

The 10th GEOSS Asia-Pacific Symposium
Accelerating the realization of the SDGs with Earth
Observations: Lessons from the Asia-Oceania Region



Global Ecosystems and Environment Observation: Annual Report from China (GEOARC)

Ecosystem Condition and Variation for AO Region

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Outlines

- 1. Introduction**
- 2. The situation of the terrestrial ecosystem**
- 3. Solar energy resources condition**
- 4. The situation of water budget**
- 5. conclusion and suggestion**



1. Background and significance

Today's world faces a shortage of natural resources and environmental negative impact of the severe deterioration and a serious threat to human survival and the safety of the earth itself.

- degraded ecosystem, biodiversity decrease(deforestation, forest fires)
- resources shortage(water shortage, arable land, food security)
- environmental pollution(Air pollution, water pollution, garbage pollution)



In order to meet global challenges:

Global climate change(*Paris Agreement*)

Disaster reduction and prevention(*Sendai Convention*)

Sustainable development(*United Nations,2020*)

In June 2015, the United Nations released a report entitled *"Transforming our world by 2030: A new agenda for global action"*.

Three dimensions: economy, society,
environment

17 total goals and 169 sub-goals

Screening monitoring projects for regional
ecological environment problems

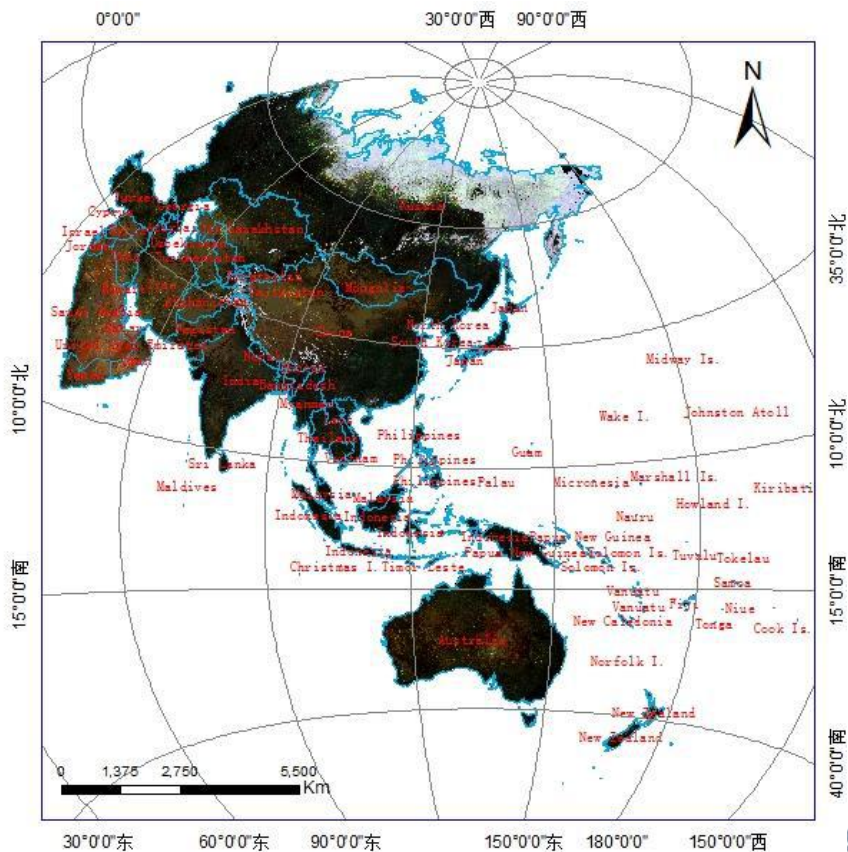
- 1) Ensure sustainable management of water and sanitation ;
- 2) Ensure the sustainable development of clean energy
- 3) Make cities inclusive, safe, resilient and sustainable
- 4) Take urgent action to combat climate change and its impacts
- 5) Conserve and sustainably use the marine resources
- 6) Protect terrestrial ecosystems, combat desertification and land degradation, and protect biodiversity
- 7) Strengthen cooperation on sustainable development and build a global partnership



- The base year(2015) of the ecological environment monitoring and evaluation to implement the UN sustainable development(2030), the condition of ecological environment of 2015 in the region must be make a comprehensive analysis.

The monitoring scope including:

- ✓ Asia
- ✓ Africa
- ✓ Europe
- ✓ Oceania
- ✓ Three oceans
- ✓ Nine major sea area





Outlines

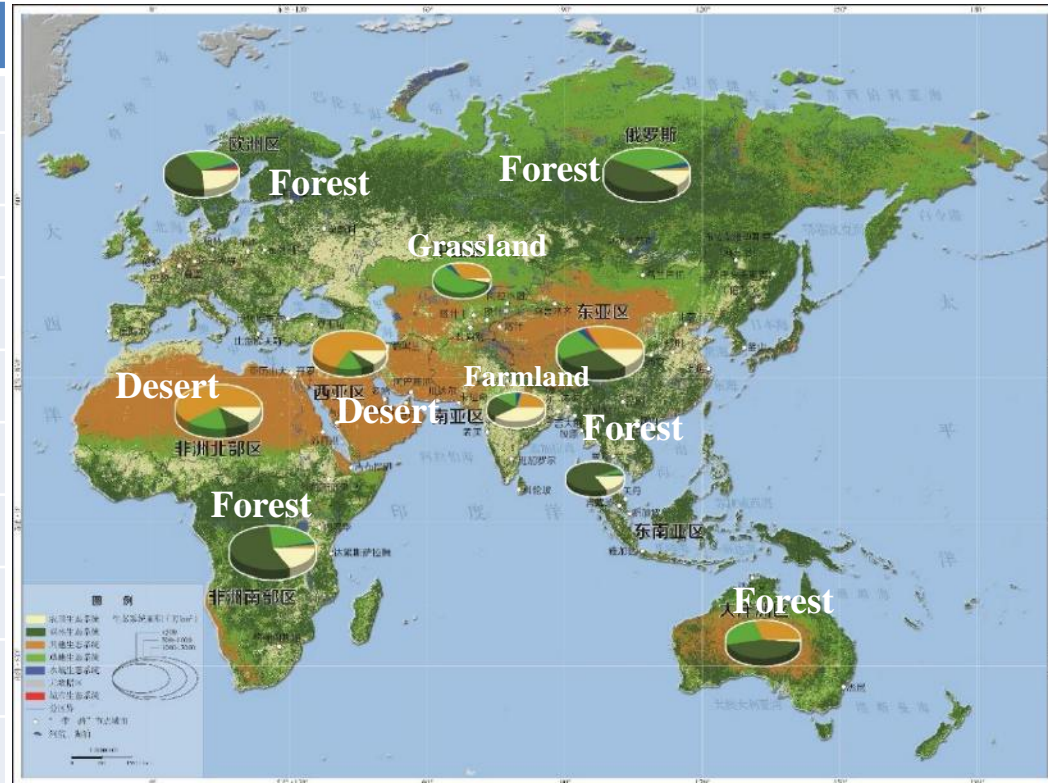
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RADI 2. The situation of the terrestrial ecosystem

The macro-structure of the ecosystem

- ✓ There is a great disparity for the zonal climate condition, so the regional ecosystem structure is significantly different.

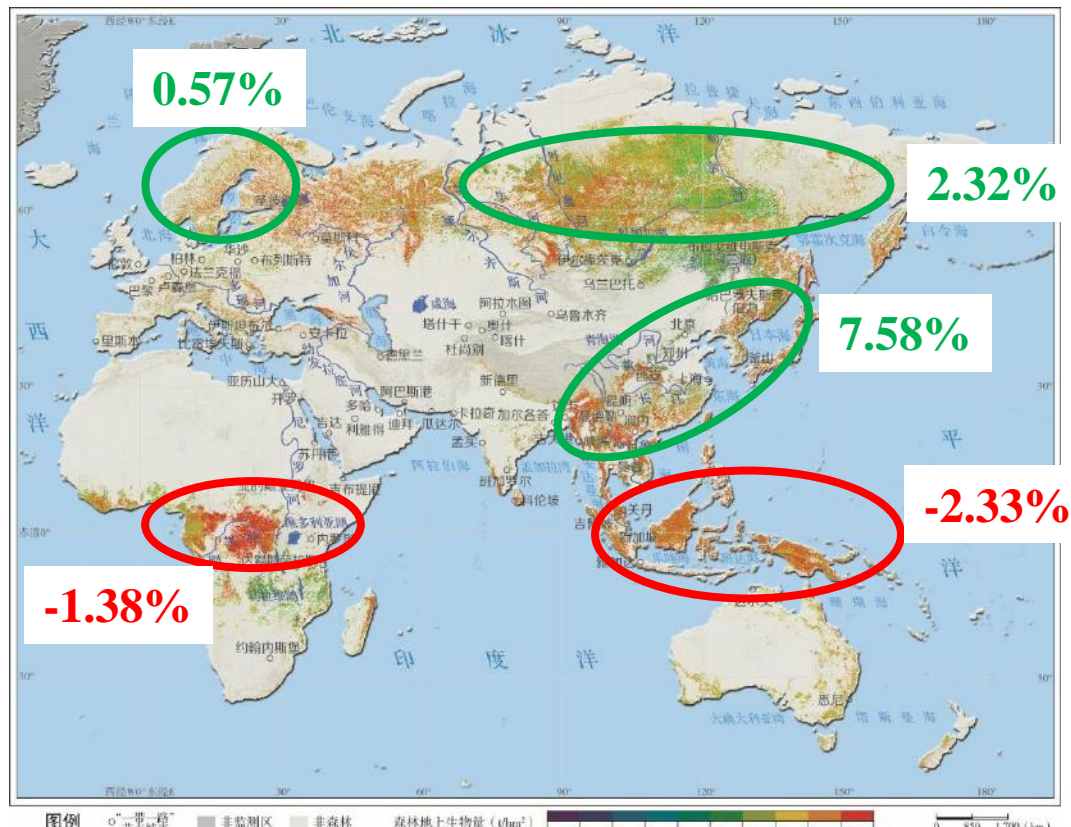
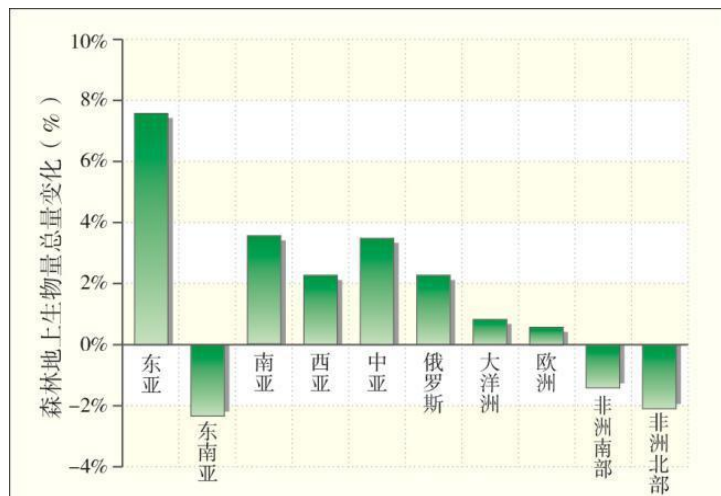
	Farmland	Forest	Grassland	Waters	City	Desert
RUS	12.1	46.81	34.79	3.73	0.12	2.45
Southeast Asia area	18.18	72.02	5.61	2.1	0.97	1.12
East Asia area	15.21	27.3	23.32	3.01	1.21	29.95
Northern Africa area	12.73	9.42	15.64	0.3	0.09	61.81
Southern Africa area	18.57	54.79	21.83	1.75	0.31	2.74
South Asia area	38.06	23.72	12.42	3.19	0.81	21.8
Europe area	23.88	43.45	25.36	3.33	2.86	1.12
West Asia area	13.59	5.91	11.02	0.74	0.47	68.26
Central Asia area	5.21	3.09	56.52	3.59	0.17	31.42
Oceania area	2.09	43.12	25.27	0.71	0.15	28.65



The situation of the terrestrial ecosystem

The condition and change of forest ecosystem

- ✓ The proportion of biomass in Russia, southern Africa, Europe, forest and mixed needle of southeast Asia and tropical rainforest of southeast Asia was 32.82%, 26.71%, 10.59%, 8.80% and 7.74%.
- ✓ The total biomass of forest land was 281.3 billion tons in 2015, an increase of about 1% over 2010.

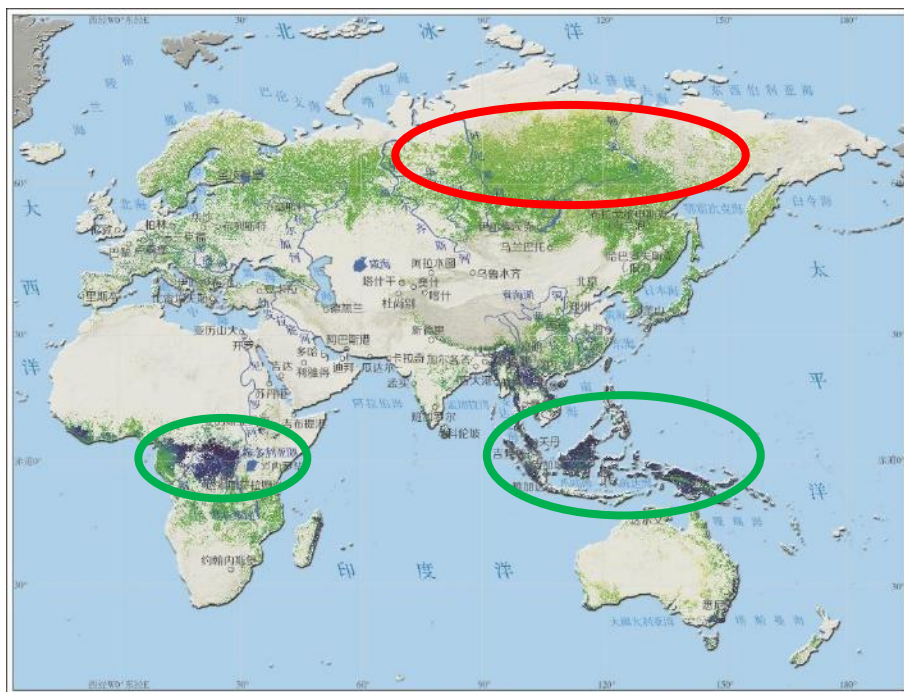


Distribution of forest biomass on the ground in 2015

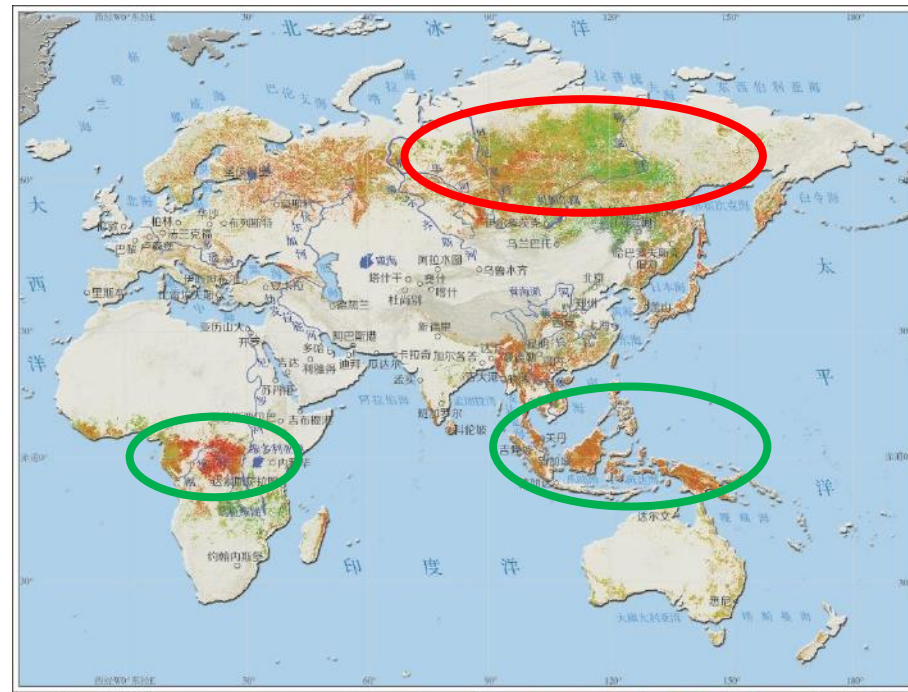
The situation of the terrestrial ecosystem

The condition and change of forest ecosystem

- ✓ The rain forest in southern Africa and southeast Asia area are the two main global forest carbon sink area.
- ✓ Due to the shorter growth period and the smaller average annual leaf area index in the northern forest of Russia, the forest solid carbon capacity is relatively weak.



Distribution of average leaf area index in 2015

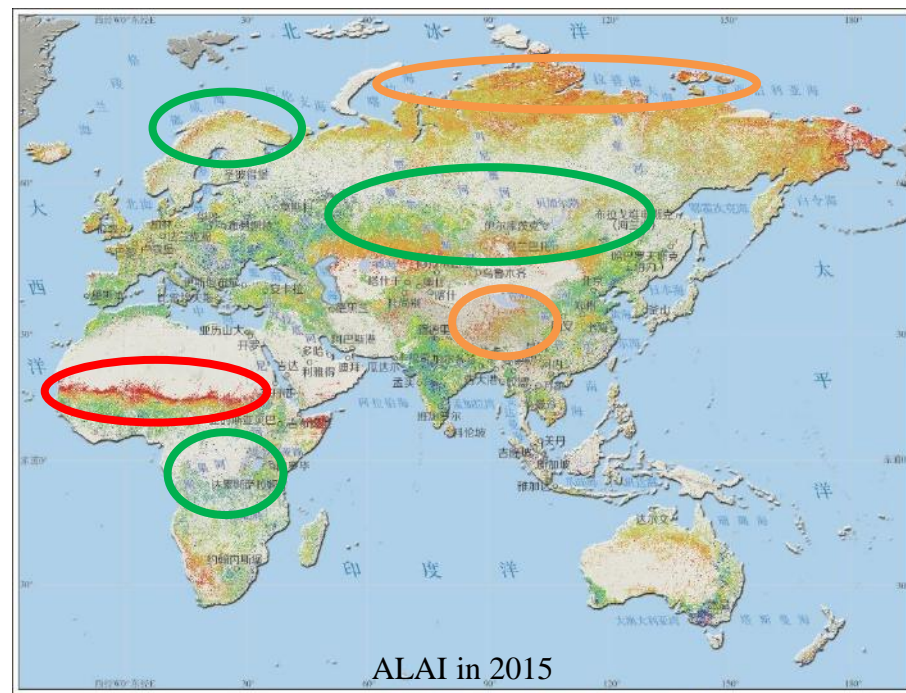
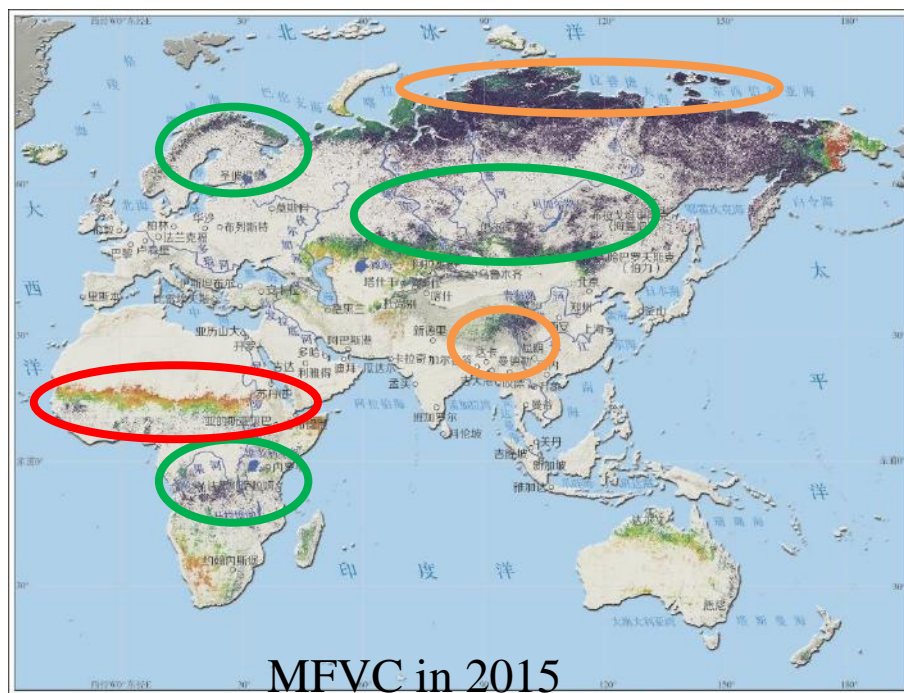


Distribution of forest biomass on the ground in 2015

The situation of the terrestrial ecosystem

The condition and change of grassland ecosystem

- ✓ Mainly distributed in the Mongolian plateau, southern Europe, southern Africa region and northern Australia.
- ✓ The annual maximum vegetation coverage and the average leaf area index is higher in southern Russia cold grasslands, European temperate grassland and southern African savanna.

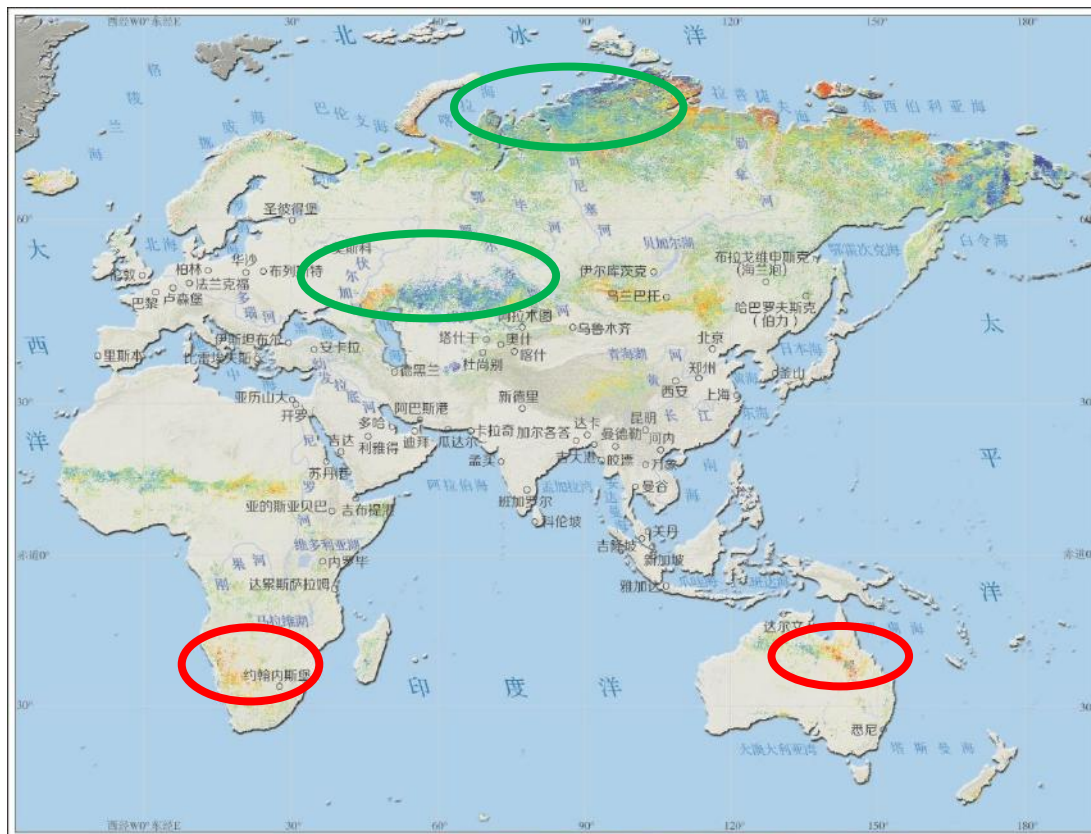


The situation of the terrestrial ecosystem

The condition and change of grassland ecosystem

- ✓ Affected by el Niño events in 2015, in southern Africa and tropical north of Australia region, the decline of the average leaf area index was up to about 3.79%.
- ✓ In central Asia and in northwestern Russia, the annual maximum coverage of the grassland has a increase of 7.51% due to increased rainfall.

Area	percentage of ALAI anomaly(%)	Percentage of the MFVC anomal(%)
Russia area	-0.52	1.51
Central Asia area	7.51	7.51
West Asia area	5.00	6.31
East Asia area	0.76	-2.19
Europe area	2.27	-0.24
Oceania area	-3.79	-1.55
southern Africa area	1.16	-0.86

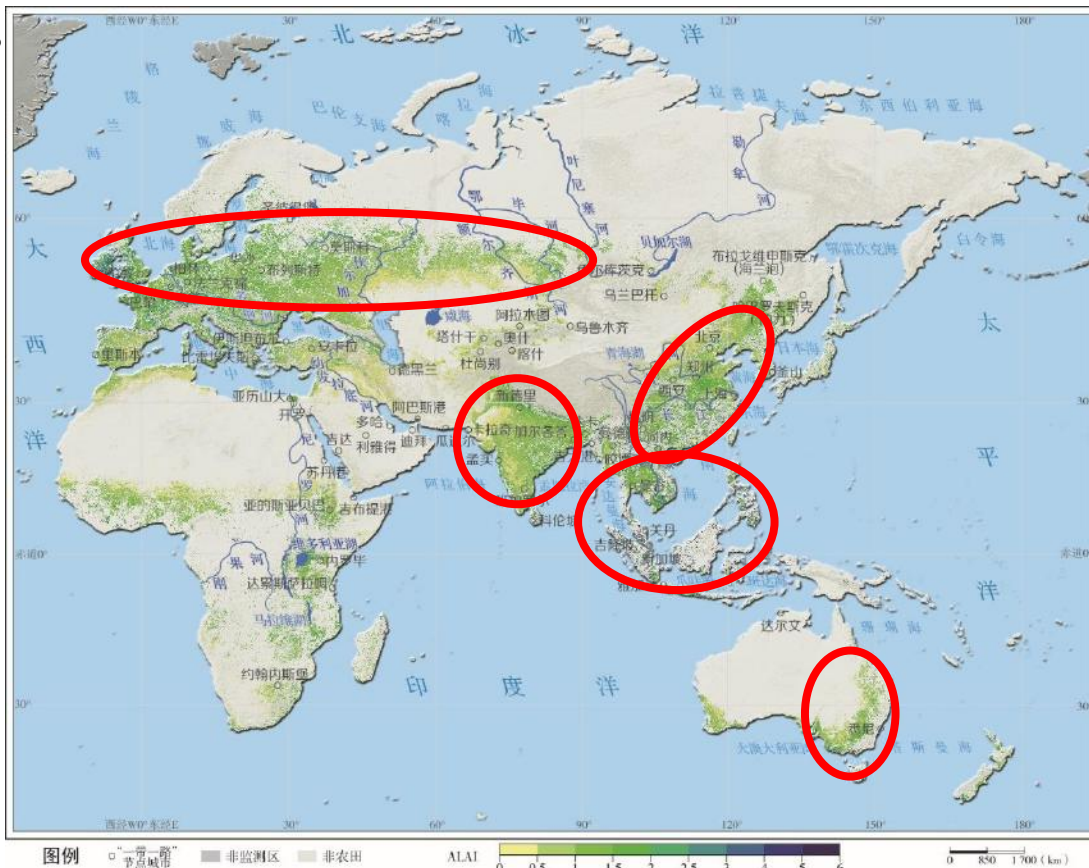


图例 一带一路 节点城市 非监测区 非草地 MFVC距平 -0.5 -0.3 -0.2 -0.1 -0.05 -0.001 0.001 0.05 0.1 0.2 0.3 0.5 0 850 1700 (km)

The condition and change of farmland ecosystem

- ✓ Mainly distributed in western Russia, southeast Asia, South Asia, eastern China, Europe and south Australia.
- ✓ Southeast Asia the average leaf area index is higher than 2. South Asia and Oceania are dominated by single-season crops, with an average leaf area index of less than 1.

Area	ALAI	MFVC
Russia area	0.95	0.92
Southeast Asia area	2.05	0.93
South Asia area	0.89	0.76
East Asia area	1.03	0.93
Europe area	1.36	0.89
Oceania area	0.98	0.8

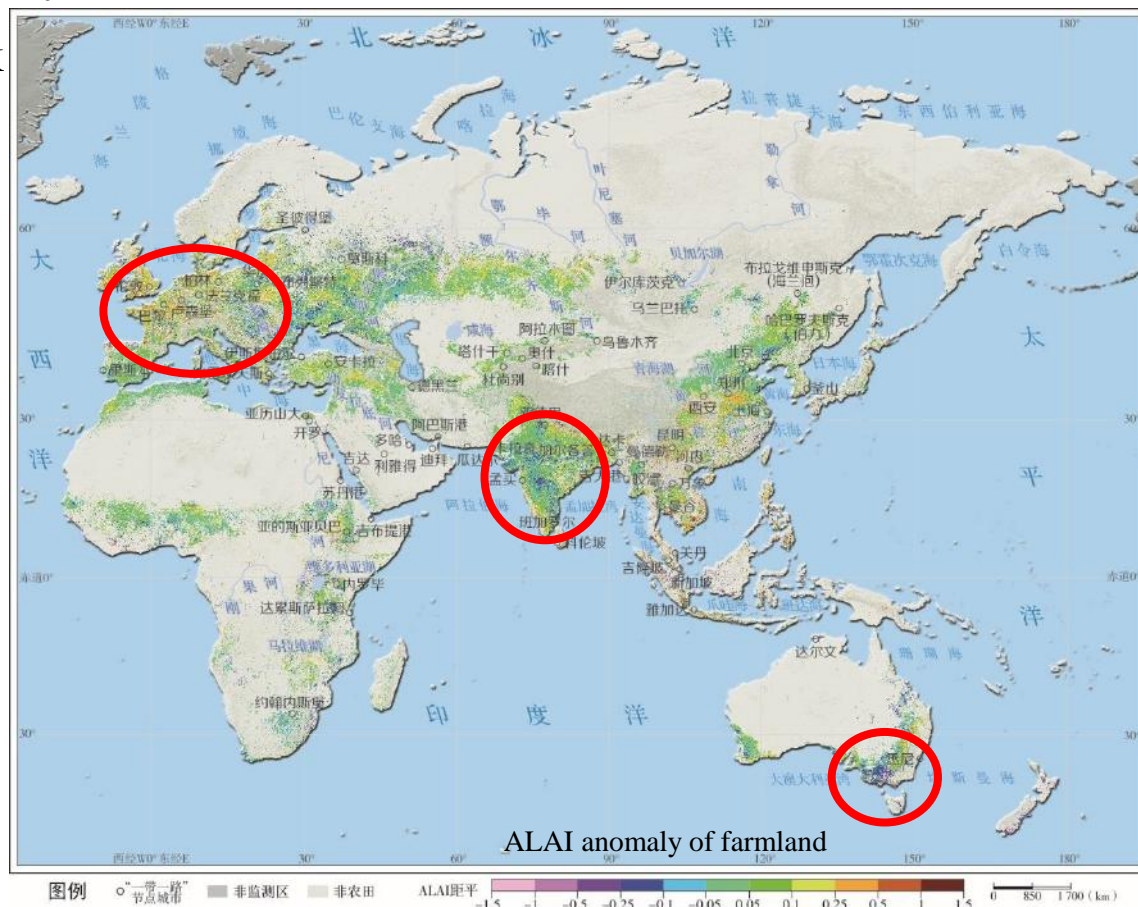


The situation of the terrestrial ecosystem

The condition and change of farmland ecosystem

- ✓ Affected by el Niño events in 2015, in these three farmland regions, the annual average leaf area index change respectively 4.10%, 5.13% and 1.97% because of the reduced rainfall and drought, causing bulk grain and oil crops reduction.

Country	Crop types	Change of production
India	Corn	-6.4%
	Wheat	-4.5%
France	Corn	-1.8%
	Rice	-6.9%
Australia	Wheat	0.9%





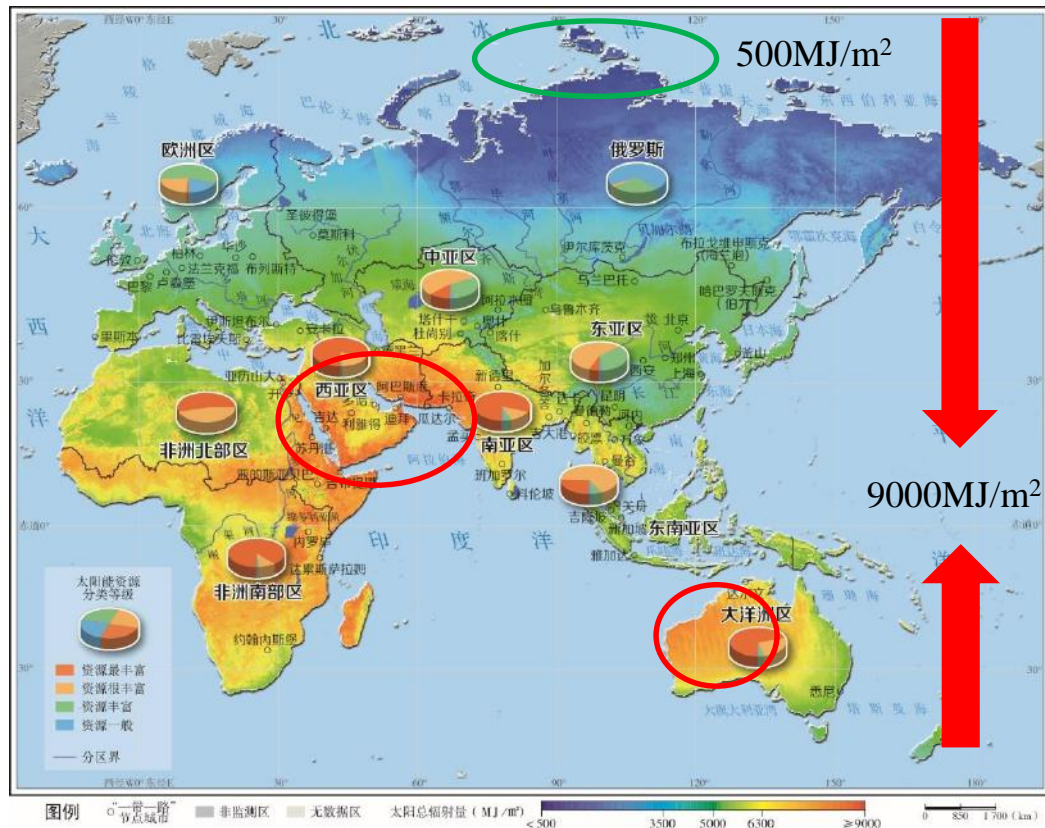
Outlines

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3. Solar energy resources condition

The spatial distribution characteristic of total solar radiation

- ✓ Africa, South Asia, west Asia, Oceania: The average annual solar radiation is greater than 6,500 MJ/m² (the most abundant)
- ✓ southeast Asia, central Asia, east Asia: The average annual solar radiation is greater than 5300 MJ/m² (very rich)
- ✓ Russia's average annual solar radiation of 3093 MJ/m², the minimum is only 500 MJ/m². (general)
- ✓ With high cloud cover in the Qinghai-Tibet Plateau, the annual total solar is lower than of central Asia in the same latitude.

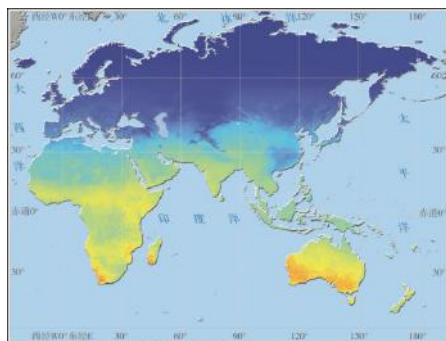


The annual total solar radiation
(Grade classification reference national standard QX/T 89-2008)

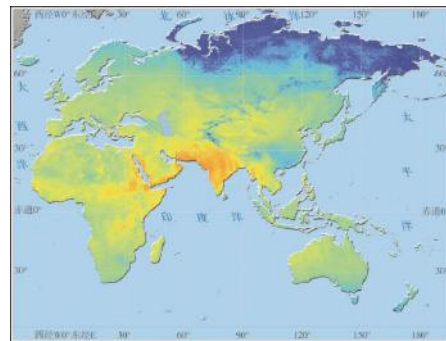
Solar energy resources condition

Seasonal variation characteristics of the total solar radiation

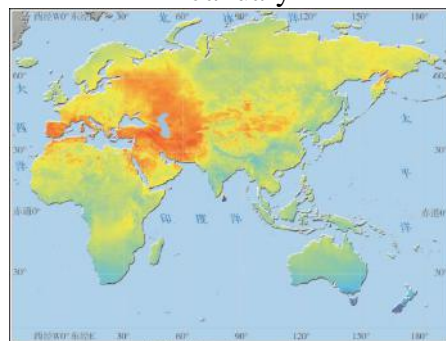
- ✓ In Russia area with high latitudes, solar radiation seasonal change is most violent, with radiation on the month accumulation up to 650 MJ/m² and the minimum only 50 MJ/m².
- ✓ In southeast Asia area with low latitudes, the sun radiation seasonal changes is the most weak, and monthly cumulative solar radiation difference is less than 100 MJ/m².



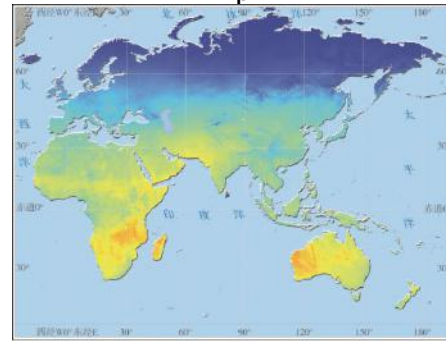
图例 ■ 非洲测区 太阳总辐射量 (MJ/m²) 0 345 690 1035 1750 3500 (km)
January



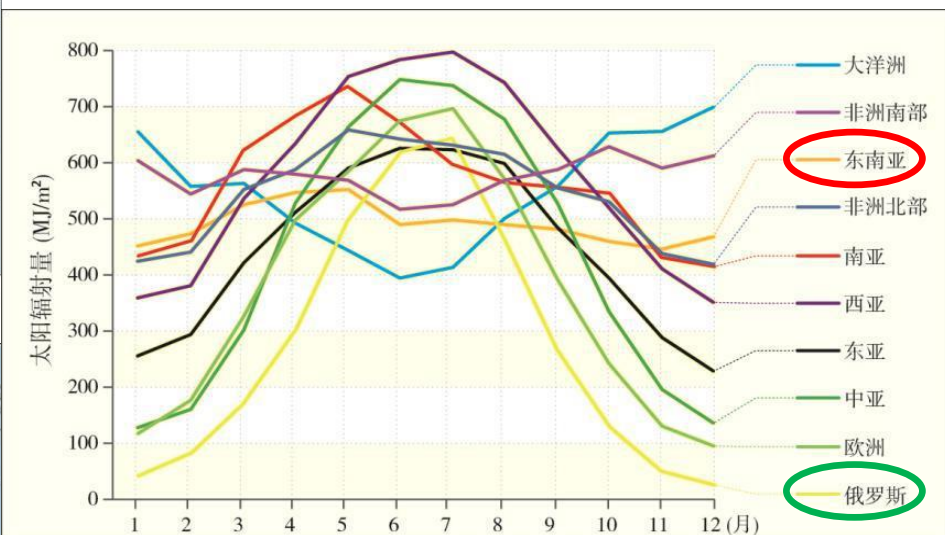
图例 ■ 非洲测区 太阳总辐射量 (MJ/m²) 0 345 690 1035 1750 3500 (km)
April



图例 ■ 非洲测区 太阳总辐射量 (MJ/m²) 0 345 690 1035 1750 3500 (km)
July



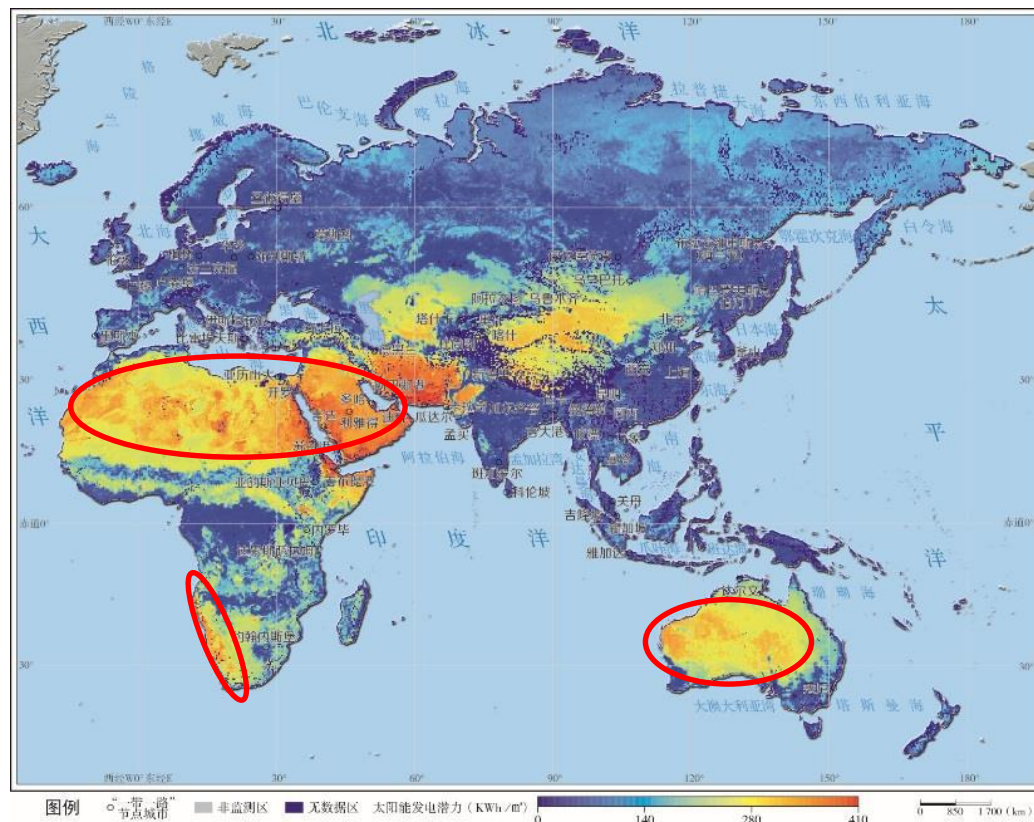
图例 ■ 非洲测区 太阳总辐射量 (MJ/m²) 0 345 690 1035 1750 3500 (km)
October



The seasonal changes of different geographical partition

Solar power generation potential and development status

- ✓ In west Asia, the Sahara desert and Kgalagardi desert of Africa and central and western regions of Australia, solar power potential is the highest, the annual solar power generation is greater than 350 KWh/m².
- ✓ Because of farmland and forest vegetation coverage is higher, large-scale development of solar energy is not appropriate in southeast Asia, South Asia India.
- ✓ In Russia, high latitude and other natural geographical conditions determines its lower solar power potential.



Regional solar power potential in 2015



Solar energy resources condition

Solar power generation potential and development status

- ✓ Australia has excellent solar resources endowment, the future of solar power has huge potential.
- ✓ In Europe, promoted by "roof project" policy.
- ✓ In African, economy is not developed, solar energy utilization is lack.
- ✓ In west Asia, the photovoltaic installations are small.

Country	Area	Installed photovoltaic capacity (GW) (PV permeability)	Solar Energy Potential ($10^3 \times \text{TWh}$)	GDP ($10^{11} \$$)	Power generation potential per capita ($10^4 \times \text{KWh}$)	GDP per capita ($10^3 \$$)	electricity consumption per capita ($10^2 \times \text{KWh}$)
China	East Asia	78.1(1.8%)	1055.8	110.1	77.0	8.0	39.1
Japan		42.8(4.9%)	4.9	43.8	3.8	34.5	78.4
Korea		4.4(1.15%)	1.5	13.8	2.9	27.2	105.2
Germany	Europe	41.2(7%)	11.5	33.6	14.1	41.3	88.8
Italy		19.3(7.3%)	7.0	18.2	11.6	30.0	50.0
United Kingdom		11.6(3.4%)	5.0	28.6	7.7	43.9	50.9
France		7.1(1.63%)	22.9	24.2	34.3	36.2	68.9
Spain		5.5(3.33%)	27.6	12.0	59.5	25.8	53.6
Belgium		3.4(4.25%)	0.8	4.6	6.7	40.3	76.6
Greece		2.6(7.4%)	3.5	1.9	32.5	18.0	50.9
Netherlands		2.1(1.78%)	0.7	7.5	4.2	44.3	66.8
Czech Republic		2.1(3.4%)	1.6	1.9	15.6	17.5	62.4
Switzerland		1.6(2.83%)	1.7	6.7	20.3	80.9	74.3
Romania		1.5(2.88%)	8.5	1.8	43.0	9.0	25.9
Austria	1.1(1.78%)	2.8	3.8	32.4	43.8	82.9	
Denmark	0.9(2.75%)	0.3	3.0	5.2	52.0	58.3	
India	South Asia	9(1.55%)	126.8	21.0	9.7	1.6	8.0
Pakistan		1.7	153.8	2.7	81.4	1.4	4.6
Thailand	Southeast Asia	2.2(1.93%)	27.0	4.0	39.7	5.8	25.6
Philippines		0.9	6.3	2.9	6.2	2.9	7.0
Israel	West Asia	0.9(2.85%)	3.8	3.0	45.5	35.7	64.7
Turkey		0.8(0.48%)	75.8	7.2	96.4	9.1	39.0
Australia	Oceania	5.9(3.85%)	1563.9	13.4	6576.4	56.3	99.4
South Africa	Africa	1.5(1.03%)	197.1	3.1	358.6	5.7	41.7



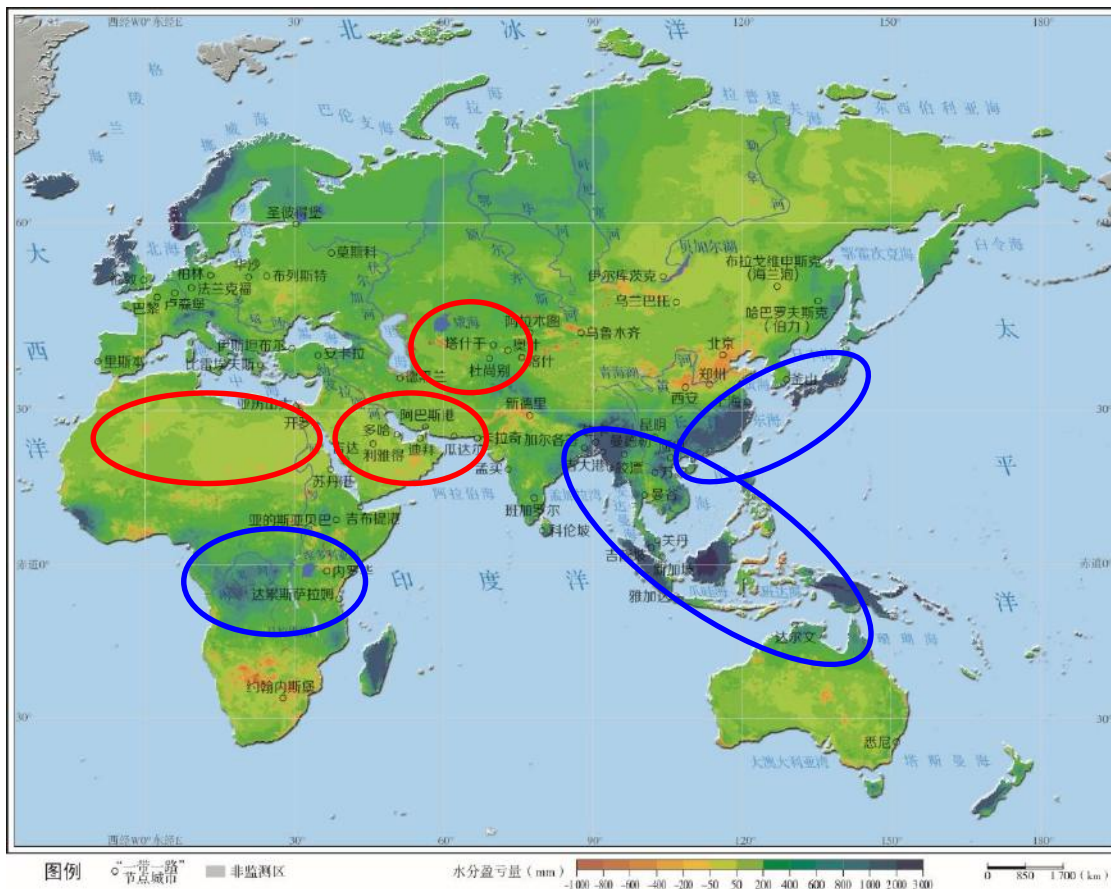
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4. The situation of water budget

The distribution pattern of water budget

- ✓ In central Africa, southeast east Asia and southeast Asia, the water budget is above 200 mm, 600 mm and 1000 mm respectively.
- ✓ In central Asia, west Asia and north Africa, evapotranspiration maintaining basic balance.

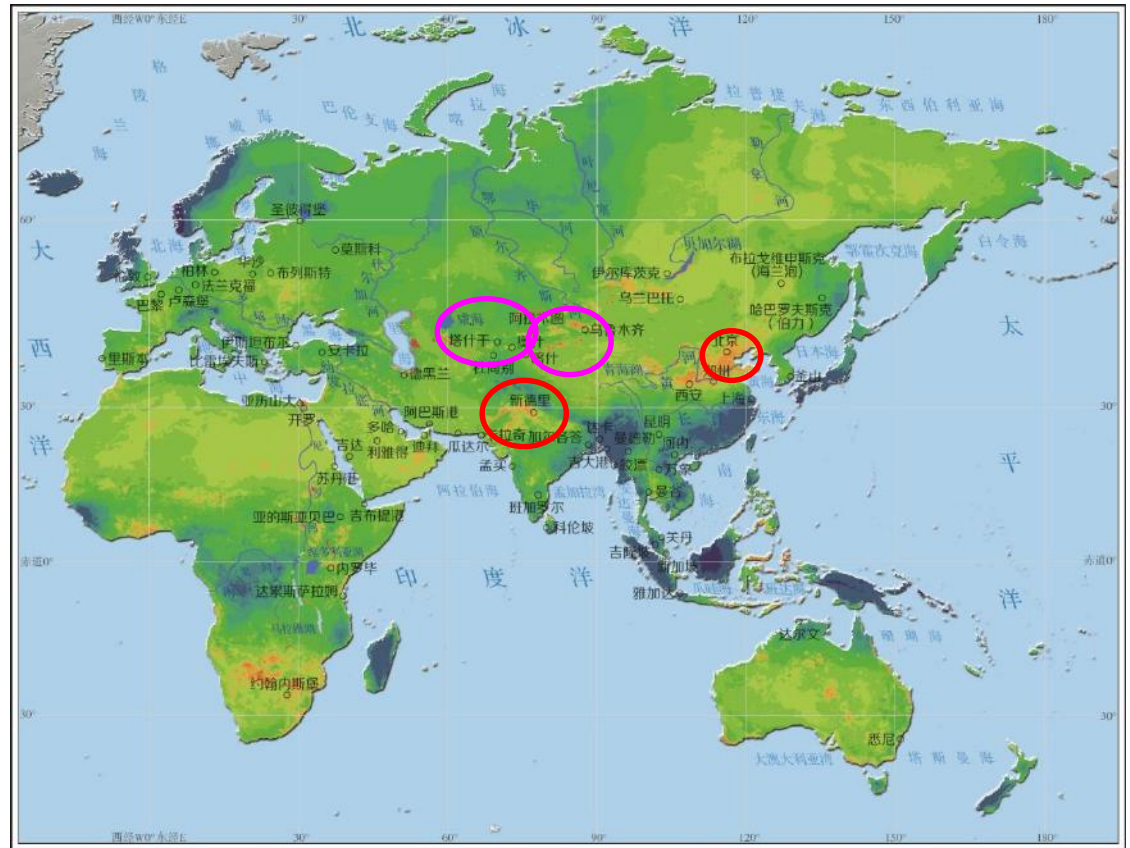


The distribution of regional water budget in 2015

The situation of water budget

The distribution pattern of water budget

- ✓ China's trim river basin and central Asia tin river basin, agricultural water use ecological environmental water;
- ✓ Northwest India and north China plain agricultural irrigation area, referencing the surface water and ground water for agricultural irrigation has caused underground water level a significant decrease, land subsidence and ecological degradation.

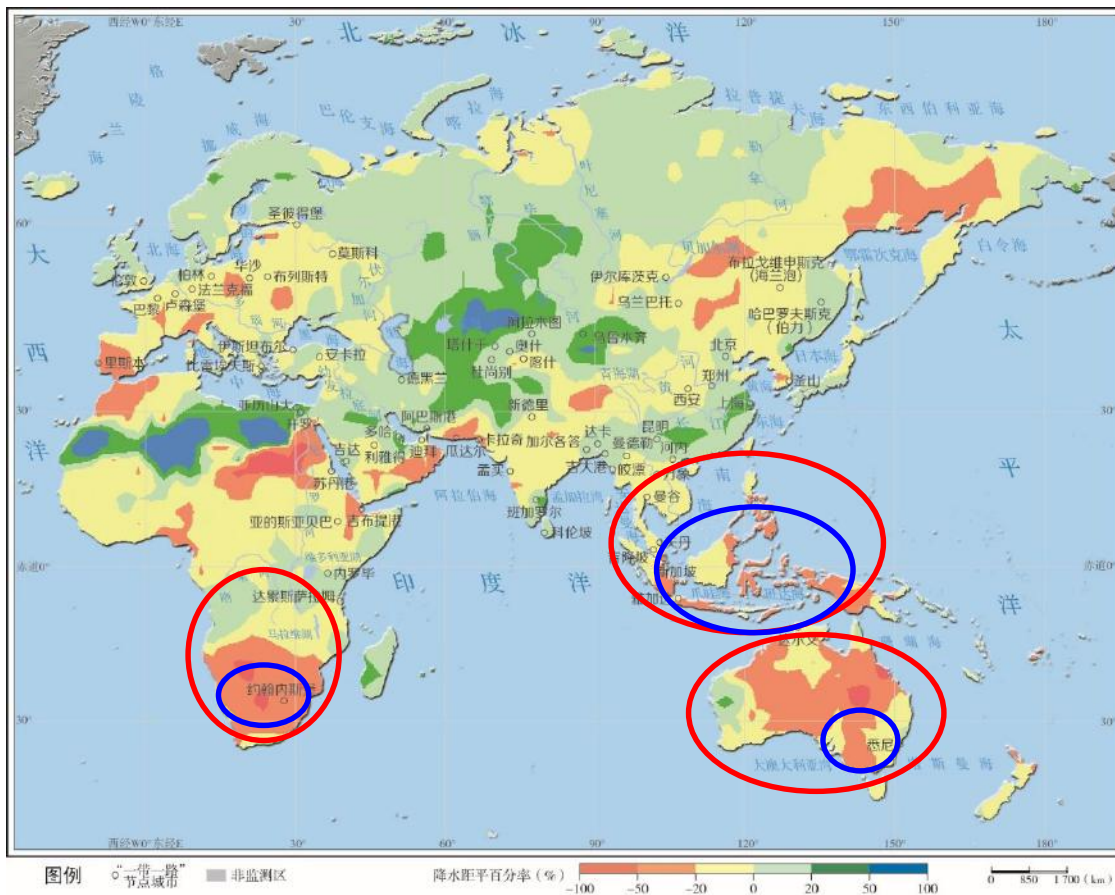


图例 ○ 一带一路节点城市 ■ 非监测区 水分盈亏量 (mm) -1000 -800 -600 -400 -200 -50 50 200 400 600 800 1000 2000 3000 0 850 1700 (km)

Distribution of regional water budget in 2015

The effects of el Niño events on regional water budget

- ✓ The 2015 super el Niño event resulted in significantly reduced precipitation and severe drought:
- ✓ Annual precipitation less on average by 20.5%, 14.7% and 12.1% in Oceania, southeast Asia and southern Africa.
- ✓ Precipitation less by 35.9%, 21.3% and 35.9% in orange river in southern Africa, southeast Asia, Malaysia and Australia the Murray-darling river basin.



Distribution of precipitation anomaly percentage in 2015



Outline of the report

- 1. Background and significance**
- 2. Overall technical route and method**
- 3. Main contents of the report**
- 4. conclusion**

4. Conclusion

- 1. The regional total biomass of forest reaches up to 281.3 billion tons. The rain forest in southern Africa and southeast Asia area, around the equator, are the two main global forest carbon sink area. In 2015, the el Niño event led to a severe agriculture and grass drought, with significant impacts on food production and livestock production.**
- 2. In the desert oasis and the intensive agricultural irrigation area, the atmospheric precipitation cannot meet the demand of the water consumption of the farmland evapotranspiration.**
- 3. The spatial distribution of solar energy resources in the areas is uneven, mainly affected by latitude, terrain and cloud cover. The most suitable area for solar power generation are mainly distributed in the low latitude desert and sparse vegetation areas.**

Thank you very much!

