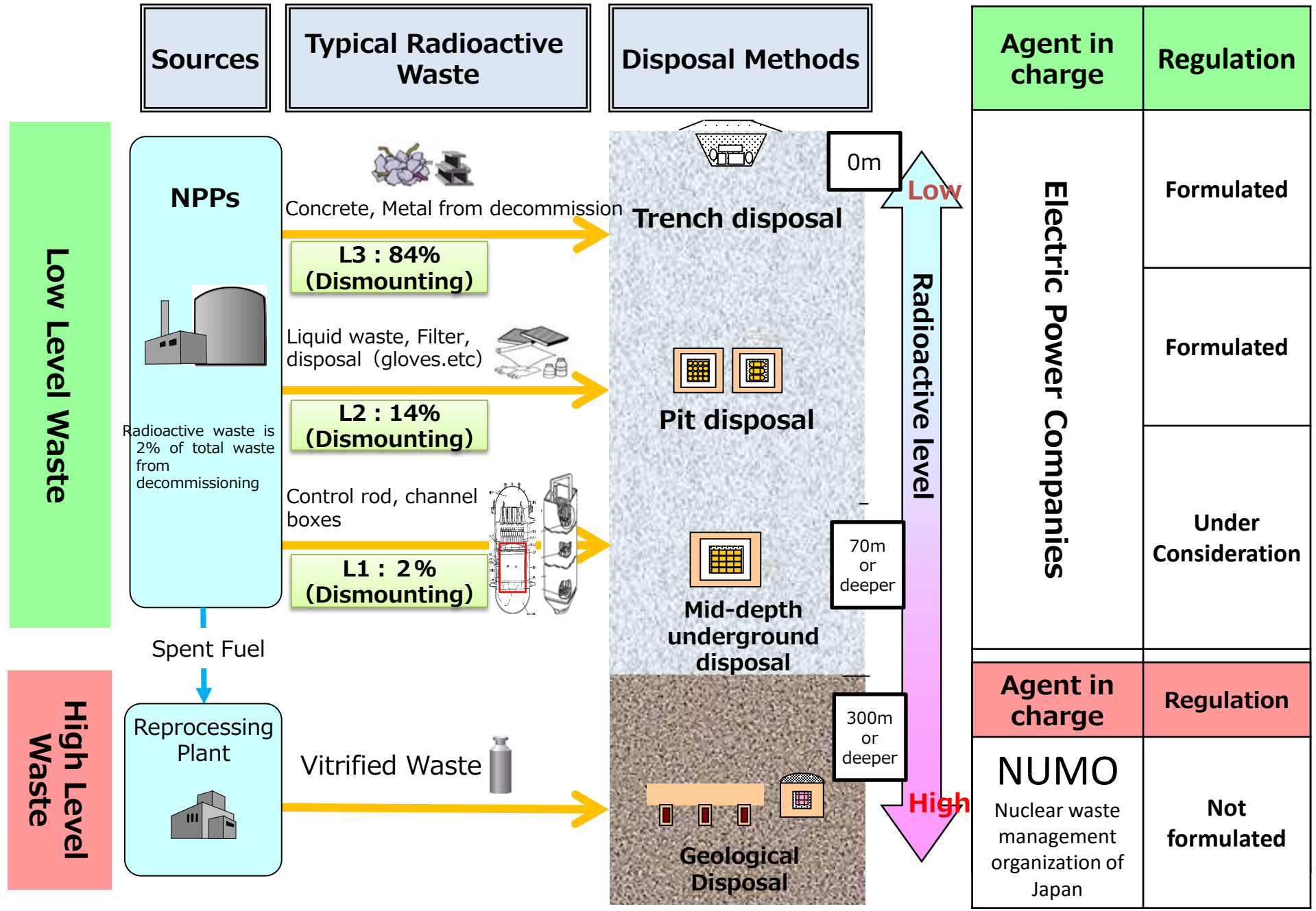
METI

Geological Disposal of High-Level Radioactive Waste in Japan

Radioactive Waste Management Policy Division

Overview of Radioactive Waste Disposal in Japan



History of Legislation on Geological Disposal of High-Level Radioactive Waste

1976: JAEC "Report on Radioactive Waste Management"

- PNC and JAERI (now JAEA) started R&D for HLW geological disposal

*JAEC: Japan Atomic Energy Commission, PNC: Power Reactor and Nuclear Fuel Development Corporation, JAERI: Japan Atomic Energy Research Institute, JAEA: Japan Atomic Energy Agency

1998: JAEC "Report on Basic Concept of HLW Geological Disposal"

- Basic concept about securing way of financing, foundation of implementer, site selection process, public communication and planning URL projects etc. was summarized.

1999: JNC (now JAEA) "H12 report"

- JNC summarized geological disposal concept, geological environment features, engineering technology and safety assessment etc. to evaluate technical feasibility of HLW geological disposal in Japan.

*JNC: Japan Nuclear Cycle Development Institute,
H12: Project to Establish the Scientific and Technical Basis for HLW Disposal in Japan

2000: "Final Disposal Act" Promulgated

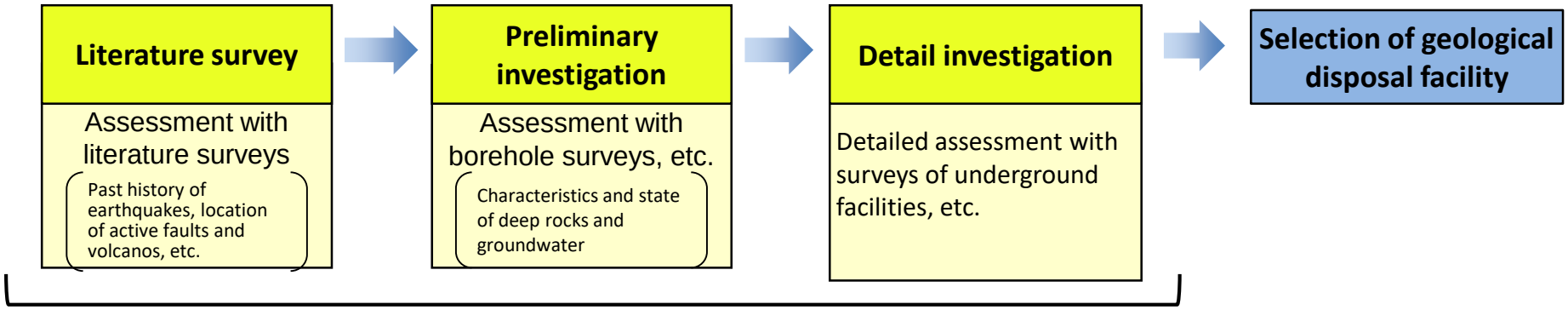
- NUMO was established as an implementer of the HLW geological disposal in Japan

Overview of the “Final Disposal Act”

◆ **The followings were included in the** “Final Disposal Act” (enacted in 2000) in order to systematically and reliably conduct the final disposal (disposal in a stratum more than 300 m deep underground) of high-level radioactive waste generated after the reprocessing of spent fuel used in nuclear power generation.

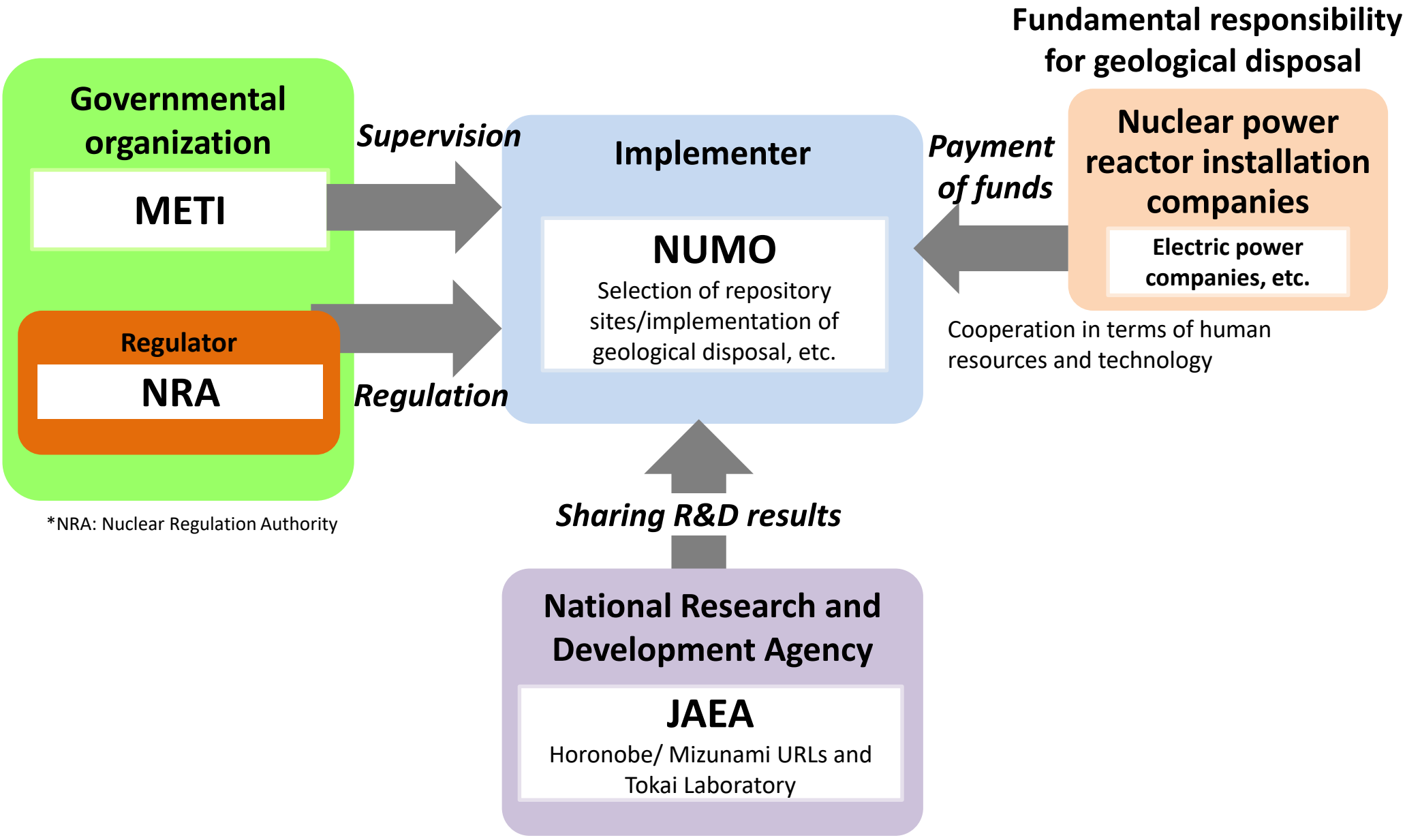
- **Minister** of Economy, Trade and Industry **stated a basic policy** for final disposal of specified radioactive waste (Cabinet decision).
- Nuclear Waste Management Organization (NUMO) established as an implementer for geological disposal.
- Three-stage selection investigation process was set for selection of repository sites, etc.

◆Selection process outlined in the “Final Disposal Act”



※The government will hear the opinions of local municipalities in each stage of the investigation process (not proceed to the next stage if local municipalities oppose).

Implementation System for Geological Disposal



Timeline of Review of Initiatives for Geological Disposal

- In December 2002, **NUMO started open solicitation** for all municipalities to apply for an investigation.
- In January 2007, **Toyo Town** in Kochi Prefecture **submitted a formal application.** Following this submission, a controversy erupted around the pros and cons of their participation in the survey, which divided the town politically. **The application was withdrawn** after the mayoral election in April of the same year.
- To date, **no formal investigation has been carried out**.

Review of initiatives

Est. of Ministerial Meeting on Final Disposal (Dec 2013)

Discussion on direction of review

Strategic Energy Plan (Apr. 2014)

Revision of the basic policy based on the Final Disposal Act (May 22, 2015)

Points on the Revision of the Basic Policy Based on the Final Disposal Act (May 22, 2015)

(1) Responsibility of current generations and potential for future generations to choose

- The responsibility of the current generation, which has generated the waste, is to successfully promote measures for geological disposal, in order not to pass the burdens on to future generations.
- Specifically, current generations must ensure the potential for **reversibility and retrievability** (R&R) to offer future generations the potential to change to more ideal disposal methods. R&D for the alternative disposal options will be conducted to ensure there is a broad range of options.

(2) Encourage national public understanding and regional understanding

- It is important to encourage the public to share respect and appreciation for areas that contribute to final disposal projects and to recognize the need to return profits to those areas.
- Seamless provision of information from the national government to local governments throughout Japan through numerous careful dialogues.

(3) Activities spearheaded by the national government

- Proposals made to related local governments to obtain their understanding and cooperation in nationwide scientific screening that is considered to be more scientifically suitable and the status of activities to promote understanding of geological disposal including geological feature in Japan.

(4) Support for the region to contribute to the project

- Support of activities and the establishment of a Forum for Dialogue in which a diverse set of residents can take part towards proactively building consensus in the area.
- Consider enacting comprehensive support measures to contribute to sustainable development of the regions.

(5) Improvements of the organizational structures

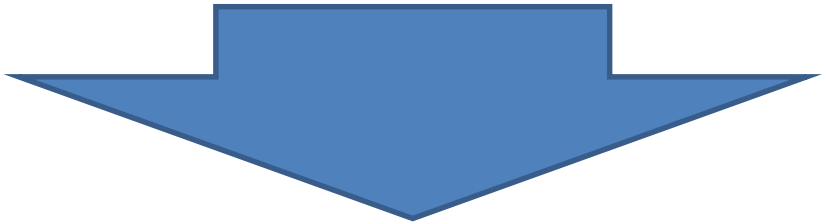
- Strengthen the organizational system of the project entity NUMO (Nuclear Waste Management Organization of Japan).
- Clarification of the involvement of the Japan Atomic Energy Commission and implementation of ongoing assessments in order to ensure reliability. The Nuclear Regulation Authority, Japan will successively present safety considerations related to safety regulations according to the progress of NUMO's surveys.
- Promote the expansion of storage capacity for spent fuel.

Discussion of requirement and criteria for nationwide screening

Nationwide Map –Making Process

- 2014: Geological Disposal Technology WG started
- 2015: Interim summary was published
- 2016: OECD/NEA International Peer Review

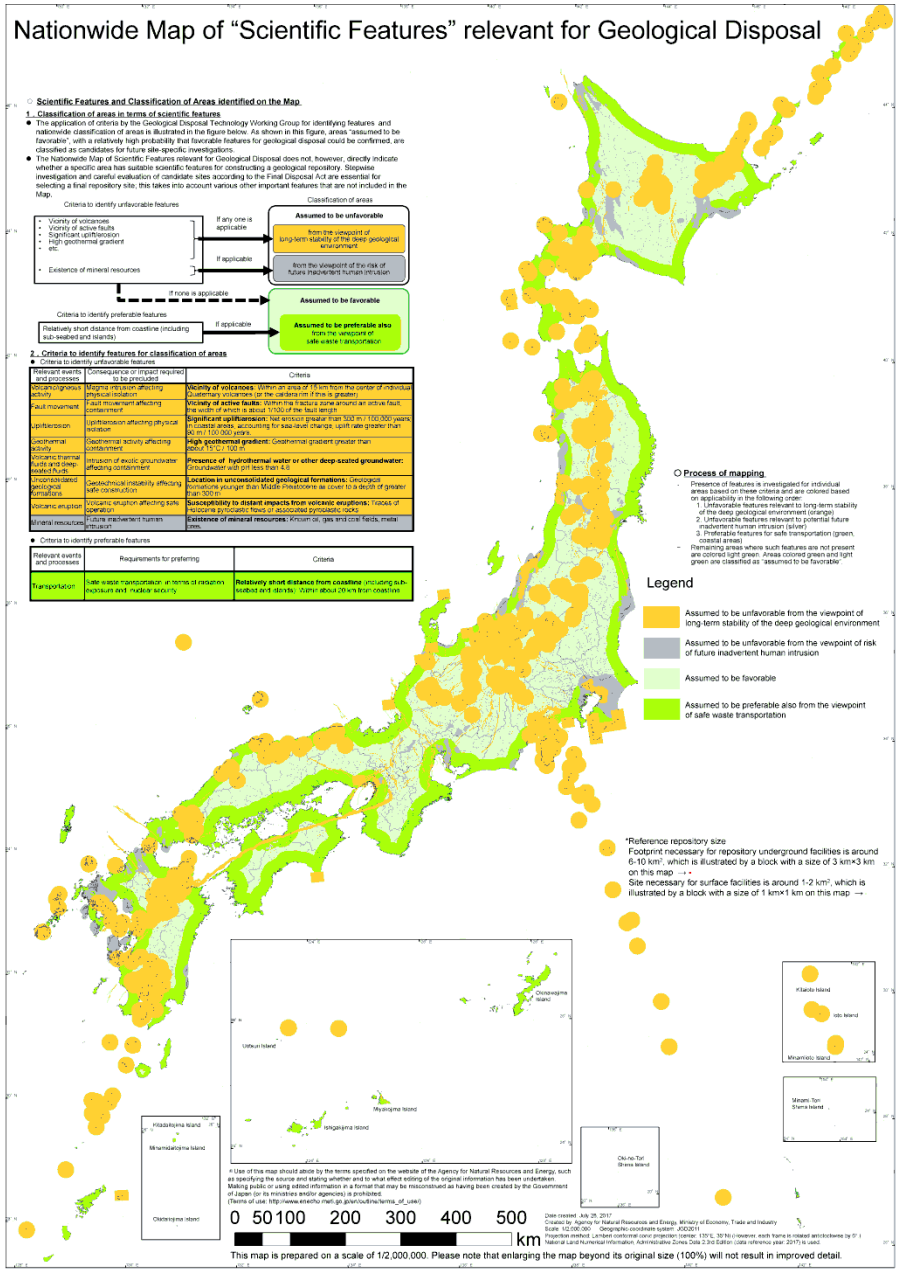
  (https://www.oecd-nea.org/rwm/pubs/2016/7331-japan-peer-review-gdrw.pdf)
- 2016: JAEC review
- 2017: Final Report was published : **Requirement and criteria were set up for making nationwide map**



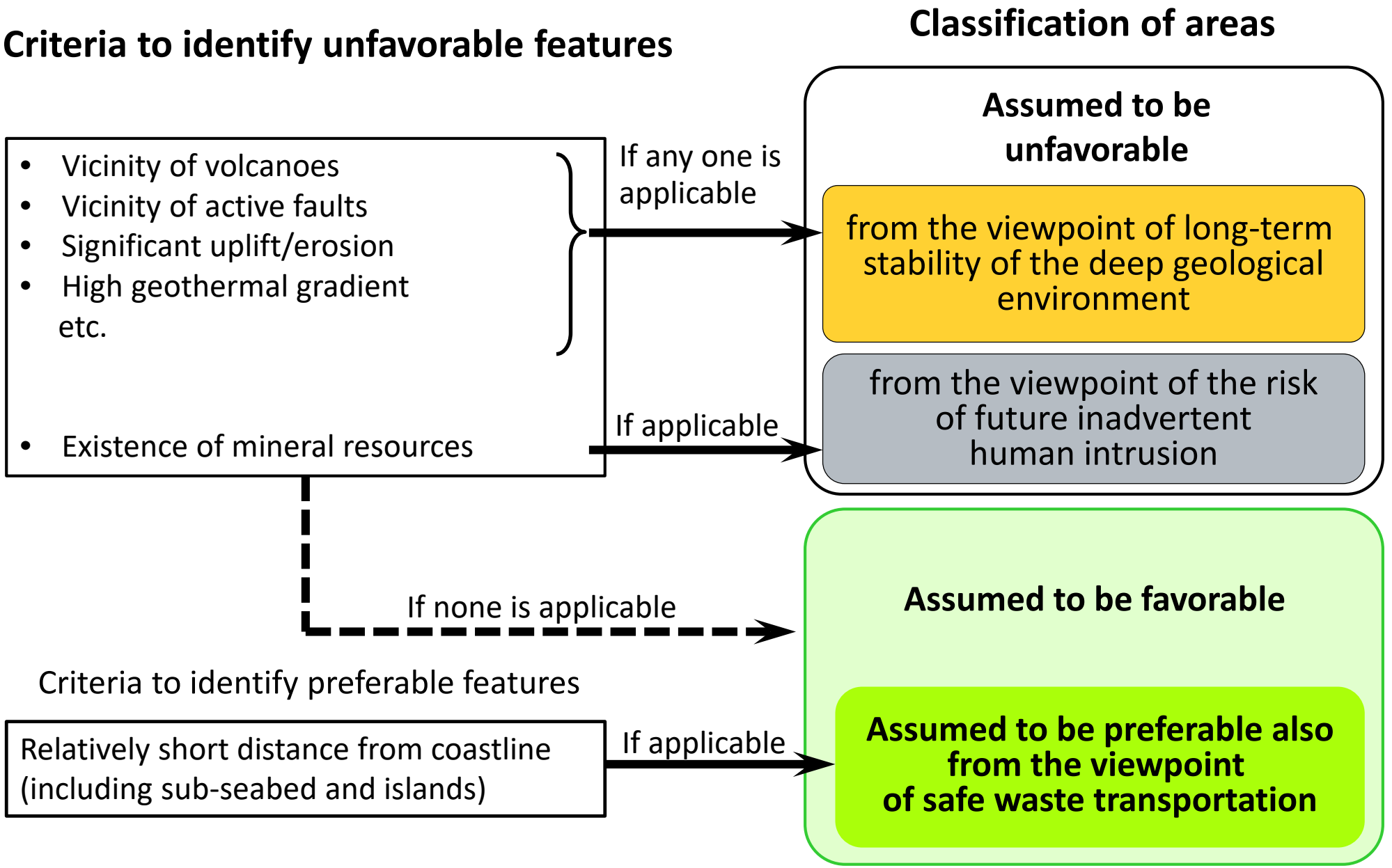
- July 2017: Publication of **Nationwide Map of Scientific features**

  (http://www.enecho.meti.go.jp/category/electricity_and_gas/nuclear/rw/kagakutekitokuseimap/)

“Nationwide Map of Scientific Features”



Status of the "Nationwide Map of Scientific Features for Geological Disposal"



Requirement and Criteria

		Requirement	Criteria
Geological Environment Features and Long-Term Stability	**Volcanic/igneous activity**	• Magma intrusion affecting physical isolation	× Vicinity of volcanoes: Within an area of 15km from the center of individual Quaternary volcanoes (or the caldera rim if this is greater)
	Fault movement	• Fault movement affecting containment	× Vicinity of active faults: Within the fracture zone around an active fault, the width of which is about 1/100 of the fault length
	Uplift/erosion	• Uplift/erosion affecting physical isolation	× Significant uplift/erosion: Net erosion greater than 300m/100,000 years; in coastal areas, accounting for sea-level change, uplift rate greater than 90m/100,000 years
	Geothermal activity	• Geothermal activity affecting containment	× High geothermal gradient: Geothermal gradient greater than about 15°C/100m
	Volcanic thermal fluids and deep-seated fluids	• Intrusion of exotic groundwater affecting containment	× Presence of hydrothermal water or other deep-seated groundwater: Groundwater with pH less than 4.8
	Mineral resources	• Future inadvertent human intrusion	× Existence of mineral resources: Known oil, gas and coal fields, metal ores
Construction and Operation of Facilities	**Volcanic eruption**	• Volcanic eruption affecting safe construction	× Susceptibility to distant impacts from volcanic eruptions: Traces of Holocene pyroclastic flows or associated pyroclastic rocks
	Unconsolidated geological formation	• Geotechnical instability affecting safe construction	× Location in unconsolidated geological formations: Geological formations younger than Middle Pleistocene as cover to a depth of greater than 300m
Transportation	**Transportation**	• Safe waste transportation in terms of radiation exposure and nuclear security	✓ Relatively short distance from coastline (including sub-seabed and islands): Within about 20km form coastline

✓ : preferable　　× : unfavorable

Step-by-step approach toward site selection and geological disposal

- The publication of the map is **the first step on a long way toward completion of geological disposal.**
- With the aim that multiple municipalities will undertake site investigations**, we will continue to hold public dialogues to ensure a deeper public understanding of the issue**.

Publication of Nationwide Map of Scientific Features

Deepen national and regional comprehension

Nationwide explanatory meetings using the map

Listening to public voices

- **Prioritized activities focusing on "green (coastal area)"**
- Supporting regional deliberation
- Promotion of R&D
- International cooperation & contribution

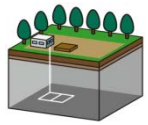
With the aim that multiple municipalities will accept site investigations

Site investigations

Conducted by NUMO based on regional comprehension

Literature survey

Preliminary investigation (borehole survey, etc.)



Detailed investigation (construction & studies in underground facilities)

Selection of final disposal site

Concluding remarks

<Purpose of the Map>

- The Nationwide Map of Scientific features for Geological Disposal was published in order to deepen the public understanding, not for the site selection directly.

<First step by map>

- Publication of the map is the first step in a long way and a new challenge toward geological disposal completion. Government and NUMO will implement and hope multiple regions' acceptance of site investigation.

<International cooperation>

- Sharing learned knowledge with countries would be helpful for implement of geological disposal. Japan can share the reaction of the map publication.