



NRCS

National Radon Control Strategy
Straitéis Náisiúnta um Rialú Radóin

National Radon Control Strategy

Phase 2

2019 - 2024

National Radon Control Strategy

Phase Two: 2019-2024

Report of the National Radon Control Strategy Coordination Group



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Chapter 1: Background

What is radon?

Radon is a radioactive gas formed in the ground by the radioactive decay of uranium which is present in all rocks and soils and the gas can accumulate in homes and workplaces. It is the greatest source of exposure to ionising radiation for the general public in Ireland and the leading cause of lung cancer after smoking. It is estimated that exposure to radon accounts for approximately 300 lung cancer cases each year [1]. Advisory or statutory reference levels have been established for workplaces, homes, schools and long-stay residential institutions, these are set out in Annex 1.

The scale of the radon problem in Ireland

The National Radon Survey was carried out during the 1990s. This survey, which was based on measurements in over 11,000 homes, predicted that 7% of the national housing stock in existence at the time had radon concentrations above the National Reference Level of 200 becquerels per cubic metre (Bq/m³) for radon in homes. Based on the results of the survey, the geographic weighted national average radon concentration of 89 Bq/m³ was calculated and a map of Radon in Irish Dwellings was published (Figure 1), identifying High Radon Areas (A High Radon Area is one where it is predicted that more than 10% of homes will have radon concentrations above the National Reference Level). Approximately one third of the country, mainly in the west and south-east, was classified as a High Radon Area. Due primarily to geological factors, the radon problem in Ireland is greater than for many of our European neighbours.

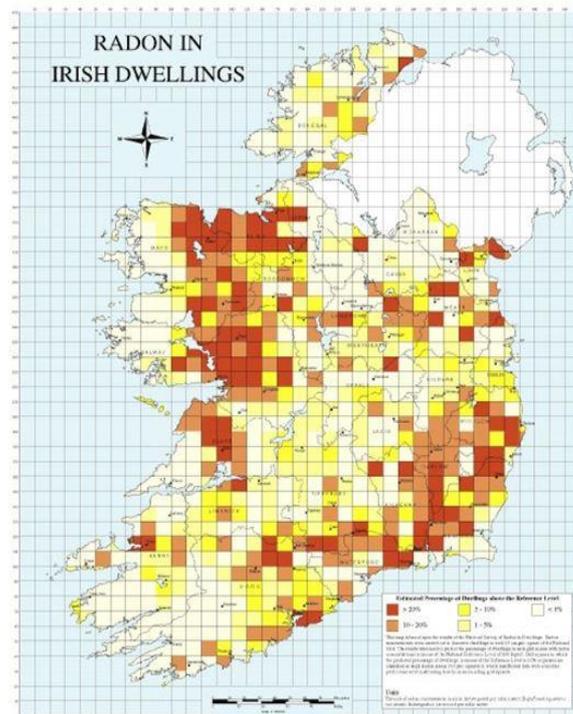


Figure 1. The Radon Risk Map

In 2015 a survey was carried out to update the geographic weighted national average radon concentration. This study showed that this figure is now 77 Bq/m³, a 13% reduction since the metric was first established as 89 Bq/m³. A second study designed to update the population weighted national average radon concentration

showed that this figure is now 98 Bq/m³, an increase since it was first established to be 91 Bq/m³. This increase may be attributed to the increase in the Irish population, the growth in the national housing stock and changes in its distribution since the metric was first established. The population weighted average of 98 Bq/m³ was used to update the number of radon related lung cancers in Ireland, which is currently conservatively estimated to be around 300 cases per year.

Trinity College Dublin (TCD), with the support of the Geological Survey of Ireland (GSI) and the Environmental Protection Agency (EPA), have developed a logistic regression model to detect radon prone areas in Ireland. Using this model, TCD developed a new high spatial resolution radon risk map of Ireland based on a combination of approximately 32,000 geocoded indoor radon measurements and bedrock geology, soil geology, soil permeability and aquifer type. This research estimated that approximately 10% of the Irish population (460,000 people) may be exposed to radon above the reference level of 200 Bq/m³ [2]. Independent validation of this significantly refined radon risk map is currently underway and it is envisaged that ultimately this map will replace the existing map.

Phase One of the National Radon Control Strategy

Recognising the scale of the radon problem in Ireland, the Government tasked an inter-agency group to develop a strategy, which would comprehensively address the radon problem in Ireland. Phase 1 of the [National Radon Control Strategy](#) (NRCS) was published by this group in February 2014. The overarching objective of the NRCS was and continues to be “**to minimise the exposure to radon gas for people in Ireland and to reduce to the greatest extent practicable the incidence of radon related lung cancers**”. This Strategy was implemented and monitored through coordinated action from Government Departments, public bodies and other stakeholders and the key achievements of this work are summarised below:

- The establishment and launch of a dedicated website www.radon.ie which provides customised information for different groups (such as homeowners, medical professionals and local authorities). This website was launched in 2016 and received almost 100,000 views in both 2017 and 2018;
- The development and rollout of a short targeted training course for construction site staff on radon prevention. This course is now run by the Construction Industry Federation and has been attended over 100 people to date;
- The development and rollout of a targeted training course for local authorities, public bodies and radon contractors on radon remediation. This course has been attended by 87 people to date;
- The establishment of two registration schemes for radon services operated by the EPA. There are currently 6 registered radon measurement services and 11 registered radon remediation services;
- A programme of local radon awareness campaigns was held in all twelve priority counties. In addition, an annual “Radon Day” has been established in November of each year to maintain awareness of radon on an ongoing basis. These campaigns have resulted in the measurement of over 5,000 homes in high radon areas and the identification of over 800 homes with high radon levels;

- The development and rollout of a research survey to assess the uptake of free radon testing where offered in conjunction with a 50% grant towards necessary remedial work. The learnings from this research will be used to inform the development of a proposed national grant scheme;
- The inclusion of three questions regarding radon in the conveyancing process since 2017;
- The EU Directive 2013/59 EURATOM requires a National Radon Control Strategy to be developed by Member States. Implementation of [Statutory Instrument No 30 of 2019](#) gives effect to this requirement.

In addition to the above, a significant body of research has been carried out. Highlights include:

- Research showing that implementation of the Building Regulations since 1998 has resulted in a 13% reduction in the average level of radon in Ireland [3];
- Research showing that the number of radon-related lung cancers is now approximately 300 per year. This increase from the previous figure of 250 cases annually is primarily due to an increase in the age and size of the population in the intervening years [1];
- Research establishing the suitability of various types of aggregates for radon extraction and initial work to measure the effectiveness of passive sumps to reduce radon concentrations [4,5];
- The development of a high-resolution radon risk map by combining geological parameters with radon measurement data [2].

Overall, implementation of Phase 1 of the NRCS has resulted in strong partnerships between a wide range of stakeholders and further developed Ireland's expertise in this area to the extent that Ireland is recognised internationally as a leader in this area. Phase 1 of the NRCS has also met the requirement of the Ionising Radiation Regulations 2019 that a National Radon Control Strategy be established and implemented well in advance of this requirement.

The achievements of Phase 1 of the NRCS and supporting research are summarised in Annexes 2 and 3 and detailed in the reports: "National Radon Control Strategy – Final Report to Government" [6] and "Review of Knowledge Gaps paper 2014 – 2018" [7].

Chapter 2: Continuing to reduce the risk from radon to people living in Ireland

Despite the significant progress made during implementation of Phase One of the NRCS, radon continues to be the greatest source of radiation exposure to the public. To continue to address this, it is important that the actions implemented during Phase One are maintained, that the research needed to support the implementation of these actions continues and that the learnings from implementing Phase One are built upon. In this way, work will continue to minimise exposure to radon gas for people in Ireland and to reduce the incidence of radon related lung cancers.

The establishment and maintenance of a NRCS is now a requirement of the Ionising Radiation Regulations. In addition, the 2015 International Atomic Energy Agency's (IAEA) Integrated Regulatory Review Service (IRRS) Mission to Ireland made a number of suggestions and recommendations that are implemented through the NRCS.

Ionising Radiation Regulations

The [Radiological Protection Act 1991 \(Ionising Radiation\) Regulations 2019](#) require that radon be tackled on an ongoing basis through the implementation of a National Radon Control Strategy (Regulation 64).

This legislation specifies that the National Radon Control Strategy shall include the following:

- measures to promote the identification of homes with radon concentrations above the national reference level;
- the provision of information aimed at encouraging remedial work in homes above the national reference level;
- local and national information on indoor radon exposure and the associated health risks, on the importance of performing radon measurements and on the technical means available for reducing existing radon concentrations.
- provisions to identify high radon areas.

In addition, Schedule 14 of this legislation sets out the list of items to be considered in preparing the National Radon Control Strategy.

IAEA Integrated Regulatory Review

In 2015 the International Atomic Energy Agency's (IAEA) Integrated Regulatory Review Service (IRRS) Mission to Ireland, a periodic peer review to assess the regulatory framework for nuclear and radiation safety in Ireland, was carried out. This review assesses Ireland's regulatory framework against IAEA Basic Safety Standards [8]. Several recommendations and suggestions regarding tackling radon were made, these may be summarised as follows:

Suggestion 15: The Government should consider provisions to support remediation by owners of homes with high radon levels. Work to address this suggestion has begun by carrying out a pilot study of financial support for testing and remediation. This work will be progressed during Phase Two of the NRCS.

Suggestion 16: The regulatory body should consider a plan of how to determine the workplaces with the highest radon levels. This will be addressed through the implementation of the revised Ionising Radiation Regulations as described above. In addition, a risk-based programme will be implemented to specifically address radon in underground workplaces that are vulnerable to higher levels of radon.

Recommendation 20: The Government should review and revise the specific regulations addressing radon in workplaces to enhance their effectiveness. This will be addressed through the implementation of the revised Ionising Radiation Regulations as described above.

National Strategies

The National Radon Control Strategy is supported by the National Cancer Strategy [9], the Irish Cancer Society's Lung Cancer Action Plan [10] and the Healthy Ireland initiative [11].

Priorities for Phase Two

A review of awareness campaigns carried out from the perspective of Health Psychology [12] pointed out that *“the extent to which awareness programmes can ... change behaviour remains unclear – the programmes can provide knowledge but ... such information may not translate into behaviour in the face of psycho-social and financial barriers to action”*. The review advises that the State has an important role to play in managing the risk from radon and that increased governmental regulation, supported by financial incentives, combined with high quality information programmes are required to significantly increase the rate of testing and remediation.

This perspective is reflected in the gap experienced between awareness of radon and the low uptake of testing and remediation. For example, a 2017 EPA survey showed that 75% of the population are aware of radon yet there is typically a 22% uptake to the offer of free tests with typically about 20% of householders with radon above the reference level carrying out remediation. The Economic and Social Research Institute have noted that there may be novel approaches that could improve the rate of testing and remediation where financial support is offered. Behavioural research trials to assess different approaches to communication of risk and financial supports offered will inform the development of a proposed national grant scheme.

The priorities of Phase Two of the NRCS are set out below:

Priorities for Phase 2 of the NRCS

Translating awareness into action

Research has shown that high levels of awareness about radon do not necessarily translate into action. It is important to develop targeted communications and other “nudges” that will increase both the testing and remediation rate in homes and workplaces and so reduce the gap between awareness and action.

Supporting householders financially

The establishment of financial support for householders is critical for the long-term effectiveness of the National Radon Control Strategy. First steps have been taken to assess the uptake and cost of a scheme to provide financial support to homeowners for radon testing and remediation. The next step is to review the outcome of this work from a behavioral science perspective, to assess different approaches to communication of risk and financial supports and ultimately, to design a national scheme that will optimize uptake.

Government regulation

Research has shown that financial supports must be combined with regulatory approaches and high quality information. To this end it is important to continue public awareness programmes and at the same time to work towards increased regulation of radon exposure. Specifically, the mandatory inclusion of radon in the conveyancing process, the inclusion of radon in rental regulations and the implementation of workplace regulations will be priorities for Phase Two.

Passive Prevention Systems

The next revision of Technical Guidance Document C (which sets out the regulations relating to protecting new buildings from radon) provides an important opportunity to consider whether the latest academic and field research on radon mitigation can be incorporated into Building Regulations. Specifically, where relevant and appropriate, research on the composition and use of hardcore, the effectiveness of preventive measures (including passive sumps and radon membranes), the impact of requirements for ventilation and measures designed to build energy efficient homes, along with the radon risk map will feed into the updated guidance to ensure that all new homes are installed with optimized passive prevention systems.

Research to support effective and efficient implementation of the NRCS.

It is important to note that the actions set out in this Strategy should be considered in conjunction with the supporting paper, “Knowledge Gaps– Phase 2 (2019-2024)” [13], which sets out in detail the research required to support the implementation of the NRCS. In particular, the requirements of Regulation 64 of the Ionising Radiation Regulations as set out above will be addressed through research measures such as development of the radon risk map and associated research to identify high risk areas.

Chapter 3: Recommendations

Phase Two of the National Radon Control Strategy sets out a series of recommended actions, taking account of:

- The status of actions and learnings from implementation of Phase One of the NRCS
- Feedback from consultation with wide range of stakeholders
- The requirements of the [Radiological Protection Act 1991 \(Ionising Radiation\) Regulations 2019](#)
- The recommendations and suggestions of the IAEA's Integrated Regulatory Review Service Mission

These recommendations are set out in five thematic areas as follows:

- (1) Radon prevention in new buildings;
- (2) Use of property transactions to drive action on radon;
- (3) Communications and advocacy;
- (4) Promoting confidence in radon services and
- (5) Radon in workplaces and public buildings.

3.1 Radon prevention in new buildings

Background

There is international evidence indicating that the correct installation of passive preventive measures (membranes and passive sumps) in new buildings is the most cost effective way of protecting the population against radon. This finding is supported by the economic analysis undertaken for Ireland of various radon intervention options, which demonstrates that the incorporation of such measures in new buildings can be cost effective in all parts of the country [14].

Since 1998, Irish Building Regulations have addressed this by requiring that reasonable measures be taken during the construction of new buildings to mitigate danger to health due to radon. Specific technical guidance to these regulations [15] requires all homes built since July 1st 1998 in High Radon Areas be fitted with a radon membrane and all homes in all areas are fitted with a standby sump which can be activated where necessary.

Recent research has shown that homes built in High Radon Areas since 1998 have average indoor radon levels 26% lower than those built in the same areas before 1998 [3] and other surveys have shown that, on average, radon concentrations in houses built after 1998 in high radon areas are lower than in those built before 1998 by up to 50% [16].

These results indicate that the Building Regulations have been somewhat effective, but they also illustrate some practical difficulties relating to the correct installation of radon membranes under site conditions and protection of the integrity of the membrane once installed. This difficulty has also been highlighted through

stakeholder engagement. To address this, a short targeted training course for construction site staff on radon prevention has been developed with the aim of improving the standard of membrane installation. This course addresses the need to ensure that building trades' people have a good understanding of radon preventive techniques, however, uptake to date has been relatively low. In addition, it is important to ensure that building professionals have a good understanding of this topic by ensuring radon is addressed in the relevant undergraduate courses and continuing professional development for architects, surveyors and engineers.

Research to identify the optimum specifications to prevent entry of radon by considering the membranes, hardcore and sump system employed in homes in Ireland is due to be completed by NUI Galway in 2019. The outcome of this research will form an important input into the next revision of Technical Guidance Document C.

Recent research has shown that the installation of passive sumps as a preventive measure may offer a complementary preventive measure. Research carried out by Public Health England [17] has shown that the use of passive sumps can reduce radon by about 30%, while research in progress in NUI Galway on the effectiveness of passive sumps in conjunction with membranes also shows promising results [18]. This points to the potential to include the requirement that all new homes are installed with a passive radon sump as a complementary preventive measure to the installation of a membrane. Consequently, if academic and field research indicate that such a measure is technically, functionally and economically viable, there is potential to replace the current requirement that new homes in all parts of the country be fitted with a standby radon sump (a standby sump is not of itself a preventive measure but is intended to reduce the cost of any future remediation) with a requirement to install a passive radon sump in the next review of Technical Guidance Document C. This combination of measures would constitute a passive prevention system ensuring future new homes are optimally protected from radon.

In addition to considering the outcomes of research on membranes, hardcore and sump systems, the impact of requirements for ventilation and measures designed to build energy efficient homes should also be considered when updating Technical Guidance Document C to ensure that all new homes are installed with optimized passive prevention systems.

Recommended Actions

Building Control

A.1. The next revision of Technical Guidance Document C should be strengthened by ensuring new homes have optimal passive prevention systems installed through:

- Incorporating the outcome of research on the optimum specifications for radon preventive techniques in Ireland to ensure new buildings are optimally protected from radon. This should include research on hardcore composition, sump effectiveness, barrier effectiveness, the impact of

requirements for ventilation and measures designed to build energy efficient homes on indoor radon levels.

- Consideration of the current radon risk map as published on www.radon.ie.

Training and Continuing Professional Development

- A.2. Work in partnership with the Construction Industry Federation and the Local Government Management Agency to ensure that the training course for site staff is promoted and reviewed as appropriate (see A.27).
- A.3. Work in partnership with third level and other training organisations to ensure that radon is included in the relevant undergraduate and apprentice courses (third level organisations, SOLAS, the Education and Training Board).
- A.4. Work in partnership with the relevant professional bodies to develop a continuing professional development module on radon (the Royal Institute of Architects in Ireland, Engineers Ireland, the Society of Chartered Surveyors Ireland).

3.2 Use of property transactions to drive action on radon

Background

The 2016 census showed that 71% (1,147,552) of homes in Ireland are privately owned, 20% (326,493) are rented from a landlord or voluntary body and 9% (143,178) are rented from local authorities. Of the homes that are privately owned, the EPA has measured approximately 65,000, or approximately 6% of these. Of the homes that are rented from local authorities, approximately 21,000, or 15% have been tested for radon.

To summarise, approximately 95% of Irish householders are living in homes that have not been tested for radon. In addition, recent EPA research has estimated that 9% (145,550) of all Irish homes are predicted to be above the reference level, figures that are supported by research carried out by TCD [2]. To date, the EPA has identified approximately 9,000 of these homes. This means that there are over 135,000 households that are unknowingly living in homes with radon concentrations that are above the reference level.

Privately owned homes

Since 2017, it has been a requirement when a second-hand house is being sold for the sellers' solicitor to ask the following questions:

1. Has a radon test been carried out?
2. If a radon test has been carried out, please supply the report.
3. Has any action to reduce radon levels been undertaken?

This information is then passed on to the buyer's solicitor. If the buyer has any concerns their solicitor will advise that they get expert advice. At present, there are no data on the impact that this requirement has had on radon testing, nor are there any data about whether the stakeholders (homes buyers, sellers, solicitors and

estate agents) are aware of this requirement. It should be noted that there is no requirement for a homeowner to test or remediate their home for radon before selling it. A statutory requirement to test for radon and remediate where necessary would have a significant impact on testing and remediation rates. Such a requirement would need to be supported with measures to ensure that it can be implemented in a practical way.

Rented homes

Since 20% of the housing stock are rented from private landlords or voluntary bodies and there are no data for testing rates for this sector, it is important to ensure that measures are in place to ensure that radon in rented homes is addressed. The Housing (Standards for Rented Houses) Regulations 2017 sets out the standards required for rented homes. Radon was not included in the most recent revision of this legislation in 2016, consequently there are no legal requirements for landlords concerning either testing or reduction of radon levels in rental properties. The next revision of this legislation should address this to include the requirement that radon testing and, where necessary, remediation is carried out by landlords. The forthcoming “All of Government Plan to Tackle Climate Disruption” will set ambitious targets for energy retrofitting of existing rented dwellings and presents an opportunity to test for, and remediate for radon, where indicated.

Social homes

Local authorities have already carried out significant work in addressing radon in social housing, however it is important that this work continues to be a priority for local authorities as there are still a significant number of these homes that have yet to be tested for radon. In addition, it is important to ensure that those homes that have already been remediated continue to have radon levels below the reference level by retesting every five years.

Recommended Actions

Property sales

A.5. Work in partnership with the Law Society of Ireland and other stakeholders towards a requirement that conveyancing legislation includes a requirement that radon testing and, where necessary, remediation are compulsory when selling a home in a high radon area.

A.6. Work in partnership with SEAI and DHPLG to ensure that (a) the BER Advisory Report that is required when a home is sold is revised to include information about radon and (b) a requirement to provide information about radon testing and remediation to building owners as part of the hand-over documentation is considered.

A.7. Raise awareness of the questions about radon now included in the conveyancing process with the following groups: solicitors, estate agents, surveyors, home buyers and sellers. This work should include surveys of awareness levels among these groups.

The private rented sector

A.8. Work in partnership with the relevant stakeholders to support practical implementation of a requirement for landlords to test for and, where necessary, remediate radon.

A.9. Raise awareness of radon among landlords and tenants. The Residential Tenancies Board (RTB) have in place a comprehensive stakeholder consultation framework and conduct quarterly stakeholder meetings with a large cohort of landlords and tenants. It is recognised that this framework would be a useful vehicle for raising awareness within the rental sector of the radon issue.

Social housing

A.10. Work with local authorities to ensure the programme of testing, remediating and retesting (where retrofitting or refurbishing are carried out) of social housing by local authorities continues to be a priority.

A.11. Promote local authorities' attendance at training courses on site prevention and remediation (see A28).

3.3 Communications and advocacy

Background

A National Communications and Advocacy Strategy for Radon was approved by the National Radon Control Strategy Coordination Group in 2016. This Strategy captured and reflected the existing wealth of experience and lessons learned about radon risk communications and behavioural change, both nationally and internationally. Among the lessons learned is the importance of continuing to advocate with both local and national politicians. Likewise, regular communication with the local and national media through press releases and interviews has considerably strengthened the radon message nationally.

In addition, a health psychology review of EPA radon campaigns has shown that *“the awareness campaigns are broadly comparable to similar multi-media community education programmes in content and process, follow the best practice guidelines for radon risk communication and their level of impact on radon testing and remediation is comparable to those reported in the peer-reviewed empirical literature”*. However, the review also pointed out that *“the extent to which awareness programmes can address these gaps to change behaviour remains unclear – the programmes can provide knowledge but ... such information may not translate into behaviour in the face of psycho-social and financial barriers to action”*. The review advises that the State has an important role to play in managing the risk from radon and that increased governmental regulation, supported by financial incentives, combined with high quality information programmes are required to significantly increase the rate of testing and remediation.

Recommended Actions:

Build understanding and awareness

A.12. Continue the annual Radon Day events on 7th November (European Radon Day). Integrate both national and local awareness raising by continuing to focus on radon in the 12 priority counties (Carlow, Clare, Galway, Kerry, Kilkenny, Louth, Mayo, Sligo, South Tipperary, Waterford, Wexford and Wicklow).

A.13. Continue to communicate the radon message through local and national media, engagement with local authorities and local and national government representatives for each priority county.

- A.14. Carry out stage-matched awareness raising by targeting specific groups, including:
- (a) Those that have already tested above the reference level for radon but have not yet remediated.
 - (b) Those buying and selling their homes and professionals such as estate agents and solicitors.
 - (c) Organisations such as the Irish Cancer Society, Healthy Ireland, the Irish Lung Foundation, ASH, and QUIT, whose primary role is preventive, but who may also have a role in supporting those that have been affected by radon related health problems.
- A.15. Continue to host the Radon Forum event to inform and update the national radon community.
- A.16. Continue to engage with the radon research community through regular workshops focussing on radon research.
- A.17. Continue to promote awareness of radon at EPA outreach events including the National Ploughing Championships, the Young Scientist Exhibition and Science Week events.

Financial supports

A.18. Work with behavioural scientists to review the outcome of the research survey to estimate uptake and associated costs of financial incentives for homeowners. Incorporate this into the development of a national grant proposal.

Access to independent advice

- A.19. Continue to maintain and develop the website www.radon.ie.
- A.20. Continue to provide the EPA's 24/7 Free Phone and radon@epa.ie services.
- A.21. Work with local authorities to ensure that information about radon is available on their websites and awareness is raised with environmental awareness officers.

Normalising the testing for and remediation of radon

- A.22. Continue to work to normalise the testing for and remediation of radon through measures such as:
- The creation of visible cues in homes and workplaces.
 - The inclusion of radon in appropriate school curricula.
 - Exploring the potential impact of digital monitors to nudge action.

3.4 Promoting confidence in radon services

Background

Two courses have been developed, in partnership with radon professionals, for radon services, building professionals and site staff. One of these courses focuses on radon remediation and the second one on radon preventive systems. It is important to ensure that both courses are available as required and that they are periodically reviewed and updated, also in partnership with measurement and remediation professionals.

Likewise, it is important that training is available for construction professionals through the development of Continuing Professional Development modules on radon in cooperation with the relevant professional bodies.

The EPA maintains a register of radon testing services. Registered radon measurement services have provided evidence of successful proficiency testing, have agreed to provide their service in accordance with the EPA's Radon Measurement Protocol, are tax compliant and appropriately insured. The EPA also maintains a register of radon remediation services. Registered remediation services must meet a set of requirements including attending the training course on remediation followed by a successful assessment, adherence to a code of practice, tax compliance, and appropriate insurance. Further details of these registration schemes are available on www.radon.ie. The EPA provides a free post-remediation testing service to householder that have tested above the reference level and subsequently remediated their homes. This provides independent confirmation to the householder that remediation work has been successful in reducing the radon levels in their homes. It is important that both registration schemes and the free post-remediation service are maintained to continue to provide confidence to members of the public that avail of radon services.

Implementation of the Building Control Regulations 2014 is set out in the Code of Practice for Inspecting and Certifying Buildings and Works [19]. This Code defines the Assigned Certifier is a competent, registered professional who will inspect the building works during construction and provide a Certificate of Compliance on Completion. An Ancillary Certifier may be assigned to sign off on specific part of the Building Regulations. It is recommended that the Ancillary Certifier that signs off on the installation of radon preventive systems has attended the training course on radon preventive systems.

Actions:

Registration schemes

- A.23. Continue administration of the EPA registration schemes for remediation contractors and measurement services. These schemes should be reviewed and updated periodically in consultation with the radon industry.
- A.24. Continue to provide a free post-remediation service to homeowners that have remediated.

Training

- A.25. Continue to provide the training course in radon remediation and ensure that it is updated periodically, in consultation with the radon industry.
- A.26. Continue to support the provision of the training course on radon preventive systems and ensure that it is updated periodically, in consultation with the radon industry.
- A.27. Work with stakeholders such as the Local Government Management Agency, the Construction Industry Federation and others to promote attendance at both courses by local authority staff, building professionals and site staff.
- A.28. Develop a Continuing Professional Development module on radon in cooperation with the relevant professional bodies.

3.5 Radon in workplaces and public buildings

The regulations governing radon in workplaces are set out in the [Ionising Radiation Regulations 2019](#). These regulations establish the following:

1. The national reference level for indoor radon concentrations in workplaces is 300 Bq/m³.
2. An employer or self-employed person who is responsible for a workplace shall measure the indoor radon concentrations where the workplace is:
 - (a) underground, including mines and show caves;
 - (b) on the ground floor or basement level in High Radon Areas;
 - (c) identified by the EPA as being liable to have radon concentrations above 300 Bq/m³
3. Workplace measurements shall be carried out in accordance with guidelines issued by the EPA.
4. If the result of any workplace radon measurement exceeds 300 Bq/m³, the employer or self-employed person, shall reduce the radon concentrations to below the national reference level. This work shall start as soon as practicable and be completed within 12 months of the date of radon measurement report.
5. Following this, further radon measurements shall be carried out within one month of completion of the remedial measures, to determine whether the radon concentrations have been reduced to below 300 Bq/m³.
6. Where the radon concentration continues to exceed 300 Bq/m³ following remediation, the employer or self-employed person shall notify the EPA and assess the risk to workers according to EPA guidelines within three months of the notification.

Guidance on the implementation of this legislation will be available from the EPA. It should be noted that a multi-agency approach to addressing radon in workplaces has been very successful. This approach has included targeting multiple risks in a single inspection (e.g. raising awareness of radon as a workplace hazard by HSA in general workplace health and safety inspections) and collaboration in relation to promotion and awareness activities.

In general, public buildings are also workplaces and in most cases the measures for the protection of workers are likely to provide adequate protection for the public also. However, in certain types of public building, where the public occupancy is high, such as schools and Early Years (pre-school) Services, specific measures may also be required to protect the public. It is noted that the Department of Education and Skills has already tested radon levels in Irish schools in the free education system and that all new build schools have radon preventive systems installed and are tested for radon within five months of construction. Regarding Early Years (pre-school) Services, it is important to raise awareness of the requirements of the Ionising Radiation Regulations 2019 among TUSLA inspectors, County Childcare Committees and relevant voluntary bodies.

Finally, it is important to note that the implementation of legislative requirements must be strongly supported with educational and awareness raising measures.

Actions:

Regulation

A.29. Develop guidance documents to support the regulatory requirements on the following:

- Measurement of radon in above ground workplaces
- Measurement of radon in underground workplaces
- Measurement of radon in Long-Stay Institutions

A.30. Extend the registration scheme for radon measurement services (see 2.4) to include measurement of radon in workplaces.

A.31. Continue cooperation on radon with other State agencies (including the HSA, the HSE, Building Standards (DHPLG), and TUSLA) to ensure a coordinated approach to radon in workplaces.

Awareness raising and training

A.32. Work to raise awareness of the legislative requirements, with a focus on underground workplaces as a priority, among the following target groups:

- Employers
- Unions
- Health and Safety Professionals
- School Principals and Boards of Management
- TUSLA inspectors, County Childcare Committees and voluntary bodies
- Assigned Certifiers
- Building Professionals

A.33. Develop tailored information and training modules for those with responsibility for Early Years Services.

Chapter 4: Implementation

Coordination

It is recommended that Phase Two continues to be overseen and guided by a Steering Group made up of representatives of the key departments and agencies responsible for delivery of the NRCS. The responsibilities of this group include:

- Coordinating the work on radon across the relevant departments and agencies;
- Monitoring the implementation of the Strategy according to the agreed metrics;
- Reporting annually to Government on progress;
- Ensuring that the effectiveness of the plan is assessed at appropriate intervals, and
- At the end of the period covered by the action plan, making recommendations to Government on what further actions it considers necessary at that time.

Strategy Targets

The insight provided by Hevey [12] and the experience both nationally and internationally point to the importance of setting realistic targets for any action on radon based primarily on behavioural change. However, it is expected that the approach presented in this strategy will deliver more than heretofore as it builds on the learnings of Phase One of the Strategy.

By end 2024 (5 years):

- Radon awareness is maintained at 75% and the gap between awareness and willingness to act has been reduced. It should be noted that 75% awareness is considered close to full awareness by experts on public awareness surveys.
- Remediation rate increased to 30% for all homes over the reference level where financial support is available to householders. At present, the remediation rate is about 20%, which is typical of many European countries. Where financial support is available, an increase to 30% within 5 years should be achievable.
- Radon testing and remediation are a standard part of the public building, social housing, crèche, school and workplace inspection and/or management programmes for high radon areas.
- Radon testing and remediation are reflected in rental and conveyancing regulation requirements
- Employers, particularly those with responsibility for underground workplaces, are implementing the requirements of the [Ionising Radiation Regulations 2019](#).
- Radon awareness, prevention and control is an established part of relevant Continuous Professional Development for architectural, engineering, construction and health and safety professionals

By end 2029 (10 years):

- The national geographically weighted average domestic indoor radon level will be reduced by 10% compared to current 77 Bq/m³ (this metric should be measured 10 years following the implementation of revised Technical Guidance Document C and/ or the establishment of financial incentives). It has been estimated that if all the homes in Ireland were below the reference level of 200 Bq/m³, that the National Average Indoor Radon Level would be 64 Bq/m³, consequently a 10% reduction to 70 Bq/m³ would be a significant step towards this goal.
- Radon awareness is maintained at 75% and the gap between awareness and willingness to act has been reduced.
- The remediation rate is increased to 40% for all homes over the reference level where financial support is available to householders.
- All public buildings, social housing and crèches in high radon areas have been tested for and, where necessary, remediated for radon.
- All workplaces in high radon areas are implementing the requirements of the [Ionising Radiation Regulations 2019](#).
- There are high levels of awareness of the prevention and control of radon among architectural, engineering, construction and health and safety professionals.

Evaluation of the Strategy – Baseline Metrics

The overall objective of the NRCS is to “minimise the exposure to radon gas for people in Ireland and to reduce to the greatest extent practicable the incidence of radon-related lung cancers”. To measure progress towards this goal, a set of metrics has been agreed by the Coordination Group. These metrics are made up of two types and their use will be reviewed during the course of the implementation of this Strategy:

Leading indicators: These give a real-time measure of progress towards reducing exposure. These indicators can be used as reliable evidence that the long-term objective will be achieved.

Lagging indicators: These complement the leading indicators and provide information that may not be sufficiently timely to helpfully direct ongoing actions.

Baseline metrics, i.e. the starting point for these metrics and the agreed frequency for their repetition, are set out below.

Leading Indicators

Metric	Metric Value	Year Measured	Repeat Frequency	Proposed year	Comment
No. of domestic radon tests	1327	Average for 2014 -2017	Annually	2019	Source: EPA data
No. of radon tests linked to conveyancing	To be established	N/A	Annually	TBC	Method to collect data to be developed
Remediation rate	22%	2015	5 years	2020	Source: EPA survey
Rate of successful outcome for those who remediate	70% on first attempt	2015	5 years	2020	Source: EPA survey
No. of courses held & attendance at Remediation Training	5 courses held 87 attendees	2016	Dependent on scheduling of training course	As course is scheduled	Source: EPA
No. of courses held & attendance at Radon Prevention Training	5 courses held (including 1 pilot) 78 attendees	2017	Dependent on scheduling of training course	To be decided	Source: CIF
No. of businesses that include radon in H&S assessment using BeSmart	1506	Annual average for 2012-2018	Annually	2019	
Website hits	Almost 100,000	Average for 2017 and 2018	Annually	2019	Source: EPA

Lagging Indicators

Metric	Metric Value(s)	Year measured	Repeat frequency	Proposed year
Population weighted national average indoor radon concentration	98 Bq/m ³ (Arithmetic mean)	2017	8 years	2025
Geographic weighted national average indoor radon concentration	77 Bq/m ³ (Arithmetic mean) Mean for homes built pre-98 vs post-98 98 vs post-98 86 Bq/m ³ vs 64 Bq/m ³	2015	8 years	2023
Radon awareness levels	75% with 21% likely to test their home	2017	3-5 years	2020-2022

Review

It is envisioned that the Action Plan set out in Appendix 1 will be carried out over the 5 years between 2019 and 2024. The group recommends that at the end of the 5 years a detailed review be carried out covering:

- the status of each action
- the impact of the measures taken to date;
- likely effectiveness of the Strategy in the longer term in reducing the risk from radon;
- updated assessment of the cost effectiveness of the interventions recommended in the Strategy;
- review of stakeholder experience of the Strategy;
- lessons learnt and outstanding issues and
- identification of further actions appropriate at that time.

Costs

The costs arising from the actions proposed will to a large degree require the commitment of time and expertise from specialist public servants and researchers. The costs to industry are generally modest and are typically associated with training or the development of new guidance. The cost to individuals relate to the incorporation of radon preventive systems into new buildings at the time of construction, the cost of certifying the membrane, testing of existing buildings or remediation of existing buildings with high radon levels. These costs typically range from approximately €50 for radon testing to a few hundred euro for preventive measures to approximately €1,000 for remediation. Similar costs will be incurred by landlords.

The relatively modest cost of implementing the NRCS actions may be compared to the economic cost associated with not addressing radon. An Economic Review of the Irish Geoscience Sector was prepared for the Geological Survey of Ireland by Indecon International Economic consultants [20]. This report sets out

the economic cost of radon-induced lung cancer as over €340 million per annum due to radon related lung cancer, but this does not include the significant human costs or the impacts on the health service.

Timing

It is proposed that the actions set out in this plan will be delivered within the five-year period from 2019 to 2024. The action plan sets out strategic phasing for each action, which considers the priority associated with the action and the natural sequence in which some of the actions need to happen. Actions are classified as phases 1&2 where they are ongoing, and either phase 1 or phase 2, depending on their priority and the sequence in which they should happen.

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Appendix 1: Action Plan

No	Action	Lead	Participants	Phase
1	<p>The next revision of Technical Guidance Document C should be strengthened by ensuring new homes have optimal passive prevention systems installed through:</p> <ul style="list-style-type: none"> • Incorporating the outcome of research on the optimum specifications for radon preventive techniques in Ireland to ensure new buildings are optimally protected from radon. This should include research on hardcore composition, sump effectiveness, barrier effectiveness, the impact of requirements for ventilation and measures designed to build energy efficient homes on indoor radon levels. • Consideration of the current radon risk map as published on www.radon.ie. 	DHPLG	EPA, DCCAE, HSE, Radon Researchers	1
2	Work in partnership with the Construction Industry Federation and the Local Government Management Agency to ensure that the training course for site staff is promoted and reviewed as appropriate.	DHPLG	EPA, Radon Industry	1&2
3	Work in partnership with third level and other training organisations to ensure that radon is included in the relevant undergraduate and apprentice courses (third level organisations, SOLAS, the Education and Training Board).	EPA	DHPLG	2
4	Work in partnership with the relevant professional bodies to develop a continuing professional development module on radon (the Royal Institute of Architects in Ireland, Engineers Ireland, the Society of Chartered Surveyors Ireland).	EPA	DHPLG, Radon Industry	2

5	Work in partnership with the Law Society of Ireland and other stakeholders towards a requirement that conveyancing legislation includes a requirement that radon testing and, where necessary, remediation are compulsory when selling a home in a high radon area.	EPA	Law Society, Estate Agents	2
6	Work in partnership with SEAI and DHPLG to ensure that (a) the BER Advisory Report that is required when a home is sold is revised to include information about radon and (b) a requirement to provide information about radon testing and remediation to building owners as part of the hand-over documentation is considered.	SEAI and DHPLG	EPA	1
7	Raise awareness of the questions about radon now included in the conveyancing process with the following groups: solicitors, estate agents, surveyors, home buyers and sellers. This work should include surveys of awareness levels among these groups.	EPA	Law Society	1
8	Work in partnership with the relevant stakeholders towards rental legislation including a requirement that landlords carry out radon testing in High Radon Areas (and, where necessary, remediation).	DHPLG	EPA, RTB, CCMA	1&2
9	Raise awareness of radon among landlords and tenants. The Residential Tenancies Board (RTB) have in place a comprehensive stakeholder consultation framework and conduct quarterly stakeholder meetings with a large cohort of landlords and tenants. It is recognised that this framework would be a useful vehicle for raising awareness within the rental sector of the radon issue.	EPA	RTB	1

10	Work with local authorities to ensure the programme of testing, remediating and retesting (where retrofitting or refurbishing are carried out) of social housing by local authorities continues to be a priority.	CCMA	EPA, DHPLG	1&2
11	Promote local authorities' attendance at training courses on site prevention and remediation.	CCMA	EPA, LGMA, DHPLG	1&2
12	Continue the annual Radon Day events on 7 th November. Integrate both national and local awareness raising by continuing to focus on radon in the 12 priority counties (Carlow, Clare, Galway, Kerry, Kilkenny, Louth, Mayo, Sligo, South Tipperary, Waterford, Wexford and Wicklow).	EPA	Local authorities & Environmental Awareness Officers	1&2
13	Continue to communicate the radon message through local and national media, engagement with local authorities and local and national government representatives for each priority county.	EPA	CCMA	1&2
14	Carry out stage-matched awareness raising by targeting specific groups, including: <ul style="list-style-type: none"> (a) Those that have already tested above the reference level for radon but have not yet remediated. (b) Those buying and selling their homes and professionals such as estate agents and solicitors. (c) Organisations such as the Irish Cancer Society, Healthy Ireland, the Irish Lung Foundation, ASH, and QUIT to support smokers and those that have been affected by radon related health problems. 	EPA		1&2
15	Continue to host the Radon Forum event to inform and update the radon community	EPA		1&2

16	Continue to engage with the radon research community through regular workshops focusing on radon research.	EPA		1&2
17	Continue to promote awareness of radon at EPA outreach events including the National Ploughing Championships, the Young Scientist Exhibition and Science Week events.	EPA		1&2
18	Work with behavioural scientists to review the outcome of the research survey to estimate uptake and associated costs of financial incentives for homeowners. Incorporate this into the development of a national grant proposal.	EPA	ESRI, SEAI	1
19	Continue to maintain and develop the website www.radon.ie .	EPA		1&2
20	Continue to provide the EPA's 24/7 Free Phone and radon@epa.ie services.	EPA		1&2
21	Work with local authorities to ensure that information about radon is available on their websites and awareness is raised with environmental awareness officers.	EPA	CCMA	1
22	Continue to work to normalise the testing for and remediation of radon through measures such as: <ul style="list-style-type: none"> • The creation of visible cues in homes and workplaces. • The inclusion of radon in appropriate school curricula. • Exploring the potential impact of digital monitors to nudge action. 	EPA	DES	2

23	Continue administration of the EPA registration schemes for remediation contractors and measurement services. These schemes should be reviewed and updated periodically in consultation with the radon industry.	EPA	Radon Industry	1&2
24	Continue to provide a free post-remediation service to homeowners that have remediated.	EPA		1&2
25	Continue to provide the training course in radon remediation periodically and ensure that it is updated periodically, in consultation with the radon industry.	EPA	Radon Industry, LGMA, CCMA	1&2
26	Continue to support the provision of the training course on radon preventive systems and ensure that it is updated periodically, in consultation with the radon industry.	DHPLG	EPA, Radon Industry	1&2
27	Work with stakeholders such as the Local Government Management Agency, the Construction Industry Federation and others to promote attendance at both courses by local authority staff, building professionals and site staff.	EPA	CCMA, CIF, Radon Industry, RIAI, SCSI, EI	1&2
28	Develop a Continuing Professional Development module on radon in cooperation with the relevant professional bodies.	EPA	RIAI, SCSI, EI	2
29	Develop guidance documents to support the regulatory requirements on the following: <ul style="list-style-type: none"> • Measurement of radon in above ground workplaces • Measurement of radon in underground workplaces • Measurement of radon in Long-Stay Institutions 	EPA	HSA, HSE, HIQA	1

30	Extend the registration scheme for radon measurement services to include measurement of radon in workplaces.	EPA	Radon Industry	1
31	Continue cooperation on radon with other State agencies (including the HSA, the HSE, Building Standards (DHPLG), and TUSLA) to ensure a coordinated approach to radon in workplaces.	EPA	HSA, DHPLG, TUSLA	1&2
32	Work to raise awareness of the legislative requirements, with a focus on underground workplaces as a priority, among the following target groups: <ul style="list-style-type: none"> • Employers • Unions • Health and Safety Professionals • School Principals and Boards of Management • TUSLA inspectors, County Childcare Committees and voluntary bodies • Assigned Certifiers and Building Professionals 	EPA	HSA, DES, TUSLA, DHPLG	1&2
33	Develop tailored information and training modules for those with responsibility for Early Years Services.	TUSLA	EPA	2

Annex 1: Reference levels for radon

Advisory or statutory reference levels have already been established for workplaces, homes, schools and long-stay residential institutions. The Reference Level is not a rigid boundary between safety and danger but represents a radon concentration above which action to reduce radon levels is likely to be needed. The Reference Level for radon in workplaces in Ireland is 300 Bq/m³, measured over any consecutive three-month period. This Reference Level is specified in the Radiological Protection Act 1991 (Ionising Radiation) Regulations 2019 (S.I. No. 30 of 2019).

The Reference Level for the long-term exposure to radon in homes is 200 Bq/m³ measured in accordance with the EPA's measurement protocol. This Reference Level, which was set by Government in 1990, is in line with the recommendations of the World Health Organization. The statutory Reference Level for radon in workplaces of 300 Bq/m³ also applies to schools. However, in order to provide the same level of protection as in the home, the Department of Education and Skills recommends a Reference Level of 200 Bq/m³ in all schools. This advice covers pre-schools as well as primary and post-primary schools.

While the majority of radon exposure situations are covered by the Reference Levels for homes, schools and workplaces, there are some instances where there is not a clear distinction between residential areas and workplaces. These include long-stay institutions such as, prisons, nursing homes and live-in training centres. In these cases, the EPA recommends that the 200 Bq/m³ Reference Level should apply to those areas that are clearly residential in nature. In areas that are clearly workplaces, the workplace Reference Level of 300 Bq/m³ should apply. Where there is a doubt as to whether the area is residential or a workplace, it is recommended that the lower Reference Level of 200 Bq/m³ be used.

Annex 2: Summary of status of Phase 1 of the NRCS

No.	Action	Status
1	Develop a branding strategy and communications programme for the launch of the NRCS	Complete
2	Develop a dedicated radon website as resource for stakeholder groups	Complete
3	Establish a co-ordination group comprising key public bodies to oversee and co-ordinate implementation of the NRCS	Complete
4	Make recommendations to the DHPLG on the amendment and strengthening of technical guidance on radon prevention in new buildings where indicated by the results of peer-reviewed research and field-testing.	This action is dependent on the outcome of ongoing research to investigate optimal radon preventive and remediation techniques (Action 9). Recommended for inclusion in NRCS Phase 2.
5	Promote radon as a sign off measure within the Building Control (Amendment) Regulations 2014	Complete
6	Work with key stakeholders to ensure that short targeted training for site staff on radon prevention are developed and delivered	Complete
7	Work with universities to include radon awareness in relevant undergraduate courses	Recommended for inclusion in NRCS Phase 2.
8	Develop a Continuing Professional Development module on radon in cooperation with the relevant professional bodies	Recommended for inclusion in NRCS Phase 2.
9	Promote targeted research on radon to support effective and efficient implementation of the NRCS	A number of research projects complete. Others are ongoing.
10	Update the national assessment of indoor radon levels	Complete.
11	Research to assess the combined effectiveness of passive sumps and sealing the base of the building	Research was commissioned in 2016 and is underway in NUI Galway. Further field trials are required.
12	Implement a broadly based multi annual programme of local radon awareness campaigns	Complete.

13	Develop and implement a national communications strategy to underpin local campaigns	Complete
14	Implement a targeted multi-annual programme aimed at increasing awareness among different groups of “influencers”	Annual “Radon Day” being held on 7 th November each year to maintain established awareness of radon among targeted groups.
15	Promote the continuation of the programme of radon testing and remediation of social housing	Dedicated information for local authorities published on www.radon.ie . Technical advice provided to support local authorities as required. Remediation Training Course attended by local authority housing staff. Ongoing work in local authorities has been collated.
16	Develop guidelines for local authorities on dealing with requests for information on radon	Complete: www.radon.ie provides tailored advice for local authorities.
17	Develop a protocol for dealing with individuals with high radon measurements between: EPA, DCCAE, HSE, local authorities and HSA	Complete: Communications and Advocacy Strategy provides for more targeted support of householders with high radon levels.
18	Amend the advisory report which accompanies the BER certificate to include advice on radon	Scheduled for action in NRCS Phase 2.
19	Develop a detailed strategy to examine recommendation on conveyancing	Complete: revised Contract for Sale published by Law Society for use in January 2017 and publicised.
20	Amend the Housing (Standards for Rented Houses) Regulations to address radon	Complete: Review of Regulations carried out Jun/ July 2016. EPA submitted

		comments re inclusion of radon. Can be included in Phase 2 of the NRCS.
21	Amend checklist used by local authorities for inspection of rental properties (private and social) regarding the rate of radon testing and the levels found	Recommended for inclusion in Phase 2 of the NRCS.
22	Develop a detailed paper on financial incentives to encourage action on radon	A pilot scheme to estimate uptake (and associated costs) of potential financial incentives is underway.
23	Develop framework for training in radon remediation	Complete
24	Update “Radon in existing buildings – corrective options” published by DECLG	Addressed through the rollout of training courses on preventive systems and remediation (Actions 6 and 23).
		Recommended for inclusion in Phase 2 of the NRCS. This action may not be required as the information is now available through www.radon.ie and training courses.
25	Develop criteria which remediation contractors must meet to be included on a Government list or website	Complete
26	Develop validation or registration scheme for radon measurement services in Ireland	Complete
27	Review existing legal requirements concerning radon in workplaces together with any new requirements arising from BSS and recommend changes.	Complete
28	Co-ordinated programme to enforce regulations re radon in workplaces to be put in place.	This action is ongoing.
29	Enhance cooperation on radon with other state agencies	Ongoing.

30	Develop guidance on the need for retesting of previously remediated buildings	Complete.
31	New Action - Work with TUSLA to develop a training course for those with responsibility for radon in crèches.	Recommended for inclusion in Phase 2 of the NRCS.

Annex 3: Summary of research carried out to support Phase 1 of the NRCS

No.	Knowledge gap deliverable	Identified as Phase 1 knowledge gap?	Current Status	Knowledge gap for Phase 2 identified?
1	Updated geographic weighted national average	Yes	Complete	No
2	Updated population weighted national average radon concentration	Yes	Complete	No
3	An improved radon risk map	Yes	On-going	Yes
4	Tellus survey	No	On-going	No
5	Research on radon and increased airtightness/energy efficiency carried out	Yes	Complete	Yes
6	Study of radon concentrations in passive homes carried out	Yes	On-going	Awaiting results
7	Development of a more robust radon preventive system.	Yes	On-going	Awaiting results. Further research may be required.
8	Investigation into the long-term effectiveness of radon remediation systems	Yes	Complete	No
9	Optimum positioning of radon fan exhaust on buildings being remediated and optimum fan power that should be used in active radon systems	Yes	Not commenced	To be considered for Phase 2
10	Update the rate of radon remediation	Yes	Complete	No
11	Review of public information programmes to enhance home radon screening uptake and home remediation.	Yes	Complete	No

No.	Knowledge gap deliverable	Identified as Phase 1 knowledge gap?	Current Status	Knowledge gap for Phase 2 identified?
12	Rate of testing and remediation when financial incentives are provided	Yes	On-going	Yes
13	Assessment of the level of awareness of radon among solicitors, surveyors, landlords and new home owners is unknown.	Yes	Not commenced	To be considered for Phase 2
14	Survey of radon awareness levels amongst the public carried out	No	Complete	No
15	Radon awareness and testing in patients of a rapid access lung cancer clinic	No	Complete	To be considered for Phase 2
16	Study of building characteristics and indoor radon levels carried out	No	On-going	Awaiting results.
17	Development of seasonal correction factors for workplaces	No	Complete	No
18	High radon areas and lung cancer prevalence in Ireland	No	Complete	No
19	Economic cost of radon related lung cancer in Ireland	No	Complete	No
20	An outdoor radon survey and minimizing uncertainties in low level measurements using CR-39 detectors	No	Complete	No
21	Inter-comparison of radon detectors for one to four-week measurement periods	No	Complete	No

Annex 4: Abbreviations

Abbreviation	
ASH	Action on Smoking and Health
BER	Building Energy Rating
DCCAIE	Department of Communications, Climate Action and Environment
DHPLG	Department of Housing, Planning and Local Government
EPA	Environmental Protection Agency
HSA	Health and Safety Authority
HSE	Health Services Executive
IAEA	International Atomic Energy Agency
IRRS	Integrated Regulatory Review Service
NRCS	National Radon Control Strategy
QUIT	HSE health education campaign encouraging smokers to quit
RTB	Rental Tenancy Board
SEAI	Sustainable Energy Authority of Ireland
TCD	Trinity College Dublin
TUSLA	Child and Family Agency