GLOBAL CONFERENCE ON EMERGENCY MANAGEMENT

Response to Nuclear and radiological Emergencies in Animal Production Systems

By Ivancho NALETOSKI & Gerrit J. VILJOEN

Joint FAO/IAEA Centre of Nuclear Techniques in Food and Agriculture / Animal Production and Health Section

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3-5 April 2023 | Maison de la Chimie, Paris, France

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Who are we?

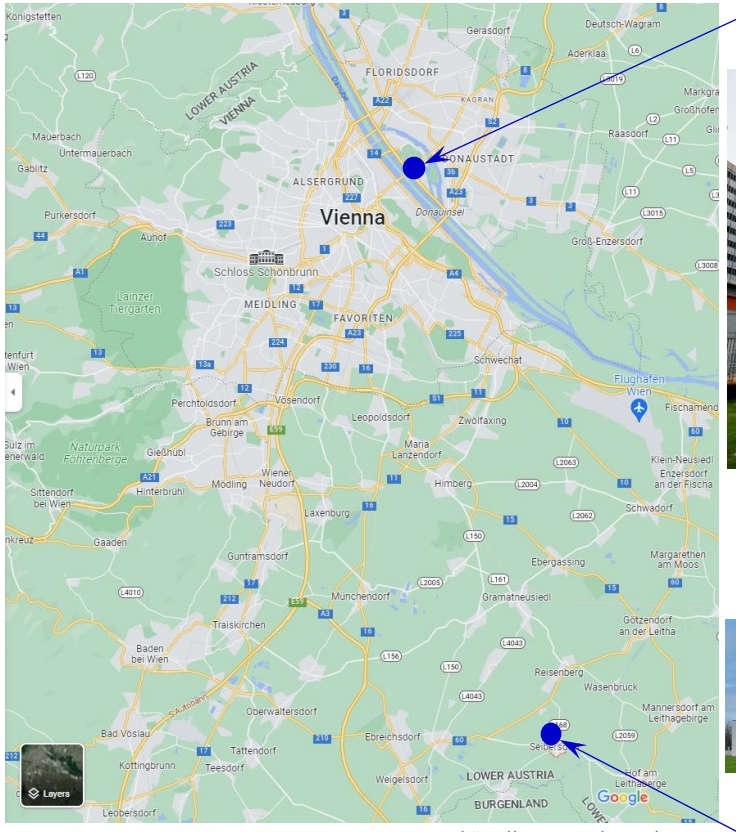
https://www.iaea.org/about/animal-production-and-health-section

https://www.fao.org/agriculture/fao-iaea-nuclear-techniques/en/

FAO | **IAEA**

Joint FAO/IAEA Centre of Nuclear Techniques in Food and Agriculture

Soil & Water Management & Crop Nutrition Section	Soil & Water Management & Crop Nutrition Laboratory
Plant Breeding & Genetics Section	Plant Breeding & Genetics Laboratory
Animal Production & Health Section *	Animal Production & Health Laboratory *
Insect Pest Control Section	Insect Pest Control Laboratory
Food & Environmental Protection Section	Food & Environmental Protection Laboratory



https://www.google.com/maps

IAEA HQ
Lat, Lon: 48.234908, 16.416851

IAEA Seibersdorf Laboratories
Lat, Lon: 47.974243, 16.509823

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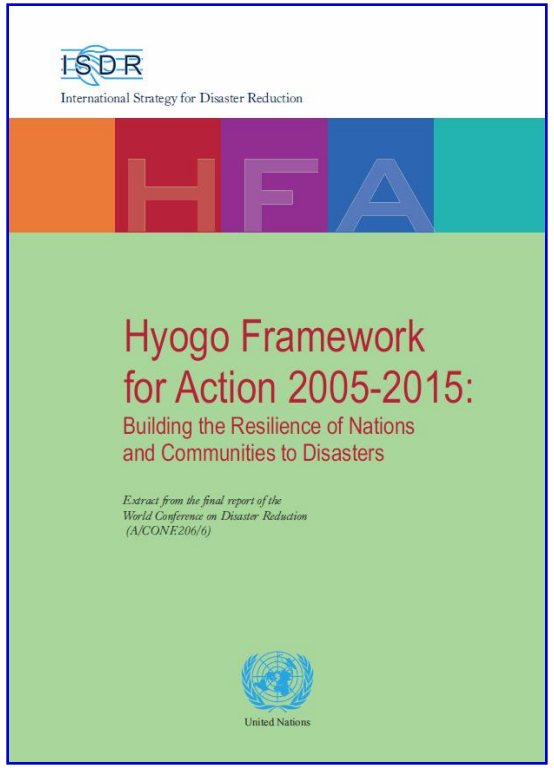
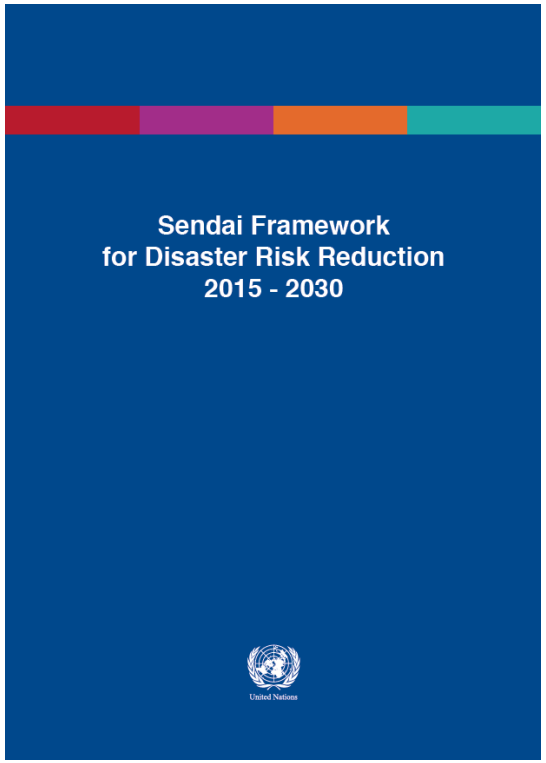
United Nations Office for Disaster Risk Reduction (UNDRR)

Global Frameworks



https://www.unisdr.org/files/1217_HFAbrochureEnglish.pdf



https://www.undrr.org/implementing-sendai-framework/what-sendai-framework

UNDRR Strategic Framework 2022-2025 | UNDRR

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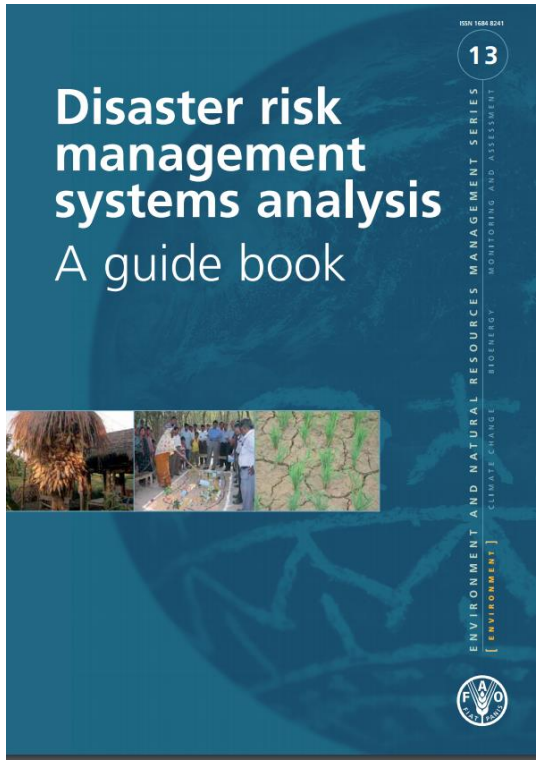
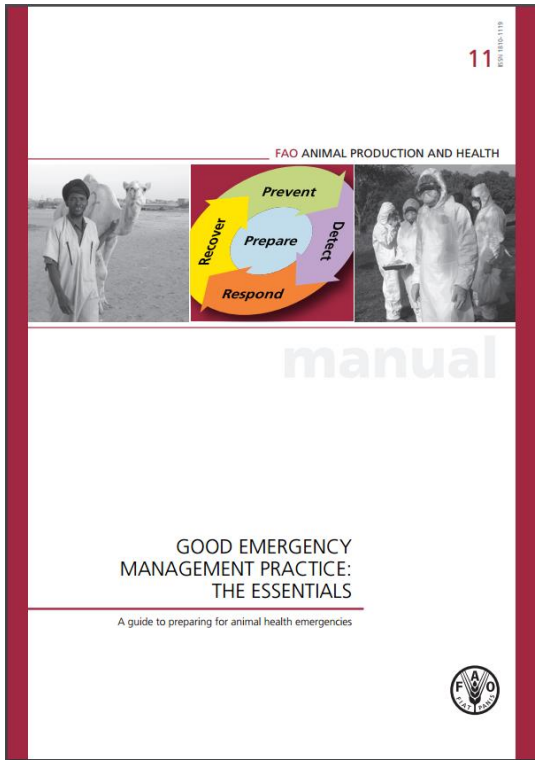
Emergency Management in Animal Production and health

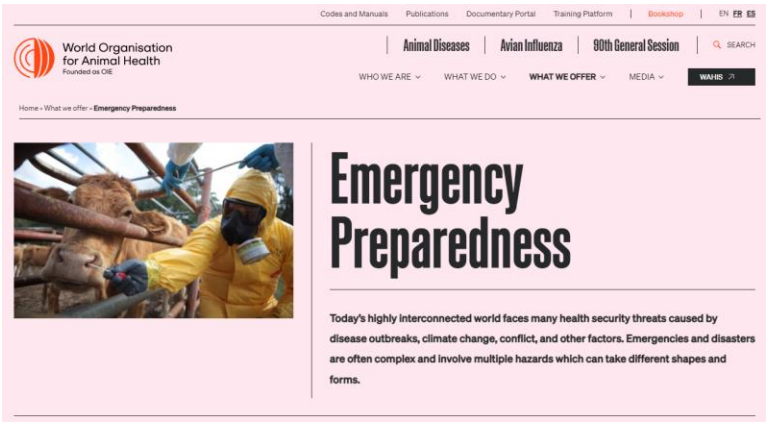
International Organizations



http://www.fao.org/3/a-i0304e.pdf



http://www.fao.org/docrep/014/ba0137e/ba0137e00.pdf



https://www.woah.org/en/what-we-offer/emergency-preparedness/

https://www.woah.org/en/a-gateway-to-resilience-integrating-animal-health-in-emergency-management/

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IAEA Safety Standards

-Hierarchically organized

-Safety principles (blue)

-Safety requirements (red)

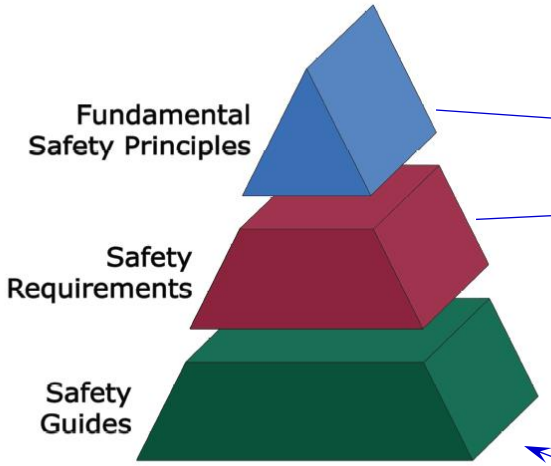
-Safety guides (green)

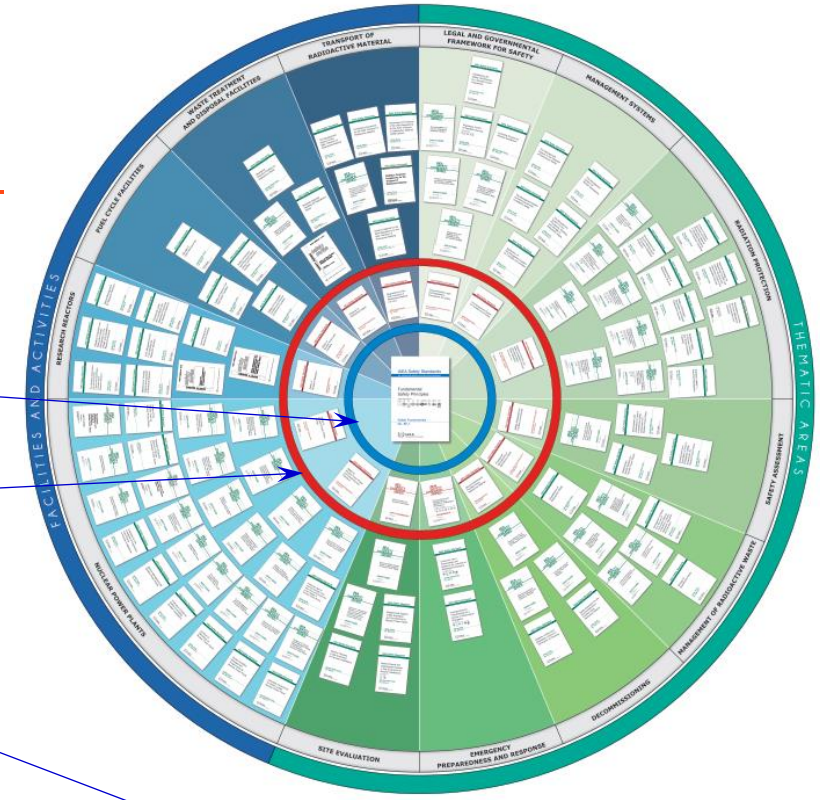
-Topic-wise organization

-Each triangle (colour) of the circle represents collection on different topics

-Strong search engine on the IAEA Web

-Vas majority (if not all) open access, downloadable from the IAEA Web.





https://www.iaea.org/resources/safety-standards

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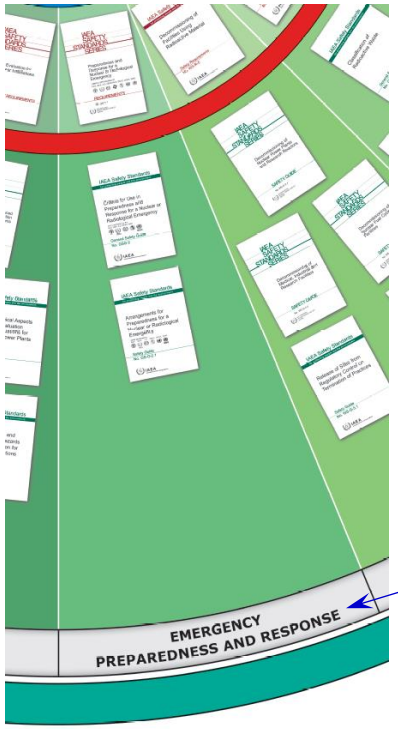
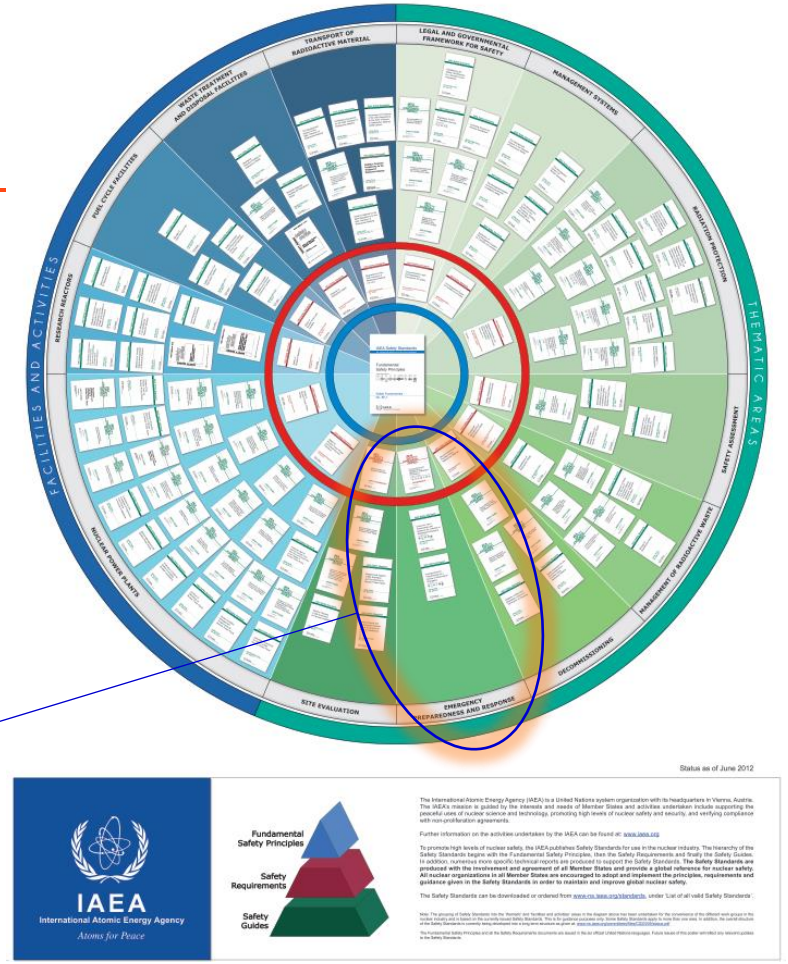
IAEA Safety Standards

An Introduction to IAEA Safety Standards on Protection of People and the Environment

https://www.iaea.org/resources/webinar/an-introduction-to-iaea-safety-standards-on-protection-of-people-and-the-environment-gsg-8-gsg-9-and-gsg-10



https://gnssn.iaea.org/regnet/IAEA%20Safety%20Standards/SSP-EN_V10_2012-06_FINAL.pdf



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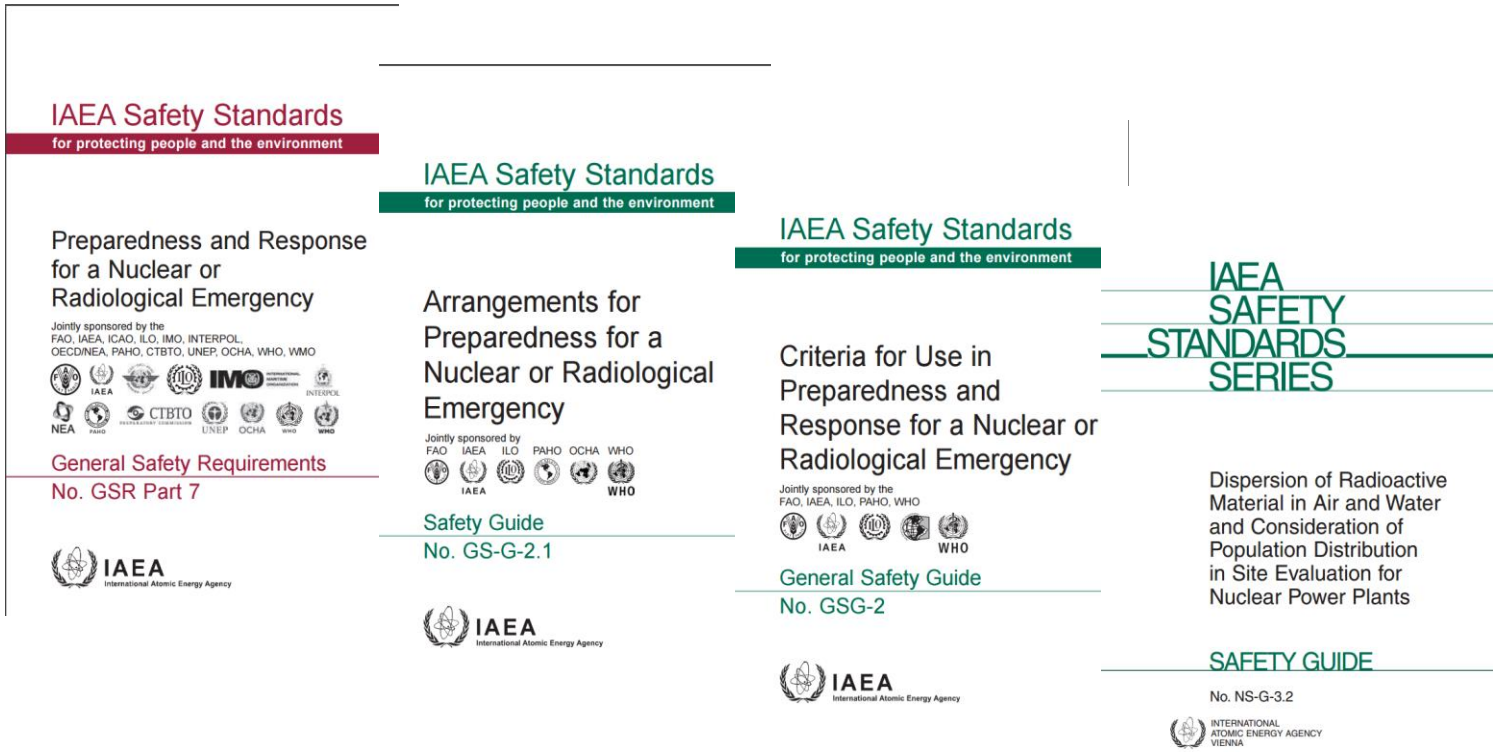
Preparedness and Response for a Nuclear or Radiological Emergencies



http://www-ns.iaea.org/standards/documents/topics.asp?sub=120

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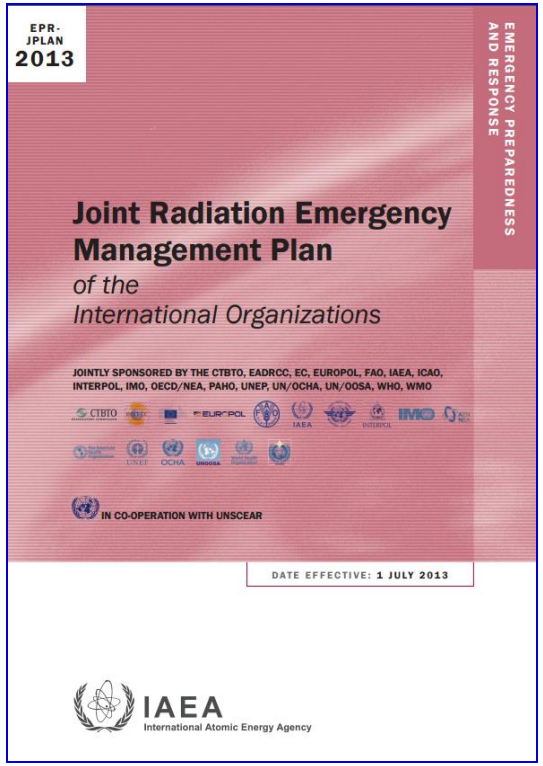
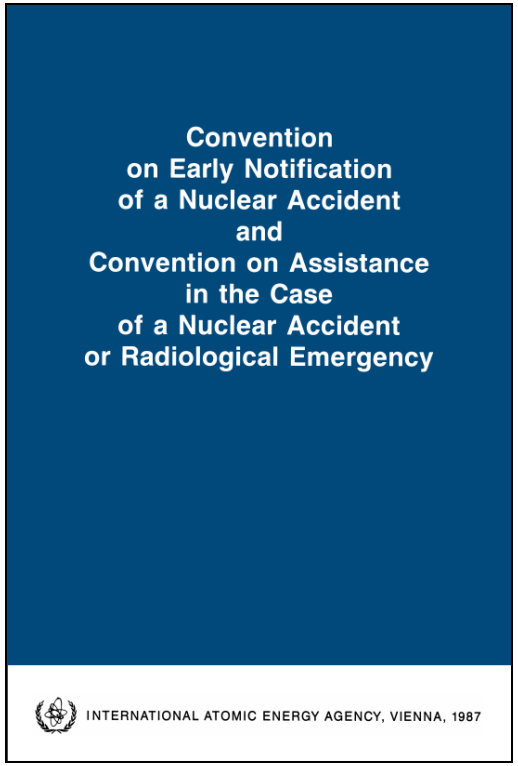


https://www-pub.iaea.org/MTCD/Publications/PDF/EPR-JPLAN-2017_web.pdf



http://www-pub.iaea.org/MTCD/Publications/PDF/Pub0765_web.pdf

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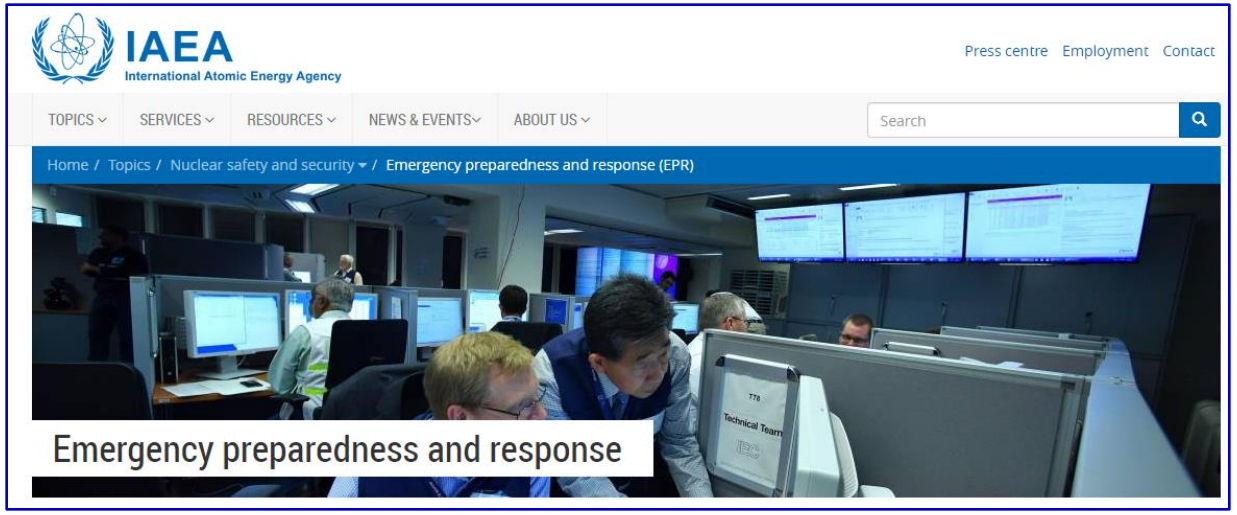
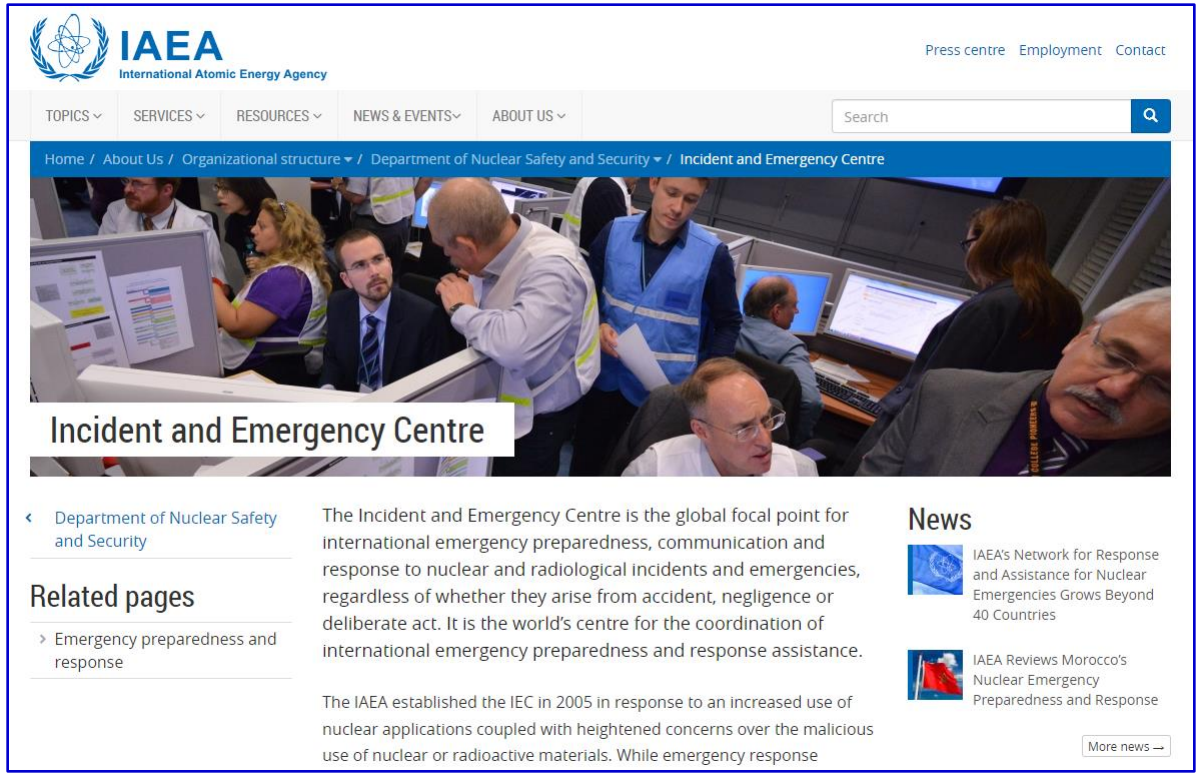
Incident and Emergency Centre (IEC) of IAEA

-Overall Coordination of the Response to Nuclear and radiological Emergencies
-Direct connection to National Authorities
-Direct connection to relevant International Organizations
-Direct connection to various expert teams
-Multi sectorial desks at IEC, including the FAO/IAEA desk



Nuclear and radiological emergency preparedness and response | IAEA



https://www.iaea.org/about/organizational-structure/department-of-nuclear-safety-and-security/incident-and-emergency-centre

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Preparedness and Response for a Nuclear or Radiological Emergencies

in Animal Production Systems

International emergency frameworks, standards, guides for animal production and health

-Consider “animals + emergencies” component

-Do not consider much the “nuclear + radiological” component

IAEA Emergency preparedness and response standards

-Consider “nuclear + radiological” component

-Don not consider much the “animals + emergencies” component

How to integrate “animals + emergencies” component and the “nuclear + radiological” component?

How to bring the response mechanisms from strategic to technical level?

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Preparedness and Response for a Nuclear or Radiological Emergencies

in Animal Production Systems

-Fukushima Daiichi Nuclear Accident – 11 March 2011

-IEC immediately operational 24h / day / 7 days a week

-Continuous communication with the National Authorities

-Continuous communication with relevant Integrational Organizations

-Permanent "food monitoring" desk operational at IEC

-5 Staff members of the Joint FAO/IAEA Centre

-Systematic collection of the national monitoring records, submitted by Japanese authorities

-Establishment of the FAO/IAEA (Fukushima Foodstuff) Database)

Details in: "UNSCEAR 2013 Report, Annex A, Levels and effects of radiation exposure due to the nuclear accident after the 2011 great east-Japan earthquake and tsunami, Appendix C and Appendix F"; Attachment C-8

https://www.unscear.org/docs/reports/2013/UNSCEAR_2013A_C-8_FAO_IAEA_food_database_2014-07.pdf

-Plenty of questions by the general public on "How to... ?"

https://www.iaea.org/topics/response/fukushima-daiichi-nuclear-accident

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in Animal Production Systems

-FAO/IAEA (Fukushima Foodstuff) Database)

-Timeframe; 15 March 2011 – 15 March 2012

-125826 records

-Each record with 50 attributes

- Approx. 77% products of animal origin (yellow highlighted in the table)

Supplement 5:

Number of foodstuff samples under UNSCEAR expert subgroup C2 (sub) categories, collected from 15 March 2011 until 15 March 2012 (Number in columns reflects the number of months after the accident)

C2_Category	C2_Subcategory	1	2	3	4	5	6	7	8	9	10	11	12	Total	% Total
Algae	Algae	5	3	16	2	16	19	16	43	53	33	48	65	*319*	*0.3%*
Cereals	Other cereals			11	64	84	6	132	151	40	2	8	9	*507*	*0.4%*
	Rice and rice products (excl oil)					61	1 731	1 948	107	54	24	52	33	*4 010*	*3.2%*
	Wheat and wheat products			1	78	153	15	8	20	31	8	22	9	*345*	*0.3%*
Eggs	Poultry eggs	20	14	6	22	28	45	25	44	60	34	81	74	*453*	*0.4%*
Food of mixed composition	Food of mixed composition								8	8	5	16	21	*58*	*0.0%*
Freshwater fish and shellfish	Crustaceans (freshwater)			1	2		1	2	1			1	3	*11*	*0.0%*
	Freshwater fish	10	18	102	99	70	89	56	50	61	17	63	185	*820*	*0.7%*
	Molluscs (freshwater)								2			2		*4*	*0.0%*
Fruits	Fresh and processed fruits	88	44	115	219	417	604	577	536	430	185	205	92	*3 512*	*2.8%*
	Juices							4	15	15	7	16	6	*63*	*0.1%*
Marine species (e.g. Fish and Shellfish)	Crustaceans (Marine)		4	4	3	12	14	20	22	17	10	27	26	*159*	*0.1%*
	Marine fish and migratory fish	82	140	173	270	271	481	742	1 054	783	448	1 010	764	*6 218*	*4.9%*
	Molluscs (marine)	14	20	49	48	57	86	88	116	116	63	178	121	*956*	*0.8%*
	Other marine species	2	1	14	16	13	14	7	5	7	3	12	5	*99*	*0.1%*
Meat	Beef / cattle	9	25	18	88	2 865	6 060	8 402	13 419	18 849	10 574	13 371	10 509	*84 189*	*66.9%*
	Other meat	1	4	3	1	5	63	91	87	117	64	91	23	*550*	*0.4%*
	Pork meat (excl wild boar)	26	19	16	25	43	57	55	57	64	35	76	69	*542*	*0.4%*
	Poultry	15		7	12	10	22	11	36	29	18	31	32	*223*	*0.2%*
Milk and dairy products	Milk	241	131	149	140	133	194	196	226	258	217	337	271	*2 493*	*2.0%*
	Other dairy products		5	8	11	29	9	35	16	73	17	58	28	*289*	*0.2%*
Mushrooms	Mushrooms	96	159	36	29	107	242	527	514	297	170	385	227	*2 789*	*2.2%*
Other plants	Other plants	37	29	21	16	15	100	173	455	352	55	52	52	*1 357*	*1.1%*
Unclassified	Unclassified product	1	72	171	185	167	106	1 579	379	160	116	114	107	*3 157*	*2.5%*
Vegetables	Leafy vegetables	621	548	481	243	64	90	128	293	300	154	301	275	*3 498*	*2.8%*
	Other vegetables	344	385	565	660	763	678	448	575	558	271	511	399	*6 157*	*4.9%*
	Root vegetables	8	60	71	219	99	177	390	565	514	239	384	322	*3 048*	*2.4%*

https://www.unscear.org/docs/reports/2013/UNSCEAR_2013A_C-8_FAO_IAEA_food_database_2014-07.pdf

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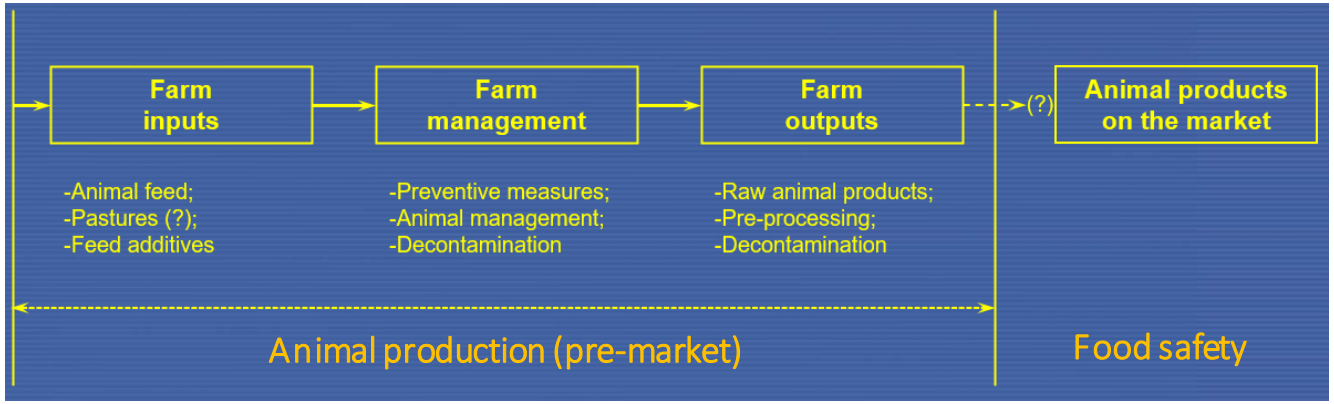
in Animal Production Systems

-Address preparedness and response in animal production systems (before placement of the products on the market for human consumption)

- -Farm inputs
- -Farm management
- -Farm outputs (primary products)



-Designed a module in a regional IAEA TC Project

- -Emergency management coordination meeting
- -Workshops
- -Expert meetings
- -Training courses

-Development of manuscript for veterinary services with practical instructions on the measures applicable in animal production systems.

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in Animal Production Systems

-Regional Workshop - to Review International Emergency Preparedness Response Standards and Examine Veterinary Authority Participation; Austria, Vienna 2016-05-23 - 2016-05-27

*-**Ludovic PLÉE;** Emergency Management Centre for Animal Health; FAO HQ;*
*-**Gary VROEGINDEWEY;** Chair, WOAH ad hoc group on Veterinary Emergencies; Professor at the Lincoln Memorial University-College of Veterinary Medicine and Director, One Health Program; USA;*
*-**Sebastian Eugen HEATH;** Federal Emergency Management Agency (FEMA); USA*
*-**IAEA Experts** on Preparedness and Response to Nuclear and radiological Emergencies*

-Regional Workshop on Distribution of radionuclides in agri. facilities and setting mitigation measures for animal production systems; 2016-10-17 – 2016-10-21; Vienna; Austria;

-FAO/IAEA-NARO Technical Workshop on Remediation of Radioactive Contamination in Agriculture; 2016-10-17 – 2016-10-18; Vienna, Austria

(https://www.iaea.org/publications/13444/strategies-and-practices-in-the-remediation-of-radioactive-contamination-in-agriculture)

*-**Brenda J HOWARD;** Centre for Ecology & Hydrology; Lancaster Environment Centre; Lancaster; UK*
*-**Viktor S. AVERIN;** Biology Faculty; Gomel State University; Gomel; Belarus]:*
*-**Sergey FESENKO;** IAEA; Vienna; Austria*
*-**Anne NISBET;** Public Health England; Chilton; Didcot; UK*

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-Regional Training Course on the use of Decision-Making Modules for Remediation Measures in Animal Production Systems; 2017-05-22 – 2017-05-25; Budapest; Hungary

-***Anne NISBET;*** *Public Health England, Chilton, Didcot, Oxon, OX11 0RQ, UK*
-***Catrinel TURCANU;*** *Belgian Nuclear Research Centre SCK·CEN, B-2400 Mol, Belgium*
-***Astrid LILAND;*** *Norwegian Radiation Protection Authority, 1361 Østerås, Norway*

-Regional Training course in the application, the use and the maintenance of field survey instruments; Research Institute of Radiology (RIR), Gomel, Belarus; 2017-11-27 – 2017-12-01

-***Aliaksandr ZAITSAU,*** *RIR Director; Gomel; Belarus*
-***Aliaksandr PADALIAK,*** *Associate Professor, RIR Deputy Director for Science; Gomel; Belarus*
-***Viktar AVERYN,*** *Dean of Biology Faculty in Francisk Skorina Gomel State University; Gomel; Belarus*
-***Aliaksandr TSARANOK,*** *Head of RIR laboratory for environmentally safe animal production in the areas of technogenic contamination; Gomel; Belarus*
-***Katsiaryna NILAVA,*** *Head of RIR laboratory for prediction of radionuclides and chemicals behaviour in ecosystems; Gomel; Belarus*

-Regional Training Course on Mngm. Options in Response to Nuclear and Radiological Emergencies in Animal Production Systems; Skopje, North Macedonia; 2018-11-26 – 2018-12-07

-***Viktar AVERYN,*** *Dean of Biology Faculty in Francisk Skorina Gomel State University; Gomel; Belarus*
-***Sviatoslav LEVCHUK;*** *National University of Life and Environmental Sciences of Ukraine; Ukrainian Institute of Agricultural Radiology; Kyiv reg., 08162 Ukraine*
-***Sergei ISACHENKO;*** *Research Institute of Radiology (RIR); Gomel; Belarus*

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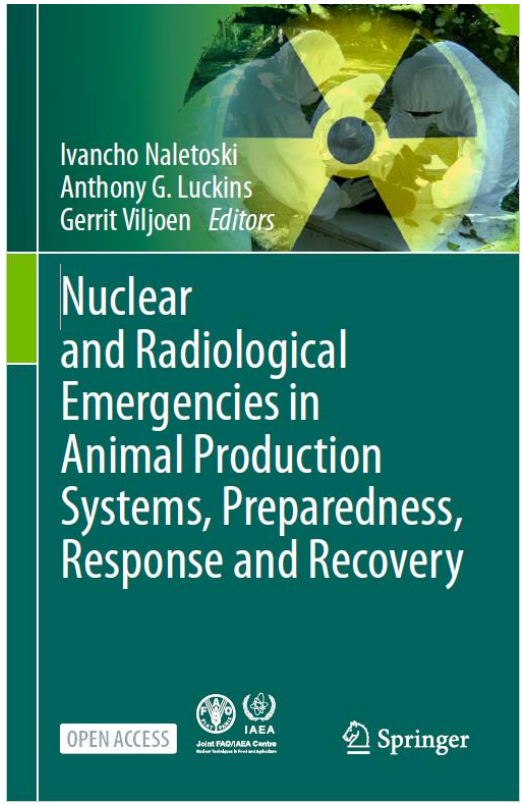
Nuclear and Radiological Emergencies in Animal Production Systems, Preparedness, Response and Recovery
Ivancho Naletoski, Anthony G. Luckins; Gerrit Viljoen - Editors
ISBN 978-3-662-63020-4 ISBN 978-3-662-63021-1 (eBook); https://doi.org/10.1007/978-3-662-63021-1

1. **Gary Vroegindewey:** National Veterinary Services Roles and Responsibilities in Preparing for and Responding to Nuclear and Radiological Emergencies
2. **Viktar S. Averyn:** Short Refresher of Radiobiology
3. **Viktar S. Averyn:** Measurement of Radioactivity
4. **Kevin Kelleher:** Preparedness and Response to Nuclear and Radiological Emergencies in Animal Production Systems in the Context of IAEA Safety Standards
5. **Brenda Howard:** Environmental Pathways of Radionuclides to Animal Products in Different Farming and Harvesting Systems
6. **Anne Nisbet:** Management Options for Animal Production Systems: Which Ones to Choose in the Event of a Nuclear or Radiological Emergency?
7. **Joint FAO/IAEA Centre of Nuclear Techniques in Food and Agriculture:** Information Systems in Support of the Decision-Making Tools

Annexes:

Annex A: Anne Nisbet: Datasheets on the Management Options

Annex B: Anne Nisbet: Worked Examples to Illustrate Decision-Aiding Framework



https://link.springer.com/book/10.1007/978-3-662-63021-1

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Management options and the Decision-Making Framework

-Total 33 management options for animal production systems

-15 management options applicable to live animals
-Change husbandry practices (10 options)
-Use of additives (5 options)

-9 management options applicable to animal products

-9 management options applicable to waste disposal

Table 6.1 Management options for animal production systems

Category	Subcategory	No.	Management option
Applicable to live animals (15 management options)	Change husbandry practices (10 options)	1	Clean feeding
		2	Live monitoring
		3	Manipulation of slaughter times
		4	Natural attenuation with monitoring
		5	Restrictions on hunting
		6	Select alternative land use
		7	Selective grazing regime
		8	Short-term sheltering of dairy animals
		9	Slaughtering (culling) of livestock
		10	Suppression of lactation before slaughter
	Use of additives (5 options)	11	Addition of AFCF[a] to feed
		12	Addition of calcium to feed
		13	Addition of clay minerals to feed
		14	Administration of AFCF[a] boli to ruminants
		15	Distribution of saltlicks containing AFCF[a]
Applicable to animal products (9 management options)		16	Closure of air intake systems at processing plants
		17	Decontamination of milk
		18	Dilution
		19	Local provision of monitoring equipment
		20	Processing of milk for consumption
		21	Product recall
		22	Raise intervention levels
		23	Restrict entry of food into food chain
		24	Salting of meat
Applicable to waste disposal (9 management options)		25	Biological treatment of milk
		26	Burial of animal carcasses
		27	Burning of animal carcasses
		28	Disposal of milk to sea
		29	Incineration
		30	Landfill
		31	Landspreading
		32	Processing and long-term storage
		33	Rendering

[a]AFCF is also known as Prussian blue

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Preparedness and Response for a Nuclear or Radiological Emergencies

in Animal Production Systems

Nuclear and Radiological Emergencies in Animal Production Systems, Preparedness, Response and Recovery
Ivancho Naletoski, Anthony G. Luckins; Gerrit Viljoen - Editors
ISBN 978-3-662-63020-4 ISBN 978-3-662-63021-1 (eBook); https://doi.org/10.1007/978-3-662-63021-1

Management options and the Decision-Making Framework

-Each management option described by 21 attributes

Name of management option	
Time of application	Time relative to the NRE when the option is applied
Effectiveness	**Provides information on the effectiveness of the management option and factors affecting effectiveness**
Management option effectiveness	Effectiveness is the reduction in activity concentration in the animal product after applying the management option
Factors influencing effectiveness of procedure	Technical and social factors
Requirements	**Provides information on all of the equipment and facilities required to carry out the management option**
Specific equipment	Primary equipment for carrying out the option
Ancillary equipment	Secondary equipment that may be required to implement the option
Utilities and infrastructure	Utilities and infrastructure which may be required to implement the option
Consumables	Consumables which may be required to implement the option
Skills	Skills which may be required to implement the option
Budget	Indicates whether the cost of implementation is low, medium or high
Waste	**Some management options create waste, the management of which must be carefully considered at the time the option is selected**
Amount and type	Nature and volume of waste (e.g. number of livestock carcasses, volume of milk and amount of soil). Also, indication of whether waste is contaminated and, if so, to what level compared with the original material
Possible transport, treatment and storage routes	Type of vehicle required to transport waste. Requirement to treat waste in situ or at an offsite facility. Options for storage if no direct disposal option Datasheets for waste treatment and disposal options are hyperlinked
Impact	**Provides information on side effects incurred following implementation of the management option**
Environmental	Impact of option on the environment (e.g. biodiversity, pollution)
Agricultural	Impact of option on agricultural practices
Social	Impact of option on behaviours
Practical experience	
Evidence	Widely used. Trialled. Experimental
Key references	
	References to key publications leading to other sources of information

(continued)

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Management options and the Decision-Making Framework

-Eight-step decision making framework

Step	Action
1	Identify one or more production systems that are likely to be/have been contaminated
2	Refer to selection tables for either milk or meat production systems. These selection tables provide a list of relevant management options, including those for waste disposal
3	Refer to look-up tables showing applicability of management options for each radionuclide
4	Refer to look-up tables showing key constraints for each management option
5	Refer to look-up table showing typical effectiveness of each management option
6	Refer to look-up table showing whether options incur additional doses to those involved in their implementation either directly or through the management of any secondary wastes
7	Refer to individual datasheets for remaining options and note any additional constraints
8	Based on the outputs from Steps 1 to 7, select and combine options that should be considered as part of the recovery strategy

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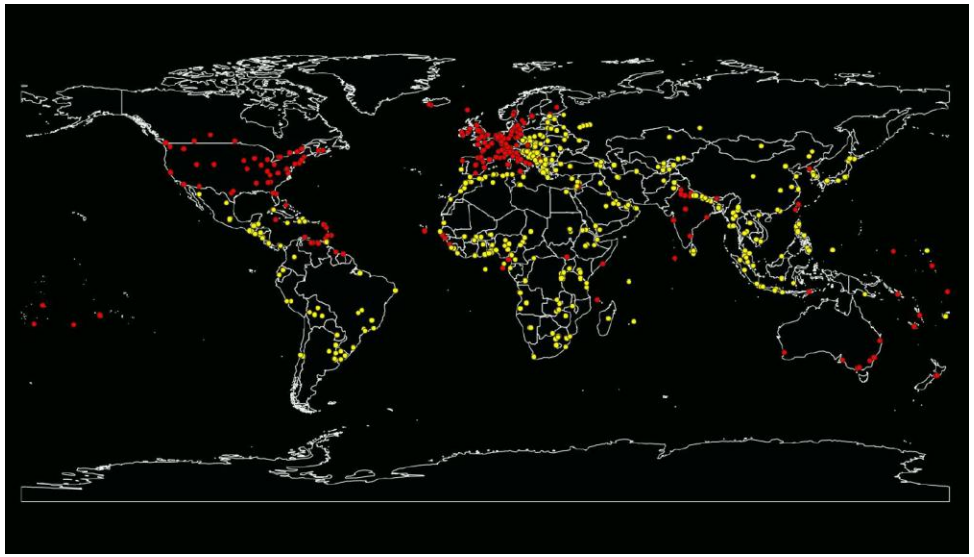
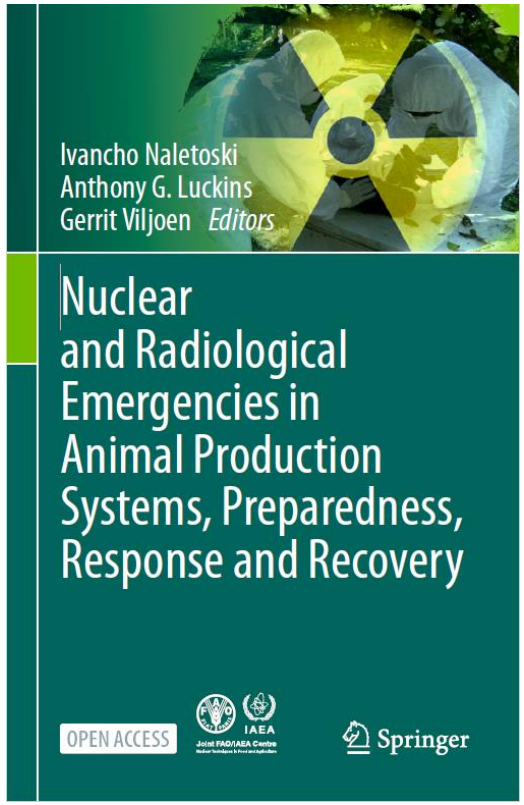
-Open source (free of charge for download)

-Information distributed to ~2000 veterinary institutions (*veterinary authorities, official laboratories and veterinary schools / faculties throughout the world*)

-As of 22 March 2023, 17.000 accesses



Veterinary institutions notified on the publication of the Manuscript on NREs (map)



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Preparedness and Response for Animal Health Emergencies

-Multiple responses to emergency requests to member states

-APH member of eh FAO-IEC

-Diagnostic packages from IAEA HQ / Laboratory directly to member states ovicidal veterinary laboratories

-Emergency response through the FAO global stockpile project based at the Animal Production and Health laboratories at the Joint FAO/IAEA Centre

-Supply with standard reference materials and proficiency tests

-Support in molecular characterization of the locally circulating pathogens

-VETLAB Network to support standardization, upgrade and implementation / maintenance of ISO17025 standard

-ZODIAC initiative

-Initiated by the IAEA DG & Approved by the BoG of IAEA

-Five pillars [*i) Capacities & Technology transfer; ii) Research & development – novel technologies for detection & monitoring Zoonotic diseases iii) Real-time decision-making support; iv) Impact on human health; v) Providing access to an Agency Coordinated Response for Zoonotic diseases*].

-Nominating ZODIAC National Coordinators and Laboratories (ZNCs and ZNLs)

-Supply ZNLs with:

a. Detection and characterization packages for priority zoonotic diseases

b. Establish advanced regional centers for pathogen characterization (WGS)

c. Improve the bio-safety / bio-security (bio-risk management) in ZNLs

d. Continuous training support for the above-mentioned activities

Distribution of the ZNLs of ZODIAC

-Blue spots – support ***a.***

-Red spots – support ***b.***

-Grey spots – ZNLs still not supplied with the support packages

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Thank you

Speaker: Ivancho NALETOSKI

Technical Officer (Animal Health)

i.naletoski@iaea.org

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