CLIMATE CHANGE IMPACTS ON THE WATER RESOURCES OF GHANA

BY

BARNABAS A. AMISIGO

CSIR-WATER RESEARCH INSTITUTE, ACCRA

MOLE XXI CONFERENCE

ERATA HOTEL, ACCRA

22 JULY, 2010

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- Assessing the impact of climate change on the water resources of Ghana.
- Results.
- Responding effectively to the challenges.
- Conclusion.

INTRODUCTION - I

Water is the basis of the socio-economic development of any country.

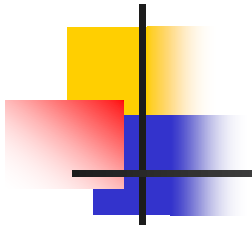
Water Resources

- Surface water
- Groundwater

Water use areas:

- Hydropower
- Agriculture including irrigation and animal husbandary
- Fishery
- Industry
- Transport and recreation
- Domestic including sanitation

INTRODUCTION - II



Climate change would have adverse impacts on our water resources.

Knowledge of the direction and magnitude of these impacts would be vital in developing the necessary responses to the challenges posed.

INTRODUCTION - III

Climate Change Impacts on Water Resources:

- Impacts on surface water availability (eg. Streamflows)
- Impact on groundwater recharge
- Impact on flooding, drought and water pollution.
- Impact on sea water intrusion into inland water bodies.

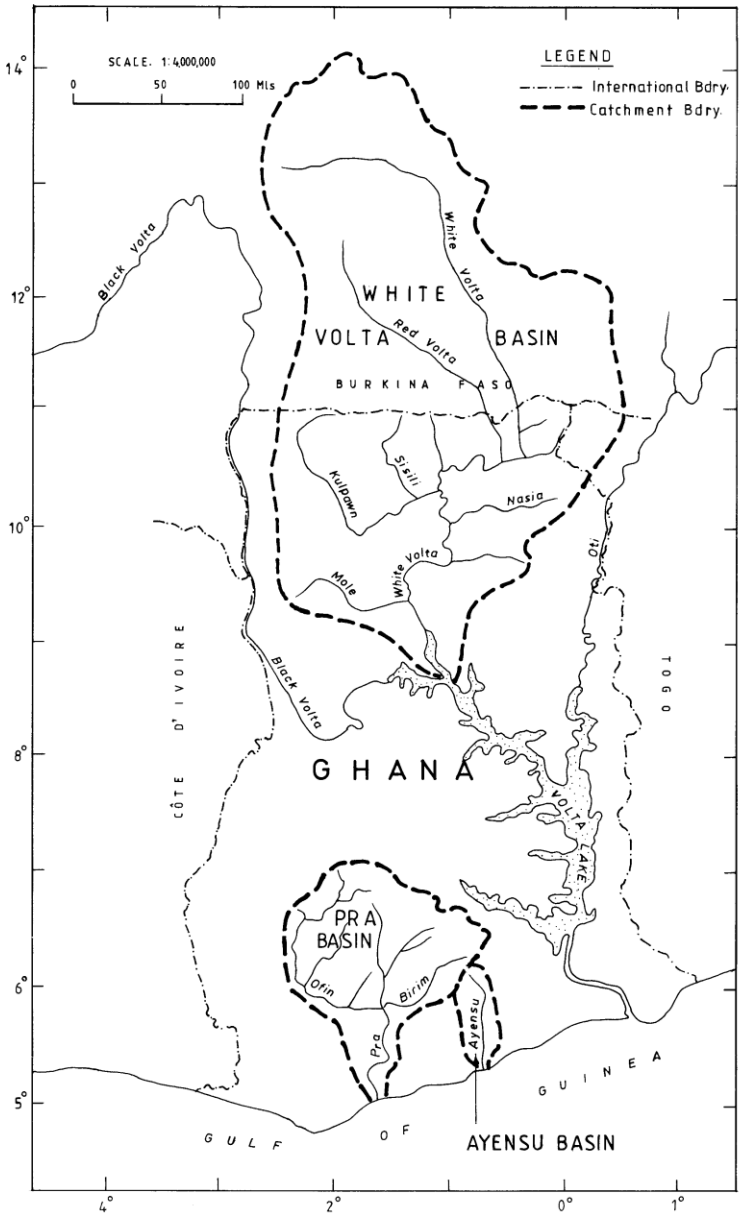
INTRODUCTION - IV

In assessing Climate Change Impacts:

- **We are trying to predict or forecast what is likely to happen in the future.**
- **Computer models – climate and hydrological models – would be very useful tools.**

Assessing the impacts of climate change - I

Representative river basins .



Impacts on:

- **surface water availability - mainly stream runoff**
- **Groundwater recharge**

Base period: 1961-1990

Climate change years: 2020 2050.

Hydrological Modeling

- **Temperature and rainfall changes extracted from the climate change scenarios for the basins for the years 2020 and 2050 and used for the simulation.**
- **Hydrological model run using the optimized parameters obtained from its calibration and validation**
- **Simulations made for Low Sensitivity, Medium Sensitivity and High Sensitivity climate change scenarios over the base period 1961-1990**

RESULTS – Surface Water - I

Percentage change in runoff – Year 2020

River Basin	Low Sensitivity	Medium Sensitivity	High Sensitivity
White Volta	-8.8	-15.8	-22.9
Pra	-12.3	-17.3	-23.1
Ayensu	-14.0	-19.6	-26.2

RESULTS – Surface Water - VI

Percentage change in runoff – Year 2050

River Basin	Low Sensitivity	Medium Sensitivity	High Sensitivity
White Volta	-24.0	-37.1	-50.9
Pra	-22.0	-32.5	-42.7
Ayensu	-24.1	-36.6	-47.8

RESULTS – Groundwater - I

Percentage change in recharge – Year 2020

River Basin	Low Sensitivity	Medium Sensitivity	High Sensitivity
White Volta	-16.5	-22.3	-29.6
Pra	-12.8	-17.6	-19.4
Ayensu	-7.0	-4.8	-25.4

RESULTS – Groundwater - II

Percentage change in recharge – Year 2050

River Basin	Low Sensitivity	Medium Sensitivity	High Sensitivity
White Volta	-27.8	-40.3	-53.7
Pra	-22.0	-30.0	-39.4
Ayensu	-44.9	-35.7	-47.8

Low current and projected future water "demand" and use

Water demand projections, White Volta Basin (2008-2025)
(White Volta IWRMP, WRC, 2008)

User category	2008 values represent current abstractions		2015		2020		2025	
	m^3/day	$10^6 m^3$/yr	m^3/day	$10^6 m^3$/yr	m^3/day	$10^6 m^3$/yr	m^3/day	$10^6 m^3$/yr
Urban[(i)] population	24,600	9.0	83,000	30.3	105,000	38.3	132,000	48.2
Rural population	17,000	6.2	72,000	26.3	77,000	28.1	82,000	29.9
Irrigation[(ii)] (15,000 ha)	458,300[(ii)]	55.0	875,000[(ii)]	105.0	1,375,000[(ii)]	165.0	1,875,000[(ii)]	225.0
Livestock	31,000	11.3	33,800	12.3	36,200	13.2	38,500	14.1
total	-	**81.5**	-	**173.9**	-	**244.6**	-	**317.2**

Mean Annual Runoff (generated in Ghana) – **5,100** Mm^3

RESULTS – Vulnerability

Vulnerability indices (Persons/million m^3 available water - surface and groundwater)

River Basin	1990	2020	2050
White Volta	203**	623***	1,839****
Pra	272**	741***	2,049****
Ayensu	723***	1,913****	6,032****

** Maginally vulnerable (water management problems); *** Vulnerable

**** Extremely vulnerable (water scarcity)

Responding to the challenges

- **Two main ways:**
  - **Mitigation**
  - **Adaptation**
    - **promotion and adoption of Water conservation and use efficiency**

- Rainwater harvesting techniques for both potable and non-portable use,
- Water recycling techniques for both industrial and non-potable domestic use
- In-field rainwater and runoff harvesting techniques for soil moisture augmentation and conservation for agricultural production.
- Streambed and groundwater storage systems to make water available in the dry periods with little loss to evaporation.
- Development or selection of drought resistant and other crop varieties that enable the production of food with less water.

Responding to the challenges - II

- Promote cross-sectoral water resources development in order to avoid the dominance of a single water use sector.
- Raise the awareness of the general population on the impacts of climate change.
- Build the capacity of all sectors of the populace to participate in the formulation and implementation of sustainable water resources management.
- Ensure both economic efficiency and socially equitable water resources allocation.
- Adequately protect water bodies and ecosystems

GLOWA Volta

Irrigation

Domestic use

Stock watering

Fishing

CONCLUSION

- **Climate change impacts adversely on future runoff and groundwater recharges in all three river basin systems of the country.**

- **The water resources and the socio-economic activities that depend on them are vulnerable to climate change**

- **Therefore, Integrated water resources management, emphasizing equitable water allocation and water conservation and use efficiency, is advocated as a prime adaptation measure.**


Thank you, for your attention!