

CHORNOBYL:

One small step for cosmos, One giant leap for humankind

(* In this text, the Ukrainian cities have been referred to with their Ukrainian names, 'Chornobyl' and 'Kyiv', in accordance with how they have been known in this geography for centuries, instead of 'Chernobyl' and 'Kiev' as the two cities are commonly referred to in English, in line with their Russian names.

“... In estranging from man (1) nature, and (2) himself, his own active functions, his life activity, estranged labor estranges the *species* from man. It changes for him the *life of the species* into a means of individual life. First it estranges the life of the species and individual life, and secondly it makes individual life in its abstract form the purpose of the life of the species, likewise in its abstract and estranged form...”

“... Estranged labor turns thus: (3) *Man’s species-being*, both nature and his spiritual species-property, into a being *alien* to him, into a *means* of his *individual existence*. It estranges from man his own body, as well as external nature and his spiritual aspect, his *human aspect*. (4) An immediate consequence of the fact that man is estranged from the product of his labor, from his life activity, from his species-being, is the *estrangement of man from man*. When man confronts himself, he confronts the *other man*...”

Karl Marx, 1844

PROLOGUE:

Photographer

The Chaosmos project, which I started in 2012, was a quest to confront with a dystopic fiction based on subjective perception and personal observations, as opposed to a documentaristic one, and which focused on the traces of the post-industrial crisis and the ensuing collapse.

It was a work that combed through the traces of a process in which humankind’s unbounded urge to dominate nature and the “other”, triggers their alienation from their labor along with themselves, which ultimately causes the destruction of all humankind.

For me, Chaosmos simultaneously contained Narcissus within itself. With a slightly different reading, I could envision humankind’s glorification of his/her own production causing its eventual demise.

Chaosmos was a work that evaluated the photographs as present day reflections of the absolute end of nature and humanity quickly brought forth in a world where existence is equated with the concept of growth, and where the process of producing more, consuming more and even reproducing more as a result of competitive policies becomes increasingly restrictive.

The photographs taken across a worldwide journey ending in 2017, and spanning 25 countries extending from the Aral Lake, which has become a desert due to the agricultural policies implemented in Kazakhstan to Detroit, which has transformed into a ghost city as a result of the American automotive industry's inability to survive against the competitive world markets, from the abandoned Iwate coal mines of Japan, dwarfed by global competition to the remnants of nuclear disasters in Chernobyl, Ukraine and Fukushima, Japan, and from the traces of the Cold War across the Balkans, in former Yugoslavia, to the mental hospitals in Northern Italy shut down following the reactions to alleged human rights violations, and to many other locations in pursuit of fallen civilizations.

I intended to access the viewer's emotions through my photographs rather than to convey information, introduce a location or witness a process. I chose not to tell the story of these photographs or disclose information regarding where and when they were taken. I sought to collate the photographs in which I could find common aspects of different places. I wanted these photographs taken in distant lands to affect the viewer in a way that prevents them from sheltering in the comfort of looking at the pain of the so-called "other".

Another common feature of my chosen locations was that many of these places bore traces of the developments of my childhood (late 60's, early 70's), and the times when we looked forward to the future.

I first went to Chernobyl with Halil Koyutürk in July 2015. Our meeting with Nikolai Fomin marked the beginning of a friendship that would last for many years. In time, the Chernobyl adventure transformed into something more than just an important component of the Chaosmos project, and metamorphosed into a medium where a new project would be developed. But this time, the time and place were fixed. I had to dig deeper, and convert my work into an archaeological excavation.

Pripyat was fascinating. The city was deserted; time seemed to have frozen. The wildness of nature was slowly reclaiming what it had formerly lent to people; a forest surrounded the city. Trees were growing inside buildings. Schools, hospitals, apartments, and gyms were all silent.

The sarcophagus, which harbored a legend, was visible from afar with all its magnificence.

Those villages that were inaccessible for the tourists, who constantly took selfies, were even more impressive. Many of these villages were uninhabited, essentially absorbed by the jungle. There were also villages with 3-5 residents—either new settlers or people who had returned. Women, most of whom were over 80 years old, lived here in peace. When they died, their homes were sealed shut, and pillaged soon after like all the other houses. The branches drooping to the ground with the weight of the fruits they bore, swayed along with the blowing wind as the Przewalski horses watched their intruders from afar.

My friendship with Nikolai developed. Over the years, he joined me on my numerous trips to Chernobyl; he became my companion. He now knew what kind of photographs I wanted to take, and made suggestions about where we should be at what time of day. As I focused on the details of a location, he would scan the environment; suggest spots that might interest me, and motivate me at times when I felt exhausted because of the repetition.

In October 2018, I went to Chernobyl with Nergis Perçinel. Nergis drew my attention to photographs hanging on a kindergarten wall. Photographs I had passed by many times before, unaware.

Dust, humidity and mold!

Photographs of children and families who had once lived there.

Nergis's suggestion opened up new horizons for me. During my subsequent visits, I focused on these photographs. I spent days with the photo albums I found inside drawers in schools, official buildings, and village houses. These photographs provided me with the most direct path to the traces and the special moments of the people who once lived here.

Their faces seemed to seek something, like they wanted their voices from the past to be heard in the present.

My final visit to Chernobyl was in February 2020. The World Health Organization had not yet declared the pandemic, and what had happened in Wuhan in December 2019 was still the problem of the 'Other' for us.

But in the globalized world, the 'other' was now amongst us, and in March 2020, we were all shaken up with a brand new process that would impact our lives deeply.

INTERLUDE: Chernobyl

BEGINNING OF AN ERA

“The revolution has resulted in Russia catching up with the advanced countries in a few months, as far as her *political* system is concerned. But that is not enough. The war is inexorable; it puts the alternative with ruthless severity: either perish or overtake and outstrip the advanced countries *economically as well.*”

V. I. Lenin, 1917

Rapid industrialization, social transformation and proletarianization of the masses, and catching up and surpassing the level of productivity of the labor force found in the most advanced capitalist countries were inevitable for the socialist rule, which was now faced with the necessity of being established as a single country.

“Communism is Soviet power plus the electrification of the whole country.”

V. I. Lenin, 1920

State Commission for Electrification of Russia (GOELRO) was established on February 21, 1920 for the purpose of economic recovery and development, and became the prototype for subsequent Five-Year Plans drafted by Gosplan. This plan, envisaged a major restructuring of the Soviet economy based on total electrification of the country. The objective of the plan was the organization of industry on the basis of modern, advanced technology and electrification,

which would put an end to the division between town and country. The establishment of heavy industry was seen as a precondition for being an independent and civilized country.

In 1913, the annual electricity production of the Russian Empire could reach 1.9 billion kWh. The target was to increase the total annual national power generation to 8.8 billion kWh. The target set for 1931 was reached and the national power output continued to surge significantly, reaching 13.5 billion kWh by the end of the first five-year plan in 1932, 36 billion kWh by 1937, and 48 billion kWh in 1940.

Despite the great devastation and the casualties of World War II, the USSR became the world's second largest electricity producer after the USA in the post-war period.

NUCLEAR ENERGY

May the atom be a worker and not a soldier (*)

(*) Three-meter-high letters in neon lights, presenting the Soviet slogan on top of a nine-story high-rise block facing the main square of Pripyat

After the atomic bombs dropped by the USA on Hiroshima and Nagasaki on August 6 and 9, 1945, and before the successful secret trial of the first Soviet nuclear bomb on August 29, 1949, Soviet engineers and scientists had begun to advocate the use of nuclear power for civilian purposes.

The Obninsk power plant, which was commissioned on June 27, 1954, was not only the USSR's but also the world's first nuclear power plant to feed the grid.

The ensuing enthusiasm and hope inspired lines of poetry (*);

Atoms for Peace

Read, Drink with your eyes the lines:

**The inevitable came true,
the newest of the miracles of the earth**

**The uranium forces
by electric current**

Over Soviet wires started to run!

**And somewhere,
echoing to hearts inspired
In this festive humdrum hour,**

**In honor of peace
new motors began to drone,
And flashed up
the lamps of Il'ich.**

**The river of Time
will carry away into silence**

**The cannibal's pyre
on the island Eniwetok,**

**But our Atom of Peace
child of Five-Year Plans,
For people
will shine for ages,
What was a dream, a fledgling yesterday,
Today is trying out
its powerful wings.
Glory be to those masters,
Who, out of the fairy tales
of the days by gone,
Created this reality.**

(*) Igor Volski, 1954

The development of the nuclear energy program in the USSR was the result of the advancement of the nuclear weapons industry, just as it had been in the USA, Britain and France. The development in other Comecon countries was similar to the process in the USSR.

Considering the increasing cost of coal and petroleum products and the difficulty of transportation and distribution in large regions with long distances and harsh geographical conditions, gravitating towards nuclear power for electricity generation emerged as a reasonable option. The USSR was cultivating its political power by keeping energy production under its control, encouraging other Comecon countries to turn to nuclear energy and was planning to export reactors.

By 1960, the USSR's electricity production had reached 290 billion kWh. The 1970s was the period when the USSR made a breakthrough in electricity generation in nuclear power plants. By 1981, the total electricity production of nuclear power plants had reached 86 billion kWh and this corresponded to 6.5% of the total production. In the following five years, the total production of nuclear power plants tripled, reaching 220 billion kWh. In 1985, nuclear power plants accounted for 14% of the total 1,500 billion kWh electricity generated. By the 1990s, USSR's electricity production had reached 1.728 billion kWh, which was 17% of the world's total electricity production. However, despite having reached 200 times the target set for the first five-year plan, it was still not sufficient to meet the astronomical needs of the USSR's energy hungry industry.

“Human nature has many curious perversities, and one of the most curious is this; that we tend to worship whatever is useful to us, and, by worshipping it, to deprive it of its utility.”

Dora & Bertrand Russell, 1923

Before the Chernobyl disaster in 1986, the perception of nuclear safety was extremely limited and was generally not considered within the context of anything other than thermal energy; nuclear energy was assumed to be safe without any doubt, and it was frequently referred to being “ten times more environmentally friendly than coal power plants”. Soviet nuclear power plants were highlighted as marvels of technology and the possibility of a serious accident was not considered as a realistic possibility. In 1975, P. Kapitsa warned that new nuclear power plants should not be built in densely populated areas, due to a potential radioactive waste issue or leakage that may occur as a result of an accident or sabotage. In a similar vein, N. Dollezhal and I. Koryakin published articles in *Pravda* in 1976 and in 1979 in

Kommunist, asserting that the ecological capacity of the regions where new nuclear power plants were located could not provide the necessary resources for cooling water in the long term. However, these warnings were either ignored or “refuted” by The Academy of Sciences of the Soviet Union.

"Does any generation have the right to risk the safety of so many future generations?"

Robert Polidori, 2001

The United States House Committee on Science, Space, and Technology, appointed in 1970, expressed the view that the Soviets adopted a design and operation-oriented security approach but ignored hypothetical possibilities, and pointed out that Soviet scientists did not equip systems with backup mechanisms, with the prediction that it would complicate the systems and make them less secure. Avoiding “unnecessary” investment costs was also in line with management’s demands. On the other hand, Soviet officials made the assessment that the Three Mile Island nuclear accident in the USA in 1979 was allegedly “due to the nature of the American economic system”, while lagging to take steps to improve the rules and regulations for the design and operation of Soviet nuclear power plants instead choosing to spread the process over time.

The Vladimir Ilyich Lenin Nuclear Power Plant built in Chornobyl consisted of four RBMK-1000 reactors. The city of Pripyat, established in 1970, near the Belarusian border, in the northern part of Ukraine, was designed as a residential town for the employees of the power plant and their families. The first reactor that was commissioned in 1977 was followed by the second, third and fourth reactors commissioned in 1978, 1981 and finally in 1983 respectively. These four reactors were capable of fulfilling 10% of Ukraine's electricity needs. The construction of reactors No. 5 and 6 began later. The plan was to build six more reactors, with a total of twelve reactors to be commissioned by 2010.

THE ACCIDENT

On April 25, 1986, the pre-scheduled test for reactor No. 4 began with a 10-hour delay. The experienced daytime workers had left, and the shift was handed over to the night workers. In case of an electrical power outage, the residual rotational energy in the turbine was expected to provide enough power to feed the main cooling water circulation pumps, while the backup diesel generators would be activated and the cooling process of the core would continue uninterrupted. However, the decelerating turbine rapidly collapsed, and was unable to provide sufficient power. The vulnerability of the system of information flow combined with the shift officers’ limited understanding of the procedures and the lack of coordination between the operators and the nuclear reactor security staff caused the situation to spiral out of control.

As a result of a series of chain reactions, two consecutive explosions were heard at 01:24 on April 26, 1986.

A report labeled “Confidential” signed by V.K. Bryukhanov was sent to the communist party officials in Kyiv and Moscow. The report noted that the reactor roof and walls were destroyed by the severity of the explosion, the ensuing fire was taken under control at 04:50, nine of the officers were injured, one was missing and one was deceased, some of the power plant

officers and firefighters who were trying to extinguish the fire were sent to regional hospitals for observation, and 26 people were sent to Moscow on a private plane. It was also reported that according to the readings taken in Pripyat at 03:00, the radiation level was detected to be at 0.1-0.5 mSv, and 0.1-0.2 mSv at 07:00, whereas a value of 30 mSv was detected in the area where the accident occurred.

At this stage, it wasn't yet known that the reactor core had exploded or that such a thing was even conceivable; the assumption was that it was the hydrogen tank that had exploded. The reported radiation levels were also inaccurate. The limits of the dosimeters used by the officers were limited to 30 mSv per hour, and the needle had hit the limit, unable to provide a reading.

The severity of the accident was only going to be comprehended following the discovery of graphite pieces scattered around the area.

The engineers in the control room were in a state of panic. The situation was out of control and they didn't know what was happening. They thought that the reactor was still active and thus maintaining the cooling water circulation was still a priority, but they were unable to activate the remote-controlled valves. Three engineers went to the pump room and turned on the valves.

Firefighters immediately arrived to extinguish the fires. The top priority was to extinguish the fire on and around the roof of the building where reactor No. 4 was located, and to secure the reactor No. 3 and cooling systems. The fires were extinguished, but many firefighters were exposed to high doses of radiation. However, the fire inside reactor No. 4 continued.

In order to control the situation and ensure order, personnel and equipment of the Interior Ministry, the KGB, Civil Defense and Soviet Army—including 2900 men from the Ukrainian Ministry of Internal Affairs—were directed toward the plant, while reinforcing force were kept at the ready for intervention. Military helicopters also supported the operations.

Research Committee member, Prof. Valery Legasov, who would later be commissioned to investigate the process, and would be forced to constantly resist the pressure from the bureaucratic management, kept urging for the evacuation of Pripyat.

EVACUATION

At 20:00 on April 26, a secret order was issued to Pripyat, for the preparation and dispatch of 1,390 buses from Kyiv and its surroundings for the possible evacuation of 51,000 people. Furthermore, hundreds of buses, as well as trucks, ambulances, trains and river ships were assigned to support when needed.

“For the attention of the residents of Pripyat! The City Council informs you that due to the accident at Chernobyl Power Station in the city of Pripyat the radioactive conditions in the vicinity are deteriorating. The Communist Party, its officials and the armed forces are taking necessary steps to combat this. Nevertheless, with the view to keep people as safe and healthy as possible, the children being top priority, we need to temporarily evacuate the citizens in the nearest towns of Kiev

region. For these reasons, starting from 27 April 1986, 14:00 each apartment block will be able to have a bus at its disposal, supervised by the police and the city officials. It is highly advisable to take your documents, some vital personal belongings and a certain amount of food, just in case, with you. The senior executives of public and industrial facilities of the city has decided on the list of employees needed to stay in Pripyat to maintain these facilities in a good working order. All the houses will be guarded by the police during the evacuation period. Comrades, leaving your residences temporarily please make sure you have turned off the lights, electrical equipment and water and shut the windows. Please keep calm and orderly in the process of this short-term evacuation.” (*)

(*) Translated excerpt of the evacuation announcement

The evacuation of Prip'yat started on April 27th at 13:30.

Prip'yat residents were told that they would return home in three days, though many would never see their homes again.

By 15:00 on the first day, 53,000 people were evacuated. The following day, talks began with regards to the evacuation of people from the 10-kilometre zone. Ten days after the accident, the evacuation area was expanded to 30 kilometres. While the Chernobyl Nuclear Power Plant Exclusion Zone has since remained, its borders have changed. The inclusion of isolated nuclear fallout hotspots outside this 30-kilometre zone over the following year eventually increased the number of evacuees to 135,000. With those evacuated between 1986 and 2000, the total number of permanently resettled persons reached approximately 350,000.

“We were waiting for hem to explain it on the TV. For them to tell us how to keep safe. But the worms, just ordinary worms, they buried themselves deep in the ground, a good half a metre or one metre down. We couldn't make sense of it. We kept digging and digging, but couldn't find a single worm for our fishing.”

Svetlana Alexievich, 1997

On April 29, evacuation started in Chornobyl and the surrounding residential areas. In the environmental measurements, levels of radioactivity were found to be above normal values. Radiation levels taken on the highway connecting the region to Kyiv showed an increase, and radiation measurement and control mechanisms were introduced for vehicles coming from the region. Regular radiation testing commenced in water basins of Kyiv and surrounding residential areas. High levels of radioactivity were detected in agricultural areas in the Chornobyl region and the Kyiv Oblast region. Testing was started on animals and animal products.

1,200 hospital beds were prepared in Kyiv and its surrounding area to serve those evacuated from the region, and experienced healthcare professionals were assigned to these hospitals. In the first stage, out of the 468 patients—79 of whom were children—38 were diagnosed to be affected by radiation.

35,304 people who left the region were resettled in Kyiv Oblast. 97% of them were offered jobs. 7,500 apartments and various dormitories to accommodate 1000 people were provided for evacuees in Kyiv. In Chernigov, an additional 500 apartments were allocated for the Ministry of Energy employees. Furthermore, a construction effort, which included 3000 apartment flats and 8000 farmhouses as well as the refurbishment of 6000 unused houses in Kyiv Oblast was underway. The 3,684 families who had been evacuated from the 21 villages in the Chornobyl region and the three villages in Polesky would thus be offered housing.

In addition to those in Kyiv Oblast, more than 1,300 doctors, 2,300 specialists, technicians and nurses, 750 medical interns and 60 scientific research assistants were assigned to support evacuees. All of those evacuated from the region underwent regular and mandatory health screenings. Following a total of 350,500 examinations, tests and screenings, 11,561 patients—3,983 of whom were children—were found to be affected by radiation, and were referred to scientific research institutes and better equipped hospitals. It was decided that a total of 150,000 people would be kept under prolonged observation.

CHAOS

According to the measurements made on April 28 at 12:00, radiation levels in Kyiv were reported to be normal, but the measurements in Pripjat showed that the gamma radiation values had increased and reached a level of 0.7 - 4.0 mSv. Reported by the KGB, this information was confidential.

The clouds loaded with radioactivity, which caused fallout, would change direction, scatter or localize in patches in certain areas with the change of wind direction due to atmospheric movements especially in mountainous regions. It was recorded that the clouds were moving in the northwest direction, heading north of the Baltic Sea over Poland and concentrating above Sweden, Finland, Latvia and Estonia.

The evacuation of the area had begun one and a half days before the official announcement of the accident. On the morning of April 28, alarms were heard at the Forsmark Nuclear Power Plant in Sweden, about 1,100 km from the Chornobyl site. The Swedish government contacted the USSR on the same day, inquiring about whether there had been an accident. Although the USSR didn't confirm it initially, they eventually did report the accident in Chornobyl when the Swedish government stated that they were ready to report the situation to the International Atomic Energy Agency.

While the accident had been referred to as a small one, the evacuation of tens of thousands of people revealed its actual scale. On the night of April 28, at 21:02, a 20-second announcement was read in *Vremya*, the main news program of the USSR Central Television, informing citizens that there had been an accident at the Chornobyl Nuclear Power Plant, where damage had been detected in one of the reactors, and that further investigation was being carried out to comprehend the full impact of the accident, adding that emergency assistance had been directed to the area and that a research commission had been established. This was the full scope of the announcement, and it was the first time that the USSR had officially announced a nuclear accident. Following this announcement, the Telegraph Agency of the Soviet Union (TASS) broadcast information on the Three Mile Island nuclear accident, which took place in the USA as well as other nuclear accidents around the world. Classical music replaced the

radio programming that had normally been planned for broadcast. Around the same time, ABC News in the USA was presenting its report on the accident.

It had been assumed that by disposing a total of 5,000 tons of sand, lead, clay and boron from helicopters, the burning reactor core could be extinguished, but none of the material could actually reach the core. Nearly 600 pilots had been exposed to high levels of radioactivity during their low flights above the reactor.

With the effect of the wind, radioactive dispersion continued in the North-Northwest direction in the atmosphere. The Soviet Air Force adopted a cloud seeding method, initially, over an area of 10,000 km² over Belarus, in order to decompose the radioactive particles carried by the clouds moving towards the highly populated areas, and to trigger sudden condensation and controlled fallout.

It was recorded that the radioactive clouds also took hold of Norway, moved towards Greenland, and also progressed from the north towards the east of Russia, then reached into central Europe and the north of Italy, while also impacting Germany and Austria.

As of April 30, concentrations of radioisotopes detected in water basins, agricultural areas, forests and animals in the region had reached a level of 0.1 - 0.2 mSV. A "Confidential" report indicated that radioactive water from the Chernobyl plant had entered the Dnieper river from the power station's cooling pond, reaching the giant reservoir of Kyiv. A network of artesian wells and pumping stations were rapidly constructed to ensure the city had fresh water supply, and underwater dams were built to prevent the further spread of radioactive sludge downstream from the riverbeds.

The water gushing out of the cooling water pipes that were destroyed with the impact of the first explosion combined with water overflow on the lower floors resulting from the firemen's intervention on the roof, which reached the cooling water pumps pools located under the reactor floor, and caused flooding at the base.

The temperature of the smoldering graphite on the reactor floor had exceeded 1,200 °C and started to burn through the reactor floor causing the concrete to melt. It was feared that, if this mixture melted through the floor into the pool of water, it could create a serious steam explosion that could eject more radioactive material. The pools had to be drained immediately. Volunteer engineers Alexi Ananenko, Valeri Bezpалov and shift supervisor Boris Barazanov entered the highly radioactive water and managed to reach the relief valves and open them to prevent the dreaded massive explosion.

By May 2, radioactive clouds covered all of Europe except the Iberian Peninsula and reached Britain, then moved across the Balkans and over the Aegean Sea and completely covered the Black Sea. In the south it reached Turkey, and in the east it reached the Caspian Sea, impacting Kazakhstan. In the following days, the clouds headed towards Alaska via Greenland and to the West Coast of the USA via the Pacific Ocean. The clouds covered the Middle Eastern countries on May 5, and continued its movement in the southeast direction. Spreading across the Eastern Mediterranean, while also moving towards the east and south of Asia, the clouds impacted a significant part of the Northern hemisphere.

Danger was still not over. The core continued to burn. To reduce the likelihood of the lava flow reaching below the reactor, the decision was made to cool down the base of the building.

On 4 May, the injection of liquid nitrogen began with the use of oil well drilling equipment. It was estimated that 25 tonnes of liquid nitrogen per day would be required to keep the base at $-100\text{ }^{\circ}\text{C}$. This idea was soon dropped. Alternatively, coal miners were deployed to excavate a tunnel below the reactor to make room for a cooling system. The plan was to incorporate a coiled formation of pipes cooled with water and covered on top with a thin thermally conductive graphite layer, which would quickly cool possible molten spillage on the pipes and to encapsulate this graphite layer between layers of concrete, each 1 meter thick, in order to stabilize the thermal conduction. On June 24, 388 miners from Moscow and Donbas regions completed the 168 meter-long tunnel. However, it was later realized that the burning in the reactor had stopped on May 10; almost half of the graphite had burned, and after three layers, the lava-like material had begun to cool and that there was no further melting. Consequently, the tunnel was filled with concrete, as a means to strengthen the foundation.

As of June 12, the preparations for the exclusion of a 120 km perimeter region with wire fences continued. 201,000 students and children from Kyiv and surrounding residential areas were sent to camps in remote areas. It was determined that the number of patients requiring long-term treatment could be around 150,000. It was estimated that there were 129 residential areas, 22,054 courtyards and squares, 46,899 buildings, 5508 kms of roads, 414 km² of fields, 210 km² of meadows in addition to forest areas that would need to be decontaminated from radioactivity.

The army was mobilized, and a comprehensive liquidating process was carried out for seven months in areas exposed to highly radioactive fallout, with the participation of hundreds of thousands of soldiers. Because of potential spreading of radioactivity, animals living in the area were culled, fields were plowed, and trees were cut down and buried. The liquidating process had to be repeated for many areas. Within fifteen months, agricultural production resumed in the region, and a limited number of villages were reopened for habitation. The reason for undertaking such an early and perilous effort, especially for an area of marginal agricultural value, rather than leaving it to its natural process was psychological. The Soviet administration sought to prevent societal panic and to restore confidence regarding nuclear energy, and even to restart the Chernobyl nuclear reactors.

By July, months of investigations into the causes of the accident had come to a certain stage, and the authorities were held responsible for not having detected and not having taken the necessary precautions for the operational errors as well as the design failure of the RMBK reactors used in Chernobyl. In line with the KGB report dated July 28, 1986, and one day after the Politburo meeting in Moscow, a decision of confidentiality was made along with a broadcast ban on the issues related to the accident which were summarized under 26 articles. First of these articles was about the “disclosure of information about the causes of the accident”.

Although broadcasting bans had been relaxed by September 24, 1987, bans on environmental issues caused by the accident, which were summarized in 8 articles, continued. In addition to the economic dimensions of the accident, the information about the impact on farm animals, forest areas and natural life, whether the measurements taken around settlements, agricultural areas, in the air and water basins were above the permissible limits or not, and the results of the analysis of agricultural and animal products were not disclosed either.

SARCOPHAGUS

Months after the explosion, the removal of debris from the roof was incorporated into the agenda. Although the radioactive debris remained largely inside the reactor building, the removal of the nearly 100 tons of radioactive waste accumulated on the roof was essential to the safe construction of the sarcophagus designed to cover the roof in order to stop the release of radioactive dust into the atmosphere. Initially, remote controlled robots were considered for the removal process. About 60 robots were utilized but their electronic control mechanisms were inefficient due to the high levels of radiation, and only 10% of the debris could be removed with this method. The replacement of robots by “bio-robots”, namely soldiers, was proposed as a solution. Thousands of soldiers were organized, wearing protective clothing, and attending the roof only once and working for a maximum of 90 seconds to collect radioactive waste. There were soldiers who went up on the roof not once but five or six times. In the end, the roof was cleaned. In this process involving 3,828 soldiers, the dose each soldier was exposed to was roughly 250 mSv.

Following the cleaning of the roof and its surrounding area, the construction of the sarcophagus on the debris to curb the spread of radioactive residues and to reduce the effect of radioactivity was also imperative for the safety of personnel working in other reactors. The design of the sarcophagus project commenced on May 20, and consisted of multiple steps: isolating the surroundings of the reactor building No. 4 with concrete, erection of walls around the perimeter, construction of a shielding wall between the reactors No. 3 and No. 4, covering of the turbine hall, closing the roof by the construction of the carrier and support walls, and establishing ventilation and filtering systems. 400,000 m³ of concrete and 7,300 tons of metal were used to cover the highly radioactive 740,000 m³ of debris containing 200 tons of radioactive lava, 30 tons of radioactive dust and 16 tons of uranium and plutonium. However, due to high radioactivity, the connections that were meant to be bolted and welded could not be done properly, the robots used for this purpose could not work efficiently, and in the end the isolation process was finished but imperfect. On October 11, 1986, the government commission released a report confirming the reliability and durability of the sarcophagus.

An evaluation made by Soviet scientists on December 22, 1988 estimated that the sarcophagus could only last 20 to 30 years without a restoration, as it had been impacted by rainwater, which caused corrosion in the carrier columns and beams. Furthermore, the roof was under risk of collapse over time and the radioactive water that seeped to the lower floors could penetrate the debris and reach the soil underneath.

In 1992, the Ukrainian government organized an international competition under the consultancy of Design Group Partnership (DGP) of Manchester for the renovation of the damaged sarcophagus. The general framework of the technical specification included the New Safe Confinement, a structure that ensured the safety of workers with less exposure to the radioactive environment through various measures such as production at a certain and safe distance as well as an arc-shaped, sufficiently high and slideable structure on rails.

During a meeting, which took place in Denver in June of 1997, G-7 countries, the European Commission and the Ukrainian government decided to initiate a program to transform the wreckage into a safe zone. With resources provided by more than 40 states and the European Bank for Reconstruction and Development, a huge construction project that would withstand environmental conditions for 100 years, prevent the spread of radioactive debris and aid the removal of the debris could thus be implemented.

Over time, sections of the roof collapsed, and surveys made in the environment indicated that there had been radioactive leakage. Partial repairs were made, but both countries in the region and other European countries feared a new release of radioactivity.

The operators in charge of the management, surveillance and security of the Chornobyl exclusion zone were only allowed to work for a limited time each day, depending on their rate of exposure to radioactivity, and the shift periods and durations were defined according to their areas of work. Those under the age of 18 were prohibited from residing within the zone. On December 15, 2000, the last remaining active reactor was also decommissioned and a new process thus commenced.

The legislation signed by Victor Yushenko, the president of Ukraine, and incorporated into the government program on June 30, 2009, which stipulated the securing of reactor No. 4, the clear out of the region and the complete dismantling of the Chornobyl power plant by 2065, only came into force on January 1, 2010.

The pre-production process of the arc-shaped structure with an ultimate external length of 165 meters, a height of 110 meters and a width of 257 meters was produced in Italy, and transported to Chornobyl on 18 ships and 2,500 trucks. In April 2016, after being assembled near the site to ensure the safety of the workers, the New Safe Confinement structure was glided onto the sarcophagus using tracks. The final assembly was completed at the end of 2018. The next step was the dismantling and demolition of the radioactive debris using the computer controlled “RoboCranes” set-up inside the structure equipped with interchangeable remote controlled robotic arms, impact drills, augers, cutters, powerful vacuum systems and closed circuit television systems.

END OF AN ERA

The Chornobyl catastrophe is acknowledged as the worst nuclear accident in history. For the USSR, the cost of the accident was not limited to the immediate environmental damages and human loss but was exacerbated with the wide area in which the post-accident recovery had to be conducted, in addition to the losses due to wasted energy resources, the shattered hopes of a nation as well as the loss of trust and national pride.

It was thanks to the devoted work of heroes, the labor of hundreds of thousands of people and the virtually unlimited resources of a great country that the possibly “much bigger” effects of the disaster were prevented. Still, the common view of scientists was that it would take thousands of years for the region to be suitable for human habitation again. Some scientists even estimated that the contaminated area would not be safe for 24,000 years.

Mystery lay inside the sarcophagus, waiting to be discovered.

“The nuclear meltdown at Chernobyl 20 years ago this month, even more than my launch of perestroika, was perhaps the real cause of the collapse of the Soviet Union five years later. Indeed, the Chernobyl catastrophe was an historic turning point: there was the era before the disaster, and there is the very different era that has followed.”

Mikhail Gorbachev, 2006

CANCER

Having spread over an area of more than 100,000 km² within the borders of the USSR, the radioactive fallout is estimated to affect an area of 49,800 km² in Russia, 37,200 km² in Ukraine, and 29,900 km² in Belarus. When evaluated together with the heavily affected areas of Europe, it is believed that more than 160,000 km² is affected by radioactive fallout. However, it is important to note that most of the studies have focused on Ukraine, Belarus, Russia and European countries, and data on the Middle East and Asian countries have not been adequately examined within the scope of the investigations.

“... Nuclear disasters recognise no international, social or cultural borders...”

Serhii Plokyh, 2019

The concealing of records and the non-disclosure of information prevented the real dimensions of the disaster from being revealed to the public even after the “Cold War” years. Anti-nuclear groups questioned the reliability of the World Health Organization (WHO)—an affiliate of the United Nations, but with different missions—and drew attention to a cooperation agreement dated May 28, 1959, between the WHO and the International Atomic Energy Agency, which included a clause stating the right to non-disclosure of certain confidential information if deemed necessary. On the other hand, the confidentiality policies implemented by the state administrations for protecting national economic interests against international competition were received with concern by the opposition circles; different institutions were reaching conflicting conclusions using the different data available, perhaps in-line with their missions and focus.

The United Nations Chernobyl Forum Report published by the WHO on May 1, 2006, predicted that a total of 9,335 people who were exposed to radiation could die over the years due to cancer. The analysis showed that a total of 200,000 liquidators who had been involved with the extraction and cleaning activities in the region between 1986-1987 and had been exposed to an average radiation dose of 100 mSv, and indicated that 2,350 of these people could die. Also according to the report, out of the 135,000 people living within a 30 km radius from the reactor and who had been exposed to an average dose of 10 mSv before being evacuated, 165 could die; out of the 270,000 people living in other areas that had been exposed to high amounts of radioactivity had been exposed to an average dose of 50 mSv, 1,660 could die, and out of the 6,800,000 people living in other areas exposed to radioactivity had been exposed to an average dose of 7 mSv, 5,160 could die.

An article published on 17 April 2011, by the Union of Concerned Scientists, established in the USA in 1969 by scientists, who are conscious of and responsive to humanitarian and environmental problems, noted that the number of cancer cases related to the disaster that were expected to result in death was around 27,000.

In a similar vein, M.V. Malko’s article in Greenpeace International's January 2007 publication investigating the Chernobyl disaster’s effects on human health, criticized the evaluations of the Chernobyl Forum for being overly optimistic, and predicted that 186,160 of the millions of cancer cases that emerged after the Chernobyl disaster between 1986 and 2056 would result in death.

The World Health Organization states that around 4,000 cases of thyroid cancer have been detected, most of them in children, despite the mortality rate being very low. Studies conducted among those who live in the region indicate that among those exposed to relatively low doses of radiation, there have been no cases where a decrease in fertility rate or birth with anomalies due to radiation have been recorded. The anxiety and fear experienced by the 350,000 people who have been forced to evacuate is underscored in studies, and it is noted that mental health cases caused by problems related to poverty and lifestyle changes have been common, and in some cases more impactful on society than radiation.

According to the records of the United Nations Scientific Committee on the Effects of Atomic Radiation, more than 6,000 cases of thyroid cancer among adolescents and children were recorded up to 2005, and while it was noted that more cases could be encountered over the years, there was no data to prove that there was another critical disease due to radiation exposure.

According to the 2015 records of the National Research Center for Radiation Medicine of National Academy of Medical Sciences of Ukraine, 651,453 officers underwent health checks between 2003 and 2007, in addition to 99,693 in Belarus and 157,086 in Russia. Studies done on those exposed to high radiation in the region reveal that mortality rates increased in Ukraine between 1988 and 2012, and those who previously seemed healthy had health problems related to cancer, cardiovascular diseases and/or disorders related to the nervous system over the years. According to records from 2008, 40,049 of the people who were exposed to high radiation in Belarus had cancer, in addition to 2,833 in Russia as recorded in another study.

On the other hand, the International Atomic Energy Agency claimed that a direct relationship couldn't be established between radiation and cancer and other diseases detected among those exposed to high radiation in the region.

People in many countries in Europe were reluctant to trust the statements of the official authorities. Many pregnant women in Denmark, Italy, Greece, and several other countries, sought out elective abortions with fear of birth anomalies due to radiation risk. The total number of elective abortions performed out of fears of radiation is estimated to be around 200,000.

Risk projections suggest that as of 2006, 1,000 cases of thyroid cancer in addition to 4,000 cases of other cancers in Europe may have been related to the radiation emitted from Chernobyl. According to predictive models, 16,000 cases of thyroid and 25,000 cases of other cancers are expected by 2065.

TURKEY

From a "free world" point of view, the "iron curtain countries" are often criticized for their violation of people's right to information and their careless attitude towards public health. But perhaps, the situation was even worse on the other side of the curtain.

In Turkey, the Turkish Atomic Energy Authority's inadequate assessment and representation of the measurement results and the light-hearted and irresponsible statements of government officials led to speculation and a countrywide panic. Meanwhile, Minister of Commerce C.

Aral's comment on how "nothing happened" to him as he drank tea on live television, President K. Evren's "Radiation can't do anything to us" declaration and Vice President T. Özal's "A little radiation is good for the bones" claim all made headlines.

With the atmospheric circulation, the radioactive clouds reached Turkey on April 28, 1986 and were shown to be effective in the eastern Black Sea coast and Thrace region until May 4. It was noted that with the rain on May 3, a wide area had been exposed to radioactive fallout. Studies conducted by the Turkish Atomic Energy Authority in the region found high levels of radioactivity in drinking water basins, pastures and agricultural areas as well as milk and milk products, tea, tobacco and nuts.

Although Karadeniz Technical University documented a rapid increase in cancer cases in the region and the Middle East Technical University Laboratories found the tea produced in the region to be highly radioactive, pressure from state institutions made these findings impossible to report, even causing people to be dismissed from their positions. It was widely believed that nuts and tea sold in markets and sent out to schools and military bases were highly radioactive.

Nineteen years after the accident and the ensuing radioactive fallout, when the construction of the first nuclear power plant in Turkey was on the agenda, Health Minister R. Akdağ declared that, scientific studies conducted in the Black Sea region have found no direct relationship between the high concentration of radioactivity in the region following the Chornobyl disaster and the increase of cancer cases, and that the increased number of cancer cases were related to increased cigarette consumption rather than radiation.

A CORDIS report on the Chornobyl accident published by WHO on April 22, 2006 claimed that the current and the expected future 70-year death toll in the three countries of the former Soviet Union - the Russian Federation, Belarus and Ukraine - were significantly lower than originally anticipated, and stated that these predictions were consistent with the "official" findings from Turkey.

WILDLIFE

"... we prefer to believe more in miracles than in the possibility of actually doing something creative with our own two hands. Look at nature. We have to learn from her. Nature is working, cleansing herself, helping us. She behaves more rationally than man. She is striving to restore the original balance, the eternal order of things..."

Svetlana Alexievich, 1997

In March 2019, representatives from research groups examining natural life in Chornobyl met in Portsmouth, UK. 30 scientists from the United Kingdom, Ireland, France, Belgium, Norway, Spain and Ukraine shared the findings from their studies on birds, frogs, fish, wasps, worms, bacteria and rotten leaves in the area.

Throughout the duration of the studies conducted in the region, it was observed that biodiversity was high and that the current radiation levels did not generally have a negative impact on animals and plants. The number of grizzly bears, wildcats, European bows, wild

pigs, and Przewalski horses in the area continued to increase. Foxes, wolves and eagles were returning.

It was noted that animals and plants in the region continued to coexist in a particular balance and order despite certain irregularities noted in some species. In areas where radioactivity was higher, lifespan of insects had been noted to be shorter, and they were more prone to be impacted by parasitics. Although albinism and various other psychological and genetic changes in some bird species, and darker skin colors in frogs were documented, it was noted that there wasn't enough data to conclude an interruption in the repair process of natural life in the region.

First of all, it was noted that natural life's radiation resistance threshold was much higher than expected or that some organisms could develop their adaptability to eschew the negative effects of radiation. It was stated that natural life in the region was developing in spite of the negative effects of radiation and the absence of humans in the region had benefited several species, especially mammals.

The verdict was that in the medium term, human existence impacted natural life more negatively than a nuclear accident. In an environment void of humans, nature could re-establish its own balance. And that was what happened in Chernobyl.

While there were various different viewpoints and evaluations regarding the development process of wild life in the area, many scientists agreed tourism in the area should be restricted.

“Who was here first? Who is stronger and more enduring on the earth: us or them? We could learn a thing or two from the animal kingdom about survival. About how to live too.”

Svetlana Alexievich, 1997

Compared to the “outside”, natural life in this exclusion zone was in full bloom. Some researchers supposed that animals had escaped from people to live in this area. An unexpected consequence of the evacuation efforts had been the transformation of this almost post-apocalyptic world into a natural habitat for animals. Perhaps being exposed to radiation was the lesser of two evils for animals as opposed to humans who hunted and meddled with the environment and the food chain. The impact of radioactivity on animals was acknowledged but in the long run it wasn't as dangerous as the expansionist species, namely, humans.

With a change of perspective, one can say that Chernobyl was not the scene of destruction, but a place where despite radiation, the lack of humans meant that nature could reveal its ability to re-establish its own equilibriums.

TOURISM

“When written in Chinese, the word ‘crisis’ is composed of two characters—one represents danger and one represents opportunity.” (*)

John F. Kennedy, 1959

(*) “The explication of the Chinese word for crisis (危机, *wēijī*) as made up of two components signifying danger and opportunity is due partly to wishful thinking, but mainly to a fundamental misunderstanding about how terms are formed in Mandarin and other Sinitic languages.” (Victor H. Mair / Malumatfurusorg)

In 2011, Ukraine opened the Chernobyl exclusion zone for tourism. Authorities were adamant that the region was “now safe”. Interest in the region was on the rise.

In a BBC interview on July 10, 2019, former comedian, and the new President of Ukraine, V. Zelensky stated that while Chernobyl is considered a black mark for Ukraine, it was time to change this perception by creating “a green corridor” for tourists, and added that the region’s GSM networks were going to be developed.

EPILOGUE:

Coronavirus disease (COVID-19) pandemic

We had believed in the human mind.

We had admired humanity’s creative brilliance in the struggle for transforming and adapting nature, we had believed that in the process of dominating nature the productivity of land could be infinitely proliferated with the implementation of capital, labor and science. However, we had forgotten that we were part of nature, with our flesh, blood and brains. Since the beginning of the industrial revolution—and exponentially so in the last 50 years—world population has multiplied by 10 to reach a total of 7.85 billion. In line with this and the changes in our habits of consumption and social lives, our energy expenditure has increased 20 times, reaching 160,000 TWh each year. And we had considered this process as our victory against nature.

“Human actions threaten more species with global extinction now than ever before. An average of around 25% of species amongst the assessed animal and plant groups are threatened suggesting that around 1 million species are now threatened with extinction, many within decades, unless action is taken to reduce the intensity of drivers of biodiversity loss. Without such action, there will be a further acceleration in the global rate of species extinction, which is already at least tens to hundreds of times higher than it has averaged over the past 10 million years.” (*)

(*) Excerpt from Report of the Plenary of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), 2019

We were talking about an endless desire to dominate the “other”, and the process in which humans, having been alienated from their labor, became alienated from nature as well as themselves to eventually destroy their own kind.

Global warming, melting of polar ice caps, avian flu, the Kyoto Protocol, SARS, ozone layer depletion...

We were watching all these developments, but it was as if we were in a theoretical discussion; many of us were gazing at an uncertain future and the agony of others from afar. We didn't question whether we had contributed to the reproduction of this process either.

Now, however, we are inevitably recognizing the fact that our planet is sick and that we are helpless. Our advanced technologies and smart bombs cannot provide a cure.

We cannot comprehend the cost of interfering with the natural balance that has evolved over millions of years, and we are horrified.

Those with the loudest voices are still blaming the "other" while some are dreaming of turning this into an "opportunity".

Yet, the virus knows neither the "other" nor the "farther".

It is not clear whether humankind will renounce this poorly written and performed theatrics or not, but solidarity of the species stands before us as an option.

Emin Altan
February 2021, Istanbul

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