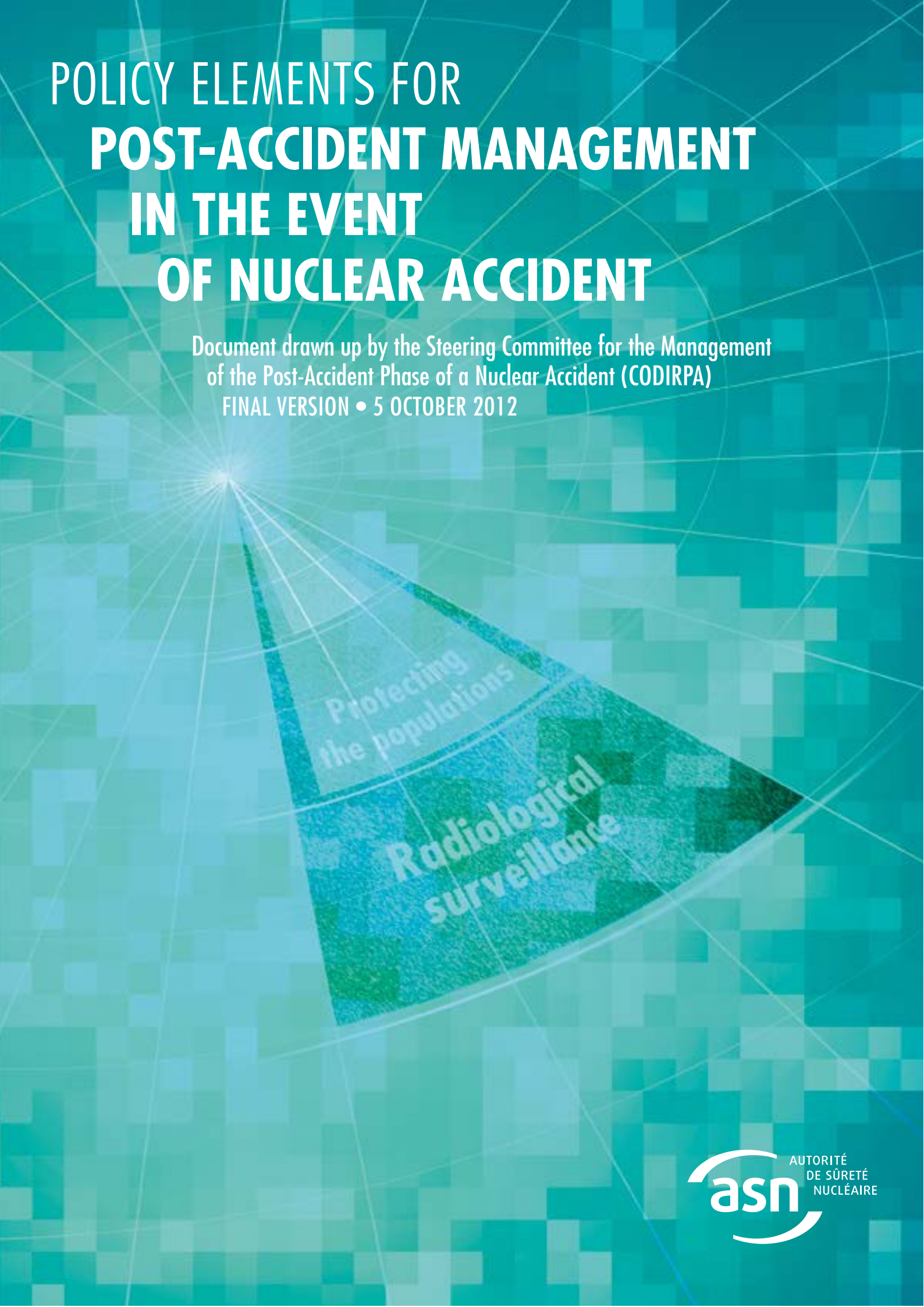
POLICY ELEMENTS FOR
POST-ACCIDENT MANAGEMENT IN THE EVENT OF NUCLEAR ACCIDENT

Document drawn up by the Steering Committee for the Management of the Post-Accident Phase of a Nuclear Accident (CODIRPA)

FINAL VERSION • 5 OCTOBER 2012



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PREFACE

The Chernobyl accident, which occurred on 26 April 1986, led to the contamination of vast expanses of land in Europe and in particular the three former-USSR Republics of Ukraine, Russia and Belarus, as well as Norway, turning the lives of a large part of the population in these countries on end. The extent of the disaster's damage brought about greater awareness of the difficulties inherent in managing the accidental and post-accidental impacts of such an event. It is vital that every lesson be learned from this disaster, in particular to analyse its impacts on the lives of the populations affected.

In France, in the years following the accident, a number of protective actions designed to mitigate the immediate radiological impacts of an accident for the populations were first set out for the emergency phase. They are regularly tested through crisis drills in which the at-risk populations are involved.

In 2005, the National directorate for nuclear safety and radiation protection (DGSNR) which has since become the Nuclear safety authority (ASN), established a Steering committee for the management of the post-accident phase of a nuclear accident or a radiological emergency (CODIRPA), at the request of the Government. This process involves a large number of stakeholders affected by post-accident management: the public authorities, operators, associations, experts, etc. This decision to take advance action, which proceeds from a far-reaching protection approach, is intended to improve protection for human beings and the environment as regards the consequences of a possible nuclear accident that might bring about contamination of the land.

The approach taken by CODIRPA has resulted in the development of policy elements for post-accident management in the event of a nuclear accident of medium scale, causing short-term releases, shown in this document. These policy elements are based on the international principles of radiation protection, as well as on the figures highlighted during the research carried out by CODIRPA participants. They also include management objectives along with a variety of actions through which these can be attained, in order to address a situation that is by nature extremely complex, due to the many topics to be addressed and the number of stakeholders involved.

PREFACE

The accident that occurred in March 2011 at the Daiichi Fukushima plant in Japan echoed the importance of an approach like the one undertaken by CODIRPA. The impacts of this event, with which the Japanese populations are still grappling, have spurred CODIRPA to address new issues. The approach is thus to be continued and enriched beyond the publication of the present document, which is now the foundation for France's post-accident management policy in the event of nuclear accident. In particular, a number of topics highlighted by the work carried out by CODIRPA need to be clarified, during the preparation phase, and the impacts of an accident of greater scale than the scenarios considered to date need to be explored.

This document is intended for the local and national stakeholders potentially affected by post-accident management. It is designed to both trigger the start of exploration about the post-accident phase in these stakeholders during the preparedness and guide them in managing an actual crisis.

The preparedness process is an initial and vital step in any nuclear accident management undertaking. Furthermore, it can stir the same stakeholders to commit to initiatives and actions that make it possible to develop methods and tools for managing the post-accident stage and develop shared working habits as well as the components of a practical radiation protection culture.

Lastly, ASN wishes to thank the many parties that contributed to the CODIRPA's work as well as to the drafting and review of this document.

A-C. LACOSTE

President of ASN
and President of CODIRPA

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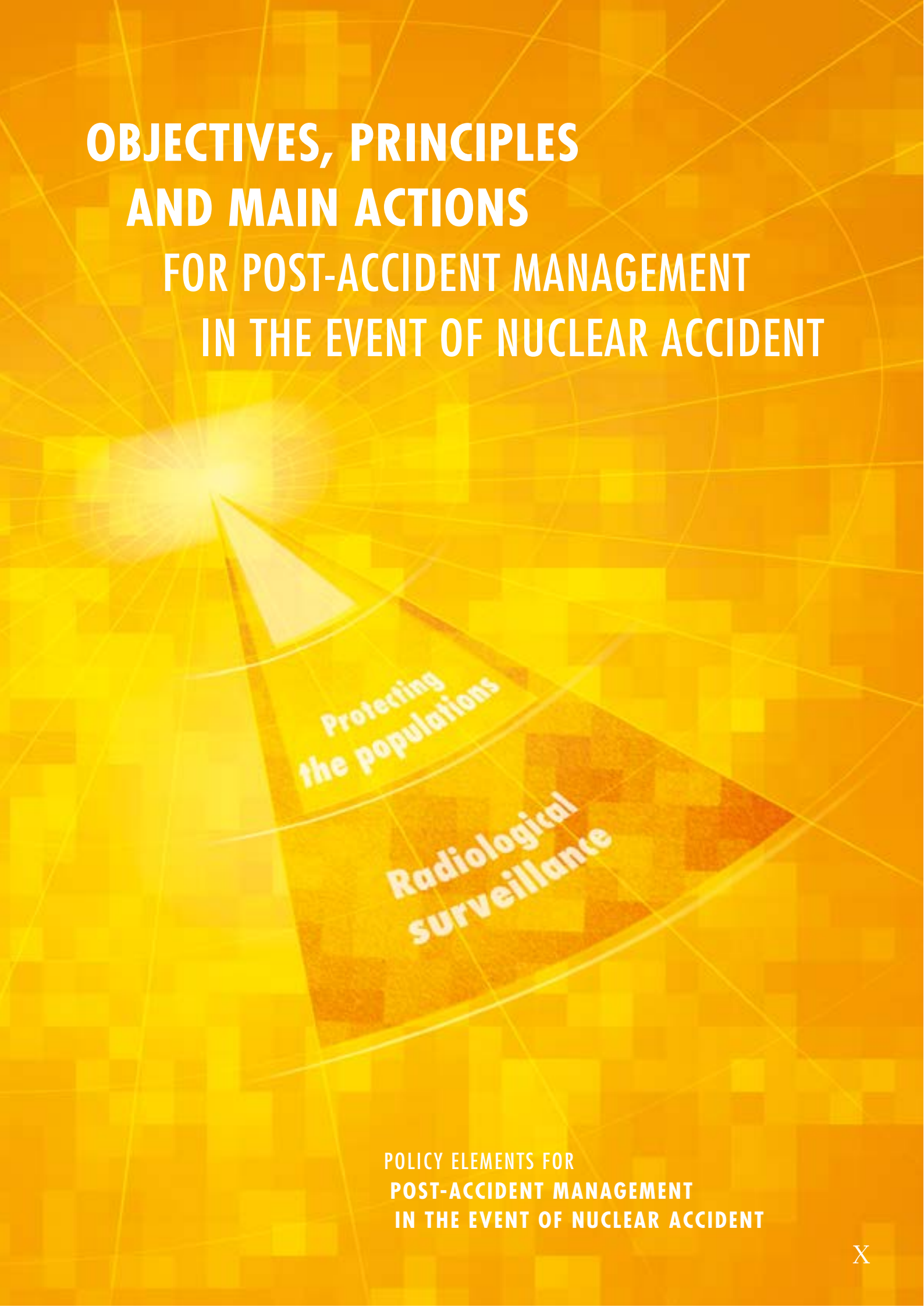

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A. Introduction

Pursuant to the Interministerial Directive on the Action of the Public Authorities, dated 7 April 2005, in the face of an event triggering a radiological emergency, the National directorate on nuclear safety and radiation protection (DGSNR), which became the Nuclear safety authority (ASN) in 2006, was tasked with working the relevant Ministerial offices in order to set out the framework and outline, prepare and implement the provisions needed to address post-accident situations arising from a nuclear accident.

In June 2005, the ASN set up a Steering committee for the management of the post-accident phase in the event of nuclear accident or a radiological emergency situation (CODIRPA)[1], put in charge of drafting the related policy elements.

To carry out its work, CODIRPA set up a number of thematic working groups from 2005 on, involving in total several hundred experts from different backgrounds (local information commissions, associations, elected officials, health agencies, expertise agencies, authorities, etc.). The working groups reports have been published by the ASN[2]. Experiments on the policy elements under construction were carried out at the local level in 2010 across three nuclear sites and several of the neighbouring municipalities, as well as during national crisis drills conducted since 2008. These works gave rise to two international conferences organised by ASN in 2007 and 2011.

The policy elements prepared by CODIRPA were drafted in regard to nuclear accidents of medium scale causing short-term radioactive release (less than 24 hours) that might occur at French nuclear facilities equipped with a special intervention plan (PPI). They also apply to actions to be carried out in the event of accidents during the transport of radioactive materials.

Following definitions of each stage of a nuclear accident, this document lists the principles selected by CODIRPA to support management efforts subsequent to a nuclear accident. Then, it presents the main actions to be implemented or started from the exit from the emergency phase as well as the guidelines for managing the transition and long-term periods. Three appendices have been included, showing in detail the actions to be taken over the three successive stages formed by the exit period from the emergency phase and the transition and long-term periods.

B. Definitions of the emergency phase and post-accident phase

In the event of an accident occurring at a nuclear facility and leading to the release of radionuclides into the environment, the distinction is commonly made between: the emergency phase, during which management efforts focus on the accident and its immediate consequences (direct exposure to radioactive releases), and the post-accident phase, or that during which management efforts are aimed at the later consequences of the accident (population exposure due to radioactive deposition having contaminated the territories).

a) The emergency phase

The emergency phase generally consists of:

- **a period of threat** resulting from facility failures, during which the operator implements actions designed to return it to an adequate level of safety and thereby prevent potential releases;
- **a period of radioactive release into the environment,** should the operator have been unable to bring the facility back to a safe and stable state.

1. Since its creation, CODIRPA has met 23 times. The minutes of all meetings are available at the ASN website, in the post-accident management section.
2. **www.asn.fr** post-accident management section.

- **an exit period from the emergency phase** during which the facility returns to a safe and stable state, significant radioactive release ceases and no further threat of release exists.

The emergency phase is characterised by the need to take action very quickly in order to cope with the actual or potential release of radioactive substances into the environment likely to lead to significant population exposure. In addition to the actions taken by the operator to bring the facility back to safe operating condition, the aim is that the public authorities be able to quickly start actions to protect the population (sheltering, iodine tablet administration, evacuation) in order to limit the exposure, as well as initiate post-accident management.

b) The post-accident phase

Generally speaking, the post-accident phase follows the emergency phase after the end of release and the facility's return to a safe state. It is composed of:

- **a transition period** (which can last up to a few weeks or a few months after the accident), during which understanding of the actual state of contamination of the various components of the environment is still imprecise and the risks of chronic exposure in individuals can still be high;
- **a long-term period** (which can last up to several years or even several decades after the accident), characterized as the lasting contamination of the territories impacted and lower yet still lasting risk of chronic exposure in individuals.

C. Objectives, principles and key points in post-accident management

Lasting contamination of the environment by radioactive substances following a nuclear accident creates a complex situation that affects every aspect of the populations' lives, including the economy of a territory. It can affect an expansive territory as well as have impacts on human activities carried out beyond its geographic borders. The many uncertainties regarding environmental contamination and population exposure which indicate the exit from the emergency phase make the implementation of actions to protect the population a necessity. The lasting nature of the contamination deposited can lead to management actions lasting several years, or even several dozen years.

In terms of health-related issues in the event of a nuclear accident followed by radioactive releases, the doses which persons residing in the territories contaminated by radioactivity may receive are too low to observably affect human health in the short term but can heighten the likelihood of developing pathologies such as certain forms of cancer. These pathologies do not come to light immediately after exposure to ionising radiations, but may emerge a few years or even a few decades later. Moreover, the worry or even distress triggered by the accident and its consequences have an immediate effect and need to be addressed appropriately, as they are major risk factors for the physical and mental health of the populations involved.

Beyond the health-related aspects, managing the consequences of a situation following a nuclear accident takes into account many issues, in particular economic and social, and involves many stakeholders, both at the national and local levels, covering a variety of areas of skill or concern.

a) Three basic objectives

Taking these issues into account, three basic objectives have been set out as regards managing the post-accident phase of a nuclear accident:

1. **to protect the populations from the dangers of ionising radiations;**
2. **to provide support to the populations victim to the consequences of the accident;**
3. **to reconquer the territories affected, from the economic and social standpoint.**

b) Four management principles

In order to determine the actions to be undertaken in preparing for post-accident management and in real-life situations, four principles were set out:

- **Principle 1 – anticipation: the issues at stake in post-nuclear accident management need to be taken into account from as early as the exit from the emergency phase; consequently, the first actions need to be planned during the preparedness stage.**

  So as to not jeopardise the efforts engaged to manage the consequences of the accident over the medium and long term, the management actions, that have to be initiated very quickly from the exit from the emergency phase, have to be prepared well in advance and the actions need to be planned, taking into account the medium and long-term issues.

- **Principle 2 – justification: the actions especially those aimed at protecting the populations must be warranted, meaning that the expected benefits, in particular in terms of radiological harm prevented, must exceed the risks and drawbacks inherent in their implementation.**

  Generally speaking, the strategy adopted for managing the accident's consequences must be suited to the situation requiring management, such that the actions and resources implemented are in proportion with the issues faced by the impacted territories and the severity of the situation to be addressed.

  In particular, it must be based in the principle of justification stated in the relevant international texts [2] on this topic and in the French Public Health Code [6], meaning that the actions implemented are warranted if their benefits, including the radiological harm prevented, exceed the risks and drawbacks which they may bring about (operator exposure, financial costs, social disruption, etc.).

- **Principle 3 – optimisation: population exposure to ionising radiations must be kept to a level as low as reasonably achievable, taking into account economic and societal factors.**

  From the standpoint of radiological protection, it is best to lower population exposure due to the accident to a level as low as reasonably achievable. The so-called optimisation principle[3] has been stated in international texts [2] and in the French Public Health Code [5].

  In line with the optimisation principle and with a view toward determining the actions to be implemented locally and set priorities, post-accident management shall be based in particular on dosimetric targets that take into account the reference levels established by the CIPR. These targets will be adjusted over time, due to the gradual reduction of contamination and on-going effort to improve protection for the populations.

3. The principle is also referred to as the ALARA principle, or "as low as reasonably achievable".

- **Principle 4 – shared construction and transparency: post-accident management must involve the populations, elected official, business community and social stakeholders. The transparency of the information provided is one of the pre-requisites for this joint spirit to come about.**

  Technological accidents, in particular radiological or nuclear events, unsettle the organisations set by man. Stakeholder support for the decisions made and their involvement in post-accident management are needed in order to secure the effectiveness of the actions initiated and to pave the way toward rebuilding economic and social life. It is thus vital that they be involved upstream from the accident, from as early as the preparedness stage, as strategies for managing the consequences of an accident are initially explored.

  Citizen information in a post-accident context must be fully-transparent, in order to trigger the best-suited behaviours, taking into account the risks involved for each segment of the population and secure the degree of trust needed to involve stakeholders in post-accident management.

c) Six key points in post-accident management

In order to attain the basic objectives of post-accident management and on the basis of the management principles set out above, the main actions by which the transition and long-term periods can be managed are to be identified during the preparedness stage, and some must be implemented from as early as the exit from the emergency phase.

The key points to keep in mind in carrying out this action are listed below:

- the immediate delineation of the contaminated territories, to be adjusted over the course of the transition stage and beyond, is a major decision and serve as the structuring framework by which action designed to protect the populations will be managed. This zoning makes it possible in particular to prohibit the consumption and placing on the market of locally-produced foods (main source of population exposure;
- the population affected by the consequences of the accident, one portion of which may be lastingly taken away from its living environment, must be given the benefit of medical and psychological care, dosimetric monitoring, epidemiological follow-up, financial support, and receive compensation for the damages incurred;
- the characterisation of the radiological situation in particular in living environments and the characterisation of the levels of contamination of foodstuffs and waters are to be undertaken as urgent necessities and as early as the exit from the emergency phase, in order to understand the extent of the contaminated territories and the impact of the said contamination as quickly as possible, with the aim of optimising the protection system. Once the radiological situation has been established, a long-term standard-practice radiological surveillance system must be implemented and be maintained throughout the post-accident phase;
- a water management plan specific to tap water is to be instituted taking into account the specifics of the exposure due to resource contamination. The aim is to maintain the best radiological quality of drinking water while adapting the actions to be initiated and possible restrictions on water resources or distribution in accordance to the potential risk;
- new governance based on watchfulness and the active participation of those affected is needed in particular to begin, where the radiological situation allows, reviving business activity and revitalising the territories impacted;

- action to mitigate contamination and manage the contaminated products may generate large amounts of waste from varying sources and different types. This sizeable influx makes it necessary to gradually replace the temporary management solutions selected at the exit from the emergency phase with lasting management solutions.

D. Actions to be implemented or started at the exit from the emergency phase

From the exit from the emergency phase, it is important that the first actions be implemented or started in order to ensure both that the general population is protected from radioactive substances found in the environment and that the affected populations receive care. These actions, to be developed across contaminated territories must be prepared, and if possible, planned upstream from the crisis.

a) Post-accident zoning and monitoring deposited radioactivity

The first post-accident zoning is established on the basis of predictive modelling of future population exposure to ambient radioactivity in the inhabited zones and food chain contamination due to radioactive depositions.

It is established on the basis of dosimetric guidance values taking into account the latest international references and European regulatory framework. The distinction is to be made between two zones each with a distinctive purpose:

- a public protection zone (ZPP) inside which action is needed in order to lower as much as possible population exposure to ambient radioactivity and ingestion of contaminated foods;
- a heightened territorial surveillance zone (ZST), which is broader and more focused on economic management, within which specific monitoring of foodstuffs and farmed crops is to be instituted.

Where applicable, within the public protection zone, a relocation perimeter, determined in accordance with the ambient radioactivity (external exposure), is to be defined. Residents must be relocated for a duration that shall vary according to the level of exposure in their living environment.

b) Early actions to protect and to manage the populations

When the population sheltering actions implemented during the emergency phase can be lifted (radioactive releases have ended and a safe and stable state has been reached at the facility), a decision can be made as to whether the populations living in the public protection zone should be kept on-site or relocated, taking into account the projected doses. The return of individuals evacuated during the emergency phase will also have to be considered at this stage.

Insofar as much of the population's radiological exposure could come from the ingestion of contaminated foodstuffs, provisions must be adopted from the exit from the emergency phase to prohibit the consumption and placing on the market of foodstuffs. The ban is to be complete within the public protection zone and pronounced for at least one month. Within the heightened territorial surveillance zone, all locally-produced foodstuffs are to be prohibited initially, and recommendations issued to limit the consumption of self-produced foodstuffs or products derived from hunting, fishing or gathering. As soon as materially possible, the radiological

verification systems appropriate to each farming production sector will be instituted in the ZST in order to allow compliant products to be placed on the market. As a precautionary action, movement shall be restricted in certain ZPP or even ZST areas, within which radioactive substances tend to build up (forests, green areas, etc.). Lastly, as concerns non-food products, prospective placing on the market are to be considered on a case-by-case basis, combined where necessary with the prior verifications needed.

The consumption of drinking water from the public adduction grid will continue to be allowed, except where specific resources and facilities identified during the preparedness stage have proved vulnerable, in which case tap water consumption may be restricted, in particular for infants, small children and expectant mothers.

Another important action to undertake in organising care for the populations is the creation of public reception and information centres (CAI), to be implemented at the exit from the emergency phase. These reception structures, organised along the reception and grouping centres called for the ORSEC Plan (CARE) must be operational from as early as the actions started to protect the populations during the emergency phase are lifted, and must provide responses to the following priority needs: reception, listening, census-taking, provision of medical and psychological support, information, accommodation and emergency grants and financial assistance to the population.

Census-taking, which consists of identifying and maintaining a register of the populations involved, in particular in the public reception and information centres (CAI), is an important action in that it is intended to facilitate re-housing and compensation operations and conditions the medical and epidemiological follow-up conducted on the populations involved. The census-taking process covers all person potentially exposed during the accident and during the post-phase accident: workers, individuals receiving medical care, persons affected by the implementation of emergency protective actions, and persons residing in the public protection zone. The local authority coordinates the census and informs those affected and the structures involved in post-accident management. Its structure includes the skills and tools available.

c) Other actions to be started

In addition to the action taken at the accident site, specific operations are to be organised and coordinated at the exit from the emergency phase. This includes: action needed to keep the facilities at the nuclear site where the accident took place and in its vicinity in safe operating condition:

- action needed to keep the facilities at the nuclear site where the accident took place and in its vicinity in a safe and stable state; actions designed to continue the functioning of facilities vital to the post-accident management process (industrial facilities, drinking water production facilities, sewage treatment plants, etc.); actions making it possible to continue to operate structures that cannot be shut down (dams, continuous process plants, etc.) located in the vicinity of the facilities impacted by the accident;
- radiological measurements and samples taken to gain a greater understanding of the environment's radiological situation;
- contamination control measures on foodstuffs in the ZSTs;
- signposting, surveillance and policing measures in the displacement scope and the organisation of personal transport and continuing activities to maintain livestock on site in this zone;

- the first cleaning actions in the public protection zone.

The actions started to improve the radiological situation (in particular cleaning buildings and roads, and possibly the first decontamination actions) are to be undertaken as quickly as possible following the exit from accidental releases in order to be as effective as possible. It is vital that the waste generated by this work be managed in an appropriate manner, defined in advance. This will make it possible to quickly undertake cleaning operations in the built areas, to be undertaken by specialized teams in the public and private sectors.

d) Informing

A positive relationship is to be maintained with the opinion-makers, in particular the media, based on sincere, open and regular interaction, coordination and respect for the rightful place of the public authorities, aimed at accurately informing while also explaining the action of the public authorities. Well-organised and coordinated information is similar to that which prevails during the release period, with health and social issues remaining preponderant.

E. Planning post-accident management during the transition period

Extending from the actions started from the exit from the emergency phase, the transition period is characterised by swift change in the radiological conditions, which becomes increasingly clear, as well as in the economic and social conditions, to which it is important to adjust the management actions in place, in particular by drawing upon flexible and adjustable decision-making criteria.

The Fukushima Accident, which came about in March 2011, shows that the issue of resuming certain social and economic activities (for instance, re-opening schools) can come to the fore very early concurrent to the implementation of specific protective actions (for instance, lowering contamination in living places) and making the appropriate information available to the relevant parties. The conditions and resources to which activity resumption is subject must offer sufficient guarantees in terms of radiation protection, when the state of the facilities may require significant mobilisation.

The transition period continues to be shaped by the need to take quick action so that the population protective actions can be effective. Lowering the population's exposure to radioactivity remains one of the fundamental, top-ranking aims of post-accident management. Supported by the gradual raising of restrictions and bans, the targeted dose reduction guides the territorial management strategy and population care strategy, and are to be included in the post-accident management programme.

The degree of relevance and effectiveness of the protective actions will depend on good characterisation of the radiological situation, which make it possible to distinguish the sites actually contaminated from those that are less so and to make it possible for all of the stakeholders involved to know where, when and how they are likely to be exposed to radioactivity as dispersed in the environment. This characterisation makes it possible, first of all, to adjust the borders of the areas across which protection actions are implemented, as defined during the exit period from the emergency phase, and secondly to initiate discussions about how the territories are to develop.

In ZPPs, the characterisation process must be focused first and foremost on the places where the population spends time (homes, schools, workplaces, etc.), first of all, the sectors presumed to be most exposed to radioactive fallout and closest to the accident site.

In ZSTs, characterisation efforts will focus, as a priority on the farmed crops to be harvested and placed on market in the short term and on the foodstuffs (from farming, gardening or occurring naturally) most sensitive to radioactive fallout, originating from the sectors presumed to be most exposed.

The first post-accident programme is to be implemented during the very first months following an accident. The first factors to take into account in this programme need to be considered during the preparedness stage, in order that it may be carried out quickly and that its consistency throughout the post-accident management phase be secured.

The concerns of social, economic and psychological nature voiced by public decision-makers, the business community and civil society are also to be taken into account as this first programme is developed, thereby contributing to the preparation of long-term management.

During the transition period, management efforts will necessarily have to shift into an increasingly participatory mode, featuring in particular greater involvement on the part of the local authorities in the decision-making processes, thereby paving the way for the long-term horizon. This will automatically bring about regular adjustments to the post-accident management programme.

The post-accident management programme is to be developed along the ten lines of action described hereafter.

a) Action 1 – Receiving the populations

The transition period is the time during which **the public reception and information centres created at the exit from the emergency phase can be stepped up.** It is a time during which the responsibilities allocated during the emergency phase should be developed (public reception and guidance, provision of information on the state of contamination in the environment and foodstuffs) and add new responsibilities, such as the provision of social and material assistance, continuity of public services, and preparation of procedures for compensation and determining victim eligibility for benefits. Outside partners are called in to help subsequently carry out networked efforts with the CAIs, in particular healthcare professionals. The CAIs can, furthermore, become a place particularly conducive to dialogue and experience-sharing, and as such foster the emergence of a practical radiation protection culture within the population.

b) Action 2 – Reducing population exposure to deposited radioactivity

Based on the results of the characterisation studies carried out on the environment's radiological conditions and updated dose projective, **a decision will need to be made as to whether the populations living in the public protection zone should be kept on site in the long term or,** if necessary, whether further relocation of the population, in full or in part, is needed. A healthy diet must be guaranteed (water and food) to all those residing in ZPPs or ZSTs, and the necessary resources must be deployed so that they can take ownership of best practices in radiation protection.

c) Action 3 – Addressing public health issue

Where public health is concerned, following the first actions started at the exit from the emergency phase, **the medical support provided to the populations is to be kept in place,** with adjustments made as appropriate to the situation, in particular through the implementation of medical follow-up.

The doses received by the populations exposed are to be subject to assessment, based on the internal contamination measurements taken from the exit from the emergency

phase, the characterisation of the radiological conditions in the environment and the information gathered about the behaviours of the exposed populations. Assessment will pertain to the doses received during the period of release, as well as those likely to have been received by the populations living or working within the ZPPs or occurring at the request of the public authorities, in particular inside the relocation perimeter. The findings shall be used to assess the possible health-related consequences of the accident and determine the direction for further population follow-up (dosimetric, epidemiological, medical).

More broadly speaking, epidemiological follow-up of the consequences of the accident will be instituted.

d) Action 4 - Refining understanding of the environment's radiological situation and monitoring developments therein

Once the first measurement programmes are completed, at the exit from the emergency phase, the priority during **the transition period will be to characterise the environment's radiological situation as quickly as possible,** including drinking water resources, and **to estimate possible changes therein.** This makes it possible to ensure that the protective actions already started are suited to the situation, and is an essential prerequisite to proceeding with a first re-assessment of the post-accident zoning. The measurement programme, carried out by a wide range of stakeholders of varying statuses, and in some cases even by foreign experts, is such that it improves the reliability of the measurements taken and contributes to improving the credibility of the information provided.

e) Action 5 - Improving the radiological quality of the environment and living environments as well as the state of aquatic environments

The resources implemented to lower contamination from as early as the exit from the emergency phase will be stepped up during the transition period in order **to continue and broaden environmental cleaning operations,** in particular in built environments. The actual types of actions started will change with time, due to the gradual decrease in the effectiveness of the cleaning. Furthermore, detailed characterisation of the environmental contamination must make it possible to target the places where the implementation of decontamination actions can be most effective in lowering individual exposure, for optimisation purposes.

f) Action 6 – Managing waste

In the event of an accident affecting a nuclear facility, the waste generated will differ in type from that produced under normal circumstances by the same facilities and be occur in larger volumes. For this reason, **distinct technical actions need to be defined and implemented to manage this type of waste.** Part of the waste produced in ZPPs and those produced in ZSTs can be generated as non-contaminated waste, depending on the clearance levels that will need to be defined taking into account the features specific to the accident. Where implemented, waste management actions must be aimed at limiting the impact of this type of management on the public and technical workers, in particular by limiting the transfer of contamination beyond those zones contaminated by the accident, and thus by giving priority, to the extent that circumstances allow, to waste management action that can be carried as close as possible to the accident site.

g) Action 7 – Improving stakeholder involvement through a well-designed governance mode

Within the context of a post-accident management programme, **the decision-making process during the transition period shifts to a more consensus-based, participatory mode, involving the affected populations, business community, associations and elected officials.** This type of governance is, in other words, structured at the local level, whereas the national-level organisation, instituted in response to an emergency situation, shifts to accommodate the long-term and address the complexity of post-accident management.

h) Action 8 – Supporting and re-deploying business activity

During the transition period, one priority is to manage the (agricultural or industrial) products that have been exposed to radioactivity. **Support for existing activities based in the contaminated territories must be organised and established in coordination with the all business stakeholders,** in particular to assist the redeployment of certain activities, as necessary. Moreover, better characterisation must be carried out so as that the actions taken for precautionary purposes regarding certain business activities can be removed.

i) Action 9 - Providing grants and compensation

The mobilisation of emergency services is one of the national government's priorities in the event of disaster due to industrial or natural events, the implementation of an emergency fund payment system being a requirement for guaranteeing the consistency of the system overall. Where necessary, **the payment of emergency grants,** initiated from the exit from the emergency phase, **shall be maintained throughout the transition period.**

The compensation plan, which is the focus of a specific legal framework – the nuclear civil liability framework – **is instituted from the start of the transition period,** drawing upon a structure that allows both requests for compensation, the review of such requests and the payment of compensation to those eligible. Coordination bodies may be established at the national level, along with all of the stakeholders, in order to organise mediation, to whatever extent necessary.

j) Action 10 - Informing

Throughout the post-accident phase, the credibility of the public statements made remains essential, as it conditions the population's support for the instructions and recommendations given. During the transition period, public communication will have to keep pace with the many new topics and sources of information that emerge and with the inevitable development of controversies. Public communication shall be structured around six major topics of information, covering: the restrictions to be adopted (instructions), health-related and environmental topics (impacts, risks, contamination), technical topics (explanation of the event, safety of the facility where the accident took place), topics of legal and economic nature (grants, compensation), "political" messages (national cohesion), and international relations (export, citizens abroad).

F. A territorial project for long-term management

The post-accident period referred to as "long-term" begins when the radiological consequences of the release have been characterised to a sufficient degree of precision that those active in the territories impacted (elected officials, business community, populations) can set out to address the future of the said territories, alongside the public authorities.

This process requires:

- a sufficiently precise understanding of the radiological situation in the environment, foodstuffs and persons so that the various parties active can protect themselves adequately (this knowledge may still improve with time);
- public authorities that have reorganised into an appropriate configuration (even though it remains subject to change, depending on the circumstances);
- stakeholders involved in the decision-making processes and actions taken to rehabilitate living conditions, which will be all the more effective in that they will have been prepared;
- the conditions needed to redeploy social and business activity and the development of a shared project within the territory.

Life in the contaminated territories remains a complex situation, however. All activity – whether economic, social or family-related – is disrupted to some degree. The situation generates many questions and concerns in those involved, in particular as regards possible deferred effects of exposure to radionuclides on health and in particular that of children. It is, moreover, seen as a schism, with a "before" the accident and an "after" the accident and little hope of returning to life as it was previously. In addition, the contaminated territories and those occupying them can become the focus of discrimination by those left unscathed. In response, it is important that decision-makers implement a territorial project in order to quickly give those active in it the means to optimise their activity from the economic, social and cultural standpoints and thereby prevent the territory and its population from becoming mired in their "victim" status over the long term.

a) Staying, leaving or returning

Offering the populations the chance to continue living in a contaminated territory over the long term or to come back and resettle there is no trivial decision and assumes the involvement of the local stakeholders in the decision and their ability to take action to improve the radiological state of their environment, in order to ensure their own protection and the extension or even development of economic and social activities within the territory.

Consequently, offering the populations the chance to stay in contaminated territories over the long term or to return to them is the responsibility of the public authorities. However, the decision itself must be made following in-depth debate with all stakeholder groups involved, at the national and local levels. One pre-requisite for keeping the populations on-site or allowing them to return for the long term is the certainty that the population can continue to be protected from exposure to ionising radiations.

For this to happen, action must be taken to lower exposure and the population must be guaranteed appropriate radiological and health-related monitoring. In the day-to-day, part of the prevention and rehabilitation initiatives will be undertaken by the individuals themselves (self-protection), with the support of the public authorities.

The decision to stay in or return to the territory affected by the accident, despite the long-term presence of contamination, may result from a weighing out a range of considerations and constraints, including radiological aspects, as well as economic and social concerns, or even property-related issues.

In territories where the decision has been made to keep the populations on-site, it shall be the responsibility of each business or social stakeholder (employer, employee, manager, etc.) to take a stance on their own level. The decision to stay or to leave, a central question with which each stakeholder will have to grapple, will lead to upheaval in all cases. It is essential that such a decision be able to be made in full knowledge of the facts, meaning that individuals need to be able to have access to all of the information, in particular on the territory's radiological situations and changes therein, so as to be able to project into the future.

b) Working and producing

In order for these efforts to bear fruit, it is important that a territorial project be drawn up in a coordinated manner and preferably during the transition period. This project must be conducive to an improvement in living conditions for the populations affected and the definition of actions to be implemented so that business and social activity can be redeployed. Its aim shall in particular be to maintain the territories integrated in the business and social community, at the national and international levels, by setting out actions designed to limit, to the greatest extent possible, discrimination across the territories by outside stakeholders. This assumes a shared review of the situation between territory residents and those living elsewhere, or even participation on the part of the latter in the efforts undertaken.

G. Conclusion

The first elements for a national policy on post-accident management were drawn up with respect to nuclear accidents triggering short-term (less than 24 hours) radioactive release of medium scale, with a chance of occurring at French nuclear facilities. The territories affected by radioactive deposits resulting from accidents of this kind may extend across significantly broader distances than those found in the off-site emergency plan (PPI), from ten to several dozen kilometres.

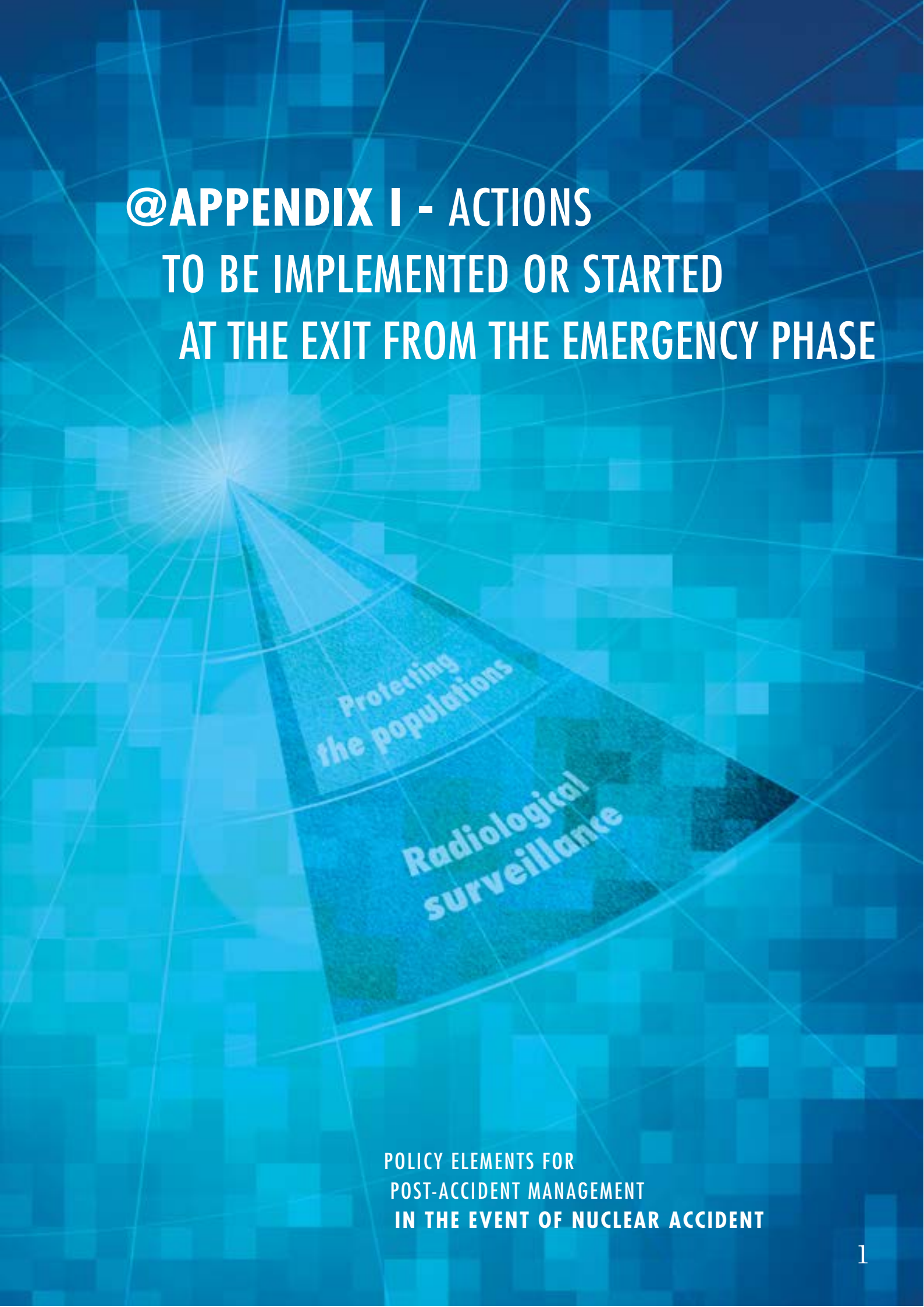
During the preparedness stage, the extension of these territories cannot be identified in advance, as it is dependent as well on environmental and meteorological factors. The footprint of the territories actually affected by the accident can be outlined only within the specific context of a confirmed accident situation, once the radioactive releases have ended, on the basis of the expertise carried out.

These policy elements outline a range of actions applicable over successive periods of time, designed in order to attain the fundamental gains achieved and in line with the principles set out. They apply also to the actions to be carried out in the event of accident during the transport of radioactive material.

This document is to be taken into account during the preparedness stage at least as concerns early actions to be initiated at the exit period from the emergency phase and, at the local level, in operational documents specific to each nuclear site.

Once the first phase of exploration into post-accident management principles has been completed, certain topics will remain to be considered in greater depth, during the preparedness (defining "thresholds" for the placing on the market of materials and manufactured products, thresholds for the release of waste, etc.). Moreover, large-scale accident management leading to long-term release (several days) will be addressed in the next stage. While the guiding principles are generally the same, the timeline and feasibility of these actions may differ, seeing as it may become necessary to undertake concurrently, but on different territories, actions to protect the population directly exposed to the release of radioactive substances into the atmosphere and others designed to protect the population exposed to deposits of these substances in the environment, as the Fukushima Daiichi accident in Japan showed.

@APPENDIX I - ACTIONS TO BE IMPLEMENTED OR STARTED AT THE EXIT FROM THE EMERGENCY PHASE



POLICY ELEMENTS FOR
POST-ACCIDENT MANAGEMENT
IN THE EVENT OF NUCLEAR ACCIDENT

When a nuclear accident occurs, leading to the release of radionuclides into the environment, a variety of **emergency protective actions** provided for under the off-site emergency plans (PPI) can be initiated, in order to prevent or lower exposure in the population. The main responses consist of sheltering and listening to, as well as possibly evacuating the population, in order to limit or even prevent exposure to the radioactive release into the air, and providing stable iodine tablets in order to limit fixation of radioactive iodine to the thyroid, should the accident have involved radioactive iodine isotopes.

Once the emergency phase has ended, other types of actions need to be implemented or started in the contaminated territories in order to ensure that the population is protected from the deposition of radioactive substances and to provide support to the impacted populations. These actions are to be prepared or even planned upstream from the crisis.

1. Reminder: Stages of nuclear crisis phasing and regulatory framework thereof

It is important to distinguish the "temporal phasing" of the accident (emergency phase and post-accident phase) from the concept of "situations" (emergency situation and long-term exposure situation) proceeding from the regulatory framework specific to radiation protection.

1.1 Definitions of emergency phase and post-accident phase

1.1.1 The emergency phase

In the most general case, **the emergency phase** is composed of:

- **a period of threat** resulting from facility failures, during which the operator implements actions designed to return it to an adequate level of safety and thereby prevent potential releases;
- **a period of radioactive release into the environment** should the operator have been unable to bring the facility back to a safe and stable state;
- **an exit period from the emergency phase,** during which the facility returns to a safe and stable state, significant radioactive release ceases and no further threat of release exists.

The emergency phase is characterised by the need to take action very quickly in order to deal with the actual or potential release of radioactive substances into the environment, likely to lead to substantial exposure of the population. In addition to the actions carried out by the operator in order to bring facilities back to safe operating conditions, the aim for the public authorities will be to quickly initiate actions to protect the population (sheltering, administration of iodine tablets, evacuation) in order to limit exposure and to initiate post-accident management.

Comment: *the emergency phase begins when the operator triggers the on-site emergency plan (PUI), after which the Prefect issues an alert and, where necessary, emergency protective actions are implemented to protect the population from radioactive release, called for in the off-site emergency plan (PPI).*

When the emergency phase comes to an end, the Prefect implements the first protective actions to protect the population living in the contaminated territories, designed to protect the populations from the contamination deposited on the ground during atmospheric dispersion. Even though these actions are to be set out in the PPI, they can also apply to contaminated territories that extend beyond those for which emergency protection actions are planned.

In the event of a nuclear accident of moderate scale causing short-term release (less than 24 hours), in which the facility quickly returns to safe state, the early actions taken to protect the population from the contamination deposited on the ground are started from the end of release. When faced with accidents that prove more complex in their consequences (main release over a longer duration – several days – followed by residual release, a return to safe operating conditions lasting several months), not yet considered in detail by CODIRPA, the early actions designed to protect the populations from contamination deposited on the ground will be started as soon as the main release ends.

Whatever the case, the exit from the emergency phase must be concurrent at least with the return of the facility to safe state.

The exit from the emergency phase is marked by a many uncertainties regarding the contamination of the environment and population exposure, making it necessary to proactively implement population protection actions across sometimes extensive expanses of land, beyond the zones for which the protective actions determined during the emergency phase were designed.

1.1.2 The post-accident phase

Generally speaking, the post-accident phase follows the emergency phase after the end of release and the facility's return to a safe state. It is composed of:

- **a transition period** (which can last up to a few weeks or a few months after the accident), during which understanding of the actual state of contamination of the various components of the environment is still imprecise and the risks of chronic exposure in individuals can still be high;
- **a long-term period** (which can last up to several years or even several decades after the accident), characterized as the lasting contamination of the territories impacted and lower yet still lasting risk of chronic exposure in individuals.

Comment: *he first protective actions initiated during the post-accident phase are designed to manage the short-term consequences of the radioactive deposits that have formed during the dispersion of releases. The territories where such deposits are found will extend beyond those covered by the protective actions started during the emergency phase. For this reason, accidents causing long-term release (a case not yet studied in detail by CODIRPA), it is recommended that the first actions designed to protect against radioactive deposits be implemented in relatively remote territories, while the emergency phase has not yet come to an end at the facility itself and in its immediate vicinity, insofar as a return to a safe state can span a longer period of time (a few weeks to a few months).*

1.2 Definitions of radiological emergency situation and lasting exposure situation

1.2.1 International reference points

As pertains to radiation protection and as far as worker and population exposure to ionising radiations resulting from a nuclear or radiological accident is concerned, the ICRP [1] has since 2007 recommended that the distinction be made respectively between "emergency exposure situations" and "existing exposure situations".

The concept of emergency exposure situation applies in particular to exposure that likely to be undergone by workers in activity at the facility affected by

the accident, but also the populations near the facilities who may be exposed directly to radioactive release. For situations of this kind, the ICRP allows reference level ranges from 20 to 100 mSv as the effective dose.

The concept of existing exposure situation applies in particular to exposure to which individuals (population and workers) are subject insofar as they live in a territory contaminated by radioactive deposits that have formed during the dispersion of release from the facility where the accident took place. For situations of this kind, the ICRP allows reference level ranges from 1 to 20 mSv per year as the effective dose.

In both of the above situations, it is the responsibility of the authorities to choose a reference level within the ranges listed, taking into account the accident conditions and developments therein.

These principles and the new terminology accompanying them, have been incorporated into the new international standards published by the IAEA at the end of 2011 [2] and were also taken into consideration in the Euratom draft directive which sets out basic radiation protection standards, as adopted in September 2011 by the European Commission and currently under review.

1.2.2 The national regulatory framework

En 2003, the Public Health Code (CSP) was supplemented to add, first of all, "radiological emergency situations" and secondly, "long-term exposure to ionising radiation situations".

Under the Code, a **radiological emergency situation** [3] is now associated with the occurrence of an event likely to lead to the emission of radioactive material or a level of exposure to ionising radiations likely to have an impact on public health. Specific regulatory requirements are defined in order to protect the population and workers mobilised during radiological emergency situations. Once the emergency phase has been triggered, which can be likened to the institution of the radiological emergency situation, the said specific requirements are immediately in effect.

From this point on, to ensure greater clarity, the territories impacted by the radiological emergency situation should be defined from the start of the emergency phase, for all or some of the municipalities located within the scope of the off-site emergency plans (PPI, in particular those where the decision has been made to institute emergency protective actions (sheltering, evacuation, administration of stable iodine, where applicable). The current regulations do not provide for such regulations (neither the triggering of the emergency phase nor the affected territories are currently established by an administrative procedure).

The lasting exposure to ionising radiations situation [4] is consequently the result of a radiological emergency situation. The workers mobilised are placed under the general regimen of the Labour Code (radiation protection for workers); where the population is concerned, exposure levels are not subject to a specific limit, generally speaking, the reference exposure levels may be set on a case-by-case basis.

Although the terminology used in France, which pre-dates that recommended by the ICRP in 2007, differs from the new international terminology, the related definitions are consistent. Moreover, the national doctrine, which introduces a possible juxtaposition between the two situations, depending on the geographic site (emergency exposure situation at the site of the accident

and neighbouring territories, first of all, existing or long-term exposure situation in more remote territories, secondly) is a concrete application of the international doctrine.

2. Defining initial post-accident zoning

Post-accident zoning is designed to provide a structuring framework within which actions to protect the population and manage contamination across the territories affected by the accident can be instituted.

2.1 Indicators and guidance values to be used in determining areas

The first post-accident zoning is established on the basis of a **predictive model** of future population exposure to the ambient radioactivity in the inhabited zones and contamination in the food chain, as a result of deposited radioactivity. This depends directly on the extent of the radioactive deposits, the persistence of which can vary substantially.

The zoning is determined by the local authority[4]. Once adopted, the first zoning is reported to the local agencies elected officials, through prefecture orders, in order to be applied administratively and operationally.

- **The public protection zone (ZPP)** is defined as the **area within which actions designed to reduce exposure to ambient radioactivity for residents of the said areas as low as reasonably achievable are warranted.** This area is defined **for the purpose of providing radiation protection for the population** living in the most contaminated territories, **based on dosimetric guidance values.**

The initial definition of the ZPP will be made on the basis of assessment of projected doses likely to be received during the month following the end of release, without taking into account the effectiveness of the contamination reduction actions implemented in the area. The ZPP is in other words delineated based on the most disadvantageous of the two following exposure indicators:

- the projected effective dose received during the first month following the end of release, regardless of pathways of exposure, including ingestion of contaminated local foodstuffs, the guidance value used being approximately 10 mSv over the first month;
- the projected thyroid equivalent dose received over the course of the first month following the end of release, regardless of pathways of exposure, in particular ingestion of contaminated local foodstuffs, the selected guidance value being approximately 50 mSv over the first month.

The dosimetric guidance values are not to be interpreted as thresholds or limits. The uncertainties as to dose estimates are such that other factors than dose should be considered. These other factors are connected with the conditions under which the actions envisioned are carried out in reality, and are best assessed at the local level. Contextual factors may also make it appropriate to use more restrictive or higher values, or even to refrain from implementing any protection actions at all.

In the ZPP, movement is to remain free in principle, except in forests or other places where radioactive substances may have concentrated, in which case access restrictions may be declared.

4. In France, the Prefect holds authority locally and is in charge of establishing the zoning, based on ASN recommendations drawn up using the assessment of consequences provided by IRSN and the operator.

Under the accident scenarios considered, the main source of potential exposure for the populations residing in the area is the ingestion of contaminated foodstuffs of local origin. Consequently, all foodstuffs produced in the ZPP or derived from fishing, hunting or gathering are to be banned from consumption and placing on the market, regardless of their degree of contamination, for a period of at least one month. These foodstuffs are thus considered waste as long as the ZPP is in effect.

Where non-food products are concerned, the possibilities for placing on the market should be reviewed on a case-by-case basis, combined where necessary with prior verifications.

It may be that, across part of the ZPP, despite the ban on consumption of foodstuffs of local origin, exposure across the population may continue to be deemed too high, due to radioactivity deposited in the living environments. In this case, inhabitants must be displaced from the relevant part of the ZPP, probably for a longer duration, and a relocation perimeter (PE) must be established.

The **relocation perimeter** shall be delineated based on the results of an assessment showing the projected effective doses over the first month following release, not taking into account the contaminated foodstuffs of local origin ingested, comparing them to a guidance value on the order of 10 mSv over the first month.

For operational purposes, the indicators used to define the ZPP and the relocation perimeter will generally be stated in magnitudes that are measurable on site, for instance, in dose equivalent (mSv/h or µSv/h) or in surface activity (Bq/m2) looking at the radionuclides that form the deposits.

- **The heightened territorial surveillance zone (ZST)** extends beyond the borders of the public protection zone. As the emergency phase comes to an end, the ZST is also delineated, using forecast assessments derived from models of the transfers of radioactivity deposited in farming areas. It is characterised by lower environmental contamination that does not require the automatic implementation of population protective actions.

This contamination is nonetheless significant and can affect in particular foodstuffs and agricultural products, substantiating the institution of specific systems to monitor the radiological quality of the relevant products. In some agricultural products and foodstuffs, contamination may exceed, albeit temporarily, the maximum permitted levels (NMA), considered of regulatory value and set at the European level to regulate the placing on the market of the said foodstuffs [7].

Comment: *At the European level, in the event of nuclear accident, Council Regulation (EURATOM) No. 3954/87 adopted on 28 December 1987 as modified by Regulation (EURATOM) n° 2218/89 adopted on 18 July 1989, which sets NMA of contamination in foodstuffs following a nuclear accident.*

The NMAs are pre-established levels thanks to which foods may be placing on the market. The levels will be instituted by European Commission regulation adopted in reflex mode immediately after an accident. They then become the regulatory limits for the Community market: the foodstuffs contaminated beyond the levels established in this manner are not to be placing on the market.

The pre-established NMA figures are valid for a duration not to exceed 3 months at most, with new regulations to be proposed by the Commission within one month following the implementation of the initial regulations, confirming or adapting the levels in accordance with the event's developments.

EURATOM REGULATION 3954/87 OF THE COUNCIL ADOPTED ON 22 DECEMBER 1987

(modified by EURATOM Regulation 2218/89 of the Council on 18 July 1989) establishing the NMAs of radioactive contamination for foodstuffs and feeding stuffs following a nuclear accident or in any other radiological emergency situation.

Consolidated appendix regarding foodstuffs

	Foodstuffs (NMA in Bq/Kg)			
	Baby food	Dairy products	Other foodstuffs except minor foodstuffs	Liquids intended for consumption
Isotopes of strontium, in particular Sr-90	75	125	750	125
Isotopes of iodine, in particular I-131	150	500	2,000	500
Alpha-emitting isotopes of plutonium and transplutonium elements, in particular Pu-239, Am-241	1	20	80	20
All other radionuclides of half-life greater than 10 days, notably Cs-134, Cs-137	400	1,000	1,250	125

Minor foodstuffs are said to be those contributing to the human diet in only very small percentages (e.g.: spices, etc.), and EURATOM Regulation 944/89 of the Commission adopted on 12 April 1989 specifies that the maximum acceptable level is 10 times greater than those of "other foodstuffs, except those of lesser significance".

EURATOM REGULATION 770/90 OF THE COUNCIL ADOPTED ON 29 MARCH 1990

Establishing maximum radioactive contamination levels (caesium 134 and caesium 137) in feeding stuffs following a nuclear accident or any other radiological emergency situation

Categories of animals	**Bq/Kg CS-134 and CS-137**
Pork	1,250
Poultry, lamb, veal	2,500
Others	5,000

The ZST is thus defined as the zone encompassing all of the perimeters within which, in a given category of agricultural production likely to be grown and harvested within the month to follow[5], the NMAs may be exceeded. Considering that the ZST is initially determined on the basis of predictive assessments carried out via modelling, a ban shall be placed on the placing on the market of all locally-produced foodstuffs, along with recommendations designed to limit the consumption of self-produced foodstuffs or derived from hunting, fishing or gathering. As early as possible, radiological monitoring devices suited to each agricultural production sector instituted in order to allow the placing on the market of compliant products.

Contrary to the ZPP where the ban shall be issued for a pre-set and renewable period, the implementation of controls is to be a priority in ZSTs. Moreover, unlike the ZPPs, aimed at protecting the populations, the ZST is designed primarily to preserve business activity, by guaranteeing that only compliant products may enter distribution channels.

Figure 1 below shows, by way of illustration, a rough depiction of a ZPP (including the possible relocation perimeter) and ZST.

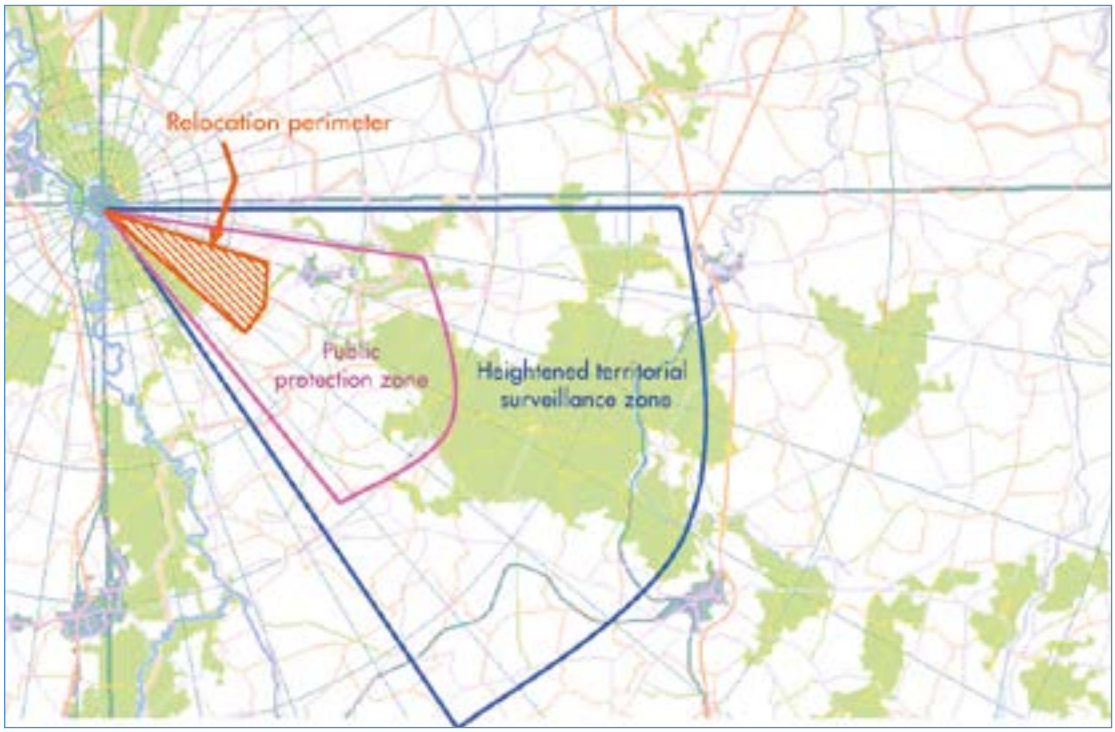


Figure 1: Rough depiction of post-accident zoning

2.2 Technical basis for defining zoning

During the exit period from the emergency phase, an approach based on predictive modelling is the only way to provide the public authorities with dose assessments for the population and on agricultural foodstuff contamination, making it possible to define the ZPP and ZST.

In order to secure the most accurate assessment possible, the modelling-based approach requires a large amount of data and information on the characteristics of the affected facility and its environment (in particular on the agricultural production), as well as assumptions about the lifestyles and diet of the populations affected. It is important to emphasise that this method, even when applied using realistic data, yields results worked with significant uncertainties. These are due to the great variability of the

5. Agricultural production gathered or produced later in the year is taken into account thereafter, during the regular revision of the post-accident zoning.

phenomena in play, the partial or imprecise understanding of the data used for the assessments, as well as the imprecision intrinsic to the models used.

In such an environment, IRSN, in charge of the first predictive assessments used to define the zoning, uses the data and reasonably conservative assumptions to compute the consequences, in order to prevent the risk that the actions used when establishing the ZPP and ZST are "adjusted upward". The expression "reasonably conservative assumptions" here refers to assumptions leading to dose or foodstuff contamination estimates on the basis of which sufficiently-protective actions can be adopted, without the ZPP's or ZST's becoming oversized as a result, as this could put the populations and local economy at an unwarranted disadvantage.

The first assessments are regularly updated, taking into account the new data gained on site, in particular the results of measurement campaigns on the actual environmental contamination gained using the existing resources (radiation monitors, measurement stations) and resources deployed to an exceptional extent (mobile laboratories, helicopter transported monitors, etc.) as well as the local environment (agricultural production, for example).

3. Starting early protective and management of the population related to zoning

3.1 Relocating or keeping populations on site, once emergency protective actions have been lifted

Sheltering actions are to be lifted as quickly as possible. The Prefect may, at this point, based on the recommendations made at the national level, either let the population reside on the ZPP area, or decide to relocate part of the population, for a period of at least one month approximately, in the event of significant contamination of the territory. In all cases, it is vital to inform the populations affected upon the lifting of the sheltering action about the measures initiated to lower their exposure and on the best practices to be adopted with regard to the contamination.

3.1.1 Lifting the emergency protective actions

The Prefect's decision to shelter and possibly evacuate the population is dependent on predictive assessments carried out by the IRSN and by the operator, subject to an advice issued by the ASN. It is generally accepted that the duration of the sheltering action is not to exceed 24 hours, taking into account:

- the necessarily anxiety-inducing environment in which the sheltering action and, later, the stay in the shelter take place;
- the families' legitimate hope to be able to bring together members who might be in different places;
- the possible need to secure foodstuffs or turn to medical care;
- the need on the part of breeders to feed and care for their animals;

The lifting of the sheltering action must thus be pronounced as quickly as possible.

If evacuation of the population has been set up during the emergency phase, three situations can be encountered:

- if the places of residence of those affected are located outside the ZPP or ZST, their return home may take place without any particular precautionary actions;

- if the places of residence of those affected are in the ZPP, outside the relocation perimeter, information provision must be planned as early as possible and actions taken to facilitate their return home, once the relevant controls have been completed at the said locations to ascertain the radiological conditions;
- if the places of residence of those affected are within the relocation perimeter, a brief return home may be organised so that the individuals can plan and get organised for the relocation which will last at least one month. A period of a few days may be left so as to facilitate the organisation of these brief returns under safe conditions.

3.1.2 Maintaining populations on-site

Within the ZPP and outside the relocation perimeter, the populations may be kept on-site, subject to the action undertaken by the public authorities to lower their exposure to ionising radiations, in particular prohibiting consumption and placing on the market of locally-produced foodstuffs.

Certain additional recommendations may also be made, designed to limit the frequentation of the most highly-contaminated places (for instance, forests), or to lower the presence of radioactive substances in living places (for instance, through ventilation or cleaning).

3.1.3 Relocating the populations

The implementation of population relocation can be decided upon a few days after the lifting of sheltering actions. During this period of time, it may be recommended to the populations involved that they limit their stay outside buildings, in order to lower their exposure due to radioactive deposits.

It is also important to plan for the fact that some people will not agree to leave without their pets.

What is relocation?

Relocation is aimed primarily at abstracting the populations from the external exposure due to deposit of radioactive particles on the surfaces. It must be announced concurrent to the lifting of emergency protective actions.

The concept of "relocation" is distinct from that of "evacuation", which is used only in the setting of an emergency situation. While both operations refer to declared population movement, they differ significantly in the conditions and timeframes which they respectively entail:

- evacuation, once decided, must by definition be carried out as quickly as possible, as it takes place under threat of more or less imminent release or under release itself, and is designed to protect the population from the risk of receiving significant doses in the short-term, due to exposure to the contaminated air mass;
- relocation may take place within a timeframe of approximately 24 hours and is designed to prevent doses that may be received over time, in the event of extended stay (typically over the course of the month to follow, as concerns relocation at the exit from the emergency phase), doses due to radioactivity deposited on the ground.

Relocation and evacuation also differ in their duration and type of housing they entail:

- evacuation may be carried out initially to temporary housing, or ORSEC reception and grouping centres (village Rolls, gymnasiums, etc.), so long as information about the likely duration of the evacuation is lacking;

- relocation, which is expected from the start to last several weeks, requires housing suited to an extended stay and consideration for the variety of individual circumstances to be accommodated.

Relocation perimeter status

Access to the relocation perimeter is secured and guarded by the police forces. It is thus limited to workers specifically mobilised in the relevant zone; such workers must also be able bear an access permit and be provided with information and, where appropriate, training about the risks of working in a contaminated environment, as well as protection and *ad hoc* surveillance.

Certain residents may return to the relocation perimeter under supervision, but only by way of exception. The procedures regarding such a return must be clearly stated (duration, protection devices, support, etc.) and planned.

Establishing the relocation perimeter

The ORSEC PPI Seveso High-Threshold Guide[6] provided by the Ministry of the Interior describes the actions that must be implemented before a zone can be roped off and analyses the consequences of this decision on traffic and evacuation from the zone.

The presence of individuals is not allowed unless they are involved in non-interruptible activities. The non-interruptible activities are not defined by regulation and are thus to be identified within the relocation scope:

- activities that need to be sustained as they enable repairs (water and electricity grid, etc.);
- non-interruptible facilities thus requiring regular monitoring;
- industries of vital importance to the national or local economy.

The radiological situation at the sites where these activities are carried out must be quickly assessed in order to determine the need to implement customary restrictions, contamination mitigation actions or specific instructions regarding the protection and monitoring of workers involved in a maintained activity.

Basic care for animals (feeding, milking, calving, etc.) at breeding operations found within the relocation perimeter shall be considered a non-interruptible activity and competent staffing is to be arranged for this purpose within a short time.

Relocating persons residing in a sensitive establishment

The relocation of populations living in sensitive establishments is to be implemented in line with the provisions set out for the said establishments. However, the said provisions must take into account the features specific to a nuclear post-accident situation.

Each healthcare establishment shall draw up a White Plan, taking into account the procedures for total evacuation and management provisions resulting from this. Due to the complexity inherent in evacuating a healthcare establishment, such an undertaking is only to be considered within the context of comprehensive mobilisation across the healthcare sector, provided for in the "extended" White Plan and encompassing: healthcare transport, patient re-direction in accordance with availability in host establishments and the specialities required, mobilisation and monitoring on the part of healthcare professionals working for the establishments, medical file transfer, etc.

6. Volume S.1.2 August 2007. Directorate of Defence and Civil Security, known as the National Directorate for Civil Security and Crisis Management since 2011.

The "extended" White Plan, which can be activated by the Prefect alone, is the enabling document by which healthcare provision across an entire *département* is to be reorganised, in order to deal with an emergency situation. It is drafted in connection with the regional level of healthcare organisation. Lastly, the zonal and national levels can also be mobilised to provide added healthcare resources and capacity for patient transport and reception as necessary. Each healthcare establishment is, under the "extended" White Plan, connected to a back-up establishment, in the event that it should, itself, become unusable.

Moreover, the establishments dedicated to the elderly or disabled are required to design an internal organisation plan (POI) in order to cope with emergency situations; penitentiary establishments are prepared for total or partial evacuation under emergency conditions.

3.2 Prohibiting the consumption and placing on the market of foodstuffs originating in the public protection zone (ZPP)

In order to lower or even prevent population exposure through the ingestion of contaminated foodstuffs within the ZPP, the public authorities pronounce, by order from the perfect, a general and automatic ban on the consumption and placing on the market[7], as defined in EC Regulation 178/2002 [8], of foodstuffs produced or not protected from contamination within the ZPP, throughout the duration of the ZPP.

Even though the prefect's order is legally binding, where consumption is concerned, the prevalent rationale is not so much to repress violations of the prefect's order than to explain, educate and communicate, in that the aim of the bans is first and foremost to limit the consumption of contaminated products by recommending changes in dietary practices.

The bans on consuming and marketing agricultural products for human consumption and foodstuffs and feeding stuffs for livestock must be pronounced by the public authorities as early as possible and, in all cases, before emergency protection actions are lifted.

3.2.1 Agricultural production for human consumption and animal feed in the ZPP

Comprehensive bans on the consumption and placing on the market are issued for the following foodstuffs and livestock feeding stuffs as defined by the European regulations [8] and agricultural products:

- agricultural products and processed agricultural products intended for human consumption of all kinds stored or produced within the area;
- foodstuffs without hermetic packaging, stored or circulating in the zone at the time of release;
- livestock forage and feeding stuffs without hermetic packaging, stored or produced in the area.

In addition to those defined in the European regulations, the ban also applies to the following categories:

- foodstuffs derived from private vegetable and fruit gardens, as well as from family-owned livestock-framings found in the area;
- products derived from hunting, fishing and gathering.

7. « Mise sur le marché » : la détention de denrées alimentaires ou d'aliments pour animaux en vue de leur vente, y compris l'offre en vue de la vente ou toute autre forme de cession, à titre gratuit ou onéreux, ainsi que la vente, la distribution et les autres formes de cession proprement dites.

As a precautionary measure, all foodstuffs and products covered originating in the ZPP, regardless of their distribution channel (direct sale or transfer free of charge, sale via intermediary, etc.) shall all be declared unsuitable for consumption or placing on the market, regardless of their actual degree of contamination, even if they turned out compliant with the regulatory restrictions on placing on the market. The foodstuffs covered are those likely to have been contaminated taking into account their exposure to radioactive fallout and thus produced or stored, but not protected at the time of the accident.

3.2.2 Consequences of bans on consumption and placing on the market in the ZPP

As the consumption and placing on the market of local foodstuffs produced in the public protection zone has become impossible, the Prefect must ensure that there exists adequate supply of healthy foods and facilitate the organisation of their distribution if necessary. This process may involve the local distributors and is to be instituted quickly.

Another consequence of the comprehensive bans on the consumption and placing on the market of these products is that they are to be managed in the same manner as contaminated waste.

Other provisions come along with this and round out the neutralisation of foodstuff production in the ZPP. For this reason, also banned in this area are the processing and transport over zone borders of all agricultural products originating in the zone, unless for the purpose of their disposal.

3.3 Prohibiting the placing on the market of foodstuffs originating in the heightened territorial surveillance zone (ZST)

Taking into account the risk that the NMAs in this zone have been exceeded and bearing in mind that it has been delineated on the basis of predictive assessments carried out through modelling, until such time as contamination control systems can be instituted for the agricultural products, it is recommended that:

- Initially, prohibit the placing on the market of all foodstuffs produced locally and support these bans with recommendations designed to limit the consumption of self-produced foodstuffs or those derived from hunting, fishing or gathering within the perimeter subject to excessively high NMA levels by the most restrictive radionuclide;
- thereafter (as soon as the radiological control devices adapted to each agricultural production sector have been instituted), allow placing on the market of compliant products and set out a strategy with the stakeholders and population, as pertains to the consumption of self-produced foods. As this is a relatively complex issue, further explorations are to be carried out during preparedness.

The prefect thus pronounces bans on placing on the market, for precautionary purposes. These actions must be supported by appropriate communication and their consequences in terms of compensation considered in all cases. If the ZST's borders are aligned with those of the municipality, this should make it easier to announce decisions to the relevant producers and agricultural sector organisations and to the population, with the cooperation of the municipal authorities.

These actions must be made known to the public and understood. It is vital that communication explaining the overall food risk management system be instituted from the start of the emergency phase exit.

During the exit period from the emergency phase, it is important to implement radiological controls as early as possible. First of all, approved laboratories will be mobilised and organised accordingly (ability to manage large flow samples, measurements to be taken under unusual conditions). Secondly, a measurement plan will be drawn up in cooperation with the professionals from the relevant food sectors. These controls will be continued and stepped up during the transition phase (see Appendix 2).

3.4 Immobilising materials and products pending assessment of possible contamination

As a precautionary measure, the placing on the market of materials and products manufactured as well as agricultural products not intended for human or animal consumption likely to have been contaminated shall be subject to case-by-case review, combined where necessary with prior controls.

3.5 Providing population support

3.5.1 Providing support to the populations at the reception and information centres (CAI)

The creation of CAIs is one of the first actions on which the public authorities must decide as the emergency phase comes to an end. The CAIs must be the place of choice for providing personalised information to those involved, in particular on issues related to radiation protection, social support or compensation. The number of CAIs to be activated depends on the breadth of the territories and the size of the population affected by the accident's consequences.

Each CAI shall by definition be:

- a local one-stop desk in that it will enable ZPP and ZST inhabitants to receive information, at the same spot, from authorised persons and initiate and carry out the necessary administrative procedures;
- a network head, as the CAI is also a place where individuals can be directed to competent professionals, if appropriate;
- a structure open to adjustment over time, as the tasks of a CAI do not all take place along the same timescale;
- gradually, a place where a practical radiation protection culture can develop for local residents and professionals, who will have chosen to stay reside and work in the ZPP or ZST;
- on a walk-in basis, a place for exchange and dialogue, served by all stakeholders.

In preparation for the exit from the emergency phase, the CAIs will need to align along the model established by the reception and regrouping centres (CARE) called for under the ORSEC system, so that they can become operational as soon as the sheltering period ends, and are in charge of the following priority tasks:

- receiving, taking census and providing medical-psychological support (in particular, initial psychological support and guidance, if appropriate, as to internal contamination measurements);
- providing information, in particular about the accident, its environmental impacts and the compensation procedures;
- assisting with housing and/or re-location;

- releasing emergency grants and financial assistance;
- supporting the restrictions resulting from the post-accident zoning through advice on best practices.

3.5.2 Identifying the populations affected by the consequences of the accident

The census-taking effort is intended to facilitate (by identifying and keeping record of those impacted) re-housing and compensation operations. It is also aimed at facilitating the implementation of medical care and epidemiological follow-up; to this end, the skills and tools implemented by the healthcare authorities and the InVS will be made available to prefectural organisation.

Initiated from the emergency phase in the collective buildings where individuals will have been sheltered, the census process is to be carried out through a questionnaire that must be offered as a matter of standard procedure to each beneficiary upon service provision, in particular at the CAI. The census-taking process is coordinated by the Prefect.

3.5.3 Providing medical care

Regarding health-related issues at stake in the event of a nuclear accident followed by radioactive release, the doses which persons residing in the territories contaminated by radioactivity may receive are too low to observably affect human health in the short term but can heighten the likelihood of developing pathologies such as certain forms of cancer. These pathologies do not come to light immediately after exposure to ionising radiations, but may emerge a few years or even a few dozens of years later.

Furthermore, the upheaval which the accident causes in the way society functions may have effects on individual health and it is important to foresee and provide care for this, to whatever extent possible (stress and psychological duress, for instance). This means that, from the very end of the emergency phase, the public authorities need to pay special attention to these effects (through psychological support, in particular), organising accordingly. Other actions must be started so that the information to be used subsequently can be gathered in due time (for instance, activating the epidemiological follow-up networks) and preclude the emergence of medium-term effects.

3.5.3.1 Providing psychological support to the populations

Epidemiological studies have emphasised the importance of the psychological impact of changes in living environment (evacuations, relocation, alteration to environment, suspension of agricultural activity, etc.) and the uncertainties that come along with them. This impact appears to depend little on the importance of contamination in the environment, but is connected more to the perception of radiological risk and other accident consequences, as well as the quality and speed of the responses provided, both from the healthcare and social standpoints.

In order to mitigate the negative aspects of these reactions, which are normal under such circumstances, clear information must be issued quickly, about the risks, recommendations on individual protection and places where support can be found (CAI). As the mission of the medical-psychological emergency units (CUMP) (or, at least, a unit capable of directing them to mental health professionals), in particular in the CAIs, provides listening services and psychological support and thereby

help enable a rapid response. Recommendations should be issued to professionals working in the healthcare networks so that they can be particularly watchful for possible signs of stress overload or psychological exhaustion and, if necessary, guide people requiring additional care such as an internal contamination measurement that can reassure the most worried people.

3.5.3.2 Estimating the doses received by the population

The process of estimating the doses actually received by the population, in particular during the emergency phase, needs to be launched as early as possible in order to quickly set epidemiological or medical follow-up on the appropriate track, if required. The projected doses estimated during and upon exiting the emergency phase, using modelling tools and based on reasonably-conservative assumptions about exposure scenarios, are intended to guide decision-making about population protective actions and are not representative of the doses actually received by the exposed populations. Within this setting and from the exit from the emergency phase, preference should be given to the internal contamination measurement in those involved. If measurement resources are lacking, retrospective estimates can be calculated. In any case, a maximum of useful information for this assessment process should be collected as soon as possible; this will make it possible, when taking census at the exit from the emergency phase or thereafter, to collect individual information about the status of the persons impacted during the accident and on their compliance with the emergency protective instructions (sheltering, administration of iodine tablets, as applicable). Moreover, the results of the environmental contamination measurements will contribute to facilitating the retrospective estimate of doses received during the emergency phase.

The internal contamination assessment will be implemented soon after. It comes in response to a two-fold aim: first of all, it makes it possible to screen individuals who may have been contaminated during the emergency phase; and secondly, it contributes to producing retrospective assessment of the doses received by the exposed population.

Internal contamination is controlled using fixed or mobile measurement tools, by anthroporadiametry or possibly through radiotoxicological bioassays. The most sensitive categories of people (children, pregnant women) are to be given priority for these tests.

Spontaneous requests are also to be taken into account in order to address the population's legitimate concerns and specific care is needed. However, in order not to divert the control resources deployed across the territory, reserved for priority groups, spontaneous requests should be addressed by other systems (permanent laboratories dedicated to internal contamination measurement such as occupational medicine departments at the closest nuclear sites, for instance).

3.5.4 Initiating epidemiological follow-up

Following a nuclear accident, population-wide health follow-up is implemented in order to attain the following targets:

- detecting possible health events early in order to facilitate the provision of medical care;

- monitoring trends in "healthcare indicators" during the post-accident phase;
- contributing overall health-related assessment of the accident's consequences.

Epidemiological follow-up also contributes indirectly to the compensation process insofar as it opens up access to information about the accident's consequences where human health is concerned.

The monitoring activated at the exit from the emergency phase consists primarily of mobilising the regional health agencies (ARS) and monitoring networks (pharmacovigilance, SurSaUD®, CUMP). The processing and analysis of data from these networks will continue during the transition period (see Appendix 2).

A task force run by the Ministry of Health may be set up at the national level to address health-related issues.

Health-related information is provided to the population by the healthcare authorities, in coordination with the InVS and intermediary stakeholders. In addition to this, the healthcare authorities circulate information to healthcare professionals and establishments in order to alert them about the possible emergence of abnormally frequent or unusual effects, an increase in signs of stress and trauma due to population relocation, as well as on the specific needs for care or information.

Healthcare professionals are also asked to inform the regional healthcare agencies of any unusual event which they may deem necessary to report, so that the latter can give rise to investigations and enable better care as needed thereafter.

3.6 Prohibiting access to places with high concentration of radioactive substances

3.6.1 For the local or passing population

At the exit of the emergency phase, the use of public and private forests is to be prohibited, as should be the removal, consumption and sale of forest products (including wood for heating) in the ZPP. Moreover, these bans may be extended to certain wooded areas of the ZST, if contamination levels so require.

These actions must be explained to the populations, for which the sociological and symbolic bearing of being denied access to the forests can be significant, in particular when extensive national forest areas attracting large numbers of visitors are involved. For this reason, relevant information messages should be sent out using the best-suited media (local papers, posting on sites or in town halls, etc.).

3.6.2 For forestry professionals

The public authorities must prohibit forestry professionals from continuing operations in forests found inside the ZPP and ZST, as most in-forest operations can be deferred by at least one season, without any major difficulties.

3.7 Allowing drinking water supply to the populations

Tap water risk management is distinct from the risk management efforts applied to foodstuffs in that, first of all, the population is "captive" with regard to tap water and, secondly, in areas that have not been subject to atmospheric deposits, exposure due to water usage would be the only real way for the population to be reached. It is thus recommended that population exposure be limited to a level as low as reasonably achievable, through the implementation of actions designed specifically to lower contamination in grid water. These actions are to be reviewed in conjunction

with water producers and distributors and can, depending on the local environment, involve mixing, substituting or implementing treatment methods, etc.

3.7.1 Emergency phase: allowing continued tap water consumption during the population sheltering period

During the atmospheric release phase of a radiological or nuclear accident, the exposure resulting from tap water consumption will not be immediate. Where exposure does take place, it will be limited and possibly even very low, with respect to other pathways of exposure (external exposure, inhalation of radioactive substances dispersed in the atmosphere) resulting from the accident.

As population sheltering during the emergency phase does not allow drinking water supply through any other means than the distribution grid, tap water consumption must continue to be allowed without restriction. Considering the expected benefit of sheltering from atmospheric release (the averted dose ranges from a few mSv to several dozen mSv), compared to the effects of possible drinking water contamination (a few µSv under scenarios of moderate scale with short-term release), there is no reason to provide tap water consumption restrictions during sheltering.

It follows, from the two points above, that water distribution and usage, in particular consumption, should continue to be allowed as usual during this phase, even when no measurement results on possible water contamination are yet available.

In all events, even when tap water contamination does occur, it will not emerge immediately, due first to the time needed for the contamination to reach the water resources and secondly the time required for the water from the said resources to reach the water production, treatment and storage facilities and, subsequently, to the consumer's tap. It should also be noted that, where this is the case, the treatment and storage facility coverage limits direct water contamination through atmospheric fallout.

By way of precaution, it is recommended that, when using superficial or comparable waters (surface waters, alluvial groundwater, water abstracted from dams or reserve basins) or water abstracted from high-permeability rock (karstic waters, in particular), pumping be stopped, in order to prevent the transfer of contamination to the distribution systems, in particular before the pollution front passes into the surface waters. Regardless of circumstances, the temporary suspension of pumping should not lead to an interruption in water circulation in the distribution grid, taking into account the sanitary risks which such a break would bring about.

The resources used and related production, treatment and storage facilities should be subject to review to determine their vulnerability, at the preparedness stage, and taking into account the maximum self-sufficiency levels of the reservoirs and water towers, as well as the existing interconnections.

3.7.2 Emergency phase exit: allowing continued tap water consumption without restriction, except under special circumstances

From as early as the emergency phase, radioactivity measurement devices of the water resources must be mobilised swiftly and implemented. Analysis must focus, as a priority, on the most vulnerable resources and related water adduction systems identified during the preparedness stage.

Where surface or comparable waters are concerned, the actions implemented during the emergency phase in order to prevent the transfer of contamination to the distribution systems shall be kept operational to whatever extent possible.

Generally speaking, there is still no reason to provide for specific restrictions on tap water consumption, except in specific cases identified during the preparedness stage. In other words, where surface or comparable waters are concerned, until such time as the first radioactivity measurement results become available and in the absence of predictive assessments demonstrating low dosimetric impact on the population, consumption restrictions can be pronounced *a priori* for the most radiosensitive groups of the population (infants, small children, pregnant women, etc.).

The chosen course of action must take into account the vulnerability of the resource used and of the production and distribution grid, on a case-by-case basis.

Use of groundwater resources

As water resources are, during the initial stage, protected from direct release, any contamination of abstracted water is not likely to emerge before a time lapse during which the most mobile radionuclides are transferred to the captured groundwater, largely exceeding the duration of population sheltering.

Consequently, when it comes to this type of resource, public grid water consumption may continue to be allowed *a priori* during the emergency phase exit, without any restriction or specific provision.

Use of circulating superficial waters

Superficial or comparable water resources (water abstracted from the surface, water abstracted from alluvial groundwater) located in the ZPP or ZST may be affected for several days (time required for radioactivity dispersion) by direct radionuclide deposits consecutive to atmospheric release.

This contamination will migrate from the start of deposit in the direction of water drift, in particular the waterway (where superficial waters are involved) and affect, following dilution, water uptakes located outside the ZST and ZPP.

It should be noted that, where this type of resource is concerned, predictive estimates of population exposure level due to ingestion of slightly-contaminated water, under moderate scenarios with short-term release, lead to effective dose levels of a few µSv via ingestion during the first month following the accident, not taking into account the effectiveness of water sanitation treatments and regardless of action on capture.

Under these conditions and until such time as the first measurement results are available, it is recommended during the exit period from the emergency phase that the use of tap water derived from circulating superficial waters continue to be allowed *a priori* for drinking and food preparation purposes.

Use of non-circulating superficial waters

Where non-circulating superficial waters, i.e. dam or reserve basin waters, are concerned, there does not exist, for the time being, any study specifically dealing with water contamination levels in accident situations. Consequently, case-by-case studies will need to be carried out during the preparedness stage to assess contamination risks and the dilution conditions for contamination deposited at the surface at the time of atmospheric release. Where necessary,

action or resource substitution (interconnection) procedures will be identified. Depending on the level of risk, this action may be implemented quickly in order to maintain water distribution.

Until such time as the measurement results are available and considering the lack of prior studies on the vulnerability of this type of resource and possible courses of action to lower contamination, temporary water consumption restrictions may be pronounced at the emergency phase exit. These actions are intended in particular for infants, small children and pregnant women, all population groups considered the most radio-sensitive.

Use of waters abstracted from high-permeability rock (karstic waters, in particular)

Due to the speed at which contamination deposited at the surface is transferred to groundwater, in particular in the presence of high precipitation (storms), this type of resource must be considered as having the same type of vulnerability as the superficial waters. The course of action recommended for the tap water is the same.

3.8 Distributing emergency grants and financial assistance

From the exit of the emergency stage, the public authorities may, depending on the severity of the accident, decide to make emergency financial assistance available to address the most immediate needs of the populations impacted[8]. In addition, some private operators have established special assistance funds for basic necessities. This immediate relief assistance paid by such operators and the emergency assistance provided by the State are distinct, but can be combined.

It is important to bear in mind that such emergency grants and assistance are not intended as direct compensation for the damages undergone by the victims; compensation itself is governed by other rules and procedures that come into play thereafter.

3.8.1 State action procedures for allocating emergency financial assistance

The Ministerial offices in charge of Public Finance have the ability to mobilise in the event of emergency to distribute funds intended to provide first aid.

The emergency funds are included in the national budget, under an endowment set aside each year by the Finance Act. Through this, the State ensures that specific, payable credits are available should circumstances require for the disaster victims.

3.8.2 The "basic necessities grants" instituted by certain operators

In addition to the emergency financial assistance paid by the State, operators provide, in coordination with the public authorities, their own resources to cover the basic needs of individuals impacted. This assistance may cover part of their urgent needs in terms of food, housing, apparel and transport for evacuated persons. They are not intended to compensate for identified and quantified "damage".

3.8.3 Payment of emergency grants

The State may, through appropriations from the Ministry of the Interior's budget, host contributions from other public agencies or private individuals; to be sidestepped is possibility that the State and the municipalities might concurrently take on expenses of the same nature, hence the importance of

8. The Ministry of the Interior is responsible for implementing emergency assistance; the funds may be paid out by the relevant territorial agencies.

pooling all available funds. It is recommended that operators place in the support fund the sums they wish to allocate for "basic needs grants". These grants will then be available to be released by the Directorate General of Public Finance in order to ensure that their payments are traceable.

In order that the distribution of emergency funds be run as effectively as possible, it is important that the Ministerial departments in charge of public financing be prepared to handle crisis management. The local antennae and contributing parties need to be identified and mobilised upstream so as to not slow down the institution of the system. The post-accident management system's centre-pin (collection and payment of donations) is the tandem team formed by the Prefect and the Head of Decentralised Departments at the Ministry of Public Finance. The Department Head, as public accountant, may pay the grants provided by the State, local authorities and Family benefits fund (CAF).

In organisational terms, applications for assistance are submitted to and reviewed by the CAI Task Force in charge of social and material assistance. The said task force collects applications for emergency grants and reviews applications, rules on each and determines the amount of assistance paid out. The State's authorised agencies provide secretarial services. This task force may be supplemented by a FISAC Task Force (action fund for service providers, craft and merchant activity), dedicated to the needs of professionals.

The payment of grants and channelling of the appropriate funds must be secured and, for this purpose, one or more bank or postal bank branches may be called upon. A payment task force may also be set up at secured premises, **differing from the CAI,** made in part available to the civil servants working at the Directorate general of public finance's offices.

4. Starting actions to manage accident consequences

4.1 Improving radiological conditions in the environment

The main aim is to lower exposure for the populations living and working on-site (barring exceptional circumstances, this action is to be carried out with the population present and possibly even with its participation). The actions taken to improve the radiological situation are generally not aimed at returning to a situation free of any contamination whatsoever, but rather at bringing contamination down to the lowest levels reasonably achievable, considering the constraints inherent in implementing them.

During the exit period from the emergency phase, taking into consideration the resources available, it is preferable that actions be taken in the ZPP. Priorities must be determined, taking into account the density of the population and the presence of establishments open to the public, in particular schools and childcare centres.

In contrast, actions designed to reduce contamination in farmlands and natural environments are not to be initiated in the immediate future and, rather, reviewed and implemented subsequently. In all events, the actions are to be graduated according to the risks involved.

Actions to improve the radiological conditions in the built environment should be undertaken as quickly as possible following the end of release so that they can be as

effective as possible. Depending on the types of radionuclides present, the actions are designed to lower contamination (γ and β emitters) or fix it (α emitters). In the former case, the aim is to lower external exposure for the population; in the second, the idea is to limit internal exposure via involuntary ingestion and by inhalation of particles set in suspension.

Three categories of solutions are most often considered:

- cleaning operations in the built environment, to be carried out by specialised public- and private-sector companies;
- the use of contamination fixation or stabilisation techniques, designed to limit airborne dust or skin contamination, to be carried out by specialised public- and private-sector companies;
- cleaning of residential and commercial spaces, to be carried out by the occupants.

4.2 Managing waste produced in the ZPP and ZST

Comment: *This chapter deals only with waste (defined as material sent for disposal by its owner). This is specified insofar as contaminated material is not automatically to be considered waste, when it remains usable without risk for the user's health.*

The first stage in waste management in a post-accident situation consists of making the distinction between contaminated waste and non-contaminated waste. Taking into account the fact that the measurement resources available at the exit from the emergency phase are largely used for other action considered as having priority (environmental characterisation, control of foodstuffs for radiological activity, etc.), the distinction shall initially be made in accordance with the zoning.

The waste produced in the ZPP are considered contaminated, except under special circumstances. This waste must be temporarily stored under specific conditions, to be implemented gradually. However, exceptional provisions may be allowed from the exit of the emergency phase, when putrescible waste cannot be stored (e.g.: milk dilution and destruction), nonetheless taking into account the vulnerability of the ground and water resources.

Within and beyond the ZST, waste will show low or even very low levels of contamination and require treatment or disposal through the conventional channels, subject to certain conditions, for instance using facilities equipped with radioactivity detection gates.

4.3 Taking the first actions related to the farming environment

The options available for managing animal and plant production are described in detail, in the main agricultural production lines, in the "Decision-making assistance guide for managing agricultural environments in the event of a nuclear accident" (ACTA/IRSN Guide).

There is no urgent need to implement specific actions regarding plant production during the first few days following the end of release.

The aim of managing livestock in ZPPs is to determine the future of the animals, taking into account the bans placed on the consumption of potentially-contaminated local foodstuffs and the sequestering of animals. These issues apply throughout the area and more acutely in the territories where population relocation has been chosen.

When it comes to animal watering, the estimates made *a priori* show that the volume activity added to cow's milk (the most sensitive production) via watering from surface water having received deposits is very low when compared to the NMAs set for dairy products. Consequently, there is no reason to modify watering practices for

farmed animals.

From the exit from the emergency phase and concurrent with the creation of the ZPP, the following are to be prohibited:

- movement of farmed animals, farmed animal products and the foodstuffs used to nourish them (except non-contaminated foods), except in the event where animal relocation results from the decision to protect the livestock;
- pasturing of animals from another area in the ZPP.

In addition, it is important to guarantee that the animals are well-treated (foods, basic care, drying of milk cows, treatment of disease, etc.). Keeping the animals in a population relocation area is conditioned by the care which the said animals may require (limited presence of the operator); their displacement to other less-contaminated areas (other sites within the ZPP, ZST or outside the contaminated area) may also be considered, until such time as a decision is made on their future.

4.4 Interventions during emergency phase exit

In addition to the work carried out on the damaged facility and that required to provide medical care, where needed to the accident victims, other types of action needs to be carried out in particular at the exit of the emergency phase. This includes intervention covering:

- necessary actions, in particular where safety is concerned, to continue operating the facilities at the site where the accident took place, or actions vital to the continuation of strategic processes (major industrial facilities, other BNIs, drinking water production facilities, sewage treatment plants) or non-interruptible activities (continuous process plants, dams, etc.) near the facilities;
- the deployment of police, monitoring, measurement or sampling actions in the relocation perimeter as well as transportation of people and the continuation of activities to maintain livestock on-site in the area;
- expertise and contamination control measurements in the ZPP and ZST;
- the first cleaning operations in the ZPP.

Interventions carried out in the vicinity of the damaged facility are governed by the regulatory framework established for radiological emergency situations (10,11) and are to be carried out preferably by personnel constituting the special action teams (Group 1). The teams may be supplemented by personnel from Group 2, who may, during emergency situations, be called upon to serve across the entirety of the affected area. Those mobilised must be provided with complete information, appropriate dosimetric systems and, if necessary, individual protection. In addition to those belonging to the categories or agencies referred to in the regulation (11), the public authorities may call upon any qualified person able to provide assistance and, in particular, any person with special qualifications (for instance, in Group 1, the personnel employed by nuclear operating facilities and in Group 2, healthcare professionals, veterinary services).

The actions implemented at the exit of the emergency phase may be continued during the transition period (see Appendix 2), under the regimen set out for long-term exposure situations. In this event, an entity must be put in charge of training and coordinating the teams mobilised.

5. Determining and implementing an initial environmental radiological contamination measurement programme

At the exit of the emergency phase, just after the end of release, very little is known about the actual extent of contamination in the environment. It is thus vital that radioactivity measurement programmes be initiated on the ground as quickly as possible in order to obtain a more realistic assessment of the radiological impacts of the accident, in particular radioactive deposit mapping. Such programmes take time and require both technical and human resources. It is for this reason that the measurement programmes and opportunities is based on the strategy to be determined in line with the priorities of the public authorities and resources available.

The first measurement programme will be aimed in particular at:

- strengthen the first action implemented during the emergency phase, by adapting them as necessary and ensuring that the territories presumed to have been spared, are indeed safe;
- to assist State agencies in implementing actions designed to provide protection and adequate follow-up of the populations at the exit of the emergency phase and at the start of the transition period.

5.1 Measurement programme designed either for expertise or control purposes

The measurement techniques used and teams in charge of implementing them depend on the objective adopted:

- either an expertise objective, wherein the resulting measurements are used to gain a greater understanding of the accident's consequences, both to compare them with the predictive assessments used to define the zoning and to determine the doses actually received by those exposed, as part of the institution of medical and epidemiological follow-up across the population;
- or a control objective, wherein the resulting measurements are used to verify compliance of the factors monitored with set criteria (for instance maximum permitted levels (NMA) for the placing on the market of foodstuffs), the level of individual exposure or the effectiveness of the cleaning actions instituted.

Depending on the main objective, the technical conditions to be fulfilled in carrying out the above measurements will vary. In all events, the acquisition of a large number of measurement results, representative of the state of contamination in the environment, is a necessity to ensure that the decisions made by the public authorities are indeed substantiated, in order to adjust or, to the contrary, maintain the protective actions already undertaken and, when appropriate, decide to stop them.

5.2 Measurement programmes adjusted in accordance with post-accident zoning

In addition to the need to tailor the measurement programmes to the main objective chosen, as described above, the measurement priorities will vary depending on the post-accident areas.

- **In the relocation perimeter (PE):**
  - the measurements carried out in the relocation perimeter must, generally speaking, be justified and optimised, in order to ensure that the teams in charge of the measurements do not receive doses unduly;

- expertise measurements are used primarily to gain a better understanding of radiological conditions in the area. They are not characterised as high-priority and their results will later be used, in preparation for a possible return of the population to all or part of the perimeter;
- control measurements must be made, as a priority, at the site where the various teams are mobilised, in order to define the appropriate protective actions, whether individual or collective.

In the public protection zone (ZPP) (outside the relocation perimeter):

- expertise measurements must make it possible to verify the that the zoning initially established on the basis of predictive modelling continues to be appropriate, focusing as a priority on the areas where fallout is assumed to be most substantial;
- control measurements must, as a priority, focus on drinking water resources, distributed water and living places, so as to support the start of contamination reduction actions;
- considering that the consumption and placing on the market of all foodstuffs are banned, measurements of contamination levels in foodstuffs produced in the ZPP is not considered a priority at the exit of the emergency phase.

In the heightened territorial surveillance zone (ZST):

- expertise measurements are designed primarily to verify the relevance of the zoning initially established;
- control measurements must, as a priority, focus on drinking water resources, distributed water and foodstuffs and fee for animals. This measurement campaign is to be organised with the professionals involved, from the exit from the emergency phase.

Outside the ZST:

At the outer edge of the ZST, measurements must be implemented at higher density and frequency than across the rest of the country, in particular as concerns drinking water resources and distributed water, in order to detect possible places of radioactivity concentration.

6. Informing the public at the exit from the emergency phase

At the exit from the emergency phase, the public authorities' communication is still structured in large part by the recommendations it contains. Communication is organised and coordinated in a manner similar to that which prevailed during the release phase. While health issues remain preponderant, new themes (behavioural, environmental, technical and legal) also need to be addressed.

The information circulated should include zone mapping and the related dosimetric estimates, the accident's impact on health, practical advice for lowering individual exposure, information about care offered and the means of reaching it (CAI), the benefits and organisation of census-taking, means for obtaining personalised information, action taken and action planned. This information shall be adapted to the various target populations and their needs.

It is vital that specific people be appointed responsible for communicating within the public authorities in order to ensure that a consistent message is delivered. Only those authorised

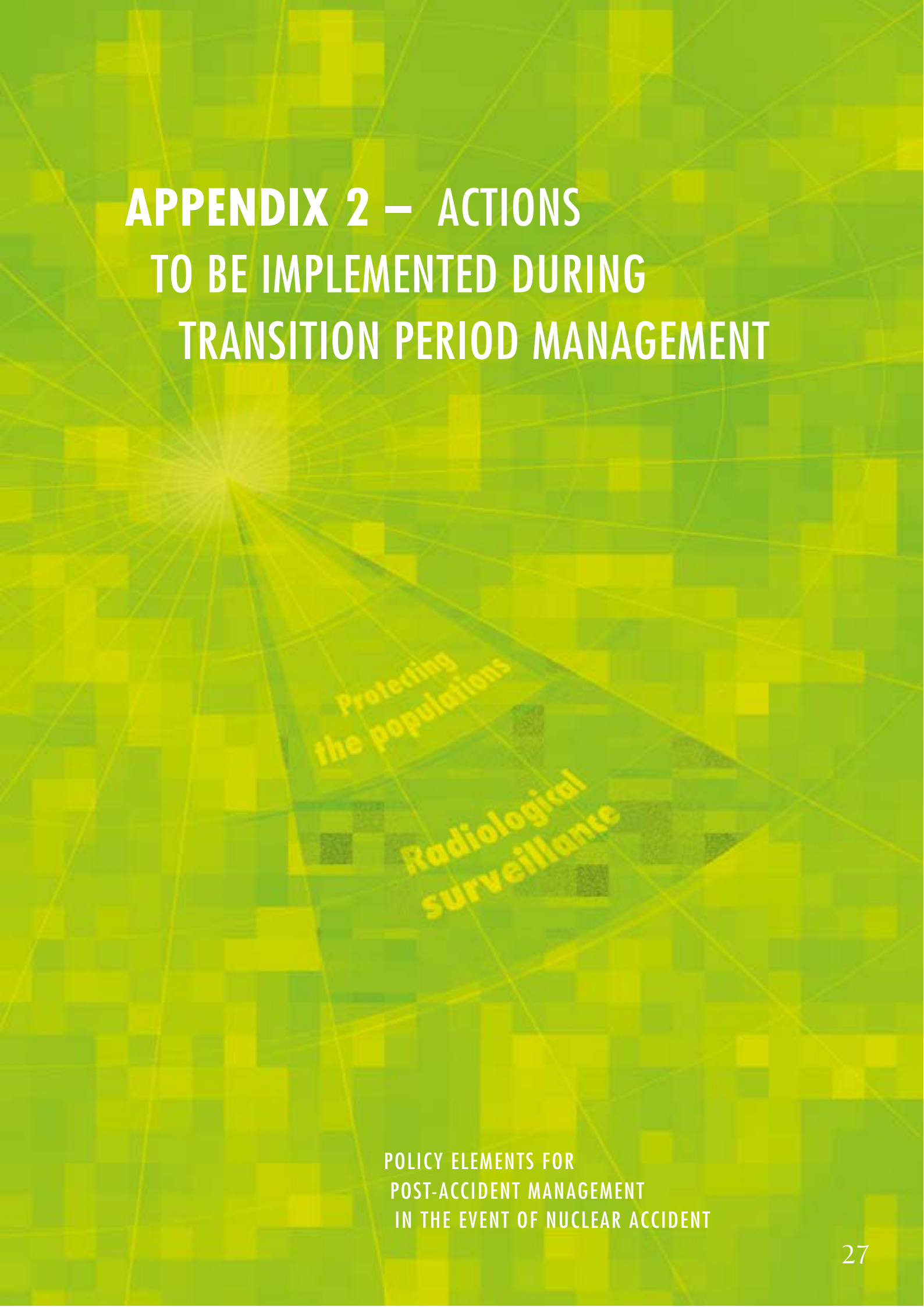
and clearly identified shall offer to speak on behalf of the public authorities, using previously-approved information channels.

The structure instituted shall be responsible for:

- informing the population, by setting up dedicated toll-free number, call centre and Web site for responding to questions about the situation, the impact of the accident, protective actions and guidance to various sources of support;
- developing messages aimed at the populations and media; gathering more precise data about the facts, mobilisation of the public authorities, explanation of the causes and consequences, and preparing positions in the face of possible criticism or controversy;
- managing relations with the press: centralising requests for information and interviews and circulating information in a coordinated manner;
- conducting intelligence and analysis on media fallout.

Special attention is to be paid to information sharing between national government agencies and the local authorities. The mayors, who are essential stakeholders on site, must be kept informed of all decisions made and related communications messages in order to carry them further and state them explicitly.

APPENDIX 2 – ACTIONS TO BE IMPLEMENTED DURING TRANSITION PERIOD MANAGEMENT



The transition period is characterised by changes in the radiological situation as well as in the economic and social situation, to which the management strategy must be adapted, in particular by the selection of flexible and evolving decision-making criteria. The period is shaped by the need to take action swiftly so that the population protection actions are effective.

A number of the protection actions implemented at the exit period from the emergency phase shall be continued during the transition period in order to limit population exposure to radioactive substances deposited in the environment. Before this implementation can take place, the radiological conditions must be properly characterised, in order to determine which areas are indeed contaminated and which are less so. In the ZPP, characterisation must focus on the places where the population spends time (living places, schools, workplaces, etc.), starting with the sectors presumed to be most exposed to radioactive fallout and closest to the damaged facility. In the ZST, characterisation will focus as a priority on agricultural production intended for harvesting and placing on the market in the short term, and foodstuffs (from agriculture, gardening or natural origin) most sensitive to radioactive fallout from the sectors assumed most exposed. This characterisation makes it possible, first of all, to adjust the implementation perimeter of the various protection actions and, secondly, to initiate discussion about the territories' foreseeable future.

Transition period management is complex: **there are many topics to be addressed, the actions to be started cover a variety of fields (public health, continuity of business and social activity, water management, agricultural production, industrial production, cleaning actions, waste management, etc.?) and call upon stakeholders from the administration, civil society and the private sector which need to be effectively coordinated.**

Extending from the protective actions initiated at the exit from the emergency phase (see Appendix 1), radiation protection for the populations is one of the priority aims of post-accident management during the transition period. This aim guides the territorial management strategy and population support policy, which are to be reflected **in the first post-accident management programme.** However, the social, economic and psychological concerns expressed by the public decision-makers and civil society also need to be taken into account when drafting this programme.

Programme and objective- based management makes it possible to identify and prioritise the actions to be initiated and mobilise the stakeholders involved by implementing and identifying the necessary human, financial and material resources, in particular those of exceptional nature.

The first post-accident management programme, implemented at the start of the transition period, based on the first components considered during the preparedness and started at the exit from the emergency phase, consists of protective actions proceeding from those started at the exit from the emergency phase (in particular, the gradual lifting of restrictions and bans), new actions that contribute to accident consequence management and pave the way for long-term management.

The first programme shall be carried out along the ten following lines of action:

1. Receiving the populations
2. Reducing population exposure to deposited radioactivity
3. Adressing public health issues
4. Refining understanding of the environment's radiological situation and monitoring developments therein
5. Improving the radiological quality of the environment and living environments as well as the state of aquatic environments;
6. Managing waste

7. Improving stakeholder involvement through a well-designed governance mode
8. Supporting and re-deploying business activity
9. Providing grants and compensation
10. Informing

This programme is geared, as a priority, toward the individuals and business community stakeholders residing, working or settled in the ZPP and ZST. However, the national and international community may be directly or indirectly affected by the situation in the contaminated territories (due to economic exchanges, movement of individuals, family ties, etc.). The questions that can emerge within this framework are to be addressed through a specific organisation, primarily at the national level.

The implementation of the first management programme must be supported by an appropriate local organisation. The *département*-level prefect of the accident site, or the prefect appointed as coordinator, shall be responsible for steering and coordinating the programme. He draws upon the efforts of specialised task forces taking over from the technical task forces in place during the emergency phase. However, during the transition period, management must shift to an increasingly participatory mode, involving the populations impacted, elected officials and social and business community stakeholders, thus paving the way for the long-term period. This will necessarily result in regular re-assessments of the post-accident management programme.

1. Receiving the populations

At the exit from the emergency phase, the CAIs were set up in order to address the first concerns raised by the populations and authorities. During the transition period, the CAIs are expected to develop, taking on new missions, such as ensuring the continuity of public services, preparing the compensation system and ensuring that victims are able to benefit from their due rights. This assumes that the mobilisation of local administrations, expert institutions, trained professionals, associations, etc. new partners are called upon to work with the CAI networks, in particular healthcare professionals and local liaison committees (CLI). Gradually, the CAIs can become a preferred place for dialogue and experience-sharing facilitating the development of a practical radiation protection culture in the population.

1.1 Broadening the responsibilities of the CAIs

The CAIs' responsibilities to be developed during the transition period are as follows:

- **Receiving individuals** and managing access to internal contamination measurement tests.
- **Providing information about the accident and its consequences,** in particular about the state of contamination in the environment and foodstuffs, conditions for continuing certain professional activities (agricultural and industrial), the foreseeable future of production after the accident and waste management.
- **Collecting and centralising questions about individual health.** Questions from individuals about their own health can be collected and forwarded to the health authorities via the CAIs (provided that the CAI staff includes individuals with the medical competences required), or directly by healthcare sector professionals, working in connection with the locally-authorised healthcare authority.
- **Developing a practical radiation protection culture,** by spreading advice and best practices in exposure reduction.
- **Providing social and material assistance,** by screening and directing vulnerable population groups or those that have become so, by assisting with rehousing and organising coverage for medical expenses.

- **Ensuring continuity of public services,** by hosting for instance an outpost of the town halls found in the relocation perimeter in the CAIs;
- **Preparing compensation,** by receiving applications for compensation and assisting prospective applicants as they put together their case files.
- **Enabling access to benefits for victims,** by informing the latter of the benefits to which victims of large-scale accidents are entitled.

1.2 Operating as a network

1.2.1 Linking together the professionals likely to cooperate with the CAIs

Some CAI responsibilities are already handled outside the accident environment by trained, skilled staff. For this reason, in certain fields, the CAI's only function is to identify and guide individuals to professionals in the appropriate fields (for instance: healthcare professionals). In this capacity, it provides at least information and, where possible, training to the latter.

1.2.2 Involving all stakeholders in CAI operation and development

In addition, the CAIs develop over the transition period to foster the involvement of all stakeholders. To illustrate, the victim assistance associations and, where applicable, the victim associations created after the accident must be able to have their place within the CAIs. Thus, and to mark the CAI's local footprint, the leadership functions, initially held by a representative of the Prefect, may be taken over by a local elected official.

2. Reducing population exposure to deposited radioactivity

2.1 Adapting the initial post-accident zoning

The zoning initially established at the exit from the emergency phase is first established for a provisional period of one month, in the ZPPs, based on predictive calculations of dosimetric consequences during this same period. The relevance of this zoning is regularly assessed thereafter, taking into account an increasingly precise understanding of the actual level of contamination in the environment. Development beyond this first month shall be defined on the basis of dose and contamination estimations in the agricultural production for the year to come. This step-by-step approach makes it possible to implement the most urgently-needed actions to be carried out, then adjust them in function of the situation's developments and in coordination with the populations affected. The range of the ZST is to be reassessed over time, as its development is closely intertwined with the result of the radiological measurements.

Changes to the zoning may come in spatial form (the surface area of a zone may increase or decrease) or in qualitative form (the recommendations connected with a zone are changed). However, even if the zoning changes over time, the populations that have lived in the zone at a given point in time and, in this capacity, benefited from particular monitoring services (health-related, epidemiological, etc.) continue to be part of the cohorts monitored.

2.1.1 Why adjust the post-accident zoning?

Adjustments to the initial zoning can be justified both by updated assessments of foreseeable consequences, thanks to an increasingly precise understanding

of environmental contamination (in particular thanks to the results of measurement programmes) and the evolution of the radiological situation (radioactive decay in radionuclides, effectiveness of contamination reduction actions). The gradually-improving characterisation of the environment further makes it possible to estimate doses potentially received by the populations over longer periods of time (one year). In addition, regarding agricultural production, the crop categories harvested change over time (seasonal effect), thus making it appropriate to adjust the control plans connected with the ZSTs.

2.1.2 How should post-accident zoning be adjusted during the transition period?

The definition of the ZPP during the transition period is based on the same guidance values as for the zoning at the exit from the emergency phase, but the dosimetric indicators are determined for a longer time period (one year):

- the indicator for the relocation perimeter is the projected effective dose **not including ingestion** over a 12-month period (period from the second to the thirteenth month following the end of the releases). The authorities may opt to relocate the populations in the territories where the dosimetric indicator exceeds the guidance value of 10 mSv. This may apply to all or part of the territory where the population has already been relocated from the exit from the emergency phase, as well as, possibly, new territories where deferred population displacement needs to be considered;
- the indicator for the ZPP is stated in projected effective dose over 12 months (period from the second to the thirteenth month following the end of the releases), taking into account all exposure pathways. Consideration for the thyroid dose is considered no longer necessary due to the fast radioactive decay of iodine isotopes in the environment. The ZPP could include territories where this dosimetric indicator exceeds the guidance value of 10 mSv.
- the indicator for the ZST remains the foreseeable contamination level in the different categories of foodstuffs likely to be produced locally over the course of the following months, taking into account changes in deposit characteristics (radioactive decay), transfer phenomena, radionuclide dilution or concentration in the various types of plant or animal productions and possible new production to come (crop and harvesting cycles). The ZST perimeter is that within which foreseeable contamination levels may exceed, at least temporarily, the NMAs.

The guidance values for the doses listed above are provided *a priori*, and by default. In the real situation, through consensus-building and continuing observation of developments in the environment radiological situation, the authorities may choose to gradually lower the guidance values on the basis of which the zoning was delineated.

2.1.3 How can change the situation of one given area?

During the transition period, the characterisation of the situation in each area shall be subject to regular re-assessment, taking into account in particular an increasingly precise understanding of the environment's radiological situation and developments therein, thanks to the more numerous findings of the measurement programmes in place. These reassessments may give rise to a change in status in a territory, in terms of zoning, in particular if the reassessment of the projected doses, taking into account changes in the dosimetric indicators

considered, or whether the change in guidance values so require. A change in status in a territory that might bring about more stringent recommendations (for example, a ZPP territory that must shift into a PE), as might result from a change in the mode used to compute dosimetric indicators beyond the first month, **must be anticipated to the greatest extent possible; to this end, the development trends within the zone that are able to come to light with relative speed (in particular, through interpretation of the deposit maps available), must be provided to the authorities as early as possible, so that they can inform the populations and initiate the required consensus-building sessions with a view toward a decision.**

In contrast, it is possible that **certain PE territories** exit the perimeter and gain the status of the rest of the ZPP. In this event, the return of the populations to the territories can be envisaged, subject to the following actions and through consensus-building with the relevant populations:

- the initiation of contamination reduction efforts, if they prove still effective;
- the resumption of State services and all infrastructures;
- the institution of support and information services for those impacted as a means of awareness-raising about best practices when living in a ZPP, especially if they are temporarily re-housed very far from the displacement zone.

Their return is *a priori* not considered as long as the effective dose, excluding the effects of ingestion, in the relevant territories over twelve consecutive months remains at around 10 mSv/year or more.

ZPP territories in which the projected dosimetric estimates fall below the guidance values should become part of the ZST. The comprehensive bans in effect in these territories will be lifted subject to NMA inspections through radiological verifications.

In ZSTs, the comprehensive bans on placing on the market will be gradually raised. However, depending on the season, new agricultural production subject to possible further bans may emerge, may make it necessary to reassess the ZST territory.

2.2 Ensuring that available foodstuffs are compliant with regulatory requirements on radioactive contamination

2.2.1 Maintaining and reinforcing management programmes for foodstuffs intended for human consumption

The bans issued at the exit from the emergency phase serve a two-fold objective:

- to keep the doses received by people living in the ZPP at the lowest level reasonably possible and prevent the doses received by these persons from rising above the chosen guidance value, by doing away with the exposure path via ingestion of contaminated foodstuffs;
- preventing place foodstuffs on the market of products in which contamination levels may exceed the maximum acceptable levels set by regulations.

In ZPPs, the comprehensive ban on the consumption and placing on the market of locally-produced foodstuffs must be maintained so long as the projected doses, taking into account all exposure paths, may exceed the guidance value, set at 10 mSv. Beyond the first month following the accident, the projected doses shall be determined over a one-year period, during which the ban on the consumption and release-to-market of the said foodstuffs would thus be maintained.

In ZSTs, a strategy on the consumption of self-produced foods shall be defined with the stakeholders and population. Recommendations designed to limit the consumption of self-produced foodstuffs or those derived from hunting, fisheries or gathering may be maintained depending on the understanding of degrees of contamination.

During the transition period, a variety of actions must be taken to consolidate the system established at the exit from the emergency phase:

- **Organising, where applicable, food supply.** Potentially contaminated foods that have been removed from consumption channels, in particular in ZPPs, the public authorities must guarantee, in both zones, the existence of food supply and, where necessary, facilitate the organisation thereof.
- **Disseminating best practices on foods and ensuring that they are understood.** The first best practice messages on food must be disseminated as soon as the exit from the emergency phase. They must be adapted to the local situation.
- **Disseminating information about the system instituted to check for compliance with the NMAs in food products released to market.** It is important that all consumers, regardless of whether they live in contaminated territories, must be informed of the systems in place.

2.2.2 Implementing radiological verifications on food products originating in ZSTs

It is by prefectural order (AP) applicable to all municipalities in the ZST that verifications are carried out, care being taken not to hinder the release-to-market of foodstuffs showing no risk of NMA non-compliance:

- foodstuffs "imported" into the ZST subsequent to the emergency phase;
- foodstuffs packaged prior to release (this measure is to be supported with information about the protection capacity of each type of packaging).

It is important that the foodstuff verification programmes inside the ZST be differentiated by type of product and place of production. Aside from agricultural products, a supplementary verification on foodstuffs processed from animal or plant raw materials from the ZST may be instituted.

A so-called "sorting" measurement strategy may be implemented in order to possibly secure one of the following statuses for the verified products:

- products for which the contamination level is lower than the NMAs: when this is the case, a "compliance certificate" can be issued for the product. This type of certificate may prove necessary to continuing activity in certain business sectors (with respect to the competition), including in the territories bordering those affected by accident fall-out;
- products that do not comply with NMA requirements: the measurements show radionuclides to be present, due to the accident, wherein the radionuclide levels exceed NMA levels. The product may be redirected for other forms of use or be considered waste.

Outside the ZST, low levels of environmental contamination resulting from the accident may be identified, but at levels that do not justify automatic monitoring. The expertise measurements and verifications via sampling implemented are thus aimed at detecting possible radioactivity concentration areas in the environment, due to specific meteorological conditions (for instance, heavy rains at the time of the accident) or particular sensitivity in the environment (forest areas, in particular).

Even though the territories located outside the zones and reflecting detectable levels of contamination are not subject to special management actions, the strategy instituted in the ZPPs and ZSTs must able to guarantee that the consumption products in circulation, in particular food products, are compliant. By definition, no contaminated food product may leave the ZPP and all agricultural production exiting the ZST is subject to radiological verification prior to release-to-market.

2.3 Ensuring water supply compliant with quality standards

During the transition period, possible contamination of water resources is subject to change as:

- pollution migrates down the waterways;
- surface water contamination declines to a level of residual activity that continues to be identifiable, due to a secondary flow of radionuclides (contaminated sediments returned to suspension, runoff, influx from confluents);
- radionuclides deposited in the soils migrating to groundwater resources.

2.3.1 Continuing the heightened surface water monitoring programme

Monitoring is continued and the frequency of sampling possibly stepped up when an event fostering secondary resource contamination by run-off (snow, rain, hydraulic change in the resource, low flow, flooding). It may lead to remedial measures in the production and distribution facilities dedicated to water for human consumption.

2.3.2 Keeping population exposure due to water as low as reasonably possible and preparing the long-term phase

The aim of water resource management during the transition period is to return as early as possible to a level of exposure in the population, due to water uses, as close as possible to that of routine situations.

A distinct approach for tap water management

A distinct approach was taken regarding tap water management at the exit from the emergency phase and is to be continued during the transition period. This approach must take into account both the features specific to exposure due to water resource contamination and developments therein (one-time exposure due to radioactivity deposits shifting into chronic exposure to residual surface water contamination and radionuclide transfers to groundwater) and be incorporated into the overall accident situation response strategy. Its aim is to keep drinking water at the best radiological quality possible, all the while tailoring measures and possible restrictions to be placed on the resource or water distribution to the level of risk identified.

Based on the analyses and expertise reports on the relevant resource contamination kinetics, derived from forecast modelling, the course of action to be taken on tap water consumption shall be established on a case-by-case basis, as the level of contamination and the kinetics are specific to each water production and distribution facility.

It is important to note that the regulations in effect[9], which provide that routine radiological quality checks are to be carried out on drinking water regardless of any nuclear accident context, cannot be used in the event of short-term

9. The 11 January 2007 Order regarding the limits and quality references for raw water and water intended for human consumption. The 13 June 2007 Circular issued by DGS on controlling and managing health risk due to the presence of radionuclides in water for human consumption, except conditioned water and natural mineral water; and the Memorandum issued by the Nuclear Safety Authority regarding health-related checks on the radiological quality of waters intended for human consumption.

contamination (see box). Specific quality criteria are to be taken into account and defined by the healthcare authorities and preparations undertaken, away from any accident context, involving all of the stakeholders.

Comment: *The existing regulations are based primarily on an estimate of the total annual indicative dose (DTI). The DTI, stated in mSv/year, is the effective dose involved resulting from the one-year inclusion of all natural and artificial radionuclides detected in water distribution, except radon and its short-life descendants. It is determined based on radionuclide concentrations measured in water and stated in Bq/L. The DTI reference value has been established by the WHO at 0.1 mSv/year, assuming lifelong daily consumption of 2 litres per inhabitant and per day. This management figure is expected to soon be incorporated into a European Directive, currently in publication.*

Should the reference figure be exceeded, away from any nuclear accident environment, actions must be taken to lower the DTI, or even remove the cause of the overrun.

In a post-accident situation, in order to address a short-term peak in contamination, a specific reference level may be defined (based, for instance, on the dose due to consumption during the first month, then the first year after the accident) and be helpful in harmonising the various courses of action taken when it comes to issuing restrictions for specific groups of the population, depending on whether they are found in ZPPs, ZSTs or outside the said zones. Until the first measurement results are available, the result of predictive dose assessments due to the ingestion of drinking water (carried out by IRSN) can be compared to this reference level, to enforce possible restrictions.

Based on this reference level, an operational indicator of radioactivity level in water may also be helpful as part of an effort to optimise the quality of distributed water. Where the indicator value is exceeded, additional investigations could be carried out on resource contamination and, where applicable, action (implementation of interconnections or substitutions) or additional treatment (for example, filtering on active coal) could be started.

Evolution depending on the type of resource

When dealing with groundwater resources, taking into consideration the transfer time, water contamination may be considered chronic and is to be managed as such, in terms of regulatory reference base (with the DTI). During the transition period, the priority is to implement long-term monitoring so as to pick up on the arrival of contamination in the groundwater and implement the appropriate actions.

When it comes to water for human consumption produced from surface waters, the expected downscaling in the activity measured, following the one-time increases in contamination levels due to radioactivity deposits in circulating waters, must make it possible to gradually implement management based on the calculated dose for ingestion (see comment), to take into account possible background noise sustained by runoff water.

Other water uses

Where surface waters are concerned, there may be uses other than the production of water for human consumption, such as bathing, fishing or sailing. Population exposure resulting from these uses develops over the course of time, all the while remaining very low. The main water-related path of exposure during the first month after of the end of the releases (period during which exposure is at its maximum) is drinking water ingestion. Over the course of the following

period (from the second to the thirteenth month following the accident), the ingestion of fish and external exposure due to bank sediments will gradually become preponderant where accidents are concerned, primarily involving iodine and caesium isotopes.

The contamination of plots due to soil irrigation with surface water that is itself contaminated remains very low compared to contamination of the same plots from direct atmospheric fallout. For this reason, there is no reason to cease irrigation, rather it is to be backed up with monitoring so as to prevent secondary contamination.

Protection actions tailored to this development may be issued based on the results of measurement programmes carried out on the main exposure paths.

2.3.3 Anticipating treatment needs or identifying new water resources in the long term

Specific forward-looking studies may be initiated to assess the level of resource contamination (in particular groundwater resources) and the emergence time associated with the said contamination. Depending on the studies' findings, the decision can be made to initiate treatment or look for new resources.

2.4 Reviewing access restrictions to forests and green areas

2.4.1 Periodic review of public access restrictions to forested areas

Public access restrictions to woodlands in ZPPs or even ZSTs, as implemented at the exit from the emergency phase, shall be maintained throughout the transition phase. Due to the characteristics and persistence of forest contamination, the perimeter of the forested areas impacted by the restrictions is to be precisely consolidated through radiological measurements. Furthermore, the duration of the restrictions may be longer in these areas than in the rest of the territories.

It is important to take into account the psycho-social impact of such a measure, in particular in regions where the forest is a resource for certain business activities, as well as a "green beating heart" open to the public.

2.4.2 Planning forest ecosystem management

Despite these restrictions, it is particularly important to sustain the existing forest ecosystem management actions. One-time actions intended to regulate wild animal populations and prevent fire risks (varying depending on the season) will be carried out.

2.5 Investing resources in the development of a practical radiation protection culture

All of the stakeholders present (populations, business community, etc.) need to be able to understand and take on board the aims of the protection actions implemented or sought by the public authorities, and even to assess them. Where this is the case, public action can become more effective and the stakeholders in the territory will be able to implement actions through which they themselves will be able to improve their protection (for instance, radiological measurements on self-produced foodstuffs).

2.5.1 Allowing individual access to measurement techniques

When individuals are given access to equipment for measuring the level of radioactive contamination in the environment, they are able to concretely

grasp a non-perceptible danger and gain the information needed (importance of contamination in food products, living places, etc.) to make their decisions and take action in the everyday, within their environment and on their own exposure. This access to measurement equipment must be encouraged and even supported.

2.5.2 Mobilising the local partners likely to take part in developing a practical radiation protection culture

The development of a practical radiation protection culture within the population must also be fostered by the action of local partners with the opportunity, in particular through their professional or association-based activities, to spread this culture and be in direct connection with the populations (teachers and scientific culture professionals); association members; healthcare professionals; local information commissions).

Likewise it is important that the local stakeholders be involved in the discussions about the health issues at stake and the epidemiological follow-up across the population. In this regard, the development of a practical radiation protection culture will play a key role in encouraging local stakeholders to become involved in the monitoring process.

2.6 Managing interventions

The above paragraphs do not concern nuclear operator workers or the contractors working at the accident site, whose protection is guaranteed under specific Labour Code provisions.

2.6.1 Transition phase workers

Any person mandated by the public authorities mobilised in a zone where there exist higher radioactivity levels due to a nuclear accident is considered an existing exposure situation workers (I-SED)[10].

Both the French Public Health Code and Labour Code contain provisions defining protection for the aforementioned workers with regard to radiological risks. Depending on the magnitude of the doses potentially received, they benefit from actions under the regulations in effect to protect workers exposed to ionising radiations. In particular, provisions on risk assessment, worker classification, protective equipment, dosimetric monitoring, medical monitoring, information and training and annual dose limitations all apply.

Considering the risk due to external exposure within the relocation perimeter, responsibilities leading to the highest levels of exposure (e.g., decontamination, cleaning) can be carried out by companies and organisations already trained in radiological works.

2.6.2 Mobilising radiation protection qualified experts (PCR) and carrying out risk assessments to implement appropriate protection for I-SED workers

During the transition period, the number of I-SED workers likely to be exposed to ionising radiation may increase. A special training effort is thus required and it is appropriate to quickly implement an entity in charge of training and coordinating the teams mobilised. This structure is in charge of the following:

- organising information and training for the teams and workers involved on basic radiation protection, calling upon skilled professionals;

10. Decree 2003-295 of 31 March 2003 regarding work in radiological emergency situations and in the event of long-term exposure

- defining actions to be implemented as a priority, taking care to reduce exposure levels for I-SED workers to the lowest level reasonably possible;
- ensuring that protection equipment suited to the radiological risks identified are provided to I-SED workers;
- supervising dosimetric monitoring in I-SED workers, taking care to ensure that the relevant data are collected and forwarded to the IRSN.

Different teams can be mobilised in this structure, in particular nuclear industry professionals (operators, specialised companies), and particularly radiation protection qualified experts (PCR) available to them by virtue of regulatory requirements.

Depending on the risk assessment results, appropriate protection will be provided to teams subject to existing exposure situation and, if necessary, individual dosimetric monitoring will be implemented.

2.6.3 Workers actively employed in the ZPP or ZST

In line with the definition of the relocation perimeter, only I-SED workers will be allowed to continue active work there.

Workers actively employed in a ZPP or ZST are likely to be exposed, to the same extent as the rest of the population, to the radioactivity deposited in the environment. As the population has been allowed to continue residing in these areas, workers may also continue their activities there, on the assumption that there has been no change in their work situation, except in certain specific cases (see 2.6.4).

2.6.4 Specific case of workers involved in professional activities likely to concentrate artificial radionuclides resulting from a post-accident situation

Certain workers are involved in professional activities likely to concentrate artificial radionuclides resulting from a post-accident situation. Protection for these workers needs to be covered by new regulatory provisions that may draw upon the 25 May 2005 order regarding professional activities implementing naturally occurring radioactive materials (NORM industries). An extension to these regulations should be considered during the preparation stage to be fully operational from the start of the transition period.

3. Addressing public health issues

Where public health is concerned, medical care must continue to be provided to the populations, although in a form adjusted to the new situation, in particular when it comes to medical follow-up.

3.1 Continuing medical care

3.1.1 Implementing internal contamination measurements

During the transition period, internal contamination measurements are to be continued. It is important to reiterate, however, that when carried out later (from a few weeks to a few months, depending on the radionuclides and the importance of the initial body intake), measurements may turn out ineffective, as the radionuclides absorbed into the body are gradually removed.

The results of the individual measurements carried out must be provided to the parties directly involved, as well as to the personal doctor, or where impossible, another healthcare professional specifically in charge of the follow-up of these individuals. This must take place as quickly as possible.

3.1.2 Organising psychological support for the populations

During the transition period, psychological support for the populations is continued where necessary, but according to different procedures. Consequently, the medico-psychological emergency units (CUMP) are gradually demobilised, to allow taking over by the professional healthcare and social network. To facilitate this transition, it may be deemed appropriate to organise information for this network specifically dedicated to post-traumatic risks. If required, the network can be stepped up by a telephone hotline or walk-in services manned by psychological support specialists in the CAIs.

3.1.3 Offering specific medical follow-up

Experience shows that the question of medical follow-up always comes up in the wake of an accident. The institution of specific medical follow-up is continued during the transition period and offered to those affected. It is necessary that actions continue in order to determine the concerned populations, procedures and financing scheme. Where necessary, supervision should also be implemented to ensure that the radiation protection practices are properly implemented.

This medical follow-up is likely to extend into the long-term period, in which case it should be completed by screening for effects that may have been deferred (forms of cancer, in particular).

3.1.4 Providing expertise to local healthcare professionals to help them respond to health-related questions subsequent to the accident

The health authorities, working in conjunction with the necessary experts (IRSN, InVS, etc.), shall establish technical support for local healthcare professionals to help them respond and address healthcare questions subsequent to the accident. Radiation protection or toxicology specialists may, for this purpose, be mobilised. If necessary, further healthcare professionals may be brought in by the Ministry of Health as back-up, in particular as part of a reserve healthcare services. Information may be specially provided to healthcare professionals and establishments.

3.2 Consolidating and making use of epidemiological follow-up results

3.2.1 Continuing population census-taking

The transition period must be used to continue, over the longer term and striving for a comprehensive result, the census initiated at the exit from the emergency phase. New stakeholders such as private healthcare professionals are to be mobilised for the census-taking, in particular in the CAIs.

3.2.2 Setting up a centralised registry system of exposure measurements

A system dedicated to collecting and registering the exposure measurements carried out in a centralised place is a necessity, as part of the medical follow-up and epidemiological follow-up run for the populations. The information collected should be made available to expertise organisations, healthcare professionals in charge of medical surveillance for the exposed populations and

authorities involved in accident management, in line with the confidentiality rules relevant to these data.

3.2.3 Analysing and reporting surveillance results

At the exit from the emergency phase, a variety of networks were activated:

- monitoring of side effects connected with the administration of stable iodine tablets (if not recommended during the emergency phase), based on the existing pharmaceutical monitoring system, stepped up and tailored to the existing needs, the healthcare professionals having been alerted about the need to report side effects and the procedures for doing so;
- monitoring of indicators, based on existing surveillance or health-related information gathering systems. It is to this end that the data collected by the health monitoring network specific to emergencies and deceases (SurSaUD®) are analysed. The responsible health authority establishes, in agreement with the InVS, the means for identifying all requests in connection with the accident, during registration of medical emergency service activities;
- monitoring tailored to the specific medical care and psychological support systems possibly implemented (CUMP, etc.).

The monitoring results must be regularly subject to analysis for the purpose of addressing the public health monitoring objectives. To this end, the healthcare authorities draw up review reports on a regular basis.

3.3 Assessing the accident's consequences on health

The accident's health-related consequences are assessed in order to determine the individual and collective harm caused by the accident and address the questions voiced by the local populations, as well as the broader questioning raised at the national and even international levels.

It is based in particular on the results of individual internal contamination measures and the process of estimating the individual doses involved from the beginning of the transition period via modelling, as well as on the analysis of scientific knowledge and uncertainties regarding the emergence of the effects of these types of exposure. The healthcare consequences likely to be observed after the accident do not depend solely on the magnitude of the doses received but can also result from the multiple forms of disruption to the populations' lives caused by the accident (or measures implemented to manage its consequences).

3.3.1 Defining a retrospective assessment strategy of doses received by the exposed population due to the accident

It is essential to have a knowledge of the doses received by those exposed in order to effectively monitor post-accident medical follow-up and to carry out the required epidemiological studies. During the transition period, two objectives will be sought:

- to "reassess" the doses received by individuals potentially-exposed during the radioactive release period of the accident and to follow-up this population;
- to assess the doses received by the individuals due to their exposure to the radioactivity deposited in the environment.

The doses are estimated based on the results of individual measurements (internal contamination) and results of ambient measurements (where available) or retrospective assessments of ambient radiological conditions using modelling tools (this is the case, for example, when determining the ambient dose rate or atmospheric radionuclide concentrations at the time of the dispersion in

the air). The quality of the retrospective dose estimates is also dependent on the precision and comprehensiveness of the information gathered from the individuals on whom the estimates were made, their circumstance and actions during the accident or their lifestyle in the ZPP set up at the exit from the emergency phase.

3.3.2 Initiating the chosen epidemiological studies

Epidemiological studies must begin from the beginning of the transition period, so as to:

- **develop a reference picture regarding the pathologies likely to appear in the long-term** (benign thyroid nodules, forms of cancer or other pathologies);
- **quantify possible health related signs likely to appear during this period** (defects due to the intake of potassium iodide, psychological manifestations following the accident, etc.);
- **plan at the national level, the logistic, scientific and administrative resources needed to establish epidemiological follow-up.**

The involvement of the populations in the affected territories (associations, local elected officials, etc.) in assessing the situation appears a necessity, from as early as this period, in particular in order to facilitate the support of the populations over the long term and the collection of field data, taking advantage of the expertise specific to these sectors and to guarantee a shared understanding of initiated actions and needs identified.

The aim then, during the transition period, is to establish the means needed to incorporate epidemiological studies into a framework that enables interaction between the various local,, national and international stakeholders.

- **designating the national and local authorities in charge of defining and implementing epidemiological follow-up**

To define and implement epidemiological follow-up, a task force headed by the Ministry of Health, calling upon outside experts as needed (possibly including foreign experts) may be set up. This task force will have access to the information analysed and collected on the basis of pre-established agreements and situation assessment tools, identify the health-related provisions and recommendations to be implemented and recommends the epidemiological studies to be carried out next. The task force shall, at the local level, be able to lean on a body that also involves representatives from the State and healthcare authorities, the population, territorial elected officials and experts. Specific information on these studies may be circulated to professionals and health-care establishments.

4. Refining understanding of the environment's radiological situation and monitoring developments therein

Once the first measurement programmes have been carried out, the characterisation of the environment's radiological situation must be continued at the quickest pace possible during the transition period. This will make it possible to ensure that the protection measures already initiated in the ZPP are relevant and is a vital pre-requisite to an initial re-assessment of the post-accident zoning, which may either lead to a differed relocation of people or, to the contrary, a return of those having been relocated.

The measurement programmes that will need to be carried out successively will thus be aimed at changing targets, and the influx of requests will be such that priorities have to be set, in particular for control measurements.

These measures may give rise to the issuance of compliance certificates, making it possible to "place on the market" products such as agricultural production or manufactured products.

The pluralistic measurement, including the provision of radiological measurement materials to the populations, will help improve the trust and support of the population, all the while contributing to the development of a practical radiation protection culture.

4.1 Sustaining and stepping up environmental contamination measurement programmes

The expertise and control measurements started at the exit from the emergency phase will be continued and supplemented in accordance with the actualized understanding of the radiological situation. The expertise measurements make it possible to improve the predictive assessments of dosimetric consequences carried out at the exit from the emergency phase and to refine the post-accident zoning. A posteriori, they will also make it possible to improve the understanding of dosimetric consequences during the release period and gain a more precise understanding of the range of radionuclides present in different places and its development over time.

The expertise measurement programmes consist of:

- investigation campaigns aimed at quantifying the accident's radiological parameters and mapping contamination in the territories;
- monitoring at set observation stations, making it possible to determine the effects of the decontamination measures and radiological decay.

The control measures make it possible for the authorities and managers to tailor the prevention measures already initiated and decide, when the time comes, to lift them, having verified the conformity of a situation (or product) with pre-set criteria. The verification measurement programmes must be adjusted to the priorities set by the public authorities, which will differ by post-accident zone. Outside and near the ZST, sampling control measurements are to be taken.

Lastly, self-surveillance measurements (radioactivity controls requested by the business community present in the affected territories or in those bordering them, either at their production facilities, or on raw materials used, or on products which they may placing on the market) are probably carried out, in particular by industrial stakeholders.

4.2 Setting up a special structure taking into account the full range of stakeholders involved

4.2.1 Defining a measurement strategy by mobilising all stakeholders

The gradual implementation of environmental radioactivity measurement programmes and persons requires that resources be mobilised for possible sampling and management thereof up to analysis and circulation of results. With the increased use of measurement capabilities, priority conflicts can emerge and time may be squandered; it is thus recommended that a capacity (stationary and mobile) structural and steering framework for radioactivity measurement be set up in advance.

In addition to verification, expertise and self-surveillance measurements,

carried out by clearly-identified stakeholders (operators and IRSN), other stakeholders are likely to contribute, including the CLIs, associations, local authorities, water agencies, etc.

In a post-accident situation, where the credibility of the measurement results is a sensitive topic, a diverse range of measurements is to be encouraged and, where possible, coordinated with the action of the public authorities, as a means of guaranteeing efficiency. The plurality of the measurements and release of results may help create a feeling of trust of on the part of the population.

The mobilisation of all stakeholders involved in the measurement process makes it necessary to continue or carry out, from the start of the transition phase, action by which it will be possible to:

- specify the framework and structure of the expertise measurement programmes and verification measurements carried out;
- provide coordination and guarantee the quality of the measurements carried out;
- plan the procedures by which results will be disseminated;
- identify possible financing issues;
- encourage and involve all measurement stakeholders.

4.2.2 Gathering, exploiting and releasing environmental measurement results and informing the public

The inter-Ministerial Directive of 29 November 2005 [12] sets the current framework on the collection and use of data from measurement campaigns required to understand the radiological situation of the environment.

The results of the measurement campaigns carried out under the surveillance programmes run by the public authorities and operator of the damaged facility, carried out for expertise or control purposes, are intended to be made public, with basic interpretative guidance that will make them easier to understand by a non-specialised audience.

A dedicated website may be created to enable access to the measurement results, gained through measurement programmes specifically set up during the radiological emergency situation and during the post-accident phase[11].

4.2.3 Financing radiological measurements

The stakeholders mobilised to carry out expertise measurements may conduct them using their own financial resources. Financial coverage for the cost of the controls called for under the regulations must be anticipated; it may be made the responsibility of the business community or be covered by the public authorities in the form of financial assistance.

Financial coverage of the cost of self-surveillance measurements should *a priori* be provided for by the stakeholders who have taken the initiative to use them. During the transition phase, as part of the consensus-building efforts carried out by the local authorities, radiological measurement systems can be offered to those wishing to measure products from their vegetable garden or local store.

11. Pursuant to the 29 November 2005 Directive, the IRSN is responsible for providing the public with the results of environmental surveillance in post-accident situations following interpretation and validation of these results and due protection for personal privacy when measurements are taken at individual homes.

5. Improving the radiological quality of the environment and living environments as well as the state of the aquatic environments

The resources implemented to reduce contamination from as early as the exit from the emergency phase shall be stepped up during the transition period in order to continue and expand cleaning operations in the environments, in particular inhabited areas. The types of actions will develop over time, due to the gradual decrease in the effectiveness of cleaning. In addition, the in-depth characterisation of contamination in the environments is expected to help better identify the places where the implementation of decontamination operations will be most effective in lowering individual exposure, in order to optimise the action taken.

5.1 Continuing cleaning and decontamination of the environments

5.1.1 Defining and prioritising actions to improve the radiological quality of the environments (cleaning strategy)

The series of actions to be carried out and the mobilisation of the different stakeholders likely to contribute (including residents) must be clearly defined in a cleaning strategy.

The cleaning operations already undertaken in the built environment at the exit from the emergency phase must be continued as the priority. Further actions can also be initiated to lower exposure in the populations: plant and shrub removal, top-soil removed of playgrounds and public places, tree pruning, grass mowing, etc.

As at the exit from the emergency phase, cleaning must be carried out in the ZPP as the priority. Within the relocation perimeter, cleaning is only to be considered for certain access paths used by the mobilised teams and for all areas of the relocation perimeter the status of which may shift to that of a basic ZPP (no relocation).

5.1.2 Mobilising the qualified stakeholders

At the start of the transition period, the teams that have been mobilised during the exit from the emergency phase to carry out cleaning operations (in particular, fire and rescue services) will give way to specialised companies (for instance, professionals specialised in remediation of contaminated areas), the personnel of which will have been trained in radiation protection and enjoy special monitoring where applicable. Thereafter, non-specialist companies may also step in (for instance, green area management professionals), once the personnel involved has been given training. Special care is to be taken when organising intermediaries between the various teams.

5.1.3 Organising and planning team deployment

It is a necessity that the various operations carried out at the territorial level be carefully planned, monitored and coordinated. This makes it possible to bring out the priority actions. Decontamination professionals must be able to continue working in line with their usual practices, and the definition of "decontamination projects" established for other situations aligns with this objective, while also making it possible to better manage risks, dosimetric and monitoring of the teams mobilised and activities carried out.

Considering the standard practices of nuclear industry professionals and the need to guarantee the teams mobilised good protection and monitoring, a base

camp must be set up so that teams can self-monitoring upon completing their activities in an area where radiological background noise is low.

As regards the participation of non-specialised professionals, they need to be provided with the training and information required for such tasks, in particular concerning radiation protection.

5.1.4 Providing residents with the information needed to implement basic cleaning measures

Except inside the relocation perimeter, teams mobilised in existing exposure situations (I-SED) may be called upon to serve in zones (ZPPs) where populations continue to live. However, by the very nature of their work, these teams can be more exposed to radioactivity than the general population, such that specific health- and radiation protection-related guidelines must be followed. The use of protection equipment, whether collective or individual, for instance, must be broadly explained to the populations in the ZPPs, which may or may not understand the need for them and be concerned about their own living conditions in the said ZPPs.

The authorities must develop information aimed at private citizens, prompting them to periodically wash their floors, vacuum their furniture, carpets or rugs and showing them where to dispose of the generated waste. The importance of adopting basic practices (wearing a mask, gloves, etc.) in order to limit exposure must be clearly explained in particular as part of the implementation of a practical radiation protection culture (for instance, in the CAIs).

5.2 Monitoring the quality of run-off waters and wastewater as well as the state of the aquatic environments and biodiversity

The waters (washing water, runoff water) can lead to radioactivity concentration phenomena in the environment or sewage treatment station sludge, regardless of the post-accident zoning.

The radioactivity deposited in the soils or in buildings may be carried elsewhere through runoff following rain or a cleaning operation in the built environment[12]. In this event, it is taken to:

- either to the rainwater channelling system and its natural outlet (river, river confluent), through radioactivity concentration phenomena may take place during the runoff;
- or to the wastewater network where the radioactivity may be concentrated in the sludge produced in the sewage treatment plants.

At the exit from the emergency phase, no particular provisions are made regarding the surveillance of wastewater and rainwater collection and channelling systems. Some places (sewage treatment plants, decanting basins, gutters, low points in the natural hydrographical network, etc.) may however concentrate radioactivity. They need to be identified, in particular the sewage treatment plants where wastewaters from the ZPP and ZST are collected, and regular measurements of radiological activity in the waters and sludge produced in the plants planned. If necessary, the sludge is channelled toward the appropriate disposal systems.

During the transition period, the following must be completed:

- an inventory of possible radioactivity concentration places must be established;

12. Washing water collection is almost impossible to carry out, except where retainer systems can be set up under the equipment being washed.

- radiological surveillance must be set up at the places identified in order to detect possible concentration of radioactivity;
- if necessary, cleaning actions must be carried out (gutters, topsoil removal on small surfaces, decantation basin scrubbing, etc.);
- possibly, the sewage treatment plant sludge disposal channels must be reviewed.

In addition to monitoring runoff water and wastewater quality, radiological surveillance is to be organised in aquatic environments (waterways, aquifers, coastal waters) and biodiversity in order to track radioactive component concentrations in the said environments over time, assess their impacts and define possible actions to take action on the most deteriorated environments. Water circulation may contaminate environments well beyond the zones defined at the exit from the emergency phase. The perimeter of this surveillance is thus to be defined in line with the characteristics of the affected drainage basins and aquifers. Surveillance data must be centralised, in particular under the national master plant on water data, in order to facilitate the work of the public authorities and the action prioritisation process; as the aim is, in the long term, to bring the resource back to good condition as defined by the "Directive on the quality of water intended for human consumption".

6. Managing waste

Implementation of the waste collection and disposal strategy initiated at the exit from the emergency phase continues throughout the transition period and is shaped by a large influx of waste generated by various sources. This strategy makes it possible to gradually replace long-term management solutions with the temporary management solutions selected at the exit from the emergency phase. Waste management within the zone must be gradually replaced by radiological characterisation supported, where necessary, with clearance levels determined on a case-by-case basis.

The management of waste resulting in particular from bans on placing on the market or from cleaning operations requires that a special management strategy be set out in order to proceed with the identification and implementation of technical solutions suited to the management of such low-contaminated waste produced in large quantities.

Information about waste management procedures must be made available to the populations, for instance at the CAIs, in order to limit the dispersion of radioactive substances (bans on open waste burning) as well as individual exposure to radioactive substances (ban on individual composting). Green waste sorting is to be organised.

6.1 Identifying and implementing technical management solutions suited to the contaminated waste

Depending on the type of waste and level of contamination involved, a variety of contaminated waste management options may be implemented. Non-contaminated waste may be disposed of or treated in the management facilities commonly used for the disposal or treatment of non-contaminated waste, subject to a few conditions, in particular that the facilities used be equipped with radioactivity detection portals.

6.1.1 Installing storage facilities for non-putrescible contaminated waste in ZPPs

Storage is the first technical management solution for non-putrescible contaminated waste. It is during the transition period that the management procedures for both the storage areas (ensuring site security, portals, environmental surveillance plan) and waste stored (waste separation by type and activity, traceability) are to be defined.

6.1.2 Monitoring the impact of possible exceptional management provisions for putrescible contaminated waste

Putrescible contaminated waste cannot be stored until such time as a final disposal solution is found. It is for this reason that exceptional provisions are implemented at the exit from the emergency phase (milk dilution and destruction, landfilling of contaminated plants and soils), composting of plants in an existing facility, etc.). During the transition phase, these provisions may be continued and supported by radiological surveillance.

6.1.3 Defining use conditions for facilities dedicated to the treatment or disposal of conventional waste

When existing facilities dedicated to the treatment of conventional waste are used to manage putrescible contaminated waste, specific adjustments and use conditions must be set out, in order to lower the impact of this use on the environment and the teams mobilised. Such actions include:

- adjustments aimed at lowering the amount of liquid effluents produced (the resulting compost may be incinerated, diluted or stored) for composting of contaminated green waste;
- special campaigns dedicated to the rendering of contaminated animals, during which risk analysis must be carried out for workers and the environment.

In contrast, it is not recommended that putrescible contaminated waste be sent to existing incinerators. Where incineration is the chosen solution, a specific incineration unit should be built to treat the contaminated waste.

6.1.4 Defining final disposal solutions

Existing radioactive waste management facilities may be used for low quantities of low-activity (FA) or very-low-activity (TFA) short-lived contaminated waste, provided that the said waste meets the facilities' acceptance criteria (conditioning, activity). However, considering that their capacity is limited, this type of waste treatment cannot become the widespread solution.

In the medium term, one or two dedicated storage facilities may be opened to hold FA and TFA waste separately, as close as possible to the damaged site.

6.2 Establishing the regulatory framework for waste management and transport

In order to secure approval for contaminated waste storage within the timeframes required by post-accident management, the regulatory tools for emergency approval or reporting must be established in advance[13].

Considering the low levels of contamination involved, radioactive waste transport in post-accident situations generally do not require that specialised workers be called upon. The transport of certain types of more highly-contaminated waste can, however, be carried out by carriers usually in charge of radioactive material transport. The waste radiological activity must thus be subject to verification prior to the start of transport.

Some transports can be exempted from the provisions regarding the European Agreement on the international transport of hazardous merchandise by road (ADR[14]). These exemption actions pertain *a priori* to the transport of contaminated waste up to the facilities located in the vicinity of the waste production sites.

7. Improving stakeholder involvement thanks to an appropriate governance mode

7.1 Gradually bringing all stakeholders on-board

The development of successive post-accident management programmes over the course of the transition period must be based on a participatory approach, involving all populations impacted (residents, workers, business community, etc.). This new form of governance shall be characterised by such features as the involvement of a large number of stakeholders impacted, in particular elected officials, and the growing importance of the local levels in decision-making process and in support for the populations.

The revitalisation of the territories affected will result from a continually evolving process, proceeding stage-by-stage and constantly reassessed thanks to the watchfulness and active participation of all those involved.

7.2 Adapting organisation modes at the local level

In order to carry out the actions characteristic of the transition period, adjustments must be made to the structures instituted by the prefecture during the emergency phase. These adjustments will vary in scope, depending on the magnitude of the crisis. The organisation shall consist of:

- a territorial structure placed under the authority of the prefect. This structure shall *a priori* be composed of representatives of decentralised government agencies and an inter-ministerial team backing them up, responsible in particular for serving as liaison and facilitating the exchange of information with the central authorities and thereby contributing to the consistency of action at the local and national levels. The structure's legal status may be a public interest grouping (GIP) composed of all stakeholders affected by post-accident management[15] ;
- a new management structure, made up of a Prefect vested with extraordinary powers, drawing upon the decentralised agencies of a dedicated Ministry or public establishment, or one of its local chapters. This will make it possible for the *département* prefect in particular to resume its traditional missions over the long term.

7.3 Adapting organisation modes at the national level

The governmental organisation instituted during the emergency phase shall be adapted to last over the longer term, applying operating principles based on traditional defence plans. The Prime Minister, or by proxy, the Minister in charge of operationally steering government action, may determine, depending on the severity of the event's consequences, the adjustments deemed necessary in terms of human and technical resources.

Taking into account the wide range of actions to be undertaken in a post-accident situation and the different areas involved, the work to be carried out on post-accident management can only be interministerial, and also involve multiple

13. Where storage areas are involved, a specific administrative regime could be adopted, entailing the creation of a facility, under Section 17XX of the ICPE nomenclature pertaining to the enforcement of the Environmental Code, 'Temporary storage facility following of waste generated by decontamination actions carried out in the wake of a nuclear accident'. Such facilities would operate on the "notification" principle (wherein the said notification could be carried out subsequently) supported by a standard government order containing helpful guidelines.

14. First of all, Article 1.1.3.1 of the Agreement calls for emergency transport intended to save human lives or protect the environment to be made exempt from the technical provisions established by the European agreement concerning the international carriage of Dangerous Good by Rood (ADR), provided that all necessary measures are taken so that this transport can be carried out safely; secondly, the concept of "special arrangement" allows the transport of radioactive materials to take place under conditions that do not match the ADR's technical provisions, provided that compensatory provisions, guaranteeing the same degree of safety are taken.

civil society stakeholders. Several types of response are possible, depending on the magnitude of the accident, to provide the needed coordination:

- the creation of a dedicated ministry. This option may be implemented in two forms: either the dedicated ministry is a lightweight structure exercising where applicable authority over a designated or specifically-created public establishment, or the ministry may be a more complex structure with specific agencies (in particular dedicated decentralised services close to the contaminated zones);
- the appointment of an interministerial delegate. The Prime Minister may adopt an order creating an interministerial delegate function to manage the nuclear accident's long-term consequences.

8. Supporting and re-deploying economic activity

Since the start of the post-accident phase, special attention is paid to managing products (farm or industrial) likely to be contaminated. Support to existing operations established in the ZPP and ZST is arranged, in particular to support the redirection deemed necessary, to be established in coordination with all business stakeholders, in particular consular chambers.

8.1 Implementing a management and support strategy for the agricultural production systems

The rapid creation of a compensation system for farmers or at least precise information about the amounts of money allocated is vital to securing the support of the agricultural profession for the accident management systems chosen.

The "Decision-making assistance guide for managing agricultural environments in the event of a nuclear accident" (ACTA/IRSN, 2007, updated in 2012), sets forth strategies and actions designed to enable agricultural sector management appropriate to the settings in which accident occurred and the types of production involved. The guide may be used as a coordinated steering tool.

During the post-accident phase, once the zoning has been established, management actions for the agricultural sector will be designed to serve two aims:

- managing the consequences of the bans on consumption and release-to-market and the lifting of the said bans);
- in the longer term, improvements of the radiological quality of production systems.

In determining a strategy that will serve these aims, it is essential to take into account the results of risk assessment describing the current and projected state of contamination in the environment, carried out by the agencies involved, in conjunction with the IRSN, which will collect contamination data and make it possible to assess the contamination dynamics, including along the food chains. Once this analysis has been completed, two types of strategies (to seek gain from or dispose of farming production) may be implemented, depending on the time scale:

- for the short term, the priority will be to manage production in progress at the time of the accident and manage the product inventory banned from the market or subject to restrictions;
- for the medium and long term, the agricultural production facilities (crop-growing land, livestock, buildings, shelters, etc.) will be managed and satisfactory production potential will be sustained.

15. State (locally), local authorities: region(s), *départements*, municipalities, consular chambers, victim associations, consumer associations, environmental advocacy associations, the CLI, insurance providers, site operators, expert institutes (IRSN, InVS, etc.), national offices (National Forestry Office, National Office for Hunting and Wild Animals), trade unions (representing a specific sector of activity), professional orders, trade unions, foreign bordering local entities, etc.)

The risks in the farming industry (workers), animals (welfare), the environment (relevant to waste production) and business activity will furthermore be assessed by the professionals and taken into account in determining the strategy to come.

All of the strategic decisions made in the short term (at the exit from the emergency phase or at the start of the transition period) regarding in particular non-marketable dairy production and crops and fresh product inventories must also anticipate, to the greatest extent possible, the medium and long terms. Likewise, agricultural production facilities must be managed in such a way that production resources and means may be restored and future production cycles prepared. This ultimately helps win back economic activity in the ZST and thereafter the ZPP.

8.2 Marketing foods produced in ZSTs

The implementation of the agricultural production analysis programme across the entirety of the ZST, as developed at the exit from the emergency phase, must make it possible to ensure compliance in the foodstuffs produced. The radiological control system should also make it possible to gradually lift in receivership actions on agricultural operations in the ZST.

8.3 Marketing materials and products in ZPPs and ZSTs

In case of immobilization of materials and manufactured products likely to have been contaminated well as agricultural products not intended for human or animal consumption, these products must be monitored to determine their future use.

8.3.1 Setting control levels on manufactured products

Under normal conditions, materials from declared or authorised nuclear activities may only be released on a case-by-case basis, as no dose or control levels have been set at the national level to regulate the clearance of such materials. In post-accident situations, were these rules to be applied, the use of many types of materials and manufactured products in a setting that may have brought about low contamination would be significantly limited.

"Clearance" in post-accident situations is thus intended as a response to exceptional circumstances. Where exceptional regulations are considered regarding manufactured products, they must remain transitory and revisable over periods of time set out in advance. Control levels can thus be set out, based on the limitations and reference figures existent at the European level, for instance in the fields of radioactive material transport and dismantling of nuclear facilities.

These control levels must be consistent with the type of contamination that may affect manufactured products and their uses:

- during the radiological emergency phase, the products may be contaminated directly by deposit, especially if they are stored outdoors. During the early stages of the post-accident phase, contamination in these products thus primarily occurs at the surface and must be compared to a criterion stated in surface activity terms (Bq/cm²);
- over time, certain materials, in particular those of natural origin, such as wood, are likely to become part of the artificial radioactivity found in the environment. Over the longer term, contamination in these products thus primarily occurs in mass and must be compared to a criterion stated in mass activity terms (Bq/kg).

Several options can be considered as regards the future of materials and manufactured products the activity of which exceeds the release-to-control

levels set:

- they may be stored until such time as radioactive decay occurs in the short-lived radionuclides or decontamination is completed, thus bringing activity back to a level in line with its commercialisation;
- use restrictions may be issued in order to limit exposure in workers and the population (e.g.: sands that can be used as sub-layers in motorways, etc.);
- they may be treated or disposed through the channels set up specifically for contaminated waste.

The commercialisation of materials and manufactured products from the ZPP or ZST not protected during the accident must be carried out in line with a protocol establishing the priority list for materials and products for which radiological verifications must be provided.

As is the case with foodstuffs, the business community may implement self-administered surveillance radiological measurements as well.

8.3.2 Coordinating placing on the market via the issuance of compliance certificates

The protocol stating the conditions for the placing on the market of materials and manufactured products shall be issued to accredited ASN bodies in order that the required technical radiation protection verifications be completed. However, it should be noted that these accreditations must be changed or adjusted authorisations issued for post-accident situations, so that the verifications can be carried out.

These bodies must be able to perform inspections (laboratory measurements, on-site measurements or portals), and issue compliance certificates.

8.3.3 Approving the placing on the of materials and manufactured products protected from radioactive fallout

Materials and manufactured products from the ZPP and ZST that were protected from radioactive fallout at the time of the accident may a priori be placed on the market; spot checks via survey may be used to confirm his. If the assumption is not confirmed, the materials and manufactured products shall be handled as though they had not been protected.

8.3.4 Assessing the radiological impact of using heating wood

The use of heating wood from the ZPP or the ZST has been temporarily suspended, until such time as the radiological impact can be assessed. The decision to keep these restrictions in effect is defined in accordance with the outcome of the assessment.

8.4 Applying provisions designed to facilitate export of national products

One of the consequences of a nuclear accident on national territory may be that provisions are taken by foreign countries subjecting the import of French products to specific conditions. Such provisions would make it mandatory for French exporters to display compliance certificates and thus subject them to prior inspections. These inspections could apply to the products deemed must sensitive in light of their use, such as foodstuffs, medicines or cosmetic products, for instance. For this reason, in order to facilitate compliance with the requirements of countries importing French products, the national authorities might, in this case:

- conduct inspections in national ports and airports;
- support economic sectors for which export is a major source of income, by running measurement campaigns that make it possible to determine the radiological quality of the entire sector or by subsidising the cost of inspections;
- facilitate the issuance of compliance certificates, in particular mobilising measurement stakeholders including from foreign countries.

8.5 Instituting support measures for the economy

Economic support measures may be instituted for all companies affected locally by the consequences of the accident:

- a mediation service for the insurance companies;
- tax measures (payment deadline extensions and tax debt instalment plans);
- payment deadline extensions on employer taxes granted across the board, possibly extending to coverage of social security contributions;
- one-time partial unemployment benefit measures (increase in State's financial contribution to partial unemployment benefits);
- mediation on loans.

Other systems may, in the event of nuclear accident, be mobilised. Examples of this include the FISAC (intervention fund for service providers, craft and merchant activity), dedicated to covering natural or technological disasters.

9. Providing grants and compensation

Where financing is concerned, it is important to make the distinction between emergency grants and compensation. Emergency grants include emergency assistance paid by the State and the basic needs grants paid by site operators to victims.

Compensation is governed by a very specific legal system (13), referred to as nuclear third-party liability (RCN), which provides that:

- a single civil manager shall be appointed for each third party (operator of the nuclear facility responsible);
- three compensation segments establishing first and foremost the financial guarantee for the operator, and secondly the public finances and national budget, and lastly, the budgets of other signatories of the Brussels Convention.

Damages eligible for compensation include those personal damages and property damages (except the nuclear facility itself and other facilities belonging to the same operator at the site).

9.1 Continuing, where necessary, the payment of emergency grants

The emergency grant management system, established at the exit from the emergency phase as described in Appendix 2, may be maintained according to the same procedures if it continues to appear necessary.

9.2 Setting up the compensation system

As the nuclear operator is the only party liable under the law, the cost of implementing this system befalls the said operator and related insurer first and foremost. The State's liability results from the law and related international agreements and consists primarily, in addition to ensuring that the compensation process runs smoothly overall, of two responsibilities: first of all, if the operator's guarantee funds are

inadequate, it must provide public funds within the limits set out by law; and secondly, if all of the funds available prove inadequate, setting up an allocation system by decree, as provided for by the Environmental Code on nuclear civil liability (formerly known as the RCN Law [14]).

It would be desirable that this system be set up immediately with the stakeholders in order to create the framework for consensus-building.

9.2.1 The State will be required to set up the necessary system to measure the extent of damage and amount of compensation

A joint letter from the relevant administrative agencies addressed to the site operator will request of the latter a complete report on victim compensation request and set the frequency with which it must address further reports to the Legal Officer of the Treasury, pursuant to Article L597-6 of the Environmental Code. Other letters may be sent to the relevant national decentralised agencies alongside this, to the Nuclear Safety Authority and all public or private expertise bodies so that they can provide their own estimates on the extent of damages. This will make it possible for the State to enjoy the visibility needed to determine whether Article L597-38 of the Environmental Code should be enforced.

9.2.2 Publishing if necessary the Decree provided for under Article L597-38 of the Environmental Code (priority rules should the available tranches be inadequate)

Under the Environmental Code, in the events where the sums available for the three compensation tranches prove inadequate, a decree adopted by the Council of Ministers establishes the procedures by which sums in the three segments will be allocated, bearing in mind that priority is given to compensation for bodily damage, in line with the procedures determined by analogy with legislation on occupational accidents.

In the event of an accident exceeding a certain degree of magnitude, it is important that Article L597-38 of the Environmental Code be implemented without delay, in order to rapidly provide a clear and established reference. It is important, consequently, that the necessary decree be adopted quickly in the Council of Ministers.

The said decree must specify and provide for:

- the list of Social Security Code articles that are to serve as the reference;
- a coverage rate for damages other than bodily damage in order not to hold up compensation;
- the definition of persons eligible to apply for compensation and, consequently, of whom verification measurements must be required;
- the definition of verification measurements;
- the creation of a medical commission, which sets the system's operating rules, in particular the frequency at which tests must be carried out, special cases and disputes regarding the need to conduct further tests, and which is in particular responsible for issuing an opinion on the causality of certain pathologies not listed in the enforcement decree of Article L597-38 of the Environmental Code (as the Commission, which shall not be composed solely of physicians, will be provided with the results of all medical examinations, this may raise questions about how to maintain medical confidentiality, in which case, the existing precedents will prove helpful).

9.2.3 Publishing the Decree provided for under Article L597-38 of the Environmental Code (presumption of causality)

A list of afflictions assumed to have resulted from the accident must be drawn up by Decree (Article L597-38 of the Environmental Code). The development of this Decree may draw upon the work of the "Interministerial Liaison Committee for Health-Related Monitoring of French Nuclear Weapon tests" and Enforcement Decree 2010-2 of 5 January 2010 regarding recognition and compensation for victims of nuclear weapon tests.

9.2.4 Organising the collection of applications for compensation and payment of sums allocated

As several compensation tranches are to be mobilised, a management mechanism must be set up that does not create breaks between the tranches and care taken to interconnect the stakeholders involved in compensation between the stakeholders, namely the operator (represented by the insurer) and the State's agencies.

Receiving applications for compensation at the CAIs

Applications for compensation are collected by the CAIs; it is carried out first by the site operator's insurer, sole responsible for managing the compensation applications in the first tranche. In order to make the question of compensation financing transparent for the victims, the insurer may continue gathering and processing compensation applications beyond the first tranche. A management convention must first be instituted between the State and the relevant insurance provider.

Setting the rules for granting advances on compensation and arranging for payment

In order to ensure continuity and consistency in payment on the various compensation tranches, the public authorities must keep informed of the liquidation and compensation payment procedures, and advances on compensation under the first tranche.

In addition, advances to be taken on the compensation may be paid by the operator, in particular to the business community stakeholders whose activities are disrupted, based on objective conditions (for instance, should foodstuffs be banned from placing on the market).

9.2.5 Creating a National Victim Monitoring Committee to Organise Consensus-building

Consensus-building bodies (monitoring committees) may be created at the national level, involving representatives from all of the stakeholder bodies: the relevant administrations, social bodies (taking into account the reference made by the law to the legislation on occupational accidents), aid associations for victims of large-scale accidents, victim associations created after the accident, foreign authorities (as applicable), the prosecutor's office and the president of the district court (court with exclusive powers during disputes following nuclear damages), as well as the representatives of the site operator and its insurance provider). This Monitoring Committee serves a three-fold mission:

- providing victims with precise information about the measures taken in their favour;
- ensuring that they receive fair and rapid compensation, in particular pursuant to multi-partner agreements calling for simplified procedures;

- ensuring the consistency of the compensation system and monitoring all of the payments made.

9.3 Assessing the need for long-term compensation

The question of compensation over the long term arises very specifically in the event of nuclear accident, taking into account its potential consequences. First of all, the funds available could quickly turn out inadequate should an accident exceed a certain magnitude and, secondly, as regards bodily damage in particular, radio-induced cancers or other pathologies may appear over the long term, at a time when the compensation funds may run dry. It may thus soon appear necessary to set up a supplementary compensation system.

Certain national legislations provide that, once the accident has occurred, the Parliament shall step in to assess the situation and make the necessary decisions. Such action may be lead to the creation of a dedicated fund, supplied by contributions from the operator responsible, or other nuclear operators, and public contribution to national solidarity, barring a supplementary financing system that might be set up before any accident.

These questions are a political decision and must be made the focus of discussions upstream, in order to determine the options taken. If they have not been settled before an accident occurs, the transition period must be put to good use to address this.

10. Informing

Throughout the post-accident phase, the credibility of the public statements made remains essential, as it conditions the population's trust and, from the practical standpoint, the latter's ability to follow the instructions and guidance given to it. During the transition period, public communication will have to keep pace with the many new topics and sources of information that emerge and with the inevitable development of controversies. Public communication shall be structured around six major themes, including: the restrictions to be adopted (instructions), health-related and environmental topics (impacts, risks, contamination), technical topics (explanation of the event, safety of the facility where the accident took place), topics of legal and economic nature (grants, compensation), "political" messages (national cohesion), and international relations (export, citizens abroad).

10.1 Diversifying information topics during the transition period

While the aim of the public authorities in providing information to the populations remains the same as during the emergency phase, its course of action must change. During the transition period, the range of topics to be addressed by the public authorities broadens. The guidance and protection instructions given to the population, along with the action taken to educate and explain remain important, but new themes may gain importance: causes of the accident, responsibilities, health consequences, legal questions, etc.

10.2 Securing an efficient functioning mode over time

During the emergency phase, different communications tasks forces will have been run successively. This crisis-time operating mode must shift, during the transition stage, to a more stabilised organisation, capable of establishing itself over the long-term.

10.3 Developing an information sharing and exchange system

Regardless of their nature (CAI or other), the creation of structures in charge of providing information to the populations at the local level is essential. Such structures must make it possible for those impacted by the accident to speak out

and share their personal experiences, as well as receive responses on a wide range of topics: health-related, economic, legal, etc. These structures must be run by trained staff (reception staff, experts, psychologists, etc.)

10.3.1 Continuing to inform the public

The CAIs are the place of choice for bringing helpful information (instructions and guidance) to the populations, to enable good post-accident management. The direct nature of their relationship makes it possible to better take ownership of the messages, thanks to a process of exchange with the population.

The population also needs to be able to ask, individually or in groups, its questions freely and receive quick, clear, objective and, if possible, personalised responses. The quality of this interpersonal question and answer relationship may contribute to consolidating the trust which the population will place in the public authorities.

10.3.2 Enabling feedback on incident management

This system must also make it possible to report and exchange information. The testimonials, questions, criticism and even false rumours collected through these systems are indicators of how the population sees the event and management thereof.

This information must thus be collected and addressed to the public authorities so that they may adjust their management methods.

10.4 Dealing with criticism and other debate

During crisis situations, the press and the public may seek information from sources other than the official sources – responsive and sometimes critical ones. This phenomenon has become all the more acute with the rise of new media (Internet, social networks).

10.4.1 Continuing media watch functions and language element production

It is important to continue disseminating information regularly about the situation and the decisions made, without hiding any uncertainties. Silence is not an option: it is in general misunderstood and generates tension. In contrast, responsive, transparent information is received as reflecting a reliable and disciplined approach on the part of the public authorities.

It is also helpful to set up a media watch in order to correct possible misunderstandings and develop language elements suited to the questions asked.

10.4.2 Developing responses suited to the new media

The rise of the new media call for a change in the way the public is informed. In nuclear post-accident situations, videos, comments or articles posted on the social networks, blogs may disrupt the message sent out by the public authorities: the latter cannot be content with traditional information based only on press releases and television interviews.

It is thus vital that communicators diversify the range of tools they use, taking into account new modes of communication. A list of such tools follows: crisis websites, intelligence, social networks, forums, the dissemination of instructional videos, etc.

10.5 Including the entirety of the population in the information system

Following a nuclear accident, information should be aimed, first and foremost, at the populations affected by the accident. However, the national population as a whole and even that beyond its borders will also be awaiting information about the accident and its consequences.

Information aimed solely at the populations affected by the accident could lead to a split in the way the situation is perceived, between those living in the immediate vicinity of the accident site and those more remote and unaffected by post-accident management. Such a divide could contribute to discrimination against the products, persons and territories affected by the accident.

10.6 Informing the international authorities

In a radiological emergency situation, the French authorities are required to inform the European Commission, the IAEA, and the safety and radiation protection authorities across Europe, in particular those of neighbouring countries (official agreements have been signed).

10.6.1 Making reliable information available promptly with translation into English

The French authorities, in a post-accident situation, would be required to deal with multiple requests for information, as well as the need to issue a structure set of situation updates, decisions and measurement results. The information it provides could be structured around the four following themes: the protection measures instituted; the results of the radioactivity measurements; the security of tap water, food and products with respect to human health; tourism.

In order to ensure that this information is accessible to foreign and international authorities, it is vital that it be translated at least into English.

10.6.2 Operating in network with the international organisations

Considering the ramifications which a nuclear accident may have at the international scale, certain international organisations have mobilised and taken it upon themselves to produce recommendations within their area of skill. It is thus important that information exchange be arranged quickly with these organisations, some of which have already been identified:

- the International Civil Aviation Organisation (ICAO) and the International Air Transport Association (IATA), as concerns traveller information, and possible bans on the use of airspace above the damaged facilities;
- the International Maritime Organisation (IMO), the International Port Association (IAPH), the International Waterways Association (PIANC), in particular as concerns maritime circulation restrictions around the impacted facility;
- the World Health Organisation (WHO), in particular as regards the accident's health-related consequences or recommendations to travellers about the quality of tap water.

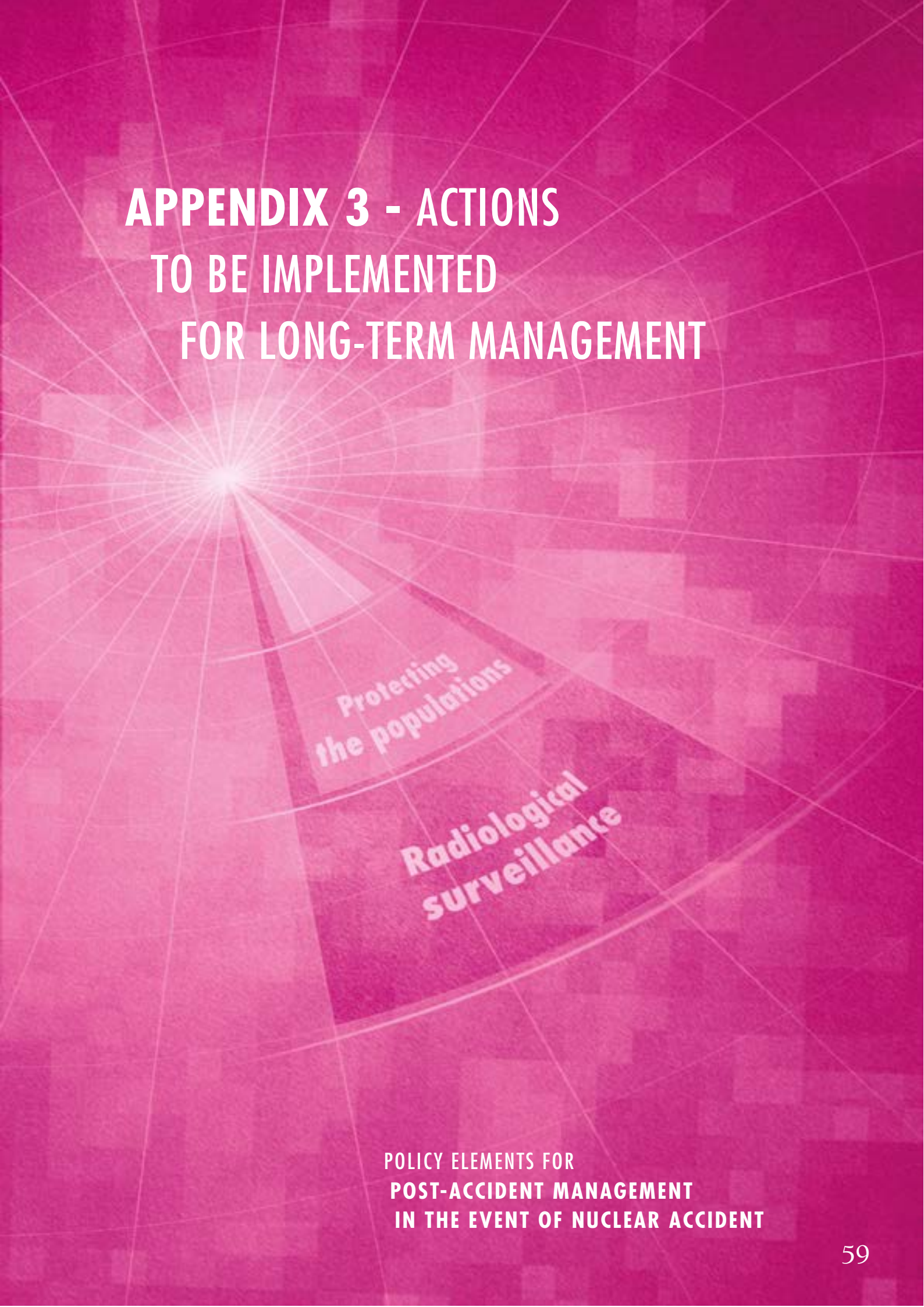
10.7 Informing the French embassies abroad and the foreign embassies in France

Foreign countries can be directly impacted by the situation in France (travel, economic cooperation, etc.). For this reason, it is vital that trusting relationships be developed between foreign embassies and national authorities in order to ensure the consistency of the messages aimed at foreign nationals living in France, to provide the information required by those likely to travel in France, and to inform foreign economic stakeholders operating in France.

The French embassies abroad are directly involved:

- explaining the authorities and economic operators the decisions made by France, in particular those regarding exported production;
- explaining to the French economic operators exporting abroad the restriction measures taken by importing countries and facilitating their administrative procedures.

APPENDIX 3 - ACTIONS TO BE IMPLEMENTED FOR LONG-TERM MANAGEMENT



POLICY ELEMENTS FOR
POST-ACCIDENT MANAGEMENT
IN THE EVENT OF NUCLEAR ACCIDENT

The transition period comes to an end when the situation in the territories can be observed to have stabilised. By this time, a relatively good understanding of the contamination in the environment and the population's exposure conditions has developed. The post-accident zone has stabilised and the first questions regarding the future of the persons affected have been addressed in a coordinated manner. The public authorities have moreover been able to organise in order to implement and steer and initial post-accident management programme, in a setting characterised by increasing stakeholder involvement.

With the possible adjustments made by the public authorities to zone borders during the transition period, as a result of long-term territorial contamination, the need emerges for a zone in which the populations can be re-housed over the long-term. In this area, the conditions required for social and economic activity to continue are no longer existent. This re-housing implies that the populations' return (or their continuing possibility to remain on-site, if they have not previously been displaced) cannot be envisioned in the medium or long term. It then becomes the responsibility of the public authorities to provide the residents with satisfactory re-housing conditions and support their professional and social integration into the new territories.

Beyond this re-housing zone, the populations are free to remain or to depart. Part of the population residing in the contaminated territory will likely to leave it behind. In the territories contaminated after the Chernobyl accident, concerns about the future health of the children was one of the main motives for families leaving the territories. Another part of the population will, in contrast, choose to remain. The initial decisions may shift thereafter, in either direction. The individuals and families must thus be able to freely make an informed decision and be able to rely on concrete support from the public authorities to facilitate that decision, whatever it may be.

For the population, the decision to remain or return to a territory affected by a nuclear accident, despite the lasting presence of contamination, may result from a variety of factors combined; the restrictions and worries associated with the presence of radioactivity are significant in this, but economic, social, family-related and even estate-related considerations will also be prominent.

As a result of the actions already initiated during the transition period, it is important that the initial census of persons having chosen to remain in the contaminated territories be updated, but also that those who have chosen to no longer reside in the territories benefit from monitoring, the aim being to gain a comprehensive assessment of view of the accident's health-related and social consequences. Furthermore, the lessons learned from the application of the first post-accident phase management programme must also be used to adapt certain actions and interconnect the following national post-accident management programmes with the territorial projects that will be implemented over the long-term period.

1. Providing support to those who have chosen to remain

1.1 Providing the populations residing in the contaminated territories with up-to-date information about the state of radiological contamination in the territories

Long-term radiological contamination in the environment is characterised by significant differences in the level of contamination across space and by a slowly-developing situation. In particular, the importance of radioactive deposits may vary significantly from one place to another, even over short distances ("leopard spots").

A reduction in individual exposure and the implementation of effective actions to rehabilitate living conditions thus assumes that the places where individuals are particularly exposed to radioactivity be placed under constant surveillance.

1.2 Fostering the development and continuity of a practical radiation protection culture in the population by drawing upon the healthcare and education systems

One of the major issues during the long-term post-accident phase is the integration into "everyday living" of individual protective actions designed to reduce chronic exposure to low doses to the lowest levels as low as reasonably achievable. It is thus vital that inhabitants be able to limit their own exposure and that of their family and be able to benefit from internal contamination and health monitoring as well as appropriate medical care, where necessary.

The public authorities may suggest a variety of actions designed to reduce population exposure as low as reasonably achievable, some of which will be implemented by the population itself. Toward this end, recommendations may be issued in order to limit movement in the most highly-contaminated places, in particular forests and places with high radioactivity concentration, or designed to lower the transfer of radioactive substance to living places. In the living places, actions may also be initiated to reduce, on the one hand, external exposure and, on the other, contamination risks (through vegetable garden produce, for instance). To illustrate, it is important to emphasise that individual protection depends in large part on the individual behaviours adopted and everyday actions implemented (self-protection) with the support of the public authorities. It is rooted in the ability of the inhabitants to develop self-sufficiency in the face of a radiological contamination situation, with each step of the post-accident phase.

2. Monitoring radiological conditions

2.1 Facilitating the local population's access to data about the contamination in its immediate environment

For a person residing in a territory, the radiological contamination in the environment is difficult to appraise, as it does not cause any direct and perceptible change to the environment. In addition to access to the results of radioactivity monitoring in the environment, in particular as reported through mapping, it is also important that a practical radiation protection culture be developed. This culture must make it possible for the population to gradually gain the understanding and know-how essential to interpreting monitoring results and, on that basis, protecting themselves and directing their action. This culture must, in particular, make it possible to make informed decisions and adopt the related behaviours in situations entailing potential or confirmed exposure to radioactivity. Then and only then will individuals be able to make decisions for the present and for the future, initiate concrete action and assess their effectiveness.

In addition, the rehabilitation actions conducted during the post-accident phase may vary in effectiveness, depending on the characteristics of the environment in which they are implemented. The stakeholders who carry out these actions thus need to be equipped with the tools necessary for assessing the effectiveness of their action, as well as the prior training required not only to make good use of them, but also to redirect their protection strategies according to the actual effectiveness of the action they see on the ground.

Lastly, it would be helpful that the information gathered, in particular the measurement results, be put to use to respond as best possible to requests for information from the population. The involvement of all non-institutional stakeholders in carrying out atmospheric radioactivity measurements may contribute to bringing out new questions or highlighting specific radiological situations within a given territory, thus helping guide the expertise or research efforts.

2.2 Providing the populations with the means to measure the radiological quality of self-produced foodstuffs or products derived from gathering, fishing or hunting

Where no watch measures have been instituted, the ingestion of contaminated foodstuffs may, in the long term, be the main path by which the population is exposed to radionuclides dispersed in the environment at the time of the accident. Monitoring foodstuffs for radiological quality is thus a key to lowering the doses taken in by the population, in particular children, via this exposure path. The distinction needs to be made, however, between two paths of exposure: first of all, foodstuffs from placing on the market channels; and secondly, self-produced foodstuffs or that derived from hunting, fishing and gathering. As concerns foodstuffs from market channels, the State is responsible for ensuring that they are not harmful to human health. Where self-produced foodstuffs are concerned, like products derived from hunting, fishing and gathering, consumption will have been banned at the exit from the emergency phase. If these bans turn out to be justified over the long term, they must be reiterated on a regular basis, with emphasis to be placed on foodstuffs particularly vulnerable to radiological contamination (mushrooms, wild berries, game, etc.). In the parts of the territory where the ban on consumption can be lifted, measurement tools may be made available to the population, enabling it to monitor itself the radiological quality of products intended for consumption, in particular those derived from hunting or gathering. Local measurement stations set up in the communities are an effective way of limiting the consumption of contaminated products not from the market.

2.3 Maintaining information points about the radiological conditions near the populations extending from the reception and information centres

It is thus important that places of information be set up in the territories, bringing together and making available the results of the various radioactivity measurement campaigns in the environment and on products. Designed as a standing measurement network by which environment radionuclide levels can be tracked and possible places of reconcentration can be monitored, the network could include not only measurement taken by institutional bodies, but also those carried out by associations and the population, taking into account the specific context around which the said measurements can be taken. When this information is made freely available, its credibility becomes all the greater, in an environment of persisting wariness toward the institutions.

2.4 Continuing to monitor contamination of aquatic environments and biodiversity

The surveillance efforts instituted during the transition period need to be extended over the long-term period. On-going analysis of surveillance results can lead to adjustments in the contamination monitoring procedures applied to the aquatic environments and biodiversity, so that the most threatening substances and most vulnerable and deteriorated environments can be monitored.

3. Ensuring the radiological, medical and epidemiological follow-up of persons

3.1 Maintaining a system for monitoring internal contamination of persons

In addition to the local measurements on food products, the public authorities must also maintain an internal contamination measurement system to monitor those living in the contaminated territories. Such a system is a very effective way, first of all, to identify the most contaminated individuals, and secondly, to verify the effectiveness of the protective actions initiated by the authorities and families to lower internal contamination.

The Belorussian example showed that regular monitoring of internal contamination in individuals using stationary and mobile (in order to reach the most remote populations) anthroporadiametric devices, along with easy access to measurement tools for food products likely to be significantly contaminated, is an effective way of developing a practical radiation protection culture in the population and thereby help keep exposure levels as low as they can reasonably remain over the long term. The spread of this culture, vital for effective individual protection, will depend on an effective interlinking between the radiological measurement systems for food products and individuals with the healthcare and educational systems, thanks to the mobilisation of the professionals working in healthcare and education.

3.2 Setting up medical and epidemiological follow-up involving local healthcare professionals

Living in a contaminated territory raises many questions and possibly even concerns and anxiety as to the possible effects of long-term contamination on health, and in particular that of children. The medical profession is particularly well-positioned to provide information and personalised healthcare advice. In addition, healthcare professionals must provide overall medical surveillance for the population over the long-term and warn the relevant authorities should a critical situation emerge from the radiological and healthcare standpoints. Moreover, they need to pay particular attention to any public health issue that may result from an economic or societal situation specific to the territory.

Monitoring for individuals must be carried out at two levels:

- locally, the healthcare professionals, who generally enjoy the trust of those who come to consult them regularly, are in a good position to respond to individual and specific questions, suggest personalised protective actions and provide long-term medical monitoring (pathologies, levels of contamination, radio-protection practices), if necessary. They can thus contribute to the development of a practical radiation protection culture. They furthermore play an important part in screening for and preventing pathologies, often more frequent in an economically and socially disrupted context;
- at the national level, epidemiologists and other researchers will determine the direction of studies conducted for epidemiological follow-up purposes, as well as that of scientific research to be carried out, in particular in response to questions from the population, often through local healthcare professionals. In order to make them more situation-relevant and better-accepted, places for exchange and consensus-building must be set up with the local stakeholders about the studies carried out, how to monitor them and their outcomes.

4. Improving the radiological quality of products

Food produced in the contaminated territories are directly affected by transfers of radioactive substances found in the environment. Furthermore, where no precautionary measures are taken, the ingestion of contaminated foods can become the preponderant channel for exposure to contamination in the population. However, radiological situation can vary significantly across the territories, with some areas significantly contaminated and others less so. If, in the most highly-contaminated areas, agricultural production should probably be discontinued, it can be allowed in less contaminated areas, particularly where special techniques are implemented, making it possible to limit product contamination.

4.1 Encouraging experimentation and experience-sharing

For several countries (in particular, Belarus and Norway), the consequences of the Chernobyl accident showed that radionuclide contamination across the territory and in the various products occurs over the long, and sometimes even very long term. In addition, more than twenty-five years after the accident, production in certain contaminated territories requires more than ever the use of special contamination-mitigation techniques.

4.2 Providing the production sectors with up-to-date information about the state of radiological contamination and using radioactivity measurement tools on products

The decision to continue production in a contaminated territory is reliant on the assumption that the producers involved have taken ownership of the new production strategies. These strategies may involve adjustments to production techniques, or even a change in direction for the local production economy, to sectors less vulnerable to radiological contamination (non-food products, energy, etc.). such changes require the development of a practical radiation protection culture within the production sectors, as well as the creation of a radiological measurement network across the whole of the territory, by which the effectiveness of the rehabilitation actions started can be assessed. Such undertakings will be all the more effective if experts are brought on board and are able to provide information about changes in product contamination levels, in line with producers' needs.

4.3 Supporting the sectors that have embarked on product quality improvement processes, possibly with the need to re-direct their production lines

Moreover, in addition to the actual contamination levels produced, the image of the contaminated territories is likely to be tarnished over the long term in the consumer mind. This vulnerability may affect products other primary production (industrial goods, equipment or consumer goods), extending also to services and activities such as tourism. Professional commitment to a continuing product quality improvement process and the implementation of heightened surveillance of contamination levels and the disposal of non-compliant products will all contribute to restoring, over time, consumer confidence. The challenge lies in reconciling the respective interests of the producers, distributors and consumers. As this challenge cannot be taken up by these stakeholders alone, the involvement of the public authorities is vital, as is the broader involvement of civil society, in order to protect the general interest.

In any case, the quality approach must involve every line, from production to distribution. Producer commitment to a quality approach requires resources and, thus, visibility on the outlets for the territory's production. This may be made part of a contractualisation process between upstream and downstream in each sector, and supported by the public authorities. It must also be made part of a territorial project.

4.4 Promoting the efforts undertaken by the local sectors to consumers and, if necessary, encourage solidarity toward specific production areas

Professional commitment to continuous product quality improvement processes is essential over the long term, but will most certainly gain from being backed up by a broader information process, in order to promote, to consumers, the efforts undertaken by the local producers and develop a shared perspective on the situation. This approach may also call upon the concept of solidarity. Solidarity can be encouraged in order to save a flagship product (wine, cheese, protected designation of origin products, etc.) or an ethnological culture[16]. It is foreseeable that this solidarity may be more developed in near-field as opposed to far-field situations.

Lastly, downstream from production channels, specific waste management measures must be developed for non-compliant products and possible residues from rehabilitation measures, over the long term and with possible waste treatment under "contaminated waste" or "hazardous waste" status, in line with already-existing channels or those to be developed across the territories. In this respect, the "producing" dimension is decisive for the future of the contaminated territories.

5. Maintaining and redeploying activity across the territory

The continuation of professional activity on a contaminated territory is a high-stakes issue for all parties involved, whether workers' place of residence is inside or outside the said territory. One of the major reasons for remaining or for departing is, to wit, not losing one's job, but also finding another job outside the territory. The continuation of economic activity is thus of central importance. Consequently, the soundness of the government decision to offer individuals the chance to remain on contaminated soil is based, beyond strictly radiological criteria, on the opportunity for them to continue working and reasonably look ahead to social and economic development in the said territory.

5.1 Providing the business community with up-to-date information about radiological contamination across the territory

As in the domestic arena, the central question which economic stakeholders will have to address is that of whether to maintain or cease professional activity in the new setting. The response to this question will obviously depend on many different factors. One of the main ones is the vulnerability of economic or professional activity where radioactivity is present in the environment. Another major factor is the degree to which the said activity is part of a broader territorial project, defined in coordination with public and private stakeholders.

16. For instance, the Sami culture in Norway was threatened due to the contamination of reindeer meat consecutive to the Chernobyl accident.

5.2 Studying the viability of the territory's activities and business sectors

In order to determine whether a specific economic activity can be kept running, discussion needs to be opened as to the viability of the activity on contaminated soil. The activity could be directly disrupted by contamination, as is the case with agricultural production, but might also be hurt by indirect effects, such as image-related problems, as would certainly be the case for tourism. Such action can nonetheless be carried out to support these activities and limit the consequences of territorial contamination on this.

The activities most sensitive to contamination are:

- those entailing significant worker exposure to ionising rays;
- those in which production or residues are contaminated or likely to be so: primary-sector activities, in particular agricultural activities, as well as, by extension, activities the aim of which is to market product and consumer goods from the contaminated territories, as well as a number of activities in the services sector.

The employees, too, have decisions to make. Some of them have no choice but to come work in the contaminated territories. Others will enjoy more or less extensive room for manoeuvre, depending on whether their professional activity is maintained in the territory, whether adequate protection and support measures are provided for their activities and whether job opportunities exist in or outside the contaminated territories, as well as personal and family-related considerations.

5.3 Re-assessing working conditions, in particular in sectors deemed vulnerable in terms of worker exposure

It is the employer's responsibility to ensure employee protection. Worker exposure must thus be subject to regular assessment in the work environments so requiring, so that working conditions can be adjusted if necessary. The Chernobyl accident experience shows, however, that only a few professional activities require a degree of watchfulness (forestry, waste management). Whatever the case and regardless of whether workers are considered exposed to ionising radiations, it is important that they be able to benefit from adequate information about the radiological status of their working environment.

5.4 Defining the ways of supporting professions involved in ensuring continuity of service notably public services

Where support is concerned, professionals may receive benefits to make their business activities attractive on the contaminated territories (housing assistance, social assistance, specifically-instituted economic support mechanisms, etc.). These benefits are not to be considered compensation for health-related risk, as the said risk must be kept as low as reasonable achievable, but indeed additional means designed in response to economic or social difficulties. The benefits can however, as the Belorussian experience has shown, become a discriminating factor for the contaminated territories. For this reason, they need to be carefully thought out and will definitely be all the more effective as they are implemented in a targeted manner across the most contaminated territories.

5.5 Fostering the development of a practical radiation protection culture for the business community

Vulnerability due to the persistence of contamination may affect raw materials, products, workplaces and premises (the radiological cleanliness of which it is important to maintain), personnel (protection is the responsibility of the employer) or waste and residue from these activities. It is up to each head of a professional activity to assess its viability. More broadly speaking, this appraisal must be able to take place within a broader review of the viability of business activity at the level of the territory and beyond.

To achieve this, the business community must, to a certain degree, develop a practical radiation protection culture and benefit from the appropriate support from the public authorities. In order for professionals to make an informed decision, this support will need to come in particular with information relevant to each sector, radioactivity measurement results (or resources for completing the required measurements), the creation of places for exchange, consensus-building and guidance, and support from professionals, as part of a territory-wide undertaking.

5.6 Organising coordination between the various stakeholders in order to put together a territorial plan

Individuals choosing to remain in a territory contaminated over the long-term must be given support, information and assistance in developing undertakings across the contaminated territories. At the territorial level, the public authorities and local authorities may initiate economic support measures for the existing activities and may institute mechanisms that can be used to trigger and support local projects. These mechanisms may be founded on the territorial plans that exist under normal circumstances.

The construction of a project for a contaminated territory must take into account every dimension of the territory (economic, social, cultural and environmental). This project is developed in coordination with the stakeholders across the territory and reassessed regularly, so that adjustments can be made as required.

5.7 Defining the supporting systems for business activities and the related implementation conditions

A territorial project sets out, in particular:

- provisions making it possible for certain business activities to continue operating and be redeployed (sector restructuring, adjustments to working conditions), as well as to give rise to creation;
- the conditions under which the professionals who have chosen to continue their activities and those who have made the opposite decision can receive support.

The continuation of certain professions, in particular in private practice or the service sector, may be encouraged in order to maintain an adequate social and business community on-site. The public authorities must furthermore work to ensure that the infrastructures and grids or networks (water, energy, transport, etc.) are maintained as well as utilities to the territories.

LIST OF ACRONYMS

ACTA:	*Association de coordination technique agricole* / Association for the Coordination of Agricultural Techniques
IAEA:	International Atomic Energy Agency
ASN:	*Autorité de sûreté nucléaire* / French Nuclear Safety Authority
AP:	*Arrêté préfectoral* / Prefectoral Order
ARS:	*Agence régionale de santé* / Regional Health Agency (FR)
CAF:	*Caisse d'allocations familiales* / Family Benefits Fund (FR)
CAI:	*Centre d'accueil et d'information* / Reception and Information Centre
CARE:	*Centre d'accueil et de regroupement* / Reception and Regroupment Centre
CLI:	*Commission locale d'information* / Local Liaison Commission
CODIRPA:	*Comité directeur pour la gestion de la phase post-accidentelle d'un accident nucléaire ou d'une situation d'urgence radiologique* / Steering committee for the management of the post-accident phase of a nuclear accident or a radiological emergency
ICRP:	International Commission for Radiological Protection
CSP:	*Code de la santé publique* / Public Health Code
CUMP:	*Cellule d'urgence médico-psychologique* / Medical-Psychological Emergency Unit
DGS:	*Direction générale de la santé* / National Health Directorate
DGSNR :	*Direction générale de la sûreté nucléaire et de la radioprotection* / National Directorate for Nuclear Safety and Radiation protection
DTI :	*Dose totale indicative* / Total Indicative Dose
FISAC :	*Fonds d'intervention pour les services, l'artisanat et le commerce* / Intervention Fund for Service Providers, Craft and Merchant Activity
GIP :	*Groupement d'intérêt public* / Public Interest Grouping

INB : *Installation nucléaire de base* / Basic Nuclear Facility

InVS : *Institut de veille sanitaire* /
French Institute for Public Health Surveillance

IRSN : *Institut de radioprotection et de sûreté nucléaire* /
French Institute for Radiation protection and Nuclear Safety

I-SED : *Intervenant en situation d'exposition durable* /
Existing Exposure Situation Workers

NMA : *Niveau maximal admissible* / Maximum Permitted Level

OMS : *Organisation mondiale de la santé* / World Health Organisation

ORSEC : *Organisation de la réponse de sécurité civile* /
Organisation for Civil Security Response

PCR : *Personne compétente en radioprotection* /
Radiation Protection Qualified Expert

PE : *Périmètre d'éloignement* / Relocation Perimeter

PPI : *Plan particulier d'intervention* / The off-site emergency plan

PUI : *Plan d'urgence interne* / On-site emergency plan

RCN : *Responsabilité civile nucléaire* / Nuclear civil liability

ZPP : *Zone de protection des populations* / Public Protection Zone

ZST : *Zone de surveillance renforcée des territoires* /
Heightened Territorial Surveillance Zone

REFERENCES

[1] ICRP Publication 103, Elsevier, 2007 The 2007 Recommendations of the International Commission on Radiological Protection.

[2] AIEA 2011, Radiation protection and safety of radiation sources: International Basic Safety Standards.

[3] Article R.1333-75 of the Public Health Code (Code de la Santé Publique).

[4] Article R.1333-77 of the Public Health Code (Code de la Santé Publique).

[5] Articles R1333-59 à 66 of the Public Health Code (Code de la Santé Publique).

[6] Articles R1333-56 à 58 of the Public Health Code (Code de la Santé Publique).

[7] Regulation (EURATOM) No. 3954/87 of the Council dated 22 December 1987 as modified by Regulation 2218/89 dated 18 July 1989 laying down maximum permitted levels of radioactive contamination of foodstuffs and of feeding stuffs following a nuclear accident or any other case of radiological emergency.

[8] Regulation (EC) No. 178/2002 of the European Parliament and Council dated 28 January 2002 laying down the general principles and requirements of food law, establishing the European Food Safety Authority and laying down procedures in matters of food safety.

[9] ASN Resolution No. 2007-DL-003 dated 7 March 2007 regarding the health-related inspections for radiological quality in water intended for human consumption, as applied through the DGS/EA4/2007/232 Circular dated 13 June 2007 on testing and management measures for health-related risks due to the presence of radionuclides in water intended for human consumption.

[10] Articles R1333-83 to 88 of the Public Health Code.

[11] Order dated 8 December 2005 regarding medical aptitude testing, radiological surveillance and training or information measures for the benefit of workers involved in managing radiological emergency situations.

[12] Interministerial directive dated 29 November 2005 on the achievement and the processing of measurements of radioactivity in the environment in case of an event causing a radiological emergency situation.

[13] Act No. 68-943 dated 30 October 1968 on third-party liability in the field of nuclear energy.

LIST OF WORKING DOCUMENTS PRODUCED BY CODIRPA[17]

Lists of working group reports:

- GT1: *Levée des actions d'urgence de protection des populations et réduction de la contamination en milieu bâti* / Lifting emergency population protection measures and reduction of contamination in built environments (headed by ASN)
- GT : *Vie dans les territoires ruraux contaminés, agriculture et eau* / Living in contaminated rural territories, agriculture and water (headed by the Ministry of Agriculture /CGAEER)
- GT3: *Évaluation des conséquences radiologiques et dosimétriques* / Assessing radiological and dosimetric consequences (headed by IRSN)
- GT4: *Suivi sanitaire des populations* / Health-related follow-up in populations (headed by InVS)
- GT : *Indemnisation* / Compensation (headed by DGEMP)
- GT6: *Gestion des déchets, produits contaminés et terres contaminées* / Waste management, contaminated products and contaminated land (headed by ASN)
- GT7: *Organisation des pouvoirs publics et implication des « parties prenantes »* / Organisation *of* public authorities and 'stakeholder' involvement (headed by SGDN)
- GT8: *Communication* / Communication (headed by ASN)
- GT "Hypotheses" *Choix des hypothèses retenues pour les évaluations des conséquences radiologiques et dosimétriques* / Selecting the hypotheses used in assessing radiological and dosimetric consequences (headed by IRSN)
- GT "Contributors" (headed by ASN)
- GT "Water": *Gestion de la ressource en eau* / Water resource management (headed by the Ministry in charge of Agriculture / CGAAER)

17. These documents are available in French at the ASN website (www.asn.fr).

- GT "Regulations" (jointly headed by CGIET and ASN)
- GT "Radiation protection Culture" (headed by CEPN)
- GT "Public Reception and Information Centre"
  (steered by the Ministry of the Interior, Overseas, Local Authorities and Immigration)

List of reports produced by CODIRPA

- *Guide expérimental de préparation à la sortie de la phase d'urgence à la suite d'un accident nucléaire conduisant à des rejets de moyenne ampleur et de courte durée sur le territoire français* / An experimental guide to preparing for the exit from the emergency phase following a nuclear accident causing releases of moderate scale (may 2010)
- Summary of local consensus-building efforts 2009
- *Lignes directrices de préparation à la gestion sur le long terme de territoires contaminés suite à un accident nucléaire sur le territoire français (rapport de la commission 2 du CODIRPA)* / Guidelines for preparing long-term management of contaminated territories following a nuclear accident on french soil (Report by CODIRPA Commission II)

Other documents

- *Guide d'aide à la décision pour la gestion du milieu agricole en cas d'accident nucléaire (guide IRSN/ACTA)* / Decision-making assistance guide for managing agricultural environments in the event of a nuclear accident (IRSN/ACTA Guide)
- *Actes du séminaire international post-accidentel nucléaire des 6 et 7 décembre 2007* / Proceedings to the international conference on nuclear post-accident situations, 6-7 December 2007
- *Synthèse du séminaire international post-accidentel nucléaire des 5 et 6 mai 2011* / Summary of international conference on nuclear post-accident situations, 5-6 May 2011

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