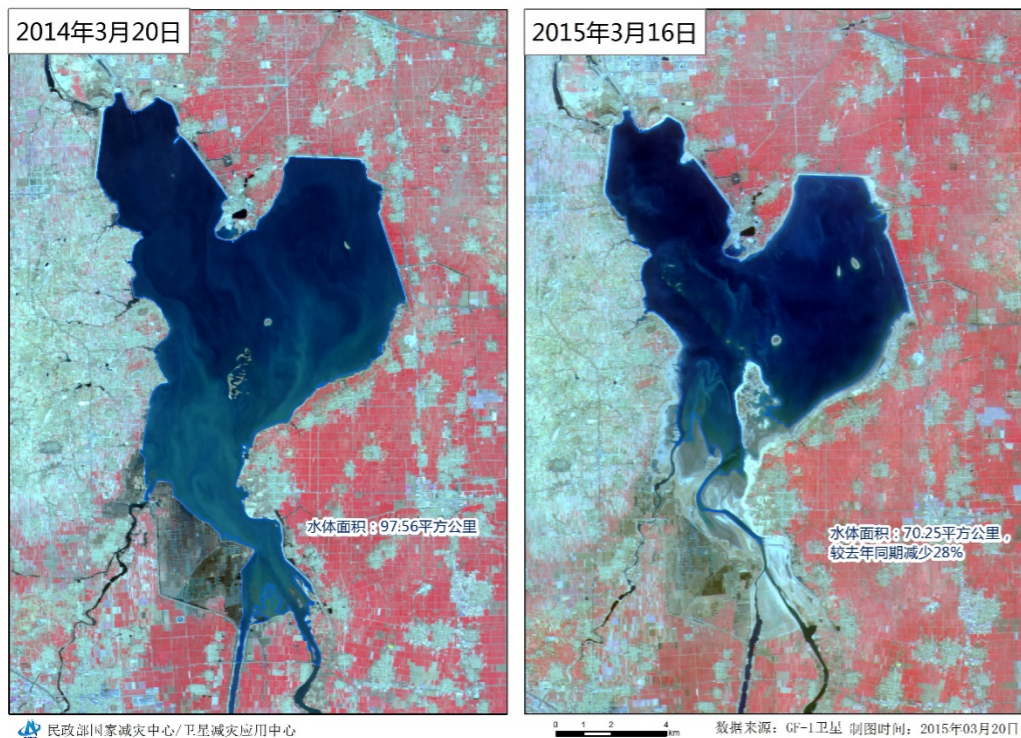
制图时间: 2015年5月26日

Drought Monitoring

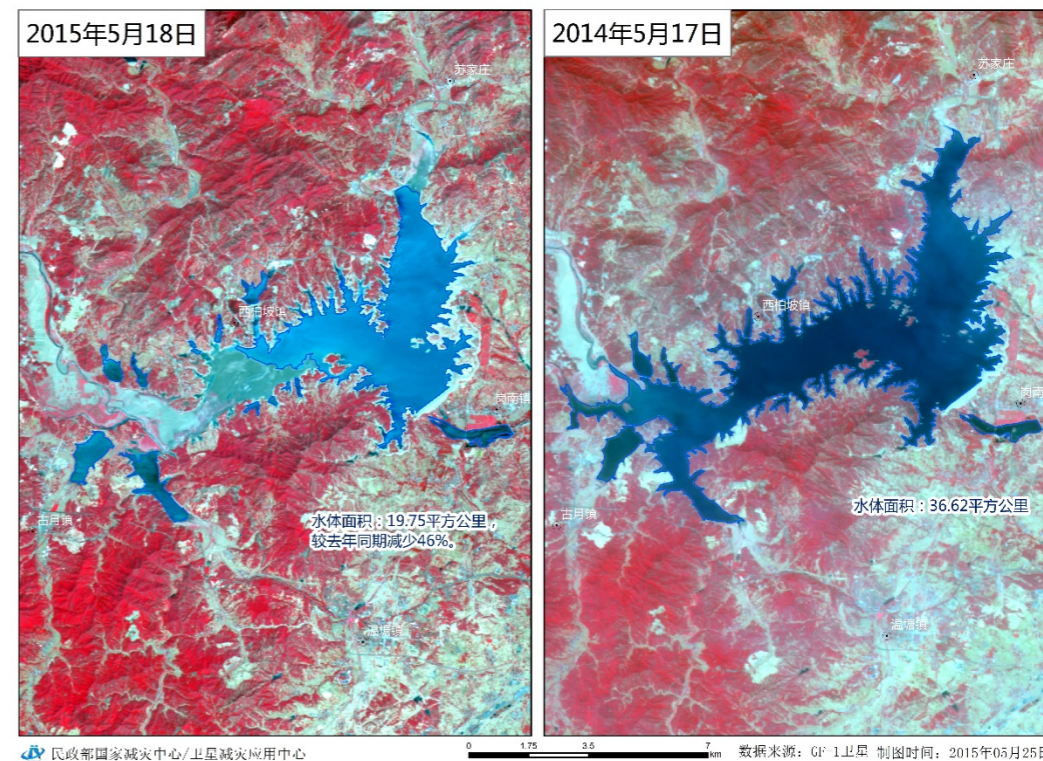


Water area

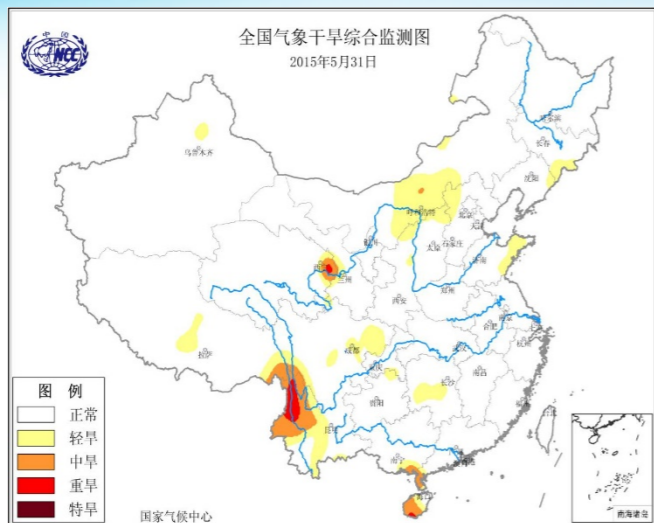
山东省潍坊市典型水体面积变化遥感监测图——峡山水库



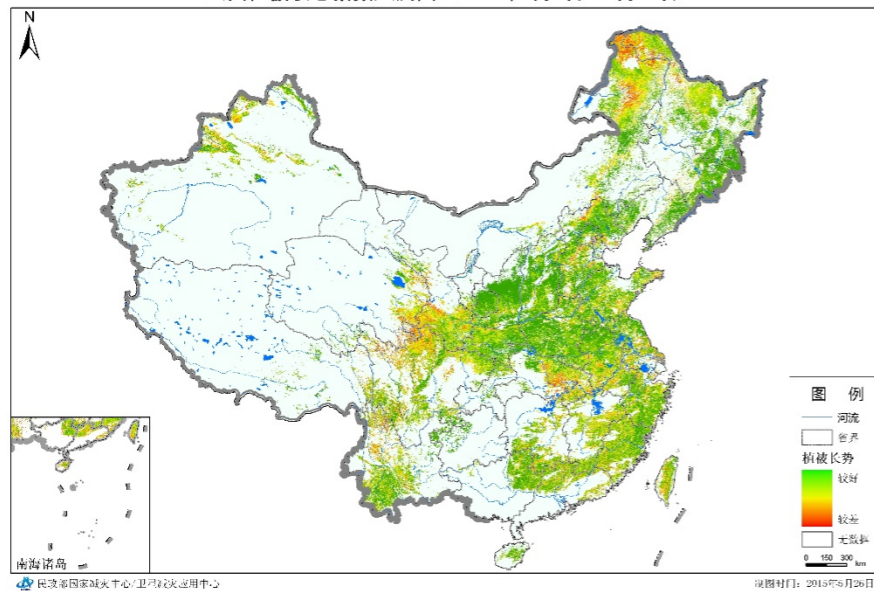
河北省石家庄市典型水体面积变化遥感监测图——岗南水库



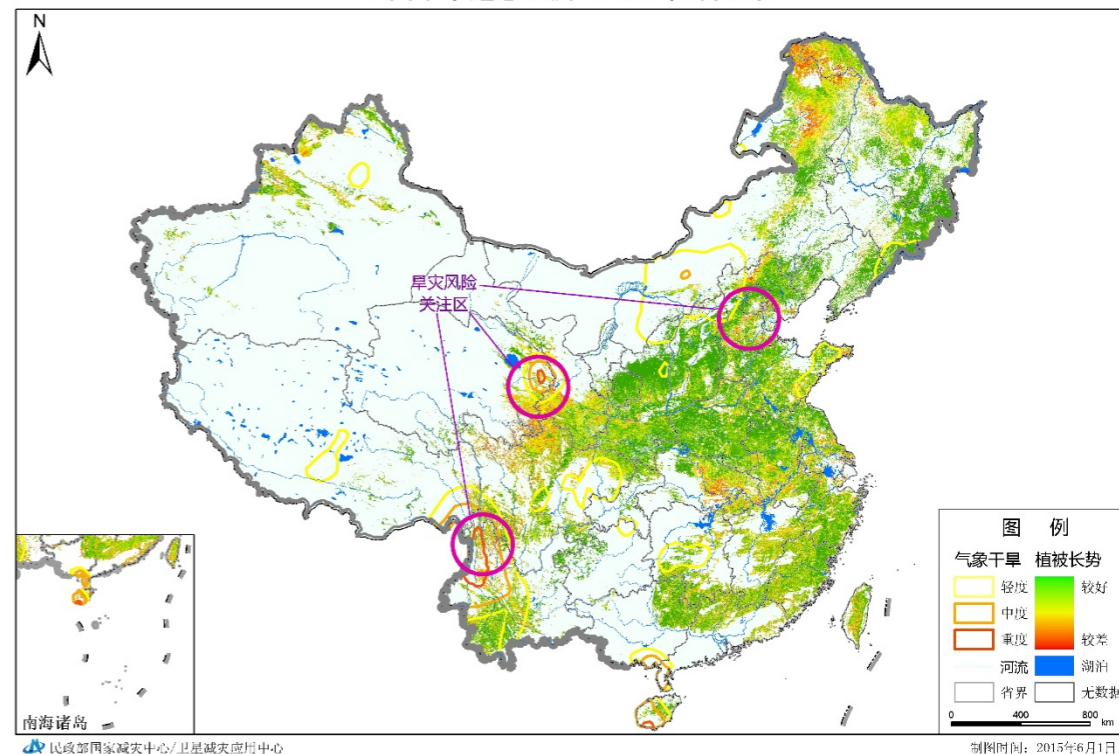
Drought Risk Assessment



全国植被状态指数监测图 (2015年5月9日-5月24日)



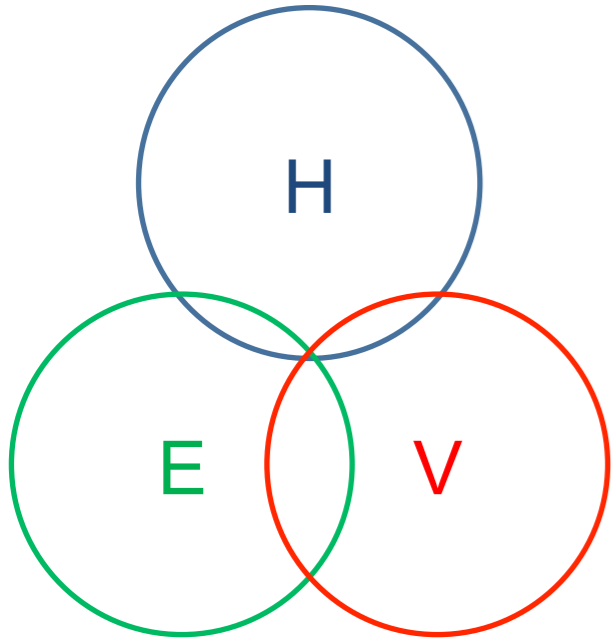
全国干旱遥感监测 (2015年5月31日)



Drought Risk Assessment

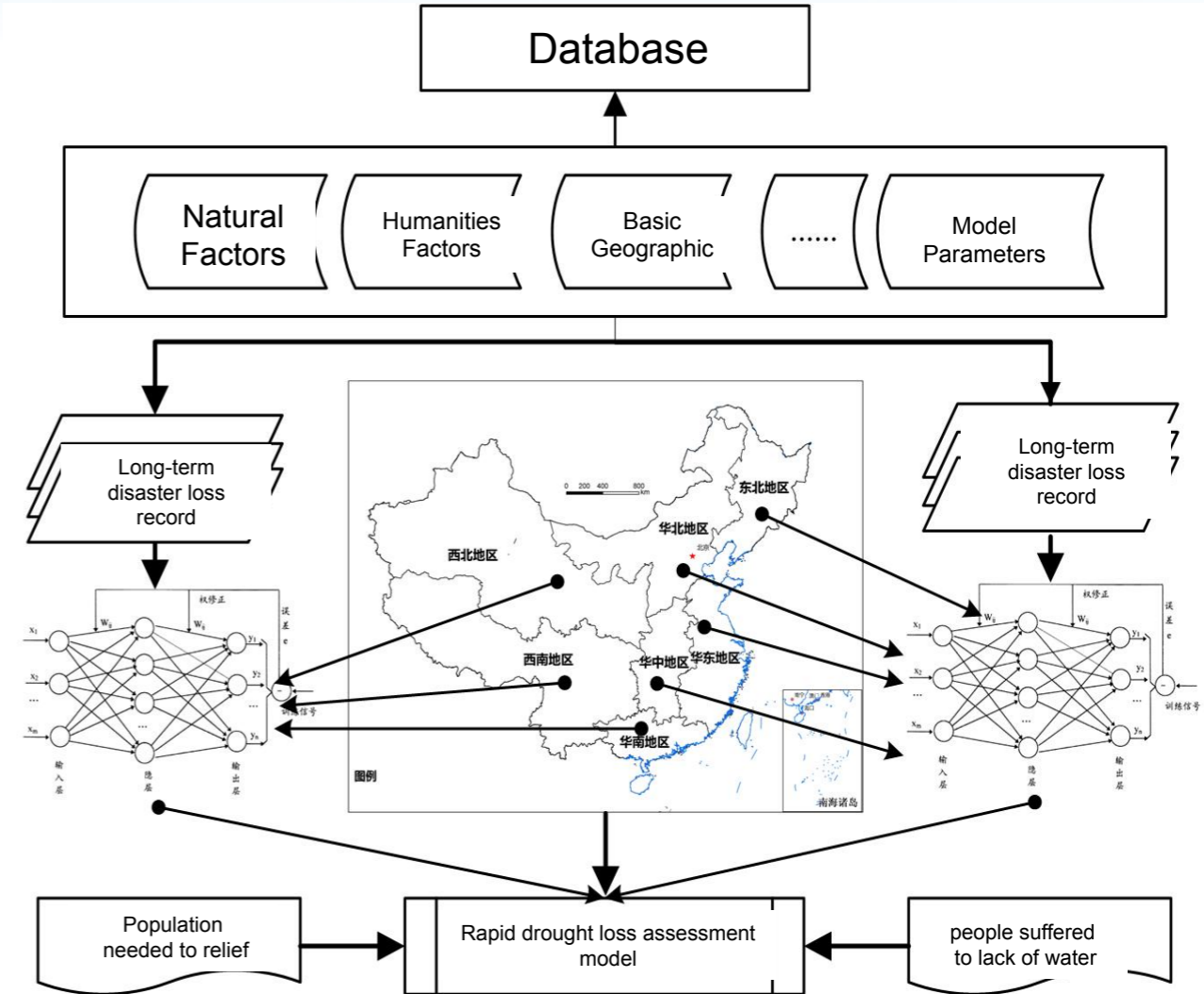
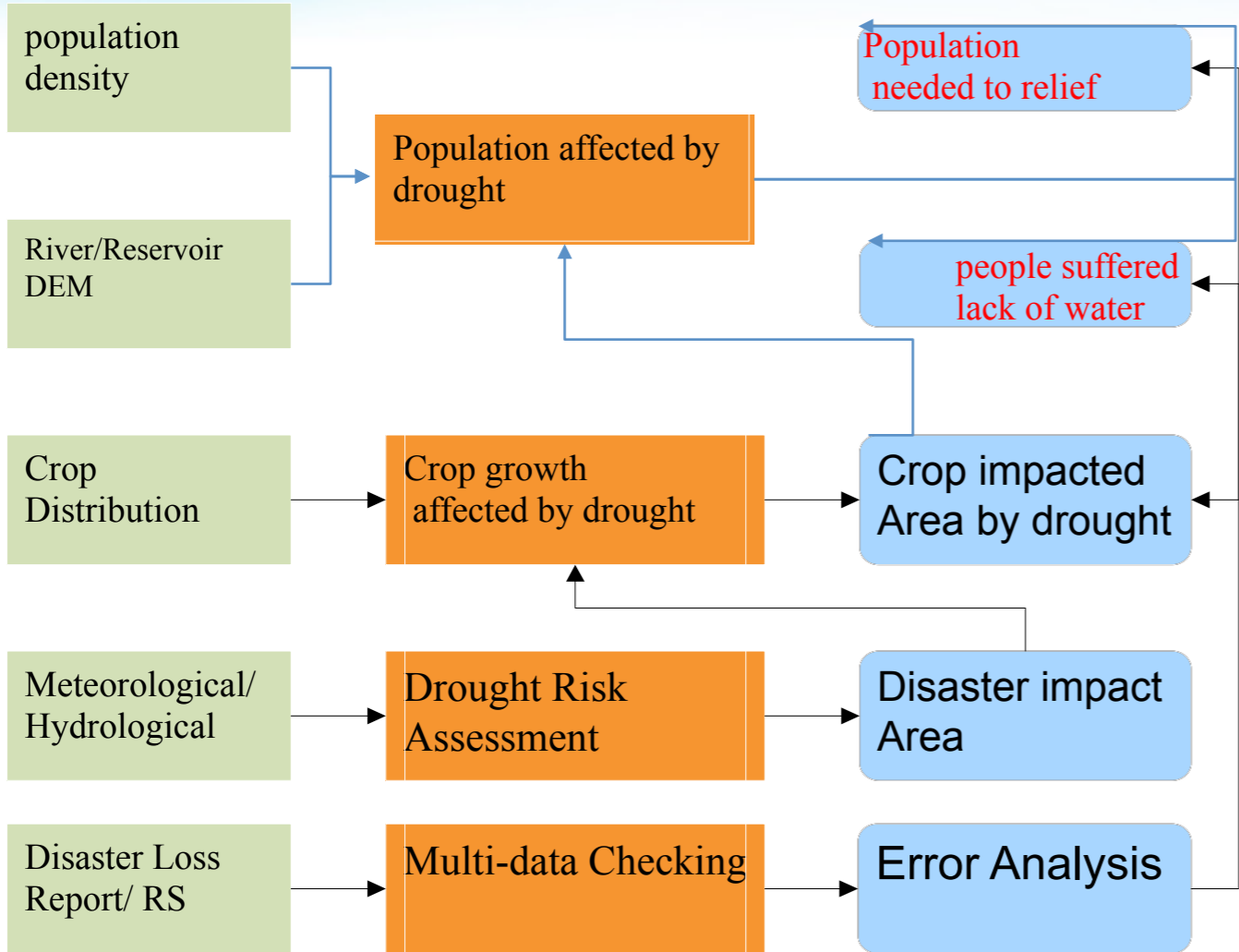


Risk assessment index system



Contents	Factors	Index
Hazard	Precipitation	The percentage of precipitation anomalies index
	Soil moisture	Vegetation water supply index
Disaster Environment	Landforms	Landforms type index
	Soil	Soil type index
	Land use	Land-use index
	Crop	Crop type index
Disaster-bearing body (vulnerability)	Population	Population density index
	Economy	GDP density index
	Resilience	Irrigation index
Historic risk	Historic Frequency	Probability index of historical drought occurrence in different periods

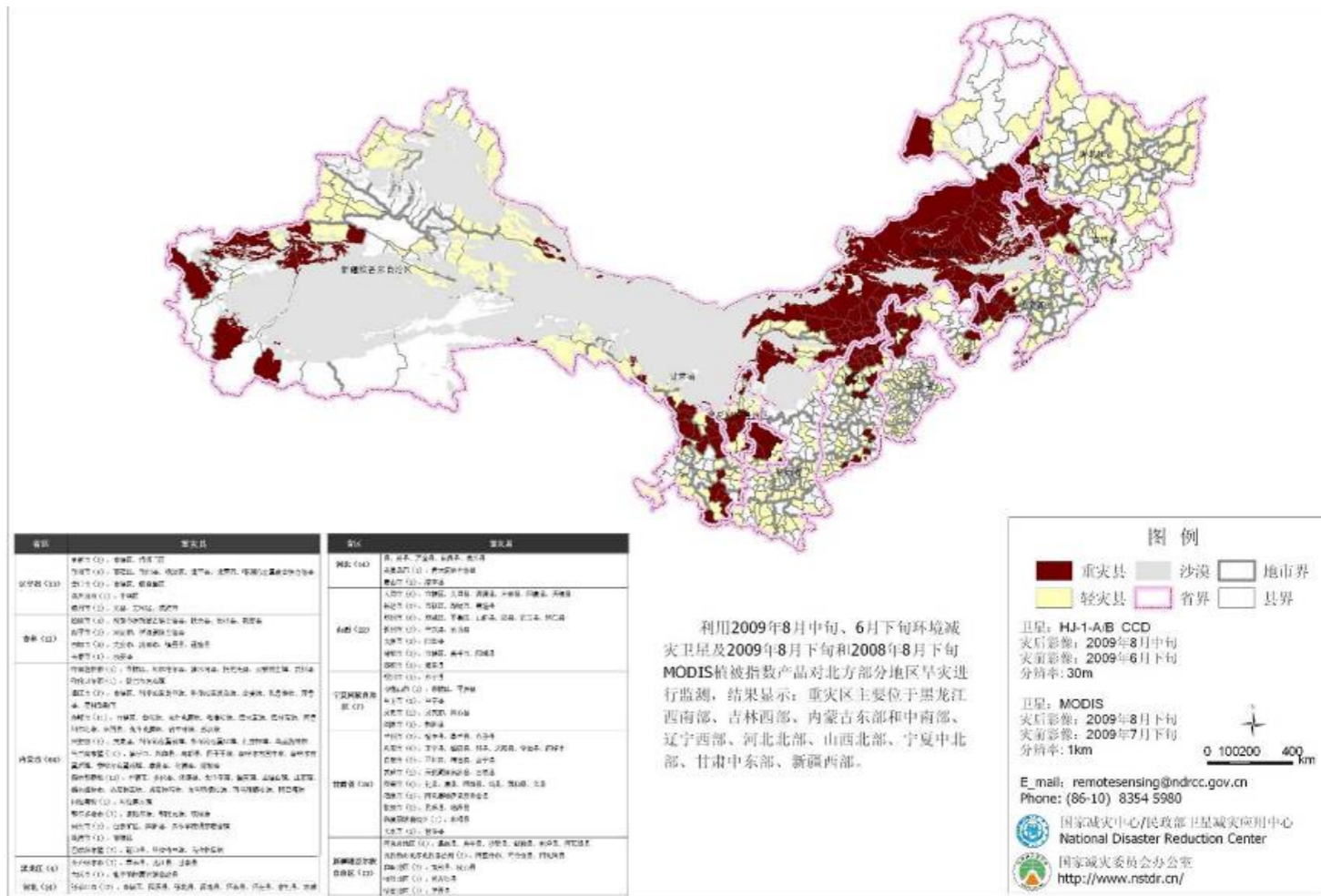
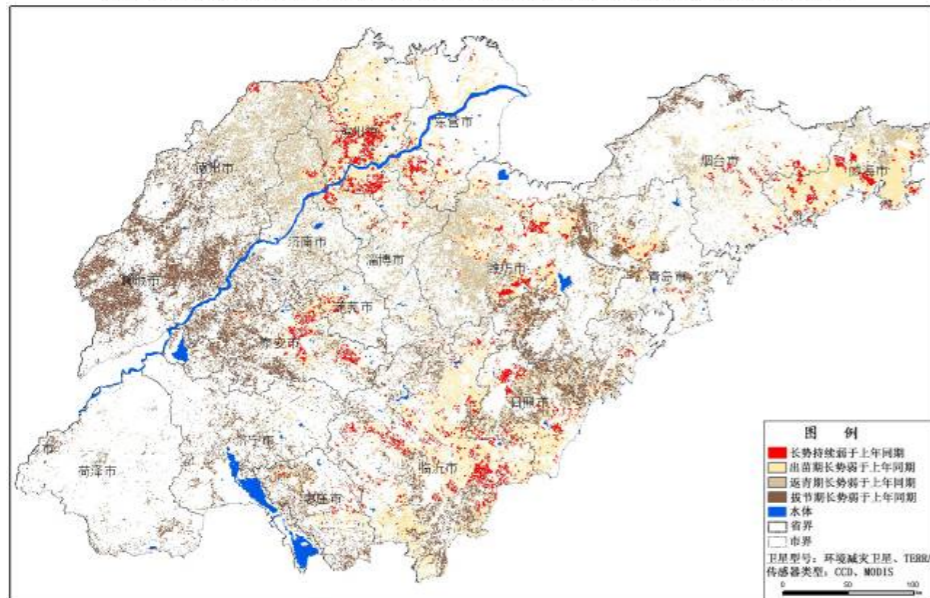
Drought Loss Assessment



Drought Loss Assessment



Wheat Growing Status Variation between 2010 and 2011 Assessment in Shandong Province





4. RECOMMENDATION



Recommendation



- Set up information database and enhance the sharing degree of disaster information.
- Improve monitoring and early warning capabilities, and develop practical **methodologies/models**.
- Expand international exchanges and cooperation, **establish international standard and criterion of space technology application in drought management.**



谢谢!