



## Climate change and carbon dynamics in the Central Asia dryland – Different issues, challenges and SDG strategies for three types of areas

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### The global importance of Central Asia dryland

• Central Asia: Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan, and China's





## Three different areas based on their responses to climate change

- Climate sensitive areas of carbon balance Northern Kazakhstan, Northern Xinjiang, and north-western slope of the mountains
- Climate change vulnerable areas the mountain glaciers and the desert oases
- Climate sensitive temperate desert ecosystems and the land corridors

Different areas have different climate change issues, ecosystem management challenges and SDG strategies.

## The climate sensitive areas

#### **Issues:**

- Large ecosystem carbon storage
- Strong climate change
- Intensive land-use changes (cropland conversion/abandonment, urbanization)



0

2

4

350-450

450-550

550-700

⊐ km

600

300

0

15

20

10

8

6

25 >25

> 700

Ecosystem productivity

Ecosystem carbon pool size

## Annual changes in precipitation

(c)

Unit: mm yr

-7

-5

< -7



-1

-3

300 600 km

>5

5

Annual variations in ecosystem productivity

## The climate sensitive areas

#### Issues:

- Large ecosystem carbon storage
- Strong climate change
- Intensive land-use changes (cropland conversion/abandonment, urbanization)

#### Challenges:

• Without good managements, these ecosystems can become large carbon sources!

## The climate sensitive areas

#### **Recommended SDG strategies:**

- Protect the large carbon pools in the forests and meadows
- Develop carbon conservative agricultural systems
- Reduce land disturbances (e.g. overgrazing)



## The climate vulnerable areas

#### **Issues:**

- Glaciers diminishing
- Population increase and food crisis



The Tianshan Glacier #1 in the Urumqi River Headwaters will disappear in the mid of this century.

Will the oasis disappear with it?



## The climate vulnerable areas

#### **Challenges:**

- Water resources become unstable, flooding and drought will become more frequent.
- Water conflicts between countries.

#### **Recommended SDG strategies:**

- More financial supports to improve water conservancy project and irrigation networks in these climate sensitive areas;
- Developing water conservative agriculture technologies;
- Cross-nation cooperation on the water conservancy projects;
- Promoting manufacturing industry to absorb labors from agriculture.

# The Climate sensitive temperate desert ecosystems

#### Issues:

- Soil erosion will intensify in areas with decreasing vegetation cover and ecosystem productivity
- Loss of biodiversity



#### Potential habitat of desert plants will change dramatically



Changes in the potential habitat of two Haloxylon species – *H. persicum* (a-d) and *H. ammodendron* (e-h) under the RCP4.5 (a, b, e, f) and RCP8.5 (c, d, g, h) scenarios by the mid- (a, c, e, g) and late (b, d, f, h) 21st century

## The climate vulnerable areas

#### **Challenges:**

 Intensified land-use change may further stress the desert ecosystem and block the pathway of vegetation migration.

Recommended SDG strategies, based on ecological model predictions:

- Setup nature reserves in vulnerable desert areas.
- Setup vegetation migration land corridors to facilitate the migration of desert plants, by limiting by limiting urbanization and cropland conversion in the migration pathway



Model predicted shifts in the potential habitats of *H. persicum* (a) and *H. ammodendron* (b) under different climate change scenarios. Dots with different colours indicate the centroids of the suitable habitats under current climate and different future climate scenarios.

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