

Public Perception on Education and Information about the ionizing radiation across the EU



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Enhancing educAtion, traininG and communication processes for informed behaviors and decision-making reLatEd to ionizing radiation risks



What to do

- Communication about ionizing radiation with the general public needs to be improved;
- An effort is needed to analyze the state of the art and the existing needs in education, training and information;
- General public needs to better understand the effects of ionizing radiation;
- **coordinate the information and communication about ionizing radiation at European level;**

How to do

- Information sources: Improving the education, training and communication;
- Mass media and Social media: Move towards mutual understanding;
- **Recipients of the information: Informed decision making process related to ionizing radiation;**
- Reaching out, involving stakeholders and dissemination of project results;
- Coordination and management of the results.



WP3-Recipients of the information: Informed decision making process related to ionizing radiation

Understanding the general public concerns and requirements related to the ionizing radiation (IR), as well as the weaknesses of the current practices represents the first necessary step in the improvement of the communication towards the general public.

The objective of WP3 is to address the following questions:

- **What is the level of general knowledge related to ionizing radiation issues among EU citizens both in nuclear and non-nuclear countries?**
- **Where do the people get information related to ionizing radiation and what are the sources of information they trust?**
- What are the differences, gaps, understandings and perceptions in the general public compared with the ones provided by professionals in the nuclear area?
- What are examples of good practices regarding ETI about the effects of IR which should be promoted and what bad practices should be avoided?
- What kind of public information coordination can ensure an informed civil society in Europe?
- What are the mental models present in the general public regarding the effects of IR, and how are IR perceived by the general public across EU?



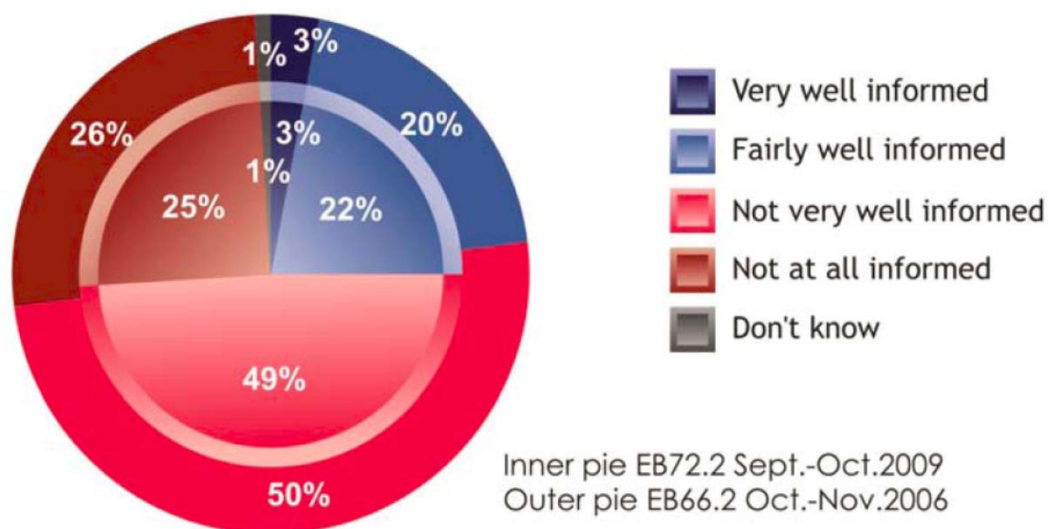
European public attitudes and beliefs towards nuclear-EUROBAROMETER analysis

Do you feel informed about nuclear issues?

Large part of the population in EU feels uninformed in this field - partly correlated to the existence of a nuclear power program.

In southern European countries, with **no operating NPPs**, the lack of information is at its highest, in Cyprus (89%), Greece (88%), Portugal (86%), and eight out of ten in Malta (82%), Latvia (84%) and Estonia (82%).

On the other hand, the group of countries with the **lowest number of respondents who feel uninformed** is led by Sweden (51%), Finland (55%) and Slovenia (60%), followed by the Netherlands and Germany (61% and 66% respectively). However, they are followed closely by the non-nuclear countries Denmark (65%) and Luxembourg (69%).



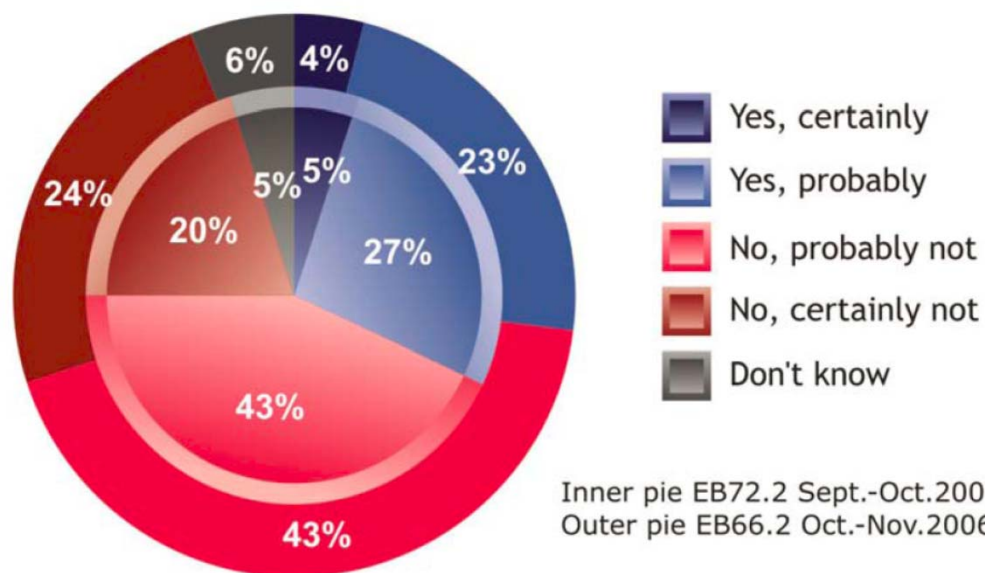
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Do you think that information that media offer is sufficient?

Either the **amount or the quality** of the information offered seems to be **insufficient** “for them **to draw their own conclusions on the risks and benefits** of energy choices in general and nuclear in particular”.

Almost two thirds (63%) of Europeans sharing this conclusion (20% consider that this information is ‘certainly’ not sufficient and a further 43% believe it is ‘probably’ not enough).

However a reasonable percentage of respondents (32%) feel that they can, at least to a certain extent, base their opinion on the information distributed by the media (only 5% are totally convinced)



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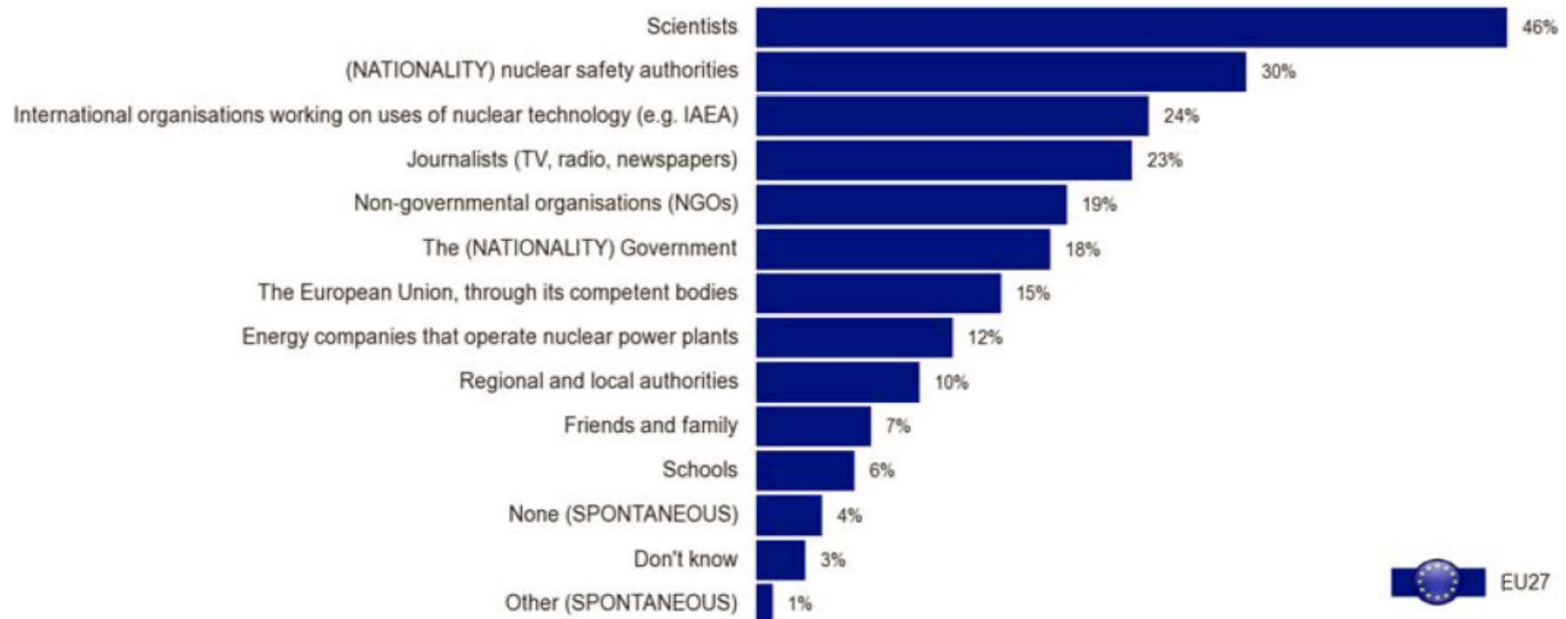


European public attitudes and beliefs towards nuclear-EUROBAROMETER analysis

Whom do you trust most?

Scientists are considered to be the most trustworthy information source across Europe with **the exception of 9 countries**: Bulgaria, Portugal, Luxembourg, Slovakia, Austria, the Czech Republic, Spain, Finland and Sweden. Respondents in Cyprus (67%), Estonia (65%), Greece (64%), Sweden and the Netherlands (63%) in particular have faith in scientists.

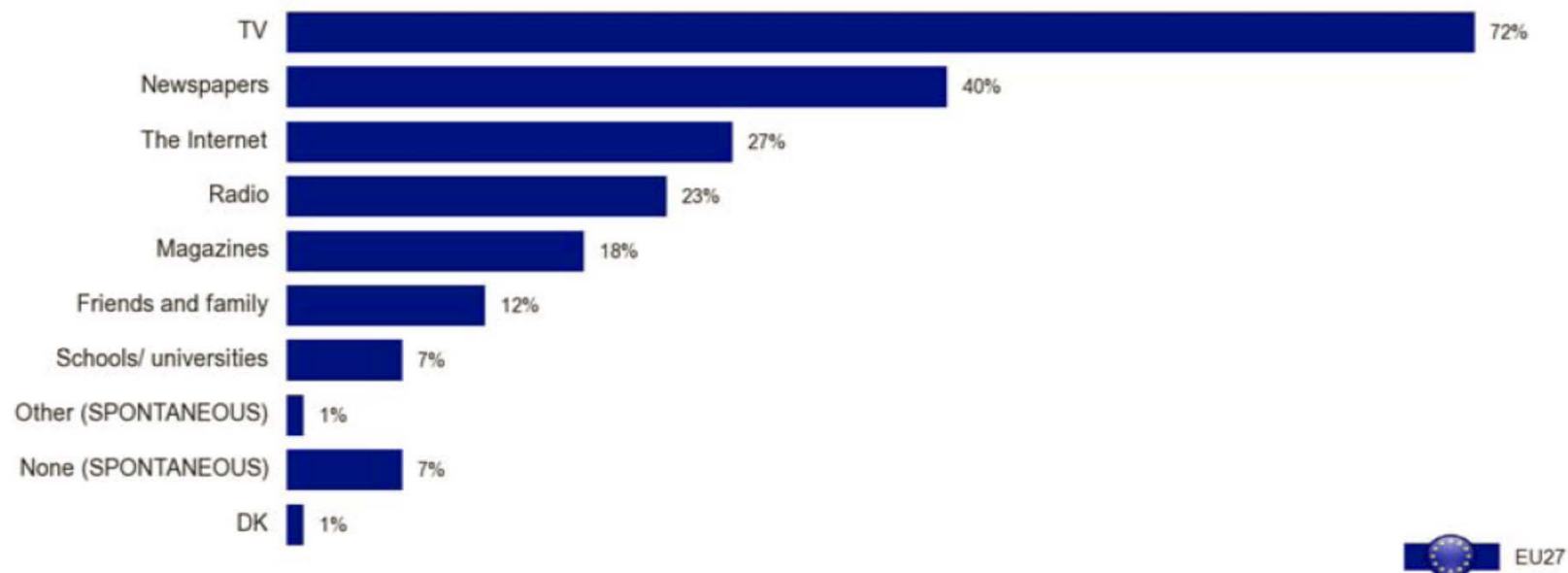
National nuclear safety authorities enjoy the trust of the largest proportion of respondents in Sweden (76%), Finland (59%), the Czech Republic (50%), Slovakia (49%) and Austria (46%). Respondents in Bulgaria and Portugal tend to trust **journalists** above the other sources (38% and 34%) while interviewees in Spain and Luxembourg have considerably more trust in their **government** (41% and 40% respectively) than other European citizens: it is their most trusted source.



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Information sources usually used in order to get information on nuclear energy

Television ranks first (72%), a long way ahead of other information sources, followed by newspapers (40%). The Internet is cited as the third most used source for information on nuclear energy (27%) followed closely by the radio (23%). Below the 20% level, respondents cite magazines (18%) or friends and family (12%). **Only 7% mention schools and universities (around 15% of the sample is aged between 15 and 24).**





Statistical analysis of Eurobarometer data based on linear regression, identified some correlations of risk perception with gender and education. Women* and **less educated** citizens tend to be more convinced that nuclear risks are miscalculated compared to men and respondents with a high level of education [...].

The more educated respondents are, the more they feel confident about the NPP operation.

*Females more often than males fear for themselves and their families because of the presence of NPPs.



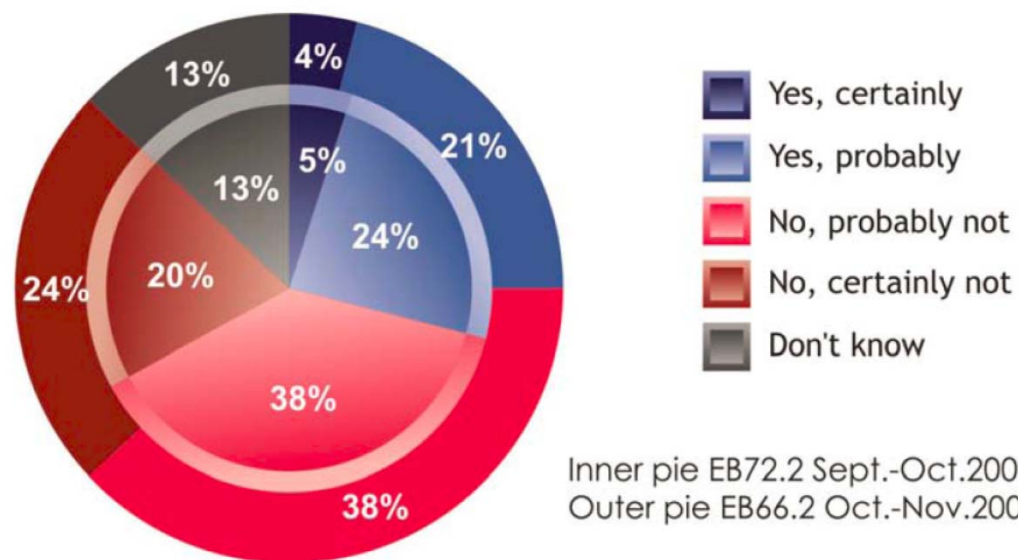
European public attitudes and beliefs towards nuclear-EUROBAROMETER analysis

Do you believe that the information school offer is sufficient?

The Eurobarometer survey on the sufficiency and adequacy of information received in school made in 2009 showed that the EU citizens regard the **information** about energy and nuclear issues **offered to children** as only **slightly more comprehensive than that provided by the media**.

58% of Europeans say that this information is **not sufficient for children to acquire 'a basic knowledge on the risks and benefits of energy choices in general and nuclear energy in particular'**.

However, 24% think that this information is probably sufficient and 4% find it certainly sufficient



Inner pie EB72.2 Sept.-Oct. 2009
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In-depth assessment of the knowledge level and attitudes of different social categories. Collecting data in Romania and Slovenia

School should be the first source of information about IR. Each country has its own education system with specific curriculum.

There are countries (having or not a nuclear power program) where basic elements on IR are provided from the secondary level (age of 10-14 years old) and are deepened in the high school (14-18 years old).

However, there are also countries where this topic is approached to a very limited extent in the pre-university levels.

A questionnaire was designed to collect data on the IR information provided by the school curricula in the EU member states.

Country

Organisation:

1. In your country, are there education programs on ionizing radiation established in the primary school?

• If yes:

a. In which year of the study?

b. How many hours are allocated to this subject?

c. What kind of information is provided?

- General knowledge in atom structure, nuclear reactions, radiations? etc.*
- Effects of ionizing radiation*
- Applications in nuclear medicine, industry, agriculture, etc.*
- Applications in energy production*

2. Are there any programs of education related to ionizing radiation on the level of secondary (high) school?

• If yes:

a. In which year of the study?

b. How many hours are allocated to this subject?

c. What kind of information is provided?

- General knowledge in atom structure, nuclear reactions, radiations? etc.*
- Effects of ionizing radiation*
- Applications in nuclear medicine, industry, agriculture, etc.*
- Applications in energy production*

3. Are the education programs strictly coordinated by the governmental institutions? What is a level of teachers' independency in creating the original, innovative programs of education?



Education and knowledge in the secondary and high school - Romania

In Romania, elements on ionizing radiation are provided in the **last year of the secondary school** during the Physics classes (7th grade, at the age of 13-14 years).

Only part of this curriculum is mandatory. Some of these topics as nuclear weapons or detailed level of information are only optional and the teacher has flexibility to choose to teach them or not.

The ionizing radiation is taken up again **in the 12th grade**, not compulsory, (at the age of 17-18 years) at a **higher level of complexity**, and consists in more advanced theoretical aspects on:

- nuclear models as proposed by Bohr and Rutherford
- calculation of the energy levels, decay process
- elements on the nucleus radius as function of mass number and production of nuclear radiations
- impacts of the radiation with the substance (Compton Effect, photoelectric effect, pairs generation) including the biological effects.
- basic elements about nuclear reactors and radioactive waste
- applications of IR in medicine.

The chapters dedicated to Atomic and Nuclear Physics cover around half of the Physics curriculum for the last year of high school.

Despite the large time allocated, this topic is not included in the baccalaureate program.



Education and knowledge in the secondary and high school - Slovenia

In Slovenia, radioactivity, ionizing radiation and nuclear energy are very **briefly mentioned** in the curricula **for secondary and high school** education. Lower secondary education, which is integrated with the primary education, is compulsory and has the same curriculum in all public schools.

Nuclear energy, radioactivity and ionizing radiation are briefly addressed in the curricula for **gymnasium** and some specialized technical schools. Applications of **ionizing radiation** are mentioned only **in the context of energy production**, other uses of ionizing radiation are not explained on the secondary school level. Potential impacts of ionizing radiation on organisms and the dose-effect relationships are also not explained.

In the lower secondary school (age 14-15 years), topics related to radioactivity and ionizing radiation are **not included in the curriculum for physics or chemistry**. Radioactivity is mentioned only as a topic to be discussed in the context of history of science and technology.

! In gymnasium (age 15-19 years), topics regarding ionizing radiation and radioactivity are included into physics curriculum. Radioactivity, half-life and mass defect, nuclear fission and fusion and principles of operation of a nuclear reactor are explained. Basic information on detection of ionizing radiation is explained. Elements regarding nuclear energy are also provided in other disciplines .

During the **secondary professional education in technical schools (age 15-19 years)**, radioactivity, ionizing radiation and nuclear energy are treated similarly as in the physics curriculum for gymnasium, only with less detail. There are no other general subjects that deal with nuclear energy and radiation.



Level of children knowledge about IR – Romania (study made in Pitesti city and Cernavoda)

Although the educational programs in school bring the first elements on IR in the secondary level or even later, in high school, **almost half of the 13 years old children** associate radiation with “**something polluting**”, “**danger – including death**” and to a lesser extent with “**chemical toxic emissions**”, nuclear weapons, malformations, skin diseases and cancer.

Both groups analyzed (from Cernavoda city, near the Cernavoda NPP and, respectively, from Pitesti, far from the NPP) **perceive radioactivity as an important danger**. A better knowledge on the general aspects related to NPP and radioactive waste has been noticed for the children from Cernavoda city.

A small part of the children living around the **Cernavoda** nuclear power plant **knows particular aspects linked to radioactive waste**. Therefore they know about the long-term impact on the environment (“*pollution is for longer time*”) and about the special waste management program.

Children consider that the *main risks of a NPP are the nuclear accidents*, while the *major risk associated to RW repository is water and soil contamination during an accident, but also during the normal operation*.

The results for the perceived frequency of the different dangers (such as pollutant emission during normal operation, radiation emission during normal operation, terrorist attack, nuclear explosion, nuclear accident) are generally very spread on the scale.

Family seems to **play a more important role in children information on IR in Cernavoda than in Pitesti**, most probable due to the fact that many parents work in the NPP or have jobs related to the power plant



Level of children knowledge about IR - Slovenia

In Slovenia, the survey investigating 16 years old schoolchildren, before receiving information during a thematic visit of the Josef Stefan Institute Information Centre, showed almost the same picture.

School children have an **incorrect representation of the IR**, almost 50% of respondents believing that radiation from a RW repository can be detected as far as 1 km from the site, and 30% thinking that NPPs cause acid rain.

Positive aspects of environmental effects of nuclear power are poorly understood. This situation does not change much over the last years.

A likely explanation is that in the **curriculum of the primary school there is practically nothing about nuclear energy and radioactivity.**



Conclusions-1

- There is a clear demand for better information and communication about IR and their applications starting from early ages;
- independent scientists are the most trustable sources;
- international organizations working on peaceful uses of nuclear technology and national safety authorities, and traditional mass media remains the major source of information;
- social media started to increase its share when information on IR is looked for
- There is a large range of information provided by the secondary and high school curricula across EU related to IR, making available to children from only little generic elements to a quite complete spectrum of theoretical aspects. **The information provided differs from country to country.**
- Studies in **Romania and Slovenia** showed that **before being educated** in IR in school most **children have already some opinion about ionizing radiation** and its applications, associating it with danger and health risk.
- There is general consensus across EU population that **schools do not offer sufficient information to children to provide them with basic knowledge** of energy and nuclear issues.



Conclusions-2

- Knowledge about different nuclear issues at European level is modest, but somewhat higher in the countries with nuclear power programs. **Education and information** influence the level of knowledge and **may determine** whether the **views** on the use of ionizing radiation **are positive or negative**.
- **A very large part of the population feels uninformed about ionizing radiation** and their applications. A vast majority of Europeans feels that **the information the media offers is not sufficient** for them to have an informed **opinion** about the risks and benefits of energy choices in general, and nuclear in particular. There is thus a clear demand for better information and communication about these issues.
- The main nuclear issues related to which European citizens would like to know more are the radioactive waste management, the main safety mechanisms and procedures at the nuclear power plants, the emergency preparedness and response plans, and the contribution of nuclear to fight against climate change.
- ...



Thank you!