INTERNATIONAL COMMISSION ON RADIOLOGICAL PROTECTION

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Report of ICRP Task Group 84 on Initial Lessons Learned from the Nuclear Power Plant Accident in Japan vis-à-vis the ICRP System of Radiological Protection

In June 2011 ICRP Task Group 84 was established on Initial Lessons from the NPP Accident in Japan vis-à-vis the ICRP System of Radiological Protection.

Most ICRP Task Groups are formed for the purpose of developing recommendations or guidance to be published in the Annals of the ICRP, and report to an ICRP Committee. Task Group 84 was exceptional in that it reported directly to the ICRP Main Commission, and was asked to develop recommendations to inform the programme of work of ICRP.

The Task Group, led by ICRP Vice-chair Abel González, identified issues and made recommendations relevant to the ICRP system of radiological protection related to the efforts carried out to protect people against radiation exposure during and after the accident at the Fukushima Daiichi nuclear power plant in Japan. Approximately half of the members of the Task Group were experts from Japanese authorities, research institutes, and universities, with the rest being ICRP Main Commission and Committee members.

The report of the Task Group was accepted by the ICRP Main Commission on October 31, 2012 during the ICRP Main Commission meeting held in Fukushima City, Japan. As the title suggests, rather than trying to identify 'lessons learned', the following summary report identifies issues and makes recommendations to the ICRP Main Commission. The report does not necessarily reflect the opinions of ICRP, but serves as an important input into the identification and prioritisation of actions for ICRP.

ICRP is already taking action based on some of the issues identified and recommendations made by the Task Group. These issues and recommendations will continue to influence the ICRP programme of work for years to come.

The Task Group compiled a considerable amount of detailed information not reflected in this summary. The Main Commission has encouraged the members of the Task Group to publish this information in the open literature.

INTERNATIONAL COMMISSION ON RADIOLOGICAL PROTECTION

Summary Report of ICRP Task Group 84

Issues Identified from the NPP Accident in Japan and Recommendations to Improve the System of Radiological Protection

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Following the Fukushima accident, ICRP convened a Task Group to identify issues arising from the accident with respect to the ICRP system of radiological protection. While the affected people were largely protected against radiation exposure and no one incurred a lethal dose of radiation (or a dose sufficiently large to cause radiation sickness), many radiological protection issues were raised.

ICRP, therefore, considered it important to summarize the issues identified following this extraordinary accident. Eighteen issues were identified as needing attention, outlined below. Relevant ICRP Recommendations were scrutinized, issues were collected and suggestions for ICRP were compiled.

The issues considered in this report have been assembled in an arbitrary order. It is important to recognize that many of the topics discussed in the current report had already been noted before the March 2011 accident as requiring further analysis.

1. Inferring radiation risks (and the misunderstanding of nominal risk coefficients)

In the aftermath of the accident, claims were raised by groups and the media that the actual risk of radiation exposure is much higher than the nominal risk coefficients recommended by ICRP. In particular, the dose and dose-rate effectiveness factor used by ICRP for estimating radiation risk at low doses were questioned in the media, notably, during a television show with a wide viewing audience in Japan.

The substantial biological, epidemiological, and ethical foundations supporting the basic notion of the nominal risk coefficients used for radiological protection purposes were misunderstood by the public at large in Japan, and the media unfortunately contributed to this misunderstanding. The concept of a dose and dose-rate effectiveness factor (DDREF) was notably not understood; in part because its wording is somewhat convoluted, even in English, but particularly after translation into Japanese and other languages. Following a review of the biological and epidemiological information on the health risks attributable to ionising radiation, the new ICRP Recommendations reconfirm previous estimates of the combined detriment due to excess cancer and heritable effects, which

remain unchanged at around 5% per sievert of effective dose. This value is coherent and consistent with international estimates of radiation risk, e.g. the estimates of the United Nations Scientific Committee on the Effects of Atomic Radiation, and the claims that radiation risks have been underestimated by ICRP are thus not substantiated.

2. Attributing radiation effects from low dose exposures

Since the accident, hypothetical estimates of future casualties due to the accident have been made. They oscillated between some tens of cases in the peer reviewed literature to half a million in reports by the media. These alarmist and unfounded theoretical calculations have caused severe emotional distress in the Japanese population.

The epistemological limitations of the sciences of radio-biology and radio-epidemiology, and their influence on the attribution of health effects to low-dose exposure situations are often ignored. A clear explanation of these limitations is essential for demonstrating the reasons why collective effective doses aggregated from small notional individual doses should not be used to attribute health effects to radiation exposure situations, neither retrospectively nor prospectively.

Notwithstanding, it may be necessary for decision-making bodies to ascribe nominal radiation risks to prospective exposure situations and impose radiological protection measures even at low doses, in part for reasons of social duty, responsibility, utility, prudence and precaution.

3. Quantifying radiation exposure

In the aftermath of the accident, the quantities and units used for quantifying radiation exposure of individuals in terms of radiation doses have caused considerable communication problems; these include the following:

- the differences between the quantities have not been well explained and are not well understood even by educated audiences;
- the distinction between the quantities used in the radiological protection system and the operational quantities used for radiation measurement is even more difficult to understand in part due to semantic problems;
- the use of the same unit for the quantities equivalent dose of an an organ and effective dose without always specifying which quantity is used has enhanced confusion further;
- the lack of a formal quantity for a radiation-weighted dose for high doses (such as an effectiveness-weighted to distinguish from the radiation weight factor) was, fortunately, not an issue in this accident but continues to be an unresolved issue; and,
- there is very little understanding for why there are so many different quantities used in radiation protection, not only many dosimetric quantities but also many radiometric quantities (such as activity and activity concentration).

There are great difficulties to communicate radiological information to non-experts and the public at large using the ICRP system and its quantities. This is a consequence of the rather intricate concept behind the system of quantities which uses more than one quantity (organ (equivalent) doses and whole body (effective) dose) and combines physical exposure data with scientific data on radiation risk for organs and tissues. In other words, the system and the quantities have shown to be well suited for operational radiation protection but they are much less suited for communication with non-experts, particularly in emergency situations.

An important confusion has been triggered by the fact that the quantities equivalent dose (to an organ or tissue) and effective dose have a common unit, the sievert. The problem seems to have been particularly relevant in the reporting of thyroid doses from the accident and is related to the fact that incorporation of radioactive iodine leads to radiation exposure almost exclusively to the

thyroid. Usually the equivalent dose is the relevant quantity for reporting organ doses but, if the dose is reported indicating only the unit, it can easily be confused with effective doses. The confusion created by not specifying the dose quantity when giving numerical values in terms of Sv merits a careful analysis of possibilities to improve the situation.

In spite of the learned difficulties, it should be emphasized that the quantities and units of the ICRP system of radiation protection have a record of successful application in practical radiation protection. They might not be well suited for communication, and probably for decision making in emergency and post-emergency situations. A strict and consequent application of a simplified dose reporting (e.g., organ dose, effective dose) could help to improve the situation in cases of emergencies. It should be remembered and stressed that the ICRP protection quantities have not been introduced for (individual or collective) risk assessment but for planning radiation protection in the low dose range and for verifying compliance with individual dose restrictions.

4. Assessing the importance of internal exposures

Internal exposures, namely radiation exposure to radionuclides incorporated into the body, have been a source of debate among the public and the media and also in some scientific circles in Japan. For a given (organ or effective) dose, internal exposures appear to be perceived as more dangerous than the same exposure from external sources.

There is compelling scientific evidence that radiation risk depends on the amount of dose received, and not on whether that dose is delivered from outside or inside the body, but this is largely ignored by the media and the public. ICRP considers that for a given radiation dose the same radiation risk should be expected, whether irradiation is from outside or inside the body. For a given dose, the ICRP system of protection is more conservative for internal than for external exposures; for the former it limits the committed dose rather than the dose actually incurred.

5. Managing emergency crises

Available international guidance address a number of issues usually arising from the emergency crisis that follows from a serious accident involving large releases of radioactive materials into the environment. However, it seems to have been scarce for those managing the crisis created by the accident. The issues of concern included the following:

- the management of an emergency exposure situation created by a prolonged release of radioactive substances from multiple units rather than by an acute release from single unit (as it was usually expected from a nuclear accident);
- the extendibility of the emergency planning zones in order to follow a changing situation;
- the prioritization of emergency protective measures;
- the planning for lifting emergency protective measures; and,
- when, why and how an emergency exposure situation should become an existing exposure situation.

In sum, those handling the crisis have difficulties with the application of the international guidance available for managing the emergency exposure situation. There were problems associated with the protracted period of release and with extending emergency planning zones (this issue is important during the emergency response phase but it may not be a matter of the principle of radiological protection but rather of regulatory policy). Prioritizing emergency protective measures was another issue of concern. The absence of quantitative recommendations for lifting emergency protective measures continues to create significant problems.

Many specific issues for crisis management following a serious accident need to be addressed more clearly in ICRP Recommendations, including: the management of the unique emergency exposure

situation created by the prolonged (rather than acute) release from the accident; the consequent need of extendibility of the emergency planning zones and of prioritization of emergency protective measures; and, finally and significantly, the lifting of emergency protective measures and the transit from the emergency exposure situation to an existing exposure situation.

6. Protecting rescuers and volunteers

The adequacy of the occupational radiological protection recommendations for workers who are not customary 'radiation' workers has been questioned. In the aftermath of the accident, these workers have included:

- rescuers, namely specialized saviours aimed at working to remove people from dangerous or distressing situations even at their own risk, including members of defence forces, fire-fighters, etc.; and,
- volunteers, namely people who freely offer to help in the aftermath of an accident rather than in the early phase.

There was some confusion on how to deal with rescuers and volunteers. For the rescuers, the dose limit for occupational exposed 'normal' workers had to be increased by the authorities after the accident, thus creating a credibility issue. For the volunteers, there was confusion on what type of dose restriction should be applied, which was increased by the fact that some volunteers were inhabiting the area, and were therefore already subjected to doses relatively elevated due to the accident, and other volunteers were coming from outside the area (and the additional dose received because of their volunteered work can be very different for these two groups).

The ICRP system of occupational protection is not specifically tailored to workers who are not 'radiation' workers but who nevertheless may be highly exposed to radiation in specific circumstances, a notable example being the 'rescuers' that intervened in the accident. The system was not conceived for people who are willingly taking high risks for saving lives or other charitable endeavour. The system is even less tailored to volunteer workers, namely, casual helpers in an emergency. Moreover, no clear policy exists for making a distinction between volunteers from the affected area and volunteers from outside the affected area.

7. Responding with medical aid

A number of medical management issues arose in the aftermath of the accident. These included the following:

- problems related to an accident as a combined disaster;
- questions on personnel involved in emergency medicine;
- dealing with people's contamination, including the selection of a screening level for contamination and the consequences of the removal of clothing ;
- the role of health physics experts for radiation safety during emergencies ;
- the appropriate model core curriculum in medical schools ;
- risk communication; and,
- medical preparedness, including drills and exercises.

Many lessons on medical management have been learned from the accident. Some of the more relevant lessons are the following:

- the complexity of disasters including damage to nuclear or radiological facilities, particularly in the case of earthquakes, increased the need for multidisciplinary measures in the medical response to such disasters;

- drills and exercises for medical radiological emergency should be carried out using scenarios that include a radiological/nuclear event caused by extreme natural events such as earthquakes and tsunamis;
- medical professionals should have basic knowledge on the phenomena of radioactivity and radiation, on their effects and, particularly on contamination with radionuclides;
- basic knowledge of radiation and its effects is extremely important for physicians, nurses, radiation technologists, and first medical responders, because all of these professionals might be involved in case of a radiological emergency medical response; and,
- the potential of damage to lifelines as well as the monitoring and/or calculation system for radiation in case of an earthquake requires intense focus and vigilance.

8. Justifying necessary but disruptive protective actions

Like in other similar situations, some of the decisions taken after the accident in order to protect the public were extremely disruptive and caused significant social harm. For instance, evacuating people from their homes is a measure that it is prone to cause serious disturbance to normal public life. Questions have arisen on whether some of these measures are justified, in the sense that they really produce more good than harm.

While the radiological protection principle of justification is usually applied to the introduction of new sources of radiation, which are expected to increase exposure of people, the principle is equally applicable to the introduction of disruptive protective actions, which are expected to decrease the exposure of people. In the immediate emergency situation and in the long-term existing exposure situation, people can only justify disruptive protective actions from the perspective of the benefit obtained from the protective action.

Applying justification in an emergency situation such as that triggered by the accident is particularly difficult. For instance, decisions on whether or not to evacuate people from areas of elevated but not high doses can present difficult dilemmas. If people remain they will incur some radiation doses and increase their plausibility of radiation induced harm in the future; if they are evacuated such a plausibility will disappear but they will certainly incur the actual detriments associated to the evacuation itself.

Further guidance on the application of the justification principle in these demanding situations would be welcomed. It should be recognized, however, that one problem with justification is that ‘balancing’ good and harm is not confined to issues associated with radiation exposure. Other non-radiation-related benefits and detriments arising from the protective action must also be considered, thus going far beyond the scope of radiological protection.

9. Transiting from an emergency to an existing situation

There have been some difficulties for transiting from the emergency exposure situation created by the accident to the existing exposure situation that will remain in the long term. A main difficulty seems to be how to define and decide when the emergency exposure situation is terminated and the existing exposure situation starts.

Transiting from the emergency exposure situation caused by the accident to an existing exposure situation in the accident aftermath has caused doubts in the Japanese authorities. It is felt in Japan that it would be easier and clearer to judge when the emergency exposure situation shifts to an existing exposure situation if the ICRP recommendations were clearer and more quantitative.

10. Rehabilitating evacuated areas

A clear lesson from the Chernobyl accident was that it was, and continues to be, extremely difficult to rehabilitate an area evacuated as a result of a nuclear accident. A large intergovernmental project was required to tackle this problem after that accident. A similar situation is occurring in the areas of the Fukushima Prefecture that were evacuated due to the accident.

Rehabilitating evacuated areas, e.g. relocating evacuated people back to their homes, constructing residential habitats for both returning refugees and new residents, has proved to be extremely difficult. In fact, evacuees from the regions designated by the Japanese government as 'difficult to return' should be relocated at least for some years. However, it is expected that those regions may be rehabilitated in the not too distant future. At that time, people including part of the relocated population may want to move into the region despite the fact that that the exposure might still be somewhat elevated. Questions arising in this case are: what is the category of the exposure situation, what is the type of exposure, and consequently how should the exposure be controlled?

The ICRP Recommendations have apparently produced some confusion among members of the public subjected to evacuation. It seems that they are interpreted as indicating that returning to their homes is a planned exposure situation and, therefore, they shall be subjected to the ICRP recommended dose limit of 1 mSv/y for planned exposure situations. While the ICRP Recommendations are not explicit on how to handle this type of situation, it might be considered implicit that returning from a temporary evacuation leads to an existing exposure situation.

11. Categorizing public exposures due to an accident

Emergency exposure situations are defined as situations that may occur during the operation of a planned exposure situation, or from a malicious act, or from any other unexpected situation, and require urgent action in order to avoid or reduce undesirable consequences. Exposure under a radiological emergency is an emergency exposure situation, and according to the ICRP recommendations should be controlled with reference levels. Implicit to this situation is the fact that restrictions on doses that were in place in the planned exposure situation before the accident, specifically the relevant regulations on dose limitations, are "suspended" or "relaxed" to make certain important and unavoidable actions possible, or to allow people to stay in the affected areas with exposure above the "normal" dose limits without violating the principles of protection i.e. to prevent the occurrence of deterministic effects and to reduce the risk of occurrence of stochastic effects to as low as reasonably achievable taking into account the prevailing circumstances.

The exposure of the public being delivered during an emergency could conceptually be treated as an existing exposure situation from the beginning and consequently no concepts such as transition from an emergency exposure situation to an existing one would really be needed. However, the time frame and the controllability of the source differ between emergency and existing exposure situations. Protective actions must be implemented urgently and in a timely manner to maximize effectiveness in an emergency exposure situation, generally on the basis of estimated doses. In the existing exposure situation, planning protective actions can only be done on the basis of good knowledge of the actual conditions of exposure to control the pathways, and often based on measured individual doses.

12. Restricting individual doses of members of the public

As the accident released large amounts of radioactive materials into the habitat, the issue on how to restrict doses to members of the public became crucial. In terms of radiological protection the evacuation and food restrictions that were adopted at the time by the authorities effectively reduced the dose received by people living in the affected area. In selecting the reference levels in some

areas under a *de facto* emergency exposure situation, the authorities tried to follow the situation-based approach recommended by ICRP. In deriving the criteria, the regulatory authority selected a reference level of 20 mSv/y, while the dose limit for planned exposure situations was (and continues to be) 1 mSv/y.

However, people living in the affected areas were confused with the logic behind the restrictions applied to individual doses, in what was perceived as a mixture of the pre-emergency, emergency and post-emergency protection policies. The fact that the reactor conditions continued to be not completely stable for a long time was not helpful. A state of uncertainty arose among the public at large, and also among authorities, on the individual dose restrictions recommended for public protection, fundamentally between the dose limit of 1 mSv/y and the various reference levels going up to 100 mSv.

There seems considerable discrepancy in understanding the dose value of 1 mSv/y. The general public and society at large tend to regard a dose above this value dangerous and consequently this creates a lot of complications in coping with radiological events.

Decisions on the levels used for restricting public doses are naturally controversial because they involve judgments on individual acceptability of risks. The issue becomes exceptionally difficult in a radiological emergency, where doses are difficult to control but people expect to be particularly well protected. The logic behind different levels of restrictions according to the prevailing circumstances is difficult to grasp and accept not only by the public but also by the competent authorities.

While the current ICRP Recommendations do take account of most of the problems described on individual dose restrictions, they perhaps fail to convey clearly the assurance for protection under any circumstance demanded by the public. For instance, it is not clear for the public that the reference levels recommended for dealing with emergencies, while being levels of dose higher than the limits used for planned situations, still provide sufficient protection to members of the public. It is also not clear what the rational is for the numbers recommended by ICRP.

13. Caring for infants and children

The protection of children in the accident aftermath has been of particular concern in Japan and parents are extremely worried about the protection of their offspring. They are suspicious that the levels of dose applied to the protection of the population as a whole do not provide sufficient safety for their offspring. They feel the reference level of 20 mSv/y is unacceptably high for children since 1 mSv/y is the established dose limit for the public.

A definite ICRP document with recommendations specifically dedicated to the protection of children and infants is not available. The relatively small difference between the detriment adjusted nominal risk coefficient for the population as a whole, which includes children, and those for the adult population, i.e. around 30%, merits at least further consideration, particularly taking into account that new data on radiation risks of children have been recently reported.

14. Considering pregnant women and their fœtuses and embryos

Pregnant women are extremely concerned about the health effects of radiation exposure due to the accident on themselves and their unborn child. Affording proper protection to fœtuses and embryos has been controversial and unclear, even at the level of the medical profession. Concerns are especially high with respect to exposures after uptake of radioactive material.

It seems that, while ICRP recommendations for the protection of pregnant women, fœtuses and embryos are detailed and available, they appear to concentrate on female workers and patients and

their fœtuses and embryos. Specific recommendations for female members of the public are not clearly available. This is especially the case for exposures after emergency and existing exposure situations. In these situations the biokinetic specificities of certain radionuclides have to be considered including the biokinetic changes of some radionuclides during the different phases of the developing embryos and fœtuses.

15. Monitoring public protection

Two main issues on monitoring the protection of the public have arisen in the aftermath of the accident, as follows:

- what should be the general policy of environmental monitoring after an accident; and,
- why members of the public are not individually monitored while workers receive that benefit.

While recommendations are available on radiation monitoring for the protection of people living in long term contaminated areas after a nuclear accident, there is a general lack of international guidance on monitoring the radiological protection of the public in the more immediate aftermath of an accident. This deficiency creates unnecessary public anxiety.

16. Dealing with 'contamination' of territories, rubble and residues, and consumer products

Following the accident, serious problems arose in relation to the presence of radioactive substances originating from the accident in the public domain, including the surrounding environment and consumer products. This situation caused serious concerns to the population and placed pressure on the authorities to act.

The fallout of some of the releases from the accident has deposited radioactive substances over large territories. The issues for the authorities are whether these territories are 'contaminated' and whether they have to be 'remediated' in order to allow their habitation. It seems therefore that there is a strong connection between the misunderstandings of the concepts of 'contamination', 'remediation' and 'habitability'. For anxious members of the general public, the issue can be summarized in this simple question: Is it safe for me and my family to live in this territory?

The disposal of 'contaminated' rubble (and more so "cleaned up dirt") is probably one of the most serious issues in the aftermath of the accident. A fraction of the 'contaminated' rubble may contain substantial amounts of radioactive substances, which may mean that it has to be treated as radioactive waste with the regulations required by relevant international conventions. The main problem, however, is that most of the rubble is not really 'contaminated' but will be so perceived by the public making its disposal an artificially serious issue.

It is expected that, following significant releases of radioactive substances into the environment, like those from the accident, products used or consumed by the public, such as foodstuffs, water and non-edible consumer products, may present slightly elevated levels of radioactive substances attributable to the accident. While natural radionuclides are present in consumer products because of natural processes, the inclusion of artificial radionuclides following accidents is a serious issue because it is perceived as the more pervasive process of incorporation of radioactivity. Its regulation has been controversial and not straightforward. In fact, the control of these consumer products is one of the main unresolved issues of practical radiological protection. It has created (and continues to create) many problems for Japan in general and for the Fukushima region in particular.

In Japan, the authorities initially issued specific guidelines for food and drink intake restrictions, which differed to both the WHO guidelines (which are lower) and to the Codex Alimentarius (which are higher). They were modified over time and the different values used were not necessarily helpful to reduce the level of confusion. In sum, the international regulation of consumer products

containing radioactive substances is bizarre and it is not surprising that it is causing so much confusion in the Japanese public and authorities alike.

Some intergovernmental agreements have been reached for dealing with the contamination of foodstuff, drinking water and non-edible consumer products. However, these agreements are incoherent and inconsistent among them. Moreover, there are differences between consumer products under accident conditions and in normal situations and also between domestic versus international control and the available guidance is not specific on these issues.

The absence of clear quantitative international guidance for dealing with “contamination” in the public domain, e.g., for remediating “contaminated” territories, disposing of “contaminated” debris and rubble, or controlling “contaminated” consumer products, has caused many problems to the authorities. In aftermath of the accident, this is one of the more important issues to deal with.

17. Recognizing the importance of psychological consequences

The radiation exposure situations created by the accident, probably combined with the outcome of the preceding catastrophic earthquake and tsunami, seems to be producing serious psychological consequences in the affected population. The psychological consequences include the same type of outcomes observed in other similar situations, such as depression, grieving, post-traumatic stress disorder, chronic anxiety, sleep disturbances, severe headaches, and increased smoking and alcohol use. However, in many areas some other outcomes are observable, such as intense anger, despair, long-term anxiety about health and health of children and, in particular, stigma and discrimination.

A recently published report by Japan’s Reconstruction Agency indicates that the stresses of personal involvement in the evacuation, management and clean-up related to the Fukushima nuclear accident have emerged as the biggest factors in ill health for Japanese people.

The accident has reconfirmed that psychological consequences are a major outcome from major radiation accidents. While they are health effects in their own right, they are basically ignored in radiological protection recommendations and standards. Advance planning for emergencies should recognise the necessity for dealing with psychological consequences and the concerns that may be engendered for decades following an accident. Responding to the mental health needs of the community as a whole raises many challenges of preparation.

18. Fostering the sharing of information

As has happened in most previous accidents involving radiation exposure, it has been recognized that after the Fukushima accident, the communication between the radiological protection experts and the authorities and between the authorities and the public at large has presented difficulties.

The accident experience reiterated how important communication is in the aftermath of a serious accident involving radiation exposure of the public. Mistakes in communicating radiation risk and protection measures to members of the public and the media have been made during previous accidents and were repeated in this accident.

A number of lessons have been reconfirmed on various issues, including:

- the relevant role of the media in a serious accident;
- the importance of sharing information with the media regularly;
- as this was the first accident involving social networks, many lessons should be extracted from this unique experience;
- the significance of involving non-radiation experts in the sharing of information; and,

- the impact of sharing information with the medical profession and with teachers.

Recommendations

While substantive international guidance is available for tackling the issues addressed by the Task Group, many lessons can be extracted from the accident experience. The Task Group recommends that action should be taken by the Commission, to ensure that:

- radiation risk coefficients of potential health effects be properly interpreted;
- the limitations of epidemiological studies for attributing radiation effects following low exposures be understood;
- any confusion on protection quantities and units be resolved;
- the potential hazard from the intake of radionuclides into the body be properly interpreted;
- rescuers and volunteers be protected with an ad hoc system;
- clear recommendations on crisis management and medical care and on recovery and rehabilitation be available;
- recommendations on public protection levels (including infant, children and pregnant women and their expected offspring) and on related issues (such as, categorizing public exposures due to an accident, transiting from an emergency to an existing situation, and rehabilitating evacuated areas) be consistent and understood;
- updated recommendations on public monitoring policy be available;
- tolerable contamination levels for consumer products, rubble and residues be defined;
- strategies for mitigating the serious psychological consequences arising from radiological accidents be sought; and,
- failures in fostering information sharing on radiological protection policy after an accident be addressed with recommendations to minimize such communication lapses.
-