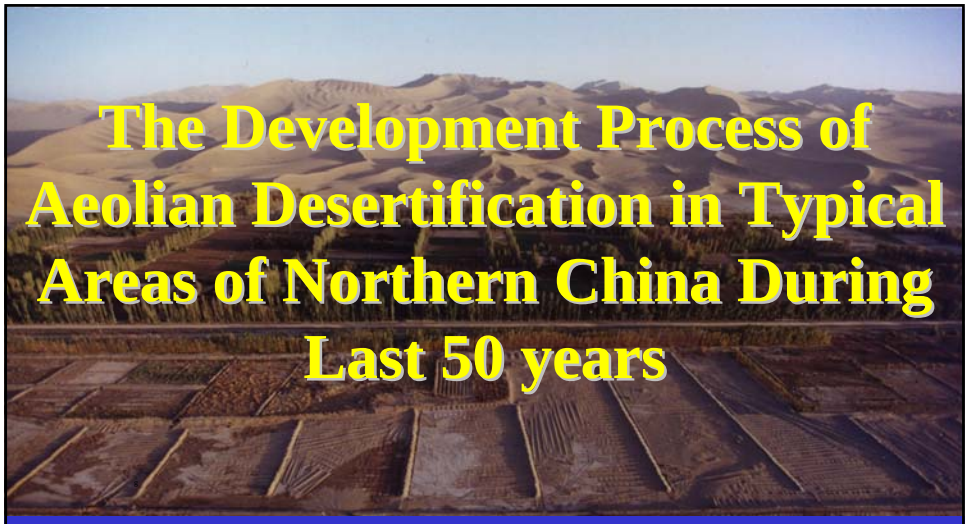

The Development Process of Aeolian Desertification in Typical Areas of Northern China During Last 50 years

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1. Introduction

Desertification is one of the most serious environmental and social-economic problem in the world today. Because rapid expansion of desertified land has resulted in economic loss, environmental degradation, locally instable political situation and social upheaval, it becomes a hot-spot issue of worldwide concern for last many decades.

United Nations Convention to Combat Desertification(UNCCD)

"desertification": ***land degradation in arid, semi-arid and dry sub-humid areas resulting from various factors, including climatic variations and human activities***

There were 263.62 x 10^4 km of desertified land , about 27.46% of country area of China in 2004.

"Desertification" through

- **Wind erosion- Aeolian desertification:183.94 x 10^4 km**
- **Water erosion- Soil & water loss: 25.93 x 10^4 km**
- **Salinization- Chemical process:17.38 x 10^4 km**
- **Frozen-melted - 36.37 x 10^4 km**

Wind erosion…

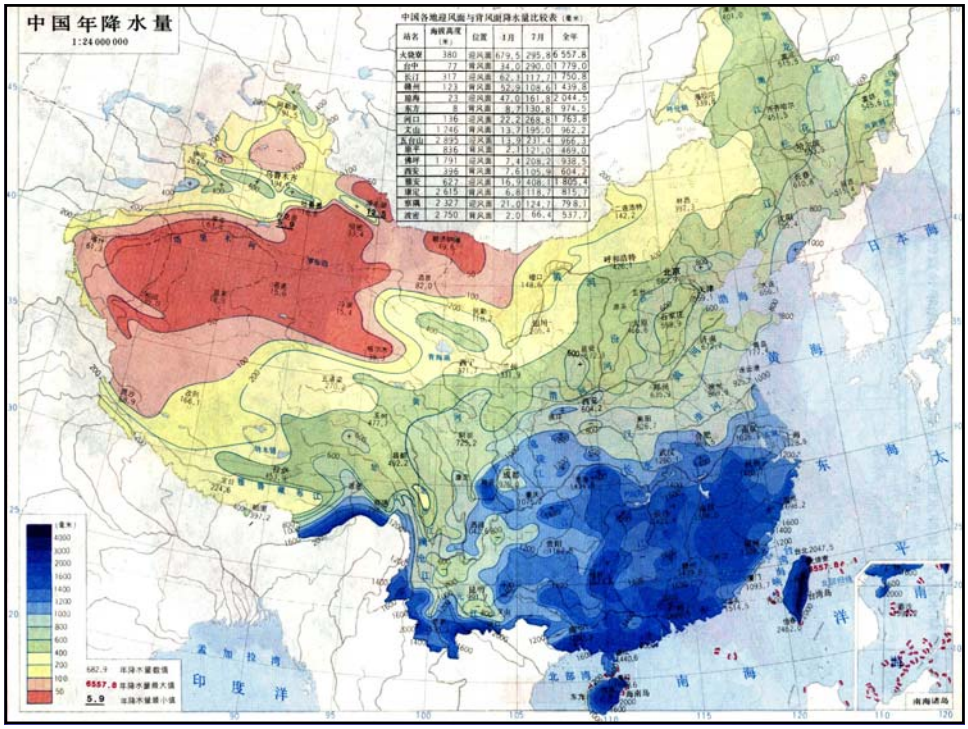
Water erosion…

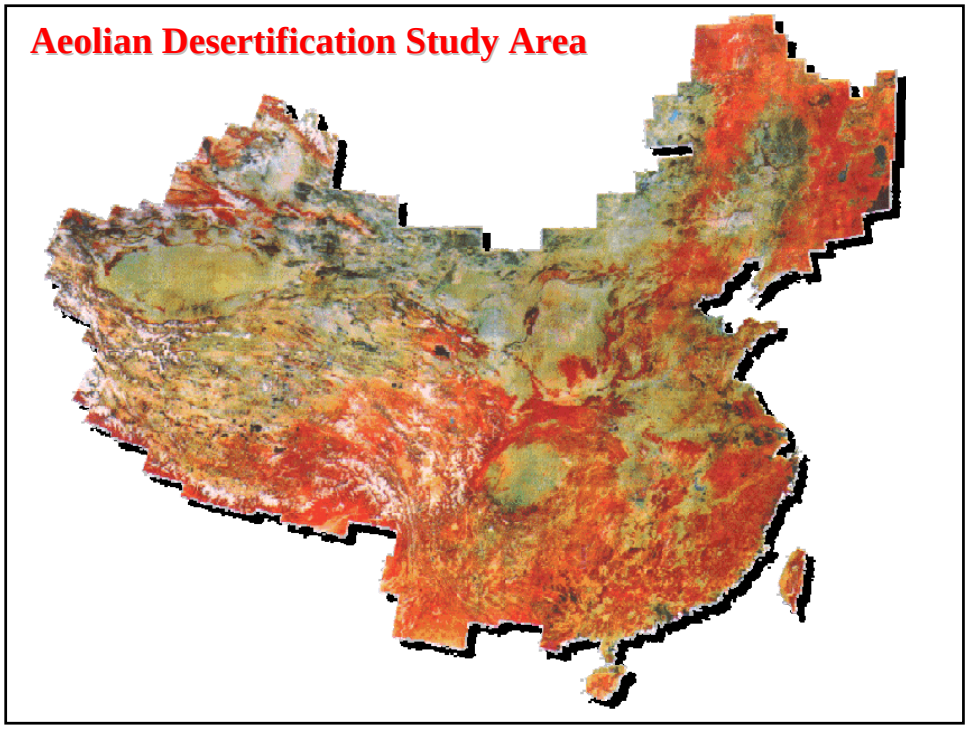
Salinization…

……

2. Situation of Aeolian Desertification in Northern China

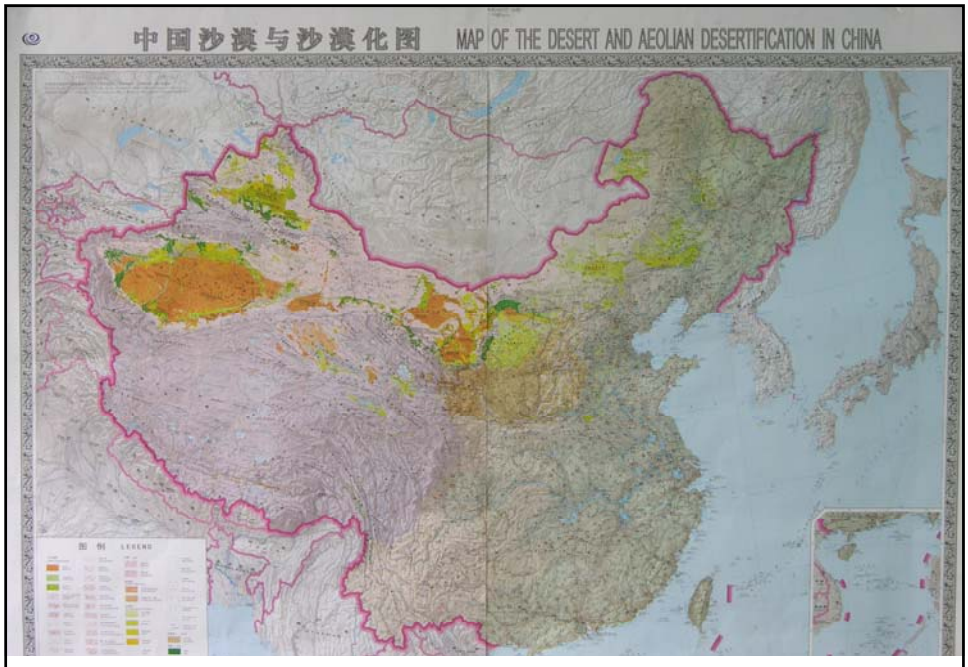
According to the actual situations in China, we defined the *aeolian desertification is land degradation through wind erosion mainly resulted from the human impacts in arid, semiarid and sub-humid regions of Northern China.*


中国年降水量
1:24 000 000
中国各地迎风面与背风面降水量比较表（毫米）
站名 海拔高度（米） 位置 1月 7月 全年
大连市 380 迎风面 679.5 295.8 6 557.8
台中 77 背风面 34.0 290.0 1 779.0
长江 317 迎风面 62.3 117.7 1 750.8
德州 123 背风面 52.0 108.6 439.8
福州 23 迎风面 47.0 161.8 2 044.5
东方 8 背风面 8.7 130.8 974.5
河口 136 迎风面 22.2 268.8 1 763.8
天山 1 746 背风面 13.7 195.0 962.2
天台山 2 835 迎风面 13.9 231.4 356.2
腾平 836 背风面 2.3 121.0 469.0
通河 1 791 迎风面 7.4 208.2 938.5
西安 396 背风面 7.6 105.9 604.2
雅安 622 迎风面 16.9 408.1 1 809.4
伊宁 2 615 背风面 6.8 118.7 815.7
察隅 2 327 迎风面 21.0 124.7 798.1
武定 2 750 背风面 2.0 66.4 537.7
印度洋
南海诸岛


Aeolian Desertification Study Area

Aeolian desertified land in typical regions of Northern China in 2000（km^2）

Region	Monitoring area	Potential to slightly desertified land	Moderately desertified land	Severely desertified land	Very severely desertified land	Total aeolian desertified land	Percent of total monitoring area
Hulun Bair sandy land	83615.0	17890.00	852.00	1990.00	161.00	20893.00	25.0%
Songneng sandy land	51588.0	1909.76	1386.25	460.43	8.94	3765.00	7.3%
Horqin sand land	105603.8	30669.32	9008.79	5815.42	4673.99	50167.52	47.5%
Xilin Gol Meng	181309.8	20999.21	11300.09	7274.83	5595.37	45169.49	24.9%
Ulaqab Meng	60967.9	9079.36	3782.65	278.44	41.57	13182.02	21.6%
Bashang Region	46013.0	7824.30	3680.73	1302.42	243.87	13051.33	28.4%
Hobq sandy land	87158.5	5214.02	13025.43	5705.72	2338.44	26283.59	30.2%
Mu Us sandy land	97352.0	20509.82	14333.78	7949.56	10679.33	53472.49	54.9%
Shiyang River Basin	120172.0	2243.32	3692.43	16704.70	10005.36	32645.81	27.2%
Heihe River Basin	202946.0	352.72	1568.20	2852.47	10090.82	14864.2	7.3%
Kumtag Region	172731.0	2594.94	4341.53	1823.95	325.14	9085.56	5.3%
3-rivers source area	89996.0	7728.00	2586.00	1314.00	1377.00	13005.00	14.5%
Qaidam Region	446562.7	3008.38	11170.07	2835.49	2606.50	19620.44	4.4%
North part of Xinjiang	272552.0	5715.39	13609.29	12948.15	9046.60	41319.43	15.2%
Middle part Xinjiang	158843.0	2238.78	2502.04	4397.90	6552.30	15691.02	9.9%
South part of Xinjiang	386651.0	1290.28	2929.70	5437.88	3813.08	13470.94	3%
Total monitoring area	2564062.0	139267.60	99768.98	78508.85	79091.35	385686.80	15.0%

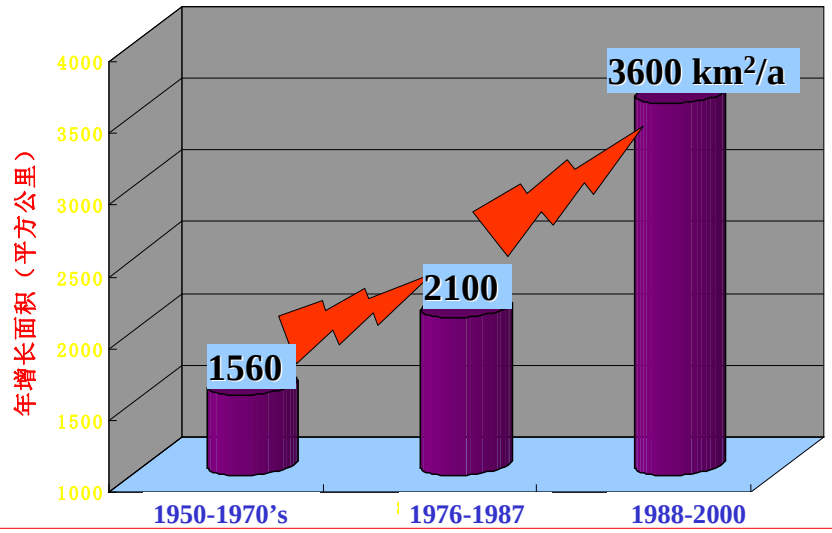


Desert and aeolian desertified land 1,740,000 km^2

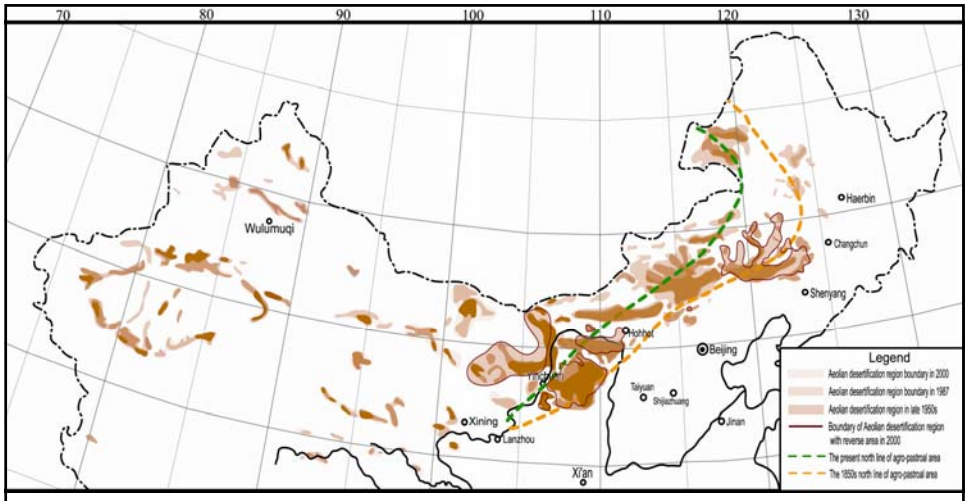
Developed trends in typical aeolian desertified regions in Northern China（km²）

Region	1975			1987			2000		
	Monitoring Area	Desertified Area	%	Monitor-Area	Desertified Area	%	Monitor area	Desertified Area	%
East part of reclamation district in Bashang Region	3471	762.3	21.9	3471	1336.6	38.5	17715	2213.6	12.5
West part of reclamation district in Bashang Region	13833	1761.7	12.7	13833	3272	23.6	13803	4756.8	34.5
Reclamation district and grazing area in Qahar grassland	9056	2848.3	31.5	9056	5992.9	66.1	28957.7	14148.2	48.9
Horqin Sandy Land region	155573	51384	48.7	105573	61008	57.8	105604	50198	47.5
Houshan grassland grazing area and reclamation regions	46660	10476.4	22.5	46660	18121.2	38.8	60968	13182.1	21.6
Ordos grassland in Ih Ju Meng	49112.4	43407	88.3	49112.4	45973	93.6	64453	45751.4	80.1
Shenmu, Hengshan, Jingbian ,Dingbian regions	18046.4	7808	43.3	18046.4	8166.9	45.3	23547	8221.7	34.9
Southwest part (Yanchi) of Ordos grassland	6761.2	1368.9	20.2	6761.2	1845.5	27.3	6744	3495	51.8
Lower reach of Heihe River in west Alxa desert	16200	3480	21.5	16200	5955	36.8	82596.3	11435	13.8
Piedmont Plain of Kunlun Mt in Qai dam Basin.	7920	4400	55.5	7920	5573	70.4	74360.4	8694	11.7

Aeolian desertified land expanded rate during last 50 years



Between 2000 and 2004, there were 6416 km² of aeolian desertified land decreased, annually -1280 km²



Map of the Aeolian Desertified Land in Different Period of 1950s,1987 and 2000 in Northern China.

The green line stand for the north-limitation of agro-pastoral ecotones around 1760 and the yellow one stand for 2000.

3. Causes of Aeolian Desertification

Aeolian desertification occurred especially during last 100 years in Northern China.

The change of natural condition, especially the climate variation for last 100 years was insufficient to cause obvious environmental change, while the rapidly increased population pressure, and the land-use in the same period may greatly disturb and deteriorate the eco-environment.

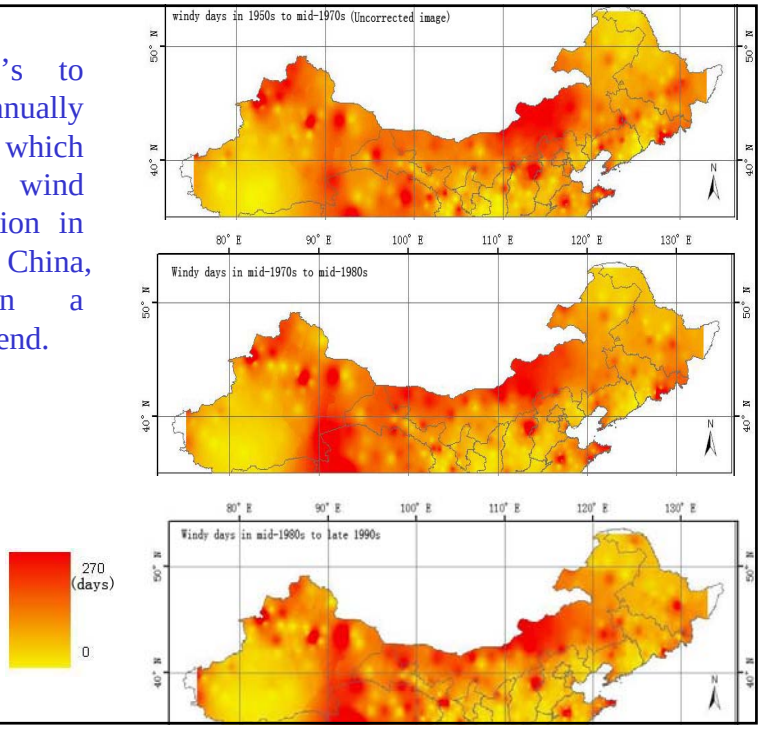
3.1 Natural factor

Adverse natural conditions: make the eco-environment quite fragile

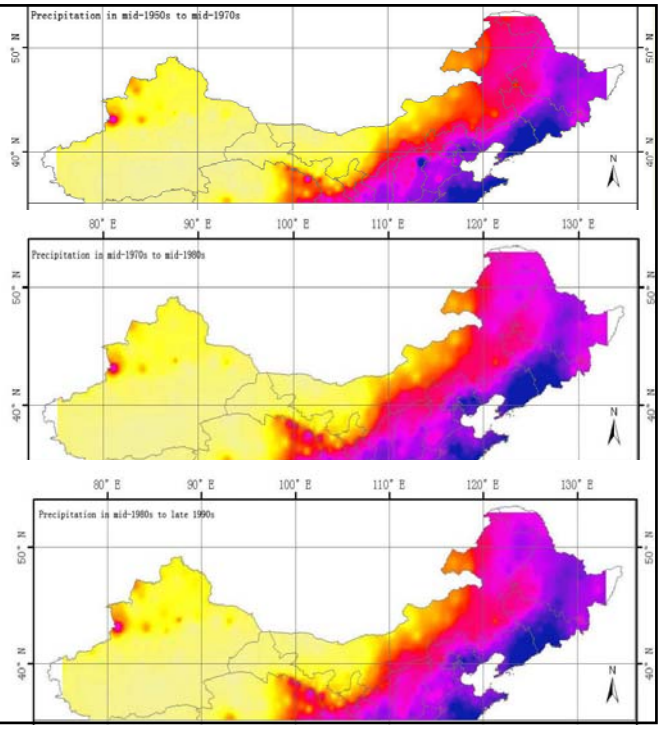
- **Rainfall < 400 mm**
- **Wind erosion**
- **Global Change**
- **Low land capacity, productivity**

The arid and semiarid climate has presented the basic conditions in favor of the aeolian desertification in Northern China

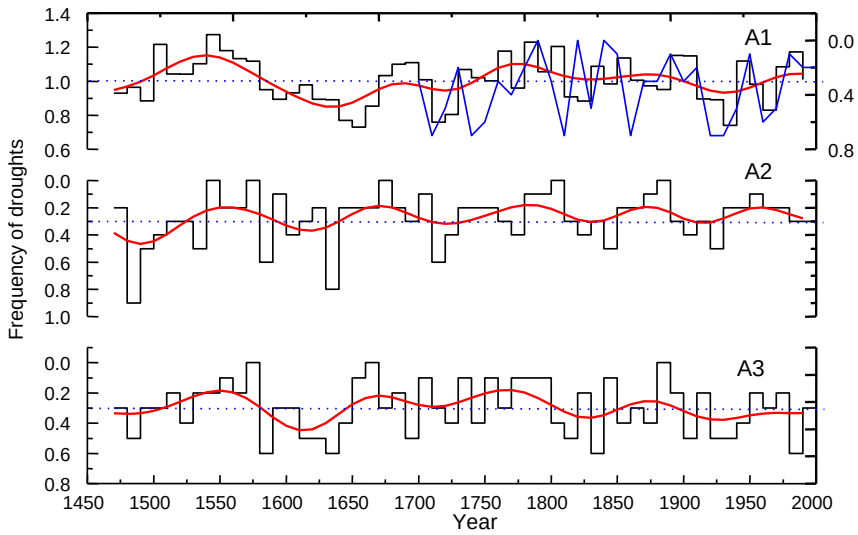
From 1950's to 2000, the annually windy days, which indicate the wind blown situation in the Northern China, had shown a decreasing trend.



There were no obvious change in precipitation in Northern China since 1950 to 2000.



rainfall macula



Decadal proxy records reflecting precipitation fluctuations in the Northern China for the last 500 years.

The A1, A2, and A3 represent drought-frequency anomalies of the Hexi region, the western semiarid zone, and the eastern semiarid zone of China, respectively.

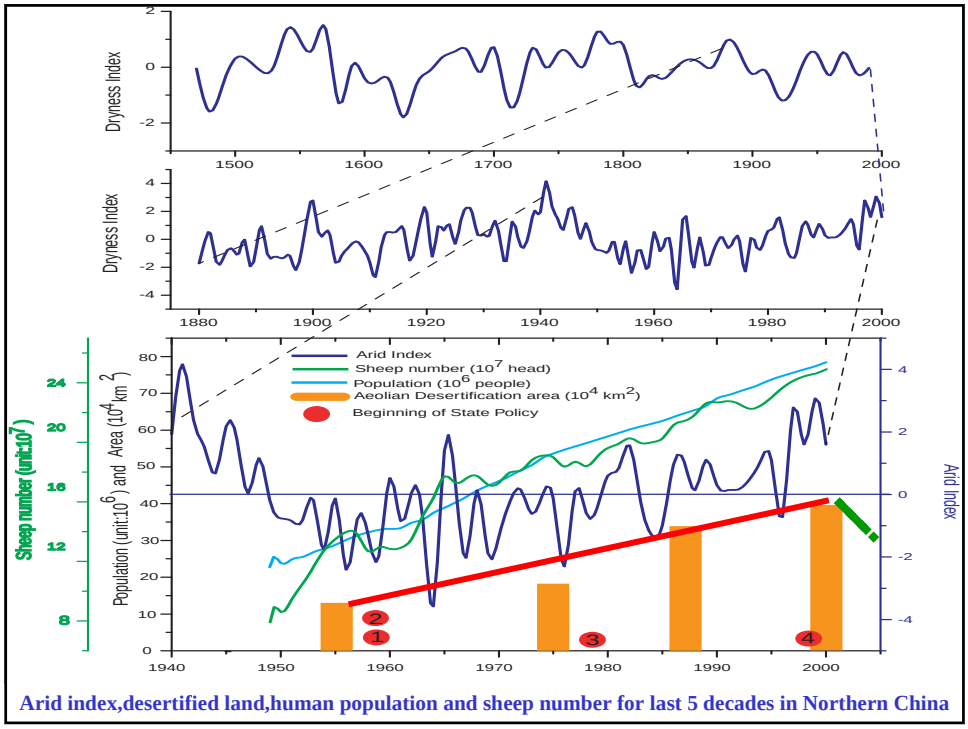
3.2 Human factors- Landuse

Human activity is much more active to aeolian desertification which mainly incarnates on the changes of the land-use and enhance of land-use intensity.

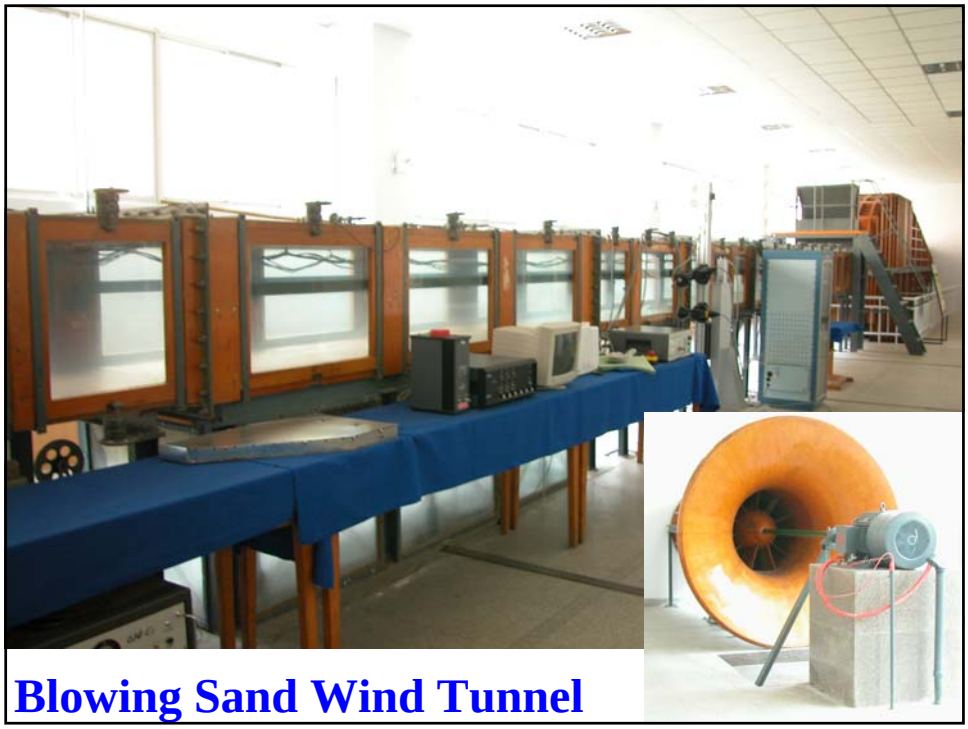
1) **Over-cultivation**
2) **Over-grazing**
3) **Over-cutting of fuel-wood**
4) **Misused water, others**

Causes of aeolian desertification from landuse in Northern China

Types causes	Area $\times 10^4 km^2$	Occupied the total desertified area (%)
over-cultivation	4.47	25.4
over-grazing	4.99	28.3
over-cutting	5.60	31.8
overuse of water	1.47	8.3
industrial construction	0.13	0.7
natural wind erosion	0.94	5.5

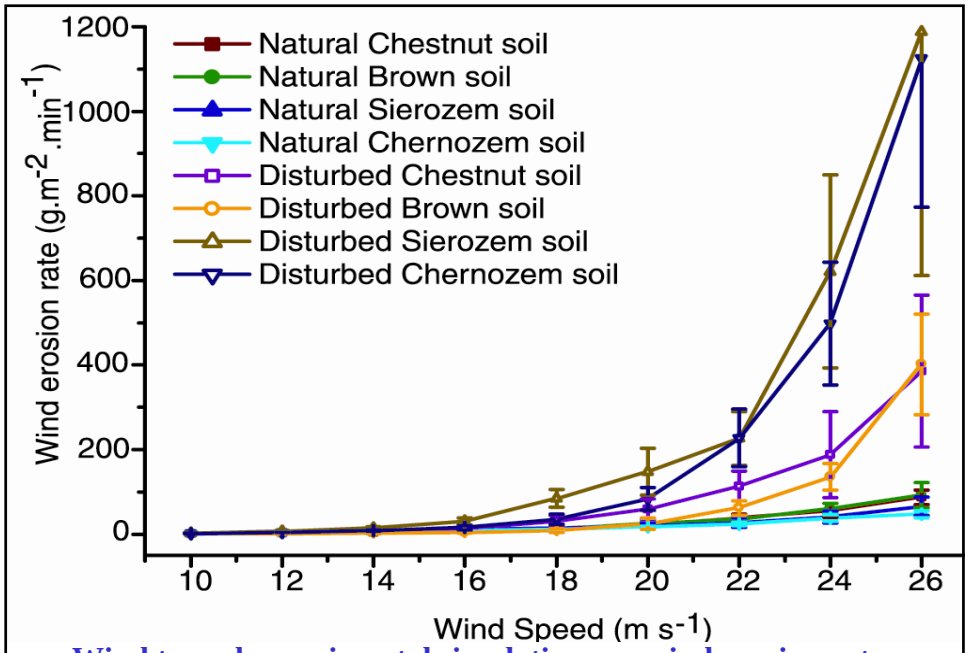


Arid index,desertified land,human population and sheep number for last 5 decades in Northern China

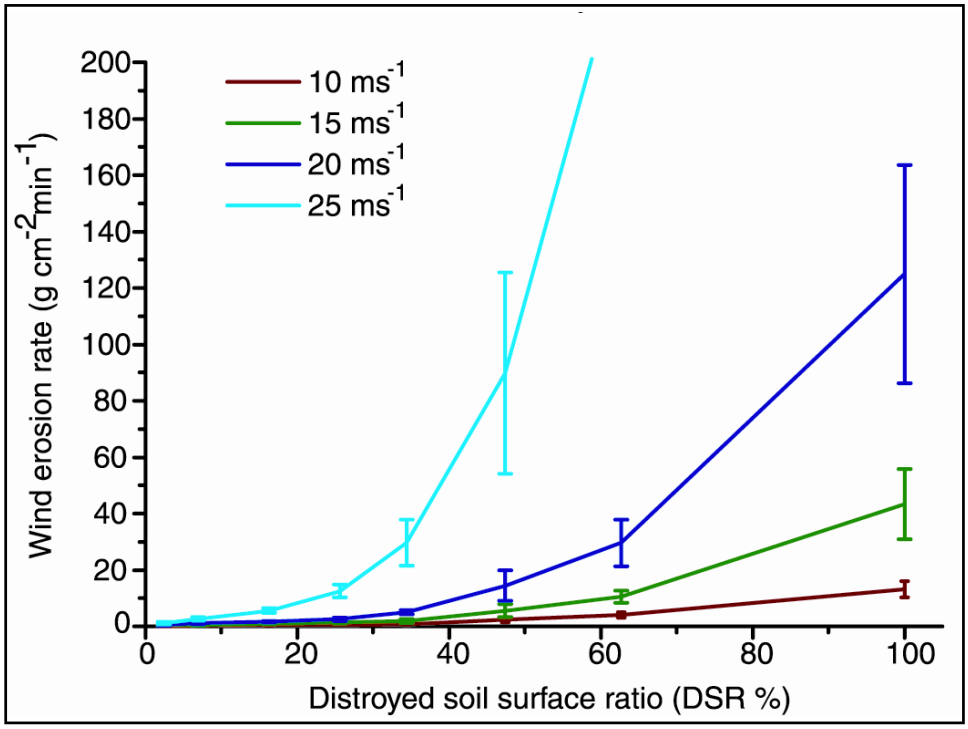


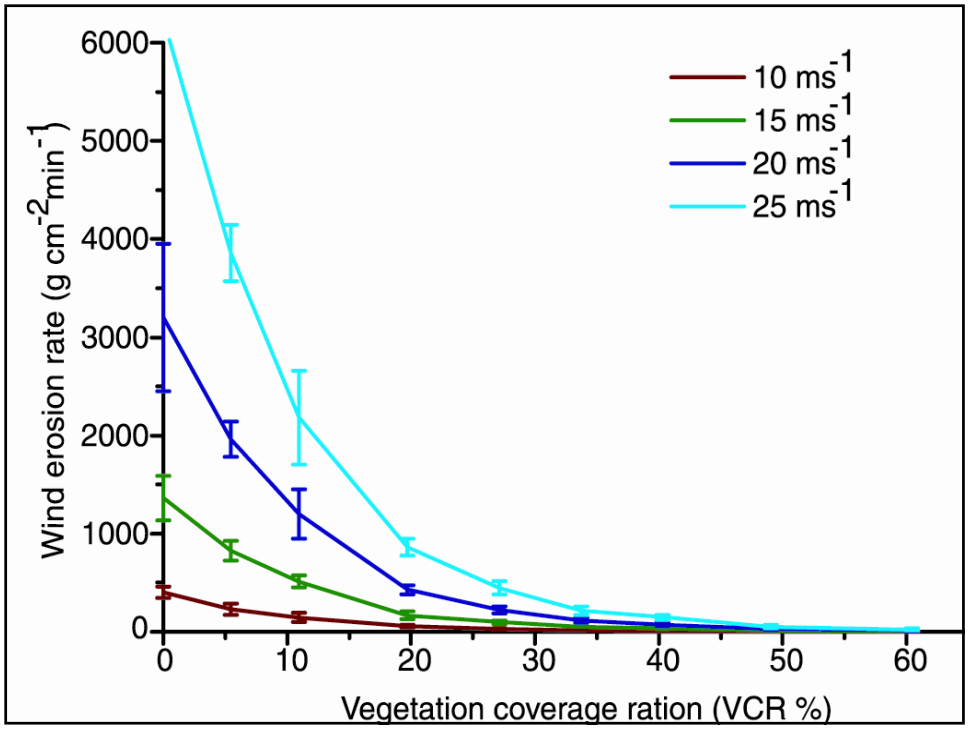
Blowing Sand Wind Tunnel

Take soil wind erosion as example, human impact can increased wind erosion at last by 4 times more contrasted with natural one. And the acceleration of degradation on soil nutrient, bio-diversity and biomass can be decreased by 3 to 10 times or more.



Wind tunnel experimental simulations on wind erosion rates of 4 kind of aeolian desertified soils in Northern China

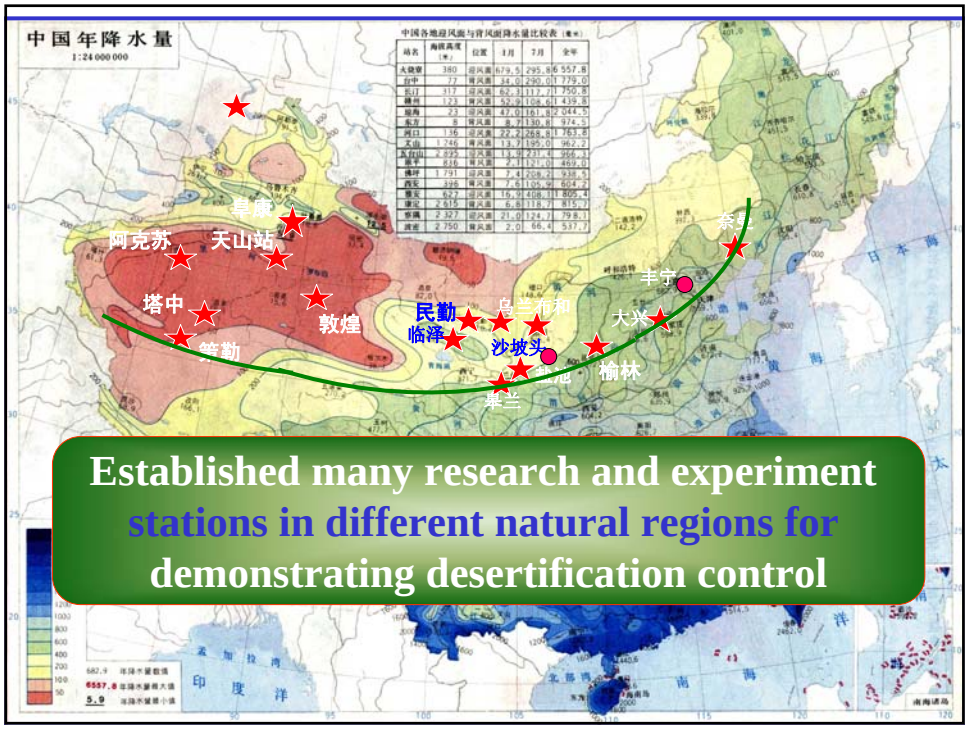

10 ms-1
15 ms-1
20 ms-1
25 ms-1
Wind erosion rate (g cm-2min-1)
Distroyed soil surface ratio (DSR %)
0
20
40
60
80
100
120
140
160
180
200


10 ms-1
15 ms-1
20 ms-1
25 ms-1
Wind erosion rate (g cm-2min-1)
Vegetation coverage ration (VCR %)
0
1000
2000
3000
4000
5000
6000
10
20
30
40
50
60

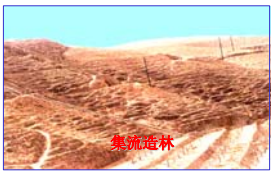
4. Aeolian Desertification Control

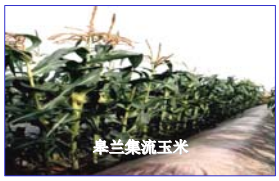
Many efforts have been emphasized on combating desertification to serve the economic construction in arid and semiarid regions since 1950's.

We try to obtain the unified objective of ecological--economic--social benefit during desertification control .

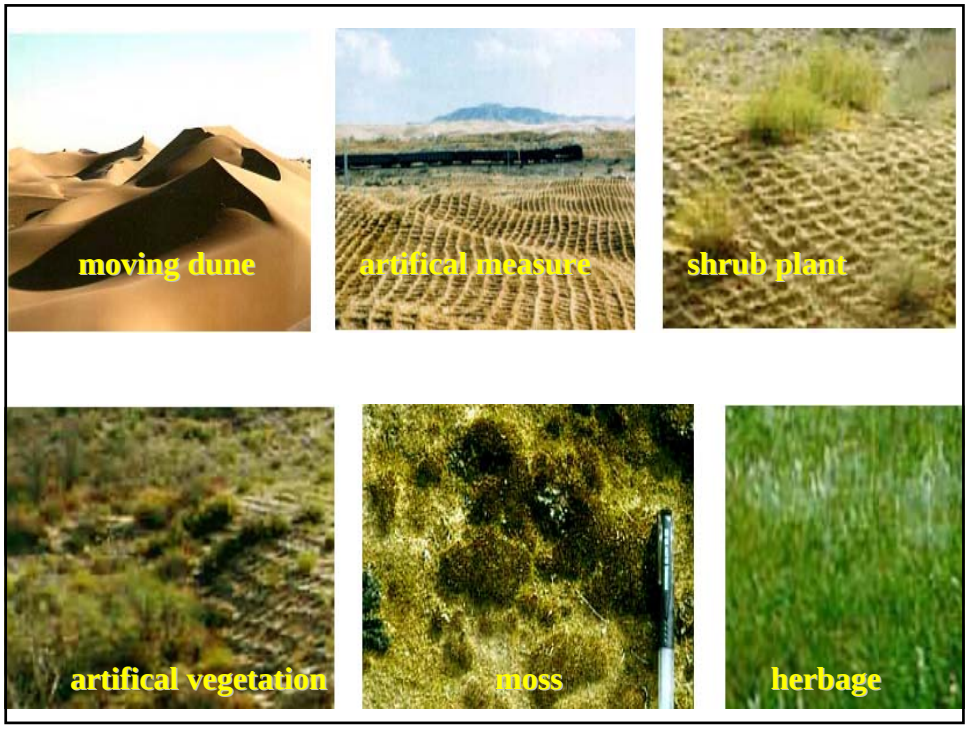


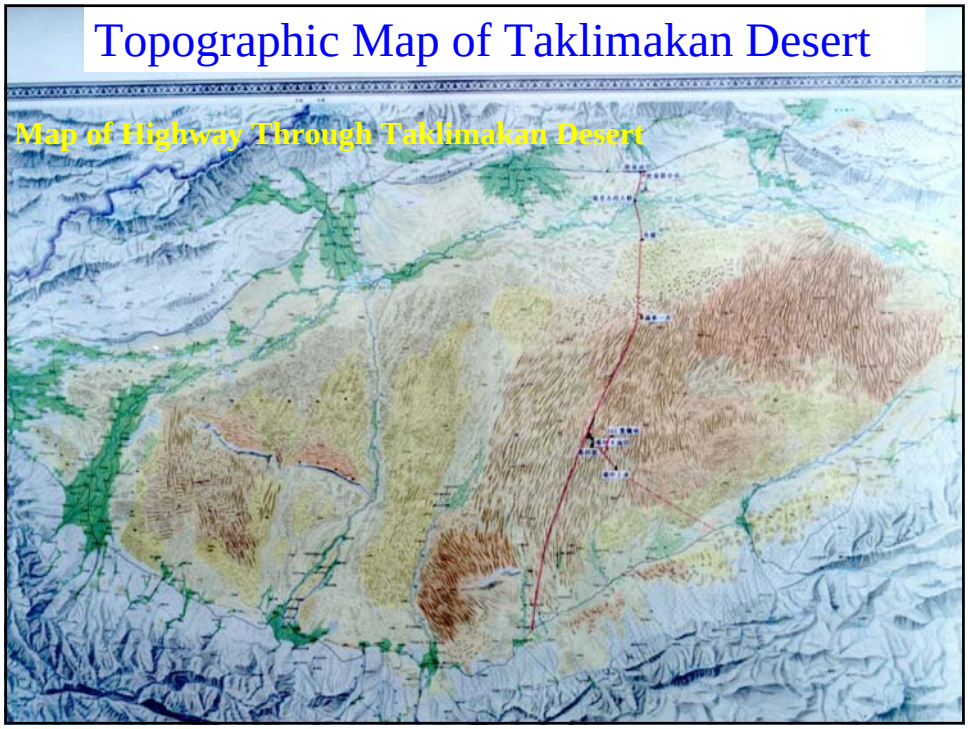
Some successful combating modes

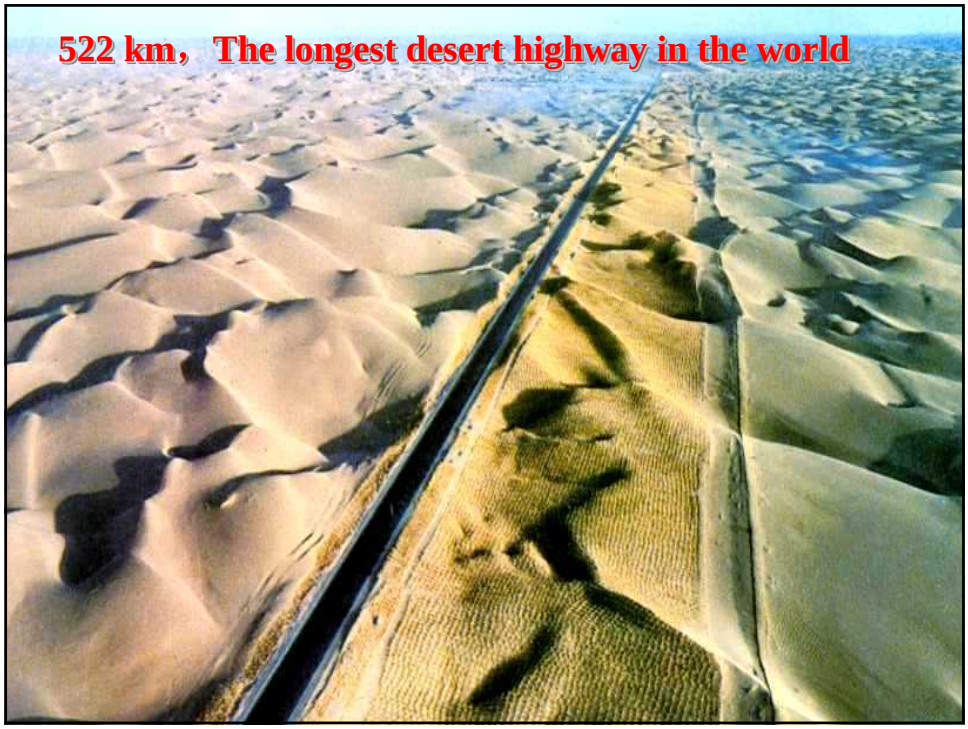





Yellow R.
1950's SP五十年代的沙坡头
Study on the evolution of vegetation and its driving mechanism in the region with less than 200mm rainfall


moving dune
artifical measure
shrub plant
artifical vegetation
moss
herbage


Topographic Map of Taklimakan Desert
Map of Highway Through Taklimakan Desert


522 km，The longest desert highway in the world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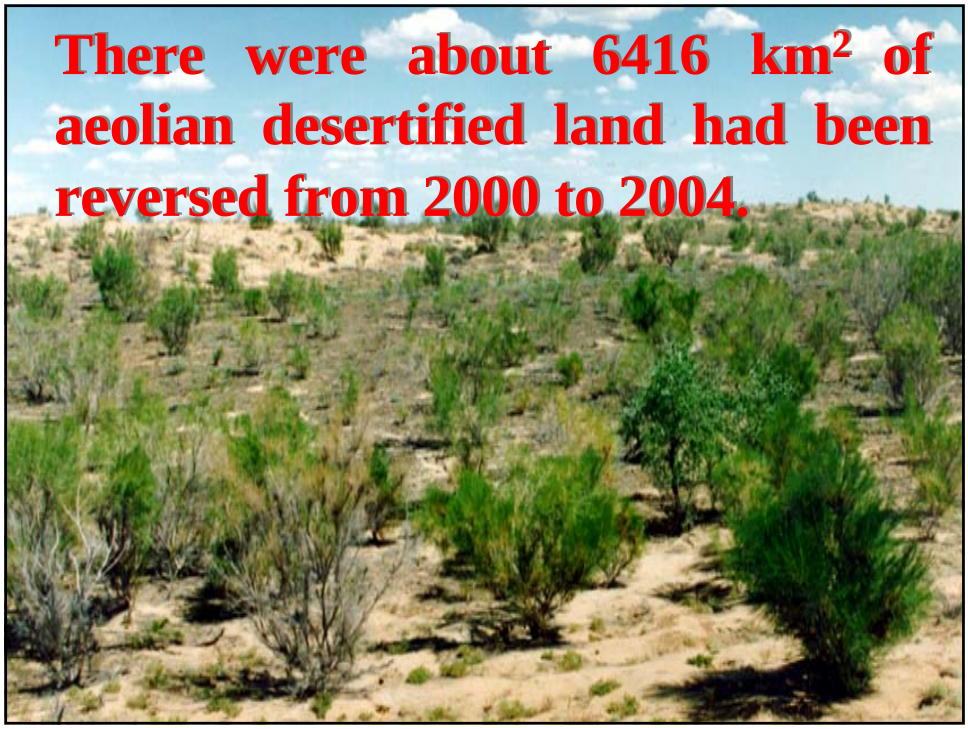
There were about 6416 km² of aeolian desertified land had been reversed from 2000 to 2004.


Thanks for your attention