



Practical Guide

for the inhabitants
of areas contaminated
by a nuclear accident

Preamble

A nuclear accident can affect areas which may be situated far from the site of the accident.

The radioactive elements get dispersed in the environment (air, water, soils) and can, if no protective action is taken, sooner or later impair people's health.

The contamination of an area lastingly affects all aspects of day-to-day living. It disturbs all activities, whether family, social, economic, etc.

This guide is intended for people who want to know whether they can carry on living in an area affected by a nuclear accident, especially in areas which, due to their low levels of radioactivity, were not evacuated, or areas to which the inhabitants have been authorised to return.

Ultimately, whether people choose to stay or to leave, it will be up to the competent authorities to support their decision from the health, material and financial aspects, by lastingly providing for decent living conditions.

This guide provides practical answers to the concerns of the population and presents the precautions to take on a daily basis. Can we live here? Under what conditions? What must we do to protect ourselves and those dear to us?

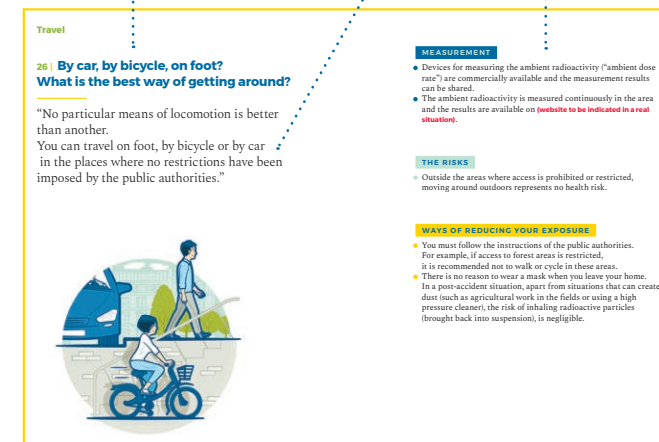
It does not claim to provide an answer to all the questions, but it sets out good radiation protection practices based on the lessons learned from the Fukushima Daiichi accident.

This guide comprises 28 thematic sheets which answer numerous questions concerning day-to-day living in an area contaminated by a nuclear accident. Each sheet is organised as follows:

The sheets, whose titles take the form of questions, address the subjects of radioactivity, health, water, food, and numerous daily activities.

The answers are first provided succinctly...

... then broken down into practical advice and recommendations.



The parts of text shown in red shall be supplemented in a real situation.

Guide prepared by the pluralistic working group of the Post-Accident Phase Steering Committee (CODIRPA) "Involvement of the regional actors in the preparation of post-accident management"—group for the "Preparation of a compendium of good radiation protection practices for populations affected by a nuclear accident".

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Glossary

1 | Introduction

After a nuclear accident, everyone must have the vital information concerning the levels of contamination in the area in which they live so that they can decide whether to remain there, adapting their way of living, or to leave. From the health, material and financial aspects, it is the duty of the competent authorities to lastingly accompany people in their choices by providing for decent living conditions.



OBJECTIVES

- This document only addresses the consequences of a nuclear power plant accident on people's day-to-day living. It concerns post-accident situations, that is to say once the radioactive releases have stopped.
- The information sheets presented in this document are intended to inform the people concerned about the long-term consequences of a nuclear accident.
- They also provide advice for people who want to take measures to reduce exposure to radioactive substances.

SUBJECTS NOT ADDRESSED

- The other types of nuclear accident (on other types of facilities or radioactive material transport accidents, for example), may be addressed in a future update of this document.
- This document does not address measures to protect people during the emergency phase (evacuation, sheltering, taking stable iodine tablets, etc.). This is why these aspects are not mentioned in this guide. Readers are nevertheless reminded that stable iodine tablets must not be taken during the post-accident phase.

HOW TO USE THIS GUIDE

- This guide is made up of practical information sheets for day-to-day living in a contaminated area.
- Appendices provide further information for those wishing to explore the subjects further.
- **A Frequently Asked Questions (FAQ) forum is provided on www.post-accident-nucleaire.fr (to be supplemented in a real situation)**

2 | Who do you contact? Who does what?

“Public Reception and Information Centres (CAI) and Community Reception and Assembly Centres (CARE) are set up to answer questions. The two reference documents are the Government Plan¹ and the Post-accident policy information². The information sheets³ of the Government Plan detail emergency management in the event of a nuclear accident.”

1: French major nuclear or radiological accident response plan (February 2014)

2: Post-nuclear accident management doctrine information (October 2012)

3: French major nuclear or radiological accident response plan measures sheets (February 2014)



WHO TO CONTACT?

- The Community Reception and Assembly Centres (CARE in French) of the municipalities or the Reception and Information Centres (CAI in French) receive the public and answer their medical, social, administrative and legal question.
- Health and education professionals, associations and economic actors can provide information to the public.
- The people concerned by the nuclear accident can involve themselves by acquiring information, learning and participating in the decisions and actions to be conducted in the area.

WHO DOES WHAT?

- The public authorities (municipalities, prefectures and government) set up the reception centres (CAIs and CAREs) and take the decisions concerning population protection measures.
- ASN, the French nuclear safety authority, advises the public authorities.
- The experts (IRSN- French Institute for Radiation Protection and Nuclear Safety, ANSES – French Agency for Food, Environmental and Occupational Health and Safety), international experts, etc.) provide the technical information.
- The Local Information Committees (CLI) and certain local associations act as information relays.

USEFUL LINKS

- To find the nearest CAI or CARE,
(Telephone No. to be indicated in a real situation)

3 | How do you get exposed to radioactivity?

“There are two routes of exposure to radioactivity: external, by irradiation from radionuclides released into the environment, and internal, by contamination resulting from inhalation or the ingestion of foodstuffs. Whether exposure is internal or external, it must be kept to the minimum level possible.”



RADIOACTIVE ELEMENTS

- The main radioactive elements present in post-accident situations following a nuclear power plant accident are iodine 131, caesium 134 and 137, and strontium 90.
- All the radioactive elements can be dispersed and deposited heterogeneously in the environment (in water, plants, animals, soils and forests).
- The iodine will have virtually disappeared after about 3 months, but the other radioactive elements (caesium and strontium) will be around for about 300 years.

HOW DO YOU GET EXPOSED?

- A person can be irradiated or contaminated further to a nuclear accident.
- A person gets irradiated if they come into contact with the radiation emitted by radioactive deposits in the environment.
- A person gets contaminated if radioactive particles are deposited on their skin or are swallowed or inhaled.
- The human body contains small quantities of natural radioactivity. Likewise, radioactivity is naturally present in our environment.

WAYS OF REDUCING YOUR EXPOSURE

- To protect yourself against radiation, you must avoid the most contaminated areas and limit the time spent in those areas (forests in particular).
- To protect yourself against contamination, you must limit the consumption of contaminated foodstuffs and water. Nevertheless, occasional consumption of slightly contaminated products does not present any particular health risk.

4 | Why and how do you measure radioactivity in the environment?

“It is vital to measure the radioactivity in the environment and in foodstuffs in order to implement protective actions.

Ambient radioactivity is measured continuously in France and the results are available on **teleray.irsn.fr/**”



MEASUREMENT

- Various quantities can be measured in the environment. The two most commonly measured quantities are the dose rate (in microsieverts per hour, $\mu\text{Sv/h}$) and the level of contamination of various products, foodstuffs or other) (in becquerels per kilogram or per litre or per square centimetre, Bq/kg, Bq/L, Bq/cm²).
- The ambient dose rate is the easiest quantity to measure. It can be measured with a flow meter or a radiation meter. It quantifies the external exposure at a given place and a given time.
- Measuring the contamination of food and other products (soil, materials, plants) is complex and must be carried out by entities that have the appropriate training and equipment (laboratories, associations, etc.).

WHY MEASURE RADIOACTIVITY?

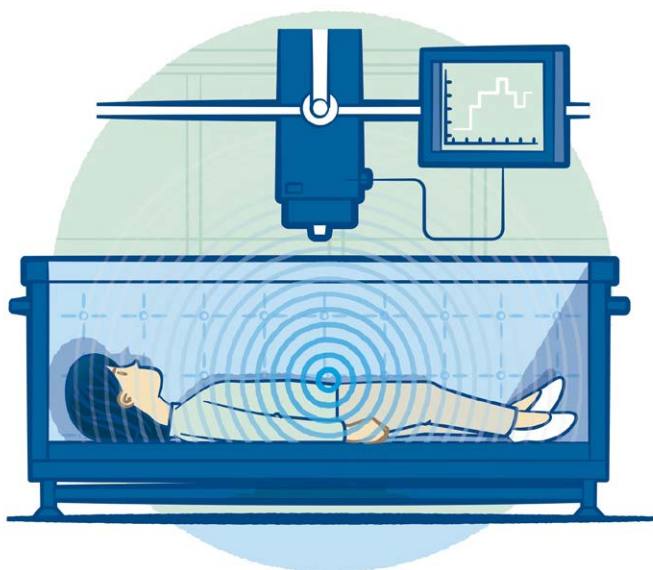
- Radioactivity is invisible, colourless and odourless. Measuring radioactivity is a way of better knowing the radiological status of our living areas and day-to-day products.
- The measurement result enables people to adapt their behaviour to reduce exposure and health risks.

THE MEASUREMENT RESULT

- Naturally occurring radioactivity is present everywhere. The naturally occurring radioactivity is integrated in the measurement result.
- For example, in France the dose rate of natural origin is between 0.03 and 0.4 $\mu\text{Sv/hour}$, depending on the nature of the ground, the altitude and the weather conditions.
- The measurements must be taken using an accurate and appropriate method for them to be usable and mutually comparable.
- Platforms sharing these measurement results are available to the public on **(Website to be indicated in a real situation).**

5 | Why and how do you measure radioactivity on the human being?

“It is vital to measure people’s exposure to radioactivity to assess the risks for their health. Both external and internal exposure can be measured.”



MEASUREMENT

- External and internal exposures can be measured with appropriate devices to determine the effect of radioactivity on the human being.
- External exposure is measured using a direct-reading personal dosimeter or by a specialised laboratory.
- Internal exposure of the human body is evaluated in specialised laboratories using whole-body radiation meters or radiotoxicological analyses.

WHY MEASURE RADIOACTIVITY?

- The combined evaluations of external dose and internal dose can provide an assessment of the individual risk for health.
- Whole-body radiation measurement and radiotoxicological examinations can only be carried if medically prescribed. The public authorities shall prioritise such examinations.

THE MEASUREMENT RESULT

- All measurement results integrate the exposures of natural origin.
- Recommendations may be made so that exposed persons adapt their daily behaviour.
- Health monitoring may be proposed if necessary.

6 | What are the health consequences of exposure?

“People are authorised to remain in areas where exposure levels are as low as reasonably achievable and considered by the authorities to have no consequences on health.”



EXPOSURE

- It is the level of exposure that determines the nature of the consequences for health: the higher the exposure, the more severe the potential consequences.

THE RISKS

- Below the high levels of exposure that lead to physical effects, the most frequent short-term health effects are those associated with anxiety and the changes in eating habits and life style: stress, sleep disorders, increase in allergic reactions, increase in cardiovascular pathologies, diabetes and obesity.
- The long-term health risks linked to exposure to radioactivity are the occurrence of cancers and leukaemia.
- The higher the exposure, the greater the risk of cancer. Cancer can arise several years after exposure. Reducing your exposure reduces the risk of developing cancer in the future.

WAYS OF REDUCING YOUR EXPOSURE

- Avoid going into or staying for any length of time in areas where radioactivity levels are highest.
- Limit your consumption of potentially contaminated products (products from the vegetable garden, hunting, fishing and wild gathering).
- Maintain a healthy lifestyle.

7 | What health monitoring services are available?

“Health monitoring of exposed persons can be put in place. This health monitoring depends on the level of exposure of each individual. Health monitoring is ensured by the general practitioner, by specialised medical facilities and by national research and expertise organisations.”



MEDICAL EXAMINATIONS

- Whole-body radiation measurement consists in measuring the radioactivity present in the body. Some radioactive elements (strontium) cannot be detected by this examination. Iodine and caesium, on the other hand, are readily detected.
- The radiotoxicological analysis consists in measuring the presence of radioactivity in urine and faeces. Strontium, for example, can be detected by this type of analysis.
- In both cases these examinations must be prescribed by a doctor so that monitoring can be proposed if necessary.

HEALTH MONITORING

- Health monitoring is provided for any exposed person if they wish, and according to their level of exposure.
- Specific monitoring for diseases of the thyroid may be organised for people who have been exposed to releases of radioactive iodine.
- Some people (children, infants and pregnant women) are more sensitive to the effects of radioactivity. Their medical monitoring is therefore adapted accordingly.
- Epidemiological studies are conducted to quantify the risk of occurrence of cancer, leukaemia and other pathologies (cardiovascular for example).

WHERE TO OBTAIN HEALTH MONITORING INFORMATION AND/OR SERVICES

- Health monitoring information can be obtained from a general practitioner or from the Reception and Information Centres (CAI) or Community Reception and Assembly Centres (CARE).
- Health monitoring will be ensured by the general practitioner or, failing this, by a dedicated medical facility.

8 | How can I protect myself and my family?

“You must follow the instructions given by the public authorities.

The foodstuffs and water under the oversight of the public authorities and put on the market are consumable; for other foodstuffs, the level of contamination must be measured before consuming them.”



MEASUREMENT

- Highly contaminated areas can be identified by measuring the ambient dose rate.
- Measuring the contamination of food products and water is more complex and must be carried out using an accurate and appropriate method (see sheet 4).

THE RISKS

- The consumption of contaminated products on a regular basis or in large quantities can present a particular risk for health.
- Likewise, a prolonged or repeated stay in a highly contaminated area can present a particular risk for health.

WAYS OF REDUCING YOUR EXPOSURE

- Avoid going into highly contaminated areas or limit the time spent there. You must follow the instructions given by the public authorities.
- Avoid consuming uncontrolled and potentially contaminated foodstuffs (home-grown fruit and vegetables, mushrooms gathered in the forest, wild game and fish), or else have them analysed before consuming them.
- It is recommended to have the water from private wells analysed before drinking it.
- Maintain a healthy lifestyle.
- Guidance documents and advice can be obtained from the Reception and Information Centres (see sheet 2).

9 | Can I drink tap water or well water?

“Tap water from the potable (drinking) water network can be consumed and used for cooking unless otherwise indicated by the public authorities. It is recommended to have the water from private wells tested before drinking it.”



MEASUREMENT

- The quality of the water in the drinking water network is checked regularly.
- The potability of well water must be tested by professionals (specialised laboratories) because water quality is not linked to the presence of radioactivity alone.

THE RISKS

- The quality of tap water is controlled and the water is only distributed if it complies with the required quality and potability standards.
- Water from the natural environment (wells, streams, etc.) must be tested.
- Occasional consumption of slightly contaminated well water does not present any particular health risk if the other potability parameters are compliant.
- Frequent or chronic consumption of contaminated water can adversely affect health.

WAYS OF REDUCING YOUR EXPOSURE

- The public authorities can implement specific measures to reduce the contamination of reservoir water.
- In some cases, the drinking water distribution network will be cut off and potable water will be supplied by other means.

10 | Can I wash laundry, water the vegetable garden and go swimming?

“You can continue to wash laundry in a machine or by hand.

The water of outdoor swimming pools must be tested before bathing in them. You must follow the public authorities’ instructions with regard to watering the garden and bathing in the natural environment (sea, lakes, ponds, rivers).”



MEASUREMENT

- It is important to test the water from private wells before using it, particularly if the water is to be used for watering the vegetable garden.
- Well water must be tested by professionals (specialised laboratories) because the quality of the water is not linked solely to the presence of radioactivity.

THE RISKS

- There are no restrictions on using tap water to wash your laundry, fill your swimming pool or water your vegetable garden.
- Rainwater may present a risk of contamination if it was collected during the passage of the radioactive plume.
- There are no restrictions on using well water to water ornamental or recreational gardens. On the other hand, you must have well water tested before using it for personal consumption or for watering the vegetable garden.
- If the public authorities authorise bathing in the natural aquatic environments, this means they do not present a health risk, including in the event of accidental ingestion of water.

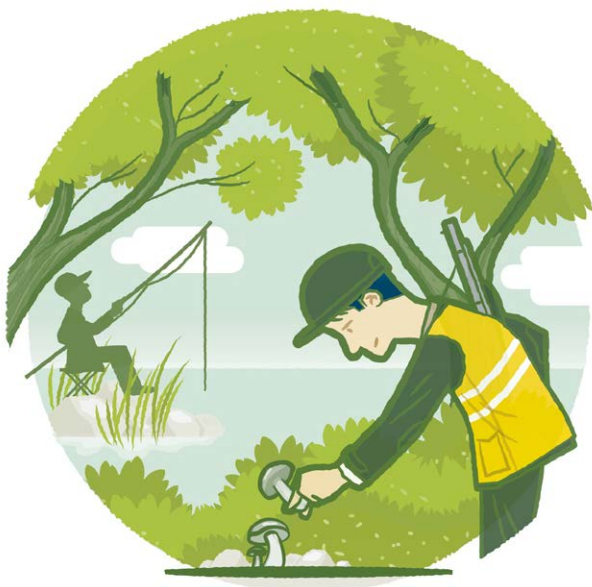
WAYS OF REDUCING YOUR EXPOSURE

- It is preferable to test swimming pool and well water before its first use.
- It may be a wise precaution to empty the reserve of rainwater collected during the passage of the radioactive plume and not to use it to water the vegetable garden. You can subsequently use newly collected rainwater to water the garden.
- You must follow the instructions of the public authorities as regards bathing in the natural environment.

11 | Can I eat the products from wild harvesting, hunting and fishing?

“Products gathered, hunted or fished before the accident and protected during it (preserves, deep-frozen products for example) can be consumed.

The natural environments (rivers, ponds, forests, etc.) may be contaminated and it is strongly recommended to test wild food products before eating them.”



MEASUREMENT

- Wild food products must always be tested before consuming them.
- You can test them yourself provided you have suitable equipment and know how to use it. Some radionuclides (strontium for example) are difficult to test for and this must be done by specialists.
- All terrestrial products contain natural radioactivity (radioactive potassium for example). It is therefore normal to detect radioactivity in foodstuffs. But the presence of certain artificial radionuclides (caesium, strontium, etc.) is unquestionably due to a nuclear accident event.

THE RISKS

- The occasional consumption, or consumption in small quantities, of slightly contaminated products does not present any particular health risk.
- Wild food products can be highly contaminated. Some species (certain mushrooms for example), concentrate radioactivity much more than others.
- It is necessary to have a sound knowledge of the wild food products that concentrate radioactivity the most.

WAYS OF REDUCING YOUR EXPOSURE

- It is recommended to follow the instructions of the public authorities, particularly regarding restrictions on wild harvesting, hunting and fishing for personal consumption.
- You must vary as much as possible the composition and source of what you eat to avoid chronic exposure.

12 | Can I eat home-grown fruit and vegetables?

“The products harvested before the accident and protected during it (in a cellar or pantry, preserves, deep-frozen products for example) can be consumed.

Products harvested after the accident may be contaminated. It is recommended to test them before consuming them.”



MEASUREMENT

- The harvested products and the earth from the vegetable garden must be tested regularly to check their level of contamination.
- You can test them yourself provided you have suitable equipment and know how to use it. Some radionuclides (strontium for example) are difficult to test for and this must be done by specialists.
- All terrestrial products contain natural radioactivity (radioactive potassium for example). It is therefore normal to detect radioactivity in foodstuffs. But the presence of certain artificial radionuclides (caesium, strontium, etc.) in home-grown fruit and vegetables is unquestionably due to a nuclear accident event. Such cases must receive special attention and be specifically tested.

THE RISKS

- The occasional consumption of slightly contaminated products does not present any particular health risk.
- The frequent or repeated consumption of contaminated products over the long term can have adverse consequences on health.
- A low level of soil contamination does not lead to contamination of all the fruit and vegetables in the vegetable garden.

WAYS OF REDUCING YOUR EXPOSURE

- Specific measures (removal of the surface layer of soil, deep ploughing, soil amendment with potash fertiliser, etc.) can reduce the contamination of the fruit and vegetables grown in your vegetable garden.
- Surface contamination of fruit and vegetables can also be reduced directly by washing or peeling them.
- If it is impossible or complicated to test your home-grown produce, keep its consumption to a minimum and vary your diet and sources of supply to reduce your exposure.

13 | Can I eat the products from local markets and market gardening?

“The products harvested before the accident and protected during it (in a cellar or pantry, preserves, deep-frozen products for example) can be consumed.

Products harvested outside a contaminated area can be consumed.

The sale of foodstuffs produced or harvested in a contaminated area is subject to public authority control.”



MEASUREMENT

- Food products coming from contaminated areas are tested by government-approved organisations before being placed on the market. Products that are unfit for consumption are disposed of as waste.
- You can test them yourself provided you have suitable equipment and know how to use it. Some radionuclides (strontium for example) are difficult to test for and this must be done by specialists.

THE RISKS

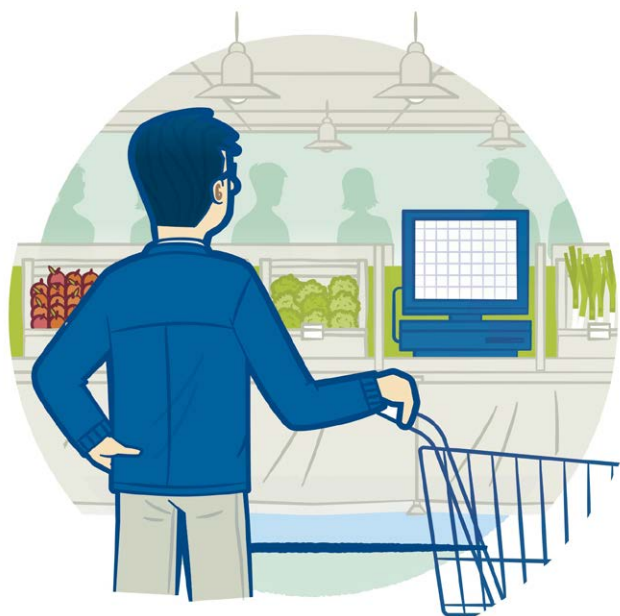
- The occasional consumption, or consumption in small quantities, of slightly contaminated products does not present any particular health risk.
- The frequent or repeated consumption of contaminated products over the long term can have adverse consequences on health.

WAYS OF REDUCING YOUR EXPOSURE

- Prefer shop-bought products (which are controlled) to home-grown products, especially if the latter are not tested.

14 | Are the foodstuffs sold in shops subject to controls?

“Food products from contaminated areas which are sold in shops are controlled by the public authorities to check for any contamination.”



MEASUREMENT

- Foodstuffs produced in contaminated areas are tested by approved organisations and controlled by the public authorities. Products that are unfit for consumption are disposed of as waste.
- All terrestrial products contain natural radioactivity (radioactive potassium for example). It is therefore normal to detect radioactivity in foodstuffs.

THE RISKS

- The occasional consumption, or consumption in small quantities, of slightly contaminated products does not present any particular health risk.
- Maximum contamination levels for foodstuffs (above which they are considered unfit for sale) shall be set through regulations. These are quality reference levels; they are not health risk thresholds. These maximum values take into account the quantity usually consumed in our diet.

WAYS OF REDUCING YOUR EXPOSURE

- Prefer shop-bought products (which are controlled) to home-grown products, especially if the latter are not tested.

15 | Do I have to change my diet?

“Having a balanced and varied diet is always a sound dietary principle to follow. The foodstuffs used to prepare meals must be tested or controlled if they come from a contaminated area.”



MEASUREMENT

- Foodstuffs coming from contaminated areas are tested by government-approved organisations before being placed on the market. Products that are unfit for consumption are disposed of as waste.
- Home-grown foodstuffs must be tested before consuming them.
- Wild food products must always be tested before consuming them.

THE RISKS

- The occasional consumption, or consumption in small quantities, of slightly contaminated products does not present any particular health risk.
- The frequent or repeated consumption of contaminated products over the long term can have adverse consequences on health.
- Meals prepared in central or canteen kitchens (nurseries, schools, nursing homes, etc.) are controlled before they are distributed so they do not present a health risks.

WAYS OF REDUCING YOUR EXPOSURE

- It is recommended to follow the instructions of the public authorities regarding restrictions on wild harvesting, hunting and fishing for personal consumption.
- There is no need to change your diet if it is balanced and limits the potential consumption of contaminated products.

16 | How do you reduce contamination in vegetable gardens and fields?

“You can reduce contamination in a vegetable garden or field either by removing the surface layer of soil or by amending it with lime or potash fertiliser and following the instructions of the public authorities.”



MEASUREMENT

- You can test the soil yourself provided you have suitable equipment and know how to use it. Some radionuclides (strontium for example) are difficult to test for and this must be done by specialists.
- Soil contains natural radioactivity (radioactive potassium for example). But the presence of certain artificial radionuclides (caesium, strontium, etc.) in agricultural land is unquestionably due to a nuclear accident event.

THE RISKS

- Some types of soils and some plant species concentrate radioactivity more than others. It is necessary to have a sound knowledge of the foodstuffs that concentrate radioactivity the most.
- A low level of soil contamination does not lead to contamination of all the fruit and vegetables in the vegetable garden.

WAYS OF REDUCING YOUR EXPOSURE

- Cutting down or disposing of the first harvest after passage of the plume are ways of reducing contamination of the agricultural environment and exposure. **The disposal route for such waste shall be specified by the public authorities.**
- In some cases (severe soil contamination for example), the top layer of soil must first be removed because the contamination is located in the first few centimetres of soil.
- Spreading lime or potash fertiliser reduces the transfer of contamination to the crops. The optimum quantities to apply must be defined in consultation with the experts and the professional sectors.

17 | What should domestic animals and livestock be given to eat?

“Pets are fed with food of industrial origin or human food derivatives. Livestock must be fed with feedstuffs controlled by the public authorities to limit the contamination of products of animal origin. Feedstuffs that were protected during the accident (covered by a tarpaulin or under shelter in closed farm buildings) can be used to feed livestock.”



MEASUREMENT

- Products of animal origin intended for human consumption are subject to specific contamination control measures (meat, milk, blood, eggs, etc. by the public authorities, the oversight bodies and the production and distribution sectors. Products that are unfit for consumption are disposed of as waste.
- The grazing of animals in contaminated areas may be authorised provided that the plant and soil analyses comply with the recommendations.

THE RISKS

- Animals are exposed to radiation and contamination in the same way as humans, and are therefore in principle subject to the same health consequences over the long term.
- The occasional consumption of slightly contaminated products does not present a particular health risk for animals.
- Feeding animals with contaminated products (hay in particular) may have consequences on the contamination of food products of animal origin intended for human consumption (dairy products, meat, eggs, etc.).

WAYS OF REDUCING THE EXPOSURE OF ANIMALS

- The exposure of animals must be limited in the same way as for humans: avoid areas at risk and give them non-contaminated feedstuffs.
- Medication may be prescribed by a vet to help decontaminate livestock.

18 | What are the good practices in the home?

“The good practices in the home consist in applying the usual rules of domestic hygiene. They are sufficient to protect you.”



MEASUREMENT

- Measuring the ambient dose rate in the various rooms of the house can give an estimate of its level of contamination. This measurement can be compared with the ambient radioactivity measurements taken in the area by a specific network.

THE RISKS

- Contamination can be brought into the house from the exterior (e.g. contaminated soil in the soles of shoes, controlled mechanical ventilation, air conditioning), but the risk is negligible.

WAYS OF REDUCING YOUR EXPOSURE

- The usual common-sense rules of domestic hygiene such as wiping your feet, regular dusting, vacuum cleaning, washing floors and airing, suffice to reduce the risk of contamination in the home. It is essential to observe rules of hygiene in everyday life and in post-accident situations.

19 | Can laundry get contaminated?

“Only laundry hanging outdoors to dry during the passage of the radioactive plume may have been contaminated.

Subsequent contamination of laundry is exceptional, and in any case negligible.”



MEASUREMENT

- There is no point in measuring the contamination of laundry. The radioactivity levels are so low that they cannot usually be detected with the standard measuring instruments (Geiger counters, radiation meters, etc.) available to private individuals.

THE RISKS

- Even when slightly contaminated (following contamination due to the deposition of radioactive dust on the surface of fabrics), exposure on contact with laundry is negligible.

WAYS OF REDUCING YOUR EXPOSURE

- The usual rules of hygiene, such as regular washing and drying outdoors or in a tumble dryer, are sufficient to protect against any exposure from slightly contaminated laundry.
- Household linen and textiles that were outdoors when the radioactive plume passed must be washed as a precautionary measure (or else thrown away).
- There is no reason not to carry on washing your linen in the washing machine or by hand and hanging it outdoors to dry.

20 | What is the best way of cleaning living areas?

“It is recommended to give the house interior a thorough cleaning after the accident (vacuum clean, wash the floors, etc.) then to return to usual housekeeping practices. With regard to the cleaning of public areas (gardens, buildings, etc.), it is recommended to follow the instructions given by the public authorities.”



MEASUREMENT

- You can measure the ambient dose rate yourself provided you have suitable equipment and know how to use it.
- It may prove worthwhile taking dose rate measurements both inside and outside your home in order to detect any concentrations of radioactivity, such as at the bottom of gutters or under trees.

THE RISKS

- You must comply with the public authorities' instructions (for example, if access to forest areas is restricted, it will of course be recommended not to go into these areas).

WAYS OF REDUCING YOUR EXPOSURE

- Unless otherwise instructed by the public authorities, normal hygiene measures are sufficient when living in the authorised areas. It is thus recommended to clean and air the living areas, to wash your hands, to vacuum the rooms and wash the floors, etc. It is essential to observe these hygiene rules in everyday life.
- There is no reason to wear a mask when doing the housework in your home. In a post-accident situation, apart from situations that can create dust (such as agricultural work in the fields or using a high pressure cleaner), the risk of inhaling radioactive particles (brought back into suspension), is negligible.
- Vacuum cleaner bags must be disposed of via the normal route (household waste).

21 | What do I do with household waste?

“Depending on the instructions of the public authorities, household waste is to be disposed of via the usual or specific routes.

Do not put waste food into composters if it has not been tested beforehand.”



MEASUREMENT

- A radiation meter can be used to measure the ambient dose rate near sites (within a few metres) where waste is stored, deposited or has been dumped.

THE RISKS

- The main risk is that people (especially the generations who did not experience the accident) forget where radioactive waste has been stored, deposited or dumped.
- The combined effects of rotting, erosion, water runoff, and various human activities (fire, agriculture) can displace the radioactivity or cause it to reappear in places that are inhabited, frequented or worked.

WAYS OF REDUCING YOUR EXPOSURE

- The waste storage sites shall be decided on by the authorities in consultation with the stakeholders.
- It is recommended not to spend time in these places if you do not have appropriate radioactivity measuring means.
- As was the case before the accident, it is prohibited to burn or dump household waste.
The burning of organic waste (grass and hedge cuttings etc., considered as household waste) is prohibited unless the prefecture has issued a waiver.

22 | Can I frequent public parks, gardens and areas for walking and strolling?

“Unless otherwise specified, you can frequent gardens, parks and places open to the public. Outdoor urban public spaces (parks and gardens, sports grounds, school playgrounds, sandboxes, squares, roads and paths) are decontaminated by the public authorities if necessary.”



MEASUREMENT

- If public places (gardens, parks, walking and strolling areas, sports grounds, etc.) are open, then their level of radioactivity has been (and is regularly) measured.
- The ambient radioactivity is measured continuously in the area and the results are available on **(website to be indicated in a real situation)**.
- Devices for measuring the ambient radioactivity (“ambient dose rate”) are commercially available and the measurement results can be shared.
- It is recommended to wear a dosimeter or to be equipped with a radiation meter before going into private gardens (or places) where you do not know the ambient radioactivity level (at least during the first visit).

THE RISKS

- Outside areas where access is restricted or prohibited, the exposure levels associated with gardens or walking and strolling areas are comparable to those of non-contaminated areas.
- If public places are open, they present no particular risk for the health of the adults or children who frequent them.

WAYS OF REDUCING YOUR EXPOSURE

- Urban spaces frequented by the public are decontaminated insofar as possible; this reduces soil contamination and therefore the ambient dose rate.
- The decontamination of wilderness areas (forests, prairies, rural paths for example) is difficult, costly, and creates large volumes of waste.
- Private gardens can in some cases be decontaminated by the owners themselves if they have the necessary technical and measuring equipment and have been trained in their use.
- Avoid long or repeated stays in places where the ambient dose rate is high or has not been measured.

23 | Can I burn wood? What do I do with the ashes?

“Wood that was protected during the passage of the radioactive plume can be used for heating or cooking.

It is preferable not to use unprotected wood which may have been contaminated.

The ashes of highly contaminated wood must be managed like radioactive waste.

The burning of organic waste is prohibited unless the prefecture has issued a waiver.”



MEASUREMENT

- Measuring the contamination of wood and ashes is a complex process which must be done by professionals.

THE RISKS

- In the event of a fire (chimney fire, forest fire), contaminated ash dust is put into suspension and dispersed in the air, contaminating the environment. This dust can be inhaled and thereby cause internal contamination.
- The combustion of wood and organic waste (grass and hedge cuttings, etc.) concentrates the radioactivity in the ashes. When these ashes are deposited on the ground, the radioactivity they contain is transferred first to the soil and then to the plants growing in it. This can lead to further contaminations of the environment and possibly of foodstuffs.

WAYS OF REDUCING YOUR EXPOSURE

- It is strongly advised not to use ashes from burned wood (potentially contaminated) as a fertiliser in vegetable gardens or cultivated fields.
- It is preferable not use wood (logs, pellets or charcoal) from areas declared contaminated by the authorities for the purpose of heating (fireplace) or cooking (barbecue).

24 | Can the wood and materials from the contaminated area be used?

“The materials manufactured or transformed in a contaminated area are checked by the public authorities before being put on the market.

Noncompliant materials are managed like waste and cannot be used or sold.”



MEASUREMENT

- The use of a radiation meter to check whether wood or materials are contaminated can be a delicate process. This is because these materials contain natural radioactivity. It is therefore necessary to take a measurement that enables the natural radioactivity to be distinguished from that due to the accident. This can prove complicated, particularly outdoors.
- The public authorities take measurements to check the radiological quality of marketed products. Products that are unfit for use shall be disposed of as waste.

THE RISKS

- The use of nonconforming materials can result in a risk for health.

WAYS OF REDUCING YOUR EXPOSURE

- It is inadvisable to use potentially contaminated construction materials. Their level of contamination must therefore be measured before using them.
- Supplies stored outdoors at the time of the accident may be contaminated. It is recommended to have them tested before using them.
- It is preferable to use off-the-shelf materials and to check their origin.

25 | Can I engage in outdoor physical activities?

“It is possible, and as a general rule even recommended, to pursue outdoor physical activities.

It is recommended to follow the instructions of the public authorities regarding access to places for engaging in physical activities.”



MEASUREMENT

- Devices for measuring the ambient radioactivity («ambient dose rate») are commercially available and the measurement results can be shared.
- The ambient radioactivity is measured continuously in the area and the results are available on **(website to be indicated in a real situation)**.

THE RISKS

- Outside areas where access is prohibited or restricted, outdoor physical activities do not present a risk for health.

WAYS OF REDUCING YOUR EXPOSURE

- Unless otherwise instructed by the public authorities, there is no need to change your habits regarding physical activities.
- There is no reason to wear a mask when you leave your home. Apart from situations that can create dust (such as agricultural work in the fields or using a high pressure cleaner), the risk of inhaling radioactive particles is negligible.
- It is recommended to observe the instructions given by the public authorities (for example, if access to forest areas is restricted, it is recommended not to go walking or running in these areas).

26 | By car, by bicycle, on foot? What is the best way of getting around?

“No particular means of locomotion is better than another.

You can travel on foot, by bicycle or by car in the places where no restrictions have been imposed by the public authorities.”



MEASUREMENT

- Devices for measuring the ambient radioactivity (“ambient dose rate”) are commercially available and the measurement results can be shared.
- The ambient radioactivity is measured continuously in the area and the results are available on **(website to be indicated in a real situation)**.

THE RISKS

- Outside the areas where access is prohibited or restricted, moving around outdoors represents no health risk.

WAYS OF REDUCING YOUR EXPOSURE

- You must follow the instructions of the public authorities. For example, if access to forest areas is restricted, it is recommended not to walk or cycle in these areas.
- There is no reason to wear a mask when you leave your home. In a post-accident situation, apart from situations that can create dust (such as agricultural work in the fields or using a high pressure cleaner), the risk of inhaling radioactive particles (brought back into suspension), is negligible.

27 | Can I go to work, visit family and friends, go shopping?

“You are perfectly free to travel (by car, on foot or by bicycle) in areas that are not subject to restrictions, to go to work or for personal reasons. It is recommended to follow the instructions of the public authorities concerning places subject to restriction.”



MEASUREMENT

- Devices for measuring the ambient radioactivity (“ambient dose rate”) are commercially available and the measurement results can be shared.

THE RISKS

- Outside the areas where access is prohibited or restricted, moving around outdoors represents no health risk.
- Some areas may be prohibited to the public on account of the contamination levels (the people living in these area are evacuated).
- Authorisations are issued for professional travel in prohibited areas (e.g. for decontamination work, companies with activities which cannot be interrupted). Specific monitoring is put in place in such situations.

WAYS OF REDUCING YOUR EXPOSURE

- It is recommended to observe the instructions given by the public authorities (for example, if access to forest areas is restricted, it is recommended not to go into these areas or to limit the time spent there).
- There is no reason to wear a mask when you leave your home or if you are going to go into a contaminated area. In a post-accident situation, apart from situations that can create dust (such as agricultural work in the fields or using a high pressure cleaner), the risk of inhaling radioactive particles is negligible.

28 | How can you protect domestic animals?

“The protection of domestic animals can be aligned with the protection of people. There are no particular recommendations concerning the movement of domestic animals inside or outside houses.”



MEASUREMENT

- There is no point in measuring the contamination of pets.
- It is recommended to measure the contamination of farmyard animals and their derivative products (meat, eggs, milk, etc.) if they are to be eaten.

THE RISKS

- Animals are exposed to radiation and internal contamination in the same way as humans.
- Small-sized domestic animals are nevertheless more resistant to the effects of exposure.
- Domestic animals that are allowed indoors can bring contaminated dust into the house.
This is nevertheless a negligible source of contamination of the house.

WAYS OF REDUCING THE EXPOSURE OF DOMESTIC ANIMALS

- If a person wants to protect their domestic animals, the animals' exposure must be limited in the same way as for humans: avoid areas at risk and give them food of industrial origin or derived from human food.

Glossary

ANSES

Agence nationale de sécurité sanitaire, de l'alimentation, de l'environnement et du travail - French Agency for Food, Environment and Occupational Health and Safety ().

ASN

Autorité de sûreté nucléaire – the French nuclear safety authority and regulator.

Becquerel (Bq)

Legal and international unit of measure used to quantify radioactivity. The becquerel (Bq) is equal to one disintegration per second.

Caesium

(Cs, atomic number 55)
Rare metal whose chemical characteristics are comparable to those of potassium. Isotopes 134 and 137 are radioactive fission products whose half-lives are 2.2 years and 30.17 years respectively.

CLI

Local information committee.

CODIRPA

Comité directeur pour la gestion de la phase post-accidentelle d'un accident nucléaire – Steering committee for managing the post-accident phase of a nuclear accident.

Contamination

Presence of an undesirable level of radioactive particles (dust or liquid) on the surface of or inside any medium (person, environment, etc.).
Contamination of a person can be external (on the skin) or internal (by inhalation or ingestion).

Decontamination

Physical, chemical or mechanical operation intended to eliminate or reduce the presence of radioactive materials.

Dose rate

Variation in dose rate per unit time (often expressed in Sieverts per hour).

Exposure

Exposure is the fact of being exposed to ionising radiation (external exposure if the source is situated outside the organism, internal if it is situated inside the organism).

Iodine

(I, atomic number 53)
Element whose radioactive isotopes are present in the fission products. All the radioactive isotopes of iodine (129, 131, 132, 133, etc.) have a short half-life (iodine 131, for example, has a half-life of 8.02 days) except for iodine 129, whose half-life is nearly 16 million years.

Ionising radiation

Radiation with sufficient energy to detach electrons from matter.

Irradiation

Exposure to radiation.

IRSN

Institut de Radioprotection et de Sûreté Nucléaire - French Institute for Radiation Protection and Nuclear Safety.

Leukaemia

Cancer of the body's blood-forming tissues.

Nuclear accident

Result of loss of control of a nuclear reactor or of a radioactive source.

Nuclear power plant

Electrical energy production unit (reactor) that uses the heat released by fission of the atom.

Plutonium

(Pu, atomic number 94)
Transuranium chemical element. The 239 isotope has a half-life of 24,110 years.

Radiation

Transfer of energy as electromagnetic waves (gamma) or particles (alpha, beta, neutrons) emitted during radionuclide disintegration.

Radiation protection

Measures intended to protect the health of the public and workers with regard to exposure to ionising radiation.

Radioactive deposit

Radioactive emissions released during a nuclear accident for example, are deposited on the ground in two modes, dry and wet (through precipitation). They cause lasting contamination of soils. Radioactive deposits induce either external irradiation or internal irradiation by ingestion of contaminated foodstuffs.

Radioactive half-life

Time required for the activity of the radionuclide to be reduced by half. The half-life varies from one radionuclide to another.

Radioactivity

Property of certain elements whose nucleus spontaneously disintegrates to form other elements by emitting ionising radiation.

Radionuclide

Radioactive isotope of an element.

Sievert (Sv)

Legal unit for dose equivalent or effective dose that provides a measure of the biological effect of a given absorbed dose on a living organism. The dose equivalent is not a measurable physical quantity but is obtained by calculation. It depends on the energy transmitted to the tissues, the type of radiation and the tissue crossed.

Strontium

(Sr, atomic number 38)

Alkaline earth element, some isotopes of which are highly abundant in the fission products, especially isotope 90, which becomes fixed in bony tissues and has a half-life of 28,15 years.

Thyroid

Endocrine gland situated in the anterior part of the neck, which synthesises the hormones vital for producing energy in the majority of cells and for growth.

Whole body radiation

Measurement of the radiation emitted by all or part of the human body in order to identify the radionuclides present and evaluate their individual levels of activity.

To find out more

Guide and its appendices available on
www.post-accident-nucleaire.fr

Reception and information centre

(Telephone No. to be indicated in real-life situation)

www.asn.fr