TOOLS FOR COMMUNITY ENVIRONMENTAL AND HEALTH MONITORING

A Manual for Pollution Impacted Communities

COMMUNITY ENVIRONMENTAL MONITORING, CHENNAI
www.sipcotcuddalore.com

HEALTHY ENERGY INITIATIVE INDIA
www.healthyenergyinitiative.org

2021

CONTENTS

SECTION I: UNDERSTANDING ENVIRONMENT, POLLUTION AND TOXICS

SECTION – II: BASICS OF COMMUNITY ENVIRONMENTAL MONITORING (CEM)

SECTION – III: LAWS THAN CAN ASSIST COMMUNITIES IN ENVIRONMENTAL PROTECTION

SECTION -- IV: Community Health Monitoring

INTRODUCTION

Community Environmental Monitoring (CEM) is an initiative to support pollution impacted communities in India. It was in the SIPCOT Industrial Complex, Cuddalore where the principles of CEM were first tested. The aim of the Cuddalore campaign was to demystify science and deploy low cost tools and technologies to systematically understand, document and report pollution. Furthermore, the interventions developed by the initiaitive were designed to help residents of pollution impacted communities express their environmental and health experiences in a language that could not be refuted by the authorities without basis. The larger goal of CEM is to help expand the democratic spaces of communities.

This manual is an effort to consolidate the experiences and learnings of communities that have employed the principles of CEM over the past decade.

The manual has been divided into four sections. The first section deals with the concepts like environment, pollution, behaviour of chemicals in our bodies and movement of chemicals in the food chain. The second section highlights the evidence building tools and techniques of documentation, reporting, environmental sampling etc. The third section focuses on relevant laws like Indian Penal Code (IPC), Right to Information Act, Public Liability Insurance Act etc. The final sections highlights Symptom checklist, Body Mapping for Disease Conditions, Symptom calendar, Health evidences, Further Actions to be taken.

We hope that this manual will serve as a useful guide to strengthen the struggles of pollution impacted communities in protecting their health and environment.

Community Environmental
Monitoring
Chennai
2021

Design & Layout: BANAO CREATIVES
www.banao.co.in
Illustrations: Shantanu Mitra and Satwik Gade
Infographics: Sources

For more details contact:

Community Environmental Monitoring,
a project of The Other Media
No.92, Thiruvallur Nagar, 3rd Street
Besant Nagar, Chennai 600090

Website: www.theothermedia.in

Email: india.cem@gmail.com

This manual and associated material is available for download @ **www.sipcotcuddalore.com**

ACKNOWLEDGEMENTS

In memory of the late Mr. Denny Larson, who intoduced the idea of community based environment monitoring to pollution impacted communities world over

Community Environmental Monitoring (CEM) would like to acknowledge the support and contribution of all its members and advisors for compiling this manual.
We would like to make a special mention of Hesperian Foundation's publication 'A Community Guide to Environmental Health' which inspired and was a vital source of information for this manual.

CEM thanks the following for their invaluable support and contributions:

Members of SIPCOT Area Community Environmental Monitoring and community members from Chhattisgarh, Himachal Pradesh, Tamil Nadu, Jharkhand, etc. who have adopted CEM and helped develop the idea further.

The 'Working-class environmentalisms in age of transnational markets' research project (BA/Leverhulme Small Research Grant; University of Edinburgh & University of Exeter)

Nityanand Jayaraman and Dr. Adithya Pradyumna for his guidance and mentorship.

Association for India's Development (AID)

Individual Donors from India

Conceived and compiled by
Dharmesh Shah
Shweta Narayan
With inputs from Pooja Kumar, Coastal Resource Centre, Chennai
Nitha Thankam George, Dr. Gajapriya G, Healthy Energy Initiative

SECTION 1

Understanding Environment, Pollution & Toxics

1 The Environment & **Environmental Justice**

SOURCE: SCREEN GRAB 'KODIKANAL WON'T' VIDEO

Communities living in polluted environments are constantly assaulted by a variety of pollutants which can take the form of noxious odours, fine dust or toxic effluents among others. The emission of such pollutants into the air, water and land is what is generally referred to as "pollution".

The term environment is commonly associated with the natural environment comprising of trees, forests, mountains, rivers and ocean. While true, this is only a partial definition. A comprehensive definition of environment should extend to the social aspects of everyday life which includes our community, our home, our neighbourhood, places where our children play and our place of work. Any damage or change in the natural and social environment can impact the mental, physical and social well being of communities.

2 Understanding **Pollution**

Pollution occurs when something that does not naturally belong in an ecosystem is forcibly introduced into it. The foreign substance that causes pollution is known as a 'pollutant'.

Most of the known sources of pollution are anthropogenic ie; caused by human activities like coal and oil burning, mining, burning of waste, construction, manufacturing etc. Natural sources like forest fires, volcanoes etc., can also contribute to the pollution load.

TYPES OF POLLUTION

SOURCE: CREATIVE COMMONS IMAGES, SCI-TECH EUROPA

Air Pollution

Air Pollution is the contamination of the air we breathe by a pollutant. The source of such pollution can be smoke or gases from car exhaust, coal or gas burning power plants, emissions from chemical production facilities like paints, plastics, pharmaceuticals or radiation from a nuclear accident like the one in Fukushima, Japan.

SOURCE: CREATIVE COMMONS IMAGES

Land Pollution

Land pollution is the degradation of the Earth's surface caused by a misuse of resources and improper disposal of wastes.

● Litter found on the side of the road ● Illegal dumping in natural habitats ● Oil spills that happen inland ● The use of pesticides and other farming chemicals ● Damage and debris caused from unsustainable mining and logging practices ● Radiation spills or nuclear accidents

Water Pollution

SOURCE: CREATIVE COMMONS IMAGES

Water pollution is the contamination of any body of water (lakes, groundwater, oceans, etc). Some examples of water pollution:

- Raw sewage running into lake or streams.
- Industrial waste spills contaminating groundwater.
- Radiation spills or nuclear accidents.
- Illegal dumping of substances or items within bodies of water.
- Biological contamination, such as bacteria growth.
- Farm runoff into nearby bodies of water.

Light Pollution

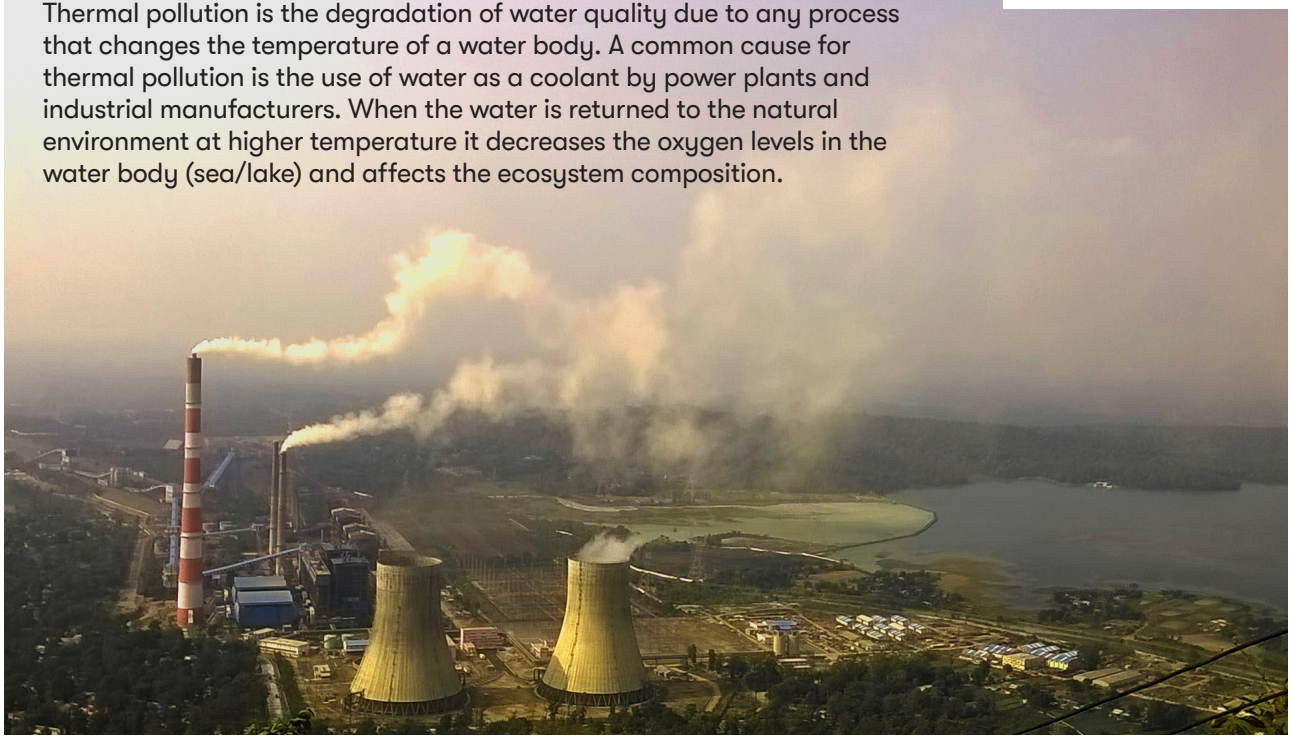
SOURCE: CREATIVE COMMONS IMAGES

Light pollution is the brightening of the night sky inhibiting the visibility of stars and planets by the use of improper lighting of communities. This is especially of concern in coastal communities which host turtle nesting sites or migratory birds.

- Street lamps that shine light in all directions, instead of with a hood to point light downward toward the street.
- Extra, unnecessary lights around the home.
- Cities that run lights all night long.

Thermal Pollution

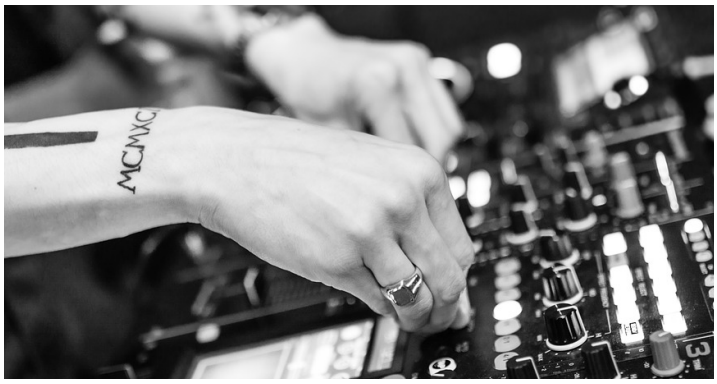
Thermal pollution is the degradation of water quality due to any process that changes the temperature of a water body. A common cause for thermal pollution is the use of water as a coolant by power plants and industrial manufacturers. When the water is returned to the natural environment at higher temperature it decreases the oxygen levels in the water body (sea/lake) and affects the ecosystem composition.



SOURCE: CREATIVE COMMONS IMAGES

SOURCE: CREATIVE COMMONS IMAGES

Noise Pollution

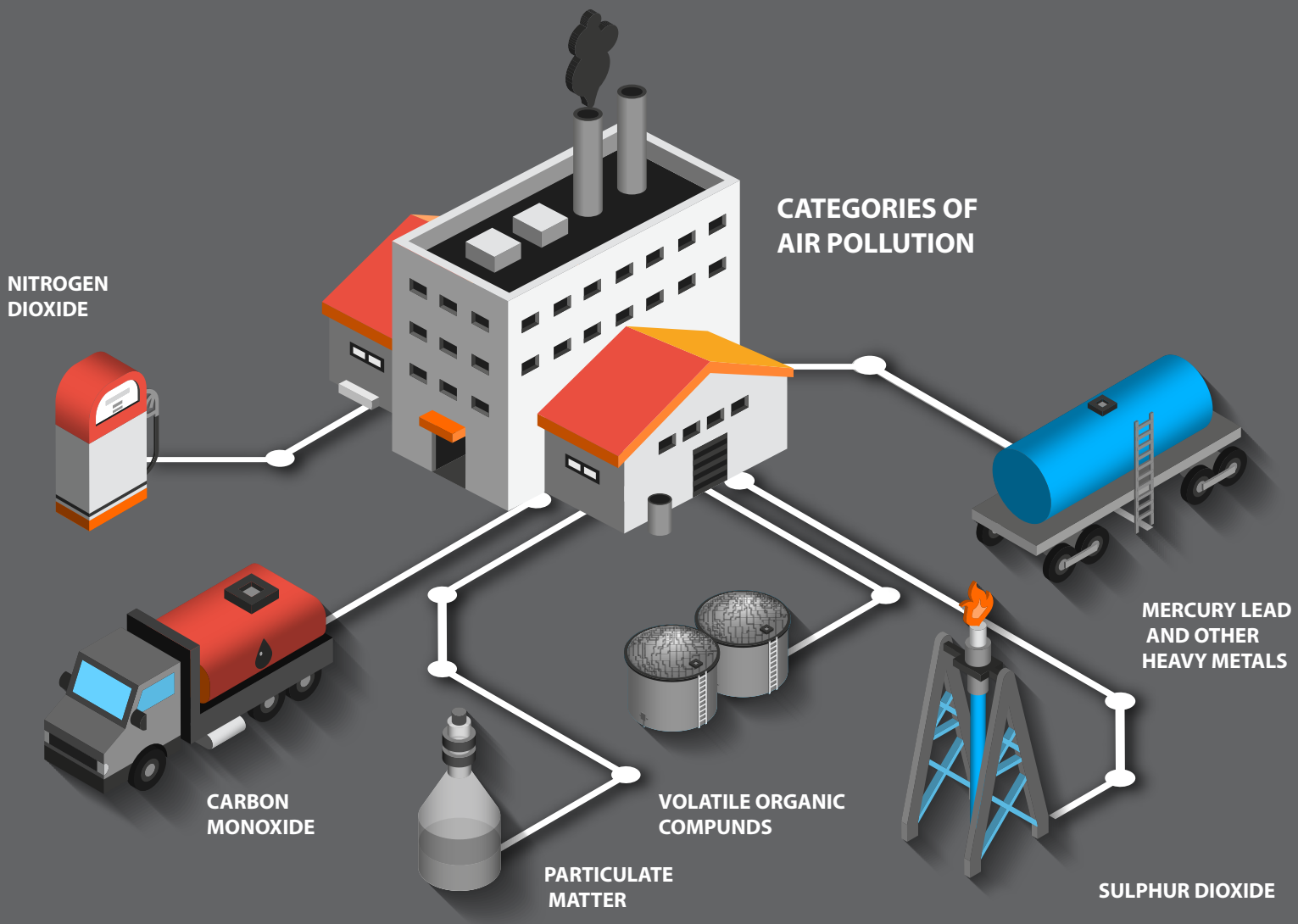


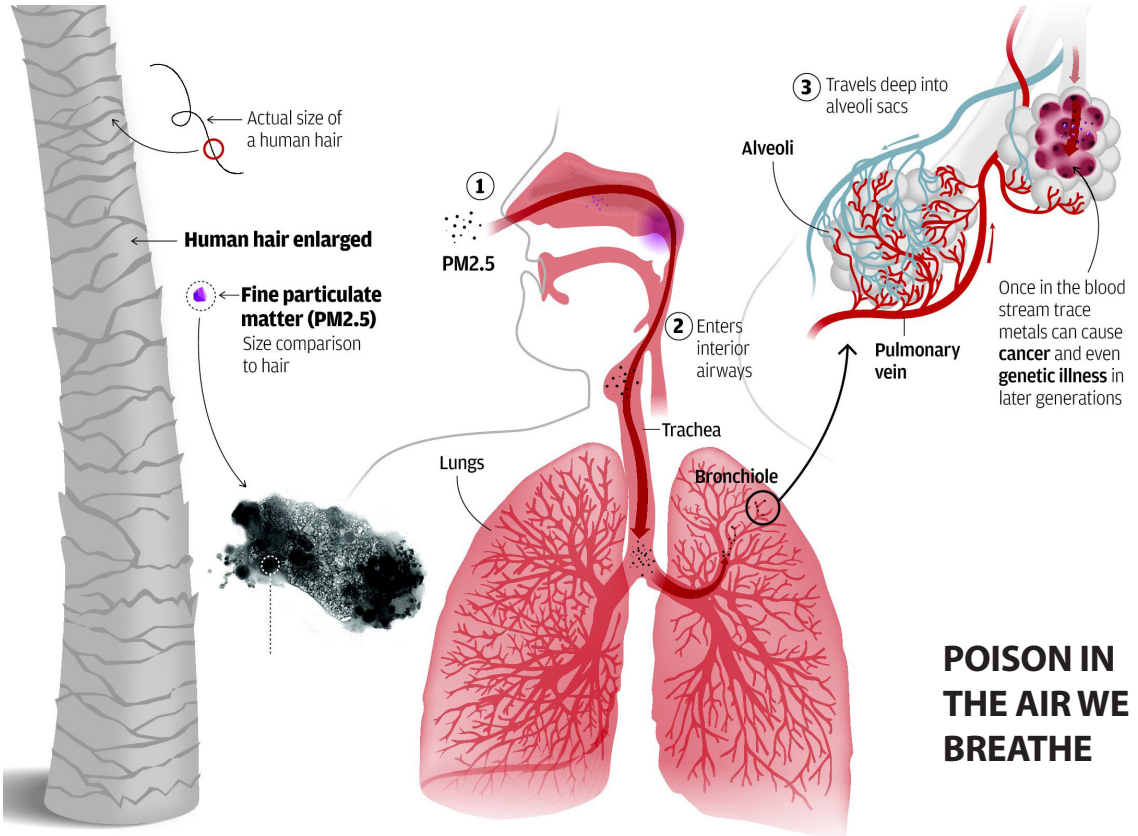
Noise pollution is generally defined as regular exposure to elevated sound levels that may lead to adverse effects in humans or other living organisms. Noise pollution can be disruptive to humans' stress levels, may be harmful to unborn babies, and drives animals away by causing nervousness and decreasing their ability to hear prey or predators.

- Street traffic sounds from cars, buses, pedestrians, ambulances etc.
- Construction sounds like drilling or other heavy machinery in operation
- Airports, with constant elevated sounds from air traffic, i.e. planes taking off or landing
- Workplace sounds, often common in open-space offices
- Constant loud music in or near commercial venues
- Industrial sounds like fans, generators, compressor, mills
- Train stations traffic
- Events involving fireworks, firecrackers, loudspeakers etc.

3 Air **Pollution**

Air pollution occurs when gases, dust particles, fumes or smoke (or odour) are introduced into the atmosphere in a way that makes it harmful to humans, animals or plants. Examples of pollutants include oxides of nitrogen and sulphur, carbonmonoxide, hydrocarbons, sand or dust particles, and volatile organic compounds that can evaporate and enter the atmosphere.





Particulate Matter (PM) – also called particle pollution is a mixture of solid particles and liquid droplets (aerosols) found in the air. Some particles, such as dust, dirt, soot, or smoke, are large or dark enough to be seen with the naked eye. Others are so small they can only be detected under the microscope.

Particle size is directly linked to their potential for causing health problems. Small particles less than 10 micrometers like PM2.5 pose the greatest health risk because they can get deep into our lungs and get into the bloodstream. Exposure to such particles can affect vital organs like the lungs and heart.

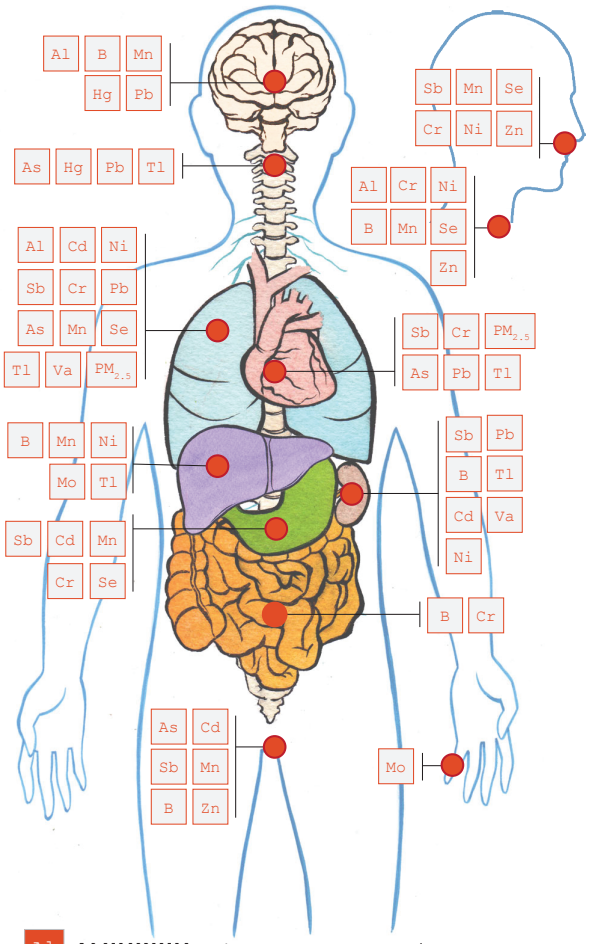
These particles come in many sizes and shapes and can be made up of hundreds of different chemicals. Some are emitted directly from sources such as construction sites, vehicular emissions, unpaved roads, smokestacks or fires.

Most particles form in the atmosphere as a result of chemical rections caused by pollutants from power plants, industries, and automobiles.

http://bit.ly/Lungvid

PRESENTED BY EARTHJUSTICE

HARM TO HEALTH FROM COAL ASH TOXICANTS



Al **ALUMINUM** Long-term exposure to dust can cause scarring of lungs (pulmonary fibrosis) with symptoms of cough and shortness of breath. May be linked to dementia.

Sb **ANTIMONY** Long-term inhalation can cause a hole in the septum dividing the inner nose and lead to permanent lung damage. May harm female fertility and damage liver, kidneys and heart.

As **ARSENIC** Ingestion can lead to nervous system damage, cardiovascular harm, and urinary tract cancers. Inhalation and absorption through skin can cause lung cancer and skin cancer, respectively.

B **BORON** Inhalation can lead over the short term to eye, nose, and throat irritation. Ingestion of large amounts can result in damage to the testes, intestines, liver, kidneys, and brain, and eventually lead to death.

Cd **CADMIUM** May cause lung and prostate cancer and damage the reproductive system. Inhalation can irritate lungs. Ingestion can cause nausea, vomiting, diarrhea and abdominal pain.

Cr **CHROMIUM** Ingestion can cause stomach and intestinal ulcers, anemia, and stomach cancer. Frequent inhalation can cause asthma, wheezing, and lung cancer. Inhalation can also irritate the nose and throat, resulting in asthma-like symptoms and damage the nose's septum.

Pb **LEAD** Exposure can result in brain swelling, kidney disease, cardiovascular problems, nervous system damage, and death. It is accepted that there is no safe level of lead exposure, particularly for children.

Mn **MANGANESE** Long-term exposure can cause permanent brain damage. Inhalation irritates nose, throat and lungs, causing coughing, wheezing and shortness of breath. May cause harm to the liver and testes and decrease fertility in males.

Hg **MERCURY** Impacts include nervous system damage and developmental harm, such as reduced IQ. Poses particular risk to children, infants and fetuses.

Mo **MOLYBDENUM** Ingestion causes gout (joint pain) and increased blood uric acid levels and is linked to high blood pressure and liver disease. Slowed growth, low birth weight and infertility found in animals.

Ni **NICKEL** Inhalation can irritate and damage the nose, throat and lungs. Acute exposure can cause headache, dizziness, nausea and vomiting. A probable carcinogen for lung cancer. Can cause chronic bronchitis and scarring of the lungs. Long-term exposure may harm liver and kidneys.

$PM_{2.5}$ **PM2.5** Particles less than 2.5mm can lodge deep in the lungs and cause premature death, as well as lung and heart disease, decreased lung function, asthma attacks, heart attacks and cardiac arrhythmia.

Se **SELENIUM** Inhalation can irritate the nose, throat, and lungs, causing coughing, wheezing, and shortness of breath. Can also cause nausea, diarrhea, abdominal pain, and headache. Repeated exposure can cause irritability, fatigue, dental cavities, loss of nails and hair, and depression.

Tl **THALLIUM** Ingestion causes nervous system damage and lung, heart, liver and kidney problems. Main ingredient in rat poison.

Va **VANADIUM** Lung irritant. Long-term exposure can cause asthma attacks with shortness of breath, wheezing, cough, and chest tightness. May damage the kidneys. Repeated high exposure may cause anemia.

Zn **ZINC** Inhalation can irritate the nose and throat, and cause wheezing and coughing. Appears to affect the male reproductive system, including sperm count.

SOURCE: AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY (ATSDR), U.S. DEPARTMENT OF HEALTH & HUMAN SERVICES. TOXICOLOGICAL PROFILES. WWW.ATSDR.CDC.GOV/TOXPROFILES

ILLUSTRATION: JOSHUA HERBOLSHEIMER. HEAD PROFILE: SERGEY NIVENS / SHUTTERSTOCK.

OZONE, SULPHUR DIOXIDE, CARBON MONOXIDE & VOCs

Ozone can be "good" or "bad" for health and the environment depending on where it's found in the atmosphere. Stratospheric ozone (found 32kms above ground) is "good" because it protects living things from ultraviolet radiation from the sun. Ground-level ozone, is "bad" because it can trigger a variety of health problems, particularly for children, the elderly, and people of all ages who have lung diseases such as asthma.

Ground level ozone, is not emitted directly into the air, but is created by chemical reactions between oxides of nitrogen (NOx) and volatile organic compounds (VOC). This happens when pollutants emitted by cars, power plants, industrial boilers, refineries, chemical plants, and other sources chemically react in the presence of sunlight.

SOURCE: BANAO CREATIVES

Sulfur dioxide is produced when oil and coal containing sulfur burns.

It can cause health issues, especially in those with existing heart or lung conditions and it mixes with water to produce sulfuric acid (what we know as acid rain) which can impact forests and aquatic life.

Carbon monoxide is produced by the incomplete burning of fossil fuels in vehicles, home heating equipment, industrial plants and waste burning are among many other sources, and is a colorless and odorless gas, poisonous to humans and animals when inhaled.

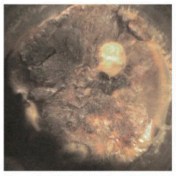
Volatile Organic Compounds (VOCs) **are chemicals** that contain carbon and can quickly turn into vapors or gases. These VOCs can be released by a number of products or items in everyday life. The simplest way to determine the presence of VOCs in the air is through their distinct odours. A list of odours has been developed by the *pollution impacted communities living in Cuddalore, Tamil Nadu.*

ACID

AMMONIA


BURNING PLASTIC


BURNT BODY


BURNT CURRY


BURNT MATERIAL


BURNT RICE


BURNT RUBBER


CHIKOO FRUIT


CHILLIS


CRUSHED NEEM


DECAYING CORPSE


DEAD ANIMAL

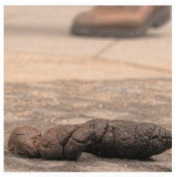

ROASTED DOUGH

FIRECRACKERS


FRUIT JUICE


CRUSHED BONE

HOSPITAL


HUMAN EXCRETA


KEROSENE

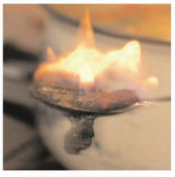

MOSQUITO COIL


NAIL POLISH


PAINT


PHENYL


PUBLIC TOILET


ROASTED SUGAR


ROTTEN EGG


ROTTEN CABBAGE


ROTTEN FRUIT

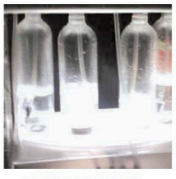

ROTTEN MILK


SEWER


SOUR


SULPHUR

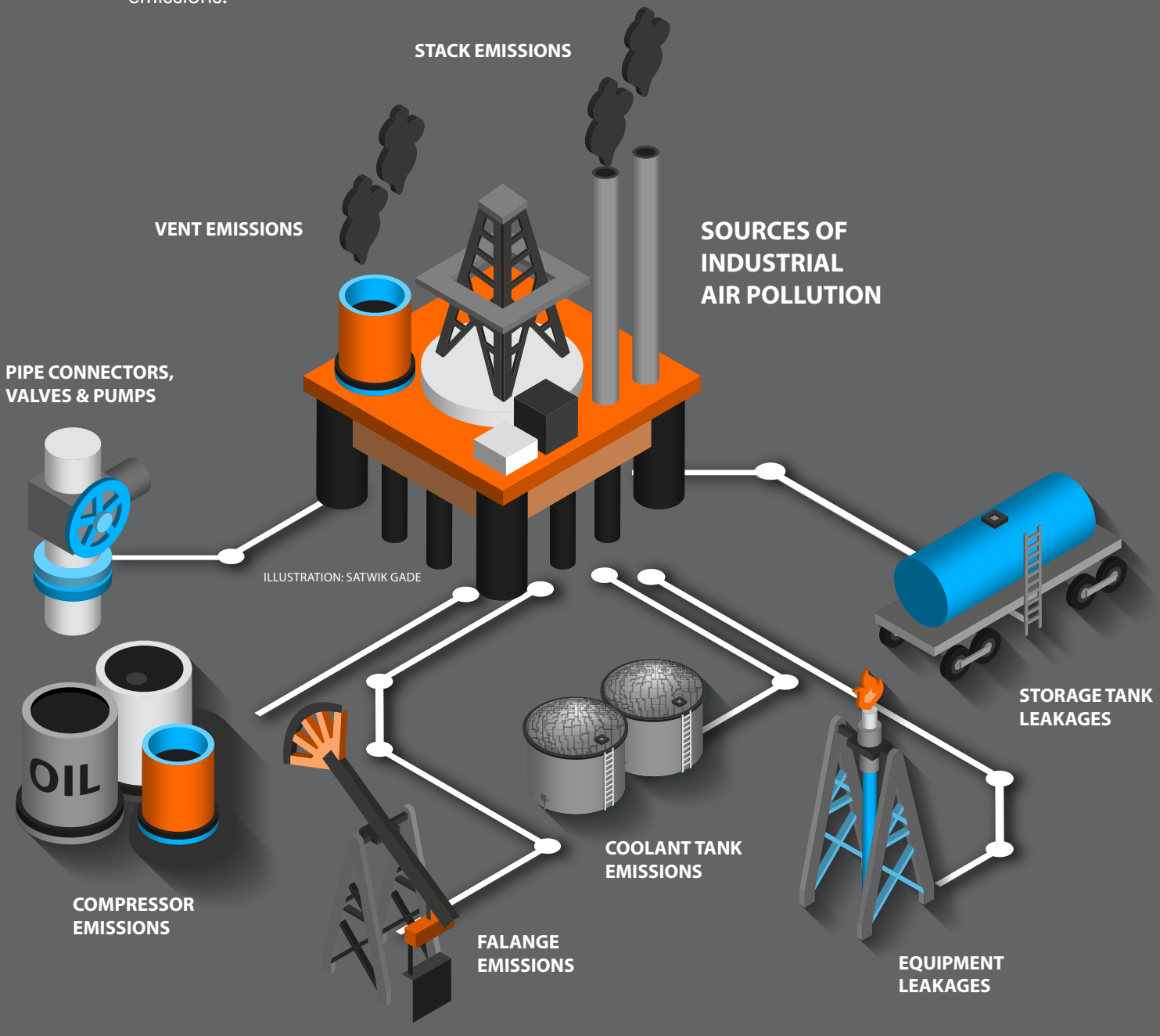

SUGARCANE


SPIRIT ALCOHOL


URINE

SOURCE: SIPCOT CUDDAOLORE CEM

Stack or vent emissions are often identified as the most significant sources of emissions in a factory. In reality, however, **fugitive emissions** from ***storage tanks***, ***cooling tanks***, ***pipe connectors***, ***valves***, ***equipment leaks***, ***flanges***, ***pumps***, ***compressors***, ***pressure release devices*** etc are capable of violating the ambient air quality standards and even exceeding the stack emissions. Pollution control agencies often do not monitor fugitive emissions.



4

Water **Pollution**

Water pollution is defined as the presence of toxic chemicals and biological agents that both exceed what is naturally found in water and may pose a threat to human health and/or the environment. Water pollution may consist of chemicals introduced into water bodies as a result of various human activities. Any kind of water can become polluted regardless of its size or location. And any amount of chemicals can pollute water, regardless of the harm they may pose to human health and the environment.

4.1

TYPES OF WATER POLLUTION

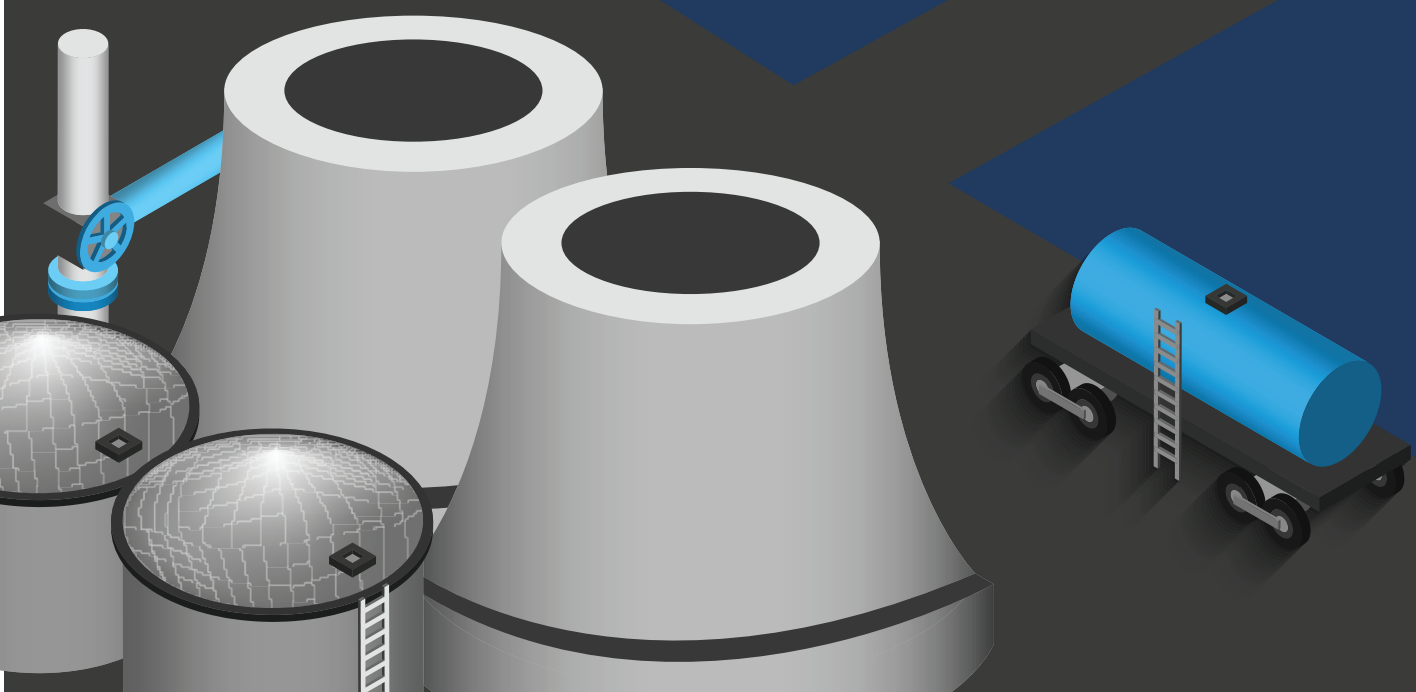
ILLUSTRATION: SATWIK GADE

5 Soil **Pollution**

Soil pollution occurs when chemicals that are toxic or otherwise dangerous for humans and other living things are found in the soil. These chemicals may be foreign to the area, or they may be naturally occurring materials that are present in dangerously high amounts. The harmful effects of soil pollution may come from direct contact with polluted soil or from contact with other resources, such as water, that have come in direct contact with the polluted soil.

Radioactive pollution

Radioactive substances resulting from explosions at nuclear or other facilities using radioactive materials that give rise to nuclear dust, radioactive wastes, that penetrate the soil and accumulate giving rise to land/soil pollution.



Domestic Waste Pollution

Urban wastes comprises of discards generated from household and commercial sources. When disposed without separation, these otherwise harmless materials can cause severe land pollution. All cities in the world have waste dumps or land fills that are major sources of pollution. The disposal of organic/food waste along with other materials like plastics, glass, metals, household hazardous items (batteries, tubelights) results in the formation of toxins that causes land and water pollution.

ILLUSTRATION: SATWIK GADE

Industrial Pollution

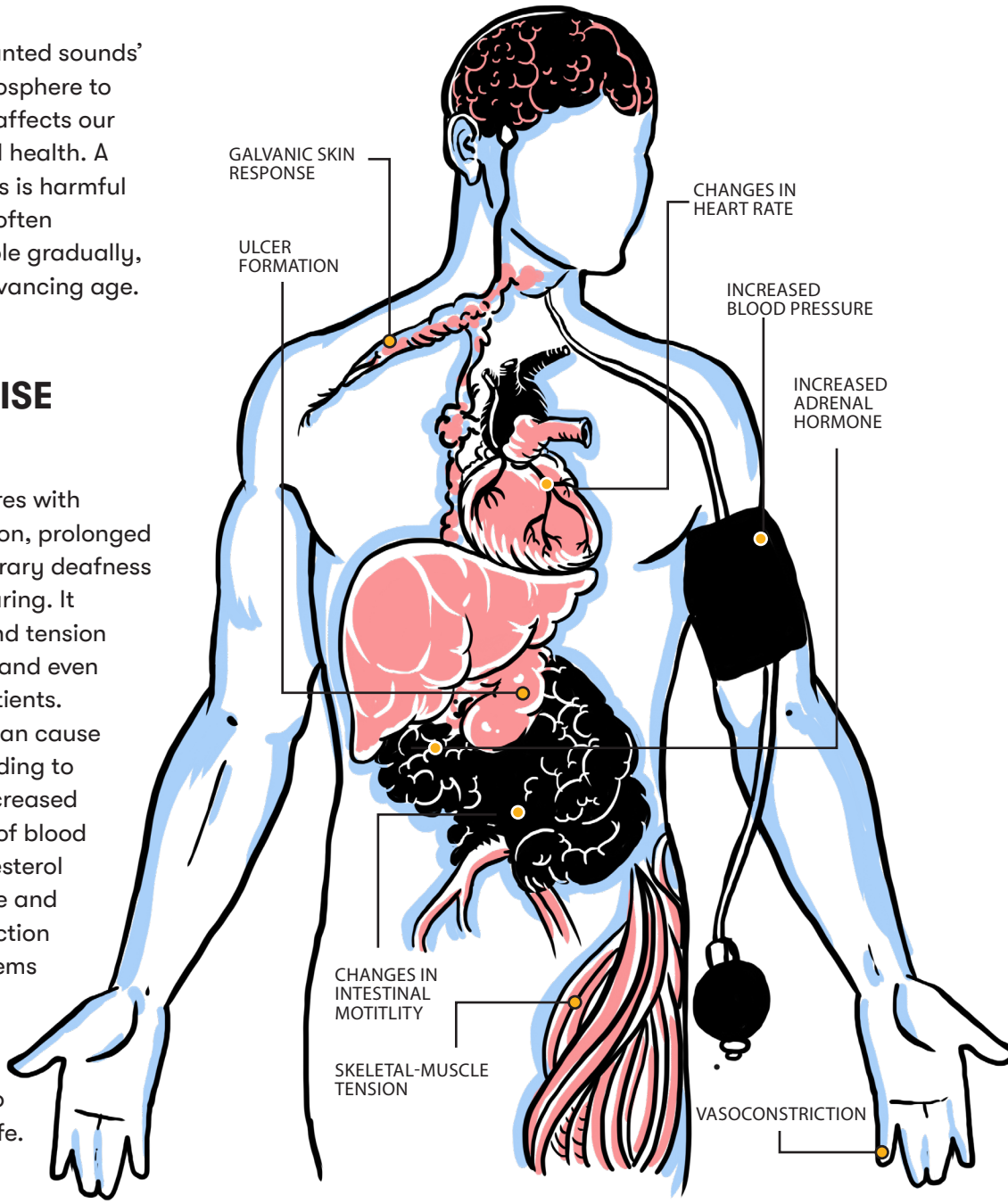
Industrial pollutants have various origins such as pulp and paper mills, chemical fertilizers, oil refineries, sugar factories, tanneries, textiles, steel, distilleries, fertilizers, pesticides, coal and mineral mining industries, drugs, glass, cement, petroleum and engineering industries etc.
These pollutants affect and alter the chemical and biological properties of soil. As a result, hazardous chemicals can enter into human food chain from the soil or water, disturb the biochemical process and finally lead to serious effects on living organisms. Herbicides and weedicides are added to increase the crop yield. Apart from these farm wastes, manure, slurry, debris, soil erosion containing mostly inorganic chemicals are reported to cause soil pollution.

6 Noise **Pollution**

Noise is defined as 'unwanted sounds' being 'dumped' into atmosphere to disturb unwilling ears. It affects our physiological and mental health. A sound of over 115 decibels is harmful to ears. The city noise is often sufficient to deafen people gradually, at least partially with advancing age.

EFFECTS OF NOISE POLLUTION

Noise pollution interferes with human communication, prolonged exposure leads to temporary deafness or permanent loss of hearing. It causes anxiety, stress and tension and may produce fright and even heart failure to heart patients. Long exposure to noise can cause hormonal imbalance leading to adverse disorders like increased heart beat, constriction of blood vessels, increase in cholesterol level, high blood pressure and hypertension and production of gastrointestinal problems like peptic ulcers. Noise can impair development of nervous system of unborn babies leading to abnormal behaviour in life.



ILLUSTRATIONS: SATWIK GADE

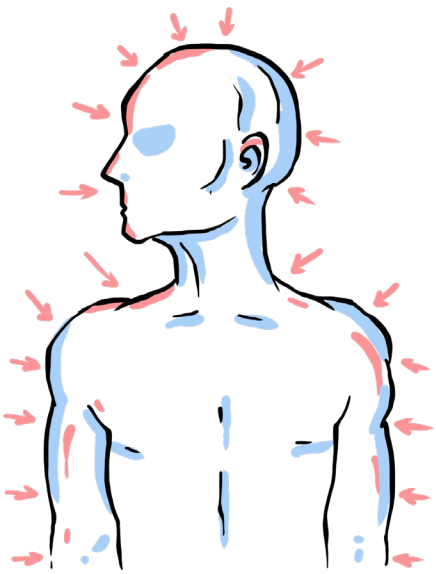
7 Chemical **Pollution**

Even though we do not realise toxic chemicals have become a part of our daily lives. From the toothpaste, toilet cleaner, soap, detergents, plastics, computers, medicines to the pesticides in our gardens all of them are made of chemicals.

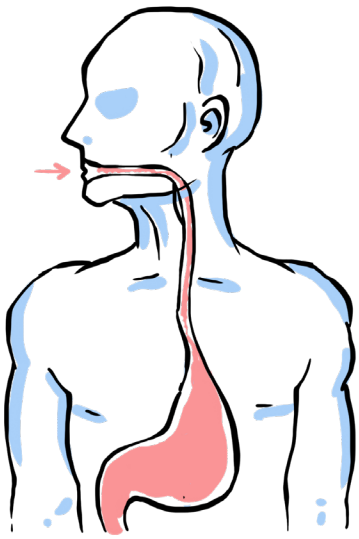
It is said that there are about more than 80,000 chemicals that have been invented so far. The effects of these chemicals are not well known. According to the existing data there are well researched studies available only for about 2% of these 80,000 known chemicals. Moreover there are no health studies available on the synergistic effects of any of these chemicals (synergistic effect refers to the combined effect of two or more chemicals on human health).

HOW CHEMICALS GET INTO OUR BODIES

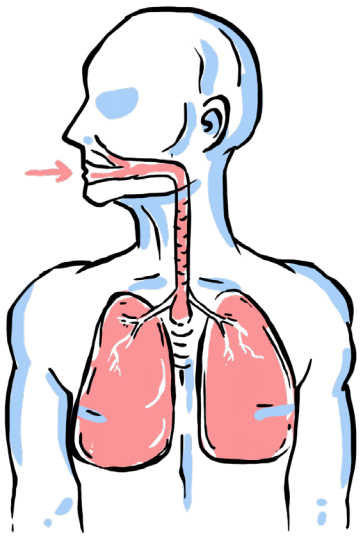
There are three main ways that the chemicals can get into our bodies. These ways are also called the **"routes of exposure".**



a) Contact is where chemicals get absorbed into the body through exposed skin or touch.



b) Ingestion is where the chemicals enters the body through the food and drinks that one takes and is then absorbed by the body.



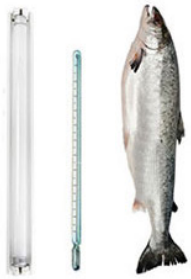
c) Inhalation is where the chemicals enters the body via the air that we breathe into our respiratory tract

EFFECTS OF COMMON CHEMICALS IN EVERYDAY USE

LEAD

AFFECTED ORGAN SYSTEMS:
Cardiovascular (Heart and Blood Vessels), Developmental (effects during periods when organs are developing) , Gastrointestinal (Digestive), Hematological (Blood Forming), Musculoskeletal (Muscles and Skeleton), Neurological (Nervous System), Ocular (Eyes), Renal (Urinary System or Kidneys), Reproductive (Producing Children)

MERCURY



AFFECTED ORGAN SYSTEMS:
Developmental (effects during periods when organs are developing) , Gastrointestinal (Digestive), Neurological (Nervous System), Ocular (Eyes), Renal (Urinary System or Kidneys)

PCBs
(Polychlorinated biphenyls)

AFFECTED ORGAN SYSTEMS:
Dermal (Skin), Developmental (effects during periods when organs are developing) , Endocrine (Glands and Hormones), Hepatic (Liver), Immunological (Immune System), Neurological (Nervous System)

FLUORIDE

AFFECTED ORGAN SYSTEMS:
Dermal (Skin), Musculoskeletal (Muscles and Skeleton), Ocular (Eyes), Respiratory (From the Nose to the Lungs)

TOLUENE

AFFECTED ORGAN SYSTEMS:
Cardiovascular (Heart and Blood Vessels), Neurological (Nervous System)

ARSENIC

AFFECTED ORGAN SYSTEMS:
Dermal (Skin), Gastrointestinal (Digestive), Hepatic (Liver), Neurological (Nervous System), Respiratory (From the Nose to the Lungs)Reproductive (Producing Children)

TETRACHLOROETHYLENE (PERC)

AFFECTED ORGAN SYSTEMS:
Developmental (effects during periods when organs are developing) , Neurological (Nervous System), Respiratory (From the Nose to the Lungs)

DDT DICHLORODIPHENYLTRICHLOROETHANE

AFFECTED ORGAN SYSTEMS:
Dermal (Skin), Musculoskeletal (Muscles and Skeleton), Ocular (Eyes), Respiratory (From the Nose to the Lungs)

PESTICIDE BANNED IN 1972

AFFECTED ORGAN SYSTEMS:
Neurological (Nervous System)

CHLORPYRIFOS

BISPHENOL A (BPA)

AFFECTED ORGAN SYSTEMS:
Cardiovascular (Heart and Blood Vessels), Developmental (effects during periods when organs are developing) , Neurological (Nervous System), Reproductive (Producing Children)

FLAME RETARDANTS

AFFECTED ORGAN SYSTEMS:
Developmental (effects during periods when organs are developing) , Hepatic (Liver)

PHTHALATES

AFFECTED ORGAN SYSTEMS:
Developmental (effects during periods when organs aredeveloping), Reproductive (Producing Children)

SOURCES:

http://articles.mercola.com/sites/articles/archive/2014/04/02/environmental-toxin-exposure.aspx
http://www.atsdr.cdc.gov/az/p.html
http://www.ask.com/question/where-is-ethanol-found
http://www.eia.gov/tools/faqs/faq.cfm?id=27&t=10
http://nihseniorhealth.gov/alcoholuse/howalcoholaffectsthebody/01.html
http://www.niehs.nih.gov/health/topics/agents/sya-bpa/
http://articles.mercola.com/sites/articles/archive/2010/02/04/fda-shifts-position-now-has-concerns-about-bpa-risks-.aspx
http://www.cdc.gov/biomonitoring/phthalates_factsheet.html
http://articles.mercola.com/sites/articles/archive/2012/09/26/phthalates-in-floors-affect-childrens-health.aspx

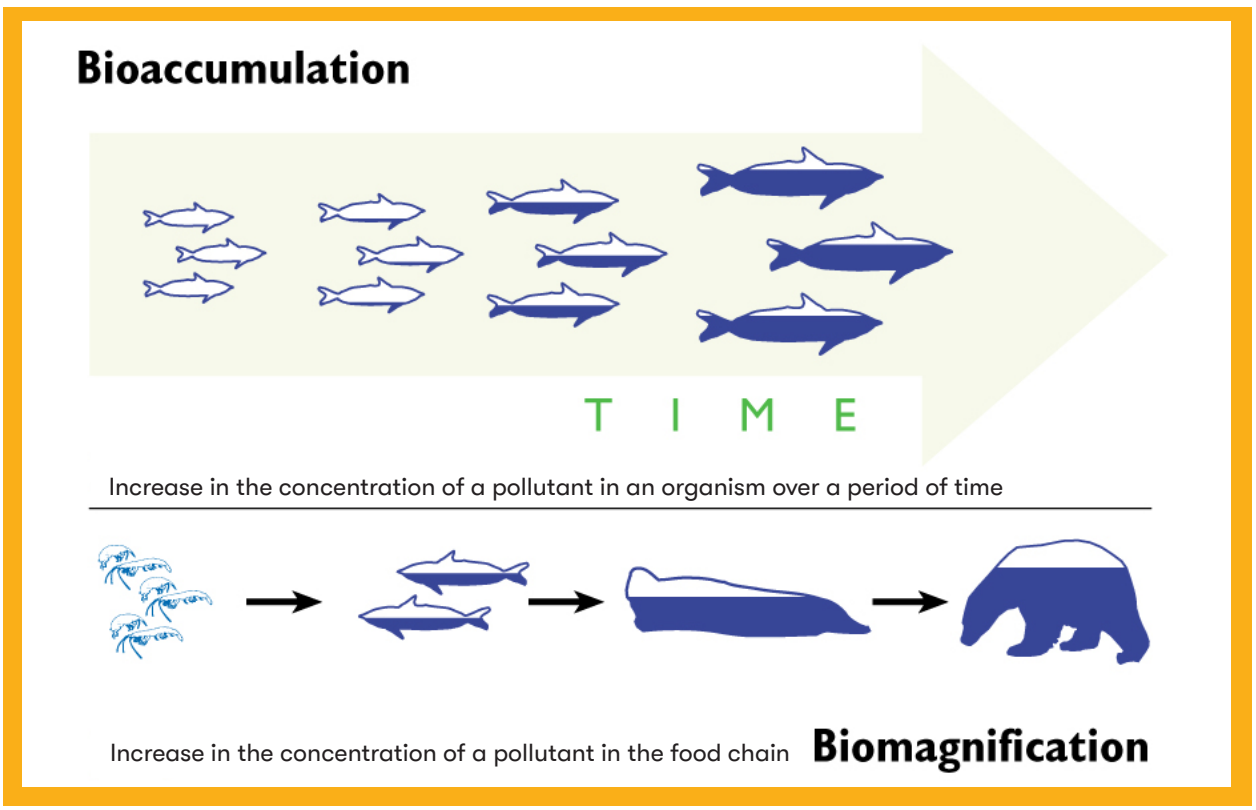
Mercola.com
Take Control of Your Health
Since 1997

EFFECTS OF CHEMICAL POLLUTION

Dangers posed by toxic chemicals are immense, even small quantities and one time exposure can cause life-long damages in human beings. It is important to understand that chemicals behave differently in different human bodies. In most cases any harm from the chemicals to our bodies is determined by the
1. nature of the chemical,
2. the duration & amount of exposure,
3. age, height and weight of the person exposed
4. State of health of the person when exposed.
5. Bio-magnification
6. Bioaccumulation

Chemicals tend to cause most damage to our bodies when its growing or changing very fast, thus pregnant women and their babies in the womb, young children, teenagers (at puberty) and elders automatically fall into the most vulnerable category.

After exposure, chemicals build up in plants and fat of animals, fish etc. This phenomenon is also called bio-accumulation. The phenomenon of increase in levels of chemicals in the bodies of larger animals, higher up the food-chain, is called bio-magnification.



SECTION 2

Basics of Communtity Enviromental Monitoring

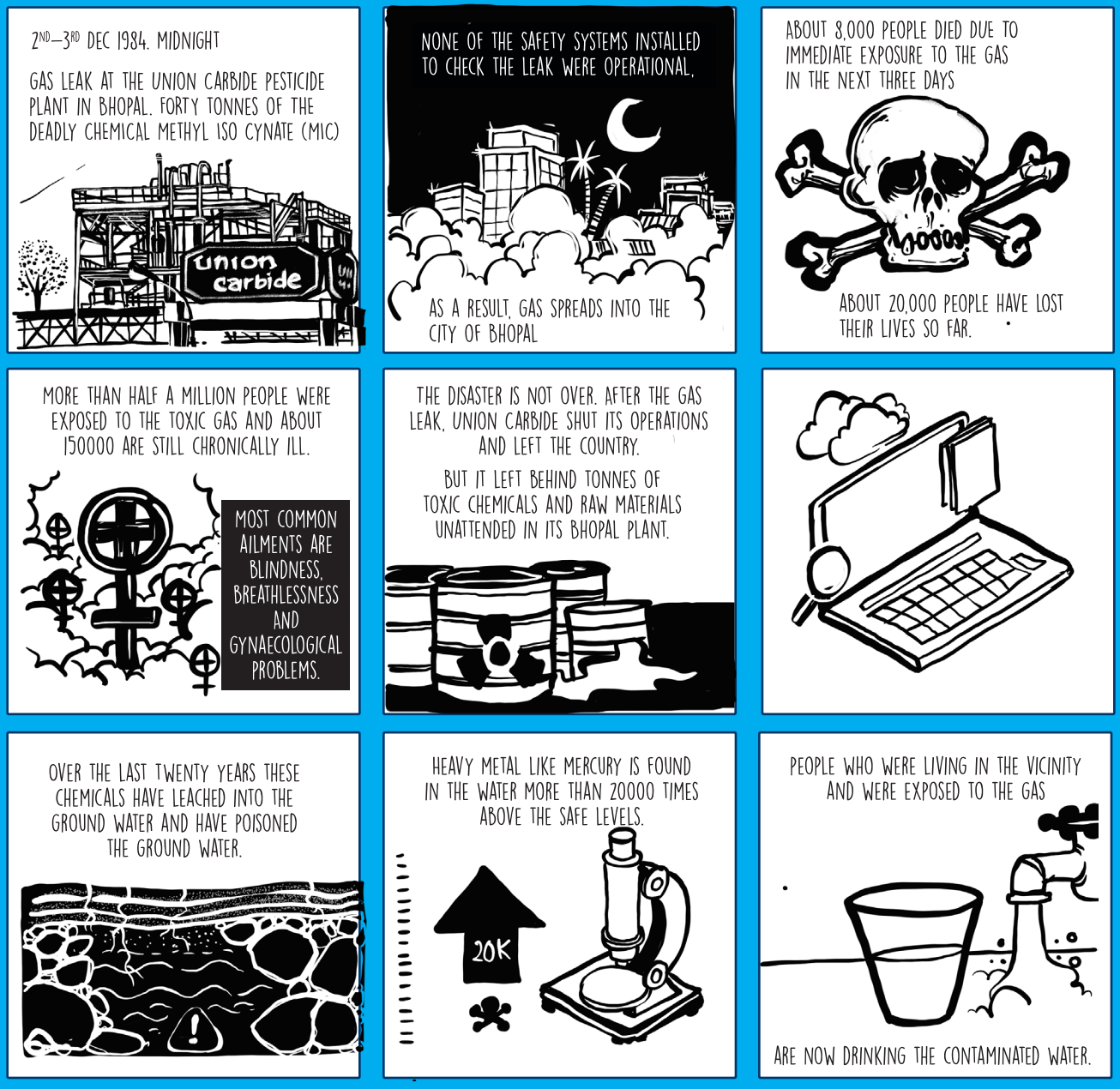
SOURCE: MICHA PATULT

1

Awareness & Understanding

Our constitution guarantees every person a right to health and safe and healthy environment. Unfortunately these rights are not available to all. Most often we see toxic industries located in marginalised communities causing harm to their health and environment. Communities that bear most of the burden of toxics and harmful substances are often those that are socially, economically, ethnically or racially underprivileged. In India we have also seen communities from marginalised castes and from poorer regions bearing the worst impact of industrial pollution. The Bhopal Gas Disaster is a classic manifestation of this phenomenon. More than three decades later the impacts of the gas leak persist and continue to harm the health of the community.

2 Bhopal Gas Disaster – **Its Relevance to Other Pollution Impacted Communities:**



COMIC: SATWIK GADE

WHAT CAUSED THE BHOPAL GAS DISASTER?

BHOPAL DISASTER WAS NOT AN ACCIDENT THAT OCCURRED IN 1984, IT WAS AN ACCUMULATION OF SYSTEMATIC ERRORS OVER A LONG TIME THAT RESULTED IN WHAT WE SAW IN DECEMBER 1984. CRUCIAL REASONS FOR THE DISASTER WERE:

UNTESTED TOXIC FACILITY TO MANUFACTURE PESTICIDE WAS SET UP IN BHOPAL.

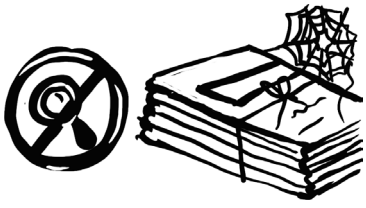
THE PLANT WAS LOCATED IN AN AREA WITH DENSE POPULATION, WITH RESIDENTIAL AREAS AT A DISTANCE LESS THAN 50 MTS FROM THE UNIT.

FACILITY LOCATED IN A WORKING CLASS NEIGHBOURHOOD WITH PEOPLE FROM SOCIALLY, ECONOMICALLY AND POLITICALLY MARGINALISED SECTIONS OF SOCIETY.

NO INFORMATION WAS SHARED WITH THE COMMUNITY OR WORKERS ABOUT THE PRODUCTS MANUFACTURED IN THE PLANT OR THE CHEMICALS USED.

COMMUNITIES KNEW LITTLE ABOUT DISASTER RESPONSE. HAZARDS AND DANGERS WERE UNDERPLAYED TO GIVE A FALSE SENSE OF SECURITY.

ENVIRONMENTAL POLLUTION, CATTLE DEATHS, WORKER INJURIES AND DEATHS DUE TO WORKPLACE HAZARDS WERE NOT TAKEN SERIOUSLY.



NO ROOT-CAUSE INVESTIGATIONS WERE CONDUCTED. ROUTINE ACCIDENTS AND HAZARDOUS INCIDENTS IN THE UNION CARBIDE FACTORY WERE IGNORED.

COMIC: SATWIK GADE

IS YOUR COMMUNITY ANOTHER BHOPAL?

A Checklist For Communities and Workers

The December 1984 Union Carbide disaster in Bhopal, India, is alluded to, even by industry officials. The facts of the disaster are sobering. Here's a checklist of why things went so horribly wrong in Bhopal before, during and after the disaster. To get an idea of the vulnerability of your community, we will try to answer the questions listed below.

Is there a plant near-by that uses **unsafe technology?**

Are large quantities of **extremely hazardous substances** used or stored onsite?

Is the facility located in a **densely populated community?**

Are community members predominantly **low-income and disadvantaged?**

Does your legal system have a **weak liability regime** to hold offenders accountable?

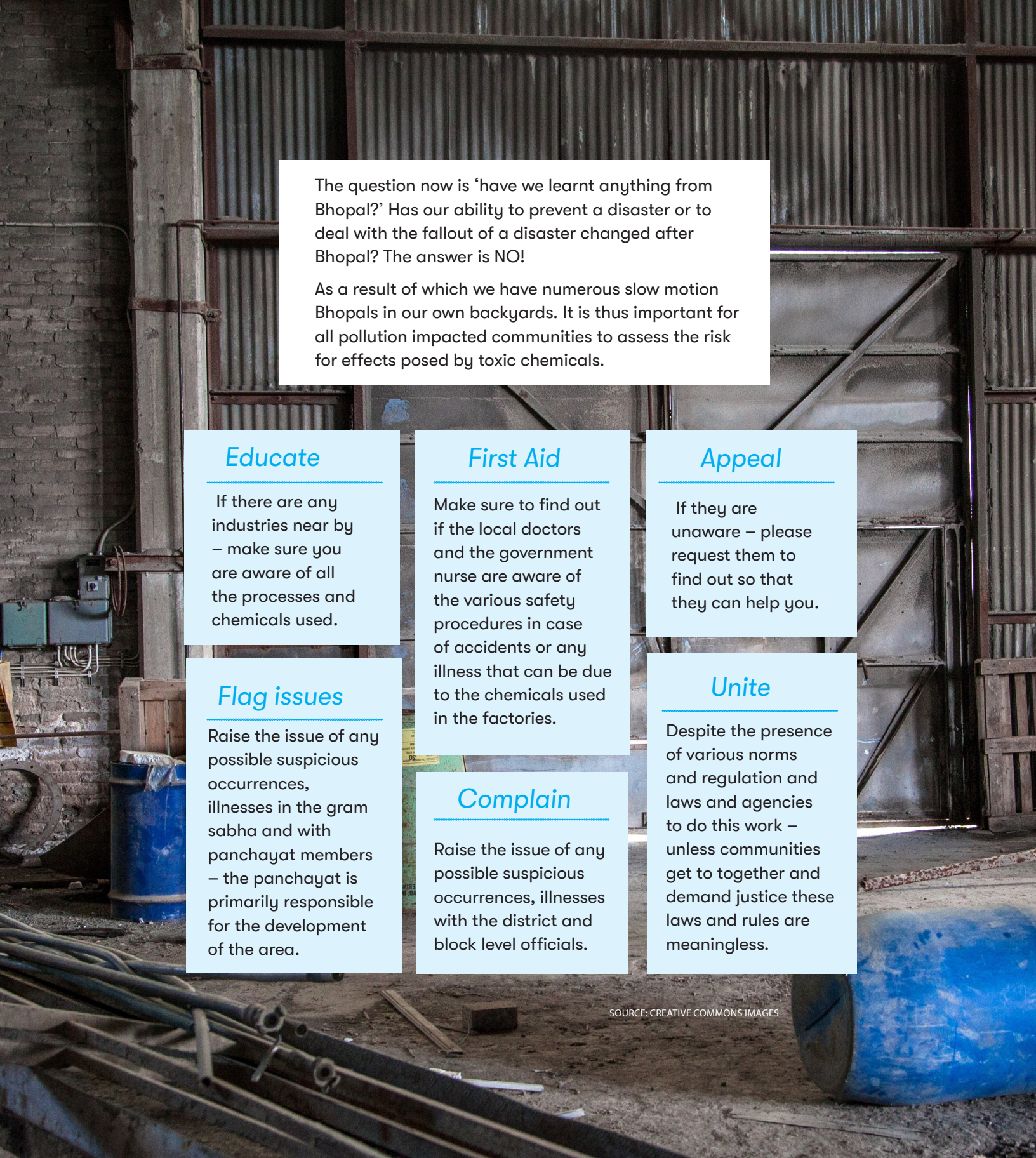
Is the company actively engaged in **downsizing and cost-cutting?**

Is there an obvious nexus between **companies and the political class?**

Is the factory run by a **powerful corporation?**

How easy is it to access information regarding hazards and toxicity of chemicals/substances **stored on factory premises.**

Does the company practice a management pattern that **ignores worker and community concerns** about frequent incidents and injuries?



The question now is 'have we learnt anything from Bhopal?' Has our ability to prevent a disaster or to deal with the fallout of a disaster changed after Bhopal? The answer is NO!

As a result of which we have numerous slow motion Bhopals in our own backyards. It is thus important for all pollution impacted communities to assess the risk for effects posed by toxic chemicals.

Educate

If there are any industries near by – make sure you are aware of all the processes and chemicals used.

First Aid

Make sure to find out if the local doctors and the government nurse are aware of the various safety procedures in case of accidents or any illness that can be due to the chemicals used in the factories.

Appeal

If they are unaware – please request them to find out so that they can help you.

Flag issues

Raise the issue of any possible suspicious occurrences, illnesses in the gram sabha and with panchayat members – the panchayat is primarily responsible for the development of the area.

Complain

Raise the issue of any possible suspicious occurrences, illnesses with the district and block level officials.

Unite

Despite the presence of various norms and regulation and laws and agencies to do this work – unless communities get to together and demand justice these laws and rules are meaningless.

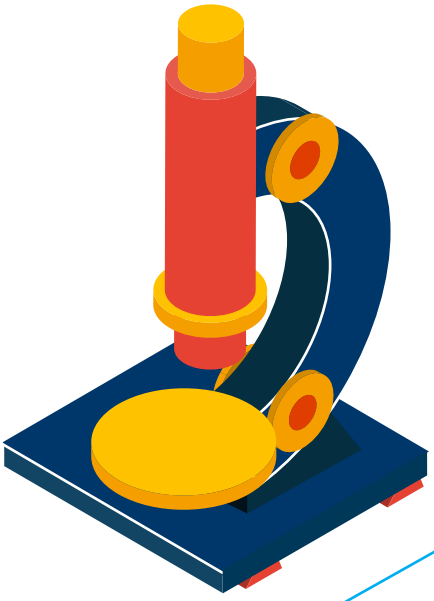
SOURCE: CREATIVE COMMONS IMAGES

3

Community **Environment Monitoring**

Most pollution impacted communities have the knowledge and the experience of the pollution but they are unable to communicate it in a language that is accepted by the authorities and policy makers. A community's experience of pollution does not automatically translate into action against the polluter. There is a need to convert such experiences into evidence.

CEM is designed to involve the communities to pool their knowledge and experiences together systematically record observations thus enabling themselves to present pollution related evidence and complaints in a language that cannot be refuted by the authorities or industries.



Observation

Identifying the problem

Documentation

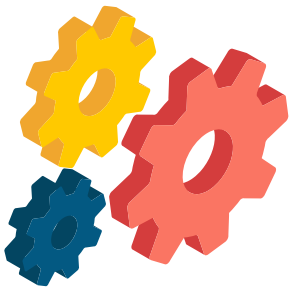
Gathering information

Generating Data

Reporting

Making sense of Data

Taking Action



With the help of systematic data and a regularly maintained record, we can actually describe the nature, occurrence and other patterns of the pollution level of the air, water etc thereby estimating the impact on the surroundings. Data generated through systematic means is reliable and universally acceptable.

The government agencies are more likely to conduct their own monitoring and come out with the results in public since they know that the communities are maintaining their own logs on the violations

Data can be used to make connections between the health concerns and the pollution and hence gain deeper understanding of the seriousness of the pollution we face. e g like high level of dust and soot in the air causes respiratory damage or high level of fluoride in the water damages the bone and teeth

Data thus generated can be used to watch industries. With the help of this Right-to-know laws we can monitor the level of contaminants in the environment and trace out their sources well. Generally it is seen that the industries tend to behave better if someone is keeping an eye on them.

Specific information also helps us to track the problem to their source and try to find out ways to solve/ address them.

Environmental monitoring is a community activity and the entire emphasis of the exercise is to engage every member of the community through different means. The persons taking the sample on a regular basis are just a part of the larger group involved in the overall vigilance. The report of the monitoring or sampling has to be shared with the local government representatives and discussed with the community in order to arrive at a collective decision.

Philosophy of CEM hinges on four basic techniques - monitoring, documenting, communication and action.

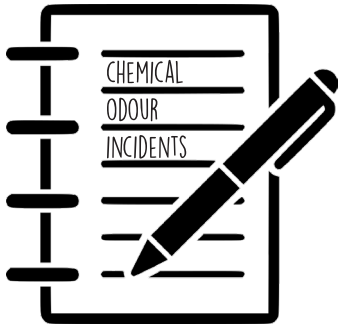
4 Documenting **Pollution:**

ILLUSTRATION: SATWIK GADE

When we think of monitoring or documenting, we invariably think of gadgets or science or scientists or expensive techniques. We tend to overlook other simpler techniques that can help achieve similar results without depending on the government or authorities. Contrary to the popular belief documenting pollution is a very inexpensive and easy task. In order to document any pollution related incident in our neighbourhood we need not employ expensive equipments instead we could use our common senses of sight, smell, hearing, touch and taste. If these experiences are systematically documented, our log books and data sheets can be turned into the most valuable and acceptable data that the authorities cannot refute without basis or proper investigation.

CUDDALORE - A SUCCESS STORY

In Cuddalore (Tamil Nadu), that has been intensely polluted by about thirty chemical industries, villagers recorded air pollution and gas leak related incidents without any expensive technical gadgets.



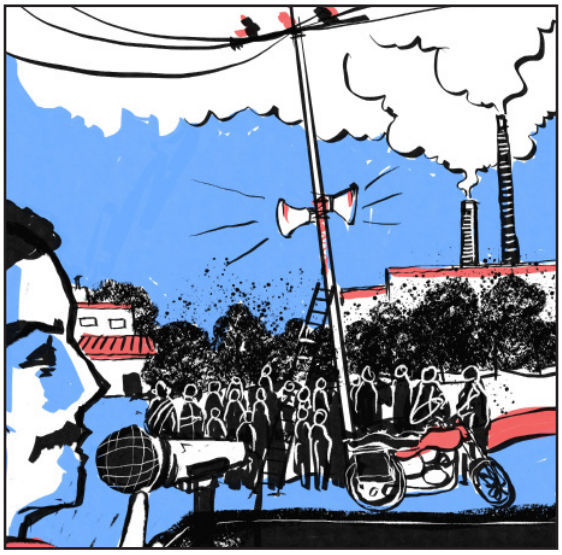
In 2004, the villagers began recording every instance of chemical odour in their community for about 14 weeks. They recorded these instances of odour while they were carrying on daily routine of activities.

What they had at the end of exercise was at least 283 incidents of chemical odours out of which 256 were serious odours where the smell was unbearable. Overall, 30 different kinds of odours (normally what was called regularly as a bad odour was eventually categorised into 30 different variety today) and 36 different health effects were recorded.

On a few occasions when the odour was really strong, community members also took air samples with the help of the bucket sampling technique (explained later in page 46) to get an in depth analysis of what they were breathing in. The bucket did not just act as a tool of scientific analysis but it also gave the confidence among the community members that they could take charge of their own environment and that they did not need to depend on government to tell them what is wrong with their environment.

The exercise revealed 24 toxic gases in the air of SIPCOT, of which at least 8 were known carcinogens including gases like

ILLUSTRATION: SATWIK GADE



chloroform, EDC, Methylene Chloride, Acetonitrile at levels 20000 times above the USEPA health based screening levels.

The government, until this study, never tested for the presence of toxic gases in the air. India does not have regulations on such gases. The results and the meticulous monitoring by the community forced the authorities to take stock of the situation and conduct their own scientific study to

Finally, after four years of indepth studies, in 2008 the government approved scientific body admitted to serious air pollution and...

... A threat to public health in the region because of chemical industries and recommended strict enforcement of law.

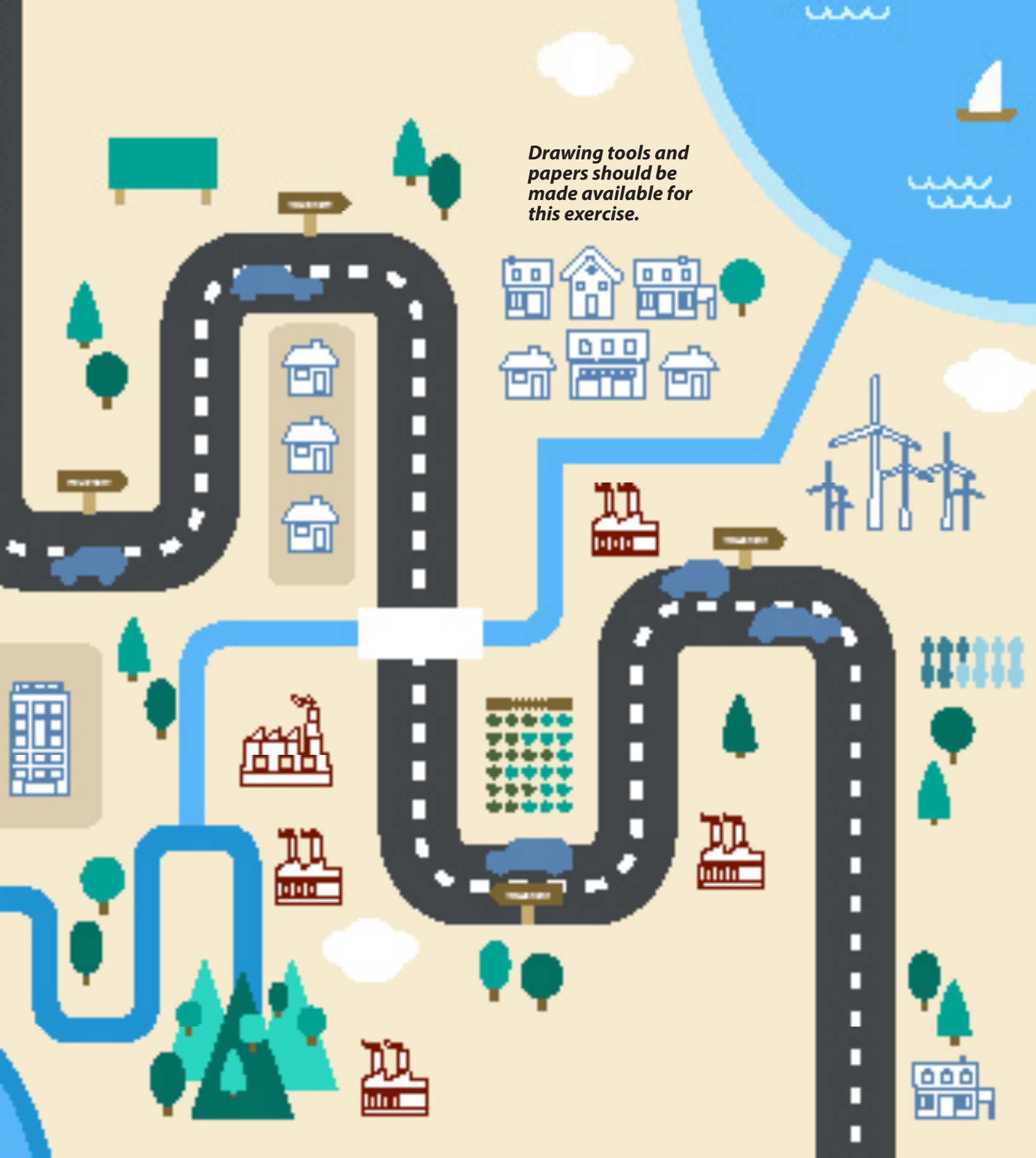
All this could not have been achieved without the communities keeping logs and relentlessly monitoring their environment!

IDENTIFYING HOTSPOTS - MAPPING

Understanding our immediate environment and the way it behaves is fundamental to how we monitor it. The way one person comprehends her/his immediate surroundings might be very different from how anonther person from the same community sees it. The mapping exercise helps pool these shared but diverse experiences and creates a comprehensive understanding of sources of pollution and its impacts. It also facilitates communication among community members/groups which is crucial element in documenting pollution.

- Roads – Highways, Main roads, Small lanes and streets
- Water Bodies – River, lakes, streams
- Industry Location (name, what do they manufacture, locating chimneys and storage units inside the industries, locating sources of effluent from the unit, identifying odours from the unit and specific health problems from pollution from the unit)
- Houses
- Wells, water pipelines, tanks
- Agricultural fields (types of crops – any changes over the period of time and the reasons)
- Religious places
- Schools
- Hospital/ Dispensaries
- Shops, Markets
- Bus stops/ community centers/ public places

(ADD/ REMOVE FROM THIS LIST ABOVE DEPENDING ON WHAT IS RELEVANT FOR YOUR COMMUNITY)


Drawing tools and papers should be made available for this exercise.

CHEMICAL ODOUR INCIDENT MONITORING

The sense of smell, hearing, sight and feeling can form the basis for documenting air pollution. International agencies, including the US EPA, and several community groups in South Africa, U.S.A. and the Philippines use chemical odour incident monitoring to document air pollution.

HOW TO RATE THE SMELL

The intensity of the smell can be rated as “high,” “low” or “No smell.” To get a degree of standardization, a simple rule of thumb can be followed. If the odour is overpowering, easily perceptible and/or induces noticeable symptoms, the odour can be rated “high intensity.” If the odour is perceptible or just barely so, rate the odour “low intensity.” It helps to do a group rating of different smells at different locations in an industrial estate to check the standardization.

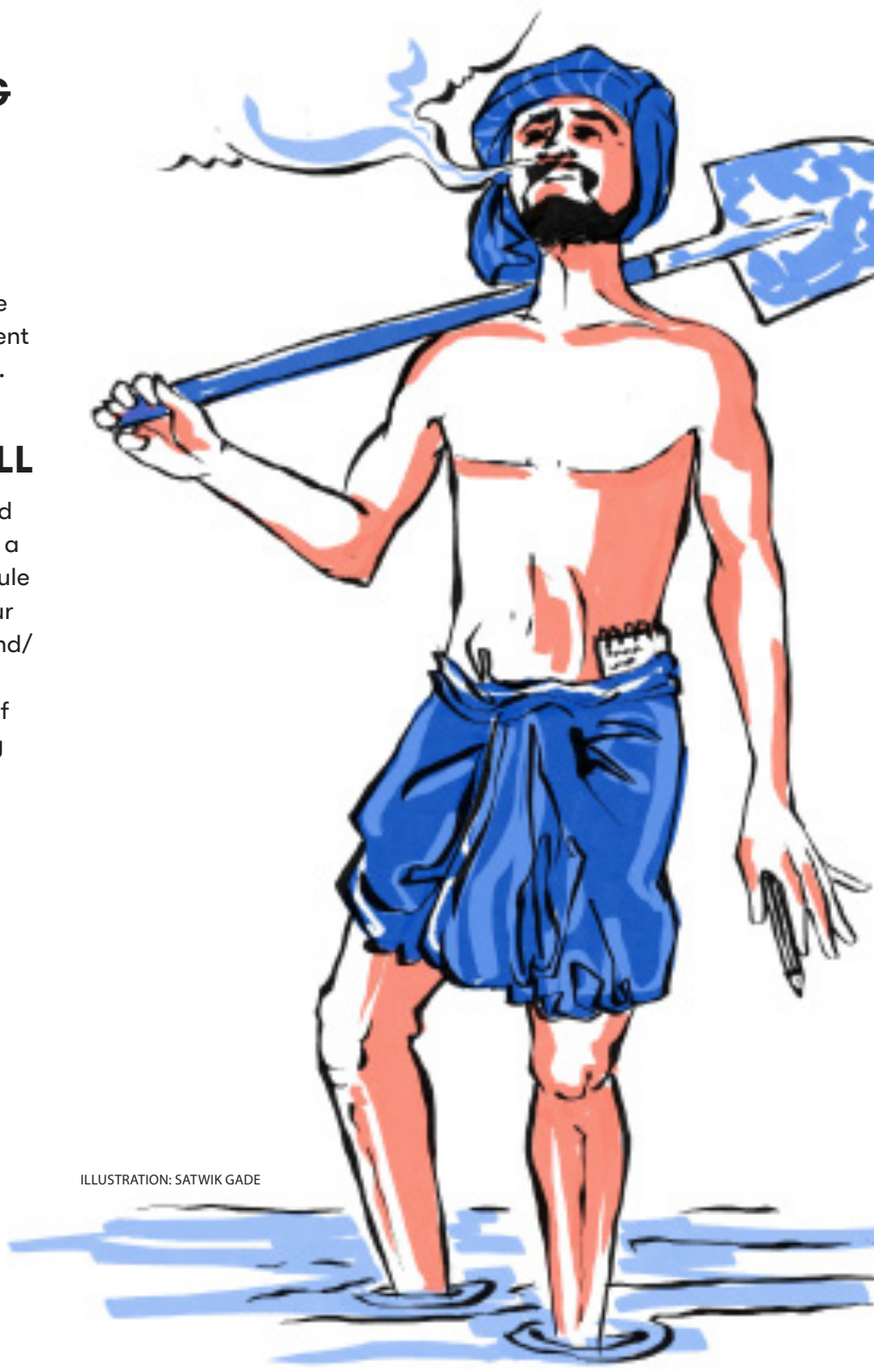


ILLUSTRATION: SATWIK GADE

HOW DOES IT WORK?

The power of the chemical odour incident monitoring, when conducted systematically, lies in its ability to yield trend data to answer questions such as these:

1. Are chemical odours present day-long?

2. Does their intensity vary with the time of day?

3. What kinds of smells are common?

Which sources are they associated with?

4. What kinds of immediate health symptoms are associated with each smell?

5. What is the geographical spread of the odours?

6. What incidents need to be closely monitored?

a. Any incident of intense smell, which may or may not have resulted in immediate health effects.

b. Any visible sign of air pollution – black smoke, coloured smoke, dust

c. Any gas leak or explosion inside the factory or around it, including chemical tanker lorry incidents

d. Any unusual hissing sound in the factory, indicating a gas leak

e. Any situation of perceptible physical reaction in the absence of smell, noise or any other visible pollution

DAILY CHEMICAL ODOUR MONITORING

STEP 1
Organise a meeting of community members (youth or women)

STEP 2
Ask them to describe the odours they experience, and list them.

STEP 3
Ask them to describe some of the immediate health effects or symptoms experienced by them as a result of the odours, and list them.

STEP 4
Ask them to maintain records of the most intense odours throughout the day, using the questionnaire on air emissions monitoring sheet given overleaf.

STEP 5
In the event of major incidents – serious emissions or soot deposit etc – a letter may be written to the regulatory authorities enclosing the incident monitoring form.

AIR EMISSIONS MONITORING/ REPORTING SHEET

Name of the monitor

Date of the incident

Address DOOR NO | STREET | COLONY

CITY/TOWN/VILLAGE | DISTRICT | STATE | PIN

Time of the incident: AM PM

Location of the monitor vis a vis the source of emission:

Name of the unit: _____

_____

(Please specify if the emissions/ leak was from any particular point of the unit)

Describe the wind flow (from the plant) during the leak:

☐ gusty ☐ steady ☐ strong ☐ light ☐ none

What was the usual direction of the wind for the area

Identify the smell:

☐ Rotten eggs ☐ Sour ☐ Acid like

☐ Gasoline/ kerosene/ oil ☐ Ammonia ☐ Nail paint/ paint

Any other:

Describe the intensity of the smell: ☐ High ☐ Medium ☐ Low

What is the immediate health effect of the smell?

Makes feel nauseous Gives a headache Eyes burning Throat closing

Difficulty in breathing any other:

How does the emission look like? ☐ Smoke ☐ vapour clouds ☐ fire ☐ Explosion

Was there any flare? If yes, colour of the smoke from the flare: _____

Any other observations? _____

(Signature of the Monitor)

FLARE MONITORING FOR REFINERY RESIDENTS

SOURCE: CREATIVE COMMONS IMAGES

For communities residing next to a refinery, flares would be a common and a constant sight.

What is flaring?

Flaring is the burning of excess gases that cannot be processed or sold. In the petroleum industry, flaring also disposes of sour gas containing hydrogen sulphide (H2S) and waste gas containing contaminants such as H2S and carbon dioxide (CO2). CO2 is a greenhouse gas that contributes to climate change. Flaring is an important safety measure and was intended to be used during emergencies, equipment failures or other "upsets" in the crude oil refining process. Flaring is primarily a safety measure; to prevent the accumulation of gases that would pose a hazard to workers and nearby residents. However, the refineries use flaring as a cheap method to get rid of their waste gases. An efficiently burning flare does not produce visible smoke. Black smoke indicates incomplete combustion, caused by water, impurities in the fuel, or poor mixing with air.

Why Flaring should be reduced?

Incomplete combustion can produce: carbon monoxide, unburned hydrocarbons; particulate matter (ash and soot); Volatile Organic Compounds (VOC's) such as benzene, toluene and xylene; Other organic compounds known as polycyclic aromatic hydrocarbons (PAH) as well as sulphur compounds such as carbon disulphide (C2 S) and carbonyl sulphide (COS).

Benzene is a known human cancer-causing agent. Carbon monoxide affects people with heart disease and can affect the central nervous system. Xylene and Toluene are developmental toxins and also affects the central nervous system. Larger particulates deposit in the upper respiratory tract, while smaller inhalable particulates travel deeper into the lungs and are retained for longer periods of time. People with asthma or chronic lung disease are especially sensitive to ash and soot. Carbon disulphide is classified as a neurotoxin as it affects the brain and can lead to paralysis if it is inhaled for a long period of time.

Nitrogen and sulphur oxides from flaring combine with water in the atmosphere to form acids. These emissions change the nature of the soil when deposited onto the ground. By reducing the amount of flaring, the petroleum industries reduce all such emissions into the environment.

FLARE MONITORING SHEET (One sheet per stack with flame)

Name of Monitor: _____

Date: _____ Time: _____

Location of Monitor: _____

Wind direction: _____

Any other Comments: _____

Identification Number of Flare Stack with flame _____

Colour of Flame _____ Height of Flame _____

Smoke COLOUR _____ Intensity of smoke ☐ High ☐ Medium ☐ Low

Noise: ☐ high ☐ medium ☐ low ☐ no noise

SOME SIMPLE LOW-COST SCIENTIFIC TOOLS FOR MONITORING

SOURCE: CREATIVE COMMONS IMAGES

Swipe samples

Particulate matter (PM) in the air contains different kinds of toxins including gases, liquids and heavy metals. PM are inhaled and also deposited on surfaces. One method of testing for toxins in air-borne particulate matter is to analyse it after it has been deposited.

In this technique, a cotton swab or filter paper is used to wipe the surface that has the deposit. The deposit thus collected is then analysed for the presence of various toxins (heavy metals). Swipe samples give a qualitative analysis of the sample and can indicate presence or absence of metals, organic compounds and radioactivity.

Buckets Samplers

Community activists in the United States have developed a well-tested tool called the "bucket" to allow communities to sample the air they breathe. Several community groups in North America, South Africa and the Philippines have successfully used the bucket. The analytical protocols are standardized and allow communities to choose from one or more of several analytical categories that test for different air pollutants with known toxicological profiles.

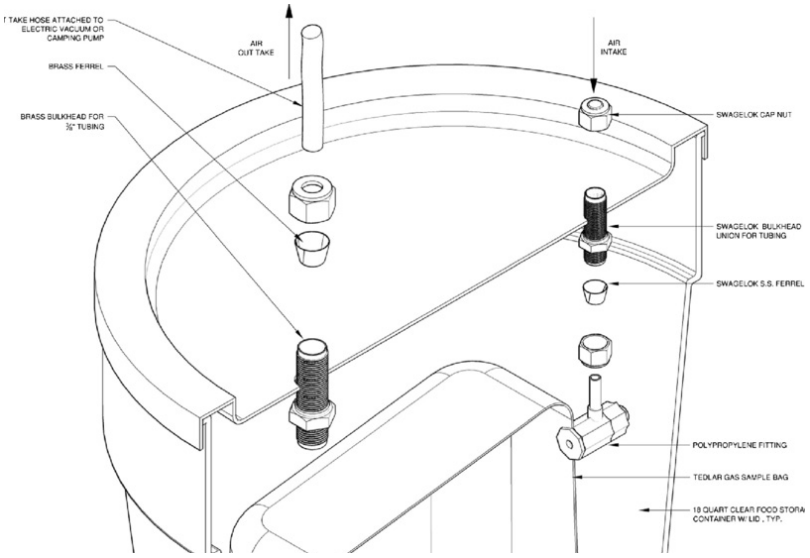
The advantage of the bucket is that it is a low-cost, but physically and scientifically robust tool, that can be deployed by the community as and when they sense intense air pollution. More importantly, it builds capacity within the community, particularly among the youth, engages them in a meaningful way in the struggle against pollution and strengthens their struggle.

SOURCE: LOUISIANA BUCKET BRIGADE

THE BUCKET BRIGADE

How does the bucket take an air sample?

The plastic bucket serves as a rugged enclosure for a standard "Tedlar" sampling bag and for the equipment needed to fill the bag with outside air. A small vacuum sucks air out of the bucket. When you open the valve attached to the sampling bag, air rushes in to fill the bag. After taking a sample, a trained person removes the sampling bag and sends it for analysis to the lab. A new bag can then be fitted to get the bucket ready for further sampling.



SOURCE: LOUISIANA BUCKET BRIGADE

What's the worth of buckets?

The buckets can be used to measure everyday pollution levels or to respond to accidental releases at the chemical factory in your area. Buckets take "grab" samples at nose-level and can give you a snapshot of what you are breathing. Buckets have proven to be a valuable tool to keep polluters in line and challenge their baseless claims that emissions are within permissible limits.

The government agencies too are more likely to begin monitoring and publish the results once they know that communities are taking regular samples and monitoring the state of the environment.

Data generated by the bucket gives information about the levels of several gases, some of them with known toxicological properties. The analytical data thus generated combined with regularly maintained chemical odour incident records provide a fair picture of air quality in an area. It would also alert us to the need, if any, for precautionary action to protect health.

Are the results credible?

Grab sampling is a well-established environmental monitoring technique. The bucket employs the same principles and techniques as the United States Environmental Protection Agency (USEPA) and the industries. Indeed, the Bucket was co-developed as a community tool by the US EPA. Bucket samples that were analysed alongside samples taken simultaneously by well-established techniques yielded similar results. Quality assurance and quality control measures provide additional scientific information and increase the credibility of the bucket samples. Currently, A few US EPA certified laboratories in the United States perform the sample analyses.

What can't the buckets do?

The laboratory can only analyze the bucket sample for gases. Bucket cannot test for Particulate Matter (PM). Buckets samples cannot be analysed for acid rain or radiation.

What pollutants can be tested using bucket samples?

For testing around chemical factories and oil refineries, two common analytical procedures are followed to test for –
1. VOC's (Volatile Organic compounds) and inorganic gases and
2. Sulphur compounds.

With bucket samples, the lab can detect many of these compounds at parts per billion (ppb) levels.

Some of the measured VOCs include – Benzene, Toluene, 3 types of Xylenes, Methylene Chloride, Tetrachloroethane, Acetone etc.

Sulphur Compounds
Sulphur compounds can also be detected at levels below 1 ppb. Some of the sulphur compounds are – Hydrogen Sulphide, Carbonyl Sulphide, Carbon Disulphide, 7 types of Mercaptans and 5 types of Thiophenes.

Bucket samples are currently being sent to a US EPA-certified laboratory in the US for analyses, because labs in India don't have one essential component required for the analyses.

Are the buckets difficult to use?

The bucket design is well suited for community use. Sturdy and easy to use, the buckets provide a less expensive way of obtaining the comprehensive information relating to toxic gases in the air. This information can help you ask informed questions and express legitimate documented concerns. The buckets represent sound science, and can provide The data-backing required to corroborate community concerns about pollution and related health effects.

For more details: visit
http://www.gcmonitor.org

AMBIENT AIR SAMPLING

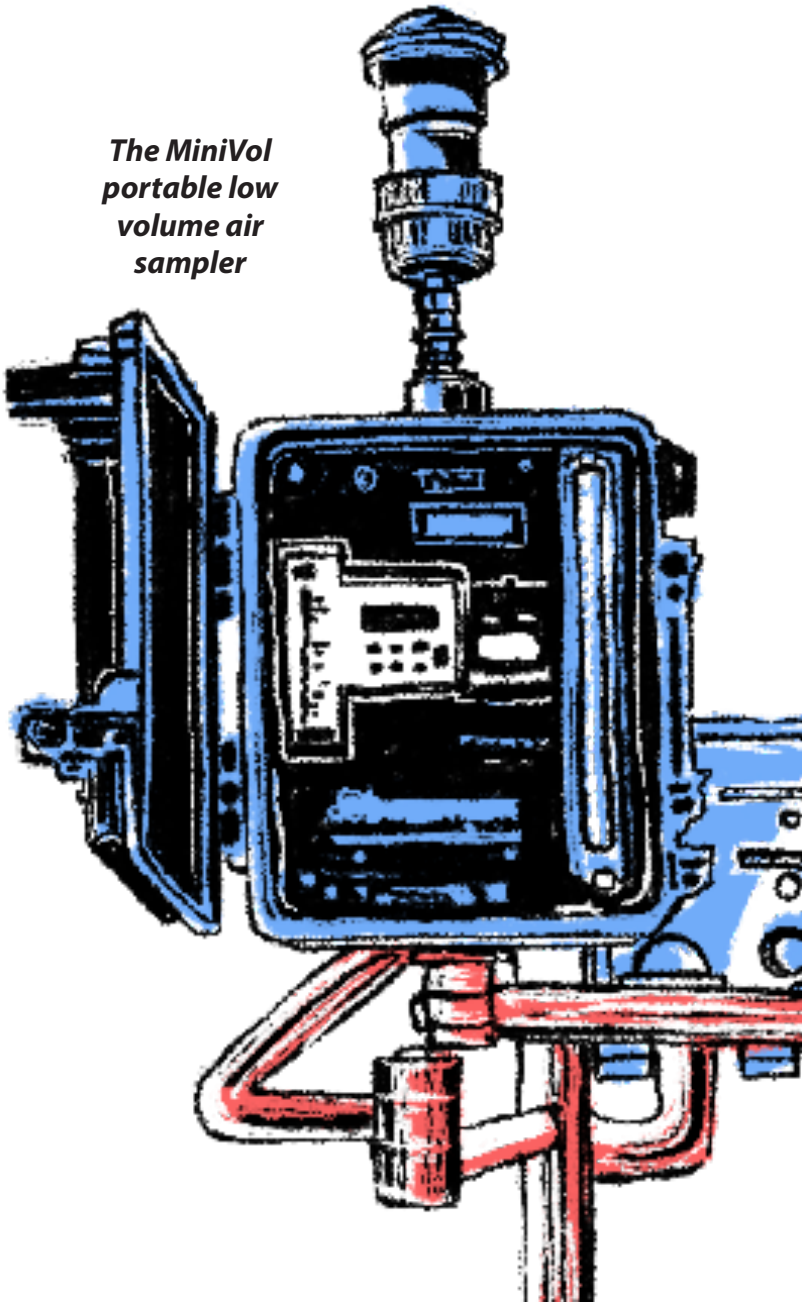
The MiniVol portable low volume air sampler is an ambient air sampler for particulate matter 10 and 2.5.

Communities living around mines, power plants and cities have used the MiniVol low volume sampler to monitor the presence of dust and heavy metals in their ambient air.

It is basically a pump controlled by a programmable timer which can be set to run for 24 hours.

In the particulate matter (PM) sampling mode, air is drawn through a particle size separator and then through a filter medium where the PM2.5 is captured along with heavy metals like lead, chromium, mercury etc. The flow meter is set at the rate of 5 liters per minute in order to mimic a healthy human lung capacity.

Due to the slightly technical nature of this process, a hands on training is required before community activists can use this on the field. The sampling machine only takes the samples, in order to understand the nature of the pollution, the filters have to be sent to a certified lab for analysis (For further details on labs, contact: india.cem@gmail.com).

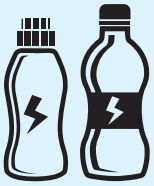


The MiniVol portable low volume air sampler

ILLUSTRATION: SATWIK GADE

THINGS WE NEED

To ensure the best results, it is important to plan in advance to determine the number of samples, team member roles, and if the samples need to meet regulatory requirements. Then make an inventory of all the equipment you might need. A typical sampling expedition for **water/soil/sludge** would require:



Bottles - plastic for heavy metals and glass for volatile organic compounds, pesticides or other reactive substance. The size of the bottle will be determined by the quantity of the sample - this information will be available with the lab analyzing your sample.

Cold Ice Pack if you are testing for volatile organic compounds and pesticides.

Zip Lock bag if needed.

Gloves (non-powdered latex) - one pair for each sample collected. It is important to discard the gloves after each sample to prevent cross contamination.

Scoops/spoons for soil and sludge samples. One for each sample.

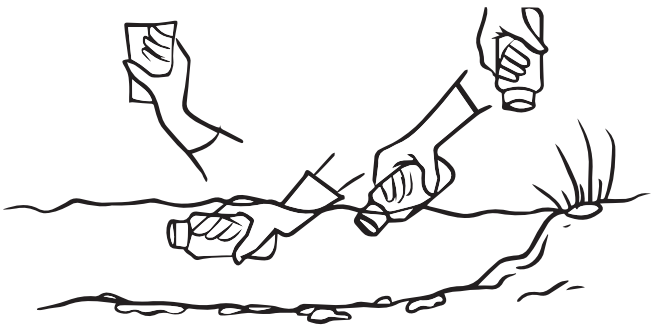
Chain of Custody forms to record the date, time, location, sample identification and name of the person who assembled the sample. Note here that if you are working in a sensitive situation then only identify samples with numbers and record the corresponding details in your personal file(s).

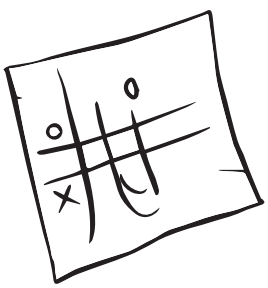
Labels to note date, time and sample ID on the bottles. Choose appropriate size.

HOW TO COLLECT A SAMPLE

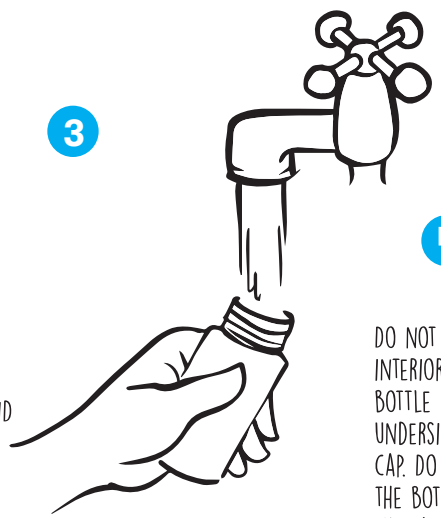
1. IF THE SAMPLE COLLECTION POINT HAS A SPECIFIC CODED IDENTIFICATION, INCLUDE IT ON THE LABEL AND CHAIN OF CUSTODY FORM. ATTACH LABEL BEFORE SAMPLING TO ENSURE ADHESION TO A DRY SURFACE.

2. IF THE SAMPLE IS BEING COLLECTED FROM A NON–POINT SOURCE LIKE A STREAM, POND OR LAKE THEN USE ONE SCOOPING ACTION TO FILL THE BOTTLE AS SHOWN IN GRAPHIC. MAKE SURE THE CAP IS TIGHTLY CLOSED. IF POSSIBLE, SCREW THE CAP UNDERWATER USING THE SECOND HAND.

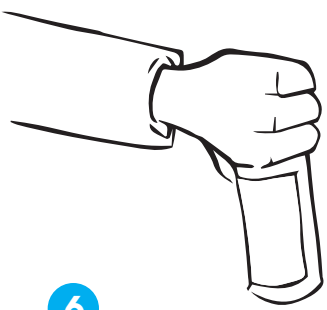




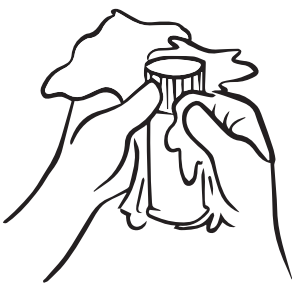
3. SAMPLE COLLECTED FROM A POINT SOURCE LIKE TAP OR A PIPELINE: HOLD THE BOTTLE AT AN ANGLE AND CAREFULLY FILL UPTO SHOULDER.

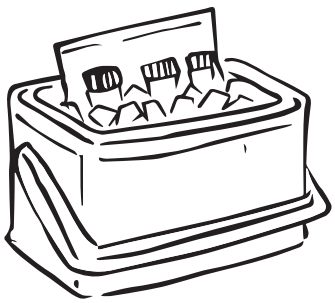


4. DO NOT TOUCH THE INTERIOR OF THE BOTTLE OR THE UNDERSIDE OF THE CAP. DO NOT ALLOW THE BOTTLE TO TOUCH THE TAP OR ALLOW WATER TO SPLASH ONTO THE TAP



5. BLOT THE SAMPLE CONTAINER WITH TISSUE TO DRY IT OFF. PLACE THE SAMPLE IN A SEALABLE PLASTIC BAG BEFORE SHIPPING IN A CLOSED CHEST OR BOX. IF ICE IS REQUIRED FOR SHIPPING, IT SHOULD BE BAGGED SEPARATELY TO PREVENT SAMPLE CONTAMINATION.





6. DELIVER THE SAMPLE TO THE LAB WITHIN A DAY OF COLLECTION IN CASE OF VOLATILES/PESTICIDES AND THREE DAYS FOR OTHER PARAMETERS.

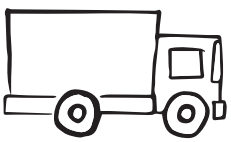


ILLUSTRATION: SATWIK GADE

DOCUMENTING WATER POLLUTION

Like air pollution and odour monitoring, communities could develop their own monitoring sheets to regularly keep tabs on water related pollution problems. Regular monitoring should be done to keep a watch on the illegal discharges into the pond, lakes, rivers and sea and to ensure action on the polluter.
Here is a sample form for any monitoring any incident relating to water pollution/ contamination in the river.

Monitoring for spills in river or streams/other water bodies

Name of the Monitor: _____

Date of the incident: _____ Time (approx): _____ am/pm

Where did the spill originate? _____

Any change in colour or appearance of the water (if yes, specify the colour)

_____

Any change in the smell of the water (if yes, please specify the type of smell)

_____

Was there any damage to plants/animals in water body? If yes, please describe it.

_____

Was there human injury as a result of the spill? If yes please describe the details:

_____

_____

Any other observations: _____

_____

_____

(Signature of the Monitor)

GROUNDWATER SURVEY

If the community is facing problems of groundwater contamination and has even lost monetarily as their water pumps, borewells and hand-pumps have been rendered useless due to the contamination, they could adapt this survey form to assess the extent and the cost of damage. The information could be used as documented evidence of the damages and for claiming compensation from the authorities and/or industries.

Step 1: Identify all villages affected by groundwater pollution.

Step 2: Take two streets per village. For each street, gather the following data: a. Total number of handpumps b. Total number of open wells c. Total number of borewells d. Total number of private water sources, and public water sources

Step 3: Fill the below form for each source (borewell, handpump and/or open well) | For private water sources, ask the owner of the household | For public water source, ask any knowledgeable person.

GROUNDWATER SURVEY FORM

Name and Address of Wellowner:

1. **What water source do you have at home?** ☐ Open Well ☐ Hand Pump ☐ Bore Well

YEAR DUG: DEPTH:

3. **What is the water used for?** ☐ Drinking ☐ Washing ☐ Only Gardening ☐ Unused

More than one use (Explain) _____

4. **If water is not used for drinking, why not?**

5. **How would you rate the quality of the water?** ☐ Good ☐ Ok ☐ Bad

6. **If answer is "OK" or "Bad", then, was the water always bad?** ☐ YES ☐ NO

If NO, since when did it turn bad? _____

7. **Describe the water: Colour** _____ **Smell** _____

Taste _____ **Anything else** _____

8. How much money did you spend to install the handpump? _____

9. What do you think is the reason for the poor quality of water? _____

_____

DOCUMENTING INDUSTRIAL ACCIDENTS INSIDE & OUTSIDE UNITS

Keeping a detailed note of the industrial accident and injuries to the workers and the community members could help the residents in many ways.

1. It forces the authorities to take action on the errant unit;

2. It forces the authorities to take stock of the existing safety situations in the factory and its implications on the community;

3. Notes taken immediately after the accident could help identify the injured workers and enable them to claim compensation legally from the industry and the government;

4. Notes could also help the injured community members claim for compensation;

5. Compilation of several such accidents over a period of time could also indicate the pattern of the safety standards practiced by the industry. and the vulnerability of the community in the region.

Questions for documenting accidents outside units

1. What was the date and time of accident?

2. Please describe the accident briefly (include vital details like wind direction, smell, sounds etc in case of gas leaks or explosions etc)

3. How many people got affected due to the accident, how many of them were from the factory?

4. Has first aid been administered to the victim(s), if yes please describe the aid.

5. Has any doctor been consulted? If yes comments.

6. Please describe the response of the company over the incident/ accident.

7. Was complaint filed with police, Pollution Control Board, Factories Inspectorate? If yes, provide copy of complaint, if not please file complaints at the earliest.

RECORDING ACCIDENTS WITHIN THE INDUSTRIES

1. Name of the person injured:

2. Age

3. Sex

4. Address

5. Name of the employer (company/ factory name)

6. Name and address of the contractor

7. Status – contract labour, permanent worker

8. Photographic evidence, if any

9. Type of work

a) Describe the incident and its causes (chemicals involved; chemical fire, electrical fire, explosion etc)

b) On the day of the incident,

Where was person(s) working?

How long was person(s) working?

Did the person have protective gear?
If yes, specify

10. Was the person qualified for the work?

If yes, specify relevant qualifications/ training

c) Describe effects of incident on victim

d) Was first aid administered?
Details of first aid

11. Was doctor consulted?

Name of doctor,

Doctor's report

Prescription

12. Describe the response of the company

Regarding cause of incident:

Regarding relief to victim

Other responses:

13. Was complaint filed with police, Factories Inspectorate?

If yes, provide copy of complaint. If not, file complaint with copies to relevant departments and panchayat.

INFORMATION TO BE GATHERED IN CASE OF CATTLE OR HUMAN DEATH

CATTLE ANIMAL INJURY/DEATH

1. Number of animals affected:

2. Kind of animal:

3. Describe injury and the cause of injury.

4. Was a veterinarian consulted? If yes any comments.

5. Was complaint filed with police, PCB? If yes, provide copy of complaint, if no please file a complaint at the earliest

6. Human injury as a result of the accident/ effluent discharge/ leak/ emissions:

7. How many people were affected?

8. How did they come in contact with the effluent/ air/ gas/ toxin?

Please fill out their personal details:

1. Name

2. Age

3. Sex

4. Occupation

5. Address

6. Date/time of injury

7. Type and extent of injury

8. Any medical treatment taken? comments of the doctor

9. Any loss of workdays. If yes, how many?

10. Photographic evidence, if any.

In case of death please compile the personal details from 1 to 5 above as well as the following information:

Describe incident leading to death –

6. How was the person exposed?

7. Was death immediate?

8. What were the symptoms observed in the victim?

DOCUMENTING SOLID WASTE / HAZARDOUS WASTE DUMPING

Date of the dumping: _____
Date of discovery: _____

Time of dumping (approximate): _____
Time of discovery: _____

Place of dumping: _____
(Please give the location details and mention if there are any water bodies or sources nearby)

Attach photograph

Which company did the waste come from?

What did the waste smell like?

What was the colour of the waste?

How did the waste look like?

How was the waste dumped? (Truck, lorry, bullock cart etc):

In case it is a truck or lorry/ tractor, please give details for the following:

- Name and address of the owner of the vehicle
- Name and address of the driver of the vehicle
- License plate number

What was the quantity of the waste? (How many truckloads or cartloads or tractor loads)

Was complaint filed with police, PCB? If yes, provide copy of complaint, if not please file a complaint immediately.

5 Reporting and **Taking Action**

Reporting a violation and taking action are the next logical step in the process of environmental monitoring. Information gathered during stages 1-3 should culminate at this stage.

Community monitors would need to report the violations to the relevant authorities, to the community, and the media for raising awareness and strengthening resistance on the issue of pollution, health and safety. Reporting and taking action is the most critical stage as it makes all documnetation efforts relevant.

REPORTING TO THE AUTHORITIES

SOURCE: CREATIVE COMMONS

It is very crucial for any violation to be first reported to the local authorities in-charge and authorised to take action. A formal reporting of the incident through a letter not only registers the complaints, also binds the officials to look into the matter. Accurate, detailed and to-the-point reporting would make it more difficult for the authorities to refute violations without a proper investigation. In case of gas leaks, odourous emissions, effluent discharge, hazardous waste dumping etc., it is important that a complaint is sent to the local Pollution Control Board (PCB) office with copies marked to the District Collector. For industrial accidents inside and outside the unit a letter has to be sent to the local and state level Factories Inspectorate with copies marked to District Collector and PCB. It is very important – a) For the letter to be sent as "Registered Post with Acknowledgment Due" and b) For the complainant to retain one copy of letter for future reference and follow-up.

Guidelines for Complaint Letter

(e.g. Pollution incident or industrial accident without injuries)

To the District Environmental Engineer
(ADDRESS)

Inspector of Factories
(ADDRESS)

Copy to:
Member Secretary, State Pollution Control Board
(ADDRESS)

Date:

Subject: Mention in one-line the purpose of the letter

Letter should describe the following:

The incident: name of the polluter if that is known.

Date/ time of the incident and other relevant details describing the incident, including wind direction, odours, smoke/fire etc in the case of air pollution incident; colour/smell of water and effects on aquatic life in the case of water incident; lorry/tanker number in the case of illegal hazardous waste dumping or effluent dumping.

Description of the type of damage due to the incident (Please mention if any human or animal injury/ impact etc) and any other relevant information
Demand for action/ investigation

Sincerely,

NAME and ADDRESS of the Complainant

REPORTING TO THE COMMUNITY

It is very important and crucial for the campaign that the community residing next to the polluting facility is made aware and updated on the reporting of violations by the monitor. Such reporting will not only make the community aware about the violations but also help build support for the monitors and strengthen monitoring efforts in the local area.
Such meetings are also crucial as it will help build a reliable information network in the community for more information on the ongoing illegalities. Reporting to the community could be done through – regular community meetings, circulation of pamphlets, wall posters, newsletters etc. Regularity of the community reporting is key in building awareness on pollution and other violations.

SOURCE: BHOPAL MEDICAL APPEAL

REPORTING TO MEDIA

Reporting to the media (local, state and national) is another effective campaign tool to highlight environmental violations in the community. It not only helps publicise the matter, but also educates a larger group of people across a vast geographical stretch.
Stories in the local newspaper and television channels about illegalities of the industrial units or ongoing

environmental violations would also pressurise the authorities to take notice of the situation and force them to take appropriate action. Communities could report to the media by holding press conferences and sending out media alerts or by personally speaking to journalists for special stories.

TAKING ACTION (DIRECT AND INDIRECT)

After monitoring, documenting and reporting it is imperative that suitable action is taken to address the problems. Actions could be taken in multiple forms from direct to non-direct. Protests, marches, dharnas (sit-ins), road blockades, hunger fasts are some forms of direct actions. Petitions, letter or post card campaigns, phone calls to officials are forms of in-direct action.

The main objective of actions are to highlight the issues of injustice, demand transperancy in decision making and pressurise the authorities to take effective measures to

a) punish the polluter

b) improve the conditions of the pollution impacted community

c) Remediate the damaged environment

TABLES

SAFETY PARAMETRES AT A GLANCE

6

Testing for **Substance Levels**

BiS: https://bis.gov.in/other/drinwatis10500.pdf/

NAAQS - Air quality: https://www.cpcb.nic.in/air-quality-standard/?&page_id=air-quality-standard

INDIAN STANDARDS FOR DRINKING WATER – SPECIFICATION (BIS 10500:1991)

Sl.No	Substance or Characteristic	Requirement (Desirable Limit)	Permissible Limit in the absence of Alternate source
1	Colour (Hazen units, Max)	5	15
2	Odour	Unobjectionable	Unobjectionable
3	Taste	Agreeable	Agreeable
4	Turbidity (NTU, Max)	1	5
5	pH Value	6.5 to 8.5	No Relaxation
6	Total dissolved solids, mg/l Max	500	2000

Note:

It is recommended that the acceptable limit is to be implemented. Values in excess of those mentioned under 'acceptable' render the water not suitable, but still may be tolerated in the absence of an alternative source but up to the limits indicated under 'permissible limit in the absence of alternate source' in col 4, above which the sources will have to be rejected.

GENERAL PARAMETERS CONCERNING SUBSTANCES UNDESIRABLE IN EXCESSIVE AMOUNTS

Sl. No	Characteristic	Requirement (Acceptable Limit)	Permissible Limit in the Absence of Alternate Source	Remarks
1	Aluminium (as Al), mg/l, Max	0.03	0.2	
2	Ammonia (as total ammonia-N) mg/l, Max	0.5	No relaxation	
3	Anionic detergents (as MBAS) mg/l, Max	0.2	1	
4	Barium (as Ba), mg/l, Max	0.7	No relaxation	
5	Boron (as B), mg/l, Max	0.5	1	
6	Calcium (as Ca), mg/l, Max	75	100	
7	Chloramines (as Cl2), mg/l, Max	4	No relaxation	
8	Chloride (as Cl), mg/l, Max	250	1000	
9	Copper (as Cu), mg/l, Max	0.05	1.5	
10	Fluoride (as F) mg/l, Max	1	1.5	
11	Free residual chlorine, mg/l, Min	0.2	1	To be applicable only when water is chlorinated. Tested at consumer end. When protection against viral infection is required, it should be minimum 0.5 mg/l
12	Iron (as Fe), mg/l, Max	0.3	No relaxation	Total concentration of manganese (as Mn) and iron (as Fe) shall not exceed 0.3 mg/l
13	Magnesium (as Mg), mg/l, Max	30	100	
14	Manganese (as Mn), mg/l, Max	0.1	0.3	Total concentration of manganese (as Mn) and iron (as Fe) shall not exceed 0.3 mg/l
15	Mineral oil, mg/l, Max	0.5	No relaxation	
16	Nitrate (as NO3), mg/l, Max	45	No relaxation	
17	Phenolic compounds (as C6 H5 OH), mg/l, Max	0.001	0.002	
18	Selenium (as Se), mg/l, Max	0.01	No relaxation	
19	Silver (as Ag), mg/l, Max	0.1	No relaxation	
20	Sulphate (as SO4) mg/l, Max	200	400	May be extended to 400 provided that Magnesium does not exceed 30
21	Sulphide (as H2 S), mg/l, Max	0.05	No relaxation	
22	Total alkalinity as calcium carbonate, mg/l, Max	200	600	
23	Total hardness (as CaCO3), mg/l Max	200	600	
24	Zinc (as Zn), mg/l, Max	5	15	

PESTICIDE RESIDUES LIMITS AND TEST METHOD

Sl. No	Pesticide	Limit (µg/l)
1	Alachlor	20
2	Atrazine	2
3	Aldrin/ Dieldrin	0.03
4	Alpha HCH	0.01
5	Beta HCH	0.04
6	Butachlor	125
7	Chlorpyriphos	30
8	Delta HCH	0.04
9	2,4- Dichlorophenoxyacetic acid	30
10	DDT (o, p and p, p – Isomers of DDT, DDE and DDD)	1
11	Endosulfan (alpha, beta, and sulphate)	0.4
12	Ethion	3
13	Gamma — HCH (Lindane)	2
14	Isoproturon	9
15	Malathion	190
16	Methyl parathion	0.3
17	Monocrotophos	1
18	Phorate	2

PARAMETERS CONCERNING TOXIC SUBSTANCES

Sl. No	Characteristic	Requirement (Acceptable Limit)	Permissible Limit in the Absence of Alternate Source
1	Cadmium (as Cd), mg/l, Max	0.003	No relaxation
2	Cyanide (as CN), mg/l, Max	0.05	No relaxation
3	Lead (as Pb), mg/l, Max	0.01	No relaxation
4	Mercury (as Hg), mg/l, Max	0.001	No relaxation
5	Molybdenum (as Mo), mg/l, Max	0.07	No relaxation
6	Nickel (as Ni), mg/l, Max	0.02	No relaxation
7	Pesticides, µg/l, Max	See Pesticide Table	No relaxation
8	Polychlorinated biphenyls, mg/l,Max	0.0005	No relaxation
9	Polynuclear aromatic hydrocarbons (as PAH), mg/l, Max	0.0001	No relaxation
10	Total arsenic (as As), mg/l, Max	0.01	0.05
11	Total chromium (as Cr), mg/l, Max	0.05	No relaxation
12	Trihalomethanes:		
a	Bromoform, mg/l, Max	0.1	No relaxation
b	Dibromochloromethane mg/l, Max	0.1	No relaxation
c	Bromodichloromethanem mg/l, Max	0.06	No relaxation
d	Chloroform, mg/l, Max	0.2	No relaxation

BACTERIOLOGICAL QUALITY OF DRINKING WATER

Sl. No	Organisms	Requirements
1	All water intended for drinking	
a	E. coli or thermotolerant coliform bacteria 2,3	Shall not be detectable in any 100 ml sample
2	Treated water entering the distribution system:	
a	E. coli or thermotolerant coliform bacteria,2	Shall not be detectable in any 100 ml sample
b	Total coliform bacteria	Shall not be detectable in any 100 ml sample
	Treated water in the distribution system	
a	E. coli or thermotolerant coliform bacteria	Shall not be detectable in any 100 ml sample
b	Total coliform bacteria	Shall not be detectable in any 100 ml sample

Note:

1) Immediate investigative action shall be taken if either E.coli or total coliform bacteria are detected. The minimum action in the case of total coliform bacteria is repeat sampling; if these bacteria are detected in the repeat sample, the cause shall be determined by immediate further investigation.
2) Although, E. coli is the more precise indicator of faecal pollution, the count of thermo-tolerant coliform bacteria is an acceptable alternative. If necessary, proper confirmatory tests shall be carried out. Total coliform bacteria are not acceptable indicators of the sanitary quality of rural water supplies, particularly in tropical areas where many bacteria of no sanitary significance occur in almost all untreated supplies
3) It is recognized that, in the great majority of rural water supplies in developing countries, faecal contamination is widespread. Under these conditions, the national surveillance agency should set medium-term targets for progressive improvement of water supplies.

GENERAL STANDARDS FOR DISCHARGE OF ENVIRONMENTAL POLLUTANTS: EFFLUENTS

Sl.No	Parameter	Standards			
		Inland surface water	Public Sewers	Land for irrigation	Marine coastal areas
1	Colour and odour	See 6 of Annexure-I	NA	See 6 of Annexure-I	See 6 of Annexure-I
2	Suspended solids mg/l, Max.	100	200	600	(a)For process waste water100. (b)For cooling water effluent 10 percent above total suspended matter of influent.
3	Particulate size of suspended solids	Shall pass 850 micron IS Sieve	NA	NA	(a)Floatable solids, max. 3 mm. (b)Settleable solids, max. 850 microns.
4	pH Value	5.5 to 9.0	5.5 to 9.0	5.5 to 9.0	5.5 to 9.0
5	Temperature	shall not exceed 5oC above the receiving water temperature			shall not exceed 5oC above the receiving water temperature
6	Oil and grease mg/l Max.	10	20	10	20
7	Total residual chlorine mg/l Max.	1			1
8	Ammonical nitrogen (as N), mg/l Max.	50	50		50
9	Total Kjeldahl Nitrogen (as NH3) mg/l, Max.	100			100
10	Free ammonia (as NH3) mg/l, Max.	5			5
11	Biochemical Oxygen demand [3 days at 27 oC] mg/l max.	30	350	100	100
12	Chemical Oxygen Demand, mg/l, max.	250			250
13	Arsenic (as As), mg/l, max.	0.2	0.2	0.2	0.2
14	Mercury (as Hg), mg/l, Max.	0.01	0.01		0.01
15	Lead (as Pb) mg/l, Max.	0.1	1		2

16	Cadmium (as Cd) mg/l, Max.	2	1		2
17	Hexavalent Chromium (as Cr+6), mg/l max.	0.1	2		1
18	Total chromium (as Cr.) mg/l, Max.	2	2		2
19	Copper (as Cu) mg/l, Max	3	3		3
20	Zinc (As Zn.) mg/l, Max.	5	15		15
21	Selenium (as Se.) mg/l, Max	0.05	0.05		0.05
22	Nickel (as Ni) mg/l, Max	3	3		5
23	Cyanide (as CN) mg/l Max.	0.2	2	0.2	0.2
24	Fluoride (as F) mg/l Max.	2	15		15
25	Dissolved Phosphates (as P), mg/l Max	5			
26	Sulphide (as S) mg/l Max.	2			5
27	Phenoile compounds (as C6H5OH) mg/l, Max.	1	5		5
28	Radioactive materials :				
a)	Alpha emitter micro curie/ml.	10 (-7)	10 (-7)	10 (-8)	10 (-7)
b)	Beta emitter micro curie/ml.	10 (-6)	10 (-6)	10 (-7)	10 (-6)
29	Bio-assay test	90% survival of fish after 96 hours in 100% effluent	90% survival of fish after 96 hours in 100% effluent	90% survival of fish after 96 hours in 100% effluent	90% survival of fish after 96 hours in 100% effluent
30	Manganese (as Mn)	2 mg/l	2 mg/l		2 mg/l
31	Iron (as Fe)	3 mg/l	3 mg/l		3 mg/l
32	Vanadium (as V)	0.2 mg/l	0.2 mg/l		0.2 mg/l
33	Nitrate Nitrogen	10 mg/l			20 mg/l

CLASSIFICATION OF INLAND SURFACE WATER

S.No.	Characteristics	A	B	C	D	E
1	Dissolved Oxygen, mg/L, Min	6	5	4	4	
2	Biochemical Oxygen Demand, mg/ L Max	2	3	3		
3	Total Coli form Organisms* MPN/100 ml, Max	50	500	5000		
4	Total Dissolved Solids mg/L Max	500		1500		2100
5	Chlorides (as CL), mg/L, Max	250		600		600
6	Colour, Hazen Units, Max	10	300	300		
7	Sodium Absorbtion Ratio, Max	10	300	300		
8	Boron (as B), mg/L Max					2
9	Sulfates (as SO4), mg/L Max	400		400		1000
10	Nitrates (as NO3), mg/L, Max	20		50		
11	Free Ammonia (as N), mg/L Max				1.2	
12	Conductivity at 25oC, micromhos/cm, Max				1000	2250
13	pH Value	6.5-8.5	6.5-8.5	6.5-8.5	6.5-8.5	6.5-8.5
14	Arsenic (as As), mg/L Max	0.05	0.2	0.2		
15	Iron (as Fe), mg/l, Max	0.3		50		
16	Fluorides (as F), mg/L, Max	1.5	1.5	1.5		
17	Lead (as Pb), mg/L Max	0.1		0.1		
18	Copper (as Cu), mg/L, Max	1.5		1.5		
19	Zinc (as Zn), mg/L, Max	15		15		

Source: Indian Standard (IS: 2296 – 1982)

Note:

* If the coli form is found to be more than the prescribed tolerance limits, the criteria for coli form shall be satisfied if not more than 20 percent of samples show more than the tolerance limit specified, and not more than 5 percent of samples show values more than 4 times the tolerance limits. Further, the fecal coli form should not be more than 20 percent of the coli form.

A' Drinking water surface without conventional treatment but after disinfection
B' Outdoor bathing (organized)
C' Drinking water source with conventional treatment followed by disinfection
D' Propagation of wild life, fisheries
E' Irrigation, industrial, cooling, controlled waste disposal

National Ambient Air Quality Standards (NAAQS) 2009

Parameters	Time Weighted Average	2009 – Industrial, Residential, Rural and Other Area	2009 – Sensitive Area
Sulphur Dioxide (ug/m3)	Annual	50	20
	24 Hours	80	80
Oxides of Nitrogen (ug/m3)	Annual	40	30
	24 Hours	80	80
PM 10 (ug/m3)	Annual	60	60
	24 Hours	100	100
PM 2.5 (ug/m3)	Annual	40	40
	24 Hours	60	60
Ozone (ug/m3)	8 Hours	100	100
	1 Hour	180	180
Lead (Pb) (ug/m3)	Annual	0.50	0.50
	24 Hours	1.0	1.0
Carbon Monoxide (mg/m3)	8 Hours	2	2
	1 Hour	4	4
Ammonia (ug/m3)	Annual	100	100
	24 Hour	400	400
Benzene (ug/m3)	Annual	5	5
Benzo(a)Pyrene (BaP) Particulate phase only ng/m3	Annual	1	1
Arsenic (ng/m3)	Annual	6	6
Nickel (ng/m3)	Annual	20	20

Source: CPCB

HAZARDOUS WASTE INCINERATOR STANDARDS - 2017

Parameter	Emission Standard	Comments
Particulates	50 mg/Nm3	Standard refers to half hourly average value
HCl	50 mg/Nm3	Standard refers to half hourly average value
SO2	200 mg/Nm3	Standard refers to half hourly average value
CO	100 mg/Nm3	Standard refers to half hourly average value
	50 mg/Nm3	Standard refers to daily average value
Total Organic Carbon	20 mg/Nm3	Standard refers to half hourly average value
HF	4 mg/Nm3	Standard refers to half hourly average value
NOx (NO and NO2 expressed as NO2)	400 mg/Nm3	Standard refers to half hourly average value
Total dioxins and furans	0.1 ng TEQ/Nm3	Standard refers to 6-8 hours sampling. Please refer guidelines for 17 concerned congeners for toxic equivalence values to arrive at total toxic equivalence.
Cd + Th + their compounds	0.5 mg/Nm3	Standard refers to sampling time anywhere between 30 minutes and 8 hours.
Hg and its compounds	0.5 mg/Nm3	Standard refers to sampling time anywhere between 30 minutes and 8 hours.
Sb + As + Pb + Cr + Co + Cu + Mn + Ni + V + their compounds	0.5 mg/Nm3	Standard refers to sampling time anywhere between 30 minutes and 8 hours.

Source: CPCB

Notes

SECTION 3

Laws that can assist communities in environmental protection

1 ENVIRONMENTAL LAWS IN INDIA

SOURCE: MICHA PATULT

In the wake of the Bhopal Gas Disaster, the government of India passed and enacted the Environment Protection Act (E.P.A.) of 1986 under Article 253 (Legislation for giving effect to international agreements) of the Constitution of India. The EPA became an umbrella legislation designed to facilitate the coordination of activities of various central and state authorities established under the earlier laws like Water (Prevention and Control of Pollution) Act of 1974 and the Air (Prevention and Control of Pollution) Act of 1981 (see box). The EPA is the only statute in India which regulates all forms of activities that are detrimental to the environment.

It is only after the enactment of the Environment Protection Act of 1986 that the evolution of environment legislation started in India. It gave a lot of power to the Central Government, especially through the Section 3(1) of the Act which empowers the Centre 'to take all such measures as it deems necessary or expedient for the purpose of protecting and improving the quality of the environment and preventing, controlling and abating environmental pollution'.

In 1994, the Environment Impact Assessment Notification was brought into the ambit of the EPA. Central Government was thus mandated to carry out an extensive form of environment impact assessment before passing of any project listed in the category A and B of the notification. It includes the aspect of 'Public Hearing' and through that, a Right to Know wherein the general public (affected), is given a chance to speak out and made aware of the proposed project. Effectively, the EIA process brought in a lot of transparency in environmental decision-making around developmental and mining projects.

The Environment (Protection) Rules, 1986 was brought into effect in pursuance of Section 25 of the Environment Protection Act, 1986 which gave the Central Government the power to make rules for the protection of environment. It has seven schedules which specifically lay down rules regarding standards for emission or discharge of environmental pollutants from industries, prescribing standards for ambient air quality, standards for emission of smoke, vapor etc. from vehicles, providing a list of authorities or agencies to be intimated in case of discharge of any pollutant in excess of prescribed standards and the prescription of general standards for discharge of environmental pollutants including municipal/ hazardous wastes.

http://envfor.nic.in/legis/env/env1.html pdf?file=1&type=node&id=6489

Enlisted below are a few standard monitoring and enforcement procedures for acts and rules under the EPA. http://cprindia.org/system/tdf/policy-briefs/Hindi-English%20Legal%20Handbook.

USE OF LEGAL PROVISIONS

Laws in most of the countries aim to protect and safeguard human and environmental rights of individuals and communities. Pollution impacted communities worldwide use legal means and take aid of the relevant laws in their respective countries to further their demand on clean, safe and healthy environment. Legal route have in the past helped the communities exert more pressure on the local administration, authorities and the polluter for more accountability.

This section of the manual mostly deals with some of the useful provisions available under the Indian Legal system such as the Indian Penal Code, Right to Information Act, Public Liability Insurance Act etc for the pollution impacted communities to seek justice.

WHAT IS THE IPC?

IPC or the Indian Penal Code is a penal code for criminal law which applies to the whole of India except for the state of Jammu and Kashmir. It lays down the definition and the remedies for all criminal acts which are committed within the area which is specified under sec 1 of the code. Even people on aircraft and ships registered in India are to be tried under this code. It has 511 sections.

The provisions under the Indian Penal Code (IPC) gives us scope to file criminal complaints against the polluter for its illegalities in compliance with the Environmental Protection norms.

WHAT IS AN OFFENCE?

"Offence" means any act or omission made punishable by any law in force.

COGNIZABLE & NON COGNIZABLE OFFENCES?

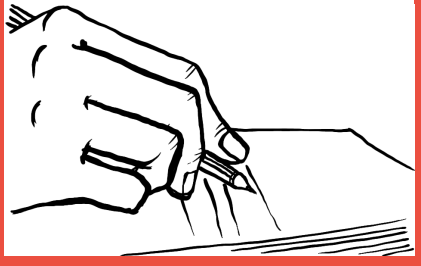
Cognizable offence means an offence for which, a police officer may, while complying with the provisions of the law, arrest without a warrant. General examples of such cognizable offence are murder, robbery, kidnapping, theft etc. From environmental point of view an example of a cognizable offence would be a massive gas leak from the industries that kills people. Non-cognizable offence refers to relatively minor offences and in this case a police officer has no authority to arrest without warrant. Example of such non cognizable offences would be public nuisance, street fight, drunken brawl etc. From an environmental point of view one example of non cognizable offence would be persistent chemical odour from the industrial unit.

HOW DO YOU FILE A POLICE COMPLAINT?

FOR FILING A POLICE COMPLAINT ONE NEEDS TO GO TO THE POLICE STATION AND REGISTER THE COMPLAINT WITH THE OFFICER THERE.

IF THE MATTER IS SERIOUS "COGNIZABLE" THEN YOU HAVE TO FILE A FIRST INFORMATION REPORT (F.I.R.).

IF THE MATTER IS NOT SO SERIOUS: "NON COGNIZABLE" THEN YOU NEED NOT FILE A F.I.R BUT REGISTER YOUR COMPLAINT WITH THE POLICE.



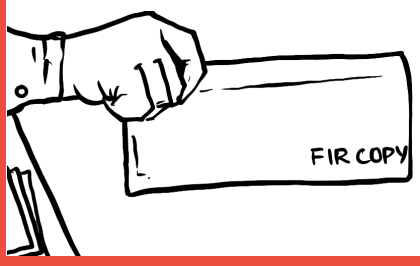
COMIC: SATWIK GADE

IN MOST CASES ITS THE POLICE THAT DETERMINES IF THE MATTER IS SERIOUS OR NOT FOR A F.I.R.

DUE TO CORRUPTION, POOR ENVIRONMENTAL AWARENESS AND INHERENT LETHARGY IN THE POLICE DEPARTMENT, THEY NORMALLY WOULD RESIST FILING ANY F.I.R NO MATTER HOW SERIOUS THE MATTER IS. MOREOVER FILING A F.I.R. WOULD ALSO MEAN INITIATION OF INVESTIGATION.

IN OTHER WORDS, IT IS MORE WORK FOR THE OFFICERS. IT OUR RESPONSIBILITY TO REALLY PERSIST UPON THE OFFICERS AND PRESS THEM TO FILE F.I.R IF THE MATTER IS VERY SERIOUS.

AIN CASE OF AN F.I.R, IT IS MANDATORY FOR THE POLICE TO GIVE YOU A COPY OF THE SAME IMMEDIATELY



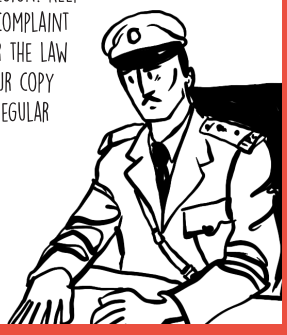
IN CASE OF A REGULAR COMPLAINT THE POLICE HAS TO PROVIDE YOU AN ACKNOWLEDGMENT OF THE COMPLAINT IMMEDIATELY.

PLEASE **DO NOT** LEAVE THE POLICE STATION WITHOUT YOUR COPY OF THE F.I.R OR ACKNOWLEDGMENT. THIS IS THE ONLY PROOF YOU HAVE.

WHAT TO DO IF THE POLICE REFUSES TO REGISTER YOUR COMPLAINT

IT IS QUITE LIKELY THAT THE POLICE WILL NOT ACCEPT YOUR COMPLAINT, IN THIS CASE YOU HAVE TO SEND A LETTER OF COMPLAINT THROUGH REGISTERED POST ACKNOWLEDGMENT DUE (RP/AD)

TO THE SUPERINTENDENT OF POLICE OF THE REGION. KEEP A COPY OF THE COMPLAINT WITH YOU. UNDER THE LAW THIS WILL BE YOUR COPY OF THE F.I.R OR REGULAR COMPLAINT.



RELEVANT SECTIONS UNDER THE IPC

Section 277

Fouling water of public spring or reservoir

Description: Whoever voluntarily corrupts or fouls the water of any public spring or reservoir, so as to render it less fit for the purpose for which it is ordinarily used, shall be punished with imprisonment of either description for a term which may extend to three months, or with fine which may extend to five hundred rupees, or with both.

Section 304-A

Causing death by negligence

Description: Whoever causes the death of any person by doing any rash or negligent act not amounting to culpable homicide, shall be punished with imprisonment of either description for a term which may extend to two years, or with fine, or with both.

Section 278

Making atmosphere noxious to health

Description: Whoever voluntarily vitiates the atmosphere in any place so as to make it noxious to the health of persons in general dwelling or carrying on business in the neighborhood or passing along a public way, shall be punished with fine which may extend to five hundred rupees.
When any of the above case causes death of a person or many persons then death due to negligence, complaint under sec 304-A of the IPC may be used in addition to these provisions.

Section 284

Negligent conduct with respect to poisonous substance

Description: Whoever does, with any poisonous substance, any act in a manner so rash or negligent as to endanger human life, or to be likely to cause hurt or injury to any person, or knowingly or negligently omits to take such order with any poisonous substance in his possession as is sufficient to guard against any probable danger to human life from such poisonous substance, shall be punished with imprisonment of either description for a term which may extend to six months, or with fine which may extend to one thousand rupees, or with both.

CEM meets RTI!

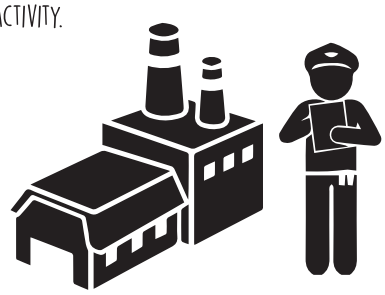
GANESH HAD NOTICED A CHEMICAL UNIT IN HIS COMMUNITY DISCHARGING ILLEGALLY INTO THE CANAL. HE HAD IMMEDIATELY FILED A COMPLAINT WITH THE LOCAL POLLUTION CONTROL BOARD AND DISTRICT ADMINISTRATION. THOUGH THE OFFICIALS INSPECTED THE SITE AND EVEN TOOK A WATER SAMPLE, THEY NEVER INFORMED GANESH ABOUT THE RESULTS OR THE COURSE OF ACTION TAKEN ON THE INDUSTRY FOR THIS GRAVE VIOLATION.

WHAT DID HE DO?

GANESH LEARNT ABOUT THE RIGHT TO INFORMATION ACT (RTI ACT) THROUGH A LOCAL COMMUNITY SUPPORT GROUP. HE IMMEDIATELY FILED AN RTI APPLICATION ASKING FOR THE RESULTS OF THE SAMPLES, THE OFFICIALS SITE VISIT REPORT AND DETAILS OF THE ACTION TAKEN ON THE UNIT FOR THE VIOLATION. UPON RECEIVING THE INFORMATION HE FOUND THAT LEVELS OF HARMFUL CHEMICALS WERE ABOVE THE STANDARDS PRESCRIBED IN THE SAMPLES TAKEN FROM THE CANAL AFTER THE INCIDENT.

ILLUSTRATION: SATWIK GADE

HIS RTI REQUEST FORCED THE OFFICIALS TO MOVE THE FILE TO HIGHER AUTHORITY AND EVENTUALLY AFTER ALMOST 8 MONTHS OF INACTION THE UNIT WAS HAULED FOR ITS ILLEGAL ACTIVITY.



THE RIGHT TO INFORMATION ACT (RTI ACT) THAT WE ENJOY TODAY IS THE RESULT OF A DECADE LONG STRUGGLE BY PEASANTS AND LANDLESS WORKERS IN RAJASTHAN.

BRAVING INTENSE OPPRESSION FROM STATE AND DISTRICT OFFICIALS, THE PEASANT MOVEMENT NOT ONLY WON THEIR STRUGGLE, BUT ALSO TRIGGERED A NATIONAL MOVEMENT FOR RIGHT TO INFORMATION.

THE ACT HAS THE POTENTIAL TO EVOLVE AS AN EFFECTIVE MECHANISM FOR THE POOR AND WORKING CLASSES TO PRACTICE DEMOCRACY BY CURBING CORRUPTION AND HOLDING GOVERNMENTS AND PUBLIC AUTHORITIES ACCOUNTABLE.
WORKERS DENIED FAIR WAGES UNDER RAINS DRAUGHT RELIEF SCHEMES WAGED A CAMPAIGN FOR TRANSPARENCY IN VILLAGE ACCOUNTS UNDER THE SLOGAN "OUR MONEY–OUR ACCOUNTS".

FEW IMPORTANT POINTS TO REMEMBER

1. Lodge a complaint in case of cattle death, and get a postmortem conducted on the cattle.

2. In case of death of person/ persons always demand a postmortem with the local government hospital. A postmortem strengthens your case tenfold.

3. In case of any environmental incident, please ensure that you fill up the incident monitoring forms or inform your local environmental monitor to fill up such forms.

4. It is always good to take a few other community members along with you when you go to the police station to file a complaint. Witnesses always help the matter.

2 Right To Information Act, 2005

A Tool to Make Authorities Accountable

SALIENT FEATURES OF THE ACT

1. The Act allows public to access information held by government and other public authority.

2. Information means letters, contracts, budgets, reports, documents, maps, etc.

3. Right to Information means right to inspect files, works and to take samples of material.

4. Public authority includes all center and state government agencies, government funded corporations and boards, all courts and any body including NGOs that are funded substantially by the government.

5. All Public Authorities should appoint Public Information Officers who will be the contact person for citizens seeking information.

6. All applications should be accompanied by application fees of Rs 10 for Tamil Nadu, the easiest way is to pay the money by affixing court fee stamp. For central Government agencies and public authorities, the letter and payment can be handed over in the local post office. There is no application fee for people Below Poverty Line (BPL).

7. Applicants should receive a response within 30 days of filing application, failing this they can appeal to the Appellate authority in 60 days, and approach the State or Central Information Commission if the Appellate Authority's decision is not satisfactory.

8. Sec 4 of the act requires all Public Authorities to disclose as much information as possible pro actively so as to minimize the need for citizens to use the Act.

9. Sec 8 of the Act deals with the various kinds of information that may not be available to citizens under the Right To Information Act.

To,
The Public Information Officer,
Address of the relevant department.

From:
Full Name of Applicant,
Full Address.

Date:
Subject: Request for information under Right to Information Act 2005

Sir/ Madam,
Exercising the rights guaranteed to me under the Right To Information Act, 2005, I would like to seek the following information:

Details of Information Required

Period

Documents required

Sincerely,
(Signature)

I have paid the application fees of Rs.10 though (Court fee stamp/DD/cash)

3 Public Liability Insurance Act 1991

Injured by a hazardous incident in your neighborhood factory? Seek Compensation

What is this Act for?

This is an Act for the purpose of providing immediate and interim relief to persons (other than workers within factory premises) affected by any hazardous incident in any factory.

Under what circumstances one can apply for compensation under the Act?

The application can be made in case of an injury sustained or death (to persons other than workers in the premises) or damage to property outside the factory, by an accident or handling of hazardous substance from a factory or its allied operations.

Who can apply and how?

1. The application for the claim of relief can be made by -
a) by the person who has sustained the injury;
b) by the owner of the property to which damage has been caused;
c) in case of a death by the accident, all or any legal representatives of the deceased;
d) any agent duly authorised by the injured, owner of the property or the legal representatives of the deceased

2. The applicant needs to make an application to the District Collector of the area in the format as prescribed by the form given below.

Who is the authority to call for, consider and grant compensations; what are the powers of the authority?

The District Collector is the authority who will take the decision on the claim.

The District Collector, upon the knowledge of the accident has to verify the occurrence of such accident and then invite applications under the format prescribed for claims of compensation under the Public Liability Insurance Act.

In case of an accident, it is very important that people inform the District Collector and ensure that the Collector's office takes adequate action and publicises the call for claim through the prescribed format to the general public.

What is the extent of compensation one can claim under the Act?

1. Reimbursement of medical expenses incurred up to a max. of Rs. 12,500 in each case.

2. For fatal accidents the relief will be Rs. 25,000 per person in addition to reimbursement of medical expenses if any, incurred on the victim up to a maximum of Rs. 12,500.

3. For permanent total or partial disability or other injury or sickness, the relief will be
a) reimbursement of medical expenses incurred, if any, up to a maximum of Rs. 12,500
b) cash relief on the basis of percentage of disablement as certified by an authorised physician. Relief or total permanent disability will be Rs. 25,000.

4. For loss of wages due to temporary partial disability which reduces the earning capacity of the victim, there will be a fixed monthly relief not exceeding Rs. 1,000 per month up to a maximum of 3 months: provided the victim has been hospitalised for a period of exceeding 3 days and is above 16 years of age.

5. Up to Rs. 6,000 depending on the actual damage, for any damage to private property.

What should an alert citizen do in order to take action and claim compensation under the Act?

Upon the occurrence of the accident the affected party should:

1. Immediately through written postal communication with acknowledgement due AND telephonic means, inform the District Collector of the accident. Also, alert the media, the Inspector of Factories and local groups about the hazardous incident.

2. Take pictures of the site where accident took place and of the damages arising from it.

3. File a police complaint immediately with the police station in whose jurisdiction the accident or the injury has occurred. Ensure that you have copy of the complaint with "Received" stamp from the Police Station.

4. Take injured person(s) immediately to a Government Hospital (private hospital certificates are not considered valid for claims of compensation).

5. Retain admission slip, discharge summary, and all the prescription slips of medicines and diagnosis of the injured with you and attach a copy with your claim for compensation. Admission slip and discharge summary should mention that the patient was a victim of a hazardous incident, and include the name of the company.

6. Obtain a certificate from the medical doctor that attended the injured/dead. The certificate should clearly mention the name and the address of the doctor who attended to the injured/dead.

7. In case of a death, please collect the 'Death Certificate' of the deceased and any other relevant reports about the cause of death.

8. Contact a local group working on the issue of environment and the local media in the area to highlight the issue.

FORM OF APPLICATION FOR COMPENSATION

Shri/Shrimati/Kumari _____ son of/ daughter of/ Widow* of Shri _____ who died/ had sustained injuries in an accident on _____ at _____ particulars in respect of accident and other information are given below :-

Name and father's name of person injured/ dead (husband's name in case of a married woman or widow):

_____

Address of the person injured/ dead:

_____

_____

Age: _____ Date of Birth: _____

Sex of the person injured/ dead: _____

Place date and time of the accident:

_____

_____

Occupation of the person injured/ dead:_____

_____

Nature of injuries sustained

_____

_____

Name and address of police station in whose jurisdiction accident took place or was registered

_____

_____CONTD...

(CONTD...)

Name and address of the medical officer/ practitioner who attended on the injured/ dead:

_____

_____

Name and address of the claimant/ claimants:

_____

_____

Relationship with the deceased: _____

Any other information that may be considered necessary or helpful in the disposal of the claim:**

_____

_____

I hereby swear and affirm that all facts noted above are true to the best of my knowledge and belief.

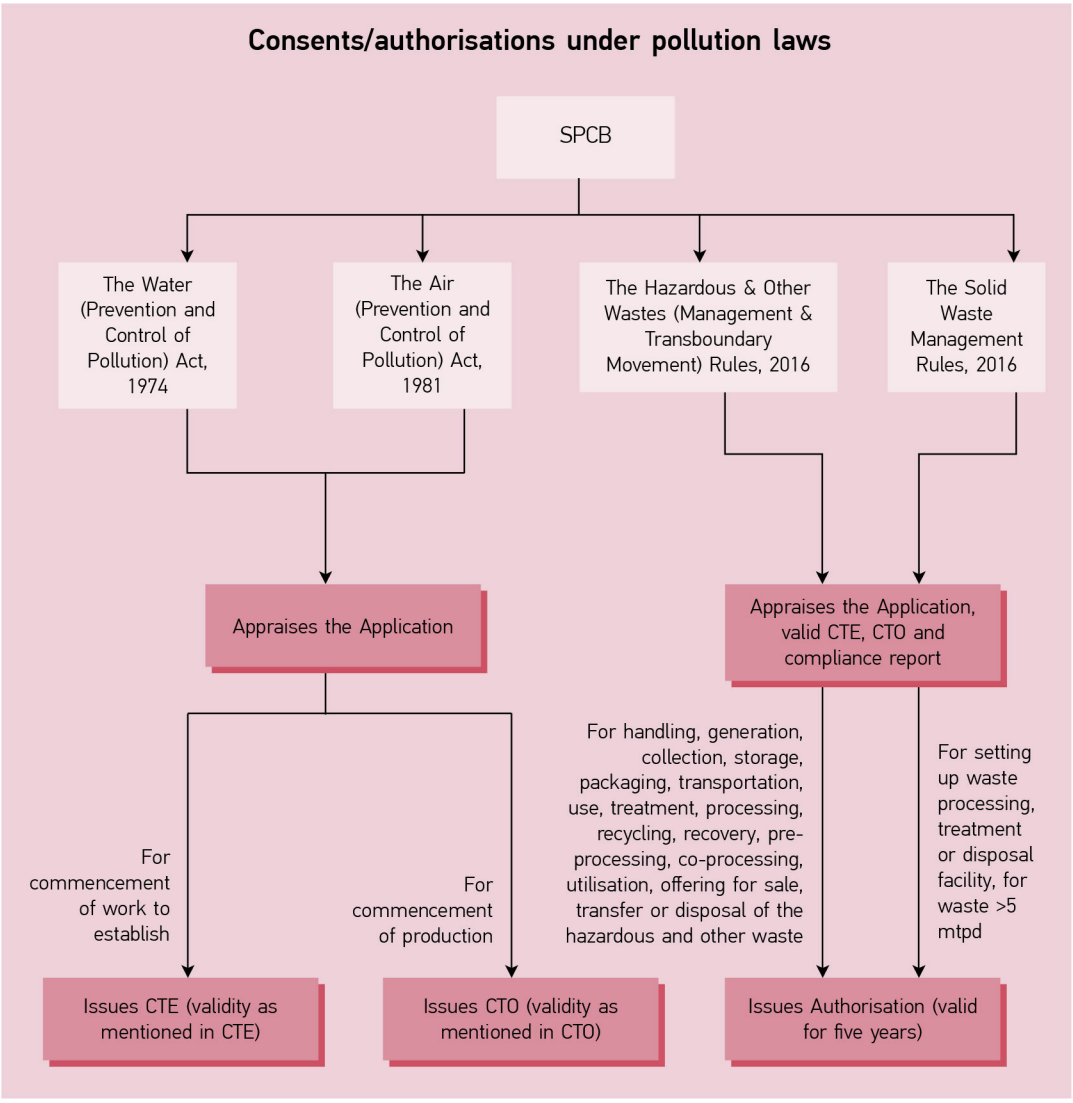
_____

Signature of the Claimant

***Strike out whichever is not applicable.**

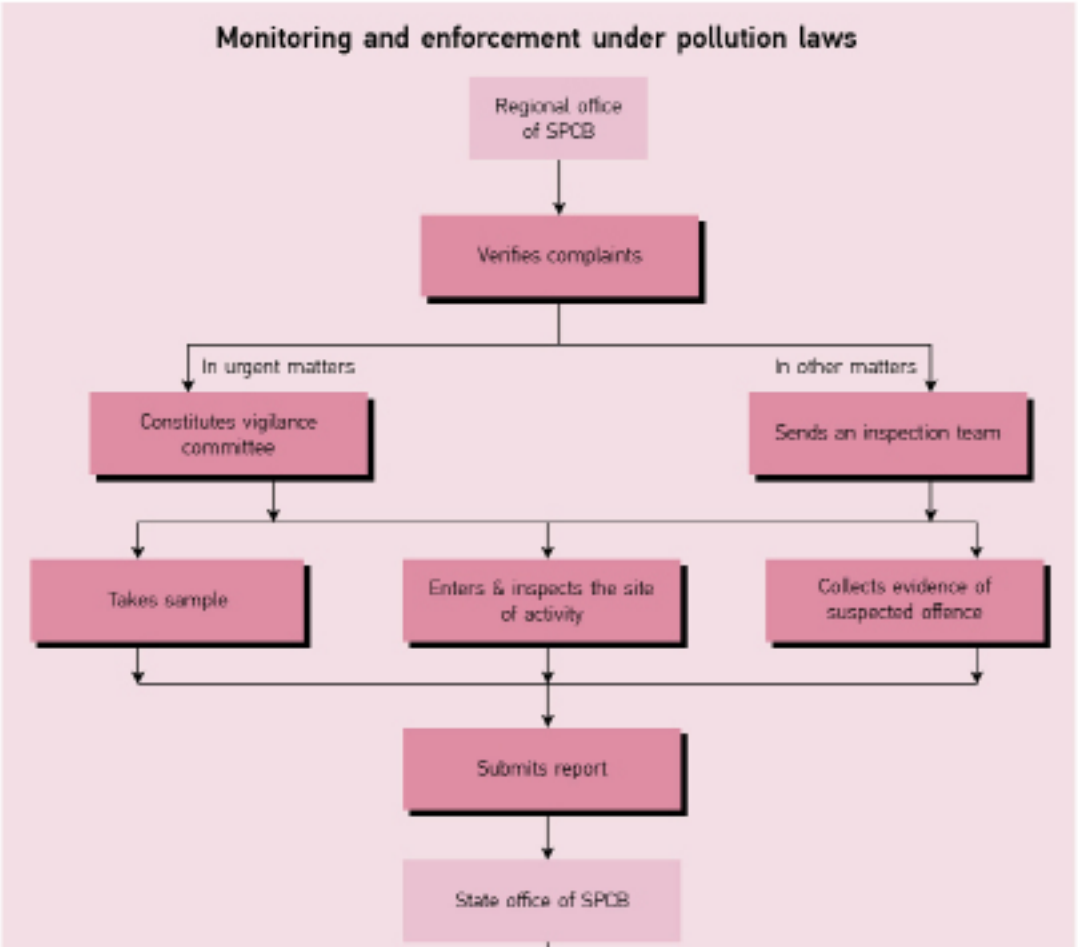
**** Any other information includes photographs/ technical reports/ health reports of the area, etc., relating to the alleged violation/ offence/ accident.**

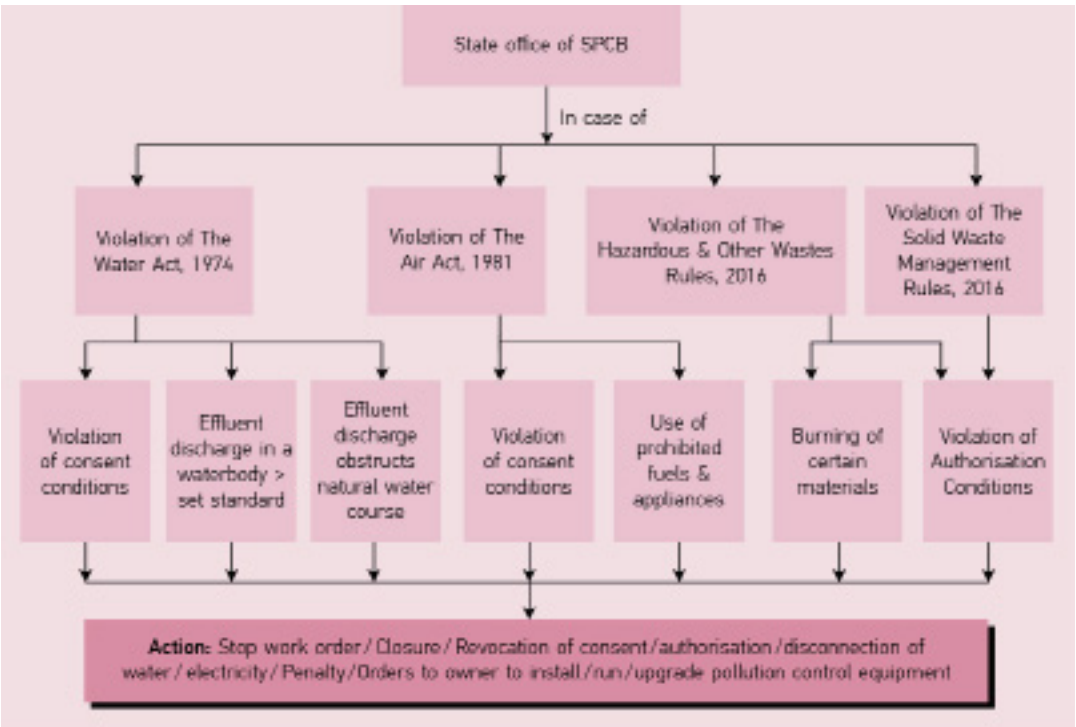
4 Flowcharts on Departmental Jurisdiction



SOURCE: CENTRE FOR POLICY RESEARCH AND NAMATI, NEW DELHI 2017

SOURCE: CENTRE FOR POLICY RESEARCH AND NAMATI, NEW DELHI 2017





SOURCE: CENTRE FOR POLICY RESEARCH AND NAMATI, NEW DELHI 2017

Notes

Notes

SECTION 4

Community Health Monitoring

Community Health Monitoring

Poorly designed or managed industrial activities can pollute the air, water, and soil. Even as communities have developed and used tools of Environmental Monitoring to hold regulatory agencies and industrial establishments accountable for pollution, they continue to bear the impacts of environmental pollution on human health. These impacts are especially relevant when considering large facilities and operations involving toxic chemicals and petrochemicals, power generation, and heavy industry in general that use materials and processes that can have serious health implications if mismanaged.

In such cases, there is concern about the health of those living in the vicinity of these activities. People from many communities living in and around heavily industrialized areas report decreasing quality of health and living, increased occurrences of diseases, development of chronic diseases among vulnerable populations like the elderly, children, and the immune-compromised.

People living near the industries are prone to acute exposure to chemicals, lasting from seconds to hours at a time. Health effects of these acute exposure show up immediately or soon after the exposure . Chronic or long-term chemical exposure is the repeated exposure to a toxic substance over a long period of time (months or years). The effects of chronic exposure can take years to become apparent and are, in many instances, permanent.

This set of tools had been developed to assist communities living near industrially polluted areas to systematically document and monitor their health status by themselves as a basis to prepare a community based health reports. Documentation includes various kinds of health evidence – including people's self-reported symptoms, to medical records

etc, which will all contribute to understanding the community's health, and can also help monitor it over a period of years. At this initial phase, this tool was specifically developed for communities living near to coal, pharmaceutical and textile industry.

Who will administer this Tool?

This set of tools will be administered by Community Monitors. They are the residents of community who can read & write and are selected on voluntary basis. They report the violation to the relevant authorities, to the community and the media for raising awareness and strengthening resistance on the issue of pollution, health and safety (Ref page 57)

Trainings will be given to the Community Monitors for administering this tool by the organization.Steps to be followed by community monitors are mentioned in each section given below

Answering to this set of tools is voluntary and the participants are free to withdraw at any time without having to give a reason and without any consequences. Participants will have all the right to refuse to answer any questions.

Training of administering the tool includes

- Detailed explanation on the objective of the tool
- Steps to be followed in completing the tool
- Steps to be followed in reporting the completed tool
- Maintaining the confidentiality of the data

1

Symptom Checklist

Symptom checklist includes the symptoms reported in the reviewed literature on health effects experienced by pollution-impacted communities.

Three tables are provided here. In **Table 1,** identification numbers are given to each family members.

Table 2 consist of list of possible symptoms that can be experienced by a pollution impacted community.

Table 3 had been given to document symptoms experienced by the participants other than the one mentioned in Table 2.
This checklist is developed for each household in the pollution impacted area. It is provided once in every month to each individual in a household by community monitors for one year. At the initial month, all the three tables will be taken to each household. As the first step,

Table 1 will be filled.

The **table 2** consists of two columns. The first column details the symptoms and the second column mentions the participant number respectively. Symptoms are divided under various body systems. Symptoms experienced by each participant will be identified and marked in the respective column.

New Sheets of **Table 2** and **3** will be taken by community monitor to the households in every month.

On marking the checklist, symptoms experienced by each person in those communities following exposure from possible sources can be obtained.

This section is particularly designed to identify the symptoms experienced by participants. Diagnosed disease conditions can be mentioned in the section 2 of “Body Mapping of Chronic conditions”.

1a Steps to fill the Symptom Checklist

PREPARATORY ACTIVITIES TO BE DONE BY COMMUNITY MONITORS

Identify the total number of household in the community

Identify the household with a number or the name of the head of the household

Identify the number of family members in each household

Give an individual identification number for each family member which includes their Name, Age and sex . These details can be filled in the table 1 "Participant identification", such as the sample table presented below.

Organize a meeting of family members in the household

Symptoms experienced by the participants other than the one mentioned in Table 2 should be mentioned in the Table 3 "Other Symptoms".

Ask each person to describe the symptoms experienced by them in the past one month

The checklist will be administered to the households once every month for a whole year

The community monitor will put a tick mark against the symptoms mentioned by each individual in the table 2 of "Acute Symptoms"below.

Source: HEI - India

For example: IF FAMILY A HAS 4 MEMBERS, (FATHER/MOTHER/2 SONS)

Identification Number	Name of the family member	Age/ Sex
P1 (Example)	xxxx (Father)	31/F
P2	xxxxx (Mother)	
P3	xxxxx (First Son)	
P4	xxxxx (Second Son)	

TABLE 1 PARTICIPANT IDENTIFICATION

Name of the head of household:
Household Identification Number:

Identification Number	Name of the family member	Age/Sex
P1		
P2		
P3		
P4		

TABLE 2 ACUTE SYMPTOMS

Month of Documentation:

	Symptoms	Participant Number			
S. No	Acute Symptoms	P1	P2	P3	P4
1.	**Respiratory system**				

	Shortness of breath				
	Throat and nasal Irritation				
	Running nose				
	Cough				
	Suffocation				
	Wheezing				
	Frequent mouth breathing				
2.	**Digestive system**				
	Abdominal Pain				
	Nausea				
	Vomiting				
	Burning Sensation				
	Diarrhoea				

3.	**Cardio-vascular system**				
	Chest pain				
	Burning sensation				
	Palpitation				
4.	**Sensory System**				
4a	**Skin**				
	Irritation				
	Redness				
	Itching				
	Sensitivity to light				
	Skin burn				
	Skin becomes cold and sweaty				
	Flushing of skin and muscles				

4b.	**Eyes**				
	Dryness				
	Vision difficulty				
	Eye pain				
	Irritation in eyes				
5.	**Central Nervous System**				
	Dullness				
	Restlessness				
	Muscle tremor				
	Convulsions				
	Headache				
	Paranoid Delusion				
	Anxiety				

	Depression				
	Increased frustration				
	Fatigue				
	Drowsiness				
	Learning disorders				
	Developmental milestone delay				
6.	**Urinary System**				
	Low urine output				
	Colicky pain				
	Blood in urine				
7.	**Reproductive system**				
7a	**Female**				
	Irregular menstruation				

	Miscarriage				
	Premature delivery				
	Low birth weight				
	Infertility				
7b	**Male**				
	Infertility				
	Erectile dysfunction				
8	**Muscular skeletal system**				
	Muscular pain				
	Swelling in legs and ankles				
9	**Dental**				
	Deposits in the teeth				
10	**Others**				
	Premature death				

ANY OTHER SYMPTOMS EXPERIENCED BY THE PARTICIPANTS CAN BE MENTIONED IN THE TABLE BELOW

TABLE 3 OTHER SYMPTOMS

Identification Number	Symptom experienced
P1	
P2	
P3	
P4	
P5	

2 Body Mapping for **Disease Conditions**

Body mapping is a visual technique used to collect data from the Participants about their diagnosed disease conditions

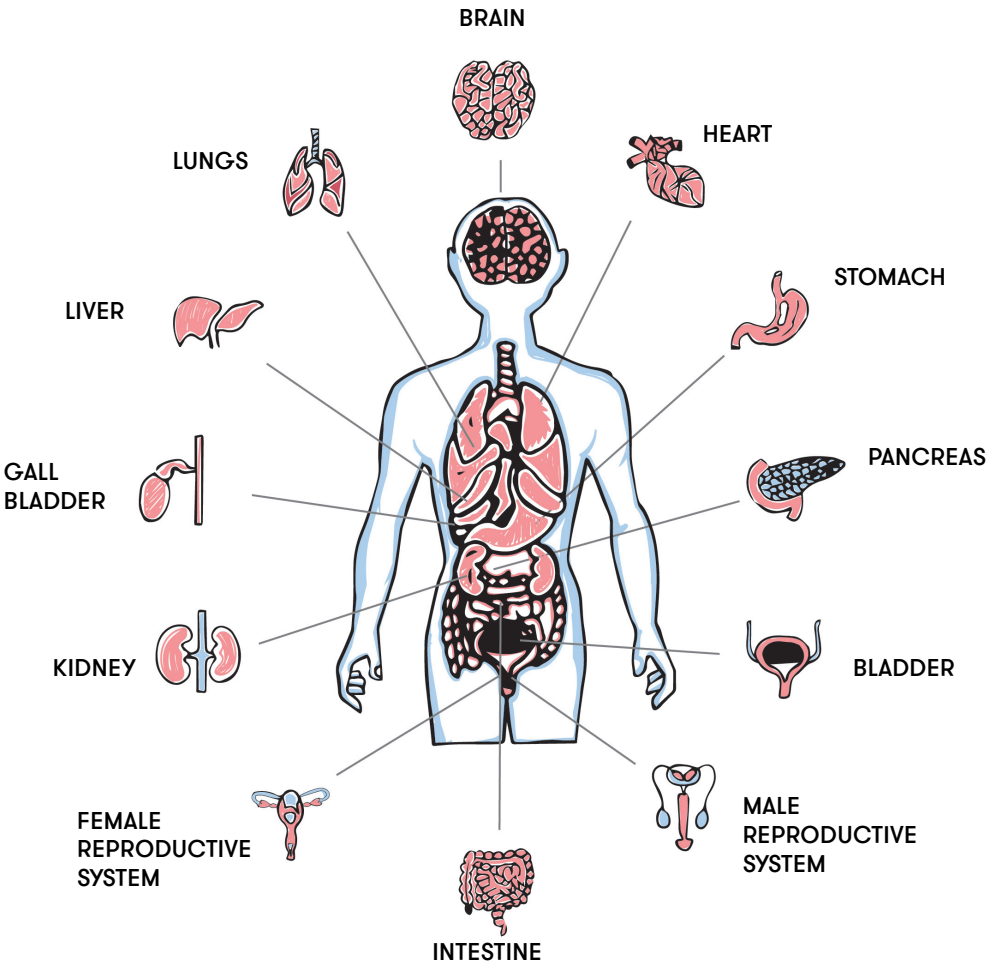
This method can be adopted even by those unable to read and write to document health problems at the individual or community level. Various types of pollutants have different effects on the body parts which can be documented. The final body-mapped image among different regions will showcase the kind of health problems they are facing

STEPS TO BODY MAP

PREPARATORY ACTIVITIES TO BE DONE BY COMMUNITY MONITORS

- Ask each person, if they are diagnosed and on treatment for any diagnosed disease conditions
- Circle the organ to which the disease condition is related
- The community monitor will circle the body part which they feel affected
- The community monitor will help the communities to circle the body part which they feel affected"
- Separate body mapping sheets will be provided to community monitors for each month
- The body mapping will be done once in every month for a year with the participating households

MONTH OF DOCUMENTATION:

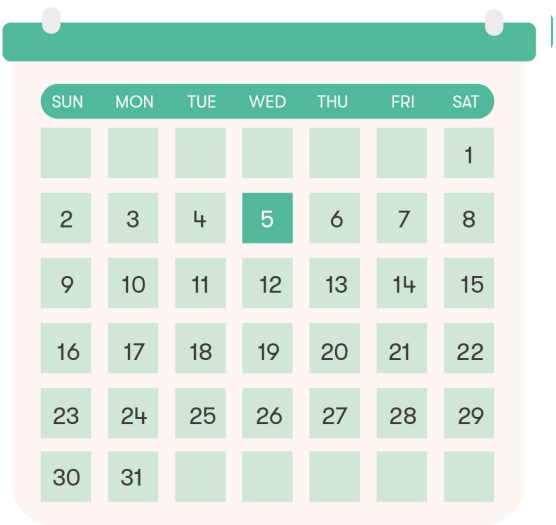


3 **Symptom** Calendar

It's often difficult to remember what symptoms anyone had during the last month. A symptom calendar allows a person or a family to self-document medical events and track what they felt and when it happened. It is a simple record of the date and symptom they are feeling. It is less time consuming and they work anywhere, don't require extra devices (beyond a pen). This calendar helps to document the frequency of symptoms experienced by the pollution impacted communities

Steps to fill the Symptom Calendar

- This section will be filled by the participants themselves.
- A separate symptom calendar will be provided to each participants.
- Mark the appropriate box in the days when the participant felt any symptoms. Participant can make a tick mark and write the symptoms they have experienced in the corresponding date.
- For any person who cannot do this by themselves, their family member can facilitate in documenting this.
- The calendar will be filled once in every day. It covers 4 weeks in a month. At the end of every month and year, complete data on the symptoms each person in the family feels will be identified.



Participant ID		Name			Age/Sex		
Date	1	2	3	4	5	6	7
	WEEK 1						
Jan							
Feb							
Mar							
Apr							
May							
June							
July							
Aug							
Sep							
Oct							
Nov							
Dec							

Date	8	9	10	11	12	13	14
	WEEK 2						
Jan							
Feb							
Mar							
Apr							
May							
June							
July							
Aug							
Sep							
Oct							
Nov							
Dec							

Date	15	16	17	18	19	20	21
	WEEK 3						
Jan							
Feb							
Mar							
Apr							
May							
June							
July							
Aug							
Sep							
Oct							
Nov							
Dec							

Date	22	23	24	25	26	27	28	29	30	31
	WEEK 4									
Jan										
Feb										
Mar										
Apr										
May										
June										
July										
Aug										
Sep										
Oct										
Nov										
Dec										

No. of days symptoms identified:

4 **Health** Evidence

Photograph of your illness (where relevant)

Prescription photocopy or photographs using smartphones

Name of the health facility or pharmacy

Medical bills photocopy or photographs using smartphones

Medicine details and photographs of investigation reports, radiological images, etc

Keep a check on how many times this has been repeated for a year

Supportive health expense photocopies or photographs using smartphones

5 **Further** Actions

Use the tool for reporting the village health needs by,

- ✓ Collecting the marked symptoms checklist
- ✓ Gathering health evidence
- ✓ Preparing a village health report (Annexure 1)
- ✓ Filing a complaint – Pollution control Board, District health service
- ✓ Keeping the records and complaint
- ✓ Following up with action taken

Annexure 1

VILLAGE HEALTH REPORT
Name of the village
Total number of households monitored:
Total number of people monitored:
Age Distribution Children (0-14): Adults (15-64): Elderly (65+):
Gender Total Number of males: Total number of females:
Possible sources of exposure:

ACUTE SYMPTOMS		
Symptoms experienced	**Number of people who experienced the symptoms**	**Percentage**
Respiratory system		
Shortness of breath		
Throat and nasal Irritation		
Running nose		
Cough		
Suffocation		
Wheezing		
Frequent mouth breathing		
Digestive system		
Abdominal Pain		
Nausea		
Vomiting		

Burning sensation		
Diarrhea		
Cardio-vascular system		
Chest pain		
Burning sensation		
Palpitation		
Sensory System		
Skin		
Irritation		
Redness		
Itching		
Sensitivity to light		
Skin burn		
Skin becomes cold and sweaty		
Flushing of skin and muscles		
Eyes		
Dryness		
Vision difficulty		
Eye pain		
Irritation in eyes		
Central Nervous System		
Dullness		
Restlessness		
Muscle tremor		
Convulsions		
Headache		
Paranoid Delusion		
Anxiety		
Depression		

Increased frustration		
Fatigue		
Drowsiness		
Learning disorders		
Developmental milestone delay		
Urinary System		
Low urine output		
Colicky pain		
Blood in urine		
Reproductive system		
Female		
Irregular menstruation		
Miscarriage		
Premature delivery		
Low birth weight		
Infertility		
Male		
Infertility		
Erectile dysfunction		
Muscular skeletal system		
Muscular pain		
Swelling in legs and ankles		
Dental		
Deposits in the teeth		
Others		
Premature death		

Aggregated data of any other symptoms experienced by the participants that were not listed in the previous table can be mentioned in the table below

OTHER SYMPTOMS		
Symptoms Experienced	**Number of people who experienced the symptoms**	**Percentage**

DIAGNOSED DISEASE CONDITIONS (BY PHYSICIAN/PAST MEDICAL HISTORY)		
Diagnosed Disease Conditions (By Physician/Past Medical History)	**Number of people affected**	**Percentage**
Respiratory system		
Digestive system		
Cardio-vascular system		

Sensory System		
Central Nervous System		
Urinary System		
Reproductive system		
Muscular skeletal system		
Dental		
Others		

Most affected month in a year:

Notes