Ministry of
Environment

NIRAS

Water Pollution Baseline Study

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&

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Outline

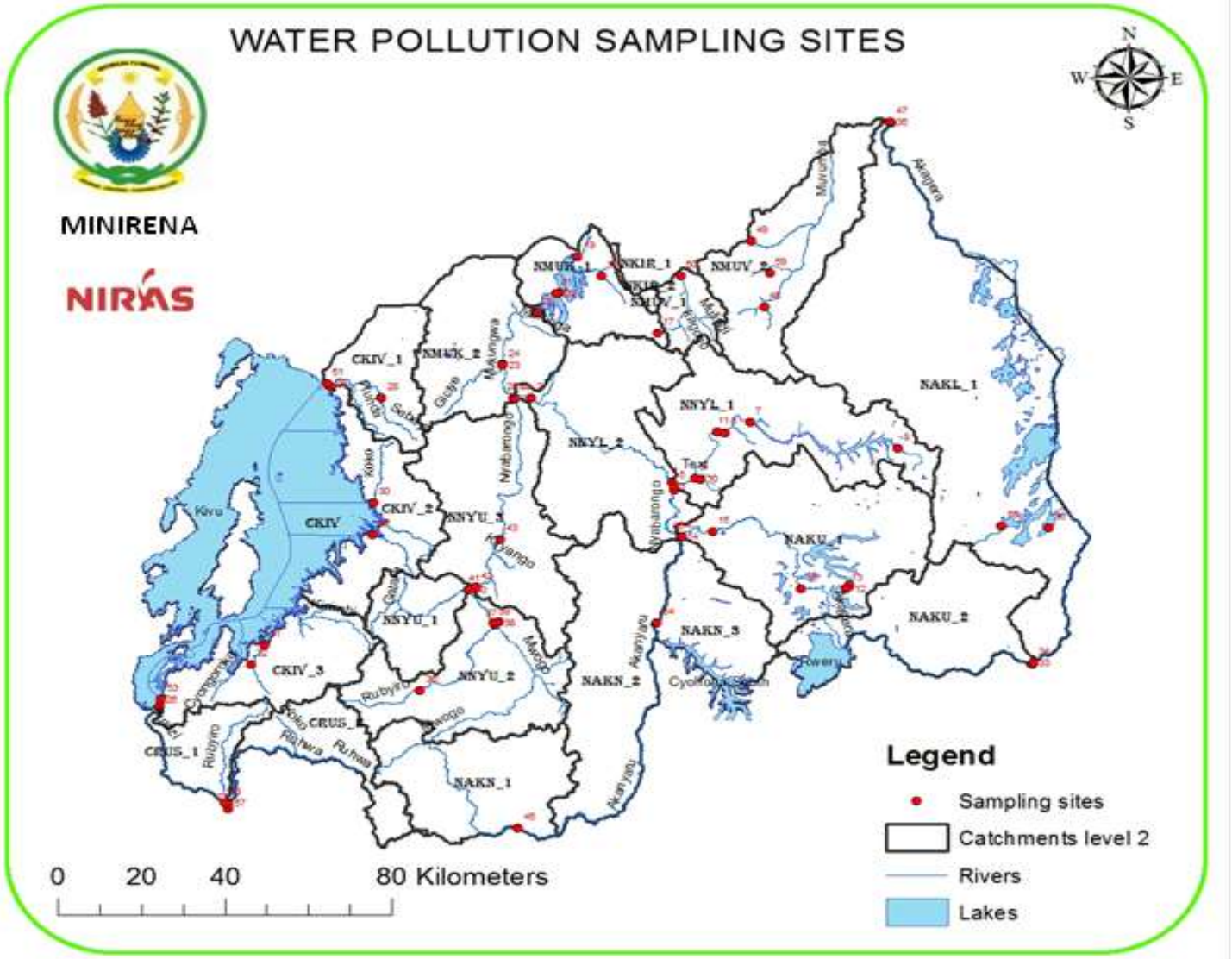
- 1. approach
- 2. Indicators
- 3. Outcome
- 4. Recommended follow-up for future regular M & E

1. Approach

- The approach that have been used was based on the monitoring of main water bodies (Rivers & Lakes) at catchment level 2;
- We used an upstream and downstream sampling approach, we have selected 58 sentinels sites in the whole country;
- A sampling matrix showing all needed data to be collected administratively and 10 physico-chemical and bacteriological parameters of the water bodies were measured at each sentinel site;
- A mapping of Point Source and Non Point Source of Water Pollution was conducted in a combined survey with the Water Users team.

Latitude (dec)	Longitude (dec)	Google map	L2 Catchment	Prov_ID	Dist_ID	Sect_ID	Cell_ID	Province	District	Sector	Cell	gauging station

EC	DO	TDS	TSS	Turbidity	pH	T	DIP	DIN	E-Coli	other field observations	Selection Reason



2. Indicators

1) Look at the ***"Annual % change in level of non-point-source water pollution"*** as captured in **ECC 15**;

2) covering the ***"Number of significant water pollution sources determined (by type and by pollution severity level"*** as captured in **ECC 16**;

3) to look at the ***"total area of ecosystems – by level of degradation"*** (disaggregated by ecosystem type) as captured in **ECC 06;**

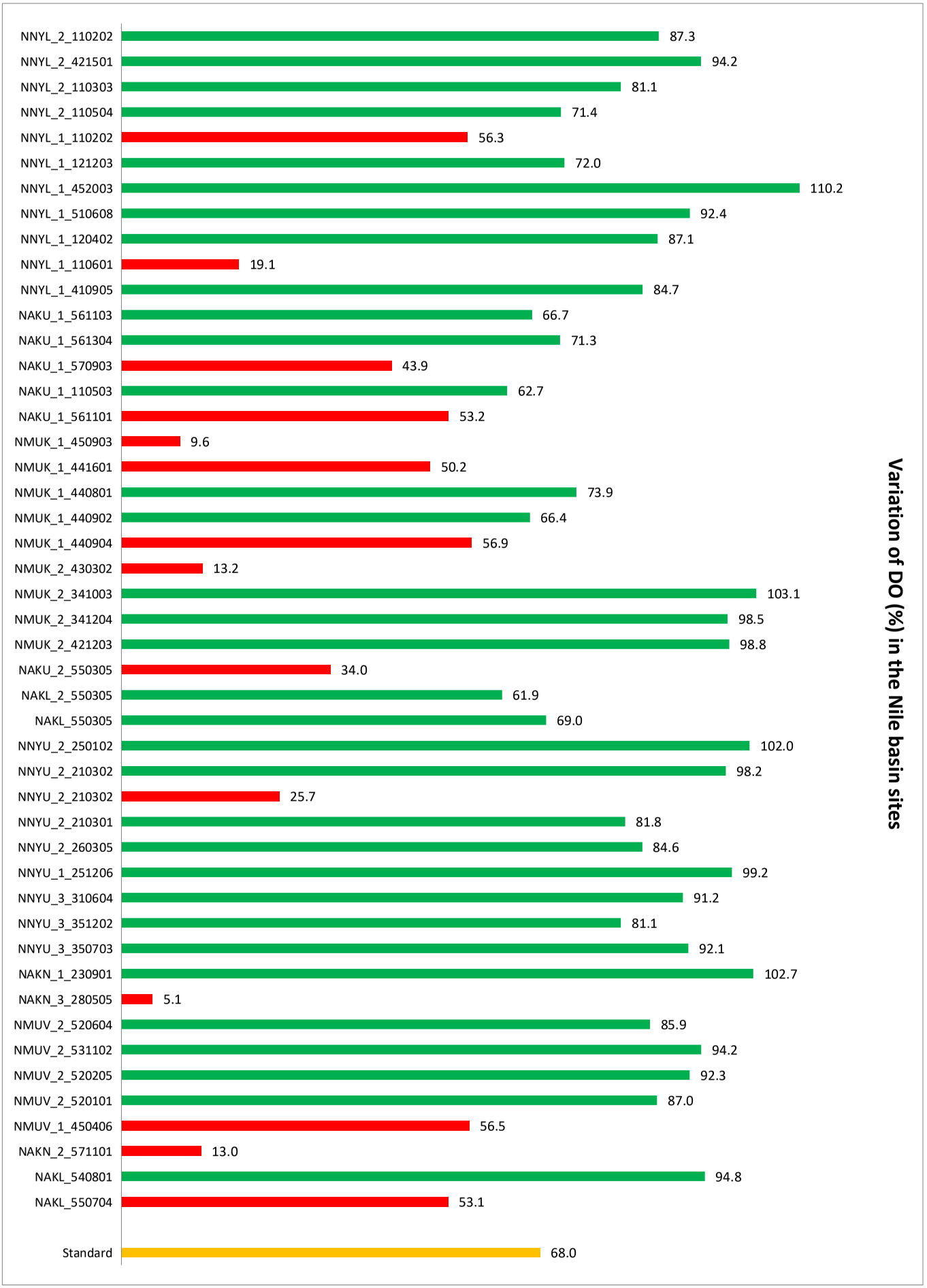
4) to report on **SDG 6 indicator number 6.3.2:** ***"Proportion of bodies of water with good ambient water quality"*** .

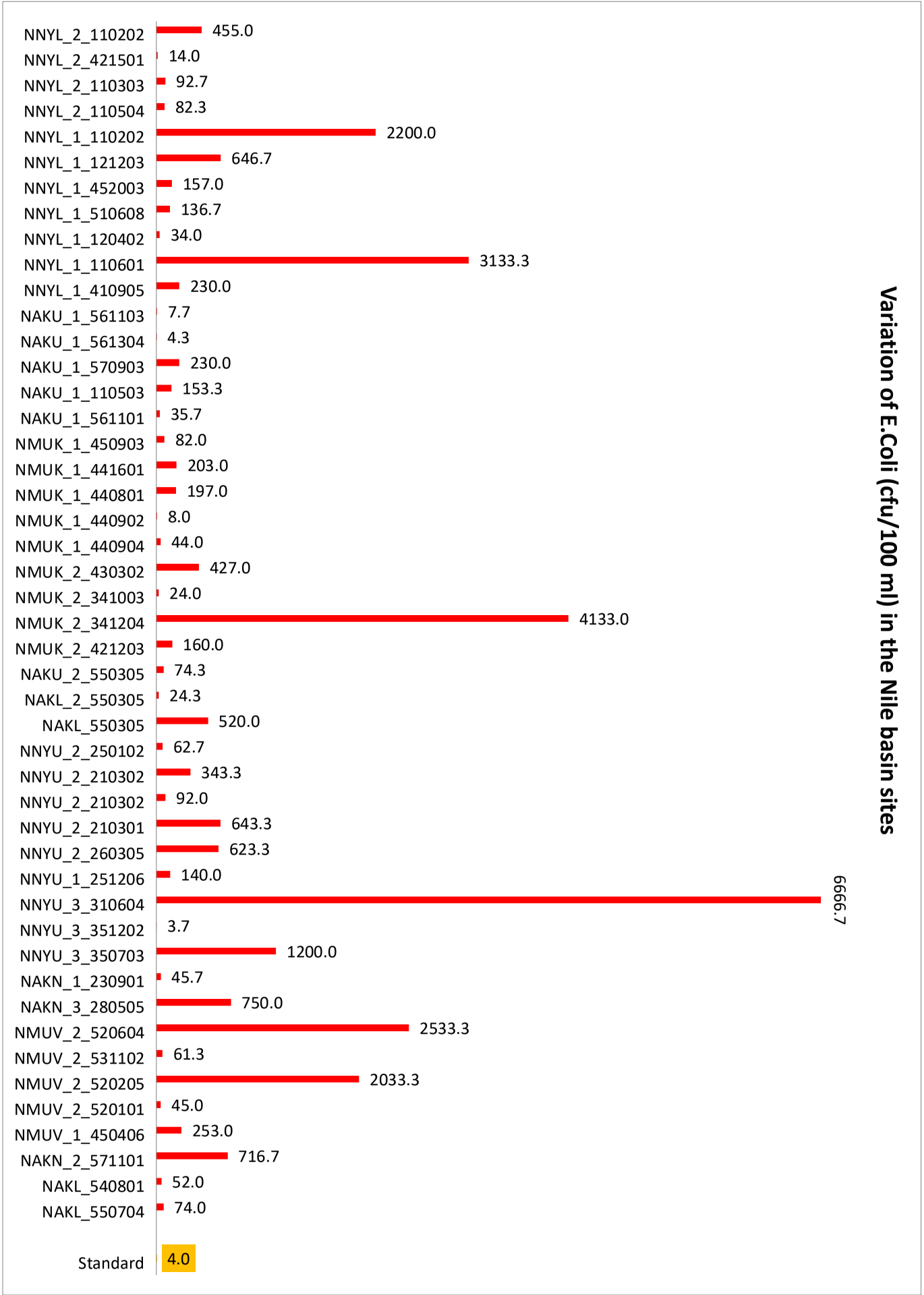
3. Outcomes

	Parameters variation			Standard limit
1	*DIN varied from **0.5** mg/l	to	**8.1** mg/l	3
2	*DIP varied from **0.0** mg/l	to	**2.2** mg/l	5
3	*DO varied from **5.1** %	to	**111.4** %	68
4	*EC varied from **22.9** µS/cm	to	**1,060** µS/cm	1000
5	E-Coli varied from **3** cfu/100 ml	to	**6,666** cfu/100 ml	4
6	*pH varied from **5.4**	to	**9.3**	6.5 - 8.5
7	T varied from **17.1** °C	to	**26.9** °C	25
8	TDS varied from **9.9** mg/l	to	**525.3** mg/l	500
9	TSS varied from **0** mg/l	to	**2,631.7** mg/l	30
10	Turbidity varied from **0.8** NTU	to	**4,105** NTU	150

NB: *the green color shows value within the accepted limit and the red color shows value below or above the accepted limit.*

** Shows the core parameter for SDGs.*


NNYL_2_110202 87.3
NNYL_2_421501 94.2
NNYL_2_110303 81.1
NNYL_2_110504 71.4
NNYL_1_110202 56.3
NNYL_1_121203 72.0
NNYL_1_452003 110.2
NNYL_1_510608 92.4
NNYL_1_120402 87.1
NNYL_1_110601 19.1
NNYL_1_410905 84.7
NAKU_1_561103 66.7
NAKU_1_561304 71.3
NAKU_1_570903 43.9
NAKU_1_110503 62.7
NAKU_1_561101 53.2
NMUK_1_450903 9.6
NMUK_1_441601 50.2
NMUK_1_440801 73.9
NMUK_1_440902 66.4
NMUK_1_440904 56.9
NMUK_2_430302 13.2
NMUK_2_341003 103.1
NMUK_2_341204 98.5
NMUK_2_421203 98.8
NAKU_2_550305 34.0
NAKL_2_550305 61.9
NAKL_550305 69.0
NNYU_2_250102 102.0
NNYU_2_210302 98.2
NNYU_2_210302 25.7
NNYU_2_210301 81.8
NNYU_2_260305 84.6
NNYU_1_251206 99.2
NNYU_3_310604 91.2
NNYU_3_351202 81.1
NNYU_3_350703 92.1
NAKN_1_230901 102.7
NAKN_3_280505 5.1
NMUV_2_520604 85.9
NMUV_2_531102 94.2
NMUV_2_520205 92.3
NMUV_2_520101 87.0
NMUV_1_450406 56.5
NAKN_2_571101 13.0
NAKL_540801 94.8
NAKL_550704 53.1
Standard 68.0
Variation of DO (%) in the Nile basin sites


Variation of E.Coli (cfu/100 ml) in the Nile basin sites
NNYL_2_110202 455.0
NNYL_2_421501 14.0
NNYL_2_110303 92.7
NNYL_2_110504 82.3
NNYL_1_110202 2200.0
NNYL_1_121203 646.7
NNYL_1_452003 157.0
NNYL_1_510608 136.7
NNYL_1_120402 34.0
NNYL_1_110601 3133.3
NNYL_1_410905 230.0
NAKU_1_561103 7.7
NAKU_1_561304 4.3
NAKU_1_570903 230.0
NAKU_1_110503 153.3
NAKU_1_561101 35.7
NMUK_1_450903 82.0
NMUK_1_441601 203.0
NMUK_1_440801 197.0
NMUK_1_440902 8.0
NMUK_1_440904 44.0
NMUK_2_430302 427.0
NMUK_2_341003 24.0
NMUK_2_341204 4133.0
NMUK_2_421203 160.0
NAKU_2_550305 74.3
NAKL_2_550305 24.3
NAKL_550305 520.0
NNYU_2_250102 62.7
NNYU_2_210302 343.3
NNYU_2_210302 92.0
NNYU_2_210301 643.3
NNYU_2_260305 623.3
NNYU_1_251206 140.0
NNYU_3_310604 6666.7
NNYU_3_351202 3.7
NNYU_3_350703 1200.0
NAKN_1_230901 45.7
NAKN_3_280505 750.0
NMUV_2_520604 2533.3
NMUV_2_531102 61.3
NMUV_2_520205 2033.3
NMUV_2_520101 45.0
NMUV_1_450406 253.0
NAKN_2_571101 716.7
NAKL_540801 52.0
NAKL_550704 74.0
Standard 4.0

3. Outcomes (con't)

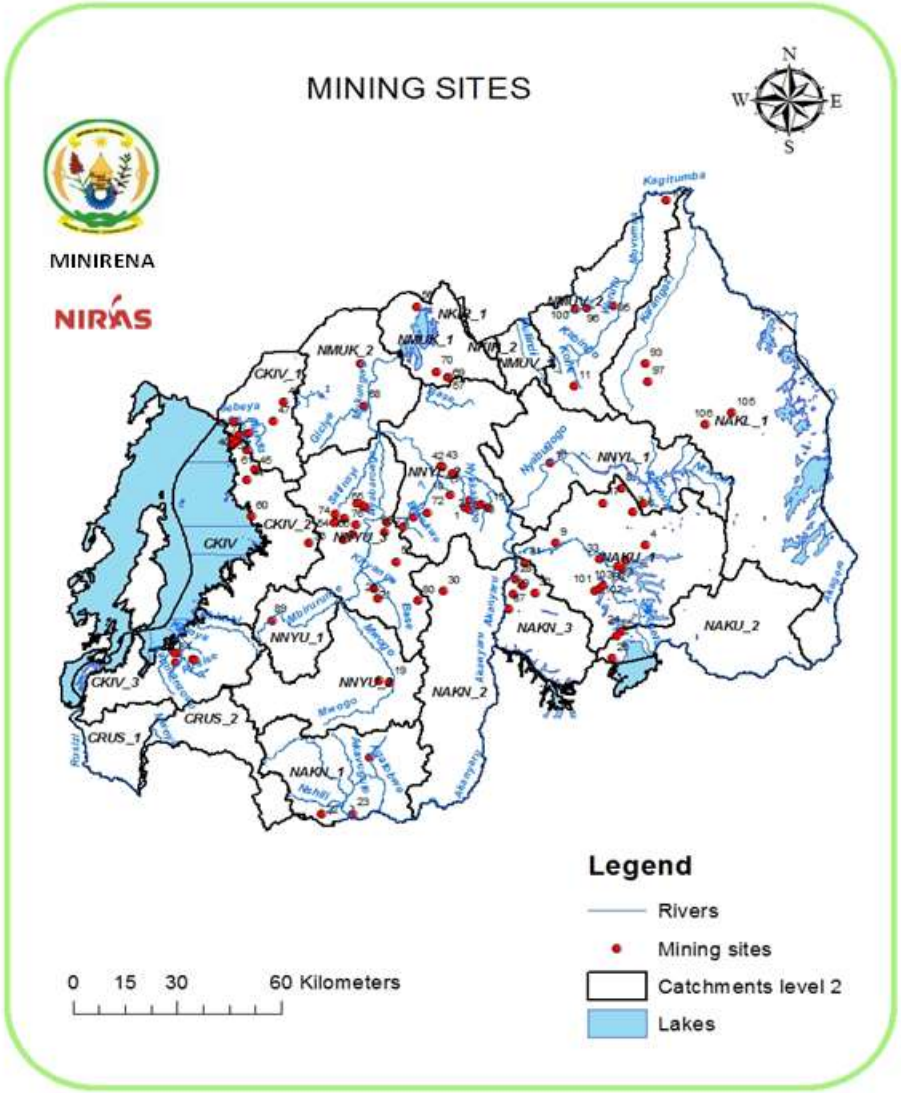
- Considering only core parameters recommended by SDGs, 23 water bodies out of 29 included in this study had % of compliance above **80 % which is the criteria.**

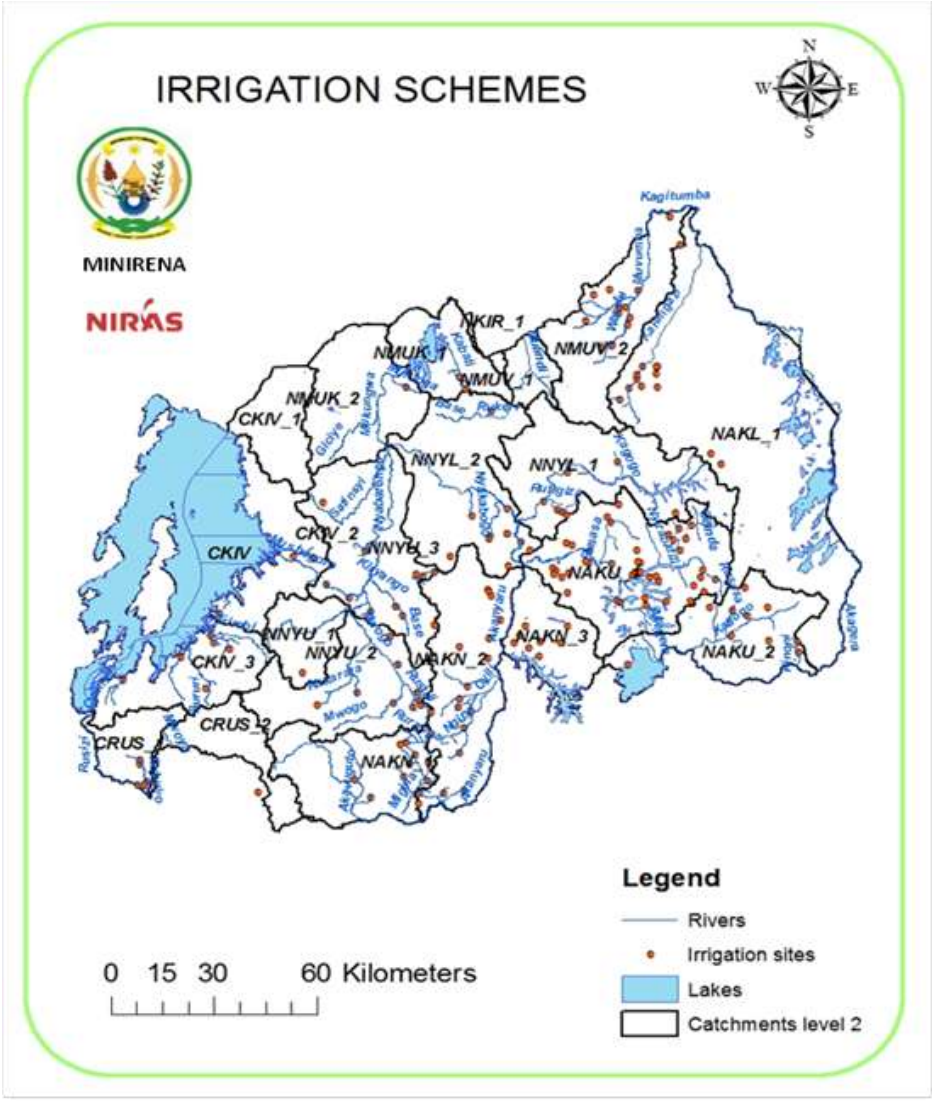
$$C = (n_{comply} / n_{meas}) * 100$$

- which makes **85.2 % of water bodies with good ambient water quality.**
- However, by considering all parameters, only 4 water bodies had the compliance above 80
- Which makes **14.8% of water bodies with good ambient water quality**

Expected Study Objectives and outcomes (TOR)	Achievement level
Objectives	
• To establish a reliable estimate of the current level of pollution of surface water bodies in the country together with a clear and reliable understanding of the principal sources of this, and to establish a baseline against which future monitoring can be conducted.	This study provided the water quality baseline for the main water bodies in each catchment level 2 of the country using 58 uniquely identified sampling sites selected after extensive discussion with key stakeholders. • Results from the **laboratory were compared to the standards** for surface water. • **E. coli, TSS & Turbidity are almost always out of the acceptable range** for surface water quality. • **DIN concentration is also above the acceptable maximum limit** and its concentration becomes very high in areas under irrigation where **chemical fertilizers are being applied at large scale like alongside of Muvumba River in Nyagatare District**. • Water pollutions sources generally big water users (coffee washing station, industries, mining companies, water treatment plants, Hydropower plants & irrigation schemes were located in each catchment level 2

RBME Indicators to be informed	
ECC 15: 'Annual % change in level of non-point-source water pollution'.	• Although the study did not cover the entire year, it established a clear methodology and representative sampling sites across the country that will be used for future monitoring. • In the future, a continuous monitoring needs to be applied on these sampling sites, taking into consideration the **seasonal variation and covering multi-year time series**, this will provide data on the annual percentage change in the level of non-point water sources of pollution but also data on the spatial and temporal distribution effects of non-point water sources of pollution.
ECC 16: 'Number of significant water pollution sources determined (by type and by pollution severity level)'	• A sample size of **517 big water users** across the country was taken and visited. These water users were classified into six main categories: **Factories and industries, coffee washing stations, irrigation schemes, water treatment plants and Hydropower plants**. • The interview and field observations revealed that most of them are contributing to **water quality deterioration as many of them don't treat or monitor the quality of generated waste water before being discharged in the environment**. • A **list of physical chemical parameter that each category of user has been established to allow** regular monitoring actions. REMA was advised to make a regular follow up and to implement the **polluter pay principles** supported by the country environmental law.


MINING SITES
MINIRENA
NIRAS
N
W
E
S
Kagitumba
NKIR_1
NMUK_2
NMUK_1
NMUV_2
NMUV_1
CKIV_1
CKIV_2
CKIV
NNYL_1
NNYU
NAKL_1
NNYU_1
NAKN_3
NAKU_2
CKIV_3
NNYU_2
NAKN_2
CRUS_2
CRUS_1
NAKN_1
0 15 30 60 Kilometers
Legend
Rivers
Mining sites
Catchments level 2
Lakes


IRRIGATION SCHEMES
MINIRENA
NIRAS
N
W
E
S
Kagitumba
NKIR_1
NMUK_1
NMUV_2
NMUV_1
NMUK_2
CKIV_1
NNYL_2
NNYL_1
NAKL_1
CKIV_2
NNYL_3
CKIV
NAKU_1
NNYU
NAKN_3
NAKU_2
CKIV_3
NNYU_2
NAKN_2
CRUS_2
CRUS
NAKN_1
0 15 30 60 Kilometers
Legend
Rivers
Irrigation sites
Lakes
Catchments level 2

The study will also contribute to the assessments required in order to monitor and report on the following indicator: **ECC 06: 'Total area of ecosystems – by level of degradation' (disaggregated by ecosystem type).**	• As this study focuses only on water quality, the ecosystems considered are water bodies while the degradation level in that context is understood as the pollution level. In this case, the ECC 06 (Total area of ecosystems – by level of degradation) was considered as part of the SDG.6.3.2 indicator that is discussed below.
The study will also enable REMA to monitor and report on the new Sustainable Development Goal (SDG) indicator number 6.3.2: 'Proportion of bodies of water with good ambient water quality'	• **A database of key water bodies (lakes and rivers) at catchment level was created and located up to District level;** • A total number of 58 representative sampling sites were selected across the country and were uniquely identified using software generated code. At each sampling sites five parameters recommended under SDGs (DO, pH, EC, DIN & DIP) plus (TDS, Temperature, TSS, Turbidity & E-coli) recommended by the expert. • The following SDGs elements to which the country should regularly report on were put out: - Number of open water bodies, number of river water bodies, - number of open water bodies with good quality, - number of river water bodies with good quality, - number of open water body monitoring locations,

4. Recommended follow-up for future regular M & E

- **1. IWRM department / REMA:** The country can increase the number of monitoring locations to provide statistically more representative measurements. W**e recommend a continuous monthly water quality monitoring framework** that could be extended to twice a month if the required resources are available. **This will help the country to respond at the same time to SDGs and the RBME indicators of ECC 15 & 16.**

- **2. Ministry of Environment / IWRM department:** To establish a roadmap for groundwater quality monitoring as this category of water is also concerned by the SDGs. During its establishment, priority should be given to locations of drinking water abstraction as recommended by the SDGs. Although there are many efforts being put in place for water quality protection, **much more efforts are still needed to address some serious issues such as sedimentation and E-coli pollution in our water bodies.** Future studies should also be conducted to measure the impact of solid waste disposal on water resources and water quality / pollution.

4. Recommended follow-up for future regular M & E

- **3. REMA / RWFA:** the two institutions in charge of water quality and water resources in Rwanda, should work closely with UR to secure all necessary resources for an effective and continuous monitoring program.

- **4.** Any sustainable regular monitoring program on water quality and pollution to be set up, should incorporate the **"polluter pays" principle**, by using the existing Organic Law to require industries and other large scale water users not only to have water permits but also **to install at their sites adequate wastewater treatment facilities** but also conduct at **their own cost regular effluent analyses and to report thereupon to the Authorities.** Therefore, compliance with the Law on Protection of the Environment will be ensure.

Thank you