

**IAEA Draft General Safety Guide DS505 (revision of RS-G-1.8),
Monitoring for Protection of the Public and the Environment, Draft dated 1 August 2024
Status: STEP 11 (Second review of the draft publication by the Review Committee(s))**

COMMENTS BY REVIEWER				RESOLUTION			
Comment No.	Para/Line No.	Proposed new text	Reason	Accepted	Accepted, but modified as follows	Rejected	Reason for modification/rejection
1	General	-	Notably, ICRP publication 103, which makes basis for the IAEA radiation protection standards, is not mentioned or referred to anywhere.	X			Reference to ICRP 103 has been added.
2	General comment	Please consider proposed changes in comment No 2, and, as necessary, in other parts of the draft, for consistency.	In various parts of the draft it is mentioned that the data provided through monitoring should be used for the evaluation of doses. As we already mentioned during the TM and in our comments in 2018, annual doses are rarely estimated on the basis of environmental monitoring results and should not be estimated/calculated only in this way. In fact, there may be several results < LoD (decision threshold) in routine monitoring that do not allow dose calculation without being too much conservative. The representativeness criterion of the calculated dose is not met, because too far from			X	Doses calculation using source and environmental monitoring data, combined with environmental dispersion, transfer and dosimetric models is a valid option to calculate retrospectively doses, and it is a well-known scientific approach recommended in the Safety Standards and used in several Member States and by the UNSCEAR.

			<p>reality. Therefore, the annual effective dose to the representative person should not be estimated based on environmental monitoring. It could be done using models and the total amount of radioactivity discharged during a year, radionuclide by radionuclide. However, the results provided by the environmental monitoring could be compared to the results of models.</p>				
3	General comment	Please consider proposed changes in comment No 4, and, as necessary, in other parts of the draft, for consistency.	<p>The notion of « sensitive biota » should be explained. Does the term correspond to the notion of endangered species as mentioned in para. 1.19 ? If yes, this seems problematic with regard to 2 aspects :</p> <ul style="list-style-type: none"> ○ This is not consistent with the European ERICA approach, based on organisms that are representative of the ecosystems in which they are living (and which therefore covers all specific species); ○ This creates an additional pressure/constraint on species that are already threatened, and this could ultimately be detrimental to the 			X	The Safety Guide in preparation provides recommendations concerning endangered species. Paragraph 1.20 specifically addresses endangered and threatened species, as well as protected areas, highlighting that in these cases the flora and fauna may require special consideration. The ERICA approach is mentioned in one of the used references, GSG-10, as an alternative to the ICRP 108 approach,

			balance of the ecosystem and biodiversity.			which is the one adopted in the IAEA Safety Standards, in agreement with international organizations such as the EC, ICRP, IUR, UNSCEAR, and UNEP.
4	General	<p>Please check the use or term radioactive material. It is used 39 times in the document. Some of the use is not in line with IAEA glossary. The radioactive substance is released.</p> <p>radioactive material - Also: radioactive substance https://vocabulary.iaea.org/iaea-safety-glossary/1192 Reference List Definitions</p> <p>1. Material designated in national law or by a regulatory body</p> <p>radioactive discharges - Also: radioactive discharge https://vocabulary.iaea.org/iaea-safety-glossary/458</p> <p>Reference List Definition</p>			X	<p>'Radioactive material' has been replaced with 'radioactive substances' in some parts of the document. This will be further considered at the time of the editorial review.</p>

		<p>Radioactive substances arising from sources within facilities and activities which are discharged as gases, aerosols, liquids or solids to the environment, generally with the purpose of dilution and dispersion.</p>					
5	Title	<p>Monitoring for Protection of the Public and the Environment → Radiological Monitoring for Protection of the Public and the Environment</p>	<p>Revised title is too brief to indicate the nature of the monitoring to be covered.</p> <p>There are two WASSC-lead Safety Guides, i.e. this document and SSG-31, so it is better to add word “radiological” to the title for clear understanding of the difference between two documents.</p>			X	<p>This has been discussed by the Secretariat in consultation with international experts and the IAEA Safety Standards specialists.</p> <p>'Monitoring' alone (as per the IAEA Glossary definition) does include "the measurement of dose, dose rate or activity.</p>
6	Safety Guide Title	<p>Radiological Monitoring for Protection of the Public and the Environment</p>	<p>There is no reason to change the title given the scope of this safety guide.</p>			X	<p>This has been discussed by the Secretariat in consultation with international experts and the IAEA Safety Standards specialist and 'Monitoring' alone (as per the IAEA Glossary definition)</p>

							does include "the measurement of dose, dose rate or activity.
7	Page 1, Para 1.1/ Line 2	The followings are suggested. (before) (see para. 3.11), (see para. 3.12), (see parpa.3.13) (after) (see para. 3.12), (see para. 3.13), (see para. 3.14)	o I think those are typos.	X			
8	Page 1 & 4, Para 1.3 & 1.17 Line 4 & 4	The followings are suggested. (before) Standards Nos GSG-10, Standards Nos GS-G-2.1 (after) Standards Nos. GSG-10, Standards Nos. GS-G-2.1	o I think those are typos.			X	According to the IAEA Style Manual, the abbreviation of 'Numbers' should be 'Nos', without the dot. Therefore, the text in the draft is correct.
9	Page 1, Para 1.4/ Line 2	(before) ~~~ commensurate with the level of radiation risk with ~ (after) ~~~ commensurate with the radiation risk with ~ or ~~~ consistent with the magnitude of the radiation risk with ~	o Based on the Requirement 29 of GSR Part 1 (Rev.1) and Requirement 1 of GSR Part 4 (Rev.1), it is suggested that the sentence is modified			X	The text in the draft is in line with the definition of graded approach in GSR Part 3: ... 'a process or method in which the stringency of the control measures and conditions to be applied is commensurate, to the extent practicable, with the likelihood and possible

							consequences of, and the level of risk'
10	1.9	This paragraph refers to para. 2.8, it should be 2.7	Editing	X			
11	Page 3, Para 1.9/ Line 2	(Before) This includes planned exposure situations, emergency situations, and existing exposure situation. (After) The three types of exposure situations (planned, emergency, and existing) are included.	o In order to clarify the exposure situation types, it is suggested that the sentence is modified.		X		It is recommended to avoid the use of passive tense in the Safety Standards. An alternative phrasing was suggested.
12	1.11	This Safety Guide provides recommendations on confirmatory monitoring programmes conducted by the regulatory body (or by another organization on behalf of the regulatory body) in relation to the operation and decommissioning of facilities and the conduct of activities.	In order to avoid misunderstandings, it should be clarified what is meant by the term "or by another organization on behalf of the regulatory body". The option of deleting this expression could be simpler, as suggested.		X		According to paragraph 4.4, the government or regulatory body may delegate specific tasks to other parties, who then act on behalf of the regulatory body. A reference to paragraph 4.4 has been included.
13		The scope lists "all exposure situations," yet it doesn't appear that direct radiation exposure of members of the public is discussed in much detail in this document (para 5.29 and 5.30 are exceptions) . Direct radiation exposure can become a non-negligible source of exposure if a facility is storing spent fuel in an above-ground interim storage facility on site. Either this mechanism of exposure should be discussed in the document (e.g., in para 5.7), or it should be listed as outside the scope of the document as in para 1.20-1.25			X		Direct radiation from the source is included in the scope of the document. See paragraphs: 5.21, 5.22, 5.29, 5.31, and 5.32. A footnote has been added to give an example of a situation where direct radiation can

							become a relevant exposure pathway, as suggested in the comment.
14	1.16, line 3, pg. 4	This Safety Guide applies to the nuclear fuel cycle facilities, including mining and processing of uranium and thorium ores .	Change to 'uranium and thorium ores' for readability			X	The word 'facilities' needs to be kept.
15	1.16	<p>The guide indicates that it does not apply to "monitoring in other industries that process materials with elevated concentrations of natural radioactivity, including the mining and milling of metalliferous and non-metallic ores, the production of coal, oil and gas, the extraction and purification of water, the generation of geothermal energy, and the production of industrial minerals, including phosphate, clay and building materials"</p> <p>Where will these be covered. It is recommended that reference be made for where these will be covered for ease of use as 1.13 indicates that the guide applies to all exposure situations.</p>				X	This safety guide does not apply to these industries because they are not considered nuclear facilities, and the regulatory framework to address these situations may change across the countries (some countries may consider them as existing exposure situations, some as planned, and some may not even consider them in their nuclear regulatory framework). The

							technical aspects and their regulation depend on how the countries address these industries in their regulatory framework; therefore is not practical adding reference in the text to where this is applicable.
16	1.17	“...This Safety Guide only addresses source and environmental monitoring for facilities and <u>activities</u> in emergency situations where an off-site release has occurred or is foreseen to occur.”	<p>Suggest to clarify which activities are part of the scope and not.</p> <p>‘Activities’ is part of definition of EPC IV in GSR Part 7 (TABLE 1).</p> <p>According to 1.17, transport accidents involving an atmospheric release of radioactive material is currently within the scope, but not accidents involving a sealed source that is intact.</p> <p>However, the definition of source monitoring (3.12) also covers external dose rate measurements from</p>			X	Paragraph 1.17 needs to be read in conjunction with the whole scope section, in which there is an extensive description of which activities are covered and which are not covered. Transport of radioactive material, for instance, is out of the scope of this Safety Guide, as stated in paragraph 1.22.

			'sources', not only atmospheric releases.				
17	1.19	This paragraph refers to para. 3.2, it should be 3.3	Editing	X			
18	1.20	Monitoring explicitly related to the assessment of exposures to flora and fauna is not covered in this Safety Guide. The monitoring programmes for members of the public are usually sufficient to conduct generic assessments for radiological protection of flora and fauna. The government or the regulatory body should determine the need for specific monitoring requirements for protection of flora and fauna based on regulatory objectives and/or the outcomes of a generic assessment. The decision to implement specific monitoring could be influenced by factors such as the presence of endangered and threatened species, protected areas, particular flora and fauna that might be at high risk, or the need to provide public assurance. If deemed necessary, a generic methodology as described in Annex I of GSG-10 [2] can be used for assessing exposures of flora and fauna.	<p>The notion of « sensitive biota » should be explained. Does the term correspond to the notion of endangered species as mentioned in para. 1.19 ?</p> <p>If yes, this seems problematic with regard to 2 aspects :</p> <ul style="list-style-type: none"> ○ This is not consistent with the European ERICA approach, based on organisms that are representative of the ecosystems in which they are living (and which therefore covers all specific species); ○ This creates an additional pressure/constraint on species that are already threatened, and this could ultimately be 			X	The Safety Guide provides recommendations concerning endangered species. Paragraph 1.20 specifically addresses endangered and threatened species, as well as protected areas, highlighting the flora and fauna that may require special consideration. The ERICA approach, mentioned is cited in a reference included in this Guide, GSG-10, as an alternative to the

			<p>detrimental to the balance of the ecosystem and biodiversity.</p> <p>Please check relating changes in other parts of the draft, for consistency.</p>				ICRP 108 approach, which is the one adopted in the IAEA Safety Standards in agreement with international organizations such as the EC, ICRP, IUR, UNSCEAR, and UNEP.
19	Page 4 & 14, Para 1.19 & 2.24 Line 3 & 4	<p>The followings are suggested.</p> <p>(before) (see para. 3.2), ~~~ presented in paras 2.26-2.35</p> <p>(after) (see para.3.3), ~~~ presented in paras. 2.25 – 2.34</p>	o I think those are typos.	X			
20	1.20	It is recommended that reference to a guide where the exclusion of flora and fauna be included I the paragraph.			X		Para 1.20 makes reference to GSG 10, where the exclusion of flora and fauna in REIA is clearly justified according with the requirements in GSR Part 3 and, nevertheless, discussed in an Annex for the countries that have national regulations covering this matter

21	1.20, lines 5-6, pg. 5	<p>‘would generally be’ was changed to ‘are usually’ and the following sentence was deleted.</p> <p>Recommended reinstatement of the sentence: The monitoring programmes for members of the public would generally be sufficient to validate the generic assessment for flora and fauna.</p>	<p>Consistency with the language used in GSG 8 & 10, where the word ‘generally’ is used in this context. The word ‘usually’ is inaccurate in many scenarios.</p>	X			
22	1.20, lines 5-6, pg. 5	<p>‘would generally be’ was changed to ‘are usually’ and the following sentence was deleted.</p> <p>Recommended the following word changes: The monitoring programmes for members of the public would generally be sufficient to validate the generic assessment for flora and fauna.</p>	<p>Changing the wording does not change the overall meaning of the consideration of including the environment and flora and fauna into the monitoring programmes. Human monitoring programs are insufficient for assessing radiological protection of flora and fauna due to differing sensitivities, exposure pathways, and biodiversity considerations. Flora and fauna may be more vulnerable to radiation, requiring site-specific assessments and lower exposure thresholds than humans. Generic assessments might overlook the impact on ecosystems, endangered species, and protected</p>	X			

			areas, which need tailored monitoring. To ensure ecosystem health, radiological impact assessments must go beyond public assurance and include specialized evaluations for non-human biota.				
23	1.26, lines 1-2, pg. 6	This Safety Guide does not address the monitoring of non-radiological contaminants or physical stressors (e.g. temperature), even though the chemical and physical properties relevant for the assessment of radiological impacts do need to be considered in a monitoring programme for radiological protection of the public and the environment	The revised change from 'should' to 'do need to' in the sentence is not addressed in the Member State comments document. Recommend slight word changes for readability and clarity.	X			
24	Page 7 2.1 Lines 3-7	This safety objective has to be achieved without unduly limiting the operation of facilities and the conduct of activities that give rise to radiation risks. While pursuing these, to achieve the highest standards of safety ¹ that can reasonably be achieved, measures have to be taken, among others, to control the radiation exposure of people and the release of radioactive material to the environment.	Redundancy of description removed			X	Editorial. Revision of language will be further conducted in the final editorial review.

¹ In the context of the IAEA safety standards 'safety' and 'nuclear safety' are interchangeable according to Ref. [5].

25	2.6	This paragraph refers to para. 2.6, it should be 2.5	Editing	X			
26	2.6	Recommendations on the responsibilities specific to each of the three exposure situations indicated in para. 2.6 2.5 are provided in Sections 5, 6 and 7 of this Safety Guide.	The different exposure situations are indicated in the paragraph above.	X			
27	Page 9, Para 2.6/ Line 3	The followings is suggested. (before) ~~~ indicated in para. 2.6 are ~~~ (after) ~~~ indicated in para. 2.5 are ~~~	o I think those are typos.	X			
28	Page 8 2.7 (c) 2.5	Existing exposure situations include situations of exposure to natural background radiation	Considering natural exposure situations could quickly lead too far and is unreasonable. Especially since NORMs are explicitly excluded, this is explained on page 4-1.16.			X	The definition of existing exposure situation in paragraph 2.5 is a quotation from GSR Part 3, therefore, it cannot be changed.
29	Page 8 2.7 (c) 2.5	Existing exposure situations include situations of exposure to natural background radiation	Considering natural exposure situations could quickly lead too far and is unreasonable. Especially since NORMs are explicitly excluded, this is explained on page 4-1.16.			X	The definition of existing exposure situation in paragraph 2.5 is a quotation from GSR Part 3, therefore, it cannot be changed.

30	2.10 2.9	... the regulatory body, or someone indicated by him, shall be responsible for review and approval ...	It is assumed that the regulator has this expertise. This may not be true for every MS.			X	This is a quotation from GSR Part 3; therefore, it cannot be changed. Moreover, while tasks can be delegated (see para. 4.4) the responsibility remains with the regulatory body.
31	2.15 2.14	... on request, ..., ...	From whom? This should be clarified.			X	This is a quotation from GSR Part 3; therefore, it cannot be changed. All interested parties, including the public, can request information (see para 5.12 (i)).
32	2.16 (b) 2.15	... estimated doses, on request, to specific members, representatives of the public or interested parties.	These records contain specific data that probably are not easy to understand for a member of the public.			X	This is a quotation from GSR Part 3; therefore, it cannot be changed.
33	Page 12, 2.1.5, (c)	Report promptly to the regulatory body the results of the monitoring programme at approved intervals, including, as applicable, the levels and composition of discharges, dose rates at the site boundary and in premises open to members of the public, results of environmental monitoring and retrospective	As bullet (b) emphasizes records are to be maintained at appropriate intervals of the results of monitoring program and estimated doses to the public, the word “or make available” is not necessary.			X	This is a quotation from GSR Part 3; therefore, it cannot be changed.

		assessments of doses to the representative person.					
34	2.19 (a) 2.16 (a)	... arrangements for local medical treatment or the transport of radioactive and / or contaminated workers or public.	The text appears incomplete.			X	This is a quotation from GSR Part 3; therefore, it cannot be changed.
35	Page 12, 2.16, lines 4-6	“for the prompt identification and declaration of an emergency, and for determining the appropriate level of the emergency response”.				X	This is a quotation from GSR Part 3; therefore, it cannot be changed.
36	Page 12, 2.16, bullet (a)	Provision for individual monitoring and area monitoring, and arrangements for medical treatment, decontamination ;	Decontamination is also part of emergency plan			X	This is a quotation from GSR Part 3; therefore, it cannot be changed.
37	Page 12, 2.16, bullet (b)	Arrangements for assessing and mitigating any consequences of an emergency exposure	Mitigating emergency exposure is more appropriate			X	This is a quotation from GSR Part 3; therefore, it cannot be changed.

38	2.19 (b)	Arrangements ... any consequences ...	The sentence needs to be more specific.			X	This is a quotation from GSR Part 3; therefore, it cannot be changed.
39	2.24	This paragraph refers to para. 2.26-2.35, it should be 2.25-2.34	Editing	X			
40	Page 13, 2.27, lines 2-5	Reference levels shall typically be expressed as an annual effective dose to the representative person in the existing exposure range of 1–20 mSv or other corresponding quantity, the actual value depending on the feasibility of controlling the situation and on experience in managing similar situations in the past				X	This is a quotation from GSR Part 3; therefore, it cannot be changed.
41	2.30 2.29	... records that cover the nature and the extent of contamination ...	Comment: Data related to possible contamination of any activity must already available and collected before site approval.			X	This is a quotation from GSR Part 3; therefore, it cannot be changed.

42	Para 2.34 b)	<p>b) Establishment of an infrastructure to support continuing ‘self-help protective actions’ in the affected areas, such as by the provision of information and advice, and by monitoring.” Self-help protective actions, according to ICRP Publication 146, para (95) include among others, measurements made by the affected stakeholders that may want to map their own radiological situation using radiation detectors that they have bought or those made available by local institutions (e.g. universities, local laboratories, etc.). These measurements are complementary to those, carried out by the organisations responsible for managing the early and intermediate phases of the emergency situations. Data collection by stakeholders may start in the intermediate phase and is likely to assume more importance during the long-term phase of the emergency situation. Resources should be preplanned to support such data collection by stakeholders, particularly by helping those affected to understand the relevance of such data to their own radiological situation and to help them make decisions on their own protection [45].</p>	Reference or clarification needed to how self-help actions relate to monitoring of the environment and protection of the public.	X			A footnote has been added to the paragraph with reference to ICRP 146.
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43	Add to Para 2.35	Creating joint monitoring protocols, creating international joint warning and monitoring systems, data exchange system between countries, drafting international agreements regarding transboundary effects, holding joint emergency exercises, creating regional environmental monitoring networks, increasing transparency in presenting reports to the public can be useful.	Considering the fact that there are no specific provisions covering monitoring associated with transboundary impacts; Is it possible to make suggestions in order to this situation? The fact that the existence of such special provisions can play an important role in ensuring security and reducing radiological effects on neighboring countries, the lack of specific provisions may fuel the conflicts between countries on how to conduct border surveillance.			X	Section 2 of the Safety Guide mainly brings the requirements in GSR Part 3 and GSR Part 7 as they are. The text in paragraph 2.35 is a quotation; therefore, it cannot be changed. Additional information on arrangements related to transboundary impacts is provided in Paragraph 6.5.
44	2.36 (e) 2.35 (c)	... arrange with the affected State the means for the exchange of information and consultations, ...	These proposed measures do not appear to be sufficient. There must be some explicit cooperation mechanism in case of a cross-border incident.			X	Section 2 of the Safety Guide mainly brings the requirements in GSR Part 3 and GSR Part 7 as they are. The text in paragraph 2.35 is a quotation; therefore, it cannot be changed. Additional information on arrangements related to transboundary impacts is provided in Paragraph 6.5

45	3.3, lines 17-19, pg. 19	air; surface water and groundwater; soil; sediments; drinking water; non-crop plants ; crops; animals and vegetables in the human food chain and other foodstuffs; as well as bioindicators (e.g. mussels, moss)	Provide examples of bioindicators in brackets: (e.g. examples of non-human biota). Plants that are not crops need to be listed.		X		Para 3.13 has some examples of bioindicators. The examples were moved to footnote 7, which pertained to paragraph 3.3.
46	3.5, lines 25-26, pgs. 18-19	Typical pathways for external exposures are irradiation from radionuclides in an atmospheric plume or deposited on different surfaces such as the soil water bodies, crops and forests (see Fig. 1)	Fig. 1 is also referenced following the sentence that outlines the typical internal exposure pathways, whilst the figure also applies to external exposure pathways.	X			
47	para 3.5 line 4	Typical pathways for external exposures are irradiation from radionuclides in an atmospheric plume or deposited on different surfaces such as the soil bodies , water bodies, crops and forests.	Editorial It is suggested to change the soil water bodies to the soil bodies, water bodies.	X			A comma was missing after 'soil'. It has been included.
48	Page 19 3-6 3.7	... the more highly exposed individual in the population (<u>extreme situations excluded</u>)	The representative person definition		X		A sentence has been included to clarify that 'extreme situations', such as extreme habit data, should be excluded.
49	Page 19 3-6 3.7	... the more highly exposed individual in the population (<u>extreme situations excluded</u>)	The representative person definition		X		A sentence has been included to clarify that extreme situations should be excluded.
50	3.7, lines 10-13, p. 19	For the purpose of verifying compliance with dose constraints, dose limits and reference levels, as relevant in planned, existing and emergency exposure situations, it is necessary to identify the	The comment provided by Member States (Member State #46) was resolved but is worded differently from the comment. The revised text is difficult to		X		A sentence has been included to clarify that extreme situations should be excluded.

		‘representative person’. A representative person is an individual assumed to receive a dose that is representative of the most highly exposed individuals in the population while their characteristics are not extreme for a single member of the population.	read and does not provide a clear definition of a ‘representative person’. The comment by the Member State representative also wrote ‘while his characteristics are not extreme’ which assumes the representative person is a male or man, which is not a valid assumption to assume.				
51	3.7 – 3.8	It is recommended to quote (") both terms " more highly exposed individuals " and " most vulnerable " as they are frequently used concepts and not specific definitions.	Clarity			X	For the IAEA style, quotation marks should be used when quoting text directly from a reference or when highlighting particular terms, which is not the case of the expressions suggested to be quoted.
52	3.7	It is proposed to consider changing "identifying the representative ..." with " defining the representative.... "	Completeness	X			‘Identifying’ and ‘defining’ are used interchangeably. terms in ICRP 101.
53	para.3.8, line 3	However, the particular characteristics of the representative person in each situation, such as location, diet , habits and age group, may be different.	Editorial It is suggested to add diet. Because the diet is a very important factor.			X	‘Diet’ is included in ‘habits’.
54	para 3.11 line 8	the portion of the radioactive substances to which people are exposed to may be considered as a source.	Editorial	X			

			It is suggested to change considered a source to considered as a source.				
55	3.13, lines 2, pg. 22	as well as in bioindicators (e.g. mussels, insects, invertebrates) that can provide a measure of trends in activity levels	Focus is given to algae and aquatic plants that are often highly tolerant of radiological exposure. Additional bioindicators should be included to encompass more sensitive organisms, such as invertebrates.		X		The examples were completed and brought to footnote 7, which pertained to paragraph 3.3.
56	3.14, pg. 21	FIG.1	Figure 1 is first referenced on page 20, but the Figure is shown on page 21. Recommend placing the figure following the text where it is first mentioned for a clear flow.			X	The placement of the figure will be adjusted during final formatting to ensure it fits properly within the page size for printing.
57		Text in the figure: ‘Benthic Organisms’	Benthic Organismus is incorrectly spelt.	X			
58		Text in the caption: Potential exposure pathways	Change “possible” to “potential” for consistency with terminology and wording that aligns with IAEA Safety Standards when describing the likelihood of exposures.			X	“Possible” is more appropriate, because such exposure pathways could occur based on the scenario described in the figure. There are no connotations related to likelihood or a latent capacity for something to happen requiring further development (i.e., considered to be the meaning of potential).

59		<p>The figure is also a bit difficult to follow as there are complex links (and a bit too many). After the redrawing of the figure, it is still confusing. Further revision is recommended to make the figure simpler and clearer for the reader to follow.</p>				X	<p>The figure is presented as an example, as complete as possible. Indeed, exposure pathways have complex links, and it is preferred to avoid oversimplification which may result in misinterpretations. The technical officers have decided to make the figure as comprehensive as possible, similar to the figure in RS-G-1.8. Unfortunately, it is not possible to include all the pathways and still have a simpler figure. While the figure may be complex, the technical officers believe it remains clear and functional for the hierarchy of an international Safety Guide.</p>
60	3.14 Fig 1	Direct irradiation from plants &crops, Farm animals and food &				X	<p>The figure is presented as an example, as</p>

		drinks should either be included or reasons for elimination be included.				complete as possible, yet not exhaustive. The mentioned pathways haven't been included because their contribution to exposures is generally neglectable.
61	FIG.1 (p.21)	<p>(1) Coloration of lines, i.e. liquid discharge processes and other processes, would be better to change for clearer discrimination.</p> <p>(2) Add "other process" line from "Groundwater" to "Food and Drink" as "Water purification."</p> <p>(3) Amend "Ingestion" on the exposure pathways from "Top soil and Subsoil" and "Surface deposits" to "Incidental ingestion."</p> <p>(4) Regarding "Surface depositions", some footnote would be better to add to this figure because only pathways through the natural environment are</p>	<p>Figure 1 of the draft is well improved comparing with Figure 1 of RS-G-1.8.</p> <p>We would like to propose some amendments and additions for further improvement and clarification.</p> <p>(1) To improve visibility of lines.</p> <p>(2) An exposure pathway derived to groundwater is missing.</p> <p>(3) Clarification. The previous version of the draft (i.e. version dated 2018-11-18) distributed to WASSC members showed as "incidental ingestion."</p> <p>(4) Clarification. From lesson learned from</p>		X	<p>Despite the figure is illustrative and presented as an example to give an idea on the environmental matrices that would need consideration, and it is not intended to cover all the actual possible exposure pathways, the improvement of visibility will be considered at the time of publication in the actual size of the pages by the IAEA publications section.</p> <p>The groundwater pathway line will be added.</p>

		shown, however other pathways such that contaminated soil and building materials (including construction waste) to be recycled and returned close to people as roads and buildings are not shown.	Fukushima Daiichi NPP accident.				'Incidental ingestion' will be added.
62	Page No.22; Section 4.1; Line-1	In certain situations , the government or the regulatory body is expected to make specific provisions in the regulatory framework to ensure that	The word "In certain situations" is inappropriate as it is a general requirement valid for all situations.	X			
63	4.1	In certain situations, t The government or the regulatory body is expected to make specific provisions in the regulatory framework to ensure that appropriate monitoring strategies and programmes are in place, and that responsibilities are clearly assigned, to provide an appropriate level of protection of the public and the environment.	It is not clear which situations are referred to here since they are not further specified. Also, it might be too late to make specific provision in the regulatory framework if a certain situation occurs. If it should rather read "For certain situations..." then those certain situations should be further specified.	X			
64	4.3	The regulatory body, or other designated / delegated organization, ...	The use of the word "relevant" is vague.		X		
65	4.4	These parties should possess sufficient technical capacity and should remain independent of any parties that are responsible for the promotion and development of the practices being regulated, as well as of any registrant, licensee (unless the national regulation imposes the licensee to carry out a particular environmental monitoring programme), designer or constructor of the facilities or activities being regulated.	In some countries such as France, the national regulation imposes the licensee to carry out an environmental programme. This programme can be seen as complementary to the programme carried out by the French IRSN in the framework of its legal missions.		X		A sentence was added to paragraph 4.5, which states the responsibilities of operating organizations, to clarify that the mandatory monitoring performed by the operators can

							complement the programmes of the government or the regulatory body.
66	4.5.i	(i) Regional Countrywide environmental monitoring.	Some countries are very large, consideration should be towards a localized or regional area	X			‘Subnational’ was used instead of ‘regional’, as regional may be interpreted as a multination region.
67	Page 57, Para 5.7/ Line 2	(before) ~~~ likely to discharge radioactivity to the environment, ~~~ (after) ~~~ likely to discharge radioactive material to the environment, ~~~	o Based on the IAEA Glossary (2022 edition), radioactivity refers to the phenomenon. In order to clarify the discharges of radionuclides, it is suggested that the sentence is modified.	X			
68	Page 26 5.7	Inverse e) and d)	More logical	X			
69	Page 26 5.7	Inverse e) and d)	More logical	X			
70	Page 26 5.7	The exposure pathways that contribute to the doses to the public, <u>including direct external exposure from the facility</u>	More generally, the paper speaks of doses linked to discharges, and external exposure to facility which may be due to storage on site for example, is forgotten.		X		The relevant exposure pathways have been described in detail in Section 3, some amendments have been made to paragraph 3.5 to make the direct irradiation from the source an explicit exposure pathway. The technical officers prefer to avoid repetition and don’t include the

						<p>suggested text in Section 5. Paragraph 5.7 is related to discharges, but direct exposure is addressed in 5.21, 5.22, and 5.32, for instance.</p>
71	Page 26 5.7	<p>The exposure pathways that contribute to the doses to the public, <u>including direct external exposure from the facility</u></p>	<p>More generally, the paper speaks of doses linked to discharges, and external exposure to facility which may be due to storage on site for example, is forgotten.</p>		X	<p>The relevant exposure pathways have been described in detail in Section 3, some amendments have been made to paragraph 3.5 to make the direct irradiation from the source an explicit exposure pathway. The technical officers prefer to avoid repetition and don't include the suggested text in Section 5. Paragraph 5.7 is related to discharges, but direct exposure is addressed in 5.21, 5.22, and 5.32, for instance.</p>

72	Page 28 5.12 (f)	(f) to detect any an unexpected increase in the radionuclide concentrations...	"any" is too much difficult to achieve in routine monitoring because it requires very high performances		X		Suggestion accepted with some editorial modifications.
73	Page 28 5.12 (f)	(f) to detect any an unexpected increase in the radionuclide concentrations...	"any" is too much difficult to achieve in routine monitoring because it requires very high performances		X		Suggestion accepted with some editorial modifications.
74	5.12	(e) To detect from an indirect manner unexpected or unauthorized releases;	In fact, the results of the environmental monitoring may contribute, but in an indirect way, to the identification of unauthorized discharges.			X	Paragraph 5.12 covers both source and environmental monitoring. Source monitoring can directly detect unauthorized discharges.
75	5.12	The first objective should be “To ensure protection of the public and the environment” since this is the primary objective of environmental monitoring. .			X		Item (a) of paragraph 5.12 has been rephrased.
76	Para 5.13 And ref [20]	Dose rates to the reference animals and plants may also be evaluated with a methodology as described in annex I of GSG-10 [2], based on the ICRP approach for the protection of the environment [20]. Proper references: [33], [53] INTERNATIONAL COMMISSION ON RADIOLOGICAL PROTECTION, Environmental Protection: The Concept and Use of Reference Animals and Plants, Publication 108, Elsevier, Oxford (2008). INTERNATIONAL COMMISSION ON RADIOLOGICAL PROTECTION, Protection of the	Reference is made to the ICRP model for protection of the environment, while [20] refers to the IAEA safety guide GSG-7 on the occupational radiation protection.	X			

		Environment under Different Exposure Situations, Publication 124, Sage Publishing, London (2014).					
77	Page 29, 5.13, lines 5-8	The environmental media and locations sampled to support human dose assessment might also be useful for the dose assessment of flora and fauna as radionuclide activity concentrations in biota are likely to be estimated from activity concentrations measured in environmental media (see para. 3.2) taking account of relevant exposure pathways and associated transfer factors.	As the doses to flora and fauna are assessed from activity concentrations in biota and relevant transfer factors.	X			
78	5.14	... and other nuclear installations, they may undergo changes throughout the lifetime that can impact the environment	The text should be clearer.		X		The sentence was rephrased.
79	Page 31 5.17, lines 8-16	Pre-operational studies should also provide information on the prospective assessment of doses to the public (see GSG-10 [2]), such as the expected inventories of radionuclides during normal operation of a facility, the possible discharge routes and the likely amounts that will be discharged to the environment, with consideration of the effluent treatment systems that will be installed.	Slightly modified			X	The suggestion changes the intended meaning of the sentence.
80	5.18	(...) The pre-operational monitoring programme should also serve to train staff, test the instrumentation to verify the adequacy of the analytical performance level initially chosen, and ensure effective organization of the	It should be added that the "pre-operational monitoring programme" also aims to verify the adequacy of the level of performance selected for monitoring,		X		Rephrased and added to the paragraph.

		monitoring programmes for the operational stage.	based on the objectives set for it. But the monitoring put in place, based on the spectrum of radionuclides usually released, only allows indirect detection of unauthorized releases.				
81	5.19, line 30, pg. 31	air, soil, water, sediments, foodstuff and non-human biota	Examples / categories of environmental media have already been specified in the sentence; rendering “environmental media” slightly redundant. Recommend adding another type of sample category (non-human biota) for completeness.		X		The word ‘other’ was added before ‘environmental media’ to clarify that the list is not exhaustive and to eliminate redundancy, as the previously mentioned samples are also considered environmental media.
82	5.19	Delete “For nuclear power plants a pre-operational environmental monitoring programme should be implemented two to three years before the planned commissioning of the plant. This pre-operational programme should provide for the measurement of background radiation levels in the vicinity of the site and their variation over and between the seasons. It should also provide the basis for the operational programme of environmental monitoring and should include the routine collection and radionuclide analyses of various samples, such as samples of air, soil, water, sediments,				X	Pre-operational monitoring programmes should be implemented irrespectively of the time required for deployment. The need of 2-3 years environmental data (which is also stipulated in GSG-9 in connection to authorization for discharges), including on the baseline of radiation,

		<p>foodstuff and environmental media collected from several fixed and identified locations outside the site.”</p> <p>Paragraph 5.19 should read: The pre-operational monitoring programme should be initiated sufficiently before the start of operation to be able to study the possible effect of the annual variability in the local environment on the measurements and the results obtained. The results of this pre-operational monitoring should be used as an input to the development of the monitoring programme for the operational stage.</p>					<p>meteorological and hydrological information, and habit data is justified to ensure the proper consideration of natural temporal variabilities in the environmental conditions and population behaviors.</p>
83	5.19	<p>The pre-operational monitoring programme should be initiated sufficiently before the start of operation²³ to be able to study the possible effect of the annual variability in the local environment on the measurements and the results obtained. For nuclear power plants a pre-operational environmental monitoring programme should be implemented two to three years before the planned commissioning of the plant. This pre-operational programme should provide for the measurement of background radiation levels in the vicinity of the site and their variation over and between the seasons. It should also provide the basis for the operational programme of environmental monitoring and should include the routine collection and radionuclide analyses of various</p>	<p>Knowledge of the initial radiological state of the environment, particularly natural radioactivity, is an important step before starting up new installations. But once known, monitoring must focus on the radionuclides that are part of the composition of the discharges and seasonality has no impact on the latter, which depend more specifically on the state of the units and/or operating hazards.</p>			X	<p>Seasonality has an impact on environmental properties which are irrespectively from the stability of the source of radionuclides being released. Background radiation levels may change significantly due, for example, dry years or rainy years. The same with the activity concentrations in environmental media or food.</p>

		samples, such as samples of air, soil, water, sediments, foodstuff and environmental media collected from several fixed and identified locations outside the site.					
84	5.20	... pre-operational stage, some areas that can be assumed as not being ...	One or more should be deleted		X		The wording has been changed to 'at least one area'.
85	Page 32 "Operational Stage"	Guidance relating to Monitoring at the Operational Stage should include regular verification of the dose estimation model.				X	Considerations on dose assessment are already provided in paragraphs 5.37 to 5.40.
86	Page 32, Para 5.21/ Line 4	The following is suggested. (before) ~~~ in the immediate vicinity of the ~~~ (after) ~~~ in the immediate vicinity of the ~~~	o I think that is a typo.	X			
87	Page 32 & 63, Para 5.23 & 8.31/ Line 3 & Table 4	The followings need to be modified. (before) ~~~ in terms of total alpha activity and/or total beta activity ~~~ (before) ~~~ total alpha or total beta activity (before) ^b If discharge limits are for gross alpha/beta activity, ~~~	o The terms of gross (alpha and beta) and total (alpha and beta) activity seem to be used in the para. 5.23 and Table-4 interchangeably. In the context of measurements, two terms are different. The current paras. could be a bit confusing. So, it is suggested that the right term is used in the line with the concept.	X			
88	5.25	(c) The likelihood of abnormal or unexpected releases needing prompt detection, and notification, and possible mitigation.	The concept of mitigation should be developed/explain, giving examples where	X			'Mitigation' was replaced by 'protective actions', which concept is

			appropriate, in order to ensure that the concept is well understood, especially for countries embarking on a new nuclear programme.				described in Section 6 and other IAEA documents.
89	Page 33, 5.26, lines 4-6	To calculate the radiation dose to the representative person, relevant meteorological, hydrological dispersion parameters such as winds, stability, mixed layer height (for atmosphere) and water current speed, mixing depth (hydrological) data should also be collected. To assess the radiological impact of the discharges, other physical and chemical parameters and dietary quantities should also be considered. ²	These lines are modified to give more information.			X	This is already included in para. 8.19, which is general for all exposure situations.
90	Para 5.27 and ref [39]	In designing the monitoring system, there should be sufficient flexibility of response for accidental releases, taking into consideration that the radionuclide composition and physical and chemical characteristics of an accidental release are likely to be different from the discharges in normal operation (see Ref. [39] [33] and ICRP Publication 114).	ICRP Publication 43 is a bit obsolete, as it recommends: "whole body dose-equivalent limit of 5 mSv (0.5 rem) in a year, as applied to critical groups", which is not in the system of RP anymore. Some other terminology and principles in this publication, like secondary limits, derived limits, intervention levels, minimum recordable		X		The text in para. 5.27 comes from the former Safety Guide on monitoring being updated (RS-G-1.8). The content of the paragraph continues to be valid, even though the ICPR reference is obsolete in terms of the dose limits. Consequently, the

² These parameters include the physical and chemical form and solubility of the radionuclide(s) discharged; the particle size distribution in the case of airborne discharges; the pH in the case of water based liquid discharges; the temperature of the effluent; and the volatility of the substances in the discharges.

			values, optimization and source upper bounds, etc have been updated in later publications as well. Most important, that dose models have been updated in several later publications eg 108, 114, and there is no need to refer to Publication 43.				reference to ICRP 43 was deleted.
91	Add to Para. 5.27	In case of unexpected discharges, quick field monitoring methods such as online measurement networks and use of portable dosimeters should be used for immediate monitoring	In this section which deals with monitoring in abnormal conditions, quick and operational methods can be added to collect data in case of unexpected discharges.			X	Paragraph 5.27 relates to source monitoring, specifically monitoring of discharges; online networks and portable dosimeters are more for environmental monitoring or monitoring intended to measure direct irradiation from the source. Online networks have been mentioned in para 5.22.
92	5.31 5.32	During decommissioning, the monitoring programme should reflect changes in the characteristics of the discharges (e.g., radionuclide composition, magnitude of discharge, release rate). As decommissioning proceeds, the	Add the proposed sentence to paragraph 5.31. Alternatively, consider adding the text to Footnote 19 following the second sentence.		X		A sentence on the need of reviewing the measures during decommissioning to minimized spread of contamination

		<p>impact on the public from direct irradiation and changes in the discharged radionuclides compared to the impact during the operational stage should be considered. The monitoring programme for the source and the environment that were in place during operation of the facility should be re-evaluated whenever dynamic changes in the site occur to determine whether they remain appropriate. The contamination control program should be reviewed and modified, as appropriate, to minimize the spread of residual radioactivity to the environment resulting from decommissioning. Any changes in the arrangements for source and environmental monitoring should be documented in the decommissioning plan and implemented, as appropriate.</p>	<p>Decommissioning, particularly during outdoor demolition and remediation, can lead to the spread of residual radioactivity by natural processes (e.g., wind or water) or human activities (e.g., generation of airborne dust, creation of discrete radioactive particles, spills from transport of demolition/remediation waste, etc.) Periodic evaluation of contamination control practices is necessary to prevent spread of residual radioactivity to the environment.</p>				<p>was added to paragraph 5.35.</p>
93	5.38	<p>(...) In many cases, only some of the radionuclides in the discharges can be measured in the relevant environmental media above the detection limits. (...)</p>	<p>In line with the measurement standards, decision threshold should be a better indicator of the analytical performance than detection limit.</p>			X	<p>The term 'detection limit' is more appropriate in the context of this Safety Guide, as it refers to the quantified parameter that, after processing, can be used for dose calculation. The 'decision threshold'</p>

							is more useful for determining whether the substance is present or not.
94	5.39	Data from environmental monitoring at the operational stage of a facility or during the conduct of an activity can be used as an input to verify compliance with any applicable derived limits on the radionuclide concentration in the environment and dose limits and constraints (see GSG-10 [2]).	The concept of “derived limits” should be developed/explained, giving examples where appropriate, in order to ensure that the concept is well understood, especially for countries embarking on a new nuclear programme. The definitions in the IAEA Glossary might not be sufficient or the glossary not be an adequate reference.			X	The definition of ‘derived limit’ in the IAEA Safety Glossary is sufficiently clear: A limit on a measurable quantity set based on a model, such that compliance with the derived limit may be assumed to ensure compliance with a primary limit.
95	5.40	“...the source may be measured or calculated using simple radiation detectors <u>or calculated</u> .”	The use of simple detectors refers to measurements not to calculations.	X			
96	Para 5.40	Add a new sentence at the end of the paragraph: “The assessment of dose from internal exposure should consider the site specific transfer factors, local food pathways and habits of population, and more recommendations are provided in para. 7.26, 7.27 and 9.16.”	Like external exposure, the dose assessment of internal exposure should also reflect.		X		Para 5.38 already addresses dose from internal exposure. A sentence was included to indicate that additional information is provided in paragraphs 9.16-9.18.

97	Page 37, 5.42, lines 3-5	Reports from source monitoring programmes should include the discharge data such as stack effluent quantities, liquid discharges etc in the periods specified to demonstrate that the discharges were within the respective authorized limits.	These lines are modified to give more information.			X	The specificities related to source monitoring are covered in other paragraphs, such as 5.24, 5.25.
98	5.45	“Operating organizations should also report promptly to the regulatory body a significant unexpected increase in environmental radiation fields or activity concentrations, or an unplanned release of a significant quantity of radionuclides.”	The term “significant” is not quantified. Either delete “significant” here or replace it with something like “by an amount specified by the regulatory body”		X		‘Significant’ is used to convey the idea of a real, meaningful increase rather than just a fluctuation within the usual deviations. Though, it has been replaced with ‘substantial’ for clarity.
99	Page 38, 5.46	The analysis should present any trends and variations observed in comparison with previous results.	These lines are modified to give more information.	X			
100	Page No.39; Section 6.1; Line-2	Monitoring during a nuclear or radiological emergency is a key tool to assess the impact on the public of a release of radioactive material and assist in the decision making on, or adjustment implementation of, protective actions to prevent or minimize the radiological consequences. For a nuclear or radiological emergency,.....	The word “adjustment of” can be replaced by a better word like “implementation of” protective actions. This is for bringing clarity.			X	Protective actions are not implemented based on monitoring results but can be adjusted according to them. 'Adjust protective actions' is the term used in GRS Part 7, and the technical officers prefer to keep it for consistence.

101	6.1	... the impact on the public of a radioactive release and assist	Wording.	X			
102	Page No.39: Section 6.3; Line-1	Monitoring during an emergency may be undertaken by several different organizations (e.g. the operating organization, the regulatory body, the technical support organizations or the, response organizations).	The word “different” can be removed as the words “several” does provide the intended meaning.	X			
103	6.4, lines 20-22, pg. 39	The monitoring strategy for an emergency exposure situation should be developed at the preparedness stage, as part of the protection strategy to protect the environment, public, emergency workers ²³ and helpers	<p>There needs to be clear inclusion of protecting the environment as part of the monitoring strategy of an emergency exposure situation.</p> <p>The resolved comment does not provide enough evidence or sufficient reasoning to not include environment; “The main aim of emergency preparedness and response is protection of the public, workers, and helpers.”</p> <p>As stipulated in the draft (referencing GSR Part 3), the emergency plan should include monitoring for the protection of the environment, and the GSR Part 7 (Prep & Response in Rad</p>	X			

			Emergency) applies to the environment.				
104	6.4, lines 20-22, pg. 39	<p>Include the environment as part of the objects of protection in the preparedness stage (insert red text):</p> <p>The monitoring strategy for an emergency exposure situation should be developed at the preparedness stage, as part of the protection strategy to protect the environment, public, emergency workers²³ and helpers</p>	There needs to be clear inclusion of protecting the environment as part of the monitoring strategy during the preparedness stage for an emergency exposure situation.	X			
105	Page 41, Para 6.9/ Line 3	<p>The following needs to be added at the end of para. 6.9.</p> <p>The government is also required to ensure that bilateral and/or multilateral assistant coordination between all the States are established for monitoring (e.g., aerial monitoring), sampling (e.g., sharing of environment media), and analysis (e.g., in situ gamma spectrometry) in accordance with the Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency [50].</p>	o Based on the Requirement 43 (para.4.5 and 4.6) of GSR Part 3 and lessons learned from the Fukushima accident, it is suggested that the new sentence is added.		X		A modification was made to Para. 6.9 to clarify that the coordination shall also be made at the international level, where appropriated.
106	6.10	...in the environment, when necessary, monitoring ...	Wording.			X	The document has been reviewed by the Safety Standards Specialist and 'where' is the appropriate word to use in this context.

107	Page No.49; Section 6.11; Point(g); Line-2	To facilitate the coordination and consistency of national emergency arrangements with relevant international emergency agreements under the relevant instruments.	Changing the words “with international emergency agreements under the relevant instruments” to “with relevant international emergency arrangements” may be considered for better clarity.		X		‘Relevant instruments’ refers, for example, to international conventions, while ‘agreements’ relates to the content of these instruments. The two terms refer to distinct concepts. Reference to the conventions for early warning and assistance in case of emergencies was added.
108	Para 6.16 Line 5	Once the release has stopped and the radioactive plume has passed, monitoring should be directed to the measurement of deposited radionuclides (including dose rates from the ground) and food and water contamination, taking into account the pathways of radiation exposure and the protection and safety of the individuals taking the measurements.	Editorial It is suggested to change food contamination to food and water contamination.	X			
109	para 6.17 line 5	by setting priorities that take into account aspects such as the population distribution and land and water use in the emergency planning zones	Editorial It is suggested to consider land and water use in the emergency planning zones.	X			
110	6.17	..., particularly after a nuclear severe accident.	Wording.	X			
111	Para 6.20, Line 2	The arrangements for environmental monitoring should take into account that a large volume of monitoring data (including dose rates, activity concentrations, diffusion condition and deposition of radionuclides in relevant media over large areas) needs to be collected and made available in a timely manner to reflect the evolving situation.	Editorial It is suggested to add meteorological condition because meteorological condition is an important factor during environmental monitoring.		X		‘Meteorological conditions’ was added.

112	6.22, lines 31-32, pg. 44	Selected representative members of the public may be provided with individual dosimeters along with instructions for their use.	The recommended comment by the Member State representative is better worded and clear than what is written in the revised document.	X			
113	6.23 , line 1-2, pg. 45 6.24	Measurements to assess the environmental intake of radionuclides in individuals should provide input for the assessment of the committed dose and may help to reassure members of the public,	‘Incorporated’ is not the correct wording as individuals or human bodies cannot incorporate radiological material but are present in human bodies through intake pathways. In addition, the comment from the Member State representative is incorrect as the Ref ICRP-119 on Dose Coefficients states ‘by an individual following intake of radioactive material into the body, where s is the integration time in years following the intake. The integration time is 50 years for adults and up to age 70 years for children.’		X		The wording has been changed to convey the meaning of intake instead of incorporation.
114	Page No. 54; Section 6.29; Line No.4	This should include arrangements for the regulatory body or other response organizations to promptly communicate to the public with clear information, including in the languages spoken by the locals.	The sentences “communicate to public clear information” can be considered to be changed as “communicate to public with clear			X	Editorial review will be further conducted by the publication’s specialists.

			information” to bring more clarity.				
115	6. 29, lines 24-27, pg. 46	<p>Comment that is an extension of a Member State representative:</p> <p>It is better to add some cautionary texts to prevent the spread of misinformation and false information to this paragraph.</p>	This could probably be expanded on to provide more detail (how communication should assist in preventing the spread of misinformation).			X	This level of detail may be beyond the intention of this Safety Guide, which is mainly focused in monitoring programmes and some important related aspects . GSG-14 addresses in more details the aspects related to public communication in emergencies.
116	6.30	The reference to a website was to be included as a footnote.	The footnote was added then removed under the Editorial Review. The Member State comment requesting provision of URL in footnote.	X			The response to the Member States’ comment should have been deleted from the resolution table, as instead of referencing the website, the Convention itself was referenced (ref. 50). The comment from the Member State was actually accepted; this was a mistake in the resolution table.

117	7.1	.. sites with residual radioactive material as a result of past activities that were not subject to effective regulatory control ...	Some example or reference should be given in relation to these sites, for clarity purposes.	X			A reference to GSG-15 was included.
118	Page 45 7.2	... with reference levels for existing exposure...	It would be interesting to indicate where these “reference levels can be found” ?	X			A reference to para. 5.8 of GSR Part 3, which states a typical range for reference levels, was added.
119	Page 45 7.2	... with reference levels for existing exposure...	It would be interesting to indicate where these “reference levels can be found” ?	X			A reference to para. 5.8 of GSR Part 3, which states a typical range for reference levels, was added.
120	7.10	The regulatory body should review monitoring programs and carry out independent monitoring, ...	Wording.		X		This is a requirement from GSR Part 3, and requirements cannot be written as ‘should’ statements. The word independent was included.
121	Page 47 7.11 (b)	To compare with reference levels...	same	X			A reference to para. 5.8 of GSR Part 3, which states a typical range for reference levels, was added
122	Page 47 7.11 (b)	To compare with reference levels...	same	X			A reference to para. 5.8 of GSR Part 3, which states a typical range for

							reference levels, was added
123	Page No. 61; Section 7.21; Line4	The environmental monitoring should also include wild food products (e.g. game meat , mushrooms, berries) where it is known they are consumed.	The word ‘game’ inside the bracket can be changed as “game meat” for bringing the intended meaning.			X	Editorial. It will be revised by language specialists according to the IAEA Style.
124	7.21	(...) The design of the environmental monitoring programme should ensure that important routes of radionuclide migration are considered, such as through soil, or groundwater, or into biological matrices that are representative or emblematic of the region in which the installation is located (milk, fish, plants, cereals, honey,...) biomass .	This is not a correct use of "biomass", which definitions seem to be: Definition 1: the total quantity or weight of organisms in a given area or volume, as in this quote: "drastic declines in insect biomass, abundance, and diversity have raised concerns among scientists". Definition 2: Organic matter used as a fuel, especially in a power station for the generation of electricity, as in this quote: "the factory is run on renewable energy, including wind, solar, and biomass"		X		The term ‘biomass’ was replaced with ‘biological matrices’. The rest of the sentence was not added as the section addresses existing exposure situations, which generally are not installations. Moreover, the first sentence of the paragraph already conveys the meaning that the samples should be taken locally.
125	Page 52 “Individual monitoring in an existing exposure situation”	It is recommended that the objectives of Individual Monitoring in an Existing Exposure Situation be added to below this section.				X	The objectives of individual monitoring in existing exposure situations are stated in paragraph 7.11, for example, items

							(a) and (h), and in paragraph 7.23.
126	Page No. 62; Section 7.24; Line-4	Individual monitoring should take into account the presence of long-lived lasting radionuclides and their possible build up in the environment.	The word “long lasting radionuclides” can be changed as “long-lived radionuclides” for better clarity.	X			
127	Page 54 and para 7.29	footnote page 54: "The term ‘derived criteria’ is related to the concept of ‘derived reference levels’, defined in Ref. [53] as a numerical value expressed in an operational or measurable quantity, corresponding to the reference level set in dose". Para 7.29 For practicality, derived criteria that correspond to the relevant dose criteria and that can be easily measured (e.g. activity per unit area, per unit weight or per unit volume; gamma dose rates at 1 m height for a defined surface) may be established as necessary (see para. 3.14 of GSG-15 [12]).	Reference to ICRP 126 is made only in a footnote page 54: "The term ‘derived criteria’ is related to the concept of ‘derived reference levels’, defined in Ref. [53] as a numerical value expressed in an operational or measurable quantity, corresponding to the reference level set in dose". To our opinion, this publication 126 deserves a bit more attention and clarification here in the corresponding para 7.29 instead of referring to the IAEA safety guide on remediation GSG-15, it should refer to the original ICRP publication 126 explaining this concept.	X			Reference to ICRP 126 (Ref. [53]) was brought into the main text.
128	8.2	Footnote 38: is the conceptual site model a qualitative model? A more detailed definition of conceptual model is encouraged.	Clarity	X			The footnote has been better elaborated.
129	Page 55 Table 2	It is noted that Individual monitoring is not recommended for Planned-Licensed				X	Monitoring of doses to individuals in

		<p>practices or sources and Planned-Multiple sources.</p> <p>It is unclear how the monitoring, albeit through dose calculation models, of a representative person will be achieved if this monitoring is not recommended.</p>					<p>planned exposures situations is not recommended. Instead, doses to the representative person are calculated using source and environmental monitoring data in combination with environmental models, habit data and dosimetric models. Information on dose calculation from source and environmental monitoring results is provided in paragraphs 9.12 to 9.18. Additional information on dose assessment can be found in Ref. 58. Dose calculation is not the focus of this Safety Guide.</p>
130	8.3	(g) Health significance of the estimated dose	Completeness		X		<p>The term 'significance of the estimated dose' refers to evaluating the dose's magnitude and its implications for radiation protection</p>

							while 'health significance' implies a direct assessment of health effects. In this context, the focus is on the dose itself and its relevance in terms of regulatory limits, not necessarily its health impacts. The word 'significance' has been changed to 'magnitude', for clarity.
131	8.9/page 57	8.9. Additional supporting information that should be considered in the design of a source monitoring programme includes information on the chemical form (i.e. which can affect the migration of radionuclides), temperature and flow rates of the release, as well as meteorological, geological and hydrological data and information on the environment.	In the fourth line of item 8.9, it is better to add the word " geological ".	X			
132	8.9	Additional supporting information that should might be considered in the design of a source monitoring programme includes information	As the objective is to suggest a possibility, "might" seems to be more appropriate.			X	'Should' is the usual wording in Safety Standards recommendations. This will be revised by the Safety Standard Specialist. The recommendation is softened by the expression 'be considered'.

133	8.12	When designing the monitoring programme, the shielding provided by buildings ³ in the area contaminated with radioactivity should be taken into account and detailed data on dose rates in living environments should be considered, wherever possible, for the accurate assessment of the external dose to the public. This could be achieved by measuring dose rates both outside and inside dwellings, giving special attention to individuals who might receive the highest dose because of their habits (e.g. farmers).	Avoid mixing different parameters are mixed. Living habits are other parameters (cf. 8.18).	X			The sentence has been deleted from 8.12 and placed in paragraph 8.18.
134	8.16, lines 8-10, pg. 59	For planned exposure situations (and existing exposure situations), the hydrological characteristics ⁴² of the aquatic environment and the meteorological characteristics of the atmosphere	Member State comment not addressed: Suggest putting ‘and existing exposure situations’ in brackets so as to clarify that the monitoring for existing situations is during the characterisation studies, not in the pre-operational stage.	X			This comment was not from Member States but from Australia WASSC-EPRSC Member at Step 7. At that time the suggestion was incorporated into the text, but after Member States comments and editorial review by the Safety Standards Specialist, the brackets have been removed.
135	8.16, lines 13-15, pg. 59	should be used to identify the general characteristics of the environment that might affect the behaviour and	‘Fate’ is not the right word to describe the anticipated behaviour or	X			

³ Shielding is relevant for radiation from anthropogenic sources, while the natural background can be different indoors and outdoors. In some cases, for example, dose rates indoors due to building materials might become higher than outdoors.

		trajectory of accidental releases and that should be considered	movement of accidental releases through out the environment				
136	Add in between para. 8.16 and para. 8.17	In addition, physical and mineralogical composition of soils, including the percentage of clay minerals and the type of clay minerals, should be identified due to their effect on the absorption of radioactive materials.	This issue is effective in the transfer and distribution of radionuclides in underground water.		X		Mineralogy has been added to paragraph 8.17 for completeness, which already addresses the soil characteristics.
137	Add to Para. 8.16	Environmental monitoring programs should consider Groundwater flow regime including flow direction, flow type and flow speed.	First: This issue is effective in the transfer and distribution of radionuclides in underground water. Secondly: it can provide some necessary basic data to investigate the exposure path of people and the environment through groundwater.	X			Groundwater is mentioned in paragraph 8.17 already. ‘Flow regimes’ have been included.
138	8.17, lines 17-18, pg. 59	Characteristics of soils and sediments such as texture, structure, porosity, chemistry and colour can also be studied to help evaluate any spatial and temporal changes in the radionuclide transfer and migration through the soil and sediment to groundwater or vegetation.	Sediments should also be included because they can act as both sources and sinks for radionuclides in terrestrial and aquatic environments, influencing their mobility, bioavailability, and long-term accumulation.	X			
139	Page No.70; Section 8.17; Line-4	Characteristics of soils such as texture, structure, porosity, chemistry and colour can also be studied to help evaluate any spatial and temporal changes in the radionuclide transfer and migration through the soil to groundwater or vegetation.	The words “can also be studied to help evaluate any spatial” can be changed as “can also be studied to evaluate any spatial” for bringing better clarity.		X		The study of these characteristics alone doesn’t allow the evaluation of spatial and temporal changes in the radionuclide transfer and migration; it only

							assists. Therefore, 'help' was changed to 'assist' for clarity.
140	Para 8.18/ Line 4	Add a new sentence after the first sentence: "The dietary habits of special populations, such as infants and pregnant women, should be taken into consideration."	Women's dietary habits may change after pregnancy, formula feeding infants may consume formula from different origins.		X		Addition made to the paragraph.
141	8.19, lines 1-2, pg. 60	Parameters such as wind speed, wind direction, stability of the atmosphere's mixing layer and magnitude and extent of any precipitation should be measured in an airborne release.	Consideration should be given to a hydrological release to aquatic environments and included.	X			
142	8.20	(c) Locations of in-situ measurements and sampling representativeness ;	It is suggested to add "representativeness" in accordance with normative procedures and 8.22.			X	The paragraph describes the content of a monitoring programme. 'Sampling representativeness' is ensured through the selection of locations, sampling procedures, and techniques, which are already covered in items (c) and (e). Representativeness is an outcome of these factors and cannot be listed as a standalone item.
143	8.25	Table 3: simple random sampling are not reproducible. This fact should be mentioned as a footnote		X			Comment added to the table.

144	p. 8.30	Add new para to section «Measuments» of chapter 8 after para 8.30: «The monitoring programmes should be sufficiently robust to detect abnormal or unauthorized discharges. This is necessary in order to have the possibility to revise the authorization for discharges in the event of detection of abnormal or unauthorized discharges. (see para 7.5 of GSG-9 [3])».	1. Para 7.5 of GSG-9 provides recommendations for the organization of measurements within the framework of monitoring programs. 2. This proposal also aims to take into account the developers' comments on the proposal to amend paragraph 5.46, formulated during the review of DS505 at step 7.		X		A sentence was added to emphasize the need for flexibility in the monitoring system, in a general sense, as Section 8 is applicable to all exposure situations. The detection of abnormal incidental releases is more applicable to planned exposures, and is already mentioned in para 5.27.
145	Table 4	Surface contamination	This line should be deleted because this is more a matter of radiation protection and radiological cleanliness than of environmental monitoring.	X			
146	Table 4, pg. 63-64	Table 4 is still shown on two pages.	Recommend condensing Table 4 into a single page for user-friendliness.			X	The placement of figures and tables will be adjusted during final formatting to ensure they fit properly within the page size for printing.
147	8.36	“...should be included in the monitoring programme and used to aeess <u>assess</u> whether...”	typo	X			

148	Page No. 77; Section 8.37: Line 5	This evaluation and review should ensures ensure that the monitoring programme is producing data that are sufficient to meet the objectives of the programme and that no significant routes of discharge or environmental transfer, and no significant exposure pathways,	The words “should ensures” can be changed as “should ensure” for clarity.	X			
149	8.39	..Any decision to make a change to the monitoring programme should be documented and approved by the regulatory body, as appropriate , along with	Completeness	X			
150	9.2	and instruments used, instrument calibration data, and measurement uncertainties <u>with confidence level</u> .	The confidence level can impact the perception of uncertainty and may be worth noting	X			
151	9.3	The data recorded should also include information on the data quality that are associated with the instruments and sample, such as: detection limits; data for blanks, duplicates and matrix spikes; instrument calibration data; background counts for background correction; and results of intercomparisons.	It should be referred to decision threshold. Decision threshold should be a better indicator of the analytical performance than detection limit.	X			
152	9.6	Unexpected results should be investigated and reported, as appropriate , to determine if any changes in the monitoring programme are needed.	Completeness		X		Inclusion was made at the end of the paragraph.
153	Page 68	Interpretation should include comparison with the assumptions made in the dose calculation		X			In previous versions of the document, comparisons with

	“Data Interpretation”	models, including verification of the models and adaptation of the models to the actual transport of radionuclides and exposure pathways.					models were mentioned in paragraphs: 5.12 (h), 5.15, 5.39, 8.13. These references were removed in response to a Member State’s comment, but the technical officers have reconsidered and reintroduced them with some rephrasing.
154	9.13	... can be done using mathematical models [Ref.?]to convert data of source or environmental monitoring ...	For clarity purposes.	X			Footnote 53, that includes a reference to mathematical models (para. 9.17) has been moved to para. 9.13.
155	9.14	The assessment of dose to the representative person should be based on the predominant exposure pathways. External exposure (e.g. irradiation from radioactivity in the air, deposited on the ground or in water and sediments) and internal exposure (e.g. inhalation, ingestion of food and drinking water) should be considered. Where the dose to the representative person is of concern, dose calculations might should be based on the results of environmental monitoring rather than source monitoring.	It should be less directive.	X			
156	9.17	When environmental monitoring provides results on the radiation levels and activity concentrations of	It should be less directive.		X		The use of dose coefficients is the

		radionuclides in air, water and food, dose coefficients should might be used for the purposes of dose assessment, in conjunction with habit data. When only source monitoring results are available or when environmental monitoring does not provide sufficient data on radiation levels and activity concentrations in air, water and food, models for dispersion and transfer of radionuclides through the environment and the food chains could be used to supplement the data .					usual approach in the IAEA Safety Standards and Member States, moreover they are included in GSR Part 3. The part 'to supplement the data' has been deleted.
157	9.17	When environmental monitoring provides results on the radiation levels and activity concentrations of radionuclides in air, water and food, dose coefficients should be used for the purposes of dose assessment, in conjunction with habit data. When only source monitoring results are available or when environmental monitoring does not provide sufficient data on radiation levels and activity concentrations in air, water and food, models for transfer of radionuclides through the environment and the food chains could be used. The use of models for transfer of radionuclides through the environment and the food chains should be used for the purposes of dose assessment, when possible, complemented as appropriate and as necessary by results provided by environmental monitoring.	In various parts of the draft it is mentioned that the data provided through monitoring should be used for the evaluation of doses. As we already mentioned during the TM and in our comments in 2018, annual doses are rarely estimated on the basis of environmental monitoring results and should not be estimated/calculated only in this way. In fact, there may be several results < LoD (decision threshold) in routine monitoring that do not allow dose calculation without being too much conservative. The representativeness criterion of the calculated dose is not met, because too far from reality. Therefore, the annual effective dose to the representative person should not be estimated based on			X	Doses calculation using source and environmental monitoring data, combined with environmental dispersion, transfer and dosimetric models is a valid option to calculate retrospectively doses, and it is a well-known scientific approach recommended in the Safety Standards and used in several Member States and by the UNSCEAR.

			<p>environmental monitoring. It could be done using models and the total amount of radioactivity discharged during a year, radionuclide by radionuclide. However, the results provided by the environmental monitoring could be compared to the results of models.</p> <p>Please implement the same modification, as appropriate, in other relevant parts of the draft.</p>				
158	9. 19, lines 14-16, pg. 71	In emergency exposure situations and in some existing exposure situations, the background radiation might, in some cases, be negligible compared to the projected doses and may then be ignored in the calculations.	Commas were not added.	X			
159	9.28, lines 11-12, pg. 73	The regulatory body, in consultation with appropriate stakeholders , should define the content and characteristics of the reports on source and environmental monitoring to be made available to the public and other interested parties	This was not addressed properly in the revised document. The justification for not adding in any mention of stakeholders was based on the sole responsibility of reports going to the regulatory body. However, as in this report's case, the Member States are stakeholders and are also responsible for conveying and		X		A sentence was included in the paragraph to reflect that the regulatory body can consult other interested parties on the content of the reports.

			defining the report's content. There needs to be mention or acknowledgement of the numerous stakeholders that are involved in the creation of reports.				
160	9.28	<p>“In planned exposure situations the regulatory body is required...” (1st sentence)</p> <p>“The regulatory body^e...” (2nd sentence)</p>	<p>GSR Part 3 Chapter 3 covers planned exposure situations.</p> <p>Suggest to add something similar to footnote ‘e’ in Table 1 stating that in other exposure situations and depending on national arrangements, other organizations may have this responsibility.</p>		X		<p>The technical officers agree that this is a requirement under planned exposure situations in GSR Part 3, but prefer to keep the first part of the paragraph general, as it can also apply to existing and emergency exposure situations. A sentence was added at the end of the paragraph to address cases where these responsibilities do not fall under the regulatory body, similar to Table 2</p>
161	Table A-1	Footnote (d):If there is no authorization to release Tritium, C-14 and alpha emitters does it means no need to measure them and include them in the inventory?	Completeness	X			Footnote has been rephrased in all tables.

		It is proposed to measure them even in the cases where there is no authorization to release.					
162	TABLE A-1. Line for Air and deposition	Rain and storm water runoff, analyze by gamma spectroscopy as well	May create an additional dose pathway			X	Runoff is included in deposition.
163		Add <u>“14C” and “U isotopic measurement” (for upstream cycle facilities)</u> for leafy vegetables, Other vegetables and fruits, cereals and meat	<p>The use of measurement results from monitoring to estimate doses is clearly recommended several times in the document. For most nuclear installations, doses result mainly from carbon-14 releases, except for sites where doses are linked to uranium releases (upstream cycle). So, considering the example of environmental monitoring proposed on table A-1, this objective of dose estimations from measurement result cannot be reached due to the lack of carbon-14 analysis in food (recommended only for milk in the paper).</p> <p>The same remark must be done for uranium for concerned plants (doses cannot be estimated using gross alpha measurements).</p> <p>Moreover, Carbon-14 released are often low and their consequences in the environment can be clearly established only with measurement results expressed in Bq/kg of carbon. However, carbon-14 activities expressed in Bq/kg fresh may give an idea</p>		X		C-14 has been included for the other foodstuffs, and alpha spectroscopy for the environmental matrices.

			of the maximum doses due to this radionuclide				
164		Add <u>“14C” and “U isotopic measurement” (for upstream cycle facilities)</u> for leafy vegetables, Other vegetables and fruits, cereals and meat	<p>The use of measurement results from monitoring to estimate doses is clearly recommended several times in the document. For most nuclear installations, doses result mainly from carbon-14 releases, except for sites where doses are linked to uranium releases (upstream cycle). So, considering the example of environmental monitoring proposed on table A-1, this objective of dose estimations from measurement result cannot be reached due to the lack of carbon-14 analysis in food (recommended only for milk in the paper).</p> <p>The same remark must be done for uranium for concerned plants (doses cannot be estimated using gross alpha measurements).</p> <p>Moreover, Carbon-14 released are often low and their consequences in the environment can be clearly established only with measurement results expressed in Bq/kg of carbon. However, carbon-14 activities expressed in Bq/kg fresh may give an idea of the maximum doses due to this radionuclide</p>		X		C-14 has been included for the other foodstuffs, and alpha spectroscopy for the environmental matrices.
165	Table A-1 (p.84) 12 th row (Leafy	Tritium ^d Gamma spectrometry → Tritium ^d	In Table A-1, Carbon-14 is only shown for Milk and Meat, and in Table	X			C-14 has been added to all foodstuffs.

	vegetables) ~14 th row(Grain) , 4 th column (Measurem ent (as appropriate to the source))	Carbon-14^d Gamma spectrometry	A-2, it is only shown for Fish. These are listed as examples because carbon is one of the main components, and therefore have a high Carbon-14 concentration, but wouldn't it be better to add Carbon-14 to leafy vegetables, other				
166	Table A-1 (p.85) 6 th row (Grass), 4 th column (Measurem ent (as appropriate to the source))	Tritium ^d Gamma spectrometry → Tritium ^d Carbon-14^d Gamma spectrometry	vegetables and fruits, grain, grass, and lichen and mosses, as they also absorb ¹⁴ CO ₂ from the atmosphere through photosynthesis? Also, with regard to the “Tritium d” of lichen, mosses and mushrooms, wouldn't it be better to align it with leafy vegetables, other			X	The table brings general examples, C-14 is usually measured in foodstuff
167	Table A-1 (p.85) 7 th row (Lichen, mosses, mushroom s), 4 th column (Measurem ent (as appropriate to the source))	Gamma spectrometry → Tritium ^d Carbon-14^d Gamma spectrometry	vegetables and fruits, grain, and grass?	X			

168	Annex, list of references, ref. [A-3]	“INTERNATIONAL ORGANIZATION FOR STANDARDIZATION, Water quality — Sampling — Part 1: Guidance on the design of sampling programmes and sampling techniques. ISO 5667-1:2023, ISO, Geneva (2023)	“This is the correct citation format for ISO standards. The latest edition of this part of the ISO 5667 series was published in 2023.”		X		Reference amended according to the IAEA style.
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