

Climate Adaptation for Nature and People:

Biodiversity Conservation and Climate Change Adaptation in China

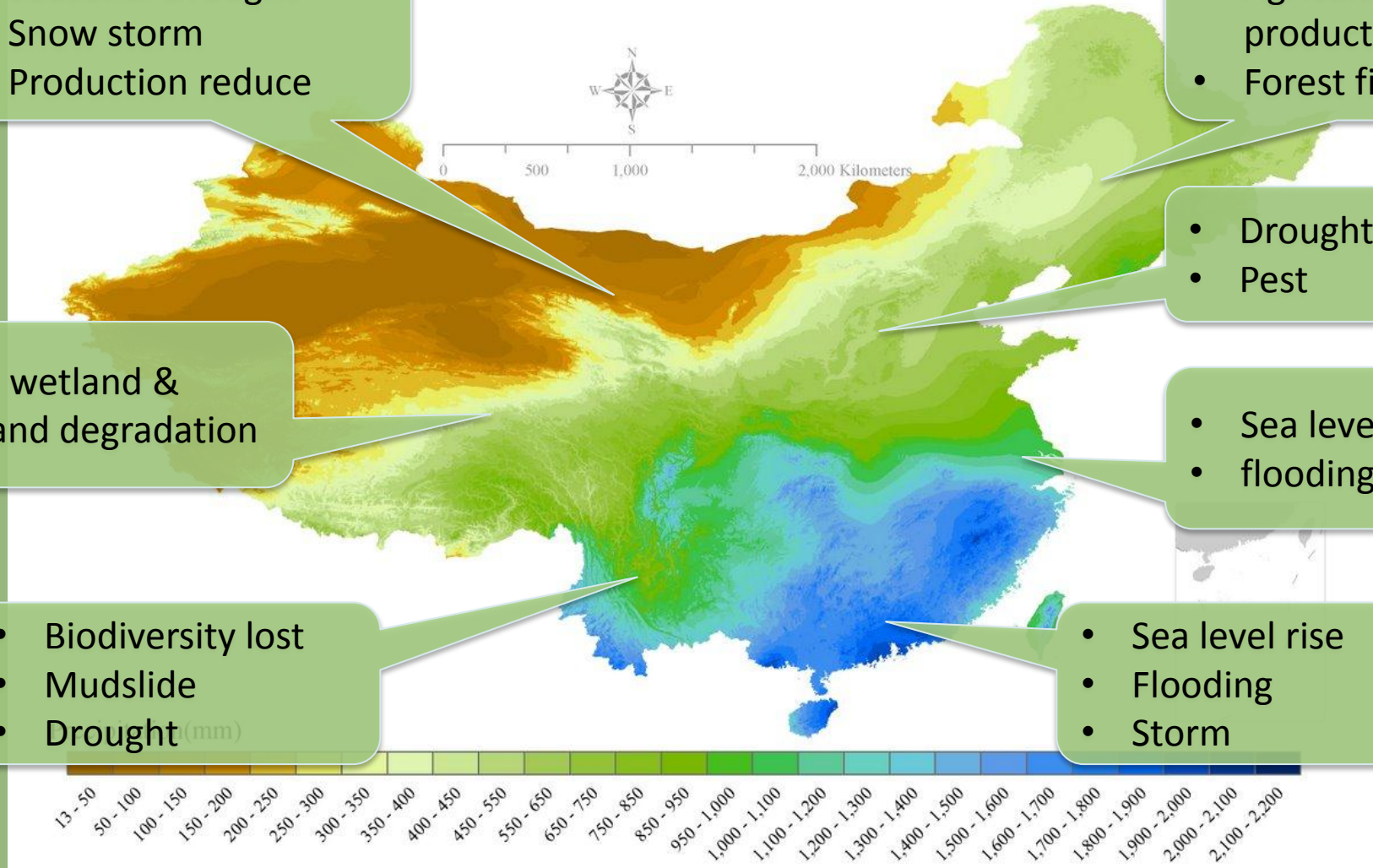


Major Climate Impact in China

- Glacier melting
- Seasonal Drought
- Snow storm
- Production reduce

- Wetland shrinking
- Agriculture production
- Forest fire risk

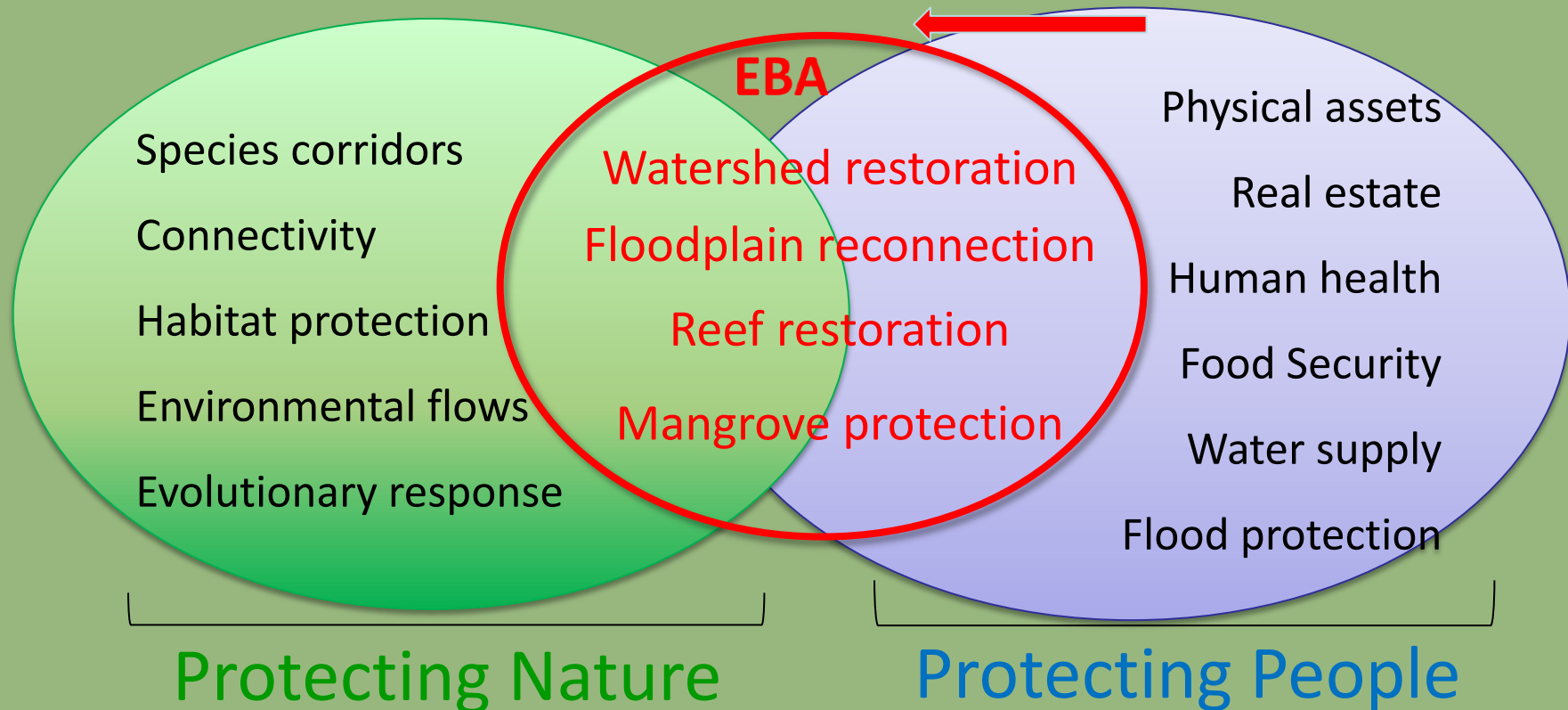
1961 - 1990



Climate Change Puts People at Risk

by altering systems and making vulnerable the lands, waters and natural resources on which the health and livelihood of the world depends

Currently: Adaptation in Water, Agriculture, food security > Biodiversity



Ecosystem Based Adaptation Processes in China

Climate Change

Climate change
trends

Impact on nature
and people

Resilient Nature

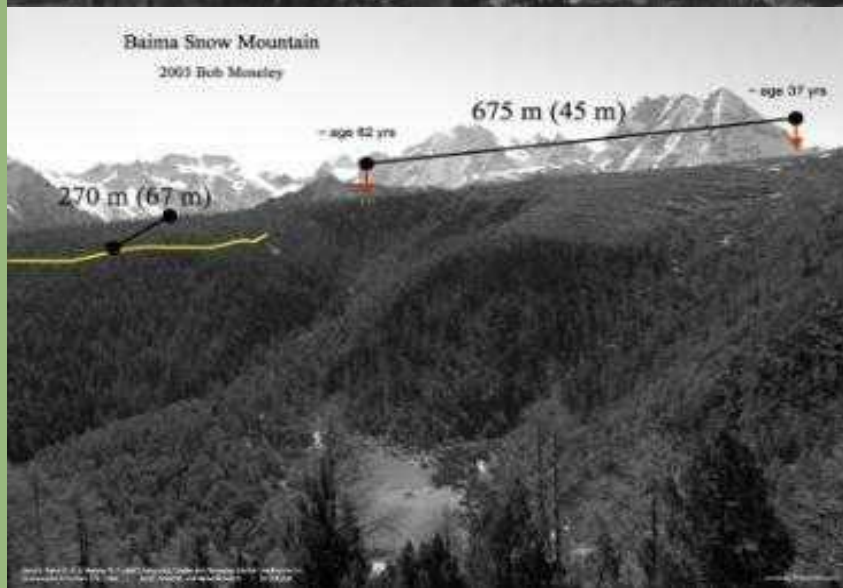
How to effectively
conserve nature
and enhance
resilience under
climate change?

Resilient People

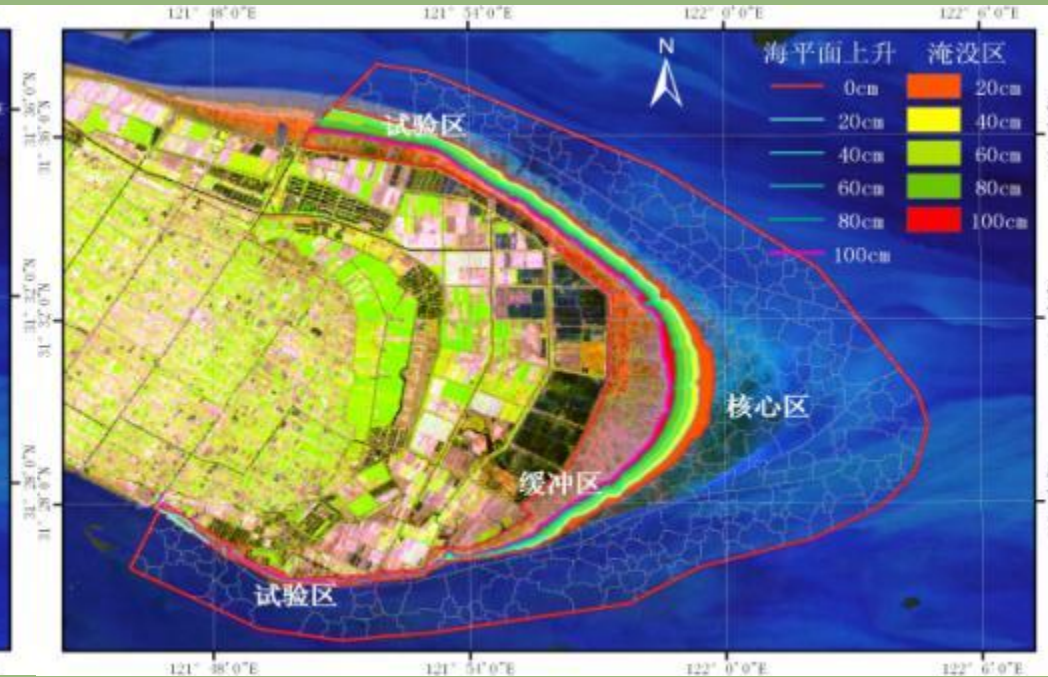
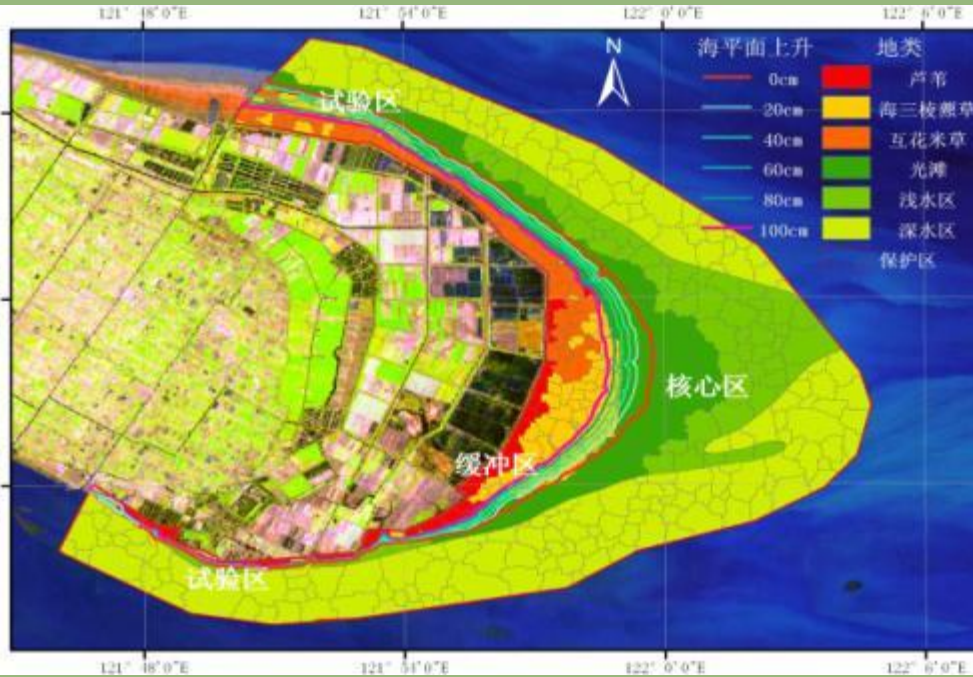
How to apply
**nature-based
solutions** to reduce
the reverse climate
change impacts on
people?

PAST work: Is biodiversity affected by climate change? How?

Observed Impact on Alpine system



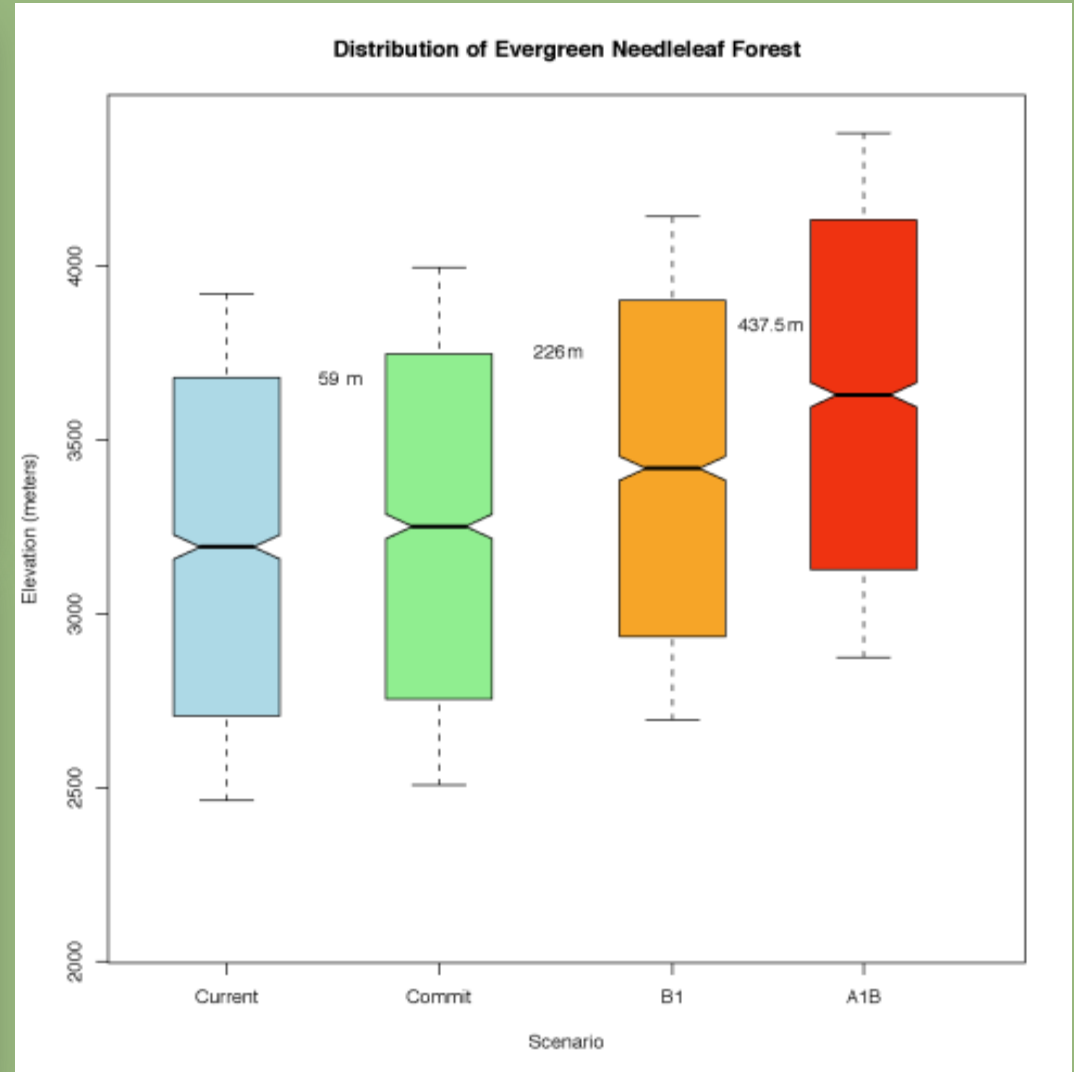
Projected sea level rise in Estuary of Shanghai



	Temp Chg. °C	Temp Chg. °C	Sea level rise (m)
Scenario	Best estimation	Interval	
B1	1.8	1.1 – 2.9	0.18 – 0.38
A1B	2.8	1.7 – 4.4	0.21 – 0.48
A2	3.4	2.0 – 5.4	0.23 – 0.51

Sea level rising	Flooded Area (ha)	Percentage of current Nature Reserve area
100 cm	2,771	48%
80 cm	2,244	39%
60 cm	1,703	30%
40 cm	1,166	20%
20 cm	641	11%

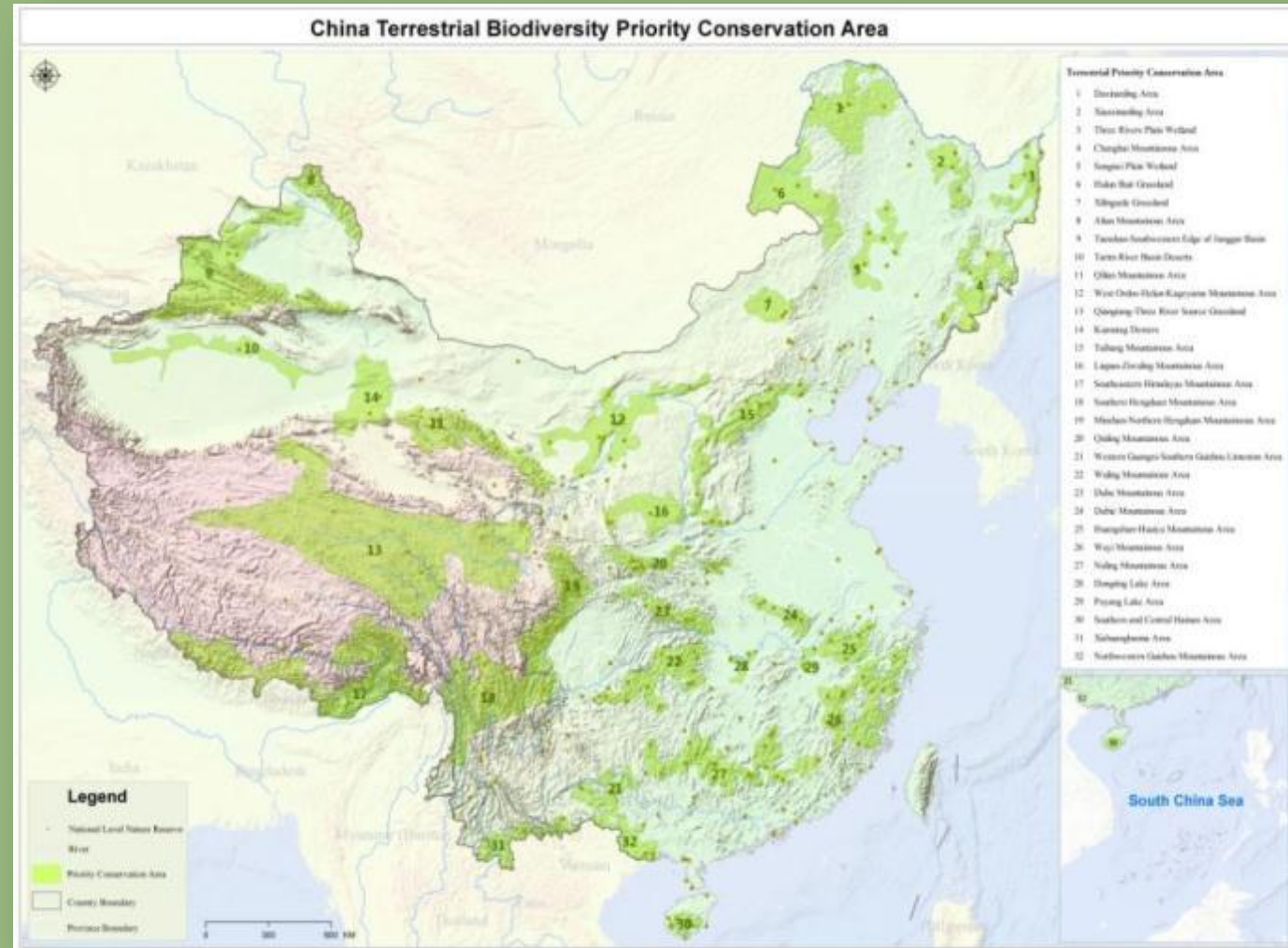
Projected impact on conifers and Golden Monkey



CURRENT work: Build up climate-resilient conservation network

China's 32 Priority Conservation Areas (PCAs)

National Biodiversity Strategy and Action Plan 2011-2030 (NBSAP) was released by State Council on Sept. 15, 2010, in which 32 Priority Conservation Areas (PCA) were identified.



CC impacts on China's 32 PCAs

temperature

precipitation

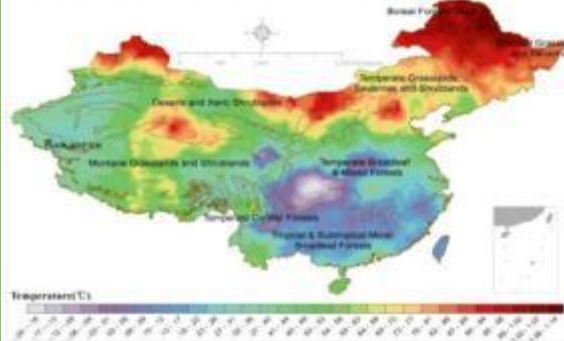
aridity

1961-2008

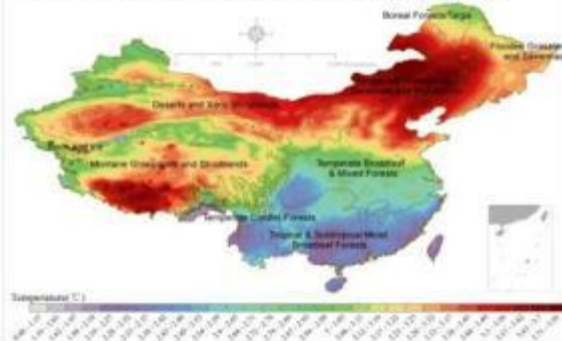
2000-2050

2000-2100

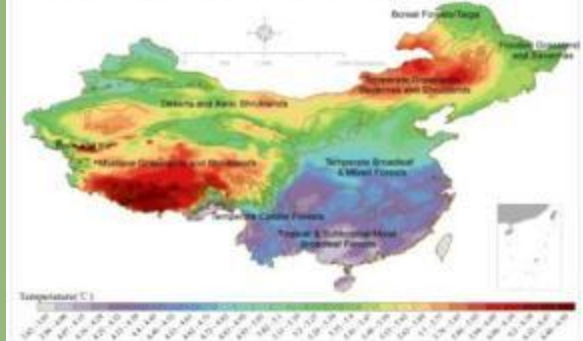
Temperature Change of Major Habitat Type, 1961- 1980 & 1980 - 2000



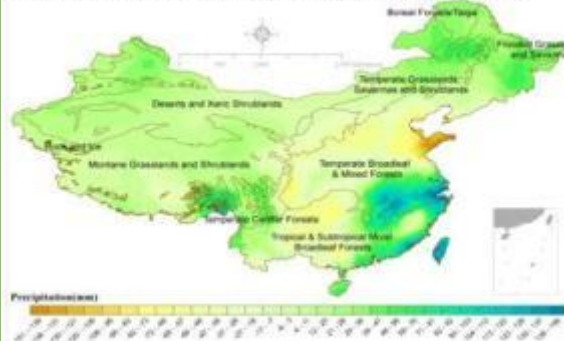
Annual Mean Temperature Change of Major Habitat Type, Baseline - 2050



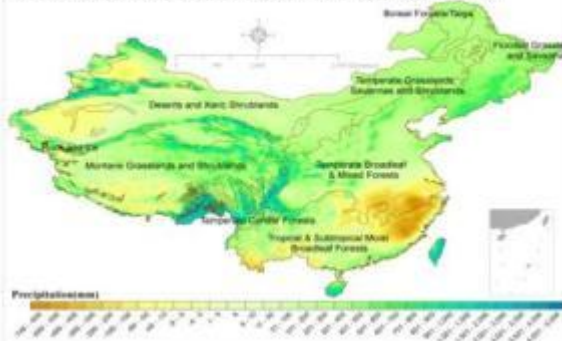
Annual Mean Temperature Change of Major Habitat Type, Baseline - 2100



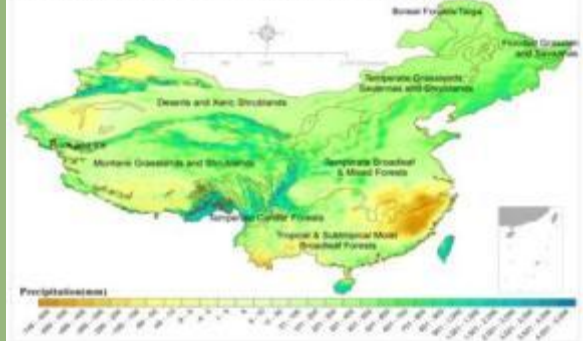
Precipitation Change of Major Habitat Type, 1961- 1980 & 1980 - 2000



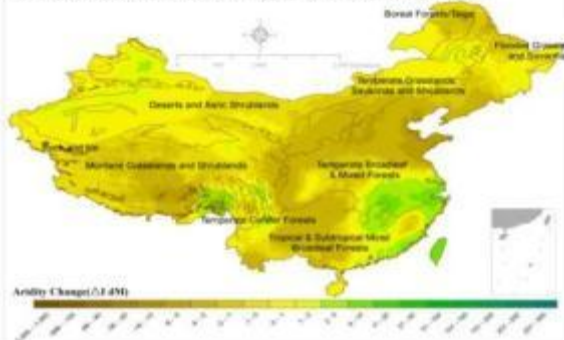
Annual Precipitation Change of Major Habitat Type, Baseline - 2050



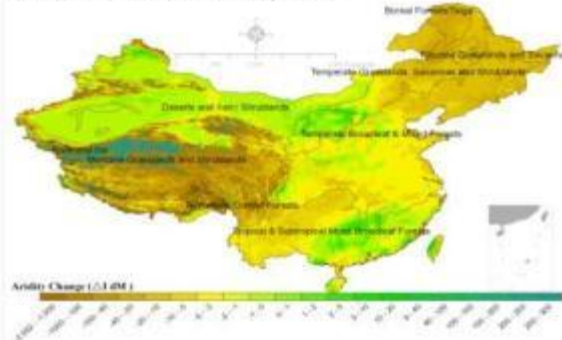
Annual Precipitation Change of Major Habitat Type, Baseline - 2100



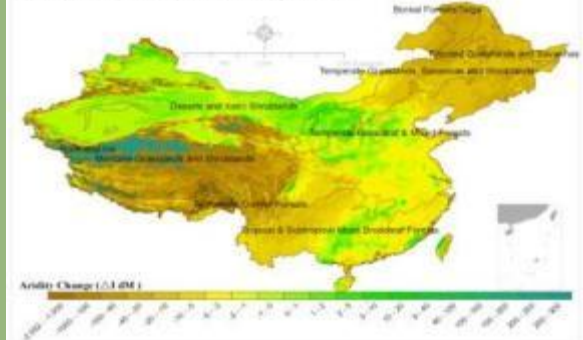
Aridity Change of Major Habitat Type, 1961 - 1980 & 1980 - 2000



Aridity Change of Major Habitat Types, 2050



Aridity Change of Major Habitat Types, 2100



CC impacts on China's 32 PCAs

temperature

precipitation

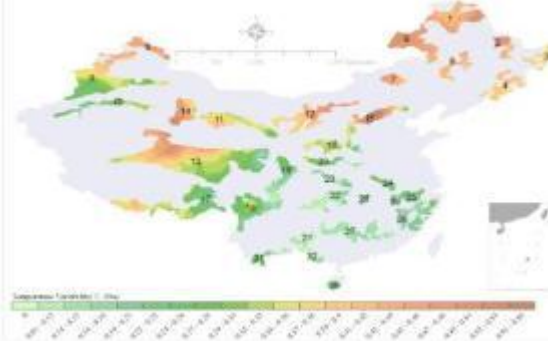
aridity

1961-2008

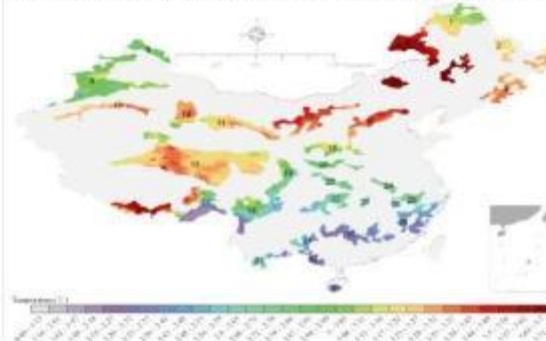
2000-2050

2000-2100

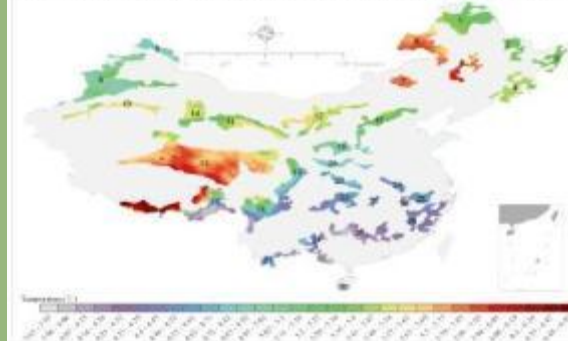
Annual Mean Temperature Variability of Priority Conservation Areas, 1961 - 2008



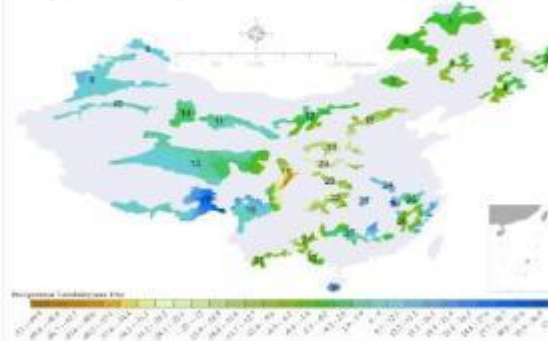
Annual Mean Temperature Change of Priority Conservation Area, Baseline - 2050



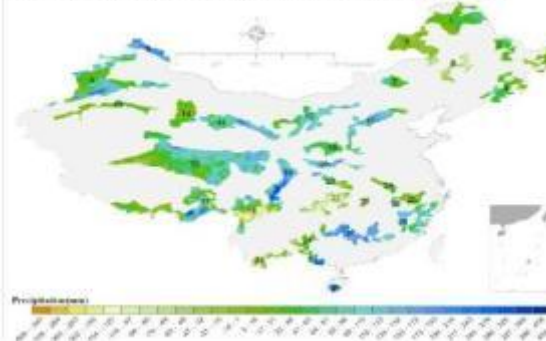
Annual Mean Temperature Change of Priority Conservation Area, Baseline - 2100



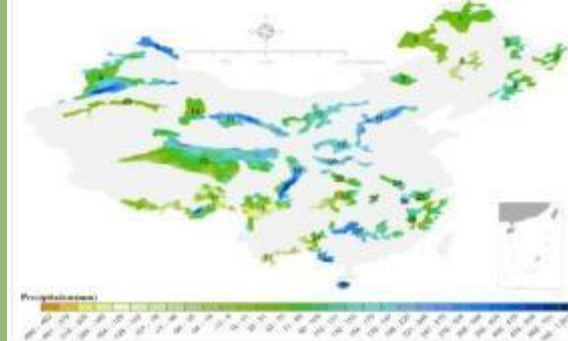
Precipitation Variability of Priority Conservation Areas, 1961 - 2008



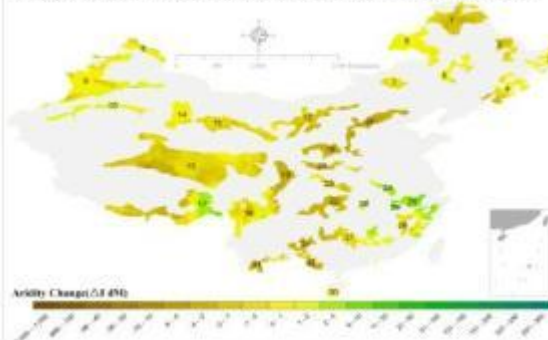
Annual Precipitation Change of Priority Conservation Area, Baseline - 2050



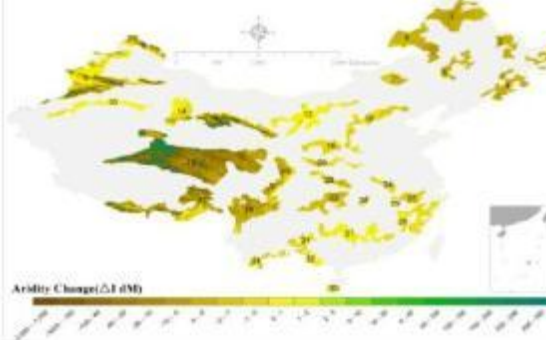
Annual Precipitation Change of Priority Conservation Area, Baseline - 2100



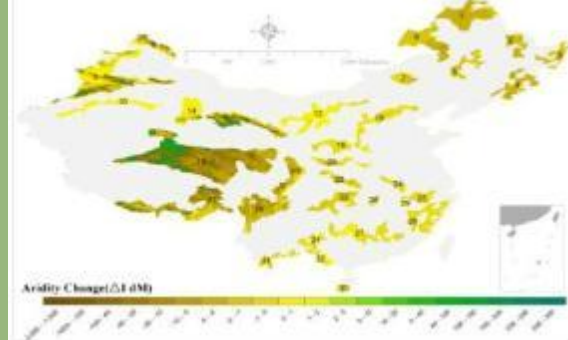
Aridity Change of Priority Conservation Areas, 1961 - 1980 & 1980 - 2008



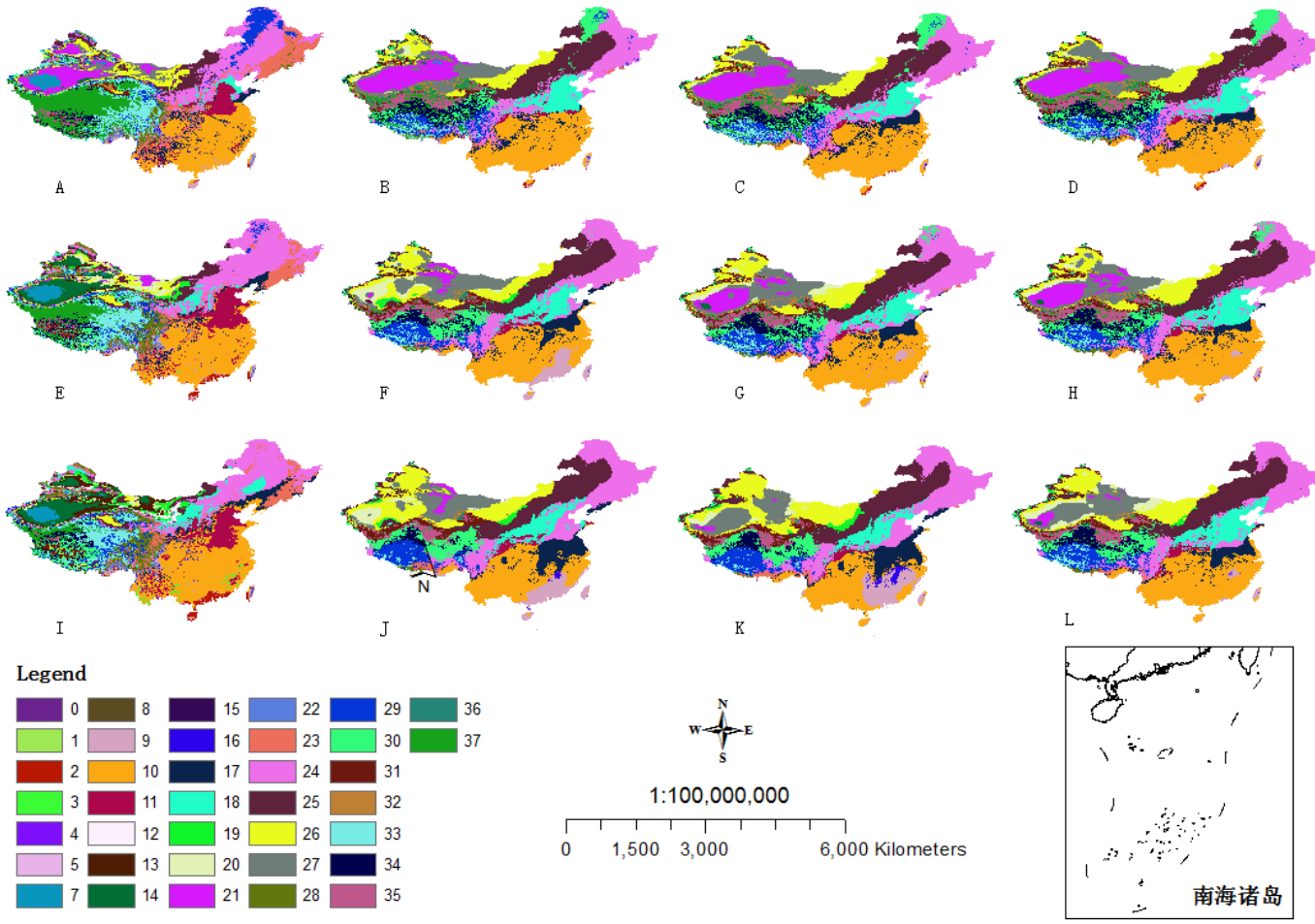
Aridity Change of Priority Conservation Areas, Baseline - 2050



Aridity Change of Priority Conservation Areas, Baseline - 2100



CC impacts on China's 32 PCAs



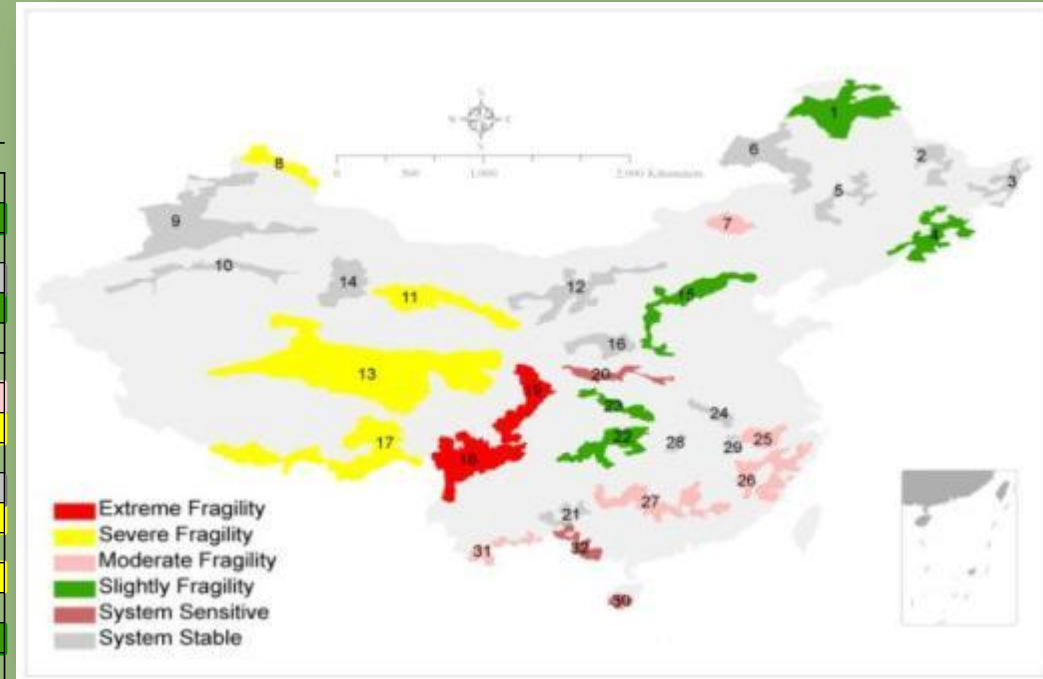
Value	zone_name	value	zone_name
0	Tropical rain forest	19	Warm temperate thorn scrub
1	Tropical wet forest	20	Warm temperate desert scrub
2	Tropical moist forest	21	Warm temperate desert
3	Tropical dry forest	22	Cool temperate rain forest
4	Tropical very dry forest	23	Cool temperate wet forest
5	Tropical thorn woodland	24	Cool temperate moist forest
6	Tropical desert scrub	25	Cool temperate steppe
7	Tropical desert	26	Cool temperate desert scrub
8	Subtropical rain forest	27	Cool temperate desert
9	Subtropical wet forest	28	Boreal rain forest
10	Subtropical moist forest	29	Boreal wet forest
11	Subtropical dry forest	30	Boreal moist forest
12	Subtropical thorn woodland	31	Boreal dry scrub
13	Subtropical desert scrub	32	Boreal desert
14	Subtropical desert	33	Subpolar rain tundra
15	Warm temperate rain forest	34	Subpolar wet tundra
16	Warm temperate wet forest	35	Subpolar moist tundra
17	Warm temperate moist forest	36	Subpolar dry tundra
18	Warm temperate dry forest	37,38,39	Polar desert

Holdridge life zone projections based on A1B scenario of RegCM3 and A1B,A2,B2 of PRECIS

RegCM3:(A,E,I);PRECIS:(B,C,D,F,G,H,J,K,L);Present:(A~D);2050S:(E~H);2100S:(I~L);A1B:(A,B,E,F,I,J);A2:(C,G,K);B2:(D,H,L)

CC impacts on China's 32 PCAs

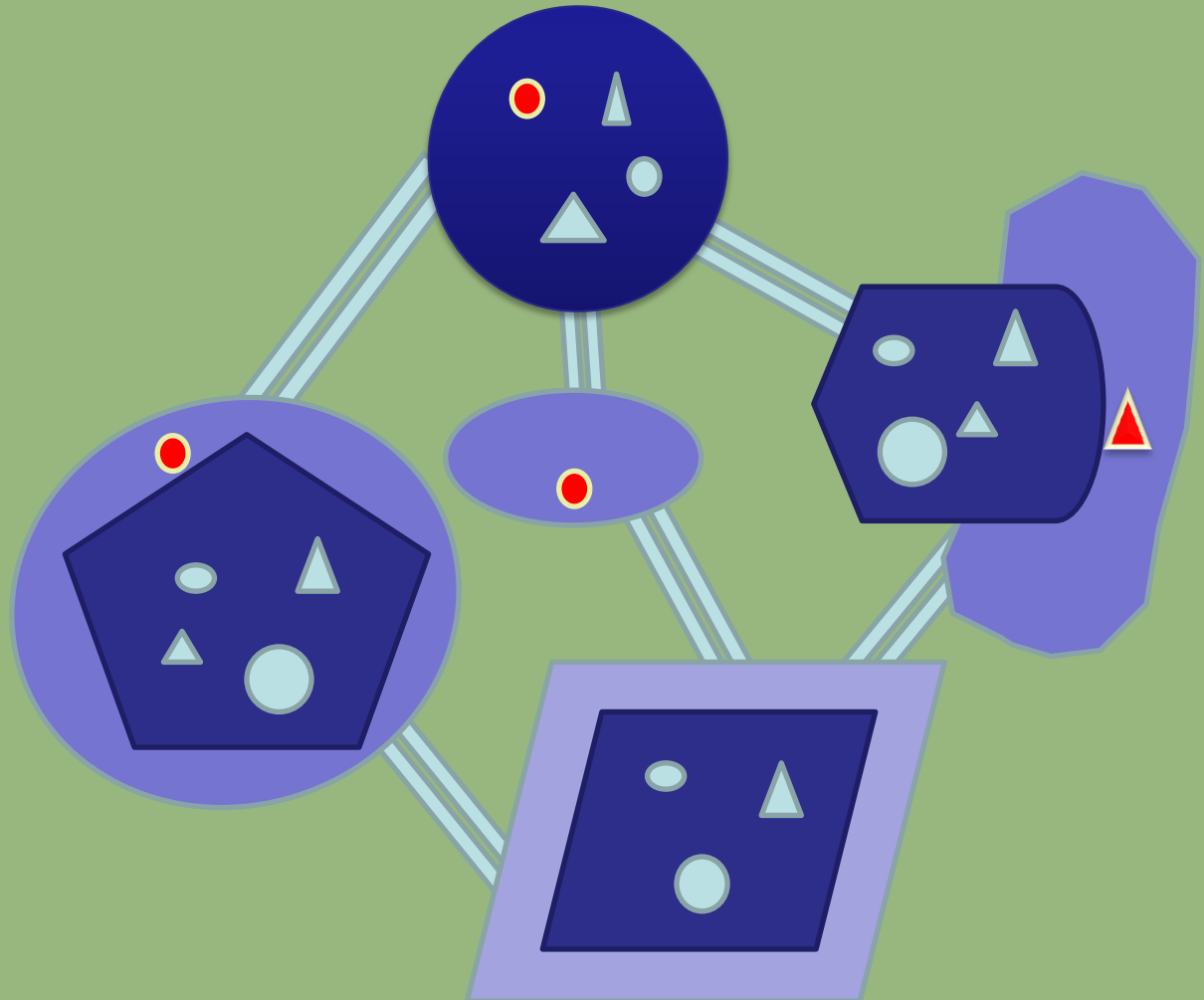
ID	Name	Sensitivity	2050		2100	
			Exposure	Veg.change	Exposure	Veg.change
1	Daxinanling Area	II	III	I	III	II
2	Xiaoxinanling Area	IV	III	II	III	II
3	Three Rivers Plain Wetland	II	IV	IV	IV	IV
4	Changbai Mountainous Area	IV	III	III	II	I
5	Songnei Plain Wetland	II	II	IV	III	III
6	Hulun Buir Grassland	III	III	IV	IV	IV
7	Xilinguole	I	III	IV	III	II
8	Altai Mountainous Area	IV	I	I	I	I
9	Tianshan-Southwest Edge of Junggar Basin	IV	II	II	II	II
10	Tarim River Basin Deserts	IV	IV	IV	IV	IV
11	Qilian Mountainous Area	IV	I	I	I	III
12	West Ordos-Helan-Kageyama Mountainous Area	IV	III	III	II	III
13	Qiangtang-Three River Source Area	III	I	I	I	II
14	Altun Mountainous Area	IV	II	III	II	III
15	Taihang Mountainous Area	III	II	I	II	IV
16	Liupan-Ziwuling Mountainous Area	III	IV	III	III	III
17	Southeast Himalayas Area	III	I	I	I	I
18	South Hengduan Mountainous Area	I	I	I	I	I
19	Minshan-North Hengduan Mountainous Area	I	I	I	I	I
20	Qinling Area	II	II	II	II	I
21	Western Guangxi-South Guizhou Limestone Area	III	IV	III	III	IV
22	Wulingshan Mountainous Area	II	III	II	IV	I
23	Dabashan Area	II	III	III	III	I
24	Dabieshan Area	II	IV	IV	IV	III
25	Huangshan-Huaiyu Mountainous Area	I	IV	II	IV	III
26	Wuyishan Area	I	III	II	IV	II
27	Naling Area	I	II	II	II	III
28	Dongting Lake Area	III	IV	IV	III	IV
29	Poyang Lake Area	III	II	IV	II	IV
30	South Central Hainan	II	I	II	I	II
31	Xishuangbanna	I	IV	III	IV	IV
32	West Guangxi Limestone Area	I	I	III	I	II



How to achieve effective conservation under climate change in 32 PCAs?

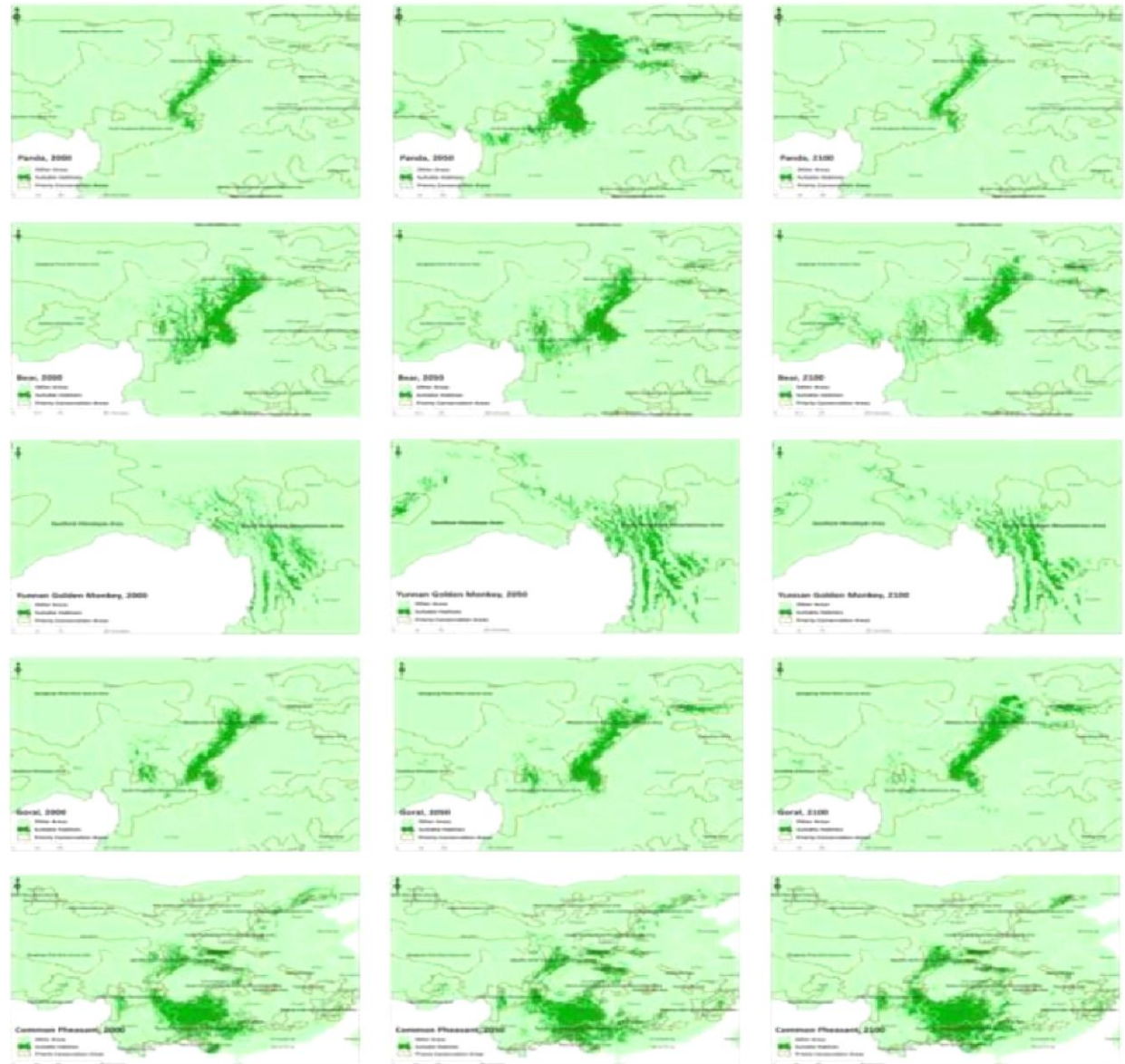
Identify Climate Resilient Conservation Network

- Enlarge protected area
- Redundancy
- Connectivity
- Evolutionary sites



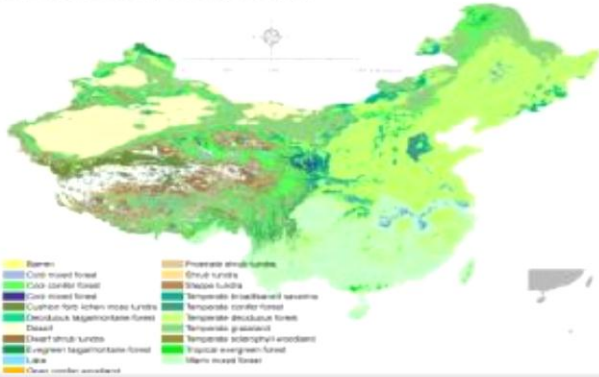
Future focal species distribution

- Giant Panda
- Asian Black Bear
- Yunnan Golden Monkey
- Goral
- Common Pheasant

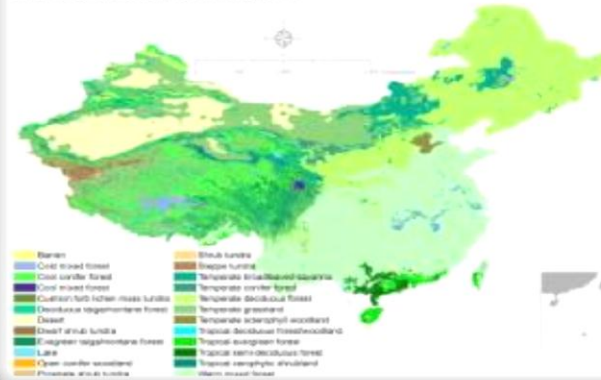


Future ecosystem types distribution

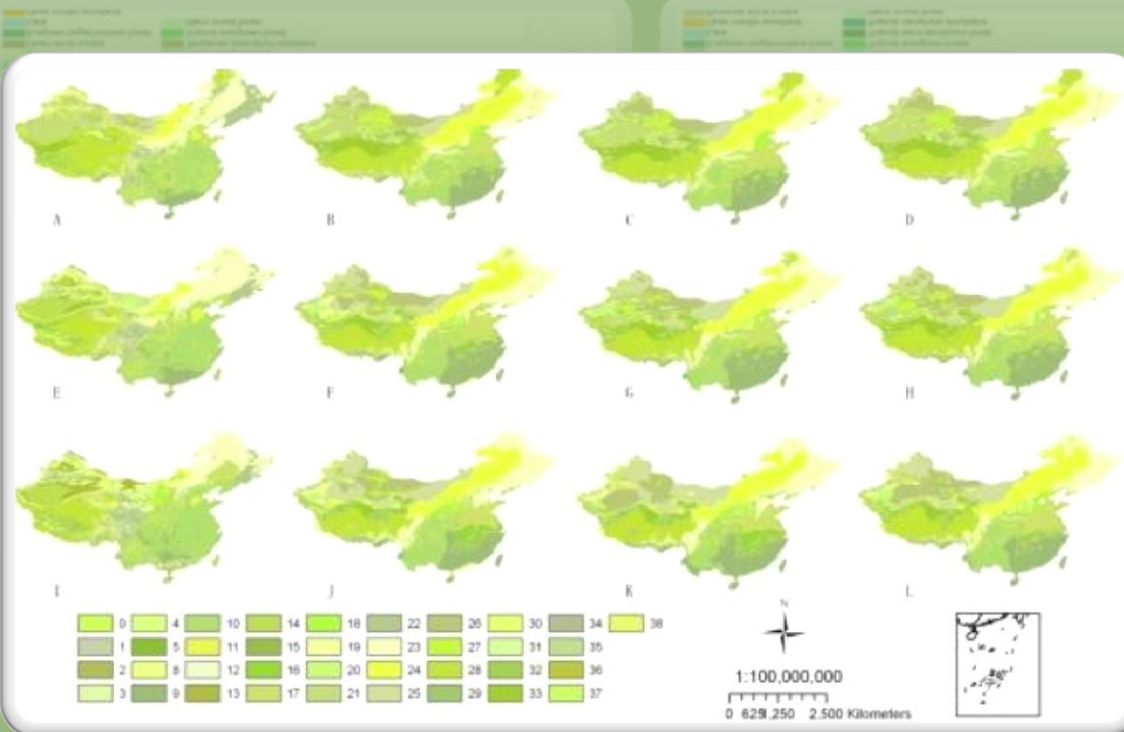
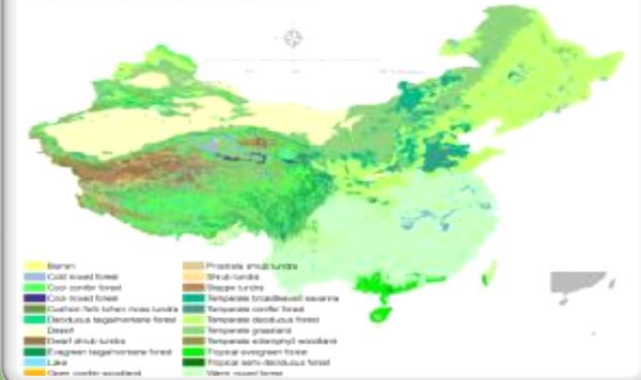
Biomes simulated by BIOME4, Present



Biomes simulated by BIOME4, 2100

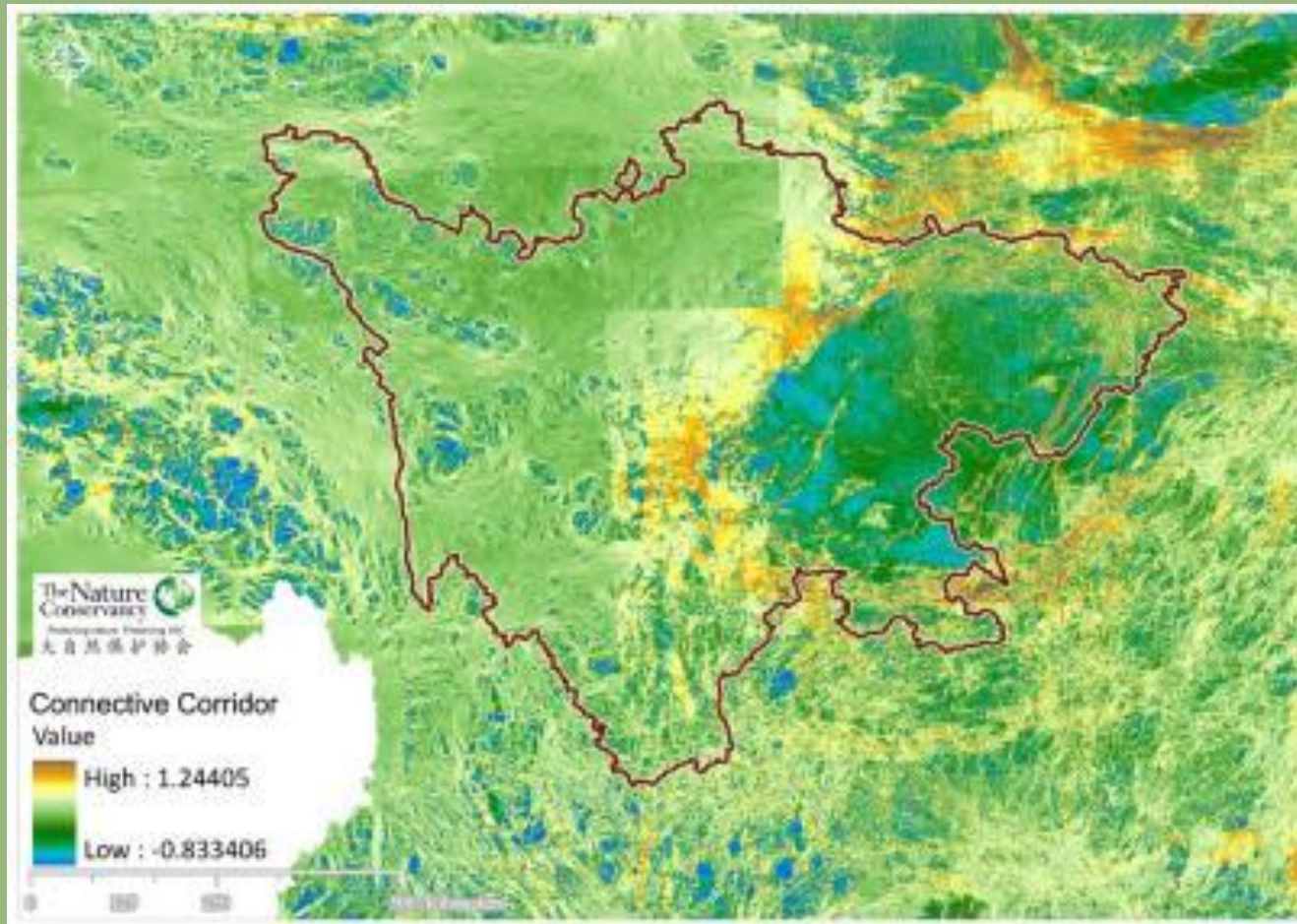


Biomes simulated by BIOME4, 2050



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Corridors -- Regional Flow Linkages



Dark Brown = High
Dark Blue = Low

FUTURE work:

- **EBA Demonstration In China**
- **Mainstream EBA in national adaptation strategy policy**

Increasing Runoff and Floods

Hypothesis of Change

Variation in precipitation patterns: reduced at some times, increased at others;
variation in intensity

Leads to: increased runoff, pollution and sedimentation in water

Leads to flooding, erosion, reduced groundwater recharge, municipal water costs



Socio-Economic Targets at Risk

- Safety of Community Homes and Infrastructure
- Water Quality for municipal supply
- Fisheries
- Water availability in dry season

Slow runoff to reduce downstream flooding

Decreasing Water Security



Hypothesis of Change

Variation in precipitation patterns: reduced at some times, increased at others; variation in precipitation intensity; increased temperatures

Leads to: drying reservoirs, increased runoff, pollution and sedimentation in water

Leads to flooding, erosion, reduced groundwater recharge, municipal water costs

Socio-Economic Targets at Risk

- Water availability in dry season: cities & agriculture
- River flow and reservoir supplies
- Increasing costs from sedimentation
- Increasing conflict between users

Watershed Protection and Restoration

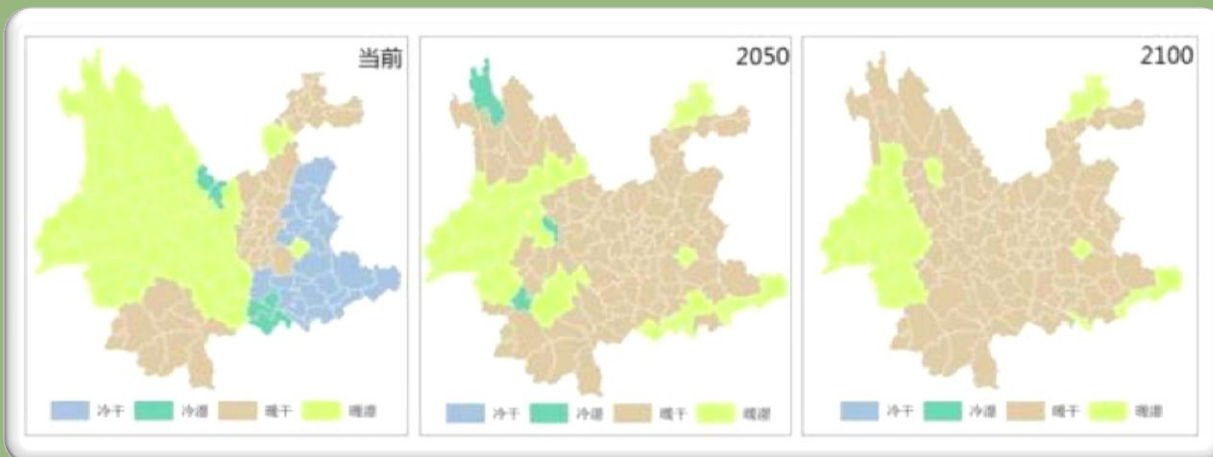
Place: Black Dragon Pool, Lijiang of Yunnan

Science to inform management of river flow, land management

Strengthen natural processes to reduce sedimentation, forest cover management

Watershed management for dry season flow, groundwater recharge, meadows

Fire for Water, reduce risk of catastrophic fire adding sedimentation



Thank you!

Questions