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Identifying remaining socio-technical challenges at the national level: Hungary

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Contents

1 Introduction

The Paks Nuclear Power Plant (Paks NPP) is the only one in Hungary serving energy production and not research or educational purposes.[1] The state-owned NPP includes four reactor units built with Soviet technology in the 1970s and commissioned in the 1980s. There was no public opposition to the building of the power plant and no protests have emerged regarding its operation. However, efforts to solve the management of radioactive waste have caused a number of conflicts over the last decades. The history of radioactive waste management (RWM) reflects an increasing demand from affected communities to be involved in RWM facility siting decisions in order to gain knowledge, control, and compensation.

This paper summarises the history of RWM in Hungary, with a special attention to changing decision making approaches, social conflicts, and socio-technical challenges. First the institutional background of RWM is outlined. Next, efforts to build facilities for the management of low- and intermediate-level waste (L/ILRW) and high-level waste (HLW) are summarized. This is followed by the short description of remaining socio-technical challenges. Finally, changes in decision-making approaches and tools are analysed.

2 Institutional Background

In Hungary the management of radioactive waste and spent fuel[2] is currently governed by the Atomic Energy Act and associated regulations (Act CXVI of 1996, amended by Act CLI of 2005, Act CIX of 2006, and Act LXXXVII of 2011). According to these regulations, the National Public Health and Medical Officer Service (NPHMOS) is responsible for licensing radioactive waste management facilities. Licensing the establishment, development and the extension of the life cycle of such facilities also requires confirmation by Parliament. A precondition for licensing RWM facilities is the submission of the safety report, - including the safety assessment of the planned facility – to the licensing authority.

The regulator of RWM facilities, and also a key player of the licensing process is the Hungarian Atomic Energy Authority (HAEA). In accordance with the Atomic Energy Act, and in order to ensure the scientific basis for governmental, regulatory, and emergency response measures concerning the safety of nuclear applications, the work of the HAEA is supported by a Scientific Council. This council consists of 12 members who are nationally known professionals in the field of nuclear energy applications. The chairman and the members of this council are appointed by the minister

[1] Aside from this power plant, Hungary has two reactors, the Budapest Research Reactor and a training reactor at the Budapest University of Technology and Economics.

[2] In Hungary spent fuel is not officially defined as waste. However, in the following we categorize it as a type of HLW.

supervising the HAEA. Within its terms of reference and taking into consideration the most recent state of knowledge, the Scientific Council is required to advise on the most important issues of principle, research and development related to nuclear safety, radiation protection and emergency response issues. (IEA Report 2007)

In 1998, in compliance with the above-mentioned regulations, the Central Nuclear Financial Fund was set up for the purpose of covering the costs of radioactive waste management and the decommissioning and dismantling of nuclear facilities, among others. The Fund is managed by the HAEA. In principle, waste generators[3] provide the Fund's resources, and the size of payments is determined annually by the Finances Act on the basis of the estimated costs of current and future waste management.

Based on the provisions of the above laws, the Hungarian Atomic Energy Authority set up an implementer organisation, the Public Agency for Radioactive Waste Management[4] (PURAM) in 1998. The duties of PURAM include tasks related to radioactive waste management (planning, building, operating, monitoring, closing RWM facilities) and the decommissioning of nuclear facilities, as well as related research and development. Its operation is financed by the Fund. It has to be noted that before the establishment of PURAM in 1998, radioactive waste management was the responsibility of the Paks NPP. In legal terms PURAM is a public company[5].

The Atomic Energy Act enabled the nuclear power plant and PURAM to help set up so-called *public information and oversight associations*. These associations are independent legal entities, composed of local governments located in the vicinity of planned or already operational nuclear facilities[6]. Their main task is participation in overseeing the safety of nuclear facilities and providing the local population with up-to-date information on important events in course of the siting, planning, construction, and operation of the facility. Funding provided for the associations can be used for public information and oversight activities, and – recently – also for regional development purposes.

[3] In principle, funds dedicated to the management of non-utility waste (e.g., waste generated by health institutions) are paid by the central government.

[4] By Government Decree 2414/1997 (XII.17), the government authorised the Hungarian Atomic Energy Authority (HAEA) to set up a not-for-profit organisation, the Public Agency for Radioactive Waste Management (PURAM) by 1 July 1998, responsible for carrying out the tasks specified in § 40 of the Atomic Energy Act. Under the terms of the Decree, PURAM takes over from the National Public Health Authority the tasks related to the collection, transport, processing and storage of radioactive wastes.

[5] The Act on Economic Entities (Act IV of 2006) cancelled public agencies as a form of legal entities, which resulted in transformation of the agency into public limited company. Its current name is Public Limited Company for Radioactive Waste Management (PURAM).

[6] Before 2011 it was the implementer who selected and invited the communities to participate in the associations, mainly on the basis of their distance from the RWM facility. In 2011 the Atomic Energy Act was amended (Act LXXXVII of 2011) and a rule was included that restricts the circle of association members to the host community and its direct neighbours. During site selection and related research processes associations may be enlarged by including potential host communities, but after selecting a final site they must be redefined according to the general rule.

It has to be noted that while the Atomic Energy Act of 1996 limited the use of funding provided for the municipalities to public information and oversight purposes, more recent amendments (Act CLI of 2005) allow that such funding be used for regional development purposes (e.g. building community infrastructure and other public facilities), as well. Consequently, the law established the legal basis for providing financial compensation/incentives to the supportive group of municipalities[7]. As of 2012 four public information and oversight associations are operational.

Additional opportunities for public information and participation in the siting of nuclear waste facilities are provided by environmental legislation. The Environmental Protection Act (Act LIII of 1995) and the Government Decree on Environmental Impact Assessment (Government Decree 152/1995 (XII. 12.)) include provisions for EIA. In case of radioactive waste facilities, a two-stage procedure is prescribed, which consists of a preliminary phase (beginning with the submission of a preliminary Environmental Impact Study (EIS)) and a detailed phase (with the submission of a detailed EIS). In the preliminary phase a comments period is mandatory, while in the detailed phase a comments period and a public hearing are prescribed. Public hearings are organised by the affected Regional Environmental Inspectorates. It should be noted, however, that EIA is not mandatory for mining activities. If geological research, or even the creation of mine shafts associated with the construction of an underground RW disposal facility are defined as mining activities, EIA – and associated public scrutiny – can be circumvented. As we will see in Chapter 3, current loopholes in the legislation allow such anomalies.

3 The History of L/ILRW Management in Hungary

3.1 The Püspökszilágy repository

The first low-level wastes generated in Hungary were institutional (i.e., medical, industrial, and other non-utility) wastes. They were stored in an experimental repository in Solymár, which was closed in 1976, when a final repository for receiving this type of waste was put into operation in Püspökszilágy (Pest County). This repository has been located in a clay-loess formation. The subsurface, technically supported (reinforced concrete tank and steel-concrete driven well) repository is divided into four parts, where the different types of waste are stored isolated from one another.

Although the Püspökszilágy repository was not built for the reception of utility waste, in the absence of a permanent repository, the low- and intermediate-level waste from the Paks NPP was delivered here between 1983 and 1989. In the wake of opposition by the local public delivery was suspended in 1989, then it was resumed in 1992 and continued until 1996. The local population's consent was obtained via negotiations where the prime stake concerned the financial compensation of the host and neighbouring settlements. Financial compensation started in 1992 and is envisioned to continue until the decommissioning of the facility.

In 1998, two settlements (Püspokszilágy and Kisnémedi) set up the Isotope Information Association (IIA), which was later joined by five other settlements (Váchartyán, Váckisújfalu, Őrbottyán,

[7] Funding assigned to municipalities cannot be used to compensate individual residents or organisations.

Galgamácsa and Vácegres). Its official aim is informing the population about changes relating to the repository and conveying complaints to the operator. In order to assist the Association the implementer organisation, PURAM opened exhibition rooms in Püspökszilágy and Kisnémedi. The IIA has received financial support from the Central Nuclear Financial Fund, and has been a tool for canalising compensation.

What made the storage of utility waste in Püspökszilágy legally possible was that the original licensing documents lacked specifications as to the type and form of waste it could receive. In 2000 tritium was found in a nearby observation well, which made the reconstruction of the facility imperative.

Regarding the future of the Püspökszilágy repository, expert investigations established that though it is theoretically suitable for the permanent storage of low- and intermediate-level utility wastes, it cannot be enlarged sufficiently to accommodate the total waste produced during the lifetime of the Paks NPP. For this reason, the plan is to remove all utility wastes from Püspökszilágy and transport them to the L/ILRW repository built in Bátaapáti recently, and use the Püspökszilágy facility exclusively for storing institutional wastes. However, long-lived institutional wastes pose a special problem since their long-term storage in Püspökszilágy is unthinkable, nor can they be stored in the newly established L/ILRW disposal facility in Bátaapáti. For this reason, decommissioning of the Püspökszilágy repository (that is, ending active monitoring) cannot take place until long-lived institutional waste is not taken to a suitable facility.

3.2 Attempts to solve the permanent disposal of the L/ILRW utility waste (Magyaregregy, Ófalu)

Since it was clear from the beginning that the Püspökszilágy repository cannot solve the problems of the management of low- and intermediate-level utility waste, the Paks NPP made an effort to build another repository already in the 1980s. The conflict that erupted over the plan to build a repository for L/ILRW in the vicinity of Ófalu (Baranya County) was one of the first environmental conflicts in Hungary. The failed attempt simultaneously exemplifies the crisis of the state socialist system and the weakness of the top-down, technocratic approach.

In 1977 the Ministry of Industry (overseeing the Paks NPP) called upon the Hungarian Academy of Sciences to assist in selecting a site for a future L/ILRW repository. The ad-hoc committee of the Academy found three options – near-surface-, tunnel- and deep geological disposal - feasible and proposed four sites, Magyaregregy, Bátaszék, Ófalu and Püspökszilágy for further investigation. In 1980, contractors of the Paks NPP identified Magyaregregy (Baranya County) as the most suitable site. The criteria leading to this decision were unclear. For further testing, getting a permit from the county council was necessary. Under state socialist rule this was supposed to be a routine administrative procedure. The county council, however, refused to issue the permit, based on the negative opinion of a group of local experts about geological conditions.

In 1983, contractors of the power station recommended another site near Ófalu (Baranya County) for hosting a near-surface facility. Criteria for selecting the type of facility (near-surface repository) and the location (site) were again unclear. Local experts again opposed the site. They argued that the soil

was not impermeable, there were some wells nearby, and the region was seismologically active. This time, however, the county council ignored the opinion of local experts and issued a two-year permit for testing in 1985.

Late in 1987, preparations for drilling started, and shortly thereafter, the news about the siting leaked out. Local residents began to oppose the facility. In response, the NPP organised public meetings, where they briefed the local population about the disposal technology and the site selection process.

In early 1988, a local citizens' committee was formed from citizens of Ófalu and nearby Mecseknádasd, which – jointly with the Baranya County Council - established a panel of independent experts and charged them with the task of reviewing the results of the previous geological tests, the Hungarian regulations and the international guidelines. Having investigated the geological data, the panel concluded that the Ófalu site is not suitable for the disposal of radioactive waste.

Due to the conflict between the panel of independent experts and the experts of the NPP, the Baranya County Council decided not to issue the land use permit, and the licensing process was suspended. The state administration tried to get out of this stalemate by inviting the Hungarian Academy of Sciences to evaluate the suitability of the Ófalu site.

After reviewing the documents and consulting with the experts of both sides, the committee of the Academy formulated its position in a rather ambiguous manner. They stated that although from a technical perspective "the site is not inappropriate", it is "unfavourable in terms of social acceptance". The committee also emphasised that the siting of an RWM facility should not be regarded as pure technical problem, but social and political issues should also been taken into consideration.

Meanwhile the management of the Paks NPP tried to negotiate with the affected local councils. The power plant offered financial compensation and some degree of oversight over the operation of the facility, however, all this came too late. The year 1989 was already the year of profound political changes. The movement against the repository came to be interpreted as a struggle of the local population against the regime. Residents protested with a large demonstration against the siting. In this situation, based on the position of the Academy of Sciences the Ministry of Health rejected the issue of the construction permit. In the fall of 1989 the NPP appealed the decision, but the government, focusing on the approaching elections, rejected reconsideration of the previous decisions.

It should be noted that the Ófalu siting happened in an extraordinary historical situation when local events mirrored the change in power politics. The rejection of the disposal facility in the given political situation signified an anti-government, anti-regime stance, but also a large degree of distrust in the nuclear power plant. It was clear that the top-down, technocratic decision-making process failed and a different approach was needed.

3.3 Finding a site in Bátaapáti

Shortly after the political transition, in 1993, a so-called National Program for Radioactive Waste Management was launched. The Program was aimed at establishing a permanent disposal facility for the L/ILRW of the Paks NPP.

The first phase of the National Program focused on the selection of a candidate site. The site-selection process was divided into three steps, namely, (i) screening, (ii) selection of potential siting areas, and (iii) choosing of a candidate site. In the first step, based on a nationwide screening,[8] the experts limited the further research to two areas. The first area appeared suitable for a near-surface disposal facility, the second one for a geological repository. Within these two areas experts found 32 geological formations suitable for further investigation for a near-surface facility and 49 formations for a geological repository (Ormai, 2000).

In the second step, public opinion and/or the opinion of local governments was surveyed. Based on the criteria of geological features, technical viability and social acceptance, - where criteria were weighted, with local acceptance given the highest weight, - further investigation was narrowed down to three near-surface and three geological sites. Thus, the sites found in the vicinity of Diósberény, Németkér and Udvari (loess formation) were deemed the most suitable for accommodating a near-surface disposal facility, and Bátaapáti, Mórágy and Sárszentlőrinc (granite formation) for accommodating a geological repository (Ormai, 1998). It has to be noted that details of the above process (specific criteria, weights assigned to them, ways of measuring criteria) have never been made public.

In the third step a single candidate site had to be selected. This also took place in several steps. The Paks NPP signed a cooperation agreement with the six selected settlements, and in 1996 the program's leadership began test drillings in the areas around Bátaapáti, Diósberény and Udvari. In 1997 HAEA decided that exhaustive investigation should begin in the vicinity of Bátaapáti. A geological repository was planned here, at 250 m depth below the surface.

In 1997, the Public Association for Information and Oversight (PAIO) was established in the vicinity of the planned site with the participation of Bátaapáti, Bátaszék, Cikó, Feked, Mórágy and Mőcsény. On the other hand, 5 settlements lying close to the site, Ófalu, Mecseknádasd, Palotabozsok, Szebeny and Véménd opposed the building of the repository and, therefore, did not join the Association. Later Véménd's local government changed its position, saying that since opposition is useless they, too, should be compensated, and in 2000 joined the PAIO.

The members of the Association have received money for information and oversight, (since 2005 also for development) purposes, the amount of which is related to the distance from the test site. During the research phase financial support amounted to five percent of the allocation for the technical investigations.

[8] Screening was performed on the basis of nature conservation, cultural heritage protection, industrial, defense, seismological, hydrological and geological considerations.

In order to better inform the public about the planned disposal facility, an exhibition room was opened in Bátaapáti. Further ways of communicating included news bulletins, edited materials, a regional monthly, and the PAIO News (the region's locally broadcast video newsletter). Besides these, camps for raising awareness, travelling exhibitions, inter-school competitions, site tours, and a variety of PR programs were organised. The Noguchi Porter Novelli[9] communications firm carried out a series of public opinion surveys in Bátaapáti and throughout the region in order to lay the foundation for the information campaign.

The second phase of the National Program involved technical (surface and subsurface) investigations at the candidate site. Detailed surface surveys at the Bátaapáti site were carried out in 1997-98. The report found the area suitable, and in 2003 the Hungarian Geological Service also confirmed this finding.

The subsurface geological, hydro-geological, geophysical and other related exploration works began in 2004. In July 2005 a (non-binding) referendum was held in Bátaapáti where the majority approved the facility. Attendance was 75% and 91% of the constituents voted in favour. In November 2005, Parliament decided with overwhelming majority to give preliminary endorsement in principle to building the facility.

As of 2012 the licensing process of the disposal facility has not been completed and the underground facility has not been licensed yet. However, as the Paks NPP ran out of storage space, transportation of the NPP's wastes to Bátaapáti started in 2008. Since then these wastes have been stored above the surface illegally, i.e., in an above-ground L/ILRW storage facility that has not gone through a proper licensing process (e.g., no environmental impact assessment has been conducted). It is remarkable that none of the neighbouring communities have complained about this situation, it was only Energiaklub, an environmental think tank, that submitted a complaint to the ombudsman's office.

The ombudsman found a number of serious irregularities in the licensing process (Ombudsman of Future Generations 2011). For example, subsurface geological surveys, including the construction of underground mine shafts (parts of the repository), were defined as mining exploration activities. This way EIA was avoided. One of the results is that none of the authorities involved in the licensing process paid any attention to the fact that the site covers a NATURA 2000 area.

It should be noted that the Bátaapáti site is very close to the Ófalu site, i.e., the candidate site of the L/ILRW facility in 1988, which was abandoned due to vigorous public protests. The fact that the repository was so smoothly accepted in Bátaapáti has several factors. Obviously, the historical background in the 1990s-2000s has been very different from the 1980s, the period of political transition. Economic needs of small settlements in the affected region are rather pressing, while political and environmental concerns play a minor role. On the other hand, in contrary to the Ófalu attempt, PURAM has taken a very different siting approach. When selecting a candidate site, they took primarily social factors (community consent) into consideration. They have also learned from

[9] Previously known as Noguchi and Peters.

Western countries how to use financial compensation and PR techniques. However, overemphasising socio-economic aspects at the expense of technical and environmental criteria, have resulted in licensing problems.

4 The History of HLW Management in Hungary

As mentioned earlier, spent fuel is not defined as radioactive waste in Hungary. In spite of hopes that it can be re-cycled and/or re-used in the future, spent fuel of the Paks NPP became an urgent problem in the early 1990s (see Chapter 4.1). Currently, 1804 spent fuel assemblies are stored in cooling pools at the Paks NPP, and 6547 spent fuel assemblies have been placed in a temporary storage facility, located in the vicinity of the NPP. (RHK, 2011)

4.1 Siting a temporary storage facility for spent fuel in Paks

Shortly after its launching, in 1986 the Paks NPP signed a contract with the Soviet partner organisation on the returning to the Soviet Union of spent fuel. In line with the contract, spent fuel was to be returned to the Soviet Union annually, after a 5-year cooling period. However, with the collapse of the Soviet Union, at the beginning of the 1990s this arrangement over the spent fuel became problematic. On the one hand, a new law was passed in Russia which banned the import of nuclear waste; on the other hand, Ukraine created difficulties over the transportation of radioactive material through its territory.

These difficulties urged the management of the power station to seek a long-term solution to the problem. In 1991 a decision was made by the Paks NPP on establishing a temporary storage facility for spent fuel in an area in the vicinity of the power plant.

The management of the Paks NPP began to think about a technology and a contractor. Seven firms were invited to submit feasibility studies. Among the seven tenders there were wet and dry type storage facilities, both in either container or chamber form. As a result of a multi-criteria evaluation, the Modular Vault Dry Storage (MVDS), a dry chamber-type option offered by GEC-ALSTHOM was chosen.

Before it even started the licensing process, the NPP began negotiations with local governments of the settlements near to the proposed storage facility; these negotiations were about informing local residents and the possibility of financial support. In order to facilitate communication, in 1992 the Public Oversight and Information Association (POIA) was created. The Association includes 13 settlements (including Paks itself) within 12 km of the power station. The original purposes of the Association were the monitoring of background radiation and informing of local residents. The expense of this public monitoring was covered by the NPP.

The establishment of POIA was urged by the plans for the temporary storage facility, although the scope of cooperation has been wider than the building of the new facility. The Association played a significant role in normalising the relations between the local residents and the power station. After creating the Association, the Paks NPP started an information campaign on the planned storage facility in the POIA settlements and negotiations over compensation with the members of the

Association. In spite of these, a period of public protests followed in Paks early 1994. These protests failed shortly. The main reason for the failure is that a significant proportion of the population of Paks has had an interest in the long-term operation of the NPP, for which finding a solution for the HLW problem was crucial.

In June 1994 negotiations between the NPP and the Paks municipal government concluded, and they signed an agreement about the interim storage facility project. In this the NPP guaranteed that no spent fuel would be placed in the storage facility as long as the Russian partners accepted it. The power plant also guaranteed that no type of nuclear waste from abroad would be stored in the facility. Finally, the NPP committed a significant amount of funding to the city of Paks.

In 1995 the license for the interim storage facility was issued and in 1997 it became operational. The chronology of events is presented in Table 1.

Table 1. Process of establishing a spent fuel temporary storage facility in Paks

Date	Events
1986	Contract with the Soviet Union about the return of spent fuel
1991	After the collapse of the Soviet Union difficulties with returning spent fuel to Russia Decision about building a temporary storage facility
1992	Decision about the technology (Modular Vault Dry Storage) and the location of the facility (in the vicinity of the Paks NPP) Creating the Public Oversight and Information Association (POIA)
1993	Information campaign in POIA settlements Negotiations about financial compensation with POIA
1994	Public protests in Paks and their failure Agreement between the NPP and the Paks municipal government about guarantees and compensation
1995	License for the facility issued
1997	The facility becomes operational

4.2 Plans for establishing a geological disposal facility in the vicinity of Boda

In the early 1990s, establishing the Paks spent fuel interim storage facility was the idea of the management of the Paks NPP. Since the interim repository's planned lifetime is maximum 50 years,

the NPP management also made a decision to establish a geological disposal facility on the long run. Although a national HLW strategy has never been officially declared by any government – and this way public discussion has been "successfully" avoided to date – geological disposal has become the *de facto* HLW management strategy. The main steps of this process are summarised below (see also Table 2).

In 1992 the Paks NPP initiated geological surveys in the area of the so-called Boda Aleurolit Formation (Baranya County), to investigate the suitability of this formation for a deep geological HLW repository. After the first round of research, in November 1995 a three-year research program was launched again in the vicinity of Boda to ascertain whether or not rock is suitable for hosting HLW. The reason for the time limit of the program was that a uranium mine operating in the area was to be closed in 1998, and in the absence of its infrastructure surveying became expensive. The conclusion of the project studying the geology at a depth of 1100 meters was that "no circumstance was found that would put the suitability of the formation for the storage of HLW into questioning" (RHK, 2005).

In 1998 a new government came into office. In 1998 they ordered discontinuation of surveys and flooding of the mine shafts. In 2003, following the 2002 change of government, another research program was launched aimed at building a permanent geological repository in two phases: first an underground research laboratory would be established, then, based on the experiences obtained there the decision on the repository would be made.

Almost concurrently with the start of the surveys, in 1996 six nearby settlements set up the West-Mecsek Public Information Association (WMPIA) with the help of the Public Agency for Radioactive Waste Management (PURAM), the implementer organisation. Some local NGOs are also members of the Association, but without a right to vote. In 2003, the area surveyed for finding a suitable location for the underground research laboratory was somewhat enlarged, affecting three further settlements which joined the Association in 2004. The main tasks of WMPIA included overseeing the geological surveys and keeping the public informed about the investigations. Funding dedicated for public information and local development are channelled through the Association. The resources allocated to WMPIA depend directly on the funds spent for geological research.

From the start PURAM has carried on intensive communication with the local public partly with the participation of the Association and partly by contracting the Noguchi communications firm. A public information office began operation in Kővágószőlős in 1999, and in August 2003 the Boda Information Park was opened. Among the Association's own tools, the WMPIA video newsletter, and a few periodic publications deserve mention, although some of them are compiled and published by Noguchi.

In 2004, the concept of the future repository called TS(R)/6/25, a variant of the Swedish KBS3 concept (with aleurolit as host rock) was defined. According to interviews, no decision has been made on the issue of retrievability yet.

Public resistance in the Boda area has been negligible. Moreover, recent public opinion surveys indicate that a kind of “participation fatigue” has set in, that people have lost interest in the latest events of the relatively prolonged information campaign. This is aggravated by recent budgetary restrictions, which have led to a slowing down of investigations, accompanied by a reduction of financial support to the Association.

In the long-range, the local government of Boda was promised that based on a local referendum they may decide whether or not to accommodate the planned underground research laboratory, and, subsequently—if tests prove the suitability of the rock formation—the repository itself. This is only a promise, not a law. On the other hand, the law stipulates that Parliament must confirm the decisions on building the laboratory and the repository.

As things stand today there is no official national strategy for the management of HLW. The contractual partners—including the WMPIA and PURAM - are authorised to conduct investigations and provide information by plans prepared annually. Due to the increasing economic problems over the last decade and the concentration of financial and human resources to completing the Bátaapáti facility, geological research in the Boda area has been going on with decreasing intensity.

Interviews suggest that “critical actors” of (and driving forces behind) the developments in HLW management – are the Paks NPP (and its owner, the Hungarian Electricity Works, - MVM) and HAEA – both highly interested in nuclear newbuild and finding a solution for the HLW problem. A third important stakeholder on the above issues is the city government of Paks.

Table 2 contains the main steps made to prepare the establishment of a HLW disposal facility in the Boda area. In Table 3 the planned process of constructing, operating, and closing an underground research laboratory and a repository are summarized.

Table 2. Former steps aimed at establishing a HLW disposal facility in the Boda area

Date	Events
1992	The Paks NPP initiates geological surveys in the area of the Boda Aleurolit Formation
1995-98	Three-year research project, which concludes that "no circumstance was found that would put the suitability of the formation for the storage of HLW into questioning"
1996	Creating the West-Mecsek Public Information Association (WMPIA). Information campaign in WMPIA settlements starts
1998	Discontinuation of surveys
2003	Start of new geological surveys, which continue with varying intensity to date
2004	TS(R)/6/25 (a variant of KBS3) defined as the concept of the planned repository

Table 3. The planned process of establishing a HLW disposal facility

2015-2029
- Implementation of field research, including preparation of the required closing reports.
- Performance of safety assessment for supporting the underground laboratory research programme, which closes the field researches and preparation of a safety report for its demonstration.
- Validation of the safety report by using international peer-review.
- Review of the content, financial and schedule conception for the long-term programme of the research.
- Preparation of the working design of the underground laboratory.
- Tendering of construction of the underground laboratory.
  Continuous monitoring.

2030-2037
- Construction of the underground laboratory.
- Planning of the research programme of the underground laboratory.
- Authority licensing of the research programme.
- Tendering of implementation of the research programme.
- Preparation of the realization plan of the underground laboratory I.
  Continuous monitoring

2038-2054
- Operation of the underground laboratory.
- Implementation of the research programme of the underground laboratory.
- Performance of safety assessment for supporting the underground laboratory research programme, which closes the field researches and preparation of a safety report for its demonstration

- Validation of the safety report by using international peer-review.
- Review of the content, financial and schedule conception for the long-term programme of the research.
- Implementation of the safety assessment for supporting the application for establishing permit of the underground storage facility, preparation of the safety report.
- Obtaining the establishing permit.
- Preparation of the realization plans of the underground laboratory II.

  Continuous monitoring

2055-2063
- Construction of the disposal facility.
- Implementation
- Implementation of the safety assessment for supporting the application for establishing permit of the disposal facility, preparation of the safety report;
- Obtaining the permit of operation
- Preparation of the realization plans of the storage facility I.

  Continuous monitoring

2064-2079

Operation of the disposal facility
- Transportation of the spent fuel stored at the interim storage facility to the disposal facility.
- Transportation of decommissioning wastes of the NPP to the disposal facility.
- Transportation of long-life radioactive wastes stored at Püspökszilágy to the disposal facility.
- Preparation of safety assessments.
- Preparation of the implementation plans of the disposal facility.

  Continuous monitoring

2080-2083
- Closing of the disposal facility.
- Preparation of safety assessment
- International peer-review
- Obtaining the required authority licences for closing.
- Updating of the implementation plans of the disposal facility.

  Continuous monitoring

2084-2133
- Preparation of safety assessments.
- Continuous monitoring

  Decision to be made about continuing or finishing the institutional control.

5 Socio-technical Challenges

5.1 Energy policy, the role of nuclear energy

5.1.1 The future of nuclear energy

Hungary has one nuclear power plant, the state-owned Paks NPP, comprising four reactor units of an upgraded pressurised water VVER-440/V-213 of Soviet design. The four units were commissioned in 1982, 1984, 1986 and 1987 respectively. Their expected lifetime at the time of construction was 30 years and the design rated output was 440 MWe per unit. The contribution of nuclear energy generated in Paks to the total generation of electric energy in 2007 and 2008 was 37%, in 2009 it was 43%. The Paks NPP is currently relying on Russia for its fuel supplies.

The Hungarian Parliament voted in 2004 to extend the lifetime (by 20 years) and expand the capacity of the Paks NPP. In 2009 Parliament granted its preliminary and theoretical consent to the commencement of activities serving the preparations for new bloc(s) on the location of the Paks NPP. The plan expects the commissioning of two 1000 MW capacity new blocs up to 2030.

Supporters of nuclear expansion argue for their position with the following:

- The use of nuclear energy primarily contributes to the maintenance of energy security. (Hungary has one of the highest gas dependencies of EU member countries). Although nuclear fuel needs also be imported, the Paks NPP has reserves of fuel for two years.
- Due to its low production costs nuclear energy contributes to the competitiveness of the national economy.
- A nuclear power station is an electric energy producer of almost no CO_2 emission; hence it is an economical and efficient means to the achievement of the objectives of climate protection.

On the other hand opponents of nuclear energy argue with the following:

- The investment costs of new nuclear reactors are very high and Hungary is unable to finance them in its current economic condition.
- In case the country would spend the necessary enormous financial resources (from loan) for building new reactors it would practically use all resources from the enhancement of energy efficiency (such as the reconstruction of the vast majority of Hungary's residential buildings that are of very poor energy efficiency), or from the development of renewable energy resources. This would preserve an expensive and outdated energy production structure for a very long period.
- Public trust in the safety of nuclear power stations has also significantly dropped due to the Fukushima accident.

In 2011 a National Energy Strategy was elaborated, which stated that the aim was "to obtain our independence from energy dependence". The five top means proposed for the accomplishment of this aim are the following in order of importance:

- Energy conservation and efficiency
- Utilisation of renewable energy sources to the highest possible proportion
- Safe nuclear energy and the electrification of transport based on it
- Creation of a bi-polar agriculture and
- Joining the European energy infrastructure.

When looking at the figures more closely, - in contrary to the top priorities of the Strategy, - disproportionately huge sums are to be spent on the development of nuclear energy, while less by magnitudes would be spent on financing energy efficiency and renewable energy.

5.1.2 Challenges

There has been no open social dialogue about the future of nuclear energy and about energy strategy in general to this day in Hungary. The issue of nuclear energy is treated as taboo by the media, and information on accidents, risks, benefits and drawbacks is rather one sided (http://okopoliszalapitvany.hu/hu/program/prezentaciok-es-hanganyagok).

The Hungarian public had a more positive attitude to nuclear energy prior to the Fukushima accident than the average of the EU-population. Hungarians saw the advantages of nuclear energy similarly to the average EU resident, but considered the risks smaller (but still bigger than the advantages!). Why did Hungarians support nuclear energy more than the average of the inhabitants of the EU?

- In Hungary the economic advantages and pressures have greater weight than the environmental and health risks;
- Trust in experts/authorities is traditionally bigger in Hungary than in the West European countries;
- Both components are strongly built upon by the communications of the nuclear institutions.

Public opinion polls (e.g., Median, 2011) conducted after the Fukushima accident show, however, that there has been a major shift in the Hungarian public opinion recently. Public support for nuclear energy has been significantly decreasing. For instance, to the question of "According to you are the nuclear power stations dangerous in general?" 62% answered that they were extremely or very dangerous, and only 35% answered that they were less or not dangerous. The Paks NPP was considered extremely or very dangerous by 52%, and less or not at all dangerous by 42%. Only 32% agreed with the extension of the operation of the Paks NPP by 20 years after the expiry of the original lifespan and 63% did not agree with it. To the question whether a new nuclear power station should be built at Paks next to the existing one, 36% said yes and 58% said no!

By now politics has also become divided, for instance, the Hungarian Socialist Party, the largest opposition party which used to support nuclear energy earlier has turned against the option of the nuclear new build. Obviously, a broad societal dialogue would be needed to the development of a well considered energy policy enjoying wide social support. However, the current government strives even more than the previous ones to squeeze out the public from energy policy decisions, to silence counter opinion, and to eliminate social control.

5.2 Regimes, roles, responsibilities

5.2.1 Regulator, implementer, and local authorities

As pointed out earlier, in Hungary radioactive waste management is currently governed by the Atomic Energy Act and associated regulations. The Hungarian Atomic Energy Authority (HAEA) is the regulator of nuclear facilities, but it is also supervising nuclear industry. The National Public Health and Medical Officer Service (NPHMOS) is responsible for licensing radioactive waste management facilities. The implementer organisation, the Public Limited Company for Radioactive Waste Management (PURAM) is responsible for the management of all types of radioactive waste and the decommissioning of nuclear facilities, as well as related research and development.

The costs of radioactive waste management, including the operation of PURAM, are being covered by the Central Nuclear Financial Fund. The Fund's resources are provided by waste generators, primarily the Paks NPP. The Paks NPP was the implementer of RWM before the establishment of PURAM in 1998, and is still the main driving force of RWM. The NPP (and its owner, the state-owned MVM) are highly interested in extending the lifetime of the existing reactors, as well as building new ones.

Important actors of RWM are the public information and oversight associations. Four such associations have been set up until recently in the neighbourhood of planned and operational RWM facilities, i.e., around the L/ILRW disposal facilities in Püspökszilágy and Bátaapáti, the Paks interim storage facility, and the planned Boda HLW facility. Associations provide a framework for negotiations between PURAM and the affected local governments, and they canalize public information and financial benefits.

The Environmental Protection Act (Act LIII of 1995) and the Government Decree on Environmental Impact Assessment (Government Decree 152/1995 (XII. 12.)) prescribe a two-stage EIA procedure for RWM facilities. Concerning the EIA procedure, the Regional Environmental Inspectorates are the responsible authorities.

5.2.2 Challenges

The role of some institutions involved in radioactive waste management and particularly of HAEA is not clear. HAEA is the chief regulatory authority of nuclear facilities. At the same time, it is the key promoter of nuclear energy. HAEA leaders often speak up in the interest of expanding nuclear power production in public communications. Clearly these are incompatible functions.

The role of some other authorities and the local associations is also problematic. As the majority of RWM facilities are located (or planned to be established) in economically disadvantaged regions,

local governments of affected settlements are greatly interested in acquiring development resources. The economic situation of the majority of these settlements highly depends on (existing or planned) RWM establishments providing financial benefits to them; hence they are not critical even when regulatory requirements are violated. An example is the recent history of the geological repository built for receiving low- and intermediate level wastes at Bátaapáti, the commissioning of which has been accompanied by a number of law-breaking anomalies. Since 2008 a large number of barrels containing waste have been transported to Bátaapáti from the Paks NPP and stored in buildings above surface. Though there is no permission whatsoever for above surface storage of the waste, neither the licensing authorities, or the Bátaapáti local government or the Association even attempted to prevent this arrangement. It was found to violate the law by the environmental ombudsman (the so-called ombudsman of future generations) only by his investigation upon the request of an environmental think tank (http://okopoliszalapitvany.hu/hu/program/prezentaciok-es-hanganyagok). It should be noted that the office of the environmental ombudsman was abolished from 1 January 2012 on, hence civil control is decreasing.

Public information and oversight associations have been trying to reduce their economic dependency on the implementer. They were those who initiated the amendment of the Atomic Energy Act, which took effect in 2005. According to the amendments, associations will be paid directly from the Central Nuclear Financial Fund in a regulated manner, rather than negotiating the amount of compensation every year with PURAM.

The operation of the Central Nuclear Financial Fund has also become problematic. According to the legal norm the sum to be paid by the Paks NPP should be determined so that it should fully cover the costs of the interim and final disposal of all types of radioactive wastes generated during the entire operational span and the subsequent decommissioning of the power station. The Atomic Energy Act ensures the stable value of the annual payments taking interest rates into consideration. However, the Paks NPP has been paying a fix annual contribution for several years, and therefore – in order to ensure the stable value of payments – the taxpayers' contribution has been increased over the years. While in 2006 the contributions of the Paks NPP made up for about 80% of the total payment, in 2011 it was only 73%, although the proportion of the waste produced by the Paks NPP in the total waste stream has not decreased in terms of volume or activity. This, of course, violates the Polluter Pays Principle.

5.3 Options: Flexibility/path dependency

5.3.1 Siting a temporary storage facility for spent fuel in Paks

As mentioned above spent fuel of the Paks NPP was to be returned to the Soviet Union annually, after a 5-year cooling period. However, with the collapse of the Soviet Union, at the beginning of the 1990s this arrangement concerning spent fuel became problematic. On the one hand, a new law was passed in Russia which banned the import of nuclear waste; on the other hand, Ukraine created difficulties over the transportation of radioactive material through its territory.

These difficulties urged the management of the power station to seek a long-term solution to the problem. A number of alternatives were considered:

(i) reprocessing abroad,

(ii) permanent disposal in Hungary,

(iii) storage abroad,

(iv) the closing down of the power station, or

(v) the construction of a temporary storage facility in Hungary.

Decision makers dismissed the option of reprocessing abroad because; among the by-products there would be high-level radioactive waste which would be shipped back to Hungary. Permanent disposal of spent fuel was also excluded because the requirements for this option are far stricter than those for temporary storage and the strict requirements would have involved a long time for licensing and construction. The option of paying for storage abroad was only considered as a short-term solution, while the closing down of the station was judged to be unrealistic, given the difficulties which would occur in trying to replace the energy loss.

In 1991 a decision was made on establishing a temporary storage facility for spent fuel in Paks. The arguments against temporary storage pointed out that this was only putting off a solution, and the problem of finding a permanent site for the radioactive material would be passed on to the next generation. However, the main argument put forward by the decision-makers in favour of temporary storage was that it would gain time, and later a decision could be made about permanent disposal, reprocessing, or export of the spent fuel.

5.3.2 Plans for establishing a deep geological repository in the vicinity of Boda

Interviews suggest that the management of the Paks NPP made a decision about preparations for geological disposal as early as in 1991. In 1992 they initiated geological surveys in the area of the so-called Boda Aleurolit Formation (Baranya County) to investigate the suitability of this formation for a deep geological HLW repository. Since then geological investigations in the Boda area have been ongoing with changing intensity (recently, due to the crisis, with less intensity than previously). Affected local communities, which have joined in an Association (WMPIA), have been informed and compensated since 1996. However, that a national strategy for the management of HLW has not been prepared to date.

In 2000, PURAM, together with the Spanish radioactive waste management agency, Enresa, prepared a document entitled “Policy for the management of high-level radioactive waste and spent nuclear fuel,” with the aim of laying the foundation for formulating a strategy for the management of HLW and long-lived wastes” (RHK, 2000). The document evaluates a number of possible options in terms of technical, economic and social feasibility criteria. There has been no public dialogue on the document, and the formulation of a strategy was again postponed.

5.3.3 Challenges

As things stand today, in principle, a number of RWM options are still open, including

(I) the export of spent fuel to Russia (with or without reprocessing, and in case of the former with or without the returning of residual HLW),

(ii) extending the lifetime of the temporary storage facility, or (iii) building a deep geological repository. There are hints in the PURAM-Enresa study that a geological repository may even serve as a regional facility. Although officially no decision has been made on geological disposal, research aimed at such a facility has been conducted for about 20 years, where a large amount of money has been spent.

In sum: we cannot speak of a broad consensus on RWM policy, and not even the transparency of the decision process. As a matter of fact, the public has not received any substantial information on the alternative methods of HLW. While it is acknowledged from time to time that "no decision has yet been taken on the back-end of the fuel cycle", and it "will be due only in the distant future", it is still claimed that "necessary preparatory works have to be commenced without delay" (RHK, 2003, p. 7–8). Geological surveys are conducted on the basis of plans prepared from one year to the next without any official government strategy, to confront the public with a *fait accompli*.

5.4 International/regional solution

When the RWM concept of Hungary was being evolved, the international solution played an important role in it right from the outset. As mentioned earlier, the Paks NPP was built with Soviet technology and Soviet technical assistance in the late 1970s. Spent fuel was also shipped back to the Soviet Union up to the early 1990s, and this arrangement was challenged only after the dissolution of the Soviet Union.

All along the negotiations related to establishing a temporary storage facility at Paks was the export and import of spent fuel on the agenda. It is highly characteristic of the dual standard of the Hungarian politicians that the agreement made between the NPP and the local government of Paks in 1994 included two demands set by the latter. First, the nuclear power company guaranteed that no spent fuel would be deposited in the temporary storage facility until the Russian government does not cancel the inter-governmental agreement on the receipt of spent fuel. Second, the power station also guaranteed that no radioactive waste of foreign origin would be deposited in the storage facility.

As it was mentioned earlier, PURAM elaborated a document entitled "Policy for the Management of High-level Radioactive Wastes and Spent Fuel" (RHK, 2000). Its purpose was to lay the foundations for the development of a strategy for the management of HLW as well as long-lived L/ILRW. The document assessed several possible variants, a regional solution (i.e. the import of HLW) as well among others. The paper, however, was not made public and one of its reasons may be that – as it will be outlined in the following – the Hungarian public categorically rejects the import of foreign wastes.

5.4.1 RWM options in public opinion

In December 2000 the Institute of Sociology of the Hungarian Academy of Sciences conducted a national-level public opinion survey with a 1000-member representative sample[10] (Tamás and Vári, 2003; Tamás et al., 2003) for the purpose of measuring opinion, attitudes, fears and wishes of the national public concerning nuclear energy and the management of radioactive waste. The research dealt in detail with social reactions to various waste management options and various site selection strategies for RWM facilities.

Respondents could assess the following site selection strategies which corresponded to different ethical principles, such as:

(i) a strategy based on a utilitarian principle ("the waste should be taken to the place where its storage/disposal would be the safest"),

(ii) a strategy that would correspond to the libertarian principle ("the waste should be brought to a place where the residents of the settlement are ready to receive it"),

(iii) a strategy operating along the principle of direct responsibility of distributional justice ("the facility should be sited where the waste is 'produced'"), and

(iv) an international solution corresponding also to the libertarian principle ("let us pay for it somewhere abroad and carry it there").

Clearly the most popular strategy was the one corresponding to the utilitarian model (technical rationality). The second most popular principle was distributional justice (responsibility). It should be noted that this concept would not only legalise the extension of the current situation (storage at Paks), but this is also the position of the Greens. The domestic libertarian variant by itself was unpopular. It is known from further questions that respondents do not think that the will of local people should be disregarded. But it is held that in places where the technical and geological conditions would not be optimal, but for some reason (for money, for jobs, etc.) local people would support the facility, it should not be established. Finally, the majority of respondents rejected waste export (it is remarkable that earlier spent fuel was transported to the then Soviet Union and no one publicly objected to it then and ever since).

The overwhelming majority – 90% – would be against the import of foreign waste for any compensation, and only 4.4% stood for it categorically. Arguments of national identity ("let us not become the waste dump of the rich") as well as environmental priorities were mixed among the arguments of rejection. The insignificant minority accepting the disposal of foreign wastes argued for it - among others - with the reduction of operational costs, and the utilisation of the income for environmental and health developments as decisive motives. These arguments, however, were underlined only by a few dozens of respondents.

[10] Representative means that proportions of the sample in respect of gender, age, type of settlement and school education corresponded to the national proportions.

It should be noted that the results of the public opinion poll, if compared to earlier surveys, indicate a general introversion compared to the late 80s. The majority of respondents did not only reject the import and export of waste but would increasingly prefer self-supply even in the field of electrical energy production. The survey also indicated a deep fall of confidence in foreign experts compared with the late 1980s (Vári, 2009).

5.4.2 Challenges

In Hungary no actor has publicly raised RWM scenarios including the import of radioactive wastes and it is not surprising when considering the public opinion poll data. At the same time documents indicate that these ideas are present in expert discourses and are on the hidden agenda of the nuclear institutions (Solymosi et al., 1999; RHK, 2000). Specifically it is the rock formations in the vicinity of Boda that are considered favourable and of sufficiently large expansion for a regional HLW repository.

It is curious that though a significant part of the population verbally rejects the export of wastes (however only half as many as those rejecting imports), but had there been an opportunity for it presumably few would object to this option. Currently this option is also open in principle, although presumably it would not be implemented due to its extremely high costs.

6 Analysis

6.1 From the "technocratic" to the "market" model of RWM

The Hungarian history of radioactive waste management includes the height and decline of the state socialist system, the political transition and the ensuing recession, the era of slow upswing, the EU accession, and the recent political and economic crisis. The legal and socio-economic changes of this eventful period exerted great influence on RWM policies. After the political transition the basic framework of rights to public participation in environmental decisions, and specifically in the siting of nuclear facilities were established. Changes in the highly industrialised countries also had a major impact, especially the shift from the former top-down, technically oriented approaches towards more democratic ones that keep social acceptance in mind.

The technocratic model of radioactive waste management was in effect from the 1970s to the end of the 1980s. The main characteristic of this model was that authorities (ministries, county councils, etc.) made their decisions behind closed doors. The central government supported its own enterprises (e.g. the Paks NPP) unconditionally. After the political transition of 1990, the implementers (first the NPP, later PURAM) switched to another model, in which negotiated agreements with the host (and neighbouring) communities play a central role. One basic element of the agreements is public information, another is the provision of generous financial benefits. Information is confined to campaigning and providing some degree of oversight. The majority of the local public has little interest in technical issues, while they are highly interested in community compensation/incentives. It is the local governments, who are involved in financial negotiations with the implementer, while it is mainly the local and/or national NGOs who express environmental and safety concerns.

Negotiations between the implementer and the affected local governments address primarily the amount of compensation and its distribution between the beneficiaries. On the other hand, - except for the failed Ófalu case - local players have never had any substantial influence on the RWM option, the technology, or the design of the RWM facility. The dominance of this "market" model has been facilitated by the recession following the political transition, as well as the economic crisis starting in 2008, which put most settlements (especially the small ones) into a very difficult financial situation.

The Paks NPP and PURAM have successfully learned from highly developed countries how to use financial compensation and PR techniques. They have also successfully adopted the idea of local committees (LC), which are common in many democratic countries[11]. However, they did not take over a number of important elements of the radioactive waste policy of these countries. For example, in Hungary we cannot speak of a socially approved energy policy, nor of a broad consensus on RWM strategy, and not even the transparency of these.

Nevertheless, we could observe an increasing public acceptance of RWM facilities at the level of host and neighbouring communities. Important factors of this change included public information at the local level, generous compensation, and provision of a certain degree of oversight for local governments. Another factor of changing attitudes was that most of the affected settlements are in an economically weak situation, and large segments of the population are afflicted by unemployment and poverty. At the same time, as indicated above, the market approach has its weaknesses, including a lack of transparency and public involvement, lack of accountability, and disregard to issues of sustainable development.

It has to be noted that - in contrary to its popularity among the affected communities, - as pointed out in section 5.4.1, - the market approach to RWM facility siting is rejected by a large proportion of the general public. Similarly, the export or import of wastes is strongly rejected by the general public, while the latter is supported by certain affected communities (e.g., the Paks city government). For the general public safety and self-sufficiency seem to be the most important priorities.

Finally, some dangers of the separation of the social and technical considerations should be pointed out. Such danger is the violation of the regulatory criteria. Since the affected population and local governments pay most of their attention to issues of financial benefits and economic development, there are only a few watchdogs (NGOs, ombudsman) caring about environmental and health issues. This has been the case not only with the Bátaapáti repository, but also with some NPP incidents/accidents not mentioned in this report[12].

6.2 Is the bubble bursting?

The result of the over-ambitious and non-transparent policy followed by institutional actors since the 1980s has been an expensive plan to establish four (!) nuclear waste facilities in a country with one

[11] The Hungarian model of local information and oversight associations differs from LCs of other countries in several respects. A comparative review of LCs in various countries is provided by COWAM (2007).

[12] The most serious accident happened in the Paks NPP in 2003, when a number of irradiated fuel assemblies were damaged.

electricity generating NPP. In addition, as of 2012, four public information and oversight associations of affected communities exist in the vicinity of operational or planned nuclear waste facilities (Figure 1), each receiving substantial financial compensation/incentives.

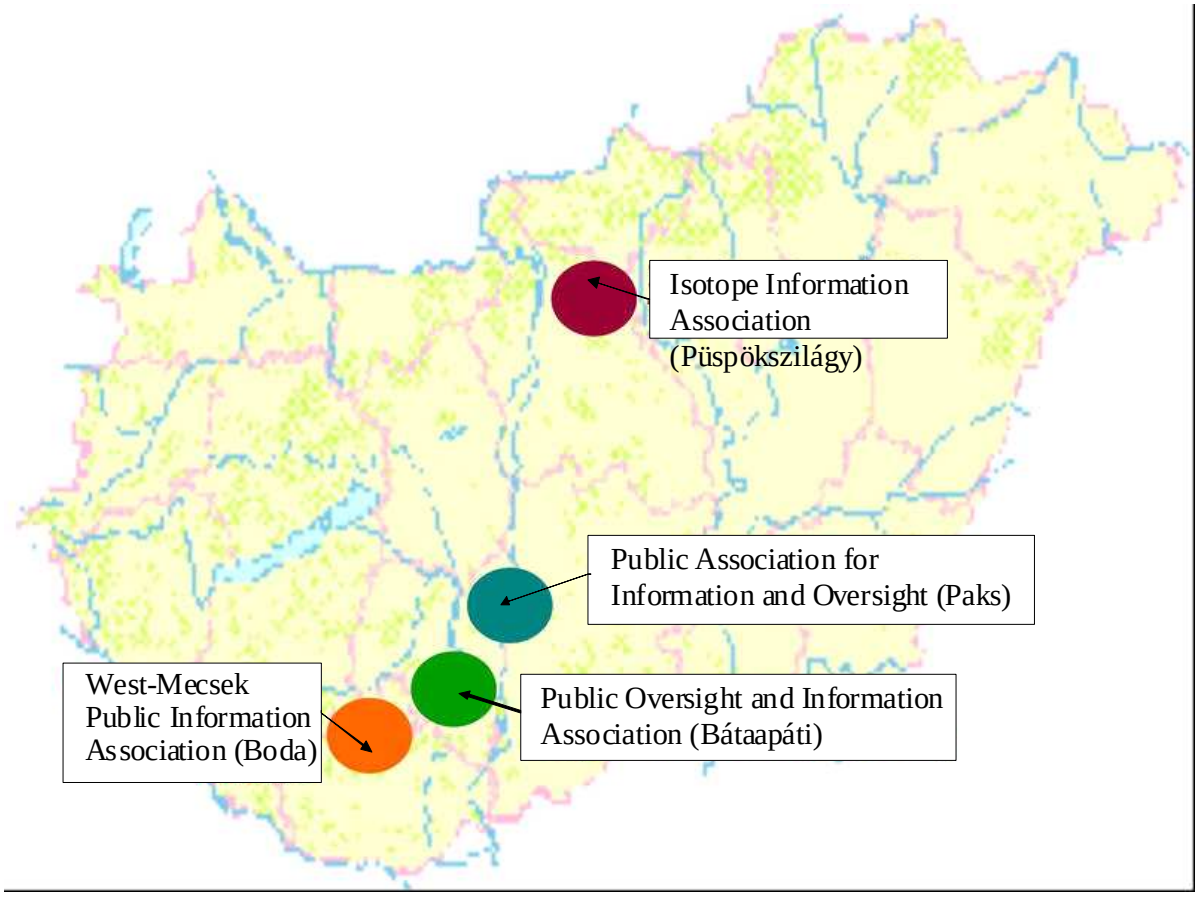

Figure 1. Public information and oversight associations

As economic recession has strongly hit the country recently, RWM policies have started to change again. It seems there have not been sufficient resources for completing the L/ILRW repository in Bátaapáti in a timely way. Geological research in the Boda area has slowed down, and is unlikely to be brought to conclusion in the near future. Even the establishment of new nuclear reactors has been questioned, primarily for the lack of economic feasibility. Due to the increasing tensions between Hungary and its European partners, the likelihood of international solutions seems small.

The potential change to a "wait and see" strategy is not necessarily in conflict with the expectations of the general public. However, there are some worrisome phenomena to be observed. Decreasing the proportion of NPP payments to the Central Nuclear Fund indicates that the Polluter Pays Principle is violated. Tools of democratic control (e.g., civil society organisations, ombudsman, freedom of media) are getting weakened or eliminated. Recent decision making practices are getting reminiscent of the top-down, authoritarian approaches followed under state socialist rule.

References

Official, national science-policy documents

Ombudsman of Future Generations (2011) Report on the Complaint on the Establishment of the Bátaapáti Low- and Intermediate Level Waste Storage Facility. Budapest: JNO-115-2010. (In Hungarian)

RHK (2000) Politics for the Management of Spent Fuel and Final Disposal of High-Level Radioactive Waste. Draft. Paks: Public Agency for Radioactive Waste Management (In Hungarian).

RHK (2003) With Responsibility, Safety, Guarantees. Paks: Public Agency for Radioactive Waste Management (In Hungarian).

RHK (2005) Underground Research Laboratory: One Step Closer to the Safe Disposal of High-Level Radioactive Waste. Paks: Public Agency for Radioactive Waste Management (In Hungarian).

RHK (2011) The 11. Medium- and Long Term Plan of the PURAM. Paks: Public Agency for Radioactive Waste Management (In Hungarian).

Unpublished documents and reports

Ormai, P. (1998) Information and Consultation Programme in Hungary on Radioactive Waste Management. Paper prepared for the seminar titled „Peaceful Uses of Nuclear Energy in Central and Eastern Europe". (Manuscript)

Ormai, P. (2000) Public Information in the Hungarian Programme Aimed at the Disposal of Low- and Intermediate-Level Radioactive Waste. Manuscript (In Hungarian).

Reports

COWAM (2007) Roadmap for Local Committee Construction. Publication of the COWAM2 EU 6th project.

IEA (2007) Energy Policies of IEA Countries. International Energy Agency (http://www.iea.org/textbase/nppdf/free/2006/hungary2006.pdf)

Eurobarometer (2010) Eurobarometer 324: Europeans and Nuclear Safety. Brussels: European Commission

Medián (2011) Public Opinion Survey on Attitudes Towards Nuclear Energy (http://www.origo.hu/itthon/20110914-median-a-tobbseg-elutasitja-a-paksi-atomeromu-elettartamanak-meghosszabbitasat-vagy.html)

Books and journal articles

Solymosi, J., Vincze, Á., Frigyesi, F., Ormai, P. (1999) Management and Final Disposal of Radioactive Waste. Hadtudomány, Vol. 9., No. 2.

Tamás, P. and Vári, A. (2003) Images of Nuclear Energy in Hungary. Egyenlitő, 1(2), pp. 2-9 (In Hungarian)

Tamás, P., Vári, A., Ferencz, Z., Schmidt, A. (2003) The New Half-century of Energetics". In: Bulla, M. and Tamás, P. (eds.) The Future of the Environment in Hungary. Budapest: HAS Research Institute of Sociology, pp. 186-216 (in Hungarian)

Vári, A. (2009) Clean Nuclear Energy: Radioactive Waste Management in Hungary and Abroad. Budapest: L'Harmattan (In Hungarian)

Vari, A., Ferencz, Z. (2007) Radioactive Waste Management in Hungary: Changing Approaches and Conflicts. Journal of Environmental Assessment Policy and Management, Vol. 9. No. 2. , pp. 185-209

Semi-structured interviews

Representative of the Ombudsman's Office

Current top-level manager of PURAM

Former top-level manager of PURAM

List of Abbreviations

COWAM – Community Waste Management
EIA - Environmental Impact Assessment
EIS - Environmental Impact Study
ENRESA - Empresa Nacional de Residuos Radiactivos (the Spanish radioactive waste management agency)
HAEA - Hungarian Atomic Energy Authority
HLW – High Level Waste
IEA – International Energy Agency
IIA - Isotope Information Association
L/ILRW - low- and intermediate-level radioactive waste
MVM – Magyar Villamos Művek (Hungarian Electricity Works)
NPHMOS - National Public Health and Medical Officer's Service
NPP – Nuclear Power Plant
PAIO - Public Association for Information and Oversight
POIA - Public Oversight and Information Association
PURAM – Public Limited Company for Radioactive Waste Management (former: Public Agency for Radioactive Waste Management)
RHK – Radioaktív Hulladékokat Kezelő Közhasznú Nonprofit Kft. (the Hungarian abbreviation of PURAM)
RWM – Radioactive Waste Management
SEA - Strategic Environmental Assessment
UNECE - United Nations Economic Commission for Europe
VVER, or WWER (from Russian: Водо-водяной энергетический реактор; transliterates as *Vodo-Vodyanoi Energetichesky Reactor*; *Water-Water Energetic Reactor*)
WMPIA - West-Mecsek Public Information Association