

Climate and Hydrological Modelling

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URADAPT 5th Re-SAP Forum
Coconut Groove Hotel, Accra

Monday, August 29, 2011



Outline

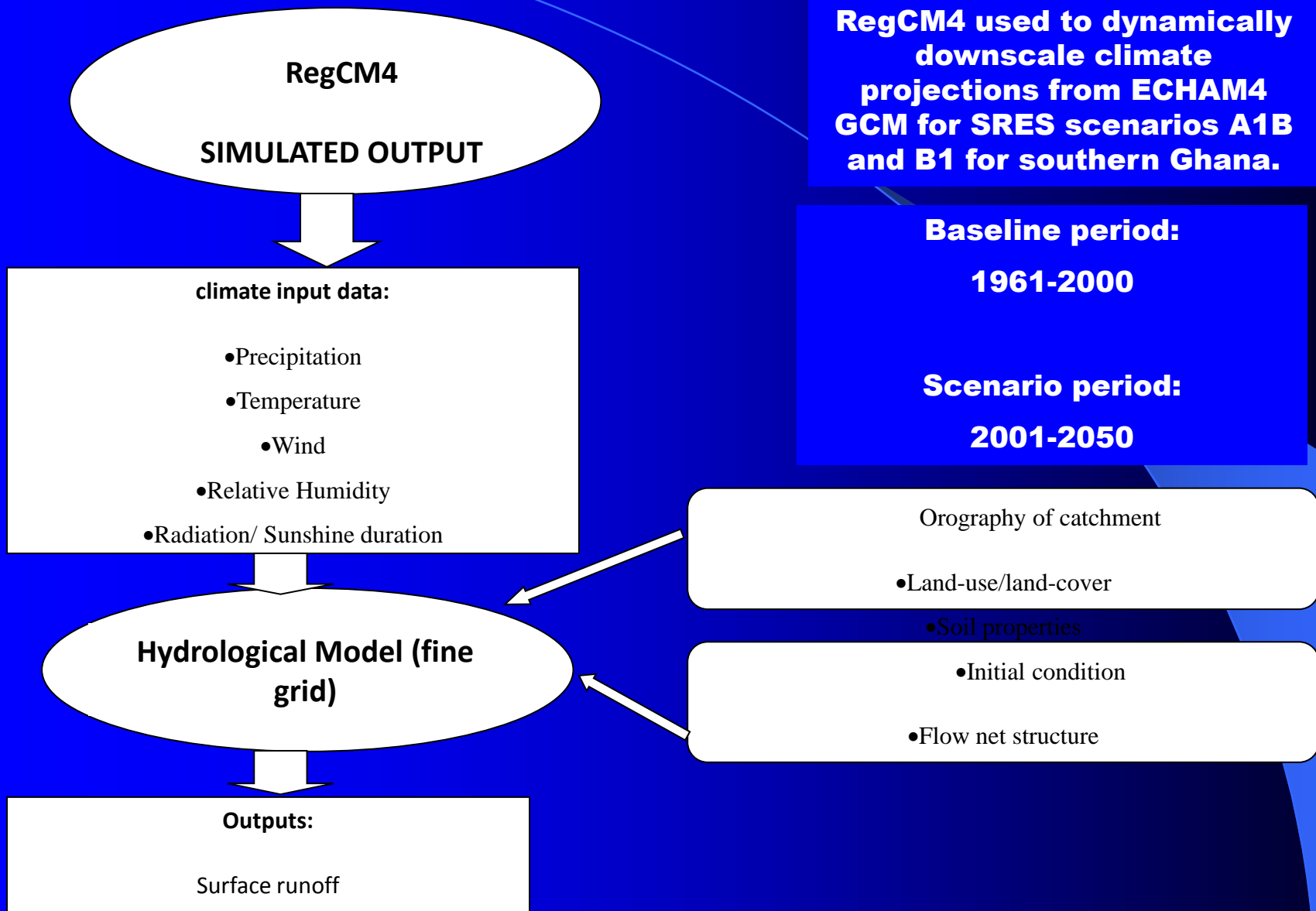
- ❖ **Introduction**
- ❖ **Modelling outcomes**
 - ❖ **Climate modelling**
 - ❖ **Hydrological modelling in the Densu Basin**
- ❖ **Implications for water use in the Densu Basin**
- ❖ **Considerations for flood management in the Odaw Basin**

Introduction I

Main objectives of the climate and hydrological modelling are to:

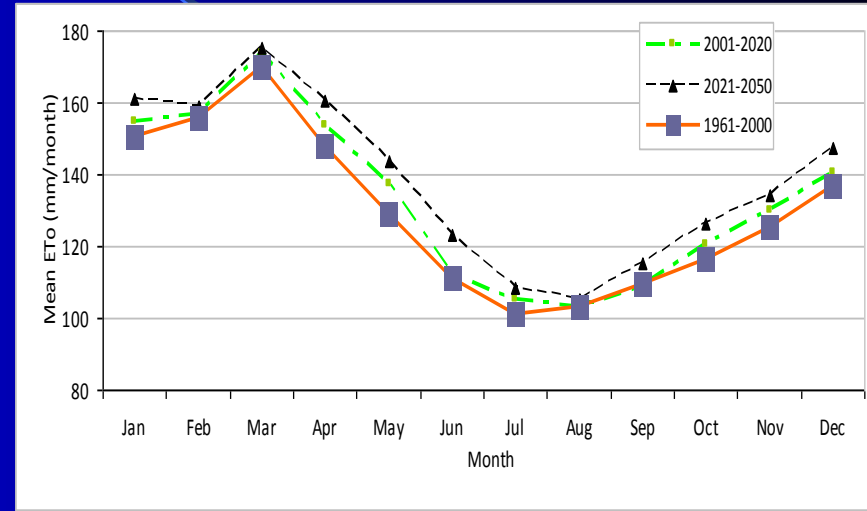
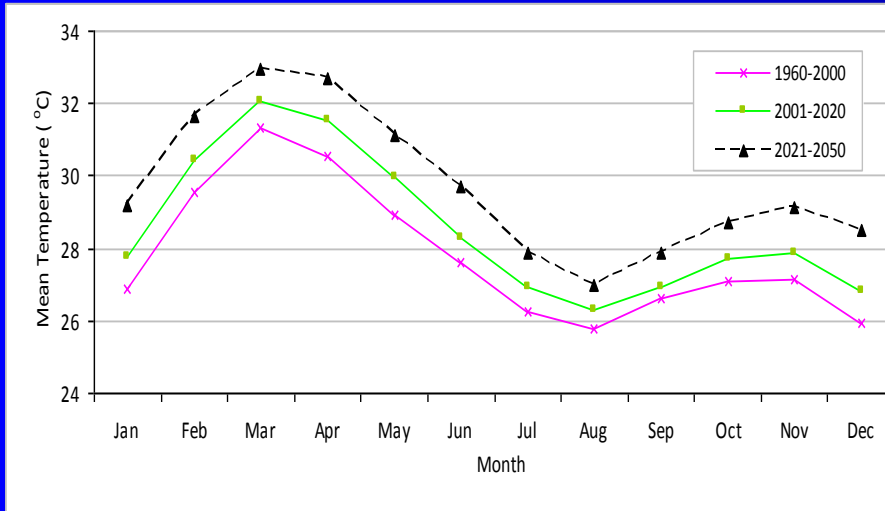
- 1. Assess the impact of climate change on rainfall in the Densu Basin.**
- 2. Assess the impact of climate change on surface water availability (Renewable water) in the Densu Basin.**
- 3. Determine the implications of upstream water use on downstream water availability, particularly at the Weija Dam.**
- 4. Assess the impact of climate change on flooding in the city of Accra.**

Climate and Hydrological modelling



Outcomes of climate modelling

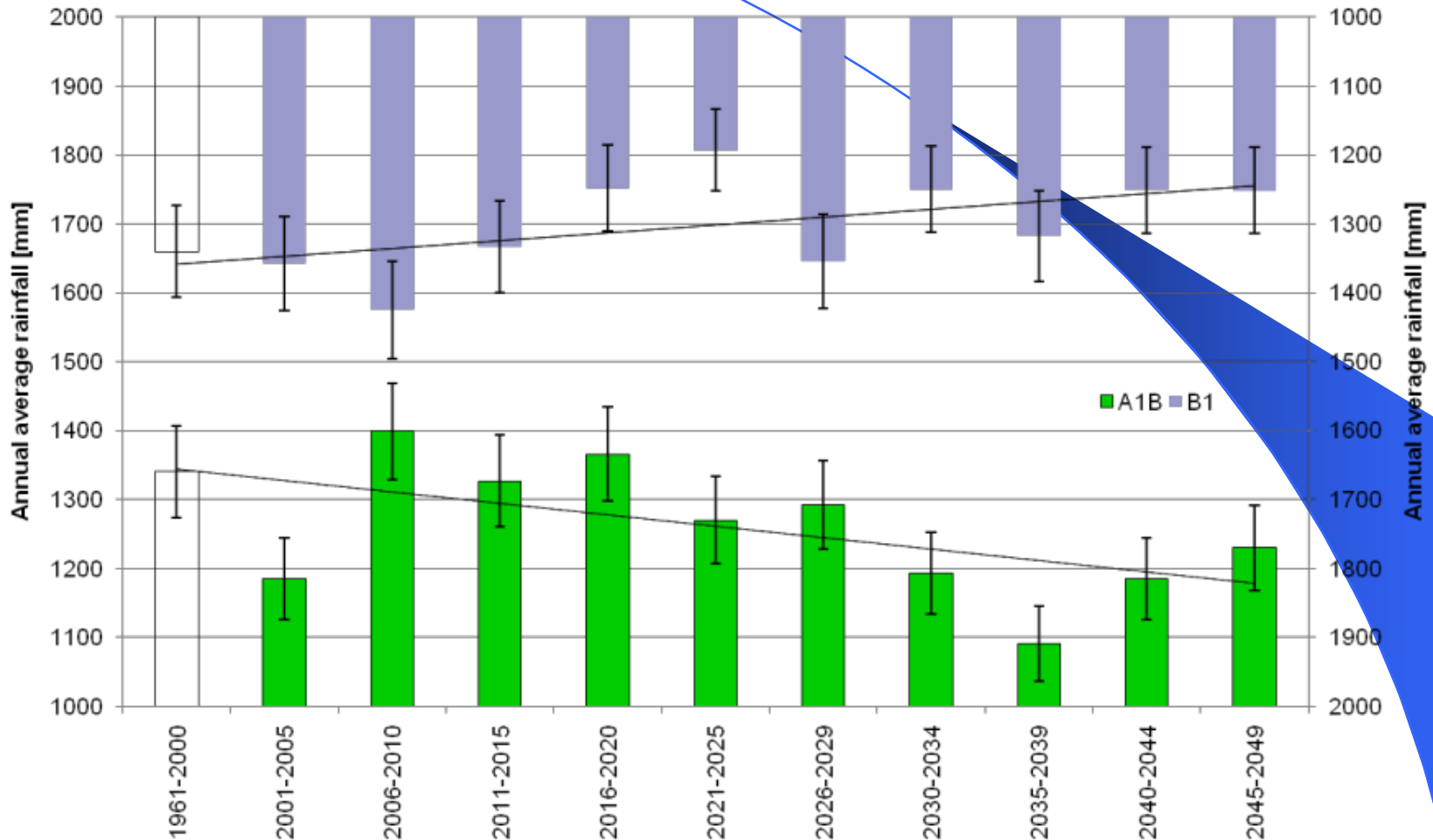
For the scenario period (2001-2050):



- 1. A projected increase in mean annual temperature of about 1.3 °C**
- 2. As a result an increase of 3.7% in the computed potential ET over the baseline period.**

Outcomes of climate modelling

TRENDS?



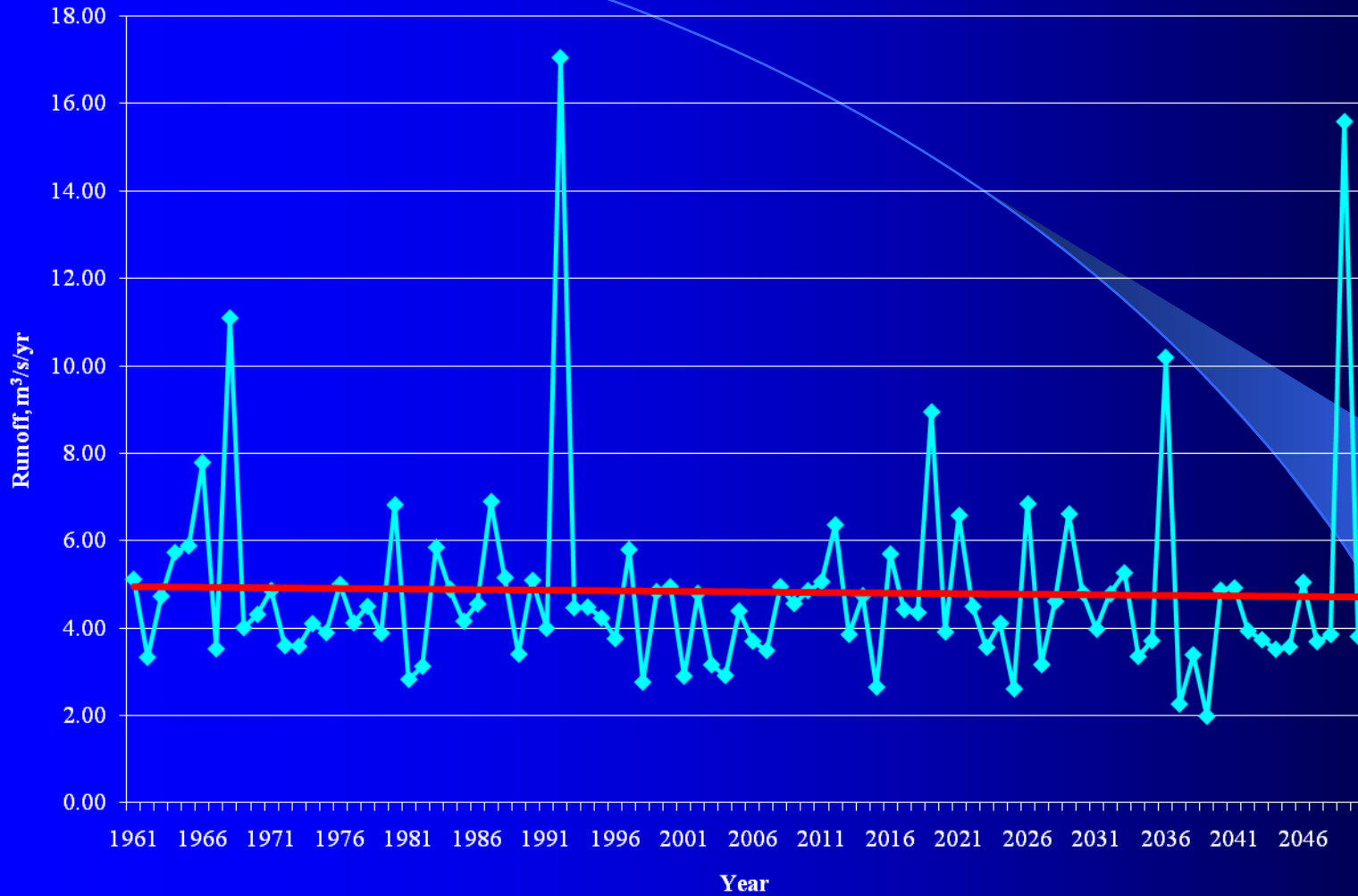
RegCM-simulated rainfall compared to average observed past rainfall



	Past (gauged) 1961-2005	Future (RegCM A1B-simulated) 2006-2050
SPI Classification	No. of occurrence	No. of occurrences
Severely-extremely wet	5	5
Moderate wet	5	5
Normal year	17	11
Moderate dry	11	6
Severely dry	4	12
Severely-extremely dry	3	6

Comparison of climate occurrences of past (1961-2005 gauged) with future (2006-2050 RegCM A1B-simulated) for the URAdapt region

Mean annual river flow with A1B Scenario at Manhia



**8% reduction in flows over the
1961-2000 period**

Implications for water use in the basin

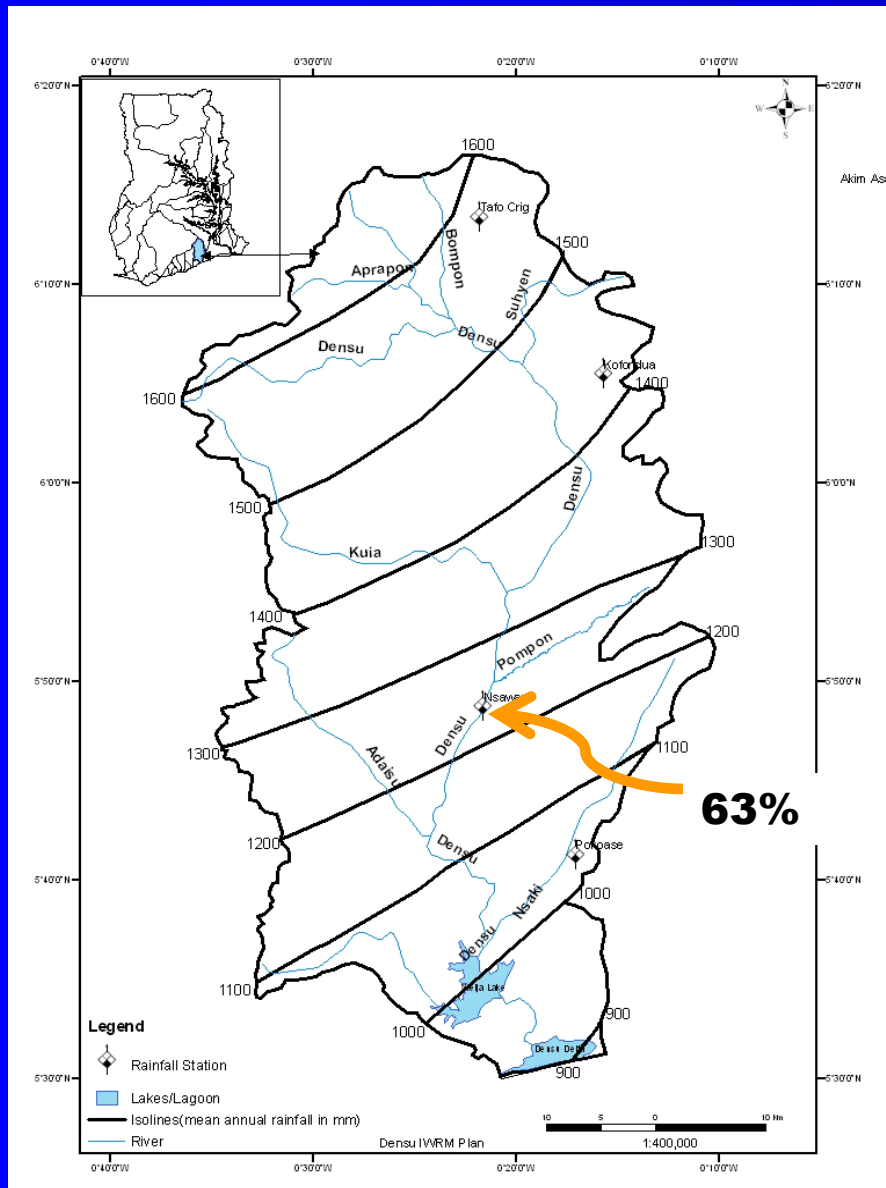
Current surface water abstraction in the basin:

Water use point	Abstraction (million m³/yr)	% of estimated basin runoff
Upstream	2.8	1
Weija	93.1	33
Total	95.9	34

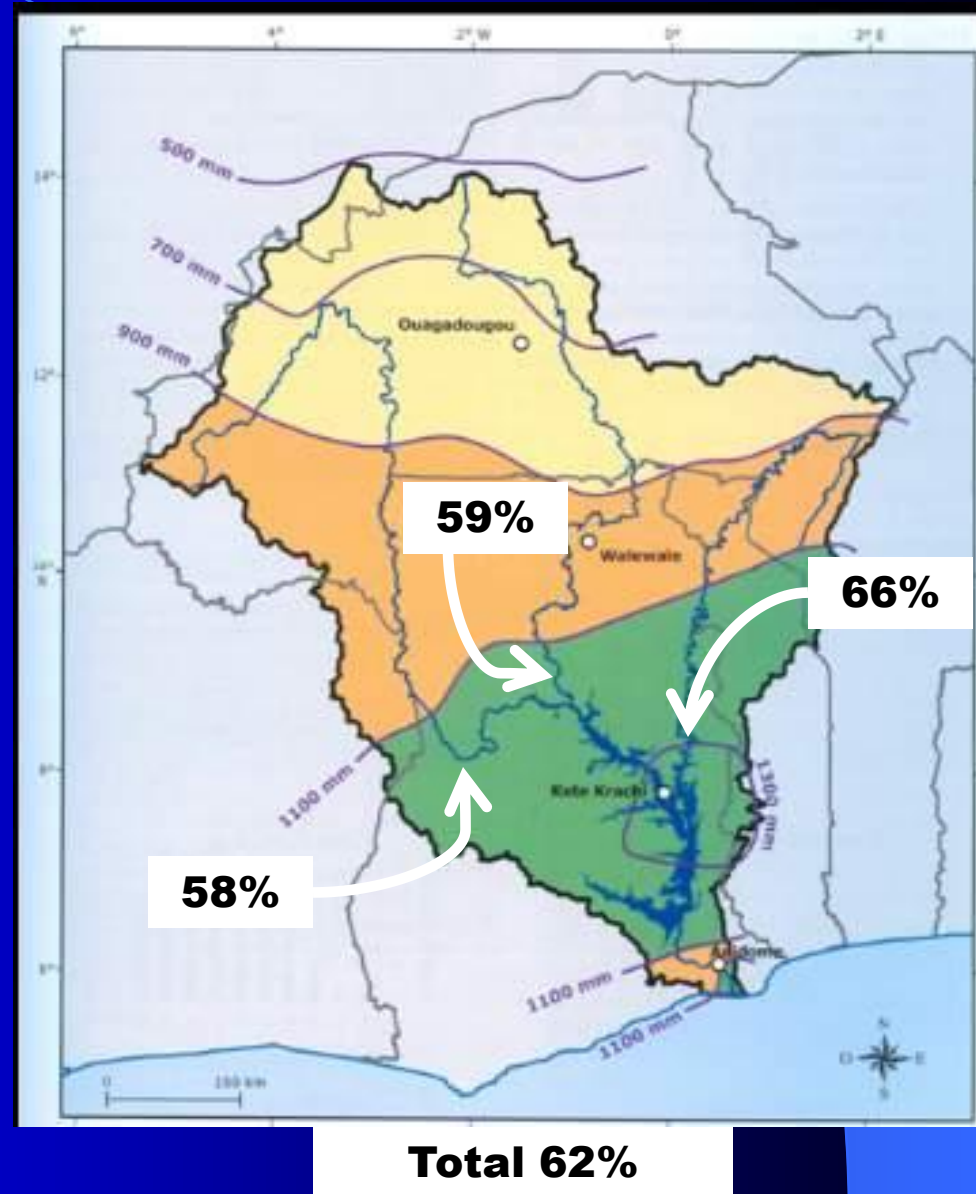
**Total upstream abstraction
is rather small**

Implications for water use in the basin II

Densu Basin Rainfall and runoff

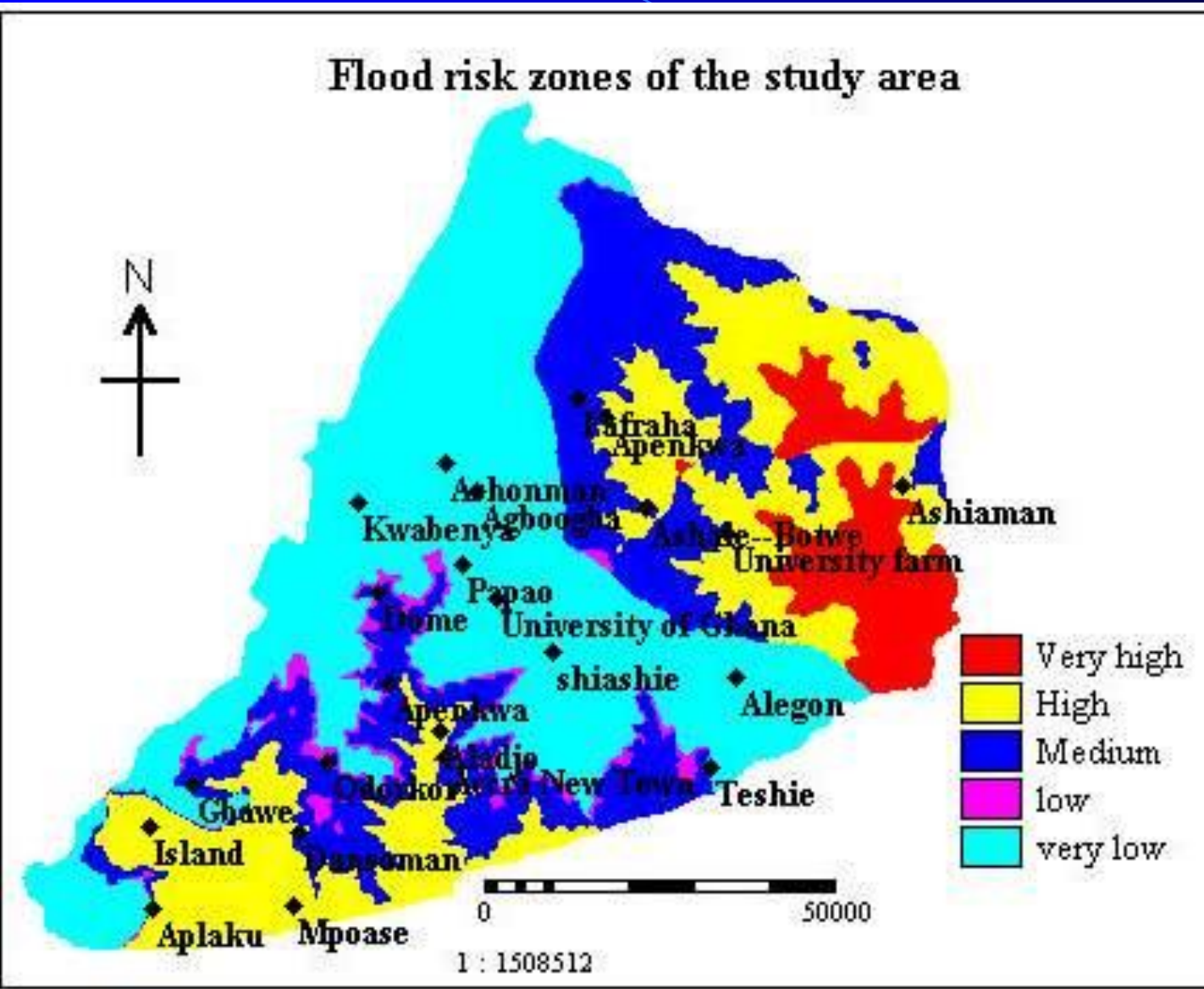


Volta Basin Rainfall and runoff



Flood modelling II

Flood risk zones of Accra:



Kofi Nyarko,
(2000)

Flood modelling I

Annual 1 day and 2 to 5 consecutive days' maximum
Rainfall for Accra:

Return Period (Years)	Annual Maximum Rainfall (mm) expected in				
	1 day	2 days	3 days	4 days	5 days
2	84.1	91.6	100.4	105.7	109.5
5	121.5	130.3	144.6	153.1	157.5
10	147.1	156.3	174.6	185.5	190.1
20	171.6	181.1	203.3	216.6	221.2
50	205.4	215.0	242.9	259.6	264.2
100	231.0	240.5	272.8	292.1	296.5

Kwaku and Duke,
(2007)



THANK YOU, for your attention