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Chernobyl:
The Nuclear Disaster that Changed Ukraine and Almost Changed the World

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Out of all the human made disasters, none are more widely recognized around the globe than the Chernobyl nuclear disaster. Films, documentaries, miniseries, have all depicted the events that transpired in Ukraine on the 26th of April in which the series of unfortunate, yet preventable events have been discussed loads of times. But, have we really thought carefully about what has changed when it comes to the environment? Have we really put our mind around the fact that not everything will be the same as it once was? In this paper, we will look further into what happened, see the changes that this event caused to the environment in geographical terms as in plants, animals, water, humans, economy etc. We will also take a look at the valuable lessons that we can learn from this in general. Like the famous writer George Santayana once said, "Those who do not learn history are doomed to repeat it."

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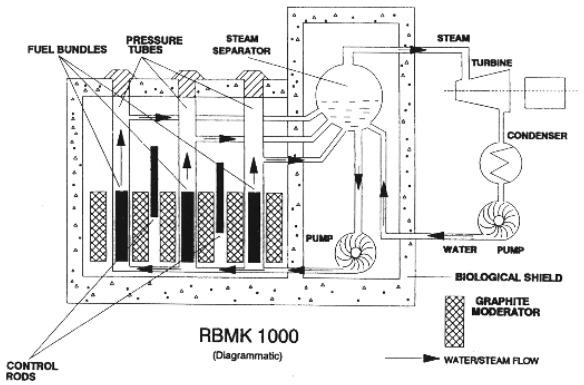
The Chernobyl disaster all started during the peak of the Cold War, a standoff between The Soviet Union, United States and their respective allies, on the 26 of April during the year 1986. Both sides were armed to the teeth in nuclear weapons with the threat of a nuclear war looming a very real possibility. Both sides raved about an apocalyptic scenario where such a war would change the entire landscape of earth itself and of course the population that lives in it. This event, the Chernobyl disaster, was a glimpse into that possible future and what may await of us if we are not careful with the technology that we possess. Before getting into the effects of what this event entailed, one should investigate how such a tragedy to both nature and humankind occurred. According to the world nuclear organization, this tragedy was a result "a flawed Soviet reactor design coupled with serious mistakes made by the plant operators" (Chernobyl Accident 1986) which was all a product of the Cold War and the mentality of Soviet Superiority. As for what particularly caused such a mess, it was due to a faulty reactor which was the Chernobyl 4th reactor to be more specific.



RBMK 100 (Source OECD NEA)

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It was during a routine shutdown that this event took place, when it was decided to test one of the shutdown functions. The purpose of this was "to determine whether cooling of the core could continue to be ensured in the event of a loss of power." (Chernobyl Accidents 1986, Sequence of Events) which was of utmost importance if the Soviets were planning to start or be a part of a future war incase power was lost during this hypothetic scenario.

At this point, one could say that the reactor was already unstable by the time they were conducting these tests. The specifics of which was the combination of both hot steam with cold water which caused the reactor to become "partially detached, rupturing the fuel channels and jamming all the control rods" (Chernobyl Accidents Appendix 1) Those in the control room didn't know what happened and thus didn't react in time to the initial explosion that occurred around 1:24 am.. Two explosions happened around that time which caused concern from those within while one worker died during the explosion and his body was never found. Attempts to shut down the reactor were largely ignored by commanding officers who thought that the radiation levels were no more than an x-ray but who were sadly wrong. Even inside the control room, people were already becoming sick with constant vomiting and illness. This was the power of radiation, able to seep into most areas unperturbed while changing everything around us. After a few days' time, a cleanup was underway even if the extent of the damage was not totally known nor were the people given a full breakdown of what had just occurred and how dangerous the situation was in. In a hypothetical scenario where no secrets were to be had, then every nation could come together and use their heads in order to quell the devastation. Yet, an ideal world is not the

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one we live in. The Soviet Command withheld most of not all information from the outside world and their own people which would later lead to significant problems, deaths and potent effects against mother nature herself.

Scientists in the control room looking on in the HBO miniseries Chernobyl (Business Insider)

The full scale of this disaster may never be fully known. But what information we do have is the large amount of nuclear substance that was released into the air right when the explosion happened. Radioactive particles swept through the entire Soviet Union while even reaching some parts of Germany and Sweden respectively. The air wasn't the parts of nature that was affected, plants, wildlife and even animals were all changed by the sudden intake in toxic radioactive waters, vegetation and even, as I mentioned previously, the air. Now, why is this so important? Can't us humans just abandon Chernobyl all together and seek new cattle to graze, chicken to feed from? Water to collected and drink? Well, that is true if we assume mother nature is stagnant. That is, if we assume that we are the only moving pieces in this world who adapt and live through sheer will of survival. Just like us, animals will see they can no longer get their sustenance

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and will move. Those animals that contain said levels of exposure will maybe leave to Poland, further west towards Belgium and so on. Everything will not stay in Chernobyl just because we made an exclusion zone. Same with the pollen in the plants, same with the animals coupling and reproducing. Once there were give, now there are hundreds. And that is why, it is such an issue. We are not static, and so are they. Therefore, this problem is so complex in which we can't just say 'lets go save nature'. There are facets, and layers to this issue. Now moving to the humanistic aspect of this disaster, one should take into consideration the harsh effects radiation has on the human body. In short, the EPA gives a full yet brief rundown about the effects of radiation and how lethal in can be:

> Exposure to very high levels of radiation, such as being close to an atomic blast, can cause acute health effects such as skin burns and acute radiation syndrome ("radiation sickness"). It can also result in long-term health effects such as cancer and cardiovascular disease. Exposure to low levels of radiation encountered in the environment does not cause immediate health effects but is a minor contributor to our overall cancer risk. (Radiation Health Effects)

What is frightening about this is the culmination of radiation in one's body. It is a silent killer that stacks up before killing you later down the line. That is how a large amount of people ended up as, though one could meet a sad end even sooner if one came into contact with large amounts of radiation all at once. This is why it is so lethal for humans, and even animals. Now imagine a huge spread of this radioactive materials spreading across Europe and killing millions. It's a morbid thought, but one that came close to reality. In this paper, we will touch upon the heroic acts of three men who saved us from this scenario a bit later

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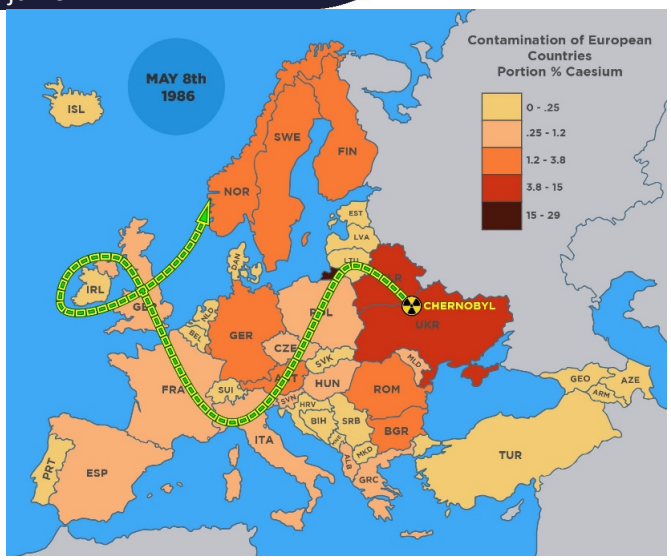

Map of the Effects and Reach of Radiation (Chernobyl Welcome)

on. Just, it is important to recognize that even though large amounts of land became uninhabitable, lots of plants and animals became radiated, water became scarce and hard to come by; our reality could have been a lot worse.

Continuing on with the affects of radiation on humans, it was so bad that the whole of Chernobyl was abandoned save for a few percentages of people who refused to leave their ancestral home. More on those people later, but as a whole, they had to leave or were forced out by the government. Soon after this, the whole place was a ghost town in which only the critters and wildlife were habiting the area. On one hand, one could see this as helpful for nature in a twisted way. What was one nature's is being giveth back. This is nature's way of healing and fixing itself. The problem lies with radiation. Even with the plants sprouting anew and new animals wandering in, it is contaminated by the radioactive

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substances around the area which in turn only makes the situation worse and the clean up even harder. In the past, the Soviet government placed clean up squads to different sectors in order to try and clean up as much as they could. But, even with today's technology it is rather difficult. The radiation levels have gone down, that much is certain, otherwise Chernobyl would have never been open to the public as a tourist location. But there are areas in which one will need to be careful if he/she ever visits. The elephant foot is one such location. It is basically nuclear waste mounted to look like a foot of an elephant. As if that isn't a clear enough how dangerous it is, in the past "the foot would have been fatal after 30 seconds of exposure; even today, the radiation is fatal after 300 seconds" (McVean, Ada) and that is with all the clean up that has been going on. Other places that are quite dangerous are the old suits worn by the clean up crew and the top of the reactor. All could be fatal if one isn't careful.

Speaking of fatal, the economic loss was also staggering due to this incident. When speaking of cleanup and organizing hunting parties to kill off radiated animals, all of this requires funds. The total amount of loss that was suffered by the Soviet Union was of "$235 billion. However, the overall amount of money…invested into the recovery amounts to just (a measly) 8 percent of the total damage" (CHERNOBYL disaster) which shows just how effective the cleanup was. Most of the clean up could be attributed to nature itself, replacing the radiate soil at its own pace. This is why, it has taken so long for the area to become livable again.

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Going back to the disaster, the fires were extinguished within 6 hours, but a bigger problem was going to happen. The Unit 4 Reactor was continuing to melt down, under it there was an enormous pool of water. The material (melted radioactive metal) was approaching this pool. Author Andrew Leatherbarrow wrote an email to Tech Insider explaining that "If it happened it would have triggered a second steam explosion that would have done unimaginable damage and destroyed the entire power station, including the three other reactors" This would have spread the radiation as far as the entirety of Europe, Asia and could even reach the Americas. Some other say that it wouldn't reach that far, but the consensus is most if not all of Europe would have been under the same effects as ground zero of Chernobyl.

In order to prevent this steam explosion, the pool underneath the reactor had to be drained by the workers, however, the basement was flooded, and the valves were underwater. Even though, mid-mission, the team's lamp died, and they were left in the dark, they successfully shut off the valves. After returning from the mission, the effects of the radioactivity they received were visible. One died, but two others survived this encounter and one would even live up to 2015, the names of these heroes were: Alexei Ananenko, Valeriy Bezpalov and Boris Baranov.

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Alexei Ananenko y Valeriy Bezpalov

After the explosion, the reactor was still releasing radioactivity in the following 10 days. More than 200 000 km2 of Europe was contaminated. Agricultural plants and animals were contaminated as well. After the early phase of deposition, and increasingly important concern was the plant contamination. However, the levels of radioactive materials in agricultural plants and animals decreased rapidly due to factors such as weathering and decay. In the past decade, the levels have gone down, yet in a much slower range. This is to say that even with the levels are going down, it is not going down as fast as expected nor wanted. It may still take years for the entire place to even reach a level that is reduced enough for people to even think of living there.

1SERGEI CHUZAVKOV/AP

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On the other hand, while people are getting smaller amounts of radiation from the agricultural products, the doses received from the forest products are expected to be high for the next few decades, as the radio-cesium levels are expected to decrease very slowly (www.greenfacts.org). Therefore, the relative importance of forests in contributing to radiological exposures of populations of several affected countries increased with time. Currently the damaged reactor is covered by a giant concrete sarcophagus to avoid the escape of more radioactive material. A New Safe Containment shield was put in place in 2016 – the largest moveable steel structure ever built, which is acting as a giant hangar over the nuclear power plant. Workers are monitoring radiation, and plan to, eventually, dismantle the sarcophagus and remove the nuclear fuel.

Now a days, Chernobyl is considered a place to do Extreme Tourism, every year thousands of tourists go to visit, keeping in mind that they are kept out of the most radioactive areas and have at least two checkpoints to measure the levels of radiation. But, is it possible to live in Chernobyl ever again? Today it is illegal to live in the exclusion zone, and despite this, about 130 to 150 people do (Moving to Chernobyl). Many are women ranging from 70 – 80 years old and are still farming their ancestral lands. Since the disaster, specialists have constantly monitored the radiation levels in the soil, trees, plants and animals around Chernobyl, even outside areas of the exclusion zone. There is no longer a risk from radiation in the atmosphere, according to Dr. Valery Kashparov, from the Ukrainian Institute of Agricultural Radiology. However, in some areas, soil contamination

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could be a threat to people's health. Kashparov and his team have found recently potentially dangerous levels of radioactive caesium-137 in cow's milk produced in areas outside the exclusion zone. In large quantities, it can damage human cells and, in some cases, lead to serious diseases such as cancer, by ingesting it. But these risks, Kashparov says, are only in specific hotpots. For more than 30 years his team has worked to map such areas so they can estimate the potential risk for people living and working around the exclusion zone (Moving to Chernobyl).

A woman that lives in the exclusion zone, in one of the hotspots pointed out by Kashparov, says that she has thought about the potential risks from radiation, but her family was feeling from something more dangerous: The threat of war. "Radiation may kill us slowly, but it doesn't shoot or bomb us" She said, "It is better to live with radiation than with war." (Moving to Chernobyl).

The Chernobyl Disaster was the biggest disaster that has ever happened. A disaster for mankind. As it could be seen, animals and plants have repopulated the affected areas with no visible damage due to radiation. Even if this was, possibly, a human error, it seems as if the planet is purging us due to our many failures. Each one of our choices affects the planet that we live on, our common house that we all share. Accidents happen, but when the powers above do not do anything other than give their one hundred percent in cleaning up their mistakes, then what good is creating awareness and making people aware actually help?

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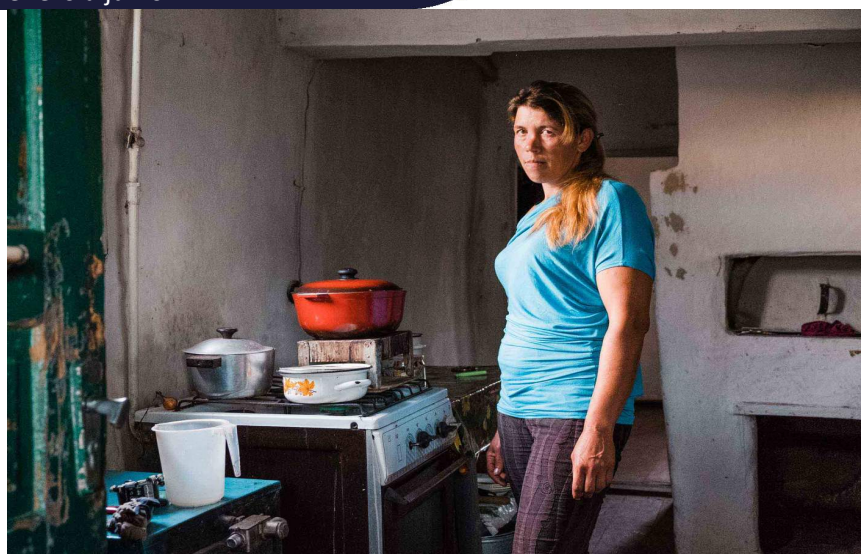

Maryna, who lives

in the exclusion zone. (Source: The people who moved to Chernobyl)

Another lesson we can learn from this is the spread of false information. The superiors due to the Cold War influence did not share the gravity of the situation with their own people nor those from the international community about this event. They said it was not that bad and kept going on with this narrative until it was too late. The same thing is happening currently with global warming. If we fail to accept the reality we are living in, then history will repeat itself. Just like Chernobyl, the earth may heal, but it may not be the same again with or without us. Planet earth can very easily become another ghost town or rather…a ghost planet. With all the pollution, climate change, global warming, humans are affecting the environment but how much more it can take, before earth can no longer survive our meddling? The better question to all of this is, can we survive ourselves?

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