10.2.6 Vehicle Parking and Traffic Management

At the Kolhapur airport, city side car parking facilities will be provided for 100 cars, VIP parking for 10 cars, taxi parking and coach parking. Parking plans for Kolhapur Airport are given in Figure 2.7 and Figure 2.8 in Chapter 2.

10.2.7 Traffic Management and Traffic Decongestion Plan

Kolhapur Airport is located approximately 6 km south-east of the. Kolhapur Airport can be approached by the following roads

i. Old Pune – Bangaluru Highway
ii. Pune – Bangaluru Highway
iii. Road from Hupari to Kolhapur Airport

Traffic survey was carried out on the road approaching to Kolhapur Airport.

Traffic Survey on the Road Connecting to Kolhapur Airport Road

Vehicles ply on the road connected to above roads two wheelers, three wheelers, cars, busses and LCVs (Goods & Passenger), etc Traffic survey carried on these road during, peak traffic is from 8.00 AM to 11.00 AM and 5 PM to 9 PM, while lean traffic is observed 11.00 PM to 5.00 PM and 9.00 PM to 8.AM. Traffic counted on the these road during study was converted to passenger car unit (PCU) as per IRC SP: 41 as per details given below:

Vehicle	**Conversion Factor as per IRC SP 41**
Car	1.0
Motorcycle	0.5
3-wheeler	1
LCV	2.2
Bus	3
Truck	4.5

Traffic Survey

Traffic survey carried out on various roads connected to Kolhapur Airport to have been presented in **Table 10.2**.

Table 10.2: Traffic Survey on Roads Connected to Kolhapur Airport

Type of Vehicles	Two Wheelers	Three Wheelers	Cars	LCV	Bus	Trucks	Total
Old Pune – Bangaluru Highway							
Vehicle Count/hr during Peak period	212	12	176	43	16	35	494
Passenger Car Units /hr during Peak period	106	12	176	95	48	158	594
Pune – Bangaluru Highway							
Vehicle Count/hr During Peak Period	168	28	282	53	26	52	609
Passenger Car Units /hr During Peak period	84	28	282	117	78	234	823
Hupari to Kolhapur Airport							
Vehicle Count/hr during Peak period	44	7	17	23	4	3	98
Passenger Car Units /hr during Peak period	22	7	17	51	12	14	122

Finding of Traffic Survey

Based on the estimated passenger numbers at Kolhapur Airport are 200. Therefore, per hour taxi and car movement is 200.

Carrying capacity of road approaching to Kolhapur Airport are given below:

Name of the Road	Capacity PCU/Day	Capacity PCU/Hour
i. Old Pune – Bangaluru Highway	45000	1875
ii. Pune – Bangaluru Highway	45000	1875
iii. Hupari to Kolhapur Airport	12000	500
Total	**102000**	**4250**

Hence, capacity of roads are well enough for traffic due to Kolhapur Airport. Contribution of traffic due to Kolhapur Airport on the road approached to airport is merely 5 %. Therefore, there is no possibility of traffic jam due airport passengers vehicles on the roads in Kolhapur city.

10.2.8 Plan for Use of Fly Ash in the Project

At the Kolhapur Airport, there is no provision of use of flyash due to design constraint for development. However, Portland pozzolana cement (PPC) will be used upto possible extent in the construction of development of Kolhapur Airport.

10.2.9 Bio Medical Wastes Management

At the Kolhapur Airport, Bio Medical Wastes Management will not be generated. However, waste generated from first aid facilities will be given to authorized bio medical wastes collection and disposal agency as Biomedical Waste Management rules, 2016.

10.2.10Measures to Encourage Reduction in Carbon Foot Print

The proposed new terminal building will be certified under Green Rating for Integrated habitat Assessment (GRIHA). GRIHA measures which will be considered in the design and consideration of the project to achieve the 4 star rating under GRIHA V-2015 are discussed below with various sustainability measures under the following categories:

- Municipal solid waste collection bins will be placed at strategic locations in the new terminal building;
- Approx. 200 kg per day municipal wastes, like, plastic, paper, packing waste, bottles, oil contaminated cottons and clothes, food waste from labour camp, etc will also be generated from Kolhapur Airport after proposed development from Aircraft. It may contaminate soil of the site, if not disposed properly. These wastes will be segregated and disposed as per Solid Waste Management Rules, 2016.
- Agency has been hired for disposal of solid wastes as per the provisions of the Solid Waste Management Rule, 2016;
- Solid waste generated from the airport is transported in close containers;
- Used lubricating waste oil and oil contaminated clothes etc is collected separately in containers and is sold to authorized recyclers as per CPCB/ Maharashtra Pollution Control Board guidelines.

4.4.5 Ambient Air Quality

During the operational phase of Kolhapur Airport after proposed development, the intermittent air emissions will be generated from aircraft engines during approach, landing, taxiing, take-off and initial climb, which is termed as reference Landing and Take-off Cycle (LTO cycle). The air pollutants of concern from the aircrafts emissions are un-burnt Sulphur Dioxide, Hydrocarbons (HC), Carbon Monoxide (CO) and Oxides of Nitrogen (NO_x) as per ICAO guidelines.

For power back up 2 DG sets of 750 KVA capacities each will be available at the Kolhapur Airport to meet the power requirement during grid power failure. Exhaust emissions comprising NO_2 and SO_2 will be generated from the operation of DG sets, which will be operated only to meet the power requirement during grid power failure.

Vehicular emissions will also be generated at Kolhapur Airport after proposed development from the operation of vehicular traffic at the airport as ground support vehicles, passengers pickup and dropping vehicles. These vehicles will

be mainly diesel and petrol driven and will be source of mainly CO, HC and NOx emissions.

For prediction of anticipated impact of emissions from Kolhapur Airport after proposed development, estimation of emissions load from Aircraft LTO, DG sets and vehicles is essential. The emissions load estimation from various emission sources has been carried out in following subsection:

Aircraft Emissions

Airport Air Quality Manual 2011 of International Civil Aviation Organization (ICAO) has been referred for the aircraft emissions, which states emissions for various types of aircraft based on one LTO cycle for SO_2, NOx, CO and HC pollutants. The referred emission rates for one LTO have been converted to g/sec based on the duration of one LTO cycle in seconds. As per International Civil Aviation Organization (ICAO), time and thrust setting for Reference LTO Cycle is 32.9 minutes (1974 seconds). During peak hour, it is considered that there will be total 2 LTO (1 LTO for each Aircraft) at the Kolhapur Airport. For aircraft emissions estimation purpose, LTO cycle emissions from A 320 types and ATR 72 of aircrafts have been considered. The estimated aircraft emissions for Kolhapur Airport are given in **Table 4.5.**

Table 4.5: Estimated Aircraft Emissions for Kolhapur Airport

Parameter	**Units**	**Value**	
Type of Aircraft	-	**A320**	**ATR 72**
Emissions per LTO Cycle			
SO_2	Kg/LTO cycle		0.2
HC	Kg/LTO cycle	0.57	0.29
CO	Kg/LTO cycle	6.19	2.33
NO_X	Kg/LTO cycle	9.01	1.82
Total Emissions during LTO (Kg/LTO Cycle)			
SO_2	g/s	0.39	0.10
HC	g/s	0.29	0.15
CO	g/s	3.14	1.18
NO_X	g/s	4.56	0.92
During peak hour there will be total 2 LTO.			
SO_2	g	0.78	0.20
HC	g	0.58	0.29

CO	g	6.27	2.36
NO_X	g	9.13	1.84
Total Emissions in 2 LTO			
SO_2	g/s	0.0005	
HC	g/s	0.0004	
CO	g/s	0.0044	
NO_X	g/s	0.0056	

(Source : Airport Air Quality Manual 2011, ICAO)

Emissions from the Operation of DG Sets

Two DG sets of 750 kVA capacity will be installed at the Kolhapur Airport to meet the power requirement during grid power failure.

The exhaust emissions comprising mainly NO_2, SO_2 and Particulate Matter from the operation of 2 DG sets of 750 kVA to be operated in the event of grid power supply failure. Intermittently particulate matter (PM), carbon monoxide (CO) and un-burnt hydrocarbons will be emitted during operation of DG sets. Exhaust emissions from DG sets will be intermittent source of emissions as DG sets will be operated only during grid power failure. 8 m stack height for DG set will be provided to vent the flue gases into the atmosphere.

The estimated exhaust emissions characteristics from the DG sets are presented in **Table 4.6.**

Table 4.6: Emissions From DG Sets Stack

Sn.	Parameters	DG Set Stack (2x750 kVA)
1.	Stack Height Above Building (m)	7
2.	Stack Dia (m)	0.3
3.	Flue Gas:	
	• Temperature (^oC)	306
	• Velocity (m/s)	11.2
	• Volume Flow Rate (Nm^3/h)	1467
4.	Concentration of Pollutants	
	• SPM (g/s)	0.04
	• SO_2 (g/s)	0.11
	• NOx (g/s)	0.14

Emissions from Vehicular Movement

Vehicular emissions will also be generated from the operation of ground support vehicles within airport and vehicular traffic for pickup and dropping of passengers at the Kolhapur Airport. These vehicles will be mainly diesel and petrol driven and emit mainly CO, HC and NO_2. The peak hourly vehicular movement 200 vehicles (including the ground service vehicles, two wheelers, buses and light duty vehicles mainly cars and light carriage vehicles). The emissions from the diesel and petrol driven vehicles have been calculated based on the CPCB emissions standards for Bharat Stage –III/IV. The estimated vehicular emissions at Kolhapur Airport are given in **Table 4.7.**

Table 4.7 : Estimated Vehicular Emissions at Kolhapur Airport

Emission Rate of Pollutants (g/s)		
NOx	**CO**	**HC**
0.01	0.02	0.01

Total emissions from aircraft, DG sets and vehicles movement at the Kolhapur Airport after proposed development are given in **Table 4.8.**

Table 4.8 : Total Emission Sources and Emission Rates

Sources	**Emission Rate of Pollutants (g/s)**				
	SO_2	**NOx**	**CO**	**HC**	**PM**
Aircraft	0.0005	0.0056	0.0044	0.0004	--
DG set	0.12	0.14	--	---	0.04
Vehicular	--	0.01	0.02	0.01	0.01

Note : All above emissions sources are not continuous sources.

4.4.5.1Air Pollution Modelling

There will no continuous emissions source at the Kolhapur Airport. Air Flights and vehicular movement will be intermittent at the airport. DG sets will be operated intermittently in the event of grid power failure. For air pollution dispersion modelling DG sets have been considered continuous source of emissions. For obtaining short-term incremental ground level concentration (glc) isopleths, Breeze Air Suite dispersion model based on Industrial Source Complex Model

(ISC-ST3) developed by USEPA was used. The ISC-ST3 model for emission sources uses the steady state Gaussian plume equation for single/multiple continuous elevated sources. Calculations are made at user specified regular rectangular/radial grid points or at specified special receptors for any averaging time period as well as for entire period of input meteorology. The model uses Pasquill-Gafford (for rural and urban areas) or Briggs for urban area dispersion parameter correlations and Briggs plume rise correlation for calculating short-or long-time incremental glc values at each grid point and these are then used for plotting the isopleths over the entire grid. Rectangular grid with 500 m grid point distance is used up to a distance of +10,000 m in X and Y directions with stack coordinate as (O, O). For aircrafts and vehicular emissions, multiple volume sources are considered while for DG set stack point model source is considered.

4.4.5.2 Source Characteristics

The estimated emission details for DG sets are given in **Table 4.8**.

4.4.5.3 Atmospheric Stability

The persistence of atmospheric stability class has been estimated using hourly monitored wind velocity data along with compiled data for sunrise, sunset, solar insolation for day-time and cloud cover for night-time for the site.

4.4.5.4 Mixing Height

The knowledge of the site specific mixing height (convective stable boundary layer and inversion height or nocturnal boundary layer) is crucial in a realistic adoption of appropriate plume rise and vertical dispersion parameters. In the absence of site specific mixing heights, "Hourly Mixing Height and Assimilative Capacity of Atmospheric in India" published by Environmental Monitoring and Research Centre, India Meteorological Department, New Delhi, 2008, has been referred for hourly mixing heights.

4.4.5.5Presentation of Results

For the short-term simulations for point emission sources, the concentrations were estimated on around 1600 receptors to obtain an optimum description of variations in concentrations over the site in 10 km radius covering 16 directions. The incremental concentrations are estimated for the study period representing pre-monsoon season. The results ground level concentrations for SO_2, NO_2 and Particulate Matter (PM) are presented in **Table 4.9.**

Table 4.9: Predicted 24-Hourly Short Term Incremental Concentrations

Pollutant	Maximum Incremental Levels, (µg/m³)	Coordinates (x, y)	Distance (km)	Direction
SO_2	2.69	(500, 000)	0.5	E
NO2	2.86	(500, 000)	0.5	E
PM	0.93	(500, 000)	0.5	E

Predicted Concentrations

GLCs values presented in **Table 4.9** reveals that the assuming that DG set will be operated continuously, maximum incremental short term 24 hourly ground level concentrations of SO_2, NO_2 and PM likely to be encountered are 1.85 µg/m^3, 2.32 µg/m^3 and 0.47 µg/m^3, respectively. The ground level concentrations are occurring at a distance of 0.5 km in E direction from the Kolhapur Airport. Isopleths for predicted ground level concentrations for SO_2, NO_2 and PM are given in **Figure 4.2** to **4.4,** respectively.

The air pollution dispersion modelling predictions indicate that the maximum ground level concentrations for SO_2 and NO_2 are likely to be well within the prescribed limit of 80 µg/m^3 for industrial, residential, rural and other area. However, it is important to mention that DG set will not be operated continuously and only operated only during grid power failure. Therefore, anticipated impacts of DG set operations will be much below to the predicted ground level constructions.

Resultant Concentrations

The maximum incremental GLCs due to the Kolhapur Airport for SO_2, NO_2 and PM are already included in baseline air quality monitoring carried during study period as Kolhapur Airport is already in operation. Based on the predicted concentrations of various pollutants due to operation of Kolhapur Airport after proposed development, it can be inferred that moderate impact is anticipated on the ambient air quality of the area, as suitable mitigation measures will be taken.

Hence, overall impact on ambient air quality during operation phase is summarized as follows:

Environmental Impact Rating	**Air Quality**
Nature of Impact	Adverse
Duration of Impact	Long term
Impacted Area	Localized
Likelihood of Occurrence	High
Severity of Impact	Medium
Significance of Impact	Moderate

Mitigation Measures

- Compliance of all standards prescribed by the ICAO during operation of aircrafts by preventive maintenance and monitoring;
- 8 m Stack height of DG sets will be as per the CPCB guidelines;
- Proper traffic management plan will be prepared to ensure that there is no traffic congestion at in front of new terminal building. It will help in reduction of vehicular emissions from the airport.
- Ground vehicles at the airport will be maintained and have a "Pollution Under Control" certificate;
- Development of greenery and landscaping at the airport for improving ambient air quality.
- Monitoring of ambient air quality/ source emissions will be carried out as per monitoring plan.