

**NATIONAL ACTION PLAN TO REDUCE THE
RISK OF
RADON EXPOSURE
2023 - 2027 г.**

Sofia
2023

LIST OF ABBREVIATIONS USED

NRA	Nuclear Regulatory Agency
DNBC	Directorate for National Building Control
EC	European Commission
EA GLI	Executive Agency “General Labour Inspectorate”
EEA	Executive Environment Agency
CAB	Chamber of Architects in Bulgaria
CEID	Chamber of Engineers in Investment Design
CBB	Chamber of Builders in Bulgaria
IAEA	International Atomic Energy Agency
ICRP	International Commission on Radiological Protection
MH	Ministry of Health
MES	Ministry of Education and Science
MoEW	Ministry of Environment and Water
MRDPB	Ministry of Regional Development and Public Works
MLSP	Ministry of Labour and Social Policy
NCC	National Coordination Council
NCRRP	National Centre for Radiobiology and Radiation Protection
RPR	Radiation Protection Regulation
RCC	Regional Coordination Council
RVA	Radon volumetric activity
WHO	World Health Organization
SU	Sofia University
RB	Republic of Bulgaria

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I. INTRODUCTION

This plan represents a joint effort of all relevant agencies in the Republic of Bulgaria involved in reducing the risk of radon exposure.

The implementation of activities under the National Action Plan for the Reduction of the Risk of Exposure to Radon 2023-2027 aims to reduce and prevent the risk of radon-related diseases, which is a natural source of ionising radiation and is the largest contributor to the internal exposure of the population.

The adopted Radon Exposure Risk Reduction Strategy 2018-2027 outlines a coherent framework for setting priorities for action to reduce the risk of radon exposure and supports the implementation of measures to implement them at national, regional, municipal level and why not in every Bulgarian home.

The Action Plan has been developed to implement the Radon Exposure Risk Reduction Strategy 2018-2027. It is the main organisational and management tool for the implementation of the Strategy and forms an integral part of it. The Action Plan takes into account national experience as well as European Union assessments and recommendations in the field of radon risk reduction.

The national plan contains actions for the implementation of the priorities set out in the strategy, indicators for follow-up, deadlines for implementation, lead institutions and partners, and sources of funding.

In order to identify the health risk and due to the complexity and scope of the problem, it is necessary to unite the efforts of all responsible institutions and actively involve them in activities to reduce the risk of radon exposure to the population of the Republic of Bulgaria, which is expected to lead to a reduction in the incidence and mortality of lung cancer.

The implementation of the National Action Plan requires a cross-sectoral approach and therefore the competences and responsibilities of both state institutions and the non-governmental sector are integrated in the actions.

The Action Plan is a document that is intended to be periodically updated every 5 years in order to achieve a qualitative and effective implementation of the objectives and priorities described in the Strategy and on the basis of the conclusions drawn from the report on its implementation.

The National Radon Risk Reduction Action Plan 2023-2027 has been developed to achieve the aims and objectives of the Radon Risk Reduction Strategy 2018-2027, based on an analysis of the implementation of the National Radon Risk Reduction Action Plan 2018-2022.

II. STATE OF PLAY

1. Implementation and enforcement of European and international norms, rules and recommendations in Bulgarian legislation.

National legislation is fully harmonised with the requirements of Directive 2013/59/EURATOM and the IAEA BSS Part 3. The achievements in this respect are the result of the tasks set out in the National Action Plan for Radon Exposure Risk Reduction 2018-2022

being properly set and implemented at a high level. The performance has been assessed in an EC inspection which showed full compliance with the requirements. In the framework of the IAEA Regional Project, it was found that according to the set reporting algorithm, Bulgaria met the requirements 90%. Regulation No. RD-02-20-1 of 2019 on the technical requirements for buildings for radon protection (promulgated, SG No. 33 of 2019) was also adopted, which is an example of the fruitful cooperation between the different competent institutions implementing the tasks under the National Plan.

The next five-year period of the National Plan (2023-2027) should analyse the implementation of the harmonised legislative framework.

2. Framework for the management and implementation of national action plans

In order to implement the activities foreseen in the National Action Plan for Radon Exposure Risk Reduction 2018-2022, the established governance structure at the regional level was optimized through 28 regional coordination councils with the participation of the regional and municipal administration, the Executive Environmental Agency, the Chamber of Engineers in Investment Design, the territorial directorates “Labour Inspectorate” and experts from regional health inspectorates. By order of the Minister of Health, a National Coordination Council (NCC) was also established, including representatives of all agencies involved in the issue.

During the implementation of the plan, the training of competent teams, including district coordinators, district coordination councils with the relevant rules for work and decision-making continued. The methodological and organisational achievements are a solid basis for the implementation of the following plans in the field of national radon risk reduction policy.

As the problem of health risk assessment of radon exposure in buildings is relatively new for radiation protection specialists, especially in the preparation of national plans and dose assessment in public buildings and workplaces, the training of the participating teams was continued with the help of the International Atomic Energy Agency (IAEA) and projects funded by EC programmes.

Contract No. RD-13-36 of 08.05.2019 was signed between the Ministry of Health and the Working Conditions Fund for organizing and conducting training of inspectors from the RHI on the topic “Risk of exposure to radon as a natural source of ionizing radiation at workplaces”, which was held in the period 17-19 June 2019.

A regional course to share best practice in the implementation of national Radon plans was organised and held from 9 to 11 April 2019, with the participation of 42 specialists from 21 countries in the region. The course was funded under IAEA Regional Project RER9153 on “Improving regional capacity to control long-term risks to society due to radon in homes and workplaces”.

Due to the declared epidemic emergency situation in the country, training and counselling was suspended from 2020 to 2022.

3. National radon activity volume studies

In relation to the National Action Plan for Radon Risk Reduction 2018-2022 Objective 3 “Collect and systematize information on radon exposure in residential and public buildings and workplaces through national surveys and other systematic measurements”, surveys continued

to be conducted in buildings throughout Bulgaria. The main tasks to be addressed by the competent authorities to identify areas likely to have elevated radon activity in buildings and the means to reduce it were structured in an organisational and methodological way.

RADON STUDIES IN DWELLINGS

The national survey is being carried out according to a procedure approved by the NCC, the task of which is to assess the spatial distribution of radon volume activity by region in the Republic of Bulgaria and to determine the distribution of average annual activities in dwellings that can be considered representative of the exposure of the population to the natural source of ionizing radiation radon.

The first systematic national survey and actual measurements were launched in 2015. Passive detectors were used to conduct the national survey for long-term (6 months) measurement of radon volumetric activity in dwellings. The distribution of the detectors was consistent with the administrative-territorial division of the country into 28 districts and 264 municipalities. The survey was conducted in two phases of 6 months each. In this way, a screening of the distribution of radon volume activity in the territory of the Republic of Bulgaria was carried out. The survey covered measurements throughout the country and contributed to the development of a wide range of guidelines and identified the need to update regulatory documents contributing to the implementation of a national strategy to reduce the impact of radon in buildings on the health of the Bulgarian population, reflecting national specificities.

In order to obtain an adequate screening result for the whole country, the distribution of detectors was done in several stages: **first stage**: the number of samples (detectors) for each district was approximately 100 radon detectors ($p(1)=100$ detectors), regardless of demographic characteristics; **second stage**: the distribution covered the placement of detectors by municipality depending on the number of population, taking into account the percentage of the population in the municipality compared to the district; **third stage**: the distribution of detectors was based on the percentage of the population in the municipality. At all stages, the distribution was made on the principle of random selection of housing in towns and villages. Very serious work was carried out on quality assurance of all measurements during the National Survey. This was firstly ensured by calibrating each batch with detectors. To ensure the accuracy of the results obtained, two types of measurements were carried out: duplicate and null measurements. The results from the duplicate detector must match the results from the primary detector. The blank detectors are used to evaluate the influence of some additional processes on the accuracy of the determination of the volumetric activity of radon: transfer from the laboratory to the room and back, storage, etc. The results were submitted for inclusion in the European Atlas of Radon Volumetric Activity in Buildings. The national study of radon activity in dwellings allowed Bulgaria to be included in the “Radon Map of Europe” and the preparation of a 10x10 km map for the country. Periodic data transmission and updates to the map of Europe confirm that Bulgaria is fulfilling its obligations under the Directive (Figure 1).

European Indoor Radon Map, November 2021

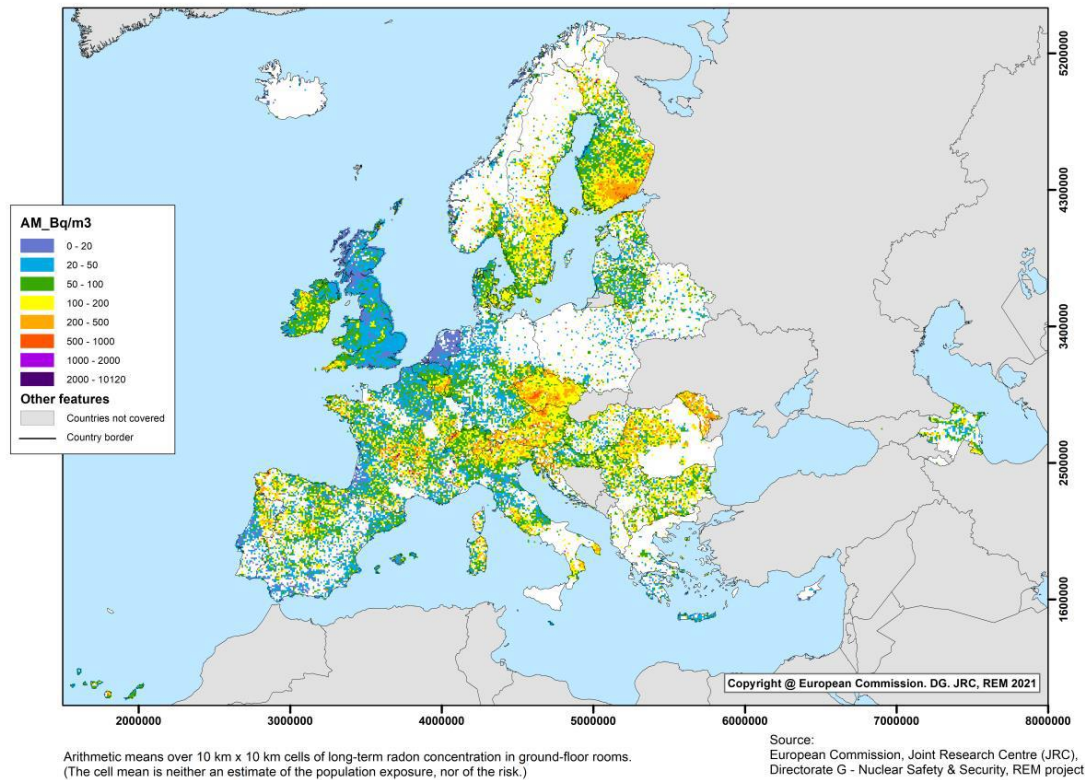


Figure 1. European Atlas - Radon as of November 2021.

Based on the results of the systematic National Survey, an addition to the National Survey Procedure has been proposed with the possibility of defining correction factors that allow the estimation of annual average radon activities in buildings when short-term measurements (3-6 months) are applied. Correction factors are determined according to the climate and geology of the given areas of the country. Defined seasonal adjustment factors would allow the prediction of the long-term risk of radon exposure to the population at a shorter time period (3 months), which reduces sampling losses and optimizes the cost of conducting surveys based on actual results.

In the first programming period, a specialised laboratory “Radon Monitoring and Prevention” was set up at the National Center for Radiobiology and Radiation Protection (NCRRP), which covers all requirements for quality and precision of measurements of radon bulk activity along the entire chain of occurrence in soil, building penetration, passive and active measurement methods, etc. Quality assurance procedures have been developed and implemented for all measurements. In addition to the organisational and methodological quality assurance measures taken, the laboratory set up at the NRDC participated in a series of inter-laboratory comparisons with international reference laboratories: Bundesamt für Strahlenschutz (BfS) in Germany; AIRP - Italy and Health Protection Agency (HPA) in the United Kingdom. The infrastructure developed to date ensures that national radon bulk activity studies can continue to be carried out to a high-quality standard. The national programme has also developed a methodology for identifying areas of elevated radon risk. On the basis of actual measurements carried out to assess the annual average radon activity in buildings, the basis for a national

database and subsequently a more detailed radon map of the Republic of Bulgaria can be established.

During the period 2018 - 2022, depth measurements by district were initiated, dividing the area of a municipality into 5 x 5 km zones. The survey is conducted at the district level, divided into municipalities, for which a number of detectors are allocated depending on the area and building stock. In the settlements, detectors are distributed in randomly selected buildings. Within the framework of the plan, **the survey of dwellings in Blagoevgrad and Sliven districts has been fully completed**, and detailed reports have been adopted by the NCC and published on the National Plan website (www.radon.bg).

Sliven district

The detailed survey of Sliven district was conducted in 731 dwellings, in which 1474 passive detectors for measuring RVA were distributed (two per dwelling). The loss rate was 16%. **The average arithmetic value for Sliven district is 154 Bq/m³**. The distribution by municipalities is as follows: *Kotel - 114 Bq/m³; Nova Zagora - 138 Bq/m³; Sliven - 145 Bq/m³ and Tvarditsa - 308 Bq/m³*. When comparing the results of the national survey for Bulgaria (2015- 2016) for Sliven District (AM = 174 Bq/m³) with those of the detailed survey of RVA (AM = 154 Bq/m³), there is a decrease in the arithmetic mean values as well as in the percentage of the expected number of dwellings above the reference level, namely 11.5% from the national survey and 8.3% from the detailed survey. Figure 2a shows the map based on the results from the 2015-16 National Survey and Figure 2b from the Detailed Survey. The detailed survey confirms that high radon levels are likely to be found in dwellings in the municipality of Tvarditsa, but enables areas in the municipality to be more precisely defined, allowing preventive measures to be taken when new buildings are constructed.

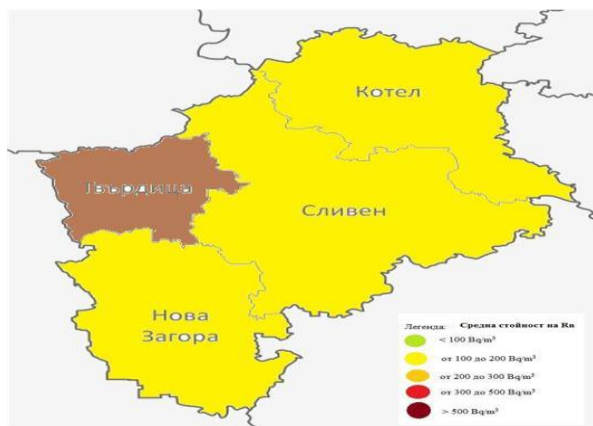


Figure 2a. Map of Sliven district based on the results of the National Survey 2015-2016

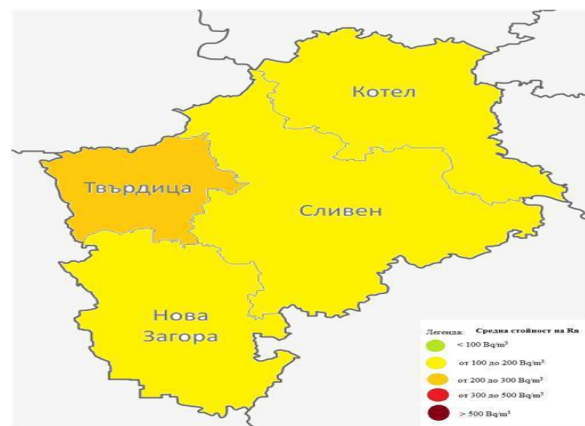


Figure 2b. Map of Sliven district based on the results of the detailed survey 2019

Blagoevgrad district

The detailed survey of Blagoevgrad district was conducted in **274 settlements located in 14 municipalities and 1280 detectors** were evaluated. The total percentage of lost results for Blagoevgrad district was 8%. The estimated annual mean value for the measured dwellings is

107 Bq/m³ , which is lower than those for Bulgaria (AM = 117 Bq/m³). The percentage of dwellings with radon activity above the national reference level of 300 Bq/m³ for Blagoevgrad District is 1.5%. The highest estimated annual mean value of radon volume activity is for Bansko municipality 201 Bq/m³ , and the lowest for Satovcha municipality 62 Bq/m³ . Figure 3a shows the map based on the results of the National Survey in 2015-2016 and Figure 3b on the detailed survey.

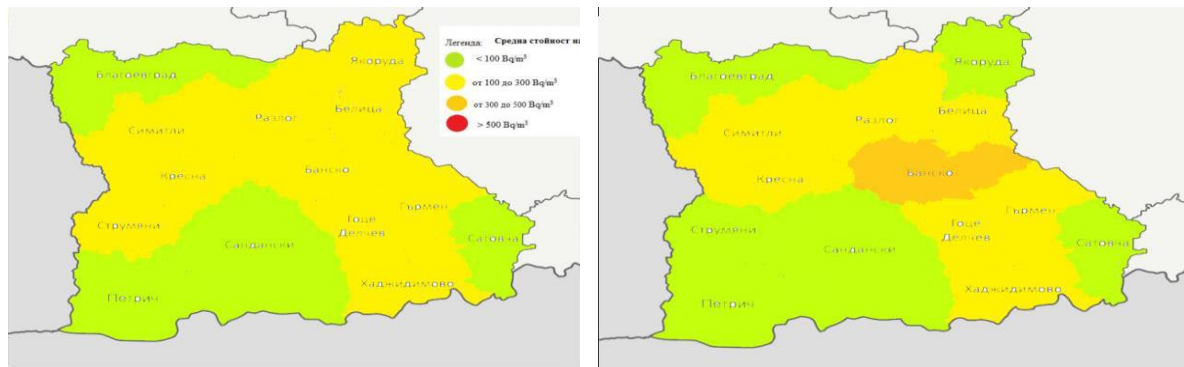


Figure 3a. Map of Blagoevgrad district based on the results of the National Survey 2015-2016

Figure 3b. Map of Blagoevgrad district based on the results of the detailed survey in 2017

When comparing the results from the national survey for Bulgaria (2015-2016) for Blagoevgrad district (AM = 96 Bq/m³) with those from the detailed survey of the OAP (AM = 107 Bq/m³), an increase in the average values is observed. The results of the detailed survey generally confirm the results of the National survey.

The following stages have been fully completed: planning; preparatory activities; setting up the detectors; collecting the survey detectors in the **districts of Kyustendil and Silistra**. By the end of 2022, the results will be summarized and a detailed report will be submitted to the NCC. The **Yambol district** survey is at the stage of sampling in dwellings in the district.

Detailed maps 5x5 km and data by municipalities and settlements are prepared and published on the website of the national plan to serve for planning activities to reduce radon exposure at the regional level, prioritization of settlements for corrective and preventive measures. Detailed surveys are extremely useful at the regional level because they provide more comprehensive results to identify areas where radon activity in buildings is likely to be above the reference level. Citizen participation is voluntary and provides the opportunity to have radon activity measured in their homes free of charge.

Therefore, these district surveys should continue in the next National Plan, but should be accompanied by a wider information campaign at local level to enable the population to participate as well as to take due responsibility for the measurements.

SURVEYS OF PUBLIC ACCESS BUILDINGS, SCHOOLS AND KINDERGARTENS

Activities 3.3.2 Preparation and adoption of a procedure for conducting surveys in buildings with public access, 3.3.5 Organization and conduct of national surveys (measurements) of radon volumetric activity in nurseries and kindergartens by district and 3.3.6 Organising and conducting national surveys (measurements) of volumetric radon activity in schools by district was a key focus of the National Action Plan for Radon Risk Reduction 2018-2022 strategic

objective - Implementing an integrated and systematic national policy to reduce the impact of radon in order to prevent health risks.

In the period 2018-2022, measurements of radon activity in public school buildings located in the **districts of Pernik, Smolyan, Kardzhali and Varna** were carried out. A survey and assessment of the annual average of RVA in all kindergartens was carried out in the **districts of Vratsa, Lovech, Montana, Razgrad and Silistra**. Figure 4 presents the districts where public school and kindergarten buildings were measured.

Schools

- **Pernik District** - The average RVA of the measured rooms is 170 Bq/m³. In 55 school premises out of 462 surveyed, RVA values above the reference level of 300 Bq/m³ were found. In 53% of the buildings surveyed, rooms were found to require remedial measures to reduce RVA levels and/or additional direct measurements to analyse radon variations during working hours.

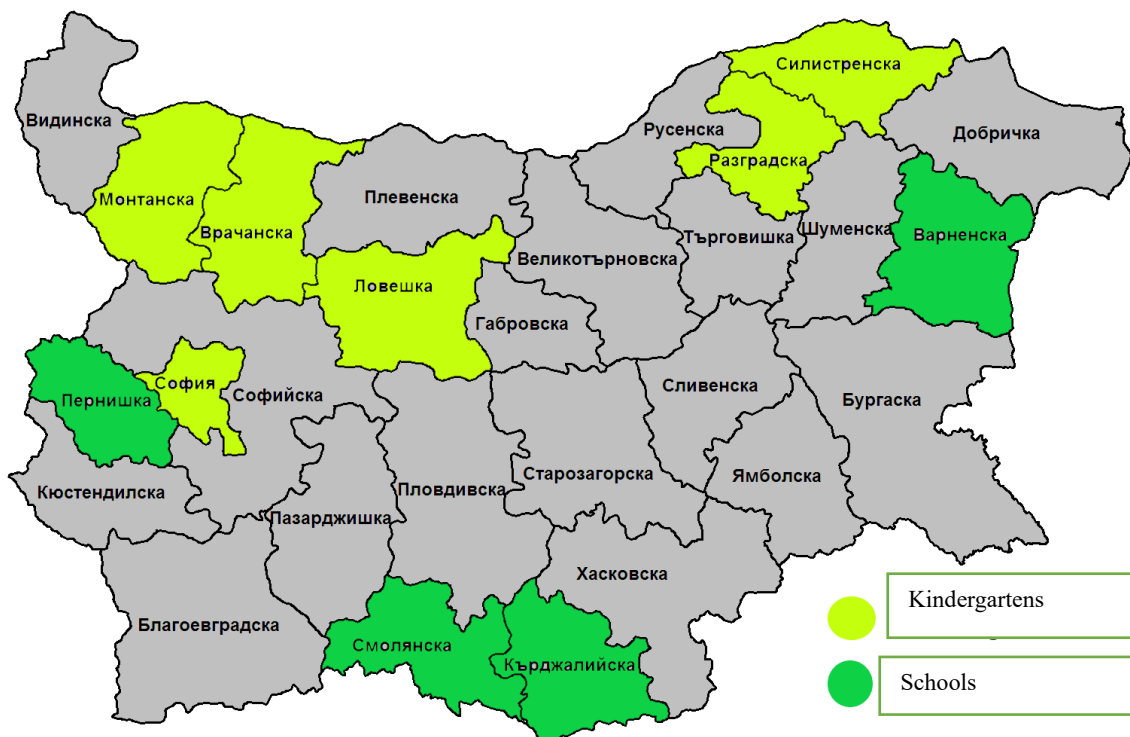


Figure 4. Areas where kindergartens and schools were measured

- **Smolyan district** - The average RVA of the measured rooms is 231 Bq/m³. In 69 premises RVA was measured exceeding the national reference level of the annual average RVA of 300 Bq/m³, or approximately 58 % of the buildings need remedial measures to reduce RVA levels.

- **Kardzhali district** - The average RVA value of the measured rooms is 140 Bq/m³. Radon activity was greater than the national reference level of 300 Bq/m³ in 28 rooms located in 30% of the buildings surveyed.

- **Varna district** - The average RVA of the measured rooms is 130 Bq/m³. Radon levels in 72 rooms were found to exceed the national reference level of 300 Bq/m³ annual average RVA. In 22 school premises the RVA was above 500 Bq/m³.

Kindergartens

- **Vratsa district** - The average RVA value of the measured rooms is 219 Bq/m³. It was found that in 160 rooms radon values exceeded the national reference level of 300 Bq/m³. Measured RVA values close to the reference level is likely to be higher due to the closure of childcare facilities during the epidemic and the non-use of the premises. These values should be analysed against the results for the whole nursery and the measurements repeated if necessary. In the premises of 18 kindergartens (67 premises) the RVA was above 500 Bq/m³.

- **Lovech district** - The average RVA value of the measured rooms is 156 Bq/m³. It was found that in 21 rooms in 12 buildings surveyed the RVA values exceeded the national reference. In 8 rooms the RVA was above 500 Bq/m³.

- **Montana district** - The average RVA of the measured rooms is 125 Bq/m³. It was found that in 30 rooms in 18 surveyed buildings the RVA values exceeded the national reference level. In 12 rooms the RVA was above 500 Bq/m³.

- **Razgrad district** - Radon measurement in kindergartens was conducted in 2015. The average RVA of the measured rooms was 152 Bq/m³. It was found that in 23 rooms out of 223 surveyed in 17 buildings the RVA values exceeded the national reference level. In 7 rooms in 6 buildings the RVA was above 500 Bq/m³.

- **Silistra district** - Radon measurement in kindergartens was conducted in 2015. The average RVA of the measured rooms was 139 Bq/m³. It was found that in 18 rooms out of 188 in 8 buildings surveyed the RVA values exceeded the national reference level and only in 1 room the RVA was above 500 Bq/m³.

In buildings where values above the reference level of 300 Bq/m³ and especially above 500 Bq/m³ are found, measures to reduce the levels of RVA need to be implemented. The measurements carried out indicate that remedial measures should be implemented in 40% of the school buildings surveyed and in 19% of the kindergarten buildings, or approximately 27% of the school and kindergarten buildings in the surveyed areas, as children and staff are chronically exposed. Prior to implementing measures to reduce radon levels, additional direct measurements should be conducted to determine appropriate remedial actions as well as to analyze RVA variations during work hours. Childcare and school managers are informed of the measured RVA values.

In order to promote the adoption of measures to reduce radon levels, the National Plan provides detectors to verify the effectiveness of the measures implemented.

The measurement of buildings with public access, such as schools and kindergartens, should continue during the period of the National Action Plan for the Reduction of Radon Exposure 2023-2027, but it is also necessary to conduct information campaigns, training seminars for building professionals to prescribe corrective measures to reduce radon exposure in them.

JOB STUDIES

Exposure to radon in buildings is an important part of the total exposure from natural sources of ionising radiation to the general public and to workers, especially in certain geographical areas or specific types of workplaces. Radon is a cause of lung cancer, for this a number of international organizations, such as ICRP Recommendation 103/2007 No; WHO (Handbook, 2009) IAEA (Basic Safety Standards - BSS, GRS part 3, 2014) have recommended the inclusion of radon exposure in the workplace in the radiation protection system. The International Commission on Radiological Protection recommends a specific tiered approach for the control of radon exposure in workplaces with the following steps: (I) optimize protection using the reference level for all buildings and workplaces (up to 300 Bq/m³); (II) optimize protection using the actual parameters of the exposure conditions, such as occupancy factor, etc.; (III) application of the relevant requirements for occupational exposure when, despite all efforts to reduce the volume activity of radon, the exposure remains above the reference level.

Council Directive 2013/59/Euratom of 5 December 2013 laying down basic safety standards for protection against the dangers arising from exposure to ionising radiation and repealing Directives 89/618/Euratom, 90/641/Euratom, 96/29/Euratom, 97/43/Euratom and 2003/122/Euratom - introduced binding legal requirements to ensure adequate protection of the public against the risk arising from exposure to radon throughout the European Union. Member States are required to establish national action plans to address the long-term risks of radon exposure in dwellings, public buildings and workplaces. Implementing the specific provisions of the Radon in the Workplace Directive presents a challenge for both radiation protection professionals and the wider occupational safety and health community.

In implementation of the National Action Plan 2018 - 2022, a Procedure for Conducting Job Surveys - Version 1/2019 has been prepared. The Appendix identifies the types of workplaces and public access buildings (Draft List) where the RVA is likely to be above the reference level and measurements are required. The draft list is based on the experience of other European countries and pilot studies are being carried out to confirm the workplaces included in the list. The radiological assessment of radon measurement results in dwellings is not automatically applicable to workplaces due to the different use, construction conditions, exposure times, heating and ventilation conditions, additional aerosol sources, aerosol parameters, chemical substances, etc. RVA measurements at workplaces pose more challenges compared to residential surveys. For example, some buildings have ventilation and heating systems that operate only during occupied hours; therefore, when assessing exposure in these buildings, the influence of this factor on RVA values must be considered.

In 2019, a Pilot Job Study was also organized in 24 buildings of 13 affiliates of Specialized Hospitals for Rehabilitation - National Complex and in one spa center. In the course of the survey, the exposure of staff was assessed, the organization for conducting RVA surveys in spa (med-spa) centres and spas and streamline the procedure for conducting RVA workplace surveys. Based on the results of the passive measurements, the direct measurements performed and the analysis of the results confirmed the key role of the ventilation systems and its mode of operation on the RVA in the rooms.

The analysis of RVA data in mineral water and in the air in treatment rooms demonstrates the relationship of radon levels in air to those in water, confirming the need to conduct controls in

spa workplaces when radon concentrations in water are higher. In workplaces where mineral water with high radon concentrations is used, radon monitoring should be carried out to limit the exposure of workers.

Ensuring healthy and safe working conditions in workplaces is the employer's obligation under European and Bulgarian legislation, however, in order to optimise control, pilot studies need to be continued to confirm the identification of workplaces on the draft list. In addition, training of occupational health professionals should be envisaged, as well as the organisation of employer information campaigns in areas where high radon levels are likely to be detected and for specific workplaces.

4. Communication strategy

Health risk communication as a factor in educating and cultivating healthy lifestyles has long been identified in the arsenal of preventive medicine and health promotion programs. The mission of the radon communication strategy is to inform the population about the harmful factor, how to measure and reduce RVA in buildings to improve indoor air quality. To date, the following main approaches have been used to implement it:

- *Creation and maintenance of the programme website.*

The National Programme's public website, <http://www.radon.bg/>, has been revamped to keep up with new trends in communication. The requirement was to meet a diverse target audience - members of the public, construction professionals, occupational health professionals, employers, print and electronic media. The site has a combination of static and dynamically generated content. The static pages include material presenting the programme; reports and results; popular science material; links to scientific publications; national programme participants and contacts.

- *Information campaigns and materials*

In the course of the implementation of the plan, as part of the developed communication strategy, different target groups were identified with their respective specificities, priorities and functions. In this context, different approaches were applied to provide information on the harmful effects of high radon levels, how to conduct measurements and implement mitigation measures. Alongside the already proven method of providing information through printed material (brochure and booklet), which are distributed to each participant in the measurements, new methods of communication with the target groups were also introduced in the process of implementing the tasks of the National Plan. The experience gained during the implementation of the first National Programme proved the effect of the direct contact of the programme implementers with the audience. This provided an opportunity for questions and feedback.

In 2019, information days were organized at the workshops for the distribution of detectors at the survey to schools and kindergartens in six regional cities of the country: Pernik, Kardzhali, Varna, Vratsa, Montana and Lovech, and information was provided to approximately **400 education workers**.

Participation in the “Spring Festival of Science” in Sofia - according to the organizers, was attended by approximately 5000 people. During the festival days, there was increased interest in the National Action Plan to reduce the risk of radon exposure. Experts from the NCRRP

provided face-to-face information to anyone interested. The organisers of the forum gave us the opportunity to give a presentation on “Radon the silent roommate”, which aimed to inform visitors what radon is; the risk of exposure; how to measure it; and mitigation measures.

During the declared national epidemic emergency, these campaigns were suspended, but should be renewed because they are effective and contribute to a better understanding of the problem.

European Radon Day - The European Radon Association (ERA) has designated 7 November (the birthday of two-time Nobel Prize winner Marie Curie), as European Radon Day. The aim is to inform EU citizens about the health risks of radon exposure. The promotion aims to support national and regional plans in individual Member States to tackle the problem of reducing radon levels in buildings. Each year a different theme is chosen and graphic material and brochures are produced in different languages.

These materials are disseminated, along with the National Plan brochures and leaflets, and published on the Plan's website, including the websites of the RHIs and the NCRRP. The European Radon Day materials are published annually on the “National Radon Strategy” Facebook page (http://www.ncrrp.org/new/bg/Europeyski_den_na_radon-p1748). For example, in 2020 the motto of the European Radon Day was “Radon and Indoor Air Quality” (Figure 5). Roll-up banners were also produced to promote the activities of the National Plan (Figure 6), which will be used in meetings with different target groups.

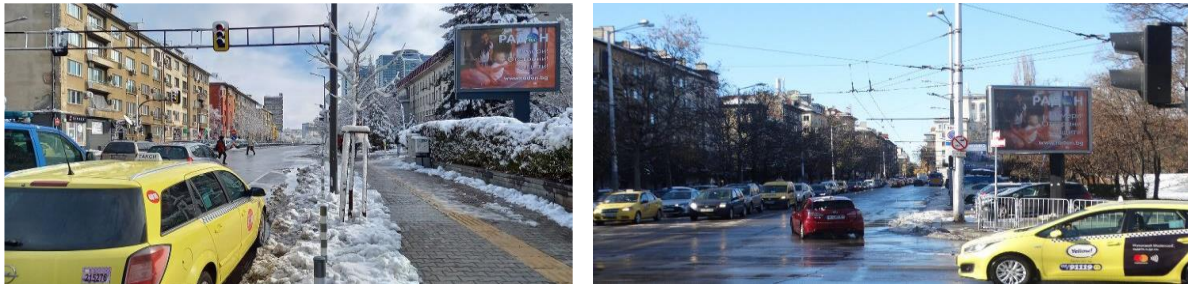


Figure 5. European Radon Day poster



Figure 6. Roll - banner

In 2021, the use of other information channels to inform the public was introduced - outdoor advertising placed on billboards in Sofia. The billboards were placed in four different locations in the capital for a period of two weeks in December 2021, the months of March and May 2022 (Figures 7 and 8).



Figures 7 and 8. Billboards in Sofia

- *Analysis of the effectiveness of the communication strategy*

During the implementation of the National Plan 2018-2022, a series of surveys on public opinion and the attitudes of target groups were conducted to improve the communication strategy.

A survey of some 880 visitors to the Spring Science Festival in Sofia showed that 70% of all face-to-face participants knew what radon was, but a relatively small percentage of people who had “heard of radon” identified it as a cause of lung cancer. The percentage of respondents who had more knowledge about the source and potential effects increased with increasing educational level and was related to occupation. Slightly more than half of those who know that radon is harmful tend to test their home.

The in-depth survey of homes in the Sliven district sought to answer the question “implementation of prescribed protection measures” when high radon levels were detected. Of the 637 occupants of the surveyed dwellings, 51% responded that they would implement the prescribed measures “necessarily and urgently”, 9% considered it “with high urgency” and only 2% “with low urgency” (Figure 9). The reason for the high percentage of residents of Sliven district who considered that the implementation of the protection measures should be carried out either obligatorily and urgently or with high urgency is most likely due to the fact that the information campaigns in the settlements were carried out by people who have authority among the local population, whom the residents of the measured dwellings trust.

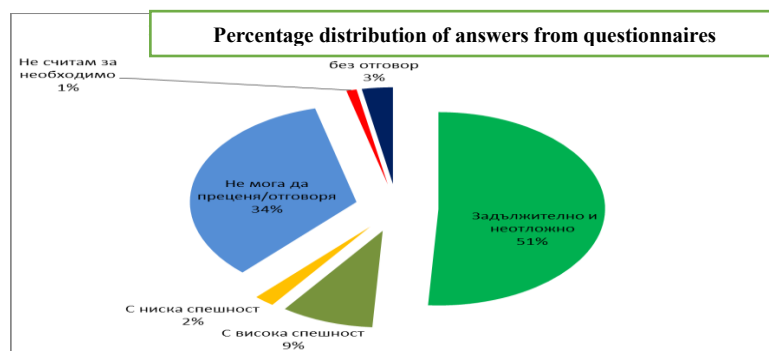


Figure 9. Percentage distribution of responses for the implementation of the prescribed protection measures participants in the detailed survey of the RVA in Sliven district

Legend:

1. **Red** - I don't think it's necessary 1%
2. **Dark blue** – No answer 3%
3. **Light blue** - I can't judge / answer 34%
4. **Yellow** - Low urgency 2%
5. **Green** – High urgency 9%
6. **Dark green** - Mandatory and urgent 51%

In 2020, a representative online survey of the population's awareness of radon as a health risk factor was launched under Project STEAM (Share, Team-up, Engage, Analyze, Monitor), which is being conducted simultaneously in 28 European countries. The questions in the survey are identical and have been adapted for each country. The survey includes questions related to the general health status of the Bulgarian population, awareness of radon and perception of its risks. The aim of the survey is to provide information, to help develop measures to reduce the burden of health risks in general and radon in particular. Some of the results obtained are:

- In spite of the information campaigns about the risk of radon, it is still not a recognizable factor in the minds of Bulgarian citizens. The main factors that threaten the health of Bulgarians, spontaneously identified in the survey, are: stress; unhealthy food and nutrition; smoking and polluted air.
- General awareness of radon and its risks is very low among the adult Bulgarian population: 77% of the population admits to knowing nothing or very little about radon; 78% of the population knows nothing or very little about health risks. People aged 65 and over are the most informed.
- Most people would not test their home for radon, but would take action in the event of high radon levels in their home.
- The internet, followed by social media, are the main sources of information on health risks. Friends and family, personal doctor and television are other important sources of information for the population.

The surveys of public opinion and the attitudes of the target groups have led to the following conclusions, which should inform the development of the tasks of the new five-year plan:

The 'information and education' strand of the communication strategy should be continued, taking every opportunity to explain the health risks of radon exposure and emphasising face-to-face meetings.

The use of the internet, social media and television as a source of information should be expanded and a system for interactive access to information (question and answer facility) should be developed. A positive change is the trust declared in the personal physician, but we need to work on recognition and trust in the structures of the Ministry of Health responsible for public health.

5. Technical rules and norms for design and reconstruction of buildings

In 2019, Regulation No. RD-02-20-1 of 2019 on the technical requirements for buildings for protection against radon was issued (pronounced, SG No. 33 of 2019). The requirements of the ordinance apply to the implementation of building measures for radon protection of new

buildings, as well as to major renovation, reconstruction, renovation, major repair or conversion, for which a building permit is required, of existing buildings and facilities.

In the training of the Masters in the specialty “Thermal Engineering” at the Technical University - Sofia is included the topic of the technical norms in the design and reconstruction of buildings for protection from radon.

III. RESULTS ACHIEVED

A key element in the implementation of the objectives of the Strategy and the National Plan is the participation of state, municipal and non-governmental organizations, as well as the community at large. It should be noted that over the past five years, a consensus has been reached among institutions on the need to pursue an active policy to reduce radon levels in residential and public buildings. The executive and local authorities, the health and education systems, NGOs, national and local media have been actively **involved and directly involved**. There is **political will** on the part of Parliament, Government, local authorities and civil society to implement the plan.

On the basis of the concrete results set out in the Strategy and its Action Plans, the following achievements can be identified for the period 2018 - 2022:

1. Comprehensive harmonisation of legislation in the field of radiation protection and construction with the requirements of European directives and IAEA and WHO recommendations.

Evidence is provided by the review of the implementation of the Euratom Directive 2013/59 carried out in 2020 by the European Commission; the IAEA Regional Project RER 9157 report on the “Achievements of the Regional Project and the Development and Implementation of National Radon Action Plans” (2022), in which the implementation of the set tasks according to the set algorithm for Bulgaria is 90-100%.

2. Conducting national surveys of radon levels in Bulgaria.

During the past period 4 districts have been fully surveyed. All schools and kindergartens in 9 districts were surveyed. Workplace surveys have been initiated and a Workplace Survey Procedure has been developed and adopted, analysing likely business activities where radon exposure risk to workers is likely to occur.

3. Implement anti-radon measures in at least 5% of public buildings where concentrations above 300 Bq/m³ have been detected.

4. Continuously increase the number of measurements in order to produce a radon map with appropriate statistical reliability.

Maps of the surveyed areas are being prepared in phases by district for use at the regional level. Detailed maps of approximately 15% of the districts have been prepared on a 5x5 km basis, and the data from the detailed surveys have been systematized by municipality. It should be borne in mind that the pandemic of Covid 19, has greatly affected the ability to conduct surveys, due to the limited opportunity for close contact and travel.

5. At least 30% of the construction experts involved in the issue should have knowledge of the application of technical requirements for radon protection in the construction of new buildings and the reconstruction of old ones.

6. Achieve media coverage reaching 30% of the Bulgarian population.

The coverage achieved needs to be expanded and the awareness-raising campaigns need to be continued by including additional communication channels.

7. At least 10% of the occupational health services and inspectors from the territorial structures of the EA GLI to be trained in the assessment of the risk of radon exposure at workplaces in the sense of the Regulation on radiation protection.

Due to the epidemiological situation, the activities were postponed until the next stage.

IV. OBJECTIVES AND PRIORITIES

Strategic objective

Reducing the collective and individual risk to the Bulgarian population from radon exposure in buildings by implementing a long-term policy to provide a stable legal and institutional framework and support the implementation of measures to reduce radon exposure.

In order to achieve the strategic objective of reducing radon exposure, the following operational objectives and priorities have been set for the systematic and phased implementation of activities:

1. Conduct an integrated and systematic national policy aimed at reducing radon exposure to prevent health risks.

1.1. Analysis of the implementation of harmonised legislation in the field of radiation protection, building standards and working conditions.

2. Establish a framework for the management and implementation of national action plans with a clear structure, priorities, responsibilities, and consistent steps, for the long-term reduction of radon exposure.

2.1. Creation by Order of the Minister of Health of a National Coordinating Council with the participation of all interested departments (MH, MRDPW, MLSP, MES, NCRRP, NRA, EEA, representatives of CAB, CEID, CBB, etc.) having responsibilities for the implementation of the policy on reducing radon exposure and establishing rules for its operation.

2.2. Establishment by order of the Director of the Regional Health Inspectorate of regional coordinating councils for the management and coordination of activities for the implementation of the policy on radon exposure reduction at regional level, including all stakeholders (territorial administrative structures of the MH, MRDPW, MOEW, MES, and EA GLI; representatives of the regional and municipal administrations; representatives of the territorial structures of the CAB, CEID, CBB, etc.), designating a regional coordinator and rules for the work of the council.

2.3. Apply adequate methods for periodic evaluation of the effectiveness of the National Action Plans including: performance evaluation; cost-effectiveness analysis and, where necessary, updating of the evaluation criteria.

3. *Collect and systematize information on radon exposure in residential, public buildings and workplaces by conducting national surveys and other systematic measurements.*

3.1. Development of a methodology for the development and maintenance of the national database for radon activity measurements. Improve and keep up-to-date the data by expanding the systematised database of measurements.

3.2. Use specific indicators to identify areas with potentially high radon concentrations based on existing maps, databases or information systems.

3.3. Organizing and conducting national surveys (measurements) of radon activity in buildings with emphasis on measurements conducted in homes, public buildings, etc.

3.4. Conduct radon surveys at workplaces where levels of volumetric radon activity are likely to be high.

3.5. Studies of radon in soil gas, soil gas permeability, radon in water, building products that can affect the volumetric activity of radon in buildings, etc.

3.6. Studies assessing the incidence of radon in an area and their ability to be used as a guide for subsequent analysis of the results of implementing radon volume reduction programs.

4. *Effective implementation of the requirements of Regulation No. RD-02-20-1 of 2019 on the technical requirements for buildings for protection against radon (promulgated, SG No. 33 of 2019).*

4.1. Training of designers and builders.

4.2. Establishing a system to provide detectors to evaluate the effectiveness of corrective actions to reduce radon concentration

5. *Improve public awareness of the health risks of radon and the opportunities for mitigation.*

5.1. Implementation of key messages of the communication strategy aimed at different target groups.

5.2. Inform stakeholders and develop appropriate communication channels for each of them

5.3. Form and train communication teams.

5.4. Planning national and regional communication programmes.

5.5. Evaluation of the achievements of the implemented communication strategy.

6. *Establish a system for monitoring radon concentrations in public buildings and workplaces.*

6.1. Assessment of workplaces according to their specificity (where a control system is necessary; places with likely high values of radon activity where the population also has access; public buildings, etc.), based on actual measurements.

6.2. Maintain a register of activities where radon exposure in workplaces cannot be ignored from a radiation protection perspective.

V. EXPECTED RESULTS

At the end of 2027 it should be expected:

- Comprehensive *analysis of the implementation of harmonised legislation in the field of radiation protection, building standards and working conditions and drafting of amendments to regulations where necessary;*
- Organise and conduct national surveys (measurements) of radon levels in residential buildings by district - 5 new districts;
- Organizing and conducting national surveys (measurements) of RVA in nurseries and kindergartens by districts - 4 new districts
- Organizing and conducting national surveys (measurements) of RVA in schools by district - 4 new districts
- Identification of workplaces from the draft list where radon concentrations are likely to be high - conduct 2 surveys
- Organizing and conducting studies (measurements) of RVA in soil gas and soil gas permeability - in 2 districts
- At least 20% of construction experts to have knowledge of the application of technical radon restrictions in the construction of new buildings and the remediation of old once;
- Achieve media coverage reaching 30% of the Bulgarian population;
- At least 10% of occupational health services and inspectors from the EA GLI to be trained in relation to the introduction of radon measurement as a factor of the working environment

IV. WORK PROGRAMME (WORK PLAN)

On the basis of the priorities, a work programme/work plan (Annex 1) has been developed, covering recommended objectives, priorities, activities, with the responsible institutions and a timeframe, as well as a financial estimate presented in Annex No. 2, to this Plan.

WORK PROGRAMME (WORK PLAN)

No.	Objective/Priority/Action	Responsible institutions	Period of implementation	Target groups/Beneficiaries	Results/ Indicators
1.	<i>Conduct an integrated and systematic national policy aimed at reducing radon exposure to prevent health risks.</i>				
1.1	<i>Analysis of the implementation of harmonised legislation in the field of radiation protection, building standards and working conditions.</i>	all departments involved in the plan	2023-2027	Citizens/population as a whole	Statutory instruments adopted and amending and supplementing instruments normative acts where necessary
2.	<i>Establish a framework for the management and implementation of national action plans with a clear structure, priorities, responsibilities, and consistent steps, for the long-term reduction of radon exposure.</i>				
2.1	<i>Establishment by order of the Minister of Health at A National Coordination Council with the participation of all concerned agencies (MH, MRDPW, MLSP, MES, NCRRP, NRA, EEA, representatives of the CAB, CEID, CBB, etc.) with responsibilities for the implementation of the radon mitigation policy and the approval of its rules of procedure.</i>	MH, concerned departments involved in the plan	Permanent	Construction specialists; Specialists in occupational medicine; Specialists in the field of education; Medical professionals	Order to establish the NCC and approved rules for its activity
2.2	<i>Establishment by order of the director of RHI of regional coordination councils for management and coordination of activities for the implementation of the policy on reducing radon radiation at the</i>	Territorial administrative structures (of the MH, MRDPW, MOEW), EA GLI,	current	Construction specialists; Specialists in occupational medicine; Specialists	Orders of the directors of RHI for the establishment of RCC and designation of

	<i>regional level, including all interested parties (the territorial administrative structures of the MH, MRDPW, MOEW, MES and EA GLI , representatives of the regional and municipal administrations, representatives of the territorial structures of CAB, CEID, CBB, etc.), by determining a regional coordinator and regulations for the work of the council</i>	regional and municipal administrations, branch organizations, etc.		in the field of education; Medical professionals	regional coordinators
2.3	<i>Implement adequate methods for periodic evaluation of the effectiveness of the National Action Plans including: performance evaluation; cost-effectiveness analysis and, where appropriate</i>				
2.3.1	Evaluation of the implementation of the national plan activities at national and regional level	NCC and RCC	2023-2027	Construction specialists; Specialists in occupational medicine; Specialists in the field of education; Medical professionals	Report
2.3.2	Evaluation and update at rules for monitoring and implementation	NCC and RCC	2023-2027	Construction specialists; Specialists in occupational medicine; Specialists in the field of education; Medical professionals	Report
2.3.3	Implementation of a system for coordination, monitoring and control of the implementation of the national plan at national and regional level (district councils)	NCC and RCC MH and NCRRP	2023-2027	Construction specialists; Specialists in occupational medicine; Specialists	monitoring and control rules

				in the field of education; Medical professionals	
2.3.4	Reporting, feedback and monitoring of the implementation of activities funded - organisational and methodological and advisory assistance	NCC and RCC MH and NCRRP	current	Participants in the national plan	Financial order of accounting of activities
3	<i>Collect and systematize information on radon exposure in residential and public buildings and workplaces by conducting national surveys and other systematic measurements</i>				
3.1	<i>Establish a methodology for the development and maintenance of the national database for radon concentration measurements. Improve and keep up-to-date the data by expanding the systematised measurement database.</i>				
3.1.1	Establish and maintain a National Measurement Database	NCRRP	2023-2027	Citizens / general population; Construction professionals; Specialists in occupational medicine	Publication of data on the plan's website
3.1.2	Improving and keeping up-to-date the national database of RVA measurements, by expanding the systematized database of measurements	NCRRP	2023-2027	Citizens / general population; Construction professionals; Specialists in occupational medicine	Keeping data up-to-date. Number of newly entered data
3.2	<i>Using specific indicators to identify areas with potentially high radon concentrations based on existing maps, databases or information systems</i>				
3.2.1	Analysis to use specific indicators to identify areas with potentially high radon activities.	all departments involved in the plan	2026-2027	Citizens / general population; Construction professionals; Specialists in	Report

				occupational medicine	
3.3	<i>Organizing and conducting national surveys (measurements) of RVA in buildings with emphasis on measurements conducted in homes, public buildings, etc.</i>				
3.3.1	Organisation and conduct of national surveys (measurements) of radon levels in residential buildings by districts	NCRRP, RHI, MH and NCC	2023-2027	Citizens/population as overall	Number of measurements performed
3.3.2	Training of persons who will participate in the organisation and conduct of the survey	NCRRP, MH and NCC	2023-2027	PHI, regional and municipal administration, construction specialists	Trained specialists
3.3.3	Organizing and conducting national surveys (measurements) of OAP in nurseries and kindergartens by districts	NCRRP, RHI, Municipalities, MH and NCC	2023-2027	PHI, regional and municipal administration, construction specialists; Medical Specialists	Number of measurements performed
3.3.4	Organization and conduct of national surveys (measurements) of RVA in schools by districts	NCRRP, RHI, interested departments participating in the plan, municipalities, MH and NCC	2023-2027	Citizens/ general population; Construction specialists; Medical professionals; Specialists in the field of education	Number of measurements performed
3.3.5	Organizing and conducting national surveys (measurements) of RVA in health facilities by districts	NCRRP and RHI, interested departments participating in the plan, municipalities and NCC	2023-2027	Citizens/ general population; Construction specialists; Medical professionals; Employers	Number of measurements performed
3.4	<i>Conduct radon surveys in workplaces where RVA levels are likely to be high</i>				

3.4.1	Identification of workplaces from the draft list where radon concentrations are likely to have high values	NCRRP, interested departments participating in the plan	2023-2027	employers and workers; Specialists in occupational medicine and EA GLI	Number of jobs identified
3.4.2	Organization and conduct of RVA survey in underground sites where there are designated workplaces, as well as workplaces where RVA is likely to have high values	NCRRP, interested departments participating in the plan	2023-2027	employers and workers; Specialists in occupational medicine and EA GLI	Number of measurements performed
3.5	<i>Studies of radon in soil gas, soil gas permeability, radon in water, building products that can affect the volumetric activity of radon in buildings, etc.</i>				
3.5.1	Organization and conduct of studies (measurements) of RVA in soil gas and soil gas permeability	NCRRP, interested departments participating in the plan	2023-2027	Citizens/ general population; Construction specialists	Number of measurements performed
3.6	<i>Studies to assess the incidence of disease in an area and their ability to be used as a guide for follow-up analysis of the results of radon mitigation programmes</i>				
3.6.1	Methods for conducting studies and defining criteria for subsequent analysis of the results of radon mitigation programmes	MH and interested and agencies, participating in the plan	2023-2027	Citizens/ general population	methodology
3.6.2	Conducting the survey	MH, NCC	2026-2027	Citizens/ general population	Data
3.6.3	Analysis of results	NCC and all departments involved in the plan	2027	Citizens/ general population	Report
4	<i>Effective implementation of the requirements of Regulation No. RD-02-20-1 of 2019 on the technical requirements for buildings for protection against radon (promulgated, SG No. 33 of 2019).</i>				
4.1	Organizing and conducting training of designers и builders. Preparing of lecture material	Branch organisations and NCC	2023-2024	Construction professionals;	Training materials prepared
4.2	<i>Establishing a system to provide detectors to evaluate the effectiveness of corrective actions to reduce radon concentration</i>				

4.2.1	Organizing and conducting an RVA survey in buildings where remedial measures have been conducted to reduce the volumetric radon activity	NCRRP, RHI, concerned departments involved in the plan	2023-2027	Citizens / general population	Number of measurements performed
4.2.2	Analysis of corrective measures carried out in buildings	MRDPW	2026-2027	Citizens/ general population; Construction specialists	Report
5	<i>Improving public awareness of the health risk of radon and the possibilities for its reduction.</i>				
5.1	<i>Implementation of key messages of the communication strategy aimed at different target groups.</i>				
5.1.1	Printing and distribution of information materials	concerned departments involved in the plan	2023-2027	Citizens / general population	Prepared and distributed informational materials
5.2	<i>Inform stakeholders and develop appropriate communication channels for each of them</i>				
5.2.1	Updating and maintaining a website	MH and NCRRP	2023-2027	Citizens / general population	website
5.2.2	Development and distribution of various audio and video recordings	concerned departments involved in the plan	2023-2027	Citizens / general population	Number of materials developed and distributed
5.2.3	Conducting public communication in the Internet space	concerned departments involved in the plan	2023-2027	Citizens / general population	Number of ad posts
5.2.4	Conducting public communication on radio and television	concerned departments involved in the plan	2023-2027	Citizens / general population	Number of interviews
5.3	<i>Form and train communication teams.</i>				
5.3.1	Creation and training of participatory communication teams and journalists	concerned departments involved in the plan, MH and NCRRP	2023-2027	Specialists, participants in the plan Print and electronic media	Trained specialists

5.4	<i>Planning national and regional communication programmes</i>				
5.4.1	Implementation of information days at the national level	NCC, NCRRP, RHI	2023-2027	Citizens / general population	Number of information days
5.4.2	Implementation of information days at the district level	NCRRP, RCC, RHI	2023-2027	Citizens / general population	Number of information days
5.5	<i>Evaluation of the achievements of the implemented communication strategy.</i>				
5.5.1	Development of criteria for evaluation of communication strategy	NCC and NCRRP	2023-2027	Citizens / general population	A report containing criteria for evaluating the communication strategy
5.5.2	Conducting a survey on the level of awareness of the population (at the end)	MH and NCRRP	2026-2027	Citizens / general population	A study report
5.5.3	Analysis of the survey results with recommendations for improving the communication strategy	MH and NCRRP	2026-2027	Citizens / general population	A report containing an analysis of the survey results with recommendations for improving the communication strategy
6	<i>Establishment of a monitoring system for radon concentration in public buildings and workplaces</i>				
6.1	<i>Assessment of workplaces according to their specifics (where it is necessary to create a control system; places with probable high values of radon concentration, where the population also has access; public buildings that can be treated as dwellings, i.e. the reference concentration should be 300 Bq/m³ and others) based on actual measurements</i>				
6.1.1	Training of occupational medicine specialists and inspectors from EA GLI	MH and NCRRP, NCC, RCC	2024-2027	employers occupational medicine specialists and EA GLI	Number of trained specialists
6.2	<i>Keeping a register of activities where radon exposure at workplaces cannot be ignored from the point of view of radiation protection</i>	NRA	constant	Citizens/ general population; employers and workers	Maintaining an up-to-date register

ANNEX 2

No.	Objective/Priority/Action	Expenditure by year in BGN				
		2023	2024	2025	2026	2027
1	Conduct an integrated and systematic national policy aimed at reducing radon exposure to prevent health risks.					
1.1	<i>Analysis of the application of the harmonized legislation in the field of radiation protection, building codes and working conditions</i>					
2	Establish a framework for the management and implementation of national action plans with a clear structure, priorities, responsibilities, and consistent steps, for the long-term reduction of radon exposure.					
2.1	<i>Creation, by order of the Minister of Health, of a National Coordination Council with the participation of all interested departments (MH, MRDPW, MLSP, MF, MES, NCRRP, NRA, EEA, representatives of CAB, CEID, CBB, etc.) having responsibilities for the implementation of the policy for reducing radon radiation and approving regulations for its work.</i>					
2.2	<i>Establishment by order of the director of RHI of regional coordination councils for management and coordination of activities for the implementation of the policy on reducing radon radiation at the regional level, including all interested parties (the territorial administrative structures of the MH, MRDPW, MOEW, MES and EA GLI, representatives of the regional and municipal administrations, representatives of the territorial structures of CAB, CEID, CBB, etc.), by determining a regional coordinator and regulations for the work of the council</i>					
2.3	<i>Implement adequate methods for periodic evaluation of the effectiveness of the National Action Plans including: performance evaluation; cost-effectiveness analysis; and in need to update the evaluation criteria.</i>					
2.3.1	Evaluation of the implementation of the activities under the national plan at the national and regional level	5000	5000	5000	5000	5000
2.3.2	Assessment and update of monitoring and implementation rules	5000	5000	5000	5000	5000
2.3.3	Implementation of a system for coordination, monitoring and control of the implementation of the national plan at the national and regional level (district councils)					
2.3.4	Reporting, feedback and control of the implementation of the activities that received funding - organizational-methodical and consulting assistance					

3	<i>Collecting and systematizing information on radon exposure in residential and public buildings and workplaces by conducting national surveys and other systematic measurements</i>					
3.1	<i>Preparation of a methodology for the development and maintenance of the national database for radon concentration measurements. Improving and keeping the data up-to-date by expanding the systematized database of measurements</i>					
3.1.1	Creation and maintenance of a National database of measurements	10000	10000	5000	5000	5000
3.1.2	Improving and keeping up-to-date the national database of RVA measurements, by expanding the systematized database of measurements	5000	5000	5000	5000	5000
3.2	<i>Using specific indicators to identify areas with potentially high radon concentrations based on existing maps, databases or information systems</i>					
3.2.1	Analysis for the use of specific indicators to identify areas with potentially high radon activities.	5000	5000	5000	5000	5000
3.3	<i>Organization and conduct of national surveys (measurements) of RVA in buildings with an emphasis on measurements conducted in residences, public buildings, etc.</i>					
3.3.1	Organization and conduct of national surveys (measurements) of radon levels in residential buildings by district	10000	10000	10000	10000	10000
3.3.2	Training of the persons who will participate in the organization and conduct of the survey	5000	5000	5000	5000	5000
3.3.3	Organization and conduct of national surveys (measurements) of RVA in nurseries and kindergartens by districts	50000	50000	50000	50000	50000
3.3.4	Organization and conduct of national surveys (measurements) of RVA in schools by districts	50000	50000	50000	50000	50000
3.3.5	Organization and conduct of national surveys (measurements) of RVA in medical facilities by districts	20000	20000	20000	20000	20000
3.4	<i>Conduct a radon survey in workplaces where RVA levels are likely to be high</i>					
3.4.1	Identification of workplaces from the draft list where radon concentration is likely to have high values	20000	20000	20000	20000	20000
3.4.2	Organization and conduct of RVA survey in underground sites where there are designated workplaces, as well as workplaces where RVA is likely to have high values	20000	20000	20000	20000	20000
3.5	<i>Studies of radon in soil gas, soil gas permeability, radon in water, building products that can affect the volume activity of radon in buildings, etc.</i>					

3.5.1	Organization and conduct of studies (measurements) of RVA in soil gas and soil gas permeability			50000	50000	50000
3.5.2	Organization and conduct of studies of the concentration of radon in mineral waters and waters intended for drinking and household purposes			10000	10000	10000
3.6	<i>Surveys to assess morbidity in a given area and their possibility to be used as a reference for subsequent analysis of the results of implementation of programs to reduce the concentration of radon</i>					
3.6.1	Methods for conducting studies and determining criteria for subsequent analysis of the results of implementation of programs to reduce radon concentration					
3.6.2	Conducting the survey					
3.6.3	Results analysis					
4	<i>Effective implementation of the requirements of Ordinance No. RD-02-20-1 of 2019 on the technical requirements for buildings for radon protection (promulgated, SG No. 33 of 2019)</i>					
4.1	<i>Training of designers and builders</i>					
4.1.1	Organizing and conducting training for designers and builders. Preparation of lecture material					
4.2	<i>Establishing a system to provide detectors to evaluate the effectiveness of corrective actions to reduce radon concentration</i>					
4.2.1	Organization and conduct of an RVA survey in buildings where corrective measures have been taken to reduce the volume activity of radon	20000	20000	20000	20000	20000
4.2.2	Analysis of implemented corrective measures in buildings					
5	<i>Improving public awareness of the health risk of radon and the possibilities for its reduction.</i>					
5.1	<i>Implementation of key messages of the communication strategy aimed at different target groups.</i>					
5.1.1	Printing and distribution of information materials	20000	20000	20000	20000	20000
5.2	<i>Informing stakeholders and developing appropriate communication channels for each of them</i>					
5.2.1	Updating and maintaining a website	10000	5000	5000	5000	5000
5.2.2	Development and distribution of various audio and video recordings	10000	10000	10000	10000	10000
5.3	<i>Formation and training of communication teams</i>					
5.3.1	Creation and training of participatory communication teams and journalists		5000	5000	5000	5000

5.4	<i>Planning national and regional communication programmes</i>					
5.4.1	Implementation of information days at the national level	30000	10000	10000	10000	10000
5.4.2	Implementation of information days at the district level		20000	20000	20000	20000
5.5	<i>Evaluation of the achievement of the implemented communication strategy</i>					
5.5.1	Development of criteria for evaluation of communication strategy	5000	5000	5000	5000	5000
5.5.2	Conducting a survey on the level of awareness of the population (at the end)				5000	5000
5.5.3	Analysis of the survey results with recommendations for improving the communication strategy					30000
6	<i>Creation of a system for monitoring the concentration of radon in public buildings and workplaces</i>					
6.1.	<i>Assessment of workplaces according to their specifics (where it is necessary to create a control system; places with probable high values of radon concentration, where the population also has access; public buildings that can be treated as dwellings, i.e. the reference concentration should be 300 Bq/m³ and others) based on actual measurements</i>					
6.1.1	Training of occupational medicine specialists and inspectors from EA GLI	10000	10000	5000	5000	5000
6.2	<i>Keeping a register of activities where radon exposure at workplaces cannot be ignored from the point of view of radiation protection</i>					
	TOTAL	400000	400000	450000	500000	530000