

Session 34
Adapting Human Land Use to Climate Change

Climate Change
Global Risks, Challenges and Decisions

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Climate change, land use policies, and adaptation
in Alxa region, Inner Mongolia, China

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Inner Mongolia with administrative division of Alxa League

- Inner Mongolia Autonomous Region
 - Population: 2.3 million
 - Area: 1 183 000 km²
 - Temperate desert to steppe ecosystems



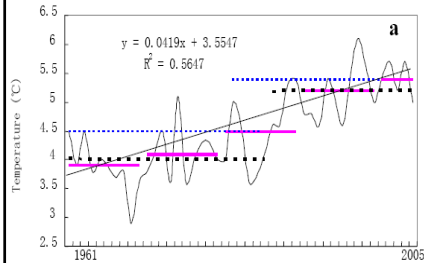
- Alxa League (region)
 - 3 main administrative units (counties)
 - Population: 0.2 million (2/3 urban)
 - Area: 270 000 km²
 - 80 000 km² of desert:
Badain Jaran, Tengger, Ulan Buh

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Temperature change in Alxa

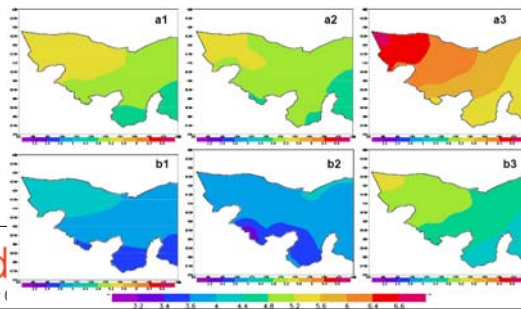


- Average temperature in Alxa is 6.0-8.5°C
- July: 22 to 26°C January: -14 to -9°C
- Strong temperature increase over last 50 years: 0.4°C/decade
- Between 3°C and 6°C temperature increase expected, mainly in summer

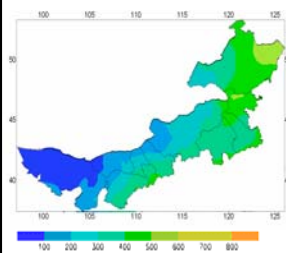
SRES A2 and B2 scenarios for 2071-2100; PRECIS model

Numbers 1-3 refer to annual, winter and summer, respectively

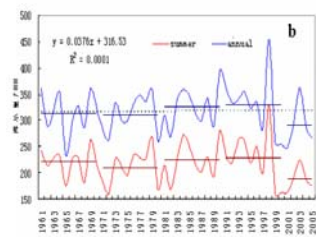
(Source: ADAM, 2008)



Precipitation change in Alxa



- Average precipitation in Alxa is 40-200mm
- Summer rain
- Minor absolute increase expected
- Greater variability expected

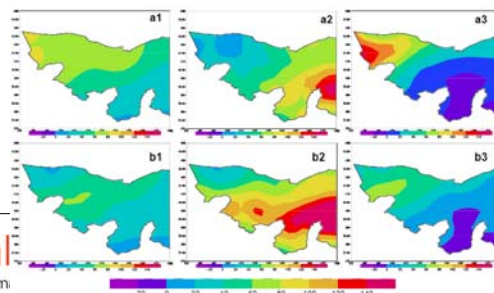


→ Increase in aridity possible

SRES A2 and B2 scenarios for 2071-2100; PRECIS model

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(Source: ADAM, 2008)



Socio-cultural and political background

- Mongol lifestyle: nomadic pastoralism
- Han Chinese farmer immigration
- Irrigation fed agriculture near oases
- Pastoralists have given up nomadic lifestyle
- permanent extensive grazing (2.2m livestock)
- Environmental policies: grassland enclosure, grazing ban, "Grain for Green", green belts
- Socio-economic policies: poverty alleviation, "Ecological migration"
- Recently: recognition of CC adaptation and mitigation by central government



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Environmental problems

- Land degradation (65% degraded → productivity loss)
- Desertification
- Increase in number of dust storms
- Water availability / groundwater levels
- Soil and groundwater salinization
- Plant diseases / insect attack
- Rodent plagues
- Invasive species



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Environmental policies and measures

- Grazing ban / rotational grazing / enclosed grassland
- Resettlement programs (Ecological migration)
- Green belts / afforestation / reforestation
- Wind breaks
- Contour planting / drip irrigation / greenhouses
- Water reservoirs / wells
- Drought-based insurance
- Weather information system
- Economic diversification
- Reduction of stocking rates



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Questionnaire methodology and basic statistics

- 98 questionnaires filled out in October and November 2008
 - few qualitative questions
 - questions were sometimes not understood as expected (e.g. bank loans)
 - responses often not independent
- **Gender:** 76% male 24% female
- **Counties:** Azuo Qi, Ayou Qi, Ejina Qi
- **Place of living:**
12% towns 43% villages 27% isolated farms 18% eco-migration villages
- **Level of education:**
28% primary 38% secondary 22% high school 12% university/college
- **Occupation:**
37% farmers 48% pastoralists
3% business 5% government 7% other (teachers)

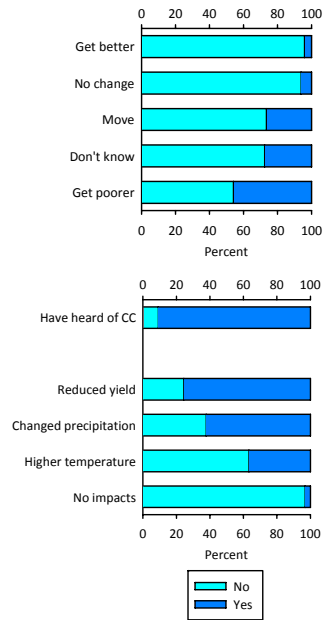
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Expected impacts and changes in livelihood with climate change

- Nearly everyone has heard of climate change
- Clearly negative association of climate change impacts and effects on livelihoods
- Better educated people tend to know more about possible temperature effects but respond more negatively to other effects because they are less affected



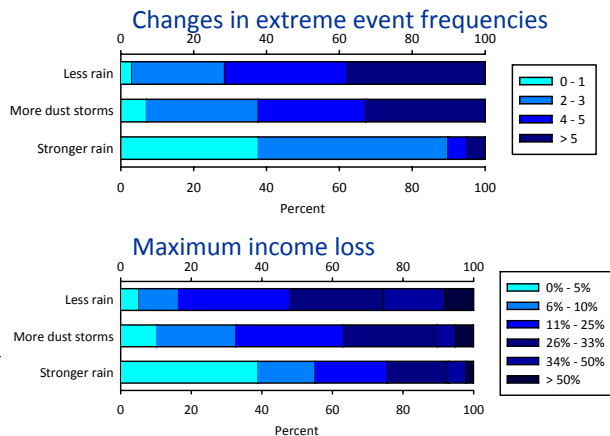
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Changes in extreme event frequencies in the past 10 years and associated maximum income loss

- Respondents noted clear differences in climate patterns
- Over 60% reported about doubling of drought and dust storm events
- Extreme rainfall not seen as important

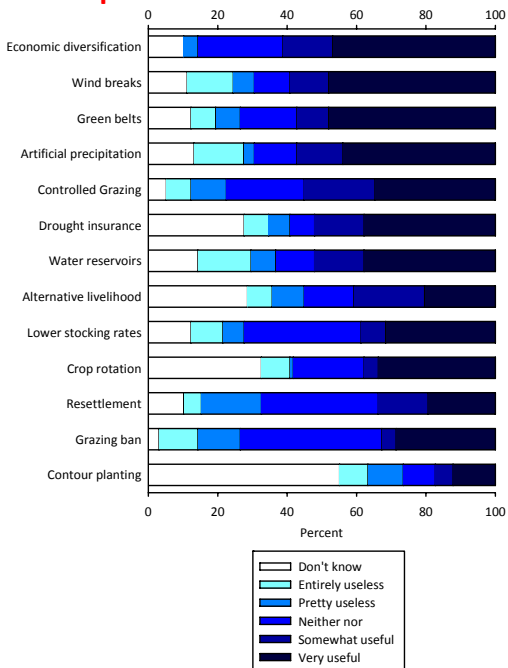
- Over 50% had lost more than 25% of income due to lack of rain
- Over one third had lost more than 25% of income due to dust storms
- Extreme rain caused less widespread impacts (25% had > 50% loss)



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Usefulness of environmental policies and measures

- Policy ranking:
 1. Economic diversification (12.2%)
 2. Green belts (10.4%)
 3. Windbreaks (8.8%)
 4. Artificial precipitation (8.6%)
 5. Water reservoirs (7.6%)
- Ecological migration and grazing ban rank 8th and 9th, respectively
- Significant effects by grouping variables
 - Isolated farms generally score low
 - Lowest level of education generally scores low
 - Farmers generally score higher than pastoralists



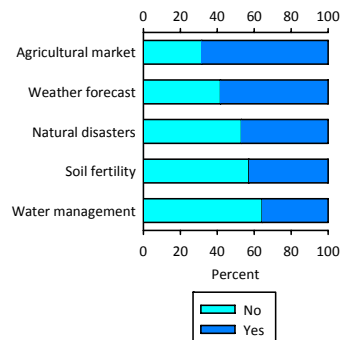
Willingness to pay for climate-related income loss insurance and information required for better decision-making

Willingness to pay

0 – 5 ¥	29%
6 – 10 ¥	32%
11 – 50 ¥	33%
51 – 100 ¥	6%
> 100 ¥	1%

- Most willing to pay for insurance
 - Significant effects by grouping variables
 - E-W trend to pay more for climate protection**
 - Pastoralists willing to pay more than farmers***
- Pastoralists: 14.46 ¥/month Farmers: 7.31 ¥/month

- Agricultural and weather information most valued
- Significant effects by grouping variables
 - W-E trend towards weather information**
 - Farmers value agricultural and soil fertility information more than pastoralists***



* p<0.05; ** p<0.01, *** p<0.001

Living conditions: evaluation of present, changes in the past and views of the future

- Most are somewhat satisfied
- Is the past being glorified?
- Strong majority expects a better future
- Significant effects by grouping variables
 - People in Ejina (W) more satisfied with current situation** and see most positive change*** (past 5 years)
 - Eco-migrants see most positive change**
 - Isolated farms see most negative change** and are most pessimistic of the future***
 - Pastoralists have more pessimistic view of future than farmers**

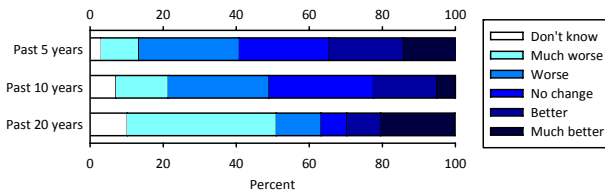
Evaluation of present

Not satisfied	33%
Somewhat	45%
Very satisfied	12%
Don't know	10%

Views of the future

Get worse	11%
Stay the same	8%
Get better	57%
Don't know	24%

* p<0.05; ** p<0.01, *** p<0.001



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Conclusions

- Environmental problems driven by land use systems and intensified by climate change
- Environmental and social policies solve some problems at expense of creating others
- Clear perception of changes and rising impacts
- Economic diversification, green belts and windbreaks viewed as most successful policies/measure
- High willingness to pay for climate protection
- Expected negative impacts of climate change but nevertheless high expectations for better future

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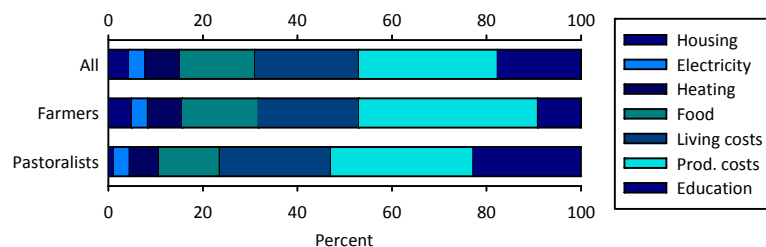
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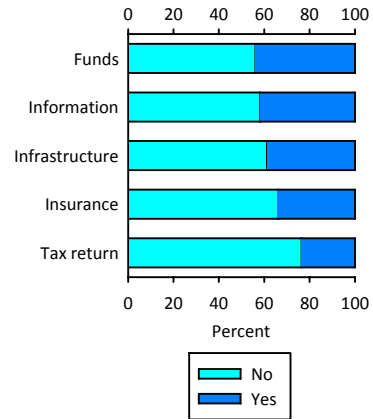
Basic personal information

- Median age of respondent: 41 ± 7 years
- Median number of household members: 4 of which 2 are children
- Annual income: 33900 ± 18700 ¥ (around 4000 €)



How does government help in a crisis (up to 3 answers)?

- Government helps, but not all and not enough
 - 80% want more funds
 - 60% want more information and infrastructure
 - 36% want greater insurance coverage
- Significant effects by grouping variables
 - Isolated farms score lower on funds*, infrastructure* and information*
 - Increasing E-W trend for infrastructure**
 - Information scores higher with education*
 - Information scores higher for farmers than pastoralists**



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