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# Understanding Radon Management in French Homes: Barriers and Facilitators from Two Regions

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1 **Understanding Radon Management in French Homes: Barriers and Facilitators from Two**  
2 **Regions**

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13

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28 Acronyms

29 **ARS:** Regional Health Agency; **ASN:** Nuclear Safety Authority; **DMP:** Data Management Plan;

30 **EAF:** Ethical Application Form; **ICRP:** International Commission on Radiological Protection;

31 **LPA:** Local Public Administration; **NORM:** Naturally Occurring Radioactive Materials; **PMA:**

32 Pays de Montbéliard Agglomération; **RAP :** (national) Radon Action Plan; **RPMT:** Revised

33 Protection Motivation Theory; **SMOC:** Swiss Model for Outcome Classification in Health

34 Promotion and Prevention; **SWOT:** Strength Weakness Opportunities Threat; **WHO:** World

35 Health Organization; **WP:** Work Package



37 **ABSTRACT**

38 **Background.** Indoor radioactive radon gas stands as a prominent contributor to lung cancer,  
39 a threat that can be readily identified and addressed. Despite the accessibility of testing and  
40 mitigation measures, their adoption rates remain disproportionately low. There is a  
41 research gap in understanding why people hesitate to test and mitigate radon. Qualitative  
42 research is crucial to identify motivations, barriers, and facilitators, serving as a valuable tool  
43 in addressing this knowledge gap and improving radon management practices.

44 **Objective.** This article presents the methodology of a qualitative research study developed  
45 in the framework of the RadoNorm European research project and applied in two French  
46 regions to investigate the barriers and facilitators in radon management in homes from the  
47 dual perspective of representatives of local public administrations (LPA) who have  
48 implemented a radon management action and inhabitants who engaged in radon  
49 management activities.

50 **Design.** Two groups of respondents were identified and recruited with a combination of  
51 strategies. Individual interviews were performed based on an open-ended interview  
52 method. Theoretical models helped to design the questions, cover the range of possible  
53 answers, and provide a practical approach for the qualitative analysis. Data management  
54 and ethical considerations were addressed.

55 **Results.** Together 13 barriers/facilitators were identified for the LPA and 9 for inhabitants,  
56 all supported by tangible elements, and then classified in a Strength Weakness  
57 Opportunities Threat (SWOT) matrix. The collection of a dual point of views allows cross-  
58 discussion on common topics: radon communication, temporality, and follow-up.

59 **Conclusion.** The research provides a methodologically-sound approach to investigate the  
60 barriers and facilitators in radon management in French homes. The results can be used by  
61 different parties to implement effective and experience-based improvements of the process  
62 of radon management, notably with the development of qualitative indicators for efficiency,  
63 improved follow-up of the exposed/concerned inhabitants in the long run and engaging  
64 reflection for minimising the cost and the complexity of radon mitigation.

65

66 **Key words:** Radon in homes; Radon management action; Perceived barriers, Perceived  
67 facilitators, Open-ended interview; Theoretical model

## 68 INTRODUCTION

### 69 The RadoNorm project

70 RadoNorm<sup>1</sup> is a Euratom Horizon 2020 research project gathering 57 organizations in  
71 Europe with the aim to strengthen the scientific and technical basis of the management of  
72 radon risk and reducing the exposure from naturally occurring radioactive materials  
73 (NORM). Work Package 6 (WP6) is dedicated to Societal Aspects of radon and NORM and  
74 the task includes *“to develop and test qualitative tools addressing the risk perceptions,  
75 views, opinions, motivations, attitudes and behaviours associated with radon”* (task 6.1.3)  
76 [1]. From a methodological standpoint, “qualitative” research is a type of research that aims  
77 to gather and analyse non-numerical (descriptive) data to gain an understanding of  
78 individuals' social reality, including understanding their attitudes, beliefs, and motivations  
79 [2]. In contrast, “quantitative” research is the process of collecting and analysing numerical  
80 data to find patterns and averages, make predictions, test causal relationships, and  
81 generalize results to wider populations.

82 Partners from RadoNorm WP6 located in six countries (Ireland, Belgium, Slovenia, Czech  
83 Republic, Germany and France) were invited to develop a qualitative research project on  
84 radon management adapted to their national context. Methodological support was  
85 provided by task Leaders who organized regular meetings, internal workshops/trainings and  
86 by other RadoNorm partners who published a literature review on social and human  
87 research in the field of radon and NORM [3].

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<sup>1</sup> <https://www.radonorm.eu>

88 We define barriers as factors (be it human, regulation, contextual, ...) that hinders or  
89 impede the implementation or the engagement in a radon management action and  
90 facilitators as factor that help and the implementation/engagement. The objective of this  
91 article is to present the research questions developed by CEPN tuned to the French context  
92 regarding the barriers and facilitators for the management of radon at home, the  
93 methodological tenets to address the research questions and the results obtained.

#### 94 **Context**

95 The current French national strategy for the management of radon is provided in the 4<sup>th</sup>  
96 National Radon Action Plan (RAP) 2020–2024<sup>2</sup> whose application for radon at homes  
97 focuses essentially on supporting local actions implemented voluntarily by “local public  
98 administrations” (LPA), meaning cities, municipalities, federations of municipalities or  
99 counties to raise awareness on radon risk and associated “radon management actions” such  
100 as distribution of radon test kits, public information meetings and support for post-  
101 measurement steps:

- 102 1. the building diagnosis (i.e. to identify the entry points and transfer mechanisms  
103 of radon in the house, generally performed by a trained building professionals),
- 104 2. mitigation work (combination of sealing and ventilation of the basement and/or  
105 the living areas),
- 106 3. and the re-test for efficiency evaluation.

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<sup>2</sup> National action plan 2020-2024 for management of the radon risk (synthesis in English), Nuclear Safety Authority, 2021  
<https://www.french-nuclear-safety.fr/asn-informs/news-releases/radon-a-naturally-occurring-radioactive-gas> [access  
January 2024].



107 The recurrent feedback is that the participants very rarely commit into the step of  
108 mitigation and building diagnosis and remediation rates remains extremely low [4]. Whilst  
109 some LPA have covered the cost of the diagnosis, this practice cannot be generalized  
110 because of budgetary constraints and the scarcity of trained professionals. Facing this issue,  
111 the LPA Pays de Montbéliard Agglomération (PMA, East of France) organized a technical  
112 workshop (circa 2 h) where volunteering inhabitants with elevated radon concentration at  
113 home measured during the winter of 2017-2018<sup>3</sup> received detailed information on radon  
114 mitigation and were able to interact with professionals with experience in radon  
115 diagnosis/mitigation.

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<sup>3</sup> In France, radon in homes is generally measured using solid state nuclear track detectors installed in living areas during minimum 2 months of the heating season (October year N – April year N+1). The results are available in Spring N+1 and a public meeting for presenting the results (and possibly the technical workshop to discuss mitigation), took place in Autumn N+1.

## 116 **METHODS**

### 117 **Research objectives**

118 The aim of the research was to understand the reasons and motivations why some LPA have  
119 chosen to initiate a radon management action, to describe their approach and their results  
120 and to identify the barriers and facilitators from these experiences, particularly since the  
121 promoters of radon management actions have hardly been the subject of qualitative  
122 research [3].

123 Local inhabitants who participated to in radon management actions were interviewed to  
124 understand, as a mirror of the LPA, the reasons to engage in radon management action,  
125 their experience and the barriers and the facilitators they have met. This research was also  
126 meant to gain a better grasp of why in general very few local inhabitants tend to engage in  
127 post-measurement steps and if the technical workshop acted was a facilitator in radon  
128 mitigation and how it interplays with the other facilitators and barriers.

### 129 **Research design overview**

130 Two groups were defined:

- 131 • Group A: representatives of LPA with experience in radon management actions. Two  
132 administrative regions were selected: Bourgogne Franche Comté and Pays de la  
133 Loire.
- 134 • Group B: inhabitants of PMA who participated to the 2017-2018 radon measurement  
135 campaign.

136 The research questions for each group were the following (Table 1).

### 137 **Table 1. – Research questions**

Research questions for LPA (group A)	Research questions for inhabitants of PMA (group B)
<ol style="list-style-type: none"> <li>1. For which reasons/motivation the LPA chose to initiate radon management actions?</li> <li>2. What approaches have been followed and what were their results?</li> <li>3. What are the barriers faced by the LPA in initiating radon management actions, what can be done to overcome them, and, conversely, what can favor radon management actions?</li> </ol>	<ol style="list-style-type: none"> <li>1. For which reasons/motivation the inhabitants choose (or not):               <ol style="list-style-type: none"> <li>a. to attend the public workshop?</li> <li>b. to host an on-site radon diagnosis?</li> <li>c. to implement radon mitigation work?</li> <li>d. to assess these actions?</li> </ol> </li> <li>2. How did the inhabitants perceive the public meeting and the technical workshop? Was it helpful and what are the areas of improvement?</li> <li>3. What are the barriers they have faced? What can be done to overcome them, and, conversely, what can favor radon management actions?</li> </ol>

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138

139 The researchers from CEPN chose to collect data through individual interviews. The research  
 140 questions are of a qualitative nature, therefore using closed questions was not deemed  
 141 relevant. Meanwhile, the steps in developing a radon management action for LPA and  
 142 engaging radon management actions for inhabitants are following a specific order calling for  
 143 the questions to be asked in a specific order too, thus rejecting an informal interview  
 144 method. To ensure a minimum level of consistency in the data, limiting the bias and

145 increase comparability of responses for their analysis, a standardized open-ended interview  
146 method was preferred.

### 147 **Theoretical models**

148 Although not systematic, qualitative researches often make use of a theoretical model  
149 coming from behavioural science to help map the research domain, consider all the possible  
150 facets, define the qualitative research problems more clearly, and guide the research  
151 design. Two theoretical models were selected and used to guide the formulation of the  
152 questions, comprehensively cover possible answers of facilitators and barriers and  
153 facilitated the data analysis involving coding the responses into themes and sub-themes [2].

154 • **For LPA**, the literature review [3] identified only two articles where LPA were the  
155 subjects of qualitative research, yet neither of them employed a model. The  
156 researchers selected the Swiss Model for Outcome Classification in Health  
157 Promotion and Prevention (SMOC, [5]) which is a logical model embracing (all) the  
158 elements of any health or prevention programme distributed in a 4 levels scheme:  
159 activities, factors, effects and benefits. SMOC can be used either to design a  
160 programme/project or an *ex-post* analysis tool and was applied by Swiss cantons in  
161 numerous fields, including the strategy against lung cancer from tobacco, which  
162 related well with radon management actions.

163 • **For inhabitants**, the selected model is the Revised Protection Motivation Theory  
164 (RMPT, [6]), a model developed for the understanding of the health behavior of  
165 individuals based on the source of information, the mediative process it initiates and  
166 the resulting coping mode. RMPT was selected among other possible models as  
167 being the most general in encompassing not only threat appraisal but also wider

168 social and cultural factors affecting the response probability, whose influence in  
169 radon management at local level was identified by previous research [7].

170 Based on the models, two lists of questions and associated probes (a probe is a question  
171 with more detailed/specificities than the main question and is used to initiate or redirect  
172 the discussion) to be addressed to each group were created. The lists of questions and  
173 probes are presented in § 1-4 of the Supplementary Materials.

#### 174 **Sampling**

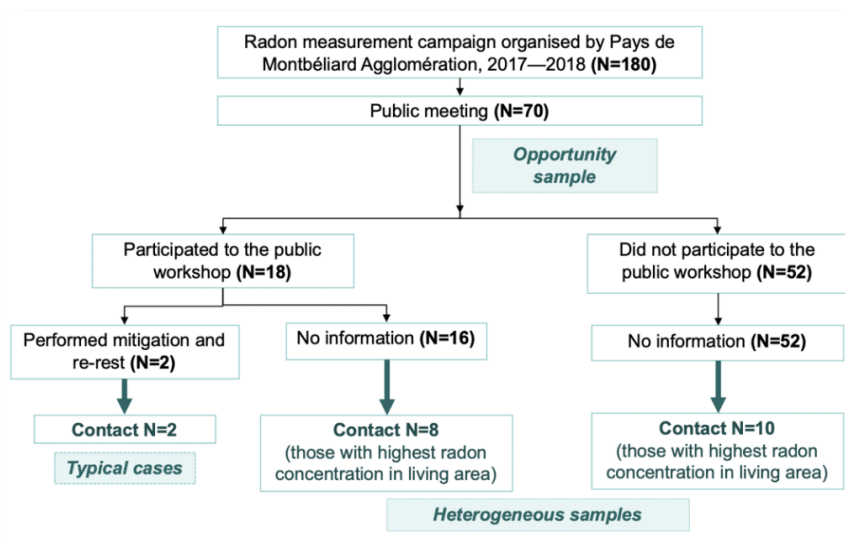
175 It is worthwhile to recall here that in qualitative research the sampling is not driven by  
176 statistic/representativity (like in quantitative research) but by its richness and explanatory  
177 value of the data. Sample sizes looks generally small (< 20) but allow for data completeness  
178 to answer the research question providing the selection/sampling is purposeful and cannot  
179 be compared with the size of group sampled for quantitative research aiming for  
180 representativeness.

181 To constitute **Group A**, the Health Regional Agency of Bourgogne Franche Comté (ARS) and  
182 the Nuclear Safety Authority (ASN) of Bourgogne Franche Comté and Pays de la Loire were  
183 contacted in May 2022 to obtain contact information for representatives of LPA who had  
184 engaged in radon management actions. Six names were provided. These representatives  
185 were invited to take part in an interview or, if they declined, they were asked to propose a  
186 new name, employing a *snowball sampling* technique. The intended objective was to  
187 interview 6 representatives.

188 **Group B** was formed by filtering the list of the participants to the PMA 2017-2018 action to  
189 identify the participants with the highest radon concentration in living areas and constitute

190 two sub-groups: one with those who took part to the public workshop and one with those  
 191 who did not (*heterogenous sample* to consider the effect of the public workshop on  
 192 mitigation intention). In addition, participants known by PMA to have performed mitigation  
 193 and re-test (*typical cases sampling*) were identified. The intended objective was to interview  
 194 20 inhabitants in total. Figure 1 is a schematic of the sampling strategy.

195 **Figure 1. Sampling strategy for Group B.**



196

197 The recruitment of LPA started in September 2022 and those of inhabitants in January 2023  
 198 after the interviews with LPA were finished. Initial contact was performed by email by  
 199 presenting the context of the project, the objectives of the interview and a consent form  
 200 (available in § 5 of the Supplementary Materials). Participants could access the Data  
 201 Management Plan (DMP) and the Ethical Application Form (EAF) of the research on request.  
 202 By March 2023, the objective to interview 6 representatives of LPA was met but only 7 out  
 203 of 20 interviews with inhabitants were conducted, despite several reminders. The  
 204 characteristics of the participants are presented in § 6 of the Supplementary Materials).

205 **Data collection and analysis**

206 Each question was meant to be asked to the interviewee and the probe was used in the case  
207 the interviewee would not elaborate. Yet in practice, the exchanges were very fluent, and  
208 the interviewees often answered several questions at once, so the interviews were mainly  
209 conversational and situational.

210 The collected answers were interpreted by coding the themes and the sub-themes,  
211 facilitated by the theoretical models which provided a reading grid. The sub-themes were  
212 classified as facilitators or barriers according to their effect on radon management action.  
213 The facilitators were then classified as Strengths or Opportunities and the barriers as  
214 Weaknesses or Threats under the SWOT matrix, which provides a deeper level of analysis.

215

216 **RESULTS AND DISCUSSION**217 **Detailed results.**

218 The detailed results, including the elements explaining each theme and sub-theme with  
 219 quotes from the participants, are presented in the § 7–8 of the Supplementary Materials.

220 **Identified barriers and facilitators**

221 The barriers and facilitators for LPA are presented in Table 2 and those for inhabitants in  
 222 Table 3.

223 **Table 2. Themes and sub-themes for local public administrations (Group A)**

<b>Themes</b>	<b>Sub-themes: facilitators (+) and barriers (–)</b>
<b>Initial motive</b>	(+) A former history with radon  (–) Radon not a priority
<b>Development of health and prevention promoting services*</b>	(+) Different approaches adapted to the local context  (+) Raising awareness through multiple channels  (–) Several difficulties in communication
<b>Advocacy, cooperation of organizations*</b>	(+) Including radon in existing plan/program  (+) Engagement of decision makers/key persons  (+) Organizational insights
<b>Social mobilization*</b>	(+) The importance of follow-up  (–) No clear vision beyond awareness



(–) Lack of intermediary players

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**Development of individual skills\*** (–) Difficulty in accessing information and knowledge

(–) Lack of skills for building professionals

224 *The themes indicated with \* are the promotion measures of the SMOC model [5]) and the ‘initial*  
 225 *motive’ theme is an emerging theme.*

226 **Table 3. Themes and sub-themes for inhabitants (Group B)**

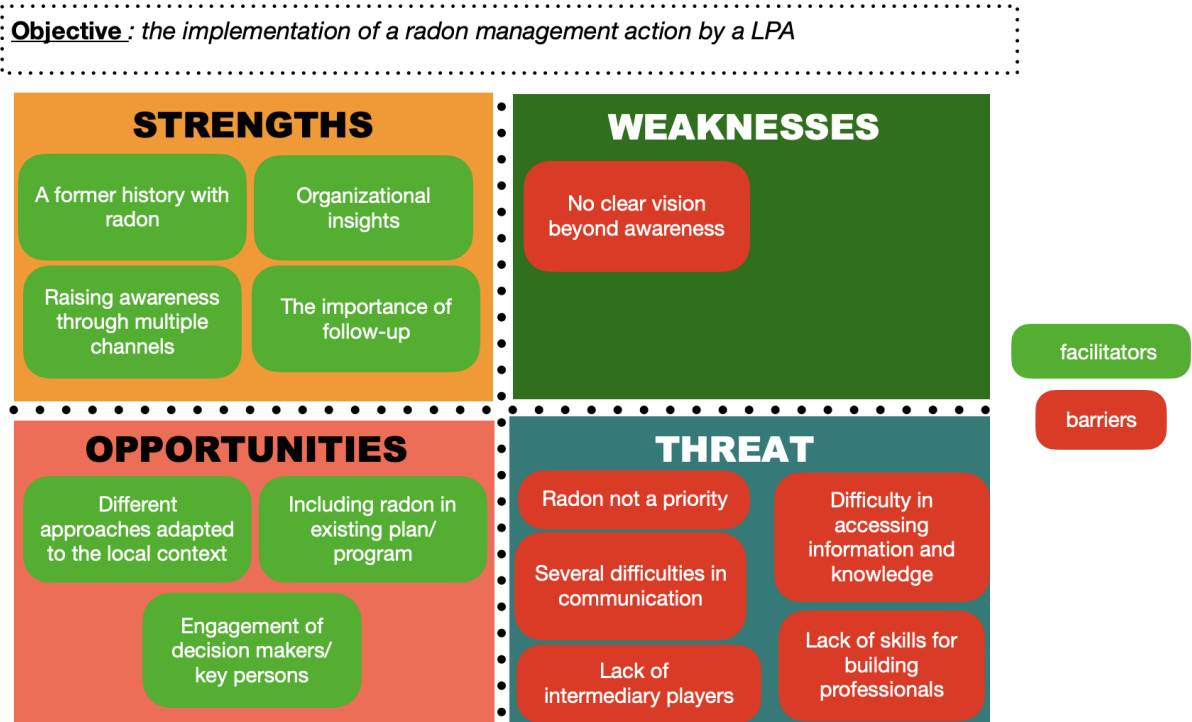
Themes	Sub-themes: facilitators (+) and barriers (–)
<b>Source of information*</b>	(+) A panoply of sources of information  (+) Engagement fostered by an individual history  (+) Public meetings and technical workshops to deliver insights about radon mitigation
<b>Cognitive mediating process*</b>	(+) A personal and qualitative appreciation of the risk  (+) Understanding of the general concepts of radon risk management  (–) Cost and complexity of mitigation works
<b>Coping modes*</b>	(+) Natural ventilation: a change in behavior  (+) Implementation of simple action at controlled cost  (–) Lack of follow-up overtime

227 *The themes indicated with \* are the themes in the RPMT [6].*

228 **A SWOT reading of the results**

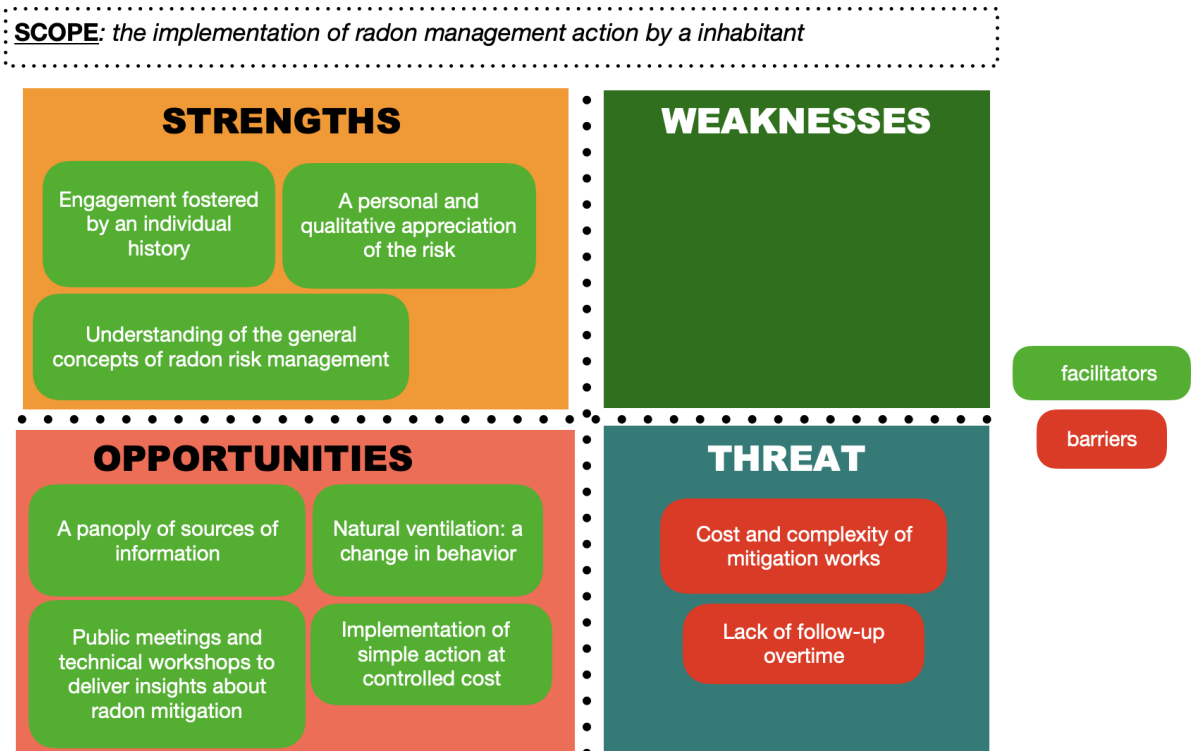
229 For each group, the barriers and facilitators have been classified under a SWOT analysis,  
 230 whose results are displayed in Figures 1 and 2.

231 **Figure 2. SWOT analysis for LPA (group A)**



232

233 **Figure 3. SWOT analysis for inhabitants (group B)**



234

235 For LPA, the internal and external factors that are favorable in achieving the intended  
236 objective of implementing the radon management actions are confronted with several  
237 unfavorable elements, predominantly external (*threats*), underscoring the need to  
238 strengthen the external support of the LPA who engage in radon initiatives.

239 For inhabitants, despite the numerous internal strengths and the external opportunities  
240 they have taken, SWOT reveals two barriers of external nature: the cost and complexity of  
241 the mitigation and the lack of follow-up and support over time. Consequently, both deserve  
242 specific attention.

### 243 **The use of theoretical models**

244 The application of SMOC for coding the LPA's data was sometimes difficult and equivocal  
245 and most of the factors within SMOC remained unidentified in the data collected and a new  
246 theme ("initial motive") had to be introduced. The creators of SMOC acknowledged that the  
247 model is not universal, and its application may be "*problematic*" in some cases and radon  
248 being potentially one of them. Conversely, no issue was met in applying RPMT to explain the  
249 behavior of the inhabitants.

250 Should comparable research be conducted in another region or country, it is suggested to  
251 adapt SMOC, develop a new model (for example, a model constructed upon the system  
252 from the International Commission on Radiological Protection [8] and recommendations  
253 from the World Health Organization [9]) or not use any predefined model and inferring it  
254 from the interviews.

### 255 **Limits**

256 The inhabitants who did not answer were mostly those who did not take part in the  
257 technical workshop (see Figure 1) consequently, the relative importance of it cannot be  
258 thoroughly investigated. In addition, this research has probably collected more facilitators  
259 than barriers; the latter will be the most difficult to identify because these are associated  
260 with the least motivated inhabitants and/or those confronted with difficult situations (for  
261 example, low financial means).

262 The research has been performed in 2 administrative regions with a high number of radon  
263 priority areas and up to 7 different radon management actions have been identified  
264 (described in § 9 of the Supplementary Materials). Data saturation (additional data are not  
265 yielding new insights) have been reached for Groups A and B. Whilst this research does not  
266 encompass all the possible situations, it covers a part of the spectrum, and the results  
267 (barriers and facilitators) might be applicable in other French regions. Recent research has  
268 identified facilitators and barriers in radon mitigation in four different European countries  
269 [10] and it will be interesting to investigate, which results are transferable to other  
270 countries, those who are not e.g. due to regulatory and other contextual differences (with  
271 the caveats of representativity and potential sensitivity to bias [11]).

## 272 **Issues in radon communication**

273 This research collected the view of both the emitters and the receptors of radon awareness  
274 materials. LPA distributed information through multiple channels (e.g. flyer, town hall office,  
275 event, press, social media, website, etc.) and the inhabitants reported having been informed  
276 through different means, supporting the current multi-channels approach. The public  
277 meeting and workshop with the presence of officials and building professionals were also  
278 deemed very important to convey information and should be pursued.

279 Several stakeholders such as mayors, landlords, family physician, pharmacists and building  
280 professionals (architects; ...) can play a role to relay information, but this remains mainly at a  
281 proposal stage.

282 Observing different but complementary viewpoints on the content of the communication by  
283 LPA and inhabitants is noteworthy. LPA indicated that they encountered some difficulties in  
284 finding information to craft their messages. They struggled to find a balance between giving  
285 a 'health' or a 'building' perspective to the message, leading to confusion regarding whom  
286 to involve in promoting the message (*"it is not up to the mayor to be more pressing about  
287 radon, but is it the Ministry of Health or the Ministry of Ecological Transition? I do not know  
288 but there is a topic here"*). Inhabitants, on the other hand, reported concerns at different  
289 level: finding radon messages to be *"inaudible"* and potentially contradicting with energy  
290 saving campaigns. All these factors combined suggest that harmonized messages on radon,  
291 clear in their approach (health vs. building) and taking into account current policies (energy  
292 saving, building retrofitting, ...) should be developed by national administration and, if  
293 already existing, promote them. This pre-defined messages would not only save time and  
294 resources of the LPA but also allow them to concentrate on radon management and  
295 especially the post-measurement steps.

#### 296 **Tuning the follow-up for post-measurement steps**

297 This research revealed that indicators of qualitative nature, to direct a local radon  
298 management action, assess it's outcomes and adapt/improve it for a next time are missing.  
299 Lack of structured efficiency indicators were similarly observed for the evaluation of the  
300 effectiveness of media campaigns to address the health risks of indoor radon to

301 homeowners [12] and the results of the implementation of national RAPs [13], confirming  
302 that indicators are a “blind spot” in most radon management activities.

303 These observations promote the development of a structured follow-up of local actions,  
304 with indicators of quantitative and qualitative nature as appropriate and extending over a  
305 long period, spanning several years from the start. These developments are essential to  
306 support motivated inhabitants, contribute to continuous improvement and  
307 comprehensively assess the success (and the justification) of radon management actions.

### 308 **Almost insuperable barriers**

309 Clearly, the main obstacles on radon management lie in the post-measurement steps. Even  
310 though the LPA have integrated radon into existing plans/programmes and have involved  
311 elected representatives and other stakeholders, inhabitants have interpreted the radon  
312 results and mitigation work very well, but mitigation work is deemed costly and  
313 complicated: (*“it is very complicated to perform the mitigation in an old house”*; *“the*  
314 *financial aspect was a barrier”*). LPA cannot allocate a budget to support inhabitants  
315 precisely because radon is an added item in existing plans/programmes and is not granted  
316 with a specific budget. In addition, building professionals with training/experience in radon  
317 are missing to take over the complicated part of the mitigation and consequently only  
318 simple actions at controlled costs are implemented by the inhabitants. The simplest action  
319 of all being opening the windows more often.

320 Proposed remedies by the interviewees go two ways: creating a specific financial support by  
321 rerouting a small part of the budget available for building energy retrofit and training  
322 building professionals on radon management. But important uncertainties about the cost  
323 and the efficiency of the mitigation works [14] make the evaluation of a budget difficult for

324 both the inhabitants and the LPA. Circling the cost-efficiency ratio of radon classical  
325 mitigation work implemented in typical building settings certainly constitutes a fruitful  
326 prospect of research. Developing training on radon addressed to building professionals does  
327 not fall within the responsibility of LPA, nor its accreditation or implementation.  
328 Nevertheless, radon trainings addressed to building professionals are becoming available by  
329 regional networks/association in Bourgogne Franche Comté<sup>4</sup> and Bretagne<sup>5</sup>, as well as at  
330 national level<sup>6</sup>.

331

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<sup>4</sup> Since 2023, a French Swiss diploma at university level on radon risk and indoor air quality is proposed: <https://www.heia-fr.ch/fr/formation-continue/risque-radon-et-qualite-de-l-air-dans-le-batiment-diplome-inter-universitaire-diu-franco-suisse-2024/>

<sup>5</sup> Since 2013, the association Approche Éco Habitat has created a radon and indoor air group address to professionals who wish to gain information and progressively build competence on radon mitigation. <https://radonbretagne.fr/professionnel-se-former-au-radon.html#top>.

<sup>6</sup> The Scientific and Technical Centre for Building (CSTB) proposed two training sessions on the protection of the buildings against gaseous pollutants from the ground. <https://formations.cstb.fr/formations/?etp=347>

## 332 **Conclusion**

333 This research aimed to identify the reasons and motivations, facilitators and barriers in  
334 radon management, from the dual points of view of local public administrations who  
335 decided to implement a radon management action and inhabitants who decided to take  
336 part in measuring radon measurement. To our knowledge, these groups have hardly been  
337 the subject of qualitative research in France, notably the viewpoint of local public  
338 administration has never been collected/analysed despite that they are identified as the  
339 lead promoter of local radon management actions in the National Radon Action Plan. Our  
340 approach consisted in performing individual open ended interviews with questions based on  
341 two theoretical models: the Swiss Model for Outcome Classification in Health Promotion  
342 and Prevention (SMOC) for the questions addressed to local public administration recruited  
343 through snowball sampling in two administrative regions with radon priority areas, and the  
344 Revised Protection Motivation Theory (RPMT) for the questions addressed to the  
345 inhabitants recruited through opportunistic and heterogenous samplings in a community  
346 with experience in radon management actions. Overall, seven (different) radon  
347 management actions, implemented at different levels (district, city, community etc.) were  
348 subject of the analysis.

349 While we recruited the expected number of local public administrations, the recruitment of  
350 the inhabitants proved to be difficult and the sample size is smaller than the intended  
351 objective; it is possible that only the radon-interested individuals stepped forward for the  
352 interview, limiting the potential for identification of the possible barriers.

353 The results obtained through the qualitative analysis contribute firstly to understanding the  
354 application of radon management actions in French homes (from the perspective of two



355 administrative regions), how the actions/activities have been perceived and what are the  
356 barriers and facilitators for each group, their location in the process and their possible  
357 relationships and their effect in the process.

358 Secondly, the results help in identifying the origins and characteristics of the facilitators (to  
359 be supported) and barriers (to be reduced/bypassed). The identification of barriers of  
360 external nature (*threats*) suggests that other stakeholders: building professionals, national  
361 administrations and other parties have a role in the achievement of local radon  
362 management actions.

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408 **Supplementary data**

409 Store DB: STOREDB:STUDYXX RadoNorm Subtask 6.1.3 - A French perspective on the  
410 barriers and facilitators in the management of radon in homes – Supplementary materials  
411 <https://doi.org/10.20348/STOREDB/1194>.

412 The supplementary data contains the following:

- 413 • Questions addressed to local public administration (group A)
- 414 • Connection between the questions in the survey instruments addressed to local  
415 public administration (group A) and the Swiss Model for Outcomes Classification for  
416 health and prevention measures (SMOC)
- 417 • Questions addressed to inhabitants (group B)
- 418 • Connection between the questions addressed to the inhabitants (group B) and the  
419 themes of the revised protection motivation theory model (RPMT)
- 420 • Information on the project addressed to local public administration and the  
421 inhabitants and consent form to participate
- 422 • Characteristics of the participants
- 423 • Detailed results for the local public administration
- 424 • Detailed results for the inhabitants
- 425 • Key characteristics of the radon management actions implemented by the local  
426 public administration

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