

**REPORT ON MOBILE NETWORK QUALITY-OF-
SERVICE (QoS)
ASSESSMENT
FOR THE FY 2023-2024**

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1. INTRODUCTION

The Authority regularly monitors licensees' compliance with licence terms of conditions, one of which is monitoring licensees' compliance with quality of mobile cellular services provided by mobile network operators to the public as a consumer protection mechanism. The quality of service (QoS) monitoring is performed according to a Quality-of-Service Assessment Framework established in 2018. This framework provides for three components used to gauge the Mobile Network Operators' (MNOs) performance; End to End testing vide Drive tests and Walk tests, Network Performance (NP-QoS) and Quality of Experience (QoE) done vide surveys.

During the period under review of 2023-2024, the Authority conducted quality of service assessment on the three MNOs in Kenya based on three (3) components; End to End testing vide drive tests and walk tests, Network Performance QoS monitoring and Quality of Experience (QoE)..

This report details results of the QoS monitoring and the outcomes of the same, based on End-to-End QoS, Network Performance and Quality of Experience (QoE) assessment that was conducted through surveys, alongside the Customer Satisfaction and perception surveys for the financial year 2023-2024.

The end-to-end testing QoS monitoring activities were conducted in all the 47 counties and also included verification of compliance to rollout coverage obligations by the MNOs in various sub-locations.

2. METHODOLOGY

The Mobile Quality of Service Monitoring is undertaken based on the framework that provides for three components used to gauge the Mobile Network Operators' (MNOs) performance namely ; End to End testing vide drive tests and walk tests, Network Performance (NP)-QoS monitoring and Quality of Experience (QoE) done vide surveys as detailed below.

2.1. End-to-End Quality of Service (QoS)

End-to-End Quality of Service (QoS) was undertaken using the drive test quality of service monitoring system. The field data obtained during the end-to-end tests is cleaned up to remove redundancies and inadmissible captures in line with the prevailing recommendations from standards development bodies such as the ITU, ETSI and IEC and analysed. Table 1 indicates the parameters considered for End-to-End Quality of Service measurements in the FY 2023-2024.

Table 1: End-to-End Drive Test QoS Measurement Parameters and Targets

Service	Parameters	Targets
Voice	Unsuccessful call ratio	$\leq 5\%$
	Dropped call ratio	$\leq 2\%$
	Call set up time	$\leq 12\text{s}$ (4G) $\leq 8\text{s}$ (Others)
	Voice quality (MOS, POLQA)	≥ 3.4 (Narrow Band)
	Handover	$\geq 96\%$
Data	Latency	$\leq 100\text{ ms}$
	Jitter	$\leq 50\text{ ms}$
	Data transfer failure ratio and Throughput of successful data transfer	Downlink failure ratio $\leq 10\%$ Uplink failure ratio $\leq 10\%$
	Ratio of Packet Loss	1 / 1,000 (1)
	Internet Accessibility	$\geq 98\%$
	HTTP set-up failure ratio and	HTTP set-up failure ratio $\leq 2\%$
	HTTP set-up time	$\geq 95\%$ within $\leq 20\text{s}$
	HTTP Completion failure ratio	$\leq 90\%$
	HTTP Completion Time	$\geq 95\%$ within $\leq 0\text{s}$
SMS	Successful SMS Ratio	$> 95\%$
	Completion Rate for SMS	$> 95\%$
	End-to-End delivery time for SMS	$> 95\%$

2.2. Network Performance (NP)

Network Performance (NP) is the gathering and analysis of network statistics called performance indicators to assess the quality of service provided by a telecommunication network. It is both a quantitative and a qualitative analysis and is a crucial tool for understanding the health of the network.

2.3. Quality of Experience (QoE)

Quality of Experience (QoE) is defined as the overall acceptability of an application or service, as perceived subjectively by the end-user (Recommendation ITU-T P.10/G.100). It is the degree of delight or annoyance of the user of an application or service. The assessment is done through surveys alongside customer satisfaction surveys.

2.4. Overall Quality of Service Computation

The aforementioned framework provides for weightings to be applied on the three components to come up with a weighted average of the QoS performance. The weighting of the components is provided in Table 1.

Table 1: QoS Components' Weighting

Provision of Framework on Weighting	
QoS Component	Weighting
End to End Drive Test QoS	60%
Network Performance QoS	25%
Quality of Experience (QoE)	15%

3. RESULTS

The performance of the Mobile Network Operators (MNO's) is as follows:

3.1. End-to-End Quality of Service

During the period under review, the Authority conducted quality of service assessment on the three MNOs namely Airtel Networks Kenya Limited, Telkom Kenya Limited and Safaricom PLC in all the 47 counties. Jamii Telecommunications Limited was not included in the QoS assessment, as it commenced provision of mobile services after the establishment of the QoS monitoring framework.

On the End-to-End drive test, Safaricom registered 86%, followed by Airtel at 80% and Telkom at 55% against the QoS threshold of 80% as depicted in Figure 1.

Figure 1: MNOs' National Drive Test QoS results for 2023-2024

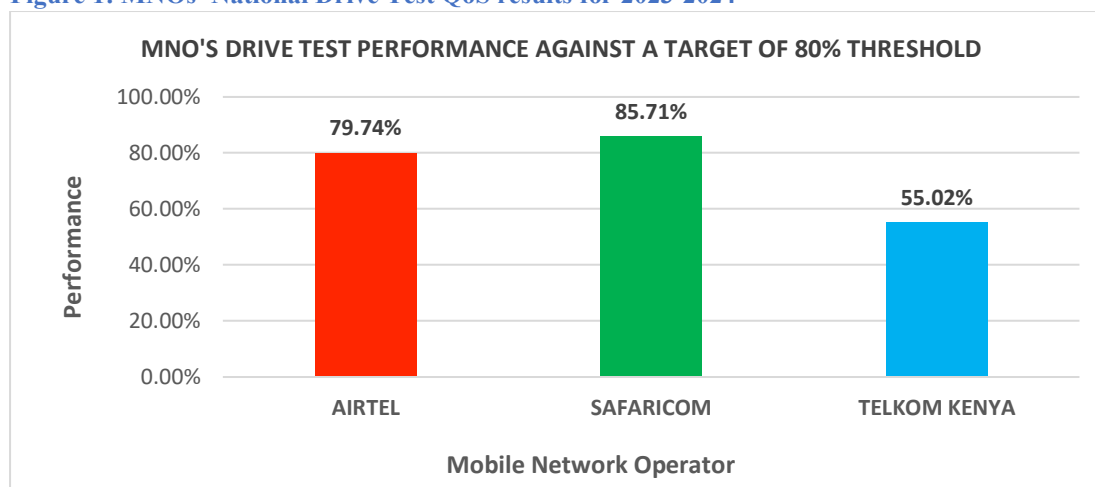


Table 2 provides the trend of the end-to-end QoS performance for each operator with the levels attained in the previous periods.

Table 2. Annual End -to-End QoS Performance

	Name	2020/2021	2021/2022	2022/2023	2023/2024
1	Telkom Kenya Limited	65.45%	73%	54.75%	55.02%
2	Airtel Networks Kenya Limited	65.45%	79%	74.66%	79.74%
3	Safaricom PLC	95.68%	95%	87.60%	85.71%
	Industry Average	75.53%	82.3%	72.34%	73.49%

3.1.1. MNOs QoS Performance per County

The performance of the MNOs per county is presented in Table 2 and Figures 2, 3 and 4 for Airtel, Safaricom and Telkom respectively.

Table 3: Drive Test QoS Performance per County

#	COUNTY	DRIVE TEST QOS PERFORMANCE PER COUNTY			
		AIRTEL	SAFARICOM	TELKOM	AVERAGE
1.	TANA RIVER	71.43%	85.71%	57.14%	71.43%
2.	KWALE	71.43%	57.14%	57.14%	61.90%
3.	KILIFI	71.43%	100.00%	42.86%	71.43%
4.	MOMBASA	57.14%	78.57%	57.14%	64.29%
5.	LAMU	85.71%	100.00%	85.71%	90.48%
6.	TAITA TAVETA	71.43%	92.86%	50.00%	71.43%
7.	NAIROBI	85.71%	92.86%	64.29%	80.95%
8.	KIAMBU	78.57%	85.71%	50.00%	71.43%
9.	MACHAKOS	100.00%	100.00%	64.29%	88.10%
10.	MAKUENI	85.71%	92.86%	57.14%	78.57%
11.	KAJIADO	78.57%	78.57%	64.29%	73.81%
12.	NAROK	85.71%	85.71%	71.43%	80.95%
13.	NAKURU	85.71%	100.00%	71.43%	85.71%
14.	KITUI	71.43%	85.71%	57.14%	71.43%
15.	GARISSA	85.71%	100.00%	57.14%	80.95%
16.	WAJIR	78.57%	92.86%	50.00%	73.81%
17.	MANDERA	83.33%	100.00%	50.00%	77.78%
18.	MARSABIT	85.71%	100.00%	85.71%	90.47%
19.	ISIOLO	57.14%	64.29%	50.00%	57.14%
20.	MERU	78.57%	85.71%	50.00%	71.43%
21.	THARAKA NITHI	85.71%	85.71%	57.14%	76.19%
22.	EMBU	85.71%	85.71%	42.86%	71.43%
23.	NYANDARUA	92.86%	100.00%	42.86%	78.57%
24.	NYERI	100.00%	100.00%	57.14%	85.71%
25.	KIRINYAGA	100.00%	100.00%	64.29%	88.10%
26.	MURANGA	100.00%	100.00%	42.86%	80.95%
27.	LAIKIPIA	64.29%	92.86%	57.14%	71.43%
28.	BARINGO	64.29%	71.43%	42.86%	59.52%
29.	BUNGOMA	64.29%	71.43%	42.86%	59.52%
30.	BUSIA	64.29%	57.14%	35.71%	52.38%
31.	ELGEIYO MARAKWET	85.71%	100.00%	71.43%	85.71%
32.	KAKAMEGA	71.43%	71.43%	42.86%	61.90%
33.	NANDI	57.14%	71.43%	42.86%	57.14%
34.	SAMBURU	71.43%	71.43%	57.14%	66.67%
35.	TRANS NZOIA	64.29%	71.43%	42.86%	59.52%
36.	TURKANA	71.43%	64.29%	50.00%	61.90%
37.	UASIN GISHU	57.14%	78.57%	42.86%	59.52%

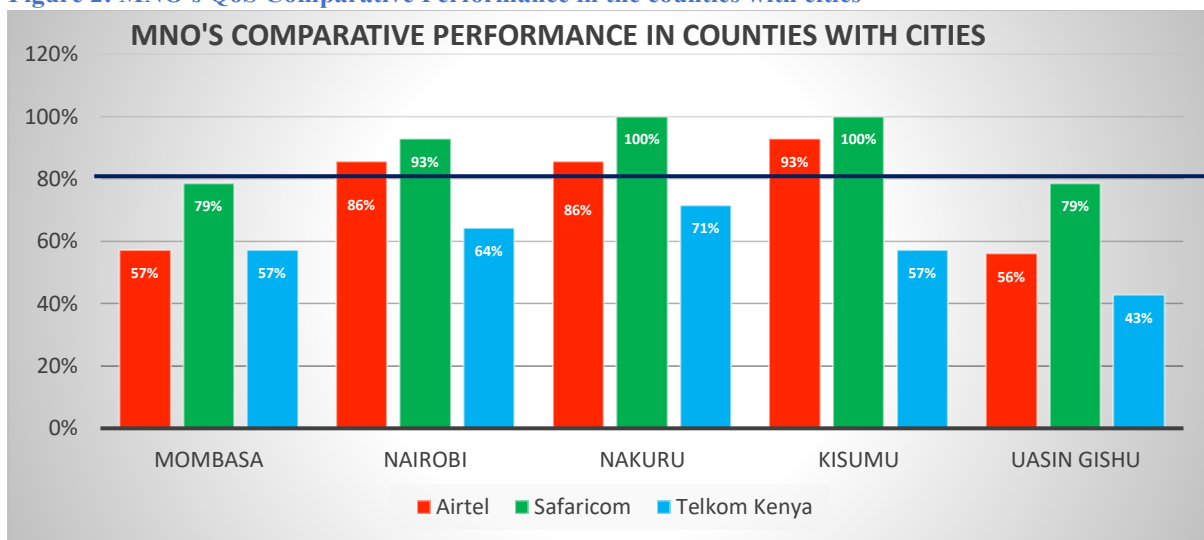
#	COUNTY	DRIVE TEST QOS PERFORMANCE PER COUNTY			
		AIRTEL	SAFARICOM	TELKOM	AVERAGE
38.	VIHIGA	57.14%	64.29%	50.00%	57.14%
39.	WEST POKOT	57.14%	57.14%	42.86%	52.38%
40.	KISUMU	92.86%	100.00%	57.14%	83.33%
41.	SIAYA	100.00%	92.86%	42.86%	78.57%
42.	HOMA BAY	85.71%	100.00%	50.00%	78.57%
43.	MIGORI	100.00%	78.57%	50.00%	76.19%
44.	KERICHO	92.86%	71.43%	50.00%	71.43%
45.	BOMET	92.86%	92.86%	57.14%	80.95%
46.	KISII	100.00%	100.00%	85.71%	95.24%
47.	NYAMIRA	100.00%	100.00%	71.43%	90.48%
	AVERAGE	79.74%	85.71%	55.02%	73.49%

The performance per county shows that Airtel met the threshold in 24 out of 47 counties (51.06%), Safaricom in 30 out of 47 counties (63.83%) and Telkom Kenya in 3 out of 47 counties (6.38%). The average drive test QoS performance countrywide was 73.49%.

3.1.2. MNOs Drive Test QoS Performance in Counties with Cities

An assessment of the MNOs' performance in the five (5) counties that have cities, shows that Airtel and Safaricom met the 80% threshold in the 3 out of the 5 counties, while Telkom failed in all the counties with cities. This is illustrated in Figure 2.

Figure 2: MNO's QoS Comparative Performance in the counties with cities



3.1.3. QoS Drive Test Performance 4-Year Trend

Table 3 provides the trend of the end-to-end QoS performance for each operator with the levels attained in the previous periods.

Table 3. Trend on Annual End -to-End QoS Performance

	Name	2020/2021	2021/2022	2022/2023	2023/2024
1	Telkom Kenya Limited	65.45%	73%	54.75%	55.02%
2	Airtel Networks Kenya Limited	65.45%	79%	74.66%	79.74%
3	Safaricom PLC	95.68%	95%	87.60%	85.71%
	Industry Average	75.53%	82.3%	72.34%	73.49%

3.2. Network Performance Quality of Service (NP-QoS)

During the period under review, the performance of the MNO's with respect to Network Performance (NP) System for monitoring under the QoS Framework were the Unsuccessful Call Ratio (Call Block Rate), Call Drop Rate and Handover Success Rate are as presented in the Table 4.

Table 4: MNOs QOS Performance Results from Network Performance System

	Unsuccessful Call Ratio	Call Drop Rate	Handover Success Rate	Compliance
Target	≤5%	≤2%	≥96%	≥80%
Safaricom	0.10	0.83	98.70	100%
Airtel	0.05	0.19	98.65	100%
Telkom	0.35	1.24	96.53	100%

All the MNOs met each of the KPIs and therefore achieved 100% performance.

3.3. Quality of Experience (QoE)

The Authority undertook the Quality of Experience (QoE) assessment through customer satisfaction survey on consumers using the mobile network services in the country to ascertain their satisfaction level with the mobile communication services. Table 5 summarizes the findings.

Table 5: Quality of Experience (QoE) for FY 2023-2024

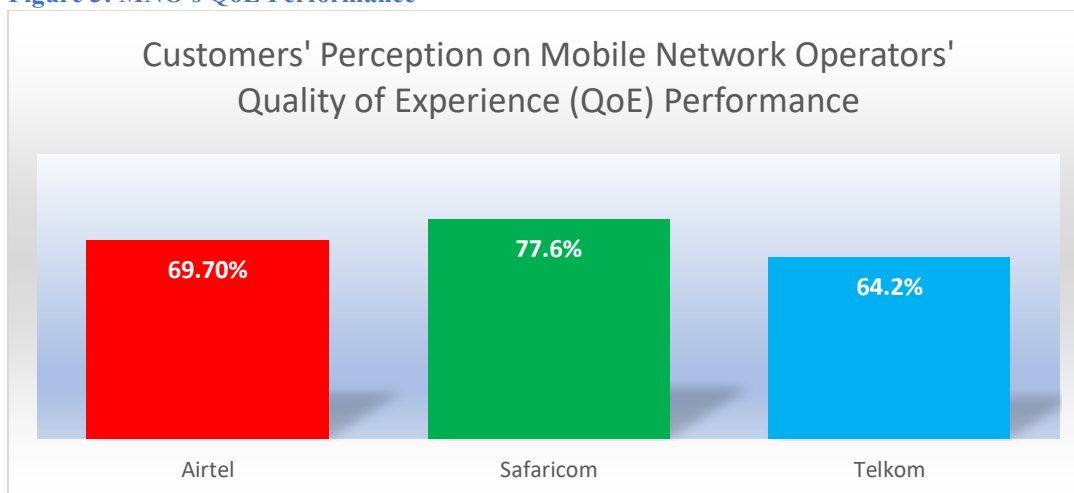
No.	Item	Airtel	Safaricom	Telkom
1.	Factors Considered to join	28.1%	42.7%	8.6%
2.	Coverage Challenges	18.0%	25.1%	6.3%
3.	Connectivity challenges (Average)	18.0%	24.2%	7.9%
4.	Loss of Service (Average without DK)	57.5%	42.9%	62.8%
5.	Coverage Satisfaction	66.9%	76.7%	59.3%
6.	Voice Quality Satisfaction	72.5%	77.6%	60.0%
7.	Speed of Internet Connection	59.4%	70.0%	57.8%
8.	Rating on Quality of Broadband Services	63.8%	72.6%	61.8%
9.	Satisfaction with Billing	65.4%	70.3%	61.8%

No.	Item	Airtel	Safaricom	Telkom
10.	Ease of Lodging Complaints	67.5%	77.3%	72.0%
11.	Satisfaction with Complaints Handling and Resolution	61.1%	72.7%	63.3%
12.	Satisfaction with Customer Care Experience	69.4%	74.8%	66.3%
Overall QoE Perception Rating of the Mobile Service Providers		69.7%	77.6%	64.2%

The overall consumer rating for the three mobile networks shows that Safaricom leads with 77.6%, followed by Airtel with 69.7% while Telkom was at 64.2%. This was a significant drop from the ratings in the previous year where Safaricom attained 89.4%, Airtel at 87.2% and Telkom at 84.8%.

Figure 3 illustrates the customers' perception of MNOs' performance.

Figure 3: MNO's QoE Performance



3.4. Overall Weighted Average Quality of Service Performance for 2023-2024

The overall performance of the MNOs was determined using the weightings for Drive Test QoS (60%), NP System QoS (25%) and Quality of Experience (15%) as stipulated in the QoS framework and as per Table 6 below

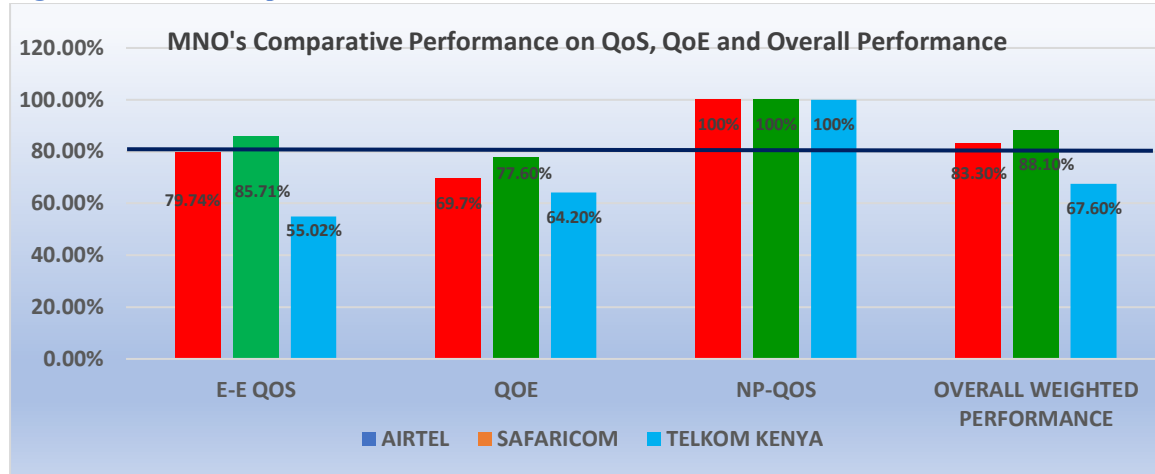
Table 6: MNO's Weighted Overall QoS Performance for FY 2023-2024

#	QOS Component	Airtel Networks Kenya Limited	Safaricom PLC	Telkom Kenya Limited
A.	End-to-End Drive Test (QoS)	79.74	85.71	55.02
B.	Quality of Experience (QoE)	69.7	77.6	64.2
C.	Network Performance (NP-QoS)	100	100	100
Overall Performance (60%A +15%B +25C)		83.3	88.1	67.6

From the analysis, Airtel and Safaricom met the threshold of 80% and complied while Telkom has failed to meet the threshold of 80% and has therefore failed to comply.

Figure 4 illustrates the comparative QoS performance on the different elements of the QoS assessment as well as the overall QoS Performance.

Figure 4: MNO's Comparative Performance on QoS, QoE and Overall QoS Performance



4. CONCLUSIONS

From the assessment, the following conclusions are made;

- Airtel and Safaricom scored 83.3% and 88.1% respectively and hence achieved the minimum 80% KPI minimum compliance threshold.
- Telkom Kenya Limited scored 67.6% and hence failed to meet minimum KPI threshold of 80%.
- There is disparity between the QoS assessment results and actual user experience arising from the provisions of the framework. The performance of the operators is based on quality of service monitoring in areas that meet network coverage threshold of -103dBm. Many areas in the country, have network coverage that do not meet coverage threshold leading to poor quality services experienced by a majority of Kenyans.
- The Authority is taking steps to address the poor coverage with the mobile operators to ensure improvement of the overall customer experience.