Kribi-Ebolowa Road Project - Cameroon - Environmental & Social Impact Assessment (ESIA)

Appendix 10 - Noise Modelling-Road & Bypasses

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TABLES

FIGURES

1. PURPOSE AND SCOPE

This document is the noise impact assessment for the Ebolowa-Akom II-Kribi Road Project (hereafter "the Project"). The Project is described in Section 2 of this ESIA report “Project Description”.

The assessment is based on specific acoustic surveys to determine ambient noise conditions conducted by local consultants in February 2022 at certain points along the road, as follows:

- 10 points located along the road RN17 and in September 2024.
- 5 points along the future diversion road from Akom II.
- 4 points along the future by-pass road of Ebolowa.

The noise impact assessment was carried out with the aid of a specific acoustic model, based on the traffic study conducted by EGIS CAMEROUN, developed by SoundPlan® software, using the French national computation method "NMPB-Routes-96 (SETRA-CERTU-LCPC-CSTB)", recommended by the European Directive 2002/49/EC to predict road traffic noise.

2. PROJECT STANDARDS ON NOISE

2.1 WBG General EHS Guidelines for Noise Management

The World Bank Group (WBG) General Environmental Health and Safety (EHS) Guidelines for Noise Management state that noise impacts should not exceed the levels presented in **Table 1** or result in a maximum increase above background levels of 3 dBA at the nearest receptor location off-site.

2.2 Cameroon Standard NC 1962:2021

Cameroon Standard NC 1962:2021 “Environment – Limits on noise and odour emissions” sets general noise limit values for existing and new installations in accordance with World Health Organization (WHO) Guidelines for Community Noise.

In this case, since the Project involves the improvement of an existent road, the limits for the existing installations of **Table 2** should be adopted. In detail, the limits of Zone I are adopted since all the noise measuring points and all the noise prediction points are within the distance of 500 m from the road.

Table 1: Project standards: WBG EHS Noise Level Guidelines

Receptors	One Hour L_{Aeq} (dBA)	
	Day-time 07:00 ÷ 22:00	Night-time 22:00 ÷ 07.00
Residential; institutional; educational	55	45
Industrial; commercial	70	70

Table 2: Project standards: Cameroon Standard NC 1962:2021 noise limits for existing installations

Zone of immissions in which the measurements are taken		Limit Values (dBA)		
		Day-time 07:00 ÷ 19:00	Transition 06:00 ÷ 07:00 19:00 ÷ 22:00	Night-time 22:00 ÷ 06:00
I	All areas where the measurement point is located less than 500 m from the extraction zone, economic or industrial activities, or specific economic activities, or less than 200 m from the economic activity zone where the establishment is located	60	55	50
II	Residential and rural habitat areas, except I	55	50	45
III	Agricultural, forest, green spaces, natural, and park areas, except I	55	50	45
IV	Recreation areas, public service areas, and community facilities	60	55	50

3. NOISE MONITORING CAMPAIGN

The noise baseline along the road was obtained through n. 3 acoustic surveys carried out by WSP and local consultants in several steps from 2022 to 2024:

Baseline noise survey along the RN 17 – 01÷12 February 2022.

Noise measurements were carried out at 10 points, which were identified as **P1÷P10** and were located along the Ebolowa - Akom II - Kribi road corridor (see **Figure 1**). Ambient noise was recorded continuously over 24 hours in each location in order to characterize the daytime and the nighttime conditions. For more details see the report "Ebolowa-Akom II-Kribi Road Construction Project - Noise Measurement - February 2022" (Appendix 3).

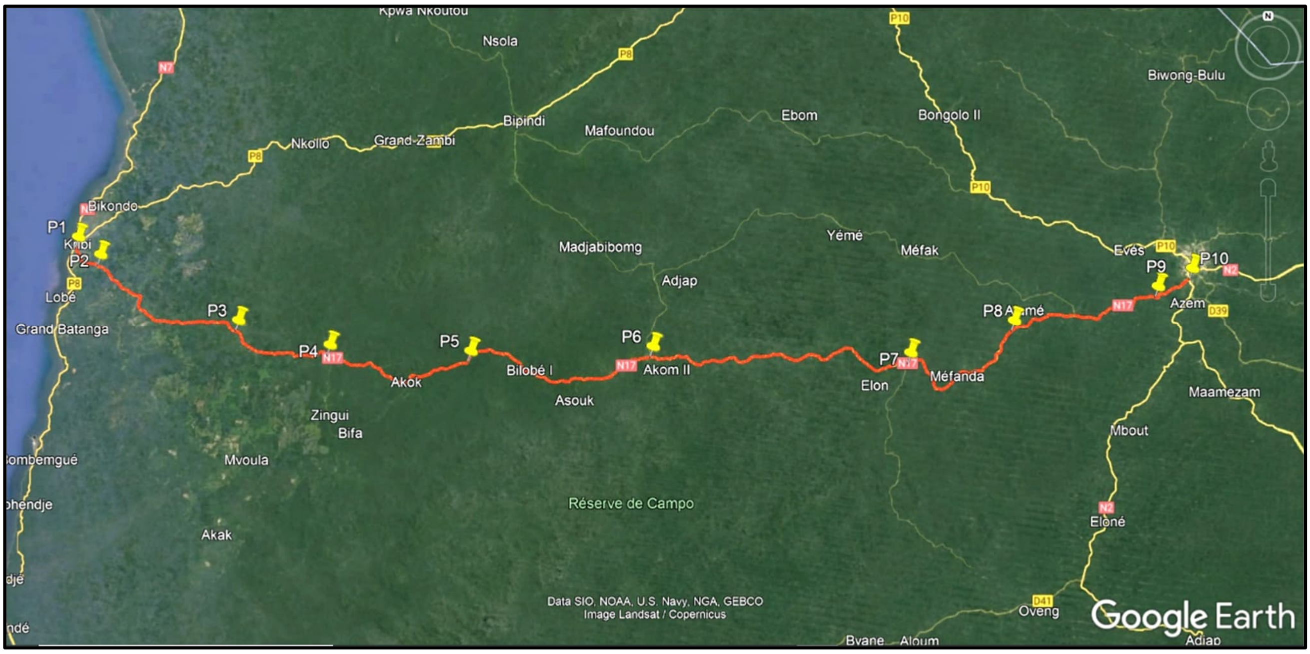

Figure 1: Location of noise measurement points P1÷P10

Noise baseline survey along the Akom II diversion road – 31 August to 05 September 2024

Ambient noise measurements were taken at 5 points, identified as **AQ/N1, AQ/N2, AQ/N3, AQ/N8, AQ/N9**, distributed along the Akom II By-Pass, specifically in Ekowong-Ndong and Tyengue (see **Figure 2**), Akom District. Noise was recorded continuously over 24 hours (day and night) in each location.

For more details see the report "Déviation Akom II - Qualité de l'air, niveau sonore, qualité de l'eau, et comptage routier - September 2024" (Appendix 18).

Noise baseline survey along the Ebolowa By-Pass –31 August to 05 September 2024

Ambient noise measurements were taken at 4 points, identified as **AQ/N10, AQ/N11, AQ/N12, AQ/N13**, distributed along the Ebolowa By-Pass. Noise measurements were taken in Adoum (see **Figure 3**), Ebolowa district. Ambient noise was recorded continuously over 24 hours (day and night) in each location.

For more details see report " Contournement Ebolowa - Qualité de l'air, niveau sonore, qualité de l'eau, et comptage routier - September 2024" (Appendix 18).

Figure 2: Akom II Diversion Road - Location of noise measurement points AQ/N1÷AK/N9

Figure 3: Ebolowa By-Pass Road - Location of noise measurement points AQ/N10÷AK/N13

Table 3 shows results at the 10 noise measurement points along RN 17, with the locations, GPS coordinates and the average equivalent sound levels measured ($L_{Aeq,T}$) in the day-time (7÷22h) and the night-time (22÷7h).

The current measured sound levels are high and, in all cases, exceed the WBG EHS limits for residential areas, both during the day-time (55 dB(A) L_{Aeq}) and during the night-time (45 dB(A) L_{Aeq}). Considering Cameroon Standard NC 1962:2021 noise limits for existing installations, only in P2 and P3 points noise levels meet day-time limit for Zone I (60 dB(A) L_{Aeq}) while at night all noise levels exceed the night-time limit (50 dB(A) L_{Aeq}).

These exceedances are due to vehicular traffic especially at points located in urban areas (P1/P10) where road traffic is intense and the incidence of noise from motorcycles, horns and other human activities is significant.

Outside Kribi and Ebolowa, the only urban areas along the NR17, human activities are concentrated along the road which connects rural communities across natural land; noise emissions there are considered due not only to vehicles but also to natural noise sources (birds, movements of the wind on the trees), that may explain the high noise levels recorded in rural areas during night-time (P2÷P9).

Table 3: RN 17 - Noise measurement points (P1÷P10) and measured LAeq in day-time/night-time

Point	Subdivision	Place	GPS Coordinates	$L_{Aeq,7-22h}$ dB(A)	$L_{Aeq,22-7h}$ dB(A)
P1	Kribi I	Tala	N: 02°56.212’ E: 09°54.470’	78.3	74.4
P2	Kribi I	Lendi Aviation	X: 02°55.034’ Y: 09°55.970’	63.7	55.8
P3	Niete	Afan Oveng	X: 02°50.632’ Y: 10°05.268’	59.8	56.5
P4	Niete	Adjap	X: 02°48.968’ Y: 10°11.411’	56.2	62.0
P5	Akom II	Ndjabilobé	X: 02°48.557’ Y: 10°20.848’	61.5	60.7
P5	Akom II	Akom II	X: 02°48.869’ Y: 10°33.027’	61.5	53.9
P7	Ebolowa 2	Akom II	X: 02°48.453’ Y: 10°50.190’	61.8	57.5
P8	Ebolowa 1	Mvieng	X: 02°50.605’ Y: 10°57.119’	63.4	56.3
P9	Ebolowa I	Azem	X: 02°52.889’ Y: 11°06.762’	67.1	58.4
P10	Ebolowa I	Ebolowa si 2	X: 02°54.090’ Y: 11°09.054’	69.7	64.3

Table 4 shows results at the 5 noise measurement points along the Akom II By-Pass Road, with the locations, GPS coordinates and the average equivalent sound levels measured ($L_{Aeq,T}$) in the day-time and the night-time.

Here as well the measured sound levels are high and, in all cases, exceed the WBG EHS limits for residential areas, both during the day-time (55 dB(A) L_{Aeq}) and during the night-time (45 dB(A) L_{Aeq}). Considering Cameroon

Standard NC 1962:2021 noise limits for existing installations, only in AQ/N3 and AQ/N9 points noise levels meet day-time limit for Zone I (60 dB(A) L_{Aeq}) while at night all levels exceed the night-time limit (50 dB(A) L_{Aeq}).

Table 4: Akom II Diversion - Noise measurement points and measured LAeq in day-time/night-time

Point	Subdivision	Village	GPS Coordinates	$L_{Aeq,7\text{-}22h}$ dB(A)	$L_{Aeq,22\text{-}7h}$ dB(A)
AQ/N1	Akom II Diversion	Ekowong-Ndong	X: 2° 49.395' Y: 10° 33.017'	61.7	61.9
AQ/N2	Akom II Diversion	Ekowong-Bettel	X: 2° 49.119' Y: 10° 33.038'	62.7	63.6
AQ/N3	Akom II Diversion	Ekowong	X: 2° 48.898' Y: 10° 33.083'	57.3	56.7
AQ/N8	Akom II Diversion	Ekowong-Ndong	X: 2° 49.723' Y: 10° 32.870'	60.5	55.7
AQ/N9	Akom II Diversion	Tyengue	X: 2° 51.131' Y: 10° 33.344'	58.5	56.8

These high noise levels can be attributed to several factors. First, road traffic, although described as light, contributes significantly to ambient noise. Secondly, the presence of people in this area increases noise emissions. Singing of birds and sound of other animals also represent a significant noise source.

Table 5 shows results at 4 noise measurements along the Ebolowa By-Pass Road, with the locations, GPS coordinates and the average equivalent sound levels measured ($L_{Aeq,T}$) in the day-time and the night-time.

Table 5: Ebolowa By-Pass - Noise measurement points and measured LAeq in day-time/night-time

Point	Villages Neighbourhoods	Point Description	GPS Coordinates	$L_{Aeq,7\text{-}22h}$ dB(A)	$L_{Aeq,22\text{-}7h}$ dB(A)
AQ/N10	Adoum	In front of Galilee Health Center	X: 2°53.039' Y: 11°9.212'	68.6	70.8
AQ/N11	Adoum Intersection	Adoum Intersection	X: 2° 53.234' Y: 11° 9.196'	74.4	72.6
AQ/N12	Adoum	Agricultural and residential area	X: 2° 53.538' Y: 11° 8.872'	51.7	55.8
AQ/N13	Adoum Boundary	Residential area, behind the EPC Adoum Church	X: 2° 53.624' Y: 11° 8.561'	66.1	64.9

As in the previous cases, measured sound levels are high and exceed the WBG EHS limits for residential areas, both during the day-time (55 dB(A) L_{Aeq}) and during the night-time (45 dB(A) L_{Aeq}). Considering Cameroon Standard NC 1962:2021 noise limits for existing installations, only in AQ/N12 point noise levels meet day-time limit for Zone I (60 dB(A) L_{Aeq}) while at night all levels exceed the night-time limit (50 dB(A) L_{Aeq}).

These exceedances are again primarily due to vehicular traffic, especially at points AQ/N10 and AQ/N11 which are located near the D39 Road and the point AQ/N13 which is near the RN 17 Road. In the case of point AQ/12, located in an agricultural area, noise from road traffic is lower than human-made and natural noise.

4. NOISE PREDICTION

4.1 Noise Propagation Model

The prediction of the noise associated with vehicular traffic on the RN17, the Akom II Diversion and the Ebolowa by-pass was obtained creating a 3D acoustic model of the site by the software SoundPlan 8.2 (license n° 6545), using the French national computation method "NMPB-Routes-96 (SETRA-CERTU-LCPC-CSTB)", recommended by the European Directive 2002/49/EC to predict road traffic noise.

NMPB-Routes-96 Standard is based on noise propagation with a linear path concept. Several propagation paths exist between noise sources and receptors. Propagation paths are dependent on topography and obstacles located between noise sources and receivers. These propagation paths are related to long term noise levels ($L_{Ai,LT}$) as given in Equation 1:

$$L_{Ai,LT} = 10 \times \log [p_i \times 10^{(0.1 \times LAi,F)} + (1 - p_i) \times 10^{(0.1 \times LAi,H)}] \quad [1]$$

Where $L_{Ai,F}$ and $L_{Ai,H}$ are the global sound levels evaluated respectively for favourable (F) and homogeneous (H) meteorological conditions; “i” is the source of noise; p_i is the possibility of the favourable conditions which, in this case, was prudently assumed to be 100%.

$L_{Ai,F}$ and $L_{Ai,H}$ can be calculated based on Equations 2 and 3:

$$L_{Ai,F} = L_{A,w} - A_{div} - A_{atm} - A_{bnd} - A_{grd,F} - A_{diff,F} \quad [2]$$

$$L_{Ai,H} = L_{A,w} - A_{div} - A_{atm} - A_{bnd} - A_{grd,H} - A_{diff,H} \quad [3]$$

Where $L_{A,w}$ is the sound power level, A_{div} is geometric propagation, A_{atm} is atmospheric absorption, A_{bnd} is boundary reduction, $A_{grd,}$ is ground effect and A_{diff} is sound diffraction. A_{div}, A_{atm}, and A_{bnd} are used for each propagation path. Sound level is calculated for each sound propagation path that extends from the source to the receiver. These calculations are performed separately for octave bands. Additionally, A_{grd} and A_{diff} are included in the calculation.

Sound power level is calculated based on Equation 4:

$$L_{A,wi} = [(E_L + 10 \times \log Q_L) + (E_P + 10 \times \log Q_P)] + 20 + 10 \times \log(l_i) + R(j) \quad [4]$$

Where E_L and E_P are noise emission levels of light and heavy vehicles, respectively, Q is hourly vehicle flux, l_i is road length in meters and R(j) is the normalized noise spectrum calculated according to EN 1793–3 Standard using the frequency of the sound emitted; “L” and “P” index refer to light and heavy vehicles.

4.2 Acoustic modelling and calibration

The prediction of the sound levels associated with the traffic on the RN 17 involved the creation of an acoustic model by software SoundPlan. The Digital Ground Model was obtained from Google Maps Platform® API while the coordinates of the road layout and buildings were obtained from Open Street Maps® API. The coordinates of the noise verification points have been obtained from **Table 3**, **Table 4** and **Table 5** imposing a height of +1.5 meters from the ground.

The SoundPlan acoustic model of the study area is represented in **Figure 1**.

Two acoustic simulations were carried out:

- Current scenario.
- Future scenario.

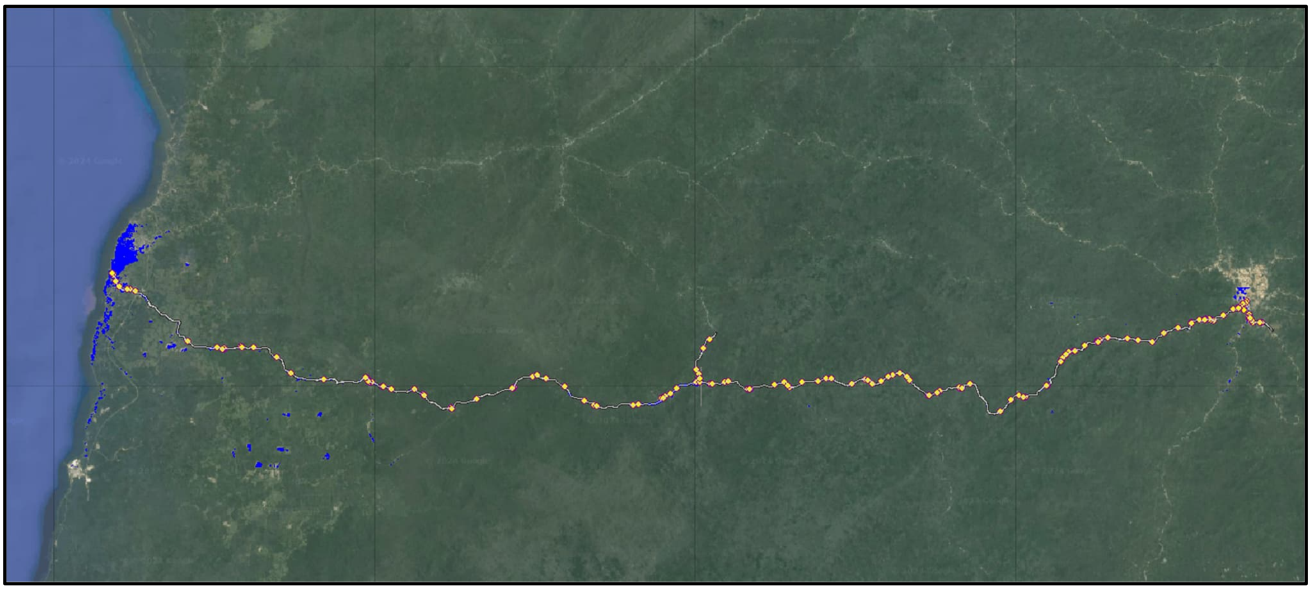

Figure 1: Acoustic model of the study area

The acoustic model for the **current scenario** was calibrated on the basis of the traffic data from the following origin/destination surveys conducted by EGIS CAMEROUN (See details in Appendix 12: Traffic Study 2024)

- Traffic data survey conducted on RN 17 Road from 07th to 18th February 2024 - Ref. report Traffic study on the Ebolowa – Akom II – Kribi Road Section / - Interim report, date 23/05/2024.
- Traffic data survey conducted on Akom II Diversion from 1st to 2nd September 2024 - Ref. report Déviation Akom II - Qualité de l'air, niveau sonore, qualité de l'eau, et comptage routier - Sept 2024.
- Traffic data survey conducted on Ebolowa By-Pass from 1st to 2nd September 2024 - Ref. report Déviation Akom II - Qualité de l'air, niveau sonore, qualité de l'eau, et comptage routier - Sept 2024.

Tables 6 to 9 summarise the above current traffic data (EGIS 2024) measured along the following road sections:

- Section "Kribi - Akom II".
- Section "Akom II - Ebolowa".
- Akom II Diversion.
- Ebolowa By-Pass.

Traffic data are bidirectional and are presented by day-time, night-time and 24h.

Data are also broken down by the following vehicle categories:

- MO = Motorcycles.
- VP = Passenger Cars.

- PU = Pick Ups.
- MB = Minibus.
- AC = Auto Cars.
- C2E = Trucks 2-Axis.
- C3E = Trucks 3-Axis.
- EA = Articulated Trucks.
- GRU = Logging Trucks.

The NMPB-Routes-96 model considers motorcycles, passenger cars, pick-ups and minibus as light vehicles, while all types of trucks are considered heavy vehicles. Considering that motorcycles are normally about 6 dB(A) noisier than cars, especially in African countries, a homogenisation coefficient k = 4 has been adopted (i.e. 1 motorcycles = 4 cars).

Table 6: current traffic data (EGIS Traffic Study 2024), section "Kribi-Akom II", two directions [vehicles/reference time]

Period	MO	VP	PU	MB	AC	C2E	C3E	EA	GRU	TOTAL
Day	867	138	107	31	5	12	13	68	2	**1243**
Night	114	14	20	1	0	1	1	6	2	**159**
24h	981	152	127	32	5	13	14	74	4	**1402**

Table 7: current traffic data (2024), section "Akom II - Ebolowa", two directions [vehicles/reference time]

Period	MO	VP	PU	MB	AC	C2E	C3E	EA	GRU	TOTAL
Day	827	191	84	31	0	13	0	2	12	**1160**
Night	33	15	7	0	0	6	0	0	0	**61**
24h	860	206	91	31	0	19	0	2	12	**1221**

Table 8: current traffic data (2024), Akom II Diversion; two directions [vehicles/reference time]

Period	MO	VP	PU	MB	AC	C2E	C3E	EA	GRU	TOTAL
24h	263	4	25	0	0	0	0	0	0	**292**
Day (*)	241	3	23	0	0	0	0	0	0	**267**
Night (*)	22	1	2	0	0	0	0	0	0	**25**

(*) Estimated

Table 9: current traffic data (2024), Ebolowa By-Pass; two directions [vehicles/period]

Period	MO	VP	PU	MB	AC	C2E	C3E	EA	GRU	TOTAL
24h	186	23	1	0	0	0	0	0	0	**210**
Day (*)	177	22	1	0	0	0	0	0	0	**200**
Night (*)	9	1	0	0	0	0	0	0	0	**10**

(*) Estimated

Since for Akom II Diversion and Ebolowa By-Pass traffic was measured on 24 hours, the breakdown of traffic flows into day-time and night-time was estimated considering the average share of, respectively, night traffic along the entire RN 17 (average 8.4 %) and the section “Akom II – Ebolowa” (5 %).

The operating speed of the road has been assumed to be equal to 60 Km/h, corresponding to the national speed limit for urban roads (editor's note: most of the noise verification points are in urbanized areas).

Considering the age of the Cameroonian vehicle fleet and the current poor conditions of the road pavement, an increased noise coefficient K = +3 dB (A) was adopted to account for the higher noise of engines and of truck overhangs.

For the **future scenario**, 2042 was adopted as the year of reference for road traffic data. **Table 10** and **Table 11** show the predicted bidirectional traffic for 2042 along the Sections “Kribi-Akom II” and “Akom II-Ebolowa”, broken down for period and vehicle categories (traffic data are from the mentioned Traffic Study carried out by EGIS CAMEROUN on May 2024).

Table 12 and **Table 13** show the predicted traffic data for 2042 along the Akom II Diversion Road and the Ebolowa By-Pass Road. As for those there aren’t data available in the Traffic Study, traffic increase has been estimated in the following way:

- traffic in Akom II Diversion was considered to be 10% of RN 17 averaged traffic projections for the road sections “Kribi - Akom II” and “Akom II - Ebolowa” (Akom II Diversion is near the middle of RN 17);
- traffic in Ebolowa By-Pass was considered to be 30% of traffic projections for the Section “Akom II - Ebolowa”.

Table 10: future traffic data (2042), section “Kribi-Akom II”, two directions [vehicles/reference time]

Period	MO	VP	PU	MB	AC	C2E	C3E	EA	GRU	TOTAL
Day	3005	480	342	87	23	145	306	312	121	**4821**
Night	398	48	63	5	0	12	23	27	121	**697**
24h	3403	528	405	92	23	157	329	339	242	**5518**

Table 11: future traffic data (2042), section “Akom II - Ebolowa”, two directions [vehicles/reference time]

Period	MO	VP	PU	MB	AC	C2E	C3E	EA	GRU	TOTAL
Day	2739	629	277	89	18	119	245	94	268	**4478**
Night	109	51	24	0	0	59	49	0	0	**292**
24h	2848	680	301	89	18	178	294	94	268	**4770**

Table 12: future traffic data (2042), Akom II Diversion; two directions [vehicles/reference time]

Period	MO	VP	PU	MB	AC	C2E	C3E	EA	GRU	TOTAL
Day	287	55	30	8	2	13	27	20	19	**464**
Night	25	4	4	0	0	3	3	1	6	**49**
24h	312	59	34	8	2	16	30	21	25	**513**

Table 13: future traffic data (2042), Ebolowa By-Pass; two directions [vehicles/reference time]

Period	MO	VP	PU	MB	AC	C2E	C3E	EA	GRU	TOTAL
Day	821	188	83	26	5	35	73	28	80	**1343**
Night	32	15	7	0	0	17	14	0	0	**87**
24h	853	203	90	26	5	52	87	28	80	**1430**

The future arrangement of the road pavement will probably lead to a reduction in noise which will however be evened out by more traffic and a likely increase of vehicle speeds. On the other hand, in 2042 it is expected that vehicles will be less noisy thanks to the technological renewal of the national vehicle fleet: for this, the future noise simulation is precautionary.

The noise impact prediction was carried out at the same points used for the 24h baseline noise measurements:

- points P01÷ P10 along the road RN17.
- points “AQ/01÷AQ/09” along the Akom II Diversion.
- points “AQ/10÷AQ13” along the Ebolowa By-Pass.

In addition to these, additional verification points have been identified at sensitive receptors along the road where there aren’t baseline sound measurements available:

- churches (CH).
- health centres (H).
- schools (SC).
- pigmy camp (PC).
- social infrastructures (SI).

Table 14 lists the verification points with their geographical coordinates and location/use.

Table 14: Noise verification points

ID	UTM Coordinates		Location / Use
	32N m E	32N m N	
P01	600892	324656	Tala
P02	603672	322488	Lendi Aviation
P03	620904	314392	Afan Oveng
P04	632288	311337	Adjap
P05	649774	310599	Ndjabilobé
P06	672340	311202	Akom II
P07	704147	310481	Akom II
P08	716983	314468	Mvieng
P09	734848	318710	Azem
P10	739092	320932	Ebolowa si 2
AQ/N1	672320	312172	Ekowong-Ndong
AQ/N2	672360	311663	Ekowong-Bettel
AQ/N3	672444	311256	Ekowong
AQ/N8	672048	312776	Ekowong-Ndong
AQ/N9	672922	315371	Tyengue
AQ/N10	739389	318995	Adoum
AQ/N11	739375	319351	Adoum Intersection
AQ/N12	738757	319915	Adoum
AQ/N13	738181	320071	Adoum Boundary
CH-00	720808	316013	Church
CH-01	668890	309874	Church
CH-02	709004	307623	Church
CH-03	712078	309382	Church
CH-04	716587	314115	Church
CH-05	717081	314489	Church
CH-06	720874	316127	Church
CH-07	602708	322744	Church
CH-08	602702	322748	Church
CH-09	632098	311512	Church
CH-10	633812	310743	Church
CH-11	638806	309804	Church
CH-12	649734	310527	Church
CH-13	673779	311021	Church
CH-14	675489	311278	Church
CH-15	681516	310904	Church
CH-16	683337	310614	Church
CH-17	700224	309587	Church
CH-18	704400	310450	Church
CH-19	705374	310971	Presbyterian Church of Cameroon
CH-20	601346	323748	Church Vrai Church de Dieu Mpangou

CH-21	659593	308433	Church
CH-22	616635	315627	Presbyterian Church TALA
CH-23	652074	311946	Vrai Church de Dieu
CH-24	603038	322695	Church
CH-25	613661	315619	Church
CH-26	614500	315340	Church
CH-27	614581	315402	Church
CH-28	616708	315571	Church
CH-29	618075	315601	Church
CH-30	626700	311653	Church
CH-31	622621	312422	Church
CH-32	632098	311513	Church
CH-33	632517	311301	Church
CH-34	633921	310756	Church
CH-35	637740	310464	Church
CH-36	634854	310429	Church
CH-37	642263	308206	Church
CH-38	652631	312168	Church
CH-39	655995	310689	Church
CH-40	664339	308435	Church
CH-41	665008	308572	Church
CH-42	690989	311003	Church
CH-43	694537	311353	Church
CH-44	695949	312111	Church
CH-45	696834	312295	Church
CH-46	698038	311376	Church
CH-47	711279	309554	Church
CH-48	714769	310791	Church
CH-49	716372	313670	Church
CH-50	717428	314807	Church
CH-51	719315	315653	Church
CH-52	721194	316266	Church
CH-53	738891	320804	Church
CH-54	738625	320705	Church
CH-55	738264	320300	Church
CH-57	737399	319990	Church
CH-58	736224	319234	Church
CH-59	734992	318607	Church
CH-60	734764	318740	Church
CH-61	734491	318821	Church
CH-63	733264	318679	Church
CH-64	732295	318436	Church
CH-65	724506	316496	Church
CH-66	684858	311175	Church

CH-67	725836	316208	Church
CH-68	730695	317762	Church Adventistes
CH-69	669663	310498	Evangelical Presbyterian Church (EPC)
CH-70	686868	311345	Church
CH-71	687813	311619	Church
CH-72	700367	309608	Church
CH-73	701650	310071	Church
CH-74	704062	310538	Church
CH-75	704340	310381	Church
CH-76	722128	316552	Church
CH-77	728965	317109	Church adventistes
CH-78	688450	311666	Evangelical Presbyterian Church (EPC)
CH-79	678594	310334	EPC of Nnemeyon
CH-80	668185	309499	Adventist Church Of Nkong Mekak
CH-81	734059	318810	EPC Azem
CH-82	701670	310080	EPC De Mefo
CH-83	738079	320100	Church
CH-84	672052	311225	Presbyterian church
CH-85	632180	311345	Parroise Adjap
CH-86	632089	311451	Sant Piere Church
CH-87	601759	323091	Parroise Sainte Anne
H-00	718077	315011	Health Center
H-01	614348	315311	Health Center
H-02	600928	324678	Integrated Health Center
H-03	734018	318760	Integrated Health Center De Bidou II
H-04	610109	316306	Integrated Health Center De Biton-Ekowong
H-05	710327	308978	Integrated Health Center De Foulassi
H-06	714687	310765	Integrated Health Center Nnelefoup
H-07	673975	311018	Integrated Health Center
H-08	686829	311372	Integrated Health Center
H-09	701327	309901	Integrated Health Center
H-10	695389	311804	Ebolowa II
H-11	642130	308115	Akom II
H-12	693420	310986	Health Centre Nnlefoup
PC_00	659866	308357	Pygmy camp
PC_01	645262	309261	Pygmy camps de Bilobè
SC-00	718178	315009	School
SC-01	601019	324450	Bilingual Catholique School, Padre Monti De Kribi
SC-02	667838	309299	Bilingual Secondary School
SC-03	653733	311700	School
SC-04	672428	311277	School Ces
SC-05	631898	311833	School Primary Public
SC-06	678248	310367	School Public Primary

SC-07	682782	311242	School EBI Primary Public
SC-08	672454	311293	School Nursery
SC-09	631774	311889	Technical Secondary School De Nelefoup
SC-10	692606	311556	Catholic School Padre Monti
SC-11	602733	322736	Public School Afan Oveng
SC-12	732289	318285	School Nursery Azem
SC-13	734065	318765	School Primary
SC-14	738076	320182	School Public Akom1
SC-15	733956	318693	School Public
SC-16	697627	311897	School Public De Bidou 3
SC-17	655957	310715	School Public Mvieng
SC-18	717047	314553	School Public Ndjabilobe
SC-19	649565	310495	School Public Nelefoup
SC-20	721013	316113	School Public Prince Aloum1
SC-21	668019	309297	Public Primary School
SC-22	675917	311350	Public Primary School
SC-23	727532	315977	Engom 1
SC-24	720933	316068	Engong
SC-25	711907	309305	Abomvomba
SC-26	695408	311818	Nelefoup
SC-27	692872	311446	Aloum 1
SC-28	683220	310745	Biboulemam
SC-29	678498	310348	Nnemeyon
SC-30	658388	308947	Assok 1
SC-31	649566	310517	Ndjabilobe
SC-32	642200	308095	Akok
SC-33	638918	309708	Elon
SC-34	600936	324640	Bilingual Middle School Pere Monti Kribi
SI-00	673651	316492	Cameroon Presbyterian Church (EPC)
SI-01	672931	315376	Public school
SI-02	672415	311670	Intersection of the catholic mission
SI-03	740795	318433	Technical high school
SI-04	739812	318406	Public school
SI-05	739679	318586	Integrated health centre
SI-06	740918	318342	Cameroon Presbyterian Church
SI-07	740679	318367	Roman Catholic Mission
SI-08	739393	318775	Primary school
SI-09	738079	320101	Church
SI-10	739382	319013	Health centre
SI-11	739458	318946	School

4.3 Results of the Noise Model - Current Scenario (2024)

When the sound levels exceed both the WBG EHS and the Cameroon NC 1962 noise limits the cell background is coloured in orange. If the sound level exceed only the WBG EHS limits, the cell background is yellow.

Table 15 shows the results of the acoustic simulations for the current scenario (year 2024) at the verification points in the day-time (7.00÷22.00) and the night-time (22.00÷7.00).

For each point, the table reports:

- the current traffic noise levels, calculated by NMPB-Rouse-96 model on the basis of 2024 traffic data.
- ambient noise levels, LAeq,T, measured in situ in February 2022 and in September 2024.
- the WBG EHS noise limits (where applicable);
- the Cameroon Standard NC 1962:2021 noise limits for existing installations for Zone I (where applicable).

Ambient noise levels are available for points P01÷P10 and AQ/N1÷AQ/N13 only, while for the remaining verification points there are no baseline data ("—").

Regarding noise limits, they are not applicable in the night-time for churches and school since these kinds of receptors are usually unoccupied at night ("n.a." = not applicable).

When the sound levels exceed both the WBG EHS and the Cameroon NC 1962 noise limits the cell background is coloured in orange. If the sound level exceed only the WBG EHS limits, the cell background is yellow.

Table 15: Results of the acoustic simulation: current scenario (2024)

Point	CURRENT TRAFFIC NOISE (modelled in 2024)		AMBIENT NOISE (measured in 2022-2024)		WBG EHS Noise Limits		Cameroon NC 1962 Noise Limits	
	Day $L_{Aeq,7\text{-}22h}$	Night $L_{Aeq,22\text{-}7h}$	Day $L_{Aeq,7\text{-}22h}$	Night $L_{Aeq,22\text{-}7h}$	Day $L_{Aeq,7\text{-}22h}$	Night $L_{Aeq,22\text{-}7h}$	Day $L_{Aeq,7\text{-}19h}$	Night $L_{Aeq,22\text{-}6h}$
P01	**65.7**	**59.5**	78.3	74.4	55	45	60	50
P02	**65.9**	**59.7**	63.7	55.8	55	45	60	50
P03	**67.7**	**61.5**	59.8	56.5	55	45	60	50
P04	**69.5**	**63.3**	56.2	62.0	55	45	60	50
P05	**63.4**	**57.2**	61.5	60.7	55	45	60	50
P06	**63.2**	**57.0**	61.5	53.9	55	45	60	50
P07	**64.8**	**55.7**	61.8	57.5	55	45	60	50
P08	**66.8**	**57.7**	63.4	56.3	55	45	60	50
P09	**65.0**	**55.9**	67.1	58.4	55	45	60	50
P10	**62.8**	**53.6**	69.7	64.3	55	45	60	50
AQ/N1	**46.8**	**39.3**	61.7	61.9	55	45	60	50
AQ/N2	**55.3**	**47.8**	62.7	63.6	55	45	60	50
AQ/N3	**65.5**	**59.3**	57.3	56.7	55	45	60	50
AQ/N8	**59.3**	**51.8**	60.5	55.7	55	45	60	50
AQ/N9	**53.4**	**45.9**	58.5	56.8	55	45	60	50
AQ/N10	**54.4**	**44.8**	68.6	70.8	55	45	60	50
AQ/N11	**57.5**	**47.9**	74.4	72.6	55	45	60	50

Point	CURRENT TRAFFIC NOISE (modelled in 2024)		AMBIENT NOISE (measured in 2022-2024)		WBG EHS Noise Limits		Cameroon NC 1962 Noise Limits	
	Day $L_{Aeq,7\text{-}22h}$	Night $L_{Aeq,22\text{-}7h}$	Day $L_{Aeq,7\text{-}22h}$	Night $L_{Aeq,22\text{-}7h}$	Day $L_{Aeq,7\text{-}22h}$	Night $L_{Aeq,22\text{-}7h}$	Day $L_{Aeq,7\text{-}19h}$	Night $L_{Aeq,22\text{-}6h}$
AQ/N12	**29.8**	**20.6**	51.7	55.8	55	45	60	50
AQ/N13	**46.7**	**37.6**	66.1	64.9	55	45	60	50
CH-00	**61.2**	**52.1**	--	--	55	n.a. (1)	60	n.a. (1)
CH-01	**57.1**	**50.9**	--	--	55	n.a. (1)	60	n.a. (1)
CH-02	**72.4**	**63.2**	--	--	55	n.a. (1)	60	n.a. (1)
CH-03	**60.3**	**51.2**	--	--	55	n.a. (1)	60	n.a. (1)
CH-04	**66.5**	**57.3**	--	--	55	n.a. (1)	60	n.a. (1)
CH-05	**60.4**	**51.3**	--	--	55	n.a. (1)	60	n.a. (1)
CH-06	**60.1**	**50.9**	--	--	55	n.a. (1)	60	n.a. (1)
CH-07	**66.8**	**60.6**	--	--	55	n.a. (1)	60	n.a. (1)
CH-08	**65.4**	**59.2**	--	--	55	n.a. (1)	60	n.a. (1)
CH-09	**71.8**	**65.6**	--	--	55	n.a. (1)	60	n.a. (1)
CH-10	**72.8**	**66.6**	--	--	55	n.a. (1)	60	n.a. (1)
CH-11	**64.5**	**58.3**	--	--	55	n.a. (1)	60	n.a. (1)
CH-12	**57.8**	**51.6**	--	--	55	n.a. (1)	60	n.a. (1)
CH-13	**61.0**	**51.8**	--	--	55	n.a. (1)	60	n.a. (1)
CH-14	**55.9**	**46.7**	--	--	55	n.a. (1)	60	n.a. (1)
CH-15	**59.0**	**49.8**	--	--	55	n.a. (1)	60	n.a. (1)
CH-16	**60.5**	**51.3**	--	--	55	n.a. (1)	60	n.a. (1)
CH-17	**59.0**	**49.8**	--	--	55	n.a. (1)	60	n.a. (1)
CH-18	**57.6**	**48.4**	--	--	55	n.a. (1)	60	n.a. (1)
CH-19	**61.2**	**52.1**	--	--	55	n.a. (1)	60	n.a. (1)
CH-20	**61.7**	**55.5**	--	--	55	n.a. (1)	60	n.a. (1)
CH-21	**58.0**	**51.8**	--	--	55	n.a. (1)	60	n.a. (1)
CH-22	**62.1**	**55.9**	--	--	55	n.a. (1)	60	n.a. (1)
CH-23	**58.9**	**52.7**	--	--	55	n.a. (1)	60	n.a. (1)
CH-24	**64.8**	**58.6**	--	--	55	n.a. (1)	60	n.a. (1)
CH-25	**70.8**	**64.6**	--	--	55	n.a. (1)	60	n.a. (1)
CH-26	**62.8**	**56.6**	--	--	55	n.a. (1)	60	n.a. (1)
CH-27	**68.1**	**61.9**	--	--	55	n.a. (1)	60	n.a. (1)
CH-28	**62.8**	**56.6**	--	--	55	n.a. (1)	60	n.a. (1)
CH-29	**61.6**	**55.4**	--	--	55	n.a. (1)	60	n.a. (1)
CH-30	**69.7**	**63.5**	--	--	55	n.a. (1)	60	n.a. (1)
CH-31	**78.4**	**72.2**	--	--	55	n.a. (1)	60	n.a. (1)
CH-32	**71.9**	**65.7**	--	--	55	n.a. (1)	60	n.a. (1)
CH-33	**67.3**	**61.1**	--	--	55	n.a. (1)	60	n.a. (1)
CH-34	**68.6**	**62.4**	--	--	55	n.a. (1)	60	n.a. (1)
CH-35	**67.9**	**61.7**	--	--	55	n.a. (1)	60	n.a. (1)
CH-36	**67.5**	**61.3**	--	--	55	n.a. (1)	60	n.a. (1)
CH-37	**59.9**	**53.7**	--	--	55	n.a. (1)	60	n.a. (1)

Point	CURRENT TRAFFIC NOISE (modelled in 2024)		AMBIENT NOISE (measured in 2022-2024)		WBG EHS Noise Limits		Cameroon NC 1962 Noise Limits	
	Day $L_{Aeq,7\text{-}22h}$	Night $L_{Aeq,22\text{-}7h}$	Day $L_{Aeq,7\text{-}22h}$	Night $L_{Aeq,22\text{-}7h}$	Day $L_{Aeq,7\text{-}22h}$	Night $L_{Aeq,22\text{-}7h}$	Day $L_{Aeq,7\text{-}19h}$	Night $L_{Aeq,22\text{-}6h}$
CH-38	57.7	51.5	--	--	55	n.a. (1)	60	n.a. (1)
CH-39	56.1	49.9	--	--	55	n.a. (1)	60	n.a. (1)
CH-40	58.3	52.1	--	--	55	n.a. (1)	60	n.a. (1)
CH-41	51.9	45.7	--	--	55	n.a. (1)	60	n.a. (1)
CH-42	55.8	46.7	--	--	55	n.a. (1)	60	n.a. (1)
CH-43	64.6	55.4	--	--	55	n.a. (1)	60	n.a. (1)
CH-44	63.7	54.6	--	--	55	n.a. (1)	60	n.a. (1)
CH-45	55.7	46.6	--	--	55	n.a. (1)	60	n.a. (1)
CH-46	66.2	57.0	--	--	55	n.a. (1)	60	n.a. (1)
CH-47	59.0	49.8	--	--	55	n.a. (1)	60	n.a. (1)
CH-48	62.4	53.2	--	--	55	n.a. (1)	60	n.a. (1)
CH-49	54.8	45.7	--	--	55	n.a. (1)	60	n.a. (1)
CH-50	60.9	51.7	--	--	55	n.a. (1)	60	n.a. (1)
CH-51	56.2	47.0	--	--	55	n.a. (1)	60	n.a. (1)
CH-52	66.7	57.6	--	--	55	n.a. (1)	60	n.a. (1)
CH-53	60.4	51.2	--	--	55	n.a. (1)	60	n.a. (1)
CH-54	61.2	52.1	--	--	55	n.a. (1)	60	n.a. (1)
CH-55	60.8	51.7	--	--	55	n.a. (1)	60	n.a. (1)
CH-57	65.3	56.2	--	--	55	n.a. (1)	60	n.a. (1)
CH-58	63.8	54.6	--	--	55	n.a. (1)	60	n.a. (1)
CH-59	57.3	48.1	--	--	55	n.a. (1)	60	n.a. (1)
CH-60	61.7	52.5	--	--	55	n.a. (1)	60	n.a. (1)
CH-61	68.6	59.4	--	--	55	n.a. (1)	60	n.a. (1)
CH-63	66.1	56.9	--	--	55	n.a. (1)	60	n.a. (1)
CH-64	63.1	54.0	--	--	55	n.a. (1)	60	n.a. (1)
CH-65	65.1	56.0	--	--	55	n.a. (1)	60	n.a. (1)
CH-66	60.3	51.2	--	--	55	n.a. (1)	60	n.a. (1)
CH-67	60.5	51.4	--	--	55	n.a. (1)	60	n.a. (1)
CH-68	63.0	53.9	--	--	55	n.a. (1)	60	n.a. (1)
CH-69	58.1	51.9	--	--	55	n.a. (1)	60	n.a. (1)
CH-70	52.9	43.8	--	--	55	n.a. (1)	60	n.a. (1)
CH-71	59.6	50.4	--	--	55	n.a. (1)	60	n.a. (1)
CH-72	64.1	54.9	--	--	55	n.a. (1)	60	n.a. (1)
CH-73	63.9	54.8	--	--	55	n.a. (1)	60	n.a. (1)
CH-74	70.9	61.7	--	--	55	n.a. (1)	60	n.a. (1)
CH-75	59.9	50.8	--	--	55	n.a. (1)	60	n.a. (1)
CH-76	60.8	51.7	--	--	55	n.a. (1)	60	n.a. (1)
CH-77	60.6	51.5	--	--	55	n.a. (1)	60	n.a. (1)
CH-78	58.2	49.0	--	--	55	n.a. (1)	60	n.a. (1)
CH-79	55.1	46.0	--	--	55	n.a. (1)	60	n.a. (1)

Point	CURRENT TRAFFIC NOISE (modelled in 2024)		AMBIENT NOISE (measured in 2022-2024)		WBG EHS Noise Limits		Cameroon NC 1962 Noise Limits	
	Day $L_{Aeq,7\text{-}22h}$	Night $L_{Aeq,22\text{-}7h}$	Day $L_{Aeq,7\text{-}22h}$	Night $L_{Aeq,22\text{-}7h}$	Day $L_{Aeq,7\text{-}22h}$	Night $L_{Aeq,22\text{-}7h}$	Day $L_{Aeq,7\text{-}19h}$	Night $L_{Aeq,22\text{-}6h}$
CH-80	60.6	54.4	--	--	55	n.a. (1)	60	n.a. (1)
CH-81	61.7	52.6	--	--	55	n.a. (1)	60	n.a. (1)
CH-82	64.7	55.6	--	--	55	n.a. (1)	60	n.a. (1)
CH-83	59.7	50.6	--	--	55	n.a. (1)	60	n.a. (1)
CH-84	54.6	48.4	--	--	55	n.a. (1)	60	n.a. (1)
CH-85	59.9	53.7	--	--	55	n.a. (1)	60	n.a. (1)
CH-86	59.0	52.8	--	--	55	n.a. (1)	60	n.a. (1)
CH-87	61.5	55.3	--	--	55	n.a. (1)	60	n.a. (1)
H-00	60.7	51.6	--	--	55	45	60	50
H-01	65.3	59.1	--	--	55	45	60	50
H-02	49.6	43.4	--	--	55	45	60	50
H-03	64.5	55.3	--	--	55	45	60	50
H-04	70.6	64.4	--	--	55	45	60	50
H-05	65.7	56.5	--	--	55	45	60	50
H-06	61.3	52.1	--	--	55	45	60	50
H-07	65.8	56.7	--	--	55	45	60	50
H-08	58.3	49.1	--	--	55	45	60	50
H-09	60.3	51.1	--	--	55	45	60	50
H-10	62.8	53.6	--	--	55	45	60	50
H-11	64.2	58.0	--	--	55	45	60	50
H-12	56.4	47.3	--	--	55	45	60	50
PC_00	55.6	49.4	--	--	55	45	60	50
PC_01	57.0	50.8	--	--	55	45	60	50
SC-00	60.2	51.0	--	--	55	n.a. (1)	60	n.a. (1)
SC-01	61.7	55.5	--	--	55	n.a. (1)	60	n.a. (1)
SC-02	50.1	43.9	--	--	55	n.a. (1)	60	n.a. (1)
SC-03	59.7	53.5	--	--	55	n.a. (1)	60	n.a. (1)
SC-04	51.2	45.0	--	--	55	n.a. (1)	60	n.a. (1)
SC-05	77.4	71.2	--	--	55	n.a. (1)	60	n.a. (1)
SC-06	60.1	50.9	--	--	55	n.a. (1)	60	n.a. (1)
SC-07	57.8	48.6	--	--	55	n.a. (1)	60	n.a. (1)
SC-08	56.1	49.7	--	--	55	n.a. (1)	60	n.a. (1)
SC-09	66.4	60.2	--	--	55	n.a. (1)	60	n.a. (1)
SC-10	59.8	50.6	--	--	55	n.a. (1)	60	n.a. (1)
SC-11	67.8	61.6	--	--	55	n.a. (1)	60	n.a. (1)
SC-12	61.7	52.6	--	--	55	n.a. (1)	60	n.a. (1)
SC-13	59.6	50.4	--	--	55	n.a. (1)	60	n.a. (1)
SC-14	58.1	48.9	--	--	55	n.a. (1)	60	n.a. (1)
SC-15	54.8	45.6	--	--	55	n.a. (1)	60	n.a. (1)
SC-16	63.9	54.8	--	--	55	n.a. (1)	60	n.a. (1)

Point	CURRENT TRAFFIC NOISE (modelled in 2024)		AMBIENT NOISE (measured in 2022-2024)		WBG EHS Noise Limits		Cameroon NC 1962 Noise Limits	
	Day $L_{Aeq,7\text{-}22h}$	Night $L_{Aeq,22\text{-}7h}$	Day $L_{Aeq,7\text{-}22h}$	Night $L_{Aeq,22\text{-}7h}$	Day $L_{Aeq,7\text{-}22h}$	Night $L_{Aeq,22\text{-}7h}$	Day $L_{Aeq,7\text{-}19h}$	Night $L_{Aeq,22\text{-}6h}$
SC-17	**55.5**	**49.3**	--	--	55	n.a. (1)	60	n.a. (1)
SC-18	**60.0**	**50.9**	--	--	55	n.a. (1)	60	n.a. (1)
SC-19	**57.9**	**51.7**	--	--	55	n.a. (1)	60	n.a. (1)
SC-20	**58.4**	**49.3**	--	--	55	n.a. (1)	60	n.a. (1)
SC-21	**69.0**	**62.8**	--	--	55	n.a. (1)	60	n.a. (1)
SC-22	**57.1**	**47.9**	--	--	55	n.a. (1)	60	n.a. (1)
SC-23	**55.8**	**46.7**	--	--	55	n.a. (1)	60	n.a. (1)
SC-24	**58.4**	**49.2**	--	--	55	n.a. (1)	60	n.a. (1)
SC-25	**62.2**	**53.1**	--	--	55	n.a. (1)	60	n.a. (1)
SC-26	**64.2**	**55.0**	--	--	55	n.a. (1)	60	n.a. (1)
SC-27	**66.8**	**57.6**	--	--	55	n.a. (1)	60	n.a. (1)
SC-28	**60.2**	**51.1**	--	--	55	n.a. (1)	60	n.a. (1)
SC-29	**55.6**	**46.5**	--	--	55	n.a. (1)	60	n.a. (1)
SC-30	**61.0**	**54.8**	--	--	55	n.a. (1)	60	n.a. (1)
SC-31	**54.9**	**48.7**	--	--	55	n.a. (1)	60	n.a. (1)
SC-32	**58.3**	**52.1**	--	--	55	n.a. (1)	60	n.a. (1)
SC-33	**65.7**	**59.5**	--	--	55	n.a. (1)	60	n.a. (1)
SC-34	**65.4**	**59.2**	--	--	55	n.a. (1)	60	n.a. (1)
SI-00	**48.5**	**41.0**	--	--	55	n.a. (1)	60	n.a. (1)
SI-01	**50.2**	**42.7**	--	--	55	n.a. (1)	60	n.a. (1)
SI-02	**40.2**	**32.7**	--	--	55	n.a. (1)	60	n.a. (1)
SI-03	**53.7**	**44.0**	--	--	55	n.a. (1)	60	n.a. (1)
SI-04	**45.6**	**36.0**	--	--	55	n.a. (1)	60	n.a. (1)
SI-05	**55.4**	**45.8**	--	--	55	45	60	50
SI-06	**38.9**	**29.2**	--	--	55	n.a. (1)	60	n.a. (1)
SI-07	**38.0**	**28.4**	--	--	55	n.a. (1)	60	n.a. (1)
SI-08	**46.5**	**36.8**	--	--	55	n.a. (1)	60	n.a. (1)
SI-09	**59.9**	**50.7**	--	--	55	n.a. (1)	60	n.a. (1)
SI-10	**52.0**	**42.3**	--	--	55	45	60	50
SI-11	**44.4**	**34.7**	--	--	55	n.a. (1)	60	n.a. (1)

(1) n.a. = Night-time noise limit is not applicable because the receptor is closed during the night

As shown in **When the** sound levels exceed both the WBG EHS and the Cameroon NC 1962 noise limits the cell background is coloured in orange. If the sound level exceed only the WBG EHS limits, the cell background is yellow.

Table 15, the modelled noise levels at points P1÷P10 are substantially in line with the in-situ measurements and are in all cases above the noise limits over the 24h. This shows that the current exceedances are mainly due to traffic noise from RN17 road. The deviations between modelled and measured sound levels are related to the presence of secondary noise sources (human noise, honking, natural sounds and birds singing, etc.) and to measurement uncertainty.

Modelled noise levels at points AQ/N1 AQ/N9 (Akom II Diversion), are in many cases already exceeding noise limits. There is, however, a greater deviation from ground measurements demonstrating that road noise has less influence than other sources.

Modelled noise levels at points AQ/N10 AQ/N13 (Ebolowa By-Pass), are in most cases below the noise limits (except AQ/N11), demonstrating that when noise measurements exceed the limits in this area, it is due not to road traffic but to sources such as human noise, bird singing, etc.).

For the remaining verification points, where baseline information on noise is not available, modelled road noise levels are generally above the limits. As many of those are churches and schools, noise limits are applicable only during the day-time as they are uninhabited at night. Points SI-01÷SI-11, which are social infrastructures located near the future Ebolowa By-Pass, are an exception as they have noise levels below the limits.

4.4 Results of the Noise Model- Future Scenario (2042)

In order to assess only the noise impact of road (the “Project”), a comparison was made between simulated sound levels in the current scenario (2024) and the future scenario (2042), which consider only the noise contribution of road traffic. Thus, the comparison and the noise assessment is not influenced by residual noise which sometimes depends on extraneous, random and non-modellable factors (human activities, birds singing, natural sounds, anomalous or sporadic sound events, etc.)

Table 16 shows the results of the acoustic simulations for the future scenario (year 2042) at the verification points in the day-time (7.00÷22.00) and the night-time (22.00÷7.00).

For each point, the table reports:

- the future traffic noise levels, calculated by NMPB-Rouse-96 model on the basis of 2042 traffic data;
- the current traffic noise levels, calculated by NMPB-Rouse-96 model on the basis of 2024 traffic data;
- the difference between future and current traffic noise levels;
- the WBG EHS noise limits (where applicable);
- the Cameroon Standard NC 1962:2021 noise limits for existing installations for Zone I (where applicable).

Regarding noise limits, they are not applicable in the night-time for churches and school since these kinds of receptors are usually unoccupied at night (“n.a.” = not applicable).

When the sound levels exceed +3 dB(A) as difference between future and current traffic noise levels, the cell background is coloured in red (except for those cases where although the increase in noise is greater than 3 dB, the sound level is below the expected limits).

Table 16: Results of the acoustic simulation: future scenario (2042)

Point	FUTURE TRAFFIC NOISE (simulation 2042)		CURRENT TRAFFIC NOISE (simulation 2024)		DIFFERENCE 2042 vs 2024		WBG EHS Noise Limits		CAMEROON NC 1962 Noise Limits	
	Day $L_{Aeq,7-22h}$	Night $L_{Aeq,22-7h}$	Day $L_{Aeq,7-22h}$	Night $L_{Aeq,22-7h}$	Day $L_{Aeq,7-22h}$	Night $L_{Aeq,22-7h}$	Day $L_{Aeq,7-22h}$	Night $L_{Aeq,22-7h}$	Day $L_{Aeq,7-19h}$	Night $L_{Aeq,22-6h}$
P01	**69.1**	**64.2**	65.7	59.5	3.4	4.7	55	45	60	50

Point	FUTURE TRAFFIC NOISE (simulation 2042)		CURRENT TRAFFIC NOISE (simulation 2024)		DIFFERENCE 2042 vs 2024		WBG EHS Noise Limits		CAMEROON NC 1962 Noise Limits	
	Day $L_{Aeq,7-22h}$	Night $L_{Aeq,22-7h}$	Day $L_{Aeq,7-22h}$	Night $L_{Aeq,22-7h}$	Day $L_{Aeq,7-22h}$	Night $L_{Aeq,22-7h}$	Day $L_{Aeq,7-22h}$	Night $L_{Aeq,22-7h}$	Day $L_{Aeq,7-19h}$	Night $L_{Aeq,22-6h}$
P02	**62.9**	**58.0**	65.9	59.7	-3.0	-1.7	55	45	60	50
P03	**62.7**	**57.8**	67.7	61.5	-5.0	-3.7	55	45	60	50
P04	**68.5**	**63.6**	69.5	63.3	-1.0	0.3	55	45	60	50
P05	**67.6**	**62.7**	63.4	57.2	4.2	5.5	55	45	60	50
P06	**66.3**	**61.4**	63.2	57.0	3.1	4.4	55	45	60	50
P07	**66.0**	**58.4**	64.8	55.7	1.2	2.7	55	45	60	50
P08	**65.2**	**57.6**	66.8	57.7	-1.6	-0.1	55	45	60	50
P09	**73.1**	**65.5**	65.0	55.9	8.1	9.6	55	45	60	50
P10	**66.8**	**59.2**	62.8	53.6	4.0	5.6	55	45	60	50
AQ/N1	**49.0**	**42.3**	46.8	39.3	2.2	3.0	55	45	60	50
AQ/N2	**55.5**	**48.1**	55.3	47.8	0.2	0.3	55	45	60	50
AQ/N3	**69.1**	**64.2**	65.5	59.3	3.6	4.9	55	45	60	50
AQ/N8	**61.8**	**55.2**	59.3	51.8	2.5	3.4	55	45	60	50
AQ/N9	**56.5**	**50.1**	53.4	45.9	3.1	4.2	55	45	60	50
AQ/N10	**60.6**	**52.5**	54.4	44.8	6.2	7.7	55	45	60	50
AQ/N11	**63.8**	**55.7**	57.5	47.9	6.3	7.8	55	45	60	50
AQ/N12	**54.9**	**46.8**	29.8	20.6	25.1	26.2	55	45	60	50
AQ/N13	**51.2**	**43.4**	46.7	37.6	4.5	5.8	55	45	60	50
CH-00	**62.5**	**54.9**	61.2	52.1	1.3	2.8	55	n.a. (1)	60	n.a. (1)
CH-01	**57.4**	**52.6**	57.1	50.9	0.3	1.7	55	n.a. (1)	60	n.a. (1)
CH-02	**69.4**	**61.8**	72.4	63.2	-3.0	-1.4	55	n.a. (1)	60	n.a. (1)
CH-03	**58.6**	**51.0**	60.3	51.2	-1.7	-0.2	55	n.a. (1)	60	n.a. (1)
CH-04	**64.3**	**56.7**	66.5	57.3	-2.2	-0.6	55	n.a. (1)	60	n.a. (1)
CH-05	**60.0**	**52.4**	60.4	51.3	-0.4	1.1	55	n.a. (1)	60	n.a. (1)
CH-06	**56.8**	**49.2**	60.1	50.9	-3.3	-1.7	55	n.a. (1)	60	n.a. (1)
CH-07	**69.2**	**64.3**	66.8	60.6	2.4	3.7	55	n.a. (1)	60	n.a. (1)
CH-08	**67.8**	**63.0**	65.4	59.2	2.4	3.8	55	n.a. (1)	60	n.a. (1)
CH-09	**73.4**	**68.5**	71.8	65.6	1.6	2.9	55	n.a. (1)	60	n.a. (1)
CH-10	**70.9**	**66.1**	72.8	66.6	-1.9	-0.5	55	n.a. (1)	60	n.a. (1)
CH-11	**63.8**	**58.9**	64.5	58.3	-0.7	0.6	55	n.a. (1)	60	n.a. (1)
CH-12	**60.0**	**55.1**	57.8	51.6	2.2	3.5	55	n.a. (1)	60	n.a. (1)
CH-13	**66.2**	**58.6**	61.0	51.8	5.2	6.8	55	n.a. (1)	60	n.a. (1)
CH-14	**57.5**	**49.9**	55.9	46.7	1.6	3.2	55	n.a. (1)	60	n.a. (1)
CH-15	**61.7**	**54.1**	59.0	49.8	2.7	4.3	55	n.a. (1)	60	n.a. (1)
CH-16	**58.4**	**50.8**	60.5	51.3	-2.1	-0.5	55	n.a. (1)	60	n.a. (1)
CH-17	**56.9**	**49.3**	59.0	49.8	-2.1	-0.5	55	n.a. (1)	60	n.a. (1)
CH-18	**58.5**	**50.9**	57.6	48.4	0.9	2.5	55	n.a. (1)	60	n.a. (1)

Point	FUTURE TRAFFIC NOISE (simulation 2042)		CURRENT TRAFFIC NOISE (simulation 2024)		DIFFERENCE 2042 vs 2024		WBG EHS Noise Limits		CAMEROON NC 1962 Noise Limits	
	Day $L_{Aeq,7-22h}$	Night $L_{Aeq,22-7h}$	Day $L_{Aeq,7-22h}$	Night $L_{Aeq,22-7h}$	Day $L_{Aeq,7-22h}$	Night $L_{Aeq,22-7h}$	Day $L_{Aeq,7-22h}$	Night $L_{Aeq,22-7h}$	Day $L_{Aeq,7-19h}$	Night $L_{Aeq,22-6h}$
CH-19	**62.4**	**54.8**	61.2	52.1	1.2	2.7	55	n.a. (1)	60	n.a. (1)
CH-20	**65.8**	**61.0**	61.7	55.5	4.1	5.5	55	n.a. (1)	60	n.a. (1)
CH-21	**59.5**	**54.7**	58.0	51.8	1.5	2.9	55	n.a. (1)	60	n.a. (1)
CH-22	**60.2**	**55.3**	62.1	55.9	-1.9	-0.6	55	n.a. (1)	60	n.a. (1)
CH-23	**59.6**	**54.7**	58.9	52.7	0.7	2.0	55	n.a. (1)	60	n.a. (1)
CH-24	**68.6**	**63.7**	64.8	58.6	3.8	5.1	55	n.a. (1)	60	n.a. (1)
CH-25	**66.8**	**62.0**	70.8	64.6	-4.0	-2.6	55	n.a. (1)	60	n.a. (1)
CH-26	**61.5**	**56.6**	62.8	56.6	-1.3	0.0	55	n.a. (1)	60	n.a. (1)
CH-27	**68.9**	**64.0**	68.1	61.9	0.8	2.1	55	n.a. (1)	60	n.a. (1)
CH-28	**61.6**	**56.7**	62.8	56.6	-1.2	0.1	55	n.a. (1)	60	n.a. (1)
CH-29	**59.1**	**54.3**	61.6	55.4	-2.5	-1.1	55	n.a. (1)	60	n.a. (1)
CH-30	**69.2**	**64.3**	69.7	63.5	-0.5	0.8	55	n.a. (1)	60	n.a. (1)
CH-31	**71.8**	**66.9**	78.4	72.2	-6.6	-5.3	55	n.a. (1)	60	n.a. (1)
CH-32	**73.6**	**68.8**	71.9	65.7	1.7	3.1	55	n.a. (1)	60	n.a. (1)
CH-33	**62.0**	**57.1**	67.3	61.1	-5.3	-4.0	55	n.a. (1)	60	n.a. (1)
CH-34	**66.2**	**61.4**	68.6	62.4	-2.4	-1.0	55	n.a. (1)	60	n.a. (1)
CH-35	**59.0**	**54.2**	67.9	61.7	-8.9	-7.5	55	n.a. (1)	60	n.a. (1)
CH-36	**64.5**	**59.6**	67.5	61.3	-3.0	-1.7	55	n.a. (1)	60	n.a. (1)
CH-37	**57.6**	**52.7**	59.9	53.7	-2.3	-1.0	55	n.a. (1)	60	n.a. (1)
CH-38	**57.5**	**52.6**	57.7	51.5	-0.2	1.1	55	n.a. (1)	60	n.a. (1)
CH-39	**61.5**	**56.7**	56.1	49.9	5.4	6.8	55	n.a. (1)	60	n.a. (1)
CH-40	**59.7**	**54.8**	58.3	52.1	1.4	2.7	55	n.a. (1)	60	n.a. (1)
CH-41	**52.8**	**47.9**	51.9	45.7	0.9	2.2	55	n.a. (1)	60	n.a. (1)
CH-42	**55.7**	**48.1**	55.8	46.7	-0.1	1.4	55	n.a. (1)	60	n.a. (1)
CH-43	**61.5**	**53.9**	64.6	55.4	-3.1	-1.5	55	n.a. (1)	60	n.a. (1)
CH-44	**64.2**	**56.6**	63.7	54.6	0.5	2.0	55	n.a. (1)	60	n.a. (1)
CH-45	**53.6**	**46.0**	55.7	46.6	-2.1	-0.6	55	n.a. (1)	60	n.a. (1)
CH-46	**67.7**	**60.1**	66.2	57.0	1.5	3.1	55	n.a. (1)	60	n.a. (1)
CH-47	**56.5**	**48.9**	59.0	49.8	-2.5	-0.9	55	n.a. (1)	60	n.a. (1)
CH-48	**60.4**	**52.8**	62.4	53.2	-2.0	-0.4	55	n.a. (1)	60	n.a. (1)
CH-49	**53.8**	**46.2**	54.8	45.7	-1.0	0.5	55	n.a. (1)	60	n.a. (1)
CH-50	**60.9**	**53.3**	60.9	51.7	0.0	1.6	55	n.a. (1)	60	n.a. (1)
CH-51	**53.5**	**45.9**	56.2	47.0	-2.7	-1.1	55	n.a. (1)	60	n.a. (1)
CH-52	**64.6**	**57.0**	66.7	57.6	-2.1	-0.6	55	n.a. (1)	60	n.a. (1)
CH-53	**68.5**	**60.8**	60.4	51.2	8.1	9.6	55	n.a. (1)	60	n.a. (1)
CH-54	**60.4**	**52.8**	61.2	52.1	-0.8	0.7	55	n.a. (1)	60	n.a. (1)
CH-55	**64.5**	**56.9**	60.8	51.7	3.7	5.2	55	n.a. (1)	60	n.a. (1)

Point	FUTURE TRAFFIC NOISE (simulation 2042)		CURRENT TRAFFIC NOISE (simulation 2024)		DIFFERENCE 2042 vs 2024		WBG EHS Noise Limits		CAMEROON NC 1962 Noise Limits	
	Day $L_{Aeq,7\text{-}22h}$	Night $L_{Aeq,22\text{-}7h}$	Day $L_{Aeq,7\text{-}22h}$	Night $L_{Aeq,22\text{-}7h}$	Day $L_{Aeq,7\text{-}22h}$	Night $L_{Aeq,22\text{-}7h}$	Day $L_{Aeq,7\text{-}22h}$	Night $L_{Aeq,22\text{-}7h}$	Day $L_{Aeq,7\text{-}19h}$	Night $L_{Aeq,22\text{-}6h}$
CH-57	**53.8**	**46.2**	65.3	56.2	-11.5	-10.0	55	n.a. (1)	60	n.a. (1)
CH-58	**63.8**	**56.2**	63.8	54.6	0.0	1.6	55	n.a. (1)	60	n.a. (1)
CH-59	**68.6**	**61.0**	57.3	48.1	11.3	12.9	55	n.a. (1)	60	n.a. (1)
CH-60	**64.4**	**56.8**	61.7	52.5	2.7	4.3	55	n.a. (1)	60	n.a. (1)
CH-61	**71.4**	**63.8**	68.6	59.4	2.8	4.4	55	n.a. (1)	60	n.a. (1)
CH-63	**68.7**	**61.1**	66.1	56.9	2.6	4.2	55	n.a. (1)	60	n.a. (1)
CH-64	**55.5**	**47.9**	63.1	54.0	-7.6	-6.1	55	n.a. (1)	60	n.a. (1)
CH-65	**65.7**	**58.1**	65.1	56.0	0.6	2.1	55	n.a. (1)	60	n.a. (1)
CH-66	**61.9**	**54.3**	60.3	51.2	1.6	3.1	55	n.a. (1)	60	n.a. (1)
CH-67	**58.4**	**50.8**	60.5	51.4	-2.1	-0.6	55	n.a. (1)	60	n.a. (1)
CH-68	**66.7**	**59.1**	63.0	53.9	3.7	5.2	55	n.a. (1)	60	n.a. (1)
CH-69	**59.7**	**54.9**	58.1	51.9	1.6	3.0	55	n.a. (1)	60	n.a. (1)
CH-70	**53.6**	**46.0**	52.9	43.8	0.7	2.2	55	n.a. (1)	60	n.a. (1)
CH-71	**61.7**	**54.1**	59.6	50.4	2.1	3.7	55	n.a. (1)	60	n.a. (1)
CH-72	**65.4**	**57.8**	64.1	54.9	1.3	2.9	55	n.a. (1)	60	n.a. (1)
CH-73	**65.5**	**57.9**	63.9	54.8	1.6	3.1	55	n.a. (1)	60	n.a. (1)
CH-74	**69.5**	**61.9**	70.9	61.7	-1.4	0.2	55	n.a. (1)	60	n.a. (1)
CH-75	**56.3**	**48.7**	59.9	50.8	-3.6	-2.1	55	n.a. (1)	60	n.a. (1)
CH-76	**60.1**	**52.5**	60.8	51.7	-0.7	0.8	55	n.a. (1)	60	n.a. (1)
CH-77	**61.0**	**53.4**	60.6	51.5	0.4	1.9	55	n.a. (1)	60	n.a. (1)
CH-78	**62.3**	**54.7**	58.2	49.0	4.1	5.7	55	n.a. (1)	60	n.a. (1)
CH-79	**61.0**	**53.4**	55.1	46.0	5.9	7.4	55	n.a. (1)	60	n.a. (1)
CH-80	**60.3**	**55.4**	60.6	54.4	-0.3	1.0	55	n.a. (1)	60	n.a. (1)
CH-81	**62.2**	**54.6**	61.7	52.6	0.5	2.0	55	n.a. (1)	60	n.a. (1)
CH-82	**65.9**	**58.3**	64.7	55.6	1.2	2.7	55	n.a. (1)	60	n.a. (1)
CH-83	**65.0**	**57.3**	59.7	50.6	5.3	6.7	55	n.a. (1)	60	n.a. (1)
CH-84	**55.2**	**50.3**	54.6	48.4	0.6	1.9	55	n.a. (1)	60	n.a. (1)
CH-85	**54.4**	**49.5**	59.9	53.7	-5.5	-4.2	55	n.a. (1)	60	n.a. (1)
CH-86	**51.2**	**46.4**	59.0	52.8	-7.8	-6.4	55	n.a. (1)	60	n.a. (1)
CH-87	**61.4**	**56.5**	61.5	55.3	-0.1	1.2	55	n.a. (1)	60	n.a. (1)
H-00	**59.3**	**51.7**	60.7	51.6	-1.4	0.1	55	45	60	50
H-01	**63.0**	**58.1**	65.3	59.1	-2.3	-1.0	55	45	60	50
H-02	**50.4**	**45.6**	49.6	43.4	0.8	2.2	55	45	60	50
H-03	**72.0**	**64.4**	64.5	55.3	7.5	9.1	55	45	60	50
H-04	**67.6**	**62.7**	70.6	64.4	-3.0	-1.7	55	45	60	50
H-05	**65.2**	**57.6**	65.7	56.5	-0.5	1.1	55	45	60	50
H-06	**59.9**	**52.3**	61.3	52.1	-1.4	0.2	55	45	60	50

Point	FUTURE TRAFFIC NOISE (simulation 2042)		CURRENT TRAFFIC NOISE (simulation 2024)		DIFFERENCE 2042 vs 2024		WBG EHS Noise Limits		CAMEROON NC 1962 Noise Limits	
	Day $L_{Aeq,7-22h}$	Night $L_{Aeq,22-7h}$	Day $L_{Aeq,7-22h}$	Night $L_{Aeq,22-7h}$	Day $L_{Aeq,7-22h}$	Night $L_{Aeq,22-7h}$	Day $L_{Aeq,7-22h}$	Night $L_{Aeq,22-7h}$	Day $L_{Aeq,7-19h}$	Night $L_{Aeq,22-6h}$
H-07	**68.8**	**61.2**	65.8	56.7	3.0	4.5	55	45	60	50
H-08	**60.0**	**52.4**	58.3	49.1	1.7	3.3	55	45	60	50
H-09	**58.9**	**51.3**	60.3	51.1	-1.4	0.2	55	45	60	50
H-10	**63.2**	**55.6**	62.8	53.6	0.4	2.0	55	45	60	50
H-11	**65.9**	**61.1**	64.2	58.0	1.7	3.1	55	45	60	50
H-12	**55.2**	**47.6**	56.4	47.3	-1.2	0.3	55	45	60	50
PC_00	**55.7**	**50.8**	55.6	49.4	0.1	1.4	55	45	60	50
PC_01	**55.0**	**50.1**	57.0	50.8	-2.0	-0.7	55	45	60	50
SC-00	**59.0**	**51.4**	60.2	51.0	-1.2	0.4	55	n.a. (1)	60	n.a. (1)
SC-01	**66.0**	**61.1**	61.7	55.5	4.3	5.6	55	n.a. (1)	60	n.a. (1)
SC-02	**45.0**	**40.1**	50.1	43.9	-5.1	-3.8	55	n.a. (1)	60	n.a. (1)
SC-03	**64.5**	**59.6**	59.7	53.5	4.8	6.1	55	n.a. (1)	60	n.a. (1)
SC-04	**52.8**	**47.9**	51.2	45.0	1.6	2.9	55	n.a. (1)	60	n.a. (1)
SC-05	**67.9**	**63.1**	77.4	71.2	-9.5	-8.1	55	n.a. (1)	60	n.a. (1)
SC-06	**62.0**	**54.4**	60.1	50.9	1.9	3.5	55	n.a. (1)	60	n.a. (1)
SC-07	**52.9**	**45.3**	57.8	48.6	-4.9	-3.3	55	n.a. (1)	60	n.a. (1)
SC-08	**56.6**	**51.5**	56.1	49.7	0.5	1.8	55	n.a. (1)	60	n.a. (1)
SC-09	**63.7**	**58.9**	66.4	60.2	-2.7	-1.3	55	n.a. (1)	60	n.a. (1)
SC-10	**56.6**	**49.0**	59.8	50.6	-3.2	-1.6	55	n.a. (1)	60	n.a. (1)
SC-11	**70.0**	**65.1**	67.8	61.6	2.2	3.5	55	n.a. (1)	60	n.a. (1)
SC-12	**70.6**	**63.0**	61.7	52.6	8.9	10.4	55	n.a. (1)	60	n.a. (1)
SC-13	**64.1**	**56.5**	59.6	50.4	4.5	6.1	55	n.a. (1)	60	n.a. (1)
SC-14	**58.8**	**51.2**	58.1	48.9	0.7	2.3	55	n.a. (1)	60	n.a. (1)
SC-15	**57.0**	**49.4**	54.8	45.6	2.2	3.8	55	n.a. (1)	60	n.a. (1)
SC-16	**68.9**	**61.2**	63.9	54.8	5.0	6.4	55	n.a. (1)	60	n.a. (1)
SC-17	**60.3**	**55.5**	55.5	49.3	4.8	6.2	55	n.a. (1)	60	n.a. (1)
SC-18	**57.7**	**50.1**	60.0	50.9	-2.3	-0.8	55	n.a. (1)	60	n.a. (1)
SC-19	**62.5**	**57.6**	57.9	51.7	4.6	5.9	55	n.a. (1)	60	n.a. (1)
SC-20	**58.2**	**50.6**	58.4	49.3	-0.2	1.3	55	n.a. (1)	60	n.a. (1)
SC-21	**68.0**	**63.1**	69.0	62.8	-1.0	0.3	55	n.a. (1)	60	n.a. (1)
SC-22	**58.3**	**50.7**	57.1	47.9	1.2	2.8	55	n.a. (1)	60	n.a. (1)
SC-23	**55.7**	**48.1**	55.8	46.7	-0.1	1.4	55	n.a. (1)	60	n.a. (1)
SC-24	**58.3**	**50.7**	58.4	49.2	-0.1	1.5	55	n.a. (1)	60	n.a. (1)
SC-25	**59.1**	**51.5**	62.2	53.1	-3.1	-1.6	55	n.a. (1)	60	n.a. (1)
SC-26	**65.0**	**57.4**	64.2	55.0	0.8	2.4	55	n.a. (1)	60	n.a. (1)
SC-27	**62.6**	**55.0**	66.8	57.6	-4.2	-2.6	55	n.a. (1)	60	n.a. (1)
SC-28	**66.2**	**58.6**	60.2	51.1	6.0	7.5	55	n.a. (1)	60	n.a. (1)

Point	FUTURE TRAFFIC NOISE (simulation 2042)		CURRENT TRAFFIC NOISE (simulation 2024)		DIFFERENCE 2042 vs 2024		WBG EHS Noise Limits		CAMEROON NC 1962 Noise Limits	
	Day $L_{Aeq,7-22h}$	Night $L_{Aeq,22-7h}$	Day $L_{Aeq,7-22h}$	Night $L_{Aeq,22-7h}$	Day $L_{Aeq,7-22h}$	Night $L_{Aeq,22-7h}$	Day $L_{Aeq,7-22h}$	Night $L_{Aeq,22-7h}$	Day $L_{Aeq,7-19h}$	Night $L_{Aeq,22-6h}$
SC-29	57.3	49.7	55.6	46.5	1.7	3.2	55	n.a. (1)	60	n.a. (1)
SC-30	66.6	61.7	61.0	54.8	5.6	6.9	55	n.a. (1)	60	n.a. (1)
SC-31	57.6	52.8	54.9	48.7	2.7	4.1	55	n.a. (1)	60	n.a. (1)
SC-32	57.1	52.2	58.3	52.1	-1.2	0.1	55	n.a. (1)	60	n.a. (1)
SC-33	68.4	63.6	65.7	59.5	2.7	4.1	55	n.a. (1)	60	n.a. (1)
SC-34	68.0	63.2	65.4	59.2	2.6	4.0	55	n.a. (1)	60	n.a. (1)
SI-00	48.3	42.6	48.5	41.0	-0.2	1.6	55	n.a. (1)	60	n.a. (1)
SI-01	53.3	46.8	50.2	42.7	3.1	4.1	55	n.a. (1)	60	n.a. (1)
SI-02	55.5	49.8	40.2	32.7	15.3	17.1	55	n.a. (1)	60	n.a. (1)
SI-03	59.9	51.7	53.7	44.0	6.2	7.7	55	n.a. (1)	60	n.a. (1)
SI-04	51.8	43.7	45.6	36.0	6.2	7.7	55	n.a. (1)	60	n.a. (1)
SI-05	61.6	53.5	55.4	45.8	6.2	7.7	55	45	60	50
SI-06	45.0	36.9	38.9	29.2	6.1	7.7	55	n.a. (1)	60	n.a. (1)
SI-07	44.2	36.1	38.0	28.4	6.2	7.7	55	n.a. (1)	60	n.a. (1)
SI-08	52.6	44.5	46.5	36.8	6.1	7.7	55	n.a. (1)	60	n.a. (1)
SI-09	65.1	57.4	59.9	50.7	5.2	6.7	55	n.a. (1)	60	n.a. (1)
SI-10	58.2	50.1	52.0	42.3	6.2	7.8	55	45	60	50
SI-11	50.6	42.5	44.4	34.7	6.2	7.8	55	n.a. (1)	60	n.a. (1)

(1) n.a. = Night-time noise limit is not applicable because the receptor is closed during the night

Table 16 shows that sound levels that in 2024 are above the limits will generally continue to be above the limits in 2042. This is mainly due to the fact that the road passes through populated areas and close to dwellings.

In many cases night limits are not applicable as the check points correspond to churches and schools.

The difference between future sound levels and current sound levels generally range from - 3 dB(A) to 3 dB(A). This means that significant increase in traffic expected from 2024 to 2042 will not bring about a significant deterioration in noise levels. In many cases, where the roadway deviates from the current one and moves away from homes, there is a reduction in noise levels.

It is noted that in cases where the noise increase is within 3 dB(A), the WBG EHS limits are met.

Sometimes in greenfield areas along the Ebolowa By-Pass and the Akom II Diversion, significantly higher noise levels are expected. This is normal as the road noise contribution is currently negligible. However, given the high level of background noise associated with other sound sources (human activities and bird singing), differences in ambient noise will likely be smaller.

In any case, the presence of exceeding limits more than 3 dB(A) implies the need for noise mitigation measures such as porous asphalt, noise barriers, speed limits in the most populated areas. The expected noise reduction for porous asphalt is about 3 dB(A) while with noise barriers, noise reductions of between 5 and 10 dB(A) are expected. It is therefore necessary to carry out detailed noise studies in the critical areas, in order to define the most appropriate noise mitigation actions considering the accessibility of the road from the population (which must not be compromised by any noise barriers).

In addition, it is recommended to carry out a noise monitoring at the end of the works to check any noise criticality in the main inhabited areas crossed by the road and plan possible noise reduction measures.

Signature Page

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