Air pollution, Noise, Radiation & Housing

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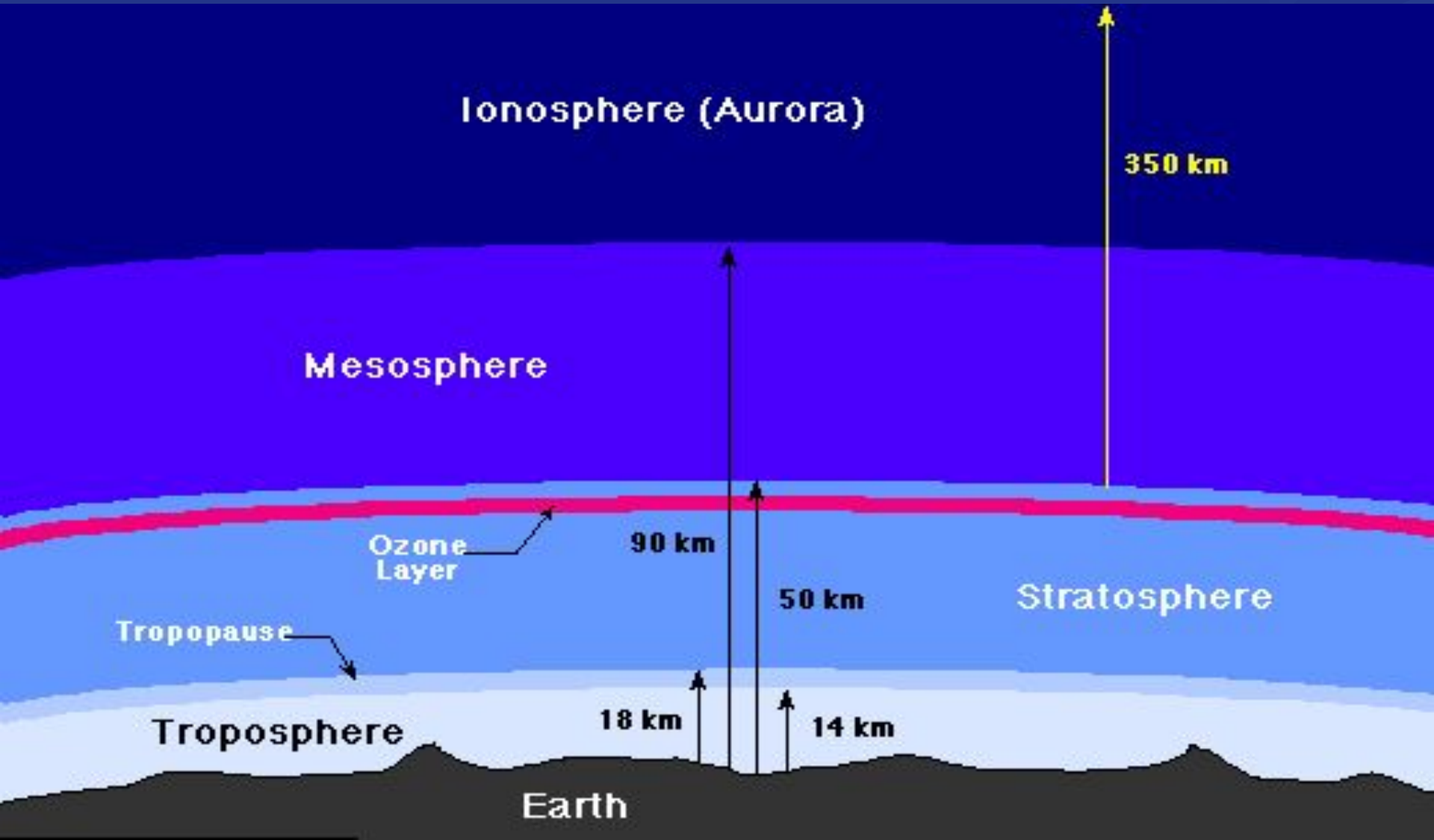
Introduction

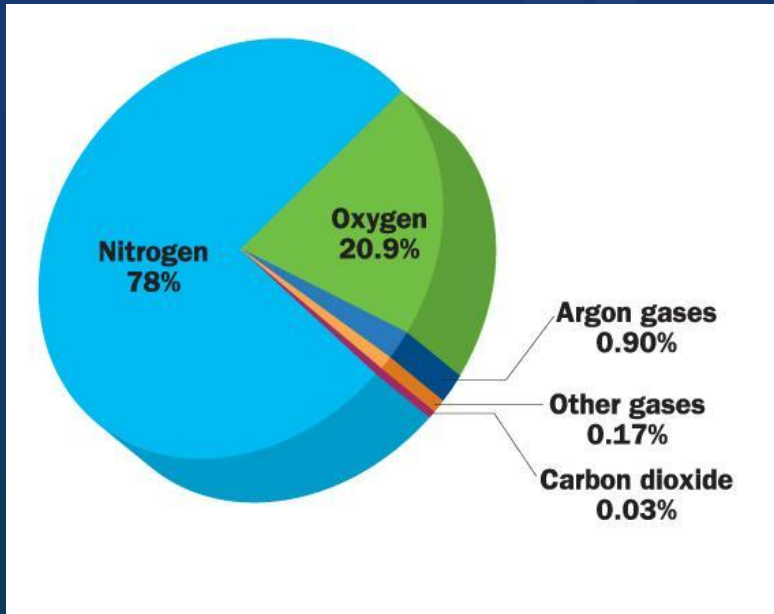
Layers of the Atmosphere



Air and its composition

Air is a mechanical mixture of gases as

- Nitrogen – 78.1%
- Oxygen – 20.93%
- Carbon dioxide-0.03%
- The balance is made up of other gases which occur in traces e.g.- argon, neon, krypton, xenon and helium.



Functions

- Supplies the life-giving oxygen.
- Human body is cooled by the air contact.
- Special senses of hearing and smell function through air-transmitted stimuli.
- Disease agents may be conveyed.

SELF - CLEANSING MECHANISM:

Wind - wind dilutes and sweeps away impurities

Sun light - oxidizes impurities & kills Bacteria

Rain - cleanses atmosphere by removing suspended and gaseous impurities

Plant life - Utilize CO_2 and generate O_2

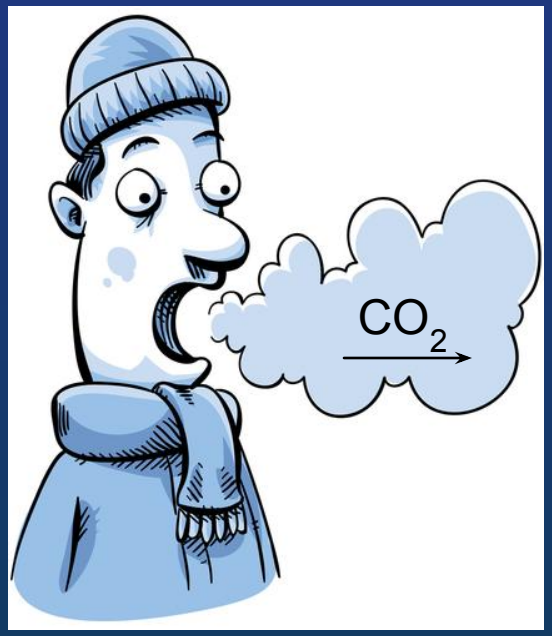
When the rate of pollution becomes too high or when the cleansing process becomes ineffective, it constitutes a health hazard.

Self Cleansing Mechanism of Air

Hydroxyl (OH) radicals — known as the detergent of the atmosphere — decompose isoprene in the air. This leads to the creation of new OH radicals, which are then able to purify the air of other pollutants and trace gases.— known as the detergent of the atmosphere The atmosphere has an astonishing ability to cleanse itself

The air of occupied room

- **Chemical changes**



- **Physical changes**

1. Rise in temperature
2. Increase in humidity
3. Decrease in air movement
4. Body odors
5. Bacterial pollution

Comfort zones

- They may be defined as the range of effective temperatures which the majority of adults feel comfortable.

- Comfortable thermal conditions are those under which a person can maintain normal balance between production and loss of heat at normal body temperature and without sweating.

Comfort zones

	Corrected effective temperature degree Celsius
Pleasant and cool	20
Comfortable and cool	20-25
Comfortable	25-27
Hot and uncomfortable	27-28
Extremely hot	28+
Intolerably hot	30+

Todays Temperature……

- Day 15 May 2014
- Temperature-31˚C

Source-www.accuweather.com

Predicted four hour sweat rate-based on Mc Ardle allowable sweat rate

- Comfort zone - 1-3 liters
- Just tolerable – 3-4.5 liters
- Intolerable – 4.5 + liters

Corrected effective temperature

- Corrected effective temperature - globe thermometer is used instead of dry bulb thermometer. It measures all 4 factors like air temperature, velocity, humidity and mean radiant heat.

Discomfort

An absence of comfort or ease

This discomfort of air is due to physical characteristics of air like temperature, humidity, air movement and heat radiation.

And most importantly VENTILATION……

Indices of thermal comfort

Thermal comfort is a complex entity and much work was done in the past to determine what constitutes thermal comfort .

- Air temperature
- Air temperature and humidity
- Cooling power
- Effective temperature
- Corrected effective temperature

- The numerical value of effective temperature is that of the temperature of still, saturated air which would induce the same sensation of warmth or cold as that experienced in the given conditions.

Air is rendered impure by

- Respiration
- Combustion
- Decomposition of organic matter
- Trade, traffic and manufacturing processes

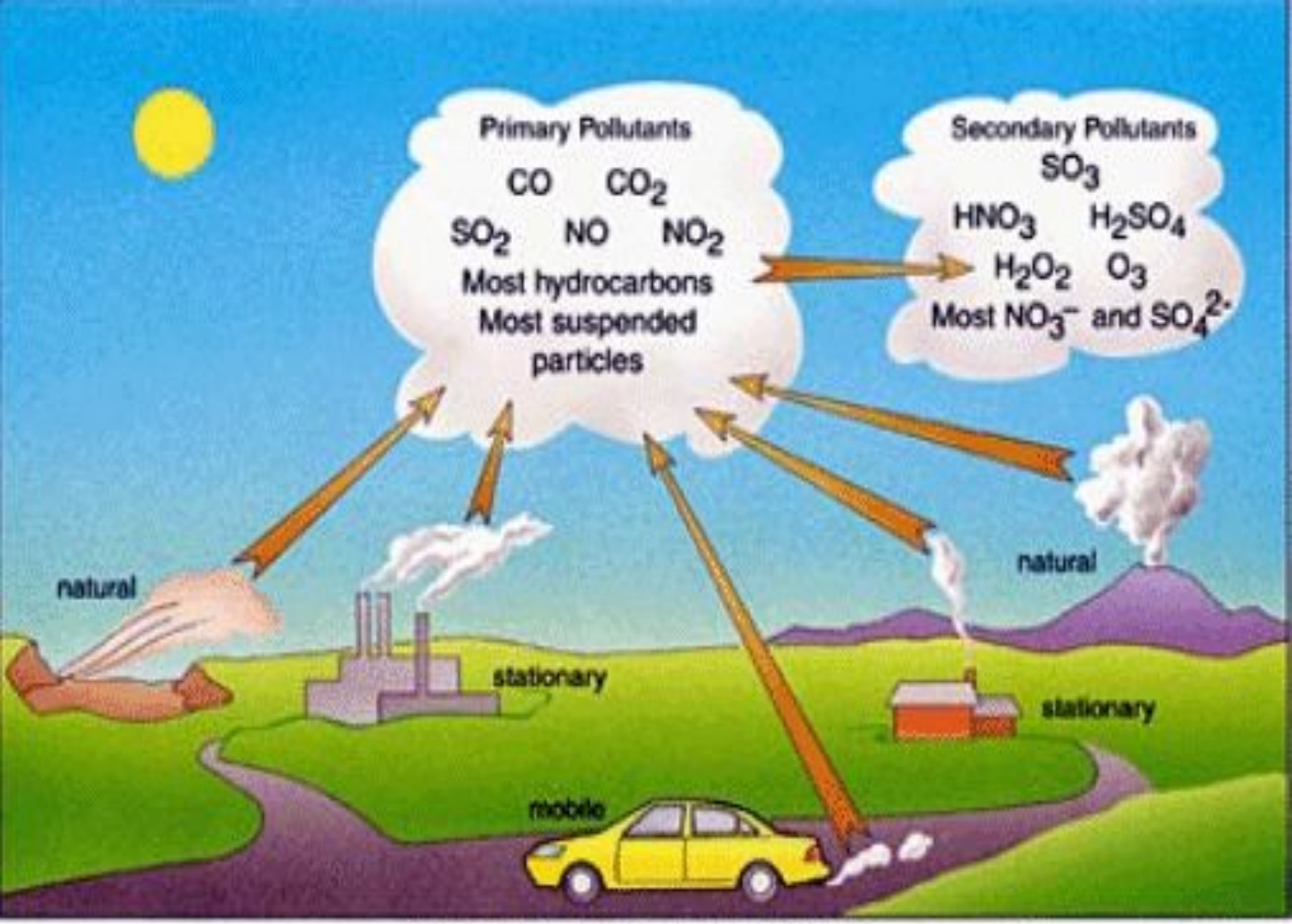
Air pollution

- The phenomenon called pollution is an inescapable consequence of the presence of man and his activities.

- The term “air pollution” signifies the presence in the ambient atmosphere of substances generated by the activities of man in concentrations that interfere with human health, safety or comfort or injuries to vegetation and animals and other environmental media resulting in chemicals entering the food chain or being present in drinking water and thereby constituting additional source of human exposure.

Sources of air pollution

- Automobiles
- Industries
- Domestic sources - 1952 London disaster
- Tobacco smoke
- Miscellaneous



Types and sources of air pollutants

GASEOUS POLLUTANTS

- 1.Carbon Monoxide
- 2.Carbon dioxide
- 3.Sulfur dioxide
- 4.Hydrogen Sulfide
- 5.Hydrogen Fluoride
- 6.Hydrogen Chloride
- 7.Oxides of nitrogen
- 8.organic compounds (hydrocarbons, Aldehydes, ketones & organic acids)
- 9.metallic contaminants (arsenic, zinc, iron, lead, cadmium)
- 10. radio active compounds
- 11. photochemical oxidants (ozone)
- 12.Fluorine compounds (Chlorofluorocarbons)

PARTICULATES

1.Dust
2.Fume
3.Mist
4.Spray
5.Smoke
6.ash

1. Carbon monoxide – it's a most common and widely distributed pollutant.

- It is a product of incomplete combustion of carbon containing materials, such as in automobiles, industrial process, heating facilities and incinerators.

- Manmade CO estimation – 350 - 600 million tones per annum.
- Concentration in urban areas depends on weather and traffic density.
- It varies with vehicles, topography.

- 2.sulphur dioxide – its one of the several forms of sulphur in the air.

- It results from the combustion of sulphur containing fossil fuel, the smelting of sulphur containing ores, and other industrial processes, domestic fires, emitted from burning of coal and oil.

- 3. lead – the combustion of alkyl lead additives in motor fuels, mining, smeltering of lead ores.

- 4. Co_2 – it is a natural constituent of the air .
  - combustion of coal, oil, and gas.

- 5. Hydrocarbons – incineration, combustion of coal, wood.

  It exerts their pollutant action by taking part in the chemical reactions that cause photochemical smog.

- 6. Cadmium – steel industry, waste incineration, volcanic action, smoking

- 7. Hydrogen sulphide – during coke production, waste water treatment plans, wood pulp production, oil refining industry.

- 8. ozone – one of the strongest oxidizing agents. There is no significant anthropogenic emission in to atmosphere. Existing ozone has been formed by chemical reactions that occur in the air. It absorbs solar radiation by nitrogen oxide.

- 9. Polynuclear aromatic hydrocarbons – incomplete combustion of organic materials.

- 10. chlorofluorocarbons, or CFC's. -

These chemicals are found in polystyrene containers, refrigerator coolant, aerosol sprays and air conditioning units. Its harmful to ozone layer.

11. Radioactive components - produced by nuclear explosions, war explosives, and natural processes such as the radioactive decay of radon

12. Ammonia - emitted from agricultural processes

- **PARTICULATES**

- DUST: Dust is formed by solid particles with their size ranging from 1 /u to 100 /u.

- FUME: Formed from particles of metals and metallic oxides by condensation of vapours by sublimation, distillation, calcination and other chemical processes.

- MIST: Condensation of vapour forms a liquid particle called as mist (<10 /u)

- SPRAY: Liquid particle obtained from the parent liquid by mechanical disintegration – spray

- SMOKE: Obtained by incomplete combustion of carbon materials & formed by destructive distillation.

- SMOG: When there is rapid cooling of lower layers of air, there is limited vertical motion and the pollutants and water vapours are trapped at lower levels and results in SMOG.
- Smoke + Fog = Smog

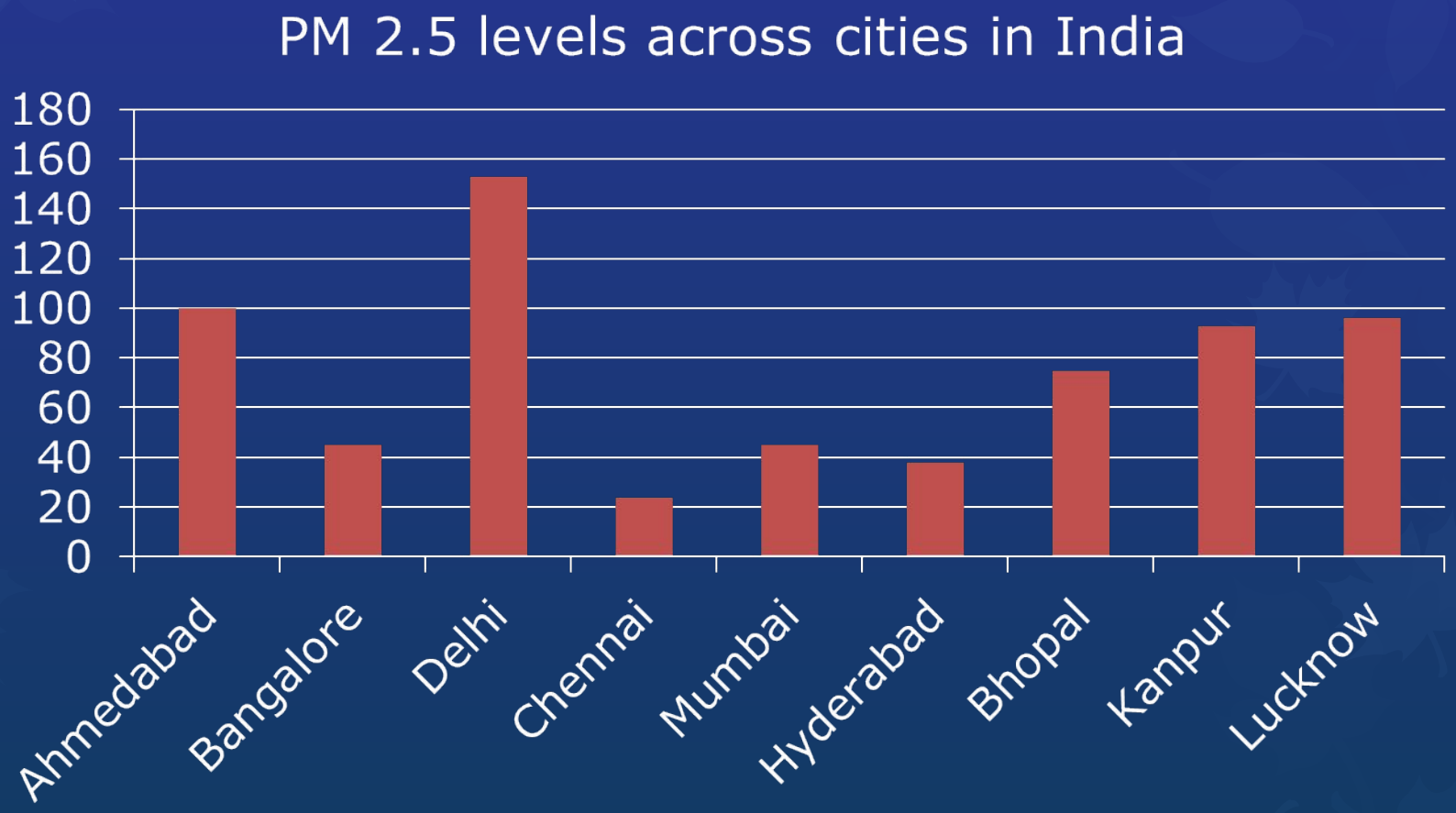
- Fly ash: Fine solid particles of ash that are carried into the air when fuel is combusted

So when is the air polluted???

- **$PM_{2.5}$**
  10 µg/m^3 annual mean
  25 µg/m^3 24-hour mean
- **PM_{10}**
  20 µg/m^3 annual mean
  50 µg/m^3 24-hour mean
- **SO_2**
  20 µg/m^3 24-hour mean
  500 µg/m^3 10-minute mean
- **O_3**
  100 µg/m^3 8-hour mean
- **NO_2**
  40 µg/m^3 annual mean
  200 µg/m^3 1-hour mean

- The world's average PM_{10} levels by region range from 26 to 208 µg/m3, with a world's average of 71 µg/m3.
- **Delhi** has the worst air in the world. Keeping Delhi company are 13 other Indian cities out of the 20 worst air-polluted places in the world.
- It has a concentration of 153 micrograms of suspended particulate matter that is less than 2.5 microns in size ($PM_{2.5}$), which has serious impact on human health. In terms of particulate matter that is less than 10 microns (PM_{10}), Delhi's annual average measurement is a scary 286.

Source-Ambient (outdoor) air pollution in cities database 2014,WHO Fact sheet



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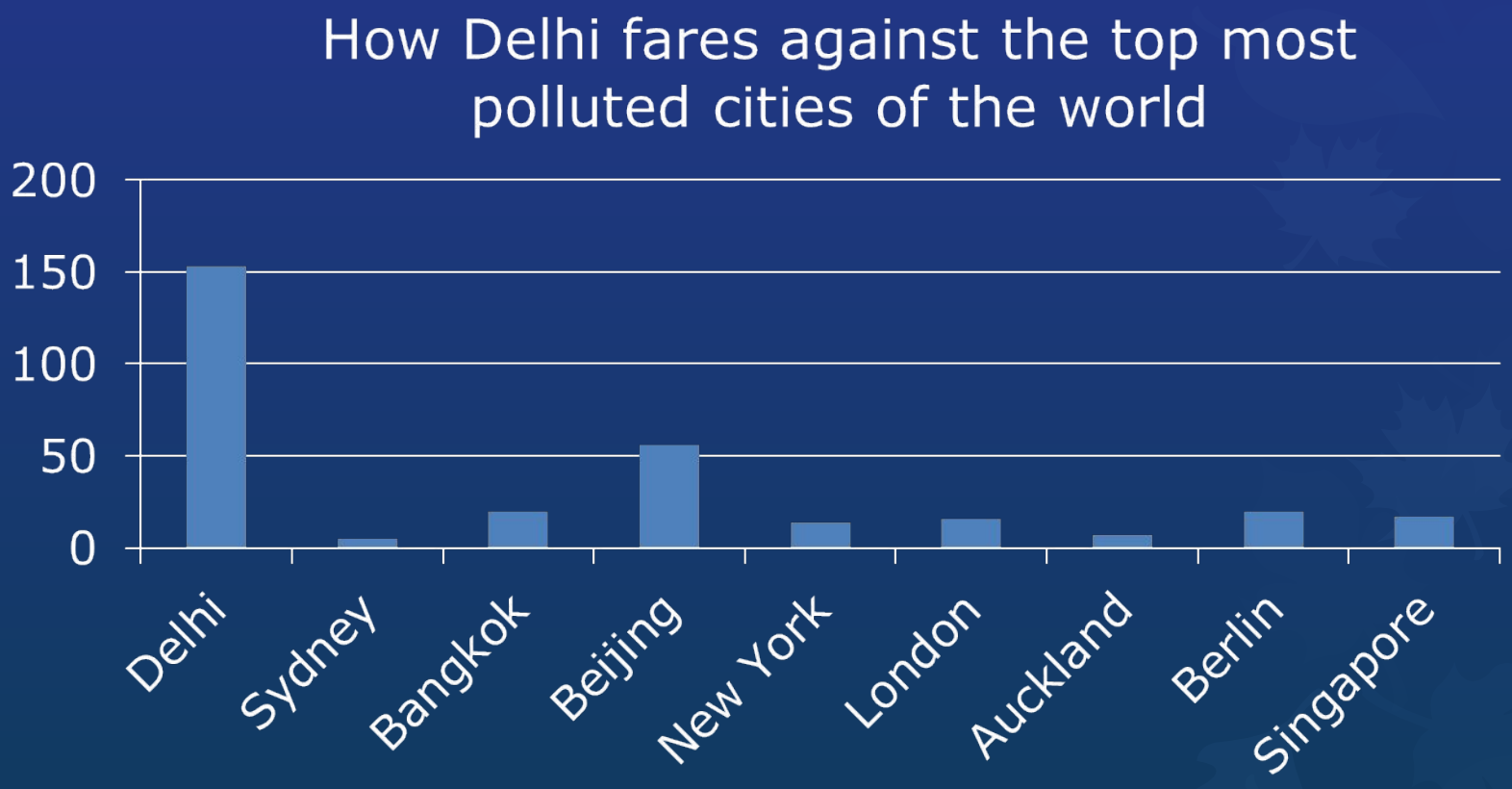


Source-Ambient (outdoor) air pollution in cities database 2014,WHO Fact sheet

Indoor air pollution

- Indoor air pollution is one of the four most critical global environmental problems probably exposes more people worldwide to important air pollutants than does pollution in outdoor air.
- Rural people in developing countries may receive as much as two thirds of the global exposure to particulates.
- Women and young children suffer the greatest exposure.

- Indoor air pollution contributes to acute respiratory infections in young children, chronic lung diseases and cancer of adults and adverse pregnancy outcomes for women exposed during pregnancy .
- Pneumonia in young children

- Indoor smoke is a serious health risk for some 3 billion people who cook and heat their homes with biomass fuels and coal. Some 4.3 million premature deaths were attributable to household air pollution in 2012. Almost all of that burden was in low-middle-income countries as well.

Impact of Air Pollution-Health

"Few risks have greater impact on global health today than air pollution: the evidence signals the need for concerted action to clean up the air we all breathe," WHO

Impact of Air Pollution- Health

Short Term-

- **Adults and Children with lung or heart conditions** - adults and children with asthma may notice that they need to increase their use of inhaled reliever medication on days when levels of air pollution are higher than average.
- **The general population** - At Very High levels of air pollution, some people may experience a sore or dry throat, sore eyes or, in some cases, a tickly cough even in healthy individuals.
- **Children** - Children with asthma may notice that they need to increase their use of reliever medication on days when levels of air pollution are higher than average.

Long Term-

- Pneumonia, heart attacks, strokes, and diabetes are higher in locations with higher long-term average particle concentrations.
- Continual exposure to air pollution affects the lungs of growing children and may aggravate or complicate medical conditions in the elderly

Effects of air pollution-Socio-Economic aspects

- Effect on Human and Animal Health
- Effect on Plant Growth
- Degeneration of Objects usefull to man
- Causing Nuisance to normal activities (For Eg- During Smog)

Outdoor air pollution

- **Smog**
- **Black carbon pollution**
- **Acid rain**
- **Greenhouse effect**
- **Holes in the ozone layer**

Each of these problems has serious implications for our health and for the whole environment.

- **Smog – type of large scale outdoor pollution.**
- **It is caused by automobile exhaust and industrial emissions.**
- **Cities are often centres of these type of activities, and many suffer from the effects of smog, especially during the warm months of the year.**

- Black carbon pollution – release of tiny particles into the air from burning fuel for energy.

- This is the major problem since the beginning of the industrial revolution and the development of the internal combustion engine.

- Mankind has become so dependent on the burning of fossil fuels.

- All these combustion related emissions now constitutes a serious problem, not only to human health but also to the entire global environment.

- **Temperature inversion** - The vertical diffusion of pollutants depend on temperature gradient. when there is a rapid cooling of lower layers , there is a little vertical motion of air & pollutants The level of atmospheric pollution depends on meteorological factors eg: topography, climate.

- Usually wind helps in the dispersal and dilution of pollutants. if topography is dominated by mountains the winds become weak and calm & pollutants tend to concentrate in the breathing zone.

- Cities surrounded by mountains also experience trapping of pollution.

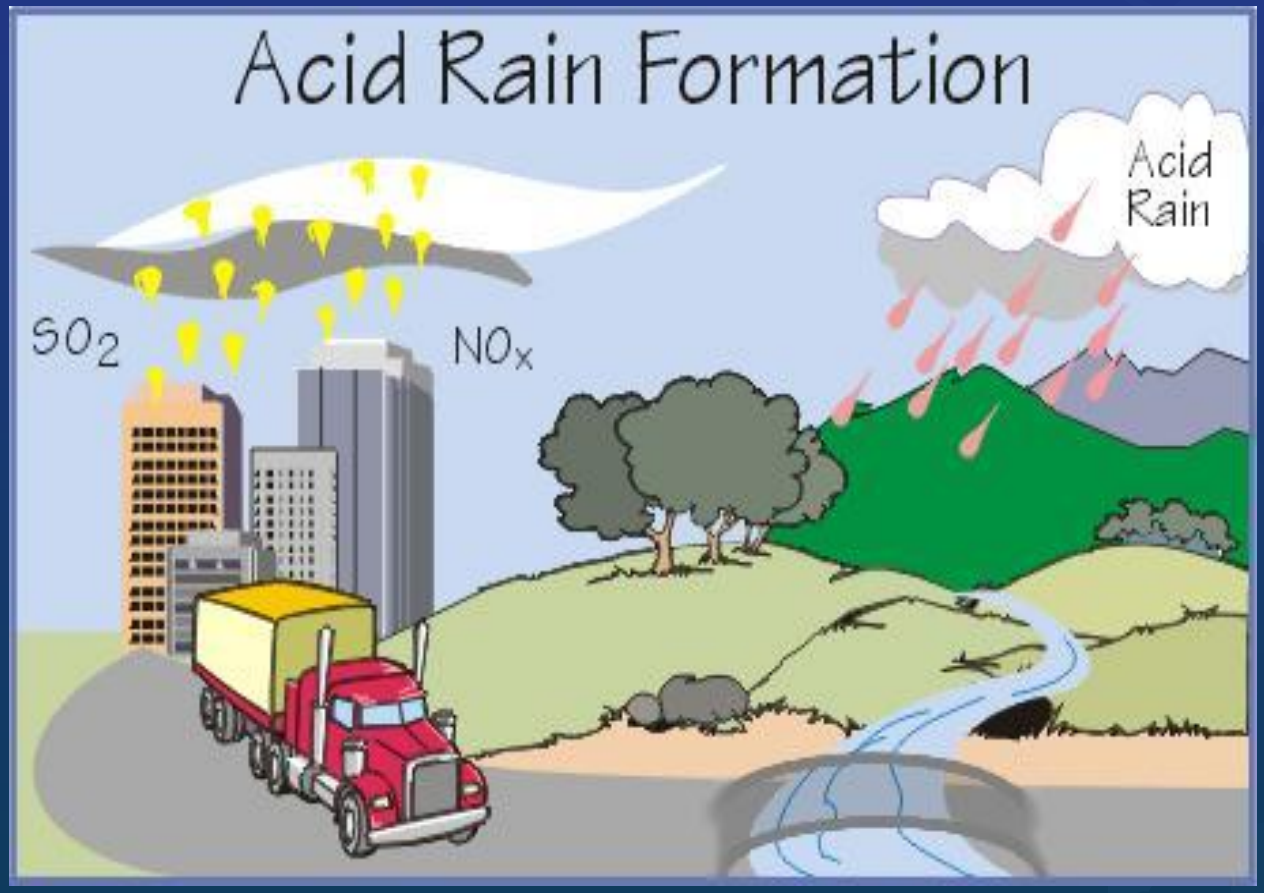
- Inversion can happen in any season.
- winter inversions are likely to cause carbon monoxide pollution.
- summer inversions are likely to create smog.

ACID RAIN

- Acid rain is rain or any other form of precipitation that is unusually acidic .

- Acid rain is mostly caused by Gaseous sulfur & nitrogen oxides - emitted from coal power plants that are using fossil fuels, electricity generation, factories, and motor vehicles -- Reacts with atmosphere.

Sulfuric acid + droplets of water in the air = water/snow acidified.



- In 1852, Robert Angus Smith was the first to show the relationship between acid rain and atmospheric pollution in Manchester, England.

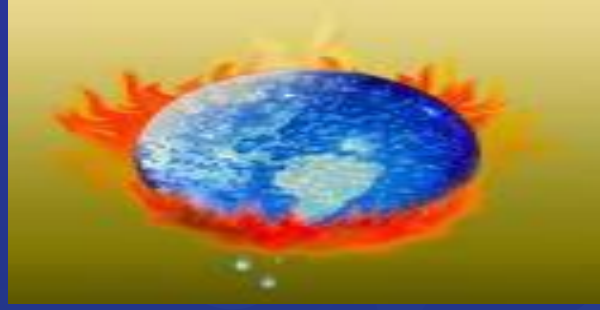
- Though acidic rain was discovered in 1852, it wasn't until the late 1960s that scientists began widely observing and studying the phenomenon. The term "acid rain" was generated in 1972.

- Since the Industrial Revolution, emissions of sulfur dioxide and nitrogen oxides to the atmosphere have increased.

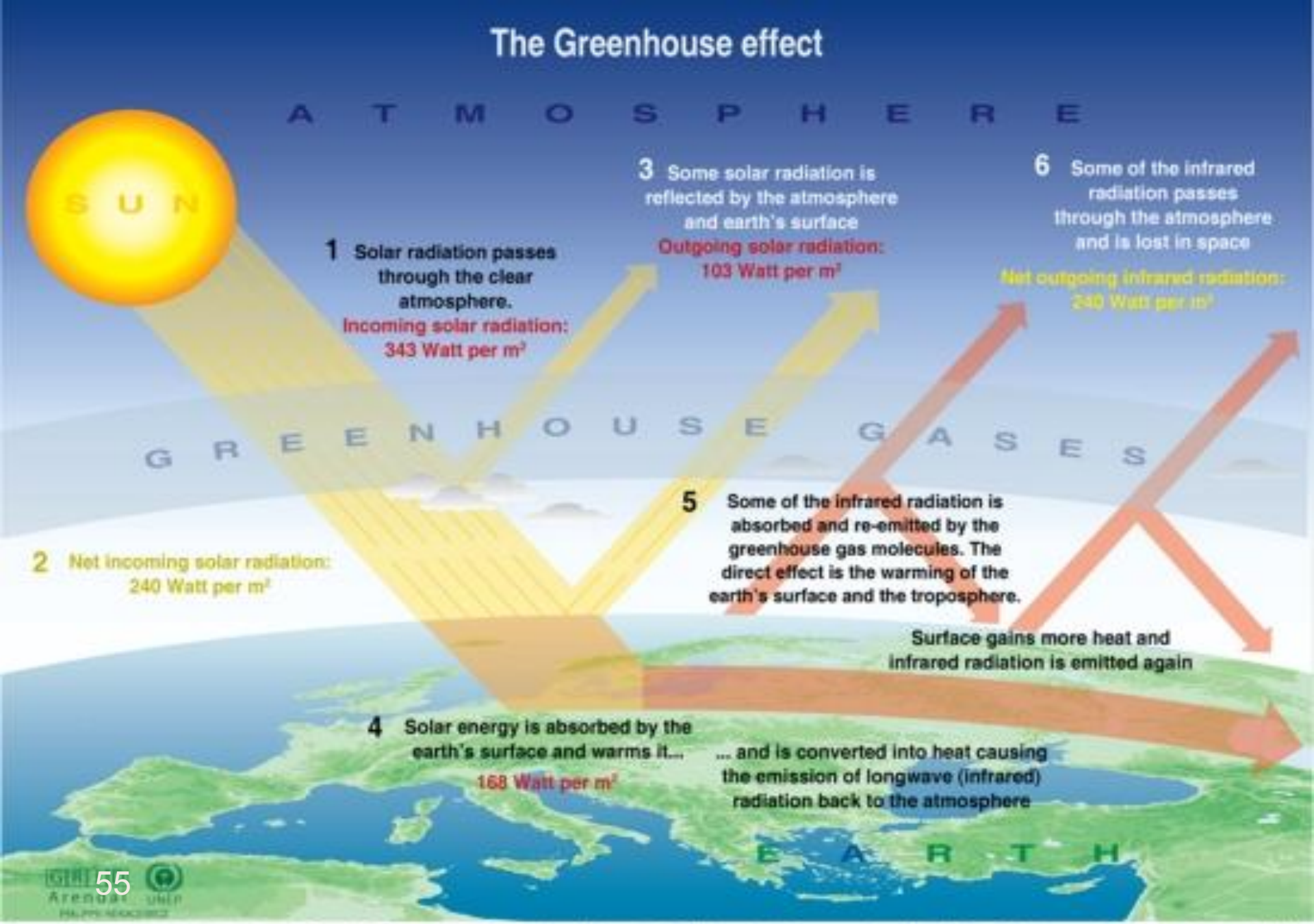
- Effects of acid rain on the environment –serious.

1. Damages plants by destroying their leaves.
2. It poisons the soil.
3. It changes the chemistry of lakes and streams.
4. Kills trees and harms aquatic animals.

Greenhouse effect



- Also referred to as global warming.
- The greenhouse effect was discovered by Joseph Fourier in 1824 and first investigated quantitatively by Svante Arrhenius in 1896.
- (A green house is a structure that market gardeners use to grow vegetables in. It is covered in clear plastic or glass to let the sun light in, and traps the heat inside, increasing the temperature. Sometimes these are also referred to as 'hot houses').



Sources: Okanagan university college in Canada, Department of geography, University of Oxford, school of geography; United States Environmental Protection Agency (EPA), Washington; Climate change 1995, The science of climate change, contribution of working group 1 to the second assessment report of the intergovernmental panel on climate change, UNEP and WMO, Cambridge university press, 1996.

- Most scientists agree that the enhanced greenhouse effect is leading to rising temperatures, referred to as global warming, and other changes in the atmospheric environment, known as climate change (a term that in common usage also includes natural changes).

- The greenhouse effect is caused by 'green house gases', which are primarily made up of……..

Green house gases:

- 1.CO_2 -Released when solid waste, fossil fuel (oil, natural gas, goal), wood etc. are burned.

- 2.Methane-Emitted during production of coal, natural gas & oil. Also from municipal solid waste, live stock raising

- 3.Nitrous Oxide: Agricultural and Industrial waste, combustion of fuels
- 4. Others :

Hydro fluorocarbons (HFCS) - Most heat absorbent

Perfluorocarbons(PFCS) - Human activity

Sulfurexafluoride(SF6) - Industrial

Chlorofluorocarbons

Ozone

Water vapour

- The atmosphere surrounding our earth contains these gases, and acts like a blanket keeping some of the heat in. If there weren't an atmospheric 'blanket' we would freeze during the night, like some of the other planets or our moon.

- In the absence of the greenhouse effect, the Earth's average surface temperature of 14 °C (57 °F) would be about -18 °C (–0.4 °F) (Black body temperature of the Earth).

- ↑G.H effect - Most scientists agree that climate change is largely due to human activity, mainly the increased use of fossil fuels.

- The main human influence on global climate is likely to be emissions of greenhouse gases such as carbon dioxide (CO_2) and methane.

- At present, about 6.5 billion tones of CO_2 is emitted globally each year, mostly through burning coal, oil and gas for energy.

- There is now a need to find new ways to fuel the lifestyles and industries of tomorrow to meet the needs of mankind.

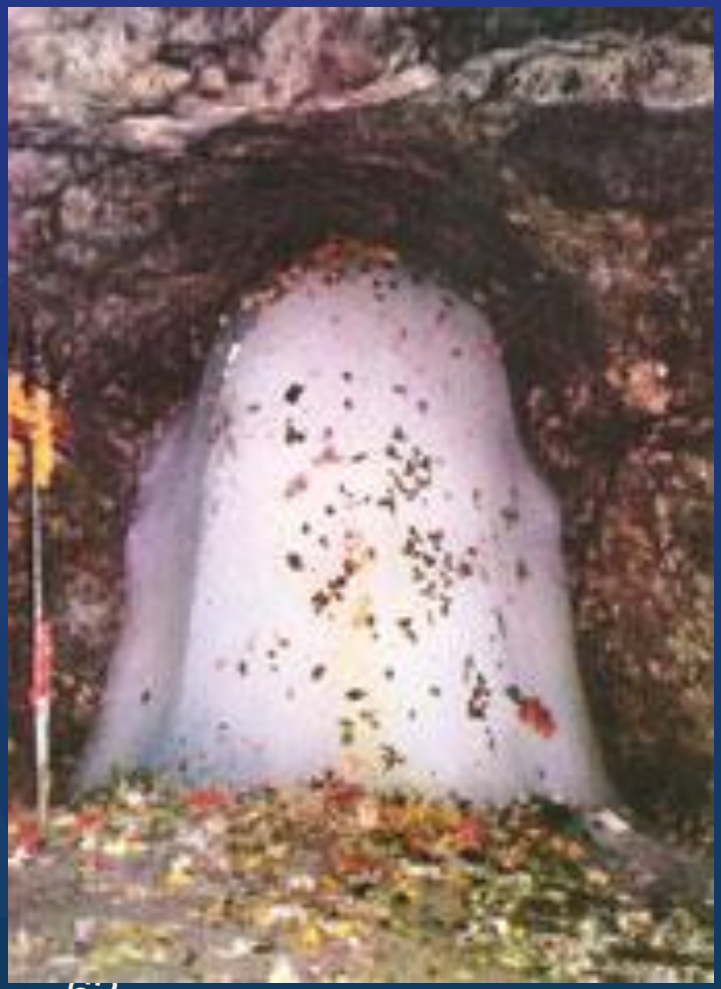
cause for ↑ greenhouse gases

- The earth is warming up due to the increasing amounts of carbon dioxide in the air. When we burn fuels like coal, oil, gas, or wood, carbon dioxide is released.

- Plants use carbon dioxide to make their food and release oxygen. So tropical forests take in large amounts of carbon dioxide from the atmosphere, but release of co2 from human activities is higher than the worlds plants can process.

- Because people are cutting down vast areas of these forests and plants being damaged by acid rain.
- Thus, amount of CO_2 in the air continues to increase. This build up acts like a blanket and traps heat close to the surface of our earth.

Impact of global warming



Episodes of Air Pollution……

Monitoring of air pollution

- The best indicators of air pollution are sulphur dioxide, smoke and suspended particles .
- Sulphur dioxide
- Smoke or soiling index
- Grit and dust measurement–deposit gauges used
- Co efficient of haze- a factor used for assessing the amount of smoke or aerosol in air
- Air pollution index- arbitrary index which takes into account 1 or more pollutants

Monitoring Air Pollution in India

- **Central Pollution Control Board** is executing a nation-wide programme of ambient air quality monitoring known as National Air Quality Monitoring Programme (NAMP). The network consists of three hundred and forty two (342) operating stations covering one hundred and twenty seven (127) cities/towns in twenty six (26) states and four (4) Union Territories of the country.

Air pollution in dental office

- “Dental Aerosols” may be defined as suspensions of extremely fine air borne particles that are liquid, solid, or combination of both.
- Aerosol particles are microscopic and are generally described as being less than 50 microns in diameter which allows them to remain suspended in air for long period of time.

- The major hazard arising from aerosols associated with their small particle size, which allows them to enter the respiratory system.
- Particle size in dental aerosols has been shown to vary greatly, ranging from 50 microns to less than 0.5 microns
- Aerodynamic diameter of the particle is equivalent to the diameter of a spherical particle of unit density, having the same settling velocity in air.

Aerodynamic diameter	Respiratory penetration
0.5-5 mic	Lungs –alveoli, bronchioles
5-10 mic	Nasal pharynx, pharynx, trachea
10-50 mic	Nose and upper airways

Aerosol particle characteristics

- 50 microns diameter is maximum particle size in aerosols
- 95% have diameter of less than 5 microns
- Particles remain airborne for over 24 hours
- 75% of particles are contaminated with micro organisms
- 95% can reach the alveoli of the lungs
- Particles can travel on air currents to other rooms.

Hazard to dental personnel

- Air turbine hand pieces, water sprays, rotary instruments, ultrasonic scalers and dental lathes all produce aerosols that have the potential for causing disease due to inhalation.
- Dental aerosols may have 3 components

1. Bacteria and viruses
2. Particles of tooth structure
3. Particles of dental materials

Bacteria and viruses in aerosols

- Herpetic lesions of the eye- virus from herpetic oral and lip lesions
- Tuberculosis – tubercle bacilli from open lesions
- Influenza or common cold – virus from infected patients
- Conjunctivitis – various organism such as staphylococcus

Particulate aerosols of tooth structure and dental materials

- Madden and associates in 1963 stated that 99% of the aerosols contained particles of 5 micron or less.
- 95% of the these particles in the aerosols could travel to the alveoli of the lung and possibly represent a serious health hazard.

- Timbrell and Eccles in1974 investigated the respirability of aerosols produced by both clinical and laboratory procedures.
- They found that the water spray would not prevent aerosols of enamel and dentin particles.
- Water spray did limit the number of particles but did not eliminate them.

Alginate

- It has been singled out in several studies to determine its contribution to dental aerosols.
- Silicon has been shown to be the chief inorganic constituent of alginate.
- Alginate particles –10-15% are silicon fibers.
- Concern has been expressed that these fibers may collect in the lung over a long period of time and have a cumulative effect that could possibly result in fibrosis or carcinoma.

Dental personnel at risk

- Dentist
- Dental assistant
- Hygienist
- Laboratory technician
- Additional office personnel

Aerosols have the ability to travel on air currents and contaminate individuals in all areas of the dental office, and not just those at the source of the aerosol.

Sources of aerosol

- **Bacterial and viral** -oral and extra oral
- **Particulates**
- **Instruments producing aerosols**

Bacterial and viral

Oral

- **Normal oral flora**
- **Bacterial plaque**
- **Calculus**
- **Respiratory disease**
- **Herpetic lesions**
- **Pulmonary tuberculosis**
- **Caries**
- **Intra oral infections**

Extra oral

Contaminated pumice from dental lathes

Contaminated water supply from dental units

Particulates

- Enamel
- Dentin
- Amalgam
- Composite resins
- Porcelain
- Acrylics
- Various metals
- Alginates

Instruments producing aerosol

- Air turbine hand piece
- Air water syringe
- Ultrasonic scalers
- Rotary brushes and wheels
- Rag wheels and brushes on dental lathes
- Prophylaxis cup
- Air abrasive prophylaxis instruments

- Any of the listed instrument can produce a bacterial aerosol in the presence of bacterial plaque, normal oral flora or an active disease
- The water spray from an air turbine hand piece has been demonstrated to produce a bacterial aerosol when operated in the mouth even though not actually cutting the tooth structure.

- The air water spray may produce aerosols with 20 times more bacteria than when water is turned off and air is used alone
- Ultra sonic scalers may increase the airborne bacterial concentration by a 3000%
- Tests on the water from dental units indicate that the water lines may become contaminated with bacteria.

Role of aerosols in disease

- Studies in 1930's and early 1940's found that laboratory technicians who performed grinding and polishing procedures had a high percentage of silicosis.

- Other investigations have found that the death rate from respiratory disease among dentists doubled from 1960 to 1972 which some have attributed to the aerosols generated by air turbine hand pieces.

Preventive measures

Most commonly recommended items

- Face mask and safety glasses
- Rubber dam
- Gloves
- High volume Suction
- Preoperative mouth rinse
- Good ventilation
- Avoid patients with respiratory infections.

Other recommendations

- Avoid use of bristle wheels
- Prevent pumice contamination
- Sterilize rag wheels for dental lathe
- Use suction for all laboratory grinding procedures
- Prohibit smoking
- Spray operatory with disinfectant

- Wipe all surfaces with disinfectant
- Flush water lines on dental unit
- Use high efficiency particulate air or electrostatic filters. Use laminar air flow.

Splatter

- Splatter is a word coined by Micik and coworkers to describe air borne particles composed of water, bacteria, and other particulate matter.

Prevention and control of air pollution

The WHO has recommended following procedures

- **Containment** – that is prevention of toxic substances into ambient air.It can be achieved by variety of engineering methods – enclosure, ventilation and air cleaning.
- **Replacement** – technological process causing air pollution by a new process that does not cause as much of air pollution.

- **Dilution** – it is valid so long as it is within the self capacity of the environment. The capacity for dilution is however limited and trouble occurs when the atmosphere is over burdened with pollutants.
- **Legislation** – Clean Air Acts. It covers such matters as height of chimneys, powers to local authorities to carry out investigations, research and education concerning air pollution, creation of smokeless zones and enforcement of standard for ambient air quality.

Environmental Impact Assessment (ElA)

- This was introduced in the country in 1978, is a handy tool to assess the environmental compatibility of the development projects in terms of their location, suitability of technology, efficiency in resource utilization and recycling etc.
- At present ElAs are done for almost all major projects including thermal power, mining, river valley, industries, atomic power, new towns, communication projects etc.

- Projects which are sensitive and located in already environmentally degraded areas and those which are central government projects costing over Rs.200 million, are also subject to EIA.

- International action –to deal with air pollution on a world wide scale the WHO has established international network of laboratories for the monitoring and study of air pollution
- Centers – London and Washington, three centers at Moscow, Nagpur and Tokyo

Disinfection of air

- Mechanical ventilation
- Ultra violet radiation
- Chemical mists- triethylene glucol vapors
- Dust control

Ventilation

- The modern concept of ventilation implies not only the replacement of vitiated air by a supply of fresh outdoor air, but also control of the quality of incoming air with regard to its temperature, humidity and purity with a view to provide a thermal environment that is comfortable and free from risk of infection.

Types of ventilation

1. Natural ventilation

- The wind-perflation,
- Diffusion
- Inequality of temperature

2 Mechanical ventilation

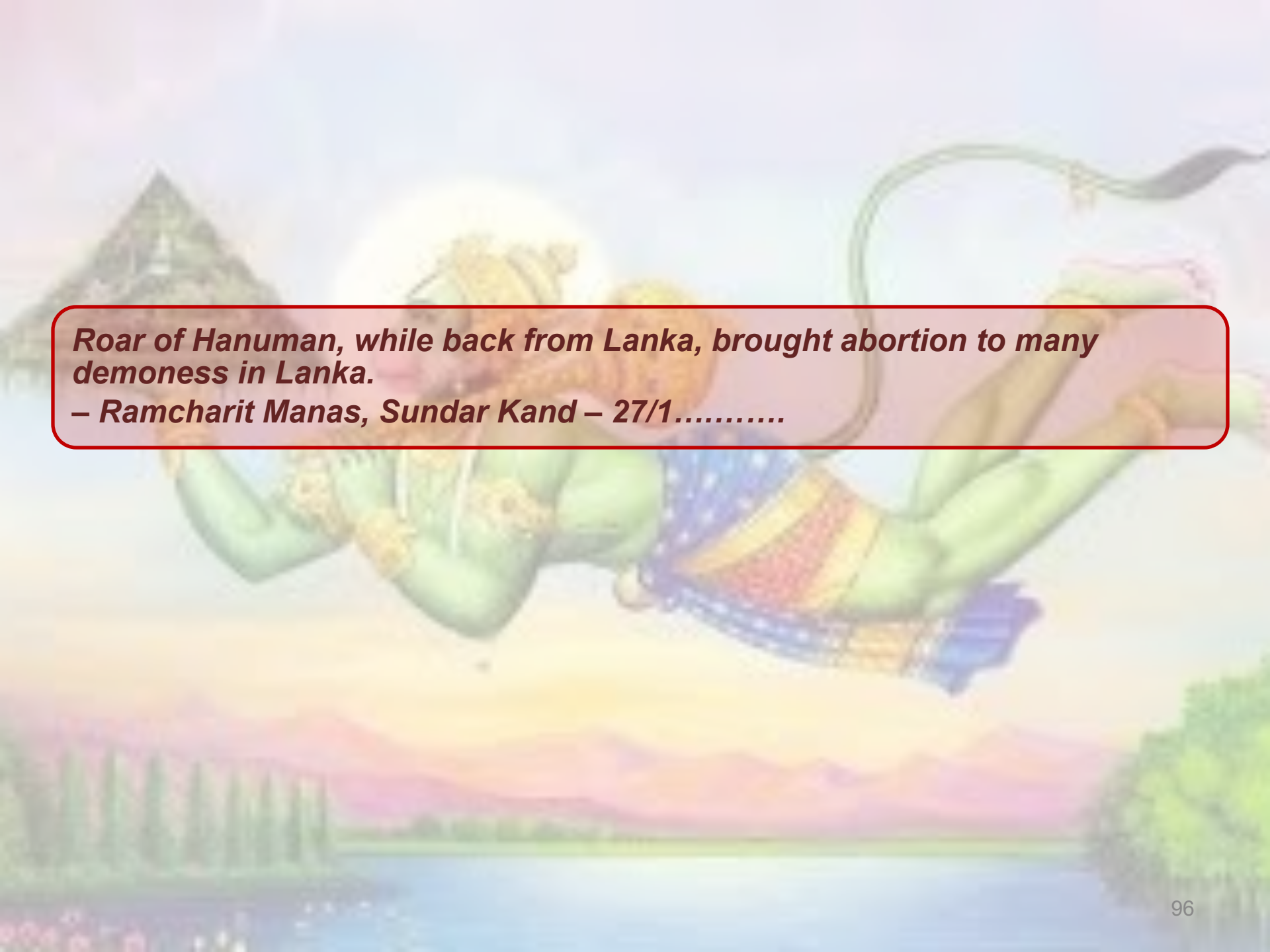
- Exhaust ventilation
- Plenum ventilation
- Balanced ventilation
- Air conditioning

Conclusion

- The objective of all development is to enhance the economic and general well-being of the people so that their standard and quality of living can be improved.
- It is imperative to incorporate environmental aspects in development projects right at the inception stage, to prevent the erosion and contamination of the resource base itself.

- Forests are a renewable source and contribute substantially to economic development. They also play a major role in enhancing the quality of the environment.
- Emphasis should be placed on afforestation.

Noise Pollution

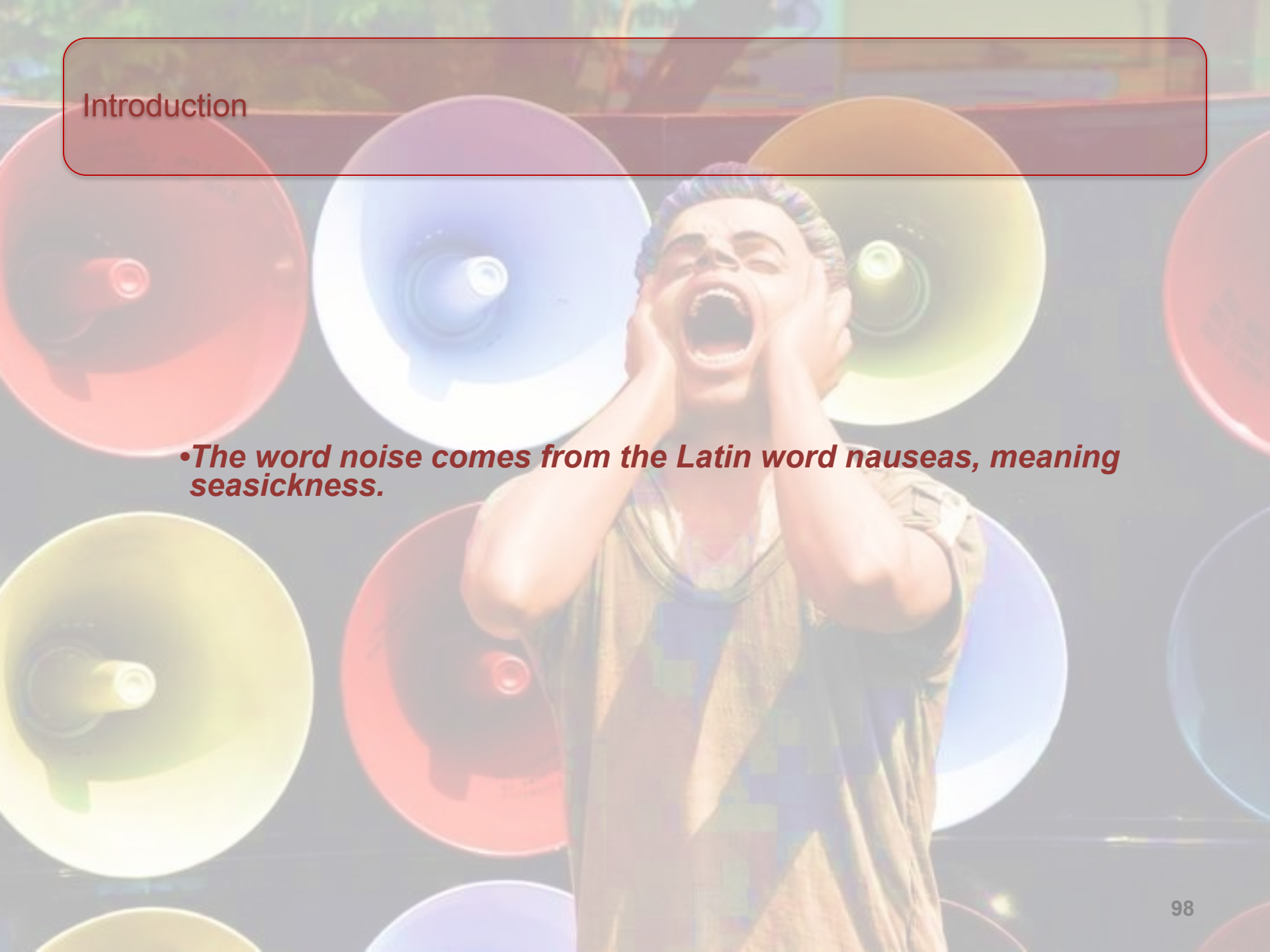


Roar of Hanuman, while back from Lanka, brought abortion to many demoness in Lanka.

– Ramcharit Manas, Sundar Kand – 27/1…….

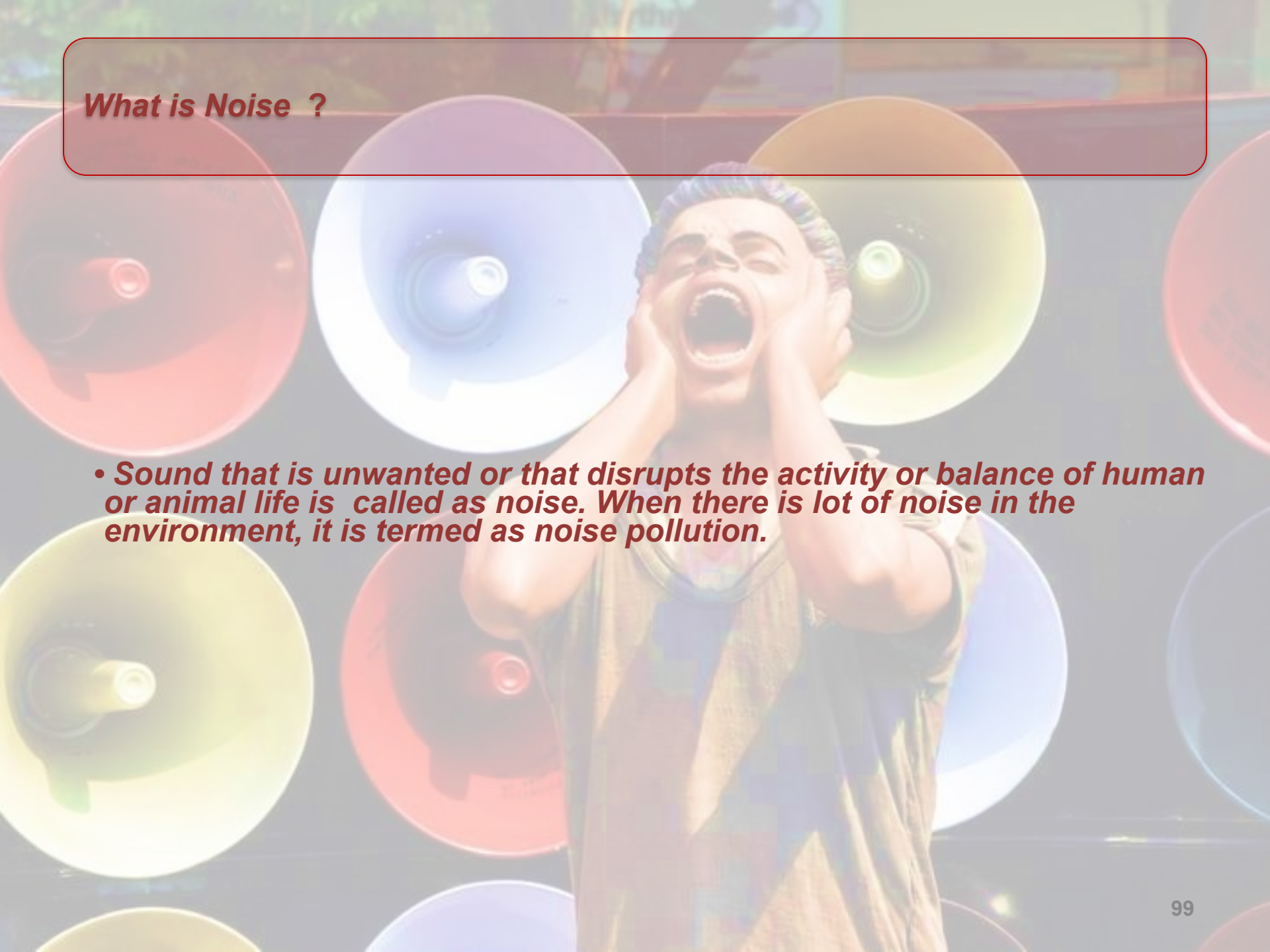
- *Introduction*
- *Sources of Noise*
- *Properties of Noise*
- *Measurement of Noise*
- *Noise at the dental office*
- *Effects of noise pollution*
- *Control of Noise pollution*

Introduction



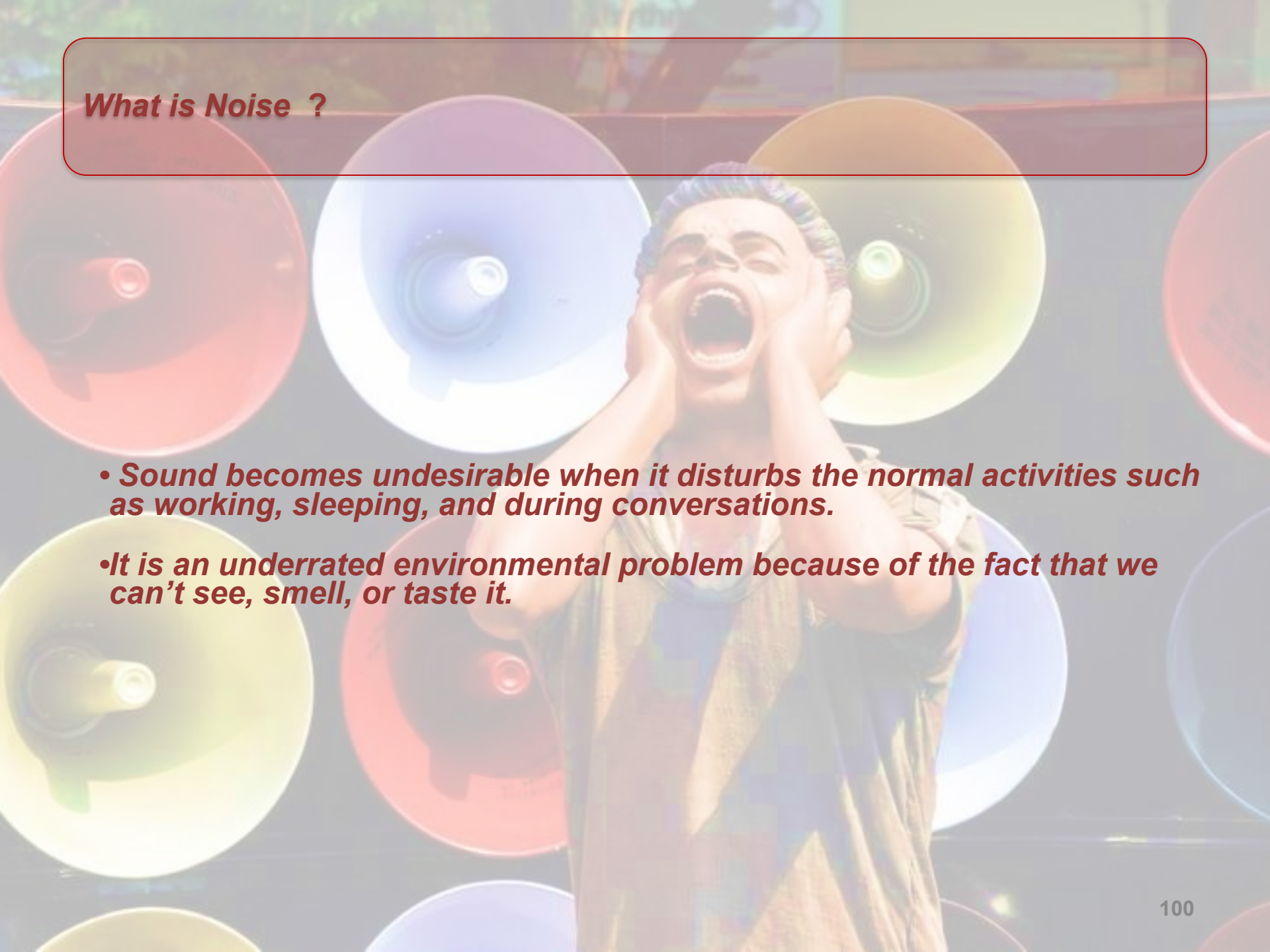
- ***The word noise comes from the Latin word nauseas, meaning seasickness.***

What is Noise ?



- Sound that is unwanted or that disrupts the activity or balance of human or animal life is called as noise. When there is lot of noise in the environment, it is termed as noise pollution.

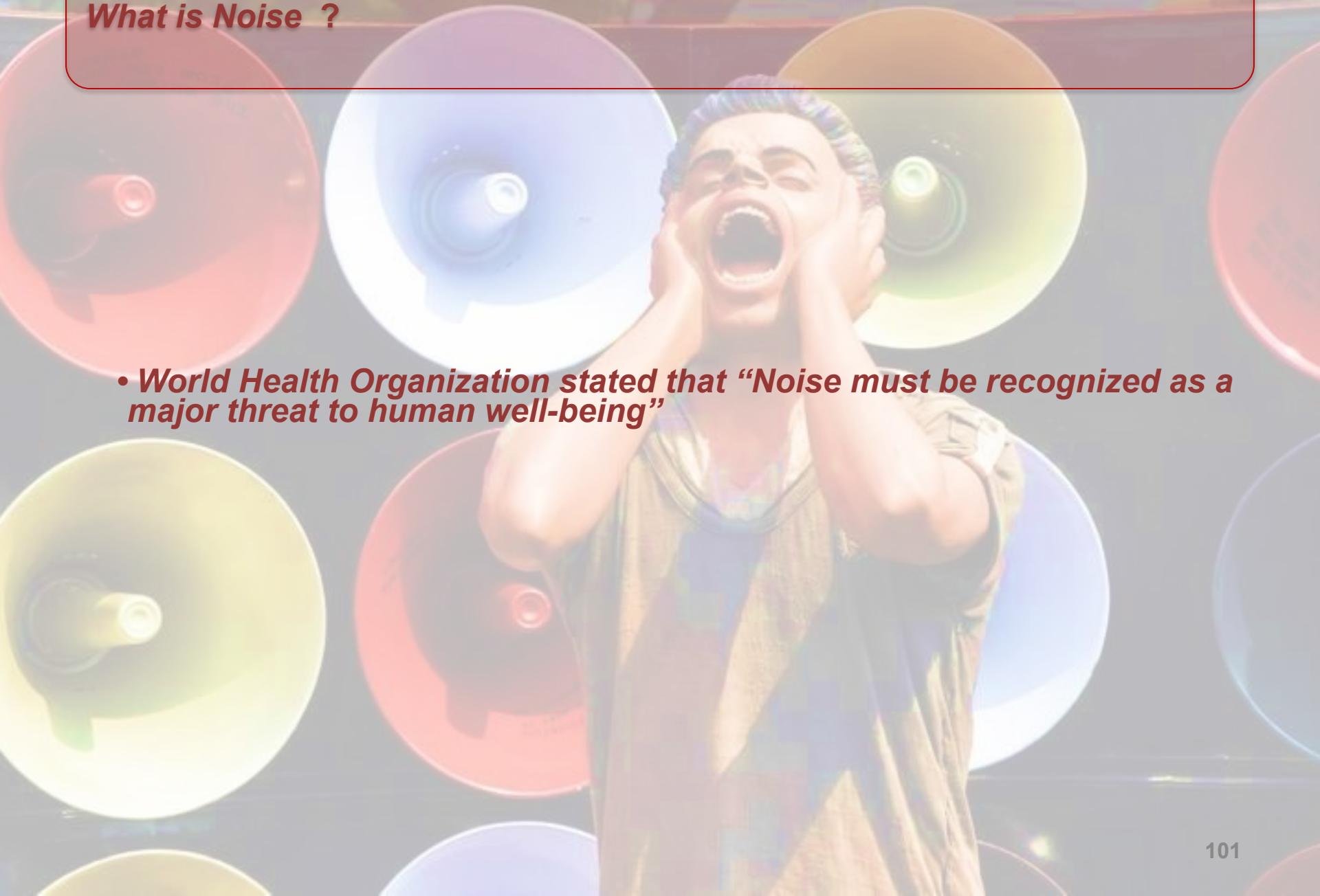
What is Noise ?



- Sound becomes undesirable when it disturbs the normal activities such as working, sleeping, and during conversations.

- It is an underrated environmental problem because of the fact that we can't see, smell, or taste it.

What is Noise ?



- *World Health Organization stated that "Noise must be recognized as a major threat to human well-being"*

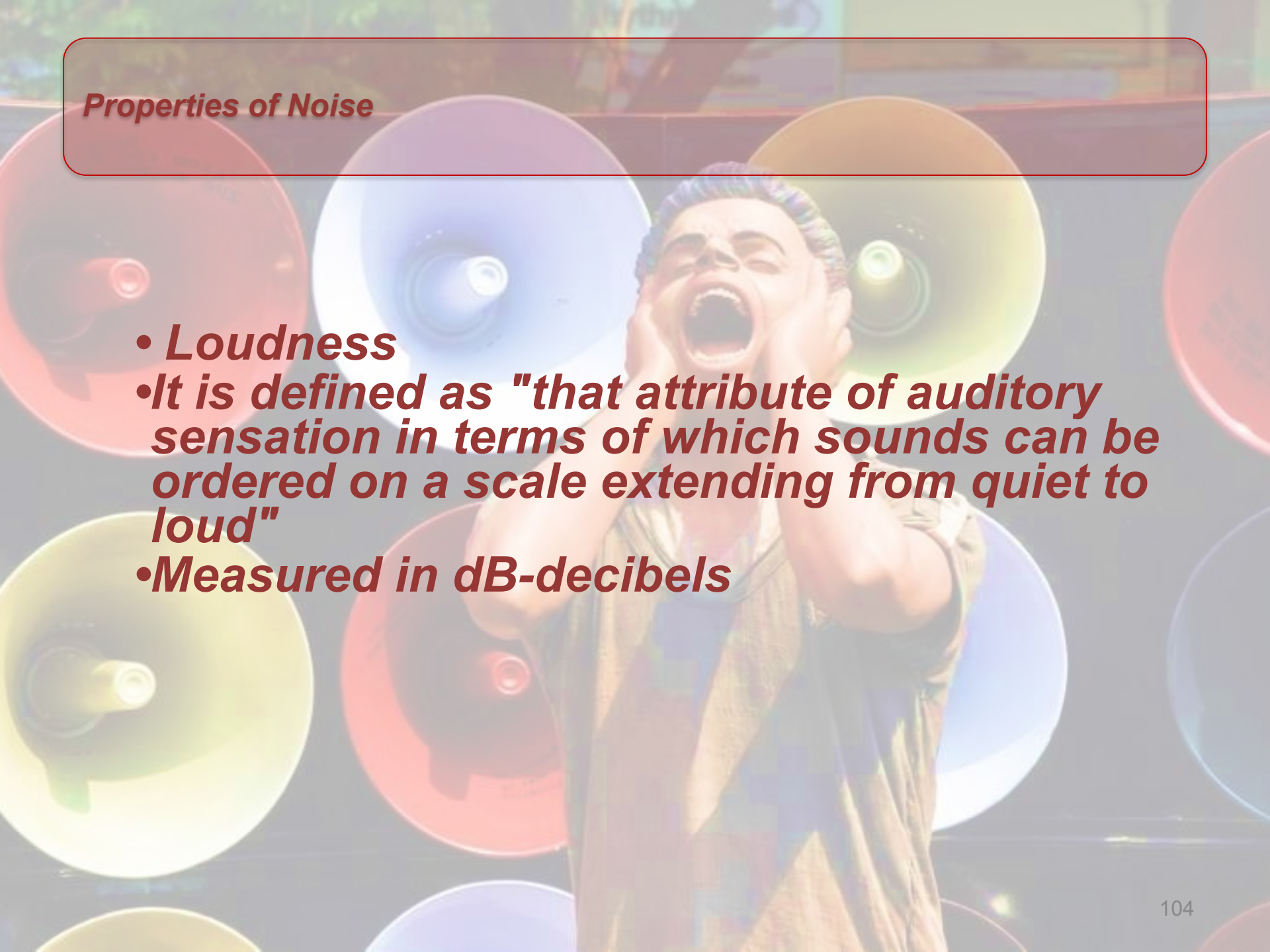
Sources of Noise Pollution

- > Transportation systems are the main source of noise pollution in urban areas.
- > Construction of buildings, highways, and streets cause a lot of noise, due to the usage of air compressors, bulldozers, loaders, dump trucks, and pavement breakers.

Sources of Noise Pollution

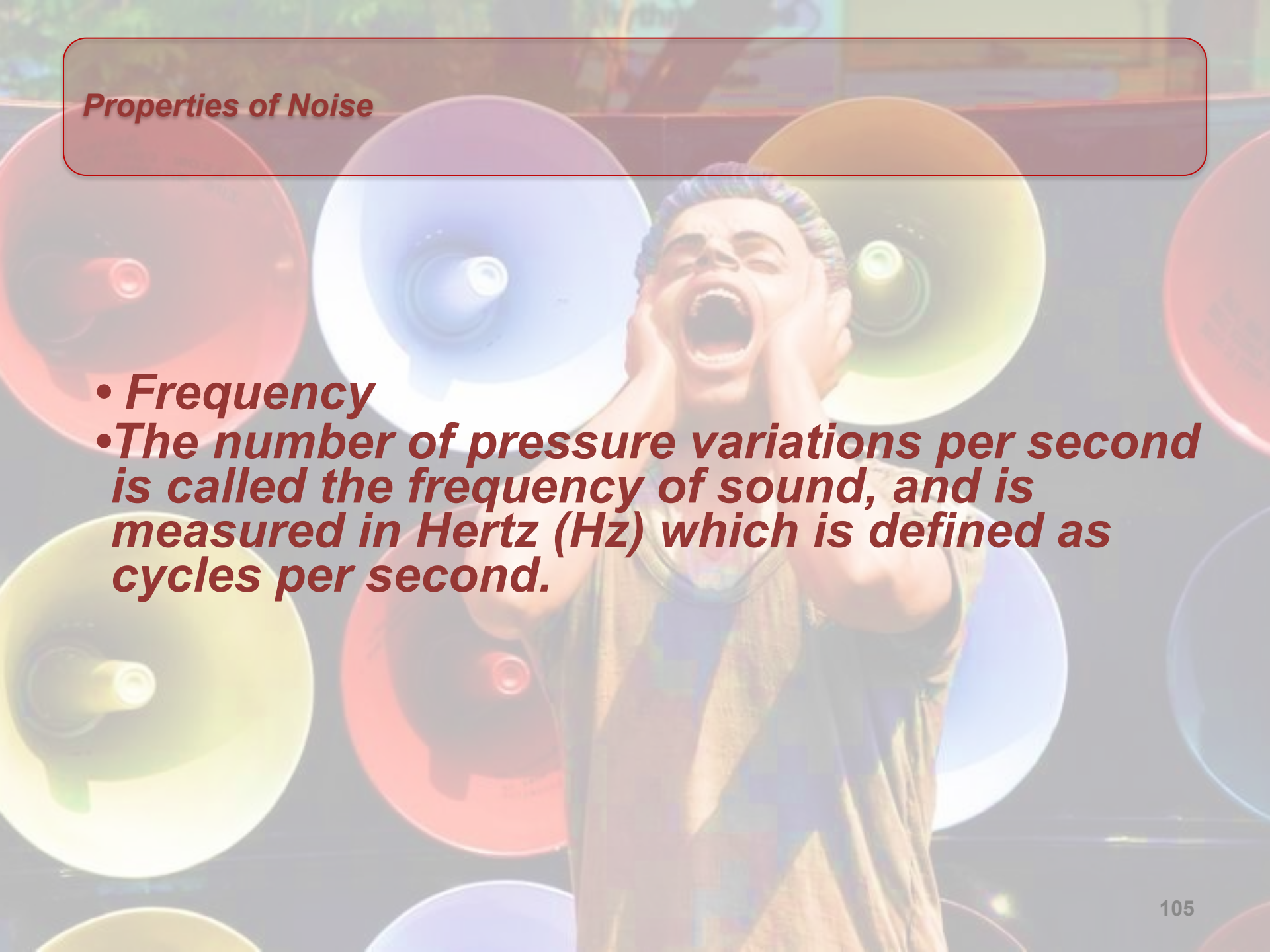
- > Industrial noise also adds to the already unfavorable state of noise pollution.
- > Loud speakers, plumbing, boilers, generators, air conditioners, fans, and vacuum cleaners add to the existing noise pollution.

Properties of Noise



- *Loudness*
- *It is defined as "that attribute of auditory sensation in terms of which sounds can be ordered on a scale extending from quiet to loud"*
- *Measured in dB-decibels*

Properties of Noise



- *Frequency*
- *The number of pressure variations per second is called the frequency of sound, and is measured in Hertz (Hz) which is defined as cycles per second.*

Noise Measurement

Noise in the dental office

Arindam Dutta et al in 2013 conducted a study to test the Sound levels in conservative dentistry and endodontics clinic. It was found that Mean sound levels in the working clinics ranged from 63.0 dB to 81.5 dB. These are within the recommended range for dental equipment.With suction and either low/high speed handpiece combination, the PG clinic was significantly noisier than the UG clinic at several time periods.

Noise in the dental office

Sushi Kadanakuppe, Padma K Bhat, C Jyothi, C Ramegowda in 2011 measured and analyzed noise in different dental learning areas that included clinical, pre-clinical areas and laboratories selected as representatives of a variety of learning-teaching activities. The noise levels were determined using a precision noise level meter . The noise levels measured varied between 64 and 97 dB(A).

Effect Of Noise Pollution On Humans-Auditory effects

- 1. Chronic exposure to noise may cause noise-induced hearing loss. Older males exposed to significant occupational noise demonstrate significantly reduced hearing sensitivity than their non-exposed peers.

Effect Of Noise Pollution On Humans- Non-Auditory

- 2. Unwanted noise can damage physiological and psychological health. Noise pollution can cause annoyance and aggression, hypertension, high stress levels, tinnitus, hearing loss, sleep disturbances, and other harmful effects.

Effect Of Noise Pollution On Humans- Non-Auditory

- 3. High noise levels can contribute to cardiovascular effects and exposure to moderately high levels during a single eight hour period causes a statistical rise in blood pressure of five to ten points and an increase in stress and vasoconstriction leading to the increased blood pressure noted above as well as to increased incidence of coronary artery disease..

Effect On Animals & Aquatic Life

- *1. Noise can have a detrimental effect on animals, increasing the risk of death by changing the delicate balance in predator or prey detection and avoidance, and interfering the use of the sounds in communication especially in relation to reproduction and in navigation . .*

Effect On Animals & Aquatic Life

- *2. An impact of noise on animal life is the reduction of usable habitat that noisy areas may cause, which in the case of endangered species may be part of the path to extinction. Noise pollution has caused the death of certain species of whales that beached themselves after being exposed to the loud sound of military sonar .*

Effect On Animals & Aquatic Life

- *3. Some other effects on wildlife & aquatic animals are:*
  - *> Hormone Imbalance*
  - *> Chronic Stress*
  - *> Panic & Escape Behavior*
  - *> Abandonment of Offspring*
  - *> Injury*
  - *> Increase in Loudness of Inter species communication .*

Indoor Noise Pollution

- Indoor noise pollution sources include car alarms, emergency service sirens, mechanical equipment, fireworks, compressed air horns, groundskeeping equipment, barking dogs, appliances, audio entertainment systems, electric megaphones, and loud people.

Noise Control Strategy

- *> Planting bushes and trees in and around sound generating sources is an effective solution for noise pollution.*
- *> Regular servicing and tuning of automobiles can effectively reduce the noise pollution.*
- *> Buildings can be designed with suitable noise absorbing material for the walls, windows, and ceilings.*

Noise Control Strategy

- > Workers should be provided with equipment's such as ear plugs and earmuffs for hearing protection .

> Similar to automobiles, lubrication of the machinery and servicing should be done to minimize noise generation.

- > Soundproof doors and windows can be installed to block unwanted noise from outside.

Noise Control Strategy

- *> Workers should be provided with equipment's such as ear plugs and earmuffs for hearing protection .*

> Similar to automobiles, lubrication of the machinery and servicing should be done to minimize noise generation.

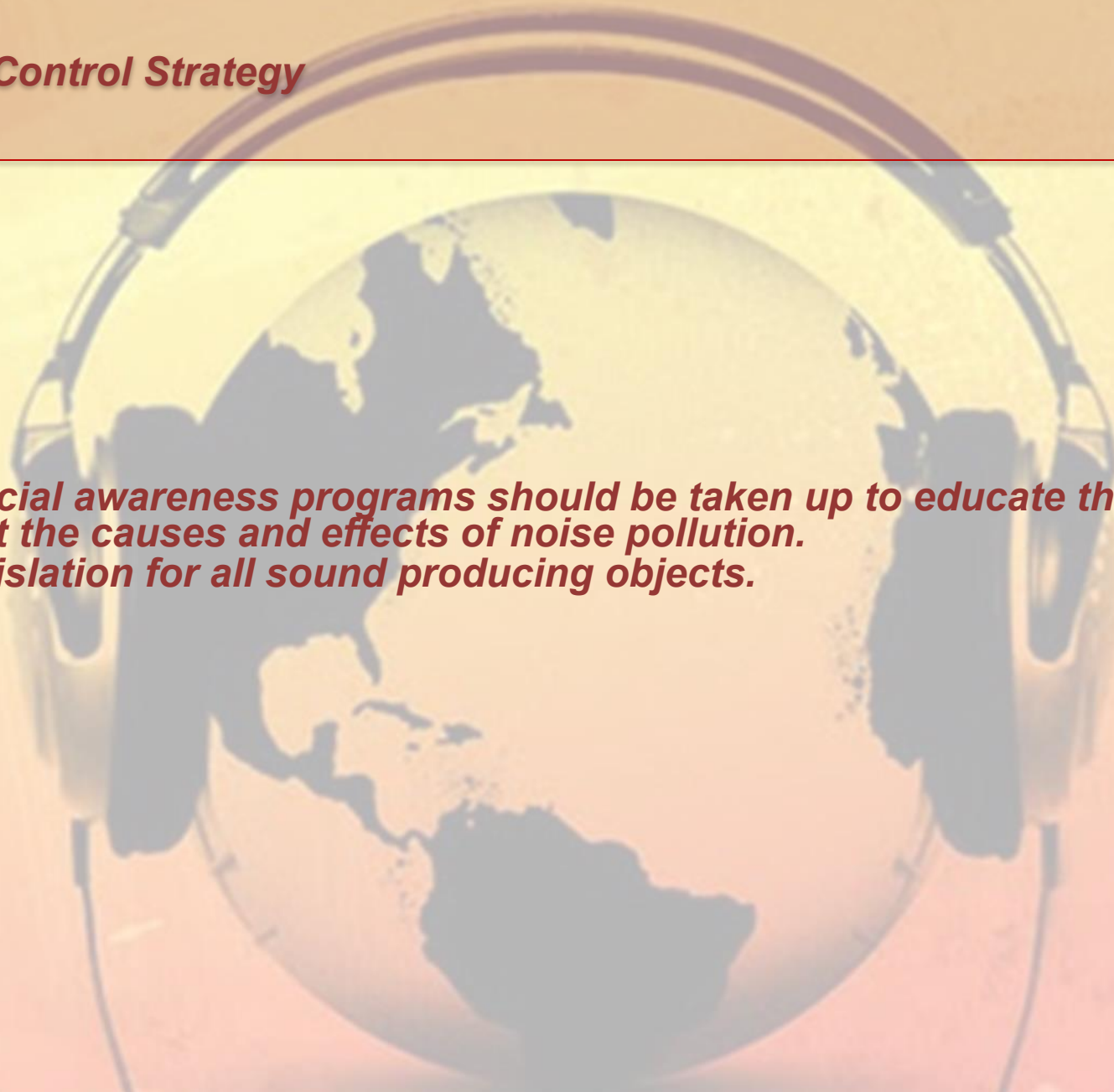
- *> Soundproof doors and windows can be installed to block unwanted noise from outside.*

Noise Control Strategy

- *> Regulations should be imposed to restrict the usage of play loudspeakers in crowded areas and public places.*
- *> Factories and industries should be located far from the residential areas*

>Community development or urban management should be done with long-term planning, along with an aim to reduce noise pollution

Noise Control Strategy



- *> Social awareness programs should be taken up to educate the public about the causes and effects of noise pollution.*
- *>Legislation for all sound producing objects.*

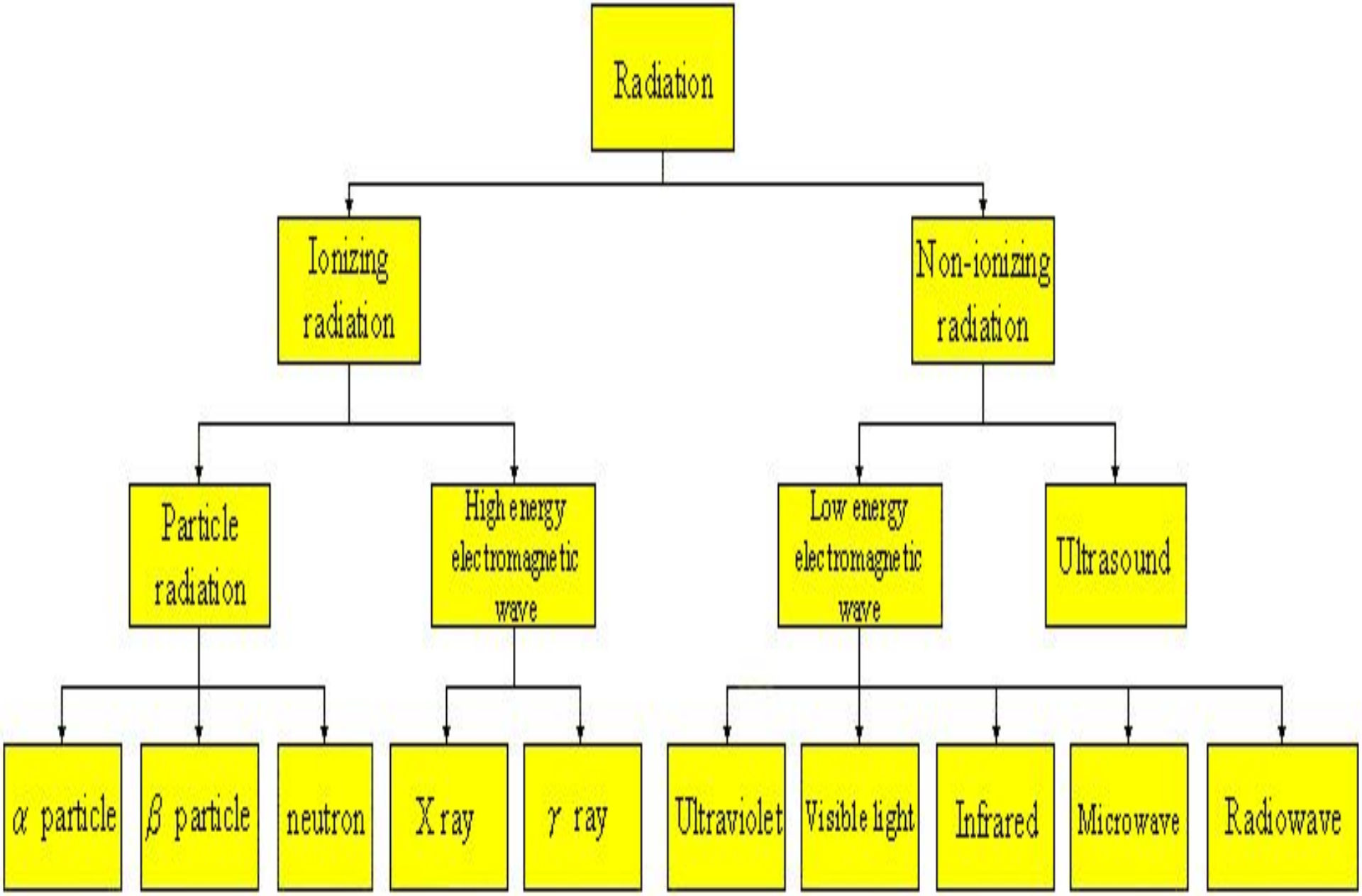
Radiation

- Introduction
- Sources of Radiation
- Types of Radiation
- Radiation Units
- Effects of Radiation on Health
- Radiation Protection
- Radiation in Dentistry

Introduction

- Radiation is energy that comes from a source and travels through space and may be able to penetrate various materials


Non-Ionizing Radiation
Ionizing Radiation
Low Frequencies
Radiofrequencies
Visible Light
X-rays & Gamma Rays
Infrared
Ultraviolet
Frequency in Hz:
0
10²
10⁴
10⁶
10⁸
10¹⁰
10¹²
10¹⁴
10¹⁶
10¹⁸
10²⁰
10²²


Radiation
Ionizing radiation
Non-ionizing radiation
Particle radiation
High energy electromagnetic wave
Low energy electromagnetic wave
Ultrasound
α particle
β particle
neutron
X ray
γ ray
Ultraviolet
Visible light
Infrared
Microwave
Radiowave

Radiation Units

- ***Radiation absorbed dose and effective dose in the*** international system of units (SI system) for radiation measurement uses "gray" (Gy) and "sievert" (Sv), respectively.
- In the United States, ***radiation absorbed dose***, effective dose, and ***exposure*** are sometimes measured and stated in units called ***rad***, ***rem***, or ***roentgen (R)***.

Dose Equivalent

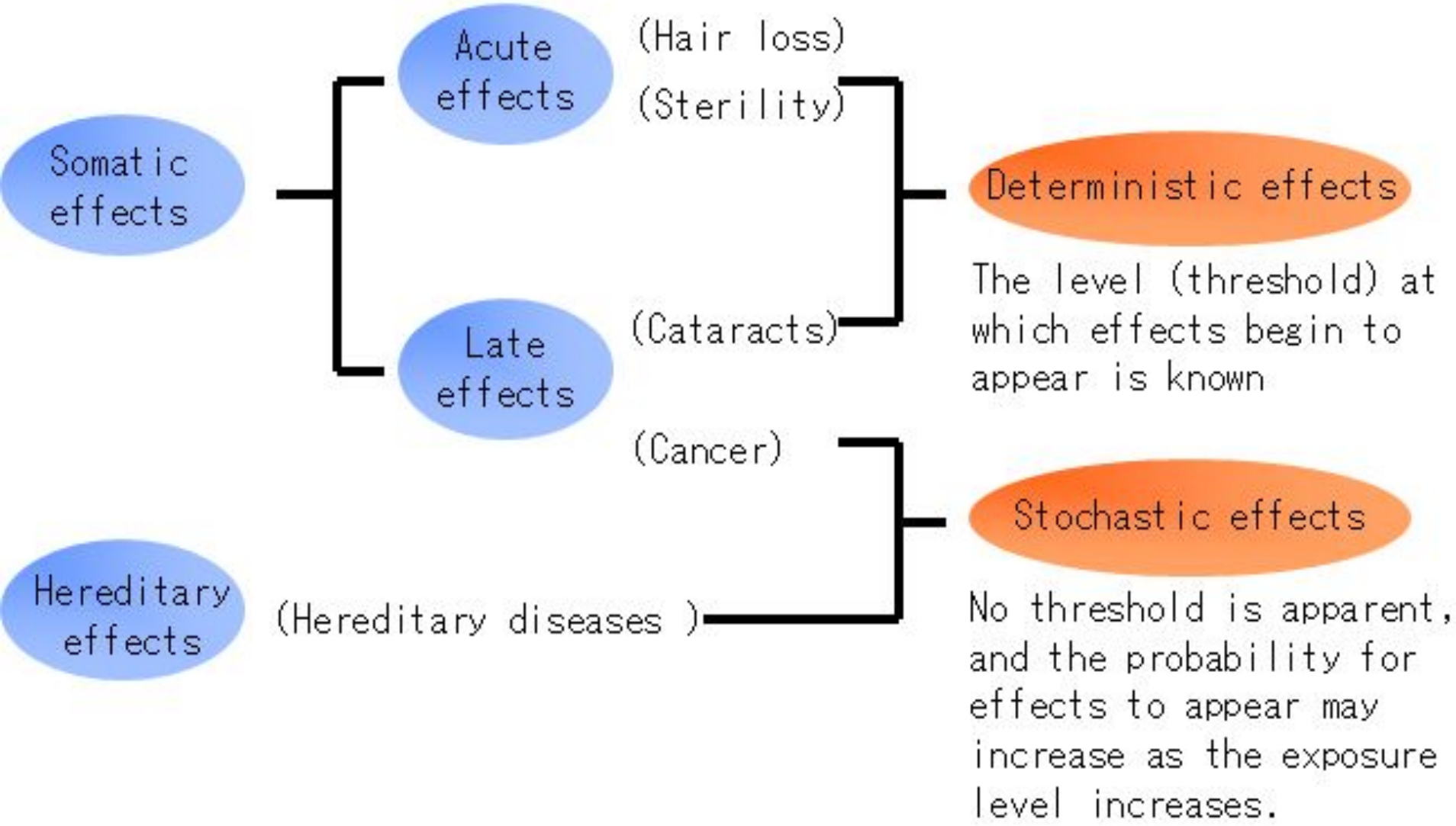
- Equivalent dose H_T is calculated using the mean absorbed dose deposited in body tissue or organ T, multiplied by the radiation weighting factor W_R which is dependent on the type and energy of the radiation R.

Dose Equivalent

$$H_T = \sum_R W_R \cdot D_{T,R}$$

H_T is the equivalent dose absorbed by tissue $D_{T,R}$ is the absorbed dose in tissue T by radiation type, W_R is the radiation weighting factor defined by regulation

Biological Effects of Radiation

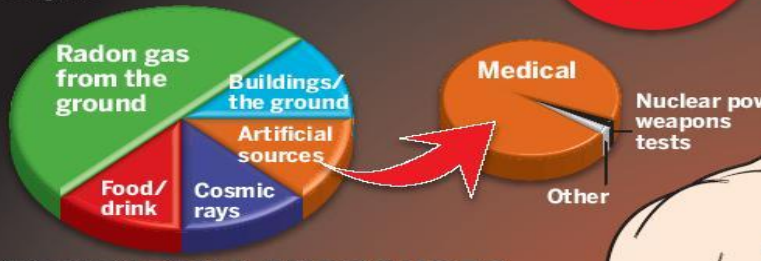


Radiation exposure

As fears of a meltdown in Japan rise, so do the fears of radiation exposure. What does radiation do to the human body?

BACKGROUND RADIATION

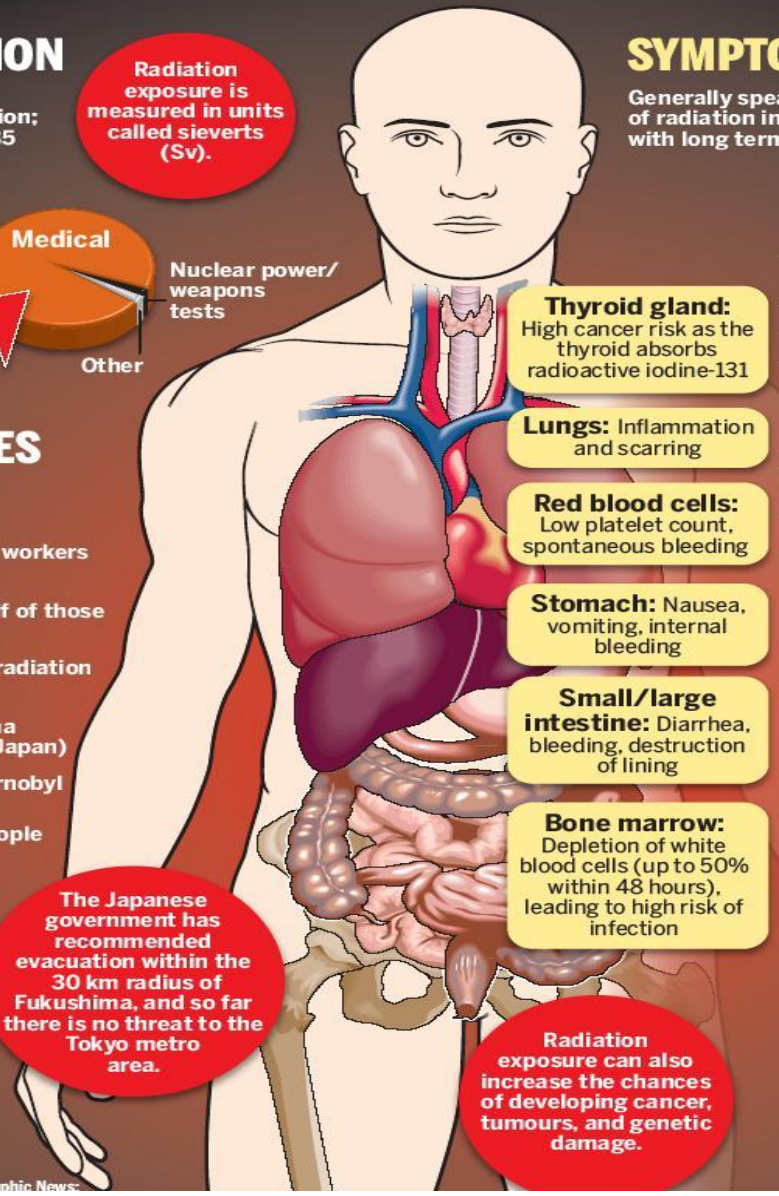
Everybody is exposed to both naturally-occurring and artificial background radiation; levels typically range from 0.0015 – 0.0035 Sv/year:



Radiation exposure is measured in units called sieverts (Sv).

COMPARING EXPOSURES

10 Sv	Fatal within weeks
6	Typical levels in Chernobyl workers who died within a month
5	A single dose would kill half of those exposed within a month
1	A single dose could cause radiation sickness and nausea
0.4	Detected level at Fukushima (as of Tuesday morning in Japan)
0.35	Exposure of relocated Chernobyl residents
0.10	Recommended limit for people working with radiation every 5 years
0.01	Full-body CT scan
0.002	Typical natural radiation per year
0.0004	Mammogram x-ray
0.0001	Chest x-ray
0.00001	Dental x-ray



Thyroid gland: High cancer risk as the thyroid absorbs radioactive iodine-131

Lungs: Inflammation and scarring

Red blood cells: Low platelet count, spontaneous bleeding

Stomach: Nausea, vomiting, internal bleeding

Small/large intestine: Diarrhea, bleeding, destruction of lining

Bone marrow: Depletion of white blood cells (up to 50% within 48 hours), leading to high risk of infection

The Japanese government has recommended evacuation within the 30 km radius of Fukushima, and so far there is no threat to the Tokyo metro area.

Radiation exposure can also increase the chances of developing cancer, tumours, and genetic damage.

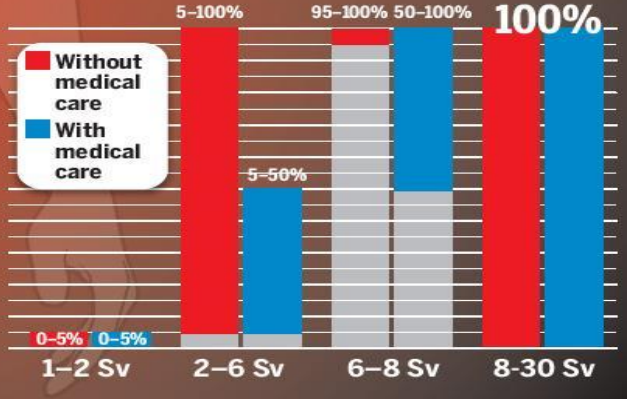
SYMPTOMS OF RADIATION EXPOSURE

Generally speaking, radiation sickness is brought on by a large dosage of radiation in a short period of time, but it has also occurred with long term exposure.

Early symptoms, exposure levels and time to symptom onset

	1–2 Sv	2–6 Sv	6–8 Sv	8–10 Sv
Nausea, vomiting	6 hrs.	2 hrs.	1 hr.	10 min.
Diarrhea	—	8 hrs.	3 hrs.	1 hr.
Headache	—	24 hrs.	4 hrs.	2 hrs.
Fever	—	3 hrs.	1 hr.	1 hr.
Later symptoms				
Dizziness, disorientation	—	—	1 wk.	Immediate
Weakness, fatigue	4 wks.	1–4 wks.	1 wk.	Immediate
Hair loss, bloody vomit and stools, infections, poor wound healing, low blood pressure	—	1–4 wks.	1 wk.	Immediate

CHANCES OF DEATH BASED ON EXPOSURE LEVEL



Sources: guardian.co.uk; World Nuclear Association; Wikipedia; Graphic News;

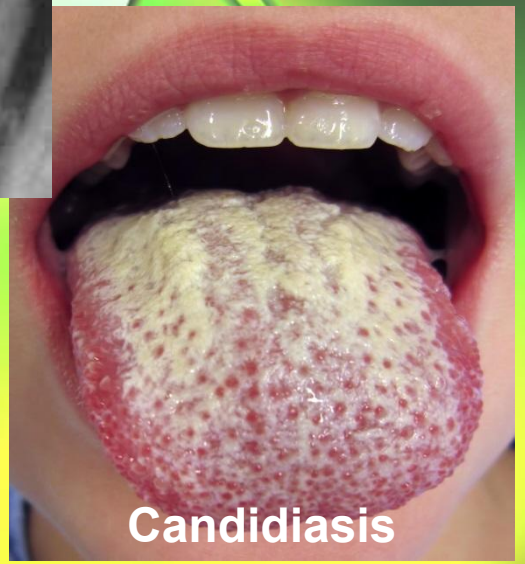
Effect of Radiation on Oral Tissues


Mucositis

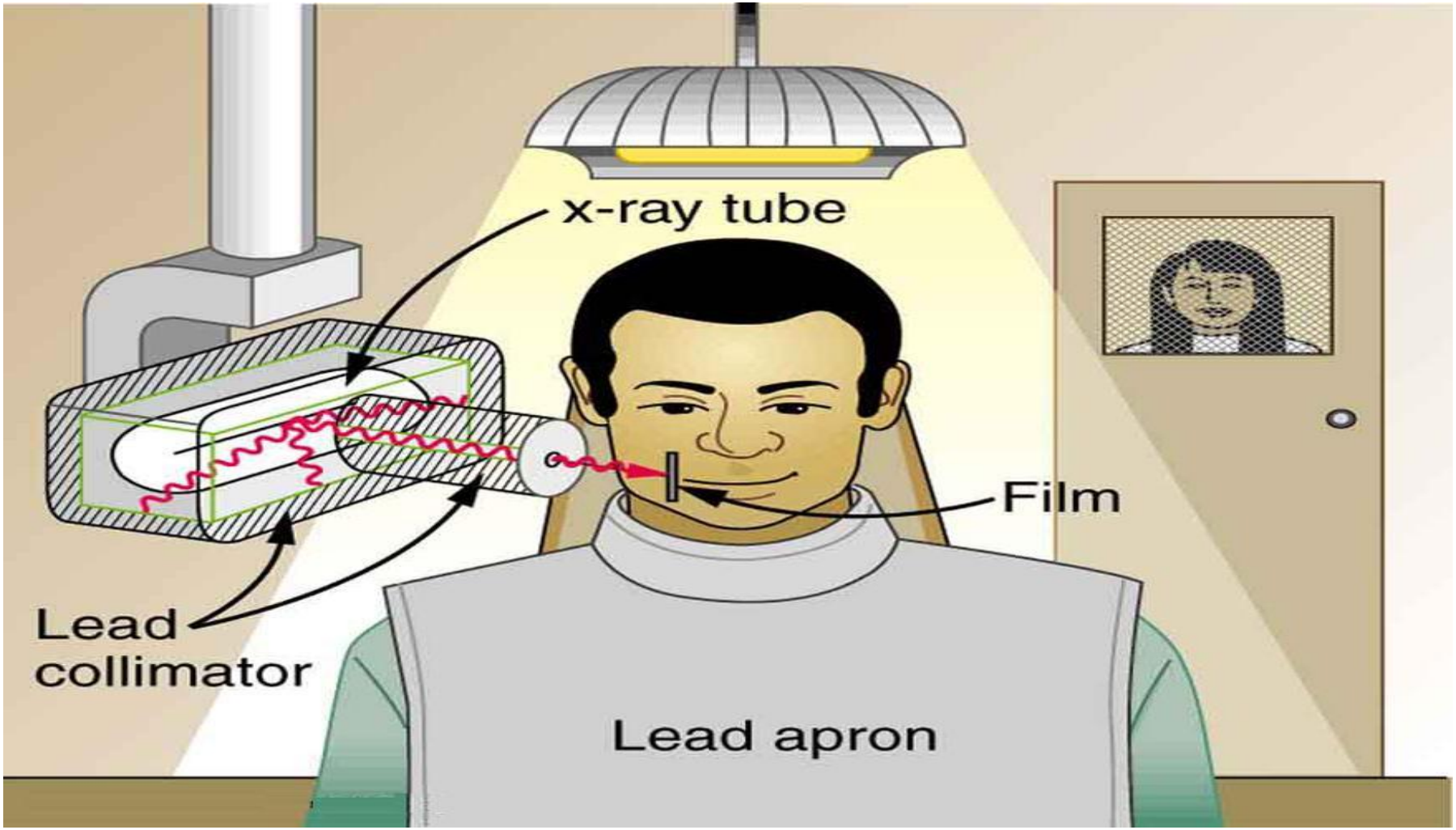

Xerostomia


Radiation Caries


Osteoradionecrosis


Candidiasis

Radiation Protection in Dentistry



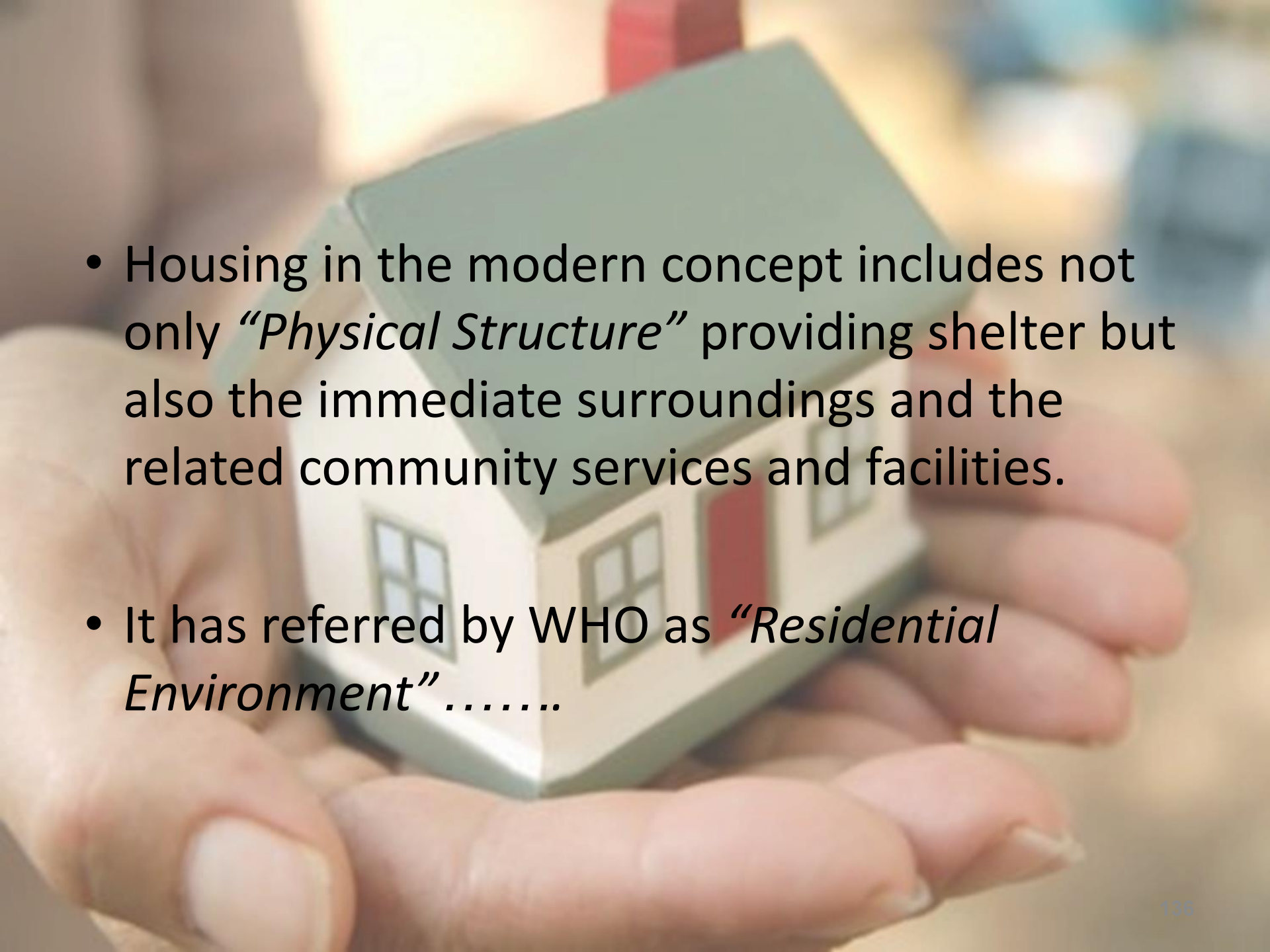

Housing

Contents

- Introduction
- Goals of Housing
- Housing standards
- Housing and Health
- Overcrowding
- Indicators of Housing
- Public Policy
- Conclusion
- References

Introduction

- A **house** is a building that functions as a home for humans or other creatures, including simple dwellings ranging from rudimentary huts of nomadic tribes and complex structures composed of many systems.



- Housing in the modern concept includes not only *"Physical Structure"* providing shelter but also the immediate surroundings and the related community services and facilities.

- It has referred by WHO as *"Residential Environment"* …….

Goals of Housing

Housing Standards

HOUSING AND HEALTH

Decent housing reduces levels of infectious and chronic illnesses, injuries and death, particularly among the poorest people.

IMPROVED WATER & SANITATION

reduces diarrhoea related deaths in young children.

BETTER FLOORING

reduces parastic infestations, diarrhoea, anaemia and improves cognitive development.

BETTER VENTILATION

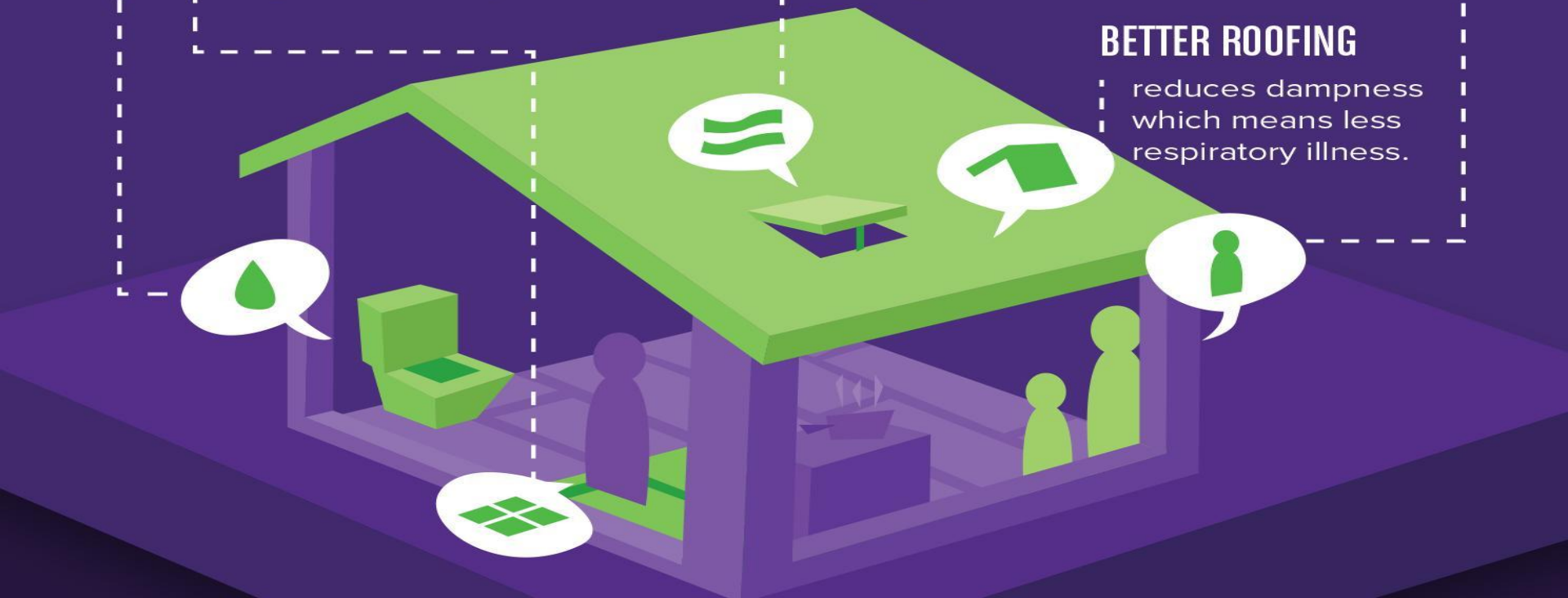
means fewer eye and lung irritations and smoke related diseases.

HEALTH

improves with reduced rates of malaria, respiratory infections and gastrointestinal illnesses.

BETTER ROOFING

reduces dampness which means less respiratory illness.



Over Crowding

- It refers to a situation in which more people are living within a single dwelling than there is space for.

- The accepted standards are…..

  1 room------2 persons

  2 room------3 persons

  3 room------4 persons

  4 room------7 persons

  5 or more rooms------ 10 persons

- According to the floor space

  110 sq.ft or more-----2 persons

  90-100 sq.ft------- 1 ½ person

  70-90 sq.ft--------1 person

  50-70 sq.ft-------- ½ person

  Under 50 sq.ft-------nil

- Sex seperation

Housing Policy World over

- **Public housing** is a form of housing tenure in which the property is owned by a government authority, which may be central or local.
- **Social housing** is an umbrella term referring to rental housing which may be owned and managed by the state, by non-profit organizations, or by a combination of the two, usually with the aim of providing affordable housing. Social housing can also be seen as a potential remedy to housing inequality.

Housing Policy World Over

- **Public housing in the United States** is housing administered by federal, state and local agencies to provide subsidized assistance for low-income households.
- The history of **European** housing policies illustrates the full range of housing policy instruments. Direct control of housing quality, by the state, is one means.

Housing Policies in India

- In India as the housing conditions are not satisfactory hence the Government of India has developed The Housing Policy of India.

- The need of policy arises because of Urbanization and Development, Rural To Urban Shift of Labour, Balanced Regional Development and New Integrated Townships and Green Field Development.

Housing Schemes in India

- **Jawahar Lal Nehru National Urban Renewal Mission (JNNURM)**
- **Interest Subsidy Scheme for Housing the Urban Poor (ISHUP)**
- **Swarna Jayanti Shahari Rozgar Yojana(SJSRY)**
- **Projects for the North-Eastern States**
- **Low Cost Sanitations**

Karnataka Housing Board

- **Karnataka Housing Board (KHB)** established under Karnataka Housing Board Act 1962 as a successor to Mysore Housing Board constituted in 1956.
- The primary objective of KHB is '**to make such schemes and to carry out such works as are necessary for the purpose of dealing with and satisfying the need of housing accommodation**'.

Conclusion

- At the end of the 10th Five Year Plan, the housing shortage is estimated to be 24.7 million. However, urban areas in our country are also characterized by severe shortage of basic services like potable water, well laid out drainage system, sewerage network, sanitation facilities, electricity, roads and appropriate solid waste disposal.

Conclusion

- Given the magnitude of the housing shortage and budgetary constraints of both the Central and State Governments, it is amply clear that Public Sector efforts will not suffice in fulfilling the housing demand.

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