Report

GSP Survey on

Air Pollution and Health

for Schools

Introduction

Air Pollution is an area of concern for everyone as it affects our health directly. As per WHO, globally, an estimated 4.2 million premature deaths are linked to ambient air pollution. Ailments like heart disease, stroke, chronic obstructive pulmonary disease, lung cancer, and acute respiratory infections have been linked to air pollution.

In India, Central Pollution Control Board (CPCB) has listed down some 122 cities which do not meet the National Ambient Air Quality Standards (NAAQS). Under National Clean Air Plan (NCAP) efforts are being made on reducing the key air pollutant - (PM 10 and PM 2.5) by the year 2024, in a time framed manner, with the support of state pollution control boards. The 122 cities will be given special attention for reducing the air pollution.

CSE has played an important role in fighting for the right to clean air since the early nineties, when we saw the implementation of CNG use for the first time in the country, till date when BS VI has come into action (April 2020). Besides working on policy and technology, it is equally imperative to spread awareness among the masses to make the right choice.

CSE's Green Schools Programme (GSP) undertook a survey study to understand the awareness levels of students on the impact of air pollution on health. The report compiles the responses of students from 26 schools from eight states, located in south and east of India - Andhra Pradesh, Bihar, Karnataka, Kerala, Odisha, Tamil Nadu, Telangana and West Bengal. One third of the non-attainment cities are situated in these eight states (Annexure 1). It is interesting to note that the survey was conducted in the months October – December, when smog can be felt in the air. The report presents an eight-state summary followed by the state-wise detailed reports. The state wise reports also present a relevant background on the schools' participation in GSP Audit 2019 (An online tool for environment education for schools through hands-on activities and tasks for students to assess the schools' resource efficiency)

About the study

The online survey and mapping exercise were shared with the 50 schools who had participated in the Air Pollution Seminar in Delhi and Anil Agarwal Environmental Training Institute (AAETI) in August 2019. The details of the Air pollution Seminar could be accessed online on the GSP website (https://www.greenschoolsprogramme.org/knowledge-bank/gsp-air-pollution-seminar-2019-20/).

The two kinds of surveys were:

- **Survey on air pollution and health** to be filled by eight students each from grade 4 to 9. Young students could take parents' help.
- **Mapping Exercise** to be completed by one student each from Grade 7 to 9.

The online survey on health impact of air pollution gauges the students opinions and awareness on the air quality at different times of the year and its health impact on the individuals and family members. The questions take into account the mobility practices followed and the types of sources of air pollution observed such as vehicles, industry, road dust, etc. In mapping exercise, the students identified and mapped the sources of air pollution in one kilometer radius area around the school.

The study has participation of 26 schools from 19 districts. Students started filling the survey from October 12, 2019 and the survey was closed on December 10, 2019. Submitted by 1139 students, an average of 46 responses was submitted per school. 29 per cent of the responses are from primary grade students.

Table 1: State wise survey responses

States	No. of Schools	Number of responses	
		Online Survey	Mapping Exercise
Andhra Pradesh	5	165	4
Bihar	2	121	2
Karnataka	1	64	1
Kerala	5	213	3
Odisha	1	12	-
Tamil Nadu	8	386	4
Telangana	2	122	1
West Bengal	1	56	3
Total	26	1139	18

Survey findings – overall

- The respondents' opinion on the air quality is almost equally divided between worsening (37 per cent) and improving (34 per cent). The rest think it is unchanged. This indicates the need to develop understanding about the ambient air quality Index (AQI), among the students.

- On a day-to-day basis, maximum exposure is to the traffic and smoky vehicles, as reported by 64 per cent respondents. Number of hours spent outside vary but more than 60 per cent respondents spend one to four hours outside.

- On the sources of air pollution, the response pattern suggests that air pollution sources are observed more in the residential areas than in the schools' vicinity. Major sources include road dust, vehicle exhaust, large and small industries and garbage burning.

- Interestingly, though respondents think that air pollution sources are observed more in the residential areas, the majority think that there is no impact of outside air pollution on the indoor air quality.

- 75 per cent of respondents take sustainable or non-polluting mode of transport to commute to school and rest take private vehicles. 41 per cent respondents get stuck in traffic and take 30 minutes or more to reach school. This implies that they have to face exposure time of minimum one hour in the congested areas, every day.

- More than 35 per cent respondents say that the frequency of visit to doctors increases in winters. 38 per cent respondents face special discomfort during severe smog episodes, most common issues include – eye irritation, wheezing, cold, suffocation, etc. The ones who do not feel the effect of smog credit the trees around them, use of masks or the geography of the area. 95 per cent of the students attribute the increase in respiratory problems to air pollution and more than 80 per cent are aware that outdoor air pollution is amongst the top killers in the world and in India.

State reports

Andhra Pradesh

13 cities from Andhra Pradesh come under the list of non-attainment cities list, namely:

Anantapur, Chitoor, Eluru, Guntur, Kadapa, Kurnool, Nellore, Ongole, Rajahmundry, Srikakulam, Vijayawada, Vishakhapatnam, Vizianagaram. According to findings of a recent study published in the journal Lancet, titled 'The impact of air pollution on deaths, disease burden, and life expectancy across the states of India: The Global Burden of Disease Study 2017', a total of 45,525 deaths in Andhra Pradesh in 2017 could be attributed to air pollution. While the estimated number of deaths attributed to household air pollution is 19,345, the number due to ambient air pollution is estimated at 23,280 and this is indicative of the fact that people are at greater risk from ambient air pollution than from household air pollution.

State survey analysis:

School from three districts participated in the survey namely Chittoor (60 responses), Krishna (52 responses) and Guntur (53 responses). Out of these cities Chittoor comes under the list of non-attainment cities of Andhra Pradesh, but the responses of the survey are contradictory. Overall 30 per cent of the respondents say that air quality in the state is worsening while in Chittoor only 16 per cent think so. Schools are aware about the energy efficient practices only two schools are using diesel buses, but they need to be more aware about using the sustainable mode or non-polluting mode while coming to school. Like in Montfort High School, 23 per cent population is using private vehicles.

About Survey:

Table 2: Number of respondents from Andhra Pradesh:

Number of schools	No. of responses	No. of responses -Grade wise
Montfort High School, Repalle, Guntur	53	Grade 4-9 Grade 4- 8 Grade 5- 10 Grade 6- 9 Grade 7- 8 Grade 8- 10 Grade 9- 8
N. St. Mathew's Public School, Vijayawada	38	Grade 4-9 Grade 4- 7 Grade 5- 5 Grade 6- 3 Grade 7- 6 Grade 8- 6 Grade 9- 11
St. Thomas High School, Nuzvid, Krishna	14	Grade 5-9 Grade 5- 2 Grade 6- 1 Grade 8- 5 Grade 9- 6
Z.P.High School, Kanipakam, Chittoor	32	Grade 6-9 Grade 6- 8 Grade 7- 8 Grade 8- 8 Grade 9- 8

Z P High School, GK Puram, Chittoor	28	Grade 6-9 Grade 6- 4 Grade 7- 9 Grade 8- 7 Grade 9- 8
Total	**165**	**165**

- **Survey on air pollution and health** was filled by total 165 students from grade 4 to 9. Young students could take parents' help
- **Mapping Exercise** – Total four schools submitted the exercise, completed by group of students. One combined mapping survey was received

Monitoring

There are six Continuous Ambient Air Quality Monitoring Stations (CAAQMS) in operation to monitor the ambient air continuously for 8 parameters, RSPM (PM10), PM2.5, SO2, NOx, NH3, CO, O3 and benzene in the following locations of Andhra Pradesh[1]: Two in Visakhapatnam, one each in Tirumala, Vijayawada, Velagapudi and Rajhamundry.

No monitoring station is located in the vicinity of schools. However, two schools—Z.P.H.S Kanipakam and N St. Mathew's Public School have air quality monitoring on their respective campuses.

GSP Overview:

Schools did well in the Audit and out of five schools two of them are in the green category and rest three were rated yellow in the GSP Audit 2019. All the schools showed good results in the air section and majority use non-polluting and sustainable mode of transport except Montfort High School where 23 per cent population is using private vehicles. Two schools have reported that they have air quality monitoring equipment in the school. All the schools have more than 20 per cent of window floor ratio in the school, ensuring good ventilation in the classrooms. Also, two schools Montfort High School and St. Thomas High School are using diesel generators in schools and can switch to renewable source of energy like solar which can reduce the need to use diesel generators.

Summary:

Schools are located in different parts of the state and represent both urban and rural population also the mix of private and public schools in the survey. Out of three districts, Chittoor and Vijayawada are among non-attainment cities of Andhra Pradesh. These schools perform well in the GSP Audit. Major source of pollution in the schools is the traffic, ZPHS
Kannipakkam reported that during the mapping exercise they found the main source of the pollution is the people comes to the temple near the school and pollution from vehicles is higher in the area. They also found garbage burning and using of fire wood in the hotels are a major source of pollution in the town. Mapping exercise done by the Montfort High School found the burning of waste in municipal dumping yard located besides the school as the main source or air pollution in their area.

Survey Responses:

1. **How many of the respondents think that air pollution is worsening?**

[1] https://pcb.ap.gov.in/continuous-ambient-air-quality-monitoring-stations-caaqms.aspx

Approximately, 30 per cent of the survey respondents know that air pollution is worsening. However, 24 per cent believe it has in fact improved while 46 per cent think it has neither improved nor declined over time but has remained the same.

Action:

Spread awareness about prevalent air pollution concentrations and the state of air quality by having a display board mentioning the air quality of the day (http://cpcb.nic.in/)

Students can help develop a protocol based on the prevalent AQI to minimize outdoor exposure for students such as avoid unnecessary outdoor activities on "Very Poor, Severe and Emergency" days.

2. What are the sources of pollution?

Almost half of the survey respondents think that traffic and smoky vehicles contribute primarily to the problem of air pollution. Followed by 26 per cent of the respondents listing smoke from garbage burning and any industry as sources of air pollution where they are more exposed.

Major source of pollution in the schools are the traffic, ZPHS Kannipakkam reported that during the mapping exercise they found the main source of the pollution is the people comes to the temple near the schools and pollution from vehicles is higher in the area.

Action:

Make students aware of the different sources of pollution. Most of the tiniest particles and gases come from combustion sources like vehicles, cooking fumes, industry, power plants and waste burning. Students can request the temple management to make the parking arrangements far from the temple and school.

If waste being burnt is witnessed, students can report / take pictures and send to concerned authorities. Enable mechanisms to report these instances.

3. Which air pollution sources are observed in the proximity?

It was observed that major source of pollution close to residence is from road dust (32 per cent), cooking (23 per cent) and construction & demolition (15 per cent). While commuting to school and near the school the main source of pollution is road dust and vehicle exhaust emissions, as responded by 40 per cent and 47 per cent respondents, respectively. Percentage of all the other pollution sources is between 5-8 per cent.

In the responses around 57 per cent of the answers opted for Not Applicable.

Action:

Students can create an awareness group in the school to generate awareness in the community as 23 per cent pollution is due to cooking only. Also they can approach local municipal bodies to ensure more cleanliness on the roads.

4. Do we think indoor air quality at home is affected by outdoor air pollution?

52 per cent respondent says that indoor air quality at home gets affected by smoking and other sources such as cookstoves, incense sticks, etc., or also from intrusion from outdoor pollution inside home.

Action:

Indoor air quality is generally ignored while discussing air pollution, though in many studies, indoor air has been found to be more polluted than the outdoor air.

A few steps such use of clean cooking fuel, planting indoor plants and reducing use of paints and chemical which release volatile organic carbon, etc, go a long way in keeping the indoor air clean.

5. **How do we commute to school?**

Approximately 74 percent of the survey respondents answered the 'other' option in the mode of transportation as they live the school and take 2 to 20 minutes to reach school. Those who live far from the schools use bus and two-wheeler as the main mode of transport- 8 per cent and 12 per cent respectively.

The findings are similar to the GSP Audit results, wherein more than 70 per cent use sustainable and non-polluting mode of transport.

Action:

To sustain the good practices, schools could undertake promotional events for children from time to time, whereby cycling and walking can be promoted as fun and healthy activity and promote sustaining the current mobility practices

Other precautionary initiatives: Regulate third party service providers: Cabs, rickshaws and auto-rickshaws that ferry children to school should be registered and kids should be encouraged to opt for only registered vendors. This will allow the school to have a say in the vehicle being safe and less polluting and hold the service provider accountable for any gaps.

Provide information on effect of commuting on environment: Students should be made to undertake exercises to calculate their carbon footprint based on their travel choice. This can help them to become aware of what they can do daily to help the environment, and early practices that get inculcated can stick around for a life time.

6. **How exposed are we?**

More than 50 per cent of survey participants spend less than 6 hours outdoors. More than 75 per cent get stuck in traffic while commuting to school. Though a very small proportion, take close to an hour to get to school. Health impacts stemming from air pollution are directly related to our breathing rate and the duration of our exposure to dirty air.

Action:

Students can be taught to read the state of air quality by having a display board mentioning the air quality of the day (http://cpcb.nic.in/)

Minimize outdoor exposure for students by avoiding or cutting down outdoor activities on high pollution days ("Very Poor, Severe and Emergency")

7. **What are the health impacts of exposure to toxic air?**

Around 39 per cent of survey respondents have complained of respiratory ailments during winters. While 90 per cent of the respondents do not have any history of respiratory problems. Some also experience health ailment during the summers and monsoons.

8. Are there any respiratory issues observed in the family members

Cough and fever are the common ailments. 28 per cent of the respondents' adult family members have suffered from cough, 15 per cent reported fever. While for respondents, it is 21 per cent and 22 per cent respectively

Action:

What this means is while the problem of air pollution gets intensified during winters, it is never gone. It is a persistent, year round problem which calls for year-round precautionary measures such as:

- *Encourage students to ensure compliance with the rules on construction activities, waste generation and burning as well as parking at the housing society level, even at home. Enable mechanisms to report these.*
- *Encouraging cycling through provision of cycling stands/parking*
- *Create "green barriers" through intensive plantation of specific trees, shrubs and bushes along entry points/parking areas and boundaries, to minimize dispersion of dust and pollutants from roads etc.*
- *Ensure proper disposal of all waste including plastics, biomass waste (dead leaves, branches etc.) to minimize emissions from burning waste.*
- *Use cleaner fuels – LPG and electricity for all energy requirements within the school including for cooking requirements.*
- *Minimize the use of Diesel Generator sets within the school premises, use temporary connections for occasional requirements such as annual functions etc. Supplement electric supply through the use of solar power generation*
- *Ensure compliance with dust control norms applicable for construction sites within the school premises or within the vicinity of the school*

Ensure sweeping of outdoor areas during non-peak hours (at least 2 hrs before school timings or late evenings) to minimize re-circulation of dust.

9. Have our health practitioners informed us of the potential health risk from air pollution?

Only 35 per cent of survey participants were informed by doctors that air pollution acts as a trigger for ailments like nasal, throat and eye irritation. 65 per cent answered no to the question. While outdoor time is absolutely essential for us, on high pollution days we should refrain from vigorous outdoor activities.

Action:

The school can take the lead to educate the children about the potential health risks related to sources of pollution, health risks, etc

Bihar

Three cities from Bihar come under the list of non-attainment cities in India - Patna, Gaya and Muzaffarpur.

As per the data from Bihar Economic Survey, It is observed that in the prevalence of main disease, in 2018-19, the number of cases was the highest in respect of Acute Respiratory Infections.

State survey analysis:

One school each from districts Begusarai and Patna participated in the survey namely Out of these cities Patna is a non attainment city and it reflects clearly in the responses. Overall, 70 per cent of the respondents think that air quality is while from Patna, more than 80 per cent think so. Traffic and smoky vehicles has been accounted as the biggest reason for air pollution in the city Mapping exercise findings states that the school is surrounded by residential area and one small industry is located in the area. More than 90 per cent respondents state they face issues like cough, sneezing, breathing and headache.

Mapping exercise submitted by students of MLZ Begusarai revealed the following sources of air pollution in the 1 km radius of school

- Burning of rotten food
- Welding work in small industries and garages
- Burning of garbage, wood and coal
- Burning of hawks, straw and weeds
- Use of diesel generator

55 per cent of respondents say they feel discomfort in breathing during smog and 48 per cent think the air quality is very bad in their city and around the school

GSP Overview:

The schools are registered with the GSP Audit, though only DPS Patna completed and submitted in 2019 and has been rated green, DPS Patna scored well in the air section Majority of the school population uses non-polluting and sustainable mode of transport. They also have the air quality monitoring equipment in school and have well-ventilated classrooms.

Summary:

Schools are located in two different districts, both are private schools located in urban areas. Patna is one of the most polluted cities in India, while Begusarai is comparatively less polluted and responses in the survey also indicate the same. The responses and the GSP Audit suggests that the schools are taking steps in the right direction to reduce air pollution.

About Survey:

Table 3: Number of respondents from Bihar

Number of schools	Number of responses	No. of responses -Grade wise
Delhi Public School, Patna	88	Grade 4-9 Grade 4- 9 Grade 5- 9 Grade 6- 3

		Grade 7- 22 Grade 8- 22 Grade 9- 23
Mount Litera Public School, Ulao, Begusarai	33	Grade 5-8 Grade 5- 8 Grade 6- 8 Grade 7- 10 Grade 8- 7
Total	**121**	

- **Survey on air pollution and health** was filled by total 121 students from grade 4 to 9. Young students could take parents' help
- **Mapping Exercise** – On mapping exercise was completed by the group of students from DPS Patna schools.

Monitoring Stations in the state and school's vicinity:

10 continuous ambient air quality monitoring stations are working in the state and out them six are stationed in Patna only. Also, seven districts have manual air quality monitoring stations too. These include: Begusarai, Darbhanga, Gaya, Muzaffarpur, Patna, Rajgir and Sasaram.

Survey Responses

1. **How many of the respondents think that air pollution is worsening?**

Approximately, 70 per cent of the survey respondents know that air pollution is **worsening**. However, 14 per cent believe it has in fact **improved** while 16 per cent think it has neither improved nor declined over time but has remained the **same**.

Action:

Spread awareness about prevalent air pollution concentrations and the state of air quality by having a display board mentioning the air quality of the day (http://cpcb.nic.in/)

Students can help develop a protocol based on the prevalent AQI to minimize outdoor exposure for students such as avoid unnecessary outdoor activities on "Very Poor, Severe and Emergency" days.

2. **What are the sources of pollution?**

Almost 76 per cent of the survey respondents think that **traffic and smoky vehicles** contribute primarily to the problem of air pollution. Followed by 14 per cent of the respondents listing **smoke from garbage burning and any industry** and commercial activities by 5 per cent as sources of air pollution where they are more exposed.

Action:

Make students aware of the different sources of pollution. Most of the tiniest particles and gases come from combustion sources like vehicles, cooking fumes, industry, power plants and waste burning.

If waste being burnt is witnessed, students can report / take pictures and send to concerned authorities. Enable mechanisms to report these instances.

3. Observed proximity of the air pollution sources

It was observed that the major source of pollution close to residence is from garbage burning, cooking, construction & demolition and hotel & restaurants as reported by 52 per cent, 48 per cent, 42 per cent and 39 per cent respondents, respectively. While commuting to school and near the school the main source of pollution is road dust, vehicle exhaust emissions and diesel gensets as reported by 44 per cent, 39 per cent and 36 per cent respondents, respectively. 31 per cent of respondents opted for Not Applicable

Action:

Students can create an awareness group in the school to generate awareness in the community as 52 per cent pollution is due to cooking only. Also, they can approach local municipal bodies to take relevant steps and stop the garbage burning in the area.

4. Indoor air quality at home

56 per cent respondent says that indoor air quality at home gets affected by smoking and other sources such as cookstoves, incense sticks, etc., or also from intrusion from outdoor pollution inside home.

Action:

Indoor air quality is generally ignored while discussing air pollution, though in many studies, indoor air has been found to be more polluted than the outdoor air.

A few steps such use of clean cooking fuel, planting indoor plants and reducing use of paints and chemicals which release volatile organic carbon, etc, go a long way in keeping the indoor air clean.

5. How do we commute to school?

Approximately 70 per cent of the survey respondents use bus asthe mode of transport followed by use of car by 15 per cent. Those who live far from the schools are using bus and car as the main mode of transport.

All of the schools have performed well and reported more than 95 per cent of sustainable and non-polluting mode of transport in the GSP Audit

Action:

Almost 15 students are using car as mode of transport, these students need to be aware about the sustainable mode of transport and schools should encourage them to use bus for commuting. Schools could undertake promotional events for children from time to time, whereby cycling and walking can be promoted as fun and healthy activity and promote sustaining the current mobility practices

Other precautionary initiatives: Regulate third party service providers: Cabs, rickshaws and auto-rickshaws that ferry children to school should be registered and kids should be encouraged to opt for only registered vendors. This will allow the school to have a say in the vehicle being safe and less polluting and hold the service provider accountable for any gaps.

Provide information on effect of commuting on environment: Students should be made to undertake exercises to calculate their carbon footprint based on their travel choice. This can help them to become aware of what they can do daily to help the environment, and early practices that get inculcated can stick around for a life time.

6. How exposed are we?

More than 61 per cent of survey participants spend less than 6 hours outdoors and 39 per cent spends around 39 per cent of their time. More than 69 per cent get stuck in traffic while commuting to school. Though a very small proportion, a few take close to half an hour to get to school. Health impacts stemming from air pollution are directly related to our breathing rate and the duration of our exposure to dirty air.

Action:

Students can be taught to read the state of air quality by having a display board mentioning the air quality of the day (http://cpcb.nic.in/)

Minimize outdoor exposure for students by avoiding or cutting down outdoor activities on high pollution days ("Very Poor, Severe and Emergency")

7. Health impacts of exposure to toxic air?

Around 51 per cent of survey respondents have complained of respiratory ailments during winters. While 92 per cent of the respondents do not have any history of respiratory problems. Some also experience health ailment during the summers and monsoons.

Action:

What this means is while the problem of air pollution gets intensified during winters, it is never gone. It is a persistent, year round problem which calls for year-round precautionary measures such as:

- *Encourage students to ensure compliance with the rules on construction activities, waste generation and burning as well as parking at the housing society level, even at home. Enable mechanisms to report these.*
- *Encouraging cycling through provision of cycling stands/parking*
- *Create "green barriers" through intensive plantation of specific trees, shrubs and bushes along entry points/parking areas and boundaries, to minimize dispersion of dust and pollutants from roads etc.*
- *Ensure proper disposal of all waste including plastics, biomass waste (dead leaves, branches etc.) to minimize emissions from burning waste.*
- *Use cleaner fuels – LPG and electricity for all energy requirements within the school including for cooking requirements.*
- *Minimize the use of Diesel Generator sets within the school premises, use temporary connections for occasional requirements such as annual functions etc. Supplement electric supply through the use of solar power generation*
- *Ensure compliance with dust control norms applicable for construction sites within the school premises or within the vicinity of the school*
- *Ensure sweeping of outdoor areas during non-peak hours (at least 2 hrs before school timings or late evenings) to minimize re-circulation of dust.*

8. Any respiratory issues observed in the family members

Cough and Running/congested nose was observed in the responses, by 41 and 35 per cent, 20 per cent of siblings and adult family members reported wheezing.

9. Have our health practitioners informed us of the potential health risk from air pollution?

Only 65 per cent of survey participants were informed by doctors that air pollution acts as a trigger for ailments like nasal, throat and eye irritation. 35 per cent answered no to the question. While outdoor time is absolutely essential for us, on high pollution days we should refrain from vigorous outdoor activities.

Action:

The school can take the lead to educate the children about the potential health risks related to sources of pollution, health risks, etc

Karnataka

Background on the state's performance on air pollution:

Karnataka has been identified as a state with non-attainment cities, namely Bengaluru, Devanagere, Gulbarga, and Hubli-Dharwad under the National Clean Air Programme by MoEF&CC. In 2017, the death rate per one lakh population attributable to air pollution in Karnataka, which was 94.8, was higher than the national average of 90. The state is in the process of combating air pollution owing to sources like vehicular emissions, industries, dust and construction, and biomass among others. This is to be done by prohibiting garbage burning, increasing open and green areas, controlling vehicular and industrial emissions etc.

State Survey Analysis:

The school that has participated in the survey is in the Bengaluru district of the state. In the outskirts of the city, the school is surrounded by many pollutants. Lake Yellama, which is close to the school, has now been connected to drainage and become a dumping site for the industrial waste. As the region is developing, construction and demolition waste is also present in great amounts along with the road dust.

However, the school has been able to manage a safer environment within the campus with an air monitoring system and approximately 38 per cent green cover to curb the carbon emissions and air pollution otherwise.

GSP Overview:

The school has performed well in the air section of the GSP Audit 2019. Located in a rural area, the school has a combination of school-owned and operator-owned vehicles. These vehicles majorly run on diesel and petrol. The classrooms of the school are well-ventilated. The school has reported to be using an air quality monitoring system, which is essential considering there is no such monitoring station in the vicinity of the school.

Summary:

Bengaluru district of Karnataka is among one of the most polluted cities in the country. Identified as a non-attainment city, the state government has been devising measures to reduce the air pollution levels in the city. The participant school in the survey mentioned in the mapping exercise how the nearby sources of pollution are responsible for the degrading air quality in the area. This being said, the school is also taking steps to ensure a clean environment for the students.

About Survey:

Table : Number of respondents from Karnataka

Name of the School	Total number of responses	Grade-wise responses
Lake Montfort School, Bengaluru	64	Grade 4: 16
		Grade 5: 12
		Grade 6: 9
		Grade 7: 9
		Grade 8: 9
		Grade 9: 9

- **Survey on air pollution and health** was filled by students from grades 4 to 9. Young students could take their parents' help. Total of 64 responses were received.
- **Mapping Exercise** was done by one student each from Grades 7 to 9. One combined mapping survey was received from the school.

Monitoring Stations in the state and school's vicinity:

There are 30 Ambient Air Quality Monitoring Stations in the state, of which, 9 are in the Bengaluru district. There is no monitoring station near the school as it is located in the outskirts.

Survey Responses

1. **How many of the respondents think that air pollution is worsening?**

Approximately 86 per cent of the survey respondents know that air pollution is worsening. 9 per cent think that it is the same. However, 5 per cent think that it is improving over time.

Action:

Spread awareness about prevalent air pollution concentrations and the state of air quality by having a display board mentioning the air quality of the day (http://cpcb.nic.in/)

Students can help develop a protocol based on the prevalent AQI to minimize outdoor exposure for students such as avoid unnecessary outdoor activities on 'Very Poor', 'Severe' and 'Emergency' days.

2. **What are the sources of pollution?**

67 per cent of the survey respondents think that traffic and smoky vehicles contribute primarily to the problem of air pollution. While vehicles indeed contribute significantly, emissions from industries, smoke from burning of garbage also have a part to play. 28 per cent of the respondents think that smoke from garbage burning is the main source of air pollution around them.

Action:

Make students aware of the different sources of pollution. Most of the tiniest particles and gases come from combustion sources like vehicles, cooking fumes, industry, power plants and waste burning

3. **Which air pollution sources are observed in the proximity?**

Close to residence, construction and demolition, road dust and concrete batching have been identified as the biggest sources of air pollution by 68, 60 and 55 per cent of the respondents respectively.

36 per cent of the respondents find road dust to be the biggest source of pollution near the school. This is followed by large industries and garbage burning that have been identified as the sources by 35 and 33 per cent respondents respectively.

During the school commute, road dust and vehicle emissions are regarded as the biggest sources by 22 per cent of the respondents.

Road dust is a common pollutant in all the categories mentioned by the respondents. Owing to the location of the school in a developing, outskirts area of the city, this is major discomfort.

Action:

Practices of garbage burning near the school can be monitored. Awareness campaigns can be organised in nearby areas to spread knowledge about the harmful effects of garbage burning.

If waste being burnt is witnessed, students can report/take pictures and send to concerned authorities. Enable mechanisms to report these instances.

4. **Do you think indoor air quality at home is affected by outdoor air pollution?**

As many as 69 per cent of the respondents feel that indoor air quality does not get affected by outdoor pollution or even indoor sources like stoves, incense sticks, etc.

Action:

Indoor air quality is generally ignored while discussing air pollution, but in many studies, indoor air has been found to be more polluted than the outdoor air.

A few steps such as the use of clean cooking fuel, planting indoor plants and reducing use of paints and chemicals that release volatile organic carbon, etc. go a long way in keeping the indoor air clean.

5. **How do we commute to school?**

As much as 56 per cent respondents only use buses to commute to school. 10 per cent use only cars to commute. The rest use two-wheelers or other modes, at times in addition to car and bus. Approximately 19 per cent of the total respondents carpool to school, which is a great exercise to reduce fuel consumption and carbon emissions. As per the GSP Audit 2019 of the school, approximately 85 per cent of the school population uses sustainable motorized vehicles and 10 per cent use non-polluting modes.

Action:

Considering that 34 per cent of the respondents take only 10 minutes or less to reach the school, non-polluting modes can be tapped into further. Schools could undertake promotional events for children from time to time, whereby cycling and walking can be promoted as fun and healthy activities and promote sustaining the current mobility practices

Other precautionary initiatives: The school can regulate third-party service providers, like cabs, rickshaws and auto-rickshaws, that ferry children to school. These should be registered and kids should be encouraged to opt for only registered vendors. This will enable the school to have a say in students' safety and controlled levels of pollution. Moreover, the service providers can be held accountable for any gaps.

Provide information on the effect of commuting practices on the environment: Students should be made to undertake exercises to calculate their carbon footprint based on their mode of travel. This can help them become aware of what they can do every day to help the environment as early practices that get inculcated can stick around for a lifetime.

6. How exposed are we?

34 per cent of the respondents spend 5 hours or more outdoors every day. Additionally, 59 per cent of the respondents also get stuck in traffic while their everyday commute to school and back. Health impacts stemming from air pollution are directly related to the duration of our exposure to polluted air. Hence, outdoor time should be kept to a minimum on high-pollution days.

Action:

Students can be taught to read the state of air quality by having a display board mentioning the air quality of the day (http://cpcb.nic.in/).

Minimize outdoor exposure for students by avoiding or cutting down outdoor activities on high-pollution days—Very Poor, Severe and Emergency.

7. What are the health impacts of exposure to toxic air?

As high as 67 per cent of the respondents feel that the frequency of visits to doctors regarding respiratory problems increases in winters, when the level of smog is alarmingly high. Almost 16 per cent face the discomfort during monsoons. It is noteworthy that 92 per cent of the respondents do not have any history of respiratory ailments. Despite this, the majority feels that respiratory issues increase during winters. It can be inferred that the high pollution levels are not only affecting people with respiratory problems but otherwise healthy people as well.

8. Are there any respiratory issues observed in the family members?

Throat irritation and fever were observed in adult members of the family in 39 per cent and 33 per cent cases respectively. However, cough and runny nose remain the most prominent symptoms in the respondents and their siblings. It is alarming to note that these symptoms could be squarely related to the increasing levels of air pollution.

Action:

What this means is while the problem of air pollution gets intensified during winters, it is never completely absent during other seasons. It is a persistent problem that calls for consistent precautionary measures. Here are some such measures that schools can follow:

- *Encourage students to ensure compliance with the rules on construction activities, waste generation, garbage burning and parking at the housing society level. Enable mechanisms to report these*
- *Encouraging cycling through the provision of cycling stands/parking*
- *Create 'green barriers' through intensive plantation of specific native trees, shrubs and bushes along the entry points/parking areas and boundaries to minimize dispersion of dust and pollutants from roads etc.*
- *Ensure proper disposal of waste including plastics and biomass waste (dead leaves, branches etc.) to minimize emissions from burning of waste*

- *Use cleaner fuels–LPG and electricity for all energy requirements within the school including cooking*
- *Minimize the use of Diesel Generator sets within the school premises. Use temporary connections for occasional requirements such as annual functions. Supplement electricity supply with solar energy*
- *Ensure compliance with dust control norms for construction sites within the school premises or vicinity of the school*
- *Ensure sweeping of outdoor areas during non-peak hours (at least 2 hours before school timings or late evenings) to minimize re-circulation of dust*

9. Have our health practitioners informed us of the potential health risk from air pollution?

64 per cent of survey participants were informed by doctors that air pollution acts as a trigger for ailments like nasal, throat and eye irritation. While outdoor time is absolutely essential for us, on high pollution days we should refrain from vigorous outdoor activities.

Action:

Schools can take the lead to educate students on the potential health risks related to sources of pollution along with the precautions that can be taken.

Kerala

Background on the state's performance on air pollution:

Kerala is among one of the states where the prescribed NAAQS (National Ambient Air Quality Standards) are not violated. This is not to say that the state is entirely air pollution free but that the air quality in the various cities of Kerala is still cleaner as compared to the other cities of Indian states. As per the Greenpeace India report on air pollution in January 2020, Airpocalypse IV, none of the cities in Kerala exceed the PM10 level set by NAAQS.

As per the data provided by schools, there still are many issues to be tackled at the ground level such as proper management of waste so as to reduce harmful gas emissions, use of public transport rather than private, regular quality monitoring of vehicles, regulating use of diesel run ferries, and banning burning of waste.

State Survey Analysis:

The schools that participated in the survey paint a mixed picture of the state. While participants from some schools are constantly battling the sources of air pollution in the vicinity of their schools, participants from other schools mention that the air quality in their parts of the state actually seems to be improving. Schools in districts Alappuzha and Ernakulam have identified many air pollutants close to the campuses. In Alappuzha, commercial sites like brick factories and aluminium factories seem to be contributing the most to the air pollution. Additionally, due to these factors and mismanagement of waste, pollution in the river Achan Kovil has also become an issue. In Ernakulam, waste burning incinerators and pollution caused by diesel run ferries contribute to air pollution.

Interestingly, another school from the Ernakulam district has noted that owing to the lush greenery and spice gardens surrounding the school, the air quality is good. Even though there is no air quality monitoring within the 10 KM radius of the school, the school has installed one and keeps a close check on the air quality.

While the state is performing well as per the NAAQS, there are many factors that lower the air quality in specific areas that need to be addressed.

GSP Overview:

All the schools that participated in the survey have performed well in the Air section of the GSP Audit 2019. Out of five, three schools are located in the rural areas of the state and two in urban areas. All schools use sustainable motorised vehicles more than private vehicles. Non-polluting modes of transport like cycling and walking are also used, by a small fraction of the population though. Two schools have air quality monitoring machines installed in the campus and none of the schools have any AQM station in the vicinity. All the schools have ensured proper ventilation in classrooms along with ample green area for better air quality.

Summary:

The participant schools in the state are aware of the air quality and the consequent sources of air pollution around the school and residence. It is remarkable that schools in some areas have managed to maintain and even improve the quality of air by massive plantation, use of sustainable modes of travel and proper management of waste. Inside the schools as well, efforts are being made

to maintain good air quality as recorded in the audit. However, to bring all the cities at par, even more measures need to be undertaken such as checking the pollution level and age of vehicles regularly, ensuring efficient ways of waste management, and making students aware of how they can take better measures with regard to air pollution in their cities.

About the Survey:

Table : Number of respondents from Kerala:

Name of the School	Total number of responses	Grade-wise responses
Bishop Hodges Higher Secondary School, Alappuza	14	Grade 4: 3
		Grade 7: 1
		Grade 9: 10
CMS LP School, Ennooramvayal, Pathanamthitta	17	Grade 4: 10
		Grade 5: 7
Global Public School, Ernakulam	71	Grade 4: 16
		Grade 5: 9
		Grade 6: 10
		Grade 7: 8
		Grade 8: 18
		Grade 9: 10
Kairali Vidya Bhavan Senior Secondary School Nedumangad, Thiruvananthapuram	55	Grade 4: 8
		Grade 5: 12
		Grade 6: 7
		Grade 7: 11
		Grade 8: 8
		Grade 9: 9
SBOA Public Senior Secondary School, Ernakulam	56	Grade 4: 9
		Grade 5: 9
		Grade 6: 9
		Grade 7: 9
		Grade 8: 9
		Grade 9: 11
Total	**213**	

- **Survey on air pollution and health** was filled by students from Grades 4 to 9. Young students could take their parents' help. Total of 213 responses were received.

- **Mapping Exercise** was done by one student each from Grades 7 to 9. One combined mapping survey was received from each of the three schools- Bishop Hodges Higher Secondary School, CMS LP School, Ennooramvayal and Global Public School.

Monitoring stations in state and school's vicinity:

There are 24 Ambient Air Quality Monitoring Stations in the state, of which, 4 are in Thiruvananthapuram, 2 in Alappuzha and 1 in Pathanamthitta. There is no station in the vicinity of any of the schools. However, two schools—Global Public School and SBOA Public Senior Secondary School—have air quality monitoring on their respective campuses.

Survey Responses

1. **How many of the respondents think that air pollution is worsening?**

The perception of the quality of air in the city is fairly distributed. Surprisingly, 36 per cent of the respondents feel that the air quality in the city is improving. Approximately 34 per cent think that it is worsening and 30 per cent feel that it is the same.

Of the respondents that think that the air quality of the city is improving, 49 per cent live in Thiruvananthapuram. Of the respondents who feel that the air quality is the same, 72 per cent live in the Ernakulam district.

Action:

Spread awareness about prevalent air pollution concentrations and the state of air quality by having a display board mentioning the air quality of the day (http://cpcb.nic.in/)

Students can help develop a protocol based on the prevalent AQI to minimize outdoor exposure for students such as avoid unnecessary outdoor activities on 'Very Poor', 'Severe' and 'Emergency' days.

2. **What are the sources of pollution?**

A majority of the respondents, i.e., 67 per cent opined that traffic and smoky vehicles mainly contribute to the problem of air pollution. The second biggest pollutant as per the respondents it smoke from garbage burning, chosen by 20 per cent of the respondents. A minute section of the respondents feel that commercial activities contribute the most to the pollution.

Action:

Make students aware of the different sources of pollution. Most of the tiniest particles and gases comes from combustion sources like vehicles, cooking fumes, industry, power plants and waste burning

3. **Which air pollution sources are observed in the proximity***?*

Close to residence, road dust, domestic sources and garbage burning have been identified as the biggest sources of air pollution by 69, 48 and 46 per cent of the respondents respectively. One of the schools, Bishop Hodges Higher Secondary School, especially mentioned the frequent instances of garbage burning in the vicinity of the school due to lack of proper waste management practices and awareness.

Close to school, 30 per cent of the respondents find vehicle emissions to be the biggest source of pollution. This is followed by road dust that has been identified as the source by 23 per cent respondents.

During the school commute, vehicle emissions and garbage burning are regarded as the biggest sources by 19 per cent of the respondents.

Action:

Practices of garbage burning near the school can be monitored. Awareness campaigns can be organised in the nearby areas to spread knowledge about the harmful effects of garbage burning.

If instances of waste being burnt and water sources like rivers being polluted are witnessed, students can report / take pictures and send to concerned authorities. Enable mechanisms to report these instances.

4. **Do we think indoor air quality at home is affected by outdoor air pollution?**

53 per cent of the respondents feel that indoor air quality does not get affected by outdoor pollution or even indoor sources like stoves, incense sticks, etc. The rest of the respondents feel that indoor air quality is affected by activities inside the house as well as outdoor pollution.

Action:

Indoor air quality is generally ignored while discussing air pollution, though in many studies, indoor air has been found to be more polluted than the outdoor air.

A few steps such use of clean cooking fuel, planting indoor plants and reducing use of paints and chemical which release volatile organic carbon, etc, go a long way in keeping the indoor air clean.

5. **How do we commute to school?**

Approximately 68 per cent respondents use bus or car or both to commute to school. This population includes students who take 5 minutes to 2 hours to reach school. The rest use two-wheelers, rickshaw and other modes, at times in addition to car and bus. Approximately 23 per cent of the total respondents carpool to school, which is a great exercise to reduce fuel consumption and carbon emissions. As per the GSP Audit 2019, it is noteworthy that all the participant schools rely majorly on sustainable motorised vehicles, which is commendable since doing so ensures efficient use of resources. In Global Public School, Ernakulam, 98.17 per cent of the population takes sustainable motorized vehicles and 0.58 per cent uses non-polluting modes.

Action:

Considering that 27 per cent of the respondents take only 10 minutes or less to reach the school, non-polluting modes can be tapped into further. Schools can undertake promotional events for children from time to time, whereby cycling and walking can be promoted as fun and healthy activity and promote sustaining the current mobility practices

Other precautionary initiatives: The school can regulate third party service providers, like cabs, rickshaws and auto-rickshaws, that ferry children to school. These should be registered and kids should be encouraged to opt for only registered vendors. This will enable the school to have a say in students' safety and controlled levels of pollution. Moreover, the service providers can be held accountable for any gaps.

Provide information on the effect of commuting practices on the environment: Students should be made to undertake exercises to calculate their carbon footprint based on their mode of travel. This can help them become aware of what they can do every day to help the environment as early practices that get inculcated can stick around for a lifetime.

6. How exposed are we?

48 per cent of the respondents spend 6 hours or more outdoors every day. Additionally, 50 per cent of the respondents also get stuck in traffic while their everyday commute to school and back. This increases respondents' exposure to polluted air even more. Health impacts stemming from air pollution are directly related to the duration of our exposure to polluted air. Hence, outdoor time should be kept to a minimum on high-pollution days.

Action:

Students can be taught to read the state of air quality by having a display board mentioning the air quality of the day (http://cpcb.nic.in/).

Minimize outdoor exposure for students by avoiding or cutting down outdoor activities on high-pollution days—Very Poor, Severe and Emergency.

7. What are the health impacts of exposure to toxic air?

Approximately 34 per cent of the respondents feel that the frequency of visits to doctors regarding respiratory problems increases in winters, when the level of smog is alarmingly high. Almost 16 per cent face the discomfort during monsoons. It is noteworthy that 80 per cent of the respondents do not have any history of respiratory ailments. Despite this, they feel that respiratory issues increase during winters. It can be inferred that the high pollution levels are not only affecting people with respiratory problems but otherwise healthy people as well.

Action:

What this means is while the problem of air pollution gets intensified during winters, it is never completely absent during other seasons. It is a persistent problem that calls for consistent precautionary measures. Here are some such measures that schools can follow:

- *Encourage students to ensure compliance with the rules on construction activities, waste generation, garbage burning and parking at the housing society level. Enable mechanisms to report these*
- *Encouraging cycling through the provision of cycling stands/parking*
- *Create 'green barriers' through intensive plantation of specific native trees, shrubs and bushes along the entry points/parking areas and boundaries to minimize dispersion of dust and pollutants from roads etc.*
- *Ensure proper disposal of waste including plastics and biomass waste (dead leaves, branches etc.) to minimize emissions from burning of waste*

- *Use cleaner fuels–LPG and electricity for all energy requirements within the school including cooking*

- *Minimize the use of Diesel Generator sets within the school premises. Use temporary connections for occasional requirements such as annual functions. Supplement electricity supply with solar energy*

- *Ensure compliance with dust control norms for construction sites within the school premises or vicinity of the school*

- *Ensure sweeping of outdoor areas during non-peak hours (at least 2 hours before school timings or late evenings) to minimize re-circulation of dust*

8. Are there any respiratory issues observed in the family members?

Cough and throat irritation were observed in adult members of the family in 31 per cent and 28 per cent cases respectively. Further, cough and fever remain the most prominent symptoms in the respondents and their siblings. It is alarming to note that these symptoms could be squarely related to the increasing levels of air pollution.

9. Have our health practitioners informed us of the potential health risk from air pollution?

Sixty per cent of survey participants were informed by doctors that air pollution acts as a trigger for ailments like nasal, throat and eye irritation. While outdoor time is absolutely essential for us, on high pollution days we should refrain from vigorous outdoor activities.

Action:

Schools can take the lead to educate students on the potential health risks related to sources of pollution along with the precautions that can be taken.

Odisha

Background on the state's performance on air pollution:

Six cities from Odisha come under the list of non-attainment cities in India Angul, Balasore, Bhubaneswar, Cuttack, Rourkela and Talcher. As per the CPCB 2018 report, when Cuttack and Rourkela figured among the top polluted cities in Odisha along with Angul and industrial town Talcher and Kalinganagar, the annual concentration of air pollutants in the smart city Bhubaneswar looks no better. We have received responses from Cuttack, one of the non-attainment cities in Odisha.

State survey analysis:

School, located in the city of Cuttack and total 12 respondents submitted the survey from one school. More than 90 per cent of the questions are answered nobody and not applicable in the survey, thus making it difficult to draw definitive conclusion.

GSP Overview:

The school performed well in the air section. School does not own any vehicles and approximately 95 per cent of the school population uses non-polluting mode of transport.

Summary:

Overall the level of Air pollution seems very high in the area and the main source of pollution in traffic and Smokey vehicles. Cuttack is already in the list of non-attainment cities of Odisha

At present SAAQM network has 8 monitoring stations. The monitoring stations have been located in different areas viz. residential or rural as well as commercial.[2]

About Survey:

Table : Number of respondents from Odisha:

Number of schools	Number of responses	No. of responses - Grade wise
Khannagar Nodal Govt High School, Cuttack	12	Grade 6-9 Grade 8- 4 Grade 9- 8

- **Survey on air pollution and health** was filled by total 12 students from grade 8 to 9. Young students could take parents' help
- **Mapping Exercise** –No mapping exercise submitted.

Monitoring Stations in the state and school's vicinity:

There are two continuous monitoring stations in state located in Talcher and Brajrajnagar. Manual monitoring stations are locate in sixteen towns/cities in state, of which three are located in Cuttack.

Survey Responses

1. **How many of the respondents think that air pollution is worsening?**

[2] http://orienvis.nic.in/index1.aspx?lid=22&mid=1&langid=1&linkid=20

Approximately, 91 per cent of the survey respondents think it has neither improved nor declined over time but has remained the same. However, nine per cent believe it has in fact improved while no students believe its worsening in the area.

Action:

Though the respondents may be of the opinion that air quality is good in the area, it is important to spread awareness about prevalent air pollution concentrations and the state of air quality by having a display board mentioning the air quality of the day (http://cpcb.nic.in/)

Students can help develop a protocol based on the prevalent AQI to minimize outdoor exposure for students such as avoid unnecessary outdoor activities on "Very Poor, Severe and Emergency" days.

2. **What are the sources of pollution?**

75 per cent of the survey respondents think that traffic and smoky vehicles contribute primarily to the problem of air pollution. 16 per cent of the respondents listed smoke from garbage burning and any industry as the source of pollution

Action:

Make students aware of the different sources of pollution. Most of the tiniest particles and gases come from combustion sources like vehicles, cooking fumes, industry, power plants and waste burning.

If waste being burnt is witnessed, students can report / take pictures and send to concerned authorities. Enable mechanisms to report these instances.

3. **Observed proximity of the air pollution sources**

While commuting to school and near the school the main source of pollution is road dust and vehicle exhaust as reported by 58 per cent and 33 per cent respondents respectively. Rest of pollution sources like industry, construction garbage burning were reported to be absent.

4. **Indoor air quality at home**

75 per cent respondents say that indoor air quality at home gets affected by smoking and other sources such as cookstoves, incense sticks, etc., or also from intrusion from outdoor pollution inside home.

Action:

Indoor air quality is generally ignored while discussing air pollution, but in many studies, indoor air has been found to be more polluted than the outdoor air.

A few steps such as the use of clean cooking fuel, planting indoor plants and reducing use of paints and chemicals that release volatile organic carbon, etc. go a long way in keeping the indoor air clean.

5. **How do we commute to school?**

None of respondents use private vehicles and all reside close to the school

Action:

Though all take non-polluting mode of transport, it is good to know about the effect of commuting on environment: Students should be made to undertake exercises to calculate their carbon footprint based on their travel choice. This can help them to become aware of what they can do daily to help the environment, and early practices that get inculcated can stick around for a life time.

6. How exposed are we?

All the respondents spend between 6-12 hours outside. None of the student gets stuck in traffic while commuting to school, as all the students are living near the school only.

Action:

Students can be taught to read the state of air quality by having a display board mentioning the air quality of the day (http://cpcb.nic.in/)

Minimize outdoor exposure for students by avoiding or cutting down outdoor activities on high pollution days ("Very Poor, Severe and Emergency")

7. Health impacts of exposure to toxic air?

75 per cent of the respondents do not have any history of respiratory problems. Some also experience health ailment during the monsoons.

Action:

While the problem of air pollution may get intensified during winters, it is never gone. It is a persistent, year round problem which calls for year-round precautionary measures such as:

- *Encourage students to ensure compliance with the rules on construction activities, waste generation and burning as well as parking at the housing society level, even at home. Enable mechanisms to report these.*
- *Encouraging cycling through provision of cycling stands/parking*
- *Create "green barriers" through intensive plantation of specific trees, shrubs and bushes along entry points/parking areas and boundaries, to minimize dispersion of dust and pollutants from roads etc.*
- *Ensure proper disposal of all waste including plastics, biomass waste (dead leaves, branches etc.) to minimize emissions from burning waste.*
- *Use cleaner fuels – LPG and electricity for all energy requirements within the school including for cooking requirements.*
- *Minimize the use of Diesel Generator sets within the school premises, use temporary connections for occasional requirements such as annual functions etc. Supplement electric supply through the use of solar power generation*
- *Ensure compliance with dust control norms applicable for construction sites within the school premises or within the vicinity of the school*
- *Ensure sweeping of outdoor areas during non-peak hours (at least 2 hrs before school timings or late evenings) to minimize re-circulation of dust.*

8. Any respiratory issues observed in the family members

All the respondents reported that none of them or their family members have any respiratory issues.

Have our health practitioners informed us of the potential health risk from air pollution?

Only 75 per cent of survey participants were informed by doctors that air pollution acts as a trigger for ailments like nasal, throat and eye irritation. 25 per cent answered no to the question. While outdoor time is absolutely essential for us, on high pollution days we should refrain from vigorous outdoor activities.

Action:

The school can take the lead to educate the children about the potential health risks related to sources of pollution, health risks, etc.

Tamil Nadu

Background on the state's performance on air pollution:

In Tamil Nadu, there are two non-attainment cities, Thoothukudi and Trichy.

Chennai is the only metro city that is left behind in the 122 non-attainment cities. All other major metros are included in it. Environmentalists have in fact raised questions regarding it. Air quality monitoring stations located in different parts of the city (Manali, Velachery and IIT-Madras) have recorded high pollution levels. As per CPCB, Chennai's suburb Manali is one of the most critically polluted in India. According to Global Burden of Diseases, 2017 even though Tamil Nadu is high in socio-economic Index, it still has twice the number of deaths attributable to ambient particulate matter pollution than to household air pollution[3].

State survey analysis:

In survey study, eight schools from four districts have participated, *viz.* Coimbatore, Chengalpattu, Kanchipuram and Villupuram. Major sources of air pollution include pollution from Industries and road dust - generated from pipe line and telephone/electrical cable laying activities, vehicles movement and exhaust and pedestrian movement

The mapping exercise submitted by eight students revealed that garbage burning in market place, vehicle emissions and industries are the main sources of air pollution in the 1 km radius of school. A lot of the pollution observed has been from sources on highways or roads – be it road dust or vehicular emissions from cars. In terms of garbage burning, most of it was observed in market places – as markets do not have proper disposal system. Lastly, the region also has several factories – six of them only within one km distance of the school – and students have also observed these to be a major source of pollution in their vicinity. Amongst these factories, there is also the major car company -BMW.

GSP Overview:

The schools performed well in air section in GSP Audit 2019. All schools have well ventilated classrooms, JRK Global School reported the highest WFR lowest (5 per cent) and Fathima Central Senior Secondary School from Chennai reported the lowest. Out of the eight schools, three have CNG available in the area these are two schools from Coimbatore and one from Viluppuram and yet they do not use CNG in their vehicles.

VKM Vidhyalaya from Villuppuram has the highest SMV 99 per cent while Fathima Central has the highest non-polluting mode of transport – 63 per cent. DPS Coimbatore reported more than 70 per cent green cover while VAV International from Tirupur has reported the lowest in the GSP Audit 2019.

Three schools (DPS Coimbatore, VKM Vidhyalaya Villupuram and Vidya Mandir Estancia, Kanchipuram) use school owned vehicles while the other three (JRK Global, Amhindra World School Kanchipura, and Fathima Central Senior Secondary School, Chennai) do not own any vehicles. Remaining two– Global Pathways Matriculation School from Coimbatore and VAV International from Tirupur has a combination of school owned and operator owned vehicles.

[3] https://www.sciencedirect.com/science/article/pii/S2542519618302614

Two schools out of the eight also reported that they burn waste – Vidya Mandir Estancia Kanchipuram, burns horticultural waste. While Global Pathways Matriculation School from Coimbatore, burns sanitary waste.

Summary:

School should discourage burning of waste inside campus. Horticultural waste can be easily composted. Also, the schools that have CNG available in the area should make the change towards a cleaner fuel. As most of the schools are located close to the coastal area, air pollution is generally minimized by the sea breeze, However, during winters students have reported having cough, fever etc. due to the traffic and smoky vehicles.

Dry waste burning is seen as a major source of pollution and should be stopped by proper disposal of waste. Factories in the vicinity should be reminded through the authorities to follow emission norms to reduce air pollution. In Coimbatore and Tirupur, the AQI is moderate. In areas with high AQI, like Chennai, Villupuram and Kanchipuram, students should minimize the amount of hours they spend outside on a daily basis.

About Survey:

Table: Number of respondents from Tamil Nadu:

Number of schools	Number of responses	No. of responses - Grade wise
Delhi Public School, Coimbatore	39	Grade 4-9
		Grade 5-5
		Grade 6 –7
		Grade 7-6
		Grade 8-8
		Grade 9-4
Fathima CSS School, Chennai	56	Grade 4-12
		Grade 5-13
		Grade 6 –8
		Grade 7-1
		Grade 8-12
		Grade 9-10
Global Pathways Matriculation School, Coimbatore	54	Grade 7- 28
		Grade 8- 12
		Grade 9-14
JRK Global School, Kanchipuram	48	Grade 4-9
		Grade 5-8
		Grade 6-8
		Grade 7-8
		Grade 8-8
		Grade 9-7
Mahindra World School, Kanchipuram	47	Grade 4-8
		Grade 5-6
		Grade 6-8
		Grade 7-9
		Grade 8-8
		Grade 9-8
VAV international School,	48	Grade 4-8

Tirupur		Grade 5-8
		Grade 6-8
		Grade 7-8
		Grade 8-8
		Grade 9-8
Vidya Mandir Estancia, Kanchipuram	47	Grade 5-1
		Grade 6-11
		Grade 7-12
		Grade 8-10
		Grade 9-13
VKM Vidhyalaya CBSE School, Viluppuram	48	Grade 4-8
		Grade 5-8
		Grade 6-8
		Grade 7-8
		Grade 8-8
		Grade 9-8
Total	**387**	

Majority of the respondents are from secondary grades while 27 per cent from primary.

- **Survey on air pollution and health** was filled by students from grade 4 to 9. Young students could take parents' help. Total 387 responses were received
- **Mapping Exercise** – completed by students from Grade 7 to 9. One combined mapping survey was received from each of the four schools – JRK Global School, Mahindra World School, VAV International School and VKM Vidhyalaya.

Monitoring stations in state and in the schools' vicinity

Continuous air quality monitoring stations are located in five locations of two districts. The state has 28 manual monitoring stations in the eight districts, including, Chennai, Cuddalore, Coimabatore, Madurai, Salem, Trichy, Thoothukudi and Mettur.

Survey Responses

1. **How many of the respondents think that air pollution is worsening?**

Approximately, 44 per cent of the survey respondents know that air pollution is improving. However, 35 per cent believe it has neither improved nor declined over time but has remained the same while only 21 per cent believe it has declined.

Hence, we would have to take the responsibility of spreading awareness among our friends.

Action:

Spread awareness about prevalent air pollution concentrations and the state of air quality by having a display board mentioning the air quality of the day (http://cpcb.nic.in/)

Students can help develop a protocol based on the prevalent AQI to minimize outdoor exposure for students such as avoid unnecessary outdoor activities on "Very Poor, Severe and Emergency" days.

2. **What are the sources of pollution?**

58 per cent of the survey respondents think that traffic and smoky vehicles primarily contribute to the problem of air pollution. Followed by 26 per cent of the respondents listing smoke from garbage burning, any industry as source of air pollution where they are more exposed. The results are in line with the fact that the traffic and smoky vehicles indeed contribute significantly, yet the emissions from any industry related to smoke from burning of garbage also plays an important part.

Interestingly, around 56 per cent have not witnessed burning of garbage in their vicinity, while 32 per cent have witnessed it close to their residence. Only seven and five per cent out of the total have seen it close to school or during their school commute, respectively.

Action:

Make students aware of the different sources of pollution. Most of the tiniest particles and gases comes from combustion sources like vehicles, cooking fumes, industry, power plants and waste burning

If waste being burnt is witnessed, students can report / take pictures and send to concerned authorities. Enable mechanisms to report these instances.

3. **Which air pollution sources are observed in the proximity?**

57 per cent respondents did not observe the air pollution sources in any of the places - close to school, residence or during their school commute. 22 per cent respondents find industries as a major source of pollution, mostly during their commute to school. Hotels and restaurants are the second largest polluter, as observed by 15 per cent of the respondents. 12 per cent of the students have observed garbage burning as a source of pollution close to their school. Close to residence, construction activities and concrete batching were reported to be the major source by 26 per cent respondents During commute to school, 20 per cent respondents observed industries as source of air pollution followed by diesel gensets, as reported by 13 per cent respondents.

4. **Do we think indoor air quality at home is affected by outdoor air pollution?**

60 per cent of the students do not think that indoor air quality gets affected by outdoor air pollution

Action:

Indoor air quality is generally ignored while discussing air pollution, though in many studies, indoor air has been found to be more polluted than the outdoor air.

A few steps such use of clean cooking fuel, planting indoor plants and reducing use of paints and chemical which release volatile organic carbon, etc, go a long way in keeping the indoor air clean.

5. **How do we commute to school?**

31 per cent respondents use private vehicles like cars or two wheelers while the rest use sustainable modes of transport such as public bus or non-polluting mode of transport.

More than 50 per cent respondents have reported that it takes less than 15 minutes for them to commute from home to school. And 20 per cent of them still face traffic congestion.

65 per cent of the total population does not use a car. Out of the ones that DO use a car, 26 per cent do carpooling while only 9 per cent go only in a car.

Action:

Schools could undertake promotional events for children from time to time, whereby cycling and walking can be promoted as fun and healthy activity and promote sustaining the current mobility practices (But in this state walking is already preferred) Use of sustainable mode of transport and carpooling should be promoted.

Other precautionary initiatives: Regulate third party service providers: Cabs, rickshaws and auto-rickshaws that ferry children to school should be registered and kids should be encouraged to opt for only registered vendors. This will allow the school to have a say in the vehicle being safe and less polluting and hold the service provider accountable for any gaps.

Provide information on effect of commuting on environment: Students should be made to undertake exercises to calculate their carbon footprint based on their travel choice. This can help them to become aware of what they can do daily to help the environment, and early practices that get inculcated can stick around for a life time.

6. How exposed are we?

More than 50 per cent of survey participants spend less than four hours outdoors. However, overall 72 per cent spend from one to three hours outside daily. 61 per cent of the total population lives within 500 m of the main road. 22 per cent get stuck in traffic while commuting to school. 21 per cent reported it takes them around 10 mins to go from home to school daily. Health impacts stemming from air pollution are directly related to our breathing rate and the duration of our exposure to dirty air. Hence, we should try to cut down our outdoor time on high pollution days.

Action:

Students can be taught to read the state of air quality by having a display board mentioning the air quality of the day (http://cpcb.nic.in/)

Minimize outdoor exposure for students by avoiding or cutting down outdoor activities on high pollution days ("Very Poor, Severe and Emergency")

7. What are the health impacts of exposure to toxic air?

55 per cent of survey respondents have reported that their frequency of doctor visits increased during winters. 22 per cent could not remember when it increased while 15 per cent reported it to be increasing during the monsoons and only 9 per cent during summers.

An almost equal percentage – 34 to 35 reported that they did see the frequency increase during winter season but also an equal percentage were unsure. While 31 per cent reported that the frequency did *not* increase during winter season where more severe smog and high air pollution scenarios are observed.

Action:

What this means is while the problem of air pollution gets intensified during winters, it is never gone. It is a persistent, year round problem which calls for year-round precautionary measures such as:

- *Encourage students to ensure compliance with the rules on construction activities, waste generation and burning as well as parking at the housing society level, even at home. Enable mechanisms to report these.*

- *Encouraging cycling through provision of cycling stands/parking*
- *Create "green barriers" through intensive plantation of specific trees, shrubs and bushes along entry points/parking areas and boundaries, to minimize dispersion of dust and pollutants from roads etc.*
- *Ensure proper disposal of all waste including plastics, biomass waste (dead leaves, branches etc.) to minimize emissions from burning waste.*
- *Use cleaner fuels – LPG and electricity for all energy requirements within the school including for cooking requirements.*
- *Minimize the use of Diesel Generator sets within the school premises, use temporary connections for occasional requirements such as annual functions etc. Supplement electric supply through the use of solar power generation*
- *Ensure compliance with dust control norms applicable for construction sites within the school premises or within the vicinity of the school*
- *Ensure sweeping of outdoor areas during non-peak hours (at least 2 hrs before school timings or late evenings) to minimize re-circulation of dust.*

8. Any respiratory issues observed in the family members

The air pollution affects the immunity and ailments like common cold, cough, etc are seen to rise as air pollution increases. 50 per cent did not observe any one particular ailment in all members of the families. However, cough was found to be there in 27 per cent of the respondents in the months of October and November, followed by fever, running/congested nose and throat irritation.

9. Have our health practitioners informed us of the potential health risk from air pollution?

51 per cent of survey participants were not informed by doctors that air pollution acts as a trigger for ailments like nasal, throat and eye irritation, however, an almost equal per cent – 49 per cent were also in fact, informed of the ailments.

While outdoor time is absolutely essential for us, on high pollution days we should refrain from vigorous outdoor activities.

Action:

The school can take the lead to educate the children about the potential health risks related to sources of pollution, health risks, etc

Telangana

Background on the state's performance on air pollution:

In Telangana, four cities are listed as non-attainment cities - Hyderabad, Nalgonda and Patancheruvu and Sangareddy. 50 per cent of the air pollution is caused by vehicular emissions in Hyderabad, the major source of particulate matter (PM2.5 and PM10). The second major contributor for the particulate matter pollution is road dust in case of the PM10. About 33% of the particulate matter contribution is due to the lofted dust on account of the vehicular movement.

In a study done under the Cardiovascular Health impacts of Air pollution in Telangana, it was found that black carbon (emitted from diesel engines) was now choking the regions in Hyderabad which is close to one of the schools – Bharatiya Vidya Bhavan Atma Kuri Rama Rao School, Hyderabad. Though Khammam is not a non-attainment city, the PM 10 level was also found to be higher than the limits prescribed by CPCB.

State survey analysis:

Two schools participated in the survey from the state – one each from Hyderabad and Khammam. There are no pollution sources in 1 km radius of school, as noted by mapping exercise submitted by the school from Hyderabad. However, there is one industry located in 2.5 km.

There is a traffic junction located around 4 km radius of our school as also reported in the survey that vehicle exhaust emissions cause air pollution more in school area than the residential areas. Fly over construction is within 2 km radius. Both concrete batching and construction and demolition have been observed as being the major sources of pollution closest to their school.

GSP Overview:

Both schools fared well in the GSP Air section. More than 90 per cent use sustainable modes of transport including walking and bicycling. Both also do not own vehicles. However, while Bharatiya Vidya Bhavan Atma Kuri Rama Rao School, from Hyderabad has a very high WFR of 22 per cent, Kendriya Vidyalaya Khammam has only 12 per cent. Both have a good enough green cover as well – around 40 per cent.

Although Bharatiya Vidya Bhavan Atma Kuri Rama Rao School, from Hyderabad did well in Air section, in Waste section where the question of waste burning comes up the school has reported that it burns Sanitary napkins. GSP strongly discourages burning any kind of waste. For sanitary disposal, it is encourage that it is collected and sent to a medical facility that can then burn it in a controlled facility. This will prevent burning sanitary napkins inside campus due to which the harmful fumes then circle close to the children and affect their health.

Summary:

School should discourage burning of waste inside campus. As the school is located in the western central region of Hyderabad, there is chances of the city pollution which is however reduced due to the green cover. Though during winters students feel coughing, throat infection etc. due to the traffic and smoky vehicles.

A traffic junction is close to the school while fly over construction is being done within 2 km radius of the school. Green belt should be planted to avoided exposure to the pollution from the vehicles on flyover and the junction, . In Hyderabad city has high concentration of PM2.5 and PM10, thus one should avoid spending too much time outside esp. in winters there. While in Khammam, students should do so on critically bad air pollution days since normally the air pollution is moderate in this city.

About Survey:

Table : Number of respondents from Telangana:

Number of schools	Number of responses	No. of responses -Grade wise
Bharatiya Vidya Bhavan's Atmakuri Rama Rao School, Hyderabad	62	Grade 4-9
		Grade 5-14
		Grade 6 –9
		Grade 7-7
		Grade 8-13
		Grade 9-10
Kendriya Vidyalaya Khammam	60	Grade 4-9
		Grade 5-9
		Grade 6 –9
		Grade 7-11
		Grade 8-9
		Grade 9-13
Total	**122**	

- **Survey on air pollution and health** was filled by eight students (per class section) from grade 4 to 9. Young students could take parents' help. Total 122 responses were received
- **Mapping Exercise** – completed by students from Grade 4 to 9. Individual number of students in each grade given above. One combined mapping survey was received from Bharatiya Vidya Bhavan's Atmakuri Rama Rao School,

Monitoring stations in state and in the schools' vicinity:

The state has six CAAQMS (Continuous Ambient Air Quality Monitoring Stations), all in Hyderabad and manual stations are located in 11 districts (10 in Hyderabad and two in Khammam).

Survey Responses:

1. **How many of the respondents think that air pollution is worsening?**

Approximately, 35 per cent of the survey respondents know that air pollution is worsening. However, 49 per cent believe it has in fact improved while 16 per cent think it has remained the same. Hence, we would have to take the responsibility of spreading awareness among our friends.

Action:

Spread awareness about prevalent air pollution concentrations and the state of air quality by having a display board mentioning the air quality of the day (http://cpcb.nic.in/)

Students can help develop a protocol based on the prevalent AQI to minimize outdoor exposure for students such as avoid unnecessary outdoor activities on "Very Poor, Severe and Emergency" days.

2. **What are the sources of pollution?**

A whooping 72 per cent of the survey respondents think that traffic and smoky vehicles contribute primarily to the problem of air pollution. Followed by 22 per cent of the respondents listing smoke from garbage burning and any industry as sources of air pollution where they are more exposed. The

results are in line with the facts that vehicles indeed contribute significantly, yet the emissions from industries, smoke from burning of garbage also have a part to play.

Approximately 24 per cent have witnessed burning of garbage close to school. While only 3 per cent have witnessed burning of garbage during commute to school and 39 per cent did not witness any burning of garbage near the school or residence or in the commute.

3. **Which air pollution sources are observed in the proximity?**

45 per cent of the respondents have not observed most of the sources of pollution. 18 per cent saw road dust causing air pollution close to school and or residence. 16 per cent of the respondents have observed vehicle exhaust emissions close to their schools. This implies vehicle exhaust emissions are the second largest source of pollution according to students after road dust in Telangana when we take into account all areas – close to residence, close to school and school commute.

This is followed by concrete batching as a source of pollution near their school (15 per cent), Construction and Demolition (also 15 per cent and near school), garbage burning (14 per cent near school), cooking (14 per cent and close to residence), diesel gensets (12 per cent during school commute), hotels and restaurants (11 per cent during school commute)

Action:

Make students aware of the different sources of pollution. Most of the tiniest particles and gases comes from combustion sources like vehicles, cooking fumes, industry, power plants and waste burning.

If waste being burnt is witnessed, students can report / take pictures and send to concerned authorities. Enable mechanisms to report these instances.

4. **Do we think indoor air quality at home is affected by outdoor air pollution?**

57 per cent of the students do not think that indoor air quality gets affected by outdoor air pollution

Out of the total students that do not think indoor air quality gets affected by outdoor air pollution 67 per cent belong to Hyderabad.

Action:

Indoor air quality is generally ignored while discussing air pollution, but in many studies, indoor air has been found to be more polluted than the outdoor air.

A few steps such as the use of clean cooking fuel, planting indoor plants and reducing use of paints and chemicals that release volatile organic carbon, etc. go a long way in keeping the indoor air clean.

5. **How do we commute to school?**

Only 15 per cent of the respondents use private vehicles like car or two wheeler while the rest take bus, rickshaws or other for commuting to school.

As far as commuting time is concerned, 30 per cent of the respondents take 15 mins or less to reach school, 31 per cent take 30 to 60 mins while 23 per cent take one to two hours to reach school.

Action:

Schools could undertake promotional events for children from time to time, whereby cycling and walking can be promoted as fun and healthy activity and promote sustaining the current mobility practices

Other precautionary initiatives: Regulate third party service providers: Cabs, rickshaws and auto-rickshaws that ferry children to school should be registered and kids should be encouraged to opt for only registered vendors. This will allow the school to have a say in the vehicle being safe and less polluting and hold the service provider accountable for any gaps.

Provide information on effect of commuting on environment: Students should be made to undertake exercises to calculate their carbon footprint based on their travel choice. This can help them to become aware of what they can do daily to help the environment, and early practices that get inculcated can stick around for a life time.

6. How exposed are we?

More than 50 per cent of survey participants spend less than three hours outdoors. However, overall 80 per cent spend from one to four hours outside daily. More than 50 per cent respondents stay within 500 m of the main road, and have exposure to traffic fumes and road dust. 55 per cent get stuck in traffic while commuting to school. 12 to 18 per cent take around 10 to one hour to go from home to school daily. Health impacts stemming from air pollution are directly related to our breathing rate and the duration of our exposure to dirty air. Hence, we should try to cut down our outdoor time on high pollution days.

Action:

Students can be taught to read the state of air quality by having a display board mentioning the air quality of the day (http://cpcb.nic.in/)

Minimize outdoor exposure for students by avoiding or cutting down outdoor activities on high pollution days ("Very Poor, Severe and Emergency")

7. Health impacts of exposure to toxic air?

More than 40 per cent of survey respondents have reported that their frequency of doctor visits increases during winters, also a season when severe smog and high pollution scenarios are observed. Some also reported it to be increasing during the monsoons (20 per cent) while 27 per cent could not remember.

Action:

What this means is while the problem of air pollution gets intensified during winters, it is never gone. It is a persistent, year round problem which calls for year-round precautionary measures such as:

- *Encourage students to ensure compliance with the rules on construction activities, waste generation and burning as well as parking at the housing society level, even at home. Enable mechanisms to report these.*
- *Encouraging cycling through provision of cycling stands/parking*
- *Create "green barriers" through intensive plantation of specific trees, shrubs and bushes along entry points/parking areas and boundaries, to minimize dispersion of dust and pollutants from roads etc.*

- *Ensure proper disposal of all waste including plastics, biomass waste (dead leaves, branches etc.) to minimize emissions from burning waste.*
- *Use cleaner fuels – LPG and electricity for all energy requirements within the school including for cooking requirements.*
- *Minimize the use of Diesel Generator sets within the school premises, use temporary connections for occasional requirements such as annual functions etc. Supplement electric supply through the use of solar power generation*
- *Ensure compliance with dust control norms applicable for construction sites within the school premises or within the vicinity of the school*
- *Ensure sweeping of outdoor areas during non-peak hours (at least 2 hrs before school timings or late evenings) to minimize re-circulation of dust.*

8. Any respiratory issues observed in the family members

The air pollution affects the immunity and ailments like common cold, cough, etc are seen to rise as air pollution increases. Cough was reported to the most common one in respondents (33 per cent), their siblings (29 per cent) and adult family members (23 per cent), closely followed by fever. Sneezing and congested nose was also reported by 12 per cent respondents.

9. Have our health practitioners informed us of the potential health risk from air pollution?

47 per cent of survey participants were informed by doctors that air pollution acts as a trigger for ailments like nasal, throat and eye irritation. 53 per cent were not informed.

While outdoor time is absolutely essential for us, on high pollution days we should refrain from vigorous outdoor activities.

Action:

The school can take the lead to educate the children about the potential health risks related to sources of pollution, health risks, etc.

West Bengal

Background on the state's performance on air pollution:

The state has seven non-attainment cities namely Asansol, Barrackpore, Durgapur, Haldia, Howrah, Kolkata and Raniganj.

The participant school is closest to Kolkata. Around 65 per cent of the city's ambient air contains the deadly ultrafine particulate matter (PM2.5), making it more toxic than that of Delhi where PM2.5 concentration in the air mix is 45 per cent. Carrying higher disease burden with more cases of respiratory and other diseases as well as deaths. As per Global Burden of Disease Study, 2017, West Bengal has 91.1 deaths per thousand people attributed to air pollution much higher in Delhi (65.3 deaths per thousand people).
The ultrafine particles have diameter less than 2.5 micrometres which is about 3 per cent of the diameter of a human hair and can travel straight into the blood stream with noxious chemicals.
CSE suggests introduction of electric buses while moving away from diesel generators and blanket ban on coal usage as domestic and eatery fuel[4]

State survey analysis:

Most of the respondents attribute vehicles to be the main source of pollution. The mapping exercise submitted by three students revealed the following sources of air pollution in the 1 km radius of school

- Water bodies being used as dump yards.
- Nearby small industrial units and factories.
- Dhabas which use coal as a source of fuel for cooking.
- Continuous commute on D.H.R. road.
- Burning of garbage
- Unpaved 'kuchha' roads

A lot of young children are developing lung diseases in early ages (as young as 5 years old). There is an increase in amount of soot which causes breathing difficulty. Though the school is located on the outskirts of Kolkata, a lot of trees are being cut down due to which pollution and temperature of the surroundings has risen. Sometimes a pungent smell is released from nearby ponds as nearby water bodies are used as garbage dumps.

GSP Overview:

The school has done well in the GSP Audit 2019. 86 per cent of the school population travels by sustainable mode of transport and non-polluting mode of transport. The school maintains a window to floor ratio of 12 per cent and has uses a combination of operator owned and school owned vehicles. The school disposes of the waste responsible and does not burn it. The school uses diesel generator which does contribute to air pollution.

Summary:

School should encourage use of CNG as the fuel is available in city. Also switching to renewable source of energy like solar could cut down the need to use diesel generator. As the school is located in the outskirts of Kolkata, there is little of the city pollution. Though during winters students feel irritation in eyes accompanied with coughing, sneezing etc. due to the dust and smoke coming out of the factories.

[4] http://timesofindia.indiatimes.com/articleshow/72921350.cms?utm_source=contentofinterest&utm_medium=text&utm_campaign=cppst

The school is located close to the highway. Green belt should be planted to avoid exposure to the pollution from the vehicles on highway. The city has high concentration of PM2.5, thus one should avoid spending too much time outside especially. in winters.

About Survey:

Table: Number of respondents from West Bengal:

Number of schools	Number of responses	No. of responses - Grade wise
Mount Litera Zee School, DHR, South 24 Parganas	56	Grade 4 - 10 Grade 5 - 8 Grade 6 - 12 Grade 7 - 5 Grade 8 - 13 Grade 9 - 8

32 per cent respondents are from primary classes; Maximum responses received from grade 8 students (23 per cent).

- **Survey on air pollution and health** was to be filled by eight students (per class section) from grade 4 to 9. Young students could take parents' help. Total 56 responses were received.

- **Mapping Exercise** - completed by one student each from Grade 7 to 9. Three mapping surveys were received.

Monitoring stations in state and in the schools' vicinity

12 automatic monitoring stations are running in state and seven in Kolkata. Jadavpur air quality monitoring station is the closest of all (18 km approximately) to the school[5]. Besides, there are 16 manual stations in the city. The school has reported that there is no air pollution monitoring station in the vicinity.

Survey Responses

1. **How many of the respondents think that air pollution is worsening?**

Approximately, 57 per cent of the survey respondents know that air pollution is worsening. But the rest 43 per cent still aren't convinced. Hence, we would have to take the responsibility of spreading awareness among our friends.

Action:

Spread awareness about prevalent air pollution concentrations and the state of air quality by having a display board mentioning the air quality of the day (http://cpcb.nic.in/)

Students can help develop a protocol based on the prevalent AQI to minimize outdoor exposure for students such as avoid unnecessary outdoor activities on "Very Poor, Severe and Emergency" days.

2. **What are the sources of pollution?**

80 percent of the survey respondents think that traffic and smoky vehicles contribute primarily to the problem of air pollution. Only nine per cent of the respondents consider smoke from garbage burning and any industry to be the sources of air pollution While vehicles indeed contribute significantly, emissions from industries, smoke from burning of garbage also have a part to play.

[5] CPCB; WB PCB

Action:

Make students aware of the different sources of pollution. Most of the tiniest particles and gases comes from combustion sources like vehicles, cooking fumes, industry, power plants and waste burning ***(See Additional Information, Figure 1)***

If waste being burnt is witnessed, students can report / take pictures and send to concerned authorities. Enable mechanisms to report these instances.

3. Which air pollution sources are observed in the proximity?

Most of the students observed the air pollution sources either close to school or close to the residence. Good 82 per cent students saw road dust causing air pollution close to school and or residence. Other air pollution sources observed were vehicle exhaust emissions, industries and hotels and restaurants. 55 per cent respondents observed domestic sources such as cooking to be contributing to the air pollution near the residential areas. Interestingly, approximately 57 percent have witnessed burning of garbage close to school or residence. Nine per cent have witnessed burning of garbage during commute to school. Construction and demolition activities were also observed to be the source of air pollution.

4. Do we think indoor air quality at home is affected by outdoor air pollution?

Indoor air quality is generally ignored while discussing air pollution, though in many studies, indoor air has been found to be more polluted than the outdoor air. Outdoor pollution does affect the indoor air. 57 per cent of the survey respondents agree while the rest think otherwise.

Action:

Indoor air quality is generally ignored while discussing air pollution, though in many studies, indoor air has been found to be more polluted than the outdoor air.

A few steps such use of clean cooking fuel, planting indoor plants and reducing use of paints and chemical which release volatile organic carbon, etc, go a long way in keeping the indoor air clean.

5. How do we commute to school?

Approximately 57 per cent of the survey respondents use the bus to commute to school. Rest of them use cars, two-wheelers and rickshaws to commute to school. Of the 30 per cent respondents who use car, majority carpool.

As far as commuting time is concerned, 30 per cent of the respondents take 15 mins or less to reach school, 31 per cent take 30 to 60 mins while 23 per cent take one to two hours to reach school. Close to 40 per cent respondents face traffic congestion during commute.

Action:

Schools could undertake promotional events for children from time to time, whereby cycling and walking can be promoted as fun and healthy activity and promote sustaining the current mobility practices

Other precautionary initiatives: Regulate third party service providers: Cabs, rickshaws and auto-rickshaws that ferry children to school should be registered and kids should be encouraged to opt for only registered vendors. This will allow the school to have a say in the vehicle being safe and less polluting and hold the service provider accountable for any gaps.

Provide information on effect of commuting on environment: Students should be made to undertake exercises to calculate their carbon footprint based on their travel choice. This can help them to become aware of what they can do daily to help the environment, and early practices that get inculcated can stick around for a life time.

6. How exposed are we?

Close to 40 per cent of survey participants spend more than 6 hours outdoors. More than 70 per cent get stuck in traffic while commuting to school. More than 50 per cents respondents take more than 30 minutes to reach school and spend at least one in traffic, daily. 54 per cent respondents stay close to main road and experience vehicular pollution and road dust. Health impacts stemming from air pollution are directly related to our breathing rate and the duration of our exposure to dirty air. Hence, we should try to cut down our outdoor time on high pollution days.

Action:

Students can be taught to read the state of air quality by having a display board mentioning the air quality of the day (http://cpcb.nic.in/).

Minimize outdoor exposure for students by avoiding or cutting down outdoor activities on high pollution days ("Very Poor, Severe and Emergency"). Commuting routes can be

7. What are the health impacts of exposure to toxic air?

More than 55 percent of survey respondents have complained of respiratory ailments during winters and that the frequency of visit to the doctors increases in winters, when smog and high air pollution is observed. Some also experience health ailment during the summers and monsoons. Though more than 70 per cent respondents have no history of respiratory ailments.

Action:

What this means is while the problem of air pollution gets intensified during winters, it is never gone. It is a persistent, year round problem which calls for year-round precautionary measures such as:

- *Encourage students to ensure compliance with the rules on construction activities, waste generation and burning as well as parking at the housing society level, even at home. Enable mechanisms to report these.*
- *Encouraging cycling through provision of cycling stands/parking*
- *Create "green barriers" through intensive plantation of specific trees, shrubs and bushes along entry points/parking areas and boundaries, to minimize dispersion of dust and pollutants from roads etc.*
- *Ensure proper disposal of all waste including plastics, biomass waste (dead leaves, branches etc.) to minimize emissions from burning waste.*
- *Use cleaner fuels – LPG and electricity for all energy requirements within the school including for cooking requirements.*
- *Minimize the use of Diesel Generator sets within the school premises, use temporary connections for occasional requirements such as annual functions etc. Supplement electric supply through the use of solar power generation*
- *Ensure compliance with dust control norms applicable for construction sites within the school premises or within the vicinity of the school*

- *Ensure sweeping of outdoor areas during non-peak hours (at least 2 hrs before school timings or late evenings) to minimize re-circulation of dust.*

8. Any respiratory issues observed in the family members

The air pollution affects the immunity and ailments like common cold, cough, etc are seen to rise as air pollution increases. 57 per cent respondents observed running/congested nose to be most common ailment in the months of October and November followed by throat infection, fever and cough.

9. Have our health practitioners informed us of the potential health risk from air pollution?

66 percent of survey participants were informed by doctors that air pollution acts as a trigger for ailments like nasal, throat and eye irritation. While outdoor time is absolutely essential for us, on high pollution days we should refrain from vigorous outdoor activities.

Action:

The school can take the lead to educate the children about the potential health risks related to sources of pollution, health risks, etc

Annexure 1: List of Non attainment cities in states where survey was conducted*

S. No	State	Cities Sl. No.	Cities
1	Andhra Pradesh	1	Guntur
		2	Kurnool
		3	Nellore
		4	Vijayawada
		5	Vishakhapatnam
		6	Anantpur
		7	Chittoor
		8	Eluru
		9	Kadapa
		10	Ongole
		11	Rajahmundry
		12	Srikakulam
		13	Vizianagaram
2	Bihar	14	Patna
		15	Gaya
		16	Muzaffarpur
3	Karnataka	17	Bangalore
		18	Devanagere
		19	Gulburga
		20	Hubli-Dharwad
4	Orissa	21	Angul
		22	Balasore
		23	Bhubneshwar
		24	Cuttack
		25	Rourkela
		26	Talcher
		27	Kaliga Nagar
5	Tamil Nadu	28	Tuticorin (Thoothukudi)
		29	Trichy
6	Telangana	30	Hyderabad
		31	Nalgonda
		32	Patencheru
		33	Sangareddy
7	West Bengal	34	Kolkata
		35	Asansol
		36	Barrackpore
		37	Durgapur
		38	Haldia
		39	Howrah
		40	Raniganj

*Kerala does not have any