

# Environmental Impact Assessment (EIA) Technical Guidance on Radioactive Materials

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## **Abstract**

After the nuclear accident at Tokyo Electric Power Company's Fukushima Daiichi Nuclear Power Plant, the Ministry of the Environment Japan published the "Environmental Impact Assessment Technical Guidance on Radioactive Materials" in March 2015, which explains how to assess the environmental impact of radioactive materials released into the environment. Businesses can use the guidance when assessing radioactive materials releases from the nuclear accident. This paper presents an outline of this guidance.

The Guidance assumes that, when a considerable amount of radioactive materials is released or leaked and risks of damage to the environment due to activities, such as land development and subsea excavation that change land topography, it becomes the subject of an environmental impact assessment. The assessment would be based on the premise that measures for environmental conservation are being taken in order to prevent radiation levels from rising as a result of changes in land topography due to projects. The measures for environmental conservation would include preventing the formation of particles containing radioactive materials; preventing water from being contaminated due to rainfall on topsoil containing radioactive materials; and preventing the creation of waste- and construction-generated soil containing radioactive materials.

**Keywords:** EIA policy, radioactive materials, disaster management, nuclear accident

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## **1. Background and Purpose**

Following to the Great East Japan Earthquake on 11 March 2011, the nuclear accident at Tokyo Electric Power Company's Fukushima Daiichi Nuclear Power Plant caused the release of radioactive materials to the environment. After the nuclear accident, the Government of Japan revised the environmental laws to address radioactive materials. In June 2013, the Environmental Impact Assessment (EIA) Law was amended to address radioactive materials (Ministry of the Environment, Japan (MoEJ), 2016a). In June 2014, radioactive materials in the general environment were addressed in the environmental ministerial ordinance "Basic Guidelines for EIA (Figure 1)". Subsequently, the Ministry of the Environment tried to develop EIA technical guidance on radioactive materials. Businesses can use the guidance explaining both legal and technical information. The series of guidance documents (e.g. air and water pollution, natural conservation) had been available for EIA practitioners. This paper presents an outline of this guidance.

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The Japanese EIA law covers 13 types of major projects (e.g. roads, dams, railways, airports, power plants, land readjustment, etc.) that may have serious impacts on the environment and thus require drafting a document on primary environmental impact consideration, a scoping document, a draft Environmental Impact Statement (EIS), an EIS, a final EIS if necessary, and an impact mitigation report (MoEJ, 2012).

It should be noted that projects defined as reconstruction projects under the disaster recovery plan in response to the Great East Japan Earthquake are exempted from the EIA Law (the provisions of Article 52). The 2011 Law for Special Zone for Reconstruction requires specific (i.e. simplified) EIA for accelerated endorsement, especially for projects relating to land readjustment and railway/railroad tracks while achieving environmental preservation (Reconstruction Agency, Japan, 2016).

The Environmental Impact Assessment Technical Guidance on Radioactive Materials assumes projects subject to the EIA law.

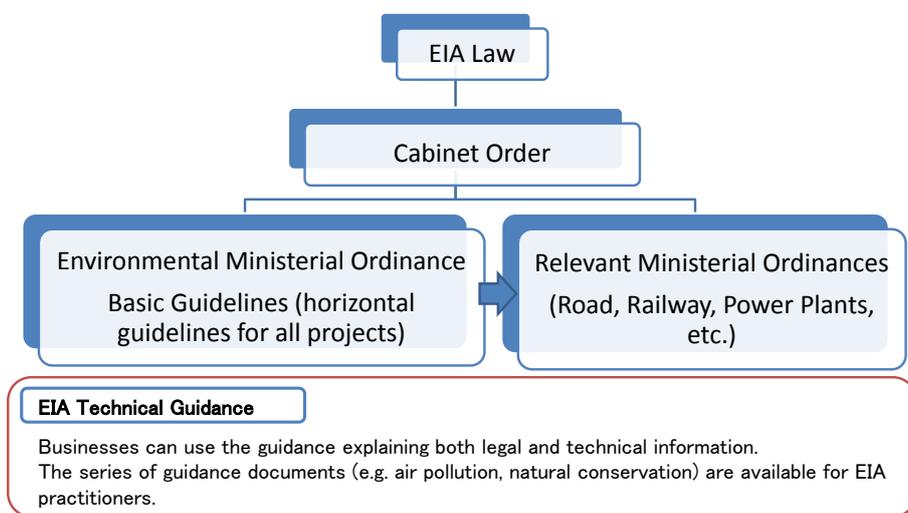


Figure 1 Japanese legal framework on EIA

## 2. Methods and Materials

To develop the guidance, the MoEJ have organized the Committee on EIA techniques consisting of eight experts. Relevant Ministries have attended in the Committee as observers. Five Committee meetings were held from September 2014 to March 2015. After drafting the guidance, the public comment period was held from January to February 2015. In March 2015, the Ministry of the Environment published the “Environmental Impact Assessment Technical Guidance on Radioactive Materials.” This 45-pages document explains how to assess the environmental impact of radioactive materials released into the environment.

No know existing guidance documents had been found for practitioners to perform EIAs on radioactive materials released from a nuclear accident.

## 3. EIA Guidance on Radioactive Materials

### 3.1. Introduction of the Guidance – Basic concept

This guidance mainly focuses on radioactive materials discharged as a result of a nuclear power

plant accident. It also covers businesses that could cause considerable amount of radioactive material spillage or scattering due to changes in land forms. The judgment criteria to designate the Fukushima exclusion zone help to determine whether an implementing activity will be subject to an EIA. The Law for Special Zone for Reconstruction designates the Fukushima exclusion zone.

### 3.2. Environmental Impact Assessments of Radioactive Materials – Early Consideration

It is important to aim to prevent or reduce environmental impacts at planning stages of a project by comparing conditions of several potential locations and/or structures for the project (Figure 2). Investigation based on existing documents is fundamental. Table 1 shows examples of the existing documents.

Table 1 Examples of information on air dose rates and radiation level

Information sources for reference	Content of information
Radiation monitoring information (the Nuclear regulation committee) <a href="http://radioactivity.nsr.go.jp/ja/index.html">http://radioactivity.nsr.go.jp/ja/index.html</a>	Air dose rates, accumulative dose, the result of aircraft monitoring, results of radioactivity concentration (floating dust, soil, radioactive fallouts, sea water, bottom sediments) monitoring are published.
Radioactive material monitoring (Ministry of environment) <a href="http://www.env.go.jp/air/rmcm/index.html">http://www.env.go.jp/air/rmcm/index.html</a>	The estimated results of radioactive material monitoring in the air, public water, underground water are released.
Fukushima radiation map (Fukushima Prefecture) <a href="http://fukushima-radioactivity.jp/">http://fukushima-radioactivity.jp/</a>	Air dose rates, the monitoring results of radioactivity concentration (reservoirs, rivers, lakes and marshes, ponds, sea water, and bottom sediment) are released.
Soil monitoring results (Fukushima Prefecture) <a href="http://www.pref.fukushima.lg.jp/sec/16025d/dojo-monitoring.html">http://www.pref.fukushima.lg.jp/sec/16025d/dojo-monitoring.html</a>	Air dose rates and radiation concentration of each nuclide, etc. around the nuclear power plant are available.

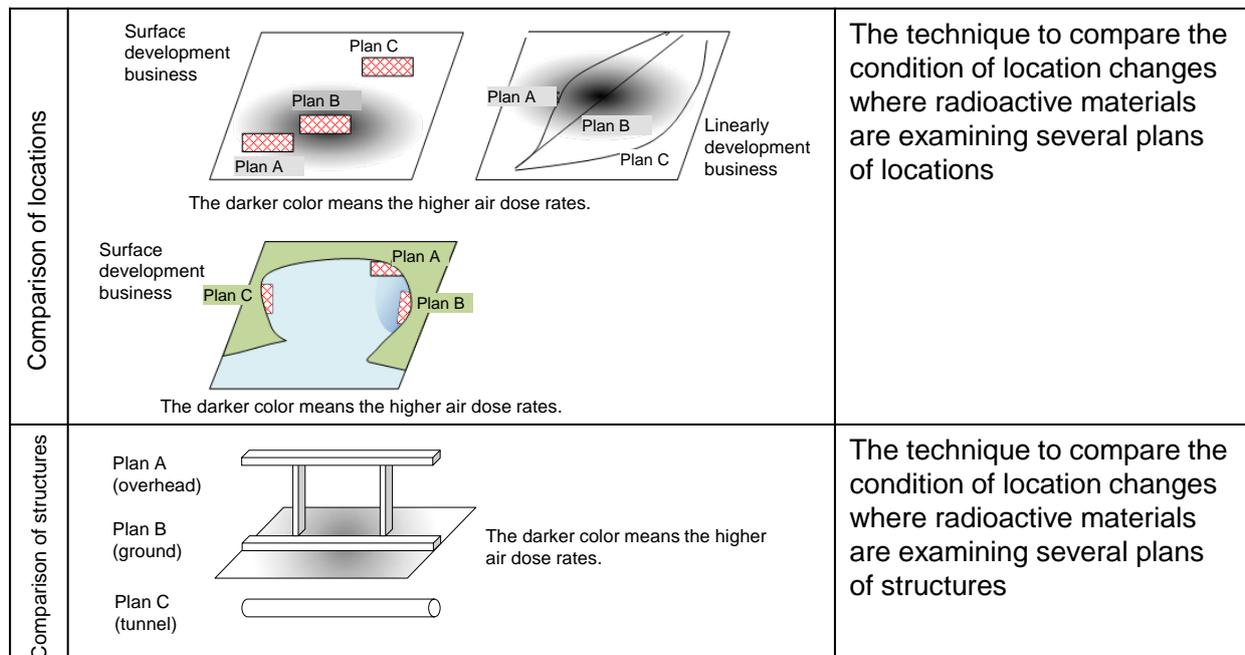


Figure 2 Comparison images for prediction and evaluation of multiple plans

### **3.3. Environmental Impact Assessments of Radioactive Materials – EIA processes**

Once a certain level of radioactive materials has been released and dangerous or adverse environmental effects exist, EIA would be required. It should be noted that a project proponent must consider whether the proposed project causes dangerous or adverse environmental effects or not under the Japanese EIA law. The EIA process is comprised of the following steps: 1) survey, 2) forecast, 3) evaluation and 4) report on the results of measures and follow-up surveys. The project including the environmental protection measure is implemented after completing the evaluation and before drafting the report on the results of measures and follow-up surveys.

#### **3.3.1. Survey**

The survey is typically based on:

- Existing survey results from national and local public authorities, and
- Air dose rate surveys as defined by the Act on Special Measures concerning the Handling of Environment Pollution by Radioactive Materials Discharged by the Nuclear Power Station Accident Associated with the Tohoku District (MoEJ, 2016b).

The act is prescriptive in outlining some of the requirements. For example, it requires using accurate equipment validated annually and measuring air dose rate from 50 centimeter to one meter above the ground.

#### **3.3.2. Forecast**

Since currently there isn't a known method for making quantifiable forecast of changes in the air dose rate, a qualitative analysis based on existing knowledge such as diffusion of particles and run-off of contaminated water and covering ground can be used to develop an estimate. The forecast should assume highest impact during activities.

#### **3.3.3. Environmental Protection Measures**

Because it is predicted that the scattering of particles and rainfall run-off from contaminated soil will lead to spread of radioactive materials, measures such as deployment of emergency containment structures, installation of water pollution prevention membranes, or use of construction soil within construction sites can be considered as environmental protection measures (Table 2) and be described in the EIS document .

Table 2 Examples of environmental protection methods

Environmental Protection Method	Measures against	
	Source	Spread or run-off
Wetting, compacting, use of anti-powdering agent to control particulate matter.	○	
Balance quantity of excavation and in-fill to limit construction soil.	○	
By using construction soil within the building site and limiting transport of the same outside the construction area.	○	
Reduction of radiation from turned-over soil and pavements.	○	
In rainy periods where turbid run off is likely, excavating the topsoil as much as possible in order to prevent cloudiness.	○	
Controlling particulate matter spread and silt run-off by dividing the excavation area of soil into one-day areas.	○	
Washing construction vehicle tires to prevent spread of particulate matter by vehicles carrying construction materials in and out of site.		○
Using perimeter wind-breakers to prevent spread of particulate matter.		○
Deploying water pollution prevention membrane to prevent silt run-off		○
Use of settling basins and sediment-water processing facilities to prevent run-off		○

### 3.3.4. Evaluation

This stage focuses on evaluating the effectiveness in reducing or preventing contamination by radioactive materials. That is, the environmental protection method is evaluated for its effectiveness in preventing an increase in radioactivity.

### 3.3.5. Follow-up survey

A follow-up survey is typically performed if the forecast has a large uncertainty or the knowledge of the effectiveness of environmental protection methods is not well-known.

### 3.3.6. Reporting the results and effectiveness of environment conservation measures - an impact mitigation report

The environmental ministerial ordinance “Basic Guidelines” suggests publishing the report on the results of a follow-up survey after activities are completed principally. Additionally, the survey results and environmental protection measures employed will be periodically published during construction and after completion of the project in order to maintain openness and inform the public.

## 4. Conclusions and Discussion

After the nuclear accident, the Government of Japan published guidance for project applicants on how to perform EIA for projects that has radioactive materials element in them. Due to lack of information on how to handle released radioactive materials, it was challenging to develop the EIA guidance. As a result of discussion at the Committee meeting, the guidance focuses on how to prevent further diffusion of radioactive materials after the occurrence of the accident.

Developing this guidance is a first step to help developing a project in Fukushima while preventing adverse environmental impact by radioactive materials. After publishing the guidance, several projects such as the construction of wind power plants have been proposed in Fukushima. It is expected that actual EIA

cases and progress of methodologies on how to forecast change of radioactivity in EIA will be used to update the guidance in future.

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