

# MASTER PLAN FAISALABAD

2021-2041



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FAISALABAD DEVELOPMENT AUTHORITY  
GOVERNMENT OF PUNJAB



# ENVIRONMENT PLAN

FAISALABAD MASTER PLAN (2021-2041)

INCLUDING STRATEGIC PLAN FOR FIVE YEAR

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## ABBREVIATIONS

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DHA	District Health Authority
EPA	Environmental Protection Agency
FDA	Faisalabad Development Authority
FMP	Faisalabad Master Plan
FPUSP	Faisalabad Peri Urban Structure Plan
FWMC	Faisalabad Waste Management Company
GOP	Government of Punjab
ISWM	Integrated Solid Waste Management
OCL	Osmani & Company Private Ltd.
PHA	Parks and Horticulture Authority
TDS	Total dissolved solid
TEPA	Traffic Engineering and Planning Agency
UN	United Nations
WASA	Water and Sanitation Agency
WHO	World Health Organization

# 1. ENVIRONMENT QUALITY

## 1.1 CURRENT SITUATION AND ANALYSIS

### 1.1.1 Air Quality

Faisalabad` has ranked the fourth<sup>12</sup>, most polluted city of the world by IQAir (2019) because of the higher PM2.5 concentration (104.6 annual year average) in the year 2019 (Figure 1 1). IQAir, a Swiss air quality technology company, uploads the air quality of major cities of the world on daily basis using Air Quality Index (AQI). Air Quality Index, is a system for translating confusing pollutant concentration measurements, into one easy-to-understand scale (Figure 1 2) to clearly represent the health risk posed by ambient air pollution.

In the month of January 2021, the AQI of Faisalabad ranged 152 – 308 with a monthly average of 219.36. The average value of PM2.5 in January 2021 is similar to the last year value (223 ug/m3) this shows that the air quality of Faisalabad is very unhealthy for the residents in winter season. The recent lockdown situation, created sudden increase in good Air Quality of Faisalabad in the month of March 2021 at IQ Air is due to the incidence of COVID-19.

In the year 2015, the ambient air quality of Faisalabad was ascertained at 12 different sites by the Consultant through SUPARCO Environmental Laboratory. The air quality analysis were carried out at twelve (12) locations selected on the basis of different land use and sensitivity of pollution reception. The sites include both highly polluted and less polluted areas. Markets, Bus station, Railway stations were selected for higher level of pollution areas. However, universities and colleges were selected as low pollution sites. The same is confirmed by the results of the analysis.

The results of the analysis are summarized in Table 1 1 and Figure 1 3 - Figure 1 9. The minimum allowable limits of the air pollutants under various international ambient air quality standards and PEQS are presented in Table 1 2. Results of the analysis revealed that the average measured levels of Oxides of Nitrogen, Sulphur Dioxide, Carbon Monoxide, Ozone and Particulate Matter (PM2.5 and PM10) at selected locations (away from industrial establishments) are within the prescribed limits of PEQS and standards of United States Environmental Protection Agency (US EPA). However, concentrations of some air pollutants (SO2, PM2.5 and PM10) are beyond permissible WHO limits. SO2 concentration was beyond WHO limits at five (5) monitored locations (highest near Jhang Bazar). Furthermore, PM2.5 concentration around Jhang Bazar was high as compared to prescribed WHO guidelines, whereas, rest of the sites showed less levels of PM2.5 as compared to WHO standards. At all the sites the PM10 concentrations were higher than the prescribed limit in WHO guideline.

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<sup>1</sup> Kabir, U. (2021). Pakistan second-most polluted country in the world in terms of air quality, claims report. The NEWS. <https://www.thenews.com.pk/latest/619608-pakistan-second-most-polluted-country-in-the-world-in-terms-of-air-quality-claims-report>

<sup>2</sup> IQAir. (2019). World Air Quality. 2019 World Air Quality Report, 1–22. <https://www.iqair.com/world-most-polluted-cities/world-air-quality-report-2019-en.pdf>






Rank	City	2019 AVG	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	 Ghaziabad, India	110.2	205.7	29.5	89.3	86.9	96.6	62.9	45.3	33	37.7	158.6	235.8	235.9
2	 Hotan, China	110.1	60.1	70.1	189.1	151.8	128.6	57.9	119.7	126	87.8	103.9	114.5	106.1
3	 Gujranwala, Pakistan	105.3	220.4	127.4	86.4	70.9	65.8	53.3	59.2	48.8	67.4	107.6	144.9	217.3
4	 Faisalabad, Pakistan	104.6	223	128.3	82	59.1	56.5	46.3	54.2	58.4	66.5	92	148.5	226.2
5	 Delhi, India	98.6	191.7	84.8	75.3	71.4	76.6	56.7	43.2	31.9	37.2	116.7	200.7	194.8

Figure 1-1: IQ Air's World's Most Polluted Cities (2019) P.M2.5







US AQI Level		PM2.5 (µg/m³)		Health Recommendation (for 24hr exposure)
	Good	0-50	0-12.0	Air quality is satisfactory and poses little or no risk.
	Moderate	51-100	12.1-35.4	Sensitive individuals should avoid outdoor activity as they may experience respiratory symptoms.
	Unhealthy for Sensitive Groups	101-150	35.5-55.4	General public and sensitive individuals in particular are at risk to experience irritation and respiratory problems.
	Unhealthy	151-200	55.5-150.4	Increased likelihood of adverse effects and aggravation to the heart and lungs among general public.
	Very Unhealthy	201-300	150.5-250.4	General public will be noticeably affected. Sensitive groups should restrict outdoor activities.
	Hazardous	301+	250.5+	General public is at high risk to experience strong irritations and adverse health effects. Everyone should avoid outdoor activities.

Figure 1-2: Air Quality Index Chart

Source: IQAir (2021)

Table 1-1: Concentration Primary Air Pollutants in Faisalabad

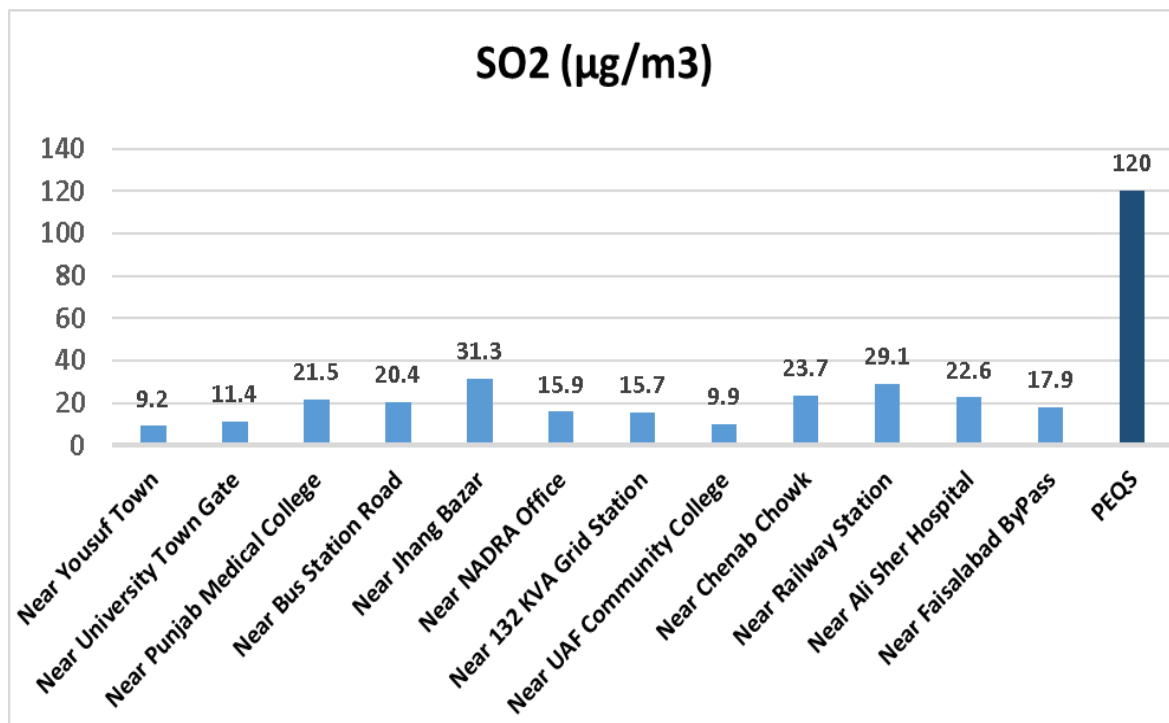
Locations	Average Obtained Concentration of Air Pollutants						
	SO <sub>2</sub> (µg/m <sup>3</sup> )	NO (µg/m <sup>3</sup> )	NO <sub>2</sub> (µg/m <sup>3</sup> )	CO (mg/m <sup>3</sup> )	O <sub>3</sub> (µg/m <sup>3</sup> )	PM <sub>2.5</sub> (µg/m <sup>3</sup> )	PM <sub>10</sub> (µg/m <sup>3</sup> )
Near Yousuf Town	9.2	2.6	16.1	2.5	11.9	14.8	63.8
Near University Town Gate	11.4	16.1	42.4	2.2	11.3	13.7	65.2
Near Punjab Medical College	21.5	12.0	55.5	3.2	8.2	21.5	84.8
Near Bus Station Road	20.4	17.8	46.3	4.2	21.0	22.6	81.8
Near Jhang Bazar	31.3	22.4	48.0	3.8	27.7	25.3	91.5
Near NADRA Office	15.9	19.1	34.2	2.6	18.6	15.8	63.0



Near 132 KVA Grid Station	15.7	16.9	33.2	2.6	11.6	14.9	66.2
Near UAF Community College	9.9	3.7	13.3	1.1	8.2	18.6	76.6
Near Chenab Chowk	23.7	21.4	36.4	2.8	23.2	22.7	88.8
Near Railway Station	29.1	23.8	42.5	3.0	24.7	22.0	78.0
Near Ali Sher Hospital	22.6	9.0	17.9	1.9	13.1	18.8	79.0
Near Faisalabad ByPass	17.9	7.8	10.9	2.5	13.6	18.4	70.8

**Table 1-2: Ambient Air Quality Standard of Punjab EPA, USEPA and WHO**

Standards		Parameters						
		SO <sub>2</sub> (µg/m <sup>3</sup> )	NO (µg/m <sup>3</sup> )	NO <sub>2</sub> (µg/m <sup>3</sup> )	CO (mg/m <sup>3</sup> )	O <sub>3</sub> (µg/m <sup>3</sup> )	PM <sub>2.5</sub> (µg/m <sup>3</sup> )	PM <sub>10</sub> (µg/m <sup>3</sup> )
PEQS	Standard	120 µg/m <sup>3</sup>	80 µg/m <sup>3</sup>	40 µg/m <sup>3</sup>	5 mg/m <sup>3</sup>	130	35	150
	Average Time	24 hrs	24 hrs	24 hrs	8 hrs	1 hr	24 hrs	24 hrs


**Figure 1-3: So2 Levels at Faisalabad Monitored by the Consultants at the Selected Site**

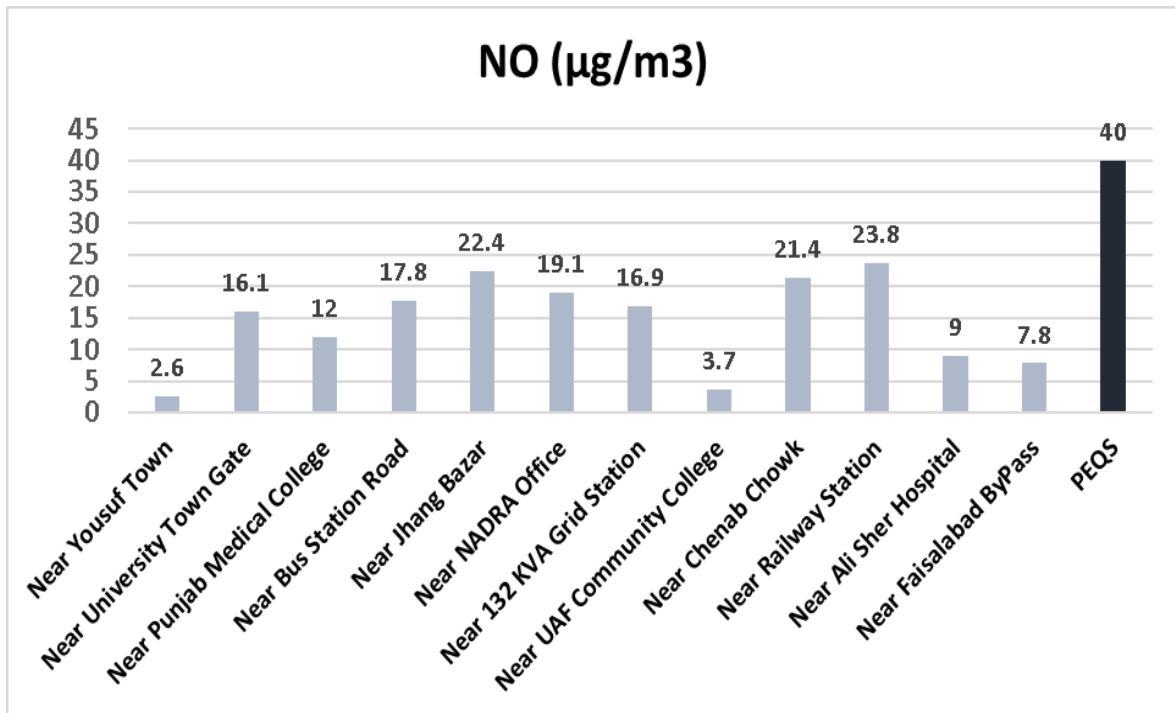


Figure 1-4: NO Levels Monitered at Faisalabad Seclected Site by Consultants

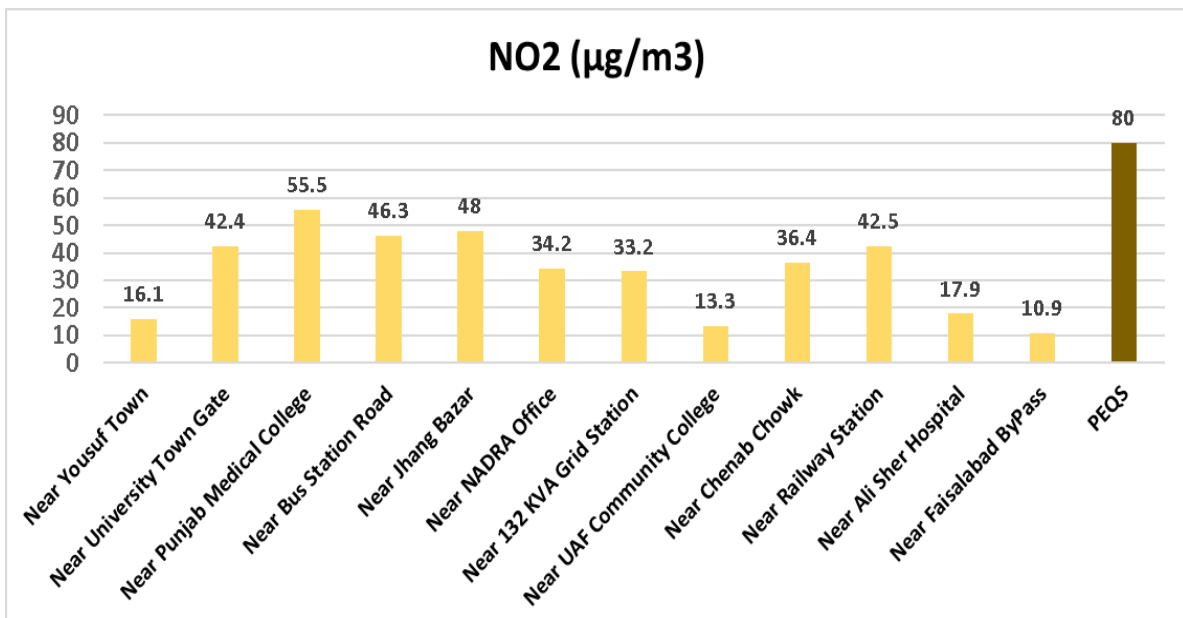


Figure 1-5: NO<sub>2</sub> Level Monitered at Faisalabad Seclected Site by Consultant

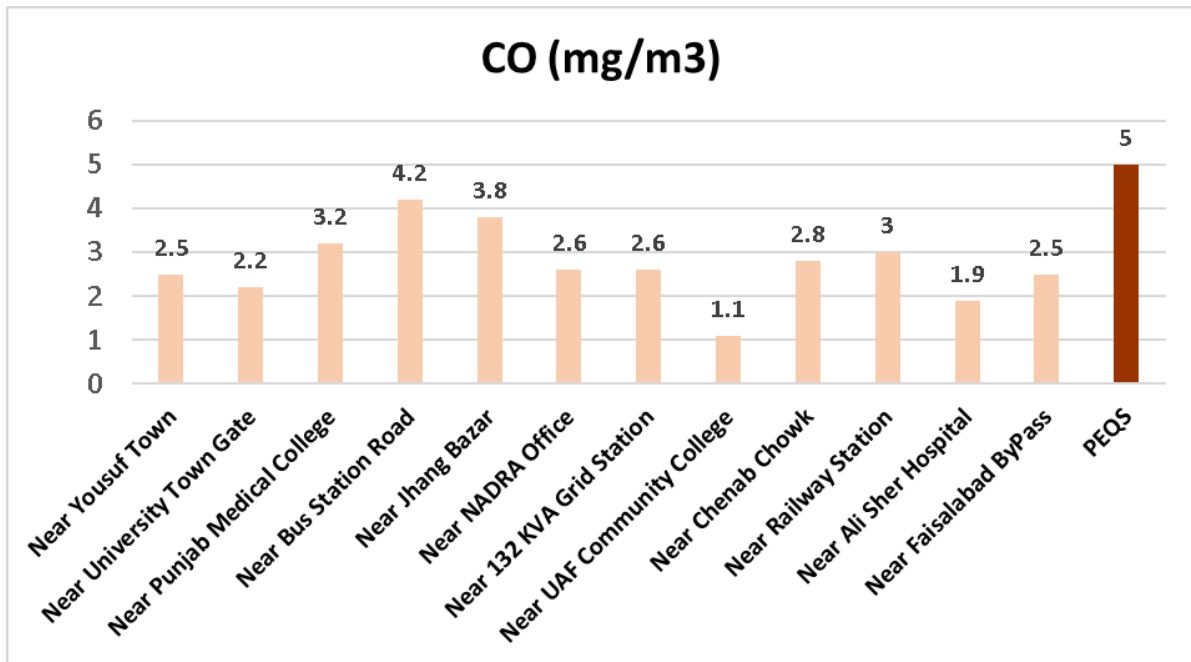


Figure 1-6: CO Level Monitored at Faisalabad Site Selected by Consultant

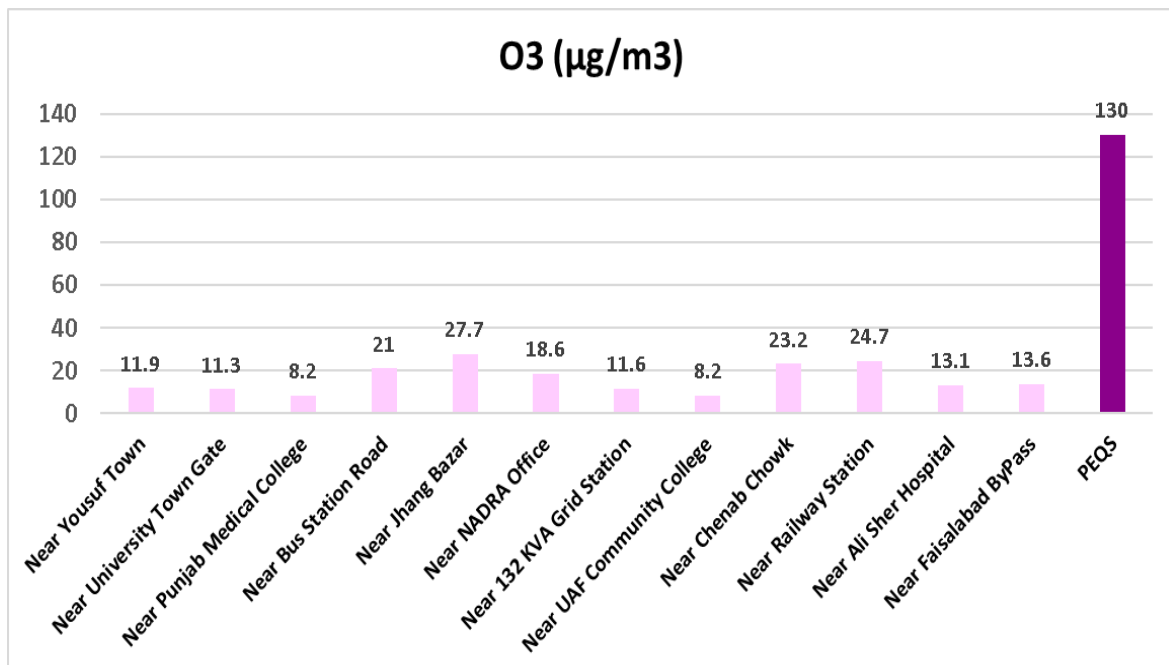


Figure 1-7: O<sub>3</sub> Level Monitored at Faisalabad Site Selected by Consultant

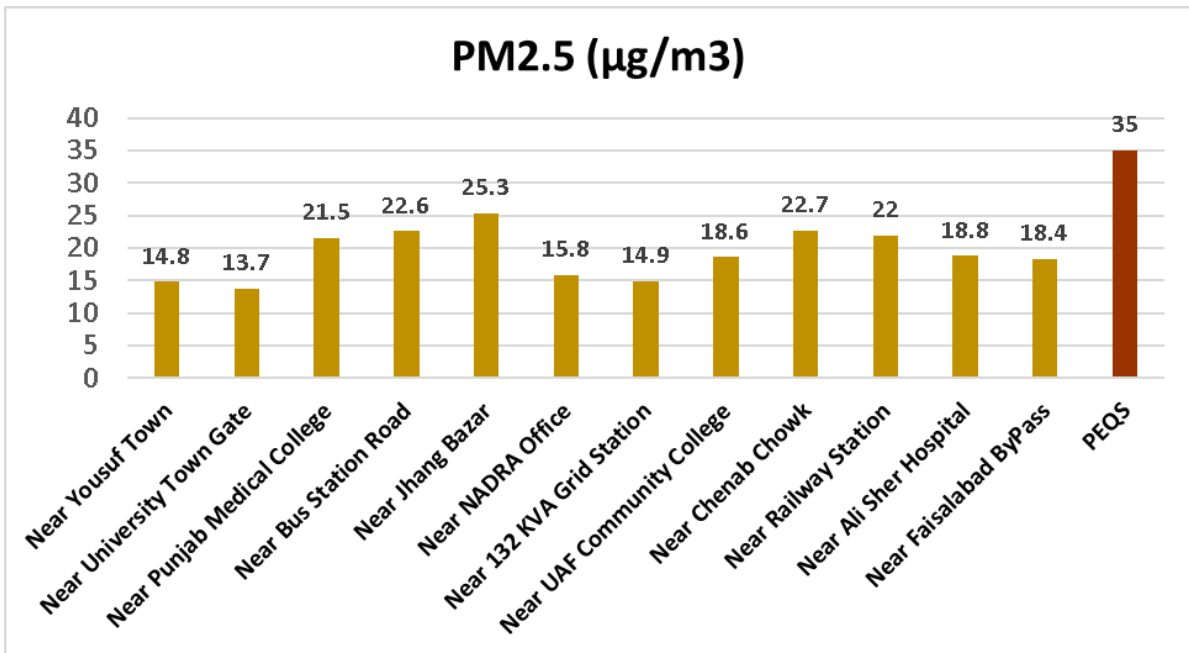


Figure 1-8: PM<sub>2.5</sub> Level Monitored at Faisalabad Site Selected by Consultant

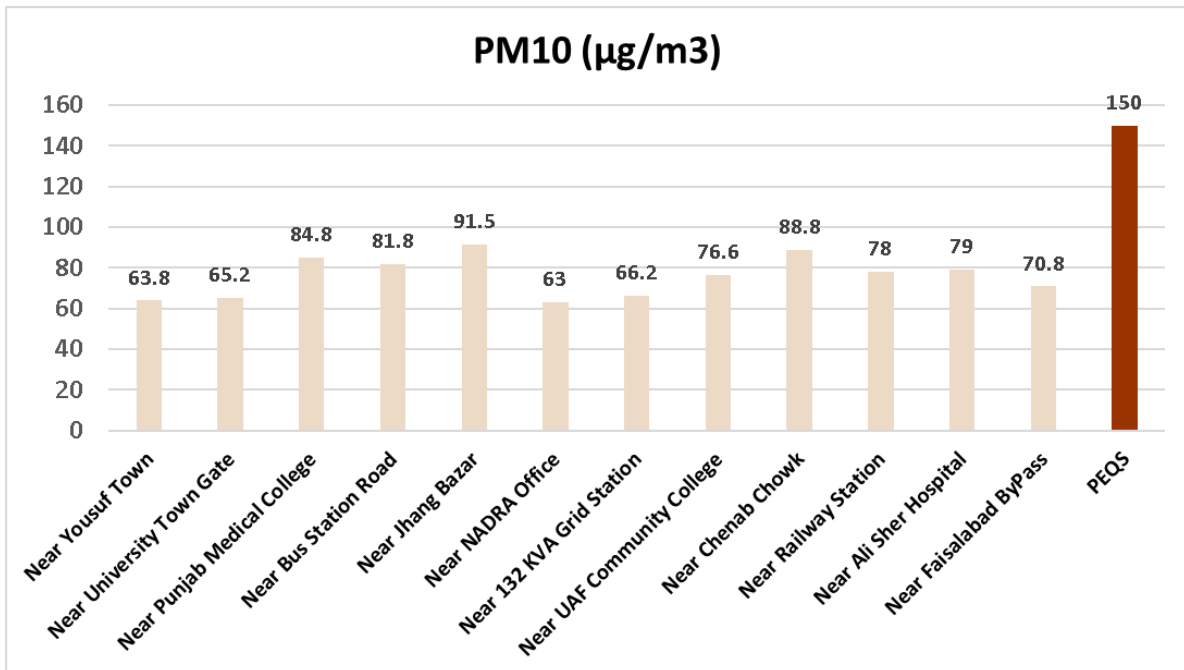


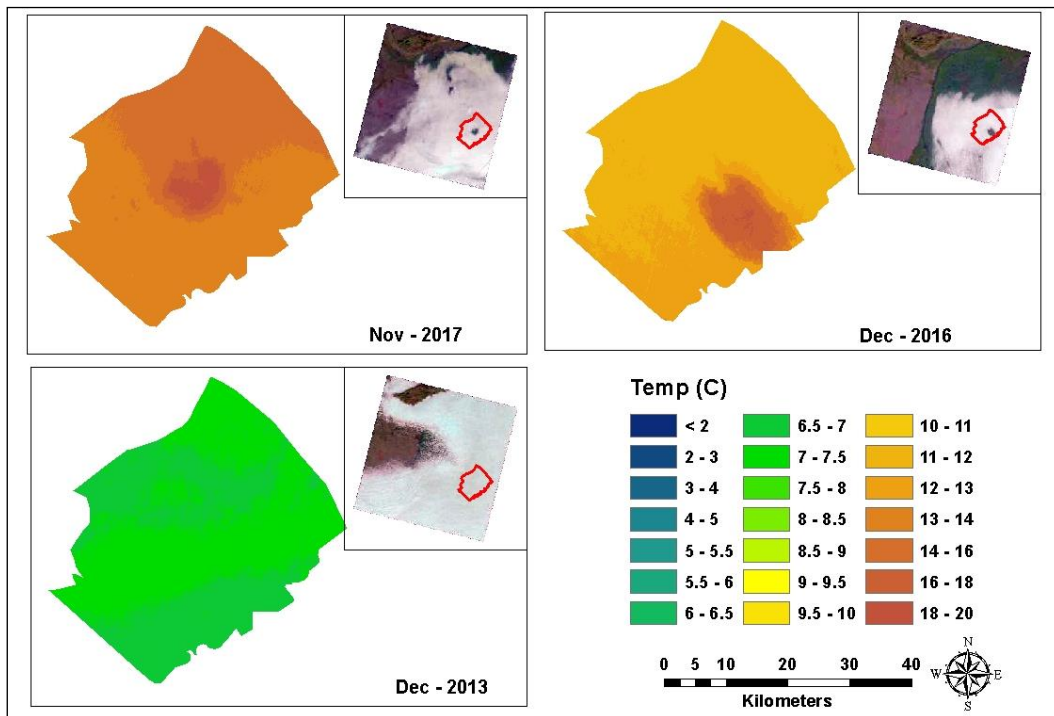
Figure 1-9: PM<sub>10</sub> levels at Faisalabad monitored by Consultant at the selected sites

### 1.1.2 Smog Analysis

Smog in Punjab is quite obvious phenomenon in winter for the last two decades. Various studies have linked the recent worsening of air quality to the burning of rice stubbles in the

Indian states of Punjab, Haryana and Uttar Pradesh. During 2016 alone, around 32 million tons of rice stubble was estimated to be burnt in Indian Punjab<sup>3,4</sup>.

Recent studies on assessment and mapping of aerosol point sources indicate that 65% of the aerosol sources were detected within Pakistan which means most of the sources are located within Pakistan<sup>5,6</sup>. The major portion of total air pollutant emissions are coming from the transport sector that holds 43% share in all sectors (power, industry, transport, and crop residue burning - CRB). The second key sector responsible for air pollutant emissions in Punjab is industry whose share is 25%. The sector at number three is agriculture (mainly considering rice residue burning including transboundary rice burning). It accounts for 20% of total air pollutant emissions with respect to other sectors.



**Figure 1-10: Variation of surface temperature in smog situation**

For a candid analysis, we have chosen Landsat-8 Data to observe thermal data and moisture variations of smog in Faisalabad. In total, three Landsat-8 scenes of the years 2013, 2016 and 2017 during winter season were downloaded and processed for surface temperature and moisture analysis (**Figure 1-10** and **Figure 1-11**). The results show an increasing trend in surface temperature whereas a decreasing trend was witnessed in moisture content from 2013 to 2016. The decrease in moisture shows that in the past few years the smog contains more smoke in the atmosphere that is lethal to human health.

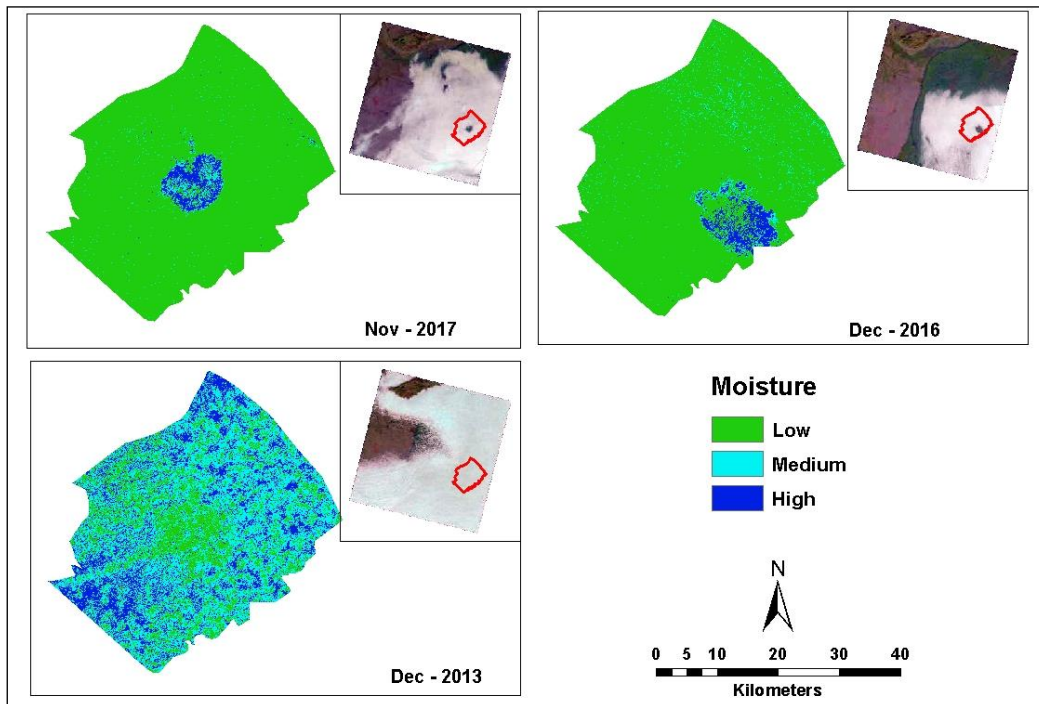
3 The Punjab Clean Air Action Plan

[https://epd.punjab.gov.pk/system/files/Annex%20D2%20Punjab%20Clean%20Air%20Action%20Plan\\_0.pdf](https://epd.punjab.gov.pk/system/files/Annex%20D2%20Punjab%20Clean%20Air%20Action%20Plan_0.pdf)

4 Walid, I. (2018). Report of the Smog Commission. 16(34789).

5 FAO, 2019, <http://www.fao.org/pakistan/news/detail-events/en/c/1179183/>

6 FAO. (2018). Remote sensing for spatio-temporal mapping of smog in punjab and identification of the underlying causes using gis techniques (r- smog).



**Figure 1-11: Variation of surface moisture in smog situation**

### 1.1.3 Noise Quality

The major sources of noise in Faisalabad are the vehicular traffic, construction activities and industrial noise. It reaches on its peak during daytime. For the documentation of the existing conditions, the noise levels were monitored, with a portable digital sound meter (Class-1), at 12 locations. The measurements were recorded 7.5-m from the edge of the carriageway and 1-m above ground level. The measurements were recorded by the Consultant through SUPARCO's Environmental Laboratory and are shown separately for day and night. During day time, the maximum level of noise (86 dBA at 10:00 hrs) ascertained in Faisalabad was recorded at Near Chenab Chowk, whereas, the minimum reading was recorded at Near UAF Community College. No site has noise level greater than PEQS recommended values on average in day time. The highest average noise level (75.88 dBA) was recorded at near Chenab Chowk, whereas, the minimum average noise level (58.59 dBA) was recorded at UAF Community College. All sites have noise levels greater than PEQS noise level, when maximum value was recorded from hourly reading. Six sites (near Punjab Medical College, near Faisalabad by Pass, near Jhang Bazar, near Bus Station Road, near Railway Station, and near Chenab Chowk) showed higher levels of noise as compared to PEQS on hourly average.

During night hours, the highest noise level (88 dBA at 03:00 hrs) was recorded at Chenab Chowk which was higher than PEQS. As compared to PEQS, all sites contain higher noise levels on hourly and average basis. Noise level estimation reveals that Chenab Chowk is the most polluted site with higher noise level in both day and night time followed by Railway Station. The least polluted site is UAF Community College both in day and night-time.

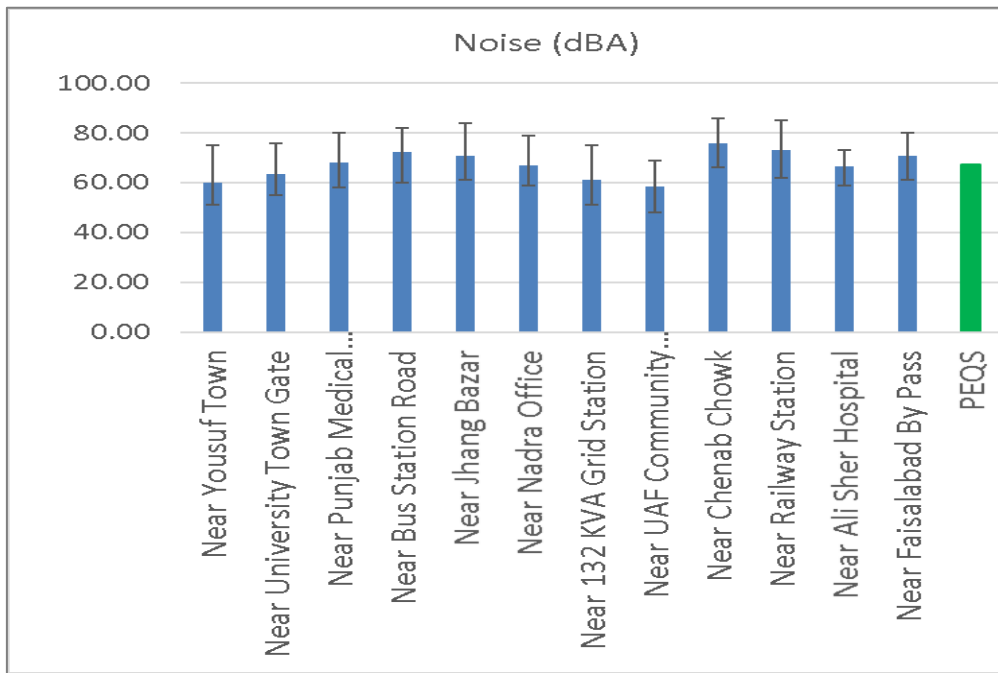


Figure 1-12: Noise Levels Observed at Day Time

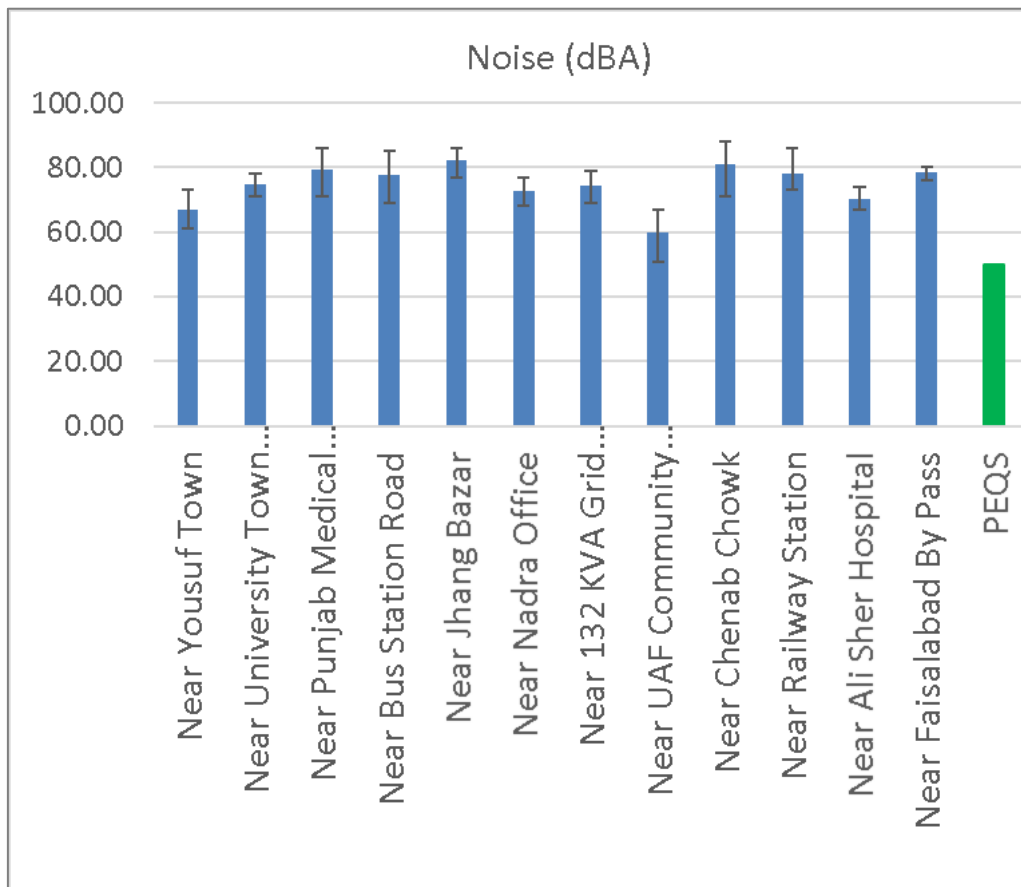


Figure 1-13: Noise Levels Observed at Night Time

## 1.1.4 Water Quality

### 1.1.4.1 Surface and Drinking Water

In the year 2019, monitoring at forty-eight (48) locations in Faisalabad was carried out for drinking water quality and thirty-seven (37) locations for surface water quality under a study<sup>7</sup>. The analysis revealed unsatisfactory results (Table 1-3 and Table 1-4) of safe drinking water supply to the people of Faisalabad due to chemical and bacteriological contamination. In total, twenty-seven (27) parameters were assessed for drinking water quality out of which ten (10) parameters are not under safe limits including Magnesium, Chloride, Sodium, Phosphate, Total Dissolved Solids, Nickel, Total *Coliform* and *E.coli*. For surface water quality, twenty-five (25) parameters were ascertained out of which three (03) parameters were above safe limits including fluoride, chromium, and *E.coli*. High levels of pollutant in drinking water showing contamination in the ground water and mixing of pollutants during water distribution system in Faisalabad as the surface water bodies have only four parameters beyond the safe limits.

**Table 1-3: Surface water quality of Faisalabad**

S.No.	Parameters	Unit	Results		PEQS	WHO Guideline Values
			Mean $\pm$ SD	Min - Max		
1	Temperature	°C	28.39 $\pm$ 2.21	25.9–31.9	-	-
2	pH	-	7.91 $\pm$ 0.26	7.5–8.6	6.5 - 8.5	6.5 - 8.5
3	Dissolved Oxygen	mg/l	4.44 $\pm$ 0.84	3.45–5.98	6	4-6
4	EC	$\mu$ S/cm	297 $\pm$ 108	134–457	-	250
5	Alkalinity	mg/l	96.08 $\pm$ 32.81	30–145	-	< 120
6	Turbidity	NTU	32.21 $\pm$ 18.95	7.2–65	<5	<5
7	Calcium (Ca)	mg/l	27.54 $\pm$ 4.13	23–34	-	75
8	Magnesium (Mg)	mg/l	28.97 $\pm$ 8.64	15–58	-	50
9	Total Hardness	mg/l	80.38 $\pm$ 17.23	56–106	<500	10-500
10	Chloride (Cl)	mg/l	85.96 $\pm$ 36.04	50–180	<250	250
11	Sodium (Na)	mg/l	114.5 $\pm$ 106.2	21–398	200	200
12	COD	mg/l	39.76 $\pm$ 7.52	23–50	-	-
13	Sulphate (SO <sub>4</sub> )	mg/l	22.65 $\pm$ 2.78	20–28	<250	250
14	Nitrates (NO <sub>3</sub> )	mg/l	3.91 $\pm$ 0.80	3.1–5.6	$\leq$ 50	50
15	Nitrates (NO <sub>2</sub> )	mg/l	0.14 $\pm$ 0.06	0.02–0.34	-	-
16	Total Dissolved Solids (TDS)	mg/l	252 $\pm$ 128	123–564	<1000	<1000
17	Iron (Fe)	mg/l	1.06 $\pm$ 0.43	0.32–1.89	-	-
18	Fluorides (F)	mg/l	3.49 $\pm$ 0.74	1.3–4.8	<1.5	1.5
19	Arsenic (As)	mg/l	0.01 $\pm$ 0.02	0.001–0.08	<0.05	0.01
20	Aluminum (Al)	mg/l	0.09 $\pm$ 0.05	0.01–0.19	-	-

<sup>7</sup>Mahfooz, Y., Yasar, A., Sohail, M.T. et al. Environ Sci Pollut Res (2019) 26: 20853. <https://doi.org/10.1007/s11356-019-05367-9>.



S.No.	Parameters	Unit	Results		PEQS	WHO Guideline Values
			Mean $\pm$ SD	Min - Max		
21	Antimony	mg/l	0.18 $\pm$ 0.05	0.123–0.288	-	-
22	Barium (Ba)	mg/l	0.68 $\pm$ 0.07	0.6–0.8	-	-
23	Chromium (Cr)	mg/l	0.24 $\pm$ 0.08	0.11–0.4	<0.05	0.05
24	Selenium (Se)	mg/l	0.21 $\pm$ 0.08	0.09–0.37	-	-
25	E.coli	-	479.46 $\pm$ 161.42	210–620	0/100 mL	0/100 mL

(Source: Mahfooz et al. 2019)

**Table 1-4: Drinking water quality of Faisalabad**

S. No.	Parameters	Unit	Results		PEQS	WHO Guideline Values
			Mean $\pm$ SD	Min - Max		
1	pH	-	6.93 $\pm$ 0.16	6.7–7.3	6.5 - 8.5	6.5 - 8.5
2	Dissolved Oxygen	mg/l	6.71 $\pm$ 0.42	5.6–7.3	6	4-6
3	EC	$\mu$ S/cm	1993 $\pm$ 1267	201–4970	-	6-Sep
4	Alkalinity	mg/l	7.67 $\pm$ 2.99	2–18.2	-	< 120
5	Turbidity	NTU	1.86 $\pm$ 0.57	1.09–3.32	<5	<5
6	HCO <sub>3</sub>	mg/l	385 $\pm$ 208	100–910	-	-
7	Calcium (Ca)	mg/l	64.4 $\pm$ 25.1	24–184	-	75
8	Magnesium (Mg)	mg/l	56.04 $\pm$ 38.3	7.29–211.4	-	50
9	Total Hardness	mg/l	392.8 $\pm$ 222	130–1330	<500	10-500
10	Chloride (Cl)	mg/l	431 $\pm$ 343	7.09–1418	<250	250
11	Sodium (Na)	mg/l	406.7 $\pm$ 278	0.7–1040	200	200
12	Potassium (K)	mg/l	3.75 $\pm$ 2.3	0.2–9		
13	Sulphate	mg/l	0.90 $\pm$ 0.76	14–1020	<250	250
14	Nitrates (NO <sub>3</sub> )	mg/l	2.75 $\pm$ 1.77	0.12–7.2	$\leq$ 50	50
15	Phosphate (PO <sub>4</sub> )	mg/l	0.22 $\pm$ 0.13	0.01–0.55	-	0.05
16	Total Dissolved Solids	mg/l	1275.5 $\pm$ 773	128.6–3181	<1000	<1000
17	Iron (Fe)	mg/l	0.09 $\pm$ 0.07	0.01–0.34	-	-
18	Fluorides (F)	mg/l	1.02 $\pm$ 0.52	0.35–1.91	<1.5	1.5
19	Arsenic (As)	mg/l	0.03 $\pm$ 0.03	0.0014–0.137	0.01	<0.05
20	Copper (Cu)	mg/l	0.22 $\pm$ 0.16	0.05–0.56	2	2
21	Zinc (Zn)	mg/l	0.90 $\pm$ 0.76	0.002–2.1	5	3
22	Cadmium (Zn)	mg/l	0.002 $\pm$ 0.00	0.001–0.007	0.01	0.003
23	Chromium (Cr)	mg/l	0.005 $\pm$ 0.00	0.002–0.01	<0.05	0.05
24	Lead (Pb)	mg/l	0.001 $\pm$ 0.00	0.001–0.001	<0.05	0.01

S. No.	Parameters	Unit	Results		PEQS	WHO Guideline Values
			Mean $\pm$ SD	Min - Max		
25	Nickel (Ni)	mg/l	0.04 $\pm$ 0.03	0.007–0.1	<0.02	0.02
26	Total Coliform	-	114 $\pm$ 16.4	90–140	0/100 mL	0/100 mL
27	<i>E. coli</i>	-	106 $\pm$ 12.7	90–120	0/100 mL	0/100 mL

(Source: Mahfooz et al. 2019)

#### 1.1.4.2 Wastewater

Wastewater is generated by the domestic, industrial and commercial sectors in Faisalabad. With the increased human activities, there has been a corresponding rise in the amount of wastewater generation in the city. Therefore, Faisalabad is intended to collect domestic / municipal wastewater/sewage that is drained to the nearby trunk sewers through a developed branch or secondary sewers from which it is finally disposed-off in the Chenab River through Paharang drain or Ravi River through Madhuana drain after treatment. There are two sewerage treatment plants in Faisalabad called Chokera and Jaranwala sewerage treatment plants. However, currently only Chokera wastewater treatment plant is in operation to discharge domestic and industrial wastewater through drains/nullahs of varying lengths. The drains are managed by Irrigation Department. The capacity of this wastewater treatment plant is very limited as compared to the total quantity of wastewater generated by Faisalabad. As a result, major share of wastewater is directly discharging into the rivers through drains without any treatment. In Faisalabad, mostly in peri urban areas, the sewage is disposed-off onto the open lands in the form of ponds, there lies the likelihood of epidemiological outbreaks in the surrounding communities due to the odor arising from them and the germs and microbes breeding in them. There are about 1,644 large, medium and some small industrial units in the district. The industrial wastewater discharges into the receiving bodies after its treatment. The basic purpose of its treatment is to clean wastewater before its final discharge into the receiving water body as per Punjab Environmental Quality Standards (PEQS) of Pakistan. The initial treatment of final effluent is the responsibility of the polluter as per the Punjab Environmental Protection Agency regulations.

#### 1.1.5 AVAILABILITY / CURRENT STATE OF URBAN GREEN SPACE

An Urban green space is defined as a collection of tree, shrubs and groundcover that grow within a city. Faisalabad's green spaces cover is only 2 per cent of its land area (**Figure 1-14**), which is quite below as compared to the international standards. The urban green spaces provide ecological services that contribute significant to the quality of life, including improved local air quality, water quality control, energy conservation and recreational opportunities. Trees also increase urban property values, reduce noise impacts, and provide stormwater management and erosion protection for our rivers and streams. Extending from street trees to backyards and parks, forests and valleys, trees contribute to safe, walkable and beautiful communities that reduce our stress and create stronger community connections between people and the natural environment.

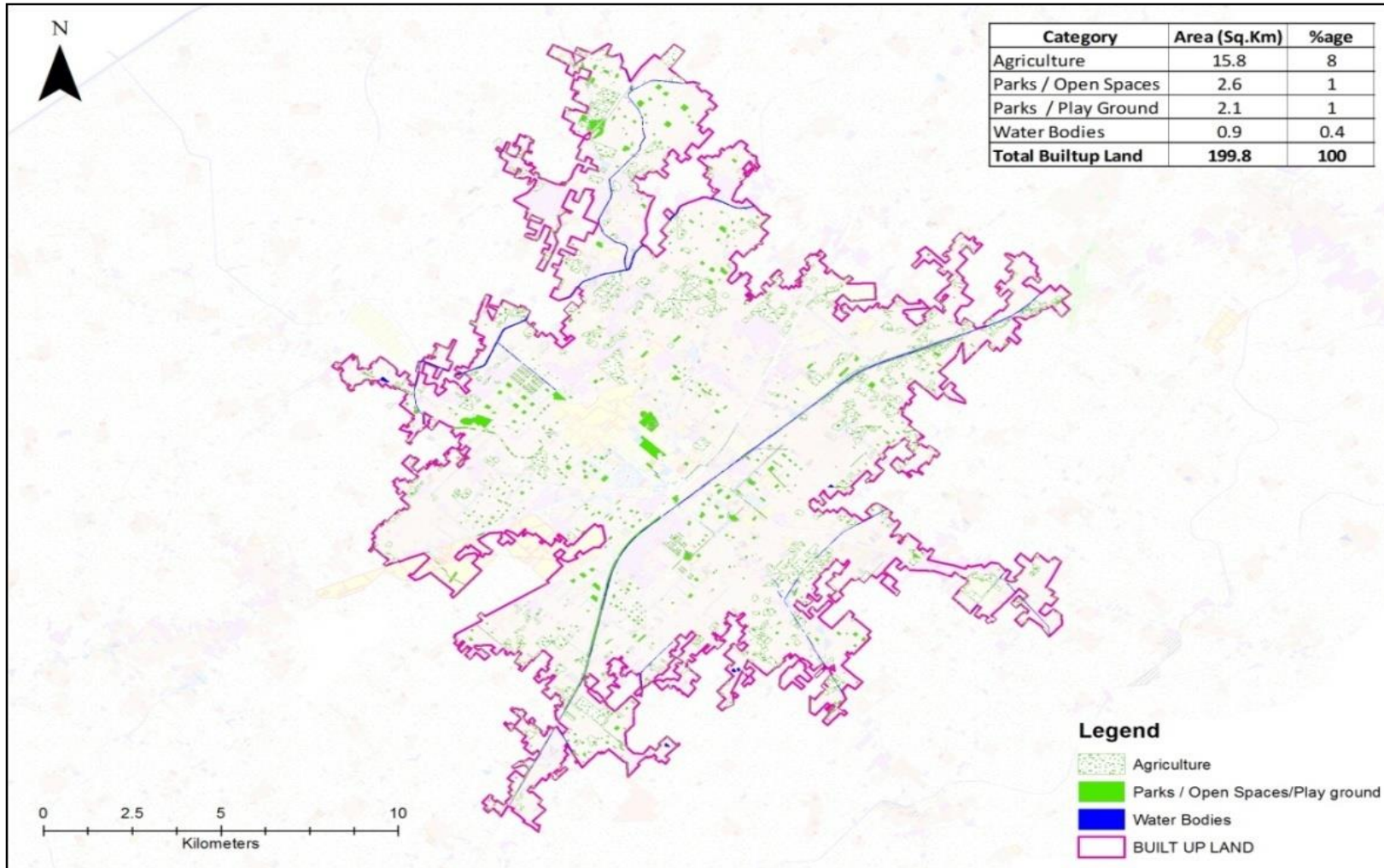


Figure 1-14: Existing urban green spaces in Faisalabad within City built-up limits

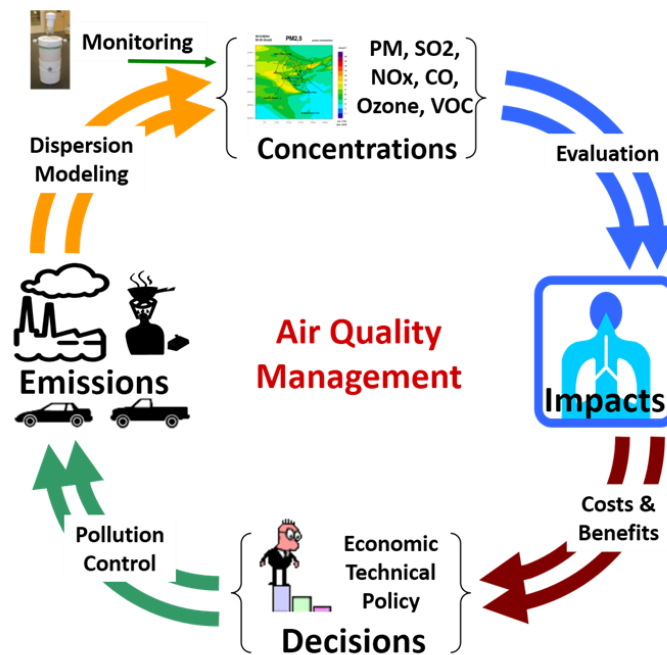


**Figure 1-15: Major Green Areas and Habitats: a) Canal Wetland; b) Agricultural Land; c) Urban Built-up Land and d) Forest in Faisalabad City**

## 1.2 PLAN AND PROPOSALS

### 1.2.1 Air Quality Improvement Plan

Clean air is essential for all forms of life. Generally, clean air is of good quality, has no harmful pollutants or emissions in it and is safe to breathe. Human activities such as transportation, generation of electricity and emissions from industrial processes can all contribute to reduced air quality. Air pollution can have significant negative impacts on human health.



Environmental impacts may include to reduced growth and productivity of vegetation as well as impacts on fish and wildlife. Related to air quality is a greenhouse gas emission (GHG), gases which absorbs radiation from the sun and traps heat in the atmosphere. To protect local air quality as well as mitigate climate change, it is important to reduce emissions.

Following precaution measures needed to be implemented for curbing air pollution in Faisalabad.

1. Creation of public awareness and education about Air pollution impacts and preventive measures on local news channel and cable network
2. Developed plans at CDGF level for plantation of Urban forest in close vicinity of City area using Prime Minister's programme Ten Billion Trees Tsunami funds.
3. Increase urban vegetation which can directly and indirectly affect local air quality by altering the urban atmospheric environment. The four main ways that urban trees affect air quality are:
  - a. Temperature reduction and other microclimatic effects
  - b. Removal of air pollutants
  - c. Emission of volatile organic compounds and tree maintenance emissions
  - d. Energy effects on buildings
4. Restrict conversion of vehicles from gasoline to second-hand diesel engines and Stricter testing & controls on vehicle emissions
5. Introduction of low-sulphur diesel and promotion of alternative fuels such as CNG, LPG and mixed fuels
6. Issues of affordable price in public transport and attractiveness of fares and services should be addressed urgently to reduce vehicular pollution
7. Resolve bottlenecks at busy traffic roads through signal free corridors. The slow traffic issues in urban areas contributing to huge quantities of GHG emissions, and also in wastage of petroleum products
8. Enforce compulsory greening around factories and in buffer zones

9. Setting up of continuous monitoring stations to record pollution or GHG levels in ambient air at major road
10. Improvement of energy efficiency in vehicles. With a view to reducing vehicular air pollution, vehicle manufacturers are introducing new vehicles in the market with eco-friendly alternative fuels like electricity, Battery operated etc. which has less or zero emission of pollutants
11. Modify transportation systems and traffic plans on the basis of traffic density maps
12. Establish public/rapid transit systems like Bus Rapid Transit System and Metro Train in Faisalabad to reduce air emission per passenger kilometre
13. Enforce the development of new industries away from the city centres.
14. Encourage the shifting of industries located in the city centres to outskirts.
15. The best practices to control air pollution from industrial sector across the globe include: adoption of green technologies, adoption of 5R strategy, shifting of polluting industries to less populated and less sensitive area, control of emission by required air pollution control equipment and development of green belt over larger area
16. Green tax could be imposed on fuel and electricity usage as well which can be used for growing trees
17. Introduce Bicycle lanes along secondary and tertiary streets
18. Restrict vehicles in city centres and develop parking plazas near market places
19. Develop, expand and maintain a connected network of safe bicycling and walking facilities around city centres (clock towers)



Figure 1-16: Vehicle bans in city center

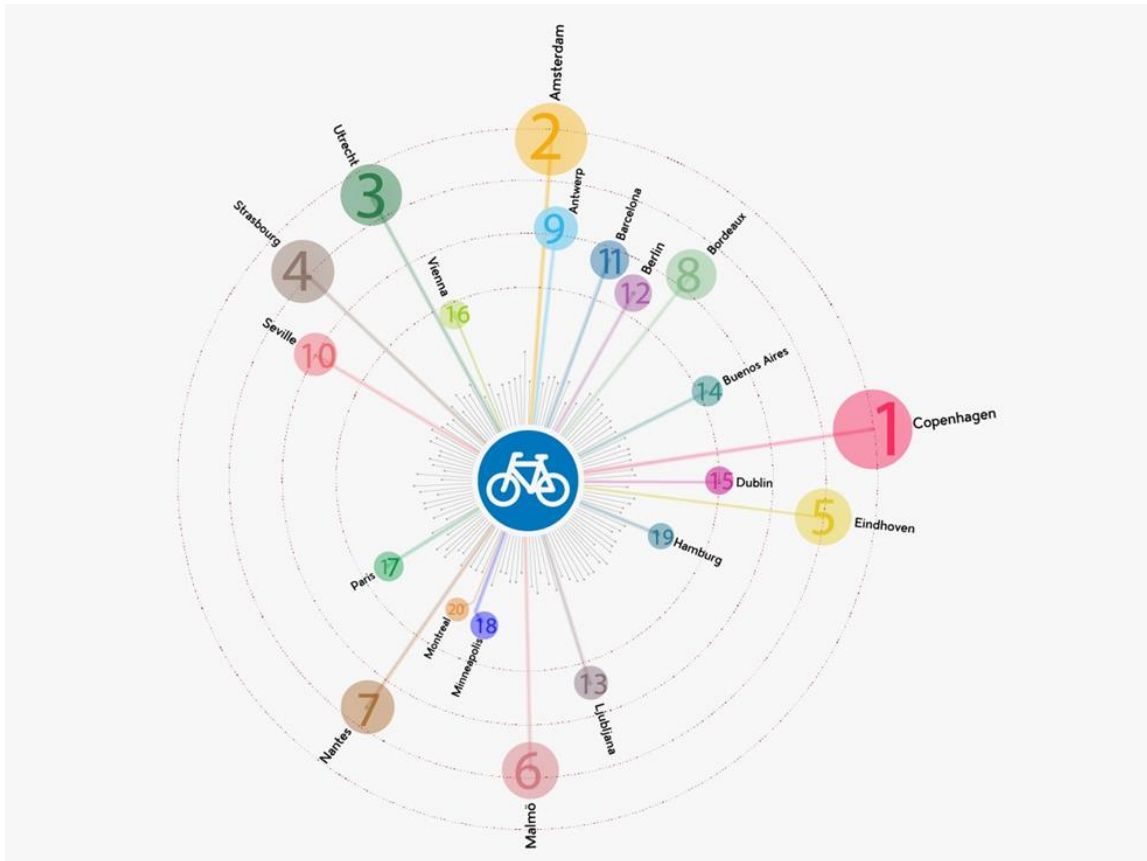


Figure 1-17: Bicycle friendly countries



AMSTERDAM, NETHERLANDS



BUDAPEST, HUNGARY



BARCELONA, SPAIN



DUBLIN, IRELAND

Figure 1-18: Bicycle system in some major cities of world

### 1.2.1.1 Smog Control Measures

1. For the control of smog in Faisalabad, air quality improvement plan is highly recommended. For the implementation, the adequate government regulation, public awareness, regional collaboration, and industrial compliance are keys to successfully controlling of air pollution including smog.
2. Develop strategies to reduce cross-border air pollution at the Punjab Government level.
3. Plant sensitive species in the vicinity of brick kilns or industrial emission areas for amelioration of degraded environment and to cope with air pollution problems.
4. Impose a ban on agricultural waste burning from November to February in Faisalabad and surrounding districts.
5. Government of Punjab must take immediate measures to control the menace by considering Punjab, especially, central Punjab as a single unit.

### 1.2.2 **Noise Quality Improvement Plan**

Noise pollution can be controlled by the following methods:

#### 1.2.2.1 Industrial Sector

1. Improvement in operation of machineries.
2. Enforce Installation of noise barriers at all industries where the noise levels exceed permissible limits. Especially at all industries located in close vicinity of residential areas.
3. Development of green areas that can also help in reducing urban noise levels to great extent.
4. Protection of green area by the concerned authority, which is otherwise being encroached for slums and illegal use by private occupants.
5. Improvement in operation of machineries.
6. Plantation of tree rows along train tracks passing through the residential and commercial areas.
7. Monitor and enforce noise standards in industrial areas.

#### 1.2.2.2 Residential Areas

1. Traffic signs are required to place on obvious points, especially, near hospitals, schools and residential areas.
2. Vehicle horns and especially pressure horns must be prohibited within city areas.
3. Control of vehicle speed and maintenance of streets can limit general traffic noise
4. Imposition of restrictions of traffic hours.
5. Imposing restrictions of operation hours for various urban functional zones.
6. Implement zoning controls and other land use policies to limit or avoid the proximity of noisy and noise-sensitive uses.
7. Subsidize acoustical retrofits (e.g. double pane windows, mechanical ventilation) for existing residential buildings near traffic noise sources.
8. Encourage electric vehicles in private and public transport to help reduce the noise at residential areas.
9. Establishment of suitable buffer zones around residential areas in order to insulate from noise emanating areas such as industrial, commercial, road, railway traffic, etc.
10. Implement and enforce policies limiting the use of construction equipment at night
11. Adopt building standards to require quiet interior.

#### 1.2.2.3 Commercial Areas

1. Setting up of road noise barriers, where appropriate
2. Ensure machinery and equipment installed in new buildings as quiet as possible



3. Implement and enforce noise standards for loud machinery and equipment and can restrict on the use, location, or timing of specific equipment or activities
4. Municipalities can purchase quieter public service and transit vehicles (e.g., electric and hybrid buses). They can also monitor and regulate private refuse service vehicles
5. Implement and enforce policies limiting the use of construction equipment at night.

### 1.2.3 Water Quality Improvement Plan

Access to clean potable water needs to be recognized as a limited resource. New integrated water management approaches that encompass the economic, social and environmental benefits of water conservation and water quality protection are critical to address this vital resource. Faisalabad's water objectives and related actions relate to managing water resources through:

- a. **Potable Water Conservation** – reducing consumption and encouraging wise use of potable water.
- b. **Water Resource Management** – protecting and enhancing Faisalabad's watersheds to improve water quality.
- c. **Storm water Management** – increasing the use of captured or recycled site water and reducing and managing storm water runoff with proper rainwater harvesting techniques.
- d. **Wastewater Treatment** – protecting exiting water resources from contamination and reduction in water usage.

#### 1.2.3.1 Potable Water Conservation

Cities largely depends on clean water for drinking, a healthy natural environment, recreation, household and commercial uses, sewage treatment and many other functions. WASA Faisalabad is responsible for treating and distributing potable water supply, which is drawn from rivers and underground resources. The conservation of drinking water should be ensured by the following measures;

1. Develop official plan policies to promote urban development forms including buildings and facilities that support reduced water consumption
  - a. Develop policies and standards requiring new development applications to submit a water conservation plan that details proposed water reduction targets, tactics and water saving devices
  - b. Develop a plan to install water conserving technology and/or retrofit low-flow fixtures
  - c. Implement wastewater and grey water demonstration projects (e.g., grey-water recycling, composting toilets)
2. Work with people to communicate the value of water and its conservation
3. Work with municipality to expand current education about potable water demand and use including the impact of water use on watershed resources, cost of treating and distributing water, current lawn watering regulations and the use of potable water for swimming pools, etc.
4. Monitoring surface water quality in Faisalabad
5. Monitoring potable water consumption of residential and industrial/commercial /institutional users
6. Support Landscaping Program that encourages the planting of native species to reduce watering requirements for residents, industrial, commercial and institutional land uses

7. Support the WASA to systematically reduce leakage in the water distribution systems
8. Monitoring total water losses includes reviewing all unmetered water such as metering inaccuracies, data handling errors, unmetered City operations as well as water thefts, pipe leakages and water main breaks
9. Collect and reuse swimming pool and mosque's ablution area water to irrigate local parkland and sports fields, as appropriate

### 1.2.3.2 Water Resource Management

Management and improvement of water resources begins at the watershed scale. A watershed is an area of land including its inhabitants and communities, agricultural, open space and natural areas that are connected by water draining to a common stream or river. Faisalabad consists of two major sub-watersheds –Chenab and Ravi Rivers. In Faisalabad, rainwater should be managed as a resource, not as a management impact. This section outlines actions related to protecting, restoring and enhancing natural heritage features, such as wetlands, lakes, rivers and streams, open spaces and parkland and green infrastructure to ensure clean water reaches groundwater and surface water features.

1. Work with Conservation Authorities to develop an education and awareness campaign about the water quality impacts of storm water runoff from private properties, including issues from fertilizers, pesticides, car washing, pets, swimming pool care, etc.
2. Collaborate with other levels of government, research institutions, conservation organizations, etc. to undertake monitoring efforts that support watershed monitoring
3. Undertake and update sub-watershed studies with the conservation agencies and community groups to maintain, restore and enhance sub-watershed health
4. Identify new initiatives to improve watershed biodiversity and connectivity
5. Develop a pilot project that captures rainwater to irrigate City sport fields and parks
6. Encourage the development of plans to manage storm water runoff as a resource to irrigate active recreation lands
7. Develop a strategy to plant demonstration rain gardens in city parks, gateway features and boulevards
8. Develop and implement a comprehensive channel remediation and stream restoration strategy in conjunction with the local communities and stakeholders

### 1.2.3.3 Stormwater Management

Stormwater management is a highly serious issue in Faisalabad City, which is reflected in the recent rainfalls of August 2021. Most of the lowlying areas were flooded with water and paralysed the city life. Stormwater management involves integrated best practices, from sediment and erosion control, to quantity and quality control facilities, to measures that can be implemented in front and rear yards, parking lots and along roads, and pollution prevention. Most of these efforts are intended to provide efficient water management to protect life and property from the hazards of stormwater and flooding. Furthermore, to protect natural features that are reliant on clean surface and groundwater, particularly streams and wetlands that provide sensitive fish and wildlife habitat.

1. Protect, preserve and enhance our urban natural areas and wetlands which naturally provide flood control
2. Construct a Rainwater Harvesting Reservoir in the Low elevation area of the City.
3. Develop a residential storm water management utilities fee to help fund storm water management retrofits and maintenance
4. Continue to acquire data to inform the condition and functional performance of the network (i.e., fog testing, zoom camera)

5. Continue to use parks for temporary excess rainwater storage and low impact development features to deter basement flooding
6. Investigate funding mechanisms on a cost recovery basis for storm water management
7. Develop and implement a storm water management facility maintenance strategy
8. Undertake low impact development projects and strategies such as rain gardens, porous pavement, etc. as part of road or parking lot reconstruction projects
9. Confirm funding to maintain and monitor low impact development features
10. Encourage downspout disconnection and basement flooding subsidy program
11. Acquire lands to enhance flood protection
12. Establish guidelines that will require the City to consider the installation of a green roof for the reconstruction and/or replacement of existing roofs at City owned buildings and facilities.



**Figure 1-19: Low-lying Areas of Faisalabad City during the August 2021 Rainfall**

#### 1.2.3.4 Wastewater Treatment

1. Control of industrial pollution should start with proper location of industries
2. The protection of existing water holding reservoir in industries is one of the good practices, which can be replicated
3. Industry may be encouraged to provide complete recycle/reuse system for water conservation, preferably by adopting Zero Liquid Discharge facility
4. Invest in existing sewers and wastewater treatment plant infrastructure
5. Install decentralized waste treatment plants in designated places
6. Reduce water pollution discharges from City operations
  - a. Buy and use product alternatives with lower toxic levels (for example, natural fertilizers, such as compost or peat, environmentally friendly cleaning products)
  - b. Decrease pesticide use in City parks and where necessary, continue to use herbicidal vinegar where practical
  - c. Increase recycling in order to reduce waste going to landfills or waterways
  - d. Identify tree planting opportunities adjacent to water courses in an effort to improve the water quality before storm water runoff
7. Other sectors like vehicle service centers and meat shops should be encouraged to have minimum treatment system, before discharging the wastewater in to sewers for final treatment
8. Vehicle service should be encouraged with no or little water usage to conserve the water resource
9. Reduce the freshwater consumption in urban centers through efficient scientific sewage treatment system and proper recycle/reuse facilities

#### 1.2.4 Urban Green Space Improvement Plan

The urban green space of Faisalabad city shall be enhanced using the following measures;

1. Update landscape standards and guidelines to increase tree planting requirements for new residential, commercial, industrial, institutional sites, parks and road projects
2. Review and update the Faisalabad's urban forest study every 10 years, including the urban forest canopy assessment and recommendations for urban forest improvements
3. Develop an urban green space management strategy for Faisalabad city using Prime Minister's programme Ten Billion Trees Tsunami funds.
4. Establish a baseline and monitoring protocol for the total number of trees planted on City-owned land per year.
5. Increase urban vegetation which can directly and indirectly affect local air quality by altering the urban atmospheric environment. High-resolution air photos of the City and surrounding areas taken every five years will inventory and monitor trees, parks and natural areas
6. Develop a communication strategy to educate residents on the benefits of Faisalabad's urban green spaces and how they can assist in maintaining its health
7. Implement the tree plantation campaign through annual funding and staff resources and undertaking community plantings in parks and open spaces, etc.
8. Develop policies to encourage private property community gardens in areas of high density in collaboration with businesses, institutions, etc.
9. Promote the use of native indigenous plants in parks as well as to the public
10. Actively seek out opportunities to increase and protect parkland, natural areas and naturalize spaces especially in locations where there is a deficit in the amount of green space
11. Create incentives for the planting of native tree species and the preservation of existing trees; for example:
  - a. Encourage species diversification and lead by example through various tree planting events with local partners
  - b. Encouraging companies to donate trees and celebrate the achievements we have made with other corporate sponsors
  - c. Communicate with developers who approach the City in order to preserve trees
12. Extension of existing parks and development of new orchards, agro farms, zoo and botanical Garden
13. Increase the amount of naturalized areas within parks
14. Review tree species for viability under a changing climate and adjust tree planting practices accordingly
15. Develop a GIS based priority planting tool to assist municipal staff and community partners to identify planting sites to maximize urban forest benefits across the city
16. Undertake and maintain an inventory of all street and park trees
17. Work with surrounding municipalities to plan for and strengthen natural linkages across municipal boundaries
18. Develop and implement a coordinated invasive species control program across City departments
19. Continue to identify and track new invasive species and develop strategies to minimize their impact
20. Develop strategies for other invasive species in parks and natural areas
21. Naturalize and expand urban forest and canopy cover using native species where appropriate
22. Identify issues that are currently impairing the quality of the natural area (i.e., habitat fragmentation/degradation, invasive species, incompatible human uses, littering, vandalism, erosion, etc.)

23. Promote the planting of flowering trees, fruit trees, or pollinator tree species where appropriate
24. Work with conservation authorities to partner with community associations, school boards and residents to plant trees on their properties, including greening parking lots
25. Continue to implement species at risk protection measures in all areas of Faisalabad and develop strategies to improve their status
26. Provide multi-use buffer zones around natural areas and parks
27. Plan for dense shade in parks, playgrounds, spectator areas of sports fields and other public spaces frequented by children and vulnerable populations
28. Ensure active transportation routes are planned with natural shade
29. Explore the potential for a private tree cutting by-law as well as the effectiveness of other Municipal tree cutting by-laws

#### 1.2.4.1 Plant Species of Faisalabad

Native plant species of Faisalabad recommended to be planted are shown in **Table 1-5**.

**Table 1-5: Recommended Indigenous Plant species in Faisalabad**

Sr.#	Botanical Name / Habit	Local Name
1	Averrhoa carambola Linn.	Kamrnga
2	Bombax ceiba Linn.	Simbal
3	Cordia gharaf (Forssk.) Ehren. Ex Asch.	Liyaar
4	Cordia myxa Linn.	Lasura
5	Ehretialaevis Roxb.	Koda
6	Oroxylum indicum (Linn.) Vent.	Talwar phali
7	Bauhinia racemosa Lamk.	Jhinjera
8	Cassia fistula Linn.	Amaltas
9	Crataeva adansonii DC.	Berna
10	Terminalia arjuna (Roxb. ex DC.) Wt. & Arn.	Arjun
11	Terminalia bellirica (Gaertn.) Roxb.	Bahra
12	Terminalia chebula Retz.	Harar
13	Ricinus communis Linn.	Arind
14	Pongamia pinnata (Linn.) Merrill	Sukhechain
15	Tecomella undulata (Roxb.) Seeman.	Lahura
16	Azadirachta indica (Linn.) A. Juss.	Neem
17	Cedrela toona Roxb. ex Willd.	Tun
18	Chukrasia tabularis Adr. Juss.	Dalmara
19	Melia azedarach Linn.	Bakiain
20	Swietenia macrophylla	King
21	Acacia modesta Wall.	Phulahi
22	Acacia nilotica (Linn.) Delile.	Desi Kikar
23	Albizia lebeck (Linn.) Benth.	Siris
24	Albizia procera (Roxb.) Benth.	Safed siris
25	Pithecellobium dulce (Roxb.) Benth.	Jangal jalebi
26	Prosopis cineraria (Linn.)	Druce
27	Prosopis glandulosa Torr.	Waliaty Jhand
28	Prosopis juliflora (Swartz) DC.	Phari Kikar
29	Ficus benghalensis Linn.	Bohr

30	Ficus racemosa Linn.	Gulhar
31	Ficus religiosa Linn.	Peepal
32	Morus alba Linn.	Tut sufaid
33	Morus nigra Linn.	Tut siah
34	Moringa oleifera	Lam.
35	Eucalyptus citriodora	Safaida
36	Nyctanthes arbor- tristis Linn.	Kuri, Har singhar
37	Phoenix dactylifera Linn.	Khajoor
38	Butea monosperma (Lam.) Taubert	Plata
39	Dalbergia sissoo Roxb.	Tali
40	Ziziphus mauritiana Lamk.	Bairi
41	Populus euphratica Olivier, Voy.	Bahan
42	Salvadora oleoides Decne.	Van
43	Salvadora persica Linn.	Pilu
44	Guazuma ulmifolia Lam.	Tanbachi St
45	Tamarix aphylla (Linn.) Karst.	Frash
46	Tamarix dioica Roxb. Ex Roth.	Ukan
47	Grewia optiva Drummand ex Burret	Dhamna
48	Salix tetrasperma Roxb.	Bed-i-laila

### 1.3 IMPLEMENTATION PLAN

PHASE	TASK	TIMELINE
<b>Air Quality Improvement Plan</b>		
<b>Phase-I</b>	<ol style="list-style-type: none"> <li>1. Creation of public awareness and education about Air pollution impacts and preventive measures on local news channel and cable network</li> <li>2. Developed plans at CDGF level for plantation of Urban forest in close vicinity of City area using Prime Minister's programme Ten Billion Trees Tsunami funds.</li> <li>3. Increase urban vegetation which can directly and indirectly affect local air quality by altering the urban atmospheric environment. The four main ways that urban trees affect air quality are:                         <ol style="list-style-type: none"> <li>a. Temperature reduction and other microclimatic effects</li> <li>b. Removal of air pollutants</li> <li>c. Emission of volatile organic compounds and tree maintenance emissions</li> <li>d. Energy effects on buildings</li> </ol> </li> <li>4. Restrict conversion of vehicles from gasoline to second-hand diesel engines and Stricter testing &amp; controls on vehicle emissions</li> <li>5. Introduction of low-sulphur diesel and promotion of alternative fuels such as CNG, LPG and mixed fuels</li> </ol>	2021-27

	<p>6. Issues of affordable price in public transport and attractiveness of fares and services should be addressed urgently to reduce vehicular pollution</p> <p>7. Resolve bottlenecks at busy traffic roads through signal free corridors. The slow traffic issues in urban areas contributing to huge quantities of GHG emissions, and also in wastage of petroleum products</p> <p>8. Enforce compulsory greening around factories and in buffer zones</p> <p><b>Smog</b></p> <p>1. For the control of smog in Faisalabad, air quality improvement plan is highly recommended. For the implementation, the adequate government regulation, public awareness, regional collaboration, and industrial compliance are keys to successfully controlling of air pollution including smog</p> <p>2. Develop strategies to reduce cross-border air pollution</p> <p>3. Government of Punjab must take immediate measures to control the menace by considering Punjab, especially, central Punjab as a single unit</p>	
<p><b>Phase-II</b></p>	<p>9. Setting up of continuous monitoring stations to record pollution or GHG levels in ambient air at major road</p> <p>10. Improvement of energy efficiency in vehicles. With a view to reducing vehicular air pollution, vehicle manufacturers are introducing new vehicles in the market with eco-friendly alternative fuels like electricity, Battery operated etc. which has less or zero emission of pollutants</p> <p>11. Modify transportation systems and traffic plans on the basis of traffic density maps</p> <p>12. Establish public/rapid transit systems like Bus Rapid Transit System and Metro Train in Faisalabad to reduce air emission per passenger kilometre</p> <p>13. Enforce the development of new industries away from the city centres.</p> <p>14. Encourage the shifting of industries located in the city centres to outskirts.</p> <p>15. The best practices to control air pollution from industrial sector across the globe include: adoption of green technologies, adoption of 5R strategy, shifting of polluting industries to less populated and less sensitive area, control of emission by required air pollution control equipment and development of green belt over larger area</p> <p>16. Green tax could be imposed on fuel and electricity usage as well which can be used for growing trees</p> <p><b>Smog</b></p> <p>4. Plant sensitive species in the vicinity of brick kilns or industrial emission areas for amelioration of degraded environment and to cope with air pollution problems</p>	<p>2028-34</p>

<b>Phase-III</b>	17. Introduce Bicycle lanes along secondary and tertiary streets 18. Restrict vehicles in city centres and develop parking plazas near market places 19. Develop, expand and maintain a connected network of safe bicycling and walking facilities around city centres (clock towers)	2035-41
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PHASE	TASK	TIMELINE
<b>Noise Quality Improvement Plan</b>		
<b>Phase-I</b>	<p><b><u>Industrial Sector</u></b></p> <ol style="list-style-type: none"> <li>1. Improvement in operation of machineries</li> <li>2. Enforce Installation of noise barriers at all industries where the noise levels exceed permissible limits. Especially at all industries located in close vicinity of residential areas</li> <li>3. Development of green areas that can also help in reducing urban noise levels to great extent.</li> <li>4. Protection of green area by the concerned authority, which is otherwise being encroached for slums and illegal use by private occupants</li> </ol> <p><b><u>Residential Areas</u></b></p> <ol style="list-style-type: none"> <li>1. Traffic signs are required to place on obvious points, especially, near hospitals, schools and residential areas.</li> <li>2. Vehicle horns and especially pressure horns must be prohibited within city areas.</li> <li>3. Control of vehicle speed and maintenance of streets can limit general traffic noise</li> <li>4. Imposition of restrictions of traffic hours</li> <li>5. Imposing restrictions of operation hours for various urban functional zones.</li> </ol> <p><b><u>Commercial Areas</u></b></p> <ol style="list-style-type: none"> <li>1. Setting up of road noise barriers, where appropriate</li> <li>2. Ensure machinery and equipment installed in new buildings as quiet as possible</li> <li>3. Implement and enforce noise standards for loud machinery and equipment and can restrict on the use, location, or timing of specific equipment or activities</li> </ol>	2021-27



PHASE	TASK	TIMELINE
<b>Noise Quality Improvement Plan</b>		
<b>Phase-II</b>	<p><b><u>Industrial Sector</u></b></p> <ol style="list-style-type: none"> <li>5. Improvement in design of machineries</li> <li>6. Plantation of tree rows along train tracks passing through the residential and commercial areas</li> <li>7. Monitor and enforce noise standards in industrial areas</li> </ol> <p><b><u>Residential Areas</u></b></p> <ol style="list-style-type: none"> <li>6. Implement zoning controls and other land use policies to limit or avoid the proximity of noisy and noise-sensitive uses</li> <li>7. Subsidize acoustical retrofits (e.g. double pane windows, mechanical ventilation) for existing residential buildings near traffic noise sources</li> <li>8. Encourage electric vehicles in private and public transport to help reduce the noise at residential areas</li> </ol> <p><b><u>Commercial Areas</u></b></p> <ol style="list-style-type: none"> <li>4. Municipalities can purchase quieter public service and transit vehicles (e.g., electric and hybrid buses). They can also monitor and regulate private refuse service vehicles</li> </ol>	2028-34
<b>Phase-III</b>	<p><b><u>Industrial Sector</u></b></p> <ol style="list-style-type: none"> <li>8. Monitor and enforce noise standards in industrial areas</li> </ol> <p><b><u>Residential Areas</u></b></p> <ol style="list-style-type: none"> <li>9. Establishment of suitable buffer zones around residential areas in order to insulate from noise emanating areas such as industrial, commercial, road, railway traffic, etc.</li> <li>10. Implement and enforce policies limiting the use of construction equipment at night</li> <li>11. Adopt building standards to require quiet interior</li> </ol> <p><b><u>Commercial Areas</u></b></p> <ol style="list-style-type: none"> <li>5. Implement and enforce policies limiting the use of construction equipment at night</li> </ol>	2035-2041

PHASE	TASK	TIMELINE
<b>Water Quality Improvement Plan</b>		
<b>Phase-I</b>	<p><b><u>Potable Water Conservation</u></b></p> <ol style="list-style-type: none"> <li>1. Develop official plan policies to promote urban development forms including buildings and facilities that support reduced water consumption                             <ol style="list-style-type: none"> <li>a. Develop policies and standards requiring new development applications to submit a water conservation plan that details proposed water reduction targets, tactics and water saving devices</li> <li>b. Develop a plan to install water conserving technology and/or retrofit low-flow fixtures</li> <li>c. Implement wastewater and grey water demonstration projects (e.g., grey-water recycling, composting toilets)</li> </ol> </li> <li>2. Work with people to communicate the value of water and its conservation</li> <li>3. Work with municipality to expand current education about potable water demand and use including the impact of water use on watershed resources, cost of treating and distributing water, current lawn watering regulations and the use of potable water for swimming pools, <i>etc.</i></li> </ol> <p><b><u>Water Resource Management</u></b></p> <ol style="list-style-type: none"> <li>1. Work with Conservation Authorities to develop an education and awareness campaign about the water quality impacts of storm water runoff from private properties, including issues from fertilizers, pesticides, car washing, pets, swimming pool care, <i>etc</i></li> <li>2. Collaborate with other levels of government, research institutions, conservation organizations, <i>etc.</i> to undertake monitoring efforts that support watershed monitoring</li> </ol> <p><b><u>Storm water Management</u></b></p> <ol style="list-style-type: none"> <li>1. Protect, preserve and enhance our urban natural areas and wetlands which naturally provide flood control</li> </ol> <p><b><u>Wastewater Treatment</u></b></p> <ol style="list-style-type: none"> <li>1. Control of industrial pollution should start with proper location of industries</li> </ol>	2021-27

PHASE	TASK	TIMELINE
<b>Water Quality Improvement Plan</b>		
	<ol style="list-style-type: none"> <li>2. The protection of existing water holding reservoir in industries is one of the good practices, which can be replicated</li> <li>3. Industry may be encouraged to provide complete recycle/reuse system for water conservation, preferably by adopting Zero Liquid Discharge facility</li> </ol>	
<b>Phase-II</b>	<p><b><u>Potable Water Conservation</u></b></p> <ol style="list-style-type: none"> <li>4. Monitoring surface water quality in Faisalabad</li> <li>5. Monitoring potable water consumption of residential and industrial/commercial /institutional users</li> <li>6. Support Landscaping Program that encourages the planting of native species to reduce watering requirements for residents, industrial, commercial and institutional land uses</li> <li>7. Support the WASA to systematically reduce leakage in the water distribution systems</li> <li>8. Monitoring total water losses includes reviewing all unmetered water such as metering inaccuracies, data handling errors, unmetered City operations as well as water thefts, pipe leakages and water main breaks</li> </ol> <p><b><u>Water Resource Management</u></b></p> <ol style="list-style-type: none"> <li>3. Undertake and update sub-watershed studies with the conservation agencies and community groups to maintain, restore and enhance sub-watershed health</li> <li>4. Identify new initiatives to improve watershed biodiversity and connectivity</li> <li>5. Develop a pilot project that captures rainwater to irrigate City sport fields and parks</li> <li>6. Encourage the development of plans to manage storm water runoff as a resource to irrigate active recreation lands</li> <li>7. Develop a strategy to plant demonstration rain gardens in city parks, gateway features and boulevards</li> </ol> <p><b><u>Storm water Management</u></b></p>	2028-34

PHASE	TASK	TIMELINE
<b>Water Quality Improvement Plan</b>		
	<ol style="list-style-type: none"> <li>2. Develop a residential storm water management utilities fee to help fund storm water management retrofits and maintenance</li> <li>3. Continue to acquire data to inform the condition and functional performance of the network (i.e., fog testing, zoom camera)</li> <li>4. Continue to use parks for temporary excess rainwater storage and low impact development features to deter basement flooding</li> <li>5. Investigate funding mechanisms on a cost recovery basis for storm water management</li> </ol> <p><b><u>Wastewater Treatment</u></b></p> <ol style="list-style-type: none"> <li>5. Invest in existing sewers and wastewater treatment plant infrastructure</li> <li>6. Install decentralized waste treatment plants in designated places</li> <li>7. Reduce water pollution discharges from City operations                             <ol style="list-style-type: none"> <li>a. Buy and use product alternatives with lower toxic levels (for example, natural fertilizers, such as compost or peat, environmentally friendly cleaning products)</li> <li>b. Decrease pesticide use in City parks and where necessary, continue to use herbicidal vinegar where practical</li> <li>c. Increase recycling in order to reduce waste going to landfills or waterways</li> <li>d. Identify tree planting opportunities adjacent to water courses in an effort to improve the water quality before storm water runoff</li> </ol> </li> <li>8. Other sectors like vehicle service centres and meat shops should be encouraged to have minimum treatment system, before discharging the wastewater in to sewers for final treatment</li> <li>9. Vehicle service should be encouraged with no or little water usage to conserve the water resource</li> </ol>	
<b>Phase-III</b>	<b><u>Potable Water Conservation</u></b>	2035-2041

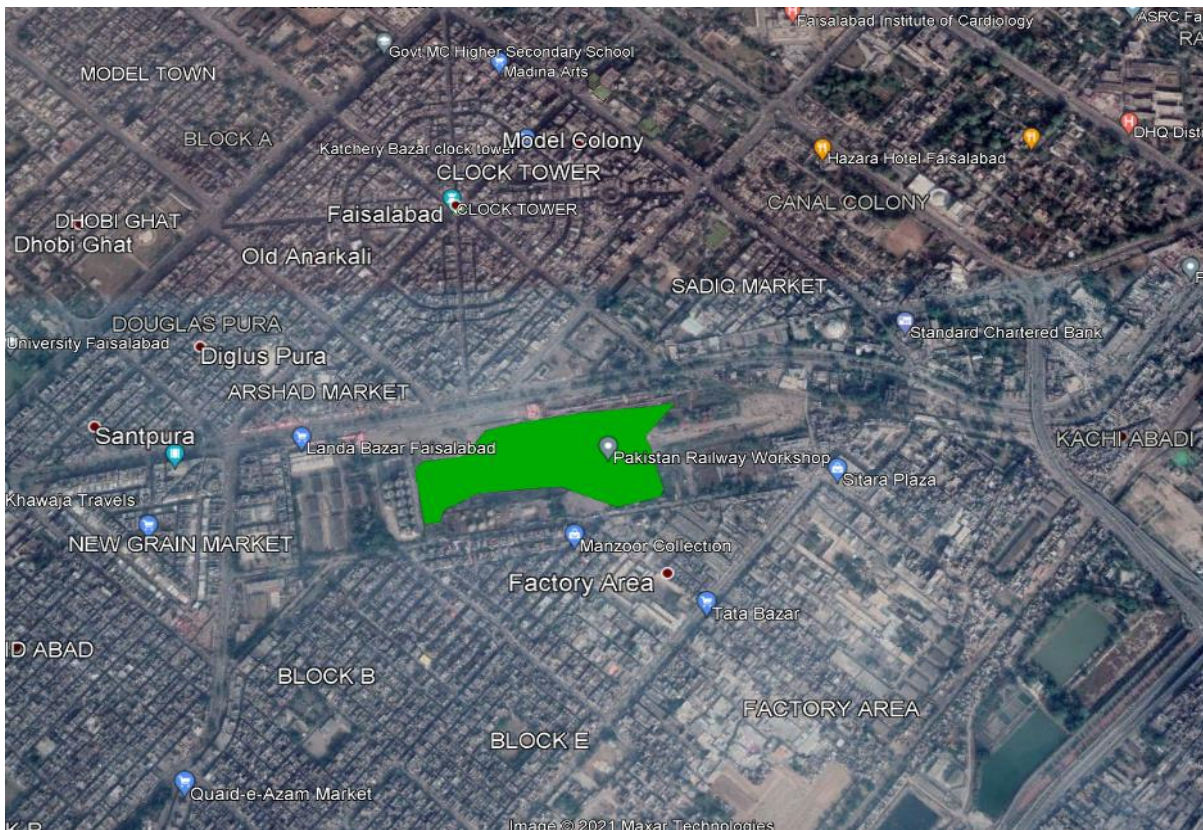
PHASE	TASK	TIMELINE
<b>Water Quality Improvement Plan</b>		
	<p>9. Collect and reuse swimming pool and mosque's ablution area water to irrigate local parkland and sports fields, as appropriate</p> <p><b><u>Water Resource Management</u></b></p> <p>8. Develop and implement a comprehensive channel remediation and stream restoration strategy in conjunction with the local communities and stakeholders</p> <p><b><u>Storm water Management</u></b></p> <p>6. Develop and implement a storm water management facility maintenance strategy</p> <p>7. Undertake low impact development projects and strategies such as rain gardens, porous pavement, etc. as part of road or parking lot reconstruction projects</p> <p>8. Confirm funding to maintain and monitor low impact development features</p> <p>9. Encourage downspout disconnection and basement flooding subsidy program</p> <p>10. Acquire lands to enhance flood protection</p> <p>11. Establish guidelines that will require the City to consider the installation of a green roof for the reconstruction and/or replacement of existing roofs at City owned buildings and facilities</p> <p><b><u>Wastewater Treatment</u></b></p> <p>10. Reduce the freshwater consumption in urban centers through efficient scientific sewage treatment system and proper recycle/reuse facilities</p>	

PHASE	TASK	TIMELINE
<b>Green spaces Quality Improvement Plan</b>		
<b>Phase-I</b>	<p>1. Update landscape standards and guidelines to increase tree planting requirements for new residential, commercial, industrial, institutional sites, parks and road projects</p>	2021-27

PHASE	TASK	TIMELINE
<b>Green spaces Quality Improvement Plan</b>		
	<ol style="list-style-type: none"> <li>2. Review and update the Faisalabad’s urban forest study every 10 years, including the urban forest canopy assessment and recommendations for urban forest improvements</li> <li>3. Develop an urban green space management strategy for Faisalabad city using Prime Minister’s programme Ten Billion Trees Tsunami funds.</li> <li>4. Establish a baseline and monitoring protocol for the total number of trees planted on City-owned land per year.</li> <li>5. Increase urban vegetation which can directly and indirectly affect local air quality by altering the urban atmospheric environment. High-resolution air photos of the City and surrounding areas taken every five years will inventory and monitor trees, parks and natural areas</li> <li>6. Develop a communication strategy to educate residents on the benefits of Faisalabad’s urban green spaces and how they can assist in maintaining its health</li> <li>7. Implement the tree plantation campaign through annual funding and staff resources and undertaking community plantings in parks and open spaces, etc</li> <li>8. Develop policies to encourage private property community gardens in areas of high density in collaboration with businesses, institutions, etc</li> <li>9. Promote the use of native indigenous plants in parks as well as to the public</li> <li>10. Actively seek out opportunities to increase and protect parkland, natural areas and naturalize spaces especially in locations where there is a deficit in the amount of green space</li> </ol>	
<b>Phase-II</b>	<ol style="list-style-type: none"> <li>11. Create incentives for the planting of native tree species and the preservation of existing trees; for example:                             <ol style="list-style-type: none"> <li>a. Encourage species diversification and lead by example through various tree planting events with local partners</li> <li>b. Encouraging companies to donate trees and celebrate the achievements we have made with other corporate sponsors</li> </ol> </li> </ol>	2028-34

PHASE	TASK	TIMELINE
<b>Green spaces Quality Improvement Plan</b>		
	<p>c. Communicate with developers who approach the City in order to preserve trees</p> <p>12. Extension of existing parks and development of new orchards, agro farms, zoo and botanical Garden</p> <p>13. Increase the amount of naturalized areas within parks</p> <p>14. Review tree species for viability under a changing climate and adjust tree planting practices accordingly</p> <p>15. Develop a GIS based priority planting tool to assist municipal staff and community partners to identify planting sites to maximize urban forest benefits across the city</p> <p>16. Undertake and maintain an inventory of all street and park trees</p> <p>17. Work with surrounding municipalities to plan for and strengthen natural linkages across municipal boundaries</p> <p>18. Develop and implement a coordinated invasive species control program across City departments</p> <p>19. Continue to identify and track new invasive species and develop strategies to minimize their impact</p> <p>20. Develop strategies for other invasive species in parks and natural areas</p>	
<b>Phase-III</b>	<p>21. Naturalize and expand urban forest and canopy cover using native species where appropriate</p> <p>22. Identify issues that are currently impairing the quality of the natural area (i.e., habitat fragmentation/degradation, invasive species, incompatible human uses, littering, vandalism, erosion, etc.)</p> <p>23. Promote the planting of flowering trees, fruit trees, or pollinator tree species where appropriate</p> <p>24. Work with conservation authorities to partner with community associations, school boards and residents to plant trees on their properties, including greening parking lots</p> <p>25. Continue to implement species at risk protection measures in all areas of Faisalabad and develop strategies to improve their status</p> <p>26. Provide multi-use buffer zones around natural areas and parks</p>	2035-2041

PHASE	TASK	TIMELINE
<b>Green spaces Quality Improvement Plan</b>		
	<p>27. Plan for dense shade in parks, playgrounds, spectator areas of sports fields and other public spaces frequented by children and vulnerable populations</p> <p>28. Ensure active transportation routes are planned with natural shade</p> <p>29. Explore the potential for a private tree cutting by-law as well as the effectiveness of other Municipal tree cutting by-laws</p>	



**Figure 1-20: Proposed Urban Forest Site**



**1.4 ENVIRONMENT AND DISASTER MANAGEMENT SECTOR PROJECTS**

Sr. No.	PROJECT	TIMELINE RANKING			PRIORITY RANKING		
		Short Term	Long Term	Both	High	Medium	Low
1	Detailed Urban Risk Assessment of Faisalabad	✓			✓		
2	Establishment of EOC (Emergency Operation Center)	✓				✓	
3	Strengthening of Rescue and Response Capacity	✓				✓	
4	Awareness Campaign on Environment and Disaster Reduction		✓			✓	
5	Shifting of Oil Depot	✓			✓		
6	Setting up of continuous monitoring stations to record pollution levels in ambient air of Faisalabad			✓	✓		
7	Installation of noise barriers for residential, commercial and industrial users		✓			✓	
9	Creation of public awareness on environmental improvement plan of Faisalabad	✓					✓
10	Air quality improvement plan for Faisalabad			✓	✓		
11	Develop a connected network of safe bicycling and walking facilities		✓			✓	
12	Plantation of sensitive species in the vicinity of brick kilns or industrial emission areas to cope with air pollution problems		✓		✓		
13	Purchase of quieter public service and transit vehicles (e.g., electric and hybrid buses)		✓			✓	
14	Establishment of suitable buffer zones around residential areas in order to insulate from noise emanating areas		✓				✓

Sr. No.	PROJECT	TIMELINE RANKING			PRIORITY RANKING		
		Short Term	Long Term	Both	High	Medium	Low
15	Continuous monitoring surface water quality in Faisalabad			✓		✓	
16	Pilot project to captures rainwater to irrigate City sport fields and park	✓				✓	
17	Flash flood management system for Faisalabad	✓			✓		
18	Pilot project to collect and reuse swimming pool and mosque's ablution area water to irrigate local parkland and sports fields		✓			✓	
19	Pilot project to establish methodologies for reduction in freshwater consumption in urban centers through efficient scientific sewage treatment system and proper recycle/reuse facilities		✓			✓	
20	Frequent acquisition of High-resolution air photos of the City and surrounding areas to inventory and monitor trees, parks and natural areas			✓	✓		
21	Plantation of native tree species and the preservation of existing trees			✓		✓	
22	Development of a GIS based priority planting tool to assist municipal staff and community partners		✓			✓	
23	Tree plantation on properties of community associations, school boards, residents including greening parking lots			✓		✓	
24	Development of dense shade in parks, playgrounds, spectator areas of sports fields, Bus stops and other public spaces frequented by children and vulnerable populations		✓			✓	