



For Your Safety

Forschungszentrum Jülich and Düren district are prepared for all eventualities

Dear Neighbours of Forschungszentrum Jülich,

From time to time, we provide you with information on precautionary measures we and Düren district have taken to ensure your safety. Many of you have already received a similar leaflet before. For others, this information will be entirely new.

In the past, it was our DIDO research reactor which necessitated special precautionary measures. This reactor was finally shut down in 2006, and the fuel elements are no longer in Jülich. Some of the precautions previously necessary are therefore no longer required.

However, even in the future we cannot entirely dispense with a response plan for radiological emergencies. This is due to the fact that in some institutes of Forschungszentrum Jülich, researchers are still working with radioactive substances. This applies, for example, to brain research, where these substances help obtain valuable insights into the functioning of the human brain, and also to environmental research, where they help optimize pesticides – an important contribution to protecting the environment. Last but not least, radioactive waste from the past must also be stored safely.

All the facilities containing radioactive substances are equipped with numerous safeguards that prevent these

substances from escaping into the environment. We want to ensure that things stay that way. Therefore we continually check all the safety precautions of our facilities and modernize them to keep up-to-date with technical developments and new legal regulations. This makes accidents where large amounts of radioactive substances are released very unlikely.

However, precaution dictates emergency plans be devised even if it is improbable that an emergency will occur. That is why, more than 30 years ago, an emergency response plan was drawn up together with the responsible authorities of Düren district. It contains a package of measures designed to protect the population. This information leaflet summarizes these measures for you. Should you have any further questions, please do not hesitate to call us.

Anyone as committed to the future as we are also has a special responsibility to safeguard that future. We are aware of our responsibility, and we are intent on fulfilling it: by setting high scientific and operational standards, employing qualified and conscientious staff, and enforcing strict safety precautions. We are happy to provide you, our neighbours, with information on these precautions



The Board of Directors of Forschungszentrum Jülich: Prof. Dr. Achim Bachem, Dr. Ulrich Krafft, Prof. Dr. Sebastian M. Schmidt and Prof. Dr. Harald Bolt

Safety

The construction and operation of facilities containing radioactive substances is subject to strict legal regulations. As part of the individual licensing procedures, all possible accidents that may occur were analysed and proven to be manageable. The safety systems are monitored continually by independent experts to ensure they are always in good working order.

Our facilities are not only protected by solid structures, they are also equipped with a number of active and passive systems designed to make them even safer. In the case of undesirable operational states, they are automatically activated or set off an alarm.

In several institutes of Forschungszentrum Jülich, radioactive substances are used for research purposes. These substances contain atoms in which the number of protons and neutrons is

not in equilibrium. The atoms have a tendency to rectify this state by emitting alpha, beta and gamma radiation until a stable nucleus remains. This may take one or several steps of radioactive decay.

Released radioactive substances can affect humans from inside and outside the body. In an exhaust air cloud, or on the ground, they cause external radiation exposure. If they enter the body through food or the air, they can accumulate – depending on their properties – in different organs of the body, where they cause internal radiation exposure.

The design, construction and operation of our facilities are therefore geared towards reliably confining and retaining radioactive substances at all times. Where necessary, additional protective, control and alerting systems are also in place.

Continuous Monitoring of the Environment



The purpose of the meteorological tower, which is 124 metres high and thus the highest structure at Forschungszentrum Jülich, is to monitor the area.

Measuring instruments inside and outside Forschungszentrum Jülich continuously monitor the atmosphere, soil and water. Some of the measurement data are sent directly to the supervisory authority, so that Forschungszentrum Jülich cannot influence them. In the many years of supervision, the data have never given cause for concern.

In addition, an environmental measurement programme is also carried out. This is to demonstrate that no elevated levels of radioactive substances can be found in the environment and, in particular, in food. These activities are supported by measurements from the meteorological tower, which can help determine the direction in which airborne emissions move and the conditions under which they do so at any time.

Forschungszentrum Jülich has taken all possible measures to ensure the safety of its surroundings. The necessary precautions have also been taken to protect against a negative impact on the environment in case of accidents, such as fires, explosions or technical failures. Forschungszentrum Jülich has a safety control centre that is always staffed and can summon the required emergency services immediately. These include Forschungszentrum Jülich's own works fire brigade, which is specially trained to fight fires involving radioactive substances. As far as their resources allow, our works fire brigade and medical services are also available to respond to other emergencies in the region.

Numerous structural, operational and other safety features mean that in all probability, any substantial negative impact on the environment has been ruled out. However, prudence requires us to be prepared for all eventualities. Düren district as the responsible governing authority drew up an emergency response plan together with Forschungszentrum Jülich 30 years ago and updates it regularly. This leaflet will give you information on the key features of this plan.

Emergency Response Plan

The emergency response plan guarantees that, in an emergency, you will be given the information you need in good time, and that all measures designed for your protection will be triggered fast and effectively. The plan's most important features are:

Alerting System and Cooperation of the Authorities

In case of an accident, the safety control centre of Forschungszentrum Jülich will be alerted first. All emergency services on campus will be deployed, including the works fire brigade and the various measurement teams and task forces. Their job is to quickly and effectively limit the impact of the accident, and, if possible, to restore safety. The employees of Forschungszentrum Jülich and the authorities will also be informed immediately.

Düren district will then set up a crisis management group which will take the necessary measures without delay: the population will be alerted and informed as early as possible and to the extent necessary; traffic routes will be blocked for the emergency services.

Any additional measures depend on the severity of the accident and the amount of radiation released. The direction of the wind and other weather conditions also play a decisive role. Forschungszentrum Jülich therefore continuously monitors and stores data on the current wind and weather conditions.

Danger Zones

For the purpose of emergency response planning, three zones have been defined in the surroundings of Forschungszentrum Jülich. Now that the DIDO research reactor has been shut down, the danger zones are considerably smaller than they used to be.

First Zone

The first zone covers the area within a radius of one kilometre around a central point on the campus of Forschungszentrum Jülich. This includes only Forschungszentrum Jülich itself, and the northern parts of the village of Daubenrath.

Second Zone

The second zone covers an area of two kilometres around the central point. It comprises the first zone as well as the villages of Stettelnich, Hambach and Selgersdorf.

Third Zone

The third zone covers a radius of 5 kilometres: the area stretches to the town centre of Jülich and to the village of Pier in a southerly direction.

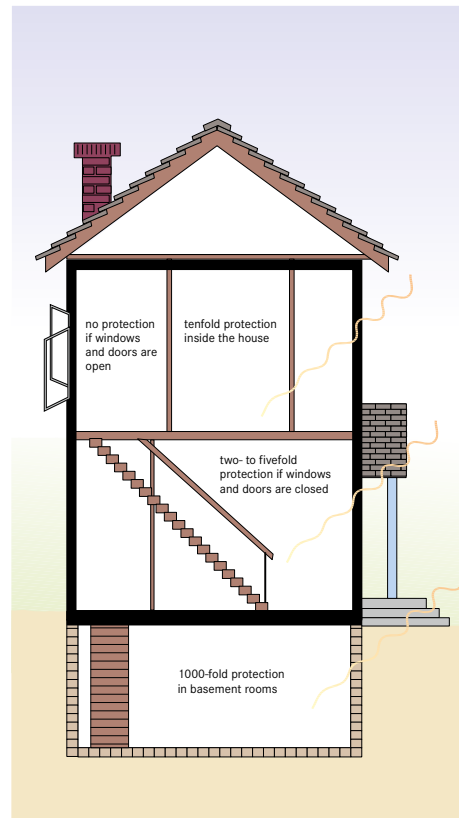
The latter two zones are subdivided into twelve segments of 30° each. This enables the emergency services to respond with different measures in the different segments, for example according to the wind direction and the distance.

In case of an emergency, the population will be alerted by means of mobile loudspeakers and radio announcements. Loudspeaker announcements will be short. Therefore, turn on your radio immediately and tune into a regional station with traffic news. Please pass on all the information available to you,

for example to relatives and neighbours. Avoid inquiries to the emergency services to keep lines free for emergency calls. The announcements will also provide information and instructions for your personal protection. The most important instructions are:

Stay Indoors

When radioactive substances are released, it is important to protect yourself and others from the radiation emitted by these substances. One of the simplest and most effective ways is to seek protection in enclosed buildings. While a radioactive cloud is moving through the area, closing windows and doors can, to a large extent, prevent radioactive substances from entering. Walls, blankets and soil will also reduce the amount of radiation penetrating from outside. A centrally located room in the basement is therefore the safest place to go to.



Staying in enclosed buildings is one of the simplest and most effective ways of protecting yourself.

This can considerably reduce the effects of radiation. In case of danger, it is therefore likely that you will be advised early to remain indoors and to close doors and windows.

If you are outside while a radioactive cloud passes through the area or shortly afterwards, it is likely that radioactive particles have become attached to your clothes and exposed areas of your skin. Experts call this "contamination". In such a case, take off your outer clothing and shoes inside the house and, if possible, collect them in plastic bags. Wash those parts of the body that were not covered. Do not forget to protect your eyes while doing so!

In this kind of situation, tap water is safe to use and drink. Food that has been stored in the house, such as canned food, can also be consumed. However, you should avoid food gathered in gardens or fields in the contaminated region after the incident.

Evacuation

The most severe measure in case of an accident is, without doubt, evacuation. For some facilities, e.g. hospitals, evacuation can pose considerable problems. Such a measure would therefore only be taken after carefully weighing the risks, and if all other measures are insufficient. Which areas are to be evacuated at what time will depend exclusively on the actual accident situation and on the weather conditions. If the area where you live is evacuated, you must observe the following instructions:

- Listen for announcements by the police and fire brigade, and for radio announcements.
- Take only those items you will urgently need within the next two to three days, in particular, medicines prescribed by a doctor, money, keys and ID cards.

- Depending on the situation, you may be asked to report to an emergency station set up specifically for this purpose in order to be tested for contamination and to receive medical attention. The location of any emergency station will also be announced.

National and International Support System

The district authorities' protective measures are embedded in a comprehensive national and international system of precautions. This ensures that in case of danger, the local emergency services will receive all the assistance they need from the state of North Rhine-Westphalia and the Federal Government. The cooperation of the different authorities in emergency management and their correct response guarantees the best possible protection for you even in the hypothetical case of an incident such as described in this leaflet.

The following instructions summarize the most important keywords and concepts.

What To Do

in the case of an accident with radioactive substances

Alerting

- The population will be alerted and informed by means of police vehicles with loudspeakers, and by radio announcements. In Düren district, these announcements will be made on the local radio station Radio Rur (92.7 MHz) and, after sign-off, on Radio NRW broadcast on the same frequency. Also stay tuned to a regional station with traffic news (e.g. WDR 2 on 100.8 MHz) and listen for announcements.
- Do not call the emergency services unless absolutely necessary.
- Inform your neighbours and relatives.

Protection Inside Buildings

- Remain indoors if possible.
- Close windows and doors as tightly as possible and seal them.
- Switch off ventilation and air conditioning systems.
- If possible, do not light an open fire, e.g. a gas stove (oxygen consumption, exhaust gases).
- Go to centrally located rooms, preferably in the basement, and take your radio with you.

What Not to Eat

- Do not eat vegetables from the garden.
- Do not drink milk directly from the farm.
- Do not drink water from open wells or from lakes, rivers, etc.

Evacuation

- Listen for announcements by the police and fire brigade, and for radio announcements.
- Pack an emergency bag containing what you and your family will need for the next two to three days. Remember to take important medicines, ID cards, keys and cash.
- Prepare your home for your absence and lock the door. Turn off gas and water at the mains, extinguish any open fire and switch off electric devices.
- Take small pets with you.
- Follow the instructions of the police. If you are evacuating with your own vehicle, use only the recommended destinations and routes. Otherwise, go to the announced assembly point.
- Switch on the car radio (station with regional traffic news).

Technical Terms and What They Mean

Radioactive substances are the result of fission processes in nuclear reactors and are also produced in accelerators. Their atoms are “unstable” and change in a series of steps until they become stable. During this process – referred to as “radioactive decay” – three types of radiation are emitted: alpha, beta and gamma radiation. In the cells of the human body, radiation causes energy to be transmitted and may change atoms and molecules in such a way that they are no longer electrically neutral. Experts call this process “ionization” and also use the derived expression “ionizing radiation”. When such changes occur in the nucleus of body cells, they can cause damage to your health.

Alpha radiation means that particles are emitted which consist of two protons and two neutrons each. These particles have only a short range, and the outermost layer of the skin shields us completely from this kind of radiation. It therefore presents a hazard only if radioactive substances enter the body.

Beta radiation consists of tiny electrically charged particles (electrons) and is absorbed fast. Its impact on humans occurs when it comes in direct contact with the body, for example if the skin is contaminated or radioactive substances are ingested.

Gamma radiation consists of electromagnetic waves, similar to X-rays. It is very penetrating and can have an effect on all inner organs even without direct contact, for example if it comes from a radioactive cloud or from radioactive substances deposited on the ground.

Radioactivity is the property of substances to decay and emit radiation. It is measured in becquerels. One Bq means that one nucleus decays per second. Radioactivity is present everywhere, even without any human influence. For example, a kilogram of soil contains enough radioactive potassium to cause between 40 and 1000 decays per second (depending on the potassium content), i.e. it has 40 to 1000 Bq/kg.

Contamination happens when radioactive substances are deposited on surfaces, for example on clothes or on the skin, or when they mix with environmental media, such as soil, air or water.

Radiation dose, which is measured in sieverts (Sv), is the amount of radiation energy absorbed by human tissue taking into account its biological effects. Doses that occur in practice are in the millisievert range (mSv), i.e. a thousandth of a sievert. The annual dose from natural background radiation in Germany is approx. 2 millisieverts.

PUBLICATION DETAILS

Information leaflet for the general public in accordance with § 53 (5) of the Radiation Protection Ordinance in coordination with the responsible authorities, Düren district and the Ministry of Economic Affairs, Energy, Building, Housing, and Transport of the State of North Rhine-Westphalia

Published by: Forschungszentrum Jülich GmbH | 52425 Jülich **Editorial team:** Dr. Reinhard Lennartz, Safety and Radiation Protection, Dr. Anne Rother, Corporate Communications (responsible according to German press law), Peter Schäfer, Corporate Communications