

# Regional Scenarios for the Wadi Drâa Catchment

GLOWA Conference  
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Atmosphere

Hydrosphere

Antroposphere

Biosphere

# the IMPETUS method

Problem clusters

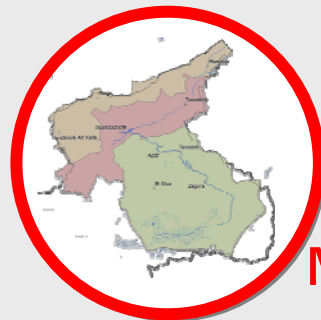
Models & Scenarios



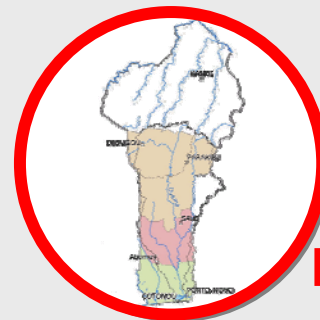
(Spatial) Decision Support Systems

# Why Scenarios ?

- **Future** cannot be **predicted** precisely
- Scenarios are contradiction-free **projections** of the present state of a system into the future
- Assessment of **alternative** development paths
- Estimation of the **uncertainty** of likely future development
- Analyse the long-term effect of political decisions



Morocco

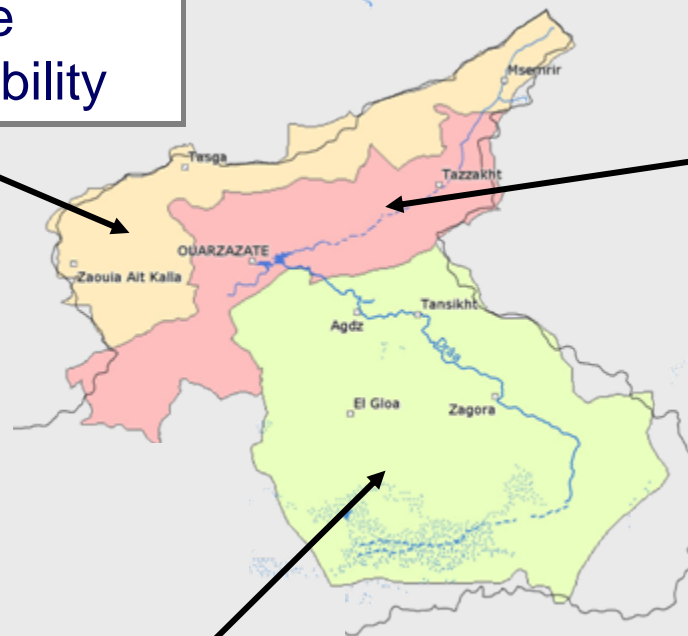


Bénin

# Characteristics of sub-regions WADI DRÂA

## **High Atlas**

- marginalised region
- poor infrastructure
- good water availability



## **Ouarzazate Basin**

- good infrastructure
- strong urban centres
- good water availability

## **Oases southern of Mansour Eddahbi Dam**

- low water availability
- dependency on dam management

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# Development of main economic framework conditions

M3: **Business as usual**

M2: **Rural development in the Drâa-lands**

**M1: Marginalisation – non-support of the Drâa-Region**

- Stagnation of tourism
- Growth rates of the industrial sector stagnate on a low level

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# Development of main economic framework conditions

M3: **Business as usual**

**M2: Rural development in the Drâa-Region through regional funds**

- Programs for enabling people to help themselves
- Increase of tourism

M1:

- Sta
- Gro
- stag



# Development of main economic framework conditions

## M3: **Business as usual**

- Slow increase of tourism
- Low rates of industrialization

M2:

- Pro
- ther
- Incr

M1:

- Sta
- Gro
- stag





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# Development of political framework conditions

M3: **Business as usual**

M2: **Rural development in the Drâa-  
funds**

**M1: Marginalisation – non-support  
of the Drâa-Region**

- Funding programs decrease
- Traditional forms of decision-making gain importance

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# Development of political framework conditions

M3: **Business as usual**

**M2: Rural development in the Drâa-Region through regional funds**

- Intensification of funding programs (according to strategy 2002)
- Valorization of local governance

M1:

- Fur
- Tra
- gain

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# Development of political framework conditions

## M3: **Business as usual**

- Funding programs for tourism only
- Traditional and modern forms of administrations exist in parallel

## M2:

- Inter
- (acc
- Val

## M1:

- Fur
- Tra
- gain





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# Developments within the agriculture sector

M3: Business as usual

M2: Rural development in the Drâa-  
funds

**M1: Marginalisation – non-support  
of the Drâa-Region**

- Agriculture areas and livestock farming remains constant
- Stagnation of productivity
- Missing innovations

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# Developments within the agriculture sector

## M3: **Business as usual**

- Low rate of innovations
- Agriculture areas and livestock farming remain constant

M2:

Incr  
proc

- Cas
- Recd

M1:

- Agr
- farm
- Sta
- Mis

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# Development of demographic framework conditions / living quality

M3: **Business as usual**

M2: **Rural development in the Drâa-lands**

**M1: Marginalisation – non-support of the Drâa-Region**

- Increased migration
- Demographic polarization
- Deterioration of living conditions

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# Development of demographic framework conditions / living quality

M3: **Business as usual**

**M2: Rural development in the Drâa-Region through regional funds**

- Decline of migration
- Improvement of living conditions

M1:

- Increase
- Decrease
- Det

A small, partially visible table or chart in the bottom right corner, likely a data table related to the demographic framework conditions.

# Development of demographic framework conditions / living quality

## M3: **Business as usual**

- Slowly growing population
- High migration
- Slight progress in basic needs supply

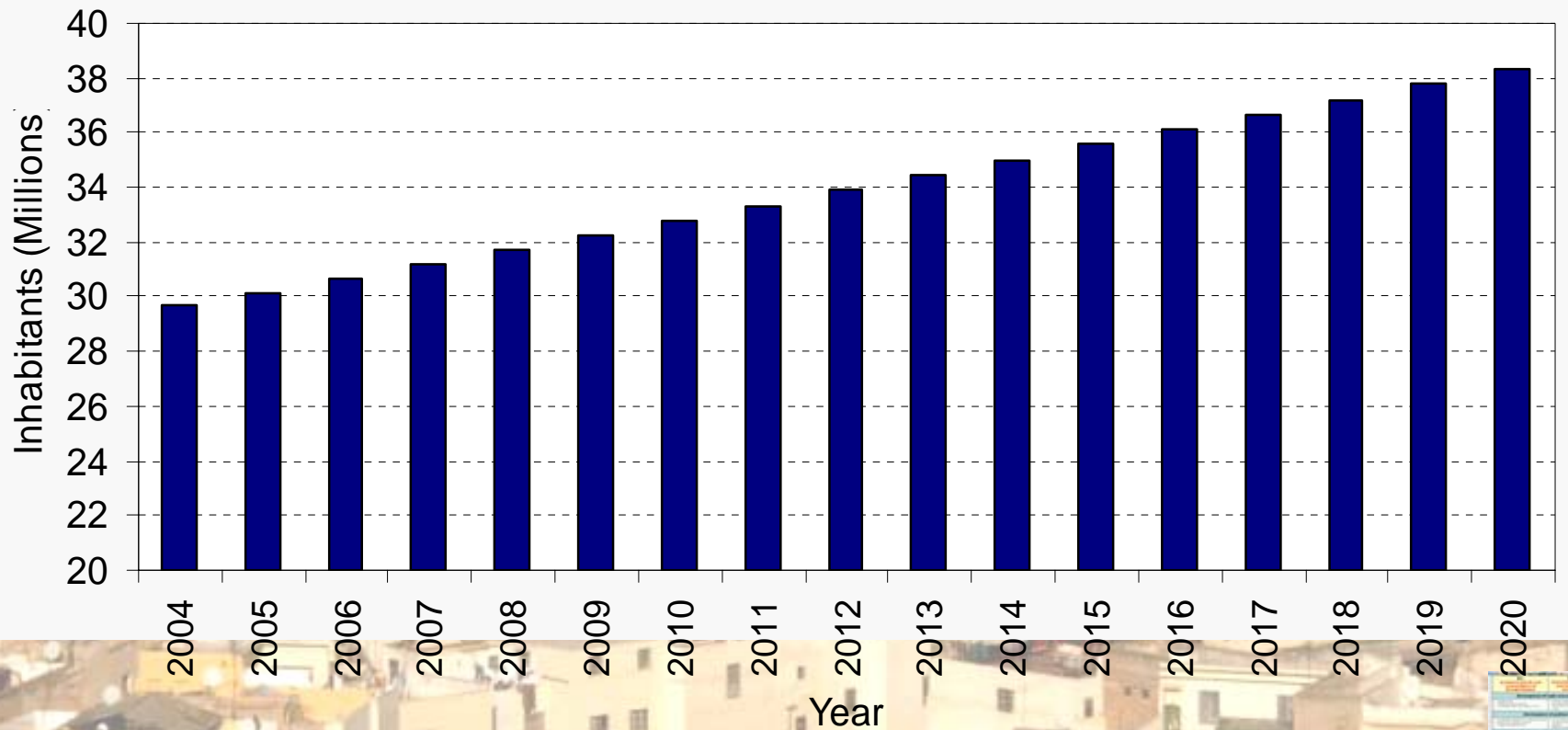
M2:

- Dec
- Imp

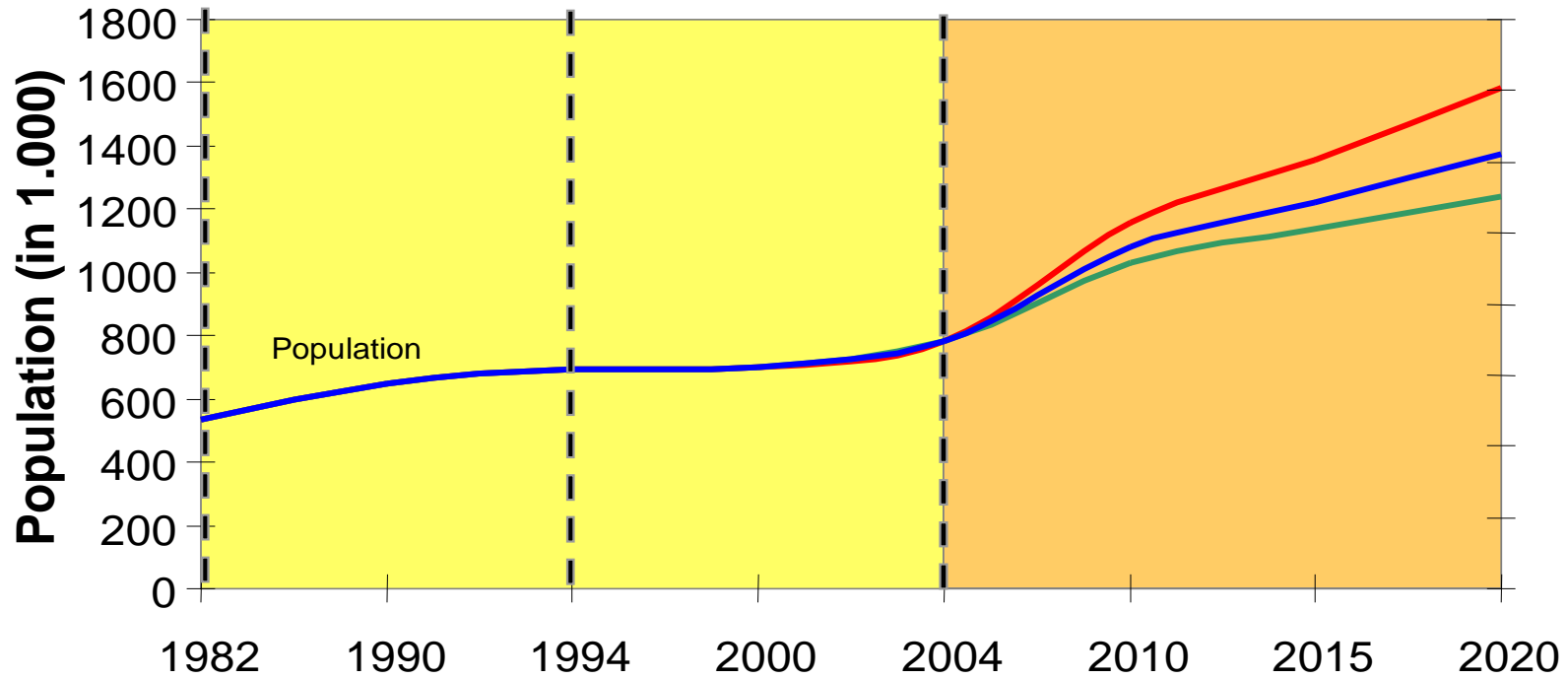
M1:

- Incr
- Der
- Det

## Population Projections Morocco



## Population Development in the Drâa Region

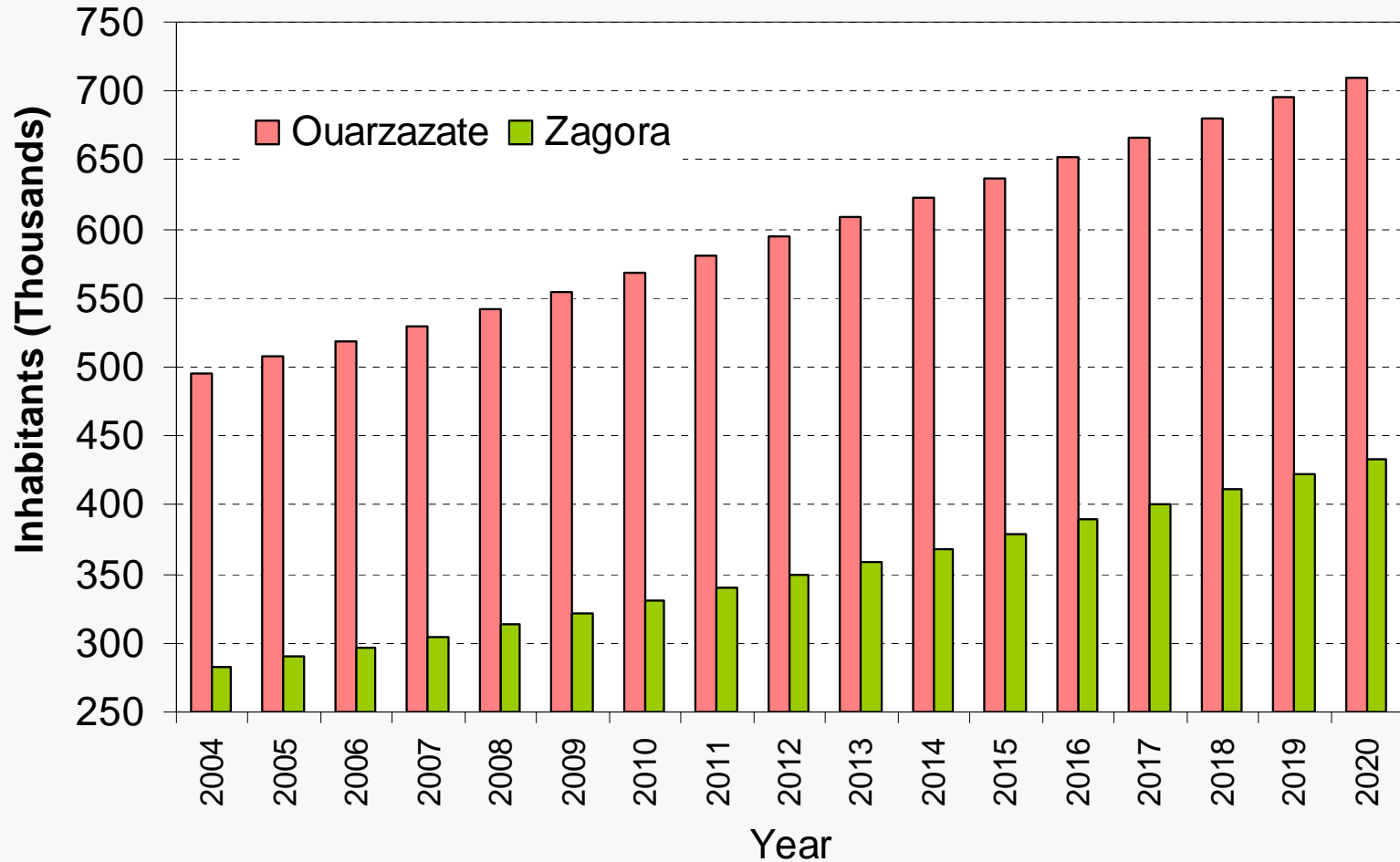


**IMPETUS scenarios**  
— M 1   — M 2   — M 3

census data      IMPETUS projections  


Sources: Royaume du Maroc, RPGH 1982, 1994, 2004

## Population Projections Ouarzazate and Zagora







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# Environment and resources

M3: **Business as usual**

M2: **Rural development in the Drâa-  
funds**

**M1: Marginalisation – non-support  
of the Drâa-Region**

- Weak resource management
- Increase of energy costs
- Uncontrolled exploitation of resources

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# Environment and resources

M3: **Business as usual**

**M2: Rural development in the Drâa-Region through regional funds**

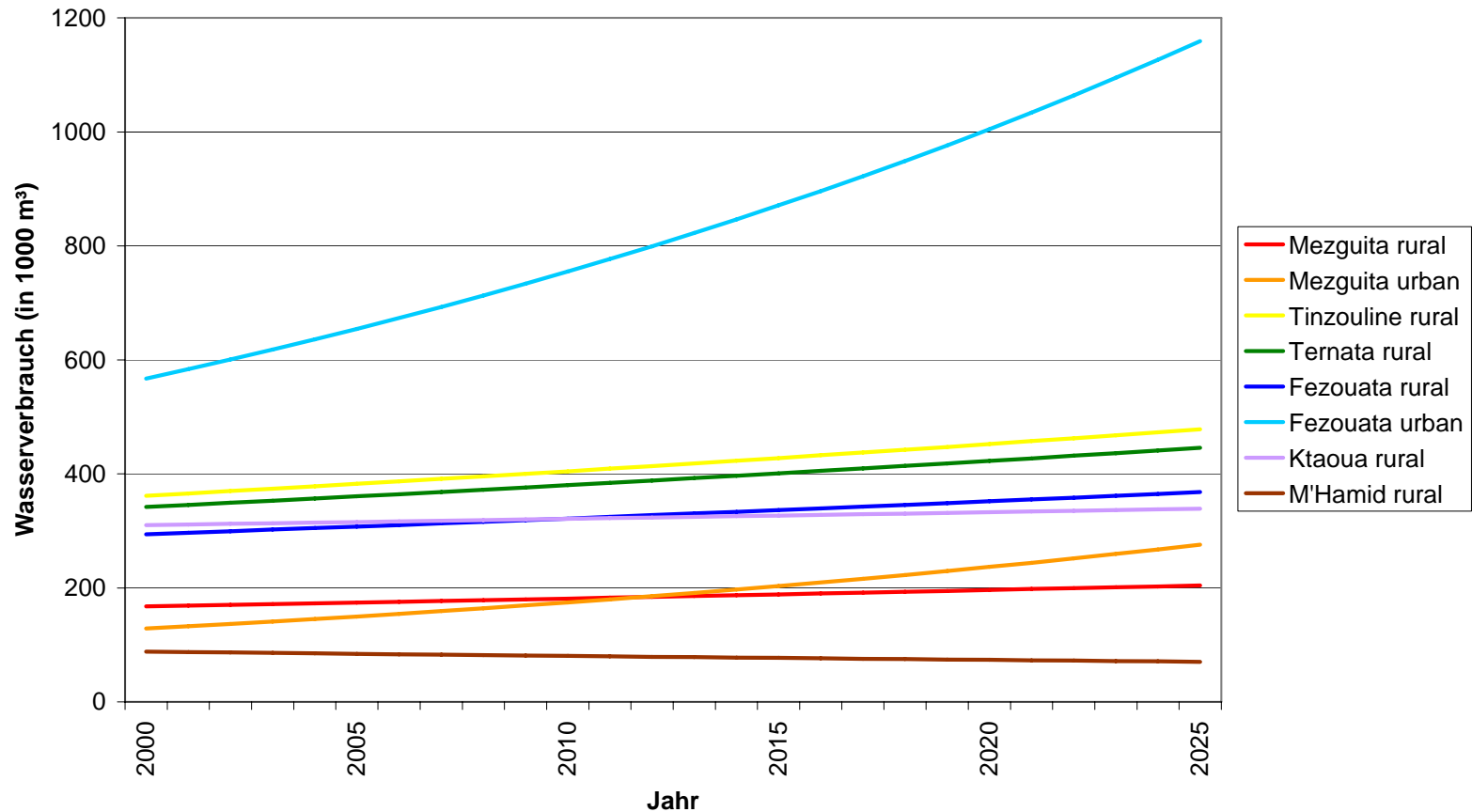
- Management strategies are implemented
- Water use increases

M1:

- We
- Incr
- Unc

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## Simulated Annual Water Use in the Drâa Oasis 2000-2020



Area	2000	2005	2010	2015	2020	2025
Mezguita rural	170	175	180	185	190	200
Mezguita urban	130	150	170	200	230	270
Tinzouline rural	360	380	400	420	440	470
Ternata rural	340	360	380	400	420	440
Fezouata rural	290	300	310	320	330	340
Fezouata urban	570	650	750	870	1000	1150
Ktaoua rural	300	310	320	330	340	350
M'Hamid rural	90	85	80	75	70	65

# Environment and resources

## M3: **Business as usual**

- Increase of energy costs
- Water scarcity sets limits to the expansion of agriculture

## M2:

- Ma
- imp
- Wa

## M1:

- We
- Incr
- Unc





# Climate scenarios



# Climate scenarios for Morocco



	Morocco		
	High Atlas	Basin of Ouarzazate	Oasis of Zagora
<b>Scenario X</b> (process oriented)	<ul style="list-style-type: none"> <li>- snow line rises by 200 m</li> <li>- more intense but less frequent rainfall events</li> <li>- no trend in annual rainfall</li> <li>- more extreme rainfall events</li> </ul>	<ul style="list-style-type: none"> <li>- slightly increased rainfall amount due to enhanced moisture transport for a) tropical-extratropical interaction and b) pressure minima off the Moroc. coast</li> </ul>	<ul style="list-style-type: none"> <li>- slightly increased rainfall amount due to enhanced moisture transport for a) tropical-extratropical interaction and b) pressure minima off the Moroc. coast</li> </ul>
<b>Scenario Y</b> (model oriented)	<ul style="list-style-type: none"> <li>- snow line rise by 200 m</li> <li>- reduced rainfall due to decreasing number of lows from the north</li> <li>- reduced seasonality</li> <li>- strong warming in winter</li> </ul>	<ul style="list-style-type: none"> <li>- substantially reduced rainfall and seasonality</li> <li>- more intense but less frequent rain events from tropical-extratrop. interaction</li> <li>- strong warming in winter</li> </ul>	<ul style="list-style-type: none"> <li>- slightly reduced rainfall</li> <li>- more intense but less frequent rain events from tropical-extratrop. interaction</li> <li>- reduced seasonality</li> <li>- weak warming in winter</li> </ul>
<b>Scenario Z</b> (business as usual)	<ul style="list-style-type: none"> <li>- snow line rise by 200 m</li> <li>- ongoing tendency towards reduced rainfall in winter</li> <li>- still large interannual variability</li> </ul>	<ul style="list-style-type: none"> <li>- no change in the long-term mean rainfall amount</li> <li>- still tendency to dry or wet periods of several years (decadal variability)</li> </ul>	<ul style="list-style-type: none"> <li>- no change in the long-term mean rainfall amount</li> <li>- still tendency to dry or wet periods of several years (decadal variability)</li> </ul>

# Climate scenarios for Morocco



	Morocco		
	High Atlas	Basin of Ouarzazate	Oasis of Zagora
<b>Scenario X</b> (process oriented)	<ul style="list-style-type: none"> <li>- snow line rises by 200 m</li> <li>- more intense but less frequent rainfall events</li> <li>- no trend in annual rainfall</li> <li>- more extreme rainfall events</li> </ul>	<ul style="list-style-type: none"> <li>- slightly increased rainfall amount due to enhanced moisture transport for a) tropical-extratropical interaction and b) pressure minima off the Moroc. coast</li> </ul>	<ul style="list-style-type: none"> <li>- slightly increased rainfall amount due to enhanced moisture transport for a) tropical-extratropical interaction and b) pressure minima off the Moroc. coast</li> </ul>
<b>Scenario Y</b> (model oriented)	<ul style="list-style-type: none"> <li>- snow line rise by 200 m</li> <li>- reduced rainfall due to decreasing number of lows from the north</li> <li>- reduced seasonality</li> <li>- strong warming in winter</li> </ul>	<ul style="list-style-type: none"> <li>- substantially reduced rainfall and seasonality</li> <li>- more intense but less frequent rain events from tropical-extratrop. interaction</li> <li>- strong warming in winter</li> </ul>	<ul style="list-style-type: none"> <li>- slightly reduced rainfall</li> <li>- more intense but less frequent rain events from tropical-extratrop. interaction</li> <li>- reduced seasonality</li> <li>- weak warming in winter</li> </ul>
<b>Scenario Z</b> (business as usual)	<ul style="list-style-type: none"> <li>- snow line rise by 200 m</li> <li>- ongoing tendency towards reduced rainfall in winter</li> <li>- still large interannual variability</li> </ul>	<ul style="list-style-type: none"> <li>- no change in the long-term mean rainfall amount</li> <li>- still tendency to dry or wet periods of several years (decadal variability)</li> </ul>	<ul style="list-style-type: none"> <li>- no change in the long-term mean rainfall amount</li> <li>- still tendency to dry or wet periods of several years (decadal variability)</li> </ul>

	High Atlas	Basin of Ouarzazate	Oasis of Zagora
Scenario X	...	...	...
Scenario Y	...	...	...
Scenario Z	...	...	...



# Morocco – High Atlas

**Scenario Z – Business as usual**

**Scenario Y – model oriented**

**Scenario X – process oriented**

- snow line rises by 200 m
- more intense but less frequent rainfall events
- no trend in annual rainfall
- more extreme rainfall events

	Morocco	
	High Atlas	North of Morocco
Scenario X	High Atlas: 100-150 mm, 1-2 events, 10-15 days	North of Morocco: 100-150 mm, 1-2 events, 10-15 days
Scenario Y	High Atlas: 100-150 mm, 1-2 events, 10-15 days	North of Morocco: 100-150 mm, 1-2 events, 10-15 days
Scenario Z	High Atlas: 100-150 mm, 1-2 events, 10-15 days	North of Morocco: 100-150 mm, 1-2 events, 10-15 days

# Morocco – High Atlas

Scenario Z – Business as usual

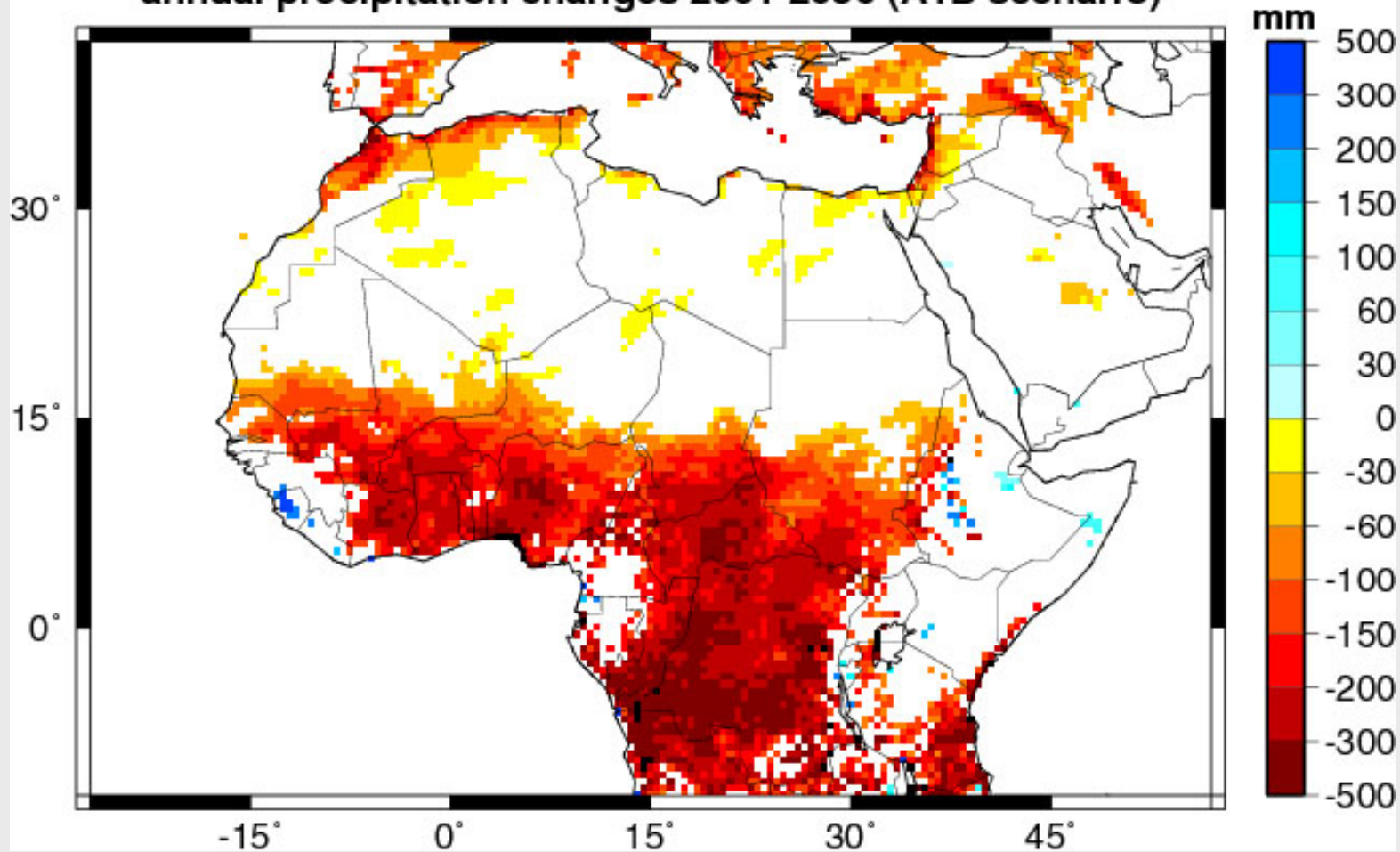
Scenario Y – model oriented

- Scenario X – model oriented**
- snow line rise by 200 m
  - reduced rainfall due to decreasing number of lows from the north
  - reduced seasonality
  - strong warming in winter
- Scenario Z – Business as usual**
- snow line rise by 200 m
  - reduced rainfall due to decreasing number of lows from the north
  - reduced seasonality
  - strong warming in winter
- Scenario Y – model oriented**
- snow line rise by 200 m
  - reduced rainfall due to decreasing number of lows from the north
  - reduced seasonality
  - strong warming in winter
- Scenario X – model oriented**
- snow line rise by 200 m
  - reduced rainfall due to decreasing number of lows from the north
  - reduced seasonality
  - strong warming in winter

Scenario	Morocco	
	High Atlas	North of Morocco
Scenario X Business as usual	High Atlas: +0.5°C, -0.5°C, +0.5°C, -0.5°C, +0.5°C, -0.5°C, +0.5°C, -0.5°C, +0.5°C, -0.5°C North of Morocco: +0.5°C, -0.5°C, +0.5°C, -0.5°C, +0.5°C, -0.5°C, +0.5°C, -0.5°C, +0.5°C, -0.5°C	High Atlas: +0.5°C, -0.5°C, +0.5°C, -0.5°C, +0.5°C, -0.5°C, +0.5°C, -0.5°C, +0.5°C, -0.5°C North of Morocco: +0.5°C, -0.5°C, +0.5°C, -0.5°C, +0.5°C, -0.5°C, +0.5°C, -0.5°C, +0.5°C, -0.5°C
Scenario Y Model oriented	High Atlas: +0.5°C, -0.5°C, +0.5°C, -0.5°C, +0.5°C, -0.5°C, +0.5°C, -0.5°C, +0.5°C, -0.5°C North of Morocco: +0.5°C, -0.5°C, +0.5°C, -0.5°C, +0.5°C, -0.5°C, +0.5°C, -0.5°C, +0.5°C, -0.5°C	High Atlas: +0.5°C, -0.5°C, +0.5°C, -0.5°C, +0.5°C, -0.5°C, +0.5°C, -0.5°C, +0.5°C, -0.5°C North of Morocco: +0.5°C, -0.5°C, +0.5°C, -0.5°C, +0.5°C, -0.5°C, +0.5°C, -0.5°C, +0.5°C, -0.5°C
Scenario Z Business as usual	High Atlas: +0.5°C, -0.5°C, +0.5°C, -0.5°C, +0.5°C, -0.5°C, +0.5°C, -0.5°C, +0.5°C, -0.5°C North of Morocco: +0.5°C, -0.5°C, +0.5°C, -0.5°C, +0.5°C, -0.5°C, +0.5°C, -0.5°C, +0.5°C, -0.5°C	High Atlas: +0.5°C, -0.5°C, +0.5°C, -0.5°C, +0.5°C, -0.5°C, +0.5°C, -0.5°C, +0.5°C, -0.5°C North of Morocco: +0.5°C, -0.5°C, +0.5°C, -0.5°C, +0.5°C, -0.5°C, +0.5°C, -0.5°C, +0.5°C, -0.5°C

# Reduced rainfall due to decreasing number of lows from the north

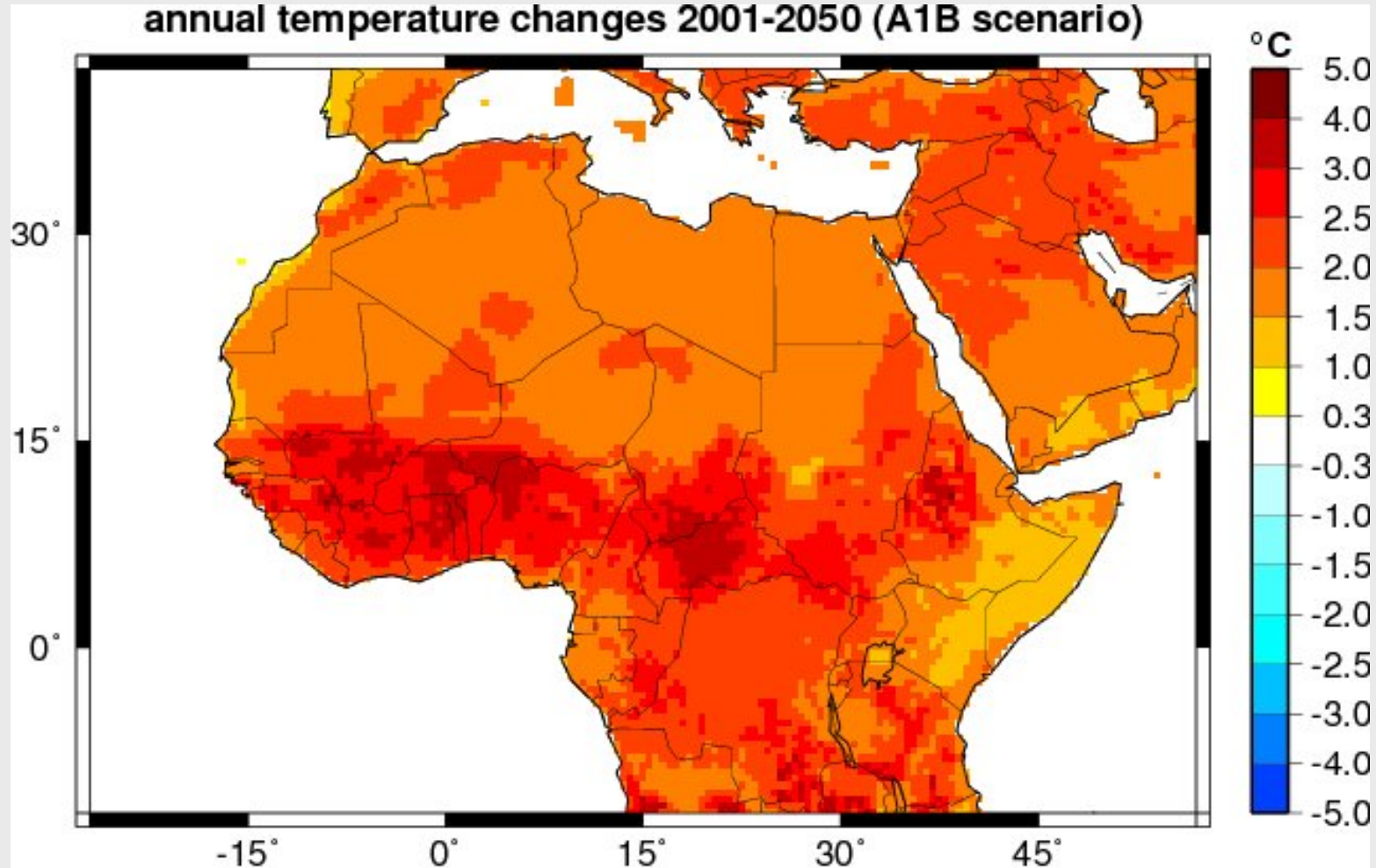
annual precipitation changes 2001-2050 (A1B scenario)



Scenario	High Rain	Low Rain	High Rain	Low Rain
Scenario 1	High Rain	Low Rain	High Rain	Low Rain
Scenario 2	High Rain	Low Rain	High Rain	Low Rain
Scenario 3	High Rain	Low Rain	High Rain	Low Rain

# Strong warming in winter

annual temperature changes 2001-2050 (A1B scenario)



Scenario	2001-2050	2051-2100
High	High	High
Medium	Medium	Medium
Low	Low	Low

# Morocco – High Atlas

## Scenario Z – Business as usual

### Scenario Z

- snow line rise by 200 m
- ongoing tendency towards reduced rainfall in winter
- still large interannual variability

### Scenario X

- snow line rise by 200 m
- more frequent snow days
- rain days reduced
- no trend in winter rainfall
- more frequent snow days

- snow line rise by 200 m
- reduced snow days
- reduced snow days
- strong interannual variability

	Morocco	
	High Atlas	North of Morocco
Scenario X	High Atlas: snow line rise by 200 m, more frequent snow days, rain days reduced, no trend in winter rainfall, more frequent snow days	North of Morocco: snow line rise by 200 m, more frequent snow days, rain days reduced, no trend in winter rainfall, more frequent snow days
Scenario Y	High Atlas: snow line rise by 200 m, more frequent snow days, rain days reduced, no trend in winter rainfall, more frequent snow days	North of Morocco: snow line rise by 200 m, more frequent snow days, rain days reduced, no trend in winter rainfall, more frequent snow days
Scenario Z	High Atlas: snow line rise by 200 m, ongoing tendency towards reduced rainfall in winter, still large interannual variability	North of Morocco: snow line rise by 200 m, ongoing tendency towards reduced rainfall in winter, still large interannual variability

# Climate scenarios for Morocco



	Morocco		
	High Atlas	Basin of Ouarzazate	Oasis of Zagora
<b>Scenario X</b> (process oriented)	<ul style="list-style-type: none"> <li>- snow line rises by 200 m</li> <li>- more intense but less frequent rainfall events</li> <li>- no trend in annual rainfall</li> <li>- more extreme rainfall events</li> </ul>	<ul style="list-style-type: none"> <li>- slightly increased rainfall amount due to enhanced moisture transport for a) tropical-extratropical interaction and b) pressure minima off the Moroc. coast</li> </ul>	<ul style="list-style-type: none"> <li>- slightly increased rainfall amount due to enhanced moisture transport for a) tropical-extratropical interaction and b) pressure minima off the Moroc. coast</li> </ul>
<b>Scenario Y</b> (model oriented)	<ul style="list-style-type: none"> <li>- snow line rise by 200 m</li> <li>- reduced rainfall due to decreasing number of lows from the north</li> <li>- reduced seasonality</li> <li>- strong warming in winter</li> </ul>	<ul style="list-style-type: none"> <li>- substantially reduced rainfall and seasonality</li> <li>- more intense but less frequent rain events from tropical-extratrop. interaction</li> <li>- strong warming in winter</li> </ul>	<ul style="list-style-type: none"> <li>- slightly reduced rainfall</li> <li>- more intense but less frequent rain events from tropical-extratrop. interaction</li> <li>- reduced seasonality</li> <li>- weak warming in winter</li> </ul>
<b>Scenario Z</b> (business as usual)	<ul style="list-style-type: none"> <li>- snow line rise by 200 m</li> <li>- ongoing tendency towards reduced rainfall in winter</li> <li>- still large interannual variability</li> </ul>	<ul style="list-style-type: none"> <li>- no change in the long-term mean rainfall amount</li> <li>- still tendency to dry or wet periods of several years (decadal variability)</li> </ul>	<ul style="list-style-type: none"> <li>- no change in the long-term mean rainfall amount</li> <li>- still tendency to dry or wet periods of several years (decadal variability)</li> </ul>

	High Atlas	Basin of Ouarzazate	Oasis of Zagora
Scenario X (process oriented)	Increased rainfall, more extreme events	Slightly increased rainfall	Slightly increased rainfall
Scenario Y (model oriented)	Reduced rainfall, strong winter warming	Substantially reduced rainfall, strong winter warming	Slightly reduced rainfall, weak winter warming
Scenario Z (business as usual)	Snow line rise, reduced winter rainfall	No change in long-term mean rainfall	No change in long-term mean rainfall

# Morocco – Basin of Ouarzazate

**Scenario Z – Business as usual**

**Scenario Y – model oriented**

**Scenario X – process oriented**

- slightly increased rainfall amount due to enhanced moisture transport for
  - a) tropical extratropical interaction and
  - b) pressure minima off the Moroc. coast

	Morocco	
	High water	Low water
Scenario X	High water	Low water
Scenario Y	High water	Low water
Scenario Z	High water	Low water

# Morocco – Basin of Ouarzazate

## Scenario Z – Business as usual

### Scenario Y – model oriented

- substantially reduced rainfall and seasonality
- more intense but less frequent rain events from tropical-extratropical interaction
- strong warming in winter

### Scenario X

- slight increase in rainfall (to 1000 mm a) tropical b) polar

Scenario	Morocco	
	High end	Low end
Scenario X	1000 mm	1000 mm
Scenario Y	500 mm	500 mm
Scenario Z	200 mm	200 mm



# Morocco – Basin of Ouarzazate

## Scenario Z – Business as usual

- no change in the long-term mean rainfall amount
- still tendency to dry or wet periods of several years (decadal variability)

### Scenario Y

- substantial sea level rise
- moderate even
- interaction
- strong warming in winter

### Scenario X

- slight to moderate
- a) transition
- b) period

Scenario	Morocco	
	High end	Low end
Scenario X	High end	Low end
Scenario Y	High end	Low end
Scenario Z	High end	Low end

# Climate scenarios for Morocco



	Morocco		
	High Atlas	Basin of Ouarzazate	Oasis of Zagora
<b>Scenario X</b> (process oriented)	<ul style="list-style-type: none"> <li>- snow line rises by 200 m</li> <li>- more intense but less frequent rainfall events</li> <li>- no trend in annual rainfall</li> <li>- more extreme rainfall events</li> </ul>	<ul style="list-style-type: none"> <li>- slightly increased rainfall amount due to enhanced moisture transport for a) tropical-extratropical interaction and b) pressure minima off the Moroc. coast</li> </ul>	<ul style="list-style-type: none"> <li>- slightly increased rainfall amount due to enhanced moisture transport for a) tropical-extratropical interaction and b) pressure minima off the Moroc. coast</li> </ul>
<b>Scenario Y</b> (model oriented)	<ul style="list-style-type: none"> <li>- snow line rise by 200 m</li> <li>- reduced rainfall due to decreasing number of lows from the north</li> <li>- reduced seasonality</li> <li>- strong warming in winter</li> </ul>	<ul style="list-style-type: none"> <li>- substantially reduced rainfall and seasonality</li> <li>- more intense but less frequent rain events from tropical-extratrop. interaction</li> <li>- strong warming in winter</li> </ul>	<ul style="list-style-type: none"> <li>- slightly reduced rainfall</li> <li>- more intense but less frequent rain events from tropical-extratrop. interaction</li> <li>- reduced seasonality</li> <li>- weak warming in winter</li> </ul>
<b>Scenario Z</b> (business as usual)	<ul style="list-style-type: none"> <li>- snow line rise by 200 m</li> <li>- ongoing tendency towards reduced rainfall in winter</li> <li>- still large interannual variability</li> </ul>	<ul style="list-style-type: none"> <li>- no change in the long-term mean rainfall amount</li> <li>- still tendency to dry or wet periods of several years (decadal variability)</li> </ul>	<ul style="list-style-type: none"> <li>- no change in the long-term mean rainfall amount</li> <li>- still tendency to dry or wet periods of several years (decadal variability)</li> </ul>

	High Atlas	Basin of Ouarzazate	Oasis of Zagora
Scenario X (process oriented)	High Atlas: snow line rises by 200 m, more intense but less frequent rainfall events, no trend in annual rainfall, more extreme rainfall events	Basin of Ouarzazate: slightly increased rainfall amount due to enhanced moisture transport for a) tropical-extratropical interaction and b) pressure minima off the Moroc. coast	Oasis of Zagora: slightly increased rainfall amount due to enhanced moisture transport for a) tropical-extratropical interaction and b) pressure minima off the Moroc. coast
Scenario Y (model oriented)	High Atlas: snow line rise by 200 m, reduced rainfall due to decreasing number of lows from the north, reduced seasonality, strong warming in winter	Basin of Ouarzazate: substantially reduced rainfall and seasonality, more intense but less frequent rain events from tropical-extratrop. interaction, strong warming in winter	Oasis of Zagora: slightly reduced rainfall, more intense but less frequent rain events from tropical-extratrop. interaction, reduced seasonality, weak warming in winter
Scenario Z (business as usual)	High Atlas: snow line rise by 200 m, ongoing tendency towards reduced rainfall in winter, still large interannual variability	Basin of Ouarzazate: no change in the long-term mean rainfall amount, still tendency to dry or wet periods of several years (decadal variability)	Oasis of Zagora: no change in the long-term mean rainfall amount, still tendency to dry or wet periods of several years (decadal variability)

# Morocco – Oasis of Zagora

**Scenario Z – Business as usual**

**Scenario Y – model oriented**

**Scenario X – process oriented**

- slightly increased rainfall amount due to enhanced moisture transport for
  - a) tropical extratropical interaction and
  - b) pressure minima off the Moroc. coast

	Morocco		
	High rate	Level of Observation	State of Nature
Scenario 1 Business as usual	High rate	Level of Observation	State of Nature
Scenario 2 Model oriented	High rate	Level of Observation	State of Nature
Scenario 3 Process oriented	High rate	Level of Observation	State of Nature

# Morocco – Oasis of Zagora

## Scenario Z – Business as usual

### Scenario Y – model oriented

- Scenario Y**
- slightly reduced rainfall
  - more intense but less frequent rain events from tropical - extratropical interaction
  - reduced seasonality
  - weak warming in winter

Scenario	Morocco		
	High water	Low water	Water of Quality
Scenario 1 Business as Usual	High water: 1.5-2.0 m, Low water: 0.5-1.0 m, Water of Quality: 1.0-1.5 m	High water: 1.0-1.5 m, Low water: 0.5-1.0 m, Water of Quality: 1.0-1.5 m	High water: 1.0-1.5 m, Low water: 0.5-1.0 m, Water of Quality: 1.0-1.5 m
Scenario 2 Reduced seasonality	High water: 1.0-1.5 m, Low water: 0.5-1.0 m, Water of Quality: 1.0-1.5 m	High water: 1.0-1.5 m, Low water: 0.5-1.0 m, Water of Quality: 1.0-1.5 m	High water: 1.0-1.5 m, Low water: 0.5-1.0 m, Water of Quality: 1.0-1.5 m
Scenario 3 Weak warming in winter	High water: 1.0-1.5 m, Low water: 0.5-1.0 m, Water of Quality: 1.0-1.5 m	High water: 1.0-1.5 m, Low water: 0.5-1.0 m, Water of Quality: 1.0-1.5 m	High water: 1.0-1.5 m, Low water: 0.5-1.0 m, Water of Quality: 1.0-1.5 m

# Morocco – Oasis of Zagora

## Scenario Z – Business as usual

- no change in the long-term mean rainfall amount
- still tendency to dry or wet periods of several years (decadal variability)

### Scenario Y

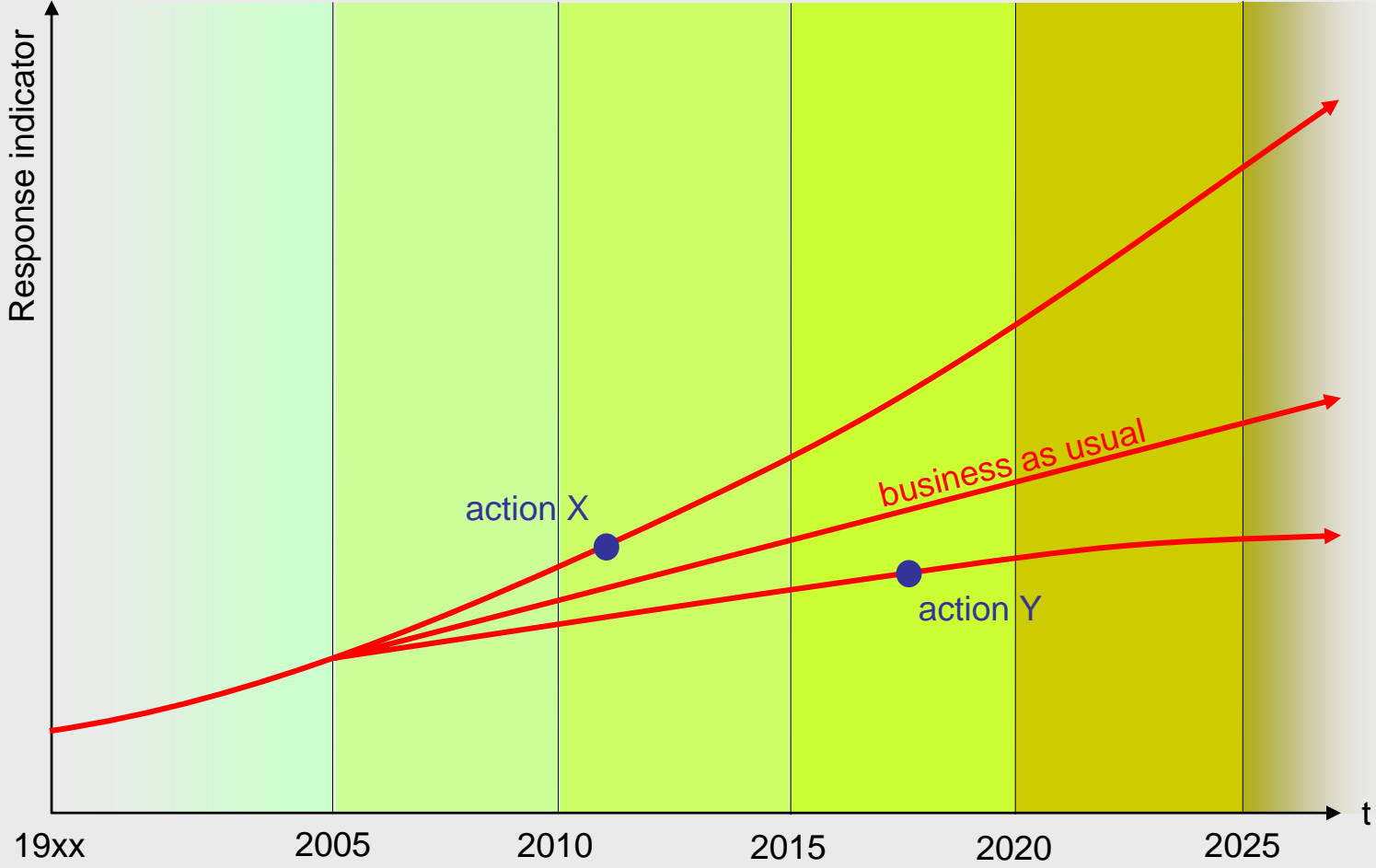
- slight increase in mean rainfall
- moderate increase in inter-annual variability
- reduced decadal variability
- weak tendency to dry or wet periods

### Scenario X

- slight decrease in mean rainfall
- to increase in inter-annual variability
- a) tendency to dry periods
- b) tendency to wet periods

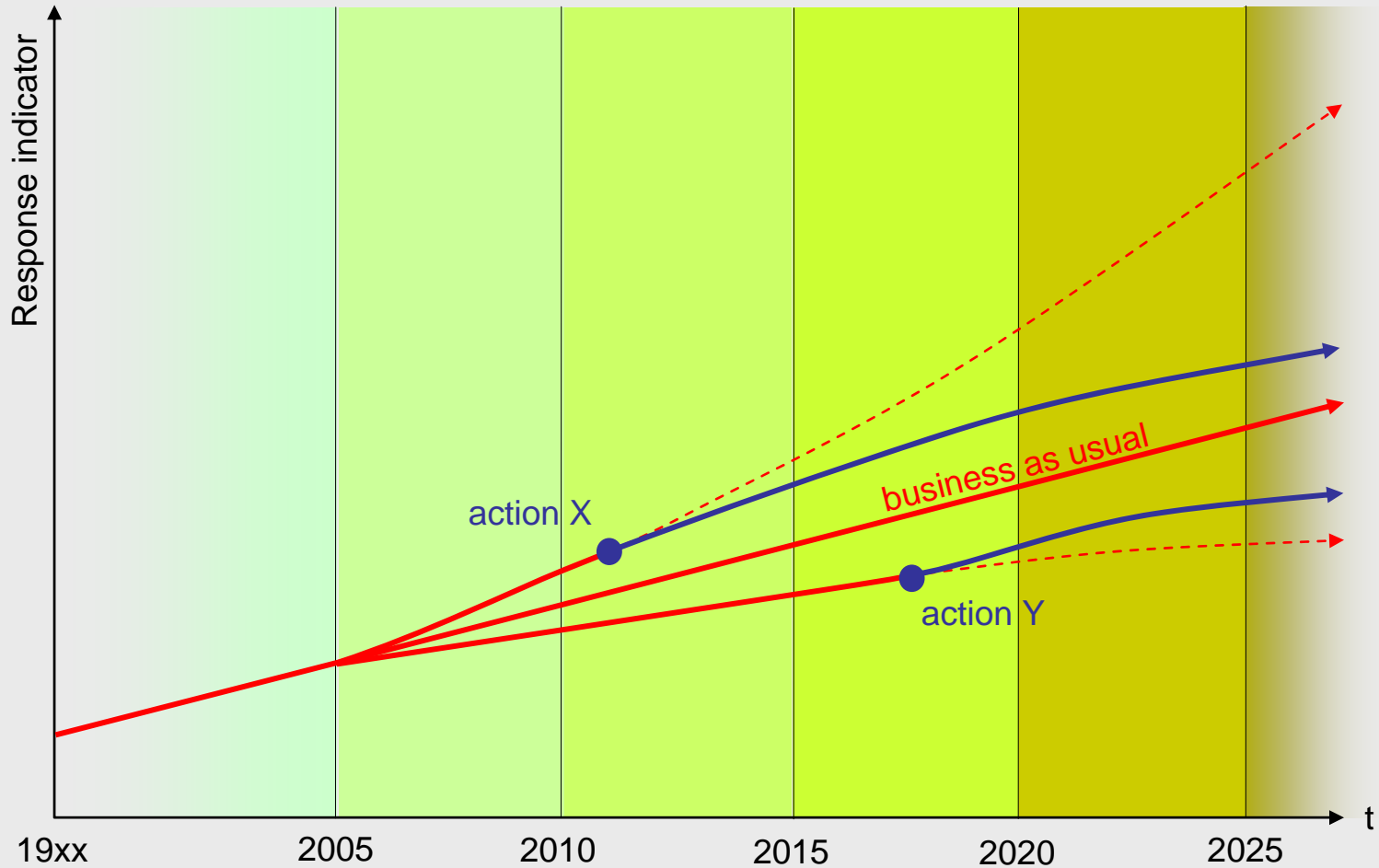
Scenario	Morocco	
	High water	Low water
Scenario X	High water: Slight decrease in mean rainfall, increase in inter-annual variability, tendency to dry periods	Low water: Slight decrease in mean rainfall, increase in inter-annual variability, tendency to wet periods
Scenario Y	Slight increase in mean rainfall, moderate increase in inter-annual variability, reduced decadal variability, weak tendency to dry or wet periods	Slight increase in mean rainfall, moderate increase in inter-annual variability, reduced decadal variability, weak tendency to dry or wet periods
Scenario Z	No change in the long-term mean rainfall amount, still tendency to dry or wet periods of several years (decadal variability)	No change in the long-term mean rainfall amount, still tendency to dry or wet periods of several years (decadal variability)

# Scenarios





# Scenarios





**Thanks for your attention!**

