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Method for the development of emergency response preparedness for nuclear or radiological accidents

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FOREWORD

The aim of this publication is to provide practical guidance and tools for emergency planning. If implemented now, it will provide a basic capability for emergency response in the event of a serious radiological accident. The Technical Document has, as yet, received limited review, but will help provide the foundations for the IAEA's formal guidance on emergency planning. Comments are welcomed, and following a period of time that will have allowed for a more extensive review, it is intended to publish the final practical guidance as a Safety Report.

The development of a written plan and an adequate preparedness cannot be effective unless the appropriate preparatory work is performed. In most countries several organizations will be identified as having a potential role to play in a radiological emergency. An organization with a mandate to organize and coordinate the country's radiological response must take the lead in writing the national plan and doing the necessary preliminary work. Experience shows that a considerable amount of discussion between response organizations will be needed to determine their precise roles and the resources and capabilities needed in an emergency.

Experience also indicates that the development of emergency response plans will be difficult without the cooperation of the organizations which have a major responsibility in a radiological emergency. It is best to involve them early in the development of plans.

Once emergency plans are adopted, each individual organization must ensure that it can carry out its role effectively through the development of the appropriate response organization and implementing procedures. After that, exercising and testing of the plans becomes a vital component. Finally, periodic reviews of the plans and modifications, based on actual events and exercise experience, must be performed.

EDITORIAL NOTE

In preparing this publication for press, staff of the IAEA have made up the pages from the original manuscript(s). The views expressed do not necessarily reflect those of the governments of the nominating Member States or of the nominating organizations.

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CONTENTS

1. INTRODUCTION

1 1 BACKGROUND

The Chernobyl and Goiânia accidents have resulted in a reexamination of many emergency planning principles and practices The new basic obligations, responsibilities and requirements for emergency situations are established in the "International Basic Safety Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources" [1] Updated guidance on the radiation protection criteria for use in planning for response to radiation emergencies is provided in "Intervention Criteria in a Nuclear or Radiation Emergency" [2]

This report supplements IAEA emergency preparedness guidance [3-5] published in the 1980s, and is consistent with the new international guidance It provides practical advice for the development of an emergency response capability based on the potential nature and magnitude of the risk

In order to apply this method, emergency planners should have a good understanding of the basic radiological emergency response principles Therefore, other applicable international guidance [1, 2] should be reviewed before using this report

1 2 OBJECTIVE

This report provides a practical step-by-step method for developing integrated user, local and national emergency response capabilities It can also be used as the basis for conducting an audit of an existing emergency response capability

1 3 SCOPE

Emergency planning must be carried out at two major levels First the user (i e , registrant or licensee) must be prepared to mitigate the potential consequences of the accident at the source and alert off-site officials Second the off-site officials (i e , Intervening Organizations) must be prepared to manage and reduce the impact on the public This TECDOC addresses development of a response capability at both levels

The range of potential radiological accidents of concern is enormous, ranging from a major reactor accident to accidents involving small amounts of radioactive material This method covers planning for the entire range of potential accidents

A minimum level of planning is appropriate in every country, even in those without any known radiological activities, because any state could be affected by an accident involving transportation, lost or stolen sources, or transboundary contamination.

Clearly, this method cannot take into account all site-specific or accident-specific factors Therefore, this report does not represent a set of obligations, planners should remain flexible in its use and adapt the requirements to take into account local socio-political and economic factors

1 4 STRUCTURE

The remainder of the document is divided into three sections

Section 2 reviews some basic concepts and describes the overall steps to follow to establish an adequate emergency response capability It also explains how to select the appropriate category of emergency planning applicable to activities in the country

Section 3 contains a worksheet for the identification and assignment of critical emergency preparedness and response functions.

Section 4 contains detailed checklists of items that should be considered by emergency planners in developing and maintaining the capability to respond to accidents. This section contains five sub-sections, one for each category of emergency planning. Readers need to refer only to the sub-section which is applicable to their activities.

2. ESTABLISHING AN EMERGENCY RESPONSE CAPABILITY

2.1. BASIC CONCEPTS

The response to a radiological accident is basically the same as the response to any accident involving hazardous material. The major difference is that in many hazardous material accidents, but not all, the hazard can be smelled, seen or heard. This is not the case with radiological accidents. Therefore provisions should be developed to identify potential radiological hazards and inform the public and emergency workers of the actions they should take. Radiological plans should be incorporated into plans for all types of hazardous materials.

This section provides a brief review of some terms and concepts that must be understood before planning can begin. This is followed by a discussion of the major steps to follow for developing a capability to respond to nuclear or radiological accidents.

2.1.1. Objectives of emergency planning

The general objectives of emergency planning are to:

(a) reduce the risk or mitigate the consequences of the accident at its source,
(b) prevent serious deterministic health effects (e.g., death), and
(c) reduce the likely stochastic health effects (e.g., cancer) as much as reasonably achievable.

The first objective is the responsibility of the user of the radioactive material or the operator of the facility. It involves preventing or reducing the release of radioactive material and exposure of workers and the public. The next two objectives are the *combined* responsibility of users and off-site organizations. They require the implementation of protective actions.

International guidance [1, 2] specifies "generic intervention levels" (GIL) at which urgent and longer term protective actions should be taken by the public and "generic action levels" (GAL) at which controls should be placed in food. These levels were selected so that the protective actions would do more good than harm, that is, the risk avoided by averting a dose will be greater than the penalty incurred by applying the protective action. Notably this also means that taking protective actions at considerably lower or higher values could increase the overall risk to the public or workers. This guidance is summarized in Appendix 1.

GILs and GALs were not designed to be used **during** an emergency; they cannot be promptly measured in the field and do not address facility conditions. However, they should be used to develop, as part of planning, operational intervention levels (OIL) and other criteria which can easily be measured during an emergency (e.g., dose rate), and on which the need for protective action can be rapidly ascertained.

2.1.2. Emergency planning categories

Before any planning can begin, the practices and activities for which emergency response planning is necessary must be identified. Emergency planning could be different for each practice. However, this can be simplified by grouping practices into five categories, each presenting common features in terms of the magnitude and timing of the hazard. Table I defines the five emergency planning categories. Guidance in the remainder of this report is organized according to these "emergency planning categories". Note that these planning categories are only used as a convenient way to provide guidance on planning and are not used during an accident.

Emergency planning for category I practices is the most demanding. For the national agency, planning and implementing the capabilities to handle emergencies at category I facilities will ensure that the capability exists to handle events of the other categories. However, for the on-site and local organizations, planning and implementation should be based on local practices and activities.

TABLE I. EMERGENCY PLANNING CATEGORIES

Category	Description of where the category applies
I	Facilities with the potential for very large releases resulting in serious deterministic health effects off-site. In addition, areas near the facility that should be prepared to take protective actions promptly in response to an accident at the facility also require this level of planning.
II	Facilities with the potential for releases resulting in off-site doses above the urgent GILs but with little or no threat of doses resulting in deterministic health effects off-site. In addition, the areas that should be prepared to take protective actions in response to an accident at the facility also require this level of planning.
III	Facilities without significant off-site risk but with the potential for accidents resulting in deterministic health effects on-site. Jurisdictions that provide fire, police or medical support to these facilities also require this level of planning.
IV	Areas with little or no known threat. This is the minimum for all countries because accidents involving lost or stolen sources or the transportation of radioactive material are possible anywhere.
V	Areas with a substantial probability of needing to implement interventions related to food in the event of accidents at facilities outside the country.

2.1.3. Planning areas and zones

For most accident types, emergency response takes place over two distinct areas:

On-site area
The area surrounding the facility within the security perimeter, fence or other designed property marker. It can also be the controlled area around a radiography source or contaminated area. This is the area under the immediate control of the facility operator or user. For transportation accidents on public roads or territories, there is in effect no on-site area.

Off-site area
The area beyond that under the control of the facility or user. Appendix 2 gives a detailed description of the planning zones in this area.

For facilities with the potential for accidents resulting in major off-site releases (planning categories I and II), the level of planning will vary depending on the distance from the facility. For these facilities, planning can be discussed for three emergency planning zones, as shown in Figure 1, and as described below:

Precautionary action zone (PAZ)
Predesignated area around a facility where urgent protective actions have been preplanned and will be implemented immediately upon declaration of a general emergency (see Section 2.1.5). The goal is to substantially reduce the risk of deterministic health effects by taking protective action *before* a release.

Urgent protective action planning zone (UPZ)
Predesignated area around a facility where preparations are made to promptly implement urgent protective measures based on environmental monitoring.

Longer term protective action planning zone (LPZ)
Predesignated area around a facility furthest from the facility and including the urgent protective action planning zone. It is the area where preparations for effective implementation of protective actions to reduce the long term dose from deposition and ingestion should be developed in advance.

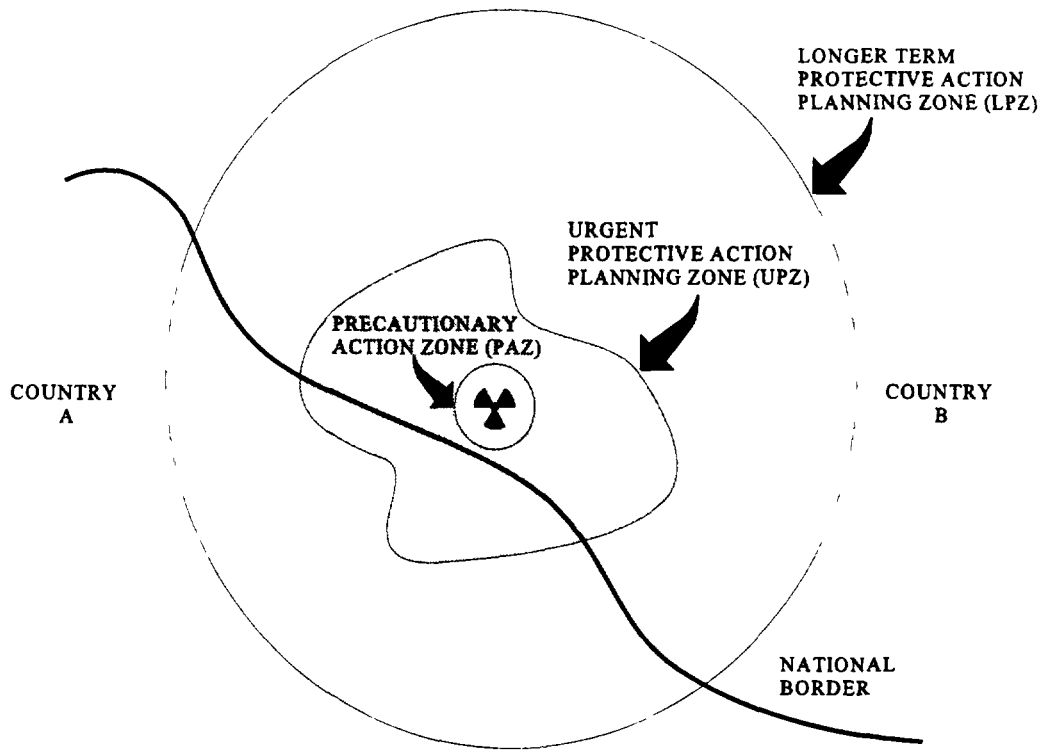

FIG. 1. Concept of emergency planning zones.

These zones should be roughly circular areas around the facility. The size of the zones can be determined by an analysis of the potential consequences. However, previous studies [8,9] of a full range of radiological and nuclear accidents provide a basis for generic zone sizes, as summarized in Appendix 2. The boundaries of the zones should be defined by local landmarks (e.g., roads or rivers) to allow easy identification during a response. It is important to note that the zones do not stop at national borders.

2.1.4. Planning levels and responsibilities

Effective emergency response requires mutually supportive and integrated emergency planning at three levels:

User - Facility
The staff at the facility or the personnel using the material at the time of the accident. They are responsible for:

(a) the immediate actions to mitigate the accident;
(b) protecting people on-site; and
(c) notifying off-site officials and providing them with recommendations on protective actions and technical assistance.

For transportation accidents, this includes the shipper, the owner of the source and the transporter.

Off-site

Organizations responsible for the protection of the public. This includes:

(a) Local officials: the government and support agencies responsible for providing immediate support to the user and prompt protection of the public in the vicinity. This also includes the police, fire fighting, civil defence or medical personnel who may be the first to learn of an accident. This may include officials from different countries if the facility is near a border.

(b) National and regional (province or State) officials: the governmental agencies responsible for planning and response on the national (or regional and State) level. These agencies are typically responsible for tasks that do not need to be implemented urgently to be effective. This includes:

    (i) longer term protective actions, and
    (ii) support of local officials in the event their capabilities are exceeded.

International

Organizations responsible for providing international assistance. This includes:

(a) IAEA implementation of the "Convention on Early Notification of a Nuclear Accident" and "Convention on Assistance in the Case of a Nuclear or Radiological Emergency". The parties to the Notification Convention commit to notify forthwith those countries that may be physically affected by an accident. These notifications can be made to directly or through IAEA. Areas in countries where urgent protective actions should be taken should be notified directly and not through IAEA. Under the Assistance Convention countries have committed to facilitate prompt assistance in the event of an accident.

(b) Organizations such as UNDHA or WHO that can provide technical, humanitarian or medical assistance in the event of an accident.

2.1.5. Emergency classes, conditions and immediate actions

Response to an emergency requires rapid and coordinated response. This can be accomplished through facilities using a classification system with the following emergency classes: general emergency, site area emergency and alert. The actions to be taken for each class should be coordinated in advance and be initiated upon declaration of the emergency. The immediate actions that should be taken for each class and other types of accidents are summarized in Appendix 3. The emergency classification should not be confused with the International Nuclear Events Scale (INES). INES is designed to indicate how serious an event was *after it is understood* and **is not the basis for the response**. Determining the INES rating is impossible early in an event, does not form part of the initial response, nor should determining the rating delay ant response actions.

2.1.6. Integrated planning concepts

Guidance is provided for each emergency planning category and is grouped into infrastructure and functional planning elements as follows.

(a) Infrastructure elements

i. Authority and Command and Control
ii. Organizational Responsibilities
iii. Response Coordination
iv. Plans and Procedures
v. Logistical Support, Emergency Supplies, Equipment, Communications and Facilities
vi. Training, Drills and Exercises

(b) Functional elements

i. Initial Accident Assessment and Classification
ii. Notification and Activation
iii. Accident Condition Mitigation
iv. Urgent Protective Actions
v. Public Education and Instruction
vi. Emergency Worker Protection
vii. Medical, Fire Fighting and Police Assistance
viii. Media Relations
ix. Longer Term Protective Actions and Intervention Related to Food
x. Psychological Impact Mitigation

The infrastructure elements must be in place to ensure that the functional elements of a response can be performed when needed (see Figure 2). Planning objectives are provided for each infrastructure element along with items to be considered when developing the capability to meet these objectives. Response objectives are provided for each functional element along with items to be considered in developing the capability. Response objectives are different from planning objectives in the following way: *planning objectives* aim at ensuring that a system, plans, procedures and resources are in place to achieve the *response objectives*. The response objective is what should be accomplished by the response.

In order to optimize the use of resources and the response effectiveness, it is recommended that response plans be highly coordinated and consolidated. In other words, planning should not be done in isolation between the organizations and agencies involved. For this purpose guidance is presented in section 4 for the user, local officials and national officials. Each planning element in Section 4 is assigned to those who appear to have a major role in implementation. The assignments are based on judgement and must be revised to reflect the conditions under which the guidance will be applied . In a consolidated approach, the element may be addressed by the user, the local authorities or the national authorities, or by a combination thereof, **as long as the plans are well coordinated**. Weaknesses at one level should be compensated at another.

Capabilities, plans and procedures should be structured into a coherent and interlocking system, as shown in Figure 3. The National Radiological Response Plan is a general description of the roles and responsibilities of all the responding organizations and their relationships. It is a summary of the more detailed plans and assures that all the other planning is integrated and compatible. At the next level are the plans developed by individual agencies, governmental jurisdictions, and facilities or users. The final level are the procedures (e.g., implementing instructions and operational procedures) and resources that will be used during an accident to carry out the plans

FIG. 2. Infrastructure needed to perform the functional areas

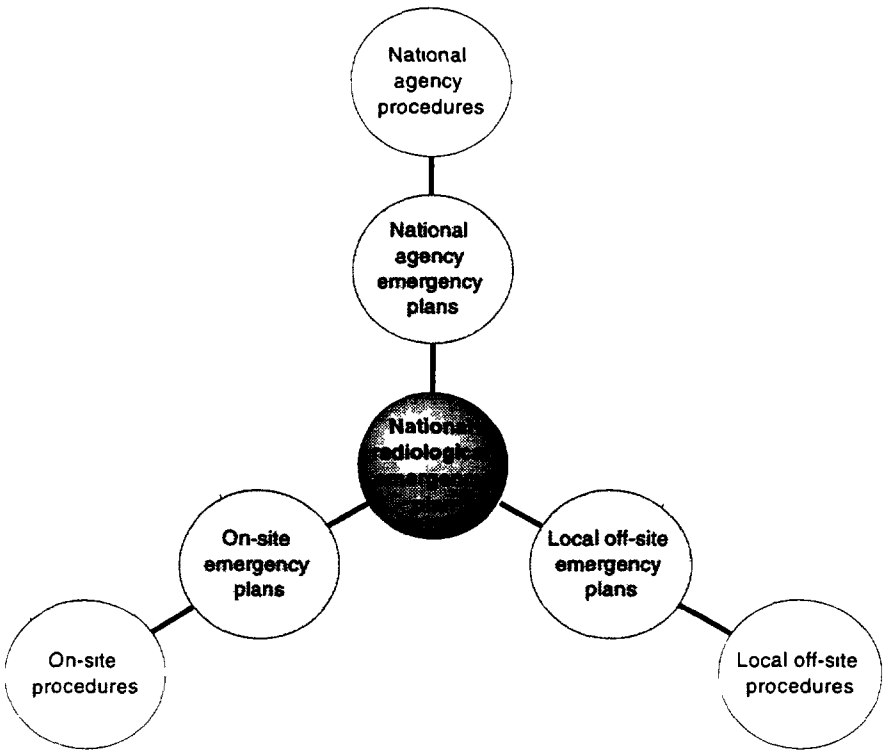

FIG. 3. Integrated planning concept.

2.2. STEP-BY-STEP APPROACH TO DEVELOPING AND IMPLEMENTING EMERGENCY RESPONSE PLANS AND PROCEDURES

2.2.1. Overview

The main features of the proposed methodology are:

(a) it is modular, i.e. the overall methodology is divided into self-contained tasks, can be planned, developed and executed independently;
(b) it is based on extensive consultation with all relevant organizations (*plans that have been developed in isolation have been consistently shown to be ineffective*); and
(c) it is iterative, i.e. plans and procedures are dynamic documents, may need to be revised throughout the process.

2.2.2. The tasks

There are ten tasks to develop and implement emergency response plans and procedures (see Fig. 4):

Task 1 - National policy review and development
Task 2 - Determine the level of preparedness needed
Task 3 - Develop the planning basis
Task 4 - Allocate responsibilities
Task 5 - Write the National Radiological Emergency Plan
Task 6 - Inform all relevant organizations
Task 7 - Form and train *interim* emergency response working group
Task 8 - Develop and implement detailed plans
Task 9 - Coordinate and test plans and procedures
Task 10 - Develop and implement ongoing updating and training programmes.

2.2.3. Getting started

A single overall National Emergency Planning (EP) Coordinator should be designated before planning can begin to:

(a) develop an integrated National Radiological Emergency Plan;
(b) coordinate the development of plans and procedures within each level (national, local and user);
(c) guide the planning process outlined in the following sections; and
(d) act as the contact point for international cooperation to include the international notification and assistance conventions [14] and IAEA assistance projects.

The EP Coordinator should have in-depth technical and operational knowledge of emergency preparedness and response issues and should have sufficient decisional authority to ensure an effective coordination process. The EP Coordinator should be provided with sufficient staff and long term resources to develop and maintain the response capability once established. This should include a multi-year budget.

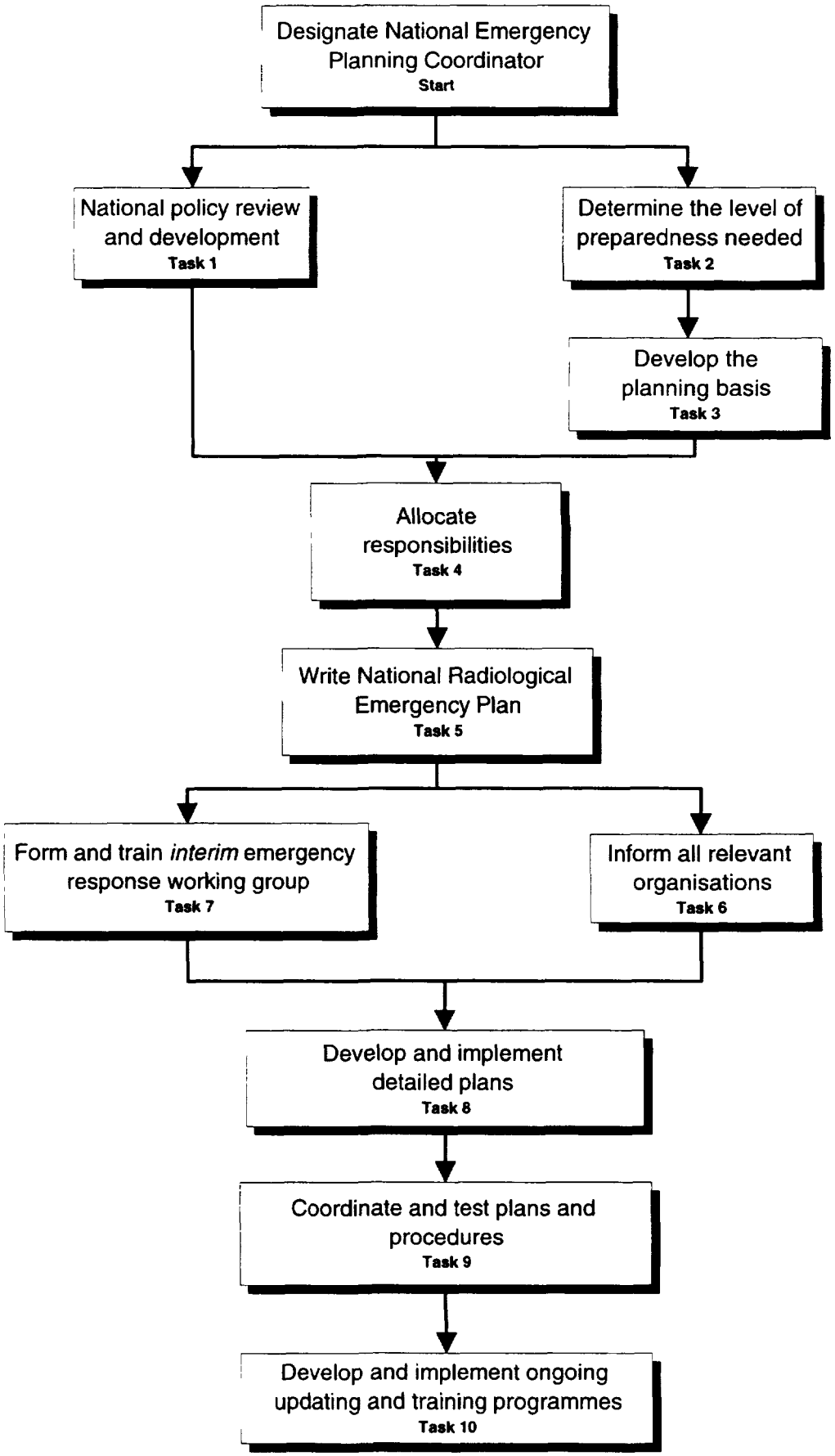

FIG. 4. Overview of the tasks for the development of an emergency response capability.

2.2.4. Task 1 - National policy review and development

Review and document the legal infrastructure and policies to ensure there is agreement on planning responsibilities at the national level. This is a crucial step, and without such an agreement it will be impossible to achieve effective plans.

The results must be documented and agreed by all the major ministries that may have a role in the response to an accident. This documentation will be incorporated in the National Plan and should include:

(a) A list of the national laws or Acts for natural or man-made accidents or emergencies, which define who is responsible for planning, decisions and actions.
(b) A brief description of the roles, responsibilities and capabilities of the major national ministries.
(c) A brief description of the responsibilities of the local governments and the users.
(d) A brief description of how response to radiological accidents is integrated into the planning for other types of emergencies.

Assure that responsibility for all types of potential radiological and nuclear accidents are addressed to include those involving licensed uses, military uses, unlicensed sources, trans-boundary releases or terrorist acts. Ensure the roles of police, military and other non-technical agencies are clearly defined and agreed. It should be clear how responsibilities may change as the accident progresses.

If the legal and regulatory infrastructure is not complete, *it is not necessary* to enact new laws before the emergency planning process can start. In fact, doing so would most likely delay the implementation of an effective emergency response capability by several months or years. If needed, government policy statements can be issued in the interim. In addition the planning may identify revisions that are necessary to the roles and responsibilities.

2.2.5. Task 2 - Determine the level of preparedness needed

Determine the level of preparedness required by determining which emergency planning categories (Section 2.1.2) apply.

This assessment can be performed by using the results of generic accident studies [e.g. 8,9,11] as summarized in Tables II and III. This is generally sufficient to initiate the emergency planning process. If a detailed analysis is to be performed, it should consider a range of potential accidents and not be limited to the "design basis" accidents. The effectiveness of various protective actions must also be evaluated to determine up to which distance from a facility detailed preparations are needed. Performance of this type of analysis is beyond the scope of this document and Tables II and III will be used to determine the level of planning.

The results of this analysis should be documented and be included in the National Plan. This should include a list and map showing the facilities and local jurisdictions that meet the criteria in Tables II and III. Several different categories may be applicable for a governmental jurisdiction (local or national); while only one category can apply to a facility. Appendix 4 provides examples of the emergency planning category for various facilities and practices. All countries fall within category IV. Categories I and II facilities that may exist outside a country should be considered during planning.

The planning that follows will be conducted only for the facilities and jurisdictions identified in this step. The level of planning will be determined by the category.

2.2.6. Task 3 - Develop the planning basis

Once the emergency planning category of the facilities and jurisdictions have been established, it is necessary to gather and document information about the possible accidents and local areas that must be

considered before plans can be developed. Appendix 5 summarises the types of information needed. This information should be documented and briefly described in the National Plan.

TABLE II. SUGGESTED EMERGENCY PLANNING CATEGORIES BY FACILITY

Category	Criteria [a]
I	Reactors with power levels greater than 100 MW(th) (power, nuclear ship and research reactors). Spent fuel pools containing more than the equivalent of a 3000 MW(th) reactor core.[b,c] Inventories of unsealed radioactive material greater than 100 times the activity listed in Table IV.
II	Reactors with power levels greater than 2[d] MW(th) and less than 100 MW(th) (power reactors, nuclear ship and research reactors). Spent fuel pools containing between the equivalent of a 10 to 3000 MW(th) reactor core.[b,c] Inventories of unsealed radioactive material greater than the activity listed in Table IV.
III	Potential of unshielded dose rates more than 10 Sv/h at 30 cm. Potential for criticality accidents. Reactors with power levels of less than or equal to 2 MW(th). Inventories of unsealed radioactive material greater than 0.10 times the activity listed in Table IV.

[a] UF_6 is not considered because the chemical hazard is far more important than the radiological hazard.
[b] Based on the average power level during the use of the fuel.
[c] For spent fuel that is less than three years old.
[d] Severe fuel damage and therefore a major off-site release is not considered credible below 2 MW(th).

2.2.7. Task 4 - Allocate responsibilities

Determine and assign the roles and responsibilities of each group, organization or individual involved in emergency preparedness and response. A list of critical responsibilities to be assigned is contained in Section 3.

Coordinators should be designated for each user (facility), group, organization, department and ministry that may have a role to play in emergency response.

Allocation of responsibilities is an interactive process. Responsibilities should be attributed in consultation with pertinent groups and must be based on realistic capabilities of that group. The individual groups assigned roles and responsibilities should agree with the assignments and make a commitment to develop the necessary response capability.

TABLE III. EMERGENCY PLANNING CATEGORY FOR GOVERNMENT JURISDICTIONS

Category	Local planning is for:	National planning is for:
I	Jurisdictions responsible for urgent protective actions within the PAZ and UPZ of a category I facility.	Countries containing or within the LPZ of a category I facility.
II	Jurisdictions responsible for urgent protective actions within the PAZ and UPZ of a category II facility.	Countries containing or within the LPZ of a category II facility
III	Jurisdictions that provide emergency services to a category III facility to include fire fighting, police and medical.	Countries containing a category III facility
IV	Always - but very limited	All countries
V	Never	Countries within 1000 km of a category I facility. Countries within 50 km of a category II facility.

TABLE IV. THE AMOUNT OF UNSEALED RADIOACTIVE MATERIAL FOR WHICH EMERGENCY PLANNING IS SUGGESTED

Radioactive material	Amount [a] [TBq]
100 times the A_2 activity limits in reference 11 with the following exceptions	
Liquid or gaseous mixed fission products	500 [b, c]
Mixed iodine to include I-123,124,125,126, 131,132, 133,134,135	100 [c, d]
Mixed noble gas to include Ar-39, 41; Kr- 81,85, 85m, 87; Xe-122, 123, 127, 131m, 133, 135	100000 [b,e]

[a] Assumes the material is in dispersable form and, a ground level release, and dose is calculated within 0.1-0.5 km where building wake dominates.

[b] The effective dose for inhalation, plume submersion (finite cloud) and 7 days ground shine is calculated and compared to the 50 mSv evacuation GIL, assuming 100% of the dose is avertable.

[c] Assumes 10% release.

[d] Based on I-131 and thyroid dose GIL of 100 mGy, assuming 100% of the dose is avertable.

[e] Based on Xe-133 which has nearly the maximum submersion dose, assumes 100% release fraction.

Tbq = 10^{12} Bq.

2.2.8. Task 5 - Write the National Radiological Emergency Plan

Develop a national emergency response plan as described in Section 2 1 6 The National Plan should be a *general* description of the role and responsibilities of the ministries, governments and facilities involved in a response It is a summary of the more detailed plans and assures that all the other planning is integrated and compatible and should include all the countries within the UPZ and LPZ All countries, ministries, facilities, groups or organizations addressed in the National Plan should review and concur with the plan The plan should also contain a brief description of the possible accidents and a concept of operation (summary of the response) Appendix 6 contains a suggested outline for the plan

The National Plan should address all the facilities and jurisdictions identified in task 2 The planning should consider the guidance provided in Section 4 for the emergency planning categories of these facilities and jurisdictions In developing the plan, consider the data gathered in tasks 1, 2, 3 and 4

2.2.9. Task 6 - Inform all relevant organizations

Once the National Radiological Emergency Plan has been developed and approved, give formal presentations to the staff that may be involved, directly or indirectly, in the maintenance and implementation of the plan This will achieve a common understanding of the response concepts and principles and will allow unforeseen issues to be raised and resolved before they become real difficulties It will also facilitate the implementation of the National Radiological Emergency Plan by maximizing staff participation and common ownership

This process should begin with workshops on the plan and its basis Meetings should also be held for the public near category I and II facilities to explain the plan and obtain public comments

2.2.10. Task 7 - Form and train an interim emergency working group

The full implementation of the plan can be a long process which involves writing procedures, training staff and holding drills and exercises In order to ensure that a response capability is in place before the National Radiological Emergency Plan can be fully implemented, an *interim* emergency response working group should be established The role of this group will be to provide the response to emergencies until the full plan can be implemented This interim capability does not need to be optimal This means that, in the interest of quickly implementing this interim capability, it will probably be necessary to "make do" with available means and resources, and with only minimal additional training

This task should not be overlooked The time and efforts invested in developing an interim organization and capability will provide significant savings during the implementation of the full emergency response capability

2.2.11. Task 8 - Develop and implement detailed plans

Develop the infrastructure and functional capabilities needed to implement the National Plan for each facility and jurisdiction identified in task 2 Capabilities should be developed to address the planning elements in Section 4 appropriate for the emergency planning category of the facility or jurisdiction This will include plans, procedures, staff, organization, facilities, equipment and training

One group should be assigned the responsibility to coordinate this effort This coordinating group will

(a) develop a schedule and requirements for the development of individual facility, group, department, ministry (etc) plans and procedures,
(b) provide assistance to individual groups in the development of plan and procedures to ensure compatibility and completeness of the planning process,

(c) organize periodic meetings between key representatives to encourage coordination; and
(d) ensure compliance with the schedule.

2.2.12. Task 9 - Coordinate and test plans and procedures

Once a response capability has been developed drills and exercises should be conducted . These drills and exercises will provide training but also will test and validate the plans, procedures and training. Following the drills and exercises deficiencies should be identified and corrected. The drill and exercises should be conducted in a sequence staring with the smallest organizational elements (e.g., monitoring teams) and culminate in a national level exercise.

2.2.13. Task 10 - Develop and implement ongoing update and training programmes

The final task is to ensure that the emergency response capability is maintained and periodically validated.

All groups should develop the means to maintain and update the emergency response programme as described in Section 4, including the following:

(a) a review of plan and procedures requirements;
(a) a review of training requirements and programme;
(b) an exercise programme; and
(c) a feed-back process for lessons learned during exercises and real emergencies.

A long term staff and budget must be provided to ensure that the capability is maintained.

3. IDENTIFICATION AND ASSIGNMENT OF CRITICAL TASKS

The following is a list of tasks that are critical to a successful response. One copy of this worksheet should be distributed to all organizations which may have a role in off-site emergency response, including:

(a) national ministries and agencies;
(b) regional ministries and agencies;
(c) governments within the UPZ and LPZ (for fixed facilities);
(d) the licensee;
(e) support organizations (fire, police, fire fighting) including private companies (if applicable); and
(f) others, as required.

Each organization should be asked to complete the portions of the worksheet which they believe apply to them. In some cases, organizations may recognize their role while admitting also their lack of resources and capabilities; in such cases, the role should be recorded on the worksheet, and a comment regarding resources and capabilities should be added.

Organizations should identify if they are responsible for the task. All completed worksheets should then assessed at the national and local levels to identify gaps and overlaps. Discussions should then be held between all coordinators responsible for emergency response to resolve these issues.

Applicable to the following category					CRITICAL TASKS	RESPONSIBLE ORGANIZATION
I	II	III	IV	V		
✔	✔	✔	✔	✔	Coordinate the national planning.	
✔	✔	✔	✔		Coordinate the local planning.	
✔	✔	✔			Coordinate the facility planning.	
✔	✔	✔			Classify the emergency at the facility and make initial off-site notification.	
✔	✔				Notify IAEA or other countries of an accident with the potential for a trans-boundary release.	
✔	✔				Receive the initial notification from the facility of a severe accident.	
		✔	✔		Provide advice and assistance to local responders (on potential radiological hazards).	
✔	✔		✔	✔	Receive notifications from IAEA or other countries of potential trans-boundary releases.	
✔	✔	✔	✔	✔	Request assistance from IAEA, WHO or other international organizations.	
✔	✔	✔	✔	✔	Activate the emergency organization.	
✔	✔	✔	✔		Mitigate the accident at its source.	
✔	✔				Make urgent protective actions decisions for the UPZ. (For each country in that zone).	
✔	✔	✔	✔	✔	Conduct prompt environmental monitoring.	
✔	✔				Assess the facility conditions and environmental data and provide technical advice to the urgent protective action decision maker.	

Applicable to the following category					CRITICAL TASKS	RESPONSIBLE ORGANIZATION
I	II	III	IV	V		
✔	✔		✔	✔	Inform the public of protective actions to take.	
✔	✔				Conduct the evacuation of the local population, transient population, special facilities (hospitals, jails, retirement homes, etc.).	
✔	✔				Conduct the monitoring and decontamination of evacuated population.	
✔	✔				Implement marine, rail and air traffic control in the affected area.	
✔	✔				Organize and operate emergency reception centres and provide emergency social services, including lodging, food, clothing, registration, inquiry and personal services.	
✔	✔				Provide support for the evacuation of special facilities (hospitals, jails, retirement homes, etc.).	
✔	✔				Provide thyroid blocking agent.	
✔	✔	✔	✔		Provide radiation protection support personnel and equipment for operations in the affected area.	
✔	✔	✔	✔		Approve abnormal emergency worker doses.	
✔	✔	✔	✔		Provide emergency medical treatment of contaminated casualties.	
✔	✔	✔	✔		Provide dosimetry services, including the analysis of bioassay samples.	
✔	✔		✔	✔	Coordinate media and public information (act as spokesperson).	
✔	✔		✔	✔	Conduct environmental monitoring and sampling programme for relocation and interventions related to food.	
✔	✔			✔	Assess the long term impact and recommend long-term relocation, food control, and decontamination.	
✔	✔			✔	Decide on longer term protective actions.	
✔	✔			✔	Implement and enforce food control measures within the country.	
✔	✔			✔	Implement and enforce food control measures for import and exports.	
✔	✔				Provide security services to protect evacuated areas.	
✔	✔	✔			Provide fire, police or medical assistance to facility.	

4. CHECKLISTS OF EMERGENCY PREPAREDNESS CONSIDERATIONS

Introduction

Please refer to the appropriate section of this checklist based on the applicable emergency planning category:

Category I:	Section 4.1.
Category II:	Section 4.2.
Category III:	Section 4.3.
Category IV:	Section 4.4.
Category V:	Section 4.5.

4.1. EMERGENCY PLANNING CATEGORY I

General accident description

Category I planning is for facilities with the potential for very large releases resulting in deterministic health effects off-site and very large and extensive contamination. This could result from:

(a) core damage accidents at nuclear reactors with power levels above 100 MW(th). Core damage will require failures of many systems and therefore there should be some warning before the core is damaged. Once core damage occurs it may be impossible to confidently predict the timing and characteristics of a major release. A major release could occur within an hour of core damage.

(b) facilities with large amounts of spent reactor fuel that must be actively cooled. These accidents should proceed slowly, with a release only possible after the fuel has been totally uncovered.

(c) fuel reprocessing facilities with the potential for a fire or explosion involving large amounts of liquid or gaseous radioactive material. These releases could be the result of fires, explosions or over-pressurization. There should be some warning before a release.

In all these accidents, the timing and size of a release is unpredictable and could result in very complex doses off-site. The risk of serious deterministic health effects will be substantially reduced by evacuation or substantial shelter of people in the PAZ before or shortly after a release. Immediate consumption of food directly contaminated by the accident could be a major source of dose through ingestion. Evacuation may be required within the UPZ and relocation may be required within the LPZ. In very severe cases, protective actions may also be required outside the planning zones.

General concept of operations

The facility will classify the accident and notify local off-site officials within the PAZ and UPZ. The facility will provide action recommendations based on facility conditions and monitoring results. The facility will take all possible actions to prevent or reduce the release. Local off-site officials will take urgent protective actions immediately within the PAZ based on the recommendations of the facility and not wait until they perform monitoring. Until relieved by off-site officials the facility will conduct monitoring of the UPZ to determine if additional actions are needed. Local off-site officials will provide police, fire and medial assistance to the site if requested. The facility operator will ensure that all workers on-site (to include those responding from off-site) are provided with radiological protection. The national level officials will promptly notify IAEA and all countries within 1000 km of the accident location if there is a potential for a severe release. The national level officials will support the local officials and conduct monitoring further from the side and coordinate longer term protective actions.

A. *INFRASTRUCTURE ELEMENTS*

The infrastructure requirements in this section should be considered in developing the capability to accomplish all of the functional requirements in Section B.

Planning Item - CATEGORY I	Facility	Local	National
A1. Authority, and Command and Control ***Planning Objectives:*** **The legal authority for developing emergency plans and for responding to radiological emergencies is in place. Each country assigns emergency planning and response responsibilities to specific organizations.**			
A1.1 Identify (by reference to specific acts, codes or statutes) the legal basis for response actions.	✔	✔	✔
A1.2 Identify who has the authority for performing the critical tasks listed in Section 3.	✔	✔	✔
A1.3 The authority for triggering pre-determined immediate protective actions and critical tasks (on-site and off-site) should be clearly assigned to individuals.	✔	✔	✔
A1.4 Develop criteria and procedures for the transfer of authority and responsibility which can occur during the course of the emergency.	✔	✔	✔
A1.5 Ensure that coordination between all levels of authority are clearly defined during all phases of the accident.	✔	✔	✔

Planning Item - CATEGORY I	Facility	Local	National
A2. Organizational Responsibilities ***Planning Objectives:*** **Responsibility to perform functions during a response is clearly assigned. Each organization has sufficient staff to perform its assigned responsibilities.**			
A2.1 Develop a block diagram of the overall response organization.	✔	✔	✔
A2.2 Define the authorities and responsibilities of each "block".	✔	✔	✔
A2.3 Identify all the organizations (including government and private) which are part of the response organization. *Note: Every position in an organization should be documented with a title, tasks to be performed and interfaces clearly defined.*	✔	✔	✔
A2.4 Develop a concept of operations for each organization that describes its role and how it relates to the other organizations. *Note: Ensure that organizations with potentially overlapping responsibilities understand their roles during an accident.*	✔	✔	✔
A2.5 Integrate radiological emergency response into the planning for other emergencies as much as possible. *Note: Existing organizations and staff should be used wherever possible. The local police, fire and other existing response organizations should respond as they do normally, normally with radiological expertise provided by the facility.*	✔	✔	✔

Planning Item - CATEGORY I	Facility	Local	National
A2.6 Assign staff to all the positions in the response organization ensuring they can be staffed in time to meet the functional requirements in Section B. Provide for continuous 24-hour per day emergency operation ensuring personnel work less than 18 hour days. *Note: Tasks that are performed promptly (for example, making protective actions decisions) must be assigned to personnel who are available immediately and over a 24 hour period.*	✔	✔	✔

Planning Item - CATEGORY I	Facility	Local	National
A3. Response Coordination ***Planning Objectives:*** **All response efforts are coordinated including those of the facility, first responders, non-governmental support organizations, local government, national government and other countries within the UPZ and LPZ. All response organizations understand and agree to their response functions.**			
A3.1 Clearly define the organizational interfaces during each phase of the response. *Note: Define which organizations interact together, how they interact (e.g. liaison staff, telephone, etc.), and who within each organization is the contact point.*	✔	✔	✔
A3.2 Ensure that there is interoperability between plans and procedures. *Note: They should have common units, common decision-making principles, compatible communication networks, common operational concepts, common sampling and measurements, compatible reporting methods, compatible public information strategies, procedures to allow access to accident site, and common protective actions criteria.*	✔	✔	✔
A3.3 Develop written agreements, memoranda of understanding, etc. between national, regional, local and on-site organizations that have a primary and support role in emergency response.	✔	✔	✔
A3.4 Establish means to coordinate the on and off-site response. *Note: This should include an Emergency Response Centre (ERC) to be the focal point for all response actions. Provisions should be in place to immediately coordinate the response before an ERC can be activated. The ERC should be staffed 24 hours a day 7 days a week during the accident, located outside the UPZ or provided with shielding and inhalation protection. Arrangements should be made for local, regional and/or national authorities to send representatives to the ERC. The ERC should have assess to facility status, radiological data (on-site and off-site), meteorological data and other data needed to implement the necessary public protective actions.*	✔	✔	✔

Planning Item - CATEGORY I	Facility	Local	National
A3.5 Develop means to coordinate the response across national boundaries within the UPZ and LPZ. *Note: Agreements should address: notification, direction and control, protective action criteria and implementation, monitoring, exchange of information, public information, reimbursement of costs and other financial provisions, liability provisions, units, language and other common conventions.*			✔

Planning Item - CATEGORY I	Facility	Local	National
A4. Plans and procedures *Planning Objectives:* **An individual is responsible for coordinating the development of emergency plans and procedures for each organization. These individuals regularly cooperate with each other to ensure an integrated level of planning is maintained. Plans and procedures are developed and reviewed to ensure effective implementation.**			
A4.1 Develop an emergency response plan with description of authorities, roles and responsibilities of the various organizations involved as well as their interrelationships. *Note: The emergency response plan is the general guideline and the basis for development of detailed implementing procedures.*	✔	✔	✔
A4.2 Identify a coordinator for emergency planning for each organization and each level (one for the facility, one for local, one for regional and /or national).	✔	✔	✔
A4.3 Develop procedures that cover all critical response tasks. These procedures should provide detailed instructions and the required information. *Note: Technical procedures should use units that are consistent with the instruments used. Technical procedures common to several groups or used by several groups should use standard units.*	✔	✔	✔
A4.4 Use a standard format for procedures, identifying each response position, date approved, and steps to be performed. *Note: The usability of the procedures should be confirmed during drills and exercises.*	✔	✔	✔
A4.5 Establish a quality assurance process to control changes to procedures that may affect the plan or other procedures. *Note: Procedures and changes to procedures should not be implemented until the appropriate personnel are adequately trained. Develop and maintain a distribution list.*	✔	✔	✔
A4.6 Ensure that all procedures, reference materials, documents required to perform a function are available at the location where the function is to be carried out.	✔	✔	✔
A4.7 Conduct a regular quality assurance review of the plan and the procedures *Note: Take into account lessons learned from accidents at similar facilities around the world and during drills and exercises.*	✔	✔	✔

	Planning Item - CATEGORY I	Facility	Local	National
A4.8	Update all perishable information quarterly (phone numbers, etc.).	✔	✔	✔
A4.9	Correct critical deficiencies to plans and procedures within a month. Improvements and modifications that are not critical should be made within 12 months.	✔	✔	✔

	Planning Item - CATEGORY I	Facility	Local	National
A5.	**Logistic Support, Emergency Supplies, Equipment, Communications and Facilities** *Planning Objectives:* Adequate emergency supplies, facilities and equipment are available.			
A5.1	Identify the equipment, supplies, communications and facilities needed to perform the emergency response tasks and functions within Section B. *Note: If possible, equipment used for emergencies should be the same as used in normal situations.*	✔	✔	✔
A5.2	Establish or designate facilities (or centres, rooms and areas) to support all the emergency response functions.	✔	✔	✔
A5.3	Designate or locate the emergency facilities so that they can operate under accident conditions, including radiological exposure conditions. *Note: Facilities which are not shielded should have backups beyond UPZ.*	✔	✔	✔
A5.4	Establish or identify a laboratory facility (fixed or mobile) off-site, outside the UPZ, for the analysis of samples (e.g., reactor coolant) in case the on-site facility becomes unavailable or contaminated. *Note: The laboratory should be close enough to allow for analysis of samples within 3 hours.*	✔		
A5.5	Provide survey and sampling teams to monitor radiation in the environment within the UPZ and LPZ in a manner consistent with Appendix 7.	✔	✔	✔
A5.6	Provide monitoring systems to detect potential emergency situations, to classify the accident and to choose appropriate protective actions. *Note: These systems may include detection of geophysical phenomena, wind direction and speed, in-plant radiation levels, plant system status (e.g. reactor coolant system pressure and temperature, levels, flow rates, etc.), fire detectors, chemical detectors. Information must be accessible during an accident (e.g. when radiation levels may prevent access, the information must be remotely available).*	✔		
A5.7	Establish means to record and display all monitoring data and radiological assessments (e.g. dose projections) in a consolidated way over the entire LPZ. *Note: This could be done, for example, using maps and colour codes or symbols.*		✔	✔

	Planning Item - CATEGORY I	Facility	Local	National
A5.8	Develop a means for routinely conducting inventory checks, restocking perishables and checking the supplies and facilities.	✔	✔	✔
A5.9	Establish a maintenance programme for the equipment, including a check list of location, and routine inspections to ensure that the equipment is available and operational.	✔	✔	✔
A5.10	Perform calibration and maintenance at intervals recommended by the equipment manufacturer. Carry out annual inter-comparisons for the equipments of groups which are expected to work together during an emergency.	✔	✔	✔
A5.11	Develop a quality assurance and control programme for all monitoring equipment and laboratory facilities. *Note: As part of this programme, laboratories should endeavour to take part in the IAEA Intercomparison Programme.*	✔	✔	✔
A5.12	Provide personal protection equipment for on-site emergency workers, including off-site personnel arriving at the site in a manner consistent with Appendix 8.	✔		
A5.13	Provide personal protection equipment for off-site emergency workers, including thyroid blocking agent and self-reading dosimeter.	✔	✔	✔
A5.14	Establish or designate a laboratory to perform analyses of environmental samples outside the UPZ in a manner consistent with Appendix 7.			✔
A5.15	Make provisions for logistical support and resources needed for the response. *Note: This includes clerical material, food, lodging, supplies, sanitary needs, transportation, communications, etc. Establish methods for prompt procurement during an emergency .*	✔	✔	✔
A5.16	Provide primary and back up communications systems for all critical links.	✔	✔	✔
A5.17	Periodically test communication equipment and components that are not routinely used.	✔	✔	✔
A5.18	Ensure that, within each organization, communication systems are compatible. Ensure that communications systems which are designed to link organizations are compatible.	✔	✔	✔

	Planning Item - CATEGORY I	Facility	Local	National
A6.	**Training, Drills and Exercises** *Planning Objectives:* Training is provided to those assigned to positions in the emergency organization. Teams drill to ensure they can perform as a unit. Integrated exercises are conducted to test the operational interface among all the organizations in the total response effort and to identify and correct deficiencies. .			
A6.1	Establish training requirements for each position and team.	✔	✔	✔
A6.2	Develop a programme that provides the training identified for each position in the emergency organization. Audit the attendance to ensure the training is being received. *Note: The training should be conducted under simulated accident conditions using the procedures, equipment and facilities to be used during a response. Ensure that senior decision-makers do not delegate staff to attend training sessions on their behalf.*	✔	✔	✔
A6.3	Develop a set of training materials.	✔	✔	✔
A6.4	Hold periodic exercises and integrated exercises of the plan. Develop an exercise programme to ensure that, over five years, all important objectives of the plan and all organizational interfaces are exercised.	✔	✔	✔
A6.5	Develop a system (e.g. tests, evaluation, etc.) to ensure that appropriate proficiency levels have been achieved and maintained and ensure that the personnel can carry out their assigned emergency functions.	✔	✔	✔
A6.6	Hold periodic drills for groups that must perform as teams to be effective. *Note: This should include the entire communication and activation system, environmental monitoring, fire fighting, damage control, control room, accident assessment and decision making.*	✔	✔	✔
A6.7	Develop a process to record lessons learned from training, drills and exercises and take corrective actions.	✔	✔	✔

Planning Item - CATEGORY I		Facility	Local	National
B1.	**Initial Accident Assessment** *Response Objective:* Promptly identify an accident and initiate a coordinated response.			
B1.1	Establish an accident classification system, criteria, and instrumentation consistent with Ref. [7] and Section 2.1.5. *Note: This system should be the basis for response implementation for all organizations. The system should provide means to assess: the status of safety systems needed to protect release barriers, damage to release barriers, radiation levels in the facility, release rates from normal discharge points, fires, reduced levels of safety or security, and off-site radiation measurements. The response of instruments during severe accidents should be considered (e.g. would they fail or become erratic). All organizations involved in the response must use the same classification. Provision should be made to reduce a classification.*	✔		
B1.2	Provide the facility operator with instruments and procedures to detect, classify and immediately respond to abnormal events.	✔		
Suggested Timing in Emergency Situations				
▸	Classify the accident	< 15 min.		

Planning Item - CATEGORY I		Facility	Local	National
B2.	**Notification and Activation** *Response Objective:* Promptly and effectively inform, activate and coordinate all organizations, groups and agencies that perform emergency response tasks.			
B2.1	Develop a clear off-site notification scheme including other countries within the UPZ and LPZ. *Note: To reduce the burden on the facility staff, limit the number of calls which the station must make. The off-site notification point should be staffed 24 hours a day, 7 days a week by personnel with the authority or means to promptly activate the off-site response. Reliable primary and back-up communication links should be provided and tested at least daily.*		✔	✔

Planning Item - CATEGORY I		Facility	Local	National
B2.2	Establish a means for triggering emergency response based on the class of the accident in a manner consistent with Ref. [7] and Appendix 3 and 9. All response organizations should initiate their initial response functions based on this class, consistent with Appendices 3 and 9. *Note: This includes clear criteria for activating each level (facility, local, national), and what organization will be responsible for assessing the available information against the activation criteria and deciding to activate the emergency organization . This should also include procedures for immediate performance of initial tasks by personnel as they arrive at their duty stations.*	✔	✔	✔
B2.3	All critical organizations involved in early response must have means to activate critical members promptly, based on the initial notification from the facility. This should include means (e.g. beepers) to reach critical persons 24 hours a day. *Note: As a minimum, the organizations whose actions are critical for mitigation, notification, assessment and urgent protective actions implementation should be included.*		✔	✔
B2.4	Develop initial notification message format and confirmation procedures. *Note: The notification message should contain the following information: class, immediate hazard, important actions taken, urgent protective actions recommended for response personnel and the public. For a general emergency, protective action recommendations should be included.*	✔	✔	✔
B2.5	Develop follow-up message format for after the initial notification. *Note: Follow-up messages should contain the following, if available: location of incident; name and telephone number (or communication channel) of caller; date/time of incident; class, basis for class; type of actual or projected release (airborne, waterborne, surface spill) and estimated duration/impact times; release projections; emergency response actions under way; recommended protective actions; request for assistance; trend assessment.*	✔	✔	✔
B2.6	Make provisions to notify countries within 1000 km and the IAEA of any accident that could potentially have a trans-boundary impact, including all core damage accidents (General Emergencies in Ref. [7] and Appendix 3).			✔
Suggested Timing for General Emergency Situations ▸ **Notify local authorities after classification** ..... ▸ **Fully activate emergency organization** ..... ▸ **Notify all countries in the LPZ** ..... ▸ Notify IAEA ..... *Note: The components of the response organizations should be activated in time to perform their functions consistent with the recommendations elsewhere in the checklist.*		<15 min. < 2 h	 < 12 h	 <24 h < 1 h < 2 h

	Planning Item - CATEGORY I	Facility	Local	National
B3.	**Accident Condition Mitigation** Response Objective: Take all reasonable immediate and follow up actions to reduce the risk or size of a release within the facility or to the environment.			
B3.1	Develop an accident management program [6] to ensure that there are provisions for early mitigation of accidents at their source to prevent or reduce uncontrolled releases of radioactive material to the environment or worker exposure. *Note: This includes emergency operating procedures and fire fighting systems. Off-site fire, medical, and police assistance should be integrated into the on-site response organizations.*	✔		
B3.2	Develop emergency operating procedures [6] to be used by facility operators for control of plant systems for a range of accident conditions including those resulting in core damage. *Note: The procedures should be triggered by observable accident symptoms.*	✔		
B3.3	Develop a list of parameters and of their expected response during abnormal conditions that can be used to trigger the application of emergency operating procedures.	✔		
B3.4	Establish access control to the control room during an emergency.	✔		
B3.5	Develop means for technical and scientific advice (or expertise) to be provided to the on-site emergency response staff. *Note: This could be provided by a technical assessment group and a link to the operating staff, or promptly dispatching technical experts to the site. This should also include means to obtain technical analysis from the designer of the facility.*	✔		
B3.6	Develop a system to display information crucial to the classification and mitigation of the accident where the facility operations are controlled and accident mitigation coordinated. *Note: This information should be displayed in a clear and integrated manner independent of normal operational information. This should include information on the status of safety systems, release barriers, on-site radiological conditions and off-site releases.*	✔		
B3.7	Establish means to be able to perform damage control in the facility to mitigate the accident. *Note: This should include damage control teams with protective equipment, monitoring instruments, lighting, damage control supplies and communications equipment.*	✔		
B3.8	Establish communication links between the facility control room, sources of technical advice and damage control teams that will be operational under accident conditions. *Note: This communication should be compatible with that used by off-site support organizations.*	✔		

Planning Item - CATEGORY I	Facility	Local	National
Suggested Timing in Emergency Situations ▸ Initiate mitigation actions ..... ▸ Provide technical assistance to facility operators	 < 15 min. < 1 h		

	Planning Item - CATEGORY I	Facility	Local	National
B4.	**Urgent Protective Actions** *Response Objectives:* Promptly implement urgent protective actions to prevent deterministic health effects and to avert doses consistent with international guidance [2].			
B4.1	Adopt national intervention levels as a basis for implementation of urgent protective actions consistent with international guidance [1,2] as shown in Appendix 1.			✔
B4.2	Establish precautionary action zone (PAZ, see Appendix 2), within which preparations are made to promptly implement urgent protective actions consistent with Appendix 9 and Ref. [7]. *Note: The boundary of this zone should be defined such that it can be easily identified by the public and responders.*		✔	
B4.3	Develop procedures to make decisions immediately upon declaration of a general emergency to take urgent protective actions within the UPZ consistent with Ref. [7] and Appendices 2 and 9. *Note: This should include arrangements with the facility to promptly recommend urgent protective actions to off-site officials for severe accidents (General Emergency). All groups of the UPZ population (e.g., hospitals, transients) and special facilities (e.g., factories) should be considered. The UPZ should include areas of other countries, where applicable.*	✔	✔	
B4.4	Develop a means to promptly conduct environmental monitoring to determine where additional protective actions should be taken. *Note: This should include default OILs and a monitoring strategy consistent with Ref. [7] and international guidance. Means to conduct environmental monitoring near the facility within 1 hour and within the UPZ within 4 hours.*	✔	✔	
B4.5	Develop techniques to revise OILs based on the actual isotopic mix of the release consistent with Ref. [7].	✔	✔	
B4.6	Develop methods to project off-site consequences based on facility conditions (for unmonitored or future release) and release rates, taking into account current and projected meteorological data. *Note: Model projections are very uncertain and should not be used as the sole basis for protective actions. For the most severe accidents accurate projections are not possible.*	✔		

Planning Item - CATEGORY I		Facility	Local	National
B4.7	Develop the capabilities, means, resources to implement urgent protective actions within the PAZ and the UPZ. *Note: This should include evacuation, shelter, distribution of thyroid blocking , reception centres, access control, monitoring of evacuees, and restriction of air, water and rail traffic. These means should concentrate on the most effective use of existing buildings, homes, transportation and communications. The normal population, transients, special groups, special facilities (hospitals, prisons), factories or other facilities that can not be quickly evacuated should all be considered in the planning.*		✔	✔
B4.8	Provide means to warn and provide instruction on urgent protective actions for the people on-site or in areas controlled by the facility. *Note: This should include means for evacuation or sheltering in pre-determined areas. Non-essential personnel should be evacuated for Site Area and General Emergencies. This should include instructions to escorts for visitors and posting of instructions and evacuation routes in the facility*	✔		
B4.9	Develop a procedure to monitor the dose in the on-site assembly areas or shelters and evacuate if necessary.	✔		
B4.10	Develop procedures and means to assure the safety of all persons on the site, including means to account for all on-site personnel. *Note: Any persons missing should be identified, and search and rescue operations conducted.*	✔		
B4.11	Establish means to monitor evacuees and provide them with instructions on decontamination if necessary.		✔	
B4.12	Establish a single point of contact and procedures to request additional assistance if the national capability to respond is exceeded. *Note: This could be accomplished through IAEA under the provisions of the "Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency".*			✔
B4.13	Develop procedures and means to recommend agriculture countermeasures (see Ref.[12]).			
Suggested Timing in Emergency Situations ▸ Recommend urgent protective actions for the public based on accident classification ..... ▸ Make decisions on urgent protective actions* ..... ▸ Complete facility protective actions ..... ▸ Conduct environmental monitoring near facility ..... ▸ Conduct environmental monitoring within UPZ ..... *Note (*) : Time from initial notification and recommendation for urgent protective actions from the facility.*		 < 15 min. < 30 min < 1 h < 1 h < 4 h	 <30 min < 4 h	 < 4 h

Planning Item - CATEGORY I		Facility	Local	National
B5.	**Public Education and Instruction** *Response Objectives:* Provide the public with information in advance and during an accident, on the actions they should take in response to the accident.			
B5.1	Prepare printed information that should be provided annually to the permanent and transient population within the UPZ on how they will be notified of an accident and on the actions they should take. *Note: The information should include material on: radiation; contacts for additional information; protective actions and plans; and response of people with special needs. It should be in a form that makes it available during an accident such as posters in public areas, calendars for personal display and inserts in telephone books.*	✔	✔	
B5.2	Provide means for prompt alerting of the population within the UPZ, that should be reliable, not vulnerable to normal power failures and routinely tested. *Note: Typical alerting methods are sirens, loudspeakers operated from police or firefighting vehicles, or special radios that can be activated from a central source. These methods should include provisions for transient populations.*		✔	
Suggested Timing in Emergency Situations				
▸	Initial notification to the public in the PAZ of urgent protective actions required. *Note: Time from initial notification and recommendation for urgent protective actions from the facility.*		< 1 h	

Planning Item - CATEGORY I		Facility	Local	National
B6.	**Emergency Worker Protection** *Response Objectives:* Ensure that emergency workers at the facility and off-site monitor their cumulative dose, conform to the international dose guidelines and are provided with the appropriate radiation protection.			
B6.1	Clearly identify the personnel necessary to implement effective protective actions, to provide radiation protection and to mitigate the accident. *Note: The personnel identified should be designated as emergency workers.*	✔	✔	✔
B6.2	Develop a programme for controlling doses to all emergency workers. *Note: This should include: training, dose guidelines consistent with Ref. [7], thyroid blocking (NPP only), procedure for approving emergency doses, means for facility operator to provide protective action recommendations based on conditions at the facility for off-site emergency workers, procedure to relate field measurements and dosimeter readings to actual dose rates and dose, system for continuously monitoring doses received during operations, collecting and recording doses received, system to monitor and control the dose in facilities near the accident that will be staffed during accidents. Provisions should be made to obtain additional dosimeters and specialized radiological protection equipment, supplies and expertise. This could be accomplished through the IAEA under the provisions of the "Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency"*	✔	✔	✔
B6.3	Develop a procedure to continuously account for emergency workers.	✔	✔	✔
B6.4	Establish provisions for tracking and medical follow-up of potentially exposed emergency workers.	✔	✔	✔
B6.5	Make provisions for the radiation protection of on-site personnel. *Note: This should include: access to a protected facility, training, instruments to measure very high dose rates, protective clothing against skin contamination and dose, respiratory protection, procedures to limit doses during interventions and ensure exposures are justified, means and criteria to detect and decontaminate serious levels of skin contamination, and communication equipment. This includes off-site fire, police, medical or other support personnel that may respond to the site.*	✔		

	Planning Item - CATEGORY I	Facility	Local	National
B7	**Medical, Fire Fighting and Police Assistance** *Response Objectives:* Provide adequate police, medical and fire support services.			
B7.1	Establish a capability to provide immediate on-site fire fighting and first aid during an emergency, and to maintain security during an evacuation of the site.	✔		
B7.2	Develop guidelines for the decontamination of injured persons.	✔	✔	
B7.3	Provide means to transport and initially treat a limited number of highly contaminated or exposed and injured individuals from the facility. *Note: the initial treatment facility should have the capability to treat non-radiation injuries of contaminated patients, decontaminate, and identify radiation exposures needing specialized treatment and prepare patients for transport.*	✔	✔	
B7.4	Develop agreements to treat highly exposed persons at an existing institution having the capability to provide specialized treatment of overexposed personnel. *Note: The capability to treat high exposures in the country is not essential and can be obtained through the IAEA or WHO Collaborating Centre.*			✔
B7.5	Make plans to treat radiation exposure among the public that concentrate on means of triage and use of existing medical facilities most effectively. *Note: Establish procedure and system of organization and notification of appropriate medical staff and support personnel.*		✔	✔
B7.6	Develop procedures to obtain the assistance of local emergency response services and allow them prompt access. *Note: This includes police, ambulance, medical, hospital and fire fighting services. This should include training on role, radiation protection, expected function during an emergency, familiarization with the facility and access to the facility.*	✔	✔	
B7.7	Make provision to provide radiation protection to local emergency response services personnel who come to the facility during an emergency.	✔	✔	

	Planning Item - CATEGORY I	Facility	Local	National
B8.	**Media Relations** *Response Objectives:* Provide the media with timely and coordinated information to ensure that the public receives accurate and consistent information concerning protective actions and the accident development.			
B8.1	Develop means for providing timely information to the media during an accident.	✔	✔	✔

	Planning Item - CATEGORY I	Facility	Local	National
B8.2	Develop procedures to ensure that the information given to the media by the various organizations involved is consistent and coordinated. *Note: This could involve defining jurisdictions, sharing information, holding joint press conferences, and operating from a joint media centre.*	✔	✔	✔
B8.3	Designate a single spokesperson for each level.	✔	✔	✔
B8.4	Establish a facility that can be used as a joint media centre during emergencies, and where the facility and governmental spokespersons can provide media briefings. *Note: The media centre should be near the facility but outside the UPZ. All levels will need to cooperate to develop joint agreements and procedures on the use of that facility.*		✔	✔
B8.5	Designate a group responsible for monitoring the media and the means to promptly respond to false information.	✔	✔	✔

	Planning Item - CATEGORY I	Facility	Local	National
B9.	**Longer Term Protective Actions and Interventions Related to Food** ***Response Objectives:*** **Effectively implement longer term protective actions and interventions related to food in a manner consistent with international guidance.**			
B9.1	Adopt national intervention levels as a basis for implementation of longer term protective actions and restriction of food consistent with international guidance [1,2] as shown in Appendix 1.			✔
B9.2	Establish longer term protective action planning zone (LPZ, see Appendix 2). Within this zone, collect information needed to effectively implement longer term and food related intervention. *Note: This should include legal considerations, population characteristics, food distribution systems, farming practices and crops, agriculture countermeasures [12] and potential relocation resources.*		✔	✔
B9.3	Develop plans and procedures to make longer term and ingestion protective action decisions within the LPZ. *Note: This should cover all aspects of the environmental monitoring programme (short and long term) within the LPZ consistent with Ref. [7]. This should include Operational Intervention Levels (OIL) for gamma measurements, food and water sampling and analysis, and surface contamination measurements. These procedures should be compatible (methods, calibration, units) between all groups and organizations involved.*		✔	✔

	Planning Item - CATEGORY I	Facility	Local	National
B9.4	Develop a detailed sampling plan for sampling of food stuff within the LPZ (see Appendix 2). Make provisions to expand the sampling region to 100-300 km around the plant for significant releases. *Note: Take into account all organizations involved in food sampling and all production sources (cattle and dairy animals, milk, fresh produce, water, fish, rain water reservoir). The monitoring results for all affected areas should be integrated into a single assessment for the LPZ.*		✔	✔
B9.5	Pre-install TLDs at strategic locations around the station (for post-accident assessment) and develop procedures to use them to determine the total dose from the accident. *Note: The TLDs should be left in place until accident is concluded. TLDs can not be used in the early decision making process.*			✔
B9.6	Develop plans and procedures to revise the predetermined longer term OILs based on environmental and other data at the time of the accident in a manner consistent with Ref. [7].			✔
B9.7	Provide means to make prompt decisions concerning short term ingestion interventions. *Note: This includes, for example: restricting immediate consumption of food (e.g., local milk or home grown garden vegetables), housing cattle and placing them on stored feed, providing uncontaminated food and water, and protecting rain water reservoirs and cisterns. Identify who has the authority to change these criteria.*		✔	✔
B9.8	Develop a system to obtain information and expertise and make decisions on longer term actions such as decontamination and agricultural countermeasures consistent with international guidance. *Note: Expertise could be obtained through IAEA.* [12]			✔
B9.9	Develop plans to implement and enforce food and water control within the LPZ considering the availability of alternate sources of uncontaminated food.			✔
B9.10	Develop plans and a system to monitor and control export of food and products			✔
B9.11	Develop plans to provide instructions to farmers for confining animals and protecting rain water reservoirs and cisterns.		✔	
B9.12	Establish provisions for tracking and medical follow-up of potentially exposed members of population.		✔	✔

Planning Item - CATEGORY I		Facility	Local	National
B10.	**Psychological Impact Mitigation** *Response Objectives:* Keep the psychological impact as low as reasonably possible.			
B10.1	Give due consideration to the lessons learned on mitigation of psychological impact during response to accidents. *Note: This should include efforts to develop and maintain trust by: a) being honest with the public, b) providing sufficient information so the nature of the threat and the reasons for the actions being taken are clear, c) providing clear and simple instruction on the actions to take, d) providing consistent advice and assessments that are in keeping with international guidance, e) using a single spokes person for the government, and f) providing a program of information for the public after the accident. Additional guidance to be developed for the next revision of this document.*		✔	✔

4.2. EMERGENCY PLANNING CATEGORY II

General accident description

Category II planning is for facilities with the potential for releases resulting in doses off-site above the urgent generic intervention levels (GILs) [1,2] but with little or no threat of doses resulting in serious deterministic health effects off-site. Facilities that may fall into this category are:

(a) nuclear reactors with power levels greater than 2 MW (th) and less than 100 MW(th). Core damage will require failures of many systems and therefore there should be warning before core damage occurs. Once core damage occurs it may be impossible to confidently predict the timing and characteristics of a release. A major release could occur within an hour of core damage.

(b) facilities with moderate amounts of spent reactor fuel that must be actively cooled. These accidents should proceed slowly with a release only possible after the fuel has been totally uncovered.

(c) facilities that could release significant amounts of radioactive material as a result of a fire or explosion. There may be some warning before a release but in most cases the release will occur with little warning.

In all these accidents the timing and size of a release is unpredictable. Urgent protective actions will most likely only be needed within the UPZ.

To be effective, evacuation or sheltering of the population in the UPZ must be implemented before or shortly after a release. Because of the rapidity at which such situations can develop, it is necessary to develop a protective action strategy which can be implemented promptly with minimal assessment. These facilities also have the potential for accidents resulting in very high doses to personnel in the facility. Ingestion can be a concern primarily within the LPZ.

General concept of operations

The facility will classify the accident and notify local off-site officials within the UPZ. The facility will provide protective action recommendations based on facility conditions and monitoring results. The facility will take all possible actions to prevent or reduce the release. Until relieved by off-site officials the facility will conduct monitoring near the site to determine if additional actions are needed. Local off-site officials will take urgent protective actions immediately within the UPZ based on the recommendation of the facility and not wait until they perform monitoring. Local off-site officials will provide police, fire and medial assistance to the site if requested. The facility operator will ensure that all workers on-site (to include those responding from off-site) are provided with radiological protection. The national level officials will support the local officials and conduct monitoring further from the site and coordinate longer term protective actions. For very severe accidents, protective actions may be required outside the planning zones.

A. *INFRASTRUCTURE ELEMENTS*

The infrastructure requirements in this section should be considered in developing the capability to accomplish all of the functional requirements in Section B.

	Planning Item - CATEGORY II	Facility	Local	National
A1.	**Authority, and Command and Control** *Planning Objectives:* The legal authority for developing emergency plans and for responding to radiological emergencies is in place. Each country assigns emergency planning and emergency response responsibilities to specific organizations.			
A1.1	Identify (by reference to specific acts, codes or statutes) the legal basis for response authorities.	✔	✔	✔
A1.2	Identify who has the authority for performing the critical tasks listed in Section 3.	✔	✔	✔
A1.3	The authority for triggering pre-determined immediate protective actions and critical tasks (on-site and off-site) should be assigned to individuals or positions on-site and in the local government organization.	✔	✔	
A1.4	Develop criteria and procedures for the transfer of authority and responsibility which can occur during the course of the emergency.	✔	✔	✔
A1.5	Ensure that coordination between all levels of authority are clearly defined during all phases of the accident .	✔	✔	✔

	Planning Item - CATEGORY II	Facility	Local	National
A2.	**Organizational Responsibilities** *Planning Objectives:* Responsibility to perform functions during a response is clearly assigned. Each organization has sufficient staff to perform its assigned responsibilities.			
A2.1	Develop a block diagram of the overall response organization.	✔	✔	✔
A2.2	Define the authorities and responsibilities of each "block".	✔	✔	✔
A2.3	Identify all the organizations (including government and private) that are part of the response organization. *Note: Every position in an organization should be documented with a title, tasks to be performed and clearly defined interfaces.*	✔	✔	✔
A2.4	Develop a concept of operations for each organization which describes its role and how it relates to the other organizations. *Note: Ensure that organizations with potentially overlapping responsibilities understand their roles during an accident.*	✔	✔	✔

	Planning Item - CATEGORY II	Facility	Local	National
A2.5	Integrate radiological emergency response into the planning for other emergencies as much as possible. *Note: Existing organizations and staff should be used wherever possible. The local police, fire and other existing response organizations should respond normally with radiological expertise provided by the facility.*	✔	✔	✔
A2.6	Assign staff to all the positions in the response organization ensuring they can be staffed in time to meet the functional requirements in Section B. Provide for continuous 24-hour per day emergency operation *Note: Tasks that are performed promptly (for example, making urgent protective actions decisions) must be assigned to personnel who are available immediately and over a 24 hour period ensuring that personnel work less than 18 hour days. .*	✔	✔	✔

	Planning Item - CATEGORY II	Facility	Local	National
A3.	**Response Coordination** ***Planning Objectives:*** **All response efforts are coordinated including those of the facility, first responders, non-governmental support organizations, local government, national government and other countries within the UPZ and LPZ. All response organizations understand and agree to their response functions.**			
A3.1	Clearly define the organizational interfaces during each phase of the response. *Note: Define which organizations interact together, how they interact (e.g. liaison staff, telephone, etc.), and who within each organization is the contact point.*	✔	✔	✔
A3.2	Ensure that there is interoperability between plans and procedures. *Note: They should have common units, common decision-making principles, compatible communication networks, common operational concepts, common sampling and measurements, compatible reporting methods, compatible public information strategies, procedures to allow access to accident site, and common protective actions criteria.*	✔	✔	✔
A3.3	Develop written agreements, memoranda of understanding, etc. between national, regional, local and on-site organizations that have a primary and support roles in emergency response.	✔	✔	✔

	Planning Item - CATEGORY II	Facility	Local	National
A3.4	Establish the means to coordinate the on and off-site response. *Note: This should include an Emergency Response Centre (ERC) to be the focal point for all response actions. Provisions should be in place to immediately coordinate the response before an ERC can be activated. The ERC should be staffed 24 hours a day 7 days a week during the accident, located outside the UPZ or provided with shielding and inhalation protection. Arrangements should be made for local, regional and/or national authorities to send representatives to the ERC. The ERC should have assess to facility status, radiological data (on-site and off-site), meteorological data and other data needed to implement the necessary public protective actions.*	✔	✔	✔
A3.5	Develop means to coordinate the response across national boundaries within the UPZ and LPZ. *Note: Agreements should address: notification, direction and control, protective action criteria and implementation, monitoring, exchange of information, public information, reimbursement of costs and other financial provisions, liability rovisions, units, language and other common conventions.*			✔

	Planning Item - CATEGORY II	Facility	Local	National
A4.	**Plans and procedures** *Planning Objectives:* **An individual is responsible for coordinating the development of emergency plans and procedures for each organization. These individuals regularly cooperate with each other to ensure an integrated level of planning is maintained. Plans and procedures are developed and review to ensure effective implementation.**			
A4.1	Develop an emergency response plan with description of authorities, roles and responsibilities of the various organizations involved as well as their interrelationships. *Note: The emergency response plan is the general guideline and the basis for development of detailed implementing procedures.*	✔	✔	✔
A4.2	Identify a coordinator for emergency planning for each organization and each level (one for the facility, one for local, one for regional and/or national).	✔	✔	✔
A4.3	Develop procedures that cover all critical response tasks. These procedures should provide detailed instructions and the required information. *Note: Technical procedures should use units that are consistent with the instruments used. Technical procedures common to several groups or used by several groups should use standard units.*	✔	✔	✔

	Planning Item - CATEGORY II	Facility	Local	National
A4.4	Use a standard format for procedures, identifying each response position, date approved, and steps to be performed. *Note: The usability of the procedures should be confirmed during drills and exercises.*	✔	✔	✔
A4.5	Establish a quality assurance process to control changes to procedures that may affect the plan or other procedures. *Note: Procedures and changes to procedures should not be implemented until the appropriate personnel are adequately trained. Develop and maintain a distribution list.*	✔	✔	✔
A4.6	Ensure that all procedures, reference materials, documents required to perform a function are available at the location where the function is to be carried out.	✔	✔	✔
A4.7	Conduct a regular quality assurance review of the plan and the procedures. *Note: Take into account lessons learned from accidents at similar facilities around the world and during drills and exercises.*	✔	✔	✔
A4.8	Update all perishable information quarterly (phone numbers, etc.).	✔	✔	✔
A4.9	Correct critical deficiencies to plans and procedures within a month. Improvements and modifications that are not critical should be made within 12 months.	✔	✔	✔

	Planning Item - CATEGORY II	Facility	Local	National
A5.	**Logistic Support, Emergency Supplies, Equipment, Communications and Facilities** *Planning Objectives:* Adequate emergency supplies, facilities and equipment are available.			
A5.1	Identify the equipment, supplies, communications and facilities needed to perform the emergency response tasks and functions within Section B. *Note: If possible, equipment used for emergencies should be the same as used in normal situations.*	✔	✔	✔
A5.2	Establish or designate facilities (or centres, rooms and areas) to support all the emergency response functions.	✔	✔	✔
A5.3	Designate or locate the emergency facilities so that they can operate under accident conditions, including radiological exposure conditions. *Note: Facilities that are not shielded should have backups beyond UPZ.*	✔	✔	✔
A5.4	Identify a laboratory facility outside the urgent protective actions UPZ, for the analysis samples (e.g., reactor coolant) in case the on-site facility becomes unavailable or contaminated.	✔		

	Planning Item - CATEGORY II	Facility	Local	National
A5 5	Provide environment survey and sampling teams to monitor within the UPZ and LPZ, in a manner consistent with Appendix 7	✔	✔	✔
A5 6	Provide monitoring systems to detect potential emergency situations, to classify the accident and to choose appropriate protective actions *Note These systems may include detection of in-plant radiation levels, facility system status (e g system pressure and temperature etc), fire detectors, and chemical detectors*	✔		
A5 7	Establish means to record and display all monitoring data and radiological assessments (e g dose projections) in a consolidated way over the entire LPZ *Note This could be done, for example, using maps and colour codes or symbols*		✔	✔
A5 8	Develop a means for routinely conducting inventory checks, restocking perishables and checking supplies and facilities	✔	✔	✔
A5 9	Establish a maintenance programme for the equipment, including a check list of locations, and routine inspections to ensure that the equipment is available and operational	✔	✔	✔
A5 10	Perform calibration and maintenance at intervals recommended by the international or national organizations Carry out annual inter-comparisons for the equipments of groups which are expected to work together during an emergency	✔	✔	✔
A5 11	Develop a quality assurance and control programme for all monitoring equipment and laboratory facilities *Note As part of this programme, laboratories should endeavour to take part in the IAEA Intercomparison Programme*	✔	✔	✔
A5 12	Provide personal protection equipment for on-site emergency workers, including off-site personnel arriving at the site in a manner consistent with Appendix 8	✔		
A5 13	Provide personal protection equipment for off-site emergency workers, including for each person thyroid blocking agent and self-reading dosimeter		✔	✔
A5 14	Establish or designate a laboratory to perform analyses of environmental samples outside the UPZ in manner consistent with Appendix 7		✔	✔
A5 15	Make provisions for logistical support and resources needed for the response *Note This includes clerical material, food, lodging, supplies, sanitary needs, transportation, communications, etc* *Establish methods for prompt procurement during an emergency*	✔	✔	✔

	Planning Item - CATEGORY II	Facility	Local	National
A5.16	Provide primary and back up communications systems for all critical links.	✔	✔	✔
A5.17	Periodically test communication equipment and components that are not routinely used.	✔	✔	✔
A5.18	Ensure that, within each organization, communication systems are compatible. Ensure that communications systems which are designed to link organizations are compatible.	✔	✔	✔

	Planning Item - CATEGORY II	Facility	Local	National
A6.	**Training, Drills and Exercises** *Planning Objectives:* **Training is provided to those assigned to positions in the emergency organization. Teams drill to ensure they can perform as a unit. Integrated exercises are conducted to test the operational interface among all the organizations in the total response effort and identify and correct deficiencies.**			
A6.1	Establish training requirements for each position and team.	✔	✔	✔
A6.2	Develop a programme that provides the training identified for each position in the emergency organization. Audit the attendance to ensure the training is being received. *Note: The training should be conducted under simulated accident conditions using the procedures, equipment and facilities to be used during a response. Ensure that senior decision-makers do not delegate staff to attend training sessions on their behalf.*	✔	✔	✔
A6.3	Develop a set of training materials appropriate for every group that is involved in emergency response.	✔	✔	✔
A6.4	Hold periodic exercises and integrated exercises of the plan. Develop an exercise programme to ensure that, over five years, all important objectives of the plan and all organizational interfaces are exercised.	✔	✔	✔
A6.5	Develop a system (e.g. tests, evaluation, etc.) to ensure that appropriate proficiency levels have been achieved and maintained and ensure that the personnel can carry out their assigned emergency functions.	✔	✔	✔
A6.6	Hold periodic drills for groups that must perform as teams to be effective. *Note: This should include the entire communication and activation system, environmental monitoring, fire fighting, damage control, control room, accident assessment and decision making.*	✔	✔	✔
A6.7	Develop a process to record lessons learned from training, drills and exercises and take corrective actions.	✔	✔	✔

Planning Item - CATEGORY II		Facility	Local	National
B1.	**Initial Accident Assessment** *Response Objective:* Promptly identify an accident and initiate a coordinated response.			
B1.1	Establish an accident classification system, criteria, and instrumentation consistent with Ref. [7] and Section 2.1.5. *Note: This system should be the basis for response implementation for all organizations. The system should provide means to assess: the status of safety systems needed to protect release barriers, damage to release barriers, radiation levels in the facility, release rates from normal discharge points, fires, reduced levels of safety or security, and off-site radiation measurements. The response of instruments during severe accidents should be considered (e.g. would they fail or become erratic). All organizations involved in the response must use the same classification. Provide criteria to reduce a classification.*	✔	✔	
B1.2	Provide the facility operator with instruments and procedures to detect, classify and immediately respond to abnormal events.	✔		
Suggested Timing in Emergency Situations				
▸	Classify the accident	< 15 min		

Planning Item - CATEGORY II		Facility	Local	National
B2.	**Notification and Activation** *Response Objective:* Promptly and effectively inform, activate and coordinate all organizations, groups and agencies which perform emergency response tasks.			
B2.1	Develop a clear off-site notification scheme including other countries within the UPZ and LPZ. *Note: To reduce the burden on the facility staff, limit the number of calls which the station must make. The off-site notification point should be staffed 24 hours a day, 7 days a week by personnel with the authority or means to promptly activate the off-site response. Reliable primary and back-up communication links should be provided and tested at least daily.*	✔	✔	✔

Planning Item - CATEGORY II		Facility	Local	National
B2.2	Establish a means for triggering emergency response based on the class of the accident consistent with Ref. [7]. All response organizations should initiate their initial response functions based on this class, and consistent with Appendices 3 and 9. *Note: This includes clear criteria for activating each level (facility, local, national), and what organization will be responsible for assessing the available information against the activation criteria and deciding to activate the emergency organization . This should also include procedures for immediate performance of initial tasks by personnel as they arrive at their duty stations.*	✔	✔	✔
B2.3	All critical organizations involved in early response must have means to activate critical members promptly, based on the initial notification from the facility. This should include means (e.g. beepers) to reach critical persons 24 hours a day. *Note: As a minimum, the organizations whose actions are critical for mitigation, notification, assessment and urgent protective actions implementation should be included.*		✔	✔
B2.4	Develop initial notification message format and confirmation procedures. *Note: The notification message should contain the following information: class, immediate hazard, important actions taken, urgent protective actions recommended for response personnel and the public. For a general emergency, protective action recommendations should be included.*	✔	✔	✔
B2.5	Develop follow-up message format for after the initial notification. *Note: Follow-up messages should contain the following, if available: location of incident; name and telephone number (or communication channel) of caller; date/time of incident; class, basis for class; type of actual or projected release (airborne, waterborne, surface spill) and estimated duration/impact times; release projections; emergency response actions under way; recommended protective actions; request for assistance; trend assessment.*	✔	✔	
Suggested Timing for a General Emergency				
▸	Notify local authorities after classification	< 15 min		
▸	Fully activate emergency organization	< 2 h	< 12 h.	< 24 h
▸	Notify other countries within the LPZ	.....	.....	< 1 h
	Note: The components of the response organizations should be activated in time to perform their functions consistent with the recommendations elsewhere in the checklist.			

Planning Item - CATEGORY II		Facility	Local	National
B3.	**Accident Condition Mitigation** *Response Objective:* Take all reasonable immediate and follow up actions to reduce the risk or size of a release within the facility or to the environment.			
B3 1	Ensure that there are provisions for early mitigation of accidents at their source to prevent or reduce uncontrolled releases of radioactive material to the environment or worker exposure *Note This includes emergency operating procedures and fire fighting systems Off-site fire, medical, and police assistance should be integrated into the on-site response organizations*	✔		
B3 2	Develop emergency operating procedures to be used by facility operators for control of plant systems for a range of accident conditions including those resulting in severe release *Note The procedures should be triggered by observable accident symptoms*	✔		
B3 3	Develop a list of parameters and of their expected response during abnormal conditions that can be used to trigger the application of emergency operating procedures	✔		
B3 4	Establish access control to the control room during an accident	✔		
B3 5	Develop means for technical and scientific advice (or expertise) to be provided to the on-site emergency response staff *Note This could be provided by a technical assessment group and a link to the operating staff, or by dispatching technical experts to the site This should also include means to obtain technical analysis from the designer of the facility.*	✔		
B3 6	Develop means to be able to perform damage control in the facility to mitigate the accident *Note this should include damage control teams with protective equipment, monitoring instruments, lighting, damage control supplies and communications equipment*	✔		
B3 7	Establish communication links between the facility control room, sources of technical advice and damage control teams that will be operational under accident conditions *Note This communication should be compatible with that used by off-site support organizations*	✔		
Suggested Timing in Emergency Situations				
▸	Initiate mitigation actions	< 15 mn		
▸	Provide technical assistance to operators	< 1 h		

	Planning Item - CATEGORY II	Facility	Local	National
B4.	**Urgent Protective Actions** *Response Objectives:* Promptly implement urgent protective actions to prevent deterministic health effects and to avert doses consistent with international guidance [2]			
B4.1	Adopt national intervention levels as a basis for implementation of urgent protective actions that are consistent with international guidance [1,2] as shown in Appendix 1.			✔
B4.2	Establish a precautionary action zone (PAZ, see Appendix 2), within which preparations are made to promptly implement urgent protective actions consistent with Appendix 9 and Ref. [7]. *Note: The boundary of this zone should be defined, such that it can be easily identified by the public and responders.*		✔	
B4.3	Develop procedures to make decisions immediately upon declaration of a general emergency to take urgent protective actions within the UPZ consistent with Ref. [7] and Appendices 2, 3 and 9. *Note: This should include provisions for the facility to promptly recommend urgent protective actions to off-site officials for severe accidents (General Emergency). All groups of the UPZ population (e.g., hospitals, transients) and special facilities (e.g. factories) should be considered. The UPZ should include areas of other countries, where applicable.*	✔	✔	
B4.4	Develop a means to promptly conduct environmental monitoring to determine where additional protective actions should be taken. *Note: This should include default OILs and a monitoring strategy consistent with Ref. [7] an international guidance. Off-site officials should have the means to conduct environmental monitoring near the plant within 1 hour and within the UPZ within 4 hours and testing of potentially contaminated food within the LPZ within 2 days.*	✔	✔	
B4.5	Develop techniques to revise OILs based on the actual isotopic mix of the release consistent with Ref. [7].	✔	✔	
B4.6	Develop the capabilities, means, resources and procedures to implement urgent protective actions (e.g., shelter, evacuation, thyroid blocking) within the PAZ and the UPZ. *Note: These means should concentrate on the most effective use of existing buildings, homes, transportation and communications.*		✔	

Planning Item - CATEGORY II		Facility	Local	National
B4.7	Provide means to warn and provide instructions on urgent protective actions for the people on-site or in areas controlled by the facility. *Note: This should include means for evacuation or sheltering in pre-determined areas. Non-essential personnel should be evacuated for Site Area and General Emergencies. This should include instructions to escorts for visitors and posting of instructions and evacuation routes in the facility.*	✔		
B4.8	Develop a procedure to monitor the dose in on-site assembly areas and shelters for habitability.	✔		
B4.9	Develop the means to assure the safety of all persons on the site. This includes means to account for on-site personnel. *Note: Any persons missing should be identified, so that search and rescue operations can begin*	✔		
B4.10	Establish the means to monitor evacuees and provide them with instructions on decontamination if necessary.	✔	✔	
B4.11	Establish a single point of contact and procedures to request additional assistance if the national capability to respond is exceeded. *Note: This could be accomplished through IAEA under the provisions of the "Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency".*			✔
B4.12	Develop procedures and means to recommend agricultural counter measures [12].		✔	✔
Suggested Timing in Emergency Situations • Recommend urgent protective actions for the public based on accident classification ..... • Make decisions on urgent protective actions* ..... • Complete facility protective actions ..... • Complete environmental monitoring near the plant ..... • Initiate environmental monitoring within UPZ ..... *Note (*) : Time from initial notification and recommendation for urgent protective actions from the facility.*		 < 15 min. <30 min < 1 h < 1 h < 4 h	 < 30min	

Planning Item - CATEGORY II		Facility	Local	National
B5.	**Public Education and Instruction** ***Response Objectives:*** **Provide the public with information in advance, and during an accident, on the actions they should take in response to the accident.**			
B5.1	Prepare printed information that should be provided annually to the permanent and transient population within the UPZ on how they will be notified of an accident and on the actions they should take. *Note: The information should include material on: radiation; contacts for additional information; protective actions and plans; and response of people with special needs. It should be in form that makes it available during an accident such as posters in public areas, calendars for personal display and inserts in telephone books.*	✔	✔	
B5.2	Provide means for prompt alerting of the population within the UPZ, that should be reliable, not vulnerable to normal power failure and routinely tested. *Note: Typically door-to-door notification methods are used implemented by police or other emergency response personnel. These methods should include provisions for transient populations.*		✔	
Suggested Timing in Emergency Situations ▸ **Initial notification to the public within te PAZ of urgent protective actions required** . . . . . . ***Note: Time from initial notification and recommendation for urgent protective actions from the facility.***		.....	**<1 h**	

Planning Item - CATEGORY II		Facility	Local	National
B6.	**Emergency Worker Protection** *Response Objectives:* Ensure that emergency workers at the facility and off-site monitor their cumulative dose, conform to the international dose guidelines and are provided with the appropriate radiation protection.			
B6.1	Clearly identify the personnel necessary to implement effective protective actions, to provide radiation protection and to mitigate the accident. *Note: The personnel identified should be designated as emergency workers.*	✔	✔	✔
B6.2	Develop a programme for controlling doses to all emergency workers. *Note: This should include: training, dose guidelines consistent with Ref. [7], thyroid blocking (NPP only), procedure for approving emergency doses, means for facility operator to provide protective action recommendations based on conditions at the facility for off-site emergency workers, procedure to relate field measurements and dosimeter readings to actual dose rates and dose, system for continuously monitoring doses received during operations, collecting and recording doses received, system to monitor and control the dose in facilities near the accident that will be staffed during accidents. Provisions should be made to obtain additional dosimeters and specialized radiological protection equipment, supplies and expertise. This could be accomplished through the IAEA under the provisions of the "Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency".*	✔	✔	✔
B6.3	Develop a procedure to continuously account for emergency workers.	✔	✔	
B6.4	Establish provisions for tracking and medical follow-up of potentially exposed emergency workers.	✔	✔	✔
B6.5	Make provisions for the radiation protection of on-site personnel. *Note: This should include: access to a protected facility, training, instruments to measure very high dose rates, protective clothing against skin contamination and dose, respiratory protection, procedures to limit doses during interventions and ensure exposures are justified, means and criteria to detect and decontaminate serious levels of skin contamination, and communication. This includes off-site fire, police, medical or other support personnel that may respond to the site.*	✔		

	Planning Item - CATEGORY II	Facility	Local	National
B7	**Medical, Fire Fighting and Police Assistance** *Response Objectives:* Provide adequate police, medical and fire support services.			
B7.1	Establish a capability to provide immediate on-site fire fighting and first aid during an emergency. Prepare means to maintain security during an emergency and evacuation of the site.	✔		
B7.2	Develop guidelines for the decontamination of injured persons.	✔	✔	
B7.3	Provide means to transport and initially treat a limited number of highly contaminated or exposed and injured individuals from the facility. *Note: the initial treatment facility should have the capability to treat non-radiation injuries of contaminated patients, decontaminate, and identify radiation exposures needing specialized treatment and prepare patients for transport.*	✔	✔	
B7.4	Develop agreements to treat highly exposed persons at an existing institution having the capability to provide specialized treatment of overexposed personnel. *Note: The capability to treat high exposures in the country is not essential and can be obtained through the IAEA or WHO Collaborating Centre.*			✔
B7.5	Develop procedures to obtain the assistance of local emergency response services and allow them prompt access. *Note: This includes police, ambulance, medical, hospital and fire fighting services. This should include training on role, radiation protection, expected function during an emergency, familiarization with the facility and access to the facility.*	✔	✔	
B7.6	Make provision to provide radiation protection to local emergency response services personnel who come to the facility during an emergency.	✔	✔	

	Planning Item - CATEGORY II	Facility	Local	National
B8.	**Media Relations** *Response Objectives:* Provide the media with timely and coordinated information to ensure that the public receives accurate and consistent information concerning protective actions and the accident development.			
B8.1	Develop means for providing timely information to the media.	✔	✔	✔
B8.2	Develop procedures to ensure that the information given to the media by the various organizations involved is consistent and coordinated. *Note: This could involve defining jurisdictions, sharing information, holding joint press conferences, and operating from a joint media centre.*	✔	✔	✔

Planning Item - CATEGORY II		Facility	Local	National
B8 3	Designate a single spokesperson for each level.	✔	✔	✔
B8 4	Designate a group responsible for monitoring the media and the means to promptly respond to false information		✔	✔

Planning Item - CATEGORY II		Facility	Local	National
B9.	**Longer Term Protective Actions and Interventions Related to Food** *Response Objectives:* Effectively implement longer term protective actions and interventions related to food in a manner consistent with international guidance.			
B9 1	Adopt national intervention levels as a basis for implementation of longer term protective actions and restriction of food consistent with international guidance [1,2] as shown in Appendix 1			✔
B9 2	Establish longer term protective action planning zone (LPZ, see Appendix 2) Within this zone, collect information needed to effectively implement longer term and ingestion protective actions *Note This should include legal considerations, population characteristics, food distribution systems, farming practices and crops, and potential relocation resources*		✔	✔
B9 3	Develop plans and procedures to make longer term and ingestion protective action decisions within the LPZ *Note This should cover all aspects of the environmental monitoring programme (short and long term) within the LPZ consistent with Ref [7] This should include Operational Intervention Levels (OIL) for gamma measurements, food and water sampling and analysis, and surface contamination measurements These procedures should be compatible (methods, calibration, units) between all groups and organizations involved*		✔	✔
B9 4	Develop a detailed sampling plan for sampling of food stuff within the LPZ (see Appendix 2). Make provisions to expand the sampling region to 10-25 km around the plant for significant releases *Note Take into account all organizations involved in food sampling and all production sources (cattle and dairy animals, milk, fresh produce, water, fish, rain water reservoir). The monitoring results for all affected areas should be integrated into a single assessment for the LPZ*		✔	✔
B9 5	Develop plans and procedures to revise the predetermined longer term OILs based on environmental and other data at the time of the accident, in a manner consistent with Ref [7]			✔

	Planning Item - CATEGORY II	Facility	Local	National
B9.6	Provide means to make prompt decisions concerning short term ingestion interventions. *Note: This includes, for example: restricting immediate consumption of food (e.g., local milk or home grown garden vegetables), housing cattle and placing them on stored feed, providing uncontaminated food and water, and protecting rain water reservoirs and cisterns. Identify who has the authority to change these criteria.*			✔
B9.6	Establish provisions for tracking and medical follow-up of potentially exposed members of population.		✔	✔

	Planning Item - CATEGORY II	Facility	Local	National
B10.	**Psychological Impact Mitigation** ***Response Objectives:*** **Keep the psychological impact as low as reasonably possible.**			
B10.1	Give due consideration to the lessons learned on mitigation of psychological impact during response to accidents. *Note: This should include efforts to develop and maintain trust by: a) being honest with the public, b) providing sufficient information so the nature of the threat and the reasons for the actions being taken are clear, c) providing clear and simple instruction on the actions to take, d) providing consistent advice and assessments that are in keeping with international guidance, e) using a single spokes person for the government, and f) providing a program of information for the public after the accident. Additional guidance to be developed for the next revision of this document.*		✔	✔

4.3. EMERGENCY PLANNING CATEGORY III

General accident description

Category III is for facilities with the potential consequences on-site only. Deterministic health effects are possible for workers at these facilities. Facilities that may fall into this category are:

(a) facilities with sources or processes with the potential of unshielded dose rates of more than 100 mGy/h at one meter,
(b) facilities with the potential for criticality accidents;
(c) reactors of less than 2 MW(th); and
(d) facilities with amounts more than 1/10 of the amounts shown in Table IV.

Most of these accidents will occur with little warning and result only in exposure of on-site personnel.

General concept of operations

The response will concentrate on the facility and on obtaining prompt fire fighting, police and medical support from off-site. The user will perform immediate life saving actions onsite. They classify the accident and notify local off-site officials. Local off-site officials will provide police, fire and medial assistance to the site if requested. The user will ensure that all workers on-site (to include those responding from off-site) are provided with radiological protection. The national level officials will support the local officials and assist in obtaining specialized treatment of exposed persons through the IAEA, if needed.

A. *INFRASTRUCTURE ELEMENTS*

The infrastructure requirements in this section should be considered in developing the capability to accomplish all of the functional requirements in Section B.

	Planning Item - CATEGORY III	User	Local	National
A1.	**Authority, and Command and Control** ***Planning Objectives:*** **The legal authority for developing emergency plans and for responding to radiological emergencies is in place. Emergency planning and emergency response responsibilities are assigned to specific organizations.**			
A1.1	Designate who has the authority for performing critical tasks.	✔	✔	
A1.2	Authority and responsibility for performance of critical tasks should be provided to individuals who are at the facility or to the local government to assure that actions are promptly carried out.	✔	✔	
A1.3	Ensure coordination and interaction between all levels of authority are clearly defined during all phases of the accident .	✔	✔	

	Planning Item - CATEGORY III	User	Local	National
A2.	**Organizational Responsibilities** ***Planning Objectives:*** **Responsibility to perform functions during a response is clearly assigned. Each organization has sufficient staff to perform its assigned responsibilities.**			
A2.1	Develop a block diagram of the overall response organization.	✔	✔	
A2.2	Define the authorities and responsibilities of each "block".	✔	✔	
A2.3	Identify all the organizations (including government and private) which are part of the response organization. *Note: Every position in an organization should be documented with a title, tasks to be performed and clearly defined interfaces.*	✔	✔	
A2.4	Develop a concept of operations for each organization that describes its role and how it relates to the other organizations. *Note: Ensure that organizations with potentially overlapping responsibilities understand their roles during an accident.*	✔	✔	
A2.5	Integrate radiological emergency response into the planning for other emergencies as much as possible. *Note: Existing organizations and staff should be used wherever possible. The local police, fire and other existing response organizations should respond as they do normally, with radiological expertise and support provided by the user.*	✔	✔	

Planning Item - CATEGORY III		User	Local	National
A2.6	Assign staff to all the positions in the response organization, ensuring they can be staffed in time to meet the functional requirements in Section B.	✔	✔	

Planning Item - CATEGORY III		User	Local	National
A3.	**Response Coordination** *Planning Objectives:* All response efforts are coordinated including those of the user, first responders, non-governmental support organizations, and local government. All response organizations understand and agree to their response functions.			
A3.1	Clearly define the organizational interfaces during each phase of the response. *Note: Define which organizations interact together, how they interact (e.g. liaison staff, telephone, etc.), and who within each organization is the contact point.*	✔	✔	
A3.2	Ensure that there is inter-operability between plans and procedures. *Note: They should have common units, common decision-making principles, compatible communication networks, common operational concepts, common sampling and measurements, compatible reporting methods, compatible public information strategies, procedures to allow access to accident site, and common protective actions criteria.*	✔	✔	
A3.3	Develop written agreements, memoranda of understanding, etc. between local and on-site organizations that have a primary and support role in emergency response.	✔	✔	

Planning Item - CATEGORY III		User	Local	National
A4.	**Plans and procedures** *Planning Objectives:* An individual is responsible for coordinating the development of emergency plans and procedures for each organization. These individuals regularly cooperate with each other to assure an integrated level of planning is maintained. Plans and procedures are developed and reviewed to assure for effective implementation.			
A4.1	Develop an emergency response plan defining authorities, roles, interrelationships and responsibilities of the various organizations involved. *Note: The emergency response plan is the general guideline and the basis for development of detailed implementing procedures.*	✔	✔	
A4.2	Identify a coordinator for emergency planning for each organization.	✔	✔	
A4.3	Develop procedures which cover all critical tasks. These procedures should provide detailed instructions and the required information. *Note: Technical procedures should use units that are consistent with the instruments used. Technical procedures common to several groups or used by several groups should use standard units.*	✔	✔	
A4.4	Use a standard format for procedures, identifying each response position, date approved, and steps to be performed. *Note: The usability of the procedures should be confirmed during drills and exercises.*	✔	✔	
A4.5	Establish an quality assurance process. *Note: This should include a distribution list. Procedures and changes to procedures should not be implemented until the appropriate personnel are adequately trained.*	✔	✔	
A4.6	Ensure that all procedures, reference materials, and documents required to perform a function are available at the location where the function is to be carried out.	✔	✔	
A4.7	Conduct a regular quality assurance review of the plan and the procedures *Note: Take into account lessons learned from accidents at similar facilities around the world and during drills and exercises.*	✔	✔	
A4.8	Update all perishable information quarterly (phone numbers, etc.).	✔	✔	
A4.9	Correct critical deficiencies to plans and procedures within a month. Improvements and modifications which are not critical should be made within 12 months.	✔	✔	

	Planning Item - CATEGORY III	User	Local	National
A5.	**Logistic Support, Emergency Supplies, Equipment, Communications and Facilities** *Planning Objectives:* Adequate emergency supplies, facilities and equipment are available.			
A5.1	Conduct an analysis to identify the equipment, supplies, communications and facilities needed to perform the emergency response tasks and functions within Section B. *Note: This should include instruments and methods to assess the principal radionuclides and human exposure pathways. If possible, equipment used for emergencies should be the same as used in normal situations.*	✔	✔	
A5.2	Establish or designate facilities (or centres, rooms and areas) to support all the emergency response functions.	✔	✔	
A5.3	Designate or locate the emergency facilities so that they can operate under accident conditions, including radiological exposure conditions.	✔	✔	
A5.4	Develop a means for routinely conducting inventory checks, restocking perishables and checking the supplies and facilities.	✔	✔	
A5.5	Establish a maintenance programme for the equipment, including a check list of location, and routine inspections to ensure that the equipment is available and operational.	✔	✔	
A5.6	Perform calibration and maintenance at intervals recommended by the international or national organizations. Carry out annual inter-comparisons for the equipments of groups which are expected to work together during an emergency.	✔	✔	
A5.7	Provide personal protection equipment for on-site emergency workers, including off-site personnel arriving at the site in a manner consistent with Appendix 8. *Note: This should include for each person thyroid blocking agent (NPPs) and self-reading dosimeter.*	✔		
A5.8	Provide reliable communications for off-site notifications and response personnel in the facility. *Note: Periodically test equipment and communications components which are not normally used.*	✔	✔	
A5.19	Ensure that, within each organization, communication systems are compatible. Ensure that communications systems that are designed to link organizations are compatible.	✔	✔	
A5.10	Establish methods for prompt procurement of special equipment and resources during an emergency, by-passing normal procurement procedures and regulations	✔	✔	

	Planning Item - CATEGORY III	User	Local	National
A.6	**Training, Drills and Exercises** *Planning Objectives:* Training is provided to those assigned to positions in the emergency organization. Teams drill to assure they can perform as a unit.			
A6.1	Establish training requirements for each position and teams.	✔	✔	
A6.2	Develop a programme that provides the training identified for each position in the emergency organization. Audit the attendance to ensure the training is being received. *Note: The training should be conducted under simulated accident conditions using the procedures, equipment and facilities to be used during a response. Ensure that senior decision-makers do not delegate staff to attend training sessions on their behalf. Integrated exercises are conducted to test the operational interface among all the organizations in the total response effort.*	✔	✔	
A6.3	Develop a set of training materials.	✔	✔	
A6.4	Hold periodic exercises and integrated exercises of the plan. Develop an exercise programme to ensure that, over five years, all important objectives of the plan and all organizational interfaces are exercised.	✔	✔	
A6.5	Develop a system (e.g. tests, evaluation, etc.) to ensure that appropriate proficiency levels have been achieved and maintained by members of the emergency response organization.	✔	✔	
A6.6	Hold periodic drills for groups that must perform as teams to be effective. *Note: This should include the entire communication and activation system, environmental monitoring, fire fighting, damage control, control room, accident assessment and decision making.*	✔	✔	
A6.7	Develop a process to record lessons learned from training, drills and exercises and take corrective actions.	✔	✔	

	Planning Item - CATEGORY III	User	Local	National
B1.	**Initial Accident Assessment** *Response Objective:* Promptly identify an accident and initiate a coordinated response.			
B1.1	Develop a means to detect and classify the spectrum of accidents that could result in serious worker or public exposure. *Note: This should include the most serious accidents possible at the facility. This criteria and instrumentation must be developed to assess (as appropriate): 1) the status of safety systems needed to prevent a release or exposure, 2) damage that could lead to a release or exposure, 3) a release or loss of shielding, 4) facility radiation levels, 5) fires, 6) reduced levels of safety or security, 7) potential public (e.g., visitors) exposure or contamination and 8) lost sources. This should include, where appropriate, routine inventory checks of sources, in-facility radiations monitors and monitoring of visitors and workers. Provide means to reduce the classification.*	✔		
B1.2	Provide the user with instruments and procedures to detect, classify and immediately respond to abnormal events.	✔		
	Suggested Timing in Emergency Situations ▸ Classify the accident	< 15 min		

	Planning Item - CATEGORY III	User	Local	National
B2.	**Notification and Activation** *Response Objective:* Promptly and effectively inform, activate and coordinate all organizations, groups and agencies which perform emergency response tasks.			
B2.1	Establish a single off-site notification point that is staffed 24 hours a day. *Note: This point should be able to provide medical, fire, police assistance and coordinate with officials responsible for assessment of public exposure.*		✔	
B2.2	Upon classification of an accident the user must have procedures to notify off-site officials promptly: 1) in the event of a potential public exposure or lost source and 2) need for emergency assistance from off site (fire, police) and 3) need for medical support for exposed or contaminated people.	✔		
B2.3	All critical organizations involved in the early response must have the means to activate critical members promptly based on the initial notification from the user. *Note: This should include means to reach critical persons 24 hours a day.*	✔	✔	
B2.4	Develop procedures for notification and requesting assistance.	✔	✔	

Planning Item - CATEGORY III	User	Local	National
Suggested Timing in Emergency Situations			
▸ Notify local authorities after classification	< 15 min		

	Planning Item - CATEGORY III	User	Local	National
B3.	**Accident Condition Mitigation** *Response Objective:* Take all reasonable immediate and follow up actions to reduce the risk or size of consequences within the facility or in the environment.			
B3.1	Conduct an analysis to identify potential accidents and identify actions that can be reasonably taken to reduce the risk of a release or exposure and to prevent an escalation of the accident. Ensure that there are provisions for early mitigation of accidents to prevent or reduce uncontrolled releases of radioactive materials or worker exposure. *Note: This includes emergency operating procedures and fire fighting systems. Off-site fire, medical, and police assistance should be integrated into the on-site response organizations.*	✔		
B3.2	Develop emergency operating procedures to be used by the user for control of facility systems to reduce the consequences of the accident. *Note: This should be done for a range of facility accident conditions including those resulting in a release, contamination, loss of shielding, exposure of workers or public and lost or stolen sources.*	✔		
B3.3	Develop a list of parameters and of their expected response during abnormal conditions which can be used to trigger the application of emergency operating procedures.	✔		
B3.4	Make arrangements for the provision of technical and scientific advice (or expertise) to help the on-site emergency response staff mitigate the accident. *Note: This should include means to obtain technical analysis from the builder of the facility or supplier of the radioactive material or device.*	✔		
B3.5	Provide means to perform damage control in the facility to mitigate the accident. *Note: this should include damage control teams with protective equipment, monitoring instruments, lighting, damage control supplies and communications equipment.*	✔		
B3.6	Establish communication links between the facility control room, sources of technical advice and damage control teams that will be operational under accident conditions. *Note: this communication should be compatible with that used by off-site support organizations.*	✔		
	Suggested Timing in Emergency Situations			
	▸ Initiate mitigation actions	< 15 min		
	▸ Provide technical assistance to the user	< 1 h		

Planning Item - CATEGORY III		User	Local	National
B4.	**Urgent Protective Actions** *Response Objectives:* Promptly implement urgent protective actions to prevent deterministic health effects and to avert doses consistent with international guidance [2]			
B4 1	Adopt national intervention levels for implementation of urgent protective actions consistent with international guidance [1, 2] as shown in Appendix 1			✔
B4 1	Upon notification of an accident involving potential public exposure or lost source develop procedures for 1) obtaining technical assistance and monitoring from the facility and 2) determining the appropriate protective action	✔	✔	
B4 2	Clearly define the officials with the responsibility for off-site response to accident involving potential public exposure or contamination and lost sources		✔	
B4 3	Develop a means to monitor environmental radiation levels outside the facility and inform and advise off-site officials of abnormal levels *Note This should be provided immediately for potential off-site releases It should be provided at the request of off-site officials for potential off-site contamination of the public or visitors or loss sources This should include default OILs developed for the potential accidental releases or exposures Monitoring equipment should be available as recommended in Appendix 7*	✔		
B4 4	Provide means to warn and provide instruction on urgent protective actions for the people on-site or in areas controlled by the user *Note This should include means for evacuation or sheltering in pre-determined areas and means to account for on-site personnel Evacuation routes and safe and assembly areas should be marked*	✔		
B4 5	Develop a procedure to monitor the dose in on-site areas	✔		
B4 9	Develop procedures and means to ensure the safety of all persons on the site in the event of an emergency, in a manner consistent with Appendix 9 *Note This should include conducting search and rescue operations for missing persons*	✔		
B4 10	Establish means to monitor evacuees and provide them with instructions on decontamination if necessary	✔		
Suggested Timing in Emergency Situations				
▸	Implement facility protective actions.	< 30 mn		

Planning Item - CATEGORY III		User	Local	National
B5.	**Public Education and Instruction** *Response Objectives:* Ensure that the public is confident about the plans in place to protect them and the environment.			
B5.1	Develop a public education programme to inform visitors about the risk and to explain the provisions in place at the facility in case of an accident.	✔		

Planning Item - CATEGORY III		User	Local	National
B6.	**Emergency Worker Protection** *Response Objectives:* Ensure that emergency workers at the facility and off-site monitor their cumulative dose, conform to the international dose guidelines and are provided with the appropriate radiation protection.			
B6.1	Adopt dose guidelines for emergency workers consistent with international guidance [1, 2].			✔
B6.1	Clearly identify the personnel necessary to implement effective protective actions to provide radiation protection and to mitigate the accident. *Note: The personnel identified should be designated as emergency workers.*	✔	✔	
B6.2	Develop a programme for controlling doses to all emergency workers. *Note: This should include: training, dose guidelines consistent with Ref. [7], life-saving actions, recommendations based on conditions at the facility for off-site emergency workers, dosimeter readings to actual dose rates and dose, system for continuously monitoring doses received during operations, collecting and recording doses received.*	✔	✔	
B6.3	Develop a procedure to continuously account for emergency workers.	✔	✔	
B6.4	Establish provisions for tracking and medical follow-up of potentially exposed emergency workers.	✔	✔	
B6.5	Make provisions for the radiation protection of on-site personnel. *Note: This should include: access to a protected facility, training, instruments to measure very high dose rates, protective clothing against skin contamination and dose, respiratory protection, procedures to limit doses during interventions and ensure exposures are justified, means and criteria to detect and decontaminate serious levels of skin contamination, and communication. This includes off-site fire, police, medical or other support personnel that may respond to the site.*	✔		

Planning Item - CATEGORY III		User	Local	National
B7	**Medical, Fire Fighting and Police Assistance** *Response Objectives:* Provide adequate police, medical and fire support services.			
B7.1	Develop guidelines for the decontamination of injured persons. *Note: These guidelines should be provided to users of radioactive sources and appropriate local hospitals.*			✔
B7.2	Provide means to transport and initially treat a limited number of highly contaminated or exposed and injured individuals from the facility. *Note: the initial treatment facility should have the capability to treat non-radiation injuries of contaminated patients, decontaminate, and identify radiation exposures needing specialized treatment and prepare patients for transport.*		✔	
B7.3	Develop agreements to treat highly exposed persons at an existing institution having the capability to provide specialized treatment of overexposed personnel. *Note: The capability to treat high exposures in the country is not essential and can be obtained through the IAEA or a WHO Collaborating Centre.*		✔	
B7.4	Develop procedures to obtain the assistance of local emergency response services and allow them prompt access. *Note: This includes police, ambulance, medical, hospital and fire fighting services. This should include training on role, radiation protection, expected function during an emergency, familiarization with the facility and access to the facility.*	✔	✔	
B7.5	Make provision to provide radiation protection to local emergency response services who come to the facility during an emergency.	✔	✔	

Planning Item - CATEGORY III		User	Local	National
B8.	**Media Relations** *Response Objectives:* Provide the media with timely and coordinated information to assure that the public receives accurate information concerning protective actions.			
B8.1	Designate a single spokesperson for the response.	✔	✔	
B8.2	Make arrangements between local and national governments for media relations assistance.		✔	✔

4.4. EMERGENCY PLANNING CATEGORY IV

General accident description

Category IV is intended for countries or areas with little or no identifiable radiation threat and provides the minimum level of preparedness. However accidents involving sealed sources such as those used for radiography; illegal sources brought into the country; re-entry of nuclear powered satellites and facilities with small amounts of radioactive material or small sources are possible any where. For these types of accidents, detailed planning at the local level is limited to being able to recognize a radioactive package, being familiar with basic precautions and knowing who should be called to provide further assistance. Countries with a significant potential for accidents involving transportation should refer to Ref. [10] for detailed guidance.

In most of these accidents local fire, police or medical officials are most likely to be first to be informed and it is most likely that these local officials will not have the capability to assess a radiological accident.

For re-entry of nuclear powered satellites the risk is very small. It will be virtually impossible to identify the area of impact with sufficient accuracy to allow reasonable protective actions to be take. Typically the impact area covers 100,000 km^2, or about the area of Austria.

General concept of operations

When local officials are notified of a potential hazard, they will take immediate precautions to confine the radioactive material and protect people in the immediate vicinity. This must include taking any life saving actions (i.e., rescue from fire) without delay or waiting for monitoring. National officials will provide advice over the phone to local officials and dispatch survey and response personnel, as required.

For lost or stolen sources, offsite officials will make public announcements describing the source and stressing the hazard.

For re-entry of nuclear powered satellites, if the area of concern can be bounded (e.g., through visual sightings), the public should be instructed to avoid and report suspicious objects and airborne monitoring should be conducted to locate radioactive debris. Ground based monitoring will only be effective for investigating reported suspicious objects or in areas first identified by airborne monitoring. Airborne monitoring can be obtained through IAEA if a limited area of concern has been identified.

If additional radiological assistance is needed, it may be requested through the IAEA under the Assistance Convention by national officials, or through agreements with other organizations.

The infrastructure requirements in this section should be considered in developing the capability to accomplish all of the functional requirements in Section B

Planning Item - CATEGORY IV		User	Local	National
A1.	**Authority, and Command and Control** *Planning Objectives:* The legal authority for developing emergency plans and for responding to radiological emergencies is in place. Emergency planning and emergency response responsibilities are assigned to specific organizations.			
A1 1	Identify who has the authority for performing critical task in Section 3			✔
A1 2	Authority and responsibility for performance of critical tasks should be assigned to individuals to ensure that actions are promptly carried out			✔

Planning Item - CATEGORY IV		User	Local	National
A2.	**Organizational Responsibilities** *Planning Objectives:* Responsibility to perform functions during a response is clearly assigned. Each organization has sufficient staff to perform its assigned responsibilities.			
A2 1	Develop a block diagram of the overall response organization			✔
A2 2	Define the authorities and responsibilities of each "block"			✔
A2 3	Identify all the organizations (including government and private) which are part of the response organization Every position in an organization should be documented with a title, tasks to be performed and clearly defined interfaces			✔
A2 4	Develop a concept of operations for each organization that describes its role and how it relates to the other organizations *Note Ensure that organizations with potentially overlapping responsibilities understand their roles during an accident*			✔
A2 5	Integrate emergency radiological response into the planning for other emergencies as much as possible *Note Existing organizations and staff should be used wherever possible The local police, fire and other existing response organizations should respond with radiological expertise provided as needed by national authorities*			✔

Planning Item - CATEGORY IV		User	Local	National
A3.	**Response Coordination** *Planning Objectives:* All response efforts are coordinated.			

	Planning Item - CATEGORY IV	User	Local	National
A3.1	Clearly define the organizational interfaces. *Note: Define which organizations interact together, how they interact (e.g. liaison staff, telephone, etc.), and who within each organization is the contact point.*			✔
A3.2	Designate a national coordinator that can be deployed to the location of an accident to coordinate the response.			✔
A3.2	Ensure that there is interoperability between plans and procedures.			✔

	Planning Item - CATEGORY IV	User	Local	National
A4.	**Plans and procedures** ***Planning Objectives:*** **An individual is responsible for coordinating the development of emergency plans**			
A4.1	Develop an emergency response plan defining authorities, roles, interrelationships and responsibilities of the various organizations involved. *Note: The emergency response plan is the general guideline and the basis for development of detailed implementing procedures.*	✔	✔	✔
A4.2	Identify a coordinator for emergency planning for each key organization.	✔	✔	✔
A4.3	Develop procedures which cover all critical tasks. *Note: These procedures should provide detailed instructions and required information. Technical procedures should use units which are consistent with the instruments used. Technical procedures common to several groups or used by several groups should use standard units.*	✔	✔	✔
A4.4	Use a standard format for procedures, identifying each response position, date approved, and steps to be performed. *Note: The usability of the procedures should be confirmed during table top exercises.*	✔	✔	✔
A4.5	Establish a quality assurance process. *Note: A distribution list should be developed.. Procedures and changes to procedures should not be implemented until the appropriate personnel are adequately trained.*	✔	✔	✔
A4.6	Ensure that all procedures, reference materials, and documents required to perform a function are available at the location where the function is to be carried out.	✔	✔	✔
A4.7	Conduct a periodic review of the plan and the procedures *Note: Take into account lessons learned from similar accidents around the world and during drills and exercises.*	✔	✔	✔

Planning Item - CATEGORY IV		User	Local	National
A4 8	Update all perishable information quarterly (phone numbers, etc)	✔	✔	✔
A4 9	Correct deficiencies to plans and procedures within 12 months	✔	✔	✔

Planning Item - CATEGORY IV		User	Local	National
A5.	**Logistic Support, Emergency Supplies, Equipment, Communications and Facilities** *Planning Objectives:* Adequate emergency supplies, facilities and equipment are available.			
A5 1	Establish or designate a location where national officials will meet in the event of a radiological accident to coordinate the response			✔
A5 2	Establish a notification point staffed 24 hours a day to which notification of accidents will be made and from which initial advice will be provided to local officials			✔
A5 2	Develop a means for routinely conducting inventory checks, restocking perishables and checking supplies and facilities	✔		✔
A5 3	Establish a maintenance programme for the equipment, including a check list of location, and routine inspections to ensure that the equipment is available and operational	✔		✔
A5 4	Provide personal protection equipment for emergency workers, including for each person self-reading dosimeter (see Appendix 8)	✔		✔
A5 5	Periodically test communication equipment components that are not normally used.			✔

Planning Item - CATEGORY IV		User	Local	National
A6.	**Training, Drills and Exercises** *Planning Objectives:* Training is provided to those assigned to positions in the emergency organization. Teams drill to assure they can perform as a unit.			
A6 1	Establish training requirements for each position and team	✔		✔
A6 2	Develop a programme that provides the training identified for each position in the emergency organization Audit the attendance to ensure the training is being received *Note Basic training or instructions should be provided to local responders on how to recognize radioactive packages, basic precautions and who to call to get assistance The first people to respond to an accident will most likely not have radiation monitoring equipment or expertise, they will need to make the initial decisions based on other information such as a description of medical symptoms, a description of the device, markings or papers*	✔	✔	✔
A6 3	Develop a set of training materials			✔

	Planning Item - CATEGORY IV	User	Local	National
A6.4	Hold periodic table top exercises of all the major organizations that will have a role in the response to radiological emergencies.			✔
A6.5	Develop a system (e.g. tests, evaluation, etc.) to ensure that appropriate proficiency levels have been achieved and maintained by members of the emergency response organization.	✔		✔
A6.6	Develop a process to record lessons learned from training, drills and exercises and take corrective actions.	✔		✔

Planning Item - CATEGORY IV		User	Local	National
B1.	**Initial Accident Assessment** *Response Objective:* Promptly identify an accident and initiate a coordinated response.			
B1 1	Develop procedures to promptly identify an accident *Note Facility events that should be identified include fires, spills, lost sources, and overexposure For local authorities, this includes recognizing radioactive packages or sources*	✔	✔	

Planning Item - CATEGORY IV		User	Local	National
B2.	**Notification and Activation** *Response Objective:* Promptly and effectively inform, activate and coordinate all organizations, groups and agencies which perform emergency response tasks.			
B2 1	Establish a single point that is staffed 24 hours to which notification of an accident can be made at from which advice and radiological monitoring and other support can be provided to local officials This point should also be prepared to receive notification from IAEA of a potential trans-boundary accident Confirm that IAEA has the correct notification point			✔
B2 2	All critical organizations involved in the response must have means to promptly activate critical members, based on the initial notification from the user or first responders			✔
Suggested Timing in Emergency Situations				
▸	Provide advice by phone to local responders			< 15 min

Planning Item - CATEGORY IV		User	Local	National
B3.	**Accident Condition Mitigation** *Response Objective:* Take all reasonable immediate and follow up actions to reduce the consequences.			
B3 1	Facilities which routinely use small amounts of radioactive material, should develop means to deal with minor spills and other radiological accidents *Note This should include means to monitor and decontaminate spills and to report lost sources*	✔		

Planning Item - CATEGORY IV		User	Local	National
B4.	**Urgent Protective Actions** *Response Objectives:* Promptly implement protective actions.			
B4.1	Develop basic procedures for responding to an large unanticipated accident involving public exposure, lost source and large areas of contamination. *Note: For lost or stolen sources provisions should be made to make public announcements. For other types of accidents, the response should concentrate on forming a coordinating body composed of responsible organizations at the time of an accident and identification of who would lead the effort. Adopt national intervention levels for implementation of urgent protective actions consistent with international guidance [1, 2] as shown in Appendix 1.*			✔
B4.2	Develop a means to provide survey team(s) to conduct environmental monitoring as recommended in Appendix 7.			✔
B4.3	Establish a single point of contact and procedures to request additional assistance if the national capability to respond is exceeded. *Note: This could be accomplished through IAEA under the provisions of the "Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency".*			✔
Suggested Timing in Emergency Situations ▸ For lost sources notify the public of hazard. ..... ▸ Provide monitoring assistance to local officials.			< 8 h	< 8 h

Planning Item - CATEGORY IV		User	Local	National
B5.	**Emergency Worker Protection** *Response Objectives:* Assure that emergency workers have access to basic radiation protection equipment.			
B5.1	Adopt dose guidelines for emergency workers consistent with international guidance [1,2].	✔		✔
B5.2	Provide means to identify the personnel necessary to implement effective protective actions, provide radiation protection and mitigate the accident. *Note: The personnel identified should be designated as emergency workers.*			✔

	Planning Item - CATEGORY IV	User	Local	National
B5 3	Develop a programme for controlling doses to all emergency workers *Note: For large contamination accidents, this should include training, dose guidelines consistent with Ref [7], procedures for approving emergency doses, system for continuously monitoring doses received during operations, collecting and recording doses received Provisions should be made to obtain additional dosimeters and specialized radiological protection equipment, supplies and expertise This could be accomplished through IAEA under the provisions of the "Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency"*			✔
B5 4	Establish provisions for tracking and medical follow-up of potentially exposed emergency workers	✔		✔

	Planning Item - CATEGORY IV	User	Local	National
B6	**Medical, Fire Fighting and Police Assistance** *Response Objectives:* Provide adequate police, medical and fire support services.			
B6 1	Develop and distribute information to local first responders (police, fire and medical officials) on recognition and initial response to potential radiological hazards to include sealed sources and transportation accidents as described in Ref. [10] *Note This should include immediate actions to confine the source, limit exposures and call a designated organization for assistance This must include clear instructions to take any life saving actions (i e., rescue from fire) without delay It must be assumed that the first responders or first parties notified will not have access to radiological monitoring They should be provided with printed material with pictures of sources, radiation shipping labels and a description of the symptoms or clues indicting radiation induced illness A phone number at which they can obtain additional advice and monitoring assistance should also be provided*			✔
B6 2	Facilities with small amounts of radioactive material should be encouraged to brief local fire fighters, police and medical officials on the nature of the hazard *Note This is to ensure that fire fighters, medical or police personnel will not be scared by the presence of radioactive material*			✔

	Planning Item - CATEGORY IV	User	Local	National
B7.	**Media Relations** *Response Objectives:* Provide the media with timely and coordinated information to ensure that the public receives accurate and consistent information concerning protective actions and the accident development.			
B7 1	Designate a single spokesperson for the response			✔

Planning Item - CATEGORY IV		User	Local	National
B7.2	Make arrangements between local and national governments for media relations assistance.		✔	✔

Planning Item - CATEGORY IV		User	Local	National
B8.	**Longer Term Protective Actions and Intervention Related to Food** *Response Objectives:* Effectively implement longer term protective actions and interventions related to food consistent with international guidance.			
B8.1	Adopt national intervention levels for implementation of longer term protective actions and restriction of food, consistent with international guidance [1,2] as shown in Appendix 1. *Note: This is required for accidents with potentially large contamination consequences (e.g. Goiânia type).*			✔
B8.2	Integrate the national organization with responsibly to implement longer term protective action and intervention related to food into the general response. *Note: This is required for accidents with potentially large contamination consequences (e.g. Goiânia type).*			✔
B8.3	Develop procedures to request for additional sampling and analysis support from neighbouring countries or through the IAEA under the provision of the "Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency."[14]			✔

4 5 EMERGENCY PLANNING CATEGORY V

General accident description

Category V is for areas that could be impacted by distant accidents resulting in significant levels of ground deposition or importation of contaminated food There should be a warning of the potential for contamination but it is possible that the first indication will be detection of contamination

General concept of operations

The country where the accident occurs (or the facility) will notify the affected country of a potentially contaminating event or notification will be received from the IAEA National officials will conduct monitoring and sampling to determine what food control actions will be required Decisions will be based on OILs determined in advance

A. *INFRASTRUCTURE ELEMENTS*

The infrastructure requirements in this section should be considered in developing the capability to accomplish all of the functional requirements in Section B.

	Planning Item - CATEGORY V	National
A1.	**Authority, and Command and Control** ***Planning Objectives:*** **The legal authority for developing emergency plans and for responding to radiological emergencies is in place. Emergency planning and emergency response responsibilities are assigned to specific organizations.**	
A1.1	Identify (by reference to specific acts, codes or statutes) the legal basis for response actions.	✔
A1.2	Identify who has the authority for performing the critical tasks in Section 3. *Note: Authority and responsibility for performance of critical tasks should be assigned to ensure that actions are promptly carried out.*	✔
A1.4	Ensure that coordination between all levels of authority are clearly defined.	✔

	Planning Item - CATEGORY V	National
A2.	**Organizational Responsibilities** ***Planning Objectives:*** **Responsibility to perform functions during a response is clearly assigned. Each organization has sufficient staff to perform its assigned responsibilities.**	
A2.1	Develop a block diagram of the overall response organization.	✔
A2.2	Define the authorities and responsibilities of each "block".	✔
A2.3	Identify all the organizations (including government and private) which are part of the response organization. *Note: Every position in an organization should be documented with a title, tasks to be performed and clearly defined interfaces.*	✔

	Planning Item - CATEGORY V	National
A3.	**Response Coordination** ***Planning Objectives:*** **All response efforts are coordinated. All response organizations understand and agree to their response functions.**	
A3.1	Clearly define the organizational interfaces. *Note: Define which organizations interact together, how they interact (e.g. liaison staff, telephone, etc.), and who within each organization is the contact point.*	✔
A3.2	Ensure that there is inter-operability between plans and procedures. *Note: They should have common units, common decision-making principles, compatible communication networks, common operational concepts, common sampling and measurements, compatible reporting methods, compatible public information strategies, and common protective actions criteria.*	✔

	Planning Item - CATEGORY V	National
A3 2	Establish means to coordinate the response	✔
A3 5	Develop means to coordinate the response across national boundaries *Note This is done to ensure consistency of decisions with countries which share or exchange food stuff*	✔

	Planning Item - CATEGORY V	National
A4.	**Plans and procedures** *Planning Objectives:* An individual is responsible for coordinating the development of emergency plans and procedures for each organization. These individuals regularly cooperate with each other to ensure that an integrated level of planning is maintained. Plans and procedures are developed and reviewed to assure effective implementation.	
A4 1	Develop an emergency response plan defining authorities, roles, interrelationships and responsibilities of the various organizations involved *Note The emergency response plan is the general guideline and the basis for development of detailed implementing procedures*	✔
A4 2	Identify a coordinator for emergency planning for each organization	✔
A4 3	Develop procedures which cover all critical tasks These procedures should provide detailed instructions and the required information *Note Technical procedures should use units which are consistent with the instruments used Technical procedures common to several groups or used by several groups should use standard units*	✔
A4 4	Use a standard format for procedures, identifying the response position, date approved, and steps to be performed The usability of the procedures should be confirmed during table top exercises	✔
A4 5	Establish a quality assurance process	✔
A4 6	Conduct periodic quality assurance reviews of the plan and the procedures *Note Take into account lessons learned from similar accidents around the world*	✔
A4 7	Update all perishable information quarterly (phone numbers, etc)	✔
A4 8	Correct deficiencies to plans and procedures within 12 months	✔

	Planning Item - CATEGORY V	National
A5.	**Logistic Support, Emergency Supplies, Equipment, Communications and Facilities** *Planning Objectives:* Adequate emergency supplies, facilities and equipment are available.	
A5 1	Conduct an analysis to identify the equipment, supplies, communications and facilities needed to perform the emergency response tasks and functions within Section B *Note If possible, equipment used for emergencies should be the same one used in normal situations*	✔
A5 2	Establish or designate facilities (or centres, rooms and areas) to support all the emergency response functions	✔

	Planning Item - CATEGORY V	National
A5.3	Make arrangements to monitor radiation in the environment.	✔
A5.4	Make provisions for resources needed for the response. *Note: Arrangements should be made to obtain assistance with specialized radiological resources needed to monitor food and ground contamination. If a country plans to use its own radiological equipment, develop a quality assurance and control programme for all monitoring equipment and laboratory facilities.*	✔

	Planning Item - CATEGORY V	National
A6.	**Training, Drills and Exercises** *Planning Objectives:* Training is provided to those assigned to key positions in the emergency organization.	
A6.1	Establish training requirements for each key position and team.	✔
A6.2	Develop a programme that provides the training identified for each position in the emergency organization.	✔
A6.3	Develop a set of training materials.	✔
A6.4	Develop a system (e.g. tests, evaluation, etc.) to ensure that appropriate proficiency levels have been achieved and maintained.	✔

Planning Item - CATEGORY V		National
B1.	**Notification and Activation** *Response Objective:* Be promptly notified of a trans-boundary accident and inform, activate and coordinate all organizations, groups and agencies which perform emergency response tasks.	
B1 1	Establish agreement with countries within 1000 km with category I facilities, countries within 50 km of category II facilities to be notified promptly of severe accident (General Emergencies)	✔
B1 2	Provide a single national point for receipt of notifications from countries within 1000 km with category I facilities, countries within 50 km of category II facilities; and IAEA of potential trans-boundary release	✔
B1 3	All critical organizations involved in response must have means to activate critical members based on the initial notification	✔

Planning Item - CATEGORY V		National
B2.	**Urgent Protective Actions** *Response Objectives:* Promptly implement urgent protective actions to prevent deterministic health effects and to avert doses consistent with international guidance [2].	
B2 1	Adopt national intervention levels as a basis for implementation of urgent protective actions consistent with international guidance [1,2] as shown in Appendix 1	✔
B2 1	Develop a method to promptly restrict the immediate consumption of food directly contaminated at high levels once identified	✔

Planning Item - CATEGORY V		National
B3.	**Public Education and Instruction** *Response Objectives:* Provide information to the public during an accident on the actions taken in response to the accident.	
B3 1	Identify the organization responsible for providing public directives in the event of a radiological emergency	✔

Planning Item - CATEGORY V		National
B4.	**Media Relations** *Response Objectives:* Provide the media with timely, consistent and coordinated information to ensure that the public receives accurate information concerning protective actions	
B4 1	Develop means for providing timely information to the media	✔

	Planning Item - CATEGORY V	National
B4.2	Develop procedures to ensure that the information given to the media by the various organizations involved is consistent and coordinated. *Note: This could involve defining jurisdictions, sharing information, and holding joint press conferences.*	✔
B4.3	Designate a single spokesperson.	✔
B4.4	Designate a group responsible for monitoring the media and means to promptly respond to false information.	✔

	Planning Item - CATEGORY V	National
B5.	**Intervention Related to Food** ***Response Objectives:*** **Effectively implement interventions related to food consistent with international guidance.**	
B5.1	Adopt national intervention levels as a basis for restriction of food consistent with international guidance [1] as shown in Appendix 1.	✔
B5.2	For your country, collect information needed within 1000 km of a category I or 50 km of a category II facility to effectively implement interventions related to food. *Note: This should include legal considerations, population characteristics, food distribution systems, farming practices and crops, agriculture counter measures [12] and potential relocation resources.*	✔
B5.3	Develop a plan for sampling of food stuff. *Note: Take into account all organizations involved in food sampling and all production sources (cattle and dairy animals, milk, fresh produce, water, fish, rain water reservoir).*	✔
B5.4	Develop plans and procedures to make ingestion protective action decisions. *Note: This should include Operational Intervention Levels (OILs) for beta and gamma measurements, air sampling and analysis, food and water sampling and analysis, and surface contamination measurements. These procedures should be compatible (methods, calibration, units) between all groups and organizations involved.*	✔
B5.5	Develop plans to implement and enforce food and water control considering local availability of replacement food.	✔
B5.6	Develop plans and means to monitor and control export of food and products.	✔
B5.7	Develop procedures to request additional sampling and analysis support from neighbouring countries or through IAEA under the "Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency"[14].	✔

Planning Item - CATEGORY II	Facility	Local	National
B10. Psychological Impact Mitigation *Response Objectives:* Keep the psychological impact as low as reasonably possible.			
B10 1 Give due consideration to the lessons learned on mitigation of psychological impact during response to accidents *Note This should include efforts to develop and maintain trust by a) being honest with the public, b) providing sufficient information so the nature of the threat and the reasons for the actions being taken are clear, c) providing clear and simple instruction on the actions to take, d) providing consistent advice and assessments that are in keeping with international guidance, e) using a single spokes person for the government, and f) providing a program of information for the public after the accident Additional guidance to be developed for the next revision of this document*		✔	✔

ABBREVIATIONS

DHA	UN Department of Human Affairs
EP	emergency planning
EPZ	emergency planning zone
ERC	emergency response centre
GAL	generic action level
GIL	generic intervention level
INES	International Nuclear Event Scale
LPZ	longer term protective action planning zone
NPP	nuclear power plant
OIL	operational intervention level
PAZ	precautionary action zone
TLD	thermoluminescent dosimeter
UPZ	urgent protective action planning zone
WHO	World Health Organization

Appendix 1
INTERNATIONAL GENERIC INTERVENTION AND ACTION LEVELS

The following three tables (A1-I, II, III) provide the generic intervention and action levels from the international guidance [1,2]

TABLE A1-I RECOMMENDED GENERIC INTERVENTION LEVELS FOR URGENT PROTECTIVE ACTIONS

Protective action	Generic intervention level (dose **avertable** by the protective action)[a,b]
Sheltering	10 mSv[c]
Evacuation	50 mSv[d]
Iodine prophylaxis	100 mGy[e]

[a] These levels are of avertable dose, i e the action should be taken if the dose that can be averted by the action, taking into account the loss of effectiveness due to any delays or for other practical reasons, is greater than the figure given

[b] The levels in all cases refer to the average over suitably chosen samples of the population, not to the most exposed individuals However, projected doses to groups of individuals with higher exposures should be kept below the thresholds for deterministic effects

[c] Sheltering is not recommended for longer than 2 days Authorities may wish to recommend sheltering at lower intervention levels for shorter periods or so as to facilitate further protective actions, e g evacuation

[d] Evacuation is not recommended for a period of longer than 1 week Authorities may wish to initiate evacuation at lower intervention levels, for shorter periods and also where evacuation can be carried out quickly and easily, e g for small groups of people Higher intervention levels may be appropriate in situations in which evacuation would be difficult, e g for large population groups or with inadequate transport

[e] Avertable committed absorbed dose to the thyroid due to radioiodine For practical reasons, one intervention level is recommended for all age groups

TABLE A1-II RECOMMENDED GENERIC INTERVENTION LEVELS FOR TEMPORARY RELOCATION AND PERMANENT RESETTLEMENT

Protective action	Avertable dose[a]
Temporary relocation	30 mSv in first 30 days 10 mSv in a subsequent 30 days
Permanent resettlement	1 Sv in lifetime

[a] The avertable dose applies to an average population being considered for temporary relocation

TABLE A1-III RECOMMENDED GENERIC ACTION LEVELS FOR FOODSTUFFS

RECOMMENDED VALUES (kBq/kg)		
Radionuclides	Foods destined for general consumption	Milk, infant foods and drinking water
Cs-134,-137, Ru-103, Ru-106, Sr-89		1
Cs-134,-137, Ru-103, Ru-106, Sr-89, I-131	1	
Sr-90	0 1	
Sr-90, I-131		0 1
Am-241, Pu-238, Pu-239, Pu-240, Pu-242	0 01	0 001

Notes

These levels apply to situations where alternative food supplies are readily available Where food supplies are scarce, higher levels can apply

These levels are intended to be applied to food prepared for consumption, and would be unnecessarily restrictive if applied to dried or concentrated food prior to dilution or reconstitution

For practical reasons, the criteria for separate radionuclide groups shall be applied independently to the sum of the activities of the radionuclides in each group

Classes of food that are consumed in small quantities (e g less than 10 kg per person per year), such as spices, which represent a very small fraction of the total diet and would make very small additions to individual exposures, may have action levels ten times higher than those for major foodstuffs

Appendix 2
SUGGESTED URGENT AND LONGER TERM PROTECTIVE ACTION PLANNING ZONE SIZES

TABLE A2 I SUGGESTED URGENT AND LONGER TERM PROTECTIVE ACTION PLANNING ZONE SIZES

FACILITY CATEGORY	PRECAUTIONARY ACTION ZONE SIZE (PAZ)	URGENT PROTECTIVE ACTION PLANNING ZONE SIZE (UPZ)	LONGER TERM PROTECTIVE ACTION PLANNING ZONE SIZE (LPZ)
CATEGORY I	3-5 km	10-25 km	50-100 km
CATEGORY II Large distances are for facilities in the top half of the range	On-site	0 5-1 km	5-10 km
	On-site	1 5-2 km	15-20 km
CATEGORY III	On-site	Not required	Not required

DISCUSSION

Precautionary Action Zone (PAZ)

The size of the precautionary action zone is based on a best estimate of the consequences in the case of a worst accident Protective actions should be implemented for the whole zone whenever the conditions for a severe accident develop

Categories I to III

The PAZ is the area where preparations should be made to quickly alert the public and workers (e g , siren systems) and instruct them on the urgent protective action to take Protective actions such as substantial sheltering, evacuation and distribution of thyroid blocking agents should be recommended immediately when severe conditions are detected in the facility without waiting for monitoring The size of the PAZ was based primarily on the following considerations

(a) Urgent protective actions taken before or shortly after a release within this zone will ***significantly reduce the risk*** of doses above the early death threshold in the worst case [a] for severe [b] accidents at this facility

(b) Urgent protective actions taken before or shortly after a release within this zone will ***prevent*** dose above the death thresholds for most severe [b] accidents at this facility

(c) For an atmospheric release under average meteorological conditions, this zone covers the distances where about 90% of the off-site risk of serious deterministic health effects could occur

[a] Worst case considering the range of potential releases and meteorological condition

[b] Accidents with the potential for early deaths off-site

Urgent Protective Action Planning Zone (UPZ)

The choice of the size of the protective action planning zones represents a judgement on the extent of detailed planning which must be performed in order to ensure effective response In a particular emergency, protective actions might well be restricted to a small part of the planning zones On the other hand, for the worst possible accidents, protective actions might need to be taken beyond the planning zones

The UPZ is the area where preparations are made to promptly perform environmental monitoring and implement urgent protective measures based on the results Plans and capabilities should be developed to implement sheltering or evacuation and distribute thyroid blocking agents (if appropriate) They should also reflect the fact that evacuation could be required up to the boundary of the zone (e g reception centres for evacuee should be sited outside this zone)

Category I

The size of the UPZ was based primarily on the following considerations

(a) Urgent actions must be taken within 4-12 hours within the zone to **significantly reduce the risk** of doses above the early death threshold for the worst case [a] severe [b] accidents for facilities within this category

(b) This distance provides approximately a factor of 10 reduction in concentration (and thus risk) compared to the PAZ boundary Thus this zone covers the distances where about 99% of the off-site risk of serious deterministic health effects could occur

(c) Detailed planning within this zone provides a substantial base for expansion of response efforts in the event of the worst severe accident

[a] Worst case considering the range of potential releases and meteorological condition
[b] Accidents with the potential for early deaths off-site

Category II

The size of the UPZ was based primarily on the following considerations

(a) For average dilution conditions, this zone covers the area where, for most accidents, the total effective dose for an individual **could exceed the Urgent Action GILs**

(b) For the worst accidents, it is very unlikely that the urgent protective action will be warranted at a significant distance beyond this zone

(c) This distance provides approximately a factor of 10 reduction in concentration compared to the facility boundary (e g, 50-100m) Thus the response preparations should concentrate on this area since it covers distances where about 90% of the off-site risk of dose above the urgent GILs could occur

(d) From a timeliness point of view, it is important to concentrate on this zone to conduct monitoring and notify the public in take urgent action GIL doses using normal door to door notification methods

(e) Beyond this distance, the plume should be better defined, allowing monitoring to concentrate on a smaller area Thus this distance provides a substantial base for expansion of response efforts if needed

Long Term Protective Action Planning Zone (LPZ)

It is the area where preparations for effective implementation of protective actions to reduce the risk of deterministic and stochastic health effects from long term exposure to deposition and ingestion of locally grown food should be developed in advance More time will be available to take effective action within this zone In general, protective actions such as relocation, food restrictions and agricultural countermeasures will be based on environmental monitoring and food sampling

The size of the LPZ was based primarily on the following considerations:

(a) Dose rates from ground contamination **warranting relocation are unlikely** beyond this distance for most accidents.

(b) This distance provides approximately a factor of 10 reduction in concentration (and thus risk) compared to the UPZ boundary. Thus this area covers distances where about 99% of the off-site risk of dose above the GILs could occur.

(c) Detailed planning within this distance provides a substantial basis for expansion of response efforts in the event of a severe accident.

Appendix 3
SUMMARY OF THE IMMEDIATE RESPONSE ACTIONS FOR EACH EMERGENCY PLANNING CATEGORY [a]

Emergency Class or condition	Immediate Response Actions				
	Category I	**Category II**	**Category III**	**Category IV**	**Category V**
General Emergency Class Events resulting in an actual or substantial risk of a release requiring implementation of urgent protective actions off-site This includes - Actual or projected damage to the core or large amounts of spent fuel - Detection of radiation level off-site warranting implementation of urgent protective measures	**Facility:** - Notify off-site officials and recommend protective actions - Evacuate non-essential personnel and account for all workers - Conduct off-site monitoring near facility - Provide radiation protection to on-site and off-site emergency response personnel - Activate full response -Take action to mitigate the accident, provide technical assistance to control room - Establish continuous communication with off-site officials	**Facility** - Notify off-site officials and recommend protective actions - Evacuate non-essential personnel and account for all workers - Conduct off-site monitoring near facility - Provide radiation protection to on-site and off-site emergency response personnel - Activate full response -Take action to mitigate the accident, provide technical assistance to control room - Establish continuous communications with off-site officials	Not Applicable	Not Applicable	Not Applicable
	Off-site: Implement immediate protective actions in the PAZ and UPZ - If major release - recommend people do not eat potentially contaminated food within 100-300 km - Conduct monitoring in and around the UPZ - Activate full response - Notify IAEA of potential trans-boundary release	**Off-site** - Implement urgent protective action in UPZ - Conduct monitoring - Activate full response			

Emergency Class or condition	Immediate Response Actions				
	Category I	Category II	Category III	Category IV	Category V
Site Area Emergency Class Events resulting in a major decrease in the level of protection for the public or on-site personnel. This includes: - A major decrease in the level of protection provided to the core or large amounts of spent fuel - Conditions where any additional failures could result in damage to core or spent fuel - High doses on-site or doses off-site approaching the urgent protective actions interventions levels.	**Facility:** - Notify off-site officials - Evacuate non-essential personnel and account for others - Conduct off-site monitoring near facility - Provide radiation protection to on-site and off-site emergency response personnel. - Activate full response -Take action to mitigate the accident, provide technical assistance to control room - Establish continuous communications with off-site officials	**Facility:** - Notify off-site officials - Evacuate non-essential personnel and account for others - Conduct off-site monitoring near facility - Provide radiation protection to on-site and off-site emergency response personnel. - Activate full response -Take action to mitigate the accident, provide technical assistance to control room - Establish continuous communications with off-site officials	Not Applicable	Not Applicable	Not Applicable
	Off-site: - Conduct monitoring - Activate full response - Provide fire, police or medical support if requested	**Off-site:** - Conduct monitoring - Activate full response - Provide fire, police or medical support if requested			

Emergency Class or condition	Immediate Response Actions				
	Category I	**Category II**	**Category III**	**Category IV**	**Category V**
Alert Class Decreased level of safety or unknown events that warrant increased readiness or assessments	**Facility:** - Notify off-site officials - Activate appropriate part of response - Conduct off-site monitoring near facility (if appropriate) -Take action to mitigate the accident and provide technical assistance to control room	**Facility:** - Notify off-site officials - Conduct off-site monitoring near facility (if appropriate) - Activate appropriate part of response -Take action to mitigate the accident and provide technical assistance to control room	**Facility:** - Notify off-site officials - Activate appropriate part of response -Take action to mitigate the accident and provide technical assistance to control room	Not Applicable	Not Applicable
	Off-site: - Increase readiness	**Off-site:** - Increase readiness	**Off-site:** - Increase readiness		

Emergency Class or condition	Immediate Response Actions				
	Category I	**Category II**	**Category III**	**Category IV**	**Category V**
Other Emergencies Accident that can result in significant exposures on site only, there is no risk of a significant release off-site	Not Applicable. *These conditions will always be classified as an alert or site area emergency in these facilities.*	Not Applicable. *These conditions will always be classified as an alert or site area emergency in these facilities.*	**Facility:** - Take live saving actions - Notify off-site officials - Evacuate non-essential personnel and account for others - Provide radiation protection to on-site personnel and send overexposed personnel for treatment -Take action to mitigate the accident and provide technical assistance to control room	**Facility, user, or shipper:** - Notify off-site officials - Provide assistance to off-site officials - Locate or isolate source	Not Applicable
			Off-site: - Provide fire, police or medical support if requested	**Off-site:** - Provide fire, police or medical support - Assist in recovering or controlling source	

Emergency Class or condition	Immediate Response Actions				
	Category I	**Category II**	**Category III**	**Category IV**	**Category V**
Potential or confirmed contamination from beyond the border from airborne contamination or imports	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Conduct food sampling and gamma monitoring to determine if food must be restricted or people relocated. If monitoring and sampling resources not available ask for assistance through IAEA

Emergency Class or condition	Immediate Response Actions				
	Category I	**Category II**	**Category III**	**Category IV**	**Category V**
Potential hazard reported to local officials (fire, medical)	Not Applicable	Not Applicable	Not Applicable	**First responders** - Take live saving actions - Isolate location - Locate additional locations and victims - Call for national official advice and monitoring. **National officials** - Provide immediate advice by phone - Provide monitoring to location -Satellite re-entry; if the area can be localized provide instructions to the public and conduct monitoring.	Not Applicable
Lost or stolen source	Not Applicable	Not Applicable	Not Applicable	**National officials** - Confirm report - Make public announcement	Not Applicable

[a] Reference [7] provides a detailed example of procedures for the detection and classification of accidents at facilities.

Appendix 4
EXAMPLES OF THE VARIOUS USES AND FACILITIES AS A FUNCTION OF CATEGORY

Facility or Practice	Risk Summary	Typical Emergency Planning Category
Byproduct Uses		
Radio-pharmaceutical Manufacturing	*Off-site*: No potential for deterministic health effects. A small potential for a release in excess of urgent level GILs near the facility. Major facility and loading dock fires appear to represent the greatest potential for a release in excess of urgent level GILs. The releases will be function of inventory and volatility. Explosions, tornadoes, spills and leaks represent small risks.	III IV
	On-site: Deterministic health effects very unlikely on-site, however dose in excess of occupational limits possible.	
Radio-pharmacies	*Off-site*: No potential for releases in excess of urgent level GILs.	IV
	On-site: No potential for exceeding urgent level GILs on site. Very small potential for exposures above operational limits.	
Hospitals	*Off-site*: No potential for releases in excess of urgent level GILs.	III
	On-site: Deterministic health effects possible to staff if sealed sources (e.g., brachytherapy or radiation beams) are used.	
Sealed Source Manufacturing	*Off-site*: A small potential for a release in excess of urgent level GILs near the facility. A major facility fire appears to represent the greatest potential for a release in excess of urgent level GILs. The releases will be function of inventory and volatility. Explosions, tornadoes, spills and leaks represent small risks.	II III
	On-site: Deterministic health effects possible to staff during manufacture process from loss of shielding or inhalation.	
Research Laboratories	*Off-site*: Unless they are storing or using large quantities of radioactive material in a single location there is no potential for releases in excess of urgent level GILs.	III
	On-site: Deterministic health effects may be possible to staff from external exposure. This will be site specific.	
Low level Waste Warehousing and Burial	*Off-site*: No potential for exceeding urgent level GILs for low level burial operations. If the wastes contains radio-iodine a major fire involving warehousing of waste may represent a small potential for a release in excess of urgent level GILs near the facility.	IV
	On-site: No potential for exceeding urgent level GILs on site. Small potential for exceeding operational exposure limits.	
Depleted Uranium Products	*Off-site*: No potential for exceeding urgent level GILs.	IV
	On-site: No potential for exceeding urgent level GILs on site.	

Facility or Practice	Risk Summary	Typical Emergency Planning Category
Sealed Source Uses		
Radiography Analysis Gaging Irradiation	*Off-site:* Localized doses sufficient to result in deterministic health effects and to exceed the urgent level GILs and localized contamination possible from lost or stolen sources.	III
	On-site: Deterministic health effects possible from external dose due to loss of shielding or inadequate access control.	
Fuel cycle		
Uranium Milling and Mining	*Off-site:* No potential for releases in excess of urgent level GILs. Contamination warranting intervention could result from tailing pond failures.	IV
	On-site: No potential for exceeding urgent level GILs.	
Yellow cake processing	Same as Uranium Milling and Mining.	IV
UF_6 Conversion Plants	*Off*-site: Potential for deaths from a UF_6 release due to chemical toxicity from HF (product of UF_6 release). The potential is a function of UF_6 inventory. Greatest risk appears to be ruptures of heated multi-ton tanks. Chemical toxicity due to a UF_6 release is far more important than radiation dose even for highly enriched uranium.	(a)
	On-site: Same as off-site.	
Enrichment Plants	*Off-site:* Same as UF_6 Conversion Plants.	(a)
	On-site: Same as UF_6 Conversion Plants.	
Fuel Fabrication Uranium	*Off-site:* Risk for UF_6 same as for UF_6 Conversion Plants. No potential for doses in excess of urgent level GILs off site from criticality accidents.	(a)
	On-site: Risk for UF_6 same as for UF_6 Conversion Plants. Potential for deterministic health effects and doses in excess of urgent level GILs on-site from criticality accidents.	
Fuel Fabrication Pu	*Off-site:* No potential for doses in excess of urgent level GILs off site from criticality accidents. Large fires or explosions could result in doses off site in excess of urgent level GIL near the facility. This will be function of inventory.	II III
	On-site: Potential for deterministic health effects and doses in excess of urgent level GILs from criticality accidents. Fires and explosion could result in doses in excess of urgent level GILs on site from inhalation.	
New Fuel (Not-irradiated)	*Off-site:* No potential for doses in excess of urgent level GILs.	IV
	On-site: No potential for doses in excess of urgent level GILs.	

Facility or Practice	Risk Summary	Typical Emergency Planning Category
Spent Fuel Storage Pool	*Off-site:* For damage to fuel in pool (under water) no potential for doses in excess of urgent level GILs. Distance of concern depends on inventory.	I II III
	On-site: For damage to fuel in pool (under water) doses from Kr-85 could exceed urgent level GILs in area containing the pool. For drained pool the dose from direct shine from pool could be several Sv/h near pool. If there is fuel melting of fire as result of the draining of the pool the dose inhalation near the pool could result in deterministic health effects.	
Spent Fuel Storage Dry Cask	*Off-site:* No potential for doses in excess of urgent level GILs.	III
	On-site: No potential for doses in excess of urgent level GILs from inhalation. If shielding is lost, direct shine dose could exceed urgent level GILs.	
Reprocessing of Spent Fuel	*Off-site:* No potential for doses in excess of urgent level GILs off site from criticality accidents. Large fires or explosions could result in doses off site in excess of urgent level GIL several kilometres from the facility. This will be function of inventory. Ruptures of large liquid storage tanks could result in expensive contamination warranting intervention.	I II III
	On-site: Potential for deterministic health effects and doses in excess of urgent level GILs on-site from criticality accidents. Fires and explosion could result in doses in excess of urgent level GILs on site from inhalation.	
Reactors (power, ship, research)		
>100 MW(th)	*Off-site:* Accidents involving severe core damage have the potential for causing deterministic health effects to include deaths off-site. Dose in excess of the urgent level GIL are possible more than 10 km from the facility. Deposition resulting in doses in excess of the relocation GILs and ingestion GALs is possible at great distances from the facility. Accident not involving core damage have only a small potential for exceeding the urgent level GILs off site.	I
	On-site: For core damage accidents dose sufficient to result in deterministic health effects to include deaths are possible on site.	
> 2-100 MW(th)	*Off-site:* Dose due to inhalation of short lived iodine in excess of the urgent level GIL are possible if cooling of core is lost (core melt).	II
	On-site: Potential for doses in excess of urgent level GILs if fuel cooling is lost. If shielding is lost direct shine dose could exceed urgent level GILs.	
2 MW(th)	*Off-site:* No potential for doses in excess of urgent level GILs.	III
	On-site: Potential for doses in excess of urgent level GILs for inhalation (depending on design) if fuel cooling is lost. If shielding is lost, direct shine dose could exceed urgent level GILs.	

Facility or Practice	Risk Summary	Typical Emergency Planning Category
Transportation		
Excepted Packages	*Off-site:* These shipments contain only minor amounts of radioactive materials. There are no risk of any radiological consequences requiring special protective actions.	IV
	On-site: Not applicable.	
Industrial Packages	*Off-site:* These shipments contain only minor amounts of radioactive materials. There are no risk of any radiological consequences requiring special protective actions.	IV
	On-site: Not applicable.	
Type A Packages	*Off-site:* The activity prescribed for Type A packages limits the radiological hazard. Dose in excess of the urgent level GILs are virtually impossible beyond the immediate vicinity of the package. In the worst case dose in excess of the urgent level GILs are possible only by inhalation of dense smoke very close to an accident involved in a large fire. Therefore the exposed person can move away without radiological monitoring. An accident ground contamination may require decontamination .	IV
	On-site: Not applicable.	
Type B Packages	*Off-site:* Type B packages can contain large amounts of radioactive material. Therefore Type B packages have been designed to withstand all credible accidents. Therefore dose in excess of the urgent level GILs are not considered credible. If however the package were ruptured and involved in a fire doses in excess of the urgent level GIL are possible close to the accident .	IV
	On-site: Not applicable.	
Unanticipated		
Pu Dispersal-Nuclear Weapon Accident	*Off-site:* If there is a fire or explosion resulting in dispersal of Pu from a weapon, deterministic health effects are possible from inhalation of the plume or resuspention of deposited material. The area of significant contamination could be on the order of a square kilometre.	IV
	On-site: Not applicable.	
Lost/stolen/ uncontrolled source - exposure or contamination	*Off-site:* Lethal dose are possible from persons handling an unshielded source. Lethal doses and considerable contamination resulting in doses above the urgent level GILs are possible from a source that has been ruptured. A considerable area can be contaminated due to dispersal by human activities.	IV
	On-site: Not applicable.	

Facility or Practice	Risk Summary	Typical Emergency Planning Category
Contamination From Trans-boundary Release	*Off-site*: Deposition resulting in doses in excess of the relocation GILs and ingestion GALs is possible at great distances from the facility and over large areas.	V
	On-site: Not applicable.	
Nuclear Powered Satellite Reentry	*Off-site*: The risk is very small and it will be virtually impossible to limit the area of concern so that reasonable protective action can be taken. Close proximity to parts of the satellite or handing of pieces could result in deterministic health effects.	IV
	On-site: Not applicable.	
Import of Contaminated Food or Materials	*Off-site:* Uncontrolled (unknowing) used of contaminated steel and other products could result in doses in excess of the urgent level GILs.	V
	On-site: The risk would come from unknowing bring radioactive material of sources on site. The facility may be the first to identify the hazard.	

(a) Chemical toxicity due to a UF_6 release is far more important than radiation dose even for highly enriched uranium.

Appendix 5
INFORMATION NEEDS FOR THE PLANNING PROCESS
FOR EACH EMERGENCY PLANNING CATEGORY

Categories needed for:					Information needed before planning begins
I	II	III	IV	V	
Identify the organization or person responsible for :					
✔	✔	✔	✔		Coordination for facility or user planning
✔	✔	✔	✔	✔	Coordination for national level planning
✔	✔	✔			Coordination for local off-site planning
✔	✔				Notification of other countries and requesting international assistance
✔	✔				Making decisions on urgent protective actions.
✔	✔				Implementing urgent protective action implementation.
✔	✔	✔			Providing fire, police and medical support
✔	✔			✔	Making decisions on longer term and ingestion protective action decisions.
✔	✔				Implementing longer term and ingestion protective actions.
✔	✔	✔	✔	✔	Coordination with the media
✔	✔		✔	✔	Off-site monitoring and laboratory analysis capabilities
Facility or user information					
✔	✔	✔			Accidents that could result in on-site exposures or off-site release warranting protective action
✔	✔	✔			Information in facility that can give prior warning of release or potential exposure
✔	✔	✔			Typical radiological composition and timing of a release
✔	✔	✔			Radiological and other environmental conditions in the facility during a response
✔	✔	✔			Actions in facility that could be taken to mitigate the accident or reduce a release
Off-site information					
✔	✔				Medical, police and fire support available
✔	✔				Typical sheltering available in the UPZ
✔	✔				Typical transportation available for evacuation with in the UPZ
✔	✔	✔	✔	✔	Communication available for decision makers
✔	✔	✔	✔	✔	Communications available to alert and inform the public
✔	✔			✔	Food and milk that is locally produced that may be directly contaminated
✔	✔			✔	Information on agriculture product collection and distribution system
✔	✔				Special populations (e.g., hospitals) and transients within UPZ
✔	✔				Special facilities (e.g. factories that can not be evacuated) that may be affected by accident
✔	✔				Transportation systems that may be affected by an accident (e.g. road, rail, air, sea, canals)
✔	✔			✔	Points of import and export of food
Off-site environment conditions					
✔	✔	✔	✔	✔	Range of weather conditions under which protective actions and monitoring may be conducted
✔	✔	✔	✔	✔	Severe conditions that may result in an accident

Appendix 6
SUGGESTED ELEMENTS OF PLANS

A6-1. NATIONAL RADIOLOGICAL EMERGENCY PLAN OUTLINE

The following is a suggested plan outline. Other formats or structures can be entirely adequate, provided that they are comprehensive. IAEA-TECDOC-718, *A Model National Emergency Response Plan for Radiological Accidents*, can also be used. Preferably, the structure of the plan should be consistent with that of other existing national plans.

TITLE PAGE

Title of the plan, approval date, concurrence/signatures, signatures of the heads of all the national level agencies with a role during the response to a radiological accident.

TABLE OF CONTENTS

1. INTRODUCTION AND BACKGROUND
   - 1.1 Purpose
   - 1.2 Participating organizations
   - 1.3 Scope
   - 1.4 Definitions
   - 1.5 Authorities
     List the national laws or acts for natural or man-made accidents or emergencies which define who is responsible for planning, and decisions and actions (See Task 1, Section 2.2.4).
   - 1.6 Relationship to other plans
     A brief description of how response to radiological accidents is integrated into the planning for other types of emergencies.

2. PLANNING BASIS
   A brief description of the accidents that fall within each emergency planning category (see Accident Summaries in Section 3 for each category). List and show on a map the facilities and local jurisdictions which fall within different Emergency Planning Categories. (see Task 2, Section 2.2.5).

3. ORGANIZATION AND RESPONSIBILITIES
   - 3.1 General responsibilities
     Responsibilities of users, local governments and national governments.
   - 3.2 National organization
     Organizational structure at the national level. Organizational block diagram. Responsibilities of each "block".
   - 3.3 Interfaces
     Description of the major interfaces with other levels of government and users, as applicable. Describe how these interfaces are implemented.

4. CONCEPT OF OPERATIONS

A brief description of the accident classification used (see Section 2.1.5). A brief description of the immediate actions and response of the national, local and user responses to meet the performance objectives for initial accident assessment and classification; notification and activation of the response organization; accident condition mitigation; urgent protective actions implementation; public education and instruction; worker protection; medical, fire fighting and police assistance; longer term protective action implementation; response coordination, recovery, international coordination, private sector response, request for government assistance and reimbursements.

5. EMERGENCY PREPAREDNESS

5.1 Responsibility

Describe who is responsible for producing plans and procedures and for maintaining them. Composition and responsibilities of an "Emergency Preparedness Committee" which ensures the coordination of all planning efforts between ministries, local governments and users.

5.2 Revisions

Explain the requirements and mechanisms for revising the plan, including how often this revision takes place.

5.3 Training

Define the general training policy and requirements, including who is responsible for training.

5.4 Exercises

Describe how often they take place, who is responsible for organizing them, and how the lessons learned can be incorporated in the plan. This should address the need for drills and table top exercises.

5.5 Public education

Define responsibilities for educating the public on emergency plans and the guidelines (if appropriate) for a public education programme to be developed.

REFERENCES

APPENDIX 1 - DISTRIBUTION LIST

APPENDIX 2 - ALLOCATION OF RESPONSIBILITIES

Contains the completed list of responsibilities from Section 3 of this Method.

APPENDIX 3 - RESPONSIBILITIES AND RESOURCES OF NATIONAL AGENCIES AND MINISTRIES

List all major ministries and national agencies which play a role in the plan, with their responsibilities and resources.

APPENDIX 4 - NATIONAL INTERVENTION LEVELS

APPENDIX 5 - FACILITIES AND SPECIALIZED RADIOLOGICAL RESOURCES

*List **major** facilities and radiological resources (or where they can be found) which are key to the response capability.*

LIST OF ABBREVIATIONS

A6-2. SUGGESTED ELEMENTS OF PLANS FOR URGENT PROTECTIVE ACTIONS

General

- ❒ Distribution of educational information in advance to the public

Decision making plans

- ❒ 24 hour capability
- ❒ ability to make decision in 15-30 minutes
- ❒ predetermined criteria based on class-facility conditions
- ❒ provision to modify decisions based on monitoring

Sheltering plans

- ❒ list of facilities and sheltering factors
- ❒ warning system
- ❒ means of providing instructions
- ❒ sheltering instructions

Evacuation plans

- ❒ population distribution
- ❒ list of special facilities that need to be staffed (e.g. public utilities, telephone switchboards)
- ❒ list of special institutions (e.g. hospitals, prisons)
- ❒ evacuation routes
- ❒ evacuation centres
- ❒ means of transportation
- ❒ traffic control procedures
- ❒ access control
- ❒ contamination control points and staffing
- ❒ registration procedures
- ❒ provisions for evacuation of special institutions
- ❒ services offered at the reception centres
- ❒ procedures for instructing the public
- ❒ communications systems

Thyroid blocking plans

- ❒ quantities required
- ❒ distribution method
- ❒ provisions for transient population
- ❒ procedures for instructing the public

Appendix 7
LIST OF SUGGESTED RESPONSE TEAMS FOR EACH EMERGENCY PLANNING CATEGORY

This table shows the minimum number of teams recommended for each category. The specifications for these teams are provided in the lists that follow.

A: Environmental Survey Team
B: Air Sampling Team
C: In-situ Gamma Spectroscopy Team
D: Personal Monitoring and Decontamination Team
E: In plant Survey Team
F: Environment/Ingestion Sampling Team
G: Isotopic Analysis Team
H: Initial Treatment Team
I: Local Response Control Team
J: National or Regional Response Control Team

Emergency planning category	**Suggested Minimum - number of teams**									
	A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**
Category I	5-10	2	2	2-5	2	2	1	1	1	1
Category II	2	1	1	1	1	1	a	1	1	1
Category III	1			1-2	1			a		
Category IV	1							a		b
Category V	5		2			1	1			1

a: procedures should be developed for requesting assistance from IAEA to provide this capability.
b: small team that could deploy to location of accident

A: Environmental Survey Team

Purpose:

- Measurement of gamma/beta dose rates from cloud shine, ground deposition or source
- Evaluation of unknown situations

Minimum staffing per team:

- 2 persons, trained annually in radiological assessment

Minimum equipment per team:

1 *Radiation survey instruments*

- High range gamma survey instrument - 1 piece
- Low range survey instruments - 2 pieces
- Contamination monitor or probe - 1 piece
- Check source for low range survey instruments

2 *Personal protective equipment*

- Self reading dosimeters for each team member
- Permanent dosimeters for each team member
- Protective overalls, overshoes and gloves - 3 sets per person
- Thyroid blocking agent -3 days supply (reactor response only)
- First aid kit

3 *Communication equipment*

- Portable radio communications - 1-set

4 *Supplies*

- Identification badges for each team member
- Torch (flashlights) for each team member
- Extra batteries (instruments and flashlight)
- Compass
- Radiation warning labels and signs
- Administrative supplies, writing pad
- Plastic for preventing contamination of instruments
- Log book
- Cases for shipment of equipment

5 *Supporting documentation*

- Standard survey maps
- Equipment operations manuals
- Response coordination procedures
- Procedures for field calibration of instruments
- Procedures for conducting monitoring
- Procedures for recording results
- Procedures for relating results to worker turn back limits
- Procedures for personal radiation protection.

6 *Transport*

- All terrain vehicle

B: Air Sampling Team

Purpose:

- Gather air samples for laboratory analysis
- Measurement of gamma/beta dose rates

Minimum staffing per team:

- 1 person, trained annually in radiological assessment

Minimum equipment per team:

1 *Radiation survey instruments*
- Low range survey instrument - 1 piece
- Contamination monitor or probe - 1 piece
- Check source

2 *Sampling equipment*
- portable air sampler - 1 piece
- aerosol filters - 10 pieces
- charcoal filters - 10 pieces

3 *Personal protective equipment*
- Self reading dosimeters for each team member
- Permanent dosimeters for each team member
- Protective overalls, overshoes and gloves - 3 sets per person
- Thyroid blocking agent - 3 days supply (reactor response only)
- First aid kit

4 *Communication equipment*
- Portable radio communications - 1 set

5 *Supplies*
- Identification badges for each team member
- Torch (flashlights) for each team member
- Extra batteries (instruments and flashlight)
- Compass
- Stop-watch
- Administrative supplies, writing pad
- Plastic for preventing contamination of instruments
- Log book
- Cases for shipment of equipment

6 *Supporting documentation*
- Standard survey maps
- Equipment operations manuals
- Response coordination procedures
- Procedures for conducting sampling
- Procedures for conducting monitoring
- Procedures for recording results
- Procedures for relating results to worker turn back limits
- Procedures for personal radiation protection.

7 *Transport*
- All terrain vehicle

C: In-situ Gamma Spectrometry Team

Purpose:

- To measure ground contamination (isotopic composition)
- To determine if ground concentration OILs are exceeded

Minimum staffing per team:

- 2 persons, well trained in gamma spectrometry and radiological assessment

Minimum equipment per team:

1 *Radiation survey instruments*

- Low range survey instruments - 1 piece
- Contamination monitor or probe - 1 piece
- Check source for low range survey instruments

2 *Portable gamma spectrometers*

- Portable survey NaI(Tl) spectrometer system - 1 set
- Detector field stand
- Calibration sources

3 *Sampling equipment*

- none

4 *Personal protective equipment*

- Self reading dosimeters for each team member
- Permanent dosimeters for each team member
- Protective overalls, overshoes and gloves - 3 sets per person
- Thyroid blocking agent - 3 days supply (reactor response only)
- First aid kit

5 *Communication equipment*

- Portable radio communications - 1 set

6 *Supplies*

- Identification badges for each team member
- Torch (flashlights) for each team member
- Extra batteries (instruments and flashlight)
- Compass
- Administrative supplies, writing pad
- Folding table
- Plastic for preventing contamination of instruments
- Log book
- Cases for shipment of equipment
-

7 *Supporting documentation*

- Standard survey maps
- Equipment operations manuals
- Response coordination procedures
- Procedures for field calibration of instruments
- Procedures for conducting monitoring
- Procedures for recording results
- Procedures for relating results to worker turn back limits
- Procedures for personal radiation protection.

8 *Transport*

- All terrain vehicle

D: Personnel Monitoring and Decontamination Team

Purpose:

- Decontamination of people
- Personnel and equipment monitoring

Minimum staffing per team:

- 3 persons, trained annually in radiological assessment and decontamination procedures

Minimum equipment per team:

1 *Radiation survey instruments*
- Contamination monitors - 2 pieces
- Low range survey instruments - 2 pieces
- Check sources

2 *Personal protective equipment*
- Self reading dosimeters for each team member
- Permanent dosimeters for each team member
- Protective overalls, overshoes and gloves - 3 sets per person
- First aid kit

3 *Communication equipment*
- Portable radio communications - 1 set

4 *Supplies*
- Identification badges for each team member
- Torch (flashlights)
- Extra batteries (instruments and flashlight)
- Radiation warning labels and signs, tags for contaminated equipment
- Administrative supplies, writing pad
- Plastic for preventing contamination of instruments
- Log book
- Cases for shipment of equipment
- Power supply

5 *Supporting documentation*
- Equipment operations manuals
- Procedures for field calibration of instruments
- Procedures for conducting contamination monitoring
- Procedures for recording results
- Procedures for personal radiation protection
- Instructions to be provided to contaminated people

6 *Decontamination equipment*
- Personnel decontamination supplies (towels, soap, detergent, brush, etc.)
- Water supply (container)
- Pressurized water spray
- Wet-dry vacuum cleaner
- Plastic covers, waste bags, bags for radioactive waste (with warning labels)

7 *Transport*
- Transportation vehicle

E: In-plant Survey Team

Purpose:

- Measure radiation levels and identify contamination hazards inside the facility and along personal evacuation route

Minimum staffing per team:

- 3 persons, well trained in radiological assessment

Minimum equipment per team:

1 *Radiation survey instruments*

- Contamination monitor or probe (if required for mission)- 1 piece
- Low range gamma survey instrument (if required for mission)- 1 piece
- High range gamma survey instrument - 1 piece
- Very high range gamma survey instrument - 1 piece
- Check sources

2 *Sampling equipment*

- Portable air sampler
- Aerosol filters
- Charcoal filters

3 *Personal protective equipment*

- Self reading dosimeters for each team member
- Permanent dosimeters for each team member
- Protective overalls, overshoes and gloves - 3 sets per person
- Respiratory protection self contained breathing apparatus (SCBA) - for each team member
- Thyroid blocking agent (reactor response only)

4 *Communication equipment*

- Means of communication

5 *Supplies*

- Identification badges for each team member
- Torch (flashlights) for each team member
- Radiation warning labels and signs
- Administrative supplies
- Writing pad
- Log book

6 *Supporting documentation*

- In plant survey maps
- Response coordination procedures
- Procedures for conducting monitoring and sampling
- Procedures for recording results
- Procedures for relating results to worker turn back limits
- Procedures for personal radiation protection.

F: Environmental and Ingestion Sampling Team

Purpose:

- Gather samples of potentially contaminated soil, food and water

Minimum staffing per team:

- 2 persons, trained in radiological assessment and sampling
- 1 local guide

Minimum equipment per team:

1 *Radiation survey instruments*
- Low range survey instrument - 1 piece
- Contamination monitor or probe - 1 piece
- Check source

2 *Sampling equipment*
- Sample bottles and bags
- Sample tags
- Knife, spoons, shovel
- Measuring tape

3 *Personal protective equipment*
- Self reading dosimeters for each team member
- Permanent dosimeters for each team member
- Protective overalls, overshoes and gloves - 3 sets per person
- Thyroid blocking agent - 3 days supply (reactor response only)
- First aid kit

4 *Communication equipment*
- Portable radio communications - 1 set

5 *Supplies*
- Identification badges for each team member
- Torch (flashlights) for each team member
- Extra batteries (instruments and flashlight)
- Compass
- Radiation warning labels and signs
- Administrative supplies, writing pad
- Plastic for preventing contamination of instruments
- Log book
- Cases for shipment of equipment

6 *Supporting documentation*
- Standard survey maps
- Equipment operations manuals
- Response coordination procedures
- Procedures for conducting sampling and monitoring
- Procedures for recording results
- Procedures for relating results to worker turn back limits
- Procedures for personal radiation protection.

7 *Transport*
- All terrain vehicle

G: Isotopic Analysis Team (Laboratory)

Purpose:

- Determine isotopic concentrations of air samples, soil samples, food, water, milk samples
- Determine if food, water or milk samples exceed the GALs

Minimum number of facilities and staffing:

- One laboratory facility with reliable power (at least 30 km from category I facility)
- 3 persons, well trained in gamma spectrometry and sample preparation

Minimum equipment:

1 *Radiation survey instruments*

- Low range survey instruments - 2 pieces
- Contamination monitor or probe - 1 piece
- Check source

2 *Gamma spectrometers*

- High resolution Ge spectrometer system
- NaI(Tl) spectrometer system
- Lead detector shielding
- Liquid nitrogen supply
- Calibration sources (energy calibration) -1 set
- Standard sources (efficiency calibration)- 1 set

3 *Sample preparation equipment*

- Standard geometry sample containers - several
- Scale, scissors, knife, spoons
- Air tight plastic bags
- Anti dust masks

4 *Personal protective equipment*

- Permanent dosimeters for each team member
- Protective overalls, overshoes and gloves, several sets per person
- First aid kit

5 *Communication equipment*

- Means of communication

6 *Supplies*

- Oscilloscope
- Radiation warning labels and signs
- Administrative supplies, log book
- Spare parts, repair tools
- Plastic for preventing contamination of instruments

7 *Supporting documentation*

- Sample preparation procedures
- Equipment operations manuals, isotope data tables
- Procedures for conducting the measurements and evaluation
- Procedures for recording results and record keeping
- Procedures for handling and measuring high radioactive samples
- Procedures for personal radiation protection

H: Initial Treatment Team (Facility)

Purpose:

- Initial medical examination of contaminated or exposed persons
- Immediate treatment of injuries
- First decontamination
- Referral as appropriate to WHO facility for radiation treatment
- Preparation of person for transport to other medical facility

Minimum number of facilities and staffing:

- One facility prepared for initial treatment and evaluation of contaminated or overexposed persons (at least 30 km from category I facility)
- 2 physicians trained annually in treating of contaminated persons
- 3 nurses trained annually in medical care of contaminated persons
- support staff (driver, medical technician)

Minimum equipment:

1 *Radiation survey instruments*

- Surface contamination monitors - 2 pieces
- Low range survey instrument - 1 piece
- Check source

2 *Personal protective equipment*

- Self reading dosimeters for each team member
- Permanent dosimeters for each team member
- Protective overalls, overshoes and gloves - 3 sets per person
- Thyroid blocking agent

3 *Supplies*

- Plastic covers for preventing spread of contamination
- Radiation warning labels and signs
- Administrative supplies, log book

4 *Supporting documentation*

- Equipment operations manuals
- Response coordination procedures
- Procedures for conducting contamination survey
- Procedures for conducting patient decontamination
- Procedures for transporting contaminated patient
- Procedures for evaluation of overexposure and for determining if they should receive specialized treatment
- Procedures for referral to WHO facility
- Procedures for recording results
- Procedures for personal radiation protection.

5 *Transport*

- Medical transportation vehicle

I and J: Local or Regional Response Command Teams

Purpose:

- Receive recommendation for protective action from facility (Cat 1 and 2)
- Make decisions for urgent protective actions
- Notify and inform the public of the protective action (Cat 1 and 2)
- Coordinate the implementation of urgent protective actions for the public
- Coordinate monitoring efforts
- Provide technical advice to decision maker
- Coordinate near the facility

Minimum staffing and facilities:

- One Emergency Response Centre (ERC) prepared to coordinate the implementation of urgent protective actions (at least 30 km from category I facility or provided with radiation protection) (Cat 1 and 2)
- A location to receive notification of an accident from the facility and activate the response (can be different form ERC)(Cat 1 and 2)
- Personnel with the authority to make protective action decisions (24 hour a day capability - not necessary at facility)(Cat 1 and 2)
- Personnel to receive and make notifications (24 hour a day capability - not necessary at facility)
- Personnel to coordinate monitoring and assess results
- Personnel to direct and support implementation of protective action (traffic control, bus drivers etc.)
- Support staff

Minimum equipment:

1 *Radiation survey instruments in facility* (ERC)(Cat 1 and 2)
- Contamination monitors -2 pieces
- Area monitor in ERC- 1 piece (Cat 1 and 2)
- Check source

2 *Personal protective equipment*
- Self reading dosimeters for each team member and decision maker
- Permanent dosimeters for each team member
- Thyroid blocking agent (reactor accidents only)

3 *Communication equipment*
- Means of 24 hour reliable communication: (Cat 1 and 2)
  - between decision makers, potential accident facility and those who implement protective actions
  - between potential accident facility and monitoring teams
- Means to notify and activate the crucial response personnel and decision makers (beepers)
- (category I only) means to alert and provide instructions to the public near the facility (e.g., sirens)

4 *Supplies*

- Back-up power supply for Centre
- Standard response and monitoring maps
- Means for recording and tracking implementation of protective actions and monitoring (Status boards or computers)

5 *Supporting documentation*

- Equipment operations manuals
- Response coordination procedures
- Procedures for making protective action decisions
- Procedures for coordination and assessing surveys

Appendix 8
LIST OF SUGGESTED RADIATION PROTECTION EQUIPMENT FOR ON-SITE EMERGENCY WORKERS

The equipment provided depends on the severity of the hazard, and could include the following:

(a) Respiratory protection: self-contained breathing apparatus is most effective. Filter-canister masks provide a good protection against iodines and particulate but are not effective against tritium;

(b) Protective clothing: protective clothing must be based on the type of hazard. For reactor accidents, it should take into consideration the potentially high doses which can be received from beta radiation. For example, there should be no exposed skin; for fire fighters, protective suits should be non plastic (or of a material which melts on the skin); for personnel expected to perform hard work and/or get wet, suits should be waterproof;

(c) Thyroid blocking agent (reactor only): it should be issued to all emergency workers prior to potential exposures;

(d) Dosimeters: thermo-luminescent dosimeters should be worn by each worker in order to provide a record of the accumulated dose after the emergency. Each person on the team should carry a self-reading dosimeter (up to 250 mSv);

(e) Survey instruments: at least one person in each team should carry a very high dose rate metre (up to 10 Gy/h). Contamination survey instruments must be available to monitor emergency workers on their exit from contaminated areas. These could include: hand-and-foot monitors, portal monitors, portable portal monitors, contamination probes (pancake probes) and scintillator probes. Care must be taken to avoid contaminating the probes;

(f) Clothing: spare clothing and disposal facilities (plastic bags) should be available at the control point to replace contaminated clothing, as required; and

(g) communication equipment that is operational in the areas where personnel may travel.

Appendix 9
SUMMARY OF SUGGESTED PROTECTIVE ACTIONS

Category	Suggested Protective Actions
Category I	**General emergency**: - Promptly evacuate or provide special [a] shelter for the public and non-essential workers on-site - Promptly evacuate or provide substantial shelter [a] for the public in the PAZ - For NPPs provide thyroid blocking within PAZ and UPZ. - Recommend the public within UPZ remain inside and listen to the radio for further instructions - Promptly conduct monitoring within UPZ (to include shelters in PAZ) to determine where OIL[c] may be exceeded and adjust protective actions - Restrict consumption of potentially contaminated food within 300 km - Restrict access to the evacuated area - Monitor a sample of the evacuated people and determine if decontamination instructions should be issued
Category II	**General emergency** - Promptly evacuate or provide special[a] shelter for the public and non-essential workers on-site - Recommend the public within UPZ remain inside and monitor the radio for further instructions - Promptly conduct monitoring of UPZ to determine where OIL[c] may be exceeded and adjust protective actions -Restrict consumption of potentially contaminated food within LPZ until monitored - Restrict access to the evacuated area - Monitor a sample of the evacuated people and determine if decontamination instructions should be issued
Category III	- Provide life saving and treat trauma - Evacuate the facility or area within the facility with the potential for high doses or contamination - Conduct monitoring within and immediately outside facility to determine where OIL[c] may be exceeded and adjust protective actions - Restrict entrance into the evacuated area - Monitor a sample of the evacuated people and determine if decontamination instructions should be issued
Category IV	**Potential lost source or transport accident** - First responders: - provide life saving or other emergency services (fire and rescue) - - evacuate area within 30 m of suspected object or as indicated by transportation accident guidelines [10] - National level conduct monitoring to determine where OIL [c] may be exceeded and adjust protective actions - For lost sources public officials make a public announcement on the hazard **Nuclear powered satellite reentry - *if area of impact can be localized*** - Instruct the public to report and stay away from any suspicious objects. - Conduct monitoring of areas that may have been impacted to determine where OIL[c] may be exceeded and adjust protective actions
Category V	- Conduct monitoring to determine where ingestion or relocation OIL[c] may be exceeded and provide appropriate protective recommendations

[a] Special shelters are designed to provide shielding and filtering

[b] Substantial sheltering is provided in large multi-storey structures.

[c] OIL - Operational intervention levels in accordance with Ref. [7].

REFERENCES

[1] INTERNATIONAL ATOMIC ENERGY AGENCY, International Basic Safety Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources, Safety Series No. 115, IAEA, Vienna (1996).

[2] INTERNATIONAL ATOMIC ENERGY AGENCY, Intervention Criteria in a Nuclear or Radiation Emergency, Safety Series No. 109, IAEA, Vienna (1994).

[3] INTERNATIONAL ATOMIC ENERGY AGENCY, Planning for Off-Site Response to Radiation Accidents in Nuclear Facilities, Safety Series No. 55, IAEA, Vienna (1981).

[4] INTERNATIONAL ATOMIC ENERGY AGENCY, Preparedness of Public Authorities for Emergencies at Nuclear Power Plants, Safety Series No. 50-SG-G6, IAEA, Vienna (1982).

[5] INTERNATIONAL ATOMIC ENERGY AGENCY, Preparedness of the Operating Organization (Licensee) for Emergencies at Nuclear Power Plants, Safety Series No. 50-SG-O6, IAEA, Vienna (1982).

[6] INTERNATIONAL ATOMIC ENERGY AGENCY, Accident Management Programmes in Nuclear Power Plants, A Guidebook, Technical Reports Series No. 368, IAEA, Vienna (1994).

[7] INTERNATIONAL ATOMIC ENERGY AGENCY, Generic Procedures for Determining Protective Actions during a Reactor Accident, IAEA-TECDOC-955, Vienna (1997).

[8] US NUCLEAR REGULATORY COMMISSION, Severe Accident Risk: An Assessment for Five US Nuclear Power Plants, NUREG-1150, USNRC, Washington, DC (1990).

[9] US NUCLEAR REGULATORY COMMISSION, A Regulatory Analysis on Emergency Preparedness for Fuel Cycle and Other Radioactive Material Licensees, US Nuclear Power Plants, NUREG-1140, USNRC, Washington, DC (1988).

[10] INTERNATIONAL ATOMIC ENERGY AGENCY, Emergency Response Planning and Preparedness for Transport Accidents Involving Radioactive Material, Safety Series No. 87, Vienna (1988).

[11] INTERNATIONAL ATOMIC ENERGY AGENCY, Regulations for the Safe Transport of Radioactive Material, Safety Standards Series No. ST-1, IAEA, Vienna (1996).

[12] INTERNATIONAL ATOMIC ENERGY AGENCY, Guidelines for Agricultural Countermeasures Following an Accidental Release of Radionuclides, Technical Reports Series No. 363, Vienna (1994).

[13] "Hydrogen Fluoride", Emergency Response Planning Guidelines, American Industrial Hygiene Association, Akron, Ohio, October 1988.

[14] INTERNATIONAL ATOMIC ENERGY AGENCY, Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency, Vienna, Adopted on 26 September 1986 during 8th plenary meeting.

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