0.2.4.5 Zone 2: the plant and port

Air quality

As can be seen in Table 0-9, there is a significant increase in NO_2 and SO_2 concentrations for each future production level relative to existing operations. For example, concentrations of NO_2 and SO_2 more than double in the 27.5 MTPA scenario relative to existing operations. This increase can be attributed to increased consumption of No. 6 fuel oil and diesel required to support the planned production increases.

Despite the increase in production level, Table 7.2 shows that there is a decrease in predicted particulate matter concentrations between existing and all future production levels. The decreases can be attributed to the increased level of dust control assumed to be installed on new processing equipment. The most significant change is between existing and 22.5 MTPA, when all of the existing equipment is finally upgraded to include additional dust suppression.

Details are presented in Chapter 2 and in Annexes 2-1 and 2-2.

Table 0-9 Change in future model predicted COPC concentrations in Kamsar compared to existing conditions (μg/m^3)

	18.5 MTPA				**22.5 MTPA**				**27.5 MTPA**			
	PM_{10}		$PM_{2.5}$		PM_{10}		$PM_{2.5}$		PM_{10}		$PM_{2.5}$	
	24 hour	Annual	24 hour	Annual	24 hour	Annual	24 hour	Annual	24 hour	Annual	24 hour	Annual
AQ-1	-17%	-14%	-15%	-4%	-52%	-45%	-48%	-39%	-36%	-25%	-30%	-13%
AQ-2	-12%	-12%	-13%	-6%	-51%	-47%	-46%	-39%	-35%	-24%	-28%	-17%

	18.5 MTPA				**22.5 MTPA**				**27.5 MTPA**			
	NO_2		SO_2		NO_2		SO_2		NO_2		SO_2	
	1-hour	Annual	10-min	24 hour	1-hour	Annual	10-min	24 hour	1-hour	Annual	10-min	24 hour
AQ-1	33%	36%	34%	33%	40%	45%	41%	41%	87%	91%	89%	88%
AQ-2	51%	38%	55%	24%	61%	38%	64%	31%	116%	88%	123%	77%

Noise and vibration

The predicted future total sound levels remain at or below the IFC daytime criteria level of 55 dBA for each scenario, and the maximum increment of 3 dBA required by the IFC is not exceeded for any future scenario. The predicted future sound levels exceed the IFC nighttime criterion of 45 dBA at each location; however, the baseline sound level also exceeded 45 dBA at these locations. The modeling analysis indicates that the expansion of the Kamsar facility is not predicted to result in noise impacts per IFC guidance.

Water and sediments

The dust (including metal constituents) deposition rates for the three future production expansion scenarios are either lower or similar to the existing scenario due to the mitigation measures that will be implemented during expanded phases of the Project. For instance, the expected increase in dust emissions resulting from the higher production rate at the processing facility at Kamsar will be offset by the addition of dust suppression systems. Hence, increased production is not expected to result in any change to the water quality and sediment quality in the marine environment in the Kamsar port area.

The higher levels predicted for SO_2 and NOx will likely not have a large effect on acidification in the waters of the estuary because the direction of deposition is mainly towards the Northeast of the plant, over land.

Another consideration for Kamsar is that the port is regularly dredged. This activity was last undertaken in 2012 and approximately 100,000 m^3 of material was removed. It is anticipated that dredging will occur every two to three years. In addition, as the Project ramps ups, the turning basin at the existing quay will need to be enlarged (418,000 m^3) During and for a short period of time following dredging, it is expected that elevated constituent concentrations would be observed in surface water. In addition, this obviously represents a significant disturbance to sediment.

The Project requires the installation of a new car dumper along with associated rail yard modifications. The potential effects of dewatering at the new car dumper construction are considered to have the largest potential effect of any construction activity; most of the other activities do not entail dewatering, and the port site itself has already been affected by continuing operations with respect to the presence of impervious surfaces, increased run-off, etc. over a period of decades. The effect from dewatering on the water levels in the upper layers are localized (radius of influence anticipated < 100 m) and of short duration, because of the clayey soils close to the surface and the limited penetration of the phreatic layer.

0.2.4.6 Zone 3: the railroad

Air quality

A generic model setup was used to assess an idling train with three locomotives idling on a rail siding. For the rail siding which is isolated from mining or processing activities (i.e., PK 14 et PK 72), the model results indicate that under the worst-case meteorological conditions, the 1-hour NO_2 WHO guideline is exceeded within approximately 625 m of the siding. None of the other WHO guidelines are exceeded.

Noise and vibration

The potential noise impact of rail traffic increases was based on an acoustic model of existing rail conditions, with source adjustments to reflect the future increases. The increases in sound level were attributable to additional daily train trips, additional locomotives and freight cars per train (where applicable), and the addition of rail sidings with idling engines. The predicted increases in sound level due to projected increases in rail traffic are summarized in Table 0-10.

Table 0-10 Summary of predicted incremental increases in rail traffic noise

Production scenario	Increment Increase (Day, 15hr Leq, dBA)		Incremental Increase (Night, 9hr Leq)		Incremental Increase (24hr Leq, dBA)		Incremental Increase (1-hr L_{eq}, dBA)	
	Mainline Only	Mainline + Siding	Mainline Only	Mainline + Siding	Mainline Only	Mainline + Siding	Mainline Only	Mainline + Siding
18.5 MTPA	1.7	2.0	0.5	0.5	1.2	1.4	0.5	0.6
22.5 MTPA	1.7	2.1	2.2	2.2	1.9	2.1	0.5	0.6

Production scenario	Increment Increase (Day, 15hr Leq, dBA)		Incremental Increase (Night, 9hr Leq)		Incremental Increase (24hr Leq, dBA)		Incremental Increase (1-hr L_{eq}, dBA)	
27.5 MTPA	2.8	3.2	2.4	2.4	2.6	2.8	0.6	0.8

0.2.4.7 Prevention, improvement and mitigation measures

The mitigation measures are described in more detail in Chapter 2 and the various Annexes. Only the more important measures are described here.

Air quality

In order to reduce off site concentrations of PM_{10}, $PM_{2.5}$ and NO_2 from haul roads and blasting activities in the future, the following measures will be undertaken:

- Commit to achieve at least 80% control of road dust via watering, or through the application of a chemical dust suppressant (e.g., calcium chloride);
- Reduce vehicle speeds on roads to 40 km/hr. or less where possible;
- If feasible, consider paving the roads, particularly in the vicinity of villages;
- Optimize the haul roads to avoid villages, trying to keep 2 km away;
- Evaluate the option of using larger trucks to limit the total number of truck trips per day;
- Eliminate the new rail siding in the vicinity of Hamdallaye (this would have the most impact in the 22.5 MTPA scenario);
- Do a feasibility study to evaluate using conveyors to transport bauxite; and,
- Investigate feasibility of expanding the rail network to transport bauxite in lieu of using an extended road network.

For Kamsar, in order to reduce off site concentrations of particulate matter and gaseous COPCs in the future, the following measures will be taken:

- Implement planned dust management systems during material processing;
- Reduce or eliminate the use of Bunker C fuel in favor of diesel; and
- Ensure dryer scrubbers are in good working order.

In order to reduce emissions of greenhouse gases from the Project, the following measures will be undertaken:

- Maximize fuel efficiency in equipment, vehicles and locomotives by implementing a good management practices including the following:
  - Ensure that all equipment, vehicles and locomotives are kept in good working order;
  - Vehicle and equipment movements should be optimized to minimize travel and idling times;
  - Rail movements should optimized to reduce idling times; and
  - Purchase new equipment and vehicles that are as fuel efficient as possible.
- Minimize greenhouse gas emissions from changes in land use by promptly rehabilitating and re-vegetating cleared areas after extraction is completed.

Noise and vibration

The evaluation of the mining activities at the proposed mine sites indicated that a number of villages would be adversely impacted when equipment was operating at certain locations. The following mitigation measures will be taken to control noise from mining operations:

- The required setback distance plots will be consulted to determine the maximum amount of equipment that can be deployed to a given mining location in a given time period (day and night). If the mining location is within the 5 dB setback radius of a village for all equipment scenarios, then mining will not take place at this location.
- Similar to the above, if it is found that mining can take place at a given location during one time period, but not another (e.g., the mine location is outside of the 5 dB setback radius during the daytime hours but not the night-time hours), this operating restriction will be adhered to;
- CBG will evaluate the feasibility of purchasing equipment with "low noise" options for new equipment, where such options are available. For example, such options are often available from equipment manufacturers and can

include high-efficiency motors, cowlings, mufflers and more efficient exhaust pipes;
- CBG will ensure that all mobile equipment is in good repair and properly maintained;
- CBG will ensure that all mobile equipment is outfitted with effective muffling devices that are in good working order;
- CBG will evaluate the feasibility / availability of white-noise reverse alarms for mobile equipment;
- Where applicable, material stockpiles will be located between the mining activity and the nearest village(s);
- CBG will evaluate options for haul routes that maximize the distance to community areas;
- CBG will regularly maintain all haul roads such that they are free of potholes or other major surface irregularities that may result in excess noise from passing haul trucks; and
- CBG will develop a noise complaints protocol to record and respond to complaints from the community.

Blasting has the potential to cause an adverse noise and/or ground vibration impact, depending on the charge mass per delay and distance to the nearest receptor. The following mitigation measures will be taken to control blasting noise and vibration:

- CBG will limit the charge mass per delay based on the actual source-receptor distance, in accordance with the tables in Chapter 2;
- CBG will complete a feasibility study for the use of surface mining techniques when the required charge mass per delay cannot be accommodated; and
- CBG will notify nearest residents of the blasting schedule.

As mentioned previously, it is further recommended that blasting noise and vibration monitoring be conducted to develop site-specific propagation curves for consideration in blast design and planning.

For Kamsar and the rail corridor, the noise effects from increased rail activity are predicted to result in impacts that are either "marginal to none" or "low". As such, an assessment of noise mitigation was not found to be necessary for the increased rail activity.

Water and sediments

If there is a need to have additional sources of wastewater discharge, the effluent must comply with IFC discharge criteria.

Erosion results in potential pollution of nearby watercourses. The CBG will use standard measures of protection against erosion, including the rapid rehabilitation of the excavated areas.

For dredging at Kamsar, the measures recommended in Section 0.3 and in Chapter 4 will be useful.

With respect to groundwater quality due to dewatering, the implementation of reasonable best management practices in the vicinity of the dewatered excavations should adequately protect against producing an adverse effect on the local shallow aquifer water quality. Measures should be undertaken to provide filtration to minimize the amount of total dissolved and total suspended solids that are discharged during dewatering.

Soil

The mitigation measures are described in more detail in Section 2.5.5 of Chapter 2.

A critical point is the stocking of the soil removed during stripping. On top of standard erosion control measures, the CBG will take the following measures:

- Educate the persons responsible for the stripping operations on the importance of the soil that was removed and its protection;
- Study the storage operations for the surface soil well so that the soil is stored in a safe spot that will not be impacted by later operations; and
- Use normal measures to ensure that the storage happens under good conditions (determine a maximum slope angle, encourage vegetation to grow to reduce wind erosion).

The opening of new mining areas and the construction of mining roads will increase the risk of erosion. Erosion leads to a loss of soil (an important resource) and to potential pollution of watercourses. The CBG will employ standard erosion control measures.

0.2.4.8 Summary presentation of the potential and residual impacts

Table 0-11 gives a summary of the potential and residual impacts by component and subcomponent. The methodology is the one described in Chapter 1. The impacts are described in more detail in Chapter 2, Sections 2.2 to 2.5. It is important to note that following the application of mitigation measures, the degree of disturbance decreases but the numerical scores often fall in the same range that defines the importance of the impact (Table 0-11). This does not mean that there is no improvement.

The potential impact levels of the Extension Project have been re-assessed in this section assuming the application of all of the mitigation measures described in Sections 2.2 to 2.5 (Chapter 2) and summarized in the ESMP (Chapter 10) and according to an aggressive and sustained schedule supported by the appropriate resources. In particular the mitigation measures for noise and vibration in the mining zone often require considerable setbacks and the residual impacts consider that these setbacks have been applied. The residual impact levels under these conditions are presented below.

Impacts of a positive nature:

High	**Medium**	**Low**	**Does not apply (n/a)**

Impacts of a negative nature:

High	**Medium**	**Low**	**Does not apply (n/a)**

Other impacts:

None = no predicted impact

Neutral = positive and negative predicted impacts counterbalance n/a = Does not apply

Table 0-11 Summary of the impacts on the physical environment

VEC/impacts by subcomponent	Construction Phase			Operation Phase		
	Zone 1	Zone 2	Zone 3	Zone 1	Zone 2	Zone 3
Air Quality						
Particulates and metals	n/a	n/a	n/a	High	Medium	Medium
Residual impacts	n/a	n/a	n/a	High	Medium	Medium
Gases (NO_2, SO_2)	n/a	n/a	n/a	High	High	Medium
Residual impacts	n/a	n/a	n/a	High	High	Medium
Noise and Vibrations						
Noise from mining operations	n/a	n/a	n/a	High	n/a	n/a
Residual impacts	n/a	n/a	n/a	Medium	n/a	n/a
Noise from explosives	n/a	n/a	n/a	High	n/a	n/a
Residual impacts	n/a	n/a	n/a	Medium	n/a	n/a
Noise from trains	n/a	n/a	n/a	n/a	n/a	Medium

VEC/impacts by subcomponent	Construction Phase			Operation Phase		
	Zone 1	Zone 2	Zone 3	Zone 1	Zone 2	Zone 3
Residual impacts	n/a	n/a	n/a	n/a	n/a	Medium
Noise from railroad sidings	n/a	n/a	n/a	n/a	n/a	Medium
Residual impacts	n/a	n/a	n/a	n/a	n/a	Medium
Noise from the plant	n/a	n/a	n/a	n/a	Medium	n/a
Residual impacts	n/a	n/a	n/a	n/a	Medium	n/a
Vibrations (explosives)	n/a	n/a	n/a	High	n/a	n/a
Residual impacts	n/a	n/a	n/a	Medium	n/a	n/a
Marine Waters						
Wastewater	n/a	n/a	n/a	n/a	Medium	n/a
Residual impacts	n/a	n/a	n/a	n/a	None	n/a
Water – aerial deposition	n/a	n/a	n/a	n/a	None	n/a
Residual impacts	n/a	n/a	n/a	n/a	None	n/a