

Chemical, Nuclear and Biological Related Disasters

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Module 4: Chemical, Nuclear and Biological Related Disasters

Chemical and Industrial Disasters, Nuclear Disasters, Biological Disasters and Epidemics, Pest Attacks, Cattle Epidemics, Food Poisoning-Definition, Cause, Types and Safety Precautions.

Industrial vs. Chemical disasters

Industrial disasters are any accidents that **occur in an industrial setting** and cause widespread damage.

These can be caused by a variety of factors, including:

- Mechanical failures
- Electrical malfunctions
- Explosions
- Fires
- Natural disasters

Chemical disasters are a **subcategory of industrial disasters** that involve the release of hazardous chemicals.

These chemicals can be toxic, flammable, or explosive.

Chemicals are used in a variety of manufacturing and processing activities.

The storage, handling, and transportation of these chemicals also pose risks.



Chemical Disasters

Chemicals pose a serious threat, requiring robust disaster management by governments, the private sector, and communities.

Chemical disasters can have devastating consequences:

- **Human casualties**

 - Acute health problems (e.g., respiratory failure, burns)

 - Chronic health problems (e.g., cancer, birth defects)

- **Environmental damage**

- **Property destruction**

High-risk elements in a chemical disaster:

- **Industrial plants**

- **Employees and workers**

- **Transportation of hazardous chemicals**

- **Nearby communities and buildings**

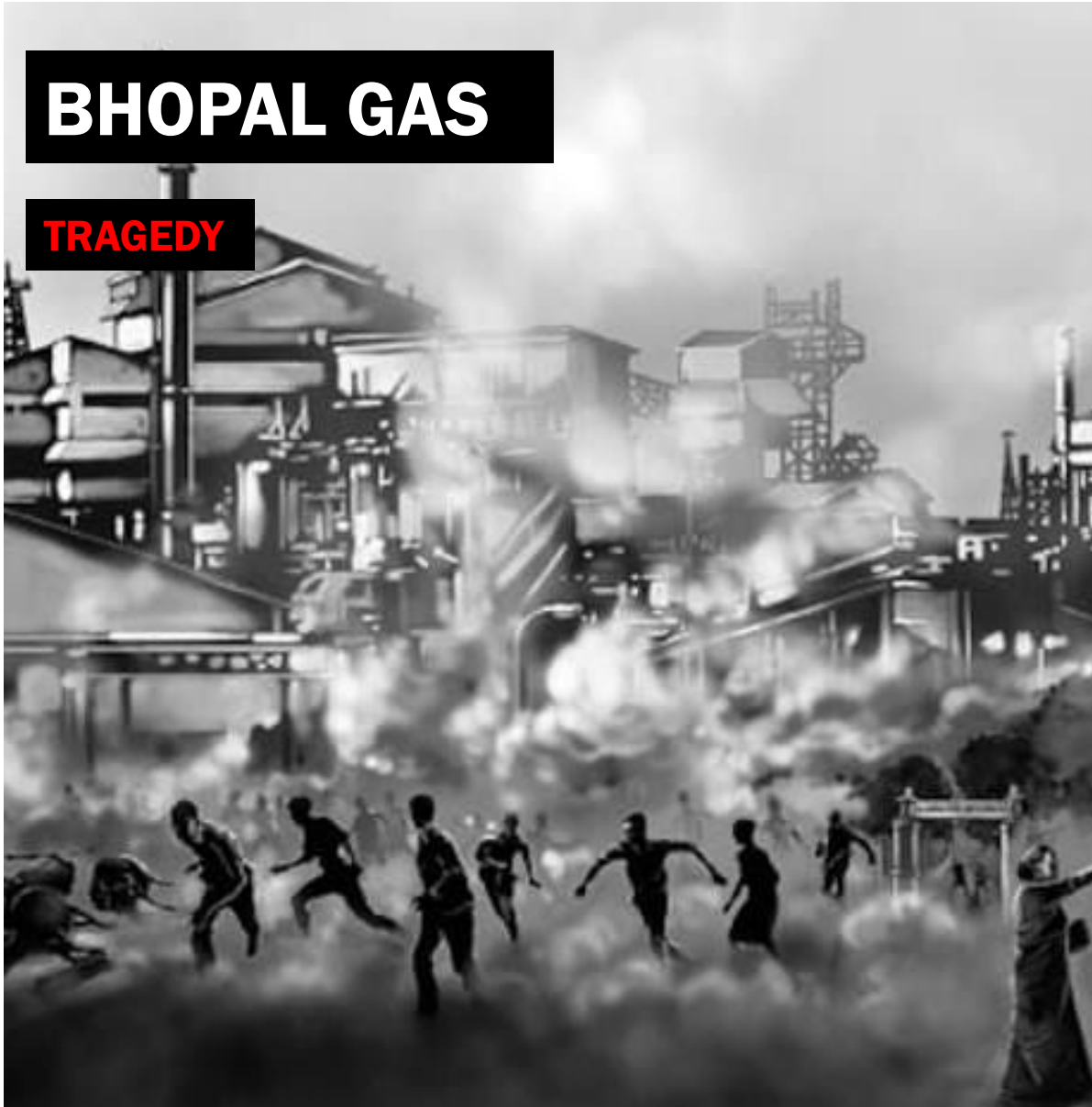
Cause of chemical disasters

- Process and safety systems failures
- Human errors
- Technical errors
- Management errors
- Induced effect of natural calamities
- Accidents during the transportation
- Hazardous waste processing/ disposal
- Terrorist attack/ unrest leading to sabotage



BHOPAL GAS

TRAGEDY



Status of Chemical Disaster Risk in India

India witnessed the world's worst chemical (industrial) disaster “Bhopal Gas Tragedy” in the year 02 December 1984.

The Bhopal Gas tragedy was the most devastating chemical accident in history, where thousands of people died due to the accidental release of the toxic gas [Methyl Iso Cyanate \(MIC\)](#).

Union Carbide India Limited (UCIL) - pesticide plant in Bhopal, Madhya Pradesh, India

Safety initiatives taken in India to address chemical risk

Following are the relevant provisions on chemical disaster management, prevailing in the country:-

Explosives Act 1884

- Petroleum Act 1934

Factories Act 1948

- Insecticides Act 1968

Environment Protection Act 1986

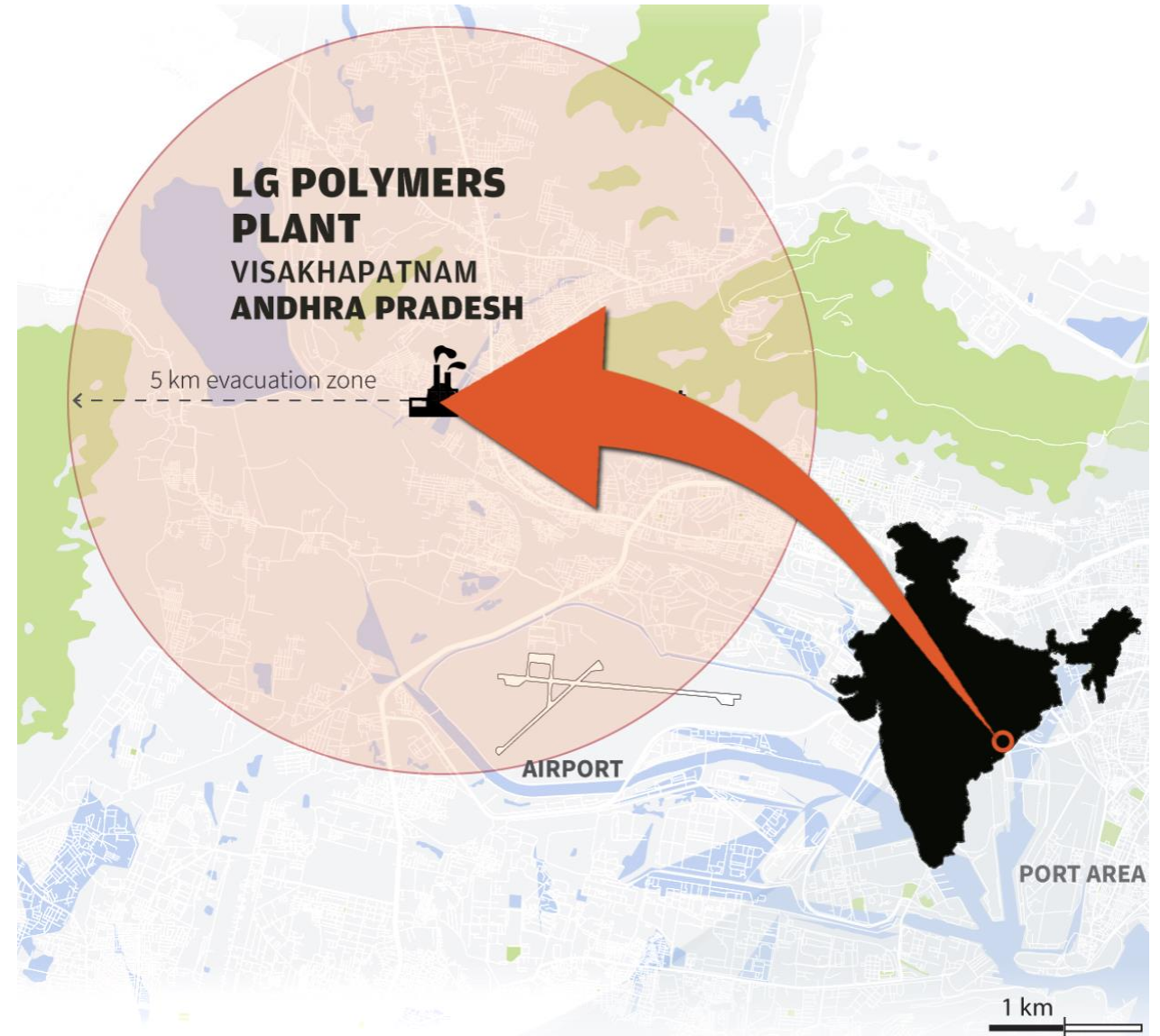
- Motor Vehicles Act 1988

Public Liability Insurance Act 1991

- Disaster Management Act 2005

Vizag gas leak

- The **styrene gas** leak at Visakhapatnam on 07 May 2020.
- It left **11 dead** while hundreds had to be hospitalized due to difficulty in breathing, headache, fatigue, and fainting.
- On May 8, the National Green Tribunal took suo moto cognisance and ordered the owners, LG Polymers India Pvt Ltd, to deposit Rs. 50 crore with the district magistrate as an interim penalty for the damage caused to life and habitat.
- The accident can be attributed to the company's negligence and failure to adhere to the safety protocol.



How did the accident happen?

- The plant was using styrene monomer (C_8H_8) to produce expandable plastics. Styrene monomer must be stored at temperatures strictly below $17^\circ C$.
- Partial plant shutdown due to COVID-19 pandemic (excluding scheduled maintenance)
- Improper storage temperature of styrene
- Pressure build-up in storage chamber
- Valve failure
- Leakage of 3 tonnes of toxic styrene gas

Severity of the Styrene Leak in Visakhapatnam

Styrene levels in the air:

500 times higher than the prescribed limit

> 2,500 ppb (parts per billion)

WHO safety limit: < 5 ppb

Exposure:

The leak affected nearby residential areas and a revenue village

The large area (240 hectares) contributed to higher exposure rates

What is Styrene?

- Organic compound used in making plastics and resins
- Manufactured in refineries
- Classified as "hazardous and toxic" in India
- Likely carcinogen

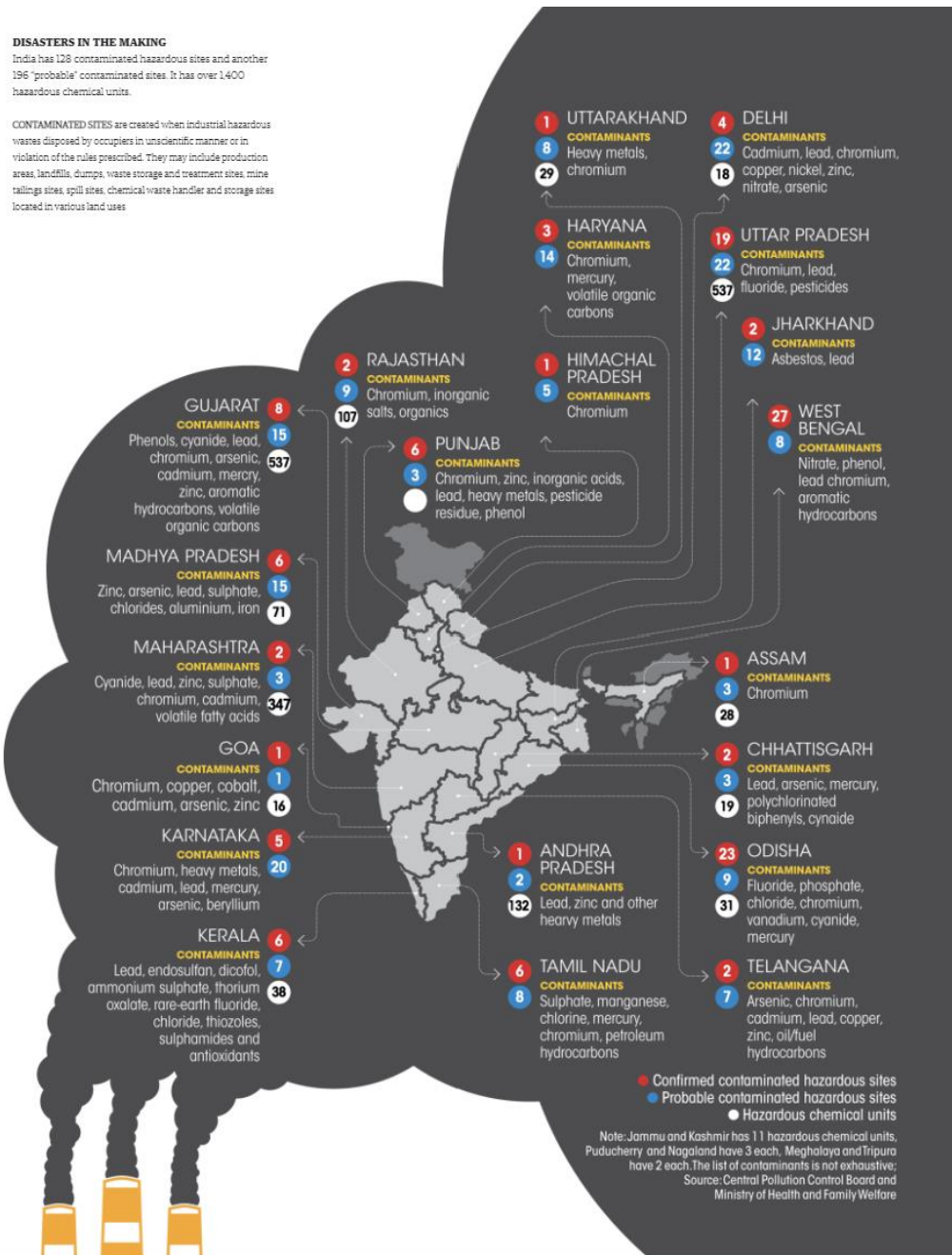
Exposure:

- Inhalation, skin, and eye contact
- Short-term effects: irritation (eyes, mucous membranes), gastrointestinal problems
- Long-term effects: nervous system impacts (headaches, fatigue, weakness, etc.), hearing loss, nerve damage
- High concentrations (>800 ppm) can lead to coma

DISASTERS IN THE MAKING

India has 128 contaminated hazardous sites and another 196 "probable" contaminated sites. It has over 1400 hazardous chemical units.

CONTAMINATED SITES are created when industrial hazardous wastes disposed of in unsuitable manner or in violation of the rules prescribed. They may include production areas, landfills, dumps, waste storage and treatment sites, mine tailings sites, spill sites, chemical waste handler and storage sites located in various land uses.

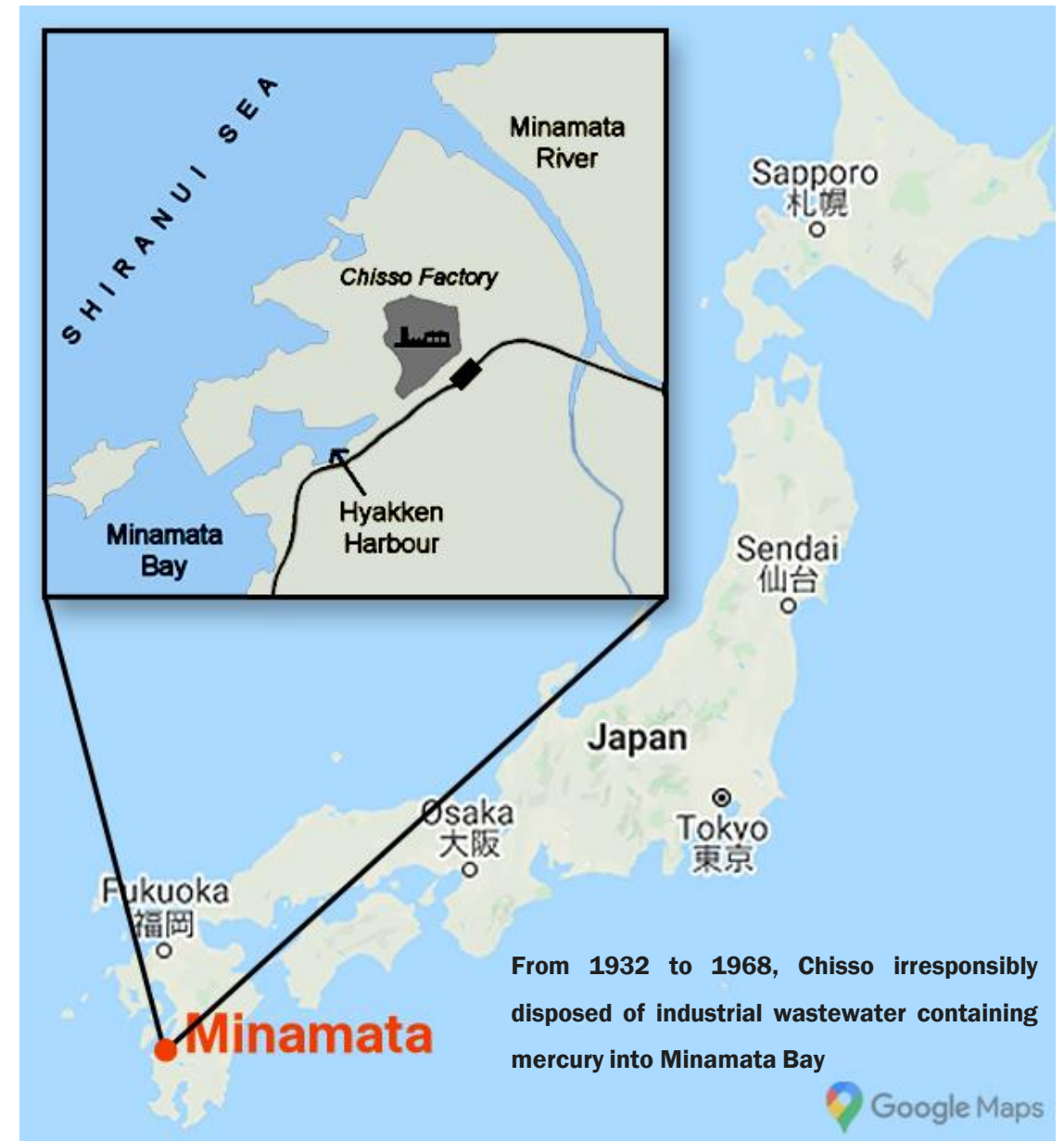


Visit https://www.downtoearth.org.in/dte-infographics/vizag_gas_leak/index.html

MINAMATA

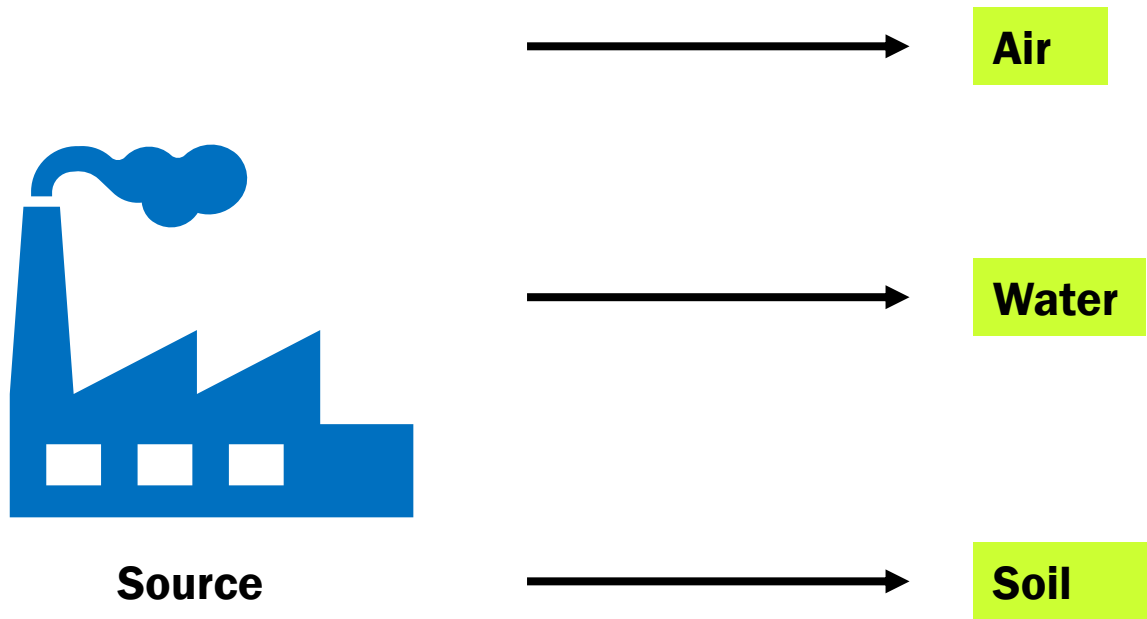
MERCURY POISONING

- Chisso Corporation, a chemical factory, released industrial wastewater into Minamata Bay.
- The wastewater was contaminated with **inorganic mercury**.
- Inorganic mercury in the wastewater came into contact with anaerobic bacteria in the bay sediment.
- The bacteria converted the inorganic mercury into methylmercury, the most toxic form of mercury.
- Minamata disease is a neurological disorder identified first in 1956.



Source: <https://www.historyvshollywood.com/reelfaces/minamata/>

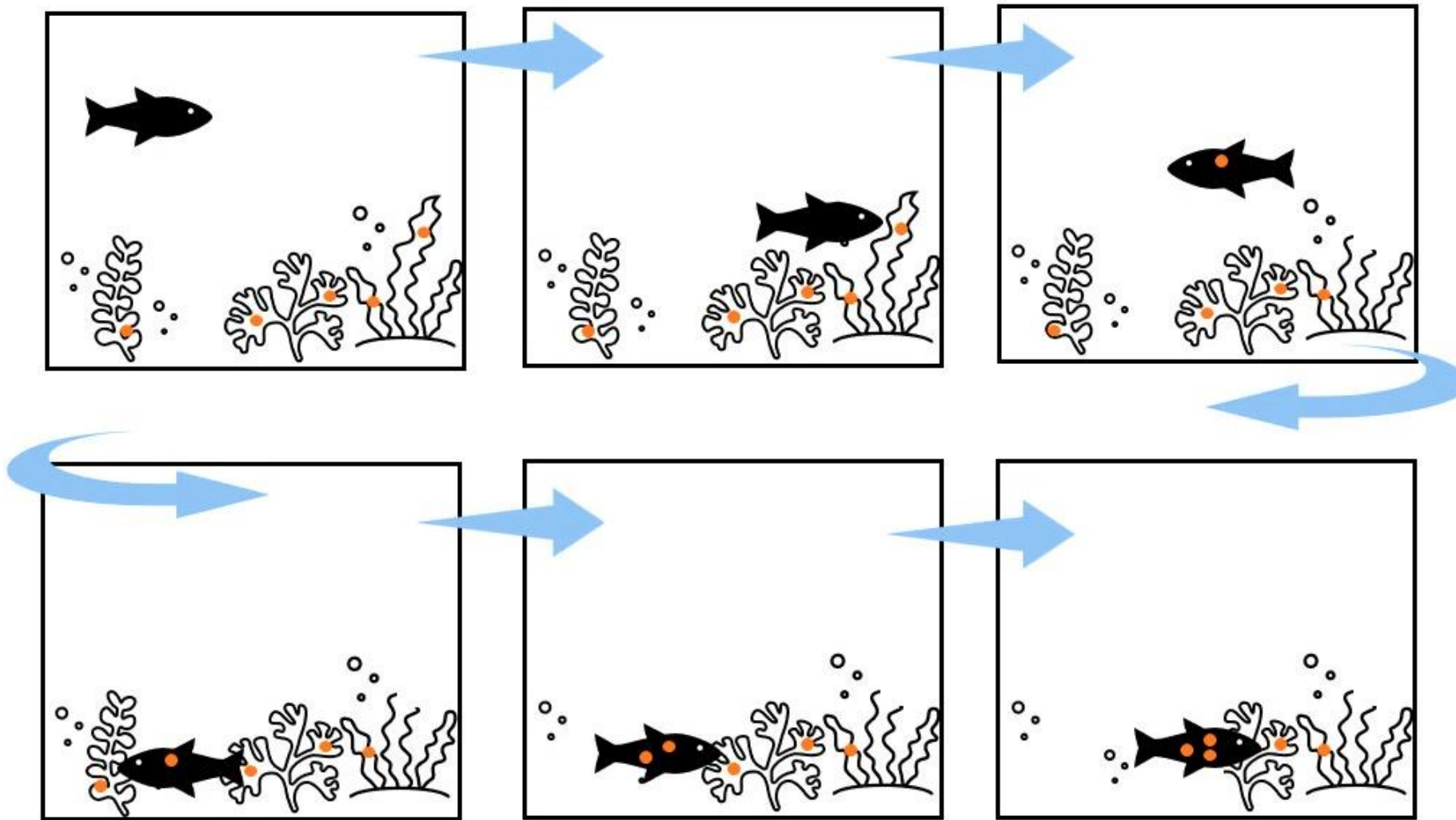
Environmental contamination



A chemical is released from an industry

Bioaccumulation

● = Chemical pollutant



Bioaccumulation

A progressive increase in the amount of a substance in an organism or part of an organism occurs because the rate of intake exceeds the organism's ability to remove the substance.

Precautions to be taken during and after the Chemical (Industrial) Accidents

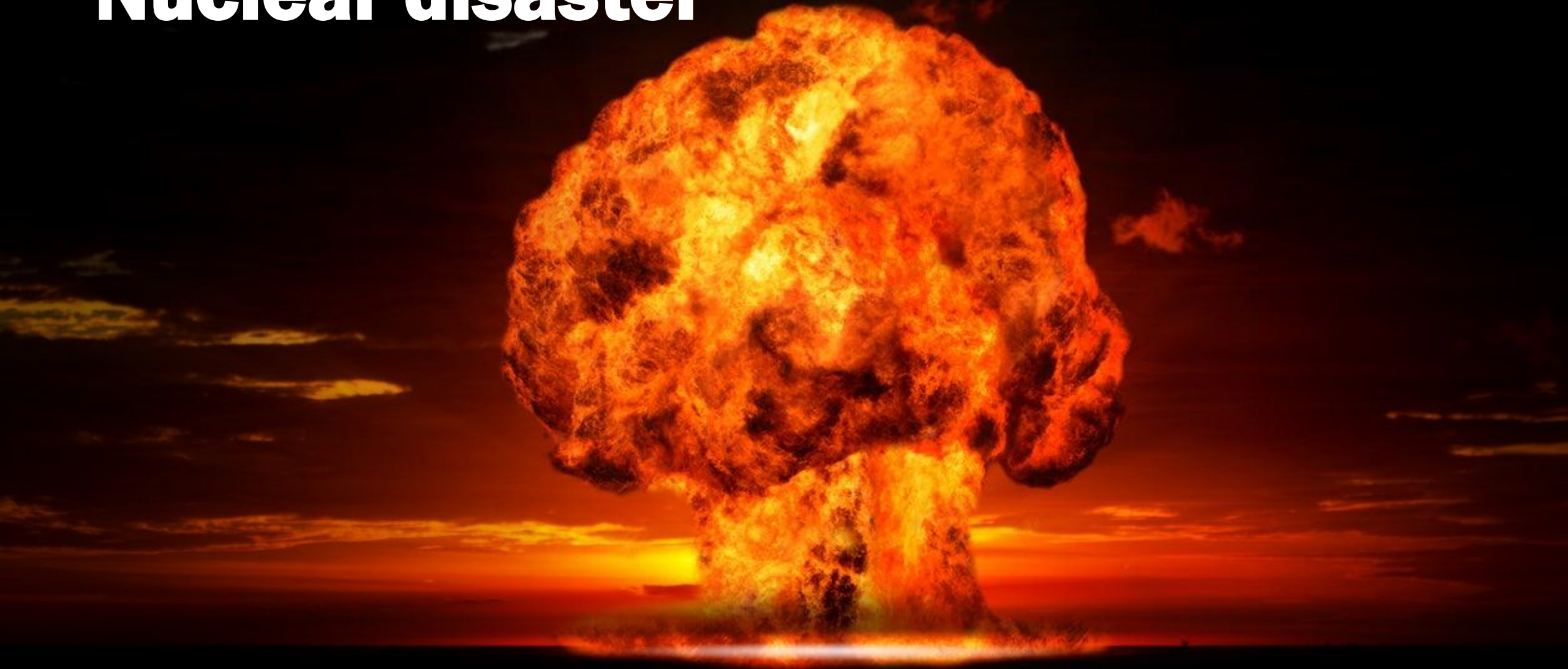
1. Do not panic, evacuate calmly and quickly perpendicular to wind direction through the designated escape route
2. Keep a wet handkerchief or piece of cloth/ sari on face during evacuation
3. Keep the sick, elderly, weak, handicapped and other people who are unable to evacuate inside house and close all the doors and windows tightly.
4. Do not consume the uncovered food/ water etc open to the air, drink only from bottle
5. Change into fresh clothing after reaching safe place/ shelter, and wash hands properly
6. Inform Fire & Emergency Services, Police and medical services from safe location by calling 101, 100 and 108 respectively.
7. Listen to PA (Public Addressal) System of the plant/ factory, local radio/ TV channels for advice from district administration/fire/health/police and other concerned authorities
8. Provide correct and accurate information to government official.
9. Inform others on occurrence of event at public gathering places (like school, shopping centre, theatre etc.).
10. Don't pay attention to the rumours and don't spread rumours.

CHEMICAL : DO'S & DONT'S

General Precautions During Normal Time

1. Do not smoke, lit fire or spark in the identified hazardous area
2. Sensitize the community living near the industrial units and they should be more vigilant about the nature of industrial units and associated risks.
3. Keep the contact numbers of nearest hazardous industry, fire station, police station, control room, health services and district control room, for emergency use.
4. Avoid housing near the industries producing or processing the hazardous chemicals, if possible.
5. Participate in all the capacity building programmes organized by the government/ voluntary organizations / industrial units.
6. Take part in preparing disaster management plan for the community and identify safe shelter along with safe and easy access routes.
7. Prepare a family disaster management plan and explain it to all the family members.
8. Make the family/ neighbours aware of the basic characteristics of various poisonous/ hazardous chemicals and the first aid required to treat them.
9. Adequate number of personal protective equipments needs to be made available, to deal with emergency situation.
10. Prepare an emergency kit of items and essentials in the house, including medicines, documents and valuables.

Nuclear disaster



Radiation, Radioactivity and Radioactive Materials

- Lightbulb = Has the ability to emit light



Light

Lumen (lm) or Watt (W)

► Unit of light bulb brightness



Lux (lx)

► Unit of brightness

- **Radioactive materials** = Have the ability to emit radiation (radioactivity)



Radiation



Becquerel (Bq)

► Unit of radioactivity

Conversion factor

Sievert (Sv)

► Unit of radiation exposure dose that a person receives

*Sievert is associated with radiation effects.

Units of Radiation and Radioactivity



Radioactive materials



Survey meter

This rock has **radioactivity** (the ability to emit radiation).

Becquerel (Bq)

Unit for intensity of radiation:
one nucleus decays (disintegrates) per second = 1 becquerel

Sievert (Sv)

Unit of radiation exposure dose which a person receives:
associated with radiation effects

Exposure Dose from Natural and Artificial Radiation

Natural radiation (in Japan)

From outer
space
0.3mSv



From foods
0.99mSv



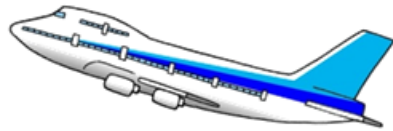
From radon and
thoron in the air
0.47mSv

From the ground
0.33mSv



Annual dose from natural radiation (Japanese average): 2.1 mSv

Annual dose from natural radiation (global average): 2.4 mSv



Tokyo to New York
Air travel (round trip) **0.08~**
0.11mSv

Artificial radiation



CT scan **2.4~**
(single scan) **12.9mSv**



Chest X-ray scan (single scan) **0.06mSv**

mSv: millisieverts

Sources: Prepared based on the 2008 UNSCEAR (United Nations Scientific Committee on the Effects of Atomic Radiation) Report; "Environmental Radiation in Daily Life (Calculation of National Doses), ver. 3" (2020), Nuclear Safety Research Association; and ICRP (International Commission on Radiological Protection) 103, etc.

Nuclear Disasters

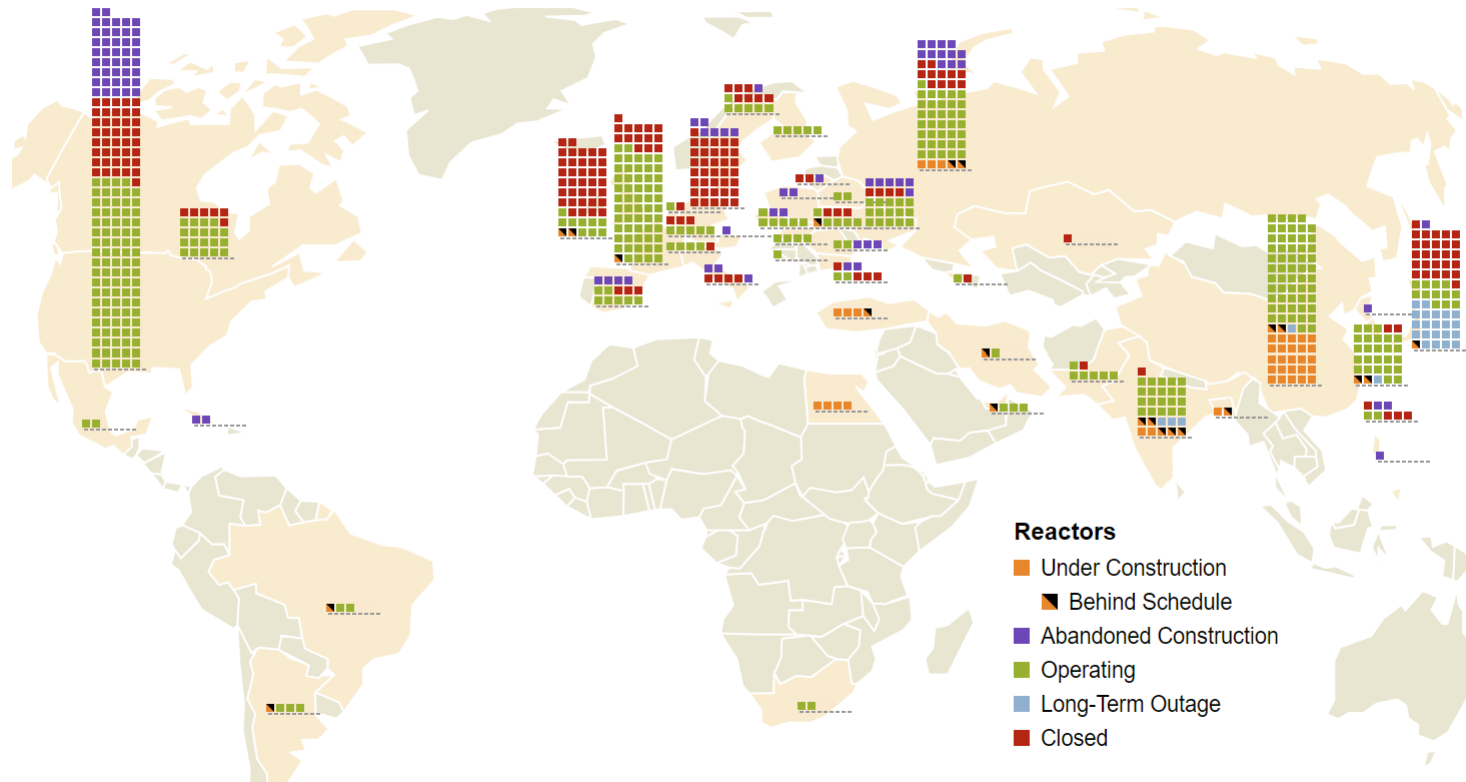
A nuclear emergency/ Disaster is a result of the release of radioactive materials, injurious radiation, or a combination of both. It occurs during the process of release of radiation or radioactive material either during the nuclear events which may include the explosion of a Radiological Dispersal Device (RDD), nuclear weapons, Improvised Nuclear Device (IND), or during the working of nuclear reactors.

Examples of nuclear disasters

- **Fukushima Daiichi nuclear disaster (2011) – Japan**
- **Chernobyl disaster (1986) - Russia**
- **Three Mile Island accident (1979) - Harrisburg, Pennsylvania**
- **SL-1 accident (1961) - Idaho**

Nuclear Power Reactors in the World

by Status, as of 2 March 2024.



Go to this link <https://www.worldnuclearreport.org/reactors.html#tab=iso;>

Check the following,

1. Which country has the highest nuclear reactor?
2. How many does India have?

Causes of nuclear and radiological emergencies

Nuclear and radiological emergencies may occur due to the following:

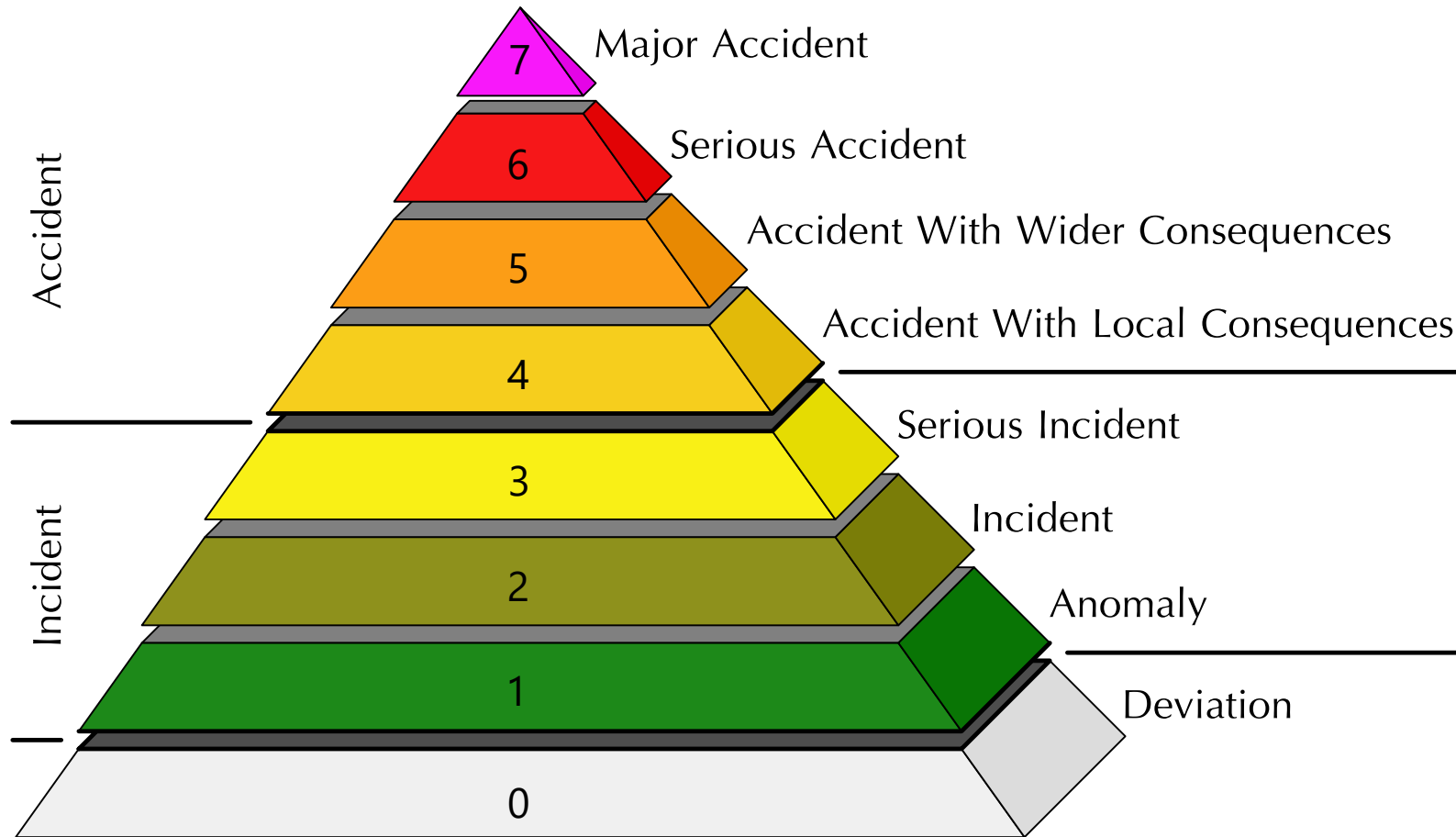
- 1. Intentional use of nuclear weapons in the event of war** (For example, the atomic bomb dropped on Hiroshima, Japan, in 1945, containing only about 64 kg (140 pounds) of highly enriched uranium, released energy equaling about 15 kilotons of chemical explosive)
- 2. Accidents in nuclear power projects** (Fukushima Daiichi nuclear disaster in 2011)
- 3. Accidents in handling radiation sources** (Radiation emergencies may result from the misuse of radioactive sources during industrial, medical, or research applications, accidental exposure to uncontrolled (abandoned, lost, or stolen) radiation sources, accidents during transport of radioactive materials, but also can be combined with conventional emergencies (a fire or a release of chemical substances), natural disasters, military conflicts, or malicious acts involving radiation sources).

Fukushima Daiichi nuclear disaster (2011)

- **March 11, 2011: A massive earthquake (magnitude 9.0) strikes off the coast of Japan.**
- **Earthquake triggers a powerful tsunami with waves exceeding 10 meters.**
- **Tsunami inundates the Fukushima Daiichi nuclear power plant, disabling critical cooling systems.**
- **Loss of cooling system leads to reactor meltdowns in three units (Units 1, 2, and 3).**
- **Radioactive materials are released into the atmosphere, contaminating surrounding areas.**
- **Evacuation zones established around the power plant.**



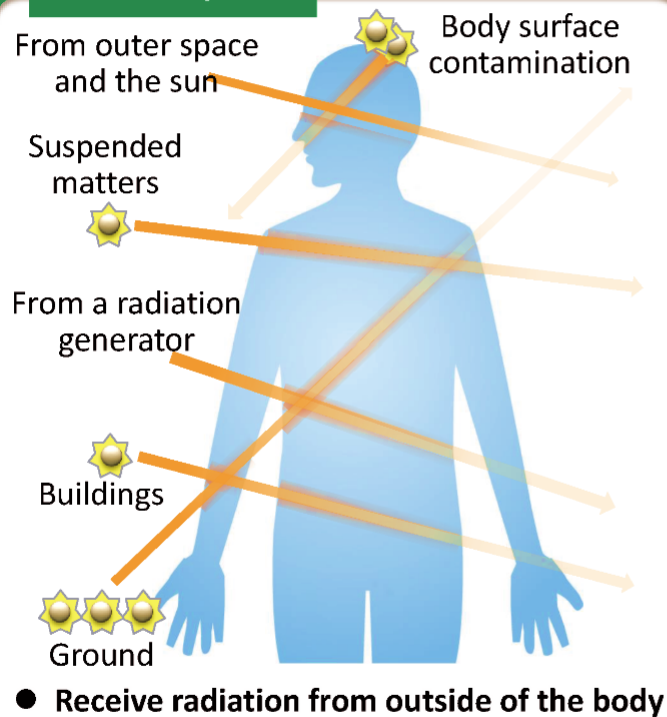
The International Nuclear and Radiological Event Scale (INES) was introduced in 1990 by the International Atomic Energy Agency (IAEA) to enable prompt communication of safety-significant information in case of nuclear accidents.



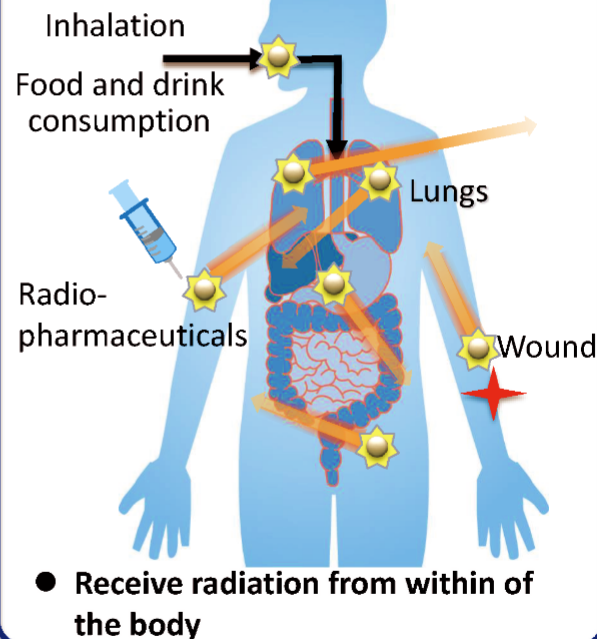
Exposure Routes

Internal and External Exposure

External exposure



Internal exposure



The body is equally exposed to radiation in both cases.



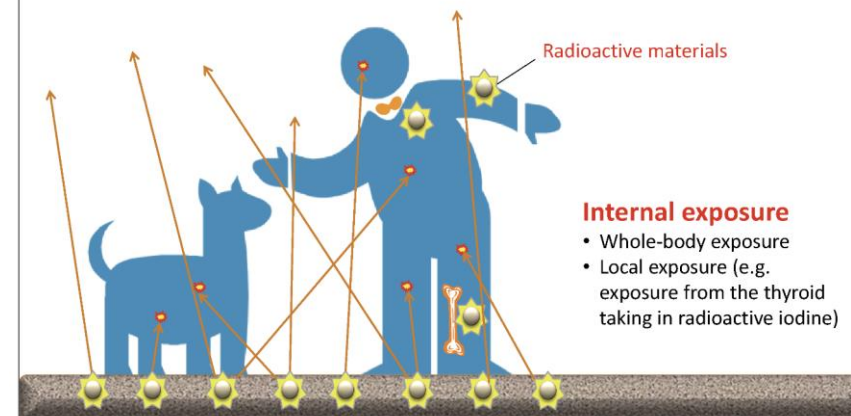
"Radiation exposure" refers to the situation where the body is exposed to radiation. There are two types of radiation exposure, "internal exposure" and "external exposure."

Exposure Routes

Various Forms of Exposure

External exposure

- Whole-body exposure
- Local exposure (e.g. exposure by X-ray examination or local body surface contamination)



Exposure Routes

Internal Exposure

(i) Ingestion

From the mouth (swallowing)
Absorption through the digestive tract

(ii) Inhalation

Incorporation from the respiratory airways
Absorption from the lungs and the surface of the airways

(iii) Percutaneous absorption

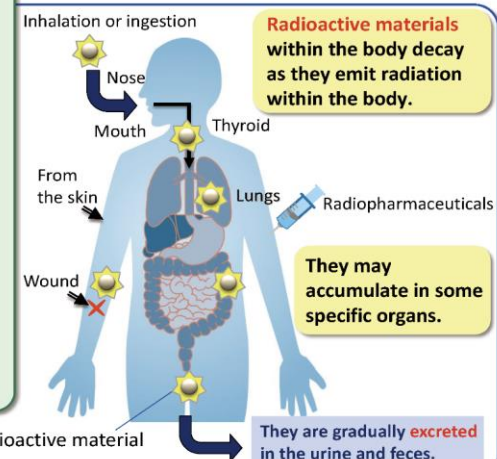
Absorption from the skin

(iv) Wound contamination

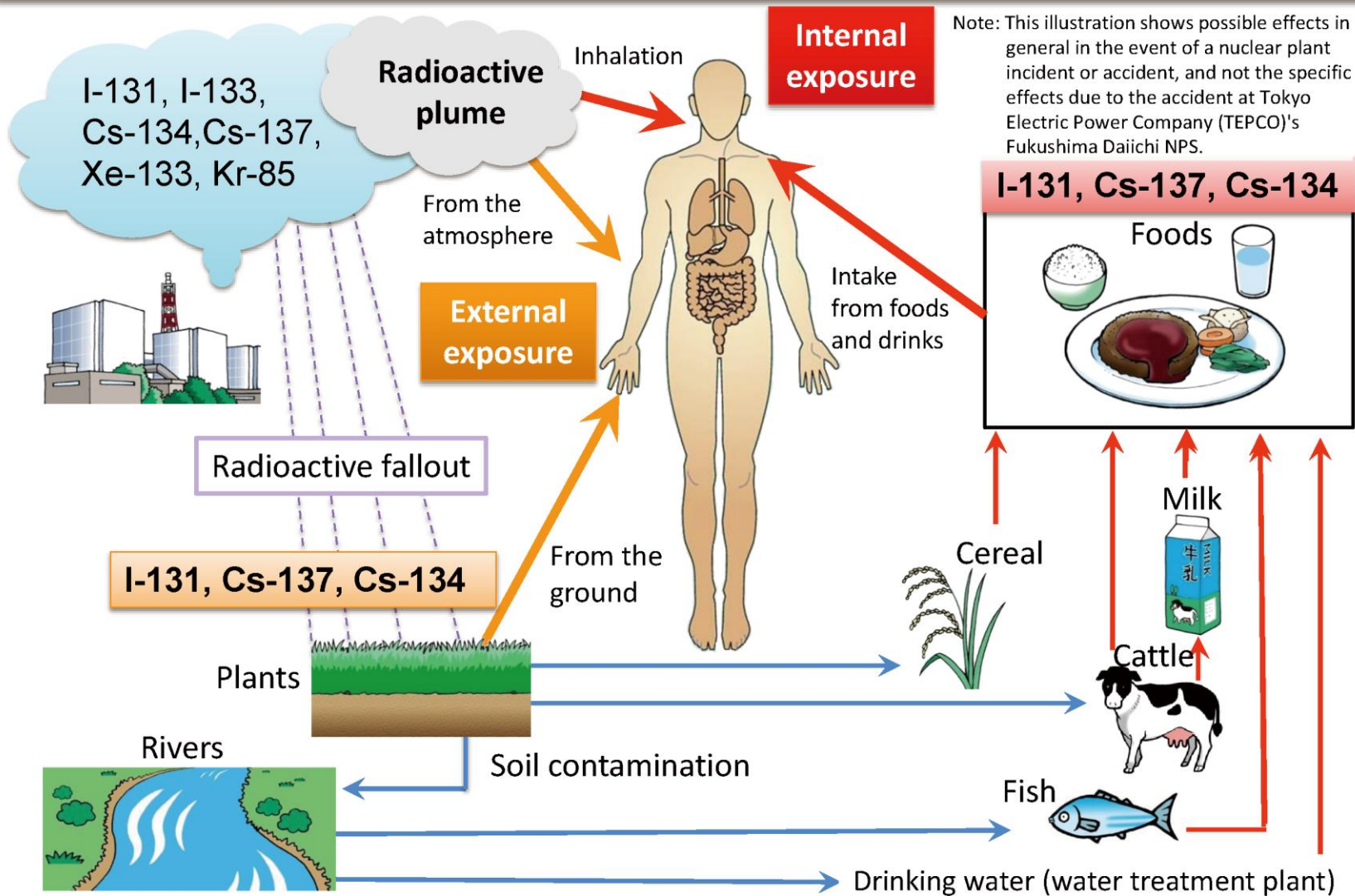
Contamination from a wound

(v) Intake of radiopharmaceuticals

Injection, oral administration (→ (i))
Inhalation of gas (→ (ii))



Effects of Reactor Accidents



Exposure Modes and Effects

High-dose exposure

(Exposed to a large amount of radiation)

Low-dose exposure

(Exposed to a small amount of radiation)

Acute exposure

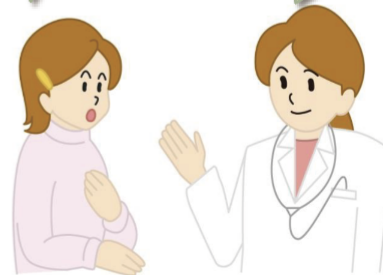
(Radiation exposure on one occasion or in a short time)

Chronic exposure

(Radiation exposure over a long period of time)

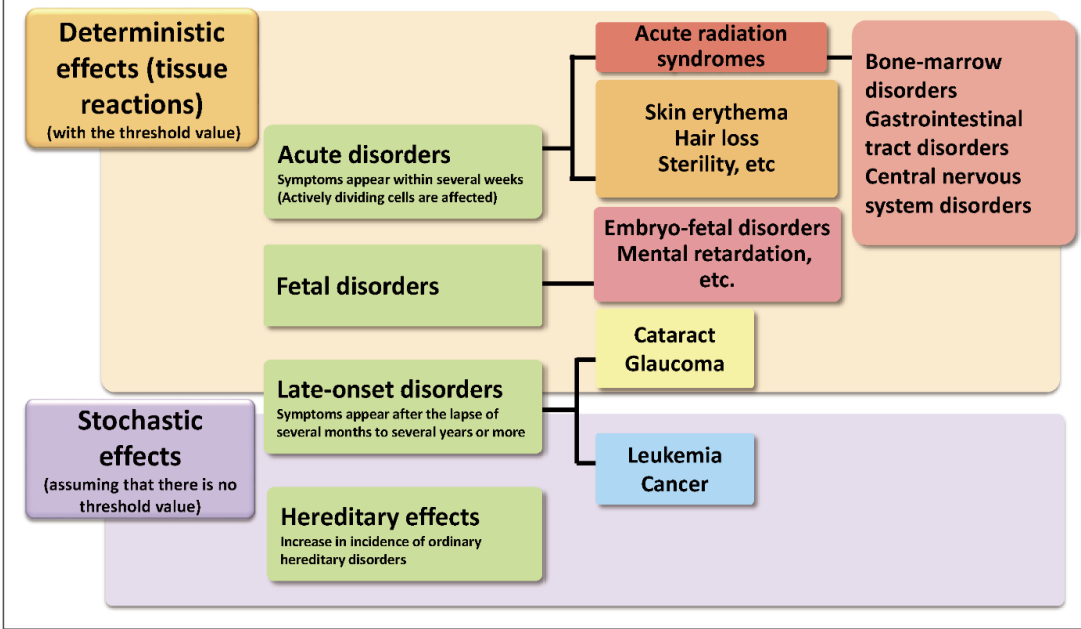
Skin injury,
nausea, hair
loss?

Acute disorders
appear when having
been exposed to a
large amount of
radiation in a short
time.



Types of Effects

► Consideration is to be given to what health effects arise after radiation exposure, the amount of exposure, parts exposed to radiation (whole-body exposure or local exposure), and the exposure situation over time (acute or chronic).



Classification of Radiation Effects

		Incubation period	e.g.	Mechanism of how radiation effects appear
Categories of effects	Physical effects	Within several weeks = Acute effects (early effects)	Acute radiation syndromes* ¹ Acute skin disease	Deterministic effects (tissue reactions) caused by cell deaths or cell degeneration* ² 
		After the lapse of several months = Late effects	Abnormal fetal development (malformation)	Stochastic effects due to mutation 
			Opacity of the lens	
	Heritable effects	Cancer and leukemia		
		Hereditary disorders		

*1: Major symptoms are vomiting within several hours after exposure, diarrhea continuing for several days to several weeks, decrease of the number of blood cells, bleeding, hair loss, transient male sterility, etc.
*2: Deterministic effects do not appear unless having been exposed to radiation exceeding a certain dose level.

Threshold Limit Value (TLV): The maximum concentration of an ingredient or substance that a person can be exposed to over a specified period without experiencing adverse effects.

Risks of Health Effects of Radiation

Risks

- The magnitude of the influence of damage
- The possibility of any damage (probability)
- The combination of the magnitude of the influence and the possibility (probability)

Quantitatively expressed probability, not focused on the actual existence of damage

In particular, when considering stochastic effects of radiation,

**Risks =
The probability (of contracting cancer or dying of cancer)**

Having risks  (Surely) being subject to damage

Risk assessment

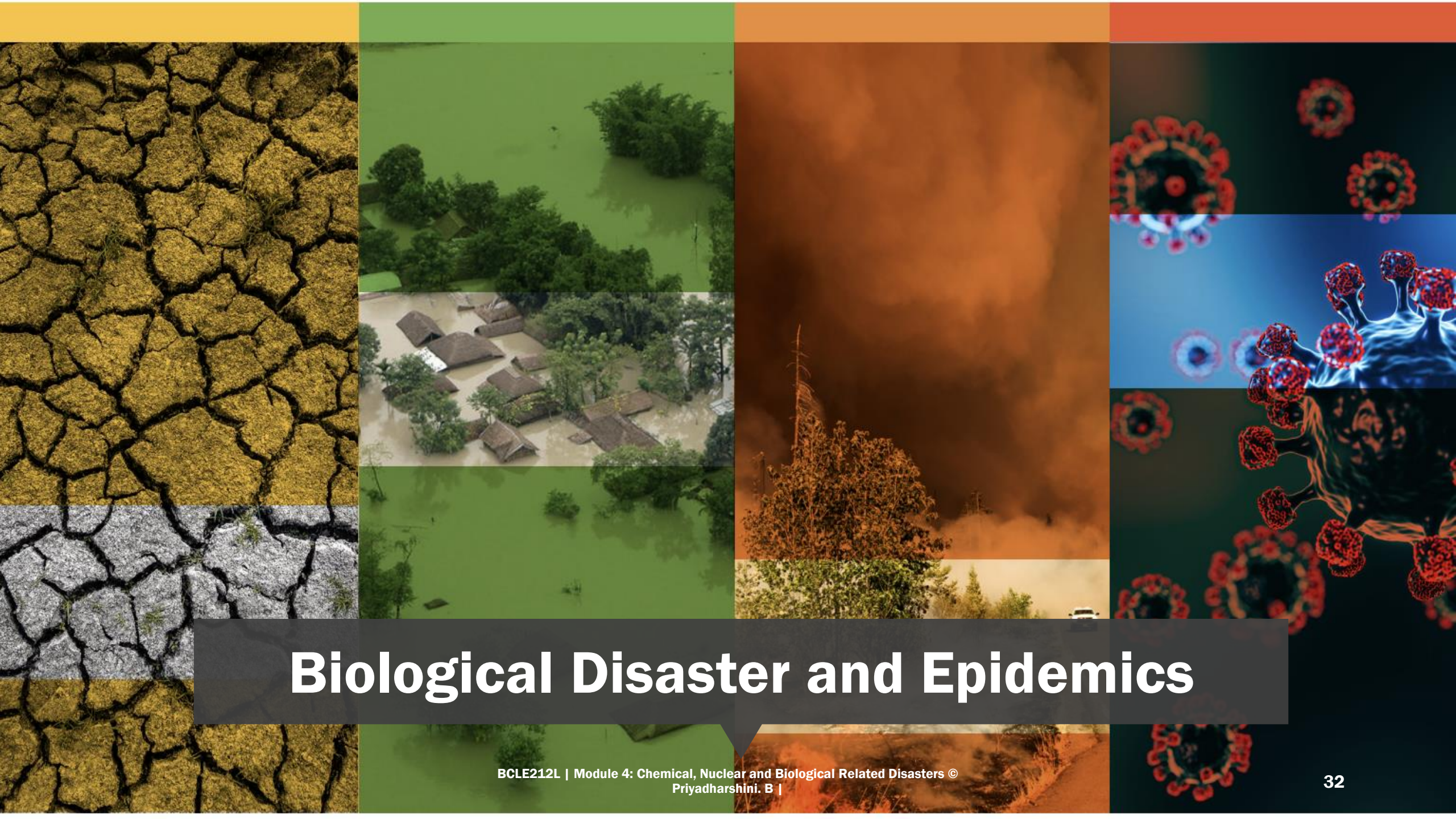
DO's

1. Go indoors. Stay inside.
2. Switch on the radio/television and look out for public announcements from your local authority.
3. Close doors/windows.
4. Cover all food, water and consume only such covered items.
5. If in the open, cover your face and body with a wet handkerchief, towel, dhoti or sari. Return home, change/remove clothes. Have a complete wash and use fresh clothing.
6. Extend full cooperation to local authorities and obey their instructions completely -- be it for taking medication, evacuation, etc.
7. You must be aware of nuclear radiation hazard. Discuss on Nuclear radiation safety among children and family members, to reduce their fear of radiation.

NUCLEAR: DO'S & DONT'S

DONT's

1. Do not panic.
2. Do not believe in rumours passed on by word of mouth from one person to another.
3. Do not stay outside/or go outside.
4. As far as possible, AVOID water from open wells/ponds; exposed crops and vegetables; food, water or milk from outside.
5. Do not disobey any instruction of the district or civil defence authorities who would be doing their best to ensure the safety of you, your family and your property.



Biological Disaster and Epidemics

Biological Disasters

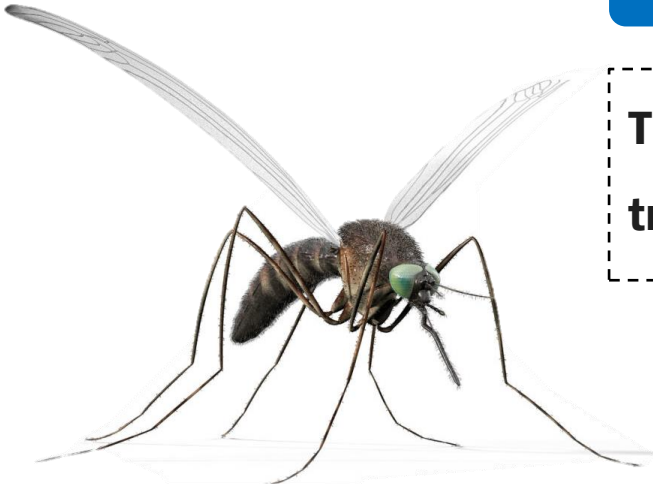
Biological disasters are causative of processes or phenomena of organic origin or conveyed by **biological vectors**, including exposure to pathogenic micro-organisms, toxins, and **bioactive substances** that may cause loss of life, injury, illness or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage.

Impacts

Bioactive substances are a broad category of natural or synthetic compounds found in living organisms that can induce a reaction in living tissues or cells.

Bioactive substances

Biological vectors



These actively carry the pathogen within their bodies, often multiplying it before transmitting it to a new host.

Arthropod vectors

Some mosquitoes may harbor pathogens that may infect humans and cause disease. Examples are:

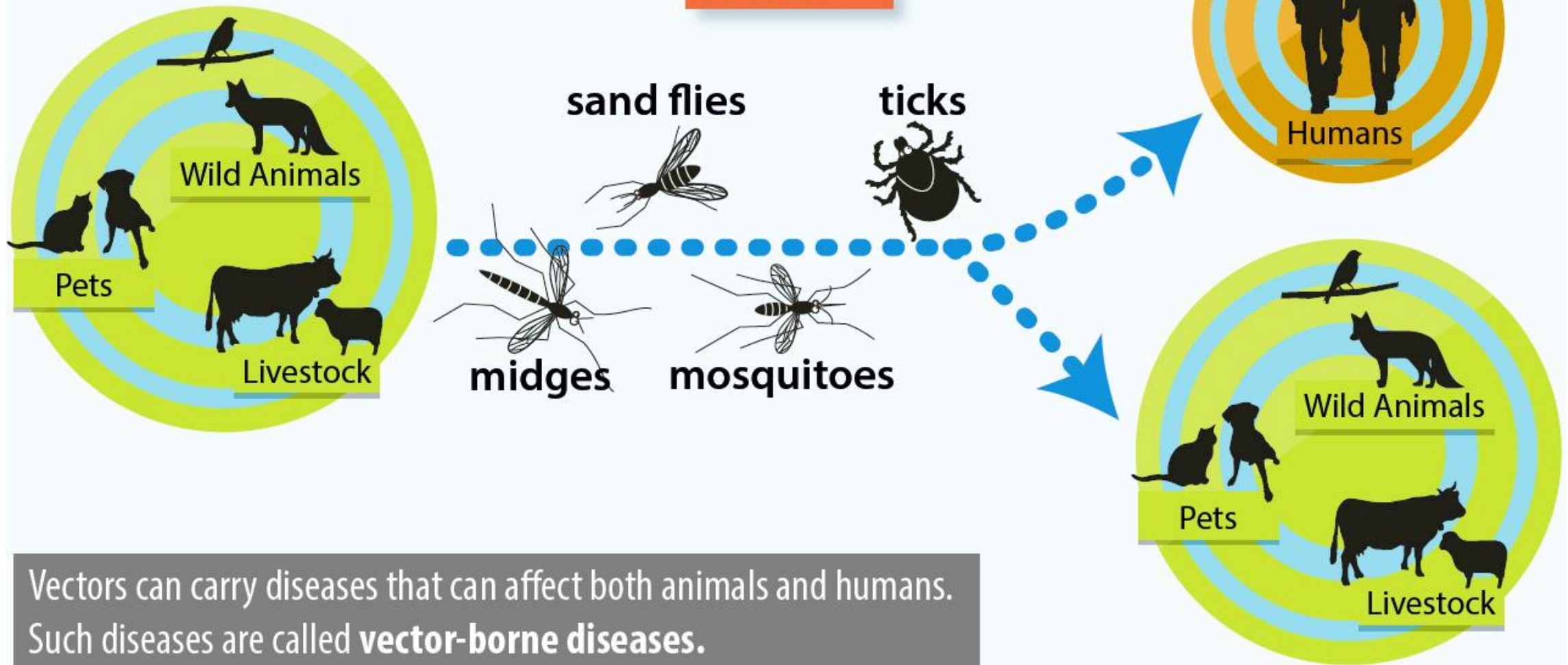
- Aedes: Chikungunya, Zika, Dengue, Yellow Fever, Lymphatic Filariasis
- Anopheles: Malaria, Lymphatic Filariasis
- Culex: West Nile Fever, Lymphatic Filariasis, Japanese Encephalitis

Rodents can carry and transmit a variety of diseases that can be harmful to humans. Examples of diseases spread by rodents include:

- Salmonella
- Leptospirosis
- Hantavirus
- Plague
- Rat-bite fever



Vectors



Vectors can carry diseases that can affect both animals and humans. Such diseases are called **vector-borne diseases**.

ENDEMIC

constantly present in a certain population or region, with relatively low spread (or there may be periods when it doesn't affect people at all, if it is only present in the environment).



Example: Malaria, Dengue Fever

EPIDEMIC

when there is a sudden increase in cases spreading through a large population like a country (an outbreak is similar, but usually covers a smaller geographic area).



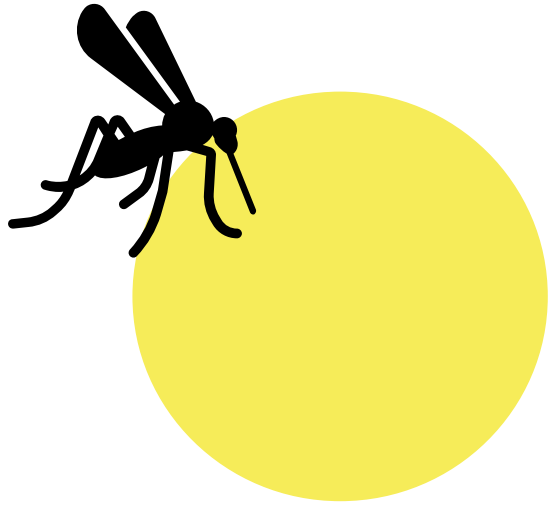
Example: Cholera, Plague, Japanese Encephalitis (JE)/Acute Encephalitis Syndrome (AES)

PANDEMIC

when there is a sudden increase in cases spreading through several countries, continents, or the whole world.



Example: Influenza H1N1 (Swine Flu) or Covid 19, Spanish Flu (1918)



Selected biological disasters in India

Extreme weather events like floods, resulting from monsoon rains, create a conducive environment for vector-borne diseases such as Dengue and Japanese encephalitis. The rising temperature increases the survival time of bacteria in the water which causes waterborne diseases like cholera and diarrhoeal disease.

1. Dengue

Dengue is a viral disease transmitted by Aedes mosquitoes.

Four serotypes of the dengue virus exist (DENV 1-4).

Dengue is a prevalent arbovirus in tropical and subtropical regions.

Increasing number of dengue cases over the past 20 years (Source: NCDC)

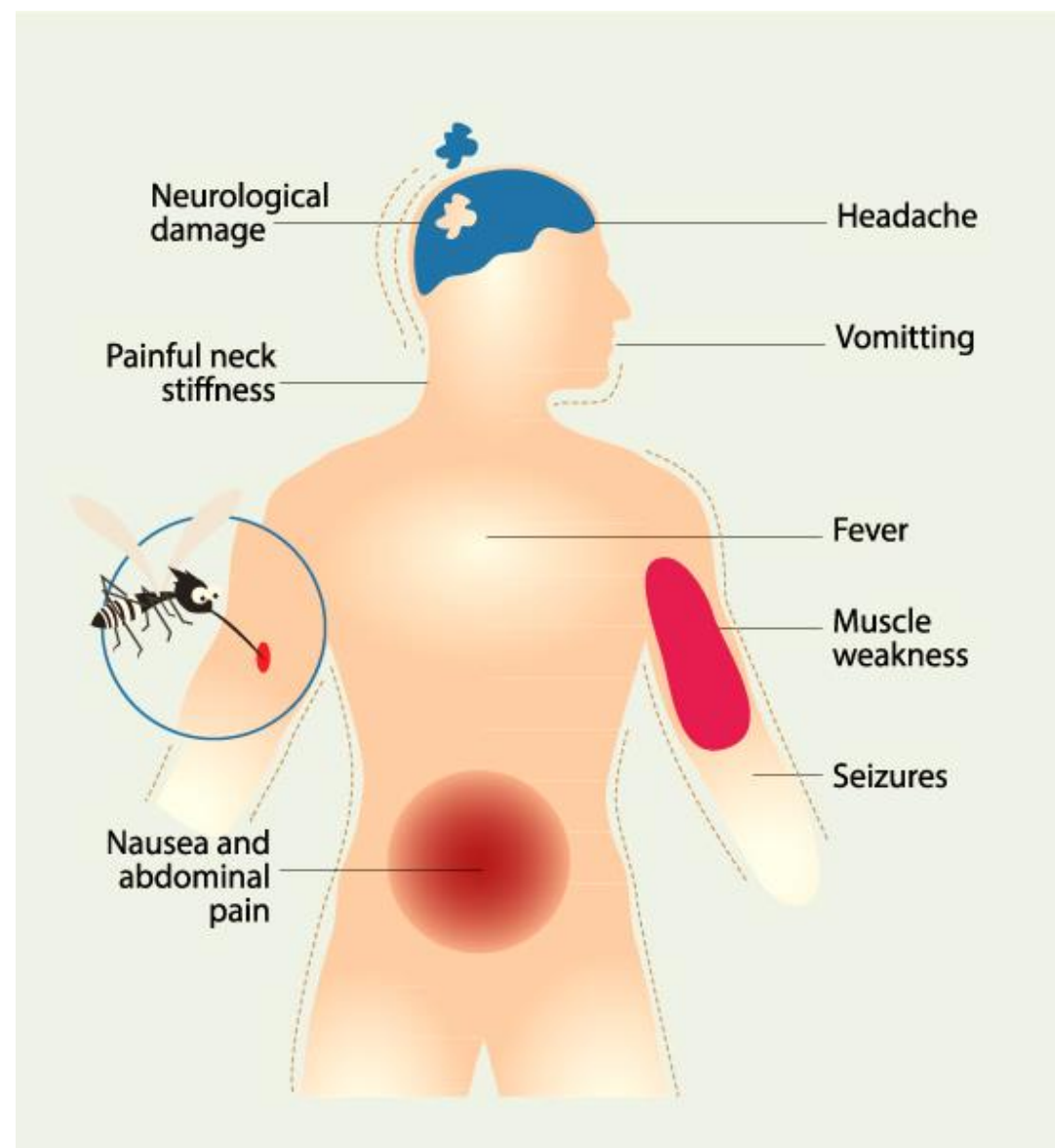
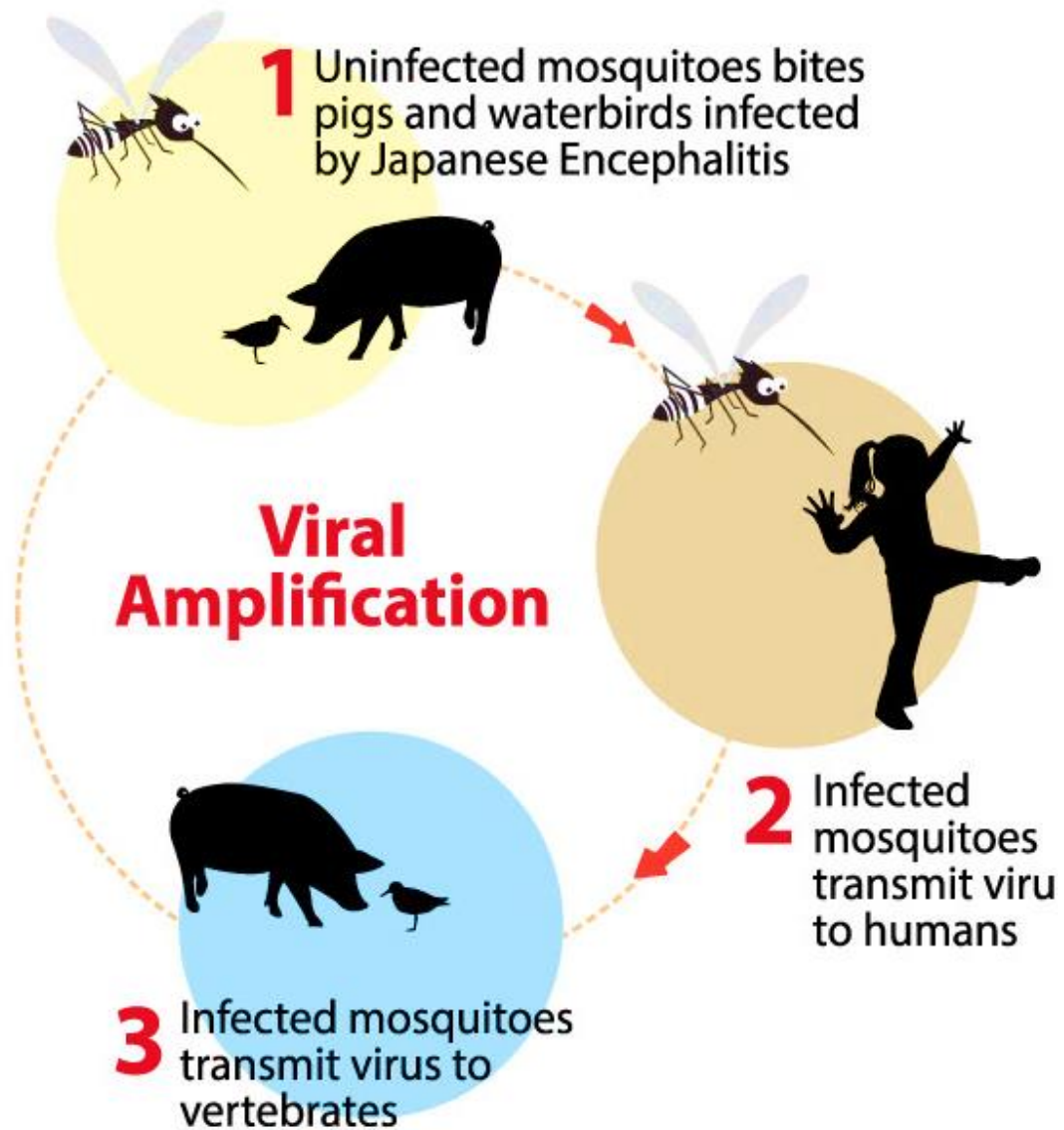
Complex interplay between host, vector, and virus

Climatic factors significantly influence dengue transmission. Warmer temperatures lead to:

- Increased mosquito survival and reproduction
- Faster viral multiplication

2. Japanese Encephalitis (JE)

- Japanese encephalitis (JE) is a mosquito-borne viral infection that can cause inflammation of the brain (encephalitis).
- JE: A common mosquito-borne flavivirus encephalitis
- Found in eastern and southern Asia, affecting over 3 billion people
- Most JE infections cause no symptoms (asymptomatic).
- It is a major public health concern in India, particularly in children.
- First JE case reported in India: 1955 (South India)
- Spread to North India: 1978
- Extensive and recurrent outbreaks since then
- Significant morbidity and mortality (though underreported)
- Estimated 50,000 cases and 15,000 deaths annually in Asia (Tiwari et al., 2012)
- Highest risk: Children aged 3-6 years
- One-third of patients die
- Half of the survivors suffer from long-term neuropsychiatric problems





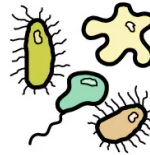
3. COVID-19

- **COVID-19, caused by SARS-CoV-2, is a global pandemic that reached India in January 2020.**
- **By mid-2020, India became a global hotspot with the highest number of daily new cases, second only to the USA.**
- **As of February 7, 2021, India had over 10.84 million confirmed cases and over 155,000 deaths, making it the worst-hit country in Asia and second globally. ([sources can be mentioned but not displayed due to policy])**
- **The pandemic severely impacted the Indian economy, leading to its first negative growth rate in decades.**

BIOLOGICAL: DO AND DON'TS

BEFORE THE DISASTER

- Plan for Family Biological Disaster Plan.
- Preparation by ensuring Prevention measures:-Personal cleanliness - daily bath, don't grow long nails and wear clean clothes.
- Hand Hygiene (Wash hands with soap and water before preparing food or eating, after passing stools, coughing or sneezing).
- Eat nutritious and balanced food.
- Immunisation state should be upto date.
- Prevent overcrowding.
- Good ventilation.
- Protect from hot and cold weather.
- Health Education.
- Surveillance.
- Take a First Aid and Cardio-Pulmonary Resuscitation (CPR) training.
- Subscribe to a Medical Insurance Plan.



Washing your Hands



DIARRHOEAL GROUP OF DISEASES INCLUDING CHOLERA

Do's

- Hand Hygiene.
- Encourage drinking of water from a safe source or water that has been disinfected (chlorinated). Add bleaching powder in all community wells at regular intervals. Use water pumped out from India Mark II hand pumps, if installed in the village/community.
- Drink boiled potable water in an emergency that has been boiled for at least 15 minutes and consumed it the same day.
- Promote storage of water in narrow-mouthed container.
- Cook food thoroughly especially meat, poultry, eggs, and seafood until it is steaming, and eat it while it is still hot.
- Ensure cooked meat and poultry is safe and no part of the meat discolored or foul smelling, or in the case of egg, their shells are not cracked.
- If food is not eaten immediately, reheat cooked until it is steaming hot before serving.
- Keep food items covered.
- Increase fluid intake as soon as diarrhoea starts by drinking ORS solution or homemade preparation of Table Salt 5 grams (1 teaspoon) in and 20 grams (4 teaspoons) of Sugar dissolved in 1 liter of drinking water.
- Encourage banana eating, which provides potassium.
- Continue feeding children when they are sick and to continue breastfeeding if the child is being breastfed.
- Refer the diarrhoea case to the nearest health facility in case of the following: Child is irritable, restless or lethargic or unconscious: eating or drinking poorly; the child has marked thirst; the child has a fever or blood in the stool.

Don't

- Do not drink water from unsafe sources.
- Do not eat uncooked food unless it is peeled or shelled.
- Do not leave cooked food at room temperature longer than 2 hours.
- Do not consume cut fruits from vendors.
- Do not defecate in open area.
- Do not give access to rats and houseflies in your premises.

RESPIRATORY GROUP OF DISEASES LIKE TUBERCULOSIS, INFLUENZA, CHICKENPOX, MENINGITIS

Do's and Don'ts:

Avoid close contact with people who are having respiratory illness.

The sick person should stay at home, and avoid going into the community, school/office, public places for at least 24 hours after symptoms have resolved.

Sick persons at home should keep distance from others.

Respiratory Hygiene/Cough Etiquette.

Cover the nose/mouth with a handkerchief/ tissue paper when coughing or sneezing which should be disposed off in dustbins;

Perform hand hygiene (e.g., frequent hand washing with soap and water, alcohol-based hand rub, or antiseptic hand wash) and thoroughly dried preferably using disposable tissue/ paper/ towel after contact after having contact with respiratory secretions and contaminated objects/materials.

Triple layer surgical Mask of standard and certified make should be worn by Suspected/ probable/confirmed cases of influenza or by the care provider in home care settings and close family contacts of such cases undergoing home care.

Get plenty of sleep, be physically active, manage your stress, drink plenty of fluids, and eat nutritious food.

Avoid smoking.

Persons who have difficulty breathing or shortness of breath should seek immediate medical attention and report to the nearby hospital.

If sick persons must go into the community (e.g., to seek medical care), then they should wear a face mask or use a handkerchief or tissues to cover any coughing and sneezing so as to reduce the risk of spreading the infection in the community.

Immunization status should be upto date as per National Universal Immunisation Programme.

MOSQUITO BORNE DISEASES LIKE MALARIA, DENGUE, FILARIA, CHIKUNGUNYA

Do's

Follow “sun-down sleeves-down” approach. Wear clothes that cover your arms and legs.

Prevent water collections on the ground and other places to prevent malaria breeding.

Empty water containers at least once a week.

Remove water from coolers from time to time.

Cover and seal any septic tanks.

Use Mosquito Nets preferably Insecticide Treated Bed Nets (ITBN).

Apply insect repellants while sleeping to keep away mosquitoes.

Seek medical advice in case of rashes, mental irritation or unconsciousness.

Don'ts

Do not encourage children to wear shorts and half-sleeved clothing.

Do not allow water to stagnate.

Do not allow discarded items to accumulate such as tires, tubes, empty coconut shells, household items, and objects wherein water may collect.

Do not bathe in village ponds and allow cattle to take bath in the same pond.

An illustration depicting a massive swarm of locusts attacking agricultural crops. The locusts are shown in various sizes and colors (dark brown, light brown, and orange) flying and crawling over the plants. The background features stylized clouds and more locusts in flight. A large black circle with a white border is positioned on the right side of the image, containing the text 'PEST ATTACK'.

PEST ATTACK

What is a pest attack?

- A rapid reproduction and spread of pests
- Pests can be insects, rodents, weeds, and microorganisms
- Damage crops, livestock, or property

Impact of Pest Attacks

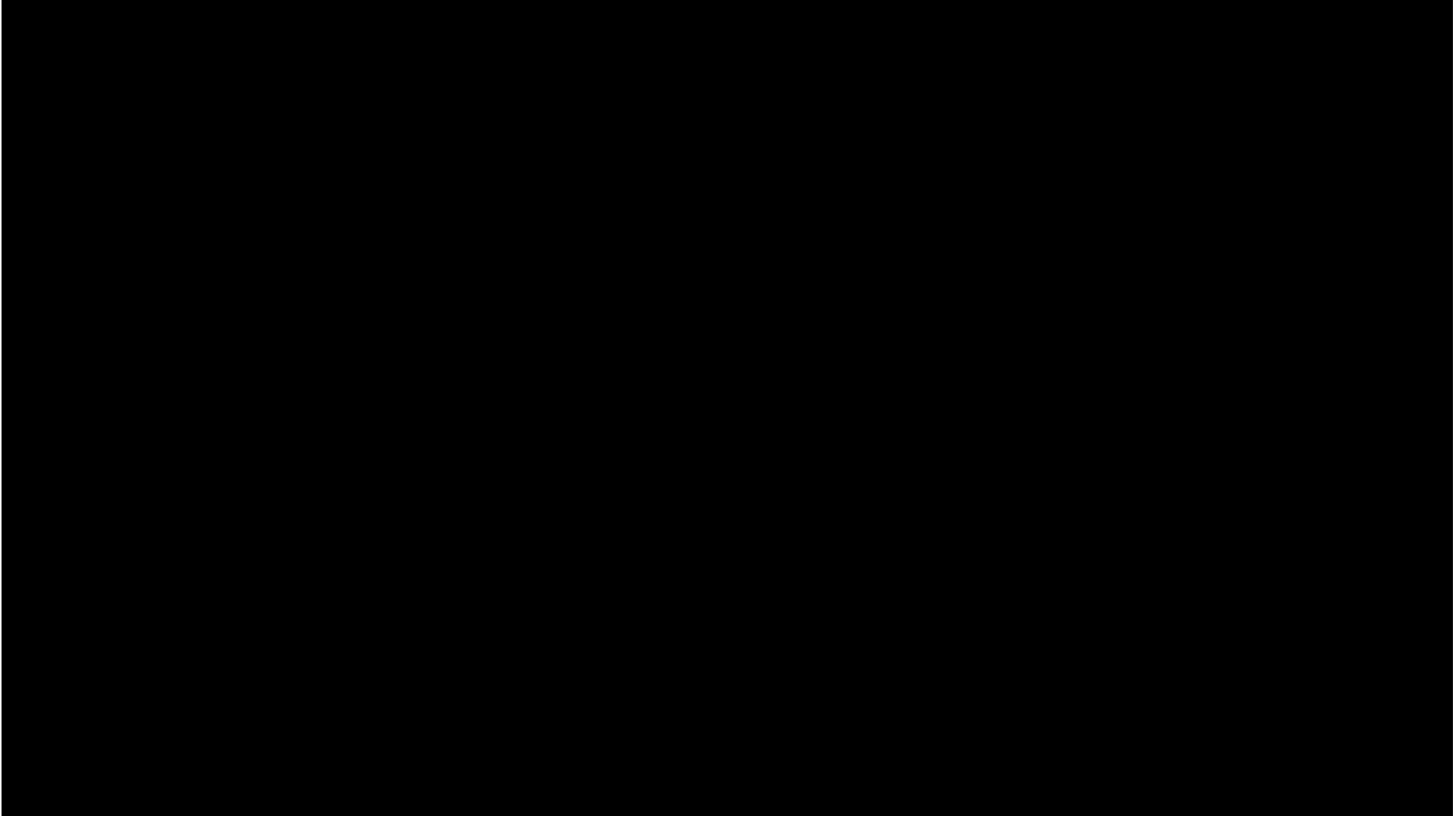
- Devastating impact on agriculture
- Significant crop losses and reduced yields
- Damage buildings and structures
- Spread diseases to humans and animals

Controlling Pest Attacks

- Preventative measures (sanitation, habitat modification, pest-resistant crops)
- Biological control (natural predators or parasites)
- Chemical control (pesticides)

Factors contributing to Pest Attacks

- Favorable weather conditions (warm, humid)
- Lack of natural predators
- Monoculture farming
- Improper storage of food and materials



Source: https://www.youtube.com/watch?v=_AhWLQCDffA&t=2s

CATTLE EPIDEMICS



What is a Cattle Epidemic?

- Rapid spread of infectious disease in cattle populations
- Can be caused by viruses, bacteria, or parasites
- Highly contagious and can cause widespread illness and death

Examples of Cattle Epidemics

- Foot-and-mouth disease (FMD): Causes fever, blisters on the mouth and feet
- Bovine spongiform encephalopathy (BSE) - Mad Cow Disease: Fatal nervous system disease
- Bovine viral diarrhea (BVD): Causes respiratory illness, diarrhea, and birth defects
- Bovine tuberculosis (BTB): Chronic bacterial infection

Impact of Cattle Epidemics

- Significant economic losses for farmers
- Reduced milk and meat production
- Trade restrictions can be imposed
- Public health concerns (zoonoses)

Preventing and Controlling Cattle Epidemics

- **Biosecurity measures (quarantine, hygiene)**

These measures aim to prevent the introduction of pathogens into cattle herds.

- **Vaccination programs**

vaccines can help to protect cattle from some of the most common and devastating cattle epidemics.

- **Early detection and reporting**

Early detection of an epidemic is essential for preventing its spread.

Farmers should be vigilant for signs of disease in their cattle and report any suspected cases to the authorities immediately.

- **Movement restrictions**

During an epidemic, restrictions may be placed on the movement of cattle to prevent the spread of the disease.



FOOD POISONING

Food poisoning

Food poisoning, also referred to as foodborne illness, is an **illness caused by consuming contaminated food or beverages**. This contamination can be caused by:

Bacteria: These are the most frequent culprits, including E. coli, Salmonella, and Staphylococcus aureus. They multiply rapidly on improperly stored or undercooked food.

Viruses: Norovirus is a common culprit that spreads through contaminated food handlers.

Parasites: Less frequent than bacteria and viruses, parasites can enter the body through contaminated water or undercooked meat (e.g., giardia).

Toxins: Preformed toxins can be found naturally in certain foods, like shellfish, and cause food poisoning if consumed.

FIVE SIGNS of SEVERE FOOD POISONING

Do you have any of these symptoms? IF SO, SEE A DOCTOR!



Bloody diarrhea



Fever higher than
102°F



Vomiting so often you
can't keep liquids down



Dehydration



Diarrhea for more
than 3 days

4 Steps to Prevent Food Poisoning

Clean

Wash your hands and work surfaces before, during, and after preparing food. Germs can survive in many places around your kitchen, including your hands, utensils, cutting boards, and countertops.

Separate

Separate raw meat, chicken and other poultry, seafood, and eggs from ready-to-eat foods. Use separate cutting boards and keep raw meat away from other foods in your shopping cart and refrigerator.

Cook

Cook food to the safe internal temperature to kill harmful bacteria. Use a food thermometer.

Chill

Keep your refrigerator 40°F or below. Refrigerate leftovers within 2 hours of cooking (or within 1 hour if food is exposed to a temperature above 90°F, like in a hot car).



References

Reference materials for each slide are quoted at the right end of the PowerPoint.