

"SICK OF AIR POLLUTION? BE PART OF THE SOLUTION"



CONTACT

The Bangalore Environment Trust,
166, Langford Road, BANGALORE-560 025.

Tel: 225515

Price: Rs. 2/-

01570

1570

TRUSTEES OF THE BET

Capt. S. Prabhala, Chairman, BEL

Prof. V. Radhakrishnan

Kumari Urmila Devi

Mr. Mohan Bopiah

Mrs. Naomi Meadows

Mr. David Lobo

Justice Bopanna

ADMINISTRATOR:

Mr. G. Govardhan

CONSULTANTS :

Dr. Raja Ramanna

Dr. B.V. Krishnamurthy

Mr. Dara Mistry

Ms. Bunny Ganapathy

Mrs. Almitra Patel

Maj. Gen. P.R. Kumar

Prof. H.V. Nagaraja Rao

Dr. N. Chandrashekara

Environmental pollution, acid rain and green house effect are the critical problems facing mankind today. Air which Bangaloreans breathe has become increasingly unhealthy as atmospheric pollution increases. Automobile emission is a major factor; next comes industrial emission. In Bangalore, the average per capita intake of pollutants is equivalent to smoking of about 6 cigarettes per day. Unless drastic remedial measures are immediately taken, Bangalore, the "Garden City", will be on its way to join Bombay and Calcutta on the road to "ecological suicide".

Air pollution not only affects human health but causes material damage resulting in economic loss. Further, it has long term effects on ecology. There is a wide spread feeling that existing legislation to curb environmental pollution is ineffective. It is for the citizens to bring pressure on the concerned authorities to take suitable action. BET provides a forum both for voicing your grievances and participating in the movement to improve environmental conditions.

The BET has a scheme of supporters consisting of individuals who are prepared to assist it in attaining its objectives. If you would like to support us, contact the Administrator to understand what BET expects you to do.

The assistance given by Prof.H.V.N. Rao, Faculty of Civil Engineering, R.V.College of Engineering, Bangalore, and co-author of the book 'Air Pollution' in preparing this booklet is gratefully acknowledged.

G. GOVARDHAN,
Administrator,
Bangalore Environment Trust.

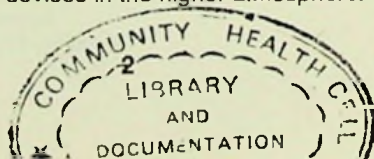
WHAT IS AIR POLLUTION?

Air pollution is one of the greatest environmental evils. Polluted air contains dust, fumes, gas, odour, smoke or vapour in various concentrations. Breathing polluted air is injurious to health of humans, animals and plants. It affects buildings, structures etc. through chemical action. Air pollution interferes with enjoyment of life.

Air pollution is experienced differently by different people. To a person walking on the road, irritation of eyes and soiled clothing; to a farmer damaged vegetation; to a pilot dangerously reduced visibility; and to industries additional capital investment for pollution control and bad publicity if investment is not made.

CAUSES OF AIR POLLUTION

1. High population density which leads to high rate of fuel consumption.
2. Extensive development of industries and discharge of waste flue gases.
3. Rapid growth of motor transport and consequent increase in the volume of exhaust emissions.
4. Increase in the quantity and use of radioactive substances and radioactive contamination of air due to the testing of nuclear devices in the higher atmosphere.



01570

E-150

AIR CONTAMINANTS

1. Natural contaminants

eg: natural fog, pollen grains, bacteria and products of volcanic eruption.

2. Aerosols (particulates)

eg: dust, smoke, fog and fumes.

3. Gases and vapours

eg: Sulphur Compounds - Sulphur dioxide, sulphur trioxide and hydrogen sulphide.

Nitrogen compounds - Nitric oxide, nitrogen dioxide and ammonia.

Oxygen compounds - Ozone, carbon monoxide and carbon dioxide.

Halogen compounds - Hydrogen fluoride and hydrogen chloride.

Organic compounds - Aldehydes and hydrocarbons.

Radioactive compounds - Radioactive gases.

EFFECTS ON HUMAN HEALTH

The air we breathe has not only life-supporting properties but also life-damaging properties. Under ideal conditions the air we inhale has a qualitative and quantitative balance

that maintains the well-being of man. But when the balance among the air components is disturbed, or, in other words, if it is polluted it may affect human health.

The average man breathes 22,000 times a day and takes 16 Kg of air each day. It far exceeds the consumption of food and water.

The effects of air pollution is more among infants, the elderly, and the infirm. Those with chronic diseases of the lungs or heart are thought to be at great risk.

Following are the important health effects:

1. Eye irritation.
2. Nose and throat irritation.
3. Irritation of the respiratory tract.
4. A variety of particulates, particularly pollen, initiate asthmatic attacks.
5. Carbon monoxide combines with the haemoglobin in the blood and consequently increases stress on those suffering from cardiovascular and pulmonary diseases.
6. Carcinogenic agents cause cancer.
7. Dust particles cause respiratory diseases. Diseases like silicosis, asbestosis, etc., result from specific dusts.

8. Gases like hydrogen sulphide, ammonia etc. cause mal odour even at low concentrations.
9. Increase in morbidity rate (disease rate) and mortality rate (death rate).
10. Radioactive fallout from testing of nuclear devices causes,
 - (a) Cancer
 - (b) Shortening of life span and
 - (c) Genetic effects or mutation.

Table 1 gives some of the disastrous air pollution events in the world:

TABLE 1. AIR POLLUTION EPISODES

Sl. No.	Month and year	Place	Mortality
1.	December, 1930	Meuse Valley (Belgium)	63
2.	October, 1948	Donora (Pennsylvania)	20
3.	November, 1950	Poza Rica (Mexico)	22
4.	December, 1952	London	4000
5.	November, 1953	New York	220
6.	January, 1956	London	1000
7.	December, 1957	London	750
8.	December, 1962	London	700
9.	January, 1963	New York	300
10.	November, 1966	New York	168
11.	December, 1984	Bhopal (India)	2300

EFFECTS ON CHILDREN

Polluted air affects children most severely. It has been reported that they suffer from reduced lung capacity. Their growth rate and haemoglobin rate drop and they are vulnerable to respiratory infection three times more than the normal. **The lead content in the exhaust fumes from motor vehicles affects the mental development of children.**

EFFECT ON PLANTS

Air pollutants interfere with plant growth and the process of photosynthesis. Damage to leaves may be in the form of necrosis (destruction of tissues), chlorosis (loss or reduction of the green plant pigment, chlorophyll, resulting in a pale green or yellow pattern) or abscission (dropping of leaves). Plant injury may also be in the form of an effect on growth without visible markings (invisible injury).

ECONOMIC LOSSES (MATERIAL DAMAGE)

Various economic losses occur because of material/property damage due to air pollutants. This is listed in Table 2.

TABLE 2 AIR POLLUTION DAMAGE TO VARIOUS MATERIALS

Sl. No.	Materials	Effects
1.	Building Materials	Discolouration, leaching.
2.	Metals	Corrosion, loss of metal, tarnishing.
3.	Paint	Discolouration.
4.	Textiles and Textile dyes	Reduced tensile strength, deterioration and fading.
5.	Rubber	Cracking, weakening.
6.	Leather	Disintegration, powdered surface.
7.	Paper	Embrittlement.
8.	Ceramics	Change in surface appearance.

Air pollutants have also caused great damage to art objects throughout the world. A good example of this intangible loss in our country is the effect of air pollutants on Taj Mahal. The renowned temple of Sri Channakeshava at Belur (Hassan District) is threatened with a similar hazard.

CIGARETTE SMOKING HAZARDS

Cigarette smoking is very dangerous to health. Cigarette smoke contains carbon monoxide, nitrogen oxides, hydrogen cyanide, nitotine, lead, vapourised tar, carcinogens and over 200 other deadly chemicals.

Cigarettes have also been reported to be radioactive. Smoking can cause lung cancer, throat cancer, peptic ulcer, chronic bronchitis, coronary heart disease and other disorders. People who smoke are more likely to die prematurely, in their forties and fifties, than those who do not smoke. Those who start smoking when young have considerably higher death rates. Further, even non-smokers (passive smokers) run risks from inhaling the smoke of cigarette smokers in the same room. It has also been reported that pregnant women who smoke have a much higher risk of giving birth to premature and low-weight babies.

Today the problem has assumed such an alarming proportion that the World Health Organisation wants smoking made taboo. In the year 1985 WHO has launched a campaign to curb cigarette smoking with the slogan, "Smoking or health, the choice is yours".

INDOOR AIR POLLUTION

Traditional fuels such as fire wood, animal dung, coal, etc., generate air pollutants like particulate matter, oxides of sulphur, oxides of nitrogen, carbon monoxide, hydrocarbons etc. as well as an unpleasant smell. They cause watery eyes, respiratory and skin irritation and headaches. The problem is of great concern in our country where over 80 percent of the time of housewives is spent in an indoor environment of which 4-6 hours is spent in kitchens.

Also, pollen, fungal spores and various types of dusts pollute indoor air and cause allergic diseases, especially asthma. Tobacco smoke aggravates the problem of indoor air pollution. Poor ventilation of houses further complicates the problem.

VISIBILITY AND AIR POLLUTION

The smokiness of the air reduces considerably the penetration of the atmosphere by the sun rays. This reduces the range of visibility, and cause road and plane accidents. Smoke combines with fog to form smog.

AMBIENT AIR QUALITY STANDARDS

The ambient air quality standards as fixed by the Central Pollution Control Board are given in Table 3.

TABLE 3. AMBIENT AIR QUALITY STANDARDS

Category	Area	Concentration in $\mu\text{g}/\text{m}^3$			
		SPM	SO ₂	NO _x	CO
A	Industrial and mixed use	500	120	120	5000
B	Residential and rural	200	80	80	2000
C	Sensitive	100	30	30	1000
SPM:-	Suspended Particulate matter	SO ₂ :- Sulphur dioxide			
NO _x :-	Oxides of nitrogen	CO:- Carbon monoxide			

The concentration of the pollutants shall be 95 percent of the time within the limits prescribed.

The category (C) covers hill stations, tourist resorts, sanctuaries, national parks, national monuments, health resorts and other such areas where cleaner air is considered desirable even if it implies some curbs on economic activity.

AIR POLLUTION LEGISLATION AND REGULATIONS

The two important Acts to control air pollution in our country are:

1. The Air (Prevention and Control of Pollution) Act, 1981.
2. The Environment (Protection) Act, 1986.

Industries specified in the schedule under the Air Act, 1981, are listed below:

1. Asbestos and asbestos products industries.
2. Cement and cement products industries.
3. Ceramic and ceramic products industries.
4. Chemical and allied industries.
5. Coal and lignite-based chemical industries.
6. Engineering industries.
7. Ferrous metallurgical industries

8. Fertilizer industries.
9. Foundries.
10. Food and agricultural products industries.
11. Mining industry.
12. Non-ferrous metallurgical industries.
13. Ores/mineral processing industries including beneficiation, pelletization, etc.
14. Power (coal, petroleum and their products) generating plants and boiler plants.
15. Paper and pulp (including paper products) industries.
16. Textile processing industry (made wholly or in part of cotton).
17. Petroleum refineries.
18. Petroleum products and petrochemical industries.
19. Plants for recovery from and disposal of wastes.
20. Incinerators.

01570

E-150

COMMUNITY HEALTH CELL
47/1, (First Floor) St. Marks Road
BANGALORE - 560 001

GUIDELINES FOR MINIMUM STACK HEIGHT

The guidelines for minimum stack height as given by the Central Pollution Control Board is as follows:

Plant type	Stack height
1. For all plants except thermal power plant	30m
2. For plants where the sulphur dioxide emission is estimated as Q(Kg/hr), the stack height, H in metres is given by	$H = 14(Q)^{0.3}$
3. For plants where the particulate matter emission is estimated as Q (tonnes/hr) the stack height, H in metres is given by	$H = 74 (Q)^{0.27}$

4. If by using the formula given in 2 or 3 above, the stack height arrived at is more than 30m, then this higher stack should be used.

In no case should the height of the stack be less than 30m for plants given in the Schedule of the Air Act, 1981, and located in industrial areas of cities.

Some Sections of the Environment (Protection) Act, 1986, which are of general interest to the public are quoted below:

Sec. 2. Definitions :- In this Act, unless the context otherwise requires:-

(a) "environment" includes water, air and land and the inter-relationship which exists among and between water, air and land, and human beings, other living creatures, plants, micro-organism and property;

(b) "environmental pollutant" means any solid, liquid or gaseous substance present in such concentration as may be or tend to be, injurious to environment;

(c) "environmental pollution" means the presence in the environment of any environmental pollutant;

(d) "handling", in relation to any substance, means the manufacture, processing, treatment, package, storage, transportation, use, collection, destruction, conversion, offering for sale, transfer or the like of such substance;

(e) "hazardous substance" means any substance or preparation which, by reason of its chemical or physicochemical properties or handling, is liable to cause harm to human beings, other living creatures, plants, micro organism, property or the environment.

Sec.7. Persons carrying on industry,operation, etc., not to allow emission or discharge of environmental pollutants in excess of the standards - No person

carrying on any industry, operation or process shall discharge or emit or permit to be discharged or emitted any environmental pollutant in excess of such standards as may be prescribed.

Sec.8. Persons handling hazardous substances to comply with procedural safeguards - No person shall handle or cause to be handled any hazardous substance except in accordance with such procedure and after complying with such safeguards as may be prescribed.

Sec.9. Furnishing of information to authorities and agencies in certain cases - (1) Where the discharge of any environmental pollutant in excess of the prescribed standards occurs or is apprehended to occur due to any accident or other unforeseen act or event, the person responsible for such discharge and the person in-charge of the place at which such discharge occurs or is apprehended to occur shall be bound to prevent or mitigate the environmental pollution caused as a result of such discharge and shall also forthwith -

(a) intimate the fact of such occurrence or apprehension of such occurrence; and

(b) be bound, if called upon, to render all assistance, to such authorities or agencies as may be prescribed.

(2) On receipt of information with respect to the fact or apprehension of any occurrence of the nature referred to in

sub-section (1), whether through intimation under that sub-section or otherwise, the authorities or agencies referred to in sub-section (1) shall, as early as practicable, cause such remedial measures to be taken as are necessary to prevent or mitigate the environmental pollution.

Sec.15. Penalty for contravention of the provisions of the Act and the rules, orders and directions - (1) Whoever fails to comply with or contravenes any of the provisions of this Act, or the rules made or orders or directions issued thereunder, shall, in respect of each such failure or contravention, be punishable with imprisonment for a term which may extend to five years or with fine which may extend to one lakh rupees, or with both, and in case the failure or contravention continues, with additional fine which may extend to five thousand rupees for every day during which such failure or contravention continues after the conviction for the first such failure or contravention.

(2) If the failure or contravention referred to in sub-section (1) continues beyond a period of one year after the date of conviction, the offender shall be punishable with imprisonment for a term which may extend to seven years.

Sec.16. Offences by Companies - (1) Where any offence under this Act has been committed by a company, every person who, at the time the offence was committed,

was directly in charge of, and was responsible to, the company for the conduct of the business of the company, as well as the company, shall be deemed to be guilty of the offence and shall be liable to be proceeded against and punished accordingly:

Provided that nothing contained in this sub-section shall render any such person liable to any punishment provided in this Act, if he proves that the offence was committed without his knowledge or that he exercised all due diligence to prevent the commission of such offence.

(2) Notwithstanding anything contained in sub-section (1), where an offence under this Act has been committed by a company and it is proved that the offence has been committed with the consent or connivance of, or is attributable to any neglect on the part of, any director, manager, secretary or other officer of the company, such director, manager, secretary or other officer shall also be deemed to be guilty of that offence and shall be liable to be proceeded against and punished accordingly.

Explanation - For the purposes of this section, -

- (a) "Company" means any body corporate, and includes a firm or other association of individuals; and
- (b) "Director", in relation to a firm, means a partner in the firm.

Sec.17. Offences by Government Departments - (1)

Where an offence under this Act has been committed by any Department of Government, the Head of the Department shall be deemed to be guilty of the offence and shall be liable to be proceeded against and punished accordingly.

Provided that nothing contained in this section shall render such Head of the Department liable to any punishment if he proves that the offence was committed without his knowledge or that he exercised all due diligence to prevent the commission of such offence.

(2) Notwithstanding anything contained in sub-section (1), where an offence under this Act has been committed by a Department of Government and it is proved that the offence has been committed with the consent or connivance of, or is attributable to any neglect on the part of, any officer, other than the Head of the Department, such officer shall also be deemed to be guilty of that offence and shall be liable to be proceeded against and punished accordingly.

Sec.18. Protection of action taken in good faith - No suit, prosecution or other legal proceeding shall lie against the Government or any officer or other employee of the Government or any authority constituted under this Act or

any member, officer or other employee of such authority in respect of anything which is done or intended to be done in good faith in pursuance of this Act or the rules made or orders or directions issued thereunder.

Sec.19. Cognizance of offences - No court shall take cognizance of any offence under this Act except on a complaint made by -

(a) the Central Government or any authority or officer authorised in this behalf by this Government; or

(b) any person who has given notice of not less than sixty days, in the manner prescribed, of the alleged offence and of his intension to make a complaint, to the Central Government or the authority or officer authorised as aforesaid.

Sec.22. Bar of Jurisdiction - No civil court shall have jurisdiction to entertain any suit or proceeding in respect of anything done, action taken or order or direction issued by the Central Government or any other authority or officer in pursuance of any power conferred by or in relation to its or his functions under this Act.

Sec. 24. Effect of others laws:- (1) Subject to the provisions of sub-section (2), the provisions of this Act and the rules or orders made therein shall have effect notwithstanding anything inconsistent therewith contained in any enactment other than this Act.

(2) Where any act or omission constitutes an offence punishable under this Act and also under any other Act then the offender found guilty of such offence shall be liable to be punished under the other Act and not under this Act.

KARNATAKA MUNICIPAL CORPORATIONS ACT, 1976

Sec.334. Under "Nuisances" says - Abatement of nuisance from dust and smoke, etc. - If in the opinion of the Commissioner the storage, dumping or deposit in any building or land, of coal, charcoal, ashes, cinders, gunny bags, wool, cotton or any material of the shifting, breaking, cutting or burning of such coal, charcoal, ashes, cinders or material or subjecting the same to any process causes or is likely to cause nuisance to the inhabitants in the neighbourhood of such building or land, by the emanation of dust, floating particles, smoke, unwholesome smell or noise or otherwise, he may, by notice, require the owner or occupier of such building or land to take such steps as may be specified in the notice for the abatement of such nuisance.

AUTOMOBILE EXHAUST POLLUTION

The pollutants emitted from automobiles are carbon monoxide, nitrogen oxides, hydrocarbons, lead fumes and black smoke. Smoke from diesel engines causes eye

irritation, impairs vision, causes cough and severe breathing problems. Lead from petrol engines leads to serious lead poisoning, apart from affecting the mental growth of children. Some of the hydrocarbons are carcinogenic. Carbon monoxide depletes the vital oxygen levels in the blood and affects brain. At higher concentrations, it is lethal. Extended exposure to nitrogen oxides can cause lung damage.

THE MOTOR VEHICLES ACT, 1988

In the amended Motor Vehicles Act, which has come into effect from July 1, 1989, rigorous anti-pollution measures have been incorporated. Penalty for the first violation is Rs. 1,000, for the second violation Rs. 2,000 and for the third violation suspension of the registration.

EMISSION STANDARDS AS PER MOTOR VEHICLES ACT, 1988.

Accordingly, the emission standards are:

- (a) Idling CO (Carbon monoxide) emission limit for all four wheeled petrol driven vehicles shall not exceed 3 percent by volume;
- (b) Idling CO emission limit for all two and three wheeled petrol driven vehicles shall not exceed 4.5 per cent by volume;

- (c) Smoke density for all diesel driven vehicles shall be as follows:

Method of Test	Maximum Smoke Density		
	Light absorption Co-efficient	Bosch Units	Hartridge Units
A) Full load at a speed of 60% to 70% of maximum engine rated speed declared by the manufacturer	3.1	5.2	75
B) Free Acceleration	2.3	-	65

These standards come into effect from 1-3-1990.

REMEDIES/ACTION TO BE TAKEN

1. Growing suitable trees like neem, tamarind, margosa, bougainvillea, peepal etc. which are capable of absorbing dust and gas from the polluted atmosphere. Tree planting on massive scale should be undertaken.
2. Service organisations should persuade the Bangalore City Corporation to stop clearing of grass from roadsides and footpaths. Grass is the best protector and consolidator of soil, and also it prevents the raising of dust in dry weather.
3. Strict enforcement of The Air Act (1981) and The Environment Act (1986) by the Government. The

01570 E-100
COMMUNITY HEALTH CELL
47/1, (First Floor) St. Marks Road
BANGALORE - 560 001

existing laws should be reviewed periodically.

4. Establishing air quality and emission standards in case of air pollutants for which standards have not been framed so far.
5. Regular ambient air quality monitoring by Organisations like Pollution Control Boards and publishing the data obtained regularly in newspapers (on front page), radio and TV, preferably in the form of a simple air pollution index understandable by the common man.
6. Engine modification and providing emission control devices by automobile manufacturers. They should intensify R & D efforts to reduce automobile pollution. Solar-powdered cars should be introduced. Heavy vehicles like lorries, trucks and buses should be provided with vertical exhaust pipes at top.
7. Banning the use of lead as additive to petrol.
8. School children should not be involved in the traffic regulation trainings till the air is clean and safe at Bangalore, as medical evidence in western countries indicate adverse health effects among children exposed to lead contaminated atmosphere.
9. Proper city planning and location of industrial areas.
10. Banning smoking in areas such as Government offices, educational institutions, official conferences, seminars, trains, railway stations and airports. Also

banning advertisements of cigarettes and other tobacco products in mass media and sports stadia.

11. Steps should be taken by factory management to reduce the hazards of occupational diseases like byssinosis, asbestosis, silicosis, etc. Detailed medical investigation of these should be undertaken.
12. Creating public awareness about air pollution hazards by exhibiting slides, documentaries, and short films in cinema theatres and TV.
13. Introducing environmental education at primary school level.
14. Voluntary organisations should be encouraged to take active role in programmes relating to environmental pollution control and abatement.

WHAT YOU CAN DO?

1. With respect to your motor vehicles, follow the guidelines given below to reduce fuel consumption and create a cleaner environment.

- (i) Service your vehicles regularly.
- (ii) Adjust carburettor to deliver a leaner air-fuel mixture to reduce carbon monoxide and hydrocarbon emissions.
- (iii) Reduce unnecessary idling of engine.

- (iv) Drive as smoothly as possible without needless acceleration or deceleration.
- (v) Do not over load the vehicles than that suggested by the manufacturers.
- (vi) Periodically check your vehicle emissions for smoke, carbon monoxide and hydrocarbons and see they are within the prescribed limits.

2. If you come across any public vehicle or private vehicle emitting excess smoke, write to the Deputy Commissioner of Police (Traffic), 14th floor, Public Utility Building, Mahatma Gandhi Road, Bangalore - 560 001, giving the following details:

- a. Details of nuisance :
- b. Date :
- c. Place :
- d. Time :
- e. Vehicle No. :
- f. Type of Vehicle :
- g. Your name and address :

3. Avoid/reduce using smoking fuels like firewood, coal and animal dung cakes for heating/cooking.

4. Stop smoking as smoking affects not only you (active smoker) but others (passive smokers) too.

5. Ensure that houses/working places are well ventilated.

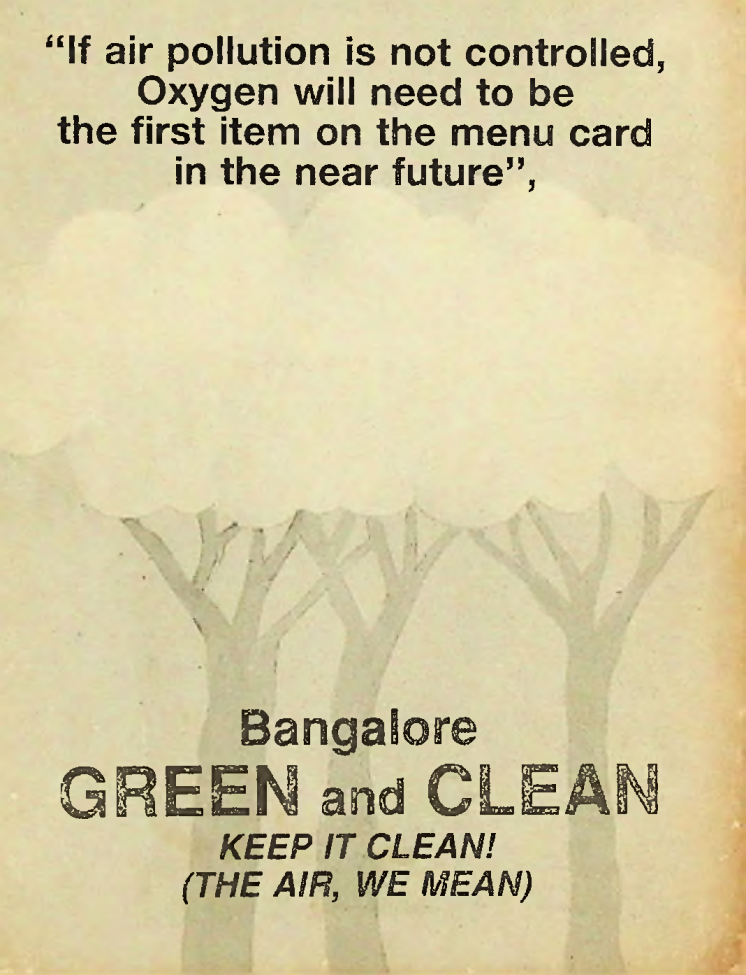
6. Prevent/discourage burning of garbage in dustbins.

7. Tell your friends and neighbours to help in keeping the environment clean so that our children can breathe fresh, unpolluted air.

TELEPHONE NUMBERS OF IMPORTANT PERSONS

	Jurisdiction	Telephone No.	
Director General of Police (Mr. A.R. Nizamuddin)	Karnataka State	211803 79421/200 567665 214100	Off. Res.
Commissioner of Police (Mr. R. Ramalingam)	Bangalore City	569203/200 24501 79421/222 333841 79421 Extn. 440	Off Res.
Deputy Commissioner of Police (Traffic) (Mr. D.N. Munikrishna)	Bangalore City	578366 79421/266 215009	Off Res
Chairman, Karnataka State Pollution Control Board	Karnataka State	576581	Off.
Member Secretary, Karnataka State Pollution Control Board	Karnataka State	576570	Off
Transport Commissioner (Mr. K. Jairaj)		24900 567548	Off Res

**“If air pollution is not controlled,
Oxygen will need to be
the first item on the menu card
in the near future”,**



Bangalore
GREEN and CLEAN

KEEP IT CLEAN!
(THE AIR, WE MEAN)