

# Progress and Emerging Issues in the Geological Disposal of High-Level Nuclear Waste in Japan

Fumito TOMOOKA

Professor at Nihon University College of Law, Tokyo Japan

Head of Researchers at Japan Energy Law Institute, Tokyo Japan

(e-mail: tomooka.fumito@nihon-u.ac.jp, ORCID: 0009-0007-1957-1777)

## Abstract

This paper discusses the progress and emerging issues in the search for a repository for the geological disposal of high-level nuclear waste in Japan. There are currently three municipalities that have indicated their willingness to accept the first phase ('Literature Survey'). This is the result of a change in government policy after the Fukushima accident in 2011. In 2017, the 'Nationwide Map of Scientific Features' was published to show the favourable and unfavourable areas that can be identified under 'scientific knowledge'. In this way, all municipalities could have changed their minds in favour of accepting the first phase of a geological disposal site in Japan. I would like to discuss this change from a legal point of view. On the one hand, some of the implications of the evidence from Toyo Town before the accident and, on the other hand, the difficulties that still exist between the municipality that has shown its will to accept and other neighbouring municipalities.

## 1. Introduction

The geological disposal of high-level nuclear waste (hereinafter: 'HLW') has been a major problem, a deadly difficult problem to solve for the nuclear power policy in Japan. Since Japan's waste disposal policy is not based on ocean or space disposal, which is prohibited by international treaty<sup>1</sup>, the only choice is 'geological disposal'. And so, in view of the internationally achieved and confirmed technology of disposal of these wastes, the remaining issues would be to find the candidates for deep disposal sites within our Japanese islands.

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<sup>1</sup> The legal history on this issue is treated in my book (in Japanese): Fumito Tomooka, *The Structure of Nuclear Law and Special Knowledges* (Shinzansha, 2024). 友岡史仁『原子力法の構造と専門知制御』(信山社、2024年)。

In fact, Japan is made up of a large number of islands, with densely populated cities on the flat land of the main islands, and high and low mountains surrounding them<sup>2</sup>. And above all, Japan is famous for earthquakes, and indeed sometimes huge, catastrophic earthquakes occur<sup>3</sup>. As a result, as with the construction of new nuclear power plants, it is extremely difficult to find suitable geological disposal sites, probably more difficult than in any other country in the world.

These physical conditions were very similar before and after the Fukushima accident in 2011. But the situation is changing as two districts in Hokkaido (the northern island of Japan) have shown their acceptance as candidates for disposal sites, which is the first phase of the decision-making process<sup>4</sup>. And another municipality (Genkai Village) in Saga Prefecture has also decided to follow the two candidates in May 2024<sup>5</sup>. This is a remarkable thing compared to the previous situation where no local government officially expressed its will to accept.

In this paper, I would like to focus first on the Japanese government's changing approach to this issue. The new approach adopted by the government is based on 'special knowledge' such as 'scientific evidence' that can explain how the candidate site would be more suitable than others. And secondly, I would like to focus on the current legal statute, which has not clarified the processes of acceptance of the disposal sites by the relevant local decision makers. However, the *Designated Radioactive Waste Final Disposal Act* (hereinafter: 'the Act') only stipulates that there should be three phases in the decision-making process ('Literature Survey', 'Preliminary Investigation' and 'Detailed Investigation'). There is no written, authoritative or public detailed guidance for local communities to participate in the decision-making process. Thus, all processes are on a 'voluntary basis', with no place for the municipalities themselves to make enforceable decisions. But a national issue such as the disposal of HLW would become a very heavy, or rather too heavy, burden for small towns and villages to deal with, and it is beyond their powers to make struggles between other municipalities and their own residents. I will come back to these issues from a legal point of view.

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<sup>2</sup> Population is 135 million people living only within the 30% of Japanese islands. See the report by the Ministry of Land, Infrastructure, Transport and Tourism, *Vulnerability of the National Territory*, p.2 (<https://www.mlit.go.jp/common/000997376.pdf>). 国土交通省『国土の脆弱性』

<sup>3</sup> Very recent big earthquake hit the Noto peninsular in Ishikawa on the 1<sup>st</sup> January in 2024 this year. The Shika nuclear power plant run by Hokuriku Electricity Power Company (HEPC) is situated about 70 km from the epicentre. See the report on the current situation of the Shika NPP relating to the 'Noto Peninsular Earthquake' at HEPC website ([https://atom.pref.ishikawa.lg.jp/resource/genan/ankan/kpdf/haihu20240327\\_1-1.pdf](https://atom.pref.ishikawa.lg.jp/resource/genan/ankan/kpdf/haihu20240327_1-1.pdf)) (27<sup>th</sup> March 2024). 北陸電力株式会社『令和6年能登半島地震志賀原子力発電所の状況（地震動、断層、津波、地盤）』.

<sup>4</sup> Three main processes are the legally stated in the Act. See 3.1 in detail.

<sup>5</sup> See 'Japan city assembly Oks request for nuclear waste site survey,' *The Mainichi* Apr. 26<sup>th</sup> 2024.

## **2. Has the Fukushima Accident Changed Minds? - Accessing Specialist Knowledge Behind the Scene**

### 2.1 What Has Changed with the Fukushima Accident in Terms of Geological Disposal?

#### ***2.1.1 Regulatory Regime***

Many nuclear policies in Japan were changed after the Fukushima accident in 2011. One notable point in the policy changes is that the regulatory system has been dramatically changed to be independent of any administrative departments of the government. The innovative central organisation in the system, the Nuclear Regulation Authority (hereinafter: 'NRA'), has all the legal responsibilities for nuclear safety based on the regulations made by the NRA itself. The NRA's responsibilities also include the assessment of repository sites from various safety perspectives, but this new authority is not expected to directly search and find out where the suitable candidate sites would exist on its own. It is the Nuclear Waste Management Organisation of Japan (hereinafter: 'NUMO') that is responsible for these latter tasks. NUMO is an organisation established in 2000 under the authority of the Ministry of Economy, Trade and Industry (hereinafter: 'METI').

#### ***2.1.2 Public Confidence***

Of all the factors, the public's distrust of the policy of geological disposal of HLW in Japan is of great importance when considering the problem. In fact, as the NUMO survey shows, since the Great East Japan Earthquake that caused the Fukushima accident, the proportion of those who agree or somewhat agree with the policy has declined significantly<sup>6</sup>. This backward trend in public opinion has prompted NUMO to refrain from any activities related to the search for potential disposal sites for the time being.

### 2.2 Previous Cases before the Fukushima Accident

Before the Fukushima accident, NUMO had started an "open call" for all willing municipalities to apply for the screening tests for suitability as a disposal site in 2002 after the law was enacted. Since

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<sup>6</sup> See Ayako Arai, Saki Ikeda, Kumiko Ezaki and Kenichi Kaku, "Communication activities through dialogue in Japanese geological disposal project of High-Level radioactive waste," 6<sup>th</sup> East Asia Forum on Radwaste Management Conference (Nov, 27-29, 2017). (downloaded at [http://eaform2017.aesj.or.jp/file/PapersList/Session2/\(2C-2\)%20\\_A.Araki\\_\(NUMO\).pdf](http://eaform2017.aesj.or.jp/file/PapersList/Session2/(2C-2)%20_A.Araki_(NUMO).pdf)).

then, many municipalities have been considering their applications for ‘literature survey’, the first phase of the screening process. Finally, the only town in Kochi Prefecture, Toyo, submitted a formal application in 2007, but withdrew it shortly afterwards. What happened in between<sup>7</sup> was as follows<sup>8</sup>.

1. The mayor of Toyo Town twice declared and sent to NUMO the will to accept it as a candidate site without informing the municipal assembly. This act of the mayor was not followed by any official process of approval by the town assembly.
2. On the contrary, after it became known that the mayor had sent his will of acceptance to NUMO for the first time, many unofficial discussions between proponents and opponents began, resulting in serious divisions among the inhabitants.
3. Neighbouring municipalities of larger units such as Kochi and Tokushima prefectures officially announced their opposition to the mayor's decision. The then governors of the two prefectures publicly urged METI not to accept NUMO's application for permission to begin the “literature survey”.

Even after the Toyo Town case, some municipalities showed interest in becoming candidates for disposal sites. For example, the mayor of a small village (Kamikoani Village) in Akita Prefecture expressed his willingness to accept in 2007. However, in this case too, the mayor was forced to withdraw his application because of strong opposition from neighbouring municipalities and the prefecture in which the village is located.

After these cases, there was no formal written application until 2020, when two of the above-mentioned municipalities in Hokkaido Prefecture appeared.

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<sup>7</sup> Various analyses of this case not only from legal but sociological views can be seen. See eg., Takahiro Saigo, Shunsaku Komatsuzaki and Hideyuki Horii, “Decisive factors of the dispute regarding high-level radioactive waste repository sitting at Toyo-cho, Kochi, Japan: An analysis of political process and possible solutions,” *Shakai-Gijutsu-Kenkyu-Ronbunshu*, vol.7, pp. 87 et seq (2010) (downloaded at [https://www.jstage.jst.go.jp/article/sociotechnica/7/0/7\\_0\\_87/\\_pdf](https://www.jstage.jst.go.jp/article/sociotechnica/7/0/7_0_87/_pdf)). 西郷貴洋＝小松崎俊作＝堀井秀之「高知県東洋町における高レベル放射性廃棄物処分地決定に係る紛争の対立要因と解決策」社会技術研究論文集 7号 (2010年) 87頁以下.

<sup>8</sup> This analysis is dealt with in detail by Keisuke Imamoto, “Direct claims, petitions, and petitions under the Local Autonomy Act and the submission of opposition resolutions and written opinions by the local assemblies: a case study on the application for the literature survey for the high-level radioactive wastes (HLW) final disposal facility in Toyo Town” in Yoshihiro Tanaka (ed.), *Nuclear Policy and Public Participation: Japan's Experience and Lessons from East Asia* (Daichi Hoki, 2022), pp.195 et seq (in Japanese). 今本啓介「地方自治法上の直接請求・請願・陳情と地方議会による反対決議・意見書提出」田中良弘編著『原子力政策と住民参加——日本の経験と東アジアからの示唆』(第一法規, 2022年) 195頁以下.

## 2.3 Publication of the Nationwide Map of Scientific Features

### ***2.3.1 Before the Publication of the Nationwide Map of Scientific Features***

Even after the Fukushima accident, the basic legal model for geological disposal was not changed. However, some new policy approaches have been adopted since then. The most important progress in this regard is that the Japanese government has focused on disclosing ‘scientific evidence’ to local communities, trying to enable them to make decisions on acceptance more easily.

In 2013, two years after the accident, the Ministerial Meeting on Permanent Nuclear Waste Disposal was held, and a year later the Strategic Energy Plan was adopted. According to this plan, the government revised the previous basic policy on the way of selecting the candidate disposal sites, and several revised points were publicly shown in 2015, as follows<sup>9</sup>:

1. Responsibility of current generations and potential for reversibility and retrievability for future generations to choose from
2. Promotion of national public understanding and regional understanding
3. Activities led by the national government
4. Support for the region's contribution to the project
5. Improvements in related organisational structures

The 2015 report was an interim summary for the revised new geological disposal policy. Therefore, in 2016, OECD/NEA published its international peer review<sup>10</sup> to approve this 2015 policy by the Japanese government. Then in 2016, the Japan Atomic Energy Commission (JAEC) published the report on the review of the activities of the Geological Disposal Technology Working Group<sup>11</sup>. And in 2017, the final report was published, revealing the requirements and criteria for the establishment of the ‘Nationwide Map of Scientific Features’<sup>12</sup>.

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<sup>9</sup> Cabinet Decision on the 22<sup>nd</sup> May 2015. See also METI Radioactive Waste Management Policy Division, *Geological Disposal of High-Level Radioactive Waste in Japan* (English Summary), p. 6.

<sup>10</sup> See OECD/NEA, *The Nuclear Management Organization of Japan's Pre-siting Safety Case Based on the Side Descriptive Model: An International Peer Review of the NUMO Safety Case*: NEA/RWM/R(2022)2 (January, 2023).

<sup>11</sup> Evaluation Report on Situations of Administrative Institutions' Activities related to Final Disposals (最終処分関係行政機関等の活動状況に関する評価報告書) .

<sup>12</sup> Advisory Committee for Natural Resources and Energy Subcommittee on Electricity and Gas Industry, Nuclear Energy Subcommittee Geological Disposal Technology Working Group, *Results of the Study on the Requirements and Standards for*

### ***2.3.2 The Content of the 2017 Report***

The requirements of the 2017 Report are as follows:

1. Characteristics and long-term stability of the geological environment (volcanic/igneous activity, faulting, uplift/erosion, geothermal activity, volcanic thermal fluids and deep fluids, and mineral resources).
2. Construction and operation of the facilities with respect to volcanic eruption and unconsolidated geological formations.
3. Transport.

The important feature of the map is to show a clear classification of the assumed areas in two ways - favourable or unfavourable. For unfavourable areas, there are several considerations such as: the long-term stability of the deep geological environment, the risk of future accidental human intrusion. The map shows that 'safe waste transport' should be added as a preferred option to the assumed favourable areas.

### ***2.3.3 Significance of the Map***

The Nationwide Map of Scientific Features changes the mind in favour of accepting the first phase of geological disposal siting in Japan.

Firstly, it has led the government to make it easier for local authorities to make decisions on accepting the first phase. So it could be said that the government's previous approach was weak. This can also be seen from the regime that most of the responsibilities were due to NUMO, and the government only supervised what NUMO did on a case-by-case basis under the regulations. Therefore, in the case of Toyo Town, the government just waits for the will of the city. So from their case, the policy was changed so that another way of applying for the 'literature survey' (when the state offered it to the municipality) was now available. But the way of 'voluntary basis' by the municipalities still exists<sup>13</sup>.

Secondly, as mentioned above, all the inhabitants can visibly find out where the supposedly favourable areas for geological disposal are. Moreover, these favourable and unfavourable areas can be

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*Presenting Areal Scientific Features Related to Geological Disposal* (published on 15<sup>th</sup> May 2017).

<sup>13</sup> This process has been added after Toyo Town case. See the Cabinet Decision on 22<sup>nd</sup> May 2015.

identified under ‘scientific’ evidence. After the Fukushima accident, nations and even potential candidate communities lost confidence in nuclear power itself. But ‘scientific’ evidence could persuade people, not politically, why that place would be favourable.

Therefore, it could be said that the local candidates in the ‘unfavourable areas’ from a scientific point of view would possibly be excluded and not entitled to apply for the official ‘literature survey’. But from a legal point of view, the map doesn’t oblige any local community not to put itself forward as a candidate, even if it is included in the ‘presumed unfavourable area’. The map gives us only ‘geological areas’, not ‘administrative areas’. At the moment, both areas of Hokkaido (Suttu Town and Kamoenai Village) appear to be included in the presumed favourable areas. But Kamoenai is on the very edge of the ‘presumed disadvantaged area’<sup>14</sup>. NUMO accepted the official applications for the ‘literature survey’ from two communities, and the interim report states that both are in favourable areas.

Of course, there may still be some questions about the interpretation of the map. The map has been made with the best considerations at the time of publishing the report in 2017. But there may be other considerations in the future from a ‘scientific’ point of view. And the map doesn’t force local governments to change their previous non-acceptance of landfills. For example, a prefecture like Hokkaido, where two municipalities currently applying for the ‘literature survey’ are located, has been opposed to any acceptance of nuclear waste since 2000. This dilemma will be discussed in detail later (see 3.2).

### **3. Some Issues Related to Disposal Process Schemes - Local Authorities and the Act**

#### **3.1 Disposal Process Schemes under the Act**

As mentioned above (see 1.), the Act sets out three phases for the construction of a permanent nuclear waste repository. Throughout the phases up to the final construction of the final site, NUMO is responsible for ensuring the proper procedures at each phase and obtaining the relevant administrative approval from the Minister of METI and the applicant local authority.

The Act states as a basic policy that democratic decision-making should take place during the

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<sup>14</sup> See the NHK report on the 13<sup>th</sup> February 2024 (<https://www3.nhk.or.jp/news/html/20240213/k10014356691000.html>).

‘preliminary investigation’<sup>15</sup>. As mentioned earlier, there are three phases in the process of selecting and deciding on the final disposal sites. ‘Literature Survey’ is the starting point of ‘Preliminary Investigation’, with only one clause<sup>16</sup> and no separate articles in the Act to regulate this phase. Therefore, it is obvious that the first phase is on a ‘voluntary basis’, guided by the economic benefits to be begotten by the applicant municipality. However, it is a truth that the official approval of a competent local authority is a matter of the utmost importance in order to facilitate the whole process.

One of the alternatives to the current status quo in the permitting process, which could achieve the democratic decision-making mentioned above, would be elections at every level of public organisation: from the local governor and the legislature down to the mayor and the local council. In the end, the citizens of the areas concerned can express their opinion by electing their representatives to be sovereign in the siting process. The other alternative is a local referendum. The problem with the first alternative would be the violent and sharp divisions between two camps in the affected areas. The problem with the second is that the Japanese legal system doesn't provide for either a national or a local referendum.

In 2015, the Cabinet decision mentioned that the way to get consensus from the residents of the candidate municipalities is for NUMO to ‘try’ to create opportunities for open discussion during the ‘preliminary investigation’ phase. The government says that local discussion or democratic processes are important. But it still insists that the central government should only direct and regulate NUMO<sup>17</sup>, not take any initiatives.

### 3.2 Practical Issues between Municipalities

As far as inter-municipal issues are concerned, there's no legal basis for the approval of the prefecture in which the candidate region is located. For example, when Hokkaido Prefecture, where two regions have officially accepted the “Literature Survey” in 2020, shows its opposing intention not

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<sup>15</sup> See article 4, paragraph 5 of the Act: The Minister of METI ‘shall hear the opinions of the prefectural governor and the mayor of the city, town or village having jurisdiction over the location of said Preliminary Investigation area, etc. and shall give due respect thereto.’

<sup>16</sup> See article 6, paragraph of the Act: When NUMO “intends to select a preliminary investigation area, it must conduct a survey using literature and other materials (referred to as ‘literature survey’ in the following paragraph) in advance on the matters listed below in accordance with the final disposal plan.”

<sup>17</sup> These tendencies of the government have consistently existed even after it revised the cabinet decision in April 2023. However, it added sentences such as: “based on the recognition that selection with emphasis on ensuring-safety is important, the government shall endeavor to obtain the understanding and cooperation of the public and relevant residents through ‘Map of Scientific Features’ that indicates areas considered to be scientifically suitable (scientifically favourable areas).” See the Cabinet Decision on 28<sup>th</sup> April 2023.



to accept any final decision on geological sites in its prefecture, citing the local law (*Ordinance on Specified Radioactive Waste in Hokkaido*) of 2000 as the reason for its consideration<sup>18</sup>. A similar case of interference occurred at the level of local municipalities. Since the acceptance of the ‘literature study’, the neighbouring municipalities (Shimamaki Village, Kuromatsu Town) have enacted their own ordinances to show their opposition to the introduction of nuclear waste into their neighbouring areas<sup>19</sup>. But these local ordinances only work to send their political messages to others, and do not legally bind other municipalities to take or not to take any decisions.

One solution to these antagonistic movements or collisions between municipalities is something like joint applications by neighbouring municipalities. Although such a case has never occurred in Japan, as evidenced by Toyo Town and other previous cases mentioned earlier, we must seek this solution. In order for small towns or villages, including prefectures, to carefully and prudently consider and find their ways for cooperation, it is necessary to have honest and fair discussions of pros and cons based on “scientific evidence” without particular ideologies and prejudices.

### 3.3 Other Remaining Issues

There are other issues to consider. The first is the relationship between the state and the prefecture. Candidate municipalities are usually towns or villages of very small population and economic size. However, as mentioned above, the prefectures where the candidates are located usually express their opposition. Ordinances to this effect have a strong impact on the public, even though they don't have the legal force of political messages, and the administrative procedure after the application by the municipalities continues unhindered according to the provisions of the law, so that from a legal point of view it makes no difference whether the will of the local governments is expressed or not. However, the political messages they send contribute to the formation of public opinion, which tends to oppose the acceptance of nuclear waste.

This is the case in Kamoenai, Hokkaido. In spite of the Hokkaido Prefectural Ordinance, which states that Hokkaido refuses to accept any nuclear waste in its prefectural area, the mayor of Kamieinai

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<sup>18</sup> However, this ordinance states that “At present, . . . .disposal methods have not been fully established” and so “under these circumstances, the bringing-in of specific radioactive waste that should be handled with utmost caution is unacceptable.” This could be interpreted to mean that the prefecture can never give permission for the construction of a geological HLW repository, even though the scientific characteristics of the level of safety that should be a condition for approval have been demonstrated.

<sup>19</sup> *Ordinance to Prevent Radioactive Materials from Bringing into Shimamaki Village* (Ordinance No.2, 2020) and *Ordinance to Prevent Radioactive Materials from Bringing into Kuromatsunai Town* (Ordinance No.1, 2021).

has accepted the state's offer for the first phase, "Literature Survey", and it is feared that sharp contradictions and struggles will arise and continue among them in the future.

Secondly, moving on to the second phase ('Preliminary Investigation') could be an issue after NUMO has completed its 'Literature Survey'. For example, Suttsu Town has enacted a local referendum ordinance for the decision to move to the second phase<sup>20</sup>, but Kamoenai hasn't. This shows that at the beginning of the next phase, similar collisions will be repeated and the issue of the first phase will remain unresolved.

Finally, how to create more incentives for municipalities not only to apply for the 'literature survey' but also to proceed to the final phase if the legal requirements are met is still a big problem to solve. For example, to give the municipalities as much subsidy as possible to enable them to develop economically<sup>21</sup>. And, of course, the grant is also a gift for being accepted as a candidate for a landfill site. In Toyo Town, however, it is reported that the mayor has been told that he has no intention of going to the next step - just accepting the grant from the state. The same may be true of the town and village in Hokkaido and Genkai in Saga Prefecture.

#### 4. Conclusion

Under the present system based on the Act, the 'Nationwide Map of Scientific Features' has been very effective at present for local communities to decide whether or not to apply for the first phase of selecting the candidate for the final disposal site of HLW.

On the contrary, the case of Toyo Town shows that there are still many difficulties in obtaining the consensus of the local residents of the region concerned. In addition, as I mentioned earlier, how can the surrounding neighbouring communities (including prefectures), which show strong opposition, be persuaded and the contradictions between them be resolved? This is one of the biggest problems in the issue of nuclear waste siting in Japan.

And the degree and method of involvement of the national government is also a big problem. The law states that the Minister of METI shall supervise and regulate NUMO from time to time. But

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<sup>20</sup> Ordinance for a Referendum on Opinions regarding the Preliminary Investigation and Detailed Investigation for the Final Disposal of Specified Radioactive Waste in Suttsu Town (Ordinance No.16, 2021).

<sup>21</sup> The legal basis for giving grant is under the 'Power Plant Location Subsidization Programme' organized by METI.

this is not specifically aimed at gaining positive local consensus. This may be the reason why NUMO is the institution run by the nuclear power producers as a non-neutral position. That is, the positive role is expected from NUMO, an organisation composed of the nuclear generators, which is semi-public and at the same time semi-private. Therefore, even the main actors in the acceptance of storage sites are still the local communities, which have to take on the role of neutralising the anti-nuclear sentiment. In view of this status quo, we must consider how the state would come to the fore as the main actor to ensure that arrangements are made to coordinate the confrontations between local bodies and residents in order to find the way to the final objectives.

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