



## Module -3

# TYPE OF HAZARDS Nuclear Hazards

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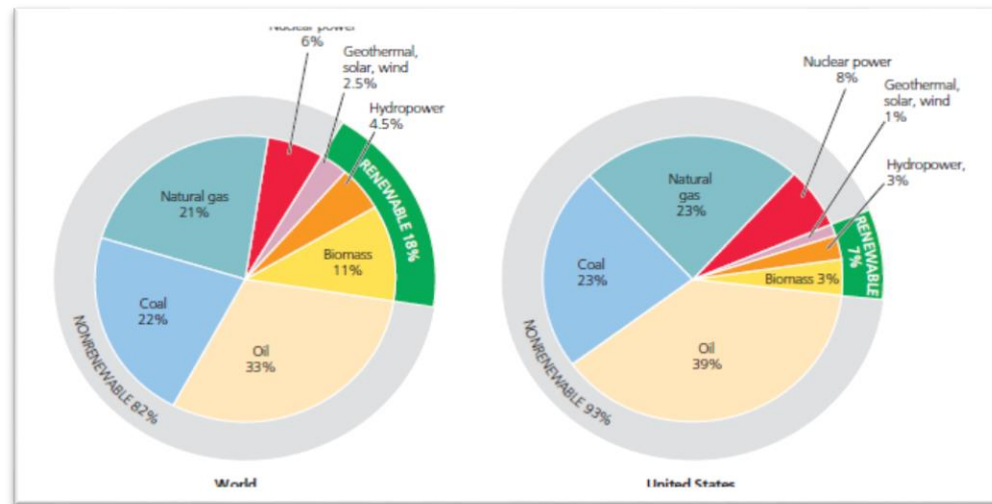
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# Types of Energy

## Renewable Energy resources

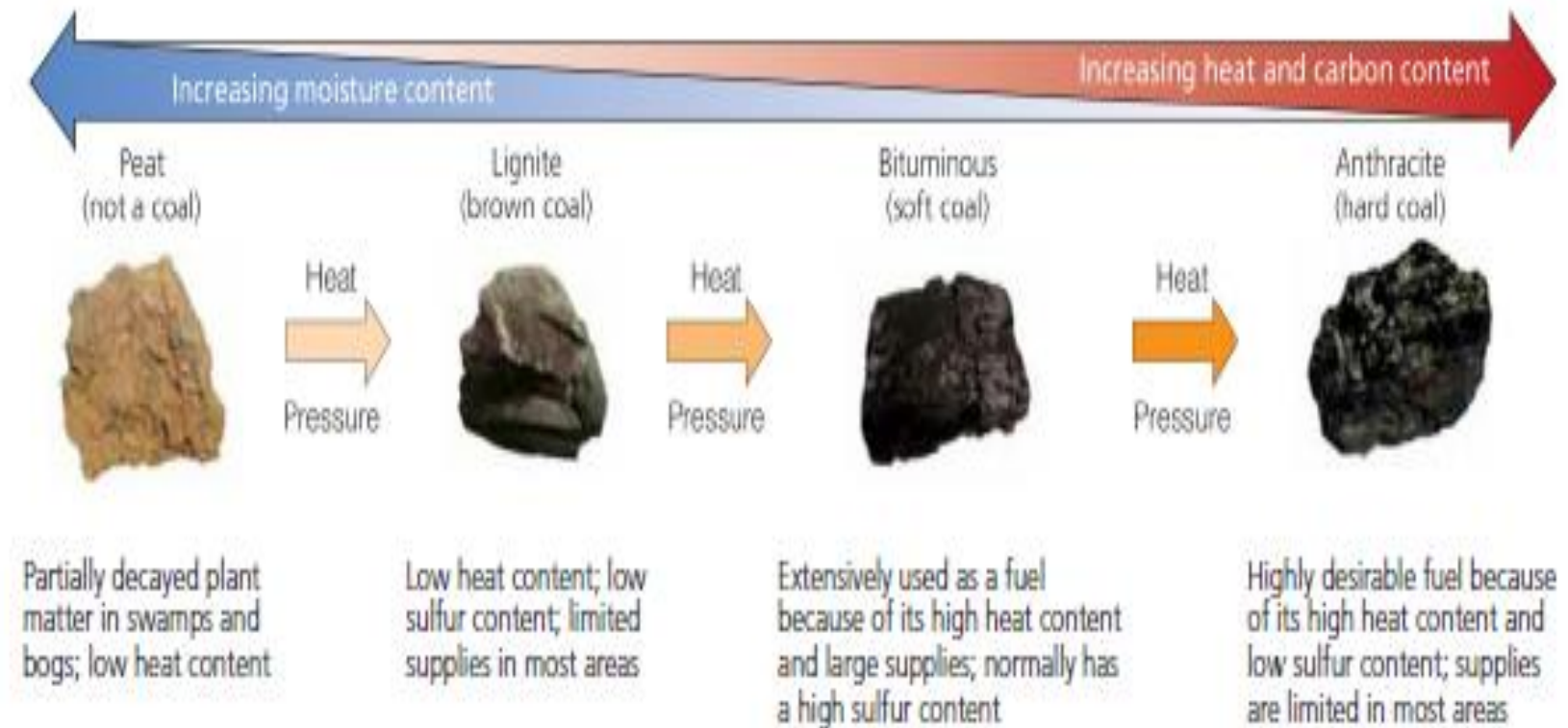
- ▶ Sun – solar energy
- ▶ Wind energy
- ▶ Hydro electrical
- ▶ Geothermal
- ▶ Ocean thermal
- ▶ Biomass energy



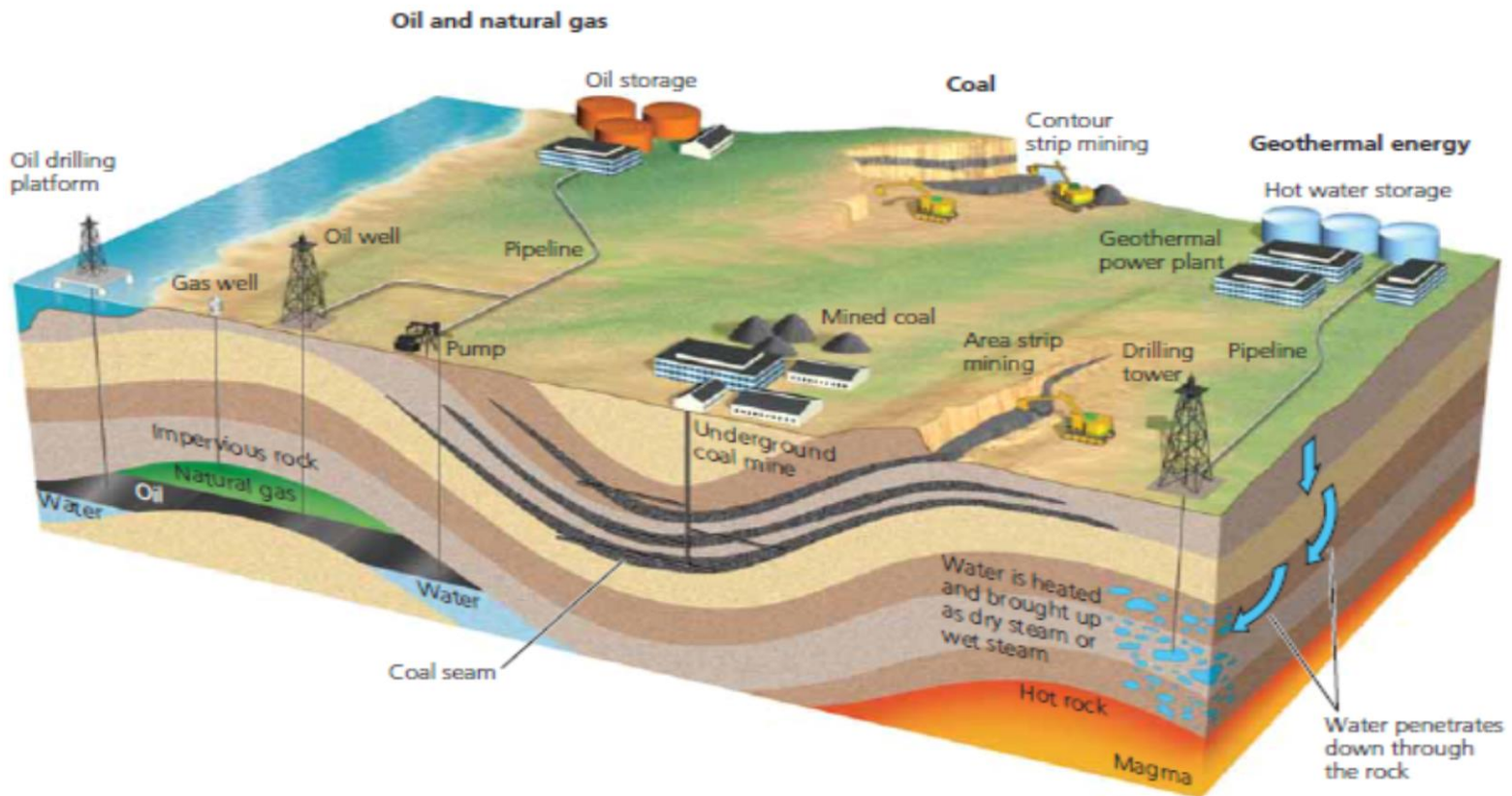
## Non-Renewable Energy resources

- ▶ SNG, LPG, CNG, Natural gas, fossil fuels, Petrol, Diesel

# Increase Carbon Value



# Oil and Natural



**Figure 13-2 Natural capital:** important nonrenewable energy resources that can be removed from the earth's crust are coal, oil, natural gas, and some forms of geothermal energy. Nonrenewable uranium ore is also extracted from the earth's crust and processed to increase its concentration of uranium-235, which can serve as a fuel in nuclear reactors to produce electricity. **Question:** Can you think of a time during a typical day when you are not directly or indirectly using one of these resources?



# Advantage & Disadvantage

## TRADE-OFFS

### Conventional Natural Gas

#### Advantages

Ample supplies

High net energy yield

Low cost

Less air pollution than other fossil fuels

Lower CO<sub>2</sub> emissions than other fossil fuels

Easily transported by pipeline

Low land use

Good fuel for fuel cells and gas turbines



Gas turbine



#### Disadvantages

Nonrenewable resource

Releases CO<sub>2</sub> when burned

Government subsidies

Environmental costs not included in market price

Methane (a greenhouse gas) can leak from pipelines

Difficult to transfer from one country to another

Can be shipped across ocean only as highly explosive LNG

Sometimes burned off and wasted at wells because of low price

## TRADE-OFFS

### Coal

#### Advantages

Ample supplies (225–900 years)

High net energy yield

Low cost

Well-developed technology

Air pollution can be reduced with improved technology



#### Disadvantages

Severe land disturbance, air pollution, and water pollution

Severe threat to human health when burned

Environmental costs not included in market price

Large government subsidies




High CO<sub>2</sub> emissions when produced and burned

Radioactive particle and toxic mercury emissions

# Conventional Vs Nuclear Energy



## TRADE-OFFS

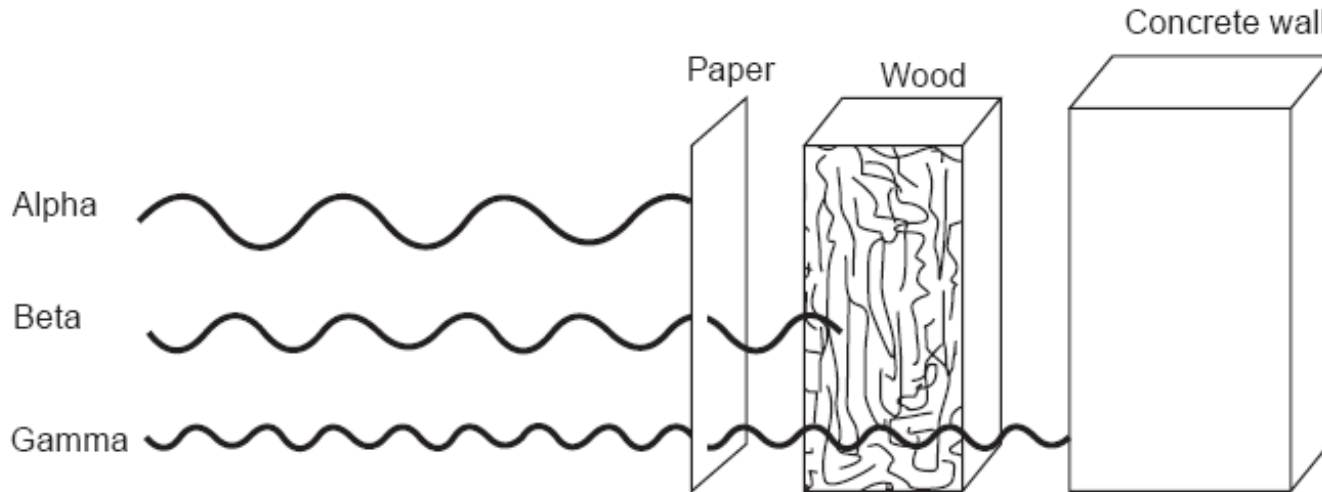
### Conventional Nuclear Fuel Cycle

Advantages		Disadvantages
Large fuel supply		Cannot compete economically without huge government subsidies
Low environmental impact (without accidents)		Low net energy yield
Emits 1/6 as much CO <sub>2</sub> as coal		High environmental impact (with major accidents)
Moderate land disruption and water pollution (without accidents)		Environmental costs not included in market price
Moderate land use		Risk of catastrophic accidents
Low risk of accidents because of multiple safety systems (except for Chernobyl-type reactors)		No widely acceptable solution for long-term storage of radioactive wastes
		Subject to terrorist attacks
		Spreads knowledge and technology for building nuclear weapons

## TRADE-OFFS

### Coal vs. Nuclear

Coal		Nuclear
Ample supply		Ample supply of uranium
High net energy yield		Low net energy yield
Very high air pollution		Low air pollution
High CO <sub>2</sub> emissions		Low CO <sub>2</sub> emissions
High land disruption from surface mining		Much lower land disruption from surface mining
High land use		Moderate land use
Low cost (with huge subsidies)		High cost (even with huge subsidies)



**1. Radioactive substances are present in nature.**

**2. They spontaneously give out fast moving particles, high energy radiations or both, until it forms a stable isotope.**

**Gamma rays – high energy electromagnetic radiation or ionization particles**

**Alpha – fast moving positively charged particles**

**Beta – High speed negatively charged electron.**

**Penetration power:  $\alpha < \beta < \gamma$**

# Sources and Effects of Radiations

## Sources:

- (i) **Natural sources:** Radon-222, Soil, rocks, air, water and food.
- (ii) **Anthropogenic Sources:** Nuclear power plant, Nuclear accidents, X-rays, Diagnostic kits, test laboratories.

## Effects of radiations:

- i) Genetic damage – DNA and chromosomes
- ii) somatic damage – Burns, miscarriages, eye cataract, cancer of bone, thyroid, breast, lungs and skin.

*Iodine( $I^{131}$ ) – Thyroid gland – Cancer*

*Strontium-90- leukemia or cancer of bone marrow.*



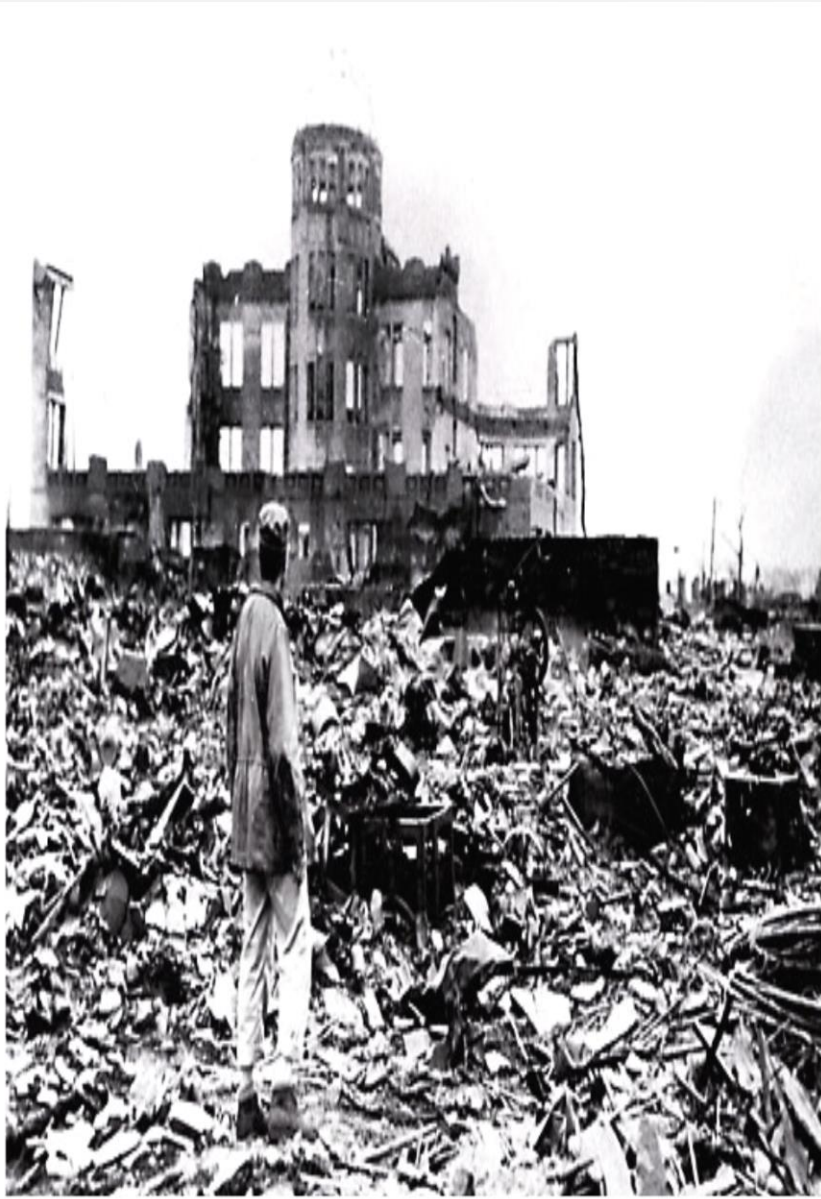
# Nuclear Hazards



# JAPAN Case Study- 1

- ▶ The atomic bomb named "**Little Boy**" was dropped on Hiroshima by the Enola Gay, a Boeing B-29 bomber, at 8:15 in the morning of **August 6, 1945**.
- ▶ "**Fat Man**" was dropped on **Nagasaki** 3 days later on **August, 9, 1945**.





The bombs killed as many as **1,40,000** people in Hiroshima and **80,000** in Nagasaki by the end of 1945.

Most of the dead were civilians.





# Acute Effects

The most common acute disorders were **epilation**, symptoms of damage to mucous membranes including **diarrhea, dysentery, melena** and **bleeding from gums**, and **impeded blood-forming functions**.

The **acute effects** had largely **subsided by the end of December**, approximately five months after the bombing.



Hair combed off of head in 3 strokes of a brush



# Radiation

- ▶ The defining characteristic of an atomic bomb that distinguishes it from any conventional bomb is radiation.
- ▶ Those exposed within about 1000 meters of the hypocenter received life-threatening doses, and most died within a few days.
- ▶ Decades later, that radiation was still producing harmful aftereffects.
- ▶ Leukemia and other cancers appeared over the course of 2 to 20 years, and radiation effects still threaten the health of the survivors.





## Keloids

Scars left by exposure to heat and radiation erupted 2-3 years after the blast

## Cataracts

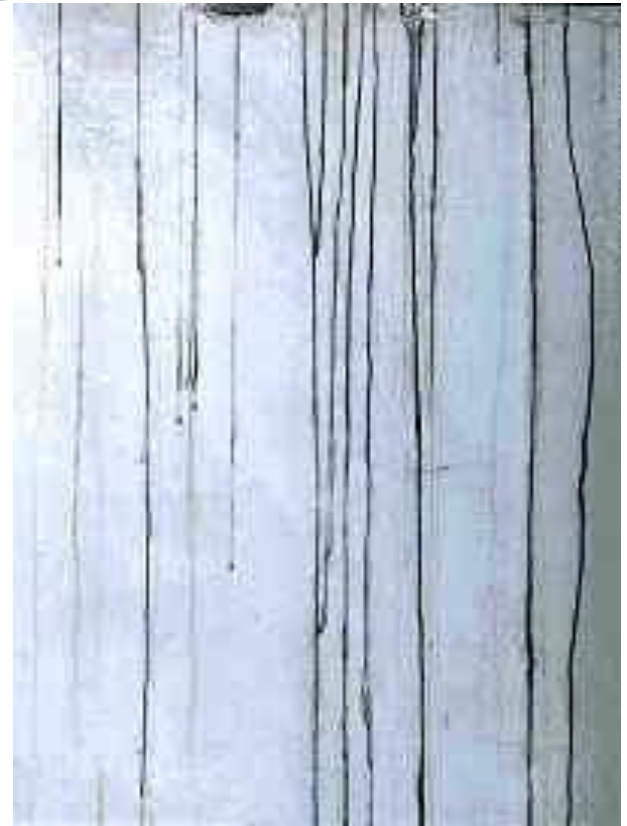
Cataracts occurred several months to several years after exposure.



# Black Rain

Soon after the explosion, a giant mushroom cloud billowed upward, carrying dirt, dust, and other debris high into the air. After the explosion, soot generated by the conflagration was carried by hot air high into the sky. this dust and soot became radioactive, mixed with water vapor in the air, then fell back to earth in what came to be called "**black rain**."

The black rain contained radioactive material. Fish died and floated to the surface in the ponds and rivers where this rain fell. Many of the people who drank from wells in areas where the black rain fell suffered from diarrhea for three months.



# Pictures





# Hiroshima Today



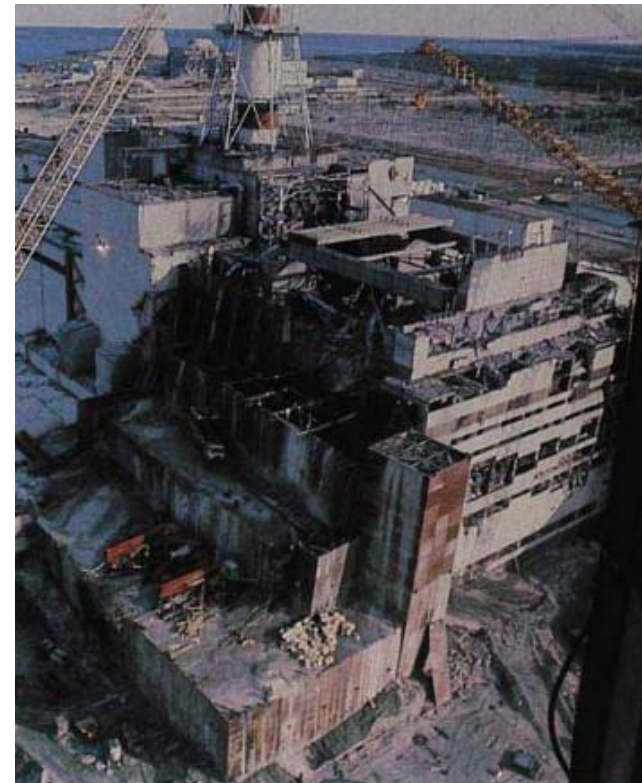


# Chernobyl Nuclear Disaster

On the 26<sup>th</sup> April 1986 a plant reactor exploded during a failed cooling system test, igniting a massive fire that burned for ten days. At 1:23am the reactor became out of control creating explosions and a fireball which blew off the reactor's heavy steel and concrete lid.

The accident released radioactivity equivalent to 400 times that of the Hiroshima bomb.

More than 350,000 people were displaced and scientists estimate up to 90,000 square miles of land in Belarus, Ukraine, and Russia (all part of the Soviet Union at the time) were contaminated with unhealthy levels of radioactive elements.



## So what?

- Radioactivity damages our DNA and changes our body's cells. This causes cancer and mutations.
- Serious exposure to radiation is likely to cause death within 2 to 4 weeks.
- 176 people were working at the reactor that night. Most were killed instantly, others died agonising deaths soon afterwards.
- Many of those who didn't die from the exposure have gone on to give birth to a mutated generation.





# Thank You