

FISA 2022

30 May - 3 June 2022  
Lyon, France



## Towards effective radiation protection based on improved scientific evidence and social considerations – focus on radon and NORM

Ulrike Kulka (on behalf of RadoNorm consortium)



This project has received funding from the Euratom research and training programme 2019-2020 under grant agreement No 900009.



10<sup>th</sup> European Commission Conference on EURATOM Research and Training in Safety of Reactor Systems  
30 May - 3 June 2022 | Lyon, France

### Challenges of Euratom HORIZON2020 NFRP-12

- **Protecting people and the environment** from the potentially harmful effects of ionising radiation.
- Harmonisation of EU planning of **response to a potential radioactive contamination**.
- Basing norms on **proper scientific knowledge** of radiation protection.
- Management of **radioactive waste and the safe decommissioning** of nuclear installations.








10<sup>th</sup> European Commission Conference on EURATOM Research and Training in Safety of Reactor Systems  
30 May - 3 June 2022 | Lyon, France

## Objectives of RadoNorm

- To support European member states in the **implementation of the European Basic Safety Standards (BSS)** at the legal, executive and operational level.
- To significantly **reduce scientific, societal as well as technical uncertainties** in all steps of the radiation risk management cycle for radon and NORM exposure situations.
- To **improve radiation protection** by
  - initiating, supporting and performing multidisciplinary, innovative, integrated **research and technical developments**,
  - integrating **education and training** in the research and development work of the project,
  - **disseminating** the project achievements through special actions targeted at the public, other stakeholders including regulatory authorities and policy makers



## RadoNorm in a nutshell

<b>Title:</b> Towards effective radiation protection based on improved scientific evidence and social considerations - focus on radon and NORM			
<b>Grant Agreement Number:</b>  <b>900009</b>	<b>Deliverables</b>   <b>85</b>	<b>CALL:</b> NFRP-2019-2020-12  Further integrating Radiation Protection research in the EU	 <b>57</b> Beneficiaries
<b>Acronym:</b>  <b>RadoNorm</b>	 <b>20 Member States</b> plus Norway and Switzerland	 <b>60</b> Month	<b>Starting Date:</b> 1 Sept. 2020  <b>End date:</b> 31 Aug. 2025
<b>Budget</b>   <b>18 Mio</b> <b>EUROS</b>	<b>Type of action:</b>  Research and Innovation action (RIA)	<b>Project coordinator:</b>  <b>BfS</b> BUNDESAMT FUER STRAHLENSCHUTZ	

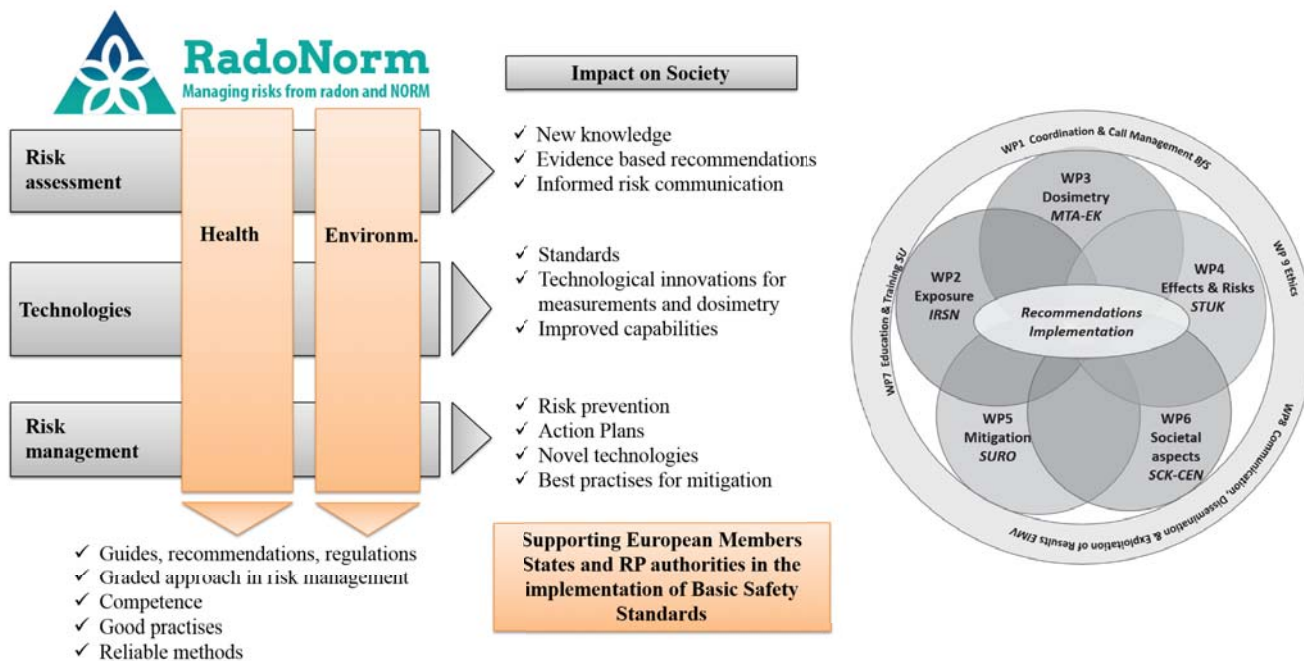


# RadoNorm partners

N°	Beneficiary	Role	Full official name
1	BFS	CO	BUNDESAMT FUER STRAHLENSCHUTZ
2	IRSN	BEN	INSTITUT DE RADIOPROTECTION ET DE SURETE NUCLEAIRE
3	EK	BEN	ENERGIATUDOMANYI KUFATOKOZPONT
4	STUK	BEN	SATELYTURVAKESKUS
5	SURO	BEN	STATNI USTAVRADIACNI OCHRANY v.v.i
6	SCK CEN	BEN	STUDIECENTRUM VOOR KERNENERGIE / CENTRE D'ETUDE DE L'ENERGIE NUCLEAIRE
7	SU	BEN	STOCKHOLMS UNIVERSITET
8	EIMV	BEN	Elektroinstitut Milan Vidmar
9	UMB	BEN	UNIVERZITA MATEJA BELA V BANSKEJ BYSTRICI
10	EPA	BEN	ENVIRONMENTAL PROTECTION AGENCY OF IRELAND
11	UANTWERP	BEN	UNIVERSITEIT ANTWERPEN
12	MERIENCE	BEN	MERIENCE SCP
13	CSTB	BEN	CENTRE SCIENTIFIQUE ET TECHNIQUE DU BATIMENT
14	AGES	BEN	OSTERREICHISCHE AGENTUR FUR GESUNDHEIT UND ERNAHRUNGSSICHER GMBH
15	KIT	BEN	KARLSRUHER INSTITUT FUER TECHNOLOGIE
16	PTB	BEN	PHYSIKALISCH- TECHNISCHE BUNDESANSTALT
17	RPI	BEN	PRIVATE JOINT STOCK COMPANY RADIATION PROTECTION INSTITUTE OF THE ACADEMY OF TECHNOLOGICAL SCIENCES OF UKRAINE
18	RIVM	BEN	RIJKSINSTITUUT VOOR VOLKSGEZONDHEID EN MILIEU
19	UHassel	BEN	UNIVERSITEIT HASSELT
20	DCS	BEN	KRAEFTENS BEKAEMPELSE
21	TCO	BEN	THE PROVOST, FELLOWS, FOUNDATION SCHOLARS & THE OTHER MEMBERS OF BOARD OF T COLLEGE OF THE HOLY & UNDIVIDED TRINITY OF QUEEN ELIZABETH NEAR DUBLIN
22	DH	BEN	Department of Health
23	UH	BEN	HELSINGIN YLIOPISTO
24	UEF	BEN	ITA-SUOMEN YLIOPISTO
25	UGR	BEN	UNIVERSIDAD DE GRANADA
26	LUMC	BEN	ACADEMISCH ZIEKENHUIS LEIDEN
27	HZDR	BEN	HELMHOLTZ- ZENTRUM DRESDEN- ROSSENDORF EV
28	INSP	BEN	INSTITUTUL NATIONAL DE SANATATE PUBLICA
29	CIEMAT	BEN	CENTRO DE INVESTIGACIONES ENERGETICAS, MEDIOAMBIENTALES Y TECNOLOGICAS- CIEMAT
30	UB	BEN	UNIVERSITAT DE BARCELONA
31	CVUT	BEN	CEKHE VYSOKE UCENI TECHNICKE V PRAZE
32	SUJCHBO	BEN	STATNI USTAV JADERNE, CHEMICKE A BIOLOGICKE OCHRANY VVI
33	UAVER	BEN	UNIVERSIDADE DE AVEIRO
34	UPorto	BEN	UNIVERSIDADE DO PORTO
35	CEA	BEN	COMMISSARIAT A L'ENERGIE ATOMIQUE ET AUX ENERGIES ALTERNATIVES
36	CEPN	BEN	CENTRE D'ETUDE SUR L'EVALUATION DE LA PROTECTION DANS LE DOMAINE NUCLEAIRE
37	INSERM	BEN	INSTITUT NATIONAL DE LA SANTE ET DE LA RECHERCHE MEDICALE
38	HES-SO	BEN	HAUTE ECOLE SPECIALISEE DE SUISSE OCCIDENTALE
39	LMU	BEN	LUDWIG- MAXIMILIANS- UNIVERSITAET MUENCHEN
40	UP	BEN	UNIVERSITE DE PARIS
41	HMGU	BEN	HELMHOLTZ ZENTRUM MUENCHEN DEUTSCHESFORSCHUNGSZENTRUM FUER GESUNDHEIT UND UMWELT GMBH
42	ISS	BEN	ISTITUTO SUPERIORE DI SANITA
43	GIG	BEN	GLOWNY INSTYTUT GORNICTWA
44	TAU	BEN	TAMPEREEN KORKEAKOULUSATIIO SR
45	UBern	BEN	UNIVERSITAET BERN
46	IDIBAPS	BEN	CONSORCI INSTITUT D'INVESTIGACIONS BIOMEDIQUES AUGUST PI I SUNYER
	HCB	BEN	HOSPITAL CLINIC DE BARCELONA
47	IGR	BEN	INSTITUT GUSTAVE ROUSSY
48	UCAM	BEN	THE CHANCELLOR MASTERS AND SCHOLARS OF THE UNIVERSITY OF CAMBRIDGE
49	IST ID	BEN	ASSOCIACAO DO INSTITUTO SUPERIOR TECNICO PARA A INVESTIGACAO E DESENVOLVIMENTO
50	SSM	BEN	STRALSAKERHETSMY
51	GSI	BEN	GSI HELMHOLTZ ZENTRUM FUER SCHWERIONENFORSCH GMBH
52	CNRS	BEN	CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE CNRS
53	DSA	BEN	DIREKTORATET FOR STRALEVERN OG ATOMSIKKERHET
54	NIPH	BEN	FOLKEHELSEINSTITUT
55	NMBU	BEN	NORGES MILJO- OG BIVITENSKAPLIGE UNIVERSITET
56	EORTC	BEN	EUROPEAN ORGANISATION FOR RESEARCH AND TREATMENT OF CANCER AISBL



## Impact of RadoNorm on RP of humans and the environment



## WP2 Exposure

Leader: Laureline Fevrier, IRSN

### Main objective

- To provide a better characterisation of the exposure of the population (public and workers) and biota to radon and other naturally occurring radionuclides (NOR).

### Progress made in the first 18 months

- Protocols and methods for data collection and compilation were established.
- Initial experimental studies and field campaigns were started to better understand the influence of various environmental factors on the mobility of uranium and radium in soils.
- Critical reviews of exposure pathways were carried out for dose assessment of public and biota at NORM industrial/legacy sites.



## WP3 Exposure

Leader: Balázs Madas, EK

### Main objectives

- To provide data for epidemiological studies on absorbed doses and their uncertainties.
- To generate new knowledge related to the role of spatial dose distribution in radiation risk.
- To identify groups potentially more sensitive to radon exposure than the general public and quantify their sensitivity.
- To provide data for biological experiments on doses at different levels of biological organisation (dosimetry and microdosimetry).

### Progress made in the first 18 months

- Existing literature has been reviewed to establish reasonable modelling scenarios and to develop a comprehensive model for the dose to embryo and foetus.
- *In vivo* dose distributions in human lungs have already been quantified to provide realistic exposure conditions for *in vitro* experiments with cell cultures.



## WP4 Effects and Risk Assessment

Leader: Sisko Salomaa, STUK

### Main objectives

- To generate new knowledge related to biological effects and responses after exposure to radon and NORM that have implications for risk assessment and radiation protection of humans and the environment.

### Progress made in the first 18 months

- The most appropriate risk models were found for duration of smoking or pack-years modified by time since exposure. Analyses were conducted for the Czech studies and the French residential study.
- Ethical agreements and data transfer agreements between institutes were established.
- A procedure was developed for constructing adverse outcome pathways combining bioinformatics and integrative systems biology.



## WP5 Mitigation

Leader: Aleš Froňka, SURO

### Main objectives

- To improve radon mitigation systems efficiency and their sustainability.
- To develop strategies for final treatment of NORM residues/waste.
- To improve regulation tools and procedures in EU MS by compiling information on lessons learned and experience gained in mitigation of radon in buildings, workplaces and NORM industry facilities.

### Progress made in the first 18 months

- Surveys were done to gauge the current regulatory approaches and international standards for systems and methods to control radon in workplaces and dwellings.
- A workshop was organised with industry representatives and relevant authorities dealing with radioactivity in water to understand mitigation measures applied in NORM-involving industries.
- 2 NORM-specific case studies were identified, that will be used to test the effectiveness of mitigation systems.



## WP6 Societal Aspects

*Leader: Tanja Perko, SCK-CEN*

### Main objectives

- To propose systematic and methodologically sound social scientific approaches to study radon and NORM.
- To improve public awareness of radon and NORM, evaluate methods to achieve behavioural change, and contribute to science based policy support for radiation protection from radon and NORM.

### Progress made in the first 18 months

- A literature review was conducted and published regarding development of a strong social scientific methodological base and toolbox for studying radon and NORM.
- An evaluation of citizen science contributions to radon research was published.
- Two public opinion surveys were conducted in Belgium, both serving as a pilot study for improved scales of the modular surveys to be conducted in 11 countries.



## WP7 Education & Training

*Leader: Andrzej Wojcik, SU*

### Main objective

- To organise the education and training of PhD students and early career researchers (ECRs) in the area of radiation protection, particular in radon and NORM.

### Progress made in the first 18 months

- 20 PhD students and 14 ECRs were recruited.
- Virtual meetings for PhD students and ECRs to present their research were organised.
- Five training courses were held.



# WP8 Communication, Dissemination and Exploitation of Results

Leader: Nadja Železnik, EIMV

## Main objectives

- To exchange and communicate information, results and ideas from the project with various stakeholders, including the general public, affected populations, regulatory organisations and international radiation protection communities.

## Progress made in the first 18 months

- The “Strategy and plan for communication, dissemination and exploitation of results” was released.
- The RadoNorm website and feeds on Twitter, LinkedIn and YouTube were launched.
- The STORE<sup>db</sup> is adapted to the requirements of the RadoNorm partners regarding data storage (development of a new OBO Foundry ontology to describe RadoNorm data).
- Mapping and establishment of relevant stakeholder’s networks.
- First stakeholder workshop was held.

[www.radonorm.eu](http://www.radonorm.eu)



10<sup>th</sup> European Commission Conference on EURATOM Research and Training in Safety of Reactor Systems  
30 May - 3 June 2022 | Lyon, France

13

## Thank you for your attention



This project has received funding from the Euratom research and training programme 2019-2020 under grant agreement No 900009.



10<sup>th</sup> European Commission Conference on EURATOM Research and Training in Safety of Reactor Systems  
30 May - 3 June 2022 | Lyon, France