

Baseline Information for Hydrological Scenario Modelling

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Outline

- ❖ **Introduction**
- ❖ **Baseline for hydro modelling in Densu Basin**
- ❖ **WR availability and use in the Volta Basin**
- ❖ **Baseline for flood modelling**

Introduction I

The main objectives of hydrological modelling under URAdapt are to:

- 1. Assess the impact of various climate change and other scenarios on water availability (Renewable water) in the Densu Basin.**
- 2. Simulate the impact of various water demand and allocation scenarios on water use in the Densu Basin.**
- 3. Assess the impact of various climate change and other scenarios on flooding in the city of Accra.**

Introduction II

Impact assessments as envisaged under URAdapt would require proper definition of baseline conditions, e.g., current situation. For hydrology, this means ascertaining, for a stated period, the :

1. Average basin

rainfall, extreme rainfall recurrence, streamflow, GW recharge, AET, baseflow, water abstraction for various purposes and landuse/cover.

2. Basin WR vulnerability (indices of WR vulnerability, stress and scarcity).

Assumption: No scenarios on soils and geology.

Baseline for Densu I

Surface Water resources:

Mean Annual Rainfall – 1,230mm or 3,198 million m³

Water abstraction scheme	Capacity million m ³ /year	Estimated streamflow million m ³ /year
Weija	97.8	
Other schemes:		
U/S Potable	3.8	
Irrigation	4.0	
Total, other schemes	7.8	
Basin Total	105.6	280.0

Compiled from
(WRC, 2007)

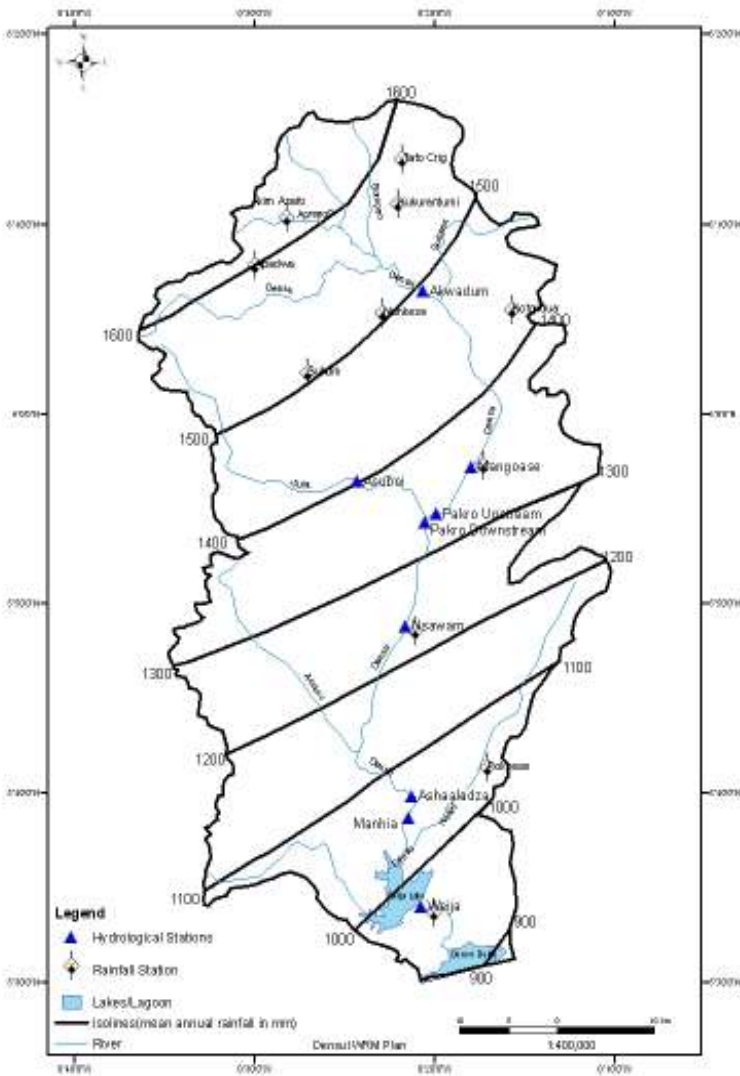
**Vulnerability index (Raskin *et. al.*, 1997) -
37.7%**

20-40% Water scarcity

>40% Severe water scarcity

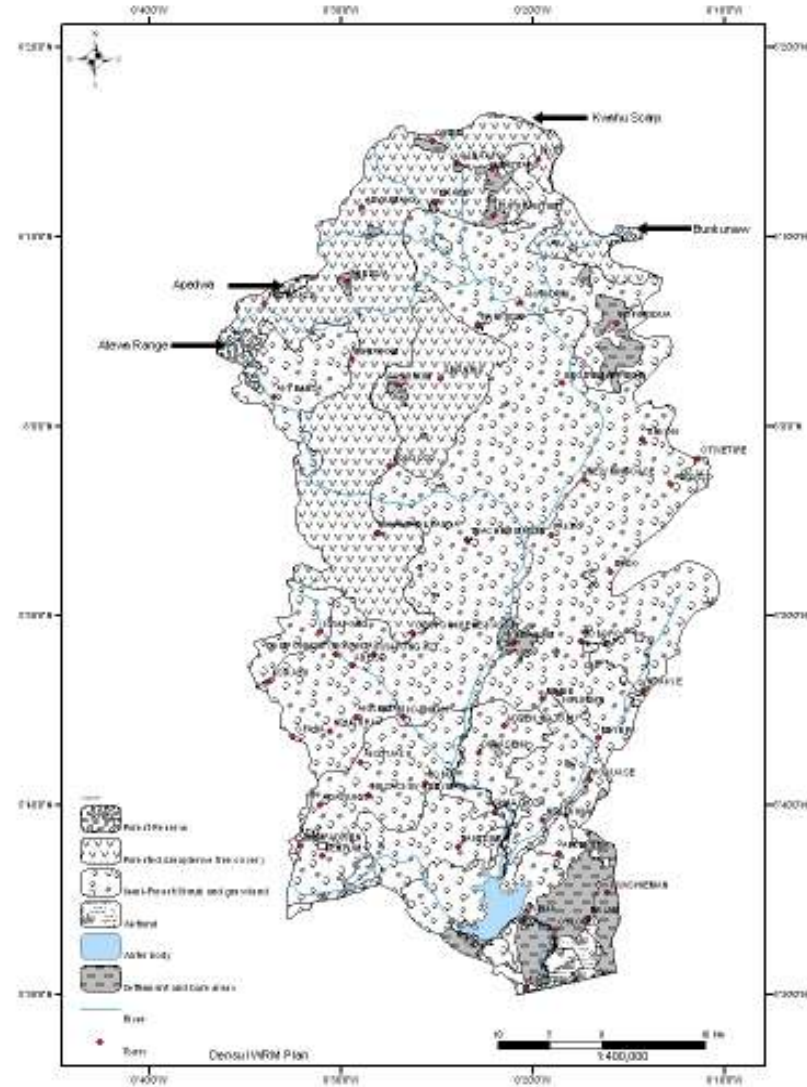
Baseline for Densu II

Basin Rainfall



Map 2.4 : River Network, Hydrological and Rainfall Monitoring Stations, Densu Basin

Basin Land use/cover



Map 2.3 : Land Use/Cover (2000) of the Densu Basin

Volta Basin Water Resources I

Surface Water resources:

Water abstraction scheme	Capacity million m³/year	Estimated streamflow million m³/year
U/S Potable	160	
Irrigation + livestock	1,000	
Basin Total	1,160	32,730.0

Compiled from de condappa et al, (2009)

Vulnerability index (Raskin *et. al.*, 1997) -

3.5%

20-40% Water scarcity

>40% Severe water scarcity

Volta Basin Water Resources II

Impacts on inflows at the Akosombo dam from 3 scenarios over a period of 20 years.

The scenarios (implemented in WEAP):

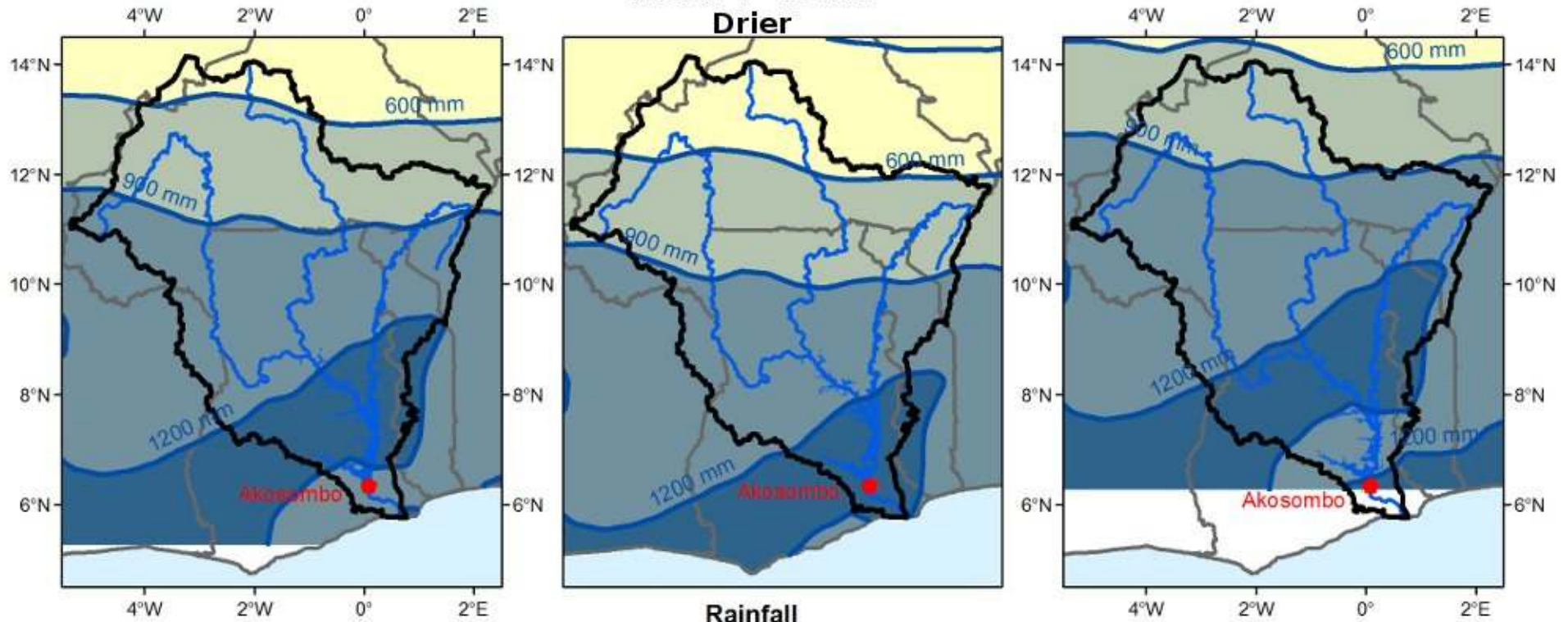
- **Development of SRs, with a growth in water demand from SRs by 10% per year.**
- **Climate change with a drier climate.**
- **Climate change with a wetter climate.**

Reference (Base) period: 1980-2000

Volta Basin Water Resources II

The CC scenarios:

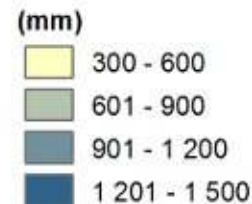
North -> South
Drier



Reference

0 150 km

Rainfall



South -> North
Wetter

Reproduced from "The Atlas of the Water Resources in the Volta basin", BFP Volta

Volta Basin Water Resources II

Results from scenario analyses

For SRs

A reduction of about 3% in inflows at Akosombo by the end of the 20-yr period.

However, about 110,000 ha more put under irrigation by the end of the period.

For CC

Estimated flows at Akosombo are 24.2 and 33.5 Mm³ for the drier and wetter scenarios respectively. Power production at Akosombo resulting in turbined water of 31.6 Mm³ as for the reference period is only possible under the wetter scenario.

Baseline for flood modelling I

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

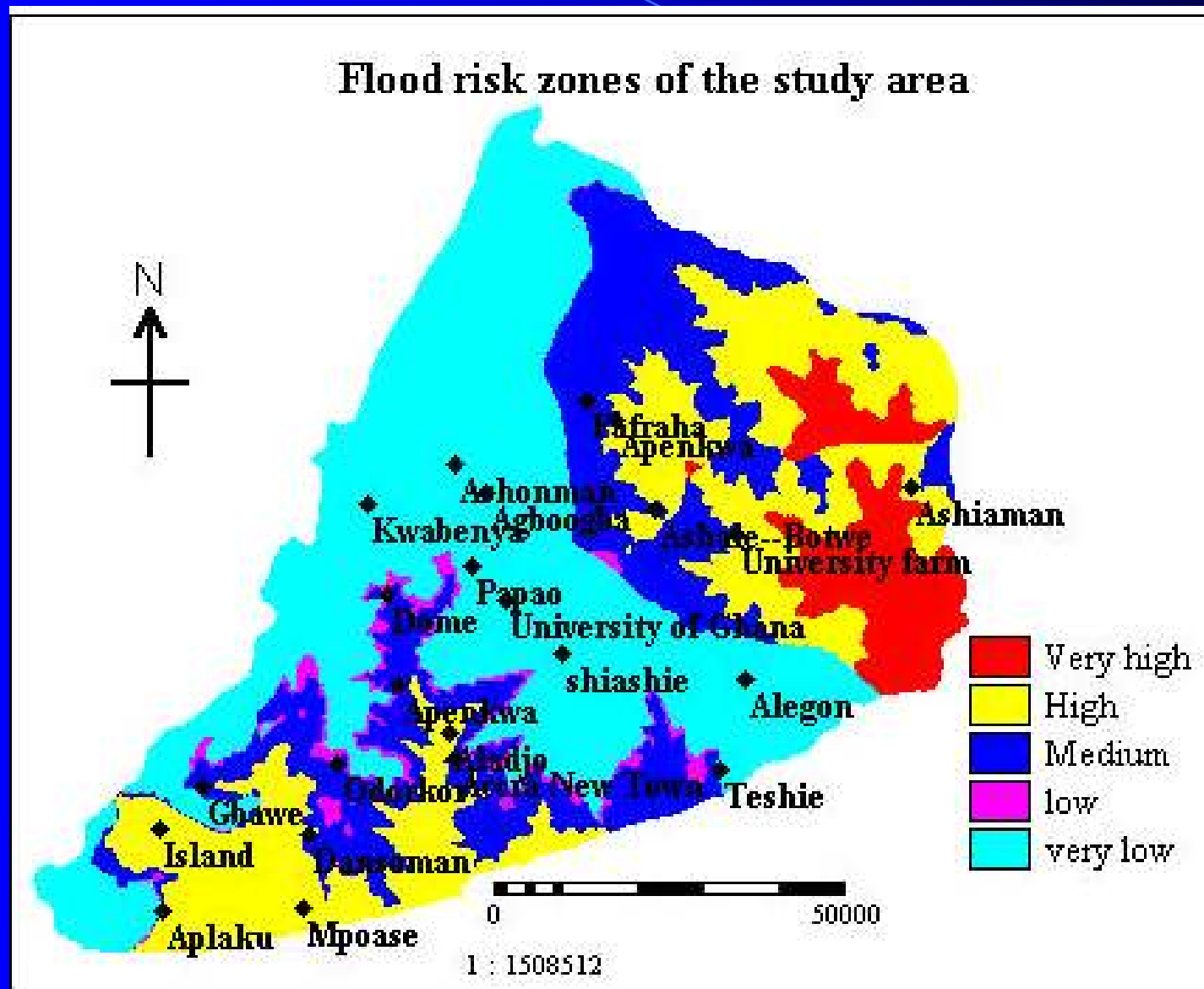
Return Period (Years)	Annual Maximum Rainfall (mm) expected in				
	1 day	2 days	3 days	4 days	5 days
2	84.1	91.6	100.4	105.7	109.5
5	121.5	130.3	144.6	153.1	157.5
10	147.1	156.3	174.6	185.5	190.1
20	171.6	181.1	203.3	216.6	221.2
50	205.4	215.0	242.9	259.6	264.2
100	231.0	240.5	272.8	292.1	296.5

Extracted from
Kwaku and Duke,
(2007)

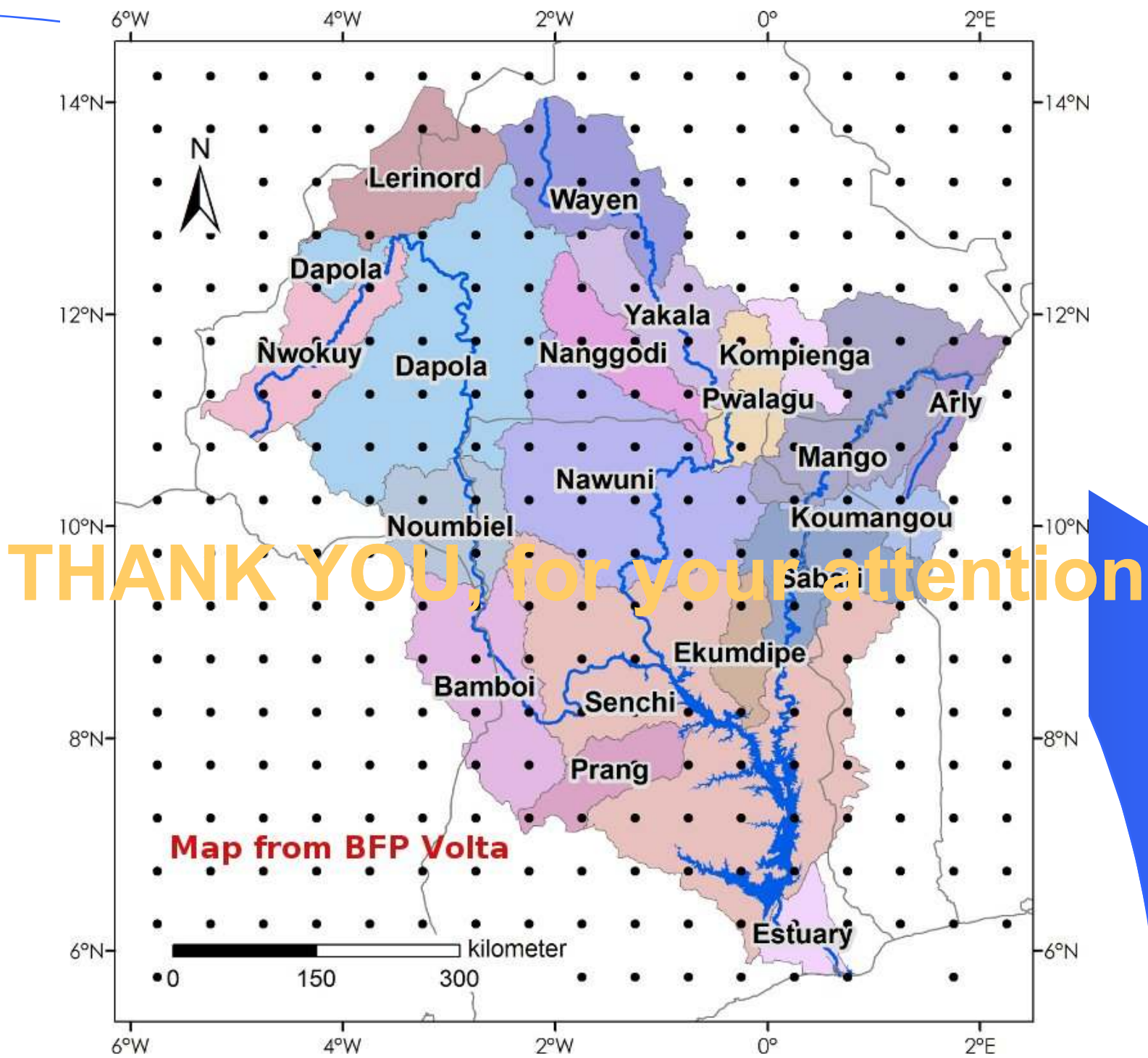
1975-2004
daily
rainfall
data for
KIA used

Baseline for flood modelling II

Flood risk zones of Accra:



Extracted from
Kofi Nyarko,
(2000)



THANK YOU, for your attention

