water & sanitation
Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

Determination of Water Resource Classes, Reserve and the Resource Quality Objectives in the Keiskamma and Fish to Tsitsikamma Catchments

Briefing Document

3rd Project Steering Committee – 21 January 2025

PURPOSE OF THIS DOCUMENT

The purpose of this briefing document is to provide members of the Project Steering Committee (PSC) with study progress information in preparation for the PSC meeting to be held on 21 January 2025.

This briefing document contains information regarding:

- Study progress to date;
- Final selected priority estuaries and results;
- Identified and proposed water resource scenarios, results and consequences for selected Integrated Units of Analysis.

OBJECTIVES OF THE PROJECT

Chapter 3 of the National Water Act, 1998 (Act 36 of 1998) provides for the protection of water resources through the implementation of Resource Directed Measures (RDM) which include the classification of water resources, determination of the Reserve and setting of Resource Quality Objectives (RQOs).

The objective of this study is, therefore, to co-ordinate the implementation of the Water Resource Classification System (WRCS) published as Regulation 810 in September 2010 for the determination of water resource classes, the Reserve and associated RQOs.

The water resource classes, the Reserve and associated RQOs will assist the DWS in ensuring sustainable protection of the water resources.

STUDY APPROACH

The approach followed for this study is based on the 8-step integrated framework (**Figure 1**) and steps for Classification, Reserve and RQOs as developed for the Operationalising of Resource Directed Measures, (DWS,2017). The study is currently focussing on Step 4: Identify and evaluate scenarios within the Integrated Water Resources Management (IWRM).

STUDY AREA AND RESOURCE COMPONENTS

The study area comprises the water resources within the Mzimvubu to Tsitsikamma Water Management Area (WMA 7) and includes the major river systems of Great Kei, Mbashe, Great Fish, Sundays and Gamtoos Rivers as well as the smaller drainage regions in-between.

All the significant water resource components are considered, namely rivers, dams, wetlands, groundwater and estuaries and, where applicable, integration/ linkages between these components will be considered.

STUDY PROGRESS

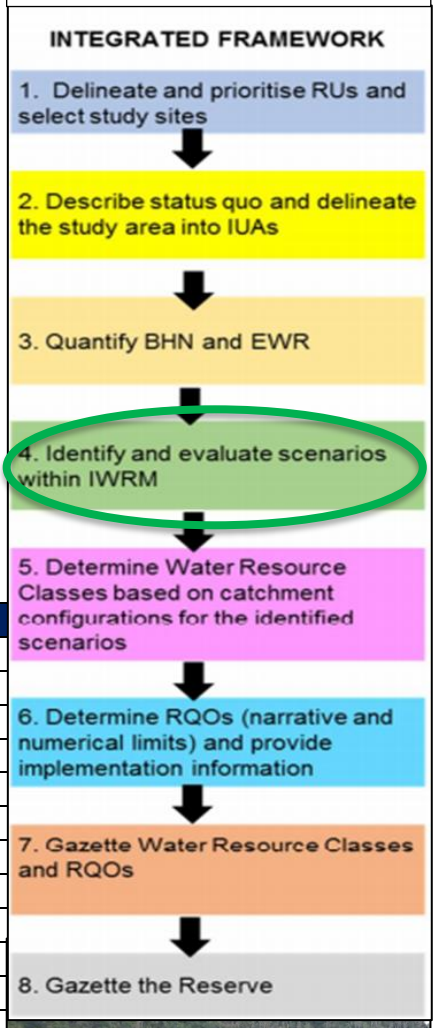
Steps 1 to 3 has been completed, and the study team is currently conducting Step 4 (**Figure 1**). The completed activities include:

- Wetland and groundwater components;
- Both river and estuarine eco-categorisation and Ecological Water Requirements (EWR) quantifications;
- Basic Human Needs component;
- Overview of the socio-economics component for the study area, including approaches to conduct their consequence assessment;
- Ecological Sustainable Base Configuration (ESBC) Scenarios; and
- Identified water resource scenario per IUA, including the results.

The followng is currently being conducted:

- Assessment of ecological (rivers and estuaries) and socio-economic consequences, including trade offs per IUA.

FIGURE 1: INTEGRATED FRAMEWORK FOR DETERMINATION OF WATER RESOURCE CLASSES, RESERVE AND RQOS

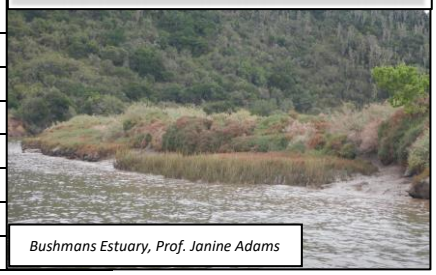


RECAP ON INTEGRATED UNITS OF ANALYSIS (IUA)

Ninteen IUAs were delineated within he study area for which scenarios have been identified and consequences assessed. Refer to **Table 1** which indicates the delineated IUAs for the study area. These are illustrated in **Appendix A, Figure A1.**

Table 1: IUAs and descriptions

IUA No. and code		Description
1	IUA_K01	Tsitsikamma and headwaters of Kromme to Kromme Dam
2	IUA_KL01	Kromme from Kromme Dam to estuary and Gamtoos
3	IUA_L01	Kouga to Kouga Dam, Baviaanskloof
4	IUA_M01	M primary catchment
5	IUA_LN01	Groot to Kouga confluence, Upper Sundays to Darlington Dam
6	IUA_N01	Sundays downstream Darlington Dam
7	IUA_P01	Primary catchment
8	IUA_Q01	Fish
9	IUA_Q02	Great Fish
10	IUA_Q03	Koonap and Kat
11	IUA_R01	Keiskamma
12	IUA_R02	Buffalo/ Nahoon
13	IUA_S01	Upper Great Kei
14	IUA_S02	Black Kei
15	IUA_S03	Lower Great Kei
16	IUA_T01	Upper Mbashe, Upper Mthatha
17	IUA_T02	Lower Mbashe
18	IUA_T03	Lower Mthatha
19	IUA_T04	Pondoland coastal



Bushmans Estuary, Prof. Janine Adams

Kowie Estuary, Prof Janine Adams

ESTUARIES

The final activity for the rivers and estuaries component fell under Step 3 which is the quantification of the EWRs. This was undertaken in detail at all priority river and estuarine sites. The rivers results were presented at the PSC2 meeting. Thus a summary of the estuarine results are displayed in **Table 2** below, along with the Present Ecological States (PES), Recommended Ecological Category (REC), as well as the Total EWR as the percentage of the natural mean annual runoff (nMAR) for the REC, and the nMAR.

Table 2: Summary of the priority estuary results per IUA

IUA	Estuaries						
	Estuary System	Quaternary catchment	Priority	PES	REC	Total EWR as %nMAR for REC	nMAR ($10^6 m^3$)
IUA_T02	Mbashe	T13E	Intermediate	B/C	B	108.5	786.9
IUA_T04	Xora	T80D	Desktop	B/C	B	TBA	52.4
	Msikaba	T60G	Desktop	A/B	A	TBA	212.4
	Mngazi	T70B	Rapid	B	B	95	87.3
IUA_R01	Keiskamma	R10M	Intermediate	C	B	76.8	128.7
IUA_R02	Nahoon	R30F	Desktop	C/D	C	TBA	32.5
	Qinera	R30F	Desktop	B/C	B	TBA	8.4
IUA_Q02	Great Fish	Q93D	Rapid	C	B/C	TBA	496.3
IUA_N01	Sundays	N40F	Desktop	C/D	B	TBA	263.1
IUA_M01	Swartskops	M10D	Intermediate	D	C	123.93	56.9
IUA_P01	Kariega	P30C	Intermediate	C	C	60	21.9
	Bushmans	P20A	Desktop	C	B	TBA	43.1
	Kowie	P40C	Desktop	C	B/C	TBA	31.4
IUA_KL01	Gamtoos	L90C	Intermediate	D	C	51.8	404.2
	Kabeljous	K90G	Rapid	B	B	89.3	5.3
	Kromme	K90E	Desktop	D	C	51	72.2
IUA_K01	Tsitsikamma	K80B	Desktop	B/C	B	TBA	19.9

**TBA – Being assessed by the estuarine specialist team*

PROPOSED WATER RESOURCE SCENARIOS EVALUATED

Table 4: Provides an overview of the identified water resource scenarios, which have been evaluated with and without the inclusion of the EWRs. These scenarios were further detailed for each IUA, outlining proposed developments in the current, medium, and long term (e.g., dams, hydropower, water transfers, and increased irrigation). Both ecological and socio-economic consequences were evaluated, and trade-offs were then assessed. This phase will ultimately determine the Water Resource Class for each IUA.

Table 4: Summary of operational scenarios for the study

Scenario	Scenario descriptions	
Scenario 1 (Sc1)	Present Day Demands	• Sc1a (without EWR) – "modelling flows in rivers/ estuaries and supply to users without EWR"
		• Sc1b (with EWR - rivers) – "the EWR for REC for rivers will be included into the models and prioritised to ensure the flows are provided to meet the ecological needs – will need to assess whether meets the socio-economic needs/potential trade-offs"
		• Sc1c (with EWR – REC for rivers and estuaries)
Scenario 2 (Sc2)	Medium Term (2030)	• Sc2a (without EWR)
		• Sc2b (with EWR - rivers)
		• Sc2c (with EWR – rivers and estuaries)
Scenario 3 (Sc3)	Long Term (2050)	• Sc3a (without EWR) • Sc3.1a (intervention alternative scenario without EWR)
		• Sc3b (with EWR - rivers) • Sc3.1b (intervention alternative scenario with EWR for rivers)
		• Sc3c (with EWR – rivers and estuaries) • Sc3.1c (intervention alternative scenario with EWR for rivers and estuaries)
Scenario 4	Water quality (considered and predicted)	• Only selected IUAs were assessed where water quality was identified to be of a concern. The future water quality status (either deterioration or improvement) is based on Sc1b – the present-day status of the water quality, along with the EWR for the set REC for rivers and/or estuaries.
Scenario 5	Climate Change (considered and predicted)	• Models were run stochastically; • Selected a drier time series (that correlated with the anticipated changes) and used that as the historical alternative sequence; • Algoa reduced availability although were not reflected within the models; • Amatola – projections were not sufficiently clear whether there was an increase/decrease, thus no change in the water balance was made; • The range of flows were assessed; • Only one climate change scenario was assessed and for specific IUAs where most impact expected

SCENARIO EVALUATION, RESULTS AND ECOLOGICAL AND SOCIO-ECONOMIC CONSEQUENCES

Step 4 aims to determine the ESBC, which defines the base ecological condition and the EWRs needed to maintain it. A hydrological model is then used to assess if these EWRs are met.

The scenario modelling for the Keiskamma, Fish to Tsitsikamma catchment areas assesses the implementation of the Reserve and the water balance per IUA, focusing on both rivers and estuaries. It evaluates whether the EWR for the REC are met, with results colour-coded: red (0–40% achievement), orange (40–70%), and green (70–100%). The study highlighted sites where EWRs are not met, which included Black Kei, Kubusi, Keiskamma, and others, to guide trade-off assessments and focus on areas where EWR compliance is most critical. Refer below for a full example of evaluating the water resource scenarios, the ESBC, the scenario results and the **preliminary** ecological and socio-economic consequences for **IUA_R02 (Buffalo / Nahoon).**

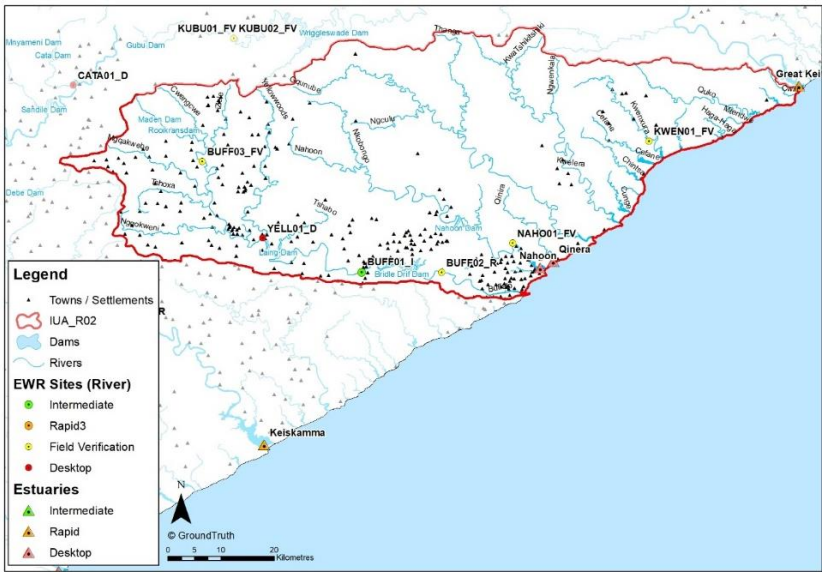


Figure 2: IUA_R02

For IUA_R02 (Buffalo/Nahoon) (**Figure 2**), the Amathole Water Supply System (WSS) was the focus of a Reconciliation Strategy Study, (DWS, 2022[1]). Current water requirements were drawn from the 2023 Annual Operating Analysis (AOA) (DWS, 2023[2]) and related DWS reporting (2024[3]), while future projections were sourced from the Reconciliation Strategy Status Report (DWS, 2011[4]).

Table 5 summarises the proposed water resource scenarios (present-day, medium, and long-term) for IUA_R02. These scenarios were assessed by comparing monthly supply against user requirements, including the EWR. Reliability of Supply (RoS) was calculated using: failures (months with supply shortfalls exceeding 0.002 million m³), Risk of Failure (RoF) as (failures + 1) ÷ total months to account for uncertainties, and RoS as 1 - RoF.

Table 6 summarises the scenario results for IUA_R02, with the present-day EBSC assessment detailed in Table 7, focusing on river and estuarine ecological requirements. For IUA_R02, the REC for the river EWR site (BUFF01_I) was D, while the estuarine RECs for Nahoon and Qinera were C and B, respectively. The EWR would be met under Scenario 1 with EWR implementation (RoS above 90% for both middle and lower Buffalo River), but failing to implement it would lead to negative ecological consequences (**Table 7**).

Table 5: Proposed catchment scenarios for IUA_R02

IUA	IUA Linkages / Comments	Rivers (EWR sites)	Estuaries	Dam releases constraints	Scenario No.	Water Requirements (million m³/year)	Augmentation Intervention
IUA_R02 (Buffalo / Nahoon)	Linked to IUA_S03 (Great Kei) Intervention scenarios Growth scenarios	BUFF03_FV: Buffalo YELL01_D: Yellowwoods BUFF01_I: Buffalo (Middle) BUFF02_R: Buffalo	Nahoon (Desktop) Qinera (Desktop) Kwelera *(potentially re-look at flows from scenarios)* Bulura *(potentially re-look at flows from scenarios)*	Laing (R2R001) Bridledrift (R2R003) Nahoon (R3R001)	Sc1	Forestry & Invasives (9.7) Irrigation (2.9) **Amathole:** Buffalo City (91.41) Amathole District (3.35)	
					Sc2	**Amathole:** Buffalo City (102.05) Amathole District (3.96)	**Buffalo City:** Water Reuse (20 million m³/a)

[1] *Department of Water and Sanitation, South Africa (2022). Amathole WSS Status Report No. 1. Prepared by Myra Consulting (Pty) Ltd for Zutari (Pty) Ltd as part of the Support on Development, Updating and Review of Strategies to Reconcile Water Availability and Requirements in South Planning Area Study.*

[2] *Department of Water and Sanitation (2023). Development of Operating Rules for Water Supply and Drought Management of Stand-Alone Dams, Schemes and Integrated Systems in the Eastern Cape, Southern Planning Area: Amathole Water Supply System 2023/2024: Annual Operating Rules. Report prepared by Mariswe (Pty) Ltd for the Department of Water and Sanitation, Water Resource Management Planning, Pretoria.*

[3] *Department of Water and Sanitation (2024). Development of Operating Rules for Water Supply and Drought Management of Stand-Alone Dams, Schemes and Integrated Systems in the Southern Planning Area: Amathole Water Supply System 2023/2024: Annual Operating Rules (Eastern Cape, Southern Planning Area). Report prepared by Mariswe (Pty) Ltd for the Department of Water and Sanitation, Water Resource Management Planning. Pretoria.*

[4] *Department of Water Affairs (2011) Development of Reconciliation Strategies for all towns in the Southern Planning Region: Provincial Summary Report – Eastern Cape. Directorate: National Water Resource Planning. DWA Report No. P RSA 000/00/15311*

IUA	IUA Linkages / Comments	Rivers (EWR sites)	Estuaries	Dam releases constraints	Scenario No.	Water Requirements (million m^3/year)	Augmentation Intervention
		NAHO01_FV: Nahoon KWEN01_FV: Kwenxura	Cintsa *(potentially re-look at flows from scenarios)*				**Amathole:** Groundwater (3.3 million m^3/a
					Sc3	**Amathole:** Buffalo City (120.66) Amathole District (4.71)	**Buffalo City:** Water Reuse (26 million m^3/a) Wesselshoek Dam (10.9 million m^3/a) **Amathole:** Groundwater (3.3 million m^3/a

Model used for assessment: WRYM; there is a water quality concern in this IUA, thus Scenario 4 will apply

Table 6: Summary of water supply volumes and flows as a result of the scenario analyses for IUA_R02

	Present Day		Reliability of Supply (Months Supplied)									
User Type	Demand	Supply	Sc1 noEWR	Sc1 EWR	Sc2 noEWR	Sc2 EWR	Sc3a noEWR	Sc3a EWR	Sc3b noEWR	Sc3b EWR	Sc3c noEWR	Sc3c EWR
Domestic	163.18	147.62	77%	73%	86%	78%	85%	77%	NA	NA	NA	NA
EWR	63.12	61.85	43%	99%	43%	99%	43%	99%	NA	NA	NA	NA
IRR	2.93	2.12	66%	66%	67%	66%	67%	66%	NA	NA	NA	NA
Hydropower	0.00	0.00	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

REC are met, with results colour-coded: red (0–40% achievement), orange (40–70%), and green (70–100%).

Table 7: A summary of the rivers and estuaries REC for IUA_R02 for the EWR sites for rivers and estuaries

EWR site code	River Name	Quaternary catchment	REC	Total EWR as %nMAR for REC	nMAR (10^6m^3)	Scenarios*		Estuary System	Quaternary catchment	REC	Total EWR as %nMAR for REC	nMAR (10^6m^3)
						EWR OFF	EWR ON					
RIVERS								ESTUARIES				
BUFF01_I	Buffalo (Middle)	R20F	D	34.46	83.8	46%	98%	Nahoon	R30F	C	62.8 + 5%	32.5
BUFF02_FV	Buffalo (Lower)	R20G	D	32.83	91.9	6%	99%	Qinera	R30F	B	98.3	8.4

In terms of the IUAs hydrology, the average flows were measured in MCM from 1920 to 2009 for each scenario and the monthly average flows illustrated in **Figure 3**.

Table 8: Average flows (1920-2009) in MCM for BUFF01_I

Scenarios	Average Flows MCM
nMAR	83.8
Sc1a (PRS)	52.1
Sc1b	59.6
Sc2a	50.9
Sc2b	58.6
Sc3a	50.0
Sc3b	57.9

The seasonal distribution (hydrograph) plot was prepared using the flows provided for the scenarios and is illustrated in **Figure 3** below. The flow durations of the scenarios for the IUA_R02 for July (dry) and March (wet) are shown in **Table 9**. The 'red' highlighted areas in the tables indicate where the EWR could not be met (deficit – meaning that there is not enough water in the system to meet the EWR (ecological consequence).

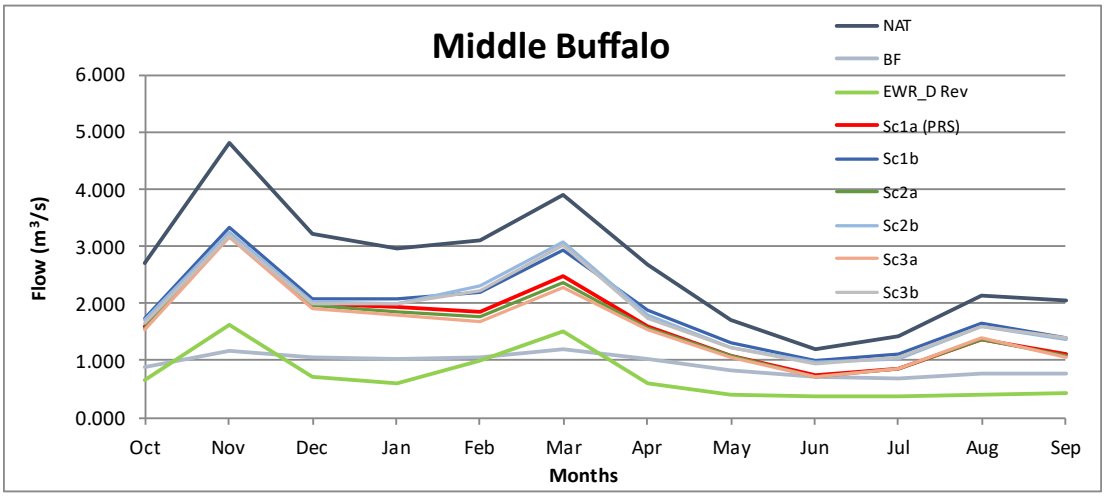


Figure 3: Seasonal distribution of scenarios for IUA_R02 (Buffalo / Nahoon)

Ecological and socio-economic consequences

Reduced summer floods and baseflows are evident, particularly without EWR implementation. Maintaining a REC of D requires EWR to be met, despite water quality issues mainly due to poor WWTW compliance. Urban water deficits with EWR average 6.11 million m³ annually (7% less than without EWR), dropping to 2.4 million m³ (3%) long term, while irrigation deficits are minor at 0.09 million m³ (4%). GDP losses are R9.4 billion (2% of catchment GDP), reducing to R2.5 billion (0.5%) with future developments.

Further detail on the identification, approach, methodology and assessment of these scenarios is provided in the Scenarios Report (**Report No. WEM/WMA7/00/CON/RDM/2324**) on the DWS website https://www.dws.gov.za/wem/WRCS/kft.aspx. The Ecological and Socio-economic Consequences Report will be released to the PSC panel for review in February 2025.

CONTACT INFORMATION

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Apendix A: Illustration of the Integrated Units of Analysis for the study

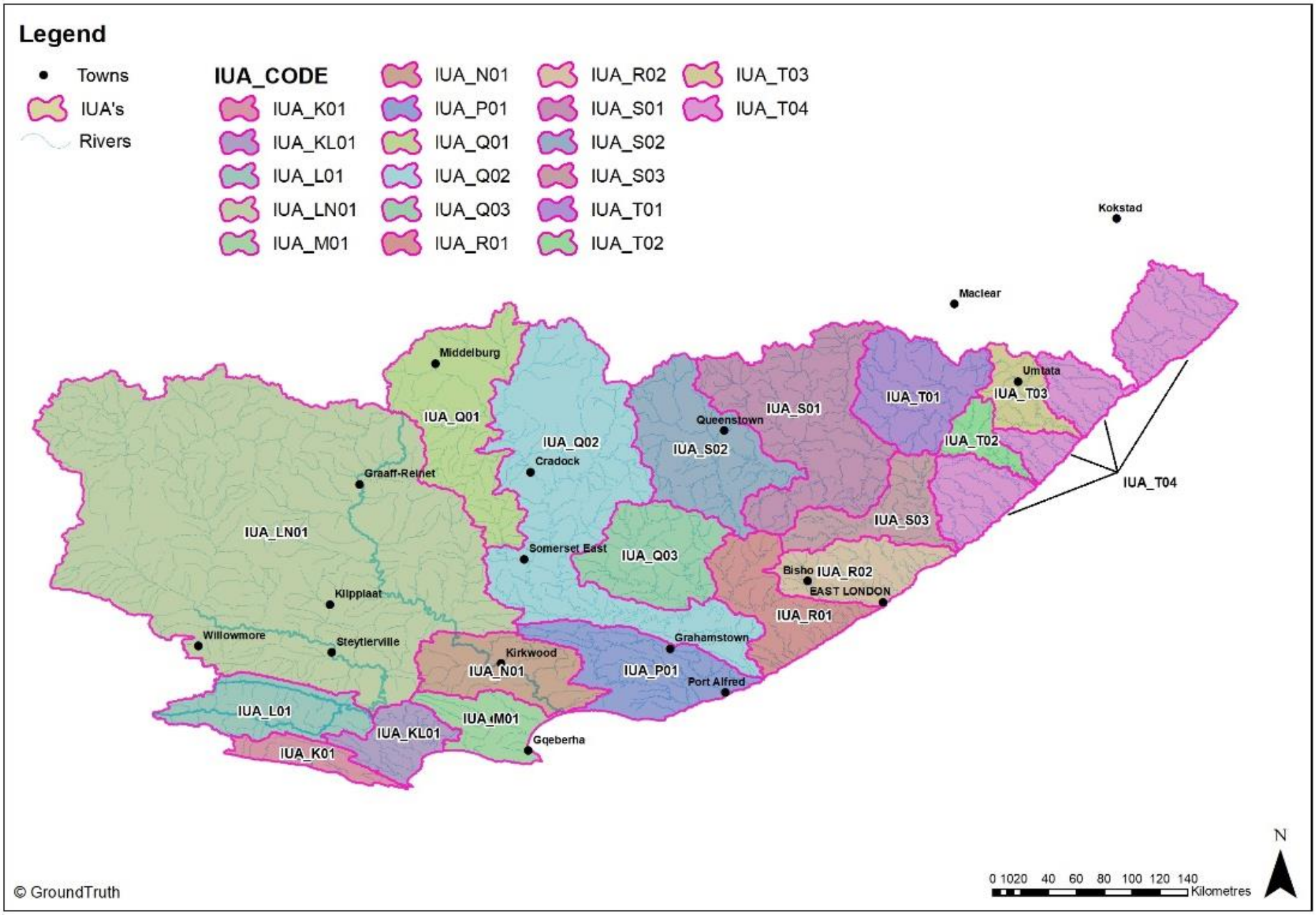

Figure A1: Integrated Units of Analysis for the study