

IMPACT OF NUCLEAR INFORMATION ON THE PUBLIC ACCEPTANCE. CASE STUDY FOR YOUNG PEOPLE IN CERNAVODA AND PITESTI TOWNS

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The general objective was to investigate the impact of nuclear information on young people's knowledge & attitudes by using different Methods/Participatory Tools in an Educational Programme. The investigation started with a baseline survey of six groups of youngsters, three each from Pitesti and Cernavoda, which was completed early in 2005. After analysis of the results an Educational Programme was proposed and developed following the FP6- COWAM2 Annual Seminar at Ljubiana. The Programme was produced by November 2005 and three methods were selected: classical methods usually used for school teaching, the discovery method, and a method involving simulation of a Local Committee. Three groups from Pitesti and four from Cernavoda underwent the Programme, following which a new questionnaire-based measurement was performed (May 2006).

Keywords: public acceptance, nuclear information, education.

1. Introduction

Despite in Romania nuclear research activities were started in early 50s, the nuclear power is very young. First NPP, Cernavoda Unit 1, about 600 MWe, was in operation since 1996. Next unit (Cernavoda Unit2) will be in operation at the end of 2007. Therefore, a relative low amount of high level waste was produced. However, some problems already exist in Romania, mainly related to historical radioactive wastes released by nuclear industry and research.

Although the radioactive waste (RW) problem is not critical in Romania, in the next future important changes are expected, mainly caused by spent fuel accumulation in Cernavoda and the society trends. Nowadays, in Romania, the public acceptance is based on a relatively low level of information and participation [1]. We appreciate RW problem should be critical in 10-15 years.

In this context the research theme COWAM2 CHK-3 was intended to investigate the methods needed to prepare young generation for a future participation in the decision making process (DMP). This is the first motivation to work with young people in this research. The second motivation is strongly connected with the knowledge transfer aspects. Three years ago, we saw in COWAM2 project the main support for our understanding for public participation

in the DMP. A real transfer of knowledge (both positive and negative aspects) from European experience to the Romanian actors is possible only if the theoretical facts will be transferred into practice. CHK-3 theme is an experimental study for qualitative and quantitative evaluation of different methods used to inform and involve people in the DMP.

2. General description

The general objective of CHK-3 was to investigate the impact of nuclear information on young people's knowledge & attitudes, by using different Methods/Participatory Tools in the Educational Programme [2].

In figure 1 a general scheme of the CHK-3 is presented.

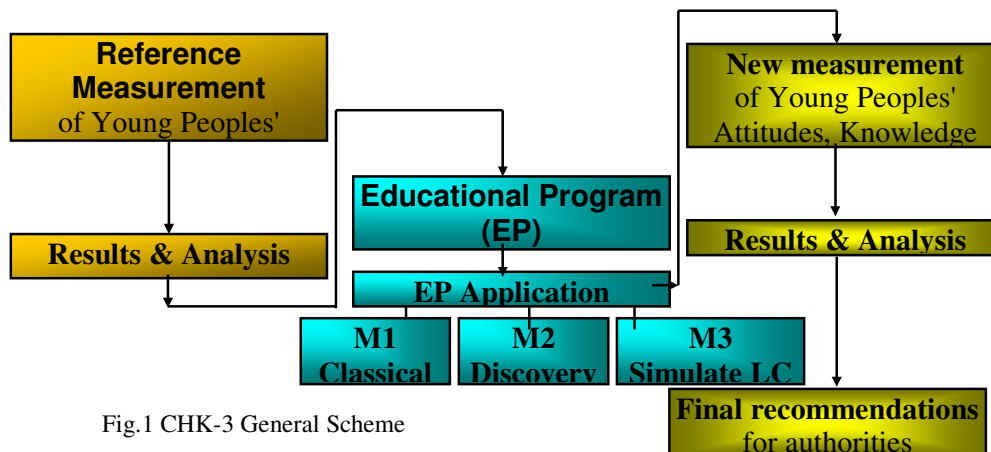


Fig.1 CHK-3 General Scheme

(1) The investigation has started in 2004 with a baseline survey intended to measure the reference state for knowledge and attitudes. Six groups of youngsters (3 from Pitesti and 3 from Cernavoda) were involved. In March 2005 a complete analyze for the **basic measurement** was released and discussed by the COWAM2 WP1 community.

(2) After the analyze an **educational program** (EP) was proposed and discussed in the COWAM2 Annual Seminar- Ljubljana 2005. The EP design was completed in September 2005 and the materials for EP was collected and produced until November 2005. Three methods were selected for EP applying: the classical methods usually used for teaching in the schools-M1, the discovery method-M2 and the LC simulation-M3. Seven groups (3 from Pitesti and 4 from Cernavoda) were involved during January 2006-April 2006 in the EP.

(3) A new questionnaire based measurement was performed after EP (May 2006). A first discussion of the result and analyse was achieved in 3rd Annual Seminar, Antwerpen, July 2006.

(4) A final document containing recommendations for authorities was released in September 2006.

3. Conclusions of the reference measurement

- (1) The children answers are similar with the answers of a population of adults. The main motivations for this situation are connected with the sources of the information (the family and the media play an important role).
- (2) The answers for opened questions proofs a fairly knowledge about radiation and RW.
- (3) An important number of children are confused related to different alternative of electric power (existing in Romania, pollution comparison, CO₂ release). However, the nuclear power and hydro power are very known by the children.
- (4) The knowledge of the children reveals the absence of a systematic educational programme in the fields of energies alternatives and environmental impact.
- (5) The radioactivity is perceived as an important danger for both groups (more than 50% answered by negative effects).
- (6) Generally RW are perceived as more dangerous than Classical Wastes.
- (7) The concern about a possible repository placed near the town is important if the distance is lower than 10 km. An important acceptance of the repository is observed in Cernavoda, despite the perception of the risk is higher than in Pitesti.
- (8) The most important conditions for a RW repository are the presence of the barriers and the placement into an unpopulated area.
- (9) The main risks for NPP are: nuclear accidents and nuclear explosion.
- (10) The main risks for RW repository are: 'Water and soil contamination during accidents' and 'Water and soil contamination during normal operation'.
- (11) The results for frequency of the different dangers are generally very spread on the scale, the answers reveals random answers or answers non-based on a previous judgement.
- (12) There are some differences between the two groups, differences introduced by the presence of the NPP in Cernavoda, but the differences are not very important.

4. Educational programme

The EP was implemented in Pitesti in January-February 2006. For M1 five lessons (one or two 50-minutes class period) were used, one per week.

For M2 a lesson (one 50-minutes class period) was used at the beginning of January, with the intention that at least 4 weeks should be dedicated to individual study. At the end of February, post-educational measurement of knowledge and attitudes were performed.

In Cernavoda, the EP was started in February 2006. For M2 an introductory presentation of nuclear energy and RW was performed. For M3, LC

organization- adopting the structure, 'staff' democratic elections, distributing the materials – was done. The intention was to have new measurement of knowledge and attitudes (based on new questionnaires) at the beginning of April. Taking into account the problems of avian flu in Cernavoda, started in March, the measurement were postponed after quarantine closing in Cernavoda. The measurement was performed in May 2006.

Short Description of the Used Methods

M1 lessons were based on the Power Point presentations, questions&answers, discussion&debat. **M2** lesson was based on a single, introductory, Ppt general presentation. The booklets, internet addresses & keywords, a list of items, the presentations used in M1 and a collection of articles and web pages written on a CD, were provided as support for individual study. During the introductory lesson we have taken notes. **M3** method was started by the discussion concerning to the question "Why a LC in Cernavoda?". The discussion was intended to reveal the actual situation in Cernavoda: the presence of the NPP introduces the necessity of population&environment protection measures, a solution for RW continuously generated in NPP operating etc. After that the discussion was continued with the role of a local committee, possible objectives and structures. The proposed objective for Cernavoda LC was "to identify the problems related to NPP and to inform people from Cernavoda town". After discussion and debat, the structure and the objective was adopted by vote. The staff was democratically elected. A list of information resources were provided for the LC. Three tasks were adopted for LC: (1) to collect data; (2) to analyse (selecting useful information, comparing different sources, conclusions); (3) to produce information for general public (posters, drawings, presentations, booklet, newsletter, etc.). The youngster will work together in LC's groups and will be co-coordinated by the staff. Teachers and project initiators will not intervene in the LC's work without a special request of staff.

5. Post-educational measurement of knowledge and attitudes

Post-educational measurement were intended to: (1) compare the attitudes and knowledge related to reference case; (2) relieve the effectivity/efficiency of the methods (M1, M2, M3) in the educational process; (3) compare the methods (advantages and drawbacks);

The questionnaire for post-educational measurement consists of 5 sections: A-Energy alternatives; B-Radioactivity; C-NPP; D-Radioactive wastes; E-Demographics. Additionally, in order to compare M1, M2, M3 methods a set of parameters was evaluated during lessons: (1) interest for subjects; (2) discipline; (3) costs; (4) easy to apply. For these parameters a scale with 5 steps was used (with 1 means high and 5 low). The results are presented in Table 1.

Table 1 EP's parameters for evaluation of lessons/presentations/activities

| Parameters | M1 | M2 | M3 |
|----------------------------|-----------|-----------|-----------|
| Interest for the subjects: | | | |
| -Initial | 2 | 2 | 2 |
| -During lessons | 3 | 1 | 1 |
| Discipline | 1 | 1 | 1 |
| Participation | 3 | 2 | 1 |
| Costs: | | | |
| -time for teaching | 1 | 3 | 3 |
| -materials | 3 | 2 | 2 |
| Easy to apply | 1 | 2 | 3 |

Related to M3, we must notice that an initial moderate pessimism was present both for the investigators and COWAM2 community, related to the level of participation and the final results. This initial condition has involved a more careful preparation of the materials and discussion (especially in the identifying the motivations and think possible support to maintain the induced motivations).

Finally we recognized the enthusiastic participation of the youngsters in all activities of EP-M3 has happened. As products/outputs: -2 posters for school (School 1 Cernavoda); -3 posters; web site (School 2 Cernavoda) have been chosen. A real competition between the three groups of each class has existed. The results are reflected in the final measurement. In order to communicate their work to the community the decision of the M3 participants was different: (1) posting the two big posters in the main hall of the School no.1 to be visible by the colleagues, teachers, parents, visitors etc; (2)communicate by a dedicate web-site(School no. 2).

The post-educational measurement shows:

-differences between post-educational and reference measurement; generally, the results are in the expected direction. For example the notoriety for different electricity alternatives (existing in Romania) increases after EP applying.

-the main dangers associated with NPP operating are nuclear accident, radioactive wastes, terrorism (fig.2) ; The EP applying increases the number of mentions for RW (Reference- 43%, M1-81%, M2-83%, M3-75%) and for nuclear accident (Reference- 68%, M1-93%, M2-98%, M3-90%). For terrorism danger M1 results are similar with the reference case, whereas M2 and M3 decrease the number of mentions (52%-M1, 56%-M2, 77%-reference). In fig.3 a comparison of the perception for nuclear's drawbacks after M1, M2, M3 applying is presented.

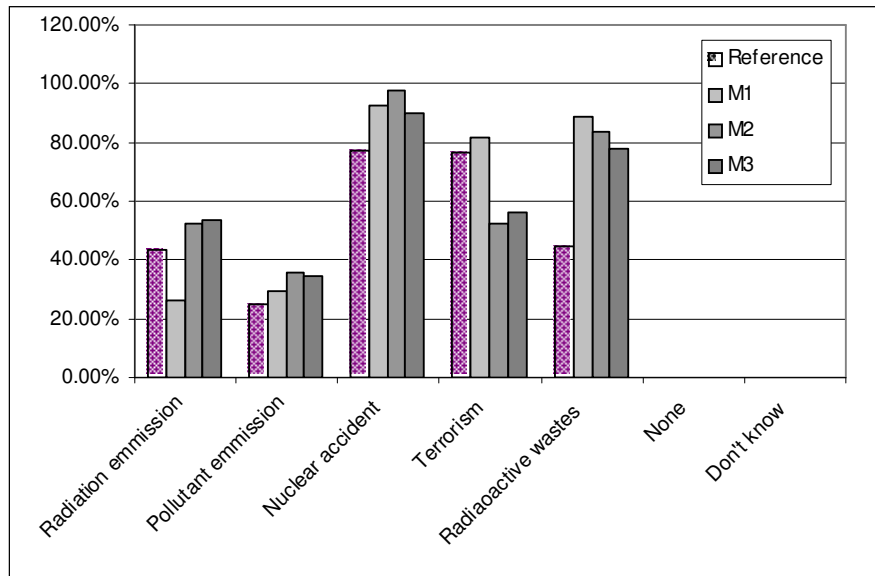


Fig. 2 Perception about dangers associated with NPPs

-the perception for the association between radioactivity and nature, weapons, NPP, medicine, research is reflected in an increased number of mentions for post-educational measurement;

-more than 65% of youngsters perceives radiations/radioactivity as dangerous in all cases: 74% (M1), 79% (M2), 66% (M3); however the radiations/radioactivity are useful (52%-M1, 41%-M2, 29%-M3), only 19%-M1, 17%-M2, 24%-M3 perceive the radiations/radioactivity as useless; a comparison of the perceptions about association of the radioactivity/radiations with different potential sources, for M1, M2, M3 and reference case is presented in fig. 4.

-after EP an increasing of awareness related to an hypothetical RW repository placed in immediate vicinity (Ref-30%, M1-63%, M2-62%, M3-56%).

-the 'safety distance' between repository and home increases after EP (Ref. 1 km; M1-100 km; M2-10 km; M3-10 km).

-the main dangers associated with RW Repositories are: water&soil contamination during accidents, natural hazards and terrorism;

-generally M1 shows more 'correct answers' (see perception of different alternatives) than M2 and M3; the explanations are based on two possible situations: a part of youngsters doesn't like individual study; they've used different information sources.

-there are differences between the repositories' conditions, dangers, importance and frequency of dangers depending on the methods used, but a

general trend exists. It shows an important influence of EP on knowledge and attitudes of youngsters.

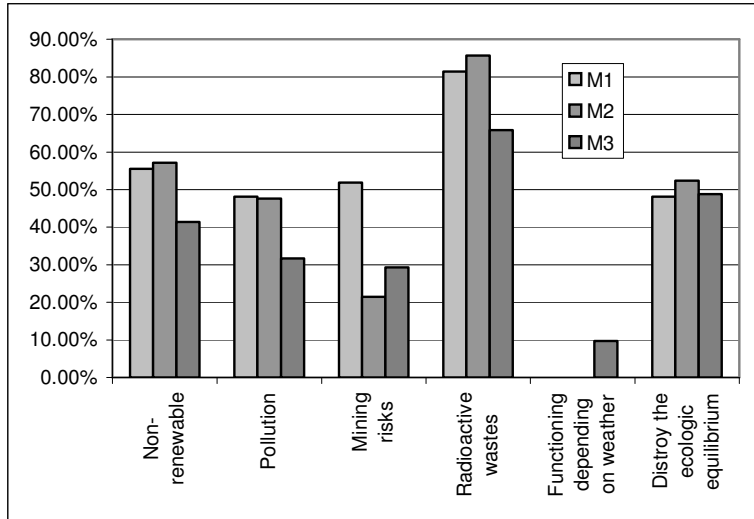


Fig. 3. Perception for Nuclear's drawbacks - comparison M1, M2, M3

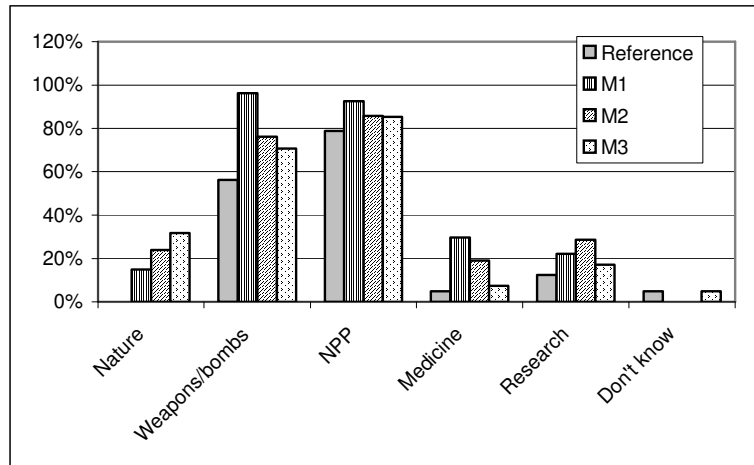


Fig. 4 Perception for Radiations/radioactivity – associated with...

6. Recommendations for authorities

A document containing the main conclusions and some recommendations for authorities are written in order to be sent to: Ministry of Education and

Research, Nuclear National Agency, Regulatory Body (CNCAN), National Agency for Radioactive Wastes (ANDRAD), Cernavoda Local Council. The main recommendations are the following:

-taking into account the democratic development of Romania, the integration in EU, globalization aspects and information processes, a public participation in the DMP for nuclear issues is compulsory in the next future;

-taking into account that RW problems will be critical in 10-15 years, young generations must be prepared for the DMP; this preparation should be started in schools (5-8th grade);

-an interdisciplinary course should be introduced in national Curricula in order to discuss energy alternatives, pollution, safety aspects, security of energy supply, radiations and radioactivity including NPP and RW repository aspects;

-for towns/localities with nuclear facilities youngsters may be easily involved in participatory activities like M3 (simulation of Local Committee), debates, discussions, visits, etc.

-despite M1 and M2 are very practical for teaching, M3 produces, in our opinion, more stable knowledge and attitudes; moreover, in M3 a transfer from youngsters to the community may occur.

7. Conclusions

Even though the Programme raised awareness of some of the dangers associated with radioactive wastes the level of acceptance remained high and constant. Given that radioactive waste problems will be critical in Romania in about ten to fifteen years, younger generations should be prepared for the Decision Making Process; such preparation should be started in secondary schools (5-8th grade);

An interdisciplinary course should be introduced in national Curricula covering energy alternatives, pollution, safety aspects, security of energy supply, radiation types and radioactivity including NPP and RW repository aspects;

For towns/localities with nuclear facilities, youngsters may readily participate in activities such as the simulation of Local Committee, debates, discussions, visits, etc.

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