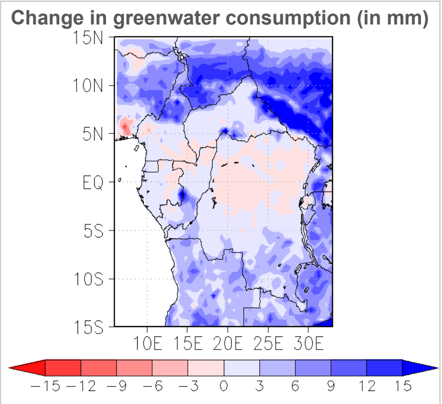
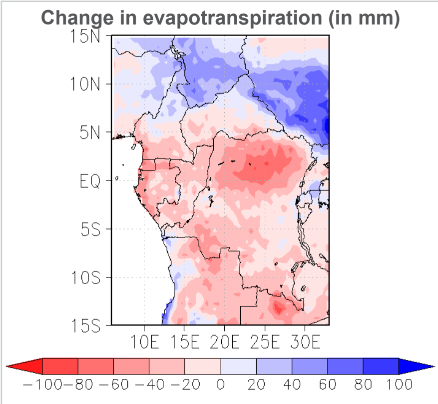
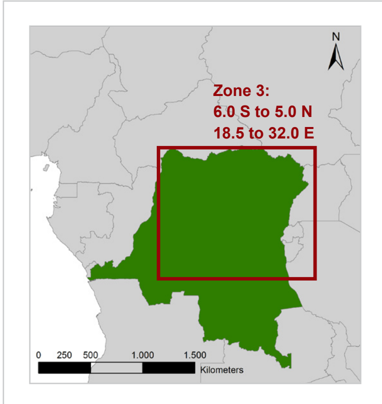
Fact-Sheet - Agriculture - Democratic Republic of the Congo (DRC)- Zone 3

Maps of projected changes - Maps show the projection of change over this century (mean of the period 2071-2100 compared to the mean of the period 1961-1990) under the “High” emission scenario. In the left panel, changes in greenwater consumption are shown and in the right panel, changes in evapotranspiration.





Definition of Zone 3 - The map below indicates the position of Zone 3 (red rectangle), representing the central regions with the mainly tropical rainforest climates and mainly a bimodal rain-regime. All values presented in this fact-sheet are changes spatially averaged over the whole zone. As the northern and central parts of DRC fall within Zone 3, projected changes for this zone are assumed to be representative for these parts of the country.



List of projected changes - The tables show the mean of the projected changes in respectively the evapotranspiration, greenwater consumption and water stress (rounded values). Note that current land use is used in this study for all assessed time periods. Consequently all changes are caused by climate change alone.

Parameters describing the water availibility for agricultural production (in mm)		Today	Projected changes			
			Low emission scenario		High emission scenario	
		2000	till 2050	till 2100	till 2050	till 2100
Evapotrans-piration	YEAR	**855**	**+2**	**+11**	**-10**	**-27**
	DJF	213	+2	+4	-1	-6
	MAM	244	+4	+8	0	-6
	JJA	196	-2	+3	-3	-1
	SON	201	-3	-3	-7	-14
Green water consumption		**878**	**+158**	**+169**	**+151**	**+140**
Water stress		**-310**	**+2**	**+2**	**+2**	**+2**

Note: Increasing values in the green water consumption indicate that more water becomes available for agricultural production. This may be caused by either increasing rainfall amounts, increasing CO_2 levels or a combination of both. The decreasing values in evapotranspiration indicate that the increasing CO_2 concentration has a stronger effect than the increasing temperatures.

Key findings for Zone 3

- Based on the analyzed ensemble of global climate projections under the assumption of a low and a high emission scenario it can be concluded that rainfall increases. The evapotranspiration is not changing much. Agricultural production is not hampered by water shortages. Crop damage may occur due to flooding, excess of water and diseases related to high air humidity. As the precipitation amounts increase this may occur more frequent. The simulated biomass increases, indicating that the agricultural production increases.

Further details can be found in the “**Impacts Report**“ and the “**Adaptation Report**“ in the report section of the final project document - also available online under www.giz.de and www.comifac.org

Data and method - The projected greenwater, evapotranspiration and water stress signals are based on the LPJ-ml Dynamic Global Vegetation model (DGVM) forced by the bias-corrected ECHAM global climate change projections. Projected changes in the climate are assessed for two different greenhouse gas emission scenarios: the “Low“ scenario is based upon the SRES B1 (IPCC-AR4) scenario; the “High“ scenario is based upon the SRES A2 (IPCC-AR4) scenario. We present the area-averaged mean change, based upon only one climate model, the ECHAM scenario, as this was the only one giving acceptable results. Land use changes up to 2006 have been used. Projections for the future land use depend on many unknown factors and are therefore difficult to incorporate. The data presented here reflect the changes that are only caused by the changing climate i.e. land use is kept constant. Increasing temperature and the rising atmospheric CO_2 concentration have an opposite effect on agricultural production. The increasing temperature results in an increasing soil evaporation whereas the rising CO_2 concentration reduces plant transpiration especially in the C_4-crops. Unfortunately little is known on the interaction of the rising CO_2 concentration, fertilizer inputs and increasing temperatures for tropical crops. More research in this direction is needed. Note that changing agricultural practises such as more inputs, new crop varieties etc. may have a strong positive effect on the future agricultural production and may compensate for the negative climate change impacts.

Key adaptation options

- Improved flood management plans to ensure limited damages to agricultural systems during high rainfall events.
- Reducing erosion risk and nutrient leaching by introduction of agroforestry systems
- To adapt to increased climate variability farming systems should become more diverse. This can be done for example by planting multiple crops and using different varieties

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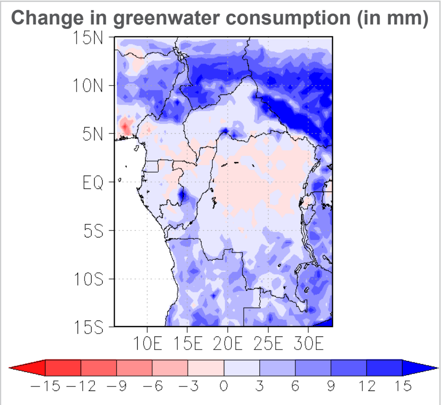
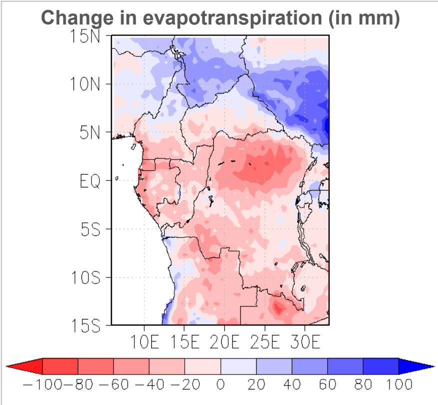
Fact-Sheet - Agriculture - Democratic Republic of the Congo (DRC)- Zone 4

Maps of projected changes

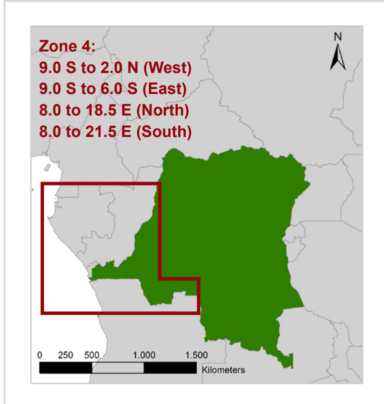
Maps show the projection of change over this century (mean of the period 2071-2100 compared to the mean of the period 1961-1990) under the "High" emission scenario. In the left panel, changes in greenwater consumption are shown and in the right panel, changes in evapotranspiration.





Definition of Zone 4

The map below indicates the position of Zone 4 (red rectangle), representing the regions north of the equator with predominantly tropical wet and dry climates with a dedicated rainy season. All values presented in this fact-sheet are changes spatially averaged over the whole zone. As the western part of DRC falls within Zone 4, projected changes for this zone are assumed to be representative for this part of the country.



List of projected changes

The tables show the mean of the projected changes in respectively the evapotranspiration, greenwater consumption and water stress(rounded values). Note that current land use is used in this study for all assessed time periods. Consequently all changes are caused by climate change alone.

Parameters describing the water availibility for agricultural production (in mm)		Today	Projected changes: Low emission scenario		Projected changes: High emission scenario	
		2000	till 2050	till 2100	till 2050	till 2100
Evapotrans-piration	**YEAR**	**813**	**-1**	**+2**	**+2**	**-27**
	DJF	240	+3	+1	+2	-8
	MAM	239	+3	+3	-2	-6
	JJA	156	-3	+2	+3	+1
	SON	179	-4	-4	-2	-13
Green water consumption		**1257**	**+210**	**+258**	**+261**	**+205**
Water stress		**-301**	**+2**	**+2**	**+2**	**+2**

Note: Increasing values in the green water consumption indicate that more water becomes available for agricultural production. This may be caused by either increasing rainfall amounts, increasing CO_2 levels or a combination of both. The decreasing values in evapotranspiration indicate that the increasing CO_2 concentration has a stronger effect than the increasing temperatures.

Key findings for Zone 4

- Based on the analyzed ensemble of global climate projections under the assumption of a low and a high emission scenario it can be concluded that rainfall increases (10-20%). The evapotranspiration is not changing much whereas the greenwater consumption initially is increasing, indicating that more water comes available for the agricultural production at the beginning of the century. Halfway the century it stagnates and the water availability does not change much. The biomass (vegetation carbon) is decreasing in this period which indicates that the agricultural production may decrease if the current farming systems and techniques are applied in this period. In the northern regions, agriculture may experience occasional crop damage due to an excess of rainfall. In the south occasional droughts will occur.

Further details can be found in the "**Impacts Report**" and the "**Adaptation Report**" in the report section of the final project document - also available online under www.giz.de and www.comifac.org

Data and method

The projected greenwater, evapotranspiration and water stress signals are based on the LPJ-ml Dynamic Global Vegetation model (DGVM) forced by the bias-corrected ECHAM global climate change projections. Projected changes in the climate are assessed for two different greenhouse gas emission scenarios: the "Low" scenario is based upon the SRES B1 (IPCC-AR4) scenario; the "High" scenario is based upon the SRES A2 (IPCC-AR4) scenario. We present the area-averaged mean change, based upon only one climate model, the ECHAM scenario, as this was the only one giving acceptable results. Land use changes up to 2006 have been used. Projections for the future land use depend on many unknown factors and are therefore difficult to incorporate. The data presented here reflect the changes that are only caused by the changing climate i.e. land use is kept constant. Increasing temperature and the rising atmospheric CO_2 concentration have an opposite effect on agricultural production. The increasing temperature results in an increasing soil evaporation whereas the rising CO_2 concentration reduces plant transpiration especially in the C_4-crops. Unfortunately little is known on the interaction of the rising CO_2 concentration, fertilizer inputs and increasing temperatures for tropical crops. More research in this direction is needed. Note that changing agricultural practises such as more inputs, new crop varieties etc. may have a strong positive effect on the future agricultural production and may compensate for the negative climate change impacts.

Key adaptation options

- Improved flood management plans to ensure limited damages to agricultural systems during high rainfall events.
- Reducing erosion risk and nutrient leaching by introduction of agroforestry systems
- To adapt to increased climate variability farming systems should become more diverse. This can be done for example by planting multiple crops and using different varieties
- Improved management of climate variability to ensure maximum yield during high rainfall years and minimum damage during dry years.

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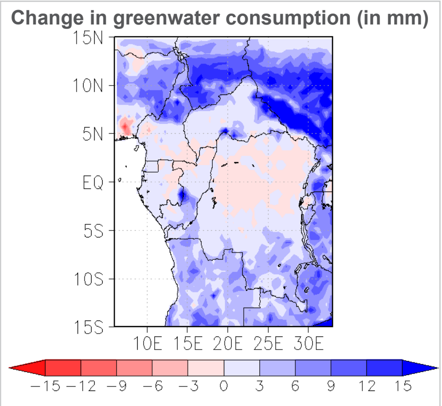
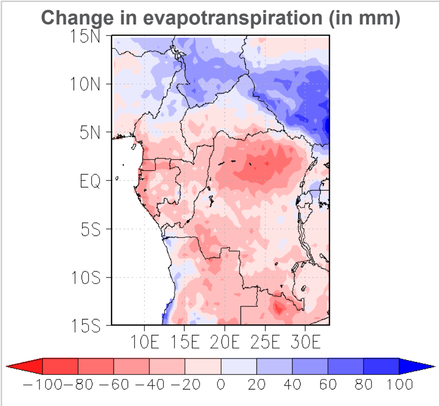
Fact-Sheet - Agriculture - Democratic Republic of the Congo (DRC)- Zone 5

Maps of projected changes

Maps show the projection of change over this century (mean of the period 2071-2100 compared to the mean of the period 1961-1990) under the "High" emission scenario. In the left panel, changes in greenwater consumption are shown and in the right panel, changes in evapotranspiration.

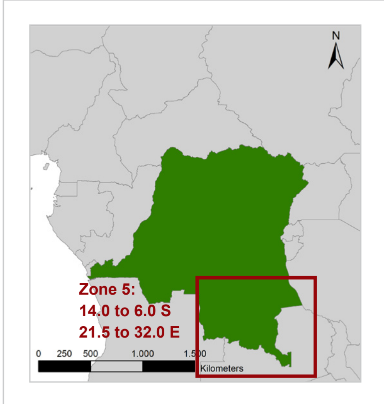




Definition of Zone 5

The map below indicates the position of Zone 5 (red rectangle), representing the subtropical regions in the south of central Africa. All values presented in this fact-sheet are changes spatially averaged over the whole zone.

As the southern part of DRC falls within Zone 5, projected changes for this zone are assumed to be representative for this part of the country.



List of projected changes

The tables show the mean of the projected changes in respectively the evapotranspiration, greenwater consumption and water stress (rounded values). Note that current land use is used in this study for all assessed time periods. Consequently all changes are caused by climate change alone.

Parameters describing the water availibility for agricultural production (in mm)		Today	Projected changes			
			Low emission scenario		High emission scenario	
		2000	till 2050	till 2100	till 2050	till 2100
Evapotrans-piration	YEAR	671	-9	-9	-12	-24
	DJF	229	0	-1	-9	-12
	MAM	251	0	-1	-2	-9
	JJA	45	-3	-1	0	+1
	SON	145	-5	-5	-1	-5
Green water consumption		2685	+508	+522	+500	+466
Water stress		-264	+5	+4	+5	+4

Note: Increasing values in the green water consumption indicate that more water becomes available for agricultural production. This may be caused by either increasing rainfall amounts, increasing CO_2 levels or a combination of both. The decreasing values in evapotranspiration indicate that the increasing CO_2 concentration has a stronger effect than the increasing temperatures.

Key findings for Zone 5

- Based on the analyzed ensemble of global climate projections under the assumption of a low and a high emission scenario it can be concluded that rainfall slightly increases (0-10%). The evapotranspiration decreases slightly. On the other hand the greenwater consumption initially increases (15-18%), however halfway the century this increase stop. This indicates that initially more water comes available for the agricultural production, however halfway the century available water remains stable. The biomass (vegetation carbon) is decreasing in this period which indicates that the agricultural production may decrease if the current farming systems and techniques are applied in this period. Note that the southern regions may experience droughts.

Further details can be found in the "**Impacts Report**" and the "**Adaptation Report**" in the report section of the final project document - also available online under www.giz.de and www.comifac.org

Data and method

The projected greenwater, evapotranspiration and water stress signals are based on the LPJ-ml Dynamic Global Vegetation model (DGVM) forced by the bias-corrected ECHAM global climate change projections. Projected changes in the climate are assessed for two different greenhouse gas emission scenarios: the "Low" scenario is based upon the SRES B1 (IPCC-AR4) scenario; the "High" scenario is based upon the SRES A2 (IPCC-AR4) scenario. We present the area-averaged mean change, based upon only one climate model, the ECHAM scenario, as this was the only one giving acceptable results. Land use changes up to 2006 have been used. Projections for the future land use depend on many unknown factors and are therefore difficult to incorporate. The data presented here reflect the changes that are only caused by the changing climate i.e. land use is kept constant. Increasing temperature and the rising atmospheric CO_2 concentration have an opposite effect on agricultural production. The increasing temperature results in an increasing soil evaporation whereas the rising CO_2 concentration reduces plant transpiration especially in the C_4-crops. Unfortunately little is known on the interaction of the rising CO_2 concentration, fertilizer inputs and increasing temperatures for tropical crops. More research in this direction is needed. Note that changing agricultural practises such as more inputs, new crop varieties etc. may have a strong positive effect on the future agricultural production and may compensate for the negative climate change impacts.

Key adaptation options

- Improved flood management plans to ensure limited damages to agricultural systems during high rainfall events.
- Reducing erosion risk and nutrient leaching by introduction of agroforestry systems
- To adapt to increased climate variability farming systems should become more diverse. This can be done for example by planting multiple crops and using different varieties
- Introduction of new varieties which are adapted the higher temperatures, heat stress and dry periods during the growing season.
- Improved management of climate variability to ensure maximum yield during high rainfall years and minimum damage during dry years.

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