

# The Chernobyl Accident and its impact on Belarus



by Michael Yohnk  
([yohnkmw@uwec.edu](mailto:yohnkmw@uwec.edu))

Geography 308  
Geography of Russia and Eastern Europe  
University of Wisconsin-Eau Claire  
Professor Zoltan Grossman  
Spring, 2005

<http://library.thinkquest.org/20331/images/chernsite.jpg>

## Where is Chernobyl?



- In Northern Ukraine
- 10 miles away from Belarus
- 80 miles North of Kiev



<http://students.vassar.edu/mezegen/Eastern%20Europe%20Map.gif>  
<http://studiohousebooks.co.uk/chernobyl/Chernobyl/chernobyl.html>

## The Chernobyl Nuclear Power Plant

- Located 11 miles north of the city of Chernobyl
- Plant consisted of 4 reactors
- Produced 10% of Ukraine's electricity
- Construction began in the 1970's
- Reactor #4 was completed in 1983
- At the time of the accident, reactors #5 and #6 were in progress.

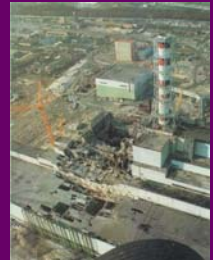


<http://www.rotten.com/library/history/nuclear-incidents/chernobyl>

## What happened?

Saturday, April 26, 1986:

- Reactor #4 was undergoing a test to test the backup power supply in case of a power loss.
- The power fell too low, allowing the concentration of xenon-135 to rise.
- The workers continued the test, and in order to control the rising levels of xenon-135, the control rods were pulled out.

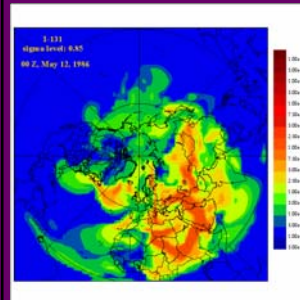


[http://www.ukrainianweb.com/images/chernobyl/chernobyl\\_reactor.jpg](http://www.ukrainianweb.com/images/chernobyl/chernobyl_reactor.jpg)

## What happened? cont'd

- The experiment involved shutting down the coolant pumps, which caused the coolant to rapidly heat up and boil.
- Pockets of steam formed in the coolant lines. When the coolant expanded in this particular design, the power level went up.
- All control rods were ordered to be inserted. As the rods were inserted, they became deformed and stuck. The reaction could not be stopped.
- The rods melted and the steam pressure caused an explosion, which blew a hole in the roof. A graphite fire also resulted from the explosion.
- To save money, the reactor was constructed with only partial containment, which allowed the radiation to escape. 13%-30% of the material escaped.

## Immediate Impact



- 203 people were hospitalized immediately. 31 of them eventually died. Most of these people were workers in the plant or local firefighters.
- NW winds from the Black Sea carried the radiation for miles in the following days. Scandinavian detectors picked up on the abundance of radiation, but the Soviet government denied everything.

<http://www.cmc.ec.gc.ca/~arqidor/ctbto/ctb13.html>

## West and Northwest Winds carried radiation

**Chernobyl global radiation patterns**

1200  
800  
400  
Chernobyl

Higher contamination Radius

<http://www.k14u.com/potassium-iodide.htm> <http://www.metoffice.com/environment/serv4.html>

## The Clean Up

- "Liquidators"
  - These were firemen who helped put out the fires and helped clean up the radiation
  - Most did not realize the dangers of radiation.
  - Many later died from radiation, because they didn't wear protection.
  - An estimated 8,000-20,000 to date have died (20% from suicide)
- Robots
  - United States supplied
  - Specifically designed to enter reactor core and help build the sarcophagus

<http://www.chernobyl-international.com/aboutchernobyl/fateoftheliquidators.asp>  
<http://er1.org/docs/photos/Disaster/Chernobyl%2002%20robotic%20inspector.jpg>

## Clean Up

Approximately 300,000 to 600,000 liquidators were involved in the cleanup of the 30 km evacuation zone around the plant in the years following the meltdown.

<http://library.thinkquest.org/3426/data/emergency/cleanup.efforts.html>

## Impact on Belarus

- 70% of total fallout fell on Belarus
- 20% of Belarus land area was evacuated
- 130,000 Belarusians evacuated
- 2.5 million Belarusians affected

<http://www.chernobyl-international.com/images/Chernobyl-Map.jpg>

## Evacuation

-Following the accident hundreds of thousands of people had to be evacuated and between 1990 and 1995 an additional 210,000 people were resettled.

**People evacuated:**

- May 2-3 (1 week later) 10 km area (45,000 people)
- May 4 30 km area (116,000 people)

-50,000 people from Pripyat, Ukraine were evacuated 2 days after the accident.

<http://library.thinkquest.org/3426/data/emergency/evacuation.html>

## Containment

- Cement sarcophagus built in the months after disaster
- 5,000 tons of sand thrown on top of reactor core

<http://www.greenpeace.org.ar/energiapositiva/img/fotos/chernobyl.jpg>

## Belarus after Chernobyl



Abandoned city in southern Belarus

<http://studiohousebooks.co.uk/chernobyl/Chernobyl/chernobyl.html>  
[http://me.sincerethought.org/gallery/album10/wic\\_6](http://me.sincerethought.org/gallery/album10/wic_6)

## Effects of Radiation



<http://www.progettohumus.it/chernobyl.php?name=dimenticafoto>

## Effects of Radiation

- Belarusian doctors identify the following effects from the Chernobyl disaster on the health of their people:
  - 100% increase in the incidence of cancer and leukemia
  - 250% increase in congenital birth deformities
  - 1,000% increase in suicide in the contaminated zones
  - “Chernobyl AIDS”--the term doctors are using to describe illnesses associated with the damage done to the immune system

## The Children of Belarus



- Children were much more affected by Chernobyl and the radiation, due to their weaker immune systems.
- 1991-1992--sickness rate among children almost tripled
- Threat to gene pool—fewer children being born.
- The following problems have increased in Belarusian children:
  - heart and circulatory diseases, malignant tumors, and disorders of the nervous system, sensory organs, of the bone, muscle and connective tissue system

<http://studiohousebooks.co.uk/chernobyl/Pictures/pictures.html>  
<http://studiohousebooks.co.uk/chernobyl/Chernobyl/chernobyl.html>

## Children cont'd

- It is estimated that 1 out of every 4 infants in Belarus will develop thyroid abnormalities.
- The normal rate of thyroid cancer would be only one in 1 million.
- In the immediate aftermath of the disaster, had the authorities supplied the children with preventive potassium iodine, it would have prevented many of the thyroid cancer cases.

## Thyroid cancer

•The thyroid gland is the most vulnerable organ to radiation in the human body.

•Normally, this is a rare disease, with only 1 case per year being reported in Belarus before the Chernobyl accident.

•Thyroid cancer can take 10-30 years to show it's effects.

•There has been a 2,400% increase in the rates of thyroid cancer in Belarus since 1986.

•In the Homyel region of Belarus, the region closest to Chernobyl, there has been a 100-fold increase in thyroid cancer.



<http://www.chernobyl-international.com/aboutchernobyl/thyroidcancer.asp>

## Belarusian Landscape



Pripyat River in Belarus



Abandoned road in Belarus

<http://home.cc.umanitoba.ca/~dmcmill/1995/Large/Belarus.html>  
<http://home.cc.umanitoba.ca/~dmcmill/1995/Large/Fishing.html>

## The Land of Belarus

- 25% of the country's farmland and forest contaminated at a dangerous level
- 10% of the land is unusable
- 1% of the entire land in Belarus was uncontaminated
- Forests ruined
- Many animals are dying as well from the radiation



<http://www.radjournal.com/chernobyl/Ride%20Through%20Chernobyl/checkpoint.htm>

## The Land cont'd



- Plutonium's half life is 24,400 years.
- The 30-km radius has been expanded into a 70-km radius, covering a portion of southern Belarus.
- Forest/brush fires have spread the radiation through the air.

[http://www.fao.org/documents/show\\_cdr.asp?url\\_file=/DOCREP/004/Y2795e/Y2795e08.htm](http://www.fao.org/documents/show_cdr.asp?url_file=/DOCREP/004/Y2795e/Y2795e08.htm)

## Other problems...

- Food & Water
  - Milk—Farmers have to watch the radiation level in milk.
  - Fish—Cannot be eaten, as water absorbs radiation and fats concentrate it
  - Radioactive Floods every spring
- Lives ruined
  - Suicide and depression
  - Even healthy people were traumatized



<http://www.spacedaily.com/images/chernobyl-airview-bg.jpg>  
[http://library.thinkquest.org/3426/data/local-effects/agriculture\\_effects.html](http://library.thinkquest.org/3426/data/local-effects/agriculture_effects.html)

## Chernobyl Today



- The plant has been shut down by Ukraine. (Dec. 2000)
- The cement sarcophagus is falling apart, due to the quick emergency construction of it.
- The UN estimates that up to 9 million people have been affected directly or indirectly by the fallout.
- The full consequences will not be seen for at least another 50 years.



[www.calguard.ca.gov/ia/Chernobyl-15%20years.htm](http://www.calguard.ca.gov/ia/Chernobyl-15%20years.htm)  
[www.balticuniv.uu.se/space/catch\\_news27.shtml](http://www.balticuniv.uu.se/space/catch_news27.shtml)

## Belarus today

- Hundreds of abandoned towns
- Land still very contaminated
- Most of budget goes towards medical facilities
- Over the next 30 years, Belarus will have spent a total of \$235 billion on dealing with radiation.
- Many areas will forever be radioactive.
- The present value of resources spent from the republican budget since 1991 amounts to about 20% of the 2001 GDP
- Belarus depends on most of its electrical power from Russia.
- Radiation is still a problem, especially in children



[http://www.iwpr.net/index.pi?development/workshops/training\\_chernobyl0103.html](http://www.iwpr.net/index.pi?development/workshops/training_chernobyl0103.html)

## Living in the contaminated zone in Belarus today...

- People must change their clothes twice a day, and may not walk in the woods for more than two hours a month.
- Radiation level charts are printed in the newspapers and dictate decisions such as whether children can be allowed out to play.
- People are told to wash food at least five times in clean water, but nobody is told where this clean water is to be found.
- Cattle are not supposed to graze in areas where the grass is less than 10cm high so their mouths will not touch the earth.
- Most people find it impossible to follow these nearly impossible instructions, so they simply give up trying.
- There are also housing shortages in Belarus and the rest of the ex-Soviet Union. This is a problem because people have a hard time moving out of the contaminated zone, since there are no other places to live.

## Sources

- Chernobyl Children's Project International
  - <http://www.chernobylchildrensproject.com/aboutchernobyl/default.asp>
- Chernobyl info. "Geographical location and extent of radioactive contamination"
  - <http://www.chernobyl.info/index.php?nav=3-3-3>
- East Camba Chernobyl Children Life Line: "The Chernobyl Accident"
  - <http://stalinofnaseeboces.co.uk/chernobyl/chernobyl.htm>
- Russian Research Center: Kurchatov Institute. "The Causes of the accident and its progress"
  - <http://www.cs.cdu.edu.au/chempageov/interj/041011/chernobylhistory.htm>
- Time Magazine. May 12, 1986. "Deadly Meltdown"
  - <http://www.time.com/time/daily/chernobyl/860512www.html>
- Uranium Information Center. August 2004. Nuclear Issues Briefing Paper 22. "Chernobyl Accident"
  - <http://www.uic.com.au/nip22.htm>
- Ukrainian Web: Chernobyl Tour
  - [http://www.ukrainianweb.com/chernobyl\\_ukraine.htm](http://www.ukrainianweb.com/chernobyl_ukraine.htm)
- Wikipedia, The Free Encyclopedia: Chernobyl accident
  - [http://en.wikipedia.org/wiki/Chernobyl\\_accident](http://en.wikipedia.org/wiki/Chernobyl_accident)
- The World Bank. "Belarus: Chernobyl Review"
  - [http://web.worldbank.org/external/countries/eca/external/belarus/external/comp/MDG-2006-24-guar/24-14147.pdf-14147\\_theStory\\_20062400.htm](http://web.worldbank.org/external/countries/eca/external/belarus/external/comp/MDG-2006-24-guar/24-14147.pdf-14147_theStory_20062400.htm)