Radon in Educational Institutions. Part I: Obligations of Heads of Educational Institutions Towards Pupils under Article 23c (1–2) of Polish Atomic Law

Radon w jednostkach systemu oświaty. Część I: obowiązki kierowników jednostek systemu oświaty względem uczniów na gruncie art. 23c ust. 1-2 Prawa atomowego

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Abstract: The article presents an analysis of the obligations of educational institution directors arising from Article 23c(1) and (2) of the Atomic Law in the context of their appropriate application to pupils under Article 32a. The authors focus on the duty to ensure radon concentration measurements and the implementation of optimization and informational measures, highlighting their significance for protecting the health of children in educational institutions. The interpretation of the term ”pupil“ and the scope of recipients of information on radon-related risks are also discussed. The analysis underscores the importance of transparent communication regarding exposure data and the necessity of appropriately adapting protective mechanisms to the specific conditions of educational facilities.

Keywords: radon, Atomic Law, radiological protection, educational institutions, exposure information, radon concentration measurements, exposure optimization

***Streszczenie**: W artykule przedstawiono analizę obowiązków kierowników jednostek systemu oświaty wynikających z art. 23c ust. 1 i 2 Prawa atomowego w kontekście ich odpowiedniego stosowania do uczniów, zgodnie z art. 32a P.a. Autorzy koncentrują się na obowiązku zapewnienia pomiarów stężenia radonu oraz realizacji działań optymalizacyjnych i informacyjnych, wskazując na ich znaczenie dla ochrony zdrowia dzieci przebywających w jednostkach systemu oświaty. Omówiona zostaje również problematyka wykładni pojęcia ”ucznia” oraz zakresu adresatów informacji o zagrożeniu radonowym. Analiza podkreśla istotność transparentnego przekazywania danych o narażeniu oraz wskazuje na konieczność odpowiedniego dostosowania mechanizmów ochronnych do specyfiki placówek edukacyjnych.*

***Słowa kluczowe:** radon, Prawo atomowe, ochrona radiologiczna, jednostki systemu oświaty, informowanie o narażeniu, pomiary stężenia radonu, optymalizacja narażenia*

1. Introduction

Regulations concerning radon, a radioactive noble gas[1] and a natural source of ionizing radiation[2], were introduced into the Polish Atomic Law[3] (hereinafter referred to as A.L.) through its extensive amendment in 2019[4]. This amendment was a result of the transposition of Council Directive 2013/59/Euratom[5] (hereinafter referred to as the BSS Directive).

1 Skłodowska-Curie, M., 1926. Stan obecny chemji polonu [The Current State of Polonium Chemistry]. *Roczniki Chemii / Annals of Chemistry*, vol. 6, pp. 357–358.

2 Barbosa, S.M., Donner, R.V., Steinitz, G., 2015. Radon applications in geosciences – Progress & perspectives. *The European Physical Journal Special Topics*, nr 224, s. 597.

3 Act of 29 November 2000 – Atomic Law (Journal of Laws of 2024, item 1277, as amended).

4 Act of 13 June 2019 amending the Atomic Law and the Fire Protection Act (Journal of Laws, item 1593, as amended).

5 Council Directive 2013/59/Euratom of 5 December 2013 laying down basic safety standards for protection against the risks 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 (OJ L 2014 No. 13, p. 1, as amended).

Because of this change, terms such as ”radon exposure“ (Article 3, point 15a A.L.), ”reference level“ (Article 3, point 26a A.L.), and ”annual average radon concentration“ (Article 3, point 47a A.L.) became elements of Polish legal terminology. Provision of Article 23b A.L. establishes a norm setting the reference level for the annual average concentration of radioactive radon in indoor workplaces and indoor spaces intended for human occupancy at 300 Bq/m^3.

The newly introduced provisions of Article 23c A.L. establishes a range of obligations for unit managers concerning radon. In particular, the norm set out in Article 23c(1)(1) A.L. imposes on managers of units engaged in activities where workplaces are located indoors on the ground floor or basement level in areas where the annual average radioactive radon concentration in a significant number of buildings may exceed the reference level specified in Article 23b, the duty to ensure the measurement of radon concentration in these workplaces[6]. Such areas, hereinafter referred to as ”radon counties,“ were designated by the Regulation of the Minister of Health of 18 June 2020[7]. They encompass a total of 27 counties[8] (186 municipalities) inhabited by approximately 2 million people[9], collectively referred to as ”radon counties“. These areas were delineated independently of the actual geological structures[10]. Among the ”radon counties“, only two are former provincial capitals (Wałbrzych, Jelenia Góra). However, most of these areas consist of rural and semi-rural municipalities characterized by dispersed housing, with a significant proportion of single-story buildings, including those serving as offices or educational institutions[11].

However, Article 23c(2) A.L. imposes on unit managers a series of duties that can be classified as optimization and informational obligations. These include ensuring the optimization of employee exposure and providing them with ongoing written information, which encompasses not only the results of radon concentration measurements in the workplace, but the values of radiation doses received by employees. Notably, the latter requirement, which necessitates conducting a specific and highly complex calculation, appears to extend beyond the competency horizon of employers (unit managers)[12].

Failure to fulfill the obligations is subject to administrative financial penalties, as outlined in the extensive catalogue of Article 123(1) A.L., whereby both the manager of the organizational unit and the unit itself may be penalized. Regarding the provisions on radon introduced in 2019, penalties may apply to: failure to fulfill the obligation of dosimetric monitoring due to the lack of radon concentration measurement in the workplace (Article 123(1)(8) A.L.); failure to provide information on radiological protection by neglecting to inform employees as required by Article 23c(2) A.L. (Article 123(1)(9) A.L.). Each of these offenses is punishable by a financial penalty of up to 40,908.60 PLN[13] for the unit manager (Article 123(1), final clause A.L.). Additionally, the organizational unit conducting activities involving exposure may be subject to a financial penalty of up to 409,086 PLN (Article 123(1b) A.L.).

6 For the sake of clarification, we intentionally omit other structural elements of the norm in Article 23c(1) A.L. that are unrelated to the subject matter of this publication, such as the remaining enumerated workplaces (those underground and related to the treatment of groundwater) or the alternative measurement method involving the potential alpha energy concentration of short-lived radon decay products instead of direct radon concentration measurements. Therefore, any further references to ”workplaces“ in this discussion pertain exclusively to those specified in Article 23c(1)(1) A.L. – i.e., those located indoors on the ground floor or basement level.

7 Regulation of the Minister of Health of 18 June 2020 on areas where the average annual radioactive concentration of radon in indoor air in a significant number of buildings may exceed the reference level (Journal of Laws, item 1139).

8 A contiguous, latitudinally aligned area of 14 Sudeten counties in the Lower Silesian Voivodeship (Dzierżoniów County, Karkonosze County, the city with county rights Jelenia Góra, Kamienna Góra County, Kłodzko County, Lubań County, Lwówek Śląski County, Polkowice County, Trzebnica County, Wałbrzych County, the city with county rights Wałbrzych, Ząbkowice Śląskie County, Zgorzelec County, Złotoryja County); additionally, in the Lublin Voivodeship—Tomaszów County; in the Opole Voivodeship—Nysa County and Prudnik County; in the Subcarpathian Voivodeship—Bieszczady County, Jasło County, Krosno County, Lesko County, Mielec County, Sanok County; in the Silesian Voivodeship—Cieszyn County; and in the Świętokrzyskie Voivodeship—Kielce County, Opatów County, and Skarżysko County.

9 Central Statistical Office, 2024. *Administrative division of Poland*. https://stat.gov.pl/statystyka-regionalna/jednostki-terytorialne/podzial-administracyjny-polski/, [accessed: 22.01.2025].

10 Significant exceedances of permissible radon concentrations have also been identified in Poland outside the designated ”radon counties“, Kovler K., A. Tsapalov, R. Bobkier, R. Wiegers, W. Schroeyers, T. Kovács, E. Toth-Bodrogi, O. El Bounagui, A. Babczuk, 2025. Indoor radon and NORM in building materials: Critical analysis of the current European regulation and road map for the next decade. *Journal of Environmental Radioactivity*, No. 285, 107668.

11 Feltynowski, M., 2018. *Planowanie przestrzenne gmin wiejskich. Zastosowanie koncepcji polityki opartej na dowodach* [*Spatial planning of rural communes. Application of the Concept of Evidence-Based Politics*]. Publishing House of the University of Lódź, Łódź, p. 23.

12 The subsequent obligations of unit directors related to radon exposure are set forth in Articles 23c(3)-(6) A.L. However, these provisions will be the subject of a separate study.

13 The Atomic Law ties the amount of fines to a specific multiple of the average salary in the national economy for the calendar year preceding the offense, as announced by the President of the Central Statistical Office pursuant to Article 20(1)(a) of the Act of 17 December 1998, on Pensions and Disability Benefits from the Social Insurance Fund (consolidated text: Journal of Laws of 2024, item 1631). The average salary for 2024 amounted to 8,181.72 PLN, as stated in the Announcement of the President of the Central Statistical Office of 11 February 2025, on the average salary in the national economy in 2024 (Official Gazette of 2025, item 125). Thus, financial penalties imposed for offenses committed in subsequent years will have different statutory upper limits. To ensure clarity in the argumentation, we provide the specific amount resulting from the calculation.

Crucially, from the perspective of this publication, the 2019 amendment also revised Article 32a A.L., introducing a new wording: "The provisions of Articles 10, 11, 14, 17, 21, 22, 23c, 26, and 29–32 shall apply accordingly to pupils, students, and trainees".

This publication examines the implications of the revised Article 32a A.L. regarding radon from the perspective of educational system institutions. These consequences are particularly significant for the managers of such institutions (e.g., school principals), who find themselves in a unique situation. They are obligated to ensure radiological protection not only for employees (in the broad sense derived from the Atomic Law's own definition of this term in Article 3(29) A.L.) and external workers (Article 3(30) in conjunction with Article 29(1) A.L.) but also for pupils. However, while the Act provides its own *sui generis* definition of a trainee (Article 3(31) A.L.), decoding the meaning of the term "pupil" requires stepping beyond its terminological framework.

Undoubtedly, the inclusion of Article 23c A.L., concerning radon, in the catalogue of provisions of this Law that, as required by Article 32a, must be applied "accordingly" to pupils should be unequivocally assessed as positive, as it represents an extension of protection against radon exposure. Nevertheless, this positive assessment does not overshadow several uncertainties that arise during the exegesis of the Atomic Law's provisions. In this article, we attempt a sui generis review of the provisions of Article 23c(1) and (2) A.L. referred to in Article 32a A.L., each time considering the requirement of their "accordingly" adjusted application.

This issue warrants attention not only due to the number of educational institutions in the "radon counties" but also considering the health implications of prolonged radon exposure, which are particularly severe in the case of children.

In February 2025, the National Atomic Energy Agency published the handbook *Radon in Buildings*[14], in which a co-author of this article participated as a consultant. This handbook, likely representing the first comprehensive presentation of the issue in Polish literature, synthetically signaled the relationship between radon-related regulations and educational institutions[15]. The 2019 amendment to the Atomic Law has been the subject of only a few analyses in domestic legal literature[16]. However, the deficit in this literature is particularly evident in studies specifically addressing regulations concerning radon, as nearly all available publications in this field originate from the natural and technical sciences. Within these disciplines, numerous, often valuable, efforts have been made in Polish scholarship to assess these regulations[17]. This article represents an attempt to bridge this research gap.

2. Radon

Since the 1950s, radon has been recognized as a confirmed cause of lung cancer. This gas infiltrates buildings from the ground, accumulating due to the so-called stack effect—a mechanism in which gases are drawn from the ground into buildings because of pressure differences. Since 1988, radon has been classified as a first-class carcinogen, being the second leading cause of lung cancer worldwide, following exposure to tobacco smoke[18].

Given that most people spend up to 90% of their time indoors[19], where radon concentrations are always higher than in outdoor atmospheric air, radon constitutes the primary source of population exposure to ionizing radiation[20]. Research findings published in 2018, which estimated lung cancer mortality rates attributable to indoor radon exposure for individual countries, indicate that Poland ranks at the top of this undesirable list (with

14 Cf. Koszuk, Ł., 2025. *Radon in buildings*. National Atomic Energy Agency, Warsaw.

15 Ibid., pp. 67–68.

16 Cf. Mik, C., 2019. Ocena rządowego projektu nowelizacji ustawy – Prawo atomowe oraz ustawy o ochronie przeciwpożarowej [Assessment of the Government's Draft Amendment to the Atomic Law and the Fire Protection Act]. *Zeszyty Prawnicze Biura Analiz Sejmowych Kancelarii Sejmu / Legal Papers of the Bureau of Research of the Chancellery of the Sejm*, No. 2, pp. 90-111; Jokiel, M., Jokiel, G., Bobkier, R., Babczuk, A., 2023. The Impact of New Legal Regulations on The Functioning of Businesses Based on The Example of Atomic Law in Poland. *Communications of International Proceedings*, No. 6, https://ibimapublishing.com/p-articles/42MGT/2023/4246623/4246623.pdf, [accessed: 29.01.2025].

17 Cf. Olszewski, J., Walczak, K., 2020. Radon in houses of Kowary–Sudety Mountains, Poland. *Nukleonika*, No. 2, pp. 150–151; Mazur, J., Kozak, K., 2020. Nowe regulacje dotyczące stężeń radonu (Rn-222) w budynkach i miejscach pracy w zapisach znowelizowanej ustawy Prawo atomowe [New regulations on radon (Rn-222) concentrations in buildings and workplaces in the provisions of the amended Atomic Law]. *Inżynier i Fizyk Medyczny / Engineer and Medical Physicist*, No. 3, pp. 169–172; Wysocka, M., Skubacz, K., Chmielewska, I., Urban, P., Bonczyk, M., 2019. Radon migration in the area around the coal mine during closing process. *International Journal of Coal Geology*, No. 212, pp. 1–9; Podgórska, Z., 2022. Metody pomiaru radonu w powietrzu, glebie i wodzie [Methods of measuring radon in air, soil, and water]. *Bezpieczeństwo Jądrowe i Ochrona Radiologiczna. Biuletyn Informacyjny Państwowej Agencji Atomistyki / Nuclear Safety and Radiological Protection. Information Bulletin of the National Atomic Energy Agency*, No. 1, pp. 3–10.

18 Bobkier, R., 2024. Ewolucja badań i regulacji prawnych radonu do 1980 r. jako przykład gadamerowskiego „stapiania horyzontów". Wstęp do problematyki filozoficznego wymiaru prawa atomowego [Evolution of Research and Legal Regulations of Radon until 1980 as an Example of Gadamerian "Fusion of Horizons": A Introduction to the Philosophical Dimension of Atomic Law]. *Bezpieczeństwo Jądrowe i Ochrona Radiologiczna. Biuletyn Informacyjny Państwowej Agencji Atomistyki / Nuclear Safety and Radiological Protection. Information Bulletin of the National Atomic Energy Agency*, No. 4, pp. 37–56.

19 Cincinelli, A., Martellini, T., 2017. Indoor air quality and health. *International Journal of Environmental Research and Public Health*, No. 14, p. 1286.

20 Bobkier, R., Kovler, K., Tsapalov, A., 2025. "Fusion of Horizons": Part I. Historical context and early radon discoveries (until 1951). *Journal of Environmental Radioactivity*, No. 283, p. 1.

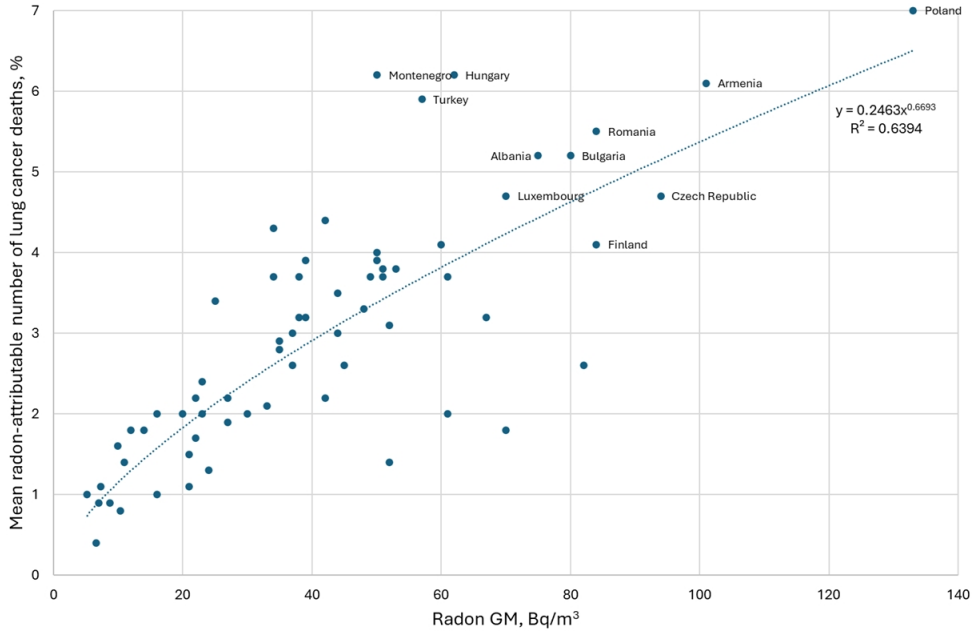

Fig. 1. Average number of lung cancer deaths attributable to radon (vertical axis, %) and average radon concentrations in buildings (horizontal axis, Bq/m^3), source: Bobkier, R., Kovler, K., Tsapalov, A., 2025. "Fusion of Horizons": Part I. Historical context and early radon discoveries (until 1951). *Journal of Environmental Radioactivity*, No. 283, p. 3.

Rys. 1. *Odsetek zgonów z powodu raka płuc przypisywanych radonowi (oś pionowa, %) i średnia stężenia radonu w budynkach (oś pozioma, Bq/m^3), źródło: R. Bobkier, K. Kovler, A. Tsapalov, "Fusion of Horizons": Part I. Historical context and early radon discoveries (until 1951), "Journal of Environmental Radioactivity" 2025, nr 283, s. 3.*

7% of lung cancer deaths attributed to radon), followed by Montenegro and Hungary (6.2%), Armenia (6.1%), Turkey (5.9%), Romania (5.5%), and Albania and Bulgaria (5.2%). The average indoor radon concentration in these countries ranges from 50 Bq/m^3 (Montenegro) to 133 Bq/m^3 (Poland)[21].

It is worth emphasizing that at radon concentrations exceeding 100 Bq/m^3, each additional 100 Bq/m^3 increases the risk of lung cancer by approximately 16%[22]. Therefore, the World Health Organization (WHO) recommends 100 Bq/m^3 as the permissible radon concentration in indoor spaces intended for human occupancy[23].

With the advancement of scientific research, the assessment of key factors influencing the degree of risk associated with radon exposure has also evolved.

For example, while in 1994 it was estimated that prolonged exposure to a radon concentration of 740 Bq/m^3 resulted in a lung cancer probability of 135 cases per 1,000 smokers and 8 cases per 1,000 non-smokers[24], by 2020, analyses indicated respective values of 260 for smokers and 36 for non-smokers[25]. Notably, the cited studies also provided analogous risk coefficients for lower radon concentrations. However, we have chosen to reference the 740 Bq/m^3 value due to its similarity to radon concentration measurements in Polish schools, which we will discuss further. It is important to highlight that in several domestic educational institutions, radon concentrations have been found to reach several thousand Bq/m^3. However, the American authors cited in the studies did not even calculate the probability of cancer development for such values, considering it unacceptable for children to remain in such exposure conditions. Notably, in 2019, state authorities in Arkansas, upon detecting radon concentrations exceeding 1,100 Bq/m^3 in some schools, decided to evacuate and demolish those buildings[26].

Similarly, over the years, estimations of the exposure period necessary for radon to cause harmful, carcinogenic health effects have evolved. In the 19th century, before the

21 Gaskin, J., Coyle, D., Whyte, J., Krewksi, D., 2018. Global Estimate of Lung Cancer Mortality Attributable to Residential Radon. *Environmental Health Perspectives*, No. 5, pp. 3–4.

22 Coretchi, L., Overcenco, A., Ababii, A., Capatina, A., Bîlba, V., Salaru, I., 2024. Contribution to the study of "smoking and radon" interaction in the lung cancer development across the Republic of Moldova. *One Health & Risk Management*, No. 1, p. 10.

23 Zeeb, H., Shannoun, F. (eds.), 2009. *WHO Handbook on Indoor Radon: A Public Health Perspective*. World Health Organization, Geneva, p. ix; cf. Pawel, D.J., Puskin, J.S., 2004. The U.S. Environmental Protection Agency's Assessment of Risks from Indoor Radon. *Health Physics*, No. 1, pp. 68–74.

24 Page, S., 1994. EPA's strategy to reduce risk of radon. [In:] *Radon. Prevalence, measurements, health risks and control*, ed. N.L. Nagda. American Society for Testing and Materials, Philadelphia, p. 137.

25 Field, R.W., 2020. Reducing the risks from radon: Information and interventions. A guide for health care providers. *Conference of Radiation Control Program Directors Publication*, No. 3, pp. 4, https://portal.ct.gov/-/media/DPH/Radon-Program/ HCProvGuide-Update-9-17-20.pdf, [accessed: 16.01.2025].

26 Arkansas Department of Health, 2019. *Lonoke Community Radon Exposure Investigation*, September 4, 2019, pp. 3–4, https://static1.squarespace.com/static/5ec3ec333d5e1123089fd333/t/624222f79ee7786534f8170d/1648501501549/AHD+Letter%2C+CO2+%26+Radon+Guide.pdf, [accessed: 24.01.2024].

discovery of ionizing radiation and radon, when only a correlation between working in mines and lung cancer incidence had been observed, it was estimated that the disease developed after an exposure period of 20 to 50 years. In the 1930s and 1940s, when radon exposure was already identified as the causative factor of cancer, the estimated exposure period was slightly over a decade[27]. In the 21st century, however, it has been proven that lung cancer can develop after only a few years of exposure to this radioactive gas[28]. It is evident that as scientific knowledge has advanced, the estimated exposure time necessary to induce harmful health effects has systematically decreased. This observation carries significant implications for risk assessment and regulatory policy, challenging the adequacy of existing safety standards and necessitating the continuous evaluation of permissible exposure limits in both work and educational environments.

Despite the evolution in the estimation of radon-related risks, one aspect remains unchanged in scholarly literature—the sensitivity of children to ionizing radiation. Their organisms, characterized by intense growth and cellular division processes, are significantly more susceptible to the effects of exposure, making the reduction of radon concentrations in educational environments a priority in public health policy.

3. The Impact of Radon on Children's Health

The effect of ionizing radiation on the human body depends not only on the dose[29], radiation type and intensity, and exposure duration but also on the biological characteristics of the individual subjected to this exposure[30].

In the context of Polish legal regulations, according to which the permissible ionizing radiation dose limit for children under the age of 16 is as much as twenty times lower than for occupationally exposed adults, it is essential to emphasize that developing children's organisms exhibit significantly greater sensitivity to the effects of this radiation[31]. The longer expected lifespan of a child increases the likelihood of adverse health effects manifesting, including cancers with prolonged carcinogenesis periods[32]. An additional risk factor is children's lifestyle, as in the climatic zone encompassing Poland, they spend a substantial amount of time indoors—on average, around 15 hours per day until the age of eight, and infants up to 20 hours daily[33]. This prolonged indoor stay increases children's exposure to radon, particularly since they breathe more rapidly than adults, leading to a higher intake of air and potentially greater absorption of harmful substances. Moreover, their respiratory system continues to develop until approximately the age of six, making it more vulnerable to damage caused by inhaled pollutants. As a result, the risk of lung cancer in children exposed to radon may be nearly twice as high as in adults for the same amount of inhaled gas[34]. These circumstances further underscore the necessity of prioritizing children's protection from ionizing radiation exposure in indoor environments.

4. Radon Concentrations in Educational Institutions (Case Study of the City with County Rights Jelenia Góra and Karkonosze County)

According to Article 23e(1) of the Atomic Law, introduced in 2019, the Chief Sanitary Inspector (GIS) was mandated to identify areas where radon concentrations in

27 Bobkier, R., Kovler, K., Tsapalov, A., "Fusion of Horizons": Part I..., op. cit.

28 Dobrzyńska, M.M., Gajowik A., Wieprzowski, K., 2023. Radon-occurrence and impact on the health. *Roczniki Państwowego Instytut Higieny / Annals of the National Institute of Hygiene*, No. 1, pp. 9–10; Rääf, C.L., Tondel, M., Isaksson, M., Wålinder, R., 2023. Average uranium bedrock concentration in Swedish municipalities predicts male lung cancer incidence rate when adjusted for smoking prevalence: Indication of a cumulative radon induced detriment. *Science of the Total Environment*, No. 855, pp. 3–5; R.W. Field, Reducing..., op. cit., p. 4.

29 Cf. Przybyszewski, W., Wideł, M., Szurko, A., Maniakowski, Z., 2008. Wpływ mocy dawki na komórkowe, biochemiczne i molekularne efekty promieniowania jonizującego [The influence of dose strength on the cellular, biochemical, and molecular effects of ionizing radiation]. *Postęp Higieny i Medycyny Doświadczalnej / Advances in Hygiene and Experimental Medicine*, No. 62, pp. 468–477.

30 Turczyńska, A., Kułak, P., Gościk, E., Krajewska-Kułak, E., 2016. Ochrona radiologiczna z punktu widzenia pacjentów Zakładu Radiologii Uniwersyteckiego Szpitala Klinicznego w Białymstoku [Radiological protection from the point of view of patients of the Department of Radiology of the University Clinical Hospital in Białystok]. *Pielęgniarstwo i Zdrowie Publiczne / Nursing and Public Health*, No. 1, p. 30.

31 Brody, A.S., Frush, D.P, Hunda, W., Brent, R.L., 2007. Radiation risk to children from computed tomography. *Pediatrics*, No. 3, p. 678.

32 Żelechowicz M., 2017. List do Redakcji dotyczący pracy pt. „Ochrona radiologiczna z punktu widzenia pacjentów Zakładu Radiologii Uniwersyteckiego Szpitala Klinicznego w Białymstoku [Letter to the Editor regarding the work entitled "Radiological protection from the point of view of patients of the Department of Radiology of the University Clinical Hospital in Białystok"]. *Pielęgniarstwo i Zdrowie Publiczne / Nursing and Public Health*, No. 1, p. 90.

33 Abdul-Wahab, S., Ikhile, E., Ahmadi, L., Elkamel, A., and Yetilmezsoy, K., 2016. Radon In The Indoor Environment-A Review. *Fresenius Environmental Bulletin*, No. 10, p. 4410. However, criticism must be directed at the Omani authors for their use of the term "Isreal" instead of "Israel", ibid., p. 4418. The derogatory term "*Isreal*" is an English wordplay derived from the question "*is real?*", implying that Israel is a non-existent, unreal state. Such a formulation bears clear hallmarks of antisemitism, Steinberg, G.M., 2023. The apartheid and racism campaigns—the NGO contribution to antisemitism. *Israel Affairs*, No. 1, p. 52. It is commonly used by authors from the Islamic cultural sphere to emphasize the claim that the territory of the State of Israel is allegedly an artificial entity within the surrounding Arab states, cf. Berkley, C., Ahmed, O., 1982. *Tayeb Salih Speaks: Four Interviews with the Sudanese Novelist*. Embassy of the Democratic Republic of the Sudan, Washington, p. 16.

34 Poku, B., Hussaini, S., 2021. Radon in child care centers: An examination of state laws and regulations in the United States. *GSC Advanced Research and Reviews*, No. 3, p. 6.

indoor air may exceed the established reference level in a significant number of buildings. In fulfilling this obligation, extensive radon concentration measurements were conducted in public utility buildings across Poland between 2020 and 2023 at the request of GIS[35]. Although the conducted studies are significant for assessing the risks associated with radon exposure, it must be regretfully noted that obtaining full access to the results of these measurements constitutes, to put it diplomatically, a specific challenge requiring particular determination.

As part of the public information access procedure, radon concentration measurement results from several institutions located in the city with county rights Jelenia Góra and Karkonosze County were obtained from the (GIS)[36]. Below, we present, in tabular form, the highest measurement recorded in each institution, adhering to the fundamental principle of pessimization in radiological protection. Epistemologically, this principle reflects the necessity of considering extreme values in risk assessment[37], as they define the boundary perspective of the threat and represent the potentially most adverse impact scenario[38]. This approach aligns with a broader risk prediction methodology, where precautionary heuristics dominate—every calculation must assume that reality may tend toward extremes rather than average values. Consequently, in assessing the risks associated with ionizing radiation exposure, maximum values are always used[39]. The adoption of this approach aims not only to determine the upper threshold of danger[40] but also to safeguard against errors arising from potential measurement uncertainties and the complex interactions between ionizing radiation and the human body. The following table includes only those institutions where radon concentrations exceed the reference level established in Article 23b A.L. by at least 150%. Before reviewing these data, it is essential to recall that this reference level is set at 300 Bq/m^3, while the WHO recommends an even lower value (100 Bq/m^3) as the permissible radon concentration in indoor spaces intended for human occupancy[41].

The average exceedance of the reference level from Article 23b A.L. (300 Bq/m^3) for the above-listed educational institutions is 311.33%. In 2025, a study on radon concentrations in Poland, conducted by the Nofer Institute of Occupational Medicine in Łódź, was published, confirming the conditions described above. The authors indicated that the highest percentage of measurements exceeding the reference level – up to 60% – was recorded in the Karkonosze County. Moreover, the highest measured radon concentration (2720 Bq/m^3) was registered in Jelenia Góra, while concentrations exceeding 1000 Bq/m^3 were also found in other locations within the Jelenia Góra Basin, including Podgórzyn and Szklarska Poręba[42].

The significant exceedances of permissible radon concentration levels observed in educational institutions within the analyzed area constitute a serious issue, both in terms of public health and legal implications, the detailed discussion of which falls beyond the scope of this publication. The scale of these exceedances necessitates a thorough analysis and the implementation of appropriate corrective measures by all entities responsible for ensuring the safe operation of educational facilities. Three key groups of entities must be particularly emphasized in this regard.

The first group consists of the heads of educational institutions (school and facility directors). Under Article 7(1b) A.L., they bear responsibility for ensuring radiological protection against radon exposure and hold personal, including financial, liability in this respect. The

35 Chief Sanitary Inspector, *Komunikat w sprawie kontynuacji w 2022 r. wykonywania, przez spółkę ACTE sp. z o.o. z siedzibą w Warszawie przy ul. Krańcowej 49, na zlecenie Głównego Inspektora Sanitarnego, pomiarów średniorocznego stężenia radonu w budynkach [Announcement on the continuation in 2022 of measurements of the average annual concentration of radon in buildings by ACTE sp. z o.o. with its registered office in Warsaw at 49 Krańcowa Street, at the request of the Chief Sanitary Inspector]*, 22 September 2022, https://www.gov.pl/web/gis/komunikat-w-sprawie-kontynuacji-w-2022-r -wykonywania-przez -spolke-acte-sp-z-oo-z-siedziba -w-warszawie -przy -ul-krancowej-49 -zlecenie-glownego-inspektora-sanitarnego -pomiarow-sredniorocznego -stezenia-radonu-w-budynkach, [accessed: 30.12.2024].

36 *Pismo Głównego Inspektora Sanitarnego z dnia 8 lipca 2024 r. – odpowiedź na wniosek o udostępnienie informacji publicznej [Letter of the Chief Sanitary Inspector of 8 July 2024 – response to the request for access to public information]*, BI. OI.0134.92.2024. The names and addresses of the institutions are provided in accordance with this letter.

37 Bielewski W., Fornalski, K.W., 2018. Obliczenia obszaru ograniczonego użytkowania wokół pierwszej polskiej elektrowni jądrowej [Calculations of the Limited Use Area Around the First Polish Nuclear Power Plant]. *Postępy Techniki Jądrowej / Advances in Nuclear Technology*, No. 2, p. 25.

38 Niewiadomski, T., Wąsiołek, P., Olszewska, M., Ryba, E., Godek, J., Waligorski, M., 1984. *Oszacowanie radiacyjnych skutków działalności człowieka dla mieszkańców woj. m. krakowskiego [Estimation of the radiative effects of human activity on the inhabitants of the Kraków Province]*. Institute of Nuclear Technology, Kraków, p. 13; Matuła, J., 1977. Ocena zasobów produktów rozszczepienia w paliwie jądrowych reaktorow energetycznych [Assessment of fission product resources in the fuel of nuclear power reactors]. *Biuletyn Informacyjny Instytutu Techniki Cieplnej Politechniki Warszawskiej / Information Bulletin of the Institute of Heat Engineering, Warsaw University of Technology*, No. 49, p. 8.

39 Tervinder, M.S., Oborska-Kumaszynska, D., Ratcliffe, A., 2013. Testy akceptacyjne i dopuszczające dla systemu PDR [Acceptance and acceptance tests for the PDR system]. *Inżynier i Fizyk Medyczny / Engineer and Medical Physicist*, No. 2, p. 124.

40 Cf. Niewiadomski, T., Godek, J., Jasińska M., Wąsiołek, P., 1983. *Ocena wielkości natężenia promieniowania jonizującego w obszarze strefy ochronnej Huty im. Lenina i Cementowni N.H. i jego skutków w odniesieniu do: gleb, wód i upraw roślinnych [Assessment of the ionizing radiation intensity in the protection zone of the Lenin Steelworks and the N.H. Cement Plant and its effects in relation to: soils, waters and plant crops]*. Institute of Nuclear Technology, Kraków, p. 13.

41 Zeeb H., Shannoun, F. (eds.), *WHO...*, op. cit., p. ix.

42 Bulewicz, K., Olszewski, J., Domienik-Andrzejewska, J., 2025. Analiza wyników komercyjnych pomiarów radonu w latach 2022–2023 [Analysis of commercial radon measurement results in 2022-2023]. *Medycyna Pracy / Workers' Health and Safety*, No. 1, p. 31–40.

Table 1. Radon concentrations in educational institutions and child-occupied facilities in the city with county rights Jelenia Góra and Karkonosze County, along with the percentage exceedance of the reference level. Data source [institution names and addresses, radon concentration values]: *Letter of the Chief Sanitary Inspector of 8 July 2024 – response to the request for public information,* BI. OI.0134.92.2024.

Tabela 1. *Stężenia radonu w jednostkach oświatowych i miejscach przebywania dzieci na terenie miasta na prawach powiatu Jelenia Góra i powiatu karkonoskiego wraz z procentowym wskazaniem przekroczenia poziomu odniesienia. Opracowanie własne. Źródło danych [nazwy i adresy jednostek, wartości stężeń radonu]: Pismo Głównego Inspektora Sanitarnego z dnia 8 lipca 2024 r. – odpowiedź na wniosek o udostępnienie informacji publicznej, BI.OI.0134.92.2024.*

Institution Name and Address	Radon Concentration [Bq/m^3]	Exceedance of the WHO recommended value (100 Bq/m^3), [%]	Exceedance of Reference Level from Article 23b A.L. (300 Bq/m^3) [%]
Municipal Integrated Kindergarten, Junaków 2a St., 58-560 Jelenia Góra	3080	**3080%**	**1026,67%**
Local Government Kindergarten No. 2, Nadrzeczna 1 St., 58-573 Piechowice	1860	**1860%**	**620,00%**
School and Kindergarten Complex, Szkolna 2 St., 58-535 Miłków	1570	**1570%**	**523,33%**
Youth Sociotherapy Center, Sprzymierzonych 9 St., 58-560 Jelenia Góra	1220	**1220%**	**406,67%**
Primary School No. 13, Piotra Skargi 19 St., 58-500 Jelenia Góra	1030	**1030%**	**343,33%**
Technical School Complex, Obrońców Pokoju 10 St., 58-500 Jelenia Góra	1030	**1030%**	**343,33%**
General and Technical Schools Complex in Jelenia Góra, John Paul II Avenue 25, 58-506 Jelenia Góra	920	**920%**	**306,67%**
Extracurricular Institutions Complex - Talent Support Center, Skłodowska-Curie 12 St., 58-500 Jelenia Góra	790	**790%**	**263,33%**
General and Vocational School Complex No. 2, 1 Maja 39/41 St., 58-500 Jelenia Góra	750	**750%**	**250,00%**
General and Sports Championship School Complex, Franciszkańska 34 St., 58-580 Szklarska Poręba	690	**690%**	**230,00%**
Psychological and Pedagogical Counseling Center, Wolności 259 St., 58-560 Jelenia Góra	660	**660%**	**220,00%**
Primary School, Kopaniec 78, 58-512 Stara Kamienica	640	**640%**	**213,33%**
Primary School, Jeleniogórska 37 St., 58-533 Kostrzyca	630	**630%**	**210,00%**
Youth Educational Center, Górna 29 St., 58-580 Szklarska Poręba	630	**630%**	**210,00%**
White Eagle Primary School, Szkolna 1 St., 58-562 Podgórzyn	610	**610%**	**203,33%**
Primary School No. 3, 1 Maja 72 St., 58-530 Kowary	600	**600%**	**200,00%**
General School Complex No. 2, Gimnazjalna 2 St., 58-560 Jelenia Góra	570	**570%**	**190,00%**
Primary School in Ścięgny, 58-535 Ścięgny 110a	490	**490%**	**163,33%**
Primary School, Szkolna 2 St., 58-560 Wojcieszyce	460	**460%**	**153,33%**
Public Kindergarten No. 1, Kryształowa 77 St., 58-573 Piechowice	450	**450%**	**150,00%**

sanction for failing to meet these obligations may include administrative fines, as stipulated in Article 123(1) A.L.

The second group comprises the governing bodies of schools and educational institutions, which, according to Article 4(16) of the Education Law, primarily include local government units. Their responsibilities, as outlined in Article 10(1)(1) of this Law, involve ensuring safe and hygienic conditions for education, and care. In this context, Article 123(1b) A.L. is also of critical importance, as it stipulates that administrative fines may be imposed not only on the heads of organizational units but also directly on the educational institutions themselves (schools and kindergartens), which are predominantly financed by local government units. Furthermore, it should be noted that if

an administrative fine is imposed on an educational institution under Article 123(1b) of the Atomic Law, its director also bears additional liability for violating public finance discipline.

The third group consists of radiation hygiene authorities, specifically the state provincial sanitary inspectors, who are responsible for overseeing compliance with regulations concerning radiological protection.

The assessment of the specific probability of lung cancer incidence among pupils (and staff) of the aforementioned educational institutions, exposed to elevated radon concentrations, falls within the domain of epidemiology as a subdiscipline of medical sciences. At the same time, it is worth noting that the above measurements conducted by GIS have led to a significant shift in the evaluation of radon exposure in the Jelenia Góra Basin. Since the 20th century, scholarly literature on this issue has primarily focused—perhaps not entirely justifiably—on the case of the town of Kowary[43], where mining industries, including uranium mining[44], had been operating for several centuries[45]. Even in the third decade of the 21st century, Kowary remained the subject of dedicated publications expressing concerns about the challenges radon concentrations in local buildings might pose for municipal authorities[46]. However, the results presented above indicate that the situation is significantly worse in other localities within the Jelenia Góra Basin, which undoubtedly necessitates a paradigm shift and presents a considerable challenge for local authorities.

The graphical representation of data on the exceedance levels of permissible radon concentrations in educational institutions within the Jelenia Góra Basin is presented in the figure below. This visualization highlights both the scale of the identified issue and its distribution across the analyzed facilities.

Additionally, as one of the co-authors of this article has only briefly indicated in a previous publication[47], at least those cases listed above where radon concentrations exceed 1000 Bq/m^3 require significant analysis by both radiation hygiene authorities and the heads of institutions (school principals) regarding the potential exceedance of ionizing radiation dose limits[48]. It is important to recall that, according to Annex No. 4 of the Atomic Law ("Ionizing Radiation Dose Limits"), these annual dose limits are as follows: for employees as well as pupils, students, and trainees aged 18 and above: 20 mSv; for pupils, students, and trainees aged 16 to 18: 6 mSv; and for pupils, students, and trainees under 16: 1 mSv.

This value, applicable to individuals under the age of 16, remains significantly lower than the dose limits established for adults, reflecting the previously discussed heightened susceptibility of this youngest age group. According to Article 14(1) A.L., which, as mandated by Article 32a A.L., must be applied accordingly to pupils, the total ionizing radiation dose for employees and the general public must not exceed the established dose limits. The conclusion that these limits—particularly for children under the age of 16—have been exceeded in cases of year-round, prolonged exposure to the high radon concentrations indicated above (even when accounting for school breaks, holidays, and vacations) is readily verifiable. The methodology for determining the effective dose burden in cases of internal exposure to radon and its progeny has already been defined within the Polish regulatory framework[49]. However, these conclusions are not merely theoretical but open the field for further considerations regarding the potential liability of educational institution administrators under Article 123(1)(5) A.L., which penalizes the failure of an organizational unit's director, responsible for radiological protection, to prevent exposure of an employee or another person in violation of Article 14(1) A.L.

A further analysis in this regard, however, requires a prior examination of the semantic scope of the term "pupil", which lacks a definition within the Atomic Law, to verify whether and to what extent individuals attending educational institutions are subject to the mechanisms established by the 2019 regulatory framework for radio-

43 Cf. Mosch, C.F., 1829. *Zur Geschichte des Bergbaues in Deutschland [On the History of Mining in Germany]*. Regierungs-Buchdrueckerei, Liegnitz, pp. 63–64, 224.

44 Adamski, W., 1988. Miasto górników i tkaczy [The City of Miners and Weavers]. [In:] *Kowary. Szkice z dziejów miasta. Tom 1 [Kowary. Sketches from the history of the city. Volume 1]*, eds. T. Bugaj. Karkonosze Scientific Society, Jelenia Góra, pp. 29–30.

45 Hess, F.L., 1932. Radium, Uranium, and Vanadium. [In:] *Mineral Resources of the United States, 1933, Part I – Metals*. Government Printing Office, Washington, p. 504; Karlsch, R., Zeman, Z.A., 2002. *Urangeheimnisse: das Erzgebirge im Brennpunkt der Weltpolitik 1933-1960 [Uranium Secrets: The Ore Mountains in the Focus of World Politics 1933-1960]*. Ch. Links Verlag, Berlin, p. 11; Borzęcki, R., Wójcik, D., Kalisz, M., 2018. Przeróbka rud uranu w rejonie Kowar [Processing of uranium ores in the region of Kowary]. *Hereditas Minariorum*, No. 5, pp. 181–213.

46 Olszewski, J., Walczak, K., Radon..., op. cit., pp. 150–151; cf. Sukanya, S., Sabu, J., 2023. *Environmental Radon: A Tracer for Hydrological Studies*. Springer, Singapore, pp. 145–166.

47 Cf. Bobkier, R., Ewolucja..., op. cit., p. 39.

48 Regarding the uncertainties surrounding the definition of this term in the Atomic Law, cf. Bobkier, R., 2024. Problematyka interpretacyjna pojęcia „kontrolowanej działalności zawodowej". Rozważania na tle definicji dawki granicznej w Prawie atomowym [Interpretative Issues of the Concept of „Controlled Occupational Activity". Considerations on the Definition of Dose Limit in the Atomic Law]. *Bezpieczeństwo Jądrowe i Ochrona Radiologiczna. Biuletyn Informacyjny Państwowej Agencji Atomistyki / Nuclear Safety and Radiation Protection. Information Bulletin of the National Atomic Energy Agency*, No. 2, pp. 14–29.

49 This methodology is derived from point 4 of the annex *„Quantities and Indicator Values for Determining Ionizing Radiation Doses Used in Exposure Assessment"* to the Regulation of the Council of Ministers of 11 August 2021, on indicators for determining ionizing radiation doses used in exposure assessment (Journal of Laws, item 1657).

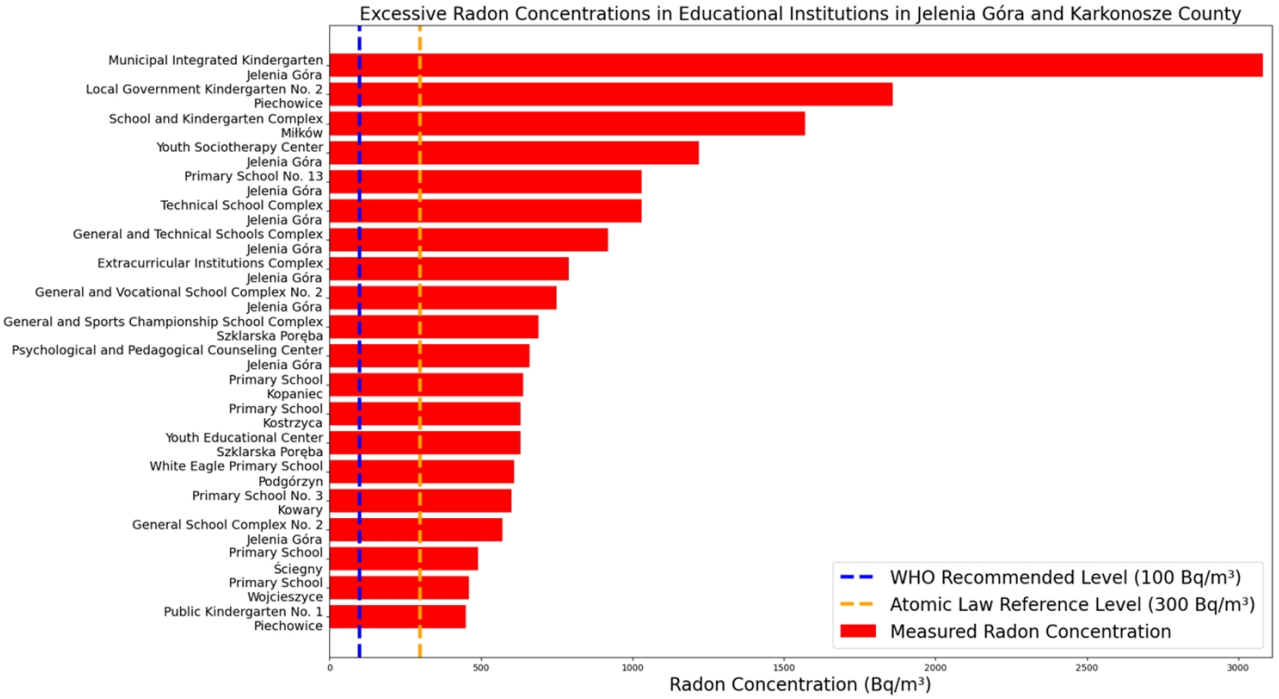

Fig. 2. Exceedance of permissible radon concentrations in educational institutions in the Jelenia Góra Basin. Own compilation, based on: *Letter of the Chief Sanitary Inspector of 8 July 2024 – response to the request for public information*, BI. OI.0134.92.2024.

Rys. 2. *Przekroczenia dopuszczalnych stężeń radonu w jednostkach systemu oświaty w Kotlinie Jeleniogórskiej. Opracowanie własne na podst.: Pismo Głównego Inspektora Sanitarnego z dnia 8 lipca 2024 r. – odpowiedź na wniosek o udostępnienie informacji publicznej, BI.OI.0134.92.2024.*

logical protection against radon. Only after clarifying this category can the extent of liability for institution administrators be determined.

5. The Concept of "Pupil"

Article 32a A.L. mandates the application of the provisions of the Atomic Law listed therein, including the key "radon-related" Article 23c, accordingly to pupils.

As R. Budzisz aptly noted in 2023, "one searches in vain for a definition of the term pupil"[50] in the Education Law[51], which in Article 4(20) merely indicates that this term should also be understood to include listeners and wards[52]. This law contains in Article 2 an extensive enumerative list of educational system institutions[53].

Legislative acts within the broader field of education law contain their own definitions of the term "pupil". However, these definitions are tailored to the specific needs of those regulations[54] and can only be applied subsidiarily to terms used in the Atomic Law. Article 3(3)(1) in conjunction with Article 3(2)(1) of the Act of 15

[50] Budzisz, R. 2023. Badania sanitarno-epidemiologiczne [Sanitary and epidemiological research]. [In:] *Zapobieganie oraz zwalczanie zakażeń i chorób zakaźnych u ludzi. Zagadnienia prawne [Prevention and combating infections and infectious diseases in humans. Legal Issues]*, ed. R. Budzisz. Wolters Kluwer, Warsaw, p. 72.

[51] Act of 14 December 2016 – Education Law (consolidated text: Journal of Laws of 2024, item 737, as amended).

[52] A similar approach was applied in Article 3(11) of the Act of 7 September 1991, on the Education System (consolidated text: Journal of Laws of 2022, item 2230, as amended).

[53] According to this provision, the education system includes: preschools, including special, integrative, those with special or integrative sections, as well as other forms of preschool education (point 1); schools: primary schools, including special, integrative, those with preschool, integrative, special, vocational preparation, bilingual, sports, and sports championship sections (point 2a); secondary schools, including special, integrative, bilingual, those with integrative, special, bilingual, military preparation, uniformed profile, sports, and sports championship sections, as well as agricultural, forestry, maritime, inland navigation, and fisheries schools (point 2b); artistic schools (point 2c); educational and care institutions, including school youth hostels, enabling the development of interests and talents as well as participation in various forms of leisure and free time activities (point 3); continuing education institutions, vocational training centers, and sectoral skills centers, allowing the acquisition and enhancement of knowledge, skills, and professional qualifications or career changes (point 4); artistic institutions—art centers that support the development of artistic interests and talents (point 5); psychological and pedagogical counseling centers, including specialized counseling centers providing psychological and pedagogical support to children, youth, parents, and teachers, as well as assisting students in choosing their educational path and profession (point 6); youth educational centers, youth sociotherapy centers, special educational and care centers, and special care centers for children and youth requiring a special organization of education, teaching methods, and upbringing, as well as rehabilitation and educational centers enabling children and youth referred to in Article 36(17), as well as children and youth with multiple disabilities, where one of the disabilities is intellectual disability, to fulfill the obligations specified in Article 31(4), compulsory schooling, and compulsory education (point 7); institutions providing care and upbringing to students during their education outside their permanent place of residence (point 8); teacher training institutions (point 9); pedagogical libraries (point 10); colleges for social service workers (point 11).

[54] Budzisz R., Badania..., [In:] *Zapobieganie...*, ed. R. Budzisz, op. cit., p. 73.

April 2011, on the Educational Information System[55] defines a "pupil" as children receiving early developmental support in schools and educational institutions, children enrolled in preschool education in kindergartens, preschool departments organized in primary schools, and other forms of preschool education, as well as pupils, listeners, wards, and graduates of schools and educational institutions. Meanwhile, Article 2(33) of the Act of 27 October 2017, on the Financing of Educational Tasks[56] states that the scope of the term "pupil" also includes adult school listeners, students at second-degree vocational schools and post-secondary schools, and children attending preschool education[57].

Considering the catalogue of educational system institutions (Article 2 of the Education Law, footnote 53), we argue that the interpretation of the term "pupil" under Article 32a A.L. should consider not only the formal organizational structure of educational institutions but, above all, their ontological purpose, which is to shape and educate individuals in conditions that ensure their safety. Consequently, the criterion for applying the radon protection norms of the Atomic Law must be the functional participation in the educational process (educational, therapeutic, etc.), regardless of the organizational form of a given institution. According to Article 3(20) A.L., radiological protection is intended to prevent exposure to radiation for all people, not just selected groups. Limiting the scope of such protection concerning radon only to pupils of institutions formally classified as schools would result in the normative depreciation of other wards and contradict the principle of equal value of life and health. The economic analysis of law provides grounds for asserting that protection against hazards should be guided by the principle of maximizing welfare based on actual needs rather than definitional boundaries set by administrative terminology[58]. The concept of safety culture, defined in Article 3(8c) A.L., prioritizes protection and security over other values, which necessitates treating children as a particularly protected group, regardless of whether they are formally classified as pupils, listeners, or wards. Indeed, Article 68(3) in principio of the Constitution of the Republic of Poland[59] imposes an obligation on public authorities to provide special healthcare to children, without any basis for differentiating their rights depending on their administrative affiliation with a specific type of institution. From this perspective, the interpretation of the term "pupil" in Article 32a A.L. must encompass all children covered by the education and upbringing system within the institutions listed in the catalogue of Article 2 of the Education Law. Any *interpretatio restrictiva* that narrows this scope would lead to an arbitrary and axiologically unjustified division, contradicting the fundamental principle of equality in health protection as a supreme value.

However, even this extensive interpretation does not eliminate a certain dissonance. This arises from a *sui generis* "ontological rupture"[60] within the structure of legal protection, which becomes evident concerning nurseries—institutions regulated by the Act of 4 February 2011, on the Care of Children Under the Age of Three[61]. Although, according to Article 2(1) of this legal act, they fulfill care, educational, and instructional functions, they are not part of the educational system, and children attending them are certainly not considered pupils. In this case, axiological reality exists on a plane separate from positive law. The statutory classification of institutions does not change the fact that children in nurseries and their older peers in schools and kindergartens are exposed to the same ionizing radiation. This formalism leads to a situation in which the protection provided by Article 32a A.L. applies only to individuals meeting the criterion of "pupil", leaving out children under the age of three, who are not significantly different from a biological and health perspective. From the standpoint of legal teleology, this protection gap is difficult to justify—if the *ratio legis* of Article 32a A.L. is the protection of particularly vulnerable groups against radon, the exclusion of the youngest children from this protection becomes a form of "normative aporia"[62], lacking any rational justification.

55 Act of 15 April 2011 on the Education Information System (Journal of Laws of 2024, item 152, as amended).

56 Act of 27 October 2017 on the Financing of Educational Tasks (Journal of Laws of 2023, item 1400).

57 This definitional ambiguity resonates within legal doctrine and jurisprudence in areas of law beyond the Atomic Law as well, cf. Wolanin, M., 2022. Dzieci i młodzież w rozumieniu ustawy o systemie oświaty. Glosa częściowo krytyczna do wyroku Wojewódzkiego Sądu Administracyjnego w Gliwicach z 2 lipca 2019 r. (III SA/Gl 426/19) [Children and youth within the meaning of the Education System Act. Partially critical commentary on the judgment of the Provincial Administrative Court in Gliwice of 2 July 2019 (III SA/Gl 426/19)]. *Orzecznictwo w Sprawach Samorządowych* / *Case Law in Local Government Matters*, No. 2, pp. 116–122; Judgment of the Provincial Administrative Court in Gliwice of 2 July 2019, III SA/Gl 426/19, LEX No. 2706528.

58 Cf. Golecki, M.J., 2019. W poszukiwaniu optymalnego prawodawcy. Dylematy regulacji i deregulacji z perspektywy ekonomicznej analizy prawa [In search of the optimal legislator. Dilemmas of regulation and deregulation from the perspective of economic analysis of law]. *internetowy Kwartalnik Antymonopolowy i Regulacyjny* / *Internet Antitrust and Regulatory Quarterly*, No. 8, pp. 11–22.

59 The Constitution of the Republic of Poland of 2 April 1997 (Journal of Laws No. 78, item 483, as amended).

60 Cf. Heller, M., 2008. Granice czasu, przestrzeni i prawdopodobieństwa [The Limits of Time, Space and Probability]. *Filozofia Nauki* / *Philosophy of Science*, No. 3–4, p. 8.

61 Act of 4 February 2011 on Care for Children up to the age of 3 (Journal of Laws of 2024, item 338, as amended).

62 Aporia (Greek: , wilderness, difficulty, doubt) is a philosophical term denoting a problematic situation in which solutions seem to be internally contradictory or irreconcilable, cf. Linhares, J.M.A. 2013. Pojęcie dowodu jako otwarta rana prawa: niezmiennie błędna aporia? [The Concept of Evidence as an Open Wound of the Law: An Invariably Erroneous Aporia?]. *Archiwum Filozofii Prawa i Filozofii Społecznej* /

With full conviction, we express a competency-based compliment to the Polish legislator, who, by emphasizing in Article 32a A.L. the necessity of extending normative protection against radon to ”pupils“, has gone beyond the minimum requirements established by the BSS Directive. The directive itself does not emphasize as explicitly as domestic Polish law the need to protect children from exposure to this gas[63], instead focusing clearly on trainees and students aged 16 and above (Article 33). Nevertheless, this normative gap in Polish law concerning children in nurseries leaves—so to speak, in four dimensions—a certain insufficiency. First, it arises from a peculiar asymmetry in legal protection against radon exposure, whereby nursery caregivers (employees) are covered by legal safeguards, whereas children, whose bodies are significantly more vulnerable to the effects of ionizing radiation, are not. This contradicts the principle of proportionality and the fundamental assumption that the more susceptible a group is to harmful factors, the more intensive its legal protection should be. Second, the situation in which a child in a kindergarten is protected under Article 32a A.L., but the same child, just a few months younger and attending a nursery, is not, is internally inconsistent and arbitrary. There is no biological or medical difference justifying the exclusion of the latter group from protection. Third, an evident issue here is the disproportion in access to information. While kindergartens are required to provide information on radon exposure (Article 23c(2) in conjunction with Article 32a A.L.), the lack of an analogous requirement for nurseries leaves parents unaware of potential risks. Fourth, in practice, it is common for nurseries and kindergartens to function within the same building as separate organizational units[64]. The children attending these institutions are subject to different protective regimes based on the formal classification of the institution rather than the actual level of risk. Given the weight of this argumentation, the current situation is, from the perspective of the principle of equality before the law, clearly flawed and warrants legislative intervention.

The above analysis necessitates a deeper examination of the protective mechanisms that arise for ”pupils“ from the key radon-related provision of Article 23c A.L.

6. Article 23c(1)(1) A.L. – Ensuring Radon Concentration Measurements (Appropriate Application)

The fundamental issue in the appropriate application of Article 23c A.L. to pupils is that its provisions refer to employees rather than individuals present in educational institutions as pupils. It is therefore necessary to determine how the obligations specified in this provision should be shaped when carried out by school principals as unit managers within the meaning of the Atomic Law. Naturally, it must be considered that the duties described in this subsection are also fulfilled concerning employees and external workers.

6.1. Locations Subject to the Measurement Requirement

The provision of Article 23c(1)(1) A.L., referenced in the introduction to this article, imposes an obligation on unit managers conducting activities in which workplaces are located indoors on the ground floor or basement level in areas classified as ”radon counties“ to ensure the measurement of radon concentration in these workplaces[65].

A workplace is a legal term used in the Labour Code[66], though it lacks a statutory definition within that act[67] and is interpreted inconsistently in legal doctrine and case law[68]. Given the subject matter of this analysis, it is necessary to refer to definitions according to which a workplace is a designated space where an employee, typically on a regular basis, begins and ends their daily work[69], or the location where routine tasks forming part of the agreed scope of work are performed[70]. The only legal act that explicitly defines the term ”workplace“ is the Regulation of the Minister of Labour and Social Policy of 26 September 1997, on General Occupational Health and

Archives of the Philosophy of Law and Social Philosophy, No. 1, pp. 5–20; Kaczmarczyk, M.R., 2019. *Aporia of Freedom. Critique of Social Theory*. Nicolaus Copernicus University Publishing House, Toruń.

63 Although it does so, for example, in Article 61(1)(1) regarding medical exposure.

64 Topolewska, M., 2019. *Żłobek i przedszkole nie mogą być zespołem [Nursery and kindergarten cannot be a unit]*, Gazeta Prawna, 4 February 2019, https://serwisy.gazetaprawna.pl/samorzad/artykuly/1395862,zlobek-i-przedszkole-nie-moga-byc-zespolem.html (accessed: 28.02.2025).

65 We note here that the provisions of the Atomic Law concerning radon, from the perspective of remote work and remote learning, are left outside the scope of this discussion. Due to its complexity, this issue requires a separate publication.

66 Act of 26 June 1974 Labour Code (Journal of Laws of 2023, item 1465).

67 Goździewicz, G., Zieliński, T., 2017. [In:] *Kodeks pracy. Komentarz [Labour Code. Commentary]*, ed. L. Florek. Wolters Kluwer, Warsaw, p. 1496.

68 Rycak, A., 2013. *Powszechna ochrona trwałości stosunku pracy [Universal Protection of the Durability of the Employment Relationship]*. Wolters Kluwer, Warsaw, p. 50; cf. Książek, D., 2013. Pojęcie i podział wyrażenia „miejsce pracy” [The Concept and Division of the Expression ‘Place of Work’]. *Studia z Zakresu Prawa Pracy i Polityki Społecznej / Studies in Labour Law and Social Policy*, No. 1, pp. 219–242.

69 Goździewicz, G. Zieliński, T., [In:] *Kodeks...*, ed. L. Florek, op. cit., p. 1496. Similarly, Wiśniewski, J., 2023. Miejsce wykonywania pracy w świetle przepisów prawa pracy [Place of work in the light of labour law]. *Studia Prawnoustrojowe / Legal and Political Studies*, No. 60, p. 382.

70 Tomaszewska, M., 2022. [In:] *Kodeks pracy. Komentarz. Tom I. Art. 1-93 [Labour Code. Commentary. Volume I. Art. 1-93]*, ed. K.W. Baran. Wolters Kluwer, Warsaw, LEX/el, comm. to Art. 29, pt. 10.

Safety Regulations[71] (hereinafter G.H.S.R.). According to § 2(7b) G.H.S.R., a workplace is a location designated by the employer to which an employee has access in connection with their job duties. At the same time, it should be emphasized that this regulation also defines the term "workroom" in § 2(3), first sentence, as a room intended for the presence of employees where work is performed. However, the legislator did not choose to reference this latter concept in the Atomic Law, juxtaposing only the terms "workplace" and "room" in Article 23c(1)(1) A.L., which creates interpretative difficulties.

The term "room" itself also lacks a statutory definition in Polish law, leading legal scholars to construct various, often divergent, interpretations of its meaning. The most comprehensive description appears to be the one defining a room as a part of a building enclosed by walls or other partitions, including a premises as well as its constituent chambers or a set of chambers.

The term "room" itself also lacks a statutory definition in Polish law[72], leading legal scholars to construct various, often divergent, interpretations of its meaning[73]. The most comprehensive description appears to be the one defining a room as a part of a building enclosed by walls or other partitions, including a premises as well as its constituent chambers[74] or a set of chambers[75].

The provision of Article 23c(1)(1) A.L. mandates the measurement of radon concentrations in rooms "at the ground floor or basement level". The interpretation of this part of the provision also raises certain doubts due to the use of the term "ground floor". The Construction Technical Conditions Regulation defines in § 3(16-18) and (21) the terms: storey, underground storey, above-ground storey, and basement. However, the concept of "ground floor" lacks a definition within the construction law system. In this regard, following administrative court rulings, the ground floor can be interpreted as the lowest, first above-ground storey, CONSTITUTING the level where the main entrance to the building is located[76]. Nevertheless, it would be advisable for the legislator to explicitly align the terminology used in the Atomic Law with the conceptual framework of the construction law. Doing so would not only prevent interpretative discrepancies but also eliminate the ambiguity in the Atomic Law provision, an issue that should not characterize legal language[77].

A functional transposition of the provision of Article 23c(1)(1) A.L. to the realities of educational system institutions is necessary to fulfill the requirement of their "appropriate" application to pupils, as mandated by Article 32a A.L. It must therefore be concluded that in areas classified as "radon counties", the directors of these institutions are obligated to ensure radon concentration measurements in all rooms located in basements and on the first above-ground storey that are designated for educational, instructional, or care-related activities where pupils, wards, or listeners regularly remain during mandatory and additional classes organized by the institution. These spaces explicitly include classrooms, subject laboratories, preschool rooms, rooms designated for practical training, lecture halls in post-secondary schools and continuing education institutions, other rooms where regular didactic activities take place (e.g., common rooms, libraries serving an educational function), and gymnasiums.

71 Regulation of the Minister of Labour and Social Policy of 26 September 1997 on general occupational health and safety regulations (Journal of Laws of 2003 No. 169, item 1650 as amended).

72 The literature emphasizes that such a definition is not provided in the provisions of the Construction Law, Zelek, M., 2022. [In:] *Kodeks cywilny. Tom II. Komentarz. Art. 353–626 [Civil Code. Volume II. Commentary. Art. 353–626]*, ed. M. Gutowski. Beck, Warsaw, Legalis, comm. to Art. 433. It is not included in the glossary of statutory terms contained in Article 3 of the Act of 7 July 1994 – Construction Law. The Regulation of the Minister of Infrastructure of April 12, 2002, on the technical conditions that buildings and their location must meet (consolidated text: Journal of Laws of 2022, item 1225), contains a range of definitions for specific types of rooms (§ 3 points 10-14), yet it does not define the fundamental concept itself.

73 Cf. Kuźmicka-Sulikowska, J., 2024. [In:] *Zobowiązania. Część ogólna. Tom II. Komentarz [Obligations. General part. Volume II. Commentary]*, ed. P. Machnikowski. Beck, Warsaw, Legalis, comm. to Art. 433; Warciński, M., 2005. Glosa do wyroku SN z dnia 5 marca 2002 r., I CKN 1156/99 [Commentary on the Supreme Court Judgment of 5 March 2002, I CKN 1156/99]. *Orzecznictwo Sądów Polskich* / *Case Law of Polish Courts*, No. 10, p. 116; Karaszewski, G., 2023. [In:] *Kodeks cywilny. Komentarz aktualizowany [Civil Code. Updated Commentary]*, eds. J. Ciszewski, P. Nazaruk. Wolters Kluwer, LEX/el., comm. to Art. 433, pt. 4; Wałachowska, M., Ziemiak, M.P., 2018. [In:] *Kodeks cywilny. Komentarz. Tom III. Zobowiązania. Część ogólna (art. 353–534) [Civil Code. Commentary. Volume III. Obligations. General Part (Art. 353-534)]*, eds. M. Fras, M. Habdas. Wolters Kluwer, Warsaw, p. 493; Jantowski, L., 2024. [In:] *Kodeks cywilny. Komentarz aktualizowany [Civil Code. Updated commentary]*, eds. M. Balwicka-Szczyrba, A. Sylwestrzak. Wolters Kluwer, LEX/el., comm. to Article 433, point 3.

74 Machnikowski, P., Śmieja, A., 2023. [In:] *Prawo zobowiązań – część ogólna. System Prawa Prywatnego. Tom 6 [Law of Obligations – General Part. Private Law System. Volume 6]*, ed. A. Olejniczak. Beck, Warsaw, p. 584.

75 Rogoziński, P., 2021. Ograniczenie prawa do rozporządzania i korzystania przez właściciela z lokalu w razie zastosowania wobec niego środka zapobiegawczego z art. 275a K.p.k. [Restriction of the Owner's Right to Dispose of and Use a Premises in the Event of the Application of a Preventive Measure under Article 275a of the Code of Criminal Procedure]. *Nieruchomości. Kwartalnik Ministerstwa Sprawiedliwości* / *Real Estate. Quarterly of the Ministry of Justice*, No. 1, p. 184.

76 Judgment of the Supreme Administrative Court of 19.10.2021, II OSK 400/21, LEX No. 3319061; Judgment of the Provincial Administrative Court in Gliwice of 21.10.2020, II SA/Gl 640/20, LEX No. 3096456; Judgment of the Provincial Administrative Court in Rzeszów of 28.06.2023, II SA/Rz 43/23, LEX No. 3600292.

77 Doczekalska, A., 2021. *Język prawny w tworzeniu i transpozycji prawa Unii Europejskiej. Procesy hybrydyzacji [Legal Language in the Creation and Transposition of European Union Law. Hybridization Processes]*. Wolters Kluwer, Warsaw, p. 75.

6.2. Measurement Methodology

The Environmental Protection Law[78] (hereinafter: E.P.L.) defines in Article 3(9) a reference methodology as a legally established measurement or testing method, which may include the method of sample collection, the interpretation of obtained data, as well as modeling methodologies for the dispersion of substances and energy in the environment. This set of requirements must be derived from a statutory provision or be authorized by such a provision[79]. Entities utilizing the environment and administrative authorities are obliged to apply reference methodologies if such methodologies have been established under statutory provisions (Article 12(1) E.P.L.). Jurisprudence emphasizes that the obligation to make determinations based on studies conducted by accredited entities applies not only to environmental protection authorities resolving a given case but also extends beyond entities utilizing the environment[80]. It is essential to underline that this provision does not explicitly limit its application to environmental protection authorities (as referred to in Article 376 E.P.L.). Therefore, it should be assumed that its scope encompasses all authorities responsible for emission measurements[81]. Furthermore, Article 12(2) E.P.L. allows for exceptions to the obligation of applying reference methodologies, permitting the use of alternative methodologies under specific conditions. These conditions require that the alternative methodology yields more accurate results and that its justification is grounded in meteorological phenomena, physical mechanisms, or chemical processes affecting substances or energy—particularly in the case of modeling methodologies for the dispersion of substances or energy in the environment. Additionally, in the case of other methodologies, full equivalence of the obtained results must be demonstrated.

This principle of result comparability ensures their reliability[82]. The Atomic Law does not contain a similar regulation. It does not establish a legally required method for conducting measurements, except for the requirement in Article 3(47a) that the annual average radon concentration must be estimated based on measurements conducted over a period of no less than one month. The only relevant provisions on this matter are found in the National Action Plan for Long-Term Hazards Resulting from Radon Exposure in Buildings Intended for Human Occupancy and Workplaces[83] (hereinafter: the Plan), which has been issued in the form of an announcement. However, Article 87(1) of the Polish Constitution excludes announcements from the sources of universally binding law in the Republic of Poland, which include the Constitution, statutes, ratified international agreements, and regulations. An announcement, in contrast, has only a declaratory character[84], serving as an official explanation of legal provisions[85]. The provisions of the Plan do not constitute legal norms that could serve as the basis for issuing individual decisions[86]. The Plan merely presents the viewpoint of the issuing authority (the Minister of Health) regarding the interpretation of Atomic Law provisions, and compliance with it "is voluntary"[87].

It is nevertheless advisable for the heads of educational institutions to adhere to the recommendations of the Plan, which, despite their general nature, provide valuable guidance. The Plan specifies in point 4.1 of Part II ("Descriptive Section") that for measuring the annual average radon concentration indoors, track detectors in a diffusion chamber should be used. Moreover, "in the

78 Act of 27 April 2001 – Environmental Protection Law (Journal of Laws of 2024, item 54, as amended).

79 Długosz, T., Swora, M., Walaszek-Pyzioł, A., Władyka, T., Żurawik, A., 2013. Szczególna regulacja działalności przedsiębiorstw w sektorach sieciowych [Particular regulation of the activity of enterprises in network sectors]. [In:] *Publiczne prawo gospodarcze. Tom 8B. System Prawa Administracyjnego [Public economic law. Volume 8B. Administrative Law System]*, eds. R. Hauser, Z. Niewiadomski, A. Wróbel. Beck, Warsaw, p. 424.

80 Judgment of the Provincial Administrative Court in Warsaw of 19.02.2019, IV SA/Wa 1763/18, LEX No. 3060124.

81 Gruszecki, K., 2022. *Prawo ochrony środowiska. Komentarz [Environmental Protection Law: Commentary]*. Wolters Kluwer, Warsaw, LEX/el, comm. to Art. 12, pt. 2.

82 Barczak, A. 2020. *Kontrola podmiotów korzystających ze środowiska [Control of Entities Using the Environment]*. Wolters Kluwer, Warsaw, p. 41.

83 The Announcement of the Minister of Health of 22 January 2021, on the publication of the National Action Plan for Long-Term Risks Arising from Radon Exposure in Buildings Intended for Human Occupancy and Workplaces (Official Gazette of 2021, item 169).

84 Kazalska, O., 2018. Zwolnienie z konstytucyjnego wymogu kontrasygnaty – rozważania na tle niekontrasygnowanych obwieszczeń Prezydenta Rzeczypospolitej Polskiej o wolnych stanowiskach sędziego w Sądzie Najwyższym i Naczelnym Sądzie Administracyjnym [Exemption from the Constitutional Requirement of Countersignature – Reflections on the Non-Countersigned Announcements of the President of the Republic of Poland on Vacant Judicial Positions in the Supreme Court and the Supreme Administrative Court]. *Studia Iuridica*, vol. 56, p. 238.

85 Błachucki, M., 2014. Urzędowe wyjaśnienia przepisów prawa wydawane przez organy administracji publicznej [Official Interpretations of Legal Provisions Issued by Public Administration Authorities]. [In:] *Źródła prawa administracyjnego a ochrona wolności i praw obywateli [Sources of Administrative Law and the Protection of Citizens' Freedoms and Rights]*, eds. M. Błachucki, T. Górzyńska. Supreme Administrative Court, Warsaw, pp. 122–123.

86 Cf. Stankiewicz, R., 2012. Prawotwórcza rola administracji w kształtowaniu sektora energetycznego (na przykładzie polityki energetycznej państwa) [The Law-Making Role of the Administration in Shaping the Energy Sector (Based on the Example of State Energy Policy)]. [In:] *Legislacja administracyjna. Teoria, orzecznictwo, praktyka [Administrative Legislation. Theory, Case Law, Practice]*, eds. M. Stahl, Z. Duniewska. Wolters Kluwer, Warsaw, p. 267.

87 Błachucki, M, 2015. Wytyczne w sprawie nakładania administracyjnych kar pieniężnych (na przykładzie wytycznych wydawanych przez prezesa UOKIK) [Guidelines on the Imposition of Administrative Fines (Based on the Example of Guidelines Issued by the President of the Office of Competition and Consumer Protection)]. [In:] *Administracyjne kary pieniężne w demokratycznym państwie prawa [Administrative Fines in a Democratic State of Law]*, ed. M. Błachucki. Office of the Commissioner for Human Rights, Warsaw, pp. 46–47.

opinion of experts conducting radon concentration measurements, to obtain the annual average radon concentration in a room intended for human occupancy, it is recommended to perform measurements during the heating season (recommended period in Poland: October – March)"[88].

It must be emphasized, however, that since these recommendations are set out exclusively in the Plan, which is not a source of universally binding law, a radon concentration measurement conducted using a different method or even outside the heating season still meets the statutory requirement established for schools and kindergartens under Article 23c(1)(1) in conjunction with Article 32a A.L.

Polish law does not impose a requirement that radon measurement itself (such as the placement of detectors or documentation of the measurement process) be conducted by a specialized, licensed entity. A suggested procedure for such measurements ("*Rational Method of Indoor Radon Measurements*") is outlined in a 2025 publication[89].

6.3. Frequency of Measurements

The Atomic Law does not explicitly specify the frequency with which unit managers are required to fulfill the obligation to ensure radon concentration measurements. The provision of Article 17(2) A.L., applied accordingly to pupils under the requirement of Article 32a A.L., determines that the assessment of pupil exposure is conducted based on control measurements of individual doses or dosimetric measurements in the learning environment. It seems appropriate to refer subsidiarily to the Regulation of the Council of Ministers of August 11, 2021, on indicators for determining ionizing radiation doses used in exposure assessment. According to § 2(4) of this regulation, the determination of these doses is based on dosimetric measurements. Additionally, § 3(1) states that exposure assessments **must be conducted for each calendar year** by determining ionizing radiation doses based on dosimetric measurements performed at intervals not exceeding three months. If the period of exposure-related activity is shorter than three months, the assessment must be conducted upon completion of that period.

6.4. Entry into Force of the Measurement Obligation

The provisions of Article 23c A.L. came into force on September 23, 2019 (Article 39 of the Act of June 13, 2019, amending the Atomic Law and the Fire Protection Act). Article 20(2) of this Act contained a transitional provision postponing the application of Articles 23c(2)-(4) A.L. for a period of two years. Since this deferral did not include Article 23c(1) A.L., which concerns the obligation to ensure radon concentration measurements, the actual date of its entry into force should be considered as July 31, 2020. On that date, the "radon counties" were designated by the Regulation of the Minister of Health of June 18, 2020, on areas where the annual average radioactive radon concentration in indoor air may exceed the reference level in a significant number of buildings.

Consequently, as of July 31, 2020, school, and kindergarten directors (unit managers) were required to ensure radon concentration measurements for pupils. This date also marks the beginning of the period relevant for potential violations of this obligation, triggering liability under Article 123(1)(8) A.L. in cases of non-compliance.

7. Article 23c(2) A.L. – Optimization and Information Obligations (Appropriate Application)

Article 23c(2) A.L. imposes one preventive obligation and four informational obligations on the directors of educational institutions. Some of these normative duties can be applied directly to pupils, while others require modifications.

7.1. Obligation to Ensure Optimization of Pupil Exposure

Article 23c(2) *in pr.* A.L., interpreted through the lens of Article 32a A.L., obliges the directors of educational institutions to ensure the optimization of pupil exposure in the locations identified in subsection 6.1 of this publication. The content of the optimization principle is derived from Article 9(1) A.L. This principle, applied to the present context, requires that an institution's activities be conducted in such a way that, with reasonable consideration of economic and social factors and the current state of technical knowledge, the number of exposed pupils and the probability of their exposure are minimized, and the ionizing radiation doses they receive are as low as possible. This optimization, based on Article 23c(2) A.L., is subject to the criterion of due diligence, as it is carried out "to reduce" exposure. Only Article 23c(3) A.L. is based on an effectiveness criterion, as it requires actions that "ensure" exposure reduction.

[88] The Regulation of the Minister of Economy of 15 January 2007, on the detailed conditions for the operation of heating systems (Journal of Laws No. 16, item 92) defines in § 2 point 20 the *heating season* (rather than the *heating period*, as used in the Plan) as the period during which atmospheric conditions necessitate the continuous supply of heat for heating buildings.

[89] Cf. Tsapalov, A., Kovler, K., Kiselev, S., Yarmoshenko, I., Bobkier, R., Miklyaev, P., 2025. IAEA Safety Guides vs. Actual Challenges for Design and Conduct of Indoor Radon Surveys. *Atmosphere*, No. 16, pp. 1–46.

7.2. Informational Obligations

The first of these, undoubtedly the easiest to fulfill, concerns increased radon exposure. Neither the Atomic Law nor the Plan specifies its scope; however, as part of so-called "good practices", it should include an acknowledgment that the pupil attends an educational institution located in a "radon county" and a reference to the legal basis for this classification (Regulation of the Minister of Health of June 18, 2020). Additionally, it should at least briefly outline the health effects of radon exposure.

Regarding the second obligation, concerning the results of radon concentration measurements, this presents a particular issue in the case of pupils. While early primary education (grades I-III) takes place within the framework of integrated learning in a single instructional room (a "classroom")[90], subject-based education for older pupils is conducted in various rooms. In such cases, it is undoubtedly necessary to provide information on the measurement results for each room subject to the measurement obligation in which a given pupil is present. Considering legal metrology[91], the result of the radon concentration measurement should be presented in becquerels per cubic meter [Bq/m^3][92]. At the same time, it should be noted—albeit marginally—that Article 23d(3)(2) A.L., which specifies the requirements for an analogous type of information provided in the context of real estate transactions, includes a requirement that the reported measured value be compared with the reference level specified in Article 23b. This requirement is not included in the provision of Article 23c(2) A.L., which is a clear weakness in terms of the informational imbalance between a real estate buyer and a pupil. Therefore, a de lege ferenda proposal deserves recognition, aiming to eliminate this informational inequality by ensuring that the information provided to pupils (or more broadly, based on the general wording of Article 23c(2) A.L., to employees) also includes a comparison of the measurement result with the normative reference level (300 Bq/m^3).

Certainly, one of the greatest challenges for school and kindergarten directors will be fulfilling the third requirement—providing pupils with information about the radiation doses they have received. This value is expressed in sieverts [S.v.][93]. The annex titled "Quantities and Indicator Values for Determining Ionizing Radiation Doses Used in Exposure Assessment" to the Regulation of the Council of Ministers of 11 August 2021[94], specifies in point 4 the method for determining the effective dose burden if the source of internal exposure is radon and its progeny present in the air. This dose is determined by measuring or calculating the potential alpha energy as the total energy of alpha particles emitted during the decay of radon-222 progeny in the radioactive series up to lead-210 (excluding this isotope) and the decay of thoron-220 progeny in the radioactive series up to lead-208, expressed in joules (J). The value of the effective dose burden, expressed in sieverts (Sv), is determined as the product of the potential alpha energy concentration, expressed in joules per cubic meter ($J \cdot m^{-3}$), the exposure time, expressed in hours (h), and the appropriate conversion coefficient. The appropriate application of Article 23c(2) A.L. to pupils requires the adoption of the conversion coefficients for radon and thoron at the workplace specified in this regulation, which are 1.4 [$Sv/J \cdot h \cdot m^{-3}$] and 0.5 [$Sv/J \cdot h \cdot m^{-3}$][95], respectively. Carrying out this calculation requires school directors not only to have knowledge of specialized parameters (energy values, radioactive series) but also to perform separate calculations for each pupil (or at least each class group) regarding the time spent in specific rooms, converted from lesson hours (45 minutes) to standard hours (60 minutes). It is a well-established fact that radon concentrations, which serve as the baseline parameter for determining radiation doses, can vary across different classrooms that a pupil occupies throughout the day.

The final requirement, contained in Article 23c(2) in fine A.L., entails informing pupils about "actions taken to reduce radon exposure in the learning environment". Undoubtedly, this refers to describing the measures outlined in section 7.1 of this article – namely, detailing the steps taken to optimize pupil exposure.

Concluding the description of the informational obligations imposed on school and kindergarten directors under Article 23c(2) A.L., it should be noted that these

[90] The Regulation of the Minister of National Education of 27 August 2012, on the core curriculum for preschool education and general education in various types of schools (Journal of Laws, item 977, as amended), Annex No. 2.

[91] Cf. Pasaribu, M., Sirait, N., 2020. Harmonization of Law in the Application of Legal Metrology. *Pertanika Journal of Social Sciences & Humanities*, No. 2, pp. 1199-1214; Popiołek, W., 2004. Metrologia prawna w Polsce – wczoraj, dziś, jutro [Legal Metrology in Poland--Yesterday, Today, Tomorrow]. *Pomiary Automatyka Kontrola / Measurements Automation Control*, No. 4, pp. 9–12.

[92] Regulation of the Council of Ministers of 5 June 2020 on legal units of measurement (Journal of Laws, item 1024, as amended), Annex No. 1, item 19.

[93] Point 21 of Annex No. 1 to the regulation indicated in the preceding footnote.

[94] Regulation of the Council of Ministers of 11 August 2021, on indicators for determining ionizing radiation doses used in exposure assessment.

[95] The conversion factor for radon in residential homes provided in the regulation must be excluded in this context. In the home environment, particularly during sleep, physical activity decreases, and respiratory rate slows, affecting the rate of air exchange in the lungs and, consequently, the dose of inhaled radon. Applying a conversion factor designed for residential homes to pupils could lead to an underestimation of the actual radiation dose absorbed in the school environment. This approach would also be unjustified and disproportionate, as the dose for teachers is calculated based on the conversion factors specified for workplaces.

obligations are structured as a conjunctive list[96], meaning that unit managers do not have the discretion to selectively provide only certain pieces of information while omitting others.

The Atomic Law does not specify a deadline for implementing optimization measures and concerning the timing and manner of fulfilling informational obligations, it uses the vague expression ”on an ongoing basis in writing“.

7.3. Deadline and Method of Fulfilling the Informational Obligation

Article 23c(2) in medio in conjunction with Article 32a A.L. mandates that the informational obligation towards pupils be carried out ”on an ongoing basis“. The interpretation of this phrase presents challenges regarding its temporal scope and practical application. According to its dictionary definition, this term implies an immediate action, adapted to changing circumstances, and aimed at maintaining the currency of information[97]. Its use in the cited provision of the Atomic Law clearly indicates a proactive obligation, requiring continuous dissemination of information as new data becomes available (e.g., providing pupils with radon concentration measurement results as they are obtained). From a philosophical perspective, the term ”on an ongoing basis“ is not merely a technical issue but stems from the fundamental principle of justice in the school-pupil relationship, as outlined in the preamble to the Education Law and concretized in Article 1(14) of that law (maintaining safe and hygienic learning, educational, and care conditions in schools and institutions). Delayed or incomplete information about health risks disrupts the epistemic balance between parties, contradicting the axiom of health and life protection as supreme values. The ambiguity surrounding the temporal dimension of this obligation has significant legal consequences for school and kindergarten directors, particularly in the context of Article 123(1)(9) A.L., which penalizes the failure to provide information on radiological protection. The imposition of an administrative fine requires determining the moment of the offense, which is crucial both for assessing the duration of the violation (a directive for penalty assessment under Article 124(3)(1) A.L.) and for calculating the five-year statute of limitations for penalization (Article 125(1) A.L.). Seeking support in legal doctrine, it is relevant to refer subsidiarily to discussions regarding the term ”immediately“, which is closely related to ”on an ongoing basis“. Literature suggests that actions must be taken without undue delay[98], sometimes within a single day[99]. Jurisprudence indicates that the term should be interpreted depending on the circumstances of the case and the situation of the obligated entity, though it is customarily understood to mean a period of approximately two weeks[100]. Regardless of these attempts to clarify the imprecise wording ”on an ongoing basis“ in Article 23c(2) A.L., its use should be assessed negatively. The legislator could have drawn upon normative solutions from the Labour Code, which precisely and concretely specifies deadlines for fulfilling informational obligations (Article 29 § 3(1) and (2), Article 29 § 32, Article 67(19) § 6, second sentence, Article 142(1) § 1(2) and (3) of the Labour Code).

Another component of the requirement contained in Article 23c(2) in medio in conjunction with Article 32a A.L. is the obligation to provide information ”in writing“. In this regard, a comparative analysis is useful, as the Labour Code provisions governing analogous requirements for notifying individuals of health and life threats (Article 207ą § 1(1) and (2)) do not specify the form in which such information should be communicated. Consequently, both collective notification[101] and any method adopted by a given employer (notice boards, email) are permissible[102]. From the perspective of educational institution directors, the solution adopted in the Atomic Law serves as a guarantee, ensuring their legal security. Given the sanctions for failing to provide information on radiological protection (Article 123(1)(9) A.L.), it is recommended—especially for evidentiary purposes—that the required information be delivered with a receipt confirmation. However, this statement necessitates further consideration of the issue of who should be the recipient of this information.

7.4. Recipients and Form of Information Under Article 23c(2) A.L. in Educational Institutions

It must be considered that a child remains under parental authority until reaching the age of majority, which includes the duty and right of parents to exercise care over the child’s person and to ensure their physical development (Article 92, 95 § 1 of the Family and Guardianship

96 Cf. Malinowski, A., 2008. *Redagowanie tekstu prawnego. Wybrane wskazania logiczno-językowe [Editing a Legal Text. Selected Logical and Linguistic Indications]*. Legal Publishing House, Warsaw, p. 157.

97 *Wielki Słownik Języka Polskiego [The Great Dictionary of the Polish Language]*, https://wsjp.pl/haslo/podglad/22929/na-biezaco, [accessed: 17.01.2025].

98 Adamiak, B, 2022. [In:] *Kodeks postępowania administracyjnego. Komentarz [Code of Administrative Procedure. Commentary]*, eds. B. Adamiak, J. Borkowski. Beck, Warsaw, Legalis, comm. to Article 12.

99 Malanowski, J., 2021. [In:] *Kodeks postępowania administracyjnego. Komentarz [Code of Administrative Procedure. Commentary]*, eds. R. Hauser, M. Wierzbowski. Beck, Warsaw, Legalis, comm. to Article 12.

100 Cf. Resolution of the Supreme Court of 19 May 1992, file No. III CZP 56/92.

101 Wyka, T., 2022. [In:] *Kodeks pracy. Komentarz. Tom II. Art. 94-304(5) [Labour Code. Comment. Volume II. Art. 94-304(5)]*, ed. K.W. Baran. Wolters Kluwer, Warsaw, LEX/el, comm. to Art. 207(1), point 1.

102 Wojciechowski, P., 2017. [In:] *Kodeks pracy. Komentarz [Labour Code. Commentary]*, ed. L. Florek. Wolters Kluwer, Warsaw, p. 1205.

Code[103]). These provisions align with Article 98(2)(2) of the Education Law, which mandates that a school's statute must specify the principles of its cooperation with parents concerning, among other things, care, and prevention. For these reasons alone, it is unequivocal that the appropriate application of Article 23c(2) A.L. to pupils, as required by Article 32a A.L., necessitates that the recipients of this information be parents[104]. This is also essential because exposure to high radon concentrations in an educational institution may require the implementation of protective measures beyond the institution itself (e.g., decisions regarding the child's activities or medical consultations). Thus, providing information solely to pupils would be insufficient and axiologically inconsistent with the purpose of radiological protection, as it is parents who are the primary decision-makers regarding their children's health. However, it remains to be considered whether denying pupils direct access to information about their exposure to radon is justified.

The most extensive body of scholarly work on radon exposure in public buildings, including schools, has been developed in the United States since the 1980s[105]. This literature emphasizes the importance of informational communication directed at children[106], stressing that—aside from necessary simplifications—it should include visualized content[107], be non-alarming[108], be limited to no more than 90 seconds, and feature friendly and engaging characters as messengers[109]. Polish law does not impose such a requirement; however, a significant analogous precedent already exists within the legal framework. The Act of May 13, 2016, on Counteracting the Threats of Sexually Motivated Crime and Protecting Minors[110] imposes in Article 22b an obligation on the governing bodies of educational institutions to establish standards for the protection of minors. Moreover, Articles 22c(5) and 22c(7) of this law mandate that these standards be formulated with due consideration for their comprehensibility by minors, requiring both a full version and a shortened version specifically intended for children. The shortened version must include information essential to minors. This precedent indicates a normative evolution toward the active recognition of children as recipients of information tailored to their cognitive abilities. It seems advisable to recommend that school and kindergarten directors adopt a similar approach in communicating information about radon exposure.

7.5. Entry into Force of the Obligation Under Article 23c(2)

Pursuant to Article 20(3) of the Act of June 13, 2019, amending the Atomic Law and the Fire Protection Act, the heads of units referred to in Articles 23c(2)-(4) A.L. were required to ensure optimization, information, and actions specified in these provisions for employees employed in these units within two years from the date of entry into force of this Act. This deadline expired on September 23, 2021.

As of that date, the heads of educational institutions were required, in accordance with Article 32a A.L., to begin fulfilling all obligations set forth in Article 23c(2) A.L. This date also marks the beginning of the period relevant for potential violations of these obligations, triggering liability under Article 123(1)(9) A.L. in cases of non-compliance.

8. Summary

The obligations of educational institution directors arising from the appropriate application of Articles 23c(1) and (2) A.L. to pupils reflect the fundamental principle of prevention in health protection law. The requirement to ensure radon concentration measurements and the obligation to inform about the associated risks are not merely technical procedures but rather the implementation of the idea of protecting individuals from a risk that—though invisible—has profound, long-term consequences, sometimes manifesting decades later.

From a legal axiological perspective, it must be emphasized that protection against ionizing radiation cannot be confined to the colloquial understanding of the term "pupil" but must encompass all individuals engaged in the educational and upbringing process.

The issue of access to information about exposure, both for pupils and their parents, reveals a broader problem of epistemic equality in health protection. A lack of reliable knowledge about potential hazards limits the ability to act

103 Act of 25 February 1964 – The Family and Guardianship Code (Journal of Laws of 2023, item 2809, as amended).

104 Within the meaning of this term as defined in Article 4(19) of the Education Law, this also includes the child's legal guardians as well as individuals or entities exercising foster care over the child.

105 Cf. Bobkier, R., Kovler, K., Tsapalov, A., 2025 "Fusion of Horizons": Part II. Modernizing radon regulation (1954–1993). *Journal of Environmental Radioactivity*, No. 283, p. 4.

106 Cf. Gordon, K., Terry, P.D., Liu, X., Harris, T., Vowell, D., Yard, B., 2018. Chen J. Radon in schools: a brief review of state laws and regulations in the United States. *International Journal of Environmental Research and Public Health*, No. 10, pp. 1-18.

107 LaTour, M., Tanner Jr., J.F., 2003. Radon: Appealing to our fears. *Psychology & Marketing*, No. 5, pp. 377-394.

108 Lemos, J. de, Brugge, D., Cajero, M., Downs, M., Durant, J., George, C.M., Henio-Adeky, S., Nez, T., Manning, T., Rock, T., Seschillie, B., Shuey, C., Lewis, J., 2009. Development of risk maps to minimize uranium exposures in the Navajo Churchrock mining district. *Environmental Health*, No. 8, p. 13.

109 Coates, R., 2014. Alert but don't alarm: radon risk communication strategies of a UK mitigator. [In:] *International Radon Symposium Proceedings, Charleston 2014*. American Association of Radon Scientists and Technologists, Hendersonville, p. 7.

110 Act of 13 May 2016 on Counteracting Threats of Sexual Offences and Protection of Minors (Journal of Laws of 2024, item 1802, as amended).

consciously, leading to an imbalance between the institution and those under its protection. In this light, the informational obligations of educational institution directors are not merely formal requirements but serve as a guarantee of the subjective recognition of pupils and their families.

At the same time, it should be noted that the appropriate application of the remaining provisions of the Atomic Law listed in Article 32a A.L. in relation to pupils raises significant interpretative challenges. This issue will be the subject of a separate study.

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