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RENEWABLE ENERGY INSTITUTE

For Greater Deployment of Wind Power

-- Examining Land Use Regulations and Environmental Impact Assessment

English Abridged Version
August 2017

About the English Abridged Version

The Japanese original of this report was released in April 2017 by Renewable Energy Institute, specifically analyzing the problems of land use regulations and Environmental Impact Assessment schemes in Japan, which are the major factors hindering the development of wind power generation in the country.

The land use regulations and Environmental Impact Assessment schemes adopted in Japan are quite different from those of Germany, the United States, and other leading countries in wind power development. This English abridged version contains extracts and partial summaries of important sections from the original report, as an attempt to inform Japan's international counterparts the current state and challenges that Japan is facing.

The report is based on the findings of the 'Study Group on the Schemes to Promote Greater Deployment of Wind Power Generation,' established by the Institute in July 2016.

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About Renewable Energy Institute

Renewable Energy Institute is a non-profit think-tank which aims to build a sustainable, rich society based on renewable energy. It was established in August 2011, in the aftermath of the Fukushima Daiichi Nuclear Power Plant accident, by its founder Mr. Son Masayoshi, Chairman & CEO of SoftBank Corp., with his own resources.

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Note:
This table of contents includes all the chapters in the Japanese original full version.
The English version is an abridged translation, and omits "Introduction," "Chapter 1," "Section 3.2 of Chapter 3," and "Chapter 4." "Sections 2.3 and 2.4 of Chapter 2" and "Conclusion" are summaries of the corresponding sections of the original report. (Chapter 2 provides the summary of Sections 2.3 and 2.4 after incorporating the outline of Section 2.4 into Section 2.3.)

* JPN: Available in the Japanese original full version only

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Summary

Today, the world is witnessing rapid growth in installed capacities of wind power generation, while, in Japan, wind power development lags behind. Among the factors pointed out as lying behind the delay are restricted grid connection of wind power plants, and higher production cost compared with other countries. In addition, the legal framework and regulations that Japan has in place, including its land use regulations and Environmental Impact Assessment (EIA) schemes, are also mentioned as significantly influencing realization of wind power projects.

In Japan, wind power generation can be developed at an accelerated pace only when, based on its characteristics including location of wind power plants, the related legal framework and regulations are reviewed and reformed in an appropriate manner. From that standpoint, this report verifies the land use and EIA schemes of Japan, illustrating the current state and identifying challenges through comparisons with other countries, and suggests courses of action to improve such schemes.

Chapter 1
Land use schemes of leading countries in wind power development: Comparison with Japan

Chapter 1 examines differences between Japan and selected countries in their land use schemes, and outlines the schemes of Germany and the United States, two countries leading the world in wind power development.

Japan has several separate laws that regulate land use, such as the City Planning Act, the Act on Establishment of Agricultural Promotion Regions (Agricultural Promotion Act), and the Forest Act, and these laws impose multiple layers of land development restrictions for their own purposes, implemented under the responsibility of competent departments of national or local governments respectively, without integration. Procedures for permission and approval for land use, EIA, and other requirements under related laws and regulations have been laid down separately. Power producers planning to develop wind power are required to go through a thick layer of procedures to clear land use restrictions and EIA, among others, in stages or all at once.

In contrast, Germany and the United States each have in place land use schemes designed to guide power producers to suitable locations for wind power facilities. In most cases, developable land areas are designated by state governments, while municipal governments are authorized to grant final permission for construction. Municipal governments zone land as urban, agricultural, and forest areas in an integrated manner. Agricultural land and forests can be converted (change of land use) by altering the zoning. Under their land use schemes, the process for altering zoning includes procedures of EIA, which is found helpful for individual projects to complete total procedures quicker.

In addition, state and municipal governments are working to set higher targets for the deployment of renewable energy. Despite some failure at the earliest stage to define appropriate positions for wind power facilities or establish reasonable regulations for them, some governments have started reviewing present regulations to replace them with more relevant ones.

Chapter 2
Wind power generation and the land use schemes in Japan: The current state and challenges

Chapter 2 outlines the current state of land use for wind power generation in Japan, and identifies the challenges of the present agricultural land use control, focusing on 'agricultural land'[1], a category of land known to be suitable as location of wind power plants while strict regulations keep it hard to construct wind turbines.

In Japan, 80 percent of the land consists of agricultural land and forests. More than 80 percent of wind power plants coming into operation between FY 1999 and FY 2009 were built on agricultural land or forests. Most of the agricultural land has already been leveled, generally provided with farm roads and other infrastructure, mainly

[1] The term 'agricultural land' includes land used for cultivation, grass collection, and livestock grazing.

through land improvement projects. Only with favorable wind conditions, many swathes of agricultural land would be found suitable for wind power generation. Wind power plants occupy a smaller area of land for exclusive use for their generation capacity, a characteristic that allows them to easily coexist with agriculture. Actually, many wind power plants have been constructed on agricultural land around Japan.

However, any development on agricultural land must satisfy stringent requirements, as it is allowed only after clearing the strict requirements to complete 2 layers of procedures; to be eliminated from the Agricultural Promotion Scheme under the Agricultural Promotion Act, and to convert land use under the Agricultural Land Act.

There used to be several schemes, such as the System for Land Use Plans for Revitalizing Rural Communities, and plans prepared by local governments for promoting agriculture in communities, that allowed construction of wind power plants on agricultural land. In fact, however, the schemes were often utilized to develop large-scale shopping centers or similar facilities. In response, tighter regulations have been introduced in a uniform manner, making wind power plants practically quite difficult to build.

Construction of wind power plants on agricultural land remained virtually impossible until 2014, when the Act on the Promotion of Renewable Energy Electric Power Generation Harmonized with Sound Development of Agriculture, Forestry and Fisheries (Rural Renewables Development Act) came into effect, opening up the possibilities of construction on agricultural land again. However, to build wind power plants in a 'designated agricultural zone', the proponents are first required to cancel the status to be included in the agricultural promotion scheme under the Agricultural Promotion Act, even before formulating the basic construction plan; hence the Rural Renewables Development Act has been used for only a few projects so far.

For enabling wind power plants to coexist with agriculture, power producers and the national and local governments each have important roles to play. Under any schemes regulating the use of agricultural land, the local governments have the authority to grant major permissions and approvals, and prepare plans. Power producers planning to construct wind power plants would find it critical to gain the understanding of the local government there. For that purpose, power producers must demonstrate the benefits wind power generation can bring to agriculture and the entire community in both quantitative and qualitative manners, while working to minimize adverse effects that the development might bring.

At the same time, municipal governments are expected to enhance their function as coordinator for maximizing benefits, and minimizing any harm, that wind power projects may bring to agriculture and communities. In turn, the prefectural and national governments power producers are expected to provide municipal governments with active support for their initiatives.

Chapter 3
Wind power generation and the scheme for Environmental Impact Assessment (EIA)

Chapter 3 focuses on the scheme of EIA for wind power projects, examining the present conditions in Japan and other countries to identify challenges and suggest specific solutions.

Since wind power plants were added in 2012 to the list of facilities regulated under the EIA Law, project risks have increased, as power operators find procedures more time-consuming and costly to complete. Several factors are pointed out as keeping the procedures time-consuming and costly: that in Japan, since there is little basic environmental information, including vegetation and migration routes, that is collected, compiled, and made available on a database, power producers must conduct surveys from zero basis; that Japan has adopted more stringent assessment requirements than most countries in terms of sizes of plants, as facilities with a capacity of "10 MW or more" are classified as Class-1 where EIA is mandatory; and that under the pilot program to reduce EIA processing time carried out by the national governments, power producers must bear the risks of cost increase and re-survey.

In Germany and the United states, in contrast, surveys are completed, on average, quicker than in Japan, for several reasons: that together with size thresholds, they have adopted concise environmental assessment (EA) as a screening process to maintain flexibility in implementation of their schemes; that assessment is carried out while selecting

zones suitable for wind power plant construction, so that the zoning does not unreasonably restrict appropriate land use; and that databases of living things and findings of municipal surveys are offered to, and shared with, potential project proponents.

To improve EIA for wind power generation in Japan, governments and power producers must fulfill roles they each have. Especially, governments must, first, immediately fully develop an information infrastructure, including the Basic Environmental Information Database; second, immediately reconsider the size threshold, based mainly on objective data of actual impact on the environment and conditions in other countries; and third, to make sure procedures will get shorter and quicker, reduce risks and costs that power producers bear.

In the medium- and long-term, they must introduce the process of concise EIA and screening to allow certain types of projects to do nothing more than simplified procedures while obliging even small-scale projects to conduct a full assessment when they are found likely to give significant impact on the environment.

Chapter 4
Policies of prefectures and their roles for greater deployment of wind power

Given that, in Germany and the United States, broader regional governments, such as states, played significant roles for development of wind power and construction of plants, Chapter 4 focuses on roles that prefectures have to play. Especially, the chapter deals with Hokkaido and the six prefectures of the Tohoku Region to examine realities of their policy programs for wind power development, and identify effects they produce and challenges they are faced with.

Targets for installation of generation capacities are set by all seven prefectures at a higher level for their existing capacities, with a large growth estimate. Among them, Fukushima has set an especially high target, around double its installation potential. Development promotion areas have also been specified by several prefectures, including Yamagata and Iwate. Fukushima identifies suitable places based on wind conditions survey, prepares environmental consideration documents for EIA, and then makes public offerings and selects tentative power producers who should take over the wind conditions survey and implement the project. In the case of Fukushima, a local government actively commits itself to a development process to mitigate the project risks for the project proponents.

2. Wind power generation and the land use schemes in Japan: The current state and challenges

Chapter 2 focuses on Japan's land use scheme, examining its current state and identifying challenges. Specifically, this chapter outlines the current state of land use for wind power generation in Japan, focusing on 'agricultural land,' a category of land known to be suitable as location of wind power plants for its characteristics in land use and infrastructure development, while strict regulations keep it hard to use for construction.

2.1. Land use for wind power generation in Japan

(1) Current state of land use for wind power generation

So far in Japan, most of the wind power plants have been constructed on agricultural land or forests. A questionnaire survey conducted by the Ministry of the Environment (MOE) for wind power plants with a total output capacity of 10 MW or more (FY 2010; n=78), shows that among the plants that came into operation in or before FY 2003 (FY 1999 - FY 2003), 52 percent are located on agricultural land and the like, and 35 percent are in forests, wilderness, etc. Among those which came into operation in or after FY 2004 (FY 2004 - 2009), the year when the New Energy and Industrial Technology Development Organization (NEDO) issued its "NEDO EIA Manuals for Wind Energy " (NEDO Manual)[2], 27 percent and 56 percent are located on agricultural land and in forests / wilderness, respectively. It seems that the two groups have switched their positions in share because, as mentioned later, construction on agricultural land has been getting more difficult.

Fig. 1 Land use for wind power plants (with a total output capacity of 10 MW or more)

Source: MOE (2011a)

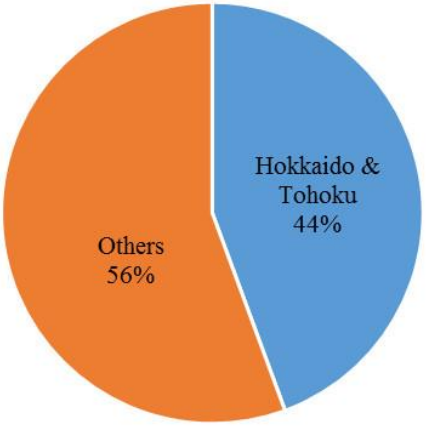
According to the data released by NEDO, wind power plants constructed around Japan with a total output capacity of 10 MW or more in FY 1999 - 2003 and FY 2004 - 2009 have installed capacity of 456 MW (70% of the total capacity installed during the period) and 1,240 MW (80%), respectively. In either case, the plants with a capacity of 10 MW or more represent a significantly large part on an installed capacity basis in Japan. Slightly less than 90 percent of them are located on agricultural land, forests, and the like.

[2] The Manual describes basic procedures for EIA, including ways to provide information for municipalities concerned, surveys on any possible impact to the environment after a plant comes into operation, and methodologies of estimation and assessment. It assumes as its target plants with a total output capacity of 10 MW or more.

(2) Agricultural land and forests in Japan

In Japan, as demonstrated above, most of the wind power plants are located on agricultural land or in forests. Then, how much area of agricultural land and forests does Japan have?

Around 80 percent of Japan's territory is covered with agricultural land and forests. Agricultural land covers 4.5 million hectares (as of 15 July 2015), 90 percent of which is found in "highly productive agricultural land," agriculture land located in a zone designated to be secured for agricultural use. Especially, the Hokkaido & Tohoku region, a part of Japan with an enormous potential of wind power generation, holds 44 percent of the total agricultural land in Japan. The region also has a larger percentage of "highly productive agricultural land," located in designated agricultural zones to the entire agricultural land (Figs. 5 and 6).



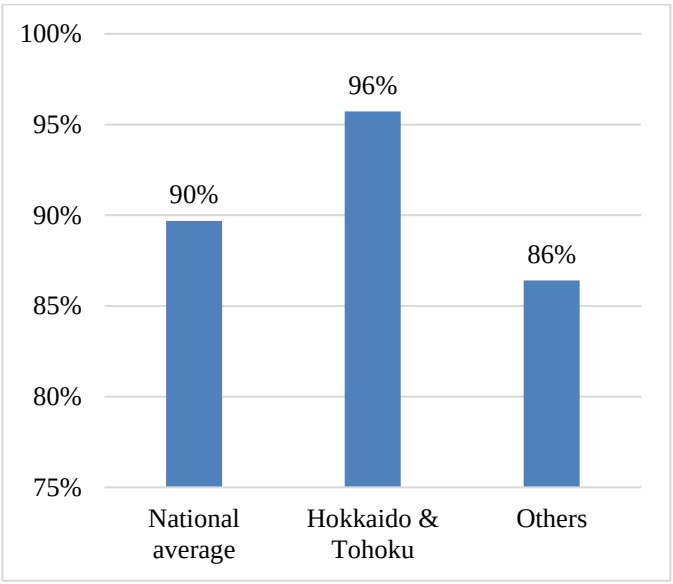


Fig. 2 Share of Japan's agricultural land located in Hokkaido and Tohoku (left)

Fig. 3 Share of highly productive agricultural land in designated agricultural zones to the entire agricultural land (right)

Source: MAFF

Meanwhile, Japan has 25 million hectares of forests, covering 70 percent of its territory. Around 50 percent of forests, or one-third of the territory, is designated as Protected Forest. Protected Forests are designated by the Minister of Agriculture, Forestry and Fisheries (MAFF) or the prefectural governor for public purposes, such as conservation of water sources, prevention of landslide and soil loss, and preservation and development of living environments. There, heavy restrictions are imposed on timber-felling, land modification, and other activities for development. The Hokkaido and Tohoku regions account for 41 percent of the entire forests covering Japan.

(3) Potentials of agricultural land and forests for wind power generation

How much potential do agricultural land and forests have for installation of wind power generation capacities? Potentials of forests have been estimated by MOE in its potential survey in two patterns: "Base scenario (development banned in Protected Forests)" and "Scenario of lifting the ban on development of Protected Forests." For the latter, only an estimate of the national total has been released. The difference between the former (282,940 MW) and the latter (440,890 MW), or 157,950 MW, should represent the potentials of Protected Forests for installation.

Meanwhile, potentials of the entire agricultural land in Japan for installation are unknown. The MOE's potential survey, mentioned above, assumes in the first place that the land use as "rice field" is a condition that bans development. "Other agricultural land" is classified as available for development, but no estimate has been made for potentials of agricultural land separately. However, several surveys have been conducted on a limited scale to estimate potentials of selected regions or types of agricultural land. For instance, a survey was conducted in Hokkaido to examine capacity installation potentials of abandoned agricultural land there. It picked out agricultural communities with a swath of 2.0 ha or more available in them, and assumed that a wind power generation facility with a capacity of 2.0 MW could be installed on a site. It found that the Prefecture had an estimated installation potential of 8,222 MW, 26-fold its actual capacities installed as of the end of FY 2014 (310 MW)[3].

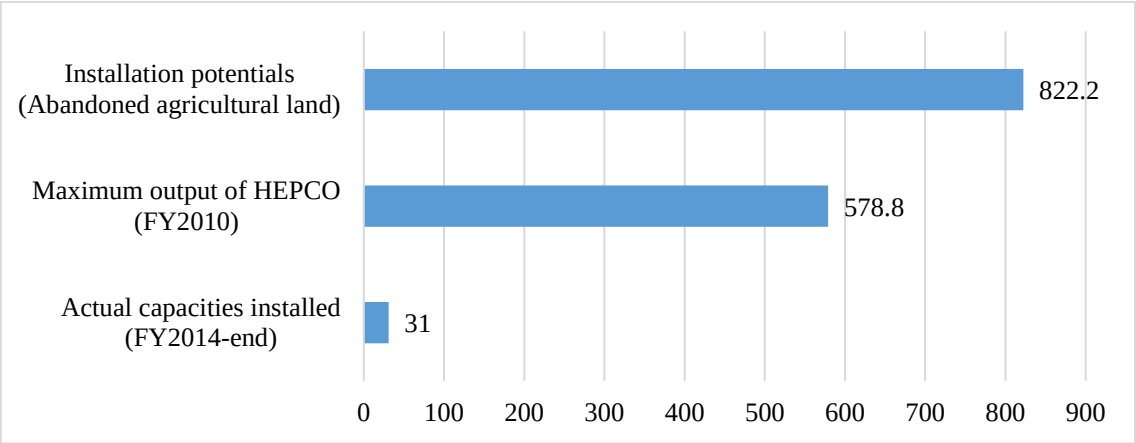


Fig. 4 Potentials of abandoned agricultural land in Hokkaido for capacity installation (10 MW)

Source: Docon (2015)

(4) Conditions of locations suitable for wind power generation

Japan is covered with agricultural land or forests over 80 percent of its land. More than 80 percent of wind power plants are located on agricultural land and forests. Given natural conditions, such as wind conditions, as well as social conditions, such as the distance from residential areas, many swathes of land suitable for wind power generation seem to be spotted on agricultural land and forests.

It should be noted, however, that agricultural land and forests are different in impact that might be given to the surroundings when a wind power plant is developed there. On forests, many of the wind power development projects are carried out along mountain ridges, as wind conditions are rather favorable there. Construction work there needs large-scale land modification, such as lumbering and reclamation for installing and transporting wind turbines. Most parts of the agricultural land, in contrast, have already been leveled, provided with farm roads and other infrastructure, mainly due to land improvement projects. Especially, the 'highly productive agricultural land' in designated agricultural zone has been fully leveled mainly through grant-aided projects, with vast areas of flat land available. For construction work, most parts of the agricultural land only need small-scale land modification, as

[3] Docon (2015) Report on the Survey of Potentials of Rural Communities for Developing Renewable Energy

roads for transportation and transmission lines for grid connection have already been prepared for them. Only with favorable wind conditions, suitable locations for power generation could be found among them.

2.2. Coexistence between agricultural land and wind power generation

Here in section 2.2, several examples of wind power plants constructed on agricultural land are presented. First, this section examines the area of land needed to construct a wind turbine, one of the conditions for coexistence between agricultural land use and wind power generation, before providing two examples of coexistence, in Hokkaido and Fukushima, to present key points for construction and coexistence.

(1) The area of land needed to construct a wind power facility

A factor lying behind cases of coexistence between agricultural land and wind power generation is the fact that a smaller plot of land is needed to construct a generation facility for its capacity. Especially, the foundation of a facility requires quite a small area for which exclusive land use is necessary. Figure 5 shows the area of land that a wind power plant actually needs for construction.

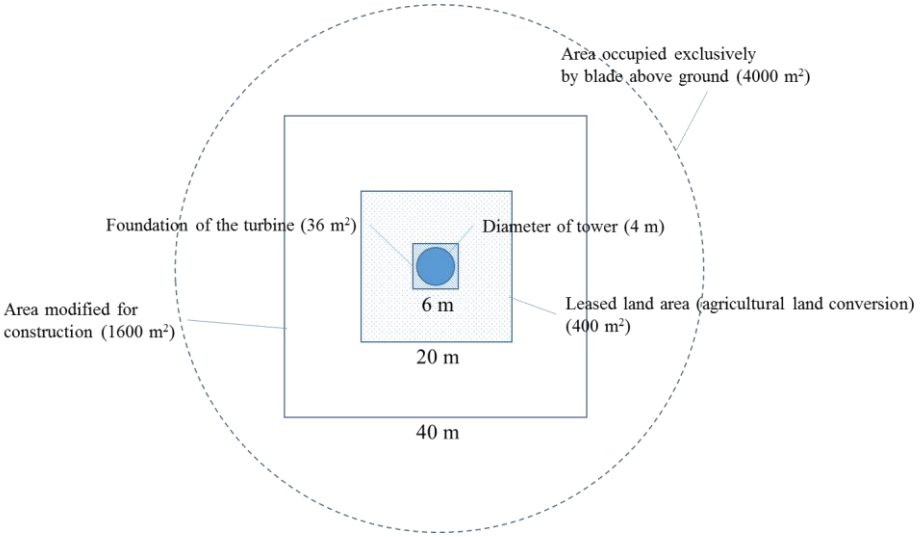


Fig. 5 The area needed to construct a wind turbine for power generation

Source: Japan Wind Power Association et al.

For a wind turbine with a capacity of 2 MW, a rough estimate shows that it can be constructed on a foundation of 36m² built on a leased land of 400m², and that an average area of 1,600m² requires modification for the construction, leaving an area of app. 4,000m² occupied exclusively by a blade above the ground. As shown in the cases mentioned below, the site of a wind turbine, other than parts on which foundations are constructed for structures for its direct use, is left available for other uses, meaning that any wind turbine needs to exclusively occupy quite a limited part of the land on which it is built.

In some cases, yards and/or roads may need development for building a wind turbine or transporting materials. When a wind turbine is constructed on a mountain ridge, a road with a width of 4 - 6m must be constructed along a distance of several or several tens of kilometers to carry a tower and a blade to the site, and a larger area of land must be modified in proportion. In contrast, on agricultural land, already leveled off, with roads built and transmission lines laid around it, constructors would need to modify a smaller area of land than on forests, an advantage of agricultural land[4].

[4] According to a questionnaire survey conducted by the MOE among power producers with wind power plants in operation as of 1 April 2010, they had modified land of 0.39 and 0.08 hectares per MW for construction of a plant and development of facilities, respectively (average among all responses).

(2) Examples of coexistence

Characterized by a smaller area of land they need when constructed, wind power plants can be built on agricultural land and coexist with agriculture. In fact, many wind farms have been developed on agricultural land around Japan (Table 1). Among the examples shown in the table, many plants are located on stock farms, although wind power plants can also be found on rice paddies and other crop fields. However, agricultural land had only been available for development of wind power plants before tightened regulations, and other factors, made it extremely difficult to build one on any farm (see Section 2.3 of Chapter 2).

Below, Tomamae Green Hill Wind Farm and Koriyama Nunobiki Plateau Wind Farm are cited as cases that demonstrate how agriculture and wind power development coexisted before regulations for agricultural land were tightened.

Table 1 Large-scale wind power plants located on agricultural land (selected)

Municipality	**Name**	**Put into operation in:**	**Scale**	**Land use**
Tomamae Town, Hokkaido	Tomamae Wind Farm	October 1999	20.0 MW (20 units)	agricultural land (stock farm)
Tomamae Town, Hokkaido	Tomamae Wind Villa Power Plant	October 2000	30.6 MW (19 units)	agricultural land (stock farm)
Kamaishi City, etc., Iwate	Kamaishi Wide-Area Wind Farm	December, 2004	42.9 MW (43 units)	agricultural land (stock farm) forests (national forest)
Wakkanai City, Hokkaido	Soya Misaki Wind Farm	November, 2005	57.0 MW (57 units)	agricultural land (stock farm) forests (national forest)
Koriyama City, Fukushima	Koriyama Nunobiki Plateau Wind Farm	December, 2006	65.98 MW (33 units)	agricultural land

Source: Renewable Energy Institute

1) Tomamae Green Hill Wind Farm (Tomamae Town, Hokkaido)

The Wind Farm was constructed by Eurus Energy and Electric Power Development Co., Ltd. (J-POWER), major wind power producers, as the first large-scale wind farm in Japan. It has a total capacity of 50.6 MW, and Eurus Energy and J-POWER put their plants into operation in 1999 and 2000, respectively. The site on which it is located is classified as highly productive agricultural land (municipal stock farm).

Source: Tomamae Town's website

What should be highlighted about the construction of this wind farm is the strong commitment shown by the Town from the earliest stage. The municipal government conducted a wind conditions survey (FY 1995 and 1996) with grants provided by NEDO and other institutions, and released the results to the public. Then, the Town placed a public offer for wind power generation projects on its municipal stock farm (about 300 hectares). Especially, the municipal government played a critical role to obtain permission and approval for development on agricultural land. At that time, stringent conditions had imposed difficulties to develop highly productive agricultural land in designated agricultural zones. As a solution, the municipal government produced a Land Use Plan for Revitalizing Rural Communities to apply a special measure under the Plan and enable construction of a wind power plant.

The key points regarding the Town's coexistence with agricultural land is the fact that a mere 0.17 percent of the stock farm area (about 300 hectares) was converted into land use to construct foundations of wind turbines, and that the municipal farm still has 130 - 250 cows grazing on the site even after the wind turbines were built there.

2) Koriyama Nunobiki Plateau Wind Farm (Koriyama City, Fukushima)

The Wind Farm, developed by J-POWER, a major wind power producer, is one of the largest wind power plants in Japan. The plant, with a capacity of 65.98 MW, came into operation in 2006. The site on which it is located is classified as highly productive agricultural land.

The Wind Farm was constructed on a field of 230 hectares developed for agriculture after World War II at a height of 1,000 m above sea level. For 153 hectares of the area, farm consolidation has been completed. Severe cold, heavy snowfall, and strong wind in winter limit the agricultural season there to six months between May and October, quite tough work conditions for farmers.

Photographed by Renewable Energy Institute.

The points to be highlighted in relation to its construction process are that the power producer set up a council with local stakeholders (community, vegetable growers' association, agricultural cooperative, and municipal government) to discuss how the power generation and agriculture could coexist and the land could be used efficiently; that the "just-in-time" method[5] was adopted to efficiently deliver and assemble components to minimize any impact on agriculture; and that the power producer carefully coordinated with growers' associations so that the construction work would impose little interference with the schedule for vegetable production and shipment.

As their efforts for coexistence with agriculture, the modification on agricultural land was limited to the minimum possible area, and all the distribution lines were laid under the ground in the site to avoid hindering farm work or harming landscape there. Especially, on the agricultural land, merely 1.48 hectares were developed in total (0.04 hectares per unit), or less than 0.6 percent of the entire cultivated area and less than one percent of the farm consolidation area.

Farmers there enjoy some benefits, such as, earning rents and income from wind turbine site management, and finding greater efficiency in farm work delivered by roads built for construction. Another benefit can be found in the services of the wind farm as a tourism resource. Cited by the Koriyama government on its official website[6] as "Nunobiki Wind Plateau," the power plant attracts a large number of tourists. Beside the site, a farmers market is opened, helping to achieve direct sales to the tourists.

[5] Yoshimura (2008) points out that "Temporary storage of large wind turbine components normally requires vast storage fields. At Nunobiki Plateau, in order to avoid jeopardizing its agricultural production, the storage yard was minimized by carrying large components from Onahama Port just in time for the assembling schedule, or the "just in time" method, which enabled improved efficiency."

[6] https://www.city.koriyama.fukushima.jp/shise/citysales/kankou/nunobikikaze.html

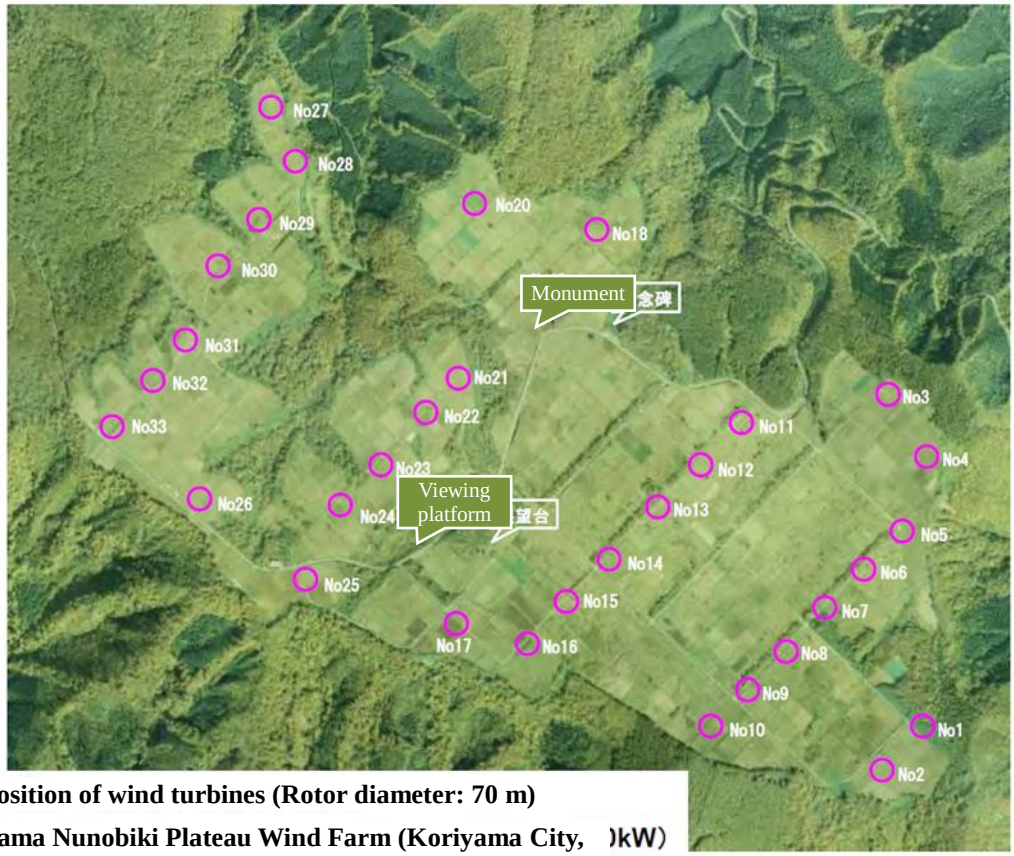


Fig. 6 Koriyama Nunobiki Plateau Wind Farm: Arrangement of wind turbines

Source: Second Working Group of the Subcommittee on Regulatory and Institutional Reform, Cabinet Office

(3) Lessons learned from the examples of coexistence

In the case of Tomamae Town, the municipal government actively committed itself to the project from the earliest stage of planning, working for the permission and approval to use agricultural land, and offering its municipal stock farm as the project site. While, in Koriyama City, a power producer formed a council with stakeholders, working actively to build a consensus among them and care for agriculture while carrying out the project. In either case, effort and ingenuity of the power producer or municipal government enabled coexistence of power generation and agricultural land. In addition to these, other cases of successful coexistence can be found around Japan (Table 8). Examining these examples, three general lessons can be obtained.

First, wind power generation can coexist with agriculture both in physical and social terms. As described before, construction of wind power plants requires quite limited space of land. Especially agricultural land, already leveled off, with roads built and transmission lines laid around it, suffers less impact from land modification than forests. This fact should offer the backdrop against which, and the ground on which, rationale and necessity for efficient schemes and smoother procedures can be explained.

Second, several successful examples of coexistence indicate that local governments have made active commitment from the earliest stage of planning, while assuming significant roles in obtaining/offering permission and approval. That suggests particular importance of cooperation from local governments in the institutional and procedural aspects. Power producers planning to construct wind farms in a municipality whose government seems reluctant should clarify and explain the ripple effects and significance the project could produce for local communities, in order to gain the understanding and cooperation of the municipal government.

Third, in the successful cases of coexistence, power producers work, for instance, to build a consensus among stakeholders, care about agriculture, help local communities benefit from development, and consequently develop a win-win relationship with farmers, local governments, the neighborhood, and other stakeholders. Only when power producers exert efforts and exercise ingenuity can they maximize the benefits of wind power plants and raise the possibilities of coexistence, thereby gaining the understanding of local communities. They should also disclose know-how and other knowledge on how to build relationships with local stakeholders and minimize impact on agriculture, so that it can be shared among them.

2.3. The current state of the agricultural land use scheme, and the position of wind power generation

(1) The agricultural land use scheme of Japan: Overview

Japan has a land use scheme designed to allow the competent departments of local governments and ministries and agencies of the national government to control land use under separate regulations, such as the City Planning Act and the Forest Act. Agricultural land is placed under especially strict control against development. Especially with "highly productive agricultural land in designated agricultural zone," a category which covers most of the agricultural land in Japan, any development project must satisfy stringent requirements and complete two procedures: to be excluded from the Scheme for the Establishment of Agricultural Promotion Regions (Agricultural Promotion Scheme) under the Agricultural Promotion Act; and to be permitted to convert land use in accordance with the Scheme for the Agricultural Land Conversion Permission under the Agricultural Land Act.

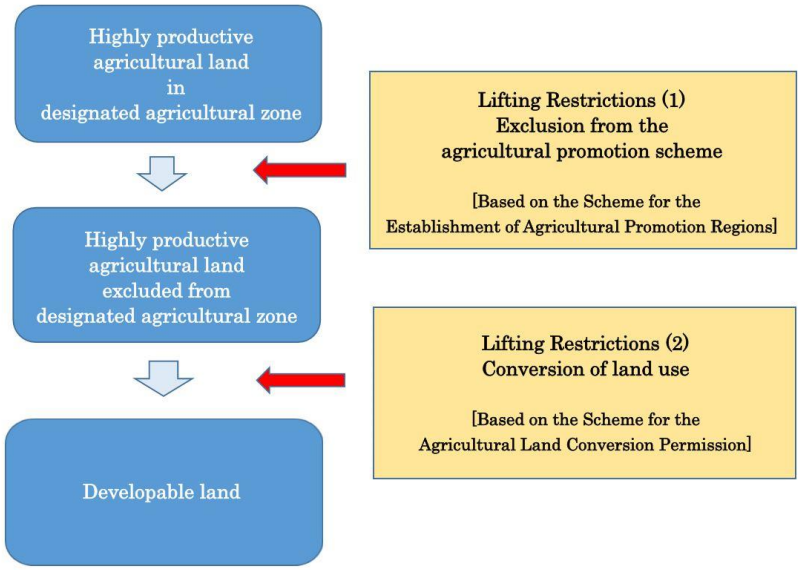


Fig. 10 Obtaining permission for a wind power plant project on agricultural land
Source: Renewable Energy Institute

(i) Procedure in accordance with the Agricultural Promotion Scheme (Exclusion from Agricultural Promotion Scheme)

The Agricultural Promotion Scheme assigns the national, prefectural, and municipal governments to take roles to designate highly productive areas as 'designated agricultural zones' where agriculture should be promoted. As mentioned above in Section 2.1 of Chapter 2, 90 percent of the agricultural land in Japan, and 96 percent in Hokkaido and Tohoku, regions especially rich in wind power resources, are located in designated agricultural zones. When anyone plans to build a wind power plant on a part of agricultural land, it often turns out to be in a designated agricultural zone. In order for a wind power plant to be constructed in the designated agricultural zone, the land must first be excluded from the zone. A set of procedures that must be completed for that purpose are referred to as "exclusion from Agricultural Promotion Scheme."

Exclusion from Agricultural Promotion Scheme is allowed only when all five of the strict requirements are satisfied, including that "No alternative site is available outside the designated agricultural zone" and that "Eight years have passed since the completion of land improvement or any other relevant program administered directly by the national government or carried out with grants it provided" (Fig. 11). Exclusion from the Agricultural Promotion Scheme cannot be authorized by a relevant municipality at its sole discretion, as consent of the prefectural governor is needed.

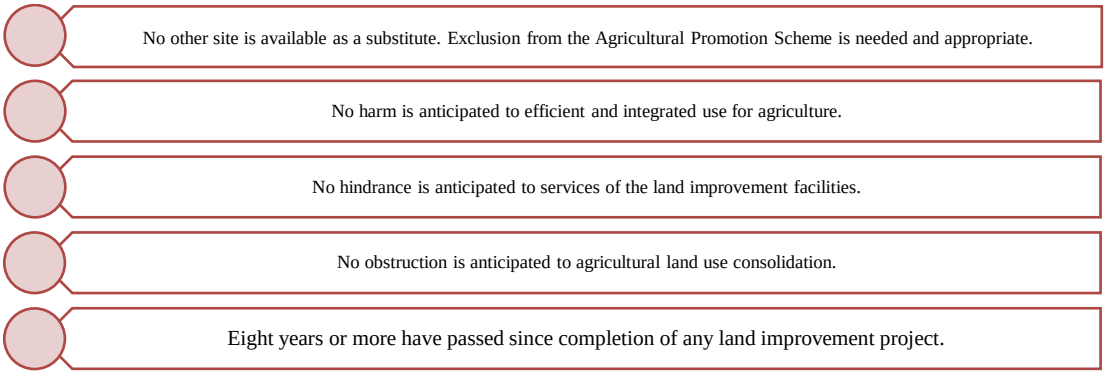


Fig. 11 Five requirements for the exclusion from Agricultural Promotion Scheme

Source: Renewable Energy Institute

(ii) Procedures under the Agricultural Land Conversion Permission Scheme (Agricultural Land Conversion)
Even when Exclusion from Agricultural Promotion Scheme is authorized for a project site, no wind power plant can be constructed there immediately. The next step that must be performed is to follow the procedures for Agricultural Land Conversion Permission Scheme, specified under the Agricultural Land Act (Agricultural Land Conversion). The Agricultural Land Conversion Permission Scheme is designed to secure highly productive agricultural land while facilitating systematic land use. Whether Agricultural Land Conversion permission is granted for a site is determined by a person authorized under the Act to grant permission and approval, or the prefectural governor, according to permission criteria. However, any area of agricultural land larger than 4 hectares can be converted to another use only when permission is obtained from the Minister of Agriculture, Forestry and Fisheries[7].

Under the Agricultural Land Conversion Permission Scheme, areas of agricultural land are classified according mainly to their productivity and the land use around them. For any agricultural land located within a designated agricultural zone or similar categories of highly productive agricultural land, conversion cannot be permitted in principle, as stricter permission criteria have been set.

(2) History of the agricultural land use scheme, and its impact on wind power generation business

Since the period of rapid economic growth, agricultural land has been decreasing steadily, mainly along with urban development. Half a century after peaking in 1961 at 6.09 million hectares, agricultural land area has shrunk by almost a quarter. Among factors Takahashi (2001) points out as lying behind the phenomenon are land-use conversion control, placed under pressure of demand from the urban areas for deregulation, having been loosened gradually, and rapid developments having been seen in deregulation of land-use conversion control under the Agricultural Land Act since around 1990. Regulations had been relaxed against social backgrounds of the day, such as intensified competition between urban and agricultural land use, rising prices of agricultural land, and decreasing successors of agriculture. The wind power plants mentioned in the preceding section as examples of development on agricultural land were successfully constructed by applying various schemes and mechanisms adopted as part of the deregulation.

However, the systems intended to enable construction of wind power plants on agricultural land have since been altered in a manner to make them difficult to apply. With the revised Agricultural Land Act of 2009, construction of wind power plants on agricultural land has become virtually impossible at last. Even on a site suitable for wind power generation, a power plant is quite difficult to build if it is located in highly productive agricultural land.

In addition, the current agricultural land system presents difficulties to maintenance of wind turbines or other operations. For instance, before a wind turbine has a large component replaced by a crane carried in and installed beside it, iron plates must be laid on the ground to prevent subsidence. For that, parts of the agricultural land need temporary conversion to approach roads. Indeed, the hurdle is not so high as that for land-use conversion for

[7] For any site measuring 2 – 3 hectares, the prefectural governor consults with the Minister before determining whether conversion permission should be granted.

constructing wind turbines, but it sometimes takes two or three months just to complete procedures for temporary conversion, a barrier to operation of wind power plants.

Even when, instead of new facilities being installed, any existing wind turbines are replaced, procedures for the Exclusion from Agricultural Promotion Scheme and Agricultural Land Conversion must be completed, given that wind power facilities are getting larger in size, and that expansion of their foundation area and modification of their arrangement are expected. Wind power plants constructed under any past schemes would be faced with tighter restrictions imposed by the stricter rules of the day.

(3) Enforcement of the Rural Renewables Development Act, and its challenges

With the introduction of stricter rules in FY 2009 for the implementation of the agricultural land use scheme, agricultural land became more difficult to convert to other uses, turning construction of wind turbines on agricultural land virtually impossible. After the Great East Japan Earthquake, which occurred in March 2011, and the adoption of an FIT system in July 2012, calls arose that construction of renewable energy power generation facilities, including wind power plants, should be allowed on agricultural land. In response, the Act on the Promotion of Renewable Energy Electric Power Generation Harmonized with Sound Development of Agriculture, Forestry and Fisheries (Rural Renewables Development Act) was established, and put into effect in May 2014. The new Act enables parts of agricultural land that satisfy specific conditions to be converted to other uses even when they are located on highly productive agricultural land, where no conversion had been permitted before.

However, as some point out, two years or more have passed since the Act came into effect, with few wind farms built on agricultural land. Behind the lack of progress lie two possible factors.

First, the Act does not apply to designated agricultural zones, which cover 90 percent of all agricultural land. In any designated agricultural zone, construction of a wind power plant can get started only after the procedures for the Exclusion from Agricultural Promotion Scheme are completed, a high hurdle for anyone who intends to use the Act for development.

Second, local governments, which should take the lead for effective application of the Act, have some internal problems, especially a lack of human resources. In general, few local governments hire employees with any expertise in wind power or other types of renewable energy. Thus, some arrangements should be made to provide local government employees with knowledge they need, of course, and make experts available to support them.

2.5. Course of action for coexistence with agriculture

So far, this chapter has outlined the state of land use for wind power generation in Japan, focusing on agricultural land, a category of land kept by strict regulations hard to use for construction of wind power plants, to present examples of coexistence between wind power generation and agriculture, describe the scheme for agricultural land use in general and the current state of the Rural Renewables Development Act, and identify challenges Japan should address. Based on examinations above, this section summarizes this chapter, specifying what course of action power producers, as well as municipal, prefectural, and national governments, should each take to facilitate coexistence between wind power generation and agriculture.

(1) Power producers

Under the current scheme, agricultural land is dually regulated by the Agricultural Promotion Act and the Agricultural Land Act. It is quite difficult to satisfy stringent requirements both for the Exclusion from Agricultural Promotion Scheme and Agricultural Land Conversion. Now, the Rural Renewables Development Act is available to convert agricultural land, though procedures for the Exclusion from Agricultural Promotion Scheme must be completed before constructing a wind power plant in any designated agricultural zone. Since the local governments have the authority to grant major permissions and approvals, and prepare plans for both of the above schemes, power producers planning to construct a wind power plant on a specific location would find it critical to gain the understanding of the local government there. However, cooperation of any local government would be difficult to obtain unless a power operator successfully leads the municipality to recognize benefits brought to them through construction of a wind power plant, such as revitalization and development of agriculture, or increase in local employment and tax revenue.

To obtain understanding and cooperation of local governments, power producers must demonstrate benefits wind power generation can bring to agriculture and the entire community both in a quantitative and qualitative manner. At the same time, as seen in the example of Koriyama City, effort must be made to minimize modified land area and the impact on agriculture, while holding full consultation with local stakeholders. As the Rural Renewables Development Act is used effectively, with cases of coexistence piled up, and understanding deepened among municipalities and agriculture stakeholders, it is expected that more local governments will fully engage themselves in development of wind power.

Once a positive cycle is established, enabling a development project to induce another, and the position of wind power generation is recognized as a power source that promotes public welfare, especially through its contribution to agriculture, exceptions from the Agricultural Promotion Act or Agricultural Land Act, and radical overhaul of the Rural Renewables Development Act which still imposes strict procedures for the Exclusion from Agricultural Promotion Scheme, would be laid on the table.

(2) Municipality

Success of wind power generation in coexistence with agriculture also depends greatly on what actions municipalities will take. In many cases, as seen before in the examples of Tomamae, etc., municipalities take the lead in deploying wind power generation as part of their initiatives to revitalize agriculture and local communities. Shrinking and aging population, and its consequence - decreases in the labor force and the decline of agriculture - are among the common challenges that local municipal governments must address. For facilitating sustainable agriculture, and, by extension, sustainable community management, municipal governments are expected to work positively to consider developing wind power generation. Once an actual development project gets started, they should avoid relying fully on power producers, and instead have regular meetings with them as well as local stakeholders on a regular basis to exchange information and identify needs and local challenges they have with the aim of securing coordination for smooth development. In the medium- and long-term, they are expected to enhance their function as coordinator for maximizing benefits and minimizing any harm that wind power projects may bring to agriculture and local communities.

(3) Prefecture & state

The prefectural and national governments are expected to provide power producers and municipalities with active support for their initiatives. The current scheme assumes that the Rural Renewables Development Act can be used effectively to develop wind power plants in a manner that they can coexist with agricultural land. In fact, however, only a few initiatives have been launched since the Act came into effect two and a half years ago. Behind this situation lie several factors, such as shortage of resources governments can deploy though they should take the lead under the current scheme, reluctance of some governments to disclose a basic plan they have already prepared, and coordination several departments and bureaus need to establish among them. In the short-term, the current scheme must be improved.

Prefectural governments, richer with resources, such as people with some expertise, than municipal ones, are expected to back up power producers and municipalities in their initiatives. Under many of the laws and regulations concerning wind power development, the prefectural governments have the authority to grant permissions and approvals. When a wind power plant is planned on a site located in a designated agricultural zone, procedures must be completed for Exclusion from Agricultural Promotion Scheme, for which consent must be obtained from the prefectural governor. Some arrangements must also be needed to help municipalities carry out their initiatives smoothly. For instance, representatives from the prefectural government should take part in a council set up by the municipal government under the Rural Renewables Development Act from the earliest stage.

As part of its short-term initiatives, the national government should expand its policy programs for supporting prefectures and municipalities in their activities under the Rural Renewables Development Act, and secure a budget for that purpose. The government should also oblige the municipalities to disclose basic plans. For the medium-and long-term, the national government should desirably reconsider its scheme for agricultural land use. Under the current scheme, wind power generation has no specific position given to it under either agricultural land-related laws, such as the Agricultural Promotion Act and Agricultural Land Act, or any other official program, such as the Basic Plan for Food, Agriculture and Rural Areas, prepared by the MAFF. Once enough evidence is obtained to rate wind power generation in the society as a power source that promotes public welfare, an effective solution would be to apply exceptions from the Agricultural Promotion Act or Agricultural Land Act, or a fundamental reconsideration of the current Rural Renewables Development Act which still imposes procedures for the Exclusion from Agricultural Promotion Scheme.

Table 2 Basic course of actions each party should take

Party	Basic course of action
Power producer	Demonstrate benefits wind power generation can bring to local agriculture and farming management on a quantitative basis. Minimize any harm projects or development may cause (minimize land modification and impact to agriculture).
	Compile successful cases of coexistence, facilitate understanding of agricultural policy & farming, and develop a win-win relationship.
Municipality	Exchange information with local stakeholders, power producers, etc. on a regular basis (to identify needs & challenges).
	Enhance functions as coordinator for maximizing benefits wind power projects bring to local communities and agriculture (minimizing harm).
Prefecture	Effectively use their expertise and resources to back up municipalities.
	Implement efficient and effective policy programs to develop environments for wind power generation.
State	Develop schemes for supporting power producers, prefectures, and municipalities in their initiatives, and secure the budget.
	Fundamentally improve the legal framework (depending on how wind power generation is rated in the society).

Source: Renewable Energy Institute

3. Wind power generation and the scheme for environmental impact assessment

Wind power projects must be planned with consideration for mitigating possible adverse impacts on the environment and human life, through environmental impact assessment (EIA) suitable to the projects. These are essential procedures that must be taken before starting the projects, and are critical for sustainable development of wind power generation. Japan has recently designated wind power generation as one of the activities subject to the Environmental Impact Assessment Law.

However, the current scheme of the EIA procedures for wind power projects has some problems, as it does not take into account the size of projects it applies to and items of evaluation it requires. This makes the procedures time-consuming and costly, consequently imposing greater project risks on power producers. This chapter focuses on the scheme of EIA for wind power projects, examining the present conditions in Japan and other countries to identify issues and suggest specific solutions.

3.1 The current state of environmental impact assessment for wind power generation

(1) Application of the scheme to wind power generation: Background

In Japan, construction of wind power plants started around the year 2000. Originally, EIA was conducted by power producers on a voluntary basis according to procedures based on the NEDO manual, mentioned previously. Some local governments, concerned about possible impacts on the environment and/or human health, added wind power generation to the list of activities subject to their existing prefectural or municipal ordinances for EIA to oblige power producers to carry out specific assessment procedures ("assessment by local ordinance").

However, some people living around wind power plants complained about health problems that they alleged had been caused by noise and low frequency sound of the windmills. Others were concerned about bird strikes, cases of birds colliding with a windmill blade, degraded landscape, and other impacts wind power stations might give to the environment and living conditions (MOE, 2011a). In response, the Central Environment Council of the Ministry of the Environment reviewed the existing scheme of EIA. In its 2010 report on a new system of EIA, the Council stated, "Studies should be conducted on whether construction of wind power facilities should be included in the activities regulated by law" (MOE, 2011a)[8].

(2) Changes to the scheme: Overview

In April 2011, the Law for Partial Revision of the Environmental Impact Assessment Law (Revised EIA; "assessment by Law") was passed to add the planning stage in its coverage, while it originally covered the operation stage alone. Then, the Revised Cabinet Order for Adding Wind Power Plants to the List of Activities, which came into effect in October 2012, added wind power plants (Class-1: capacity of 10 MW or more; Class-2: 7.5 MW or more) to the list of facilities the Law applies to. Before the revision, the list contained only hydropower, geothermal, thermal power, and nuclear power plants. After a series of revisions made to the Law and regulations mentioned above, assessment for wind power projects over a specific size has been settled in five phases: environmental consideration document scoping document, current conditions survey, draft environmental impact statement, and environmental impact statement (Fig 13).

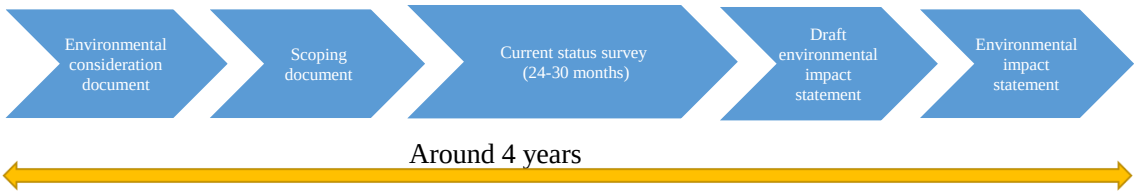


Fig. 13 Procedures for the environmental impact assessment by Law Source: MOE

[8] The report mentioned, "in places where wind power facilities were constructed, noise, bird strikes and other troubles have been reported, and a quarter of the assessments that were not regulated under local ordinance lacked local hearings."

The assessment by Law, now covering wind power projects, affects power producers mainly in two points.

First, the EIA procedures takes much longer time than before. Power producers planning to construct wind power plants with a capacity of 10 MW or more must now carry out the assessment by Law, instead of a voluntary assessment or assessment by local ordinance. According to Japan Wind Power Association (JWPA), before the assessment by Law became mandatory, a voluntary assessment or assessment by local ordinance took 14 to 21 and 24 to 36 months, respectively[9]. An assessment by Law takes longer, around four years. In the first place, wind power plants require a longer lead time before being brought into operation, as they must finish wind monitoring, basic designing, approval and authorization, consensus building, and construction work. The newly adopted process of environmental consideration document, together with other formalities, has made the preparation period even longer. In a sense, however, preparation of an environmental consideration document allows power producers to perform their internal process of planning as part of the assessment, and as a result, to start the assessment process ahead of schedule. So, it is a significant process for a scheme that applies to large-scale development projects that may give great impact on the environment.

Second, in addition to increased cost of the entire assessment process, the risk of sunk cost (irrecoverable cost) weighs heavily on power producers. Power producers are exposed to the risk of assessment results that might force their plans to be altered or discontinued. Even after the completion of an assessment, the full cost for the assessment may become a sunk cost once they fail to have their facilities connected to the grid or approved by the authorities[10]. Prolonged procedures entail various types of project risk. For instance, before the reforms made in April 2017, power producers could not complete some critical procedures that should determine whether or not a plant would successfully start commercial operation, such as obtainment of facilities approval (determination of power purchase prices), and application for grid connection, until the stage of draft environmental impact statement, just a step before the final stage (environmental impact statement). As they had to wait for recommendations made by the Minister to their draft environmental impact statement to see the procedures completed, they were exposed to some project risks, such as fluctuating purchase prices and lost available transfer capacities, for a long time in the development phase.

(3) Actions of the government (Pilot Program to Reduce the Processing Time for Environmental Impact Assessment & Model Program for the Study of Zoning Methodologies)

In accordance with the "Japan Revitalization Strategy" and the "Implementation Plan for Regulatory Reform," Cabinet Decisions made in June 2013, the national government is working to meet its target, "aiming at halving the period needed to complete procedures."

Among the major initiatives are reduction of the time of examination periods by the national government (examination of scoping documents, draft environmental impact statements, and environmental impact statements) from around 150 days to around 45 days, and the request to local governments for cooperation with reducing the examination period, as well as the "Pilot Program to Reduce the Processing Time for Environmental Impact Assessment " (FY2014 - FY2016), designed to obtain know-how for starting an environmental survey ahead of the schedule or conducting several surveys at the same time (front-loaded environmental research) and the study and preparation of basic environmental information (such as that of habitation of rare species) helpful for the EIA of wind and geothermal power plants.

[9] Materials presented by JWPA to the 17th meeting of the Investment Promotion and Miscellaneous Issues working group, the Council for Regulatory Reform, Cabinet Office.
[10] Some estimate EIA costs at 100 million yen per 10 MW of capacity.

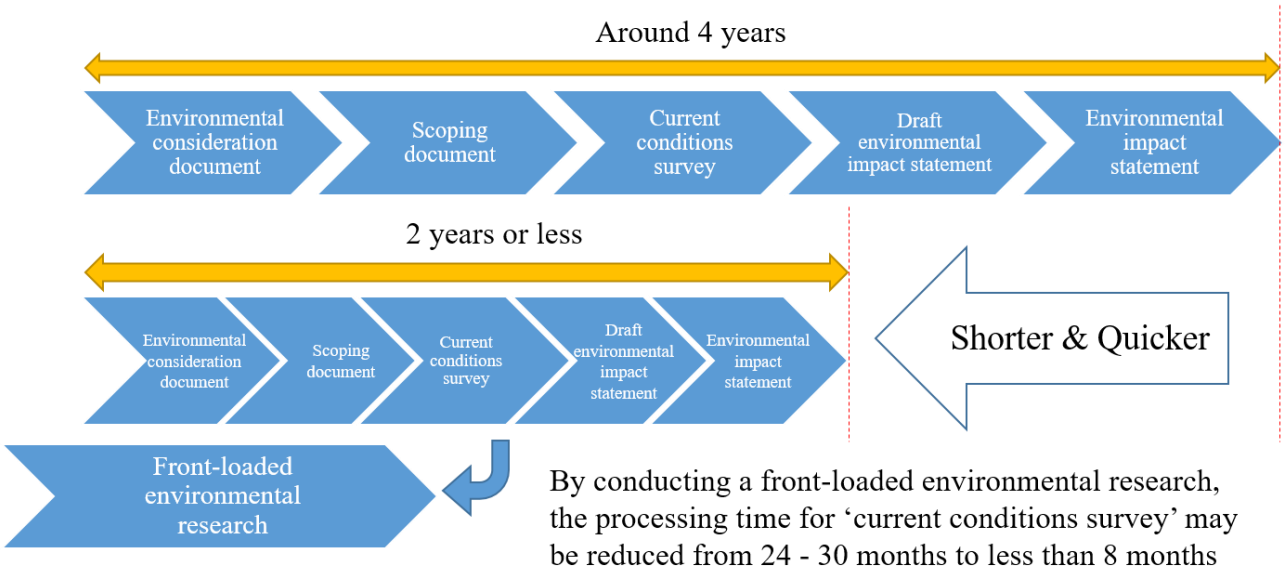


Fig. 14 Pilot Program to Reduce the Processing Time for Environmental Impact Assessment: Flow of procedures Source: MOE

In FY 2016, the Ministry of the Environment started the "Model Program for the Study of Zoning Methodologies," planned as a two-year initiative. For the Program, four areas have been selected in Miyagi Prefecture and Naruto City, Tokushima Prefecture, and others. In some countries, local governments, taking into account various regulations and possible environmental impacts, recommend specific areas suitable for wind power plants and zone them for that purpose, helping power producers set up wind power plants smoothly, with less burden imposed on them. The Japanese government says that the Model Program aims to reduce the examination period, and facilitate greater deployment of renewable energy while taking into consideration on the conditions of the natural and social environments in individual regions.

3.3 Issues on the environmental impact assessment for wind power development

(1) Compiling basic environmental information

Among the EIA procedures, the most time-consuming and costly part is the field survey. It has a critical role for accurate estimation of the impacts that the projects may have on the environment. What is important for completing necessary examinations as quickly as possible at the lowest cost is availability of compiled basic environmental information where the field surveys can base on. In countries that lead the world in wind power development, national governments or other public institutions compile basic information and offer it in a user-friendly manner. For instance, some of them produce maps that present environmental data of individual regions, and make them available on their websites.

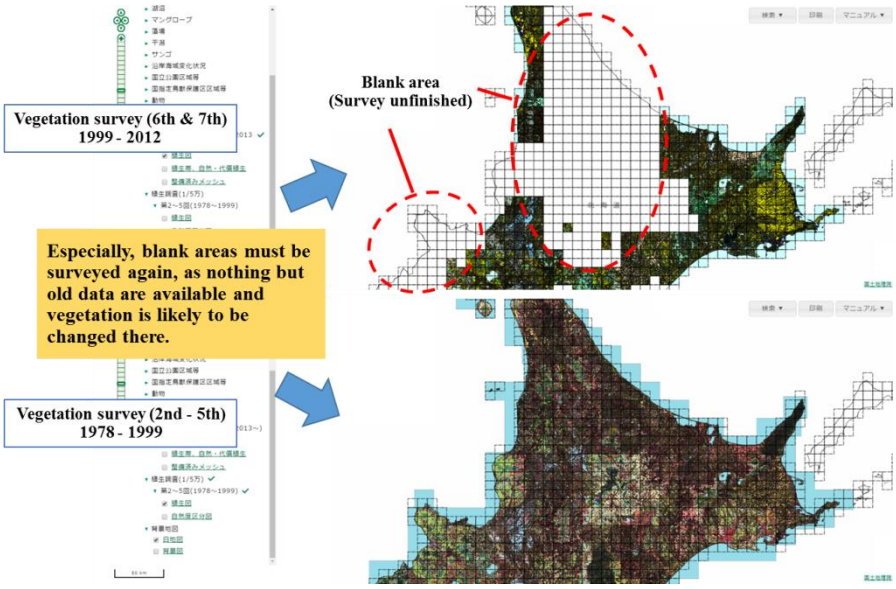


Figure 16 Compiling basic environmental information (Example of vegetation maps)

Source: Biodiversity Center of Japan, MOE

In Japan, there is little basic environmental information, such as vegetation maps and birds' migration routes, that has been collected, organized, and made available on a database, and most power producers must conduct surveys from scratch. For instance, if the Ministry of the Environment had finished vegetation surveys and made the findings available, power producers could refer to them before starting their own surveys at sites where they plan to construct wind farms. In fact, the MOE survey program has made so little progress so far that power producers can only find old data for many areas. Even in Hokkaido, a prefecture highly suitable for wind power generation, there are conspicuously many areas left blank as surveys have yet to be finished (Fig. 16).

Then, is the national government making best efforts to provide necessary information urgently? Related budget documents suggest that the answer is "No". For instance, for the National Survey on the Natural Environment (Compiling of Vegetation Maps), planned by the Ministry of the Environment for FY 2016, the government appropriated only 171 million yen (app. 1.5million USD) in the budget.

Another factor causing the delay in compiling basic environment information is the failure of power producers and the industry to accumulate and share data from follow-up surveys for existing plants and findings from completed EIAs. Specifically, while power producers must report findings of environmental surveys and other information in EIA documents, they have to make them open for public inspection only for one month. Once the period is over, browsing usually becomes restricted, thus making survey data difficult to share and examine. Copyrights of environmental impact statements are believed to belong to power producers that conducted the assessment. Actually,

the power producers are allowed to decide at their discretion whether or not the reports should be made available for the public. In many countries, in contrast, any EIA can be reexamined later, as EIA documents are considered public records and they should lie outside the coverage of copyright, so that information can fully be disclosed.

(2) Categories of projects subject to the Environmental Impact Research, and items of evaluation

In Japan, wind power plants with a capacity of 10 MW or more (Class-1) are obliged to undergo an assessment by Law. Indeed, direct comparison among countries would be irrelevant due to different natural and social conditions, but in general, Japan has adopted more stringent assessment requirements than most countries in terms of size of plants (Table 14) in the case of wind powers.

In the United States, the size threshold for mandatory assessment at the federal level (NEPA assessment) are set for a capacity of 50 MW or more, much larger than in Japan. But it does not mean that assessment is not required for wind powers smaller than 50 MW. A concise EIA, named environmental assessment (EA) under the US NEPA process, is required to wind powers except a few especially designated ones by categorical exclusion. By this scheme, even the plants with a capacity of 50 MW or more are not necessary to get into the EIA process directly. Instead, they could conduct a concise EIA (EA) first, and if they are found unlikely to cause significant impact to the environment, they can skip the detailed Environmental Impact Statement (EIS) process and finish the procedures more quickly.

Table 14 Size threshold for environmental impact assessment in selected countries: wind and thermal power plants

	Japan	US	China	South Korea	Germany	Spain
Wind	10 MW	50 MW	50 MW	100 MW	20 units	50 units
Thermal	150 MW	50 MW	All plants	10 MW	200 MW	300 MW

Source: MOE (2012)

The Ministry of the Environment refers to several factors that influenced the size threshold being set at 10 MW or more: that the manual which had been used for the voluntary assessment scheme made by NEDO covered plants with a capacity of 10 MW or more; that it was suggested that 150 MW of thermal power plant, which was already set as a threshold for assessment by Law, should be considered equivalent to 10 MW of wind power plant since they both required 5 hectares of land alteration for their construction; that, at the time of discussion, the '10 MW or more' threshold covered 80% of wind power plants, as opposed to the '30 MW or more' threshold covering merely 40%.[11].

However, none would believe that the area of land alteration for thermal power plants was a reasonable standard upon setting the size threshold for wind power plants. As shown in Chapter 2, 2.2, wind power plants may require much smaller sites to construct. Especially when built on farmland or other types of land that are already developed, only limited area of land needs alteration. For the 66 MW wind farm built in Koriyama City, for example, only 1.5 hectares of farmland was modified permanently, with another 2.2 hectares modified on a temporary basis for construction work, less than four hectares in total. In addition, access roads built for construction work can be also used by farmers, another benefit wind power plants bring with them. In the first place, wind power, a distributed power source, and thermal power, a centralized power source, are completely different in the way of calculating the land area that requires alteration. Considering that their location characteristics are different, and the types of environmental impacts are different, size thresholds for wind power plants should be determined based on more scientific and objective data.

[11] Materials presented by the MOE to the 17th meeting of the Investment Promotion and Miscellaneous Issues working group, the Council for Regulatory Reform, Cabinet Office.

According to a survey conducted by JWPA after the assessment by Law came into force, the threshold of '30 MW or more' now covers 86% of wind power plants, and even the '50 MW or more' threshold covers 70%[12]. The coverage became higher than that around 2010, when size thresholds were discussed for the first time, as power plants have become larger in size. Thus the size thresholds should be reexamined based on objective data and updated status of development.

Regarding the evaluation items and measuring methodologies, the Ministerial Ordinance stipulates typical selections for reference. The ordinance states that different evaluation items and measuring methodologies are to be selected for different power sources considering their characteristics. However, the assessment scheme being originally designed based on environmental impacts of thermal power plants and the like, nitrogen dioxide, dust, noise, and vibration are included in the evaluation items for wind power plants' construction process as well. In this regard, JWPA insists that, as demonstrated by actual measured data of land alteration area, wind power projects give significantly smaller impact on the environment than other types of power generation[13]. The current environmental evaluation items (reference items) are not fully based on updated status of development or objective data, and they must be revised to reflect the realities as soon as possible.

(3) Issues on the government's measures (Pilot Program for Reducing Process Time of Environmental Impact Assessment)

For the governments' measures aiming for quicker and shorter procedures of EIA, the following three challenges must be addressed.

First, if a front-loaded environmental research is to be conducted, it must be performed over a broader area in more detail, which often pushes up the cost.

Second, despite having conducted a front-loaded environmental research at a significant cost, power producers might be required to re-do the research if their scoping document is rejected after examination. This "reworking risk" makes power producers reluctant to conduct a front-loaded research. If a power producer that completed a front-loaded environmental research is directed at the scoping document stage to the 'reworking,' it must conduct another research[14]. The assessment process shortening program is conducted on a pilot basis, and power producers participate in it at their own risk, groping in the dark. Given that the front-loaded environmental research plays a key role in shortening the assessment, the national government should provide power producers with active support not only in financing but also in compiling and providing necessary information.

Third, Japan lacks any scheme similar to the concise EIA the United States has in place, a fundamental problem lying in Japan's domestic assessment systems.

(4) Summary of the issues regarding Environmental Impact Research

Below is the summary of the issues regarding EIA in Japan.

First, the national and local governments have yet to develop any infrastructure of information, including basic environmental information. Given that the Basic Environmental Information Database and other elements of the infrastructure are yet to be completed although they are needed for conducting environmental researches efficiently, power producers must start surveys of vegetation and bird migration routes from scratch, which may lay too heavy burden on them.

[12] Materials presented by JWPA to the 17th meeting of the Investment Promotion and Miscellaneous Issues working group, the Council for Regulatory Reform, Cabinet Office. The coverage is calculated for the power plants constructed during a period of three years from October 2012 and the projects for which assessment is being conducted (or has been completed).

[13] ibid.

[14] If the prefectural governor or the Minister of Economy, Trade and Industry orders the power producer to re-do the front-loaded environmental research during the "scoping document process," it is called "reworking."

As a solution to this issue, the governments could provide effective support for them. For instance, the state government of California develops a database of basic information of animals, so that power producers can use it for screening the locations to construct wind power plants or other facilities. This is only a part of the considerable effort California devotes to prepare sufficient information.

Second, power producers, and the industry, have yet to do enough to develop an information infrastructure, as they fail to accumulate and share data they have obtained from follow-up surveys conducted for existing plants and findings from completed EIAs. Power producers are presently obliged to make EIA documents open to the public for a limited period, only one month, and after the period, they are allowed to decide at their discretion whether they should be kept publicly available. Once a plant comes into operation, follow-up surveys are performed on a voluntary basis only.

When power producers of existing plants are allowed to hang on to basic environmental information they collected, others who intend to develop a site in the neighborhood have to repeat the same research, which is inefficient. Once barriers to new entrance are lowered, the market can grow further. That should not happen without efforts of power producers themselves. For instance, they need to make publicly available information they have obtained from surveys and/or researches they have conducted so far.

Third, the current size thresholds and evaluation items are not fully reviewed. As a result, power producers may be required to do unnecessary surveys and/or researches and procedures they find time-consuming and costly. Any requirements and items decided on sufficient scientific grounds would be fully accepted, however, as mentioned previously, that seems unlikely for the current arrangements given the process where they were made.

Finally, despite a pilot program that the national government is carrying out for helping power producers complete assessment procedures more quickly, the current initiative fails to reduce risk and cost on an acceptable level. For front-loaded environmental researches, a key to quicker completion of an assessment, power producers are required to conduct researches that cover broader areas, which would push up the cost. Once they finish a front-loaded research, they must assume "reworking risk" as they may be required to do another research at the scoping document stage. The current program for quicker assessment is less than satisfactory for reducing time and cost power producers must spend for EIAs.

3.4 Offer of specific actions for improvement

At the end of this chapter, this section, based on the current state of EIA in Japan and other countries, and the issues they face, offers specific solutions for improving Japan's EIA for greater deployment of wind power generation. Below, actions the government or power producers should take for improvement are offered in two groups along with the time scale, short-term, and medium- or long-term solutions.

(1) Actions the government should take for improvement

In the short term, the government should take three actions below for improvement.

First, the government should immediately fully develop an information infrastructure, including the Basic Environmental Information Database. Through the "Model Program for Preparation of Basic Information of EIA for Wind Power Generation, etc.," the Ministry of the Environment is working to develop a database of environmental information. The Ministry should extend the range of the Model Program and enhance the effort to collect information. For surveys conducted to obtain more and better basic information, such as the National Survey on the Natural Environment (vegetation survey, bird habitat survey, etc.) and programs for compiling information of migratory birds and sea eagles relating to wind power facilities, the Ministry should also enhance the implementation scheme and information collection effort. Naturally, to speed up implementation of these initiatives, a sufficient budget must be secured.

Locations with great potential of wind power generation are distributed unevenly, concentrated in Hokkaido and Tohoku. Priority should be given to some candidate places picked out based on wind conditions, grid capacities, and other considerations to collect basic information there earlier and develop wind power plants in an appropriate and efficient manner. As a future initiative, the Ministry of the Environment, JWPA, conservation NGOs/NPOs, and other organizations are expected to consider integrating their databases, so that they will be managed centrally by a single public institution.

Second, the current size threshold for Class-1, a capacity of "10 MW or more," should be immediately reconsidered based on objective data of actual impact on the environment and the socio-economic conditions in other countries.

The reference items should also be reviewed based on characteristics of wind power generation. The Fourth Report for Regulatory Reform mentions "narrowing down reference items" as "Start examining in Fiscal Year 2016; draw conclusions and take measures upon gaining needed data." Work for that should get started as soon as possible.

Third, to make sure procedures will get shorter and quicker, risks and cost that power producers need to bear must be reduced. On the theme of shortening the EIA period, the Fourth Report for Regulatory Reform, by the Cabinet Office, refers to establishing a methodology for front-loaded environmental researches and generalizing term-halving methods as initiatives that should be addressed. It is actually important for the national government to implement a pilot program for achieving shorter assessment periods. At the same time, however, some measures should be taken to control cost increases for an expanded range of examination and reduce the reworking risk. In this regard, development of an information infrastructure, mentioned previously, would be helpful, once any progress is made. Other solutions should also be considered.

As one of the medium- and long-term actions for improvement, study should get started on introduction of a new scheme, performing a concise EIA regardless of size thresholds. In the United States and other countries, reasonable arrangements have been developed, as concise EIA and screening process are conducted to identify any projects that may have significant impact on the environment and ensure they will undergo a full assessment, while others are allowed to finish assessment procedures in a shorter period (Table 15). In the US, most proponents could finish the process after the concise EIA.

Japan could also avoid applying uniform size threshold when deciding whether a project must undergo the assessment by Law, and instead introduce the process of concise EIA and screening to allow certain types of projects to do nothing more than carrying out simplified procedures while obliging even small-scale projects to conduct a full assessment when if they are found likely to give significant impact on the environment.

Once concise EIA and other procedures are adopted, together with size thresholds for the ordinary assessment, to legally oblige smaller projects than those coming under the requirements to examine whether they may have any environmental impact, they would also work positively for any effort to build consensus between the proponent and the stakeholders. When reconsidering size thresholds, it is also important to prevent any unnecessary worries spreading among stakeholders around a planned site by offering them opportunities to express their opinions at the planning stage as one of the measures taken to guarantee considerations on the environment and the society there.

Table 15 Size thresholds by environmental impact assessment stage (selected countries)

	US	Germany	France	Spain	UK	China
Size thresholds for ordinary assessment	>50 MW	≥50 m in total height & ≥20 units	>50 m in tower height	≥50 units	Not specified	≥50 MW & built in environmental sensitive area
Size thresholds for concise assessment	Other than specified above		Other than specified above			Other than specified above
Size thresholds for decision by screening		≥50 m in total height & 6 - 19 units: ordinary screening; 3-5 units: location screening		Other than specified above	≥3 units or >15 m in hub height; decided by local government; ≥50 MW: decided by the Secretary of State for Trade and Industry	

Source: MOE (2012)

(2) Actions power producers should take for improvement

In the short term, power producers should take two actions below for improvement.

First, power producers should also help develop an information infrastructure. For that, they should work with the Ministry of the Environment to develop its Basic Environmental Information Database, and disclose more of the information they hold by, for instance, making their assessment documents permanently available in public. JWPA says that, believing that they can make their opinions convincing enough to justify introduction of quicker assessment procedures and reconsideration of size thresholds only with data and scientific grounds accumulated through follow-up surveys and other activities, they will ask power producers for cooperation to collect information including environmental impact statements and reports of assessments and follow-up survey reports and have them shared among them. Power producers should develop a database to accumulate and share data they collect from follow-up surveys for existing plants and knowledge they obtain from projects for which assessment has been finished as soon as possible. They should also work to integrate this data, together with assessment data collected by JWPA from them, including data they collected in the days of voluntary assessment, with the MOE's Basic Environmental Information Database to build a more useful public database.

Second, given that assessment documents are made publicly available for inspection for only one month, before they usually become inaccessible, which makes survey data hard to share and/or examine, power producers should keep assessment documents permanently accessible, and disclose to the public "final reports" they must present after finishing construction and related work.

There are some who say that assessment documents cannot be disclosed due to copyright problems. But they seem to think quite differently from global standards. Even in the United States, a country where copyright is heavily protected, they consider that assessment documents should be disclosed as a matter of course.

Table 16 Specific measures to be taken for improvement

Government	
Short term	Intensive preparation of basic environmental information and development of a database
	Review of size thresholds for EIA
	Narrowing of reference items based on characteristics of wind power generation
	Facilitation of quicker procedure, with reduction of risk and cost that power producers must bear
Medium and long term	Introduction of concise EIA and screening process
Power producers	
Short term	Cooperation with the MOE to develop its Basic Environmental Information Database
	Further disclosure of information by making assessment documents permanently available to the public, etc.

Source: Renewable Energy Institute.

Conclusion: Courses of action for improving schemes to accelerate deployment

What is important for accelerating the deployment of wind power generation, as seen in Germany and the United States, is reform of the land use and EIA schemes, which this report has reviewed so far, as well as other legal frameworks and regulations in an appropriate manner, in terms of both their designing and implementation. At the conclusion of this report, we offer, based on key points that have been identified through the examinations of Japan's system so far, three suggestions on the course of action for improving systems that Japan should take for accelerating deployment of wind power generation.

First, steady effort must be exerted to make improvements under the current schemes.
As seen in several examples mentioned in this report, such as the Pilot Program to Reduce Processing Time for Environmental Impact Assessment, and the Rural Renewables Development Act, gradual progresses have already been observed in some initiatives for making improvements under the current scheme. At the national government level, new moves are appearing. A scheme is being developed to designate places with potentials for wind power development as "deployment promotion areas," and invite stakeholders to consider ways to secure smooth coordination among them concerning regulations in the areas, and share benefits delivered by wind power generation with local communities. The local and national governments should make steady progress in various initiatives while recognizing the current state and identifying challenges to improve their implementation.

Second, some measures must be taken to maximize the benefits of wind power generation to establish a positive cycle where a case of development induces another.
Once it is widely recognized that wind power generation delivers great benefits to local communities, and that it is an important power source that serves the public interest, more positive results could be achieved. For instance, regulatory hurdles may be lowered, and wind power generation may be given a clearer position in the legal framework. Some measures must be taken to maximize benefits of wind power generation and to transform it into a power source recognized as advancing public interest, thereby opening the way for improving existing schemes quickly or encouraging discussions about radical reform of the schemes for the medium and long terms. To achieve the objectives, power producers are expected to fulfill significant roles. They should work to maximize the benefits that wind power generation can deliver to the environment, society, and the economy, and demonstrate to communities and relevant government departments how much benefit it could produce, in a quantitative manner. What is also important is that, in reference to successful examples in the past, they should analyze and study methods for enabling wind power generation to produce benefits and share them with local communities, and approaches to communities for obtaining their understanding and sympathy.

Third, the current schemes should be redesigned or replaced for striking the right balance between greater deployment of wind power generation and minimization of the impact.
Neither Germany nor the United States, two of the leading countries in wind power generation, thinks light of land use or EIA. Based on information disclosure and participation, governments play leading roles in inviting projects to specific locations and simplifying procedures for EIA to save power producers time and cost, and any other burden they must assume. They take the initiative in striking the right balance between greater deployment of wind power generation and minimization of impact it may give to the environment and society.

By its nature, wind power generation can coexist with agriculture. Several examples of coexistence can also be found in Japan. This is not only because it only gives small impact on agricultural land but also because it is operated in a manner to increase farmers' income and/or benefit their business in some other forms. The question of how wind power generation can coexist with agriculture should be asked again not merely as a way of developing more wind power but also as an initiative for encouraging revitalization of agriculture. Coexistence of agriculture and energy production as described here should be a promising approach to developing a sustainable society.

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Abbreviations

EIA	Environmental Impact Assessment
EA	Concise EIA
MOE	Ministry of the Environment of Japan
MAFF	Ministry of Agriculture, Forestry and Fisheries of Japan
NEDO	New Energy and Industrial Technology Development Organization
HEPCO	Hokkaido Electric Power Company

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