Food, fibre, and raw material from dryland regions of Central Asia

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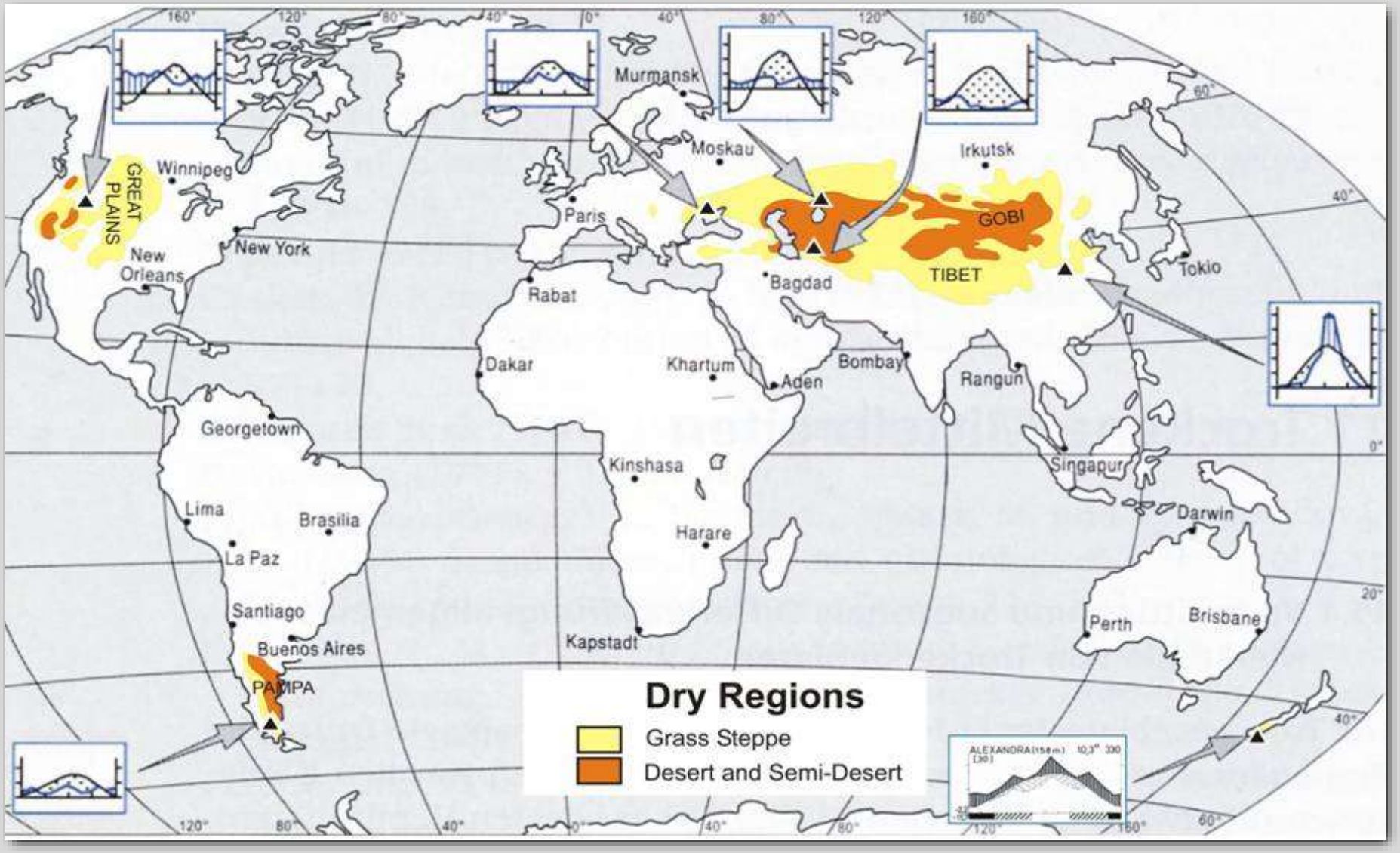
Central Asia – part of the winter-cold drylands



Central Asia: Region with the world‘s most and largest endorheic river basins

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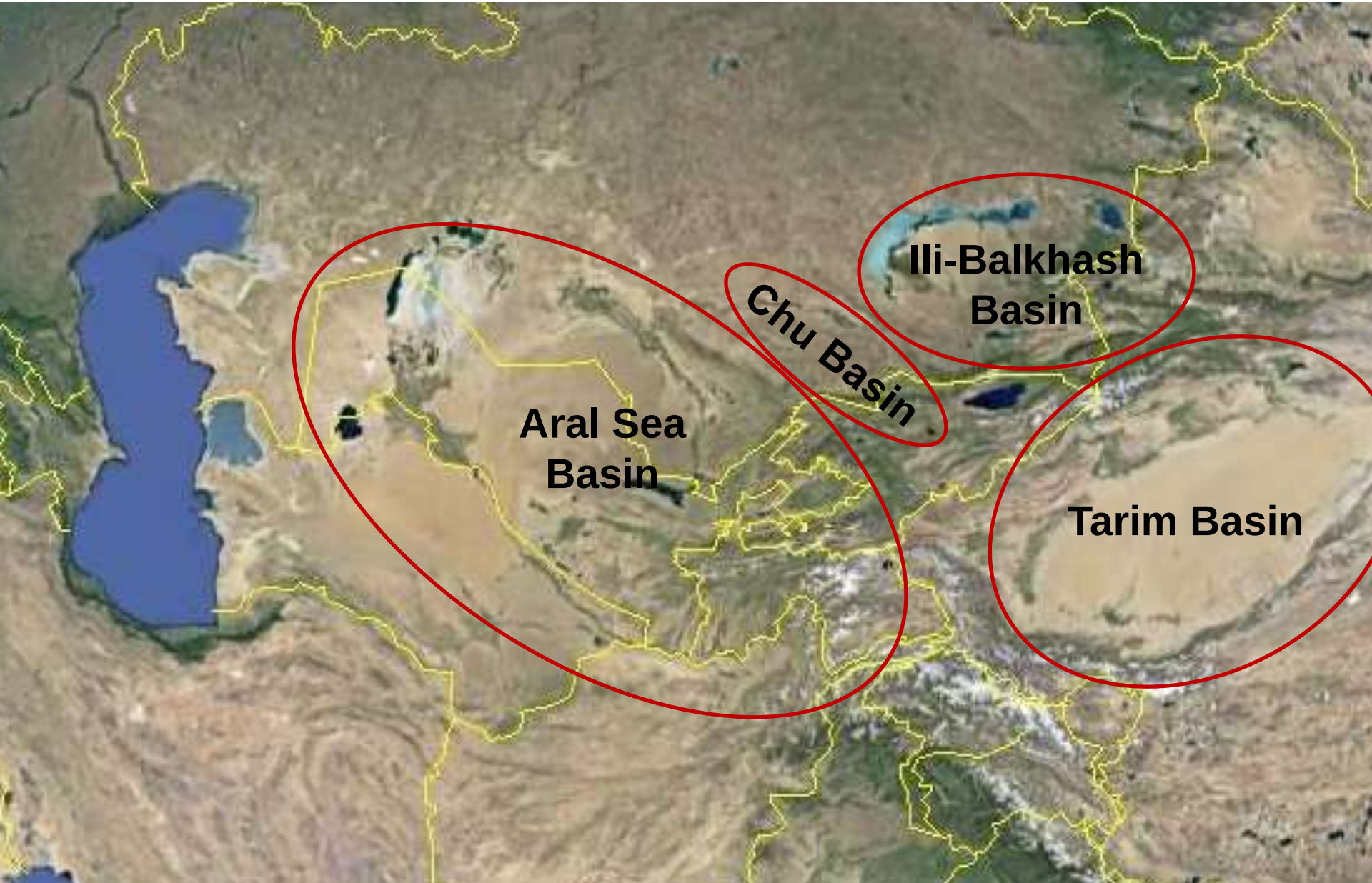
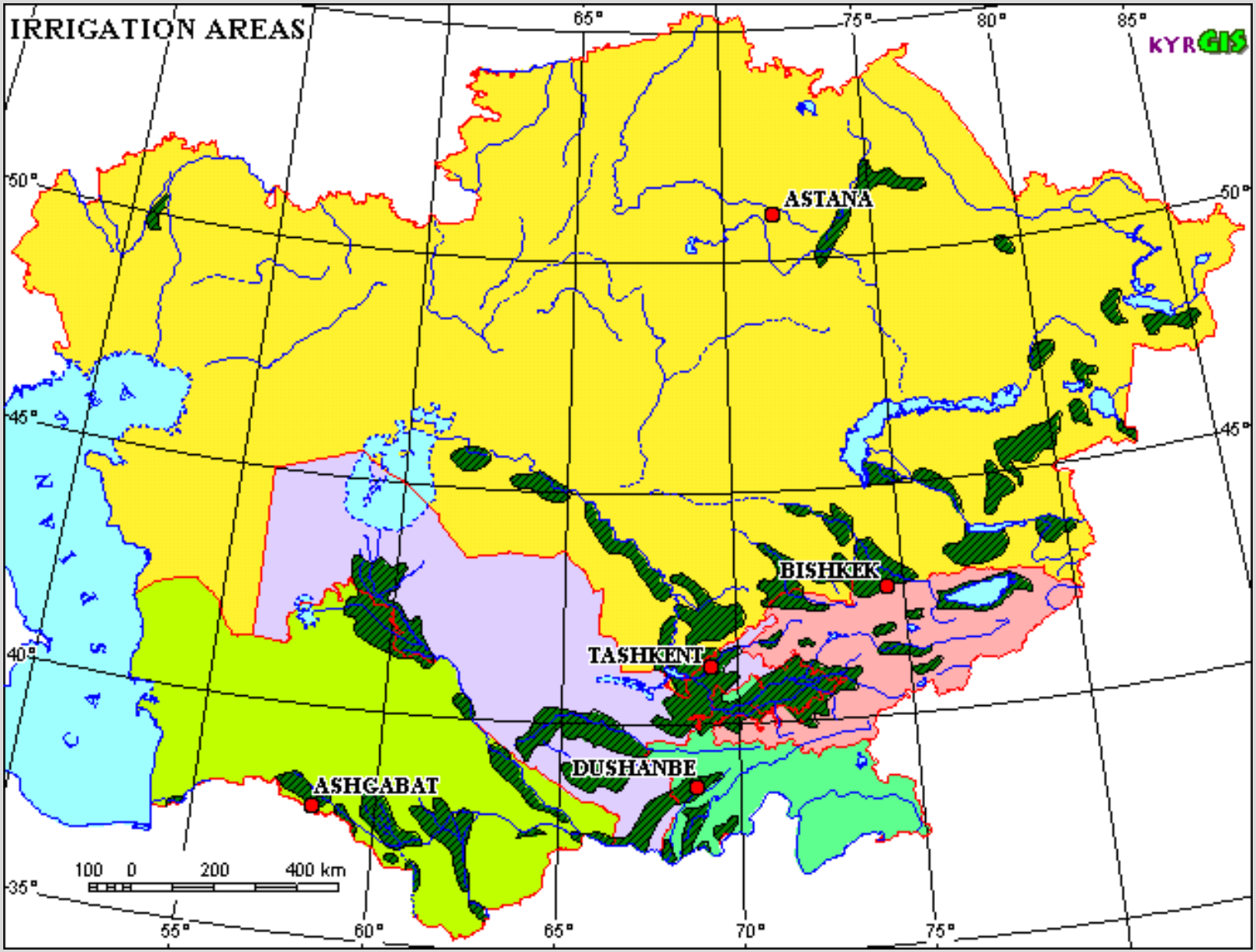
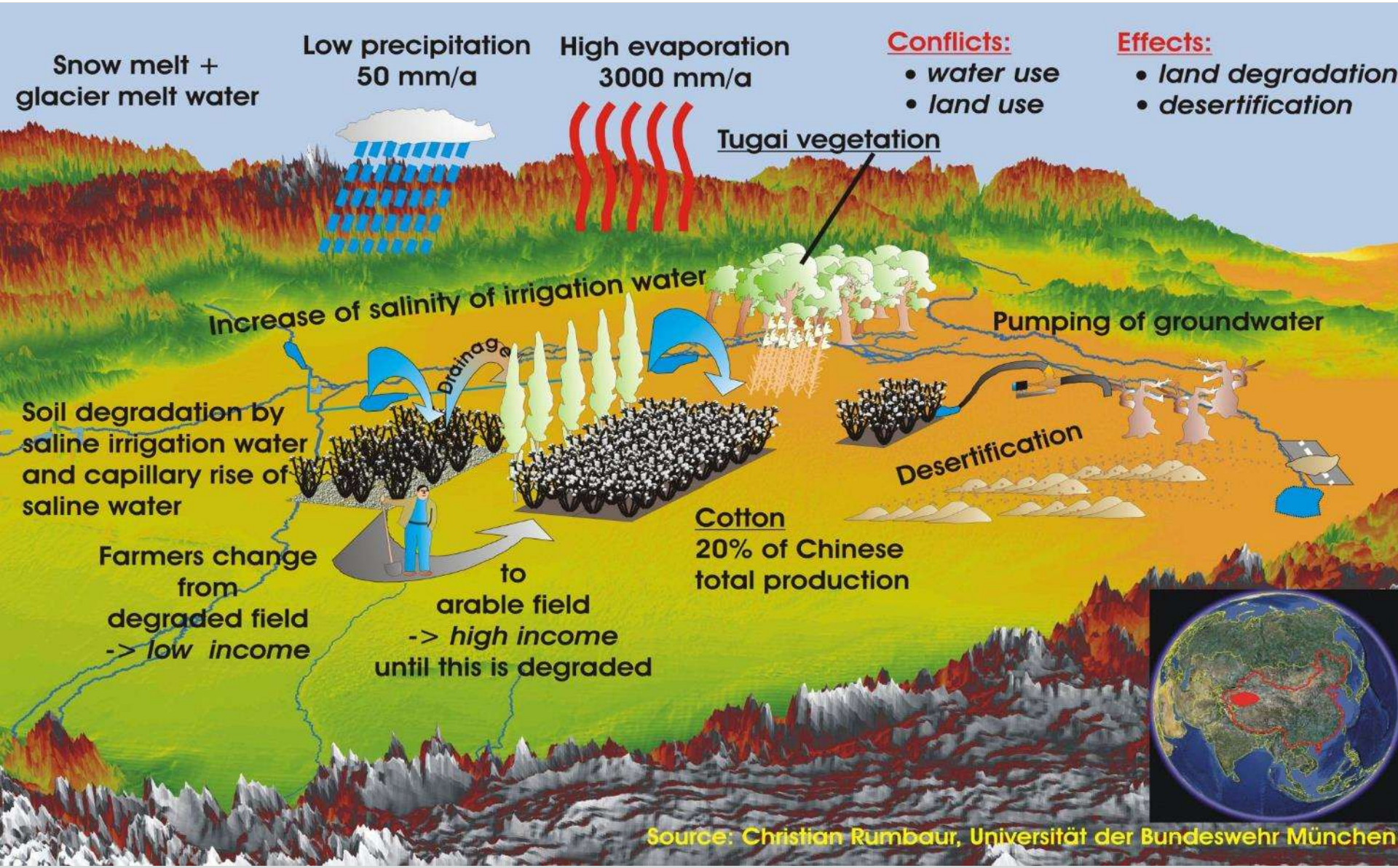


Irrigated lands: hot spots of population density dependent on rivers



Source: www.cawater-info.net

Water resources in a typical endorrheic river basin in Central Asia (Figure: Tarim Basin)



Water resources in a typical endorrheic river basin in Central Asia

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Source: Christian Rumbaur, Universität der Bundeswehr München

Which food, fibres, and raw material do we obtain from such a river basin?

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Snow melt + glacier melt water

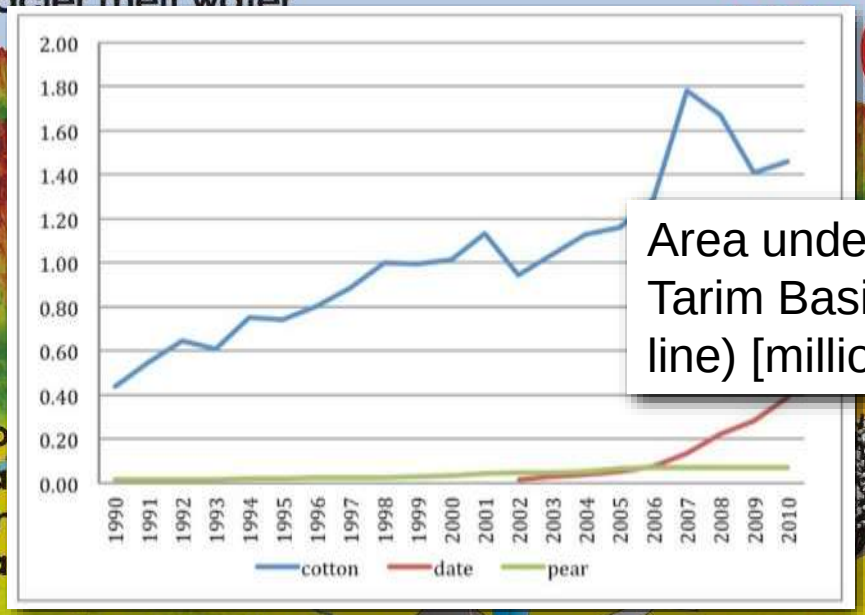
Low precipitation 50 mm/a

High evaporation 3000 mm/a

Conflicts:
- *water use*
- *land use*

Effects:
- *land degradation*
- *desertification*

Tugai vegetation



Area under cotton, Tarim Basin (blue line) [million ha]

Desertification

Cotton
20% of Chinese total production

Farmers change from degraded field -> *low income*

to arable field -> *high income* until this is degraded

Source: Christian Rumbaur, Universität der Bundeswehr München

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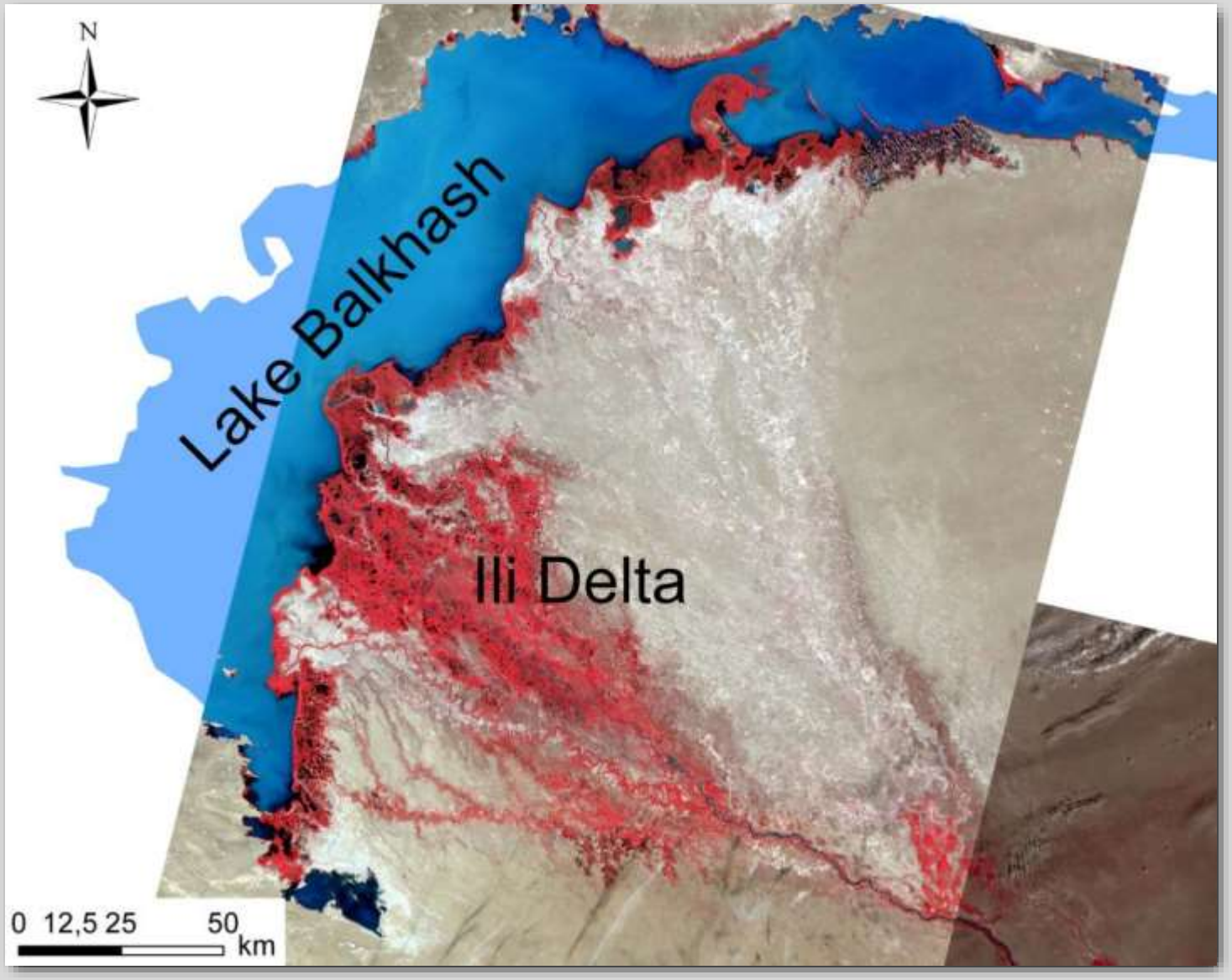

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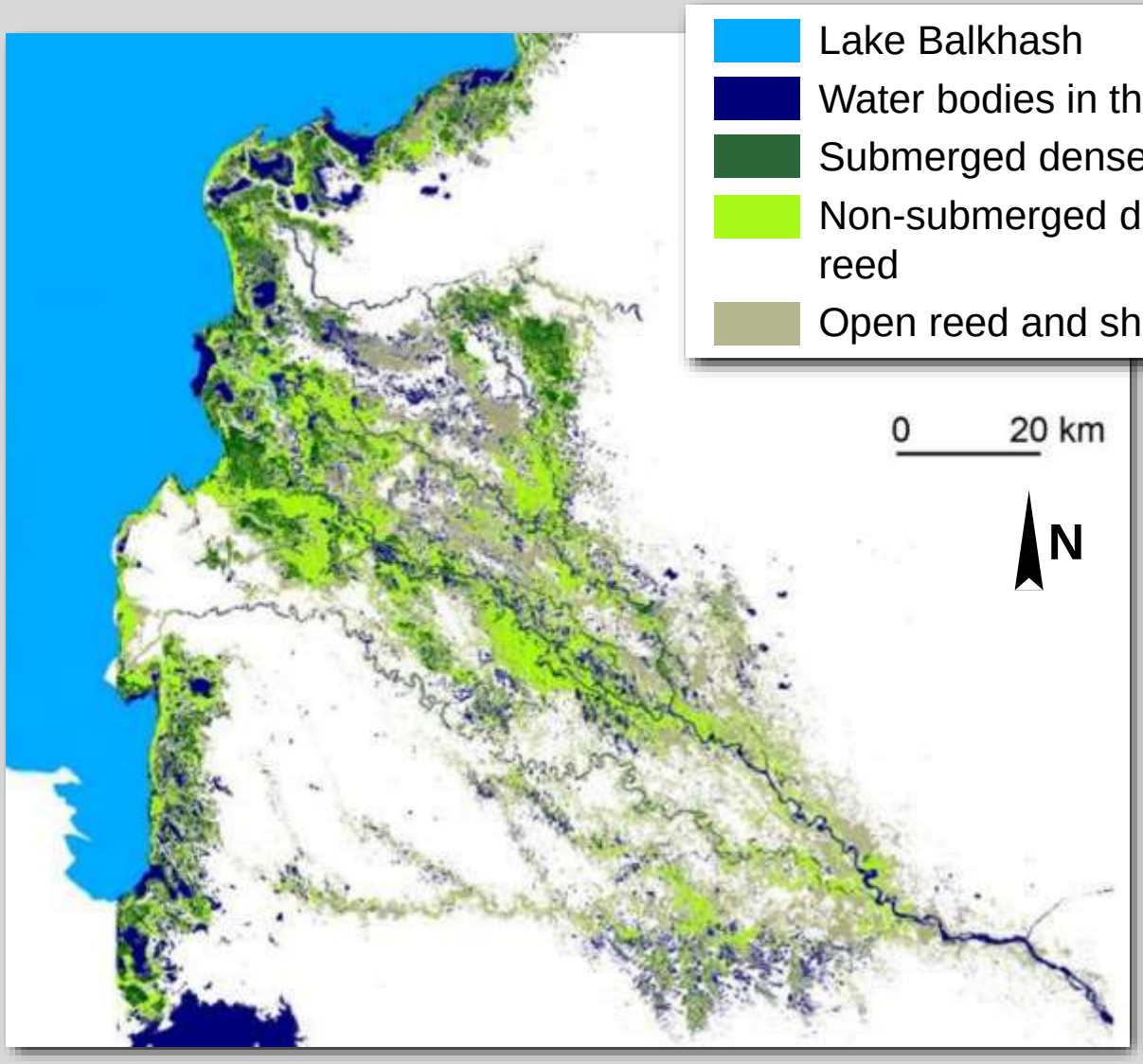
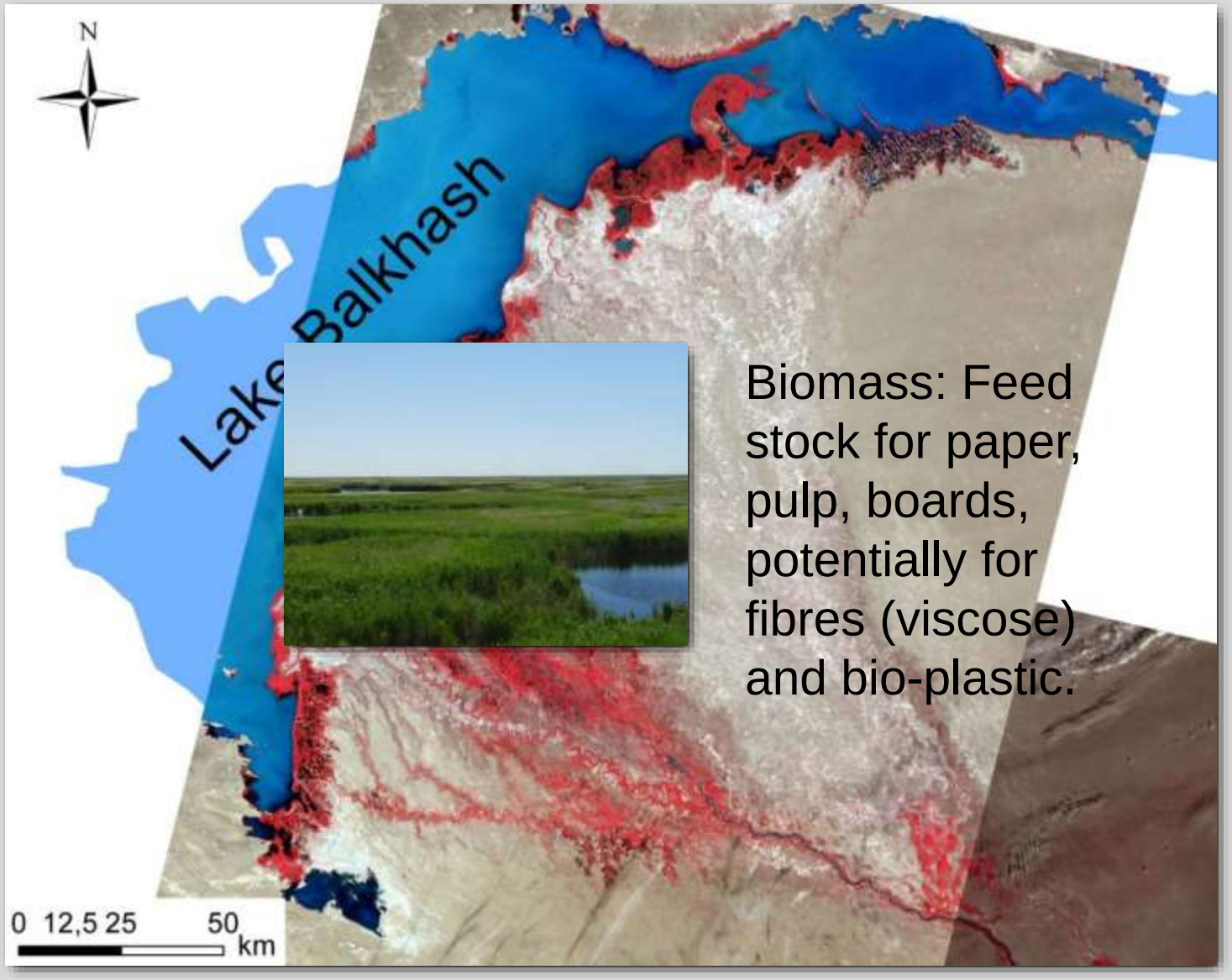


Submerged dense reed

Non-submerged dense reed

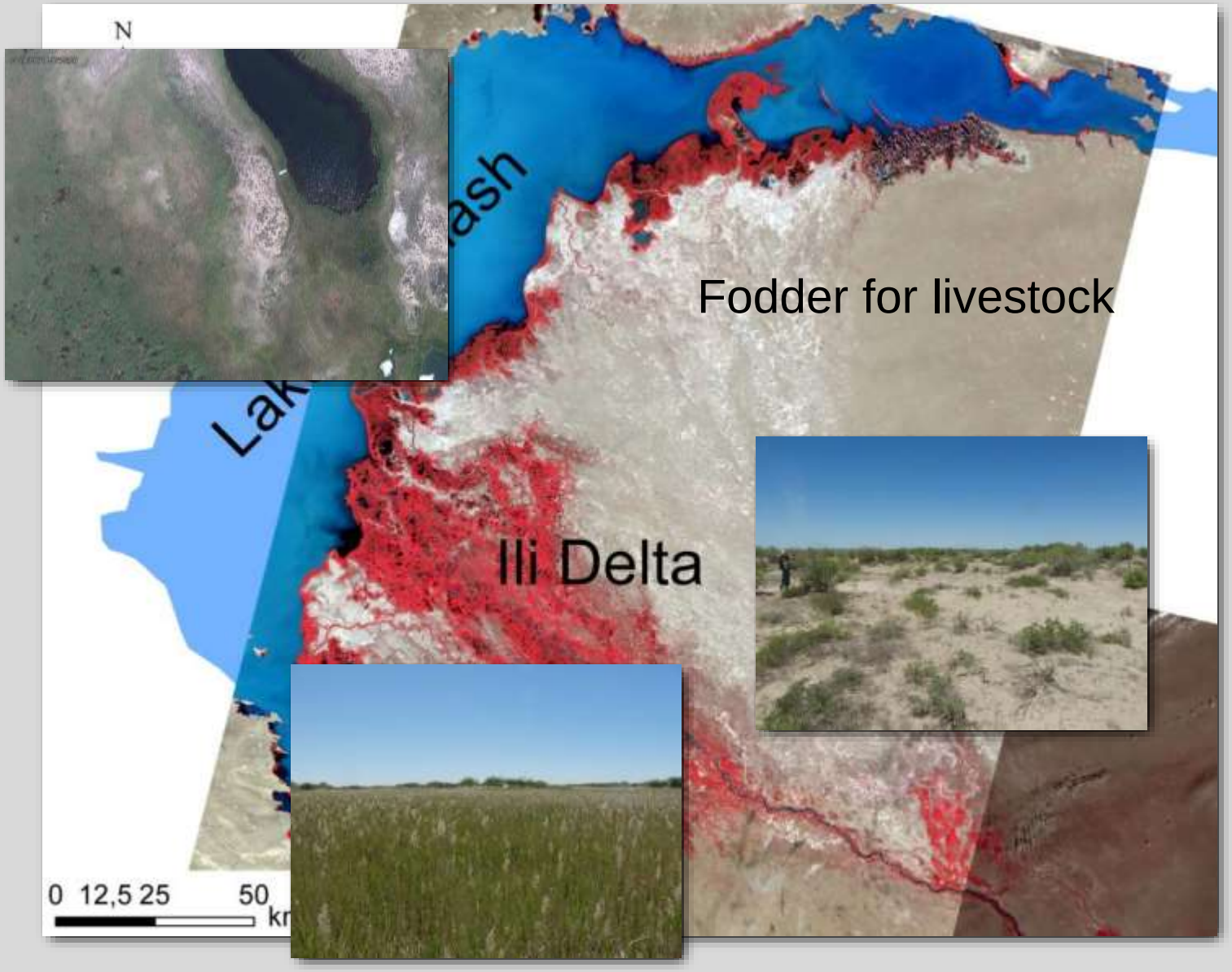
Open reed and shrub

Which food, fibres, and raw material do we obtain from such a river basin?



Biomass: Feed stock for paper, pulp, boards, potentially for fibres (viscose) and bio-plastic.

Which food, fibres, and raw material do we obtain from such a river basin?



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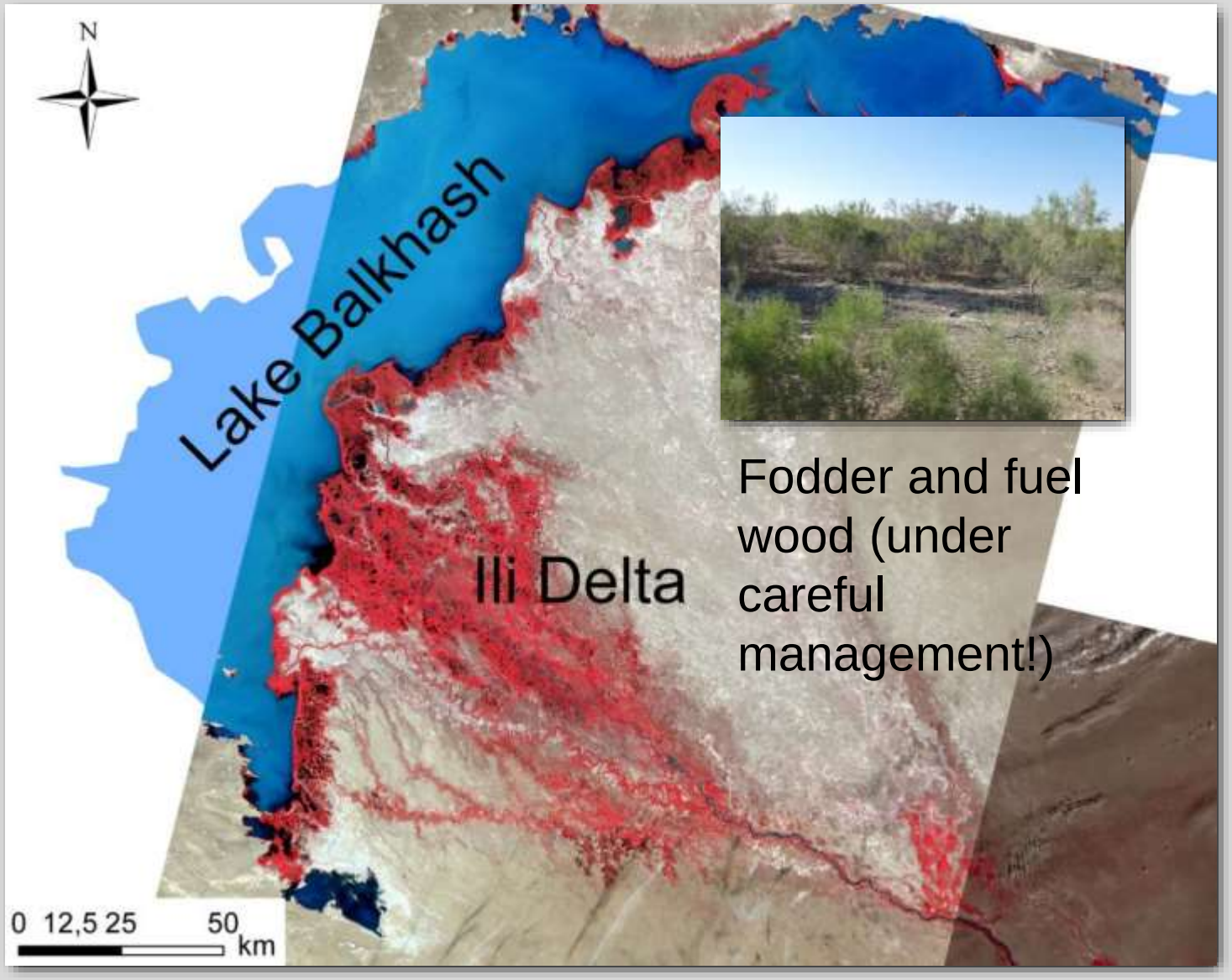
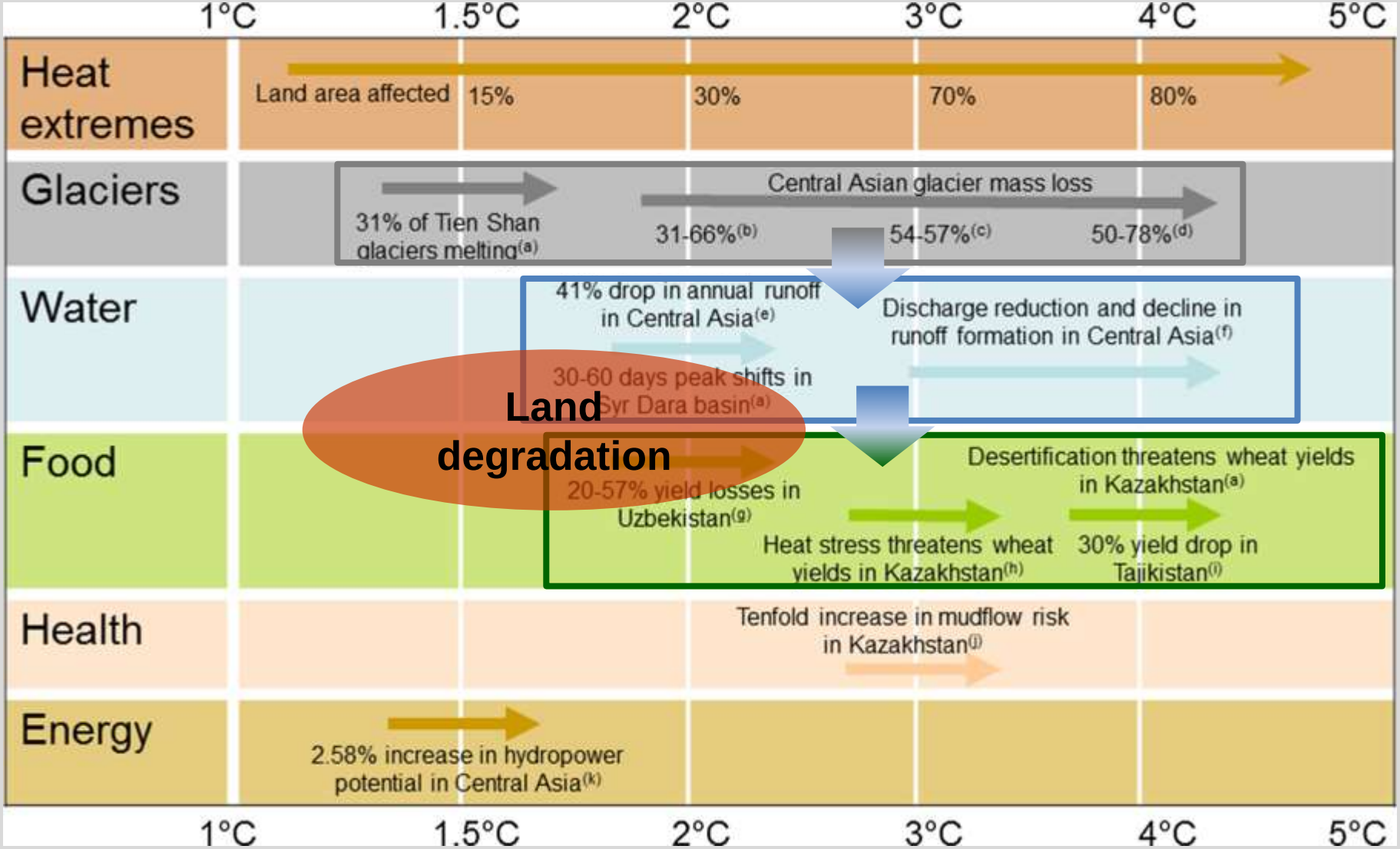


Climate change and its effects



Reyer, C.P.O., Otto, I.M., Adams, S., Albrecht, T., Baarsch, F., Cartsburg, M., Eden, A., Ludi, E., Marcus, R., Mengel, M., Mosello, B., Robinson, A., Schleussner, C.-F., Serdeczny, O., Stagl, J. Climate change impacts in Central Asia and their implications for development. *Regional Environmental Change*, **2015**, doi 10.1007/s10113-015-0893-z.

Salinization and desertification

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Reduced river runoff – enhanced desertification

Climate change -> glacier melt is expected to result in reduced river runoffs and reduced water supply to agriculture and natural ecosystems.

Competiton over water between upstream and downstream countries and regions may aggravate the results of climate change.

In conclusion, we have to be prepared for enhanced water stress and water scarcity impacting on land use and the most productive ecosystems of Central Asia.

Answers how do we address this

Technical solutions:
Improve irrigation infrastructure, from main channels down to implementation of drip irrigation.

Improved crops:
Breed and use more drought and salt resistent crops and varieties.

Agroforestry:
Tree wind breaks and trees that shade crops.

Make use of native plant species
-> **phreatophytes**

What are phreatophytes?

Phreatophytes are plant species that adapt to dry climate by using the groundwater and/or the water from the water saturated zone in the soil.

Plant species	Maximum groundwater depth [m]	Maximum EC (indicator for salt) [mS/cm]
Populus euphratica	10.7	8.7
Tamarix ramosissima	10.5	25.5
Phragmites australis (reed)	5.5	3.4
Apocynum pictum (White Kendyr)	6	5.3

Kendyr / Kutra – a promising phreatophyte: Fibres for textile and medicinal applications

A. pictum (White Kendiyr), Lopnor, Xinjiang, China

A. venetum (Red Kendiyr), Ili Delta, Kazakhstan

Kendyr / Kutra – a promising phreatophyte: Fibres for textile and medicinal applications

Fibres are extracted from the stem and have similar properties like cotton.

Salt tolerance:
Fibers can by harvested from places that have become too saline for cotton.

Phreatophyte:
Irrigation is not needed, as long as groundwater levels are maintined.

cf: https://bia.unibz.it/bitstream/handle/10863/178/2316-Article%20Text-9305-1-10-20130319.pdf?sequence=4

Fiber extraction

Kendir straw from Chui River and Ili Delta

Bast and fibres from Kendir straw

Kazakhstan harbours 2 million ha of reed beds under its arid climate:
Potential for fodder, paper and pulp, boards, possibly for fibers (viscose) and bio.plastic.

https://www.mdpi.com/2079-9276/9/6/74/pdf


Thank you for your
attention