



Toolkit

*Train for Clean Air:
Clean Air for Kids*

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Credits

Concept and Development: Prarthana Borah, Sohana Debbarma

Reviewed By: Bjarne Pederson, Glynda Bathan, Kaye Patdu, Geetanjali Kaushik

Editing: Bani Bains

Design and Layout Supervision: Prarthana Borah, Bani Bains

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PREFACE

There was a time when the most common causes of child deaths in low and middle-income countries was diarrhoea, pneumonia, and malaria. Today, these health hazards are being replaced by a less manageable threat – air pollution.

A recent report by UNICEF says that approximately 2 billion children reside in areas where pollution levels exceed the minimum air quality standards set by the World Health Organization (WHO). A large number of children who are exposed to bad air quality live in Asia, where the world's most polluted mega cities are located. A study on 10,000 children across Delhi, Mumbai, Bengaluru and Kolkata reveals that more than a third of school children in four big cities of India suffer from reduced lung capacity, with Delhi showing the worst results. In November 2015, the population of Delhi had to breathe air that was so bad that schools had to be closed and doctors advised parents to leave the city with their children.

We at Clean Air Asia are engaged in continuous research and outreach work to find solution oriented approaches to improve air quality. The Train for Clean Air: Clean Air for Kids project is an outcome of our quest for finding an India-specific, student oriented approach to meet the air pollution problem.

While children are one of the groups that is worst affected by bad air quality, they are also our hope for a cleaner, better future. Awareness raising programs inform children about the harmful effects of pollution. They also strengthen the popular demand for positive change. Awareness also plays a key factor in motivating children to drive action.

The Train for Clean Air: Clean Air for Kids Toolkit has been developed to help children understand the problem of air pollution and its sources. It is prepared to help make them conscious about their own air pollution footprint and take action, not just individually but also the community level.

Designed specifically for children between the ages of 12-15 years, the toolkit provides a holistic understanding of the air quality issues that engulf our cities with interesting facts and interactive activities.

We hope that this toolkit will help schools support our mission of Advancing Clean Air Action in Indian cities.



Prarthana Borah
India Director

TOOLKIT OVERVIEW

Air pollution in India is a result of multiple causes: the combustion of fossil fuels that are used in transportation, power generation, industries and other economic activities. Urban India is growing rapidly, and often through the very infrastructure that is creating a lag in the urban growth it aims to promote. Large cities, with poor public transport and mobility infrastructure have led to an increase in the sale and utilization of private vehicles. Other important factors contributing to the worsening air quality include area sources (such as waste burning, open cooking, suspended dust from construction and industrial wastes) and stationary sources (such as power plants).

The health consequences of the exposure to this poor quality are alarming. The 2015 Report of the Steering Committee on Air Pollution and Health Related Issues estimated that there are about 1.04 million premature deaths due to household air pollution and 6,27,000 premature deaths due to ambient air pollution in India. Of particular concern are populations most vulnerable to air pollution: women and children. In Delhi, nearly 4,00,000 children suffered from acute bronchitis and there are about half a million emergency room visits due to respiratory illness (Sethi, 2005).

As students, you hold the key to making a difference. You can play an important part in making our world a better and healthier place to live, and this toolkit is designed to provide you with basic facts and simple activities to help you in your quest to improve air quality at your school and neighborhood.

The Train-for-Clean-Air: Clean-Air-for-Kids Toolkit is a simple booklet to inform and engage middle school students on air quality issues. It aims to equip you with basic knowledge on air pollution, its impacts, sources and management by offering suggestions on engaging and motivating them in improving air quality within the school premises and in their neighborhoods.

This toolkit includes easy, fun steps and actions to help you reduce air pollution and educate your school community and family members, as you become an ambassador for clean air. When your friends and parents see you doing your bit towards better air quality, it will inspire them to take action too. You can be the spark that ignites a chain reaction! Your reward will mean cleaner air and a healthier environment for all living species.

Thank you for taking action to make India a better, healthier place!

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1

What is air pollution?

Contamination of the air by noxious gases and minute particles of solid and liquid matter (particulates) in concentrations that endanger human health and other living organisms is air pollution. It is the fourth-largest threat to human health, a condition when the quality of air deteriorates to an extent that it becomes difficult to breathe. In our daily lives, everybody contributes to air pollution. Almost everything we do and each product we purchase creates some pollution. We all bear a huge responsibility in polluting the air around us.

Did you know?



Each of us takes 20,000 breaths and breathes 13,000 liters of air in a day. Inhaling polluted air takes away at least 1-2 years of a typical human life.

Air pollution and our health

The effects of air pollution on human health are very complex as there are many different sources and their individual effects vary from one to the other. It is not only the ambient air quality in the cities but also the indoor air quality in the rural and the urban areas that are causing concern. Air pollutants that are inhaled have serious impact on human health affecting the lungs and the respiratory system. They are also taken up by the blood and pumped all around the body. Urban air pollution in India is growing at an alarming rate. As many as 1.2 million deaths take place every year due to air pollution in India (*Greenpeace, India*).

FUN FACT

THE AMOUNT OF CARBON DIOXIDE EACH PERSON IS RESPONSIBLE FOR LETTING OUT INTO THE ATMOSPHERE IS CALLED OUR "CARBON FOOTPRINT". ELECTRIC CARS HAVE A SMALLER CARBON FOOTPRINT THAN CARS THAT USE FOSSIL FUELS.

ACTIVITY 1 - "CLEAN THE DIRT"



Time - 15 minutes



Number of students - 3 to 4

Learning objectives - Understanding the impact of air pollution

Students will realize that the dirt they see around them and the dust they feel on their faces while they are in playground or in the parking lot waiting for their buses is nothing but a result of air pollution.

Materials

Wet wipes/damp cloth

Procedure

1. Go outside on a field trip around the playground, parking lot and roadside area. Take a damp cloth or wet wipe to wipe one surface. Each student should wipe a different surface.
2. On your return to the classroom, share your experiences with the group. Show your classmates the cloth and tell them what object/surface you wiped.
3. Understand that dirt in the air makes objects and surfaces dirty. It can also make it difficult to breathe.
4. This activity can also be carried out inside the classroom.



Discussion points

- What did you observe?
- Which is the place that had most dirt?
- How do you feel about the air around?
- What are the possible sources of pollution in the areas you went to?

2

Sources of Air Pollution

The following are the major sources of air pollution in India:



Industrial Waste

A number of industries are causing air pollution due to unplanned growth, use of outdated technologies and lack of policies to control pollution. Cement factories emit plenty of dust, which is a potential health hazard. Stone crushers and hot mix plants also create a menace. The suspended particulate matter (SPM) levels in such areas of stone crushing are more than five times the industrial safety limits. There are also many food and fertilizers industries that emit acid vapors in the air.



Thermal Power Stations

There are a number of power stations and super thermal power stations in the country. The coal consumption of thermal plants is several million tons. The major pollutants are fly ash, SO₂, hydrocarbons and other gases.



Transport

Ever increasing vehicular traffic density is posing a continuous threat to the ambient air quality all over India. Vehicle exhaust produces many air pollutants including un-burnt hydrocarbons, carbon monoxide (CO), nitrogen oxide (NO_x) and lead oxides. Vehicular emission is the major culprit behind smog (smoke + fog) in cities during winters.



Waste Burning

Waste or garbage burning produces a lot of smoke and toxic substances. All these pollutants are released into air that is close to ground level, where they are easily inhaled. Young children, pregnant women, older adults and people with asthma or other respiratory ailments are especially sensitive to its effects.



Construction

Construction work emits airborne pollutants. The most common impacts are dust soiling and increased ambient PM₁₀ concentrations due to dust arising from activities on the site.



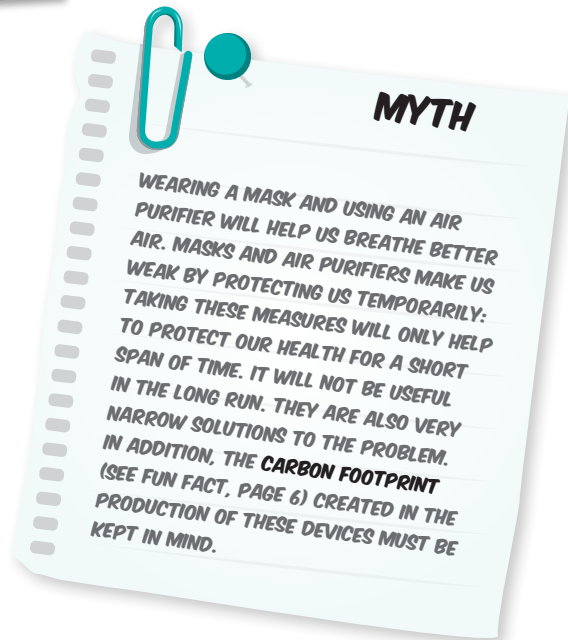
Did you know?

Air pollution contains over 200 chemicals that will age your skin as much as 10% faster when living in a city. Particles in the ambient air are an environmental neurotoxin to the aging brain. This only gets worse in larger cities with higher concentrations of air pollution.



Cultural Practices and Festivals

Activities like crop burning, open cooking, bursting of crackers (during Diwali), wood burning, etc. lead to an alarming rise in the level of Respirable Suspended Particulate Matter (RSPM) in the air. RSPM are minute particles and can contribute to various health issues including asthma and bronchitis.



ACTIVITY 2 – “AIR COLOURS”



Time - 20 minutes



Number of students - 25 to 30

Learning objectives - Relating everyday activities to air pollution





We are often unaware of how our everyday activities contribute to air pollution. The purpose of this activity is to make students aware of the air pollution that we possibly create in our daily lives.

Materials

- A cup of clean water
- Water colors
- Paint brush

Procedure

1. Take the cup of water to represent clean air
2. Add drops of colours to the cup to represent different types of air pollutants caused by the everyday activities based on the table below:

	Pollutants from power plants and industrial processes (CO, NO ₂ , PM ₁₀ , PM _{2.5} , SO ₂ , VOC _s)
	Pollutants from household activities (CO, NO ₂ , PM ₁₀ , PM _{2.5} , SO ₂)
	Pollutants from cars, motorcycles, buses, auto rickshaws, and trucks (CO, NO ₂ , PM ₁₀ , PM _{2.5} , SO ₂ , VOC _s)
	Pollutants from construction activities (CO, NO ₂ , PM ₁₀ , PM _{2.5} , SO ₂ , VOC _s)



Discussion points

Look inside the cup and discuss the following questions:

- If air pollution around you was this apparent, would you want to breathe the air?
- What are other sources of air pollution, beyond those mentioned in the activity being produced in a single day?
- What could you do to reduce the number of pollutants released each day?

3

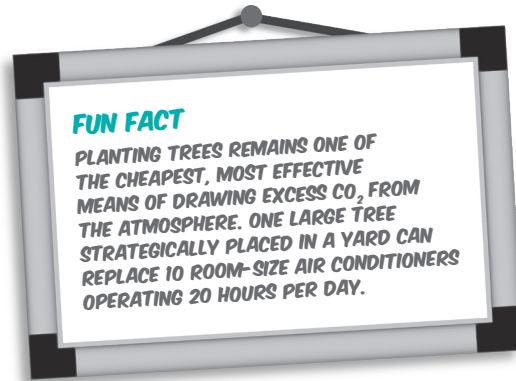
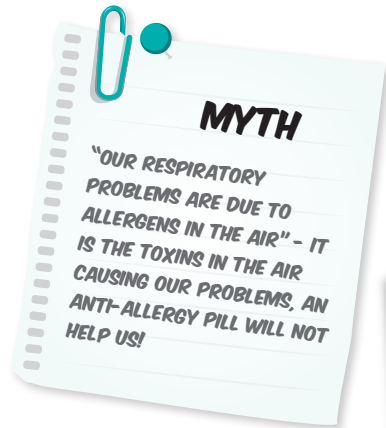
Major Air Pollutants

Pollutants	Description	Sources	Impacts on Health
Carbon Monoxide (CO)	Odorless, colorless, poisonous gas	Fuel combustion from vehicles; combustion of natural and synthetic products such as wood, cigarettes, etc.	Reduces the amount of oxygen reaching the body's organs and tissues; aggravates heart disease, resulting in chest pain
Nitrogen Oxides (NO_x)	Nitrogen and oxygen combine during combustion (burning) to form nitrogen oxides	Burning of fuels from motor vehicles, power plants, industries and residential sources	Worsens lung diseases leading to respiratory symptoms and increased susceptibility to respiratory infection
Sulphur Dioxide (SO₂)	Chemical interaction between sulphur and oxygen forms the gas	Released from petroleum refineries, paper mills, chemical and coal burning power plants	Aggravates asthma and makes breathing difficult
Particulate Matter (PM)	Fine solids and aerosols that are suspended in the air we breathe PM ₁₀ - particles that are 10 microns in diameter PM _{2.5} - particles that are 2.5 microns in diameter	Fuel combustion (burning of coal, wood, petrol, diesel); industrial processes; unpaved roads; under construction site	Short-term exposures can worsen heart or lung diseases and cause respiratory problems. Long-term exposures can cause heart or lung disease and premature deaths
Ground Level Ozone (O₃)	Formed by chemical reaction of volatile organic compounds (VOCs) and NO _x in the presence of sunlight	Motor vehicle exhaust, industrial emissions, gasoline vapors, and chemical solvents	Decreases lung function and causes respiratory symptoms, such as coughing, and shortness of breath. It also worsens asthma and other lung diseases



Did you know?

In the great "Smog Disaster" in London in 1952, four thousand people died in just a few days due to the high concentrations of air pollution.



ACTIVITY – "CATCH THE POLLUTANT"



Time - 30 minutes



Number of students - 25 to 30
(5 students in each group)

Learning objectives - Understanding the sources of air pollution in our everyday lives.

Students will be able to relate the sources of air pollution better by attempting to capture the dirt and dust in their surroundings.

Materials

(For each group)

- White disposable plate
- Color pencils
- Petroleum jelly
- Hole punch
- Shoe lace

Procedure

1. Take the white plate and draw a picture representing your idea of a 'clean earth' on one side.
2. Apply a generous amount of petroleum jelly all over on the other side.
3. Make two holes on one side of the plate using a hole puncher and insert the shoe lace in the holes you created.
4. Hang it on trees or pillars in places like playground and areas facing towards the road in the school campus.
5. Take care of it - make sure it is protected from rain or storm for one month.
6. Bring it back to the classroom after a month or so and discuss the observations.

Bhopal Gas Tragedy, 1984

At midnight on 3rd December 1984, in a densely populated area of Bhopal, Central India, a poisonous vapor was released from the tall stacks of the Union Carbide pesticide plant. About forty tons of toxic gases had leaked from the Carbides Bhopal plant and spread throughout the city.

Residents of the city awoke to clouds of suffocating gas, unaware of the magnitude of the devastation that had engulfed them. The city of Bhopal immediately turned into a city of dead bodies. The entire place smelled of burning chili peppers. Of the million people living in Bhopal at that time, more than 2,000 died immediately (one fourth of actual figures) and as many as 300,000 were injured. In addition, about 7,000 animals were affected, of which about 1000 were killed. The precise number of deaths remains a mystery till date. The degree of injury was so high that about 30% of the injured were unable to return to their jobs. Among the survivors, most of them still suffer agonizing pain from the disastrous effects of the massive poisoning. There is still apprehension of the future generations being affected. The Bhopal disaster was the worst episode in the history of industrial air pollution.

Delhi Air Pollution, 2016

In November 2016, post Diwali celebrations, severe levels of toxic air pollution in Delhi led the government to declare an “emergency situation”. The level of PM_{2.5} (the most harmful pollutant) reached at 955 µg/m³ which is 16 times the permissible/safe limit. Delhi faced the worst smog in 17 years. Schools were closed for three days and construction work coal-fired power stations were put to a halt. This is not the first time that Delhi has witnessed deteriorating air quality. It has been almost a decade since the air quality in the National Capital gradually started worsening to alarming levels. However, the last three years have been particularly bad. It has become a regular practice in Delhi every winter, where citizens, especially children, have to face the brunt. Hospitals in the city have reported increased admissions of people suffering respiratory diseases - of which India has the highest rate in the world, with 159 deaths per 100,000 people in 2012, according to the World Health Organization.

Delhi’s neighbouring states like Haryana, Punjab and UP continue to burn crop waste. Smoke emanating from here is a major component in the formation of smog over Delhi.

Did you know?



PM_{2.5} is about 30 times finer than a human hair and penetrate deep into the lungs, when inhaled. It causes heart attacks, strokes, lung cancer and respiratory diseases, and are known to pose the greatest risk to human health.

Air Quality Index

The Government of India launched its Air Quality Index (AQI) in 2015 for 10 cities - Delhi, Agra, Kanpur, Lucknow, Varanasi, Faridabad, Ahmedabad, Chennai, Bangalore and Hyderabad. AQI is an index that reports air quality on a daily basis. It tells you how clean or polluted your air is, and what associated health effects might be a concern for you. The higher the AQI value, the greater the level of air pollution and the greater the health concern. (For further information please visit: <http://cpcb.nic.in/RealTimeAirQualityData.php>)

Air Quality Index	Impact on Health	What you can do
Good 0-50	Minimal Impact	Enjoy the great outdoors
Satisfactory 51-100	May cause minor breathing discomfort to sensitive people	Rather than drive - cycle or walk when possible Conserve energy - replace incandescent bulbs with CFLs
Moderate 101-200	May cause breathing discomfort to people with lung disease such as asthma, and discomfort to people with heart disease, children and older adults	Take public transport, share a ride or carpool Consider “going green” - Plant a tree, opt for green energy and avoid hazardous chemicals or plastics
Poor 201 - 300	May cause breathing discomfort to people on prolonged exposure, and discomfort to people with heart disease	People with asthma should consider reducing exertion outdoors Encourage people around you to quit smoking
Very poor 301 - 400	May cause respiratory illness to the people on prolonged exposure. Effect may be more pronounced in people with lung and heart diseases	Restrict outdoor activities Keep tracking the air quality index of your area regularly before going out
Severe 401 - 500	May cause negative respiratory impact even on healthy people, and serious health impacts on people with lung/heart disease. Impacts can be experienced even during light physical activity	You must avoid any form of outdoor activity Spread the word to friends and family

ACTIVITY – “COUNT YOUR EMISSIONS”



Time - 75 minutes



Number of students - 25 to 30

Learning objectives - Understanding the concept of everyday emissions and their sources.

This activity will help students to work together in a group of 5-6 and calculate the impact of individual activities that are contributing to air pollution. This will help generate discussions among the group members on activities that are in causing air pollution.

Materials

- Chart paper
- Pen
- Ruler

Procedure

1. Draw and recreate the emission score activity table (shown below)
2. Answer each question individually first and find out your emission score
3. Calculate total score for the group
4. The group with least emission score will be awarded as the “Clean Air Ambassadors”



Discussion points

- What have you learnt from the activity?
- What are you taking back with you after the exercise?
- How are you going to take it forward and make your friends and family strive for clean air?

Name of student	Location	Potential sources of air pollution in your locality	What do you feel about the air around you at home, while travelling and at school? (Bad-Black Okay-Grey Good-Aquamarine	Is there any open waste/ wood burning activity in your locality? (Never-10 Sometimes-5 Always-0) [A]	How often do you and your family use public transport like bus or metro? (Never-10 Sometimes-5 Always-0) [B]	How often do your family use private vehicle for errand trips? (Always-10 Sometimes-5 Never-0) [C]	How do you come to school? (Car-10 2W-8 3W-6 Bus-2 Cycle-0 Walk-0) [D]	How far do you travel to school? >= 30 mins-10 15 to 30 mins-5 <=15 mins-0 [E]	Emission score [A+B+C+D+E]	Total emission score of the group	How as a group can you reduce your emission score?
Student1			For e.g: Home ● While travelling ● At school ●								
Student2											
Student3											
Student4											

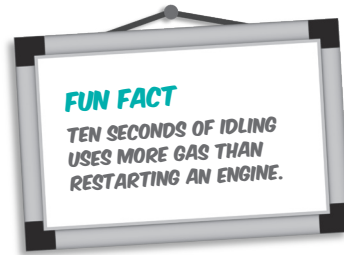
What is Idling?

Have you ever been standing or waiting on the roadside and smelt the exhaust coming out of cars, motorcycles, auto rickshaws or buses parked in the area? A vehicle that is parked or waiting with its engine turned on for 30 seconds or more is said to be idling. An idling vehicle emits 20 times more pollution than one travelling at 50 km per hour. Idling not only pollutes the air, but wastes gas and money.

Did you know?



Idling vehicles in school areas can be hard on young lungs, triggering asthma and exposing students to harmful pollution. Children breathe 50% more air per kg of body weight than adults and they are closer to the ground and also closer to vehicle tailpipes.



How can you help?

Drive/Ride smart

- While picking up students at school, buses should wait until everyone is inside before starting the engine. Buses should not idle while loading and unloading on school grounds.
- If you are going to stop for more than ten seconds, ask the driver to turn off your engine.
- Ask the driver to drive the vehicle to warm up, rather than idling the engine (usually no more than two to three minutes of idling is needed on cold winter days).

- Avoid using a remote car starter. These devices encourage you to start your vehicle before you are ready to leave, which means wasteful idling.

Be vocal

- Spread the word among your family and friends. Tell them that the benefits of reduced idling will help them save money and help protect the environment.
- Start a “No Idling Campaign” in your community.

How are we helping?

Vehicular exhaust from idling school buses can accumulate in and around the bus and pose a health risk to children, drivers and the community. Exposure to vehicular exhaust can cause lung damage and respiratory problems. Idling buses or vehicles also waste fuel and financial resources.

ACTIVITY – “IDLING SURVEY”



Time - 40 minutes



Number of students - 25 to 30

Learning objectives - Collecting and using data to understand why idling takes place and how to avoid it

This activity will enable students to collect data on the vehicles that are idling in the school neighborhood and think about encouraging family and friends to avoid idling as much as possible.

Materials

(For each group)

- Hardcopy of the survey sheet
- A watch
- Pen

Procedure

1. Divide yourselves into groups of 4-5.
2. Select an observer (spots and identifies vehicles), a timer (checks how long vehicles are left idling) and a recorder (records the number of idling and not idling vehicles) in each team and assign them their role.
3. Fill the survey sheet below based on the data collected.
4. This activity should be done for a 30-minute session in the morning and afternoon at an interval of 15 minutes.
5. Ideally, the survey should be carried out 15 minutes before the school starts and at the end of the day.
6. Submit the sheets to your teachers

5

Action Plans

Sessions	Start Time	End Time	Number of vehicles idling	Number of vehicles not idling	Total number of vehicles
Morning					
Afternoon					



Discussion points

- What are findings from the survey?
- What can be done to reduce idling at your school campus or local neighborhood?
- How can you create awareness among people and spread the word?

Read More:

Clean Air Kids (<http://www.clean-air-kids.org.uk/index.html>)

Doing Your Bit (<http://lasp.colorado.edu/home/wp-content/uploads/2011/08/Doing-Your-Bit.pdf>)

Healthy Air Living (<http://healthyairliving.com/your-school/kids-clean-air-tips.htm>)

Steps taken by government of India to reduce the air pollution:

- The Central Pollution Control Board (CPCB) and State Pollution Control Boards are implementing the Air (Prevention and Control of Pollution) Act 1981 to restore air quality.
- Stringent Emission Standards have been implemented to regulate emissions from in-use vehicles from October 2004.
- Bharat Stage-IV emission norms have been implemented in 13 mega cities including NCR for new 4-wheelers from 2010.
- Mass emission standards (Bharat Stage-III) have been notified for two, three wheelers and diesel driven agricultural tractors from April 1, 2010 throughout the country.
- Operating Compressed Natural Gas (CNG) mode public transport in Delhi.
- Introduction of metro in Delhi to promote use of mass public transport system.
- Special drives for prevention and control of pollution in 17 categories of highly polluted industries.

Taking note of the gravity of Air Pollution, the government has taken some more measures lately:

- Launch of National Ambient Air Quality Index in April 2015 starting with 10 cities and extended to 23 cities.
- Implementation of Bharat Stage-IV (BS-IV) norms in 63 cities and universalization of BS-IV in 2017.
- Decision taken to leapfrog directly from BS-IV to BS-VI fuel standards by 1st April 2020.
- Comprehensive review of all Waste Management Rules including Municipal Solid Waste, Plastic Waste, Hazardous Waste, Bio-medical Waste and Electronic Waste.
- Ban on burning of leaves, biomass, municipal solid waste.
- Installation of on-line continuous (24x7) monitoring devices by major industries.

References

Activity	How does it help?
✓ Have fun! Ride your cycle or go for a walk	It's a great way to travel and it helps you to stay fit and reduces air pollution.
✓ Take mass transit like bus or metro, share a ride or carpool	Even if you do it once or twice a week, you will reduce traffic congestion, air pollution and save money.
✓ Take care of your car and motorcycle	Regular maintenance can improve fuel mileage, extend your car's life, increases its resale value and it makes your car get easy on the air as it could reduce your car's emissions by more than half.
✓ Turn off lights when not in use	The more power that you are using, the more energy you're wasting and the more you're polluting the air.
✓ Get fuel when it is cool	Refueling during cooler times of the day or in the evening can prevent fuel fumes from heating up.
✓ Plant a garden	Planting a garden is going make your air cleaner naturally.
✓ Use low-VOC or water-based paints	The fewer oil products you use, the better it is - as that means less oil is being produced overall.
✓ Consolidate your trips	Make sure that everything you're doing can be done in one trip instead of going out several times in your vehicle. This way, you're using less fuel and contributing to lesser emissions.
✓ Conserve electricity	Carbon dioxide emissions are generated from devices like air conditioners and heaters.
✓ Reduce, reuse, recycle	Recycle as much as you can. Reuse. But most of all, reduce!
✓ Contribute	See if your state or local government already has initiatives there you can contribute to making the air quality in and around your area better.
✓ Spread the word	Talk about air quality and make other people aware.

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For more information: www.cleanairasia.org



Clean Air Asia

center@cleanairasia.org

Unit 3505 Robinsons
Equitable Tower, ADB
Avenue, Pasig City
Metro Manila 1605
Philippines

Clean Air Asia China Office

china@cleanairasia.org

11-152, GianGuoMenWai
Diplomatic
Residence Compound No.1,
XiuShui Street, ChaoYang District,
Beijing 100600 China

Clean Air Asia India Office

india@cleanairasia.org

Basement C-3, Green
Park Extension,
New Delhi 110016, Delhi,
India

261 Clean Air Asia Partnership Members

- Cities
- Environment ministries and government agencies
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