

Scenarios of Climate Change and its potential impact on agriculture, food security and nutrition in Kazakhstan and the region using the IMPACT model

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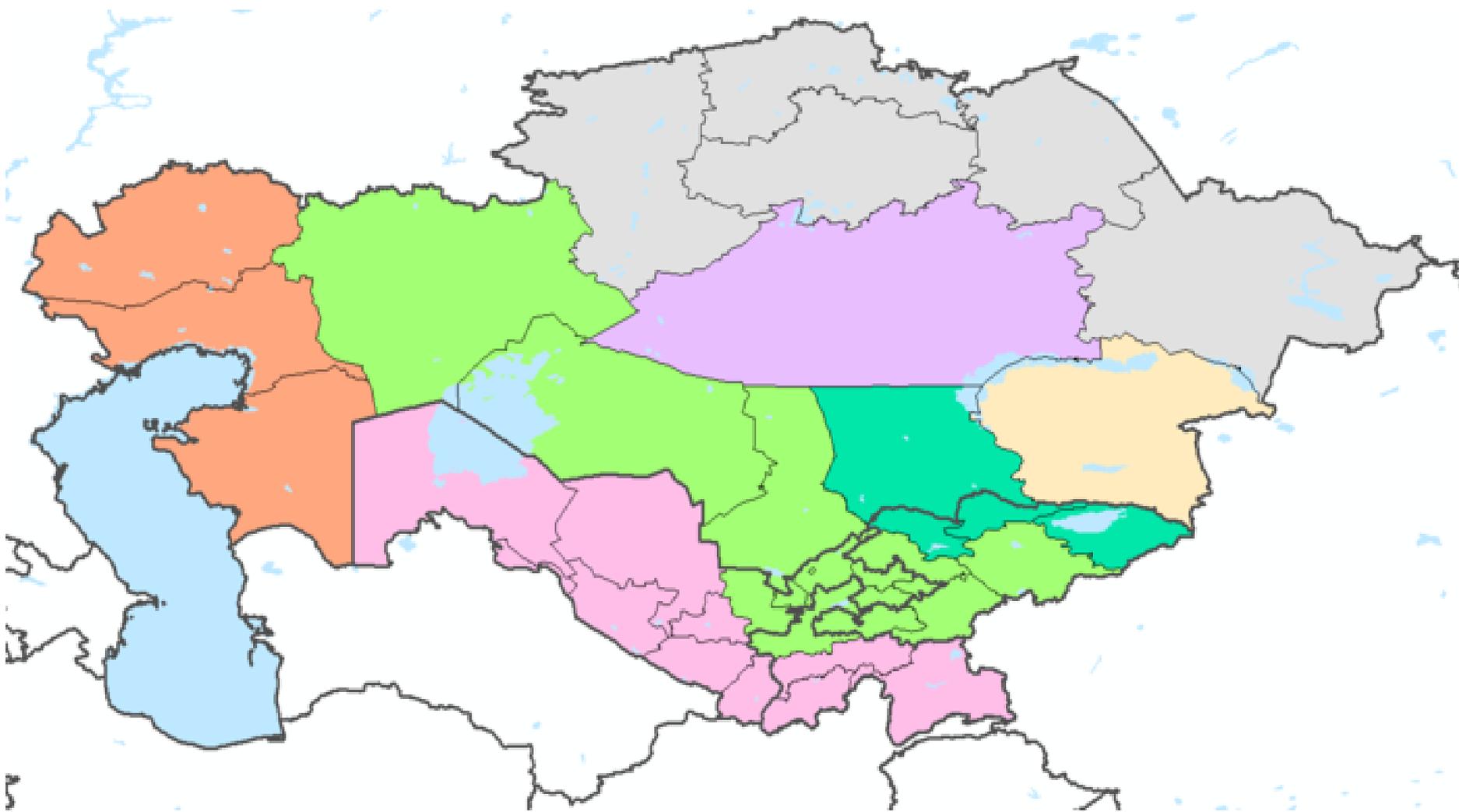
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Regions of Kazakhstan



Regions from the IMPACT model



Crops of Kazakhstan by regions

- The wheat is a major crop for Kazakhstan and according to the data for 2014 it comprises 42% of the total output of the crops, 76% of the cereals and pulses , 58% of the total harvested land and 81% of the total harvested land for cereals and pulses.
- Soft spring wheat comprises 93% of the total harvested land of wheat in Kazakhstan and grows mainly in Akmola, Kostanay and North Kazakhstan regions.
- Other crops include barley which grows mainly in the north, cotton which grows mainly in the south, sunflowers, sugarbeet, maize, flax, rice and vegetables.

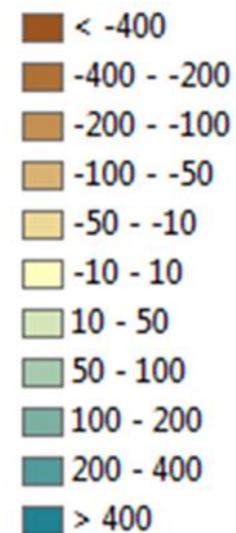
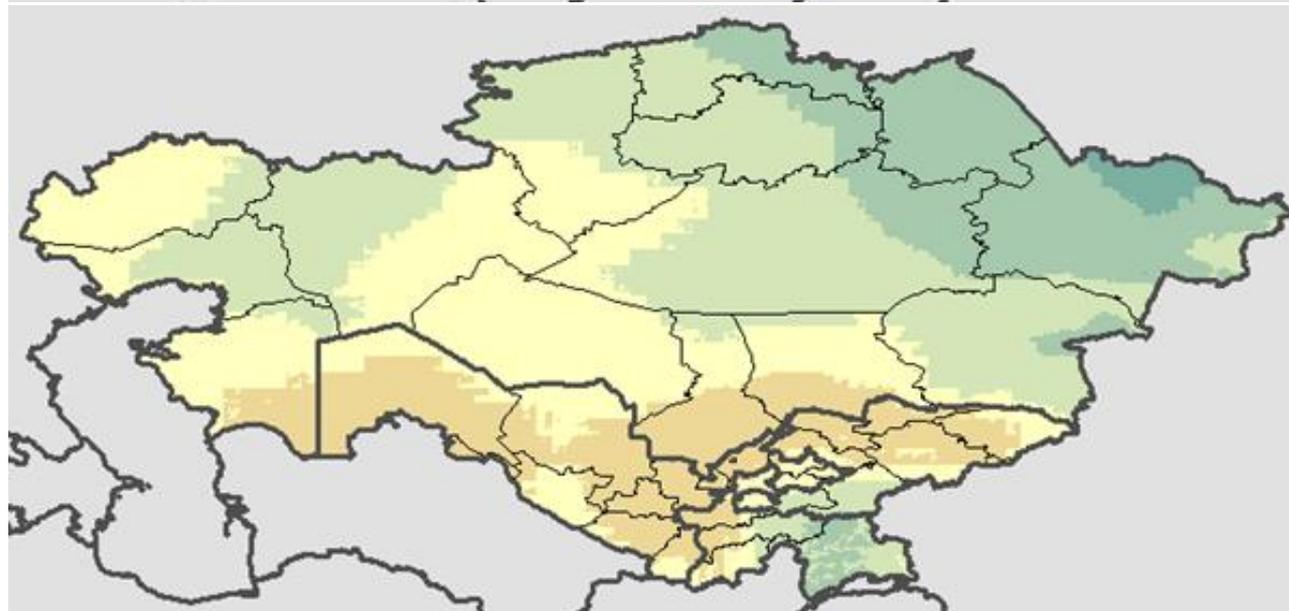
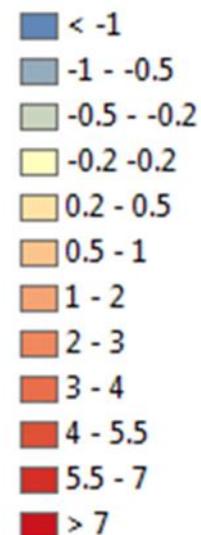
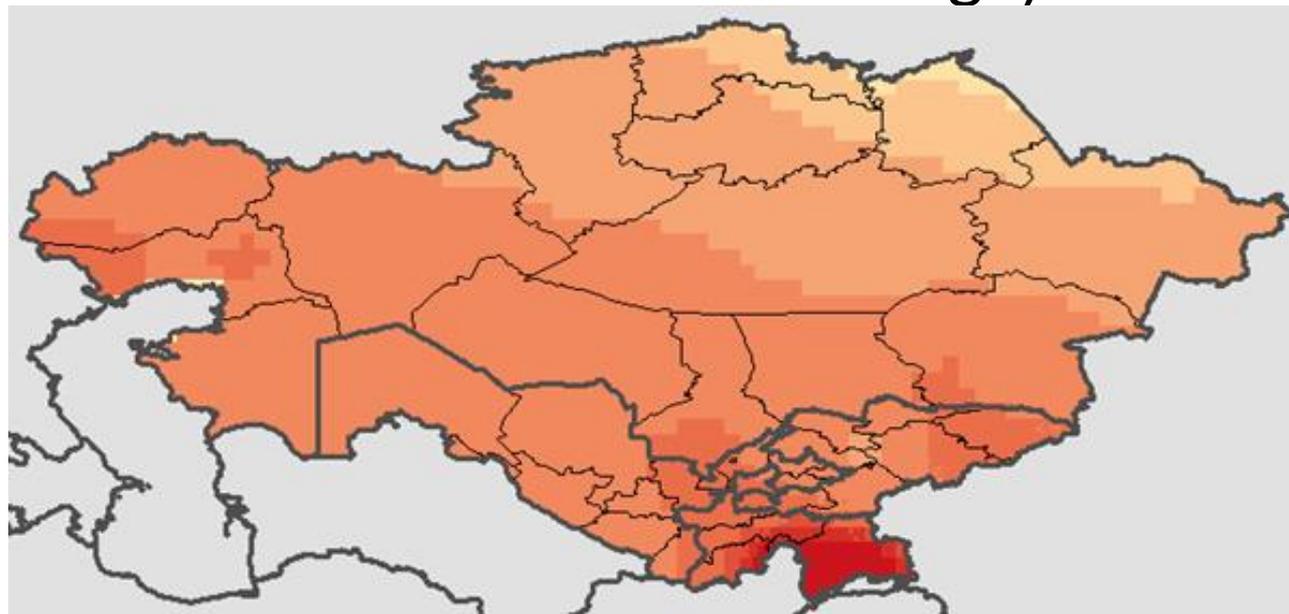
Animals of Kazakhstan by regions

- Cattle production and herding is a main industry. (Cattle constitutes 48% of the total production in 2014)
- Production of cattle is concentrated in the south of Kazakhstan: Southern Kazakhstan, Zhambyl and Almaty regions constituted 34% of cattle, 48% of lamb, 38% of goats, 32% of horses and 56% of poultry production in Kazakhstan in 2014.
- Eastern Kazakhstan region constituted 14% of cattle, 15% of lamb, 17% of goats, 13% of horses and 26% of poultry production in Kazakhstan in 2014.

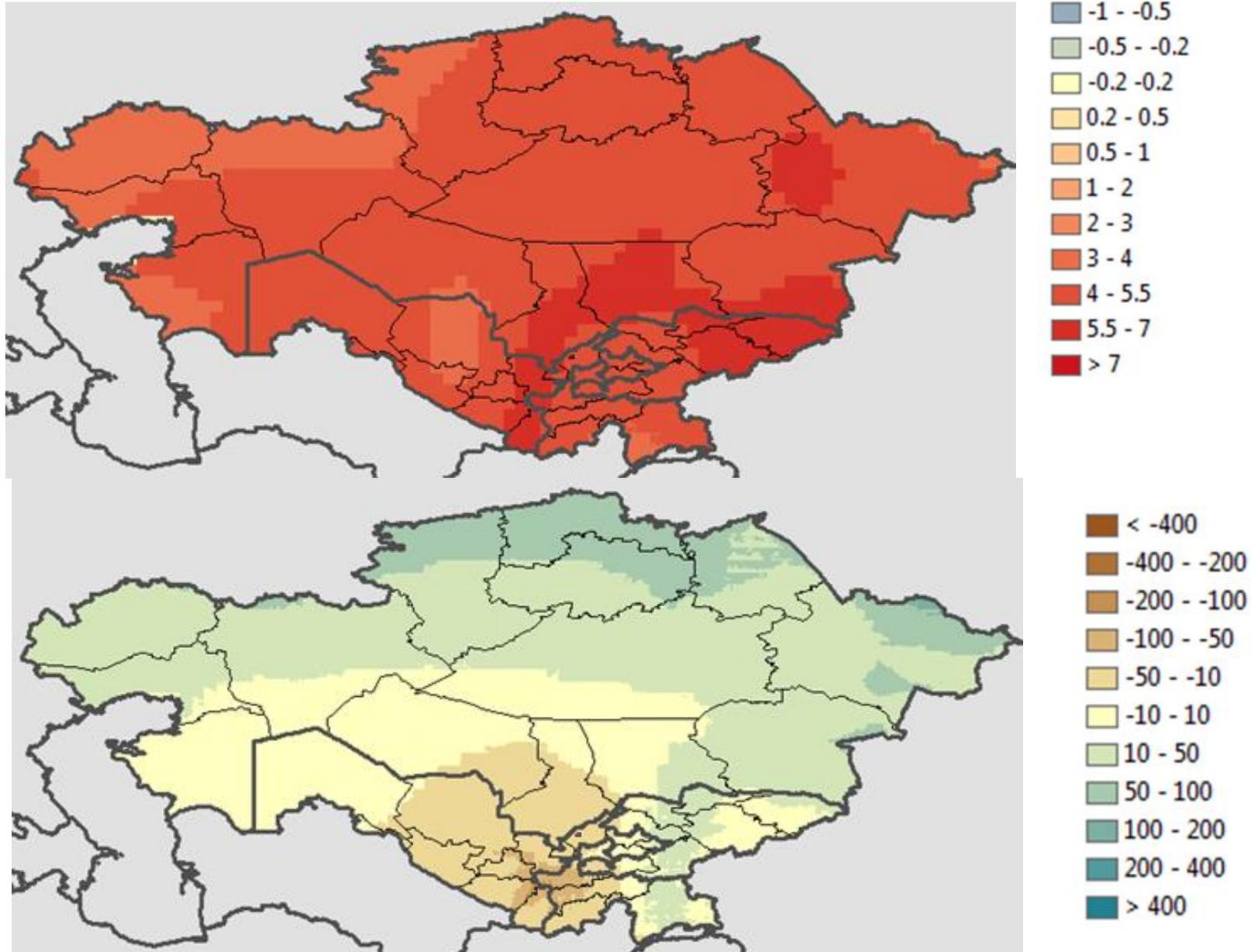
Climate change scenarios

- **GFDL:** The Geophysical Fluid Dynamics Laboratory, Princeton University, US
- **MIROC:** Japan Agency for Marine-Earth Science and Technology, Atmosphere and Ocean Research Institute (The University of Tokyo), and National Institute for Environmental Studies
- **IPSL:** The Institute Pierre Simon Laplace, France.
- **Hadgem:** Hadley Centre for Climate Prediction and Research, UK
- Graphs show predictions for the Central Asian countries.

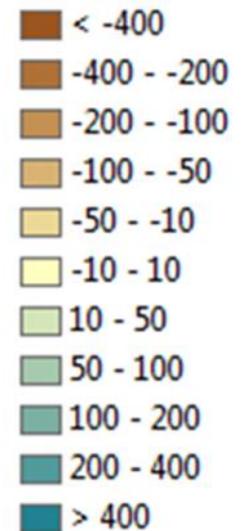
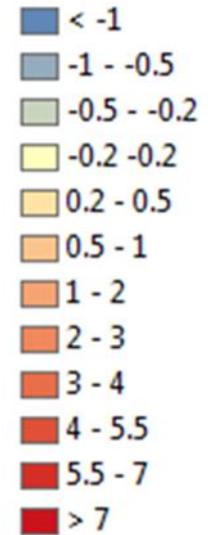
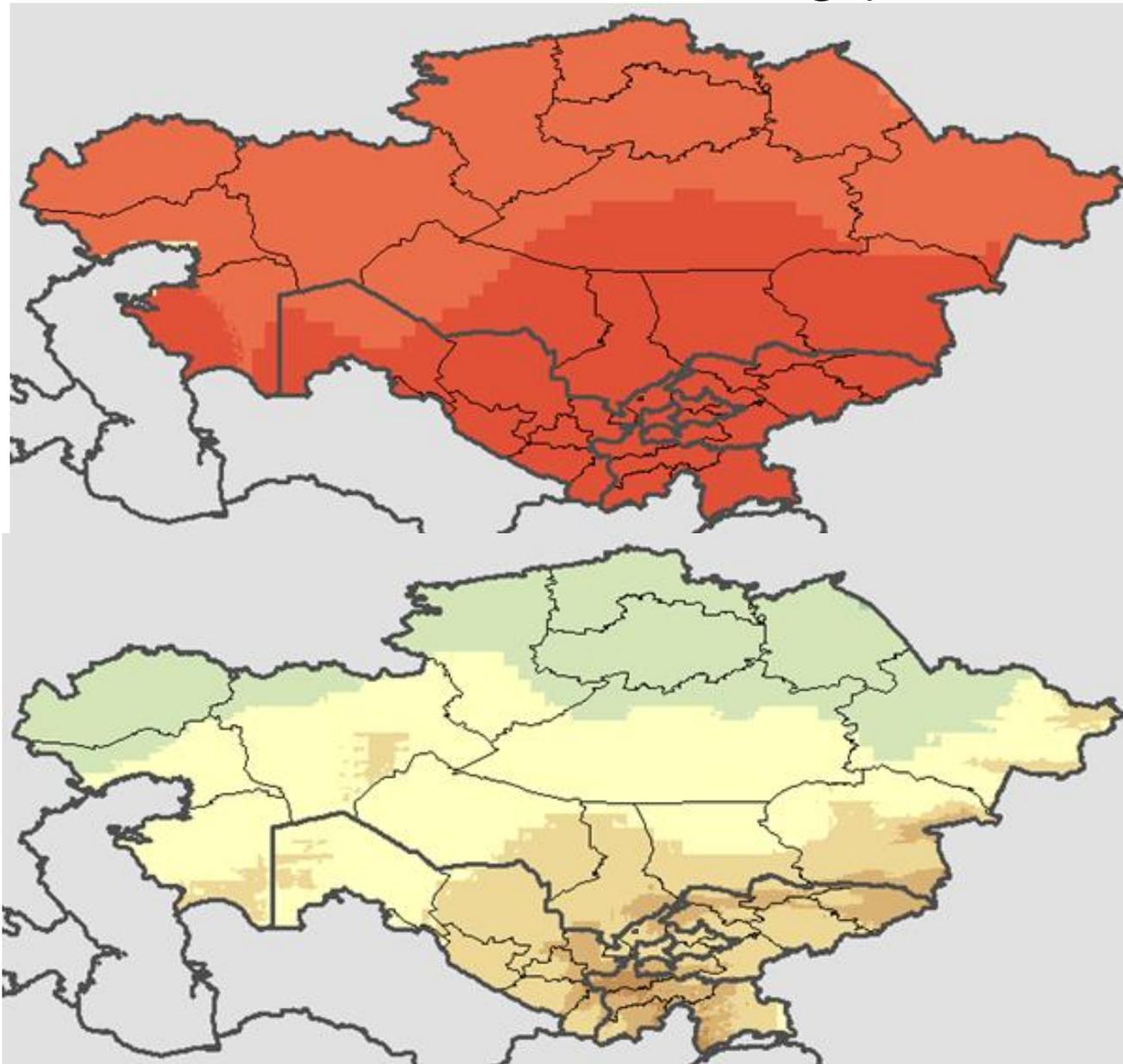
Climate scenarios: GFDL (Temperature and Precipitation change)



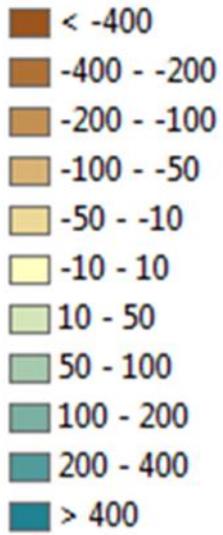
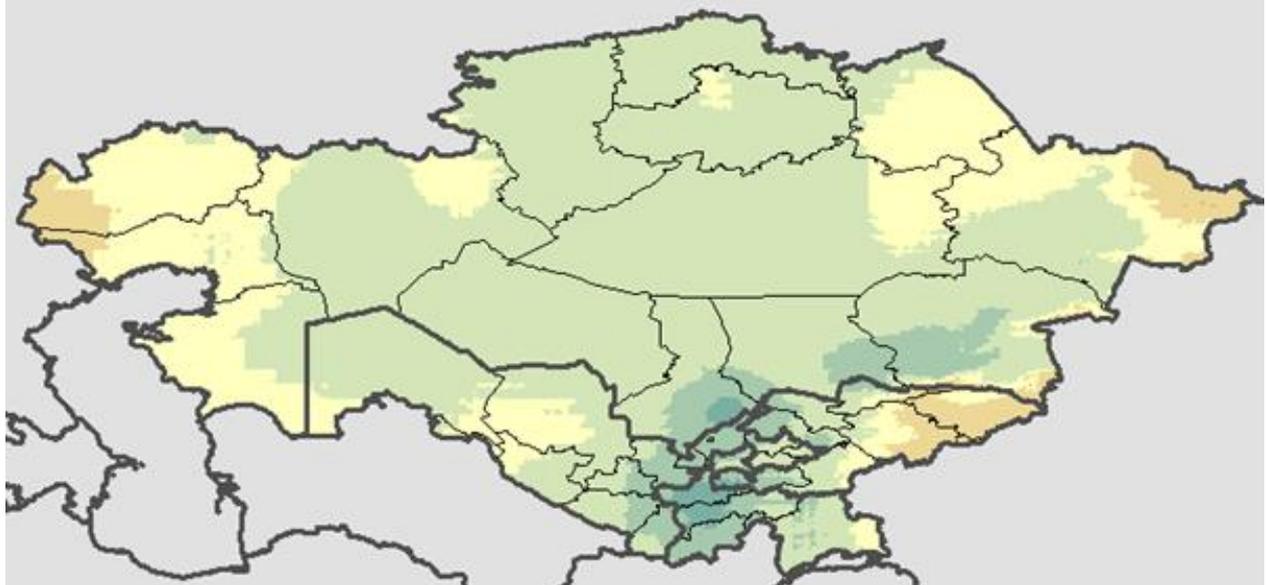
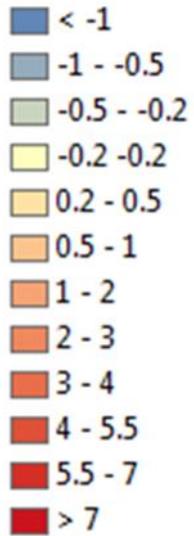
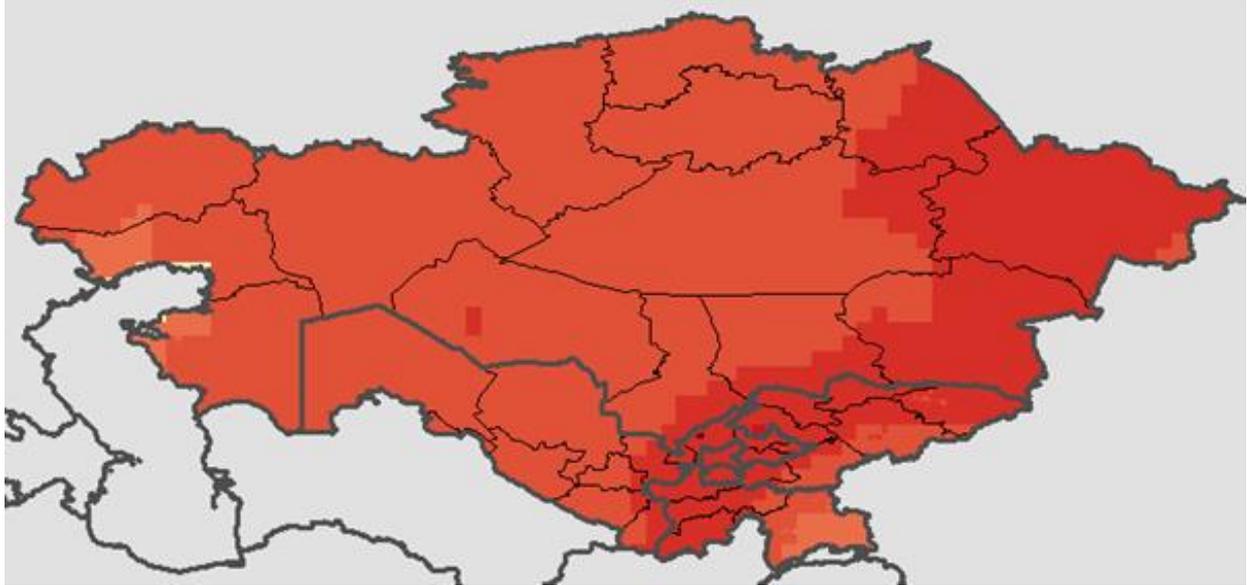
Climate scenarios: MIROC (Temperature and Precipitation change)



Climate scenarios: IPSL (Temperature and Precipitation change)



Climate scenarios: HGEM (Temperature and Precipitation change)



Climate change scenarios for Kazakhstan and the region

- Temperature is expected to increase and the precipitation is expected to increase in the north and to decrease in the south.
- **GFDL:** Predicts the smallest possible temperature increase of the four and more precipitation in the north-eastern Kazakhstan.
- **IPSL:** Higher temperatures and smaller precipitation are expected in the southern and central Kazakhstan and the rest of the Central Asian region. The driest scenario.
- **Hadgem:** The hottest scenario. The highest temperature increase is expected in the eastern part of the country.
- **MIROC:** Higher temperature but with smaller precipitation in the south and more in the north of Kazakhstan.

Policy scenarios for Kazakhstan

- Based on the agricultural programs of the government such as Agro 2020, Beef Export Development Project etc.
- In particular,
- Diversification of land allocation to crops by increasing the area for pulses, oils, potatoes and fruits and decreasing the area for wheat.
- increasing the cattle headcount and exports by 2020.
- Increasing groundwater withdrawal and increasing basin efficiency (improvement in the water infrastructure investment and water management)

Nutrition indicators in IMPACT

- **Percentage of Malnourished Children** is estimated from the average calorie consumption and other determinants (women's education and women's status relative to men's, access to safe water, health and sanitation, quality of maternal and child care etc) Smith and Haddad (2000)
- **Risk of Hunger:** Estimated from the Relative Kilocalories.

Concluding remarks

- Optimal policies conditional on the climate change scenarios.
- Trade policies: Regionally vs globally traded agricultural products.