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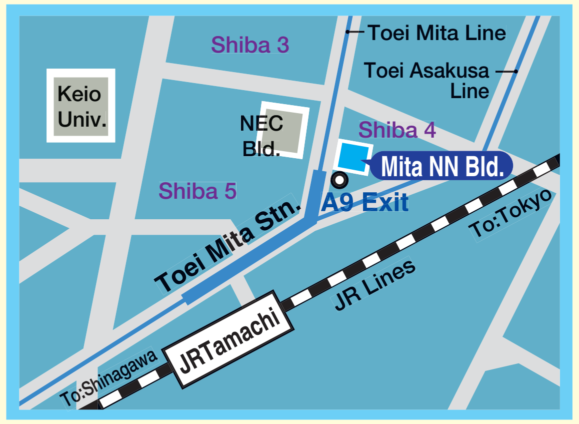

Toei Mita Line, Toei Asakusa Line (Mita Station Exit A9)
JR (Tamachi Station): 5-minute walk

NUMO 原子力発電環境整備機構

Relevant information for open solicitation of volunteers for areas to explore the feasibility of constructing a final repository for high-level radioactive waste ………… 3

Siting Factors for the Selection of Preliminary Investigation Areas

December 2002
Nuclear Waste Management Organization of Japan

Siting Factors for the Selection of Preliminary Investigation Areas

List of Contents

〈1〉 Introduction

In accordance with the “Specified Radioactive Waste Final Disposal Act” (the Final Disposal Act), the Nuclear Waste Management Organization of Japan (NUMO) will openly solicit for “areas to explore the feasibility of constructing a final repository for high-level radioactive waste” (volunteer areas), as part of the procedure for selecting “Preliminary Investigation Areas” (PIAs).

Literature surveys will be carried out for the volunteer areas and their surroundings and PIAs will then be selected from these areas, based on the results of the surveys.

In selecting PIAs, it is important to make clear the reasons for the selection. Literature surveys will be implemented based on “Siting Factors for the Selection of PIAs” (siting factors), which define the factors and principles applied in selecting PIAs .

In order to understand what siting factors are and how PIAs will be selected, NUMO hopes that each municipality(city, town or village) will refer to this material when considering applying as a volunteer area.

This material firstly provides an overall framework for the siting factors, followed by detailed descriptions of each factor.

Direct inquiries about this document or the open solicitation procedure to

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<2> What are Preliminary Investigation Areas?

A final repository site will be selected via a stepwise process as specified in the Final Disposal Act:

Selection of Preliminary Investigation Areas (PIAs)
→ Selection of Detailed Investigation Areas (DIAs)
→ Selection of a Repository Site

The PIAs will be selected from volunteer areas and their surroundings, based on the results of literature surveys carried out for these areas. DIAs will then be selected from the PIAs and a repository site from the DIAs. Construction of the repository will start following a safety review by the national government.

Where information that can be obtained by literature survey is limited, further investigations will be conducted at later stages to allow an appropriate judgment to be made based on sufficient information.

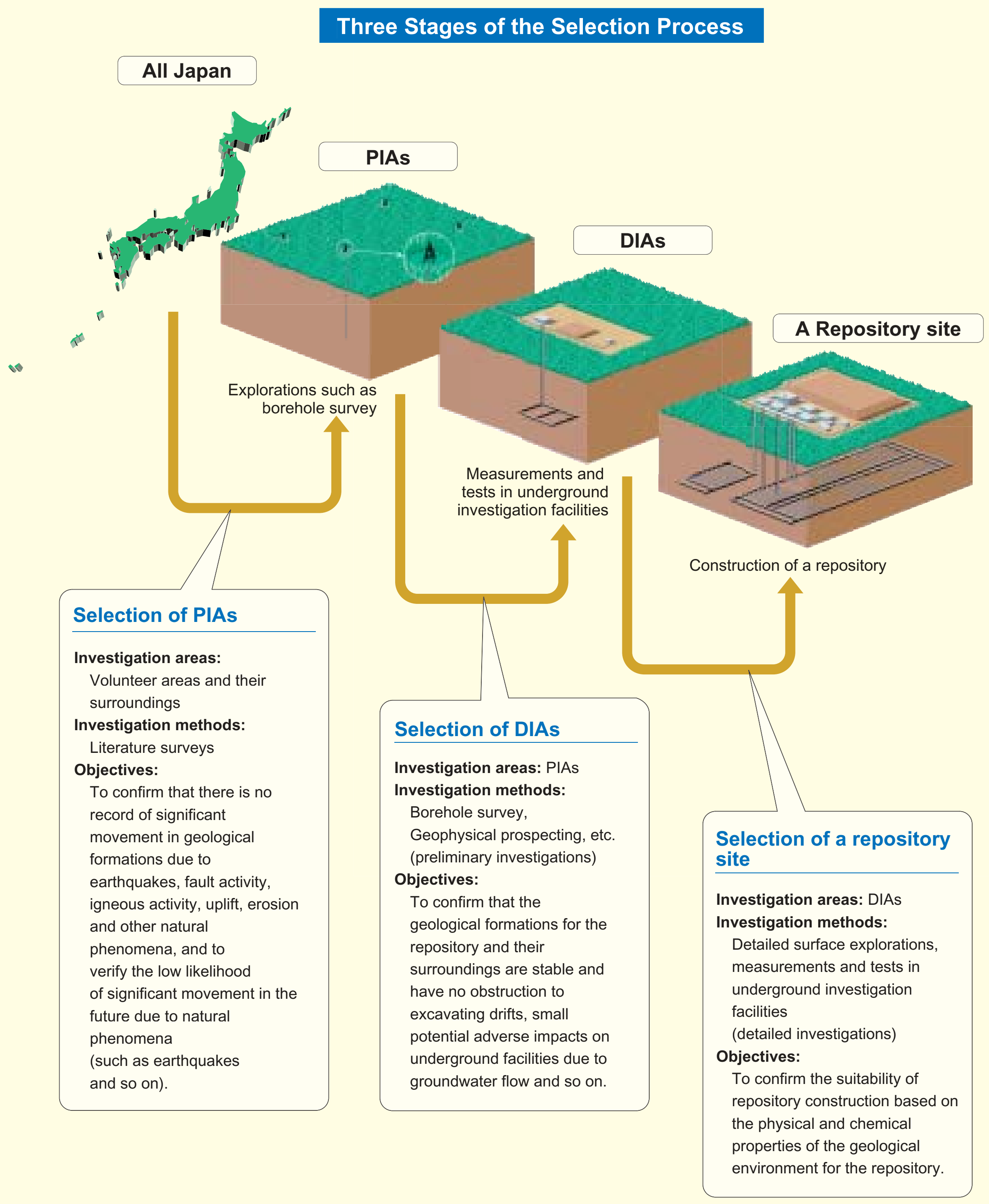
Preliminary investigations include borehole survey, geophysical prospecting, etc. The results of the preliminary investigations provide input for determining compliance with requirements such as stability of geological formations, no obstruction to drift excavation, minimizing potential adverse impacts on underground facilities due to groundwater flow, and so on. DIAs will be selected from the PIAs that meet these requirements.

At the detailed investigation stage, measurements and tests in underground investigation facilities, as well as detailed surface explorations, will be carried out. Based on the results of these detailed investigations, the suitability of a site for repository construction will be determined based on the physical and chemical properties of the geological environment and, finally, a suitable repository site will be selected from the DIAs.

In conducting each selection stage, NUMO's assessment criteria will be defined in accordance with national safety assessment guidelines that are being developed simultaneously.

Each investigation in the selection process will provide the in-depth information required for designing and constructing a repository, including information on the geological environment required for assessing the suitability of a potential repository site.

Laws and regulations besides the Final Disposal Act, such as regulations covering protection and development of the natural environment, will also be respected at the stages of repository site selection, construction and operation.



<3> Classification of Siting Factors

What are siting factors?

The goal of selecting PIAs is to identify areas for conducting preliminary investigations, excluding areas that would clearly be unsuitable as a repository site, based on data and information obtained through literature surveys.

The siting factors define the factors to be examined in the assessment in selecting PIAs; the principles for the assessment are defined taking into account the “Requirements of Geological Environment to Select Preliminary Investigation Areas of High-Level Radioactive Waste Disposal”, as well as the legal requirements for PIAs prescribed in the Final Disposal Act and associated regulations (legal requirements).

Siting factors consist of factors relating to legal requirements (Evaluation Factors for Qualification; EFQ) and favorable factors for additional assessment (Favorable Factors; FF).

Evaluation Factors for Qualification

PIAs must meet specified legal requirements. The Evaluation Factors for Qualification (EFQ) are factors to assess compliance with legal requirements and to define specific assessment criteria.

Legal requirements for PIAs are listed as follows:

a. There should be no record of significant movement in geological formations due to earthquake or fault activity, igneous activity, uplift, erosion and other natural phenomena;
b. The possibility of significant movement in the future due to earthquake or fault activity, igneous activity, uplift, erosion and other natural phenomena should be small;
c. There should be no record of unconsolidated deposits that have been deposited during the Quaternary period (i.e. in the last 1.7 million years);
d. There should be no record of mineral resources that are economically valuable.

The EFQ include earthquake and fault activity, igneous activity, uplift, erosion, unconsolidated Quaternary deposits and mineral resources. They are grouped into Nationwide Evaluation Factors (NEF) and Site-specific Evaluation Factors (SSEF).

NEF are used to assess compliance of PIAs with legal requirements, based on consistent criteria derived from nationwide information. Areas with potentially active faults or volcanoes, and with a risk of significant movement in geological formations over the next tens of thousands of years, will be excluded from the PIAs.

SSEF are used to assess compliance of PIAs with requirements, based on literature surveys for each volunteer area and its surroundings.

(1)"Requirements of Geological Environment to Select Preliminary Investigation Areas of High-Level Radioactive Waste Disposal", Nuclear Safety Commission, September 30, 2002

Favorable Factors

Favorable Factors (FF) are not part of the legal requirements for PIAs, but have to be considered by NUMO in their selection procedure. In accordance with NUMO’s policy of promoting the disposal project while taking into account “economic and operational efficiency premised on an assurance of safety”, these factors are defined as those that are relevant during the literature surveys for DIA selection, repository site selection, repository construction and operation.

For areas where compliance with legal requirements satisfies the EFQ, the characteristics of PIAs will be assessed comprehensively in terms of FF. A comparative assessment will also be carried out prior to PIA selection if necessary.

The assessment results based on FF will be used as input for investigation programs and repository design studies.

Siting Factors for Selection of PIAs

Evaluation Factors for Qualification (EFQ)

Factors used to assess compliance with legal requirements of PIAs (earthquake and fault activity, igneous activity, uplift, erosion, unconsolidated Quaternary deposits and mineral resources)

Nationwide Evaluation Factors (NEF)

Factors used to assess suitability of PIAs based on consistent nationwide criteria
Reference: Nationwide documents designated by NUMO

Site-specific Evaluation Factors (SSEF)

Factors used to assess suitability of PIAs based on literature surveys for each volunteer area and its surroundings
Reference: Nationwide/regional documents and other informations for volunteer areas

Favorable Factors (FF)

Factors used to assess characteristics of PIAs comprehensively and comparatively if necessary for areas where compliance with the legal requirements has been confirmed.
Reference: Nationwide/regional documents and other informations for volunteer areas

<4> Selection Procedure for PIAs and Application of Siting Factors

Selection of PIAs

When selecting PIAs, NUMO will evaluate the results of literature surveys using siting factors, define suitable areas for preliminary investigations and prepare a corresponding report. PIAs will thus be selected according to a procedure prescribed in “Response after Receipt of Application”, which is attached to the “Instructions for Application”. PIA selection requires the approval of the Ministry of Economy, Trade and Industry (METI).

Application of Siting Factors and Procedure

1. The start of the literature surveys will be notified to the volunteer areas (i).

   NUMO will notify the start of literature surveys for volunteer areas that are acknowledged as potential areas for survey in terms of the “Prior confirmation of the volunteered area’s geological conditions” prescribed in the “Instructions for Application” (one of the reference materials used for open solicitation of volunteer areas). The assessment principles for Nationwide Evaluation Factors (NEF) for fault activity and igneous activity will be applied to the “Prior confirmation of the volunteered area’s geological conditions” to identify conditions to be avoided in a volunteer area. NUMO should be consulted if there are any questions regarding volunteering.

2. NUMO will conduct literature surveys (ii).
   - a. NUMO will conduct literature surveys for volunteer areas and their surroundings. The survey areas will be large, to allow a range of information to be obtained for applying the siting factors.
   - b. Suitability as PIAs will be checked using NEF and Site-specific Evaluation Factors (SSEF). Areas confirmed as being suitable will then be subject to a comprehensive assessment of their characteristics using Favorable Factors (FF), and to a comparative assessment if necessary.
   - c. Materials used in the literature surveys will be drawn from open information, the quality and reliability of which will be checked by NUMO.

3. The area for a PIA is defined (iii).

   The area for a PIA will be defined based on the results of literature surveys.
   - a. Regions identified as falling into areas with active faults or igneous activity, etc., as prescribed in the Evaluation Factors for Qualification (EFQ), will be excluded from the PIAs.
   - b. A PIA may be larger than a volunteer area, depending on location with respect to areas with active faults and igneous activity and the size of the volunteer area. The zone outside the actual volunteer area will be subject to preliminary investigations, but will not be eligible for selection as a repository site.

4. The surroundings of PIAs may also be investigated (iv).

   In order to evaluate PIAs, supplementary investigations may be carried out in surrounding areas to check for active faults, igneous activity, uplift, erosion and so on. The investigations carried out simultaneously with the preliminary investigations will include surveys of active faults, volcanoes and geomorphic features, etc.

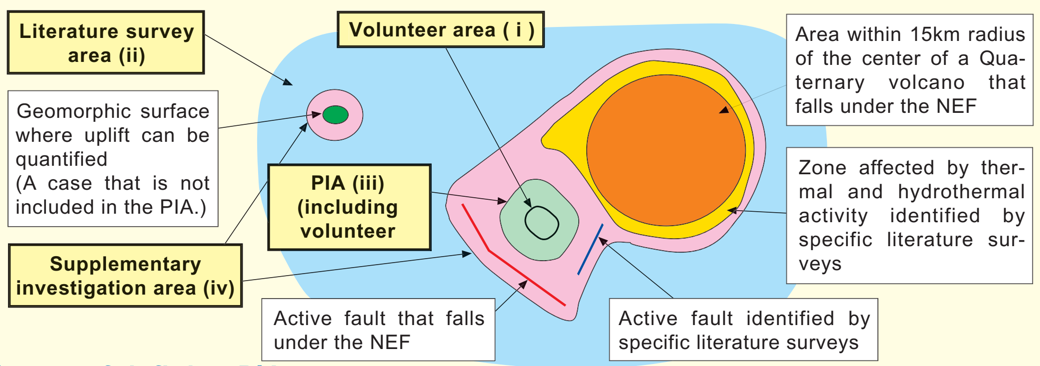
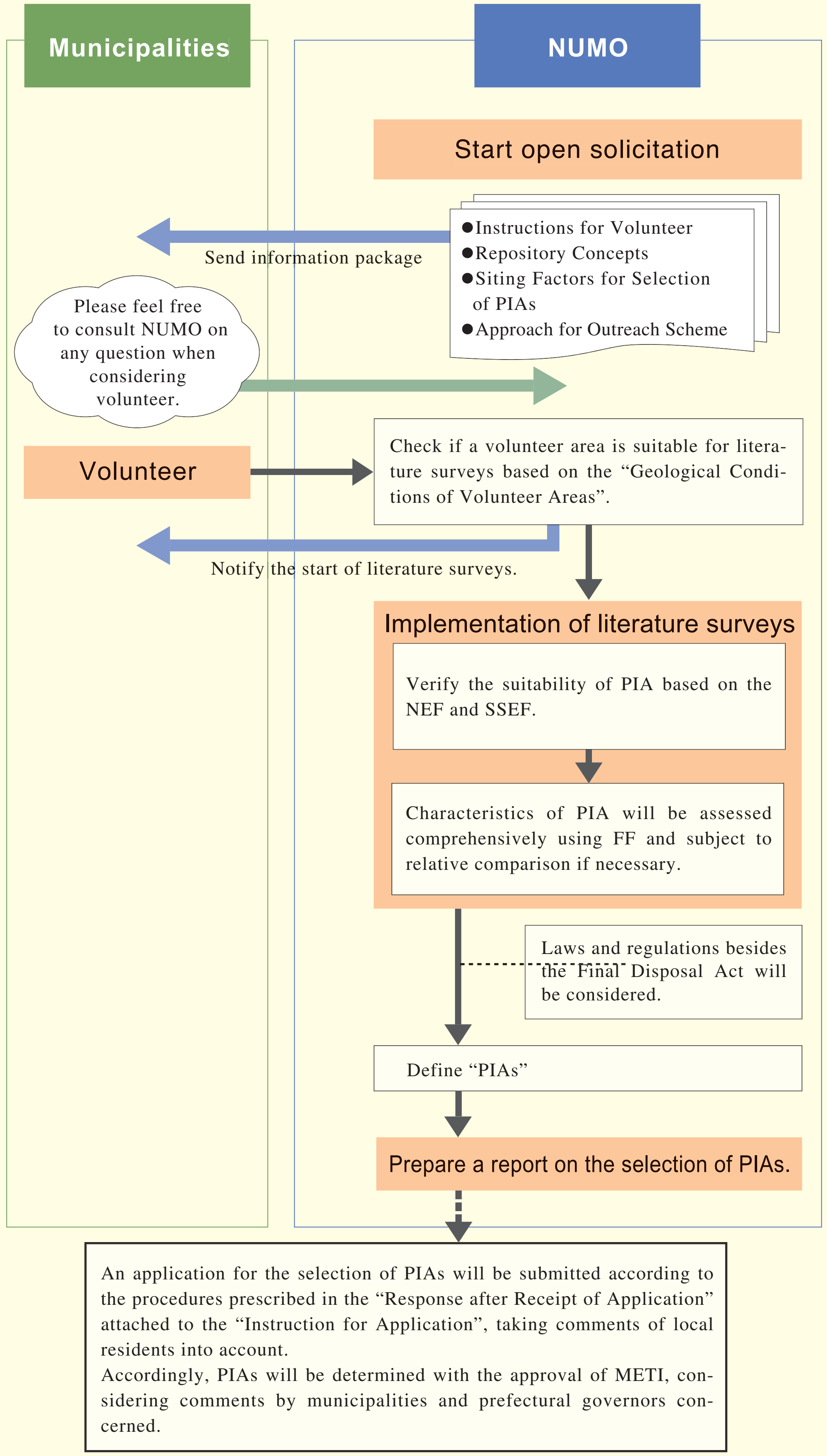


Image of defining PIAs.

Selection Procedure for Preliminary Investigation Areas and Siting Factors



<5> Content of Siting Factors

Evaluation Factors for Qualification (1)

Earthquake, Fault Activity

Major effects on a repository:

(A) “Fault activity” that may cause earthquakes and displacement/deformation of geological formations;

(B) Earthquake vibration;

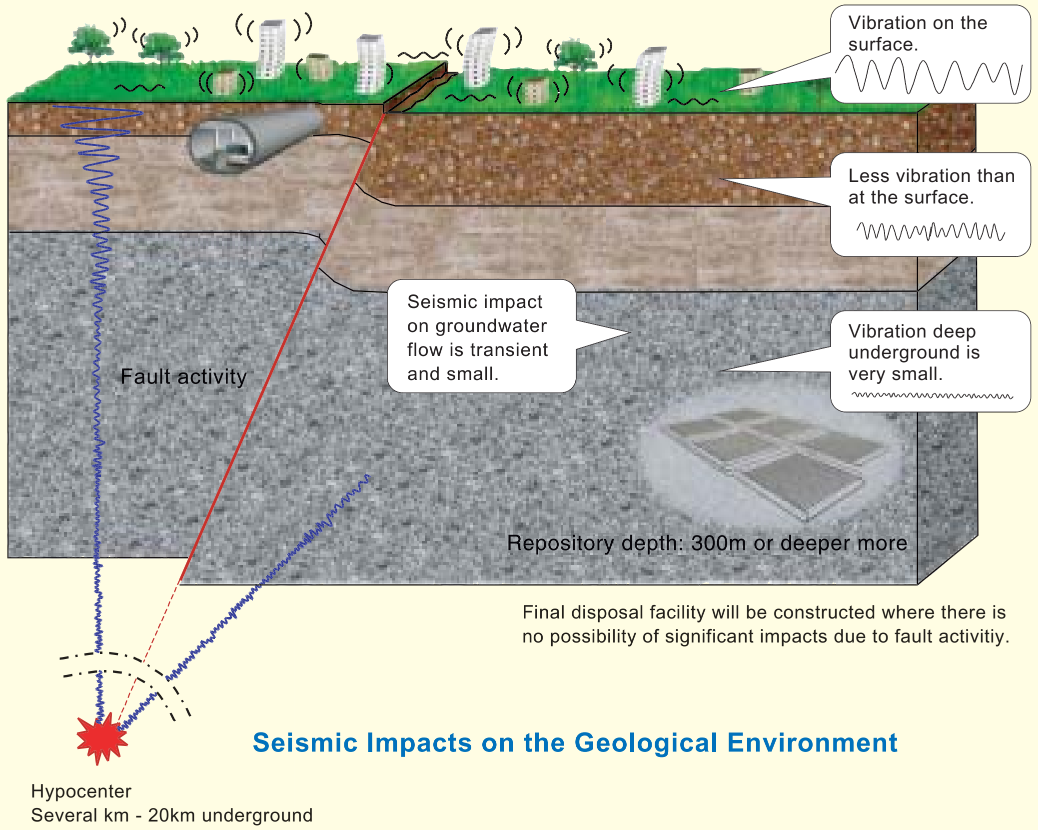
(C) “Changes in the geological environment” before and after an earthquake, such as generation of fractures and changes in flow and chemical properties of groundwater.

The impact of vibrations on surface facilities can be dealt with using the same seismic (earthquake-resistant) design as for conventional nuclear facilities. Earthquake vibrations deep underground are known to be smaller than at the surface and the impact on underground facilities will thus be less than for surface facilities.

Based on previous observations, changes in the geological environment are expected to be small and their impact on the repository will not be significant,.

Hence, (B) and (C) above will not be assessed in the selection of PIAs; they will be further investigated subsequent to the preliminary investigations, in order to examine their impact on a repository.

Events that cause “significant movement in geological formations” will include (A) fault activity associated with destruction/fracturing of rock that may have a significant impact on a repository. “Active faults, folds and flexures” (active faults, etc.) are identified by literature survey as being potentially active in the future and their impact is thus considered to be significant and problematic for designing the layout of the repository. Thus, siting factors are defined as follows:



Seismic Impacts on the Geological Environment

Evaluation Factors for Qualification (1)
Earthquake, Fault Activity

Nationwide Evaluation Factors:

PIAs are defined as excluding locations with active faults identified by nationwide literature, based on aerial photographs for inland areas and sonic profiling for offshore

Principles for assessment Most faults that have shown repeated activity and significant displacement have left topographic evidence in inland areas and in surface deposits in offshore areas. The identification of active faults should, in principle, be based on detailed in situ investigations, but they will in fact be identified based on a study of nationwide information.

Potentially significant impacts on a repository of active faults indicated in the literature below cannot be ruled out given the relevant timescale of several tens of thousands of years or more. Therefore, PIAs will exclude areas where such active faults are located.

Active faults for the purpose of selecting PIAs include active faults and inferred active faults documented in the "1 : 2,000,000 Active Fault Map of Japan" (2002)[(1)], based on aerial photographs and surface geological surveys for inland areas, and faults (normal, reverse, strike-slip and unclassified faults) indicated in the "Quaternary Structural Map of Japanese Waters" (2001)[(2)], based on sonic profiles and boreholes for offshore areas. (Refer to attached Fig. 1 and 2)

Site-specific Evaluation Factors:

In terms of active faults that have shown repeated activity and significant displacement, and other related natural phenomena, locations or zones that clearly fall into the following categories will be excluded from PIAs:

a. Locations where active faults are identified by literature information other than information used for the Nationwide Evaluation Factors
b. Extent in the fault crushed zone and surrounding deformation zones
c. Zones that are likely to have bifurcation of a fault
d. Zones with folds or flexures that have been active for the past hundreds of thousands of years

Principles for assessment With reference to "a": Locations where active faults can be easily identified by specific literature surveys, including information that falls under active faults in the Nationwide Evaluation Factors, are excluded from PIAs.

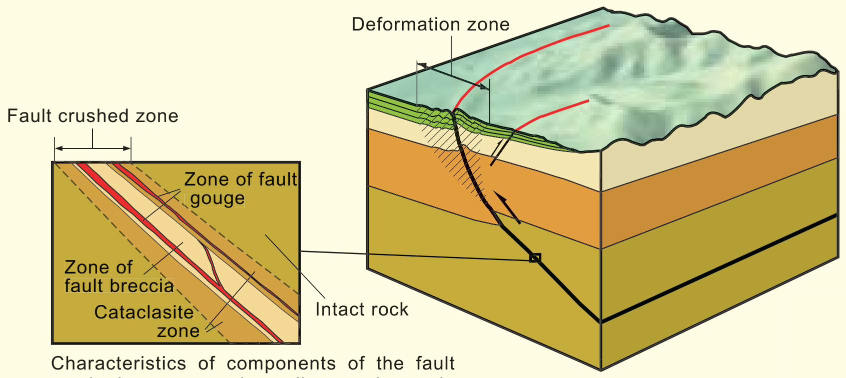
With reference to "b": Extent within the crushed zone of a fault that may cause fault activity may also cause significant deformation of a repository. Hence, considering three-dimensional features of faults such as strike and dip, fault crushed zones that include fault gouge, fault breccia and cataclasite, etc., and their surrounding deformation zones, will be excluded from PIAs. Because the extent of fault crused zones and deformation zones will vary depending on the characteristics of the fault and the surrounding rocks, thorough investigations will be conducted on an individual basis.

With reference to "c": In a case such as a reverse fault zone located near the boundary between mountains and plains, active faults may cause bifurcation some time during the next tens of thousands of years. Also, when an earthquake swarm is generated during extension of an active fault, the active fault may extend further during the next tens of thousands of years. Hence, these effects will be investigated thoroughly on an individual basis and zones with potential extensions will be excluded from PIAs.

With reference to "d": Zones where clear large-scale active folds or flexures are distributed may cause significant deformation of a repository during the next tens of thousands of years. Hence, these effects will be investigated thoroughly on an individual basis and zones with potential active folds and flexures will be excluded from PIAs.

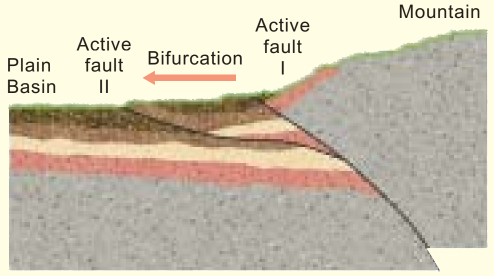
When the presence of active faults, etc. cannot be identified clearly by the literature surveys, any presence of such features that may affect the construction of a repository will be further investigated during the stage of preliminary investigations and subsequent investigations.

The content of siting factors with respect to fault activity relates to a repository for HLW that requires long-term safety to be ensured for the next tens of thousands of years. The period for assessment of local disaster prevention plans, miscellaneous plans and designs of nuclear facilities and general structures will be different from the preceding case and hence the siting factors will not be applied.



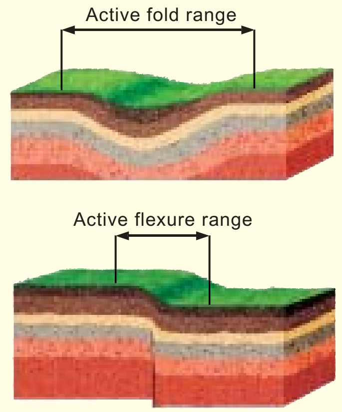
Characteristics of components of the fault crushed zone vary depending on the scale and depth of generation of the crushed zone.

Width of deformation band of active faults



When there is a reverse fault near boundaries between mountain and plain,an active fault may cause bifurcation (from I to II in the Figure) in several tens of thousand of years in the future..

Bifurcation of an active fault



Range of active folds and flexures

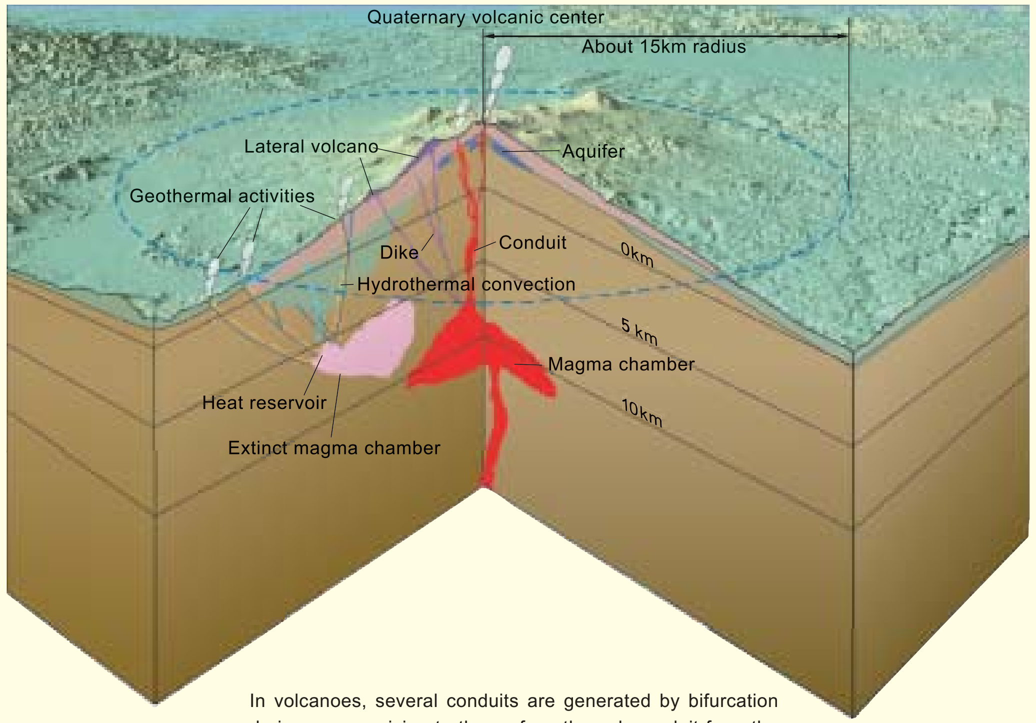
(1) T. Nakata, T. Imaizumi eds.(2002): "Digital active fault map of Japan", attached Figure, 1:2,000,000 Active Fault Map of Japan, University of Tokyo Press

(2) E. Tokuyama, E. Honza, M. Kimura, S. Kuramoto, J. Ashi, N. Okamura, H. Arato, Y. Ito, W. Soh, R. Hino, T. Nohara, H. Abe, S. Sakai, and K. Mukaiyama (2001): "Tectonic development in the Regions around Japan since the Latest Miocene", attached Figure, Quaternary Structural Map of Japanese Waters, Journal of the Japan Society for Marine Surveys and Technology vol. 13, No. 1

Evaluation Factors for Qualification (2)

Igneous Activity

"Igneous activity", including magmatic intrusion, volcanic eruption and thermal and hydrothermal activity, may cause direct damage to the repository. These are considered to fall under "significant movement of geological formations" as prescribed by law. Hence, siting factors are defined as follows:



In volcanoes, several conduits are generated by bifurcation during magma rising to the surface through conduit from the underground magma chamber. This area is called the magma activity area, which can be roughly estimated from the distribution of lateral volcanoes, lateral craters and dikes. The extent of the circle in the nationwide evaluation factors was established based on evidence that the magmatic activity areas during several tens of thousand of years to several hundreds of thousand of years were within about a 15 km radius.
Thermal or hydrothermal impacts due to geothermal activity and hydrothermal convection could extend beyond this zone.

Conceptual View of Igneous Activity and Surroundings of a Volcano (Example of a Composite Volcano)

Nationwide Evaluation Factors:

Considering the extension of areas of magmatic activity during the next tens of thousands of years, areas within a 15km radius of the center of Quaternary volcanoes will be excluded from PIAs.

Principles for assessment Magmatic intrusion and volcanic eruptions caused by magma rising from deep underground chambers have to be avoided, as these phenomena may cause significant direct damage to a repository. For this reason, areas that may be subject to magmatic intrusion or eruption over tens of thousands of years into the future will be excluded from PIAs.

Quaternary volcanoes in Japan are normally found in specific regions and this situation has not changed significantly for the last two million years in general. Hence, it is reasonable to expect that activity in the next tens of thousands of years will be limited to similar regions as at present. It is known that older volcanoes have a larger magma activity area, the extent of which is expected to be a maximum of 30km (a radius of around 15km from the center of a volcano)(1), even considering a period of tens of thousands of years. In addition, based on data in the Catalogue of Quaternary Volcanoes in Japan(2) (refer to attached Fig. 3), for almost all volcanoes (except some special cases where volcanoes belong to monogenic volcano group with a wide distribution, or have large calderas), the magmatic activity area is estimated to be within a circle with a 15km radius from a representative location of the volcano.

Site-specific Evaluation Factors:

Outside a circle of 15km radius from the center of Quaternary volcanoes, PIAs will also exclude areas that are definitely expected to have magmatic intrusions or eruptions in the next tens of thousands of years. In addition, areas that are expected to have significant thermal effects, highly acidic thermal waters or significant hydrothermal convection will also be excluded from PIAs.

Principles for assessment For areas outside a circle of 15km radius from the center of Quaternary volcanoes, distributions of Quaternary volcanoes, craters and dikes will be examined in detail on an individual basis and the possibility of magmatic intrusion or eruption will be determined.

In addition, the generation of significant heat, highly acidic thermal waters and hydrothermal convection have to be avoided because they may have a significant impact on a repository.

In case of the areas where the presense of Quatarnary volcanoes and significant impacts due to igneous activity cannot be identified from literature surveys, investigations will be continued into the preliminary investigation phase or subsequent investigation phases.

The content of siting factors for volcanoes described above applies to a repository for HLW that requires to ensure long-term safety for the next tens of thousands of years. Assessment periods for local disaster prevention plans, miscellaneous plans and designs of nuclear facilities and general structures will be different and the above siting factors will not be applied.

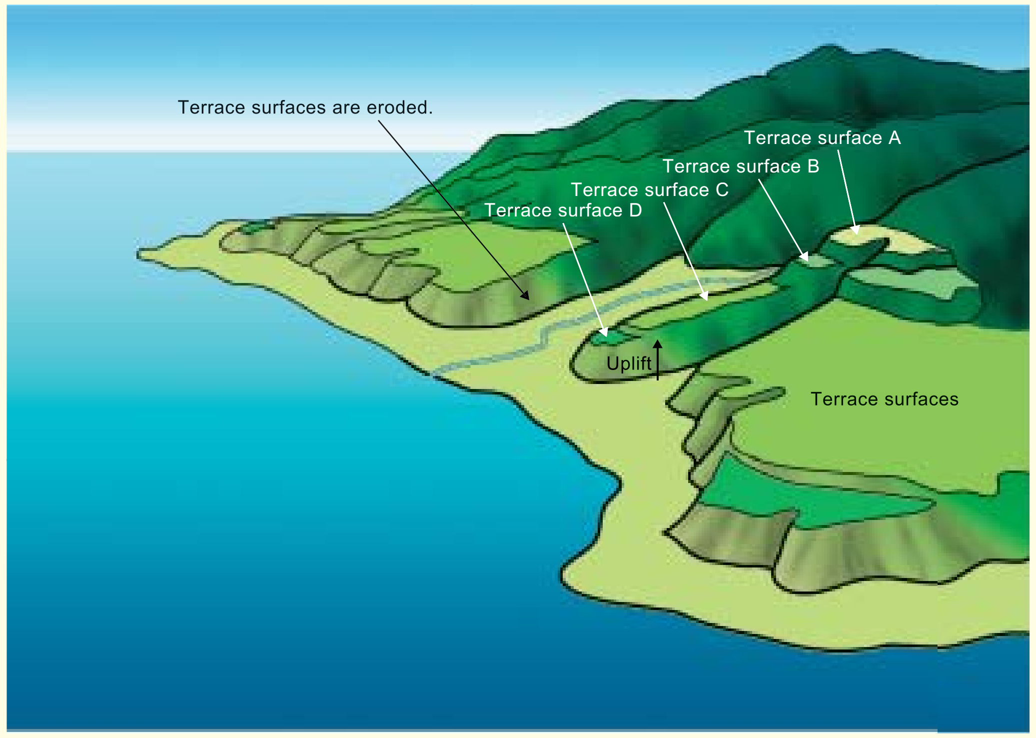
(1) Eiji Nakata, Kazuhiro Tanaka (2001): Influence of magma intrusion on the bedrock-The distribution of volcanic vent around the active volcano in Japan-: Abstract of 2001 annual meeting of Japan Society of Engineering Geology
(2) Committee for Catalogue of Quaternary Volcanoes in Japan, eds. (1999): Catalogue of Quaternary Volcanoes in Japan, v.1.0 (CD-ROM), Volcanological Society of Japan

Evaluation Factors for Qualification (3)

Uplift / Erosion

Uplift is a phenomenon that raises wide areas of land. In regions where uplift occurs, streams, rainfall, wind and glaciers will erode the raised land surfaces. However, in regions with significant uplift formed over a long period of time, erosion commensurate with uplift may occur. If the erosion is significant, emplaced HLW (vitrified waste) may eventually reach the surface.

Hence, considering that significant uplift and erosion represent "significant movement of geological formations", siting factors will be defined as follows:



As a result of uplift at the coast, terrace surfaces have been formed in order from A to D and geomorphic surfaces remain even now. The topography also indicates that the uplifted terrace surface has been eroded by a river.

Uplift and erosion (marine terrace)

Site-specific Evaluation Factors:

Areas where there is clear evidence of uplift amounting to more than 300m during the last 100,000 years will be excluded from PIAs.

Principles for assessment The trend of existing uplift and prediction of such movement in the future can generally be identified from geomorphic surfaces of terraces. Many tiered geomorphic surfaces have been formed during the past hundreds of thousands of years. In particular, geomorphic surfaces formed approximately 125,000 years ago are well preserved all over the country. From various evidence and results obtained from aerial photographs, the amount of uplift during the past 100,000 years can be determined relatively accurately based on the data for these geomorphic surfaces.

On the other hand, it is not so easy to identify the long-term effects of erosion. In general, erosion amount associated with uplift is smaller than the amount of the uplift. However, when uplift is significant, significant erosion may also be expected. Taking the most conservative case, volumes of uplift and erosion are expected to be equal.

Based on geological evidence from the last hundreds of thousands of years, the total amount of uplift during the past 100,000 years will be used as a measure for the assessment of uplift and erosion.

The possibility of vitrified waste reaching the surface due to uplift and erosion can be avoided by selecting an adequate disposal depth. The disposal depth is defined as 300 m or greater by the Final Disposal Act. In the selection of PIAs, areas where uplift in the past 100,000 years has definitely exceeded 300 m will thus be excluded from PIAs.

Where the effects of uplift and erosion are not evident from literature surveys, they will be investigated in detail at the preliminary investigation stage or in subsequent investigations.

In addition, the movement of vitrified waste towards the surface due to uplift and erosion may cause changes in the flow patterns and chemical properties of groundwater and the transport of radioactive substances contained in the vitrified waste. However, these effects are difficult to determine based on literature surveys and they will therefore be examined at the preliminary investigation stage or in subsequent investigations.

Evaluation Factors for Qualification (4)

Quaternary Unconsolidated Deposits

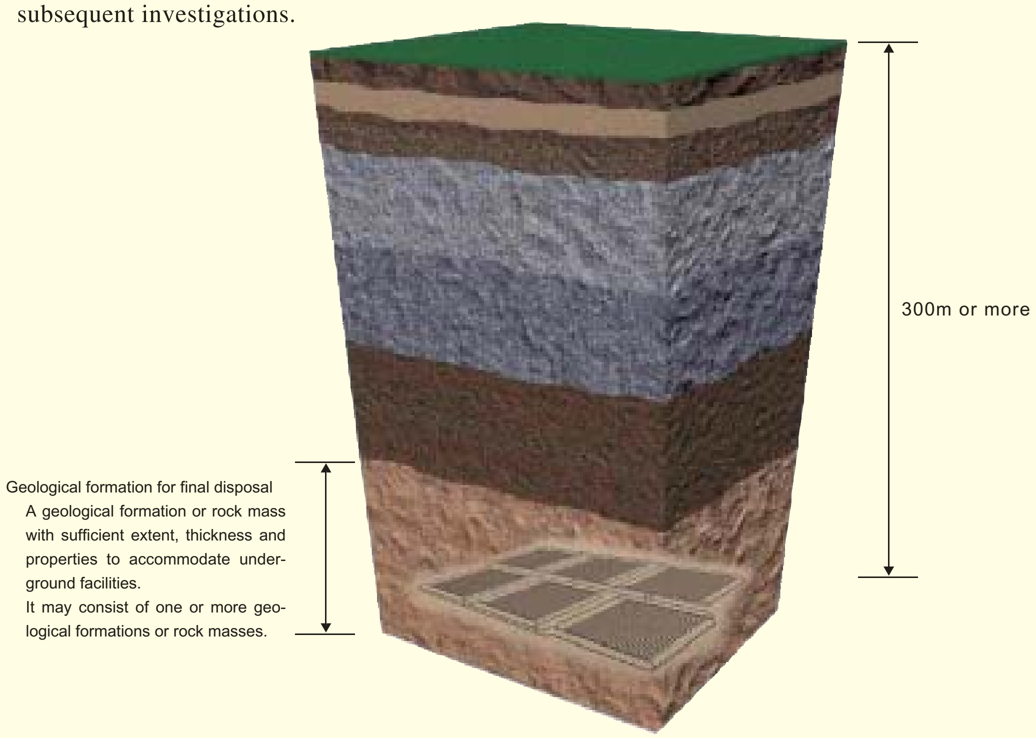
Geological formations where Quaternary unconsolidated deposits are widely distributed have low strength, which may cause difficulties in the construction of underground facilities. In addition, taking into consideration potential difficulties in maintenance and management of underground facilities during operation, siting factors will be defined as follows:

Site-specific Evaluation Factors:

PIAs will exclude areas where the geological formation intended for repository construction is composed of Quaternary unconsolidated deposits.

Principles for assessment Unconsolidated gravels, sands and muds deposited in the Quaternary period are termed Quaternary unconsolidated deposits. It is considered to be difficult to construct and maintain underground facilities in geological formations with low-strength Quaternary unconsolidated deposits. If such deposits are present below a depth of 300m, and no geological formation suitable for final disposal can be found, then such areas will be excluded from PIAs.

If the presence of Quaternary unconsolidated deposits cannot be identified by literature survey, their occurrence will be examined in the preliminary investigation stage or in subsequent investigations.



Geological formation for final disposal

Evaluation Factors for Qualification (5)

Mineral Resources

In order to prevent inadvertent human intrusion into the final disposal facility through exploration or mining of mineral resources, siting factors are defined as follows:

Site-specific Evaluation Factors:

Concerning the geological formation for final disposal, PIAs will exclude areas with mineral resources that are economically valuable.

Principles for assessment With a view to preventing human intrusion, areas with mineral resources that are considered to be economically valuable will be excluded from PIAs.

Mineral resources are defined in the Mining Law. To determine the presence of economically valuable resources, mining rights based on the Mining Law will be considered. Mining rights are rights to mine on a large scale, which implies that minerals are definitely present that are, or could be, economically valuable. The establishment of mining rights for mineral resources can be determined by checking written documents describing initiation or suspension of mining activities. Mineral resources currently being mined are considered to be economically valuable. In addition, mineral resources under suspension (including those that have not yet been excavated) are considered to be economically valuable if their quality and workable reserves are equal to, or better than, resources being actively mined. Hence, areas with such mineral resources will be excluded from PIAs.

Mineral resources that have potential economic value, but do not fall into the preceding category, will be examined in terms of their workability at the preliminary investigation stage or in subsequent investigations.

Resources that are not defined as “mineral resources” but have the potential to become valuable, such as geothermal sources, hot springs, groundwater, etc., will be examined after the selection of PIAs.

Minerals stipulated by the Mining Law The minerals stipulated by the Mining Law include gold, silver, copper, lead, bismuth, tin, antimony, mercury, zinc, iron, iron sulfide, chrome, manganese, tungsten, molybdenum, arsenic, nickel, cobalt, uranium, thorium, phosphate, graphite, coal, lignite, oil, asphalt, combustible natural gas, sulfur, gypsum, barite, alunite, fluorite, asbestos, limestone, dolomite, silica stone, feldspar, pyrophyllite, talc, fireclay and alluvial gold.

Favorable Factors

Following the assessment based on the Evaluation Factors for Qualification, the characteristics of PIAs will be assessed using literature information on Favorable Factors (FF).

In this assessment, the PIAs will be evaluated based on the FF considered as a whole rather than taken individually.

If necessary, a comparative assessment will be carried out to select PIAs using FF.

Favorable Factors:

FF for evaluating the characteristics of PIAs are as follows:

a. Properties and conditions of geological formations:
Mechanical strength, conditions of deformation, fracturing, weathering and alteration, geothermal gradient, configuration and scale of rock mass, uplift / erosion rate, potentially unusual porewater pressures, swelling host rock, gas jets, rock-burst and large-scale water inflow.

b. Hydraulic properties:
Groundwater flow rate and flow velocity, temperature, pH and Eh.

c. Investigation and assessment of the geological environment:
Scale, scope and duration of investigations, applicability of investigation technology and assessment methods, ease of assessment and modeling of geological environments, constraints on site investigation such as restrictions on land use.

d. Natural disasters during construction and operation:
Potential for critical natural disasters such as earthquakes, landslides and flooding.

e. Procurement of land:
Straightforward of procuring land.

f. Transportation:
Ease of transportation, such as distance from available harbors.

Principles for assessment The factors mentioned above are assessed comprehensively.

The following characteristics are considered to be favorable:

a. Properties and conditions of geological formations
The geological formation for final disposal and overlying geological formations should have: rock with sufficient strength, low deformation, fracturing, weathering and alteration, a low geothermal gradient, sufficient extent of bedrock for accommodating underground facilities, slow uplift / erosion or areas with continuous subsidence and a low likelihood of unusual porewater pressures, swelling host rock, gas jets, rock-burst and large-scale water inflow.

b. Hydraulic properties
The geological formation for final disposal should have: a low groundwater flow rate and flow velocity, low temperature and groundwater should not be extremely acidic or alkaline; geological formations and groundwaters at the disposal site should not be extensively oxidized.

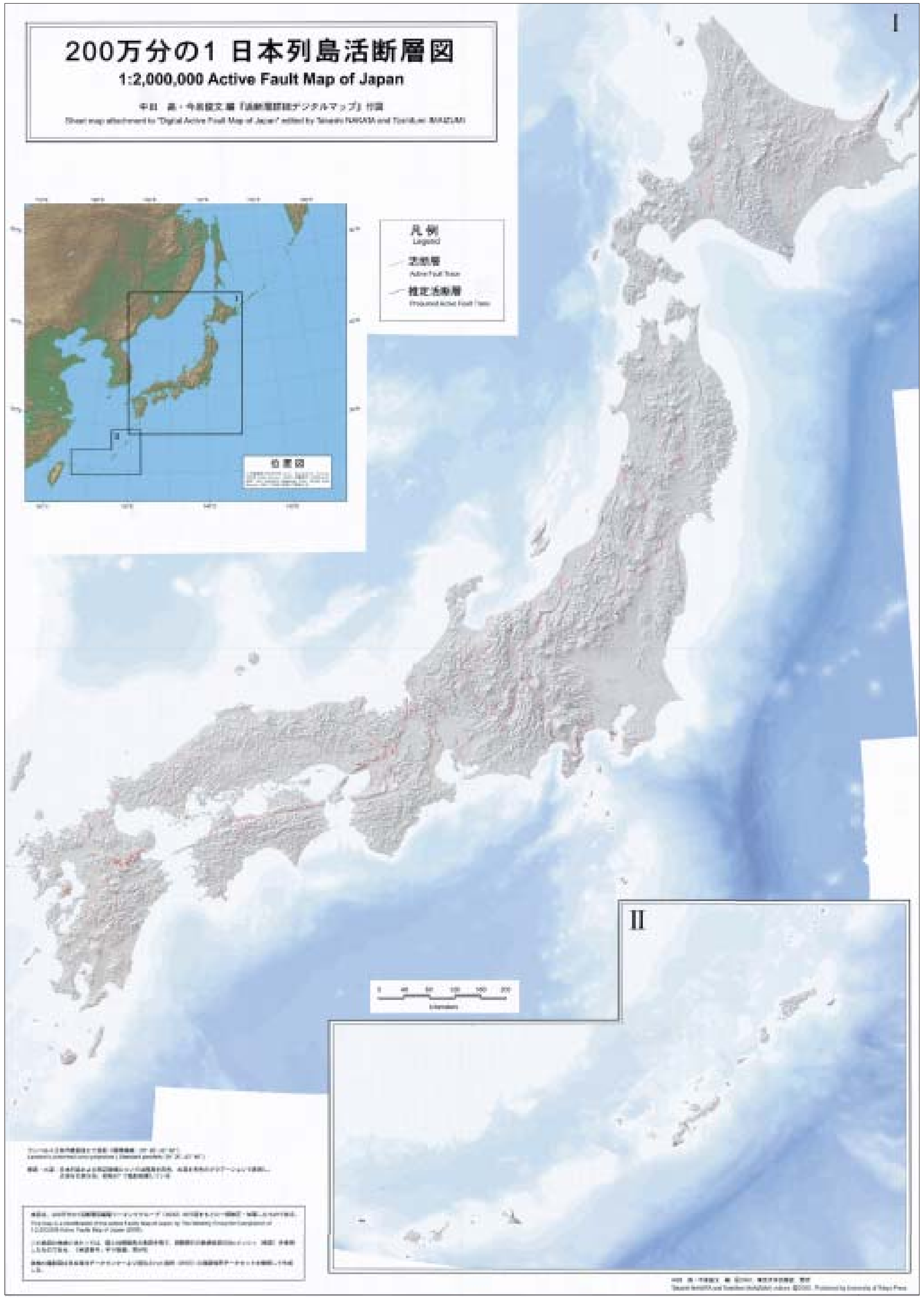
c. Investigation and assessment of the geological environment
The investigation scale, scope and cost should be reasonable and the duration of investigations should not be excessively long; application of investigation technology and assessment methods should be straightforward, as should assessment and modeling of geological phenomena such as igneous activity and fault activity; constraints on site investigation, such as restrictions on land use, should be manageable.

d. Natural disasters during construction and operation
There should be a low likelihood of critical natural disasters such as earthquakes, landslides and flooding, from the viewpoint of safety during construction and operation.

e. Procurement of land
Procurement of land should be straightforward.

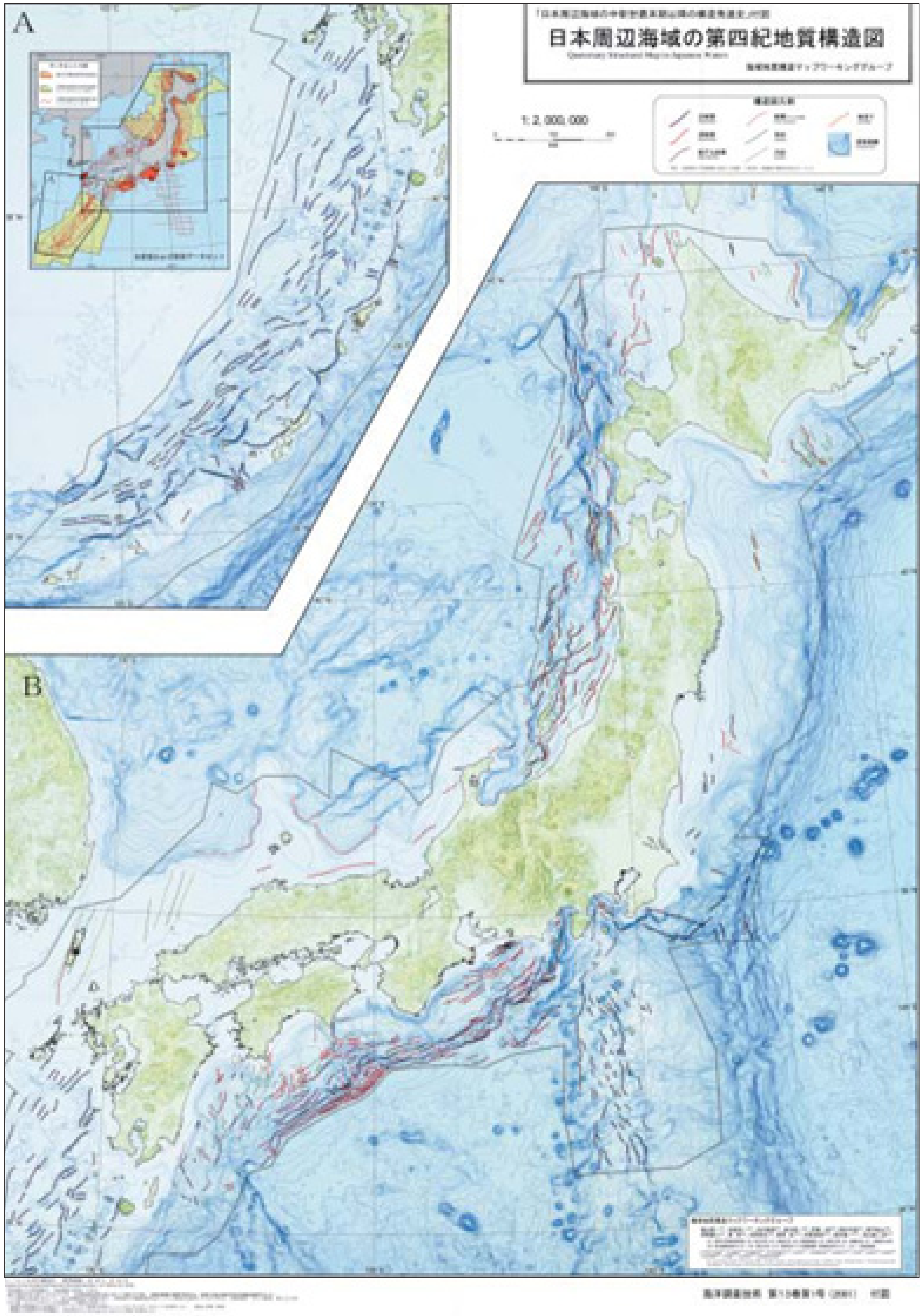
f. Transportation
Transportation should be easy, for example short distances between available harbors and the disposal site.

Attachment Figure 1 Distribution of Active Faults in Inland Areas



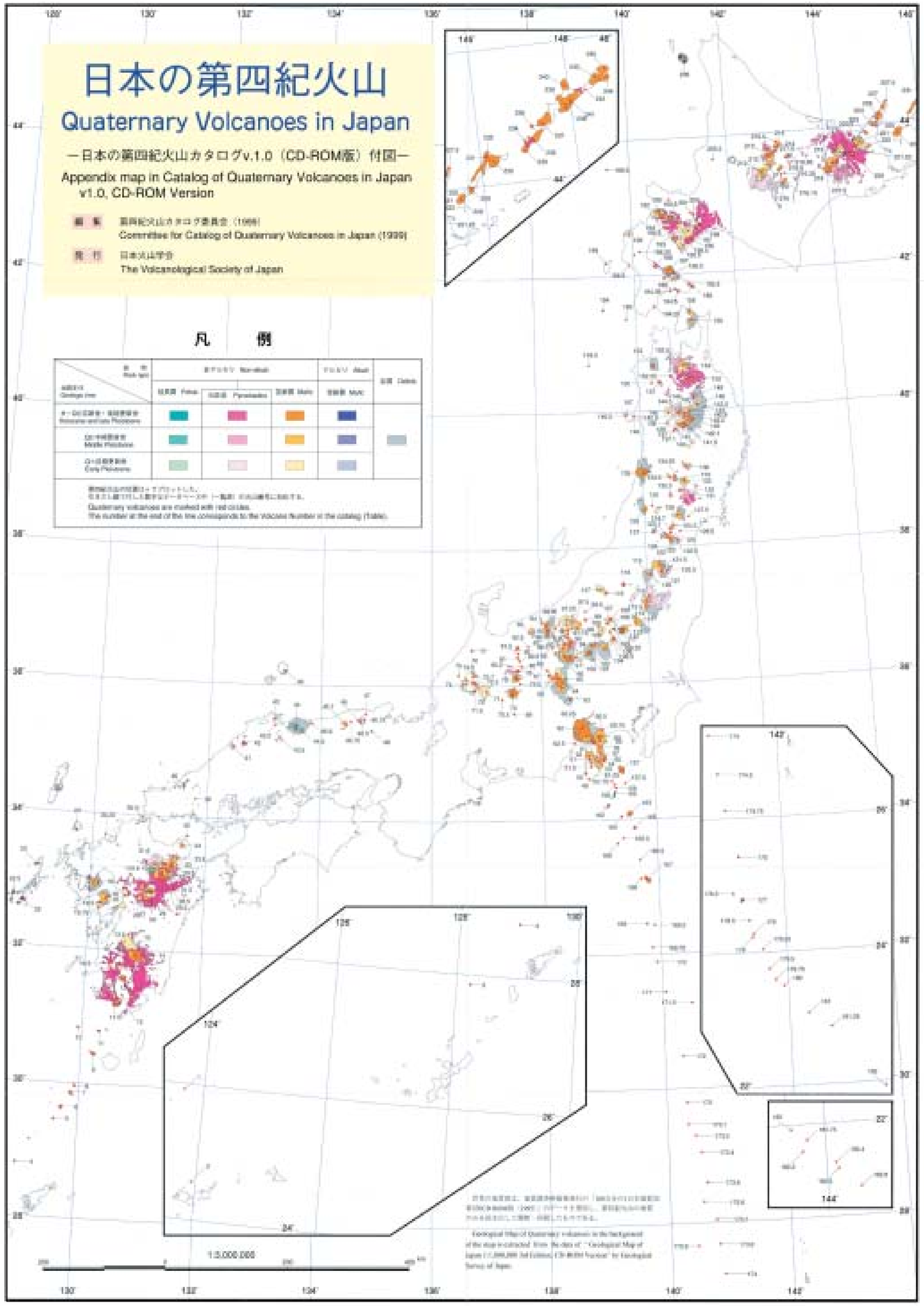
出典：中田高・今泉俊文編(2002)：「活断層詳細デジタルマップ」付図　200万の1日本列島活断層図、東京大学出版会

Attachment Figure 2 Distribution of Active Faults in Offshore Areas



出典：徳山英一ほか(2001)：「日本周辺海域の中新世最末期以降の構造発達史」付図
日本周辺海域の第四紀地質構造図、海洋調査技術、第13巻第1号、海洋調査技術学会　海洋調査技術学会承認第14001号

Attachment Figure 3 Distribution of Quaternary Volcanoes



出典：第四紀火山カタログ委員会編(1999)：「日本の第四紀火山カタログ v.1.0（CD－ROM版）」付図
日本の第四紀火山、日本火山学会