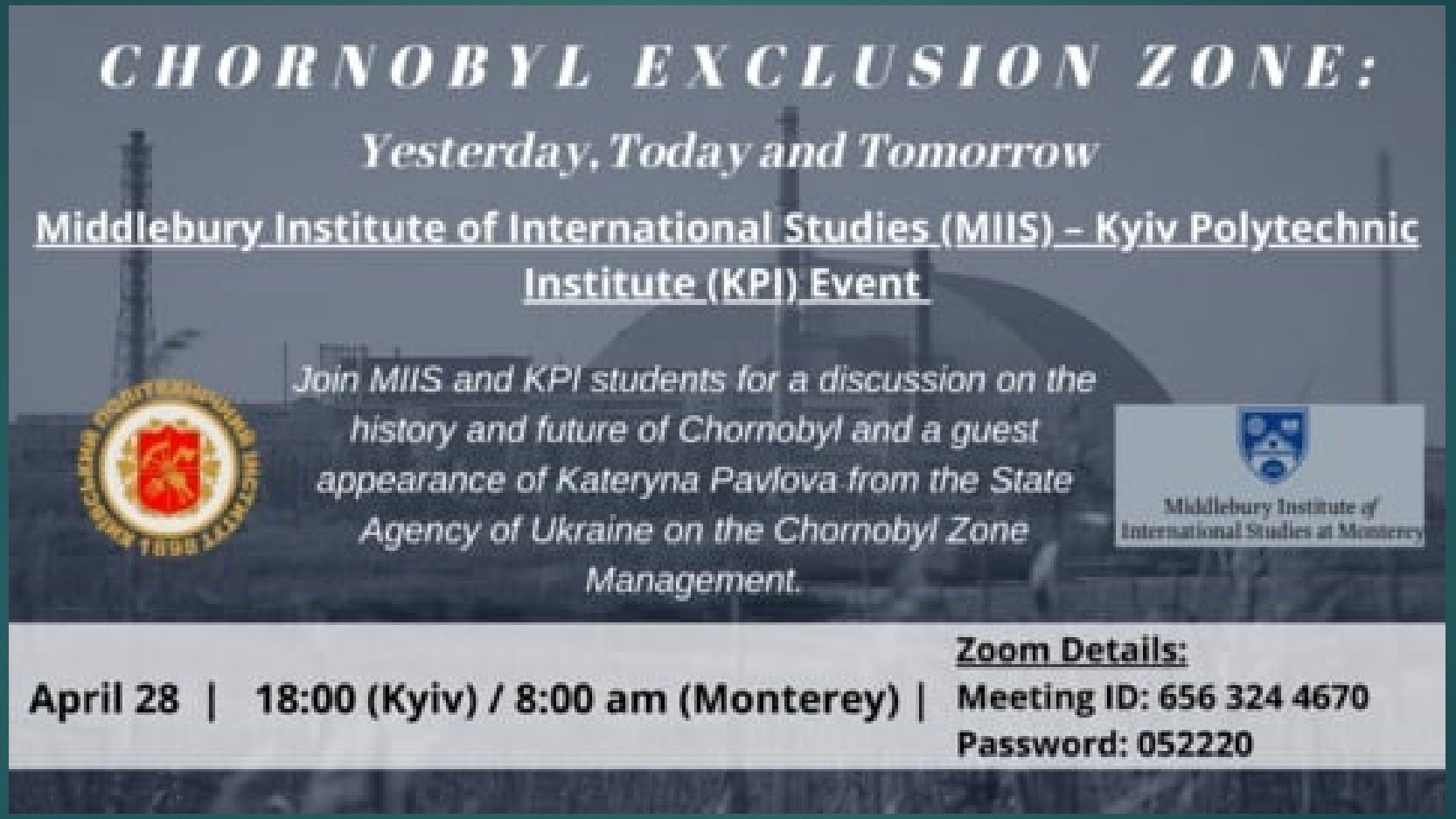
New problems of the Chernobyl zone



On the night of April 26, 1986, the largest man-made disaster on the planet occurred, a symbol of a man-made hell that a human is able to arrange for himself. As a result of the explosion at the fourth power unit of the power plant, about 400 times more radioactive substances were released into the environment than during the explosion of the “Little Boy" atomic bomb that destroyed Hiroshima.

Estimates of the number of victims of the tragedy vary greatly. According to UN official figures, only about 50 people died as a direct result of the accident and another 4,000 died from health problems caused by radiation.

However, there are other studies proving that hundreds of thousands of people became victims of the radioactive release, and in the two decades after the accident, the explosion at the Chernobyl nuclear power plant - directly or indirectly - claimed up to 200 thousand lives.

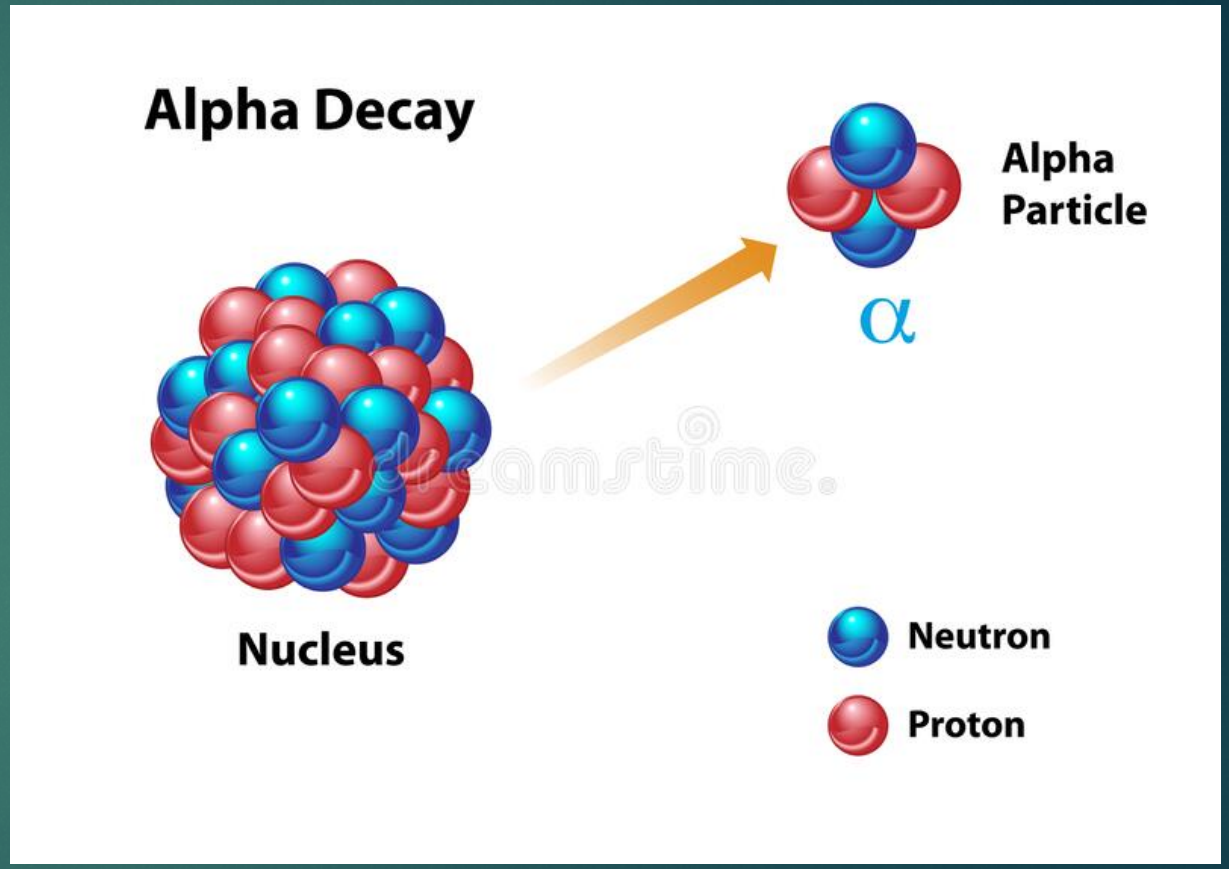
What is happening in Chernobyl today?

In the first days after the Chernobyl accident, the greatest danger to the population was radioactive iodine-131 with a half-life of eight days.

Then, in the first decades after Chernobyl, cesium-137 and strontium-90 became the biggest threats to public health. Their half-life is 30 years. That is, half of these radionuclides have already ceased to be dangerous. In the next 30 years, another half of the remaining volume will decay, and so on. For the complete decay of radioactive cesium and strontium, ten periods of 30 years each are needed - that is, three centuries. Not weak, however.

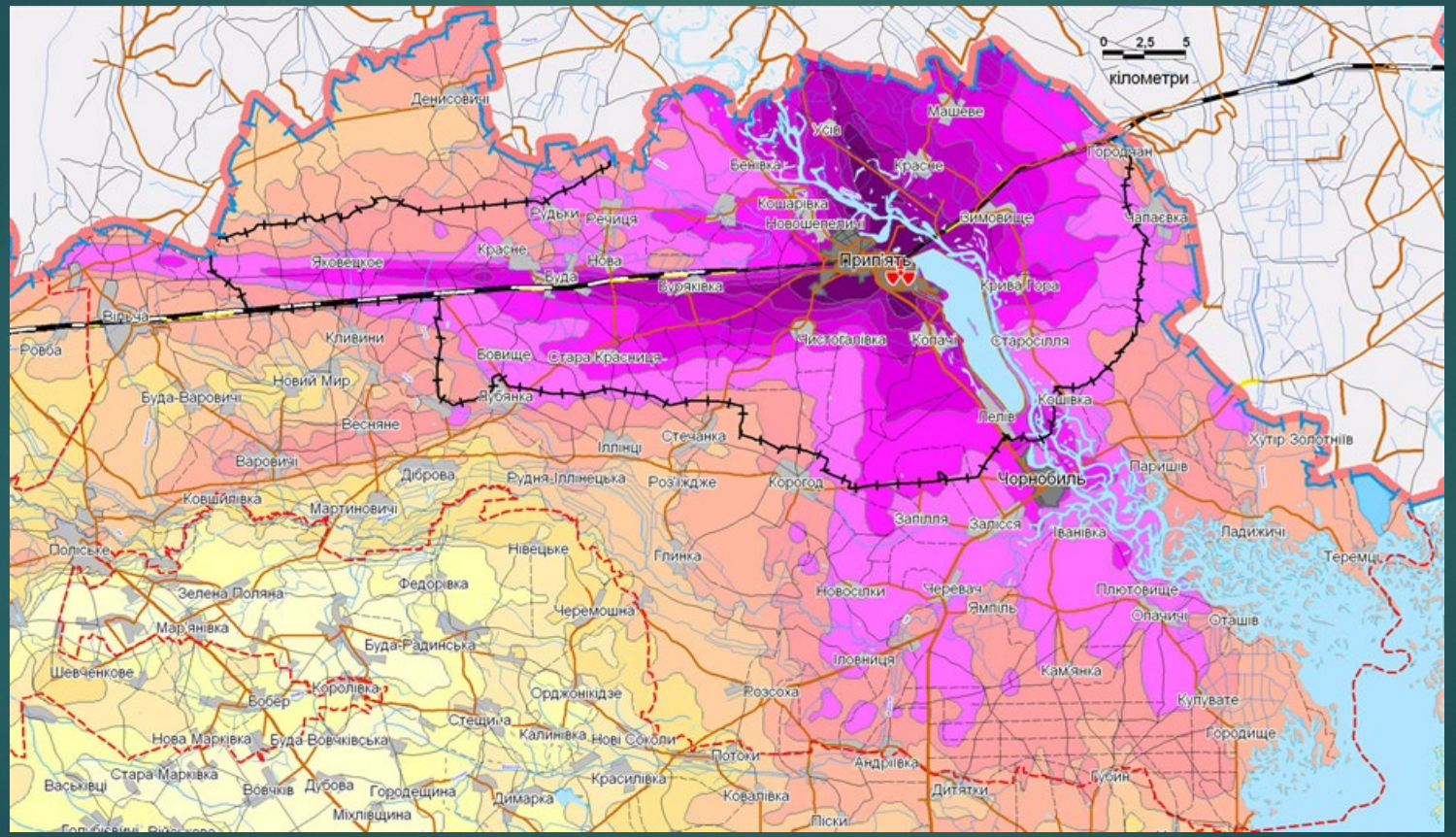
New enemy

In addition to uranium fragments - radioactive cesium and strontium - nuclei of the so-called transuranic elements were formed in the reactor. Basically, this is plutonium - 238, 239, 240 and 241. The first three of these isotopes have alpha radiation. In terms of its impact on living organisms, it is ten times more dangerous than beta and gamma radiation. Plutonium-241 has beta radiation, however, during decay, turns into americium-241 with dangerous alpha radiation.



It is known that during the Chernobyl accident, plutonium-241 with a half-life of 14 years fell out the most. And if during the first 14 years there was no americium, then with the beginning of the half-life of plutonium-241, it appeared, as experts note, not only in the 30-kilometer zone, but also outside it. Sometimes - very far from the Chernobyl nuclear power plant. 35 years have passed since the accident, and most of the plutonium-241 has already turned into americium-241. It remains to decay about 20% of the isotope. According to scientists, the peak of his creation (and therefore the greatest danger) will be 2056.

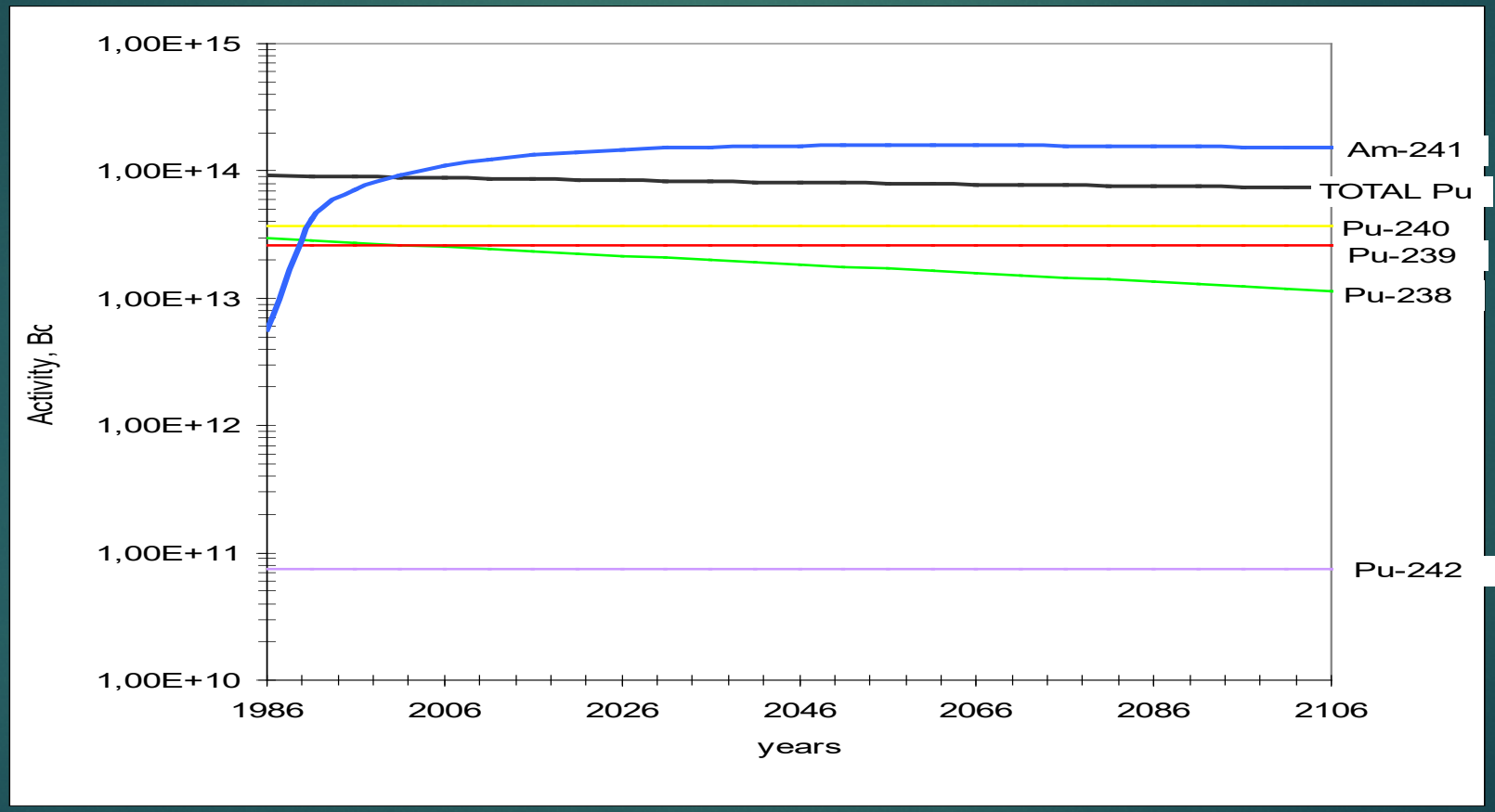
The level of distribution of americium on the territory of the Chernobyl zone



The half-life of americium-241 is 433 years. That is, at least eight to ten such periods must pass for this isotope to cease to be dangerous. And this is 4330 years!

However, even after that, not all territories will become "clean". In the "reserve" remains plutonium-239, which, according to experts, has pollinated a hundred-kilometer zone around the Chernobyl nuclear power plant. Its half-life is 24,000 years.

Time dynamics of ^{241}Am and ^{238,239,240,242}Pu activity



How will you protect yourself?

The penetrating power of alpha radiation is weakly. But on condition that radiation affects the body from the outside. You can hide from such irradiation with a sheet of paper - and the paper absorbs alpha radiation. For a human, the role of such paper is played by the keratinized upper layer of the skin. But there is also internal irradiation - if the source of alpha radiation enters the body. With food, for example. And it is already dangerous, since the body has nothing to defend against it from within.

Americium, like strontium, accumulates in the bones, which means that it is poorly excreted from the body. It is a dangerous radionuclide.

Problems with law

Until now, not a single country has not only laws, but even legislative initiatives regarding accounting and its exact permissible norms in nature, as well as in food. But, most importantly, safe norms for humans are unknown. But they should be about the same as for other isotopes with alpha radiation.

Americium is not the only problem

On the territory of the Chernobyl zone, the implementation of the E40 waterway has begun.

Waterway E40 is a planned navigable waterway, the purpose of which is to connect the Baltic and Black Seas.

The length is about 2000 km. According to the project, the route runs from Poland, through Belarus (along the bed of the Pripyat river) and to the city of Kherson in Ukraine.

The Dnieper and Pripyat rivers should become part of the E40 waterway. At the same time, the drainage basin of the Dnieper is completely polluted after the accident at the Chernobyl nuclear power plant in 1986, and Pripyat crosses the exclusion zone and passes directly next to the nuclear power plant.

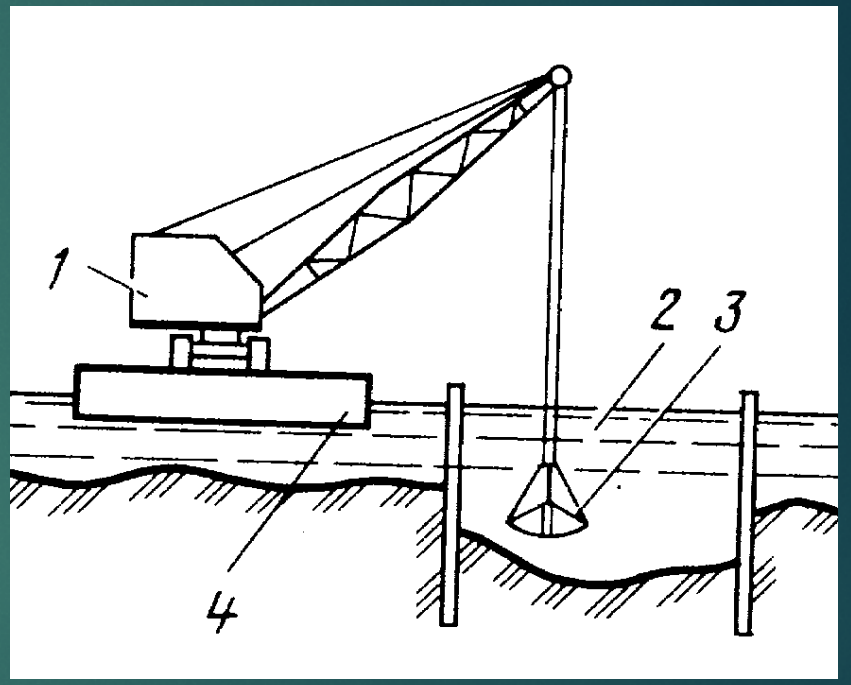
After the 1986 accident, a large number of isotopes settled on the bottom of the Pripyat and over time became covered with a layer of silt, which made the river relatively safe.

To ensure the passage of large vessels along the Pripyat, it is necessary to carry out a number of dredging works, which in turn will lead to the fact that radioactive silt will go downstream, which in turn will lead to radioactive contamination of the Dnieper and the Black Sea.

What to do?

There are several ways to prevent or at least reduce the possible consequences.

During the liquidation of the consequences of the 1986 accident, peculiar "traps" for silt were dug at the bottom of the river. They were underwater pits in which silt was collected, which was then covered with underwater sediments. To some extent, this helps to localize pollution and prevent it from spreading completely.



The second method is much more radical and costly.

The idea is not to touch the radioactive zones of Pripyat, but to build a navigable canal next to the river. There is a rich of experience in such works in the world, for example, the Welland Canal in Canada. However, this method is very expensive.

Conclusions

Since the 1986 accident, the Chernobyl zone has become cleaner than 35 years ago, but today there are many, and new problems arise associated with the consequences of that catastrophe. Not only Ukraine, but the entire world community will think about their solutions, and someday people will be able to use the Chernobyl territories again.

Thanks for attention