water affairs

Department:
Water Affairs
REPUBLIC OF SOUTH AFRICA

RESOURCE QUALITY OBJECTIVES: NON-ECOLOGICAL WATER QUALITY

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NWRCS integrated steps

1: Delineate units of analysis and describe the status quo

2: Initiation of stakeholder process and catchment visioning

3: Quantify EWRs and changes in Ecosystem Services

4: Identification and evaluation of scenarios within IWRM

5: Draft Management Classes

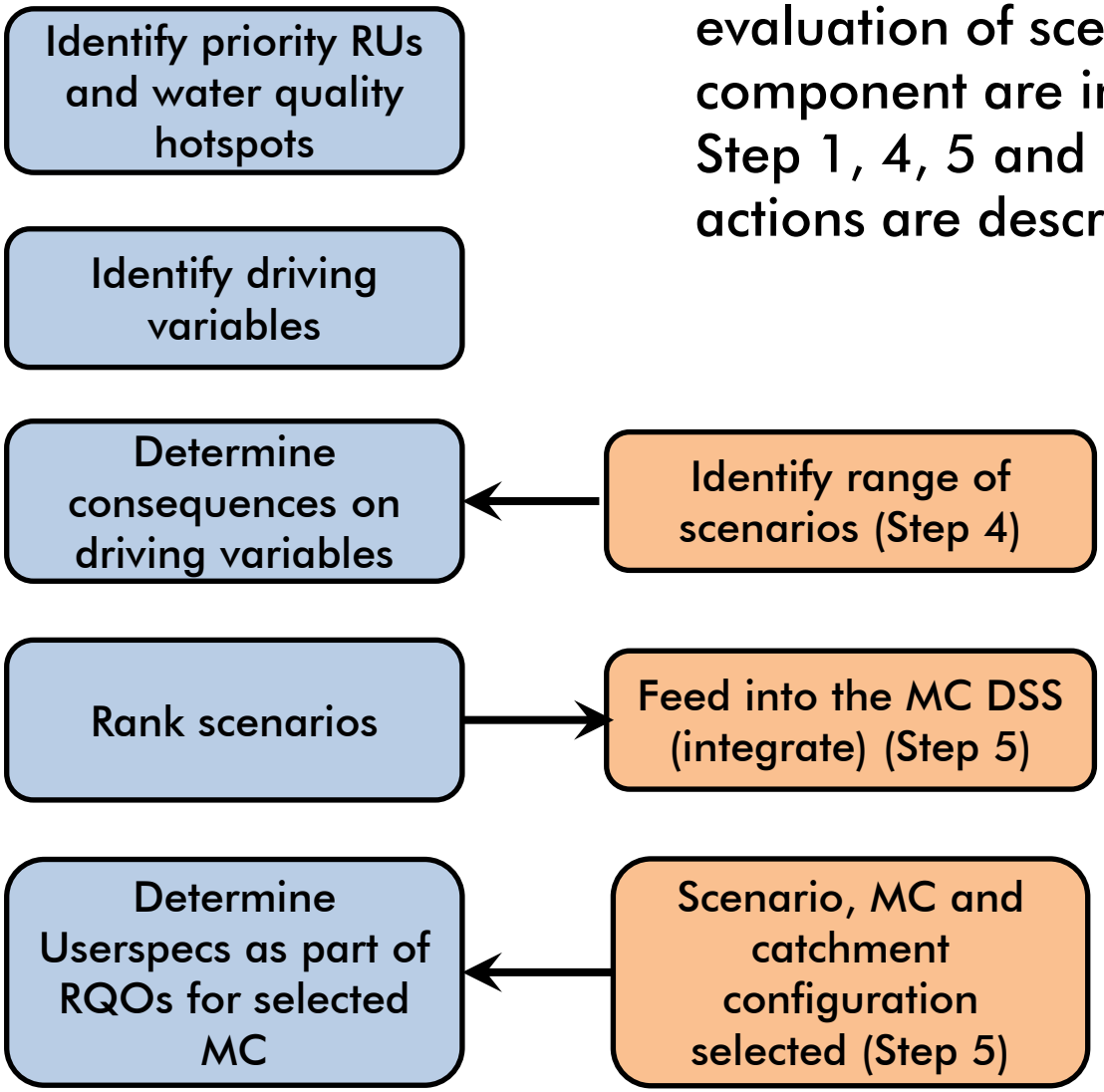
6: Resource Quality Objectives (EcoSpecs & water quality (user))

7: Gazette class configuration

WHERE DOES RQO (FITNESS FOR USE) FIT IN?

Non-ecological water quality steps

Water quality steps



The determination of RQOs and evaluation of scenarios for this component are inter-linked between Step 1, 4, 5 and 6. The sequence of actions are described below:

STEPS 4 and 6: WATER QUALITY

- **Water quality = two broad components**
  - **Ecological, i.e. as part of the EWR or Reserve process. Output = EcoSpecs.**
  - **Non-ecological, i.e. UserSpecs (excl. aquatic ecosystems).**

- **UserSpecs and consequences of scenarios (Step 4)**
  - **Wq included as a service identified in ECOSYSTEM SERVICES**
  - **Wq included indirectly in the ECONOMICS in terms of water treatment costs**
  - **NON-ECOLOGICAL WQ: Evaluate Impact of scenarios on users by (1) identifying primary user, (2) identifying driving wq variables + (3) use of WQSAM**

STEP 4: SCENARIOS – WQSAM

- **Aims to address management requirements through:**
  - ❖ **Utilising limited existing observed data (salts + nutrients)**
  - ❖ **Integrating with existing yield models**
  - ❖ **Providing estimates of RISK associated with management scenarios**
- **Method**
  - ❖ **Uses the relationships between flow and water quality to simulate water quality variable loads**
  - ❖ **Uses same nodal structure as the yield model**
- **Model Status: Existing model set up + calibrated for the Crocodile River (WRC project). Potential for using this model to evaluate scenarios.**

STEP 6: RQOs – WATER QUALITY

For RQOs focus is on the following for Userspecs, i.e. uses such as irrigation + stock-watering, domestic, recreation, industrial:

- **Collect background information**
- **Identify priority resource units (as part of the Task 1 hotspot process)**
- **Identify users + their locations within those RUs**
- **Identify driving users ito water quality**
- **Identify wq requirements of user groups**
- **Identify wq variables that drive wq state or requirements**

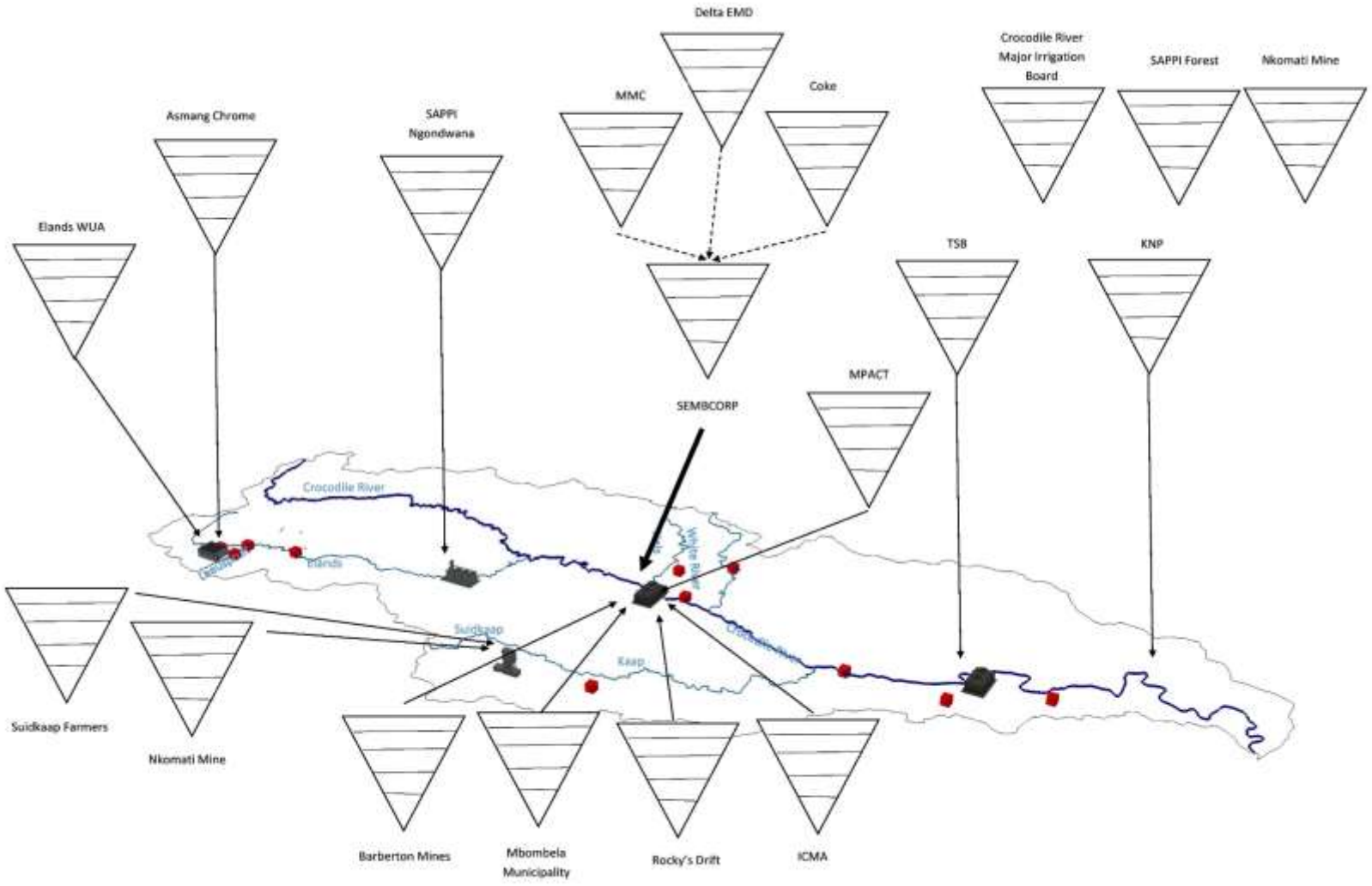
STEP 6: RQOs – WATER QUALITY

- **Background information to inform the process:**
  - **Land use + water quality status quo (a study deliverable)**
  - **Systems activity analysis to identify user groups in the catchment – see examples below for industry + WWTW for the Crocodile catchment**
  - **Output from Classification, i.e. catchment configurations and Management Classes**
  - **Data gathering, e.g. water quality objectives drafted by DWA: Water Quality Planning (see example below)**
  - **EcoSpecs from the EWR / Reserve study**
  - **Integration of outputs, i.e. EcoSpecs (as A-F categories) and UserSpecs (as Ideal – Unacceptable)**

Categories A and A/B = Ideal, B, B/C and C = Acceptable, C/D and D = Tolerable

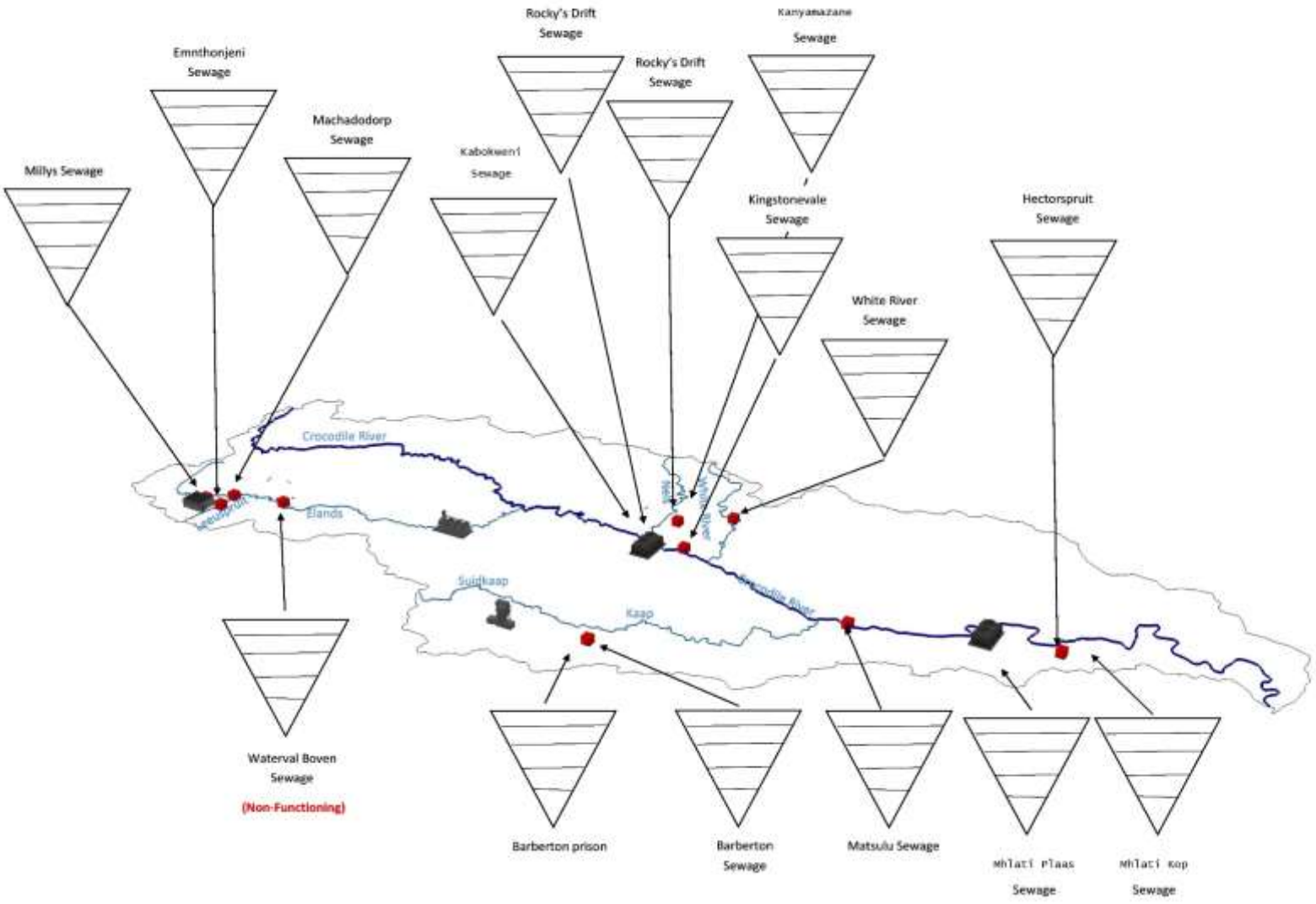
STEP 6: RQOs – WATER QUALITY

INDUSTRY STAKEHOLDERS IN THE CROC CATCHMENT



STEP 6: RQOs – WATER QUALITY

WWTW IN THE CROC CATCHMENT



STEP 6: RQOs – WATER QUALITY: UPPER X1

Variable	Units	Bound	Average_value	Average*1.5	Percentile	Wq objective	Ideal	Acceptable	Tolerable	User
Alkalinity (CaCO3)	mg/l	Upper	68.7	103.05	95	**104**	300	450	600	In3
Ammonia (NH3-N)	mg/l	Upper	0.006	0.009	95	**0.009**	0.015	0.058	0.1	EWQG
Calcium (Ca)	mg/l	Upper	13.2	19.8	95	**19.8**	10	80	80	Dom
Chloride (Cl)	mg/l	Upper	10.7	16.05	95	**16.1**	100	137.5	175	Dom AIr In3
EC	mS/m	Upper	20.9	31.35	95	**32**	30	70	85	Dom
Fluoride (F)	mg/l	Upper	0.4	0.6	95	**0.6**	0.7	1	1.5	Dom
Magnesium(Mg)	mg/l	Upper	13.8	20.7	95	**20.7**	70	100	100	Dom
NO2 and NO3	mg/l	Upper	0.6	0.9	95	**0.9**	6	10	20	Dom
pH	units	Upper	n/a	n/a	95	**8.4**	8	8.4	8.4	BHN In3
		Lower	n/a	n/a	5	**6.5**	6.5	6.5	6.5	BHN AIr In3
Potassium (K)	mg/l	Upper	3.2	4.8	95	**4.8**	25	50	100	Dom
PO4-P	mg/l	Upper	0.006	0.009	50	**0.009**	0.005	0.02	0.125	EWQG
SAR	mmol/l	Upper	0.5	0.75	95	**0.8**	2	8	15	AIr
Sodium (Na)	mg/l	Upper	8.8	13.2	95	**13.2**	70	92.5	115	AIr
SO4	mg/l	Upper	17.4	26.1	95	**27**	200	250	300	Dom In3
TDS	mg/l	Upper	140.1	210.2	95	**211**	260	800	1000	AIr
Si	mg/l	Upper	7.9	11.85	95	**11.9**	20	85	150	In3
Hardness (CaCO3)	Mg/l	Upper	47.6	71.4	95	**72**	200	300	500	Dom

STEP 6: RQOs – WATER QUALITY

- **Outputs**
  - **Water quality portion of the RQOs (aka Resource Water Quality Objectives) as the most stringent objectives considering all users (i.e. EcoSpecs and UserSpecs)**
  - **Narrative and qualitative statements will be used to describe water quality objectives**
  - **Numerical limits provide a quantitative measure to be used for monitoring purposes and auditing compliance (where data available)**
- **Main focus: An assessment of whether current levels of protection are adequate for the system**
- **All RQOs are linked to the catchment configurations that make up the Management Class of IUAs**