The Contribution of climate change to land degradation in Saudi Arabia

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The Kingdom of Saudi Arabia

- An arid country of 200 million hectares (80% of the Arabian Peninsula), with 2410 km of sea coasts,
- Estimated population: 26 million inhabitants
- Major oil and gas producer,
- Water scarcity,
- Reduced vegetal cover,
GCC countries
Residents rank among the highest per capita water users in the world
Average water consumption 300-750 liters/person/day (World Bank 2005)

Agricultural water use increased from 73.5 billion m³ in 1990 to more than 85 billion m³ 1998-2002 period (UNESCWA 2003)
Saudi Arabia: land and climate

- Different landforms

Climate gradient
Saudi Arabia: land and climate

- Diverse overlapping habitats

Average annual rainfall distribution
History of impacts

- Driver of changes: which is the main one?

VULNERABILITY

- Land use?

UNSTABILITY

- Man?

Climate change?
Awareness on climate change in KSA

• Arab Forum for Environment & Development (2009):
  • 98% surveyed individuals believed climate is changing,
  • 81% thought CC is a serious problem for the country,
  • 92% thought CC is due to human activities,
    – 36% thought that the Saudi Government was not acting sufficiently to address the problem,
    – 44% thought the opposite,
    – 20% did not have an opinion.

• Behavioral problem
Impacts
- Land-use
- Climate change

Impacts on Ecosystems
- Soil erosion
- Biodiversity

Impacts on agricultural lands
- Deterioration of aquifers.
- Soil salinization
- Abandoning fields

Conclusions and perspectives
History of impacts: land use

- Population Change = Land Use Change = = = More Impact

Spatial variations in total ppt

Impacts: Climate change

- Increase in Temperature = Increase ET = More water requirements

- $+1\,^0C = 1 - 4.5\%$

- $+5\,^0C = 6 - 19.5\%$
Impacts on Natural Ecosystems

- Change in productivity
- Change in species composition
- Soil erosion & biodiversity loss (species extinctions)
Increased frequency & intensity of extreme climate-related disasters
(IIPCC 2007, Munich Re Group 2006)
likely will trigger substantial changes in the structure and functioning of ecosystems

extreme events
Impacts on agricultural lands

- Deterioration of aquifers
- Salinization
- Dryness
Impacts on agricultural lands

- Soil salinity
- Soil erosion
- Abandoned fields
Land degradation
➢ Climate change
  ➢ Increased evapo-transpiration over precipitation (drought)
  ➢ Increased extreme events (erosion)
  ➢ Impact on productivity & stability (degradation)
  ➢ Feedback on soil processes

➢ Land use
  ➢ Increased soil erosion
  ➢ Soil salinization
  ➢ Increase pests and disease
  ➢ Threat to endangered ecosystems
  ➢ Fragmentation of habitats and ecosystems
  ➢ Introduction of exotic and invasive species
  ➢ Loss of biodiversity and ecosystem services
Anticipated negative impact of CC on range and forest lands over the next 50-100 years include:

- Increase in the frequency and changes in the patterns of natural disturbances (drought, storms, diseases),
- Change in species composition and a decrease in biodiversity,
- Drop in productivity (fodder, meat, honey...),
- Increase in desertification,
- Increase of rural exodus.
What can be done?
Forest and range activities

- KSA adopted strategies and regulations (NFS-AP, NAP-UNCCD, NRS-AP, Forest & Range law,...)
- Juniper ecosystem rehabilitation and green belts activities,
- Mangrove rehabilitation by Government agencies and PS.
- Range rehabilitation activities hindered by the common land tenure, (Al Jouf Center; Seed multiplication centers).
- 15 protected areas covering about 5% of the land area and conserving about 43% of the country's flora,
- A regional drought monitoring and early warning centre (PME).
What can we do?

Sustainable management and protection

- 15 protected areas (5% country)
- Conservation of woodlands
- Enhancing rangeland production
- Introducing integrated watershed management jointly with communities.
- to improve drought resilience
- to combat land degradation
- Restoration treatments
What can we do?

- Al Ghada (*Haloxylon persicum*) Nature Reserve

Enhancing knowledge and capacity of local community for sustainable management of natural resources

Alghada Festival Every Year
The total KSA 9th development plan budget (2010-2014) is 1,444 billion SR (385 billion US$), of which 26.5 is allocated to the Ministry of Agriculture (6.6%).

In 2007 KSA reserved US$300 million + PS funds to support cleaner and efficient oil technologies & promote CCS and transfer of environmentally friendly technologies.

Public & private sectors invest in water resource assessment, development and management.

In 2009, 3 billion SR ($800 million), to support investment by Saudi PS in agricultural projects abroad.