Erasmus "Nuclear power, a blessing or a curse-Lauriane

Watch the Arte documentary on Chernobyl, a reactor out of control

What caused the accident?
The Chernobyl accident was mainly man-made. Several causes triggered the disaster which took place on the night of 25 to 26 April 1986. First, it was a handling error in reactor No. 4: the control rods of the reactor sank too deep, causing a sharp drop in the power of the reactor, which was then at 30 megawatts. Later in the evening, the deputy chief engineer Anatolia Diatlov goes against the safety instructions. He ordered the control rods to be removed and the reactor to be restarted. He will have the experiment run even if the team does not agree. A few minutes later, the emergency shutdown system will be engaged, however, it is already too late, the power of the reactor is increasing too fast, and the control rods cannot sink more than one and a half meters because the downcomers' channels are deforming due to the heat. The accident is inevitable.

What strategy was used to stop the effects of the disaster?
Several thousand people were mobilised to stop the effects of the disaster. The fire brigade extinguishes the fires caused by the exposure on the site. They tried to extinguish the reactor, but to no avail. A few days later, several helicopters flew through the reactor pouring 5000 tons of sand and lead to stop the radiation. Later, a concrete tank was poured over the reactor.

What are the consequences of this accident?
The consequences of this accident were horrific. 50 tons of nuclear fuel were released into the atmosphere. Flaming debris fell on the site of the power plant, causing about thirty fires. The sky is illuminated in red and blue by radiation. Deadly radioactive dust and gases spread everywhere. A radioactive cloud spread across the continent, reaching several neighboring countries such as Sweden. An evacuation of the city was carried out because the radiation was too high. About a thousand buses were mobilised to evacuate the inhabitants. The men who mobilised to fight the disaster and avoid the worst lost their lives. Most of the people mobilised, i.e. more than 600,000 people such as firemen or volunteers, were irradiated. All the villages were destroyed, and the debris buried.

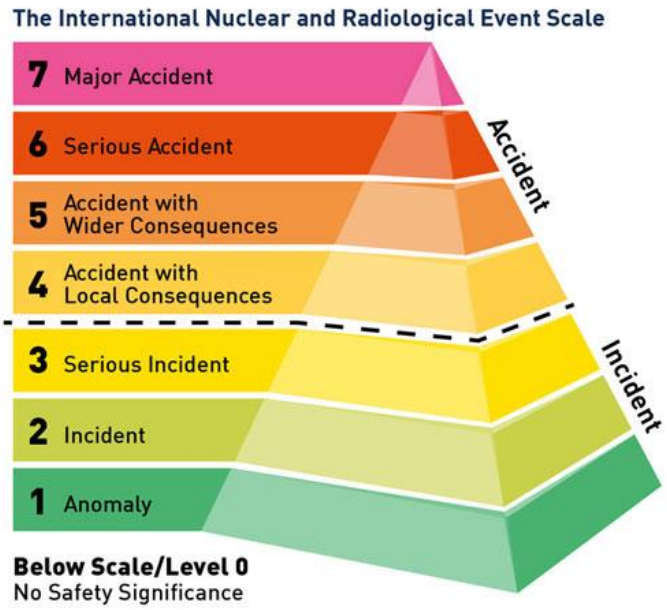
What other major nuclear accidents have occurred in the world? (to be detailed: where? causes? effects? ...)
Fukushima is another nuclear accident that occurred in 2011 in Japan with a severity of 7 on the INES scale. It was caused by a tsunami and an earthquake. This resulted in the loss of offsite and onsite power supplies, preventing cooling in all three units on site and the spent fuel storage pool. This accident caused massive and long-lasting environmental pollution and had serious health consequences. Unfortunately, about thirty other accidents were recorded, but of lesser severity.

At Three Mile Island in the United States, on 28 March 1979, a meltdown of the reactor core caused a nuclear disaster. The causes were multiple, due to a succession of design errors, human errors, and material failures. The consequences were minimal: there was no explosion or fire. Radiation is contained and radioactive releases have negligible effects on the health of people and the environment.

What is INES?
INES = International Nuclear Event Scale
INES is a scale used to communicate the severity of a civil nuclear event. It facilitates public information. This scale has 8 levels: from 0 to 7. Levels 1 to 3 correspond to "incidents" and levels 4 to 7 to "accidents".

Scientifically critique this video.

This documentary projects us a century after the Chernobyl disaster. It explains the catastrophic scenario if Man had not mastered this nuclear accident. To develop, mankind has sought to master different forms of energy, from the discovery of fire in prehistoric times to the renewable energies of today, including nuclear energy. He explains the different transformations of energy: chemical, mechanical and electrical. In 1898, Pierre and Marie Curie discovered the first radioactive element: radium. Later, the functioning of a nuclear power plant is presented: atomic fission and the protection system which includes the containment tank. Uranium is a radioactive element necessary for the operation of the power plant. It is at the heart of the reactor. Then we are shown the failure of the Chernobyl plant with the absence of the containment vessel and pressure sensors. The engineers in the control room cannot know what is happening in the core. The different phases of the disaster are explained, as well as other accidents around the world. Nuclear disasters are not the only ones to pollute the planet. There are also oil spills and chemical plant explosions. In humans, radiation is a consequence of excessive exposure to nuclear radiation. It causes skin burns, cancer and destroys the nervous system. The intervention of the three divers prevented another, more serious disaster. They opened the valves of the pool under the reactor to drain the basins and thus avoid contact between the molten magma and the water, which would have created an explosion. This would have devastated all life within a radius of 300 kilometers. However, the surrounding water and soil are polluted for several centuries. It is left to future generations to deal with the closed, highly radiated site. Nevertheless, life has returned with some changes such as genetic mutations in animals.
This documentary is very interesting. It shows us the power and the risks of nuclear energy.



THE INTERNATIONAL NUCLEAR AND RADIOLOGICAL EVENT SCALE

GENERAL DESCRIPTION OF INES LEVELS

INES Level	People and Environment	Radiological Barriers and Control	Defence-in-Depth
Major Accident Level 7	• Major release of radioactive material with widespread health and environmental effects requiring implementation of planned and extended countermeasures.		
Serious Accident Level 6	• Significant release of radioactive material likely to require implementation of planned countermeasures.		
Accident with Wider Consequences Level 5	• Limited release of radioactive material likely to require implementation of some planned countermeasures. • Several deaths from radiation.	• Severe damage to reactor core. • Release of large quantities of radioactive material within an installation with a high probability of significant public exposure. This could arise from a major criticality accident or fire.	
Accident with Local Consequences Level 4	• Minor release of radioactive material unlikely to result in implementation of planned countermeasures other than local food controls. • At least one death from radiation.	• Fuel melt or damage to fuel resulting in more than 0.1% release of core inventory. • Release of significant quantities of radioactive material within an installation with a high probability of significant public exposure.	
Serious Incident Level 3	• Exposure in excess of ten times the statutory annual limit for workers. • Non-lethal deterministic health effect (e.g., burns) from radiation.	• Exposure rates of more than 1 Sv/h in an operating area. • Severe contamination in an area not expected by design, with a low probability of significant public exposure.	• Near accident at a nuclear power plant with no safety provisions remaining. • Lost or stolen highly radioactive sealed source. • Misdelivered highly radioactive sealed source without adequate procedures in place to handle it.
Incident Level 2	• Exposure of a member of the public in excess of 10 mSv. • Exposure of a worker in excess of the statutory annual limits.	• Radiation levels in an operating area of more than 50 mSv/h. • Significant contamination within the facility into an area not expected by design.	• Significant failures in safety provisions but with no actual consequences. • Found highly radioactive sealed orphan source, device or transport package with safety provisions intact. • Inadequate packaging of a highly radioactive sealed source.
Anomaly Level 1			• Overexposure of a member of the public in excess of statutory annual limits. • Minor problems with safety components with significant defence-in-depth remaining. • Low activity lost or stolen radioactive source, device or transport package.