Summary Report of Working Group Regarding Basic Concept on Environmental Impact Assessments Related to Wind Power Generation Facilities

～To Establish a Status as a True Green Energy Source～

1. Introduction

(Anticipation of Change to a Low-Carbon Society)

- The change to a low-carbon society will require the installation of renewable energy sources. Among them, wind power generation, though regarded as being unstable in its output, has a relatively low power generation cost and its installation is anticipated.

(Concerns over Environmental Impact)

- On the other hand, its environmental impacts including complaints due to noise and low-frequency sound; collision incidents involving rare bird species ("bird strikes"); effects on plants, animals, and water environments from the required land alteration; and impacts to landscape and scenery, have been pointed out.

(Execution of Environmental Impact Assessments)

- The ordinances of some municipalities require mandatory environmental impact assessments(EIAs), and voluntary EIAs are also being carried out according to the "NEDO Manual". However, regarding assessments other than those covered by local ordinances, in approximately ¼ of all cases, public comment procedures are not being held.

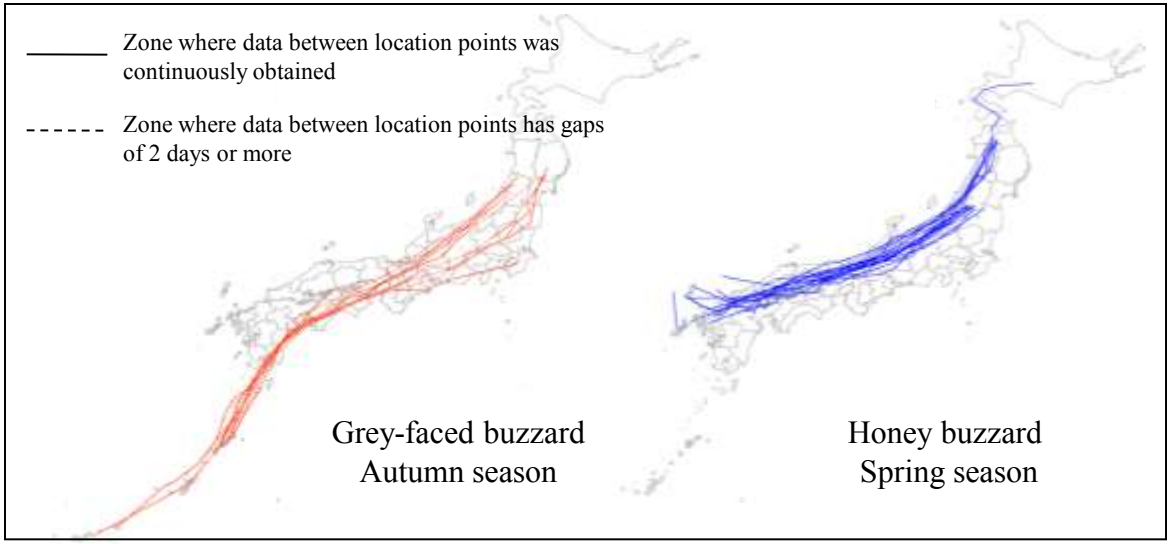
According to the report by the Central Environment Council(Feb 2010),the installation of wind power generation facilities should be added to the target projects that require mandatory EIAs under law.

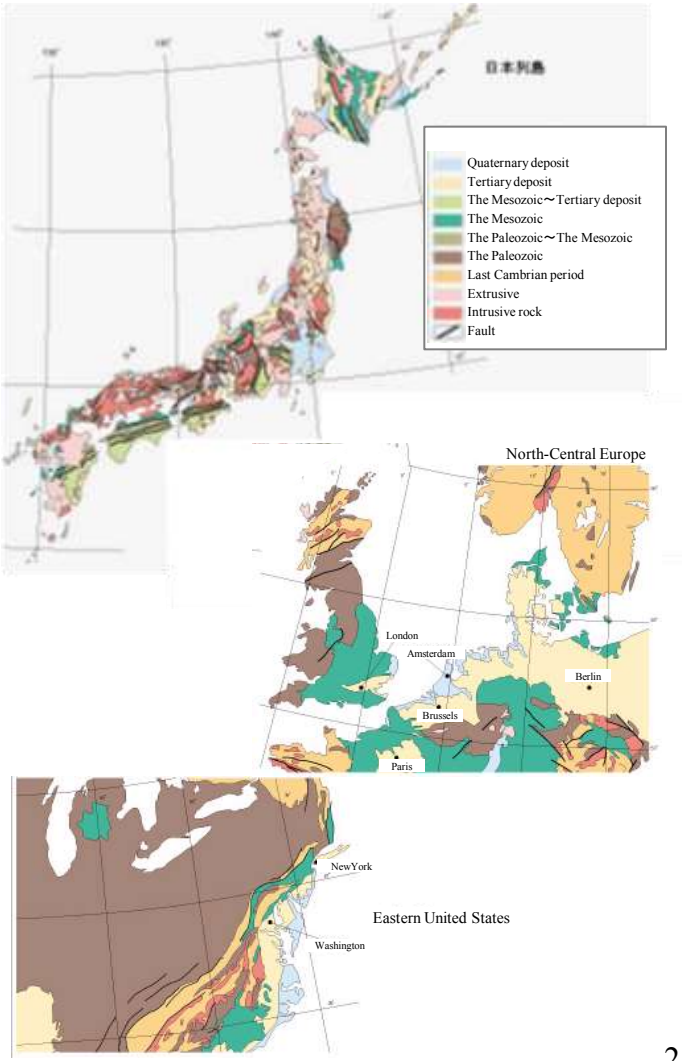
2-1. Status of our Country's Natural Environment

- Our country Japan possesses complex and diverse ecosystems, with wide range of climate zones, elevation, a complicated and fragile geology, and a high percentage of endemic species. The islands of Japan in their entirety are also an important migration route for migratory birds.

→ Because wind power generation facilities are located in mountain ridge and other fragile environments, thorough consideration of their natural characteristics is a must.

Country	Wood Land Area Percentage	Percentage of Endemic Plant/Animal Species				
		Mammals	Birds	Reptiles	Amphibians	Vascular Plants
Japan	**68.2%**	**22%**	**8%**	**38%**	**74%**	**36%**
France	28.3%	0%	0%	3%	9%	3%
S. Korea	63.5%	0%	0%	4%	0%	8%
Spain	35.9%	0%	2%	21%	14%	19%
Italy	33.9%	0%	0%	3%	29%	13%
United Kingdom	11.8%	0%	0%	0%	0%	1%
Germany	31.7%	0%	0%	0%	0%	0%
China	21.2%	0%	6%	24%	54%	56%





Sources: Japan Geotechnical Consultant Association, FAO, WRI, Partnership for the East Asian - Australasian Flyway, Ministry of the Environment

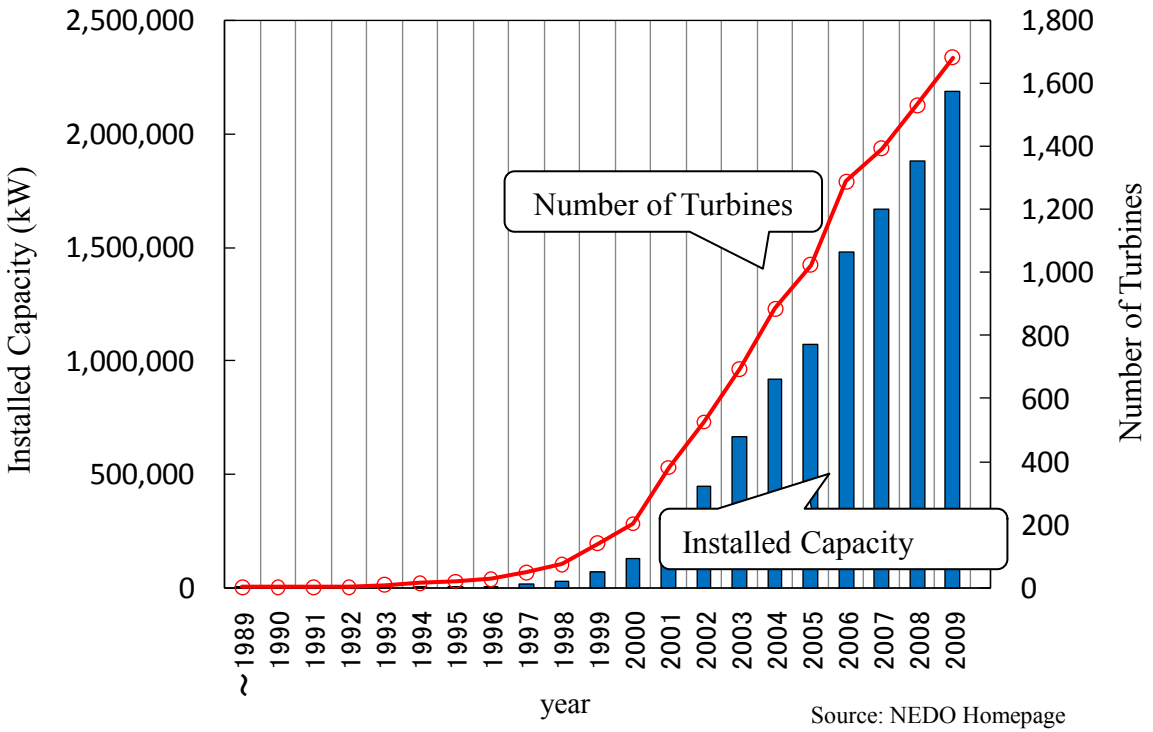
2-2&2-3. Relation to Global Warming Prevention and Status of Installation

- Anticipation for renewable energy sources is rising due to the required target of the elimination of greenhouse gases, as well as the effects of the Great East Japan Earthquake.
- From now on, it is extremely important for wind power generation facilities to carry out transparent EIAs where appropriate and give even more focus to protecting the environment, in order to accelerating the installation of renewable energy and promoting global warming prevention measures.
- In the year 2009, a new capacity of 306,000 kW (152 units) began operation in Japan, and by the end of 2009 wind power generation accounted for a total of 2,190,000kW (1,683 units). In recent years, both the rated output per unit and the total output of a single project are showing an increasing trend.

<Renewable Energy Implementation Targets, Etc.>

- "Basic Energy Plan (finalized in 6/2010 Cabinet meeting)"
  By the year 2020, the target is for renewable energy to account for 10% of primary energy sources
- "Practical Measures and Enforcement for Fulfillment of Mid- to Long-Term Greenhouse Gas Elimination Targets (Intermediate Stage) (12/2010)"
  The capacity of installed wind power generation by 2020 is forecast to be 11,310,000 kW.

<Shift of Cumulative Installed Capacity and Number of Units in Japan>



Source: NEDO Homepage

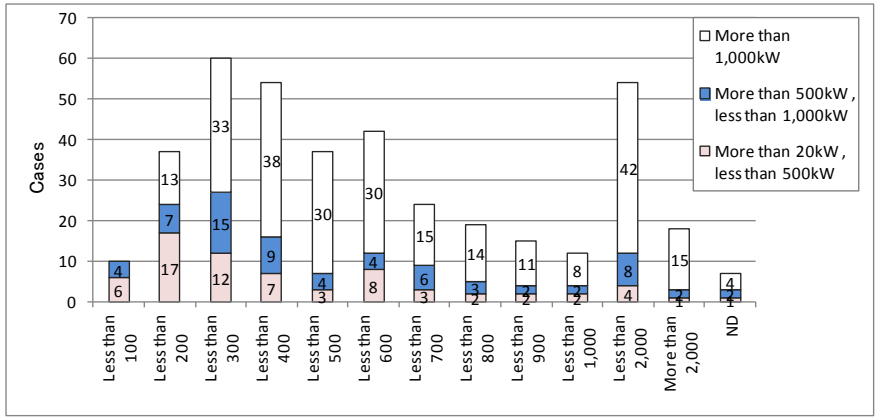
3. Status of Major Environmental Impacts due to Wind Power Generation Projects (1/2)

- Noise, Low-Frequency Sound

- Complaints were received at 64 wind power generation facilities.
- Rate of Complaints Received from Residents within 600 meters of Wind Turbines

Total Output Capacity	Rate of Facilities Received Complaints
• 5,000 - 10,000 kW :	27%
•10,000 - 15,000 kW :	38%
•15,000 - 20,000 kW :	44%
•20,000 - 30,000 kW :	69%

- Distance from Wind Turbines to Nearest Residence:
  - Under 300m: 107 Cases (28%)
  - 300m - 500m: 91 Cases (23%)
  - 500m - 1,000m: 112 Cases (29%)
  - 1,000m and farther: 72 Cases (19%)

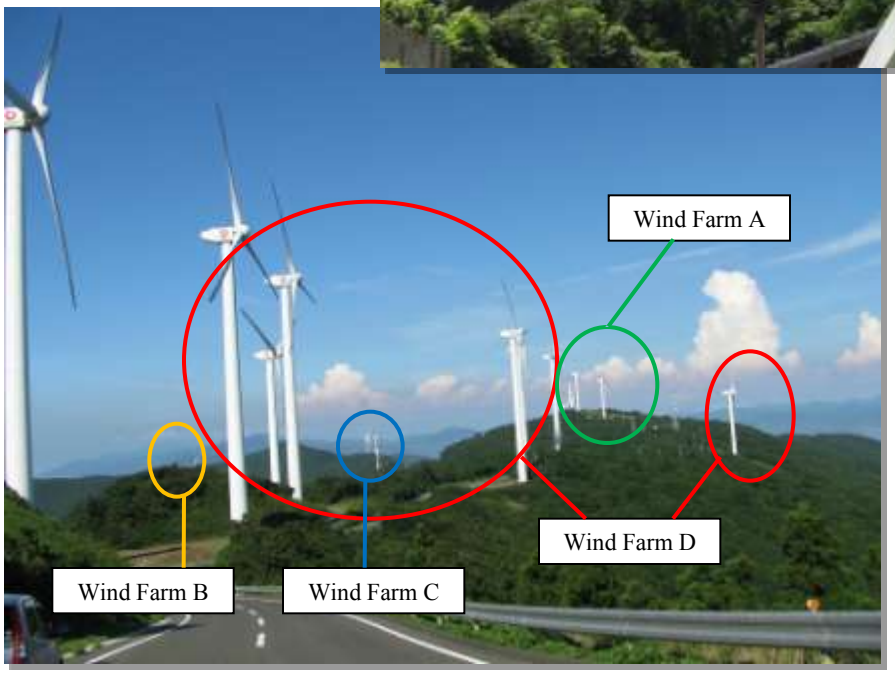


Source: Ministry of the Environment

- Landscape

Example of a wind turbine as seen from nearby residence (right)

Example of multiple wind turbines in one view (below)



Source: Ministry of the Environment (Photos are from Sadamisaki, Ehime Prefecture)

3. Status of Major Environmental Impacts due to Wind Power Generation Projects (2/2)

- Land Alteration (Impacts on Plants, Animals, Ecosystems and Water Environment)

Concerns of soil runoff and other impacts on natural environment due to construction of access roads for installation of wind turbines in areas such as mountain ridge

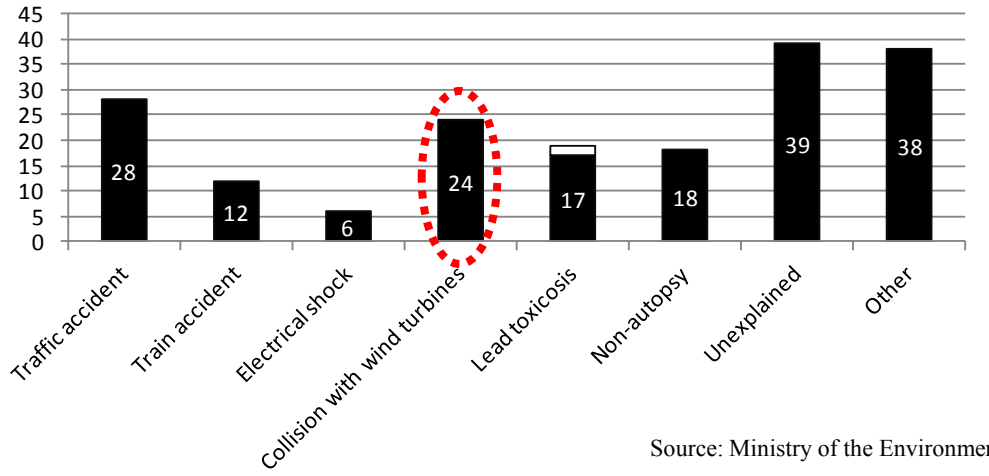
Source: Website of the relevant wind farm

(For reference)
Scale of land alteration areas
・Approx. 5 ha per 10,000 kW of wind power generation
・Approx. 3.3 ha per 150,000 kW of thermal power generation

- Bird Strikes

Source: Ministry of the Environment

The 2nd most common identifiable causes of injury/disease to white-tailed eagles (*) is “collision with wind turbines”(in Hokkaido)



Source: Ministry of the Environment

*White-tailed eagles are classified as an endangered species (as per the Ministry of the Environment Red List), a national Endangered Species of Wild Fauna and Flora (as per the Act on the Conservation of Endangered Species of Wild Fauna and Flora), and a protected species (as per the Act on Protection of Cultural Properties)

4. Current EIAs for Wind Power Generation Projects

<Local Governments Requiring EIAs for Wind Power Projects by Ordinance>

Local Government	Criteria of EIA Requirement
Fukushima Prefecture	-Class 1 Projects: -Total output 10,000 kW and over, or 15 turbines and over - Class 2 Projects: Total output 7,000 - 10,000 kW, or 10 - 14 turbines
Nagano Prefecture	Total output 10,000 kW and over
Shiga Prefecture	Total output 1,500 kW and over
Hyogo Prefecture（Kobe City）	- Uniformly in the prefecture: Total output 1,500 kW and over - Natural parks and other special protected areas: Total output 500 kW and over
Okayama Prefecture	Total output 1,500 kW and over
Nagasaki Prefecture	Total output 15,000 kW and over, or 10 turbines and over
Niigata City	- General areas: Total output 10,000 kW and over - Special-attention areas: Total output 6,000 kW and over

※As of May 2011, the number of Local Governments where wind power generation projects are governed by ordinances, or which have plans to make them so, remain at approximately half of the total (Questionnaire survey by Ministry of the Environment).

<Voluntary Evaluation of Environmental Impacts>

- In association with subsidization, EIAs are carried out according to the NEDO Manual.
- The NEDO Manual is considered to be applicable for a total output of 10,000 kW and over. Under certain limitations, it describes prediction and assessment methods, sharing of information to relevant Local Governments, and monitoring of environmental impacts during operation.

<Foreign Countries Requiring EIAs for Wind Power Projects by Law>

Country	Criteria of EIA Requirement
USA	Over 50,000 kW (Common for all power plants) *1
France	Tower height over 50 m *1, 3
S. Korea	100,000 kW and over
Spain	50 turbines and over; for Ramsar Convention wetland areas, 10 turbines and over *2
Netherlands	15,000 kW and over, or 10 turbines and over (screening)
Portugal	20 turbines and over; for Ramsar Convention wetland areas, 10 turbines and over (screening)
Italy	1000 kW and over *2
United Kingdom	3 turbines and over (screening)
Denmark	4 turbines and over, or overall height over 80m *2, 3
Germany	50 m and over 20 turbines and over 6～19 turbines (general screening) 3～5 turbines (simplified screening)
Canada	New facility (simplified assessment)
China	50,000 kW and over *1

*1: Facilities smaller than the thresholds of EIA requirement undergo simplified EIAs
*2: Facilities smaller than the thresholds of EIA requirement undergo screening
*3: For a rated plant output of 2,000kW, the tower height is approx. 60～80 m, and the overall height is approx. 90～120 m

Source: Government websites of respective countries

5-1. Index of Criteria of EIA Requirement

- For power generation projects excluding nuclear power plants, total plant output is used as the index.
- Number of units can be used as an alternative, but this will not applicable to the recent trend towards larger-scale wind turbines.

"Based on the view for consistency of the regulations and simplicity, it is considered most appropriate to use the total plant output as the index."

5-2. Criteria of EIA Requirement

<Relation to Local Ordinances>
Since there are cases where the criteria are not determined below the threshold stipulated by the EIA law, **a national minimum standard should be set.**
<Relation to Voluntary Actions>
Consistency with the NEDO Manual (10,000 kW and over) should be considered.
<Occurrence of Complaints>
Complaints received relating to noise and low-frequency sound **increase to nearly 40% starting from a capacity of 10,000 kW.**
<Impact on Plants, Animals and Ecosystems>
Considering the vulnerability of plants and animals in the sitting locations, **geothermal power generation (10,000 kW), which is similar to wind power**, should be referred to. **Wind power of a scale (10,000 kW) with land alteration area comparable to that of thermal power (5ha)** should be considered.
<Relation to Coverage Ratio>
The coverage ratio of other power generation projects at the time of legislation **(thermal 97%, hydroelectric 84%) should be referred to. (wind power 10,000kW: 80%)**

"As it is the scale at which environmental impacts become significant, the criteria should be set at 10,000kW. ・・・

<Relation to Energy Policies>
The criteria that can meet the implementation targets of the Basic Energy Plan is necessary. Also considering the influence of the Earthquake, **it should be between 20,000 to 30,000 kW or 50,000 kW.**

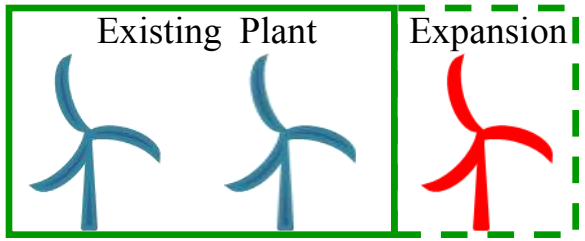
However, there was also the opinion that taking into account the promotion of renewable energy, the criteria should be 20,000kW and over

<Noise, Low-Frequency Sound>
From even a single turbine, actual claims of health hazards are being received.
<Bird Species>
There are actual examples of **collision deaths of rare bird species** from **1,000～2,000 kW capacities and higher.**

In addition, considering the actual cases of negative impacts due to noise, low-frequency sound, and bird strikes, another opinion was that the criteria should be 5,000 kW or less

5-3. Other Items Relating to Criteria of EIA Requirement

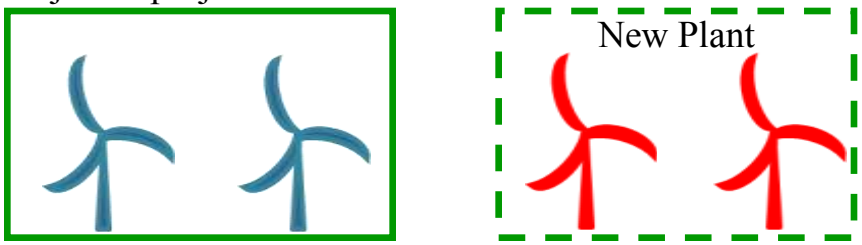
<Plant Expansion>



Plant expansion projects should be subject to the same criteria of EIA requirements as new projects.

<Cumulative Impacts from Multiple Projects>

Adjacent project under construction



In the screening process, if adjacent wind power generation plants with overlapping construction schedules, treated as a collective plant, exceed the criteria of EIA requirement of Class 1 project, EIAs shall be conducted.

<Offshore Wind Power>

All domestic instances of offshore wind power generation facilities are sited close to land.

No specific criteria of EIA requirement are necessary.

Source: Ministry of the Environment

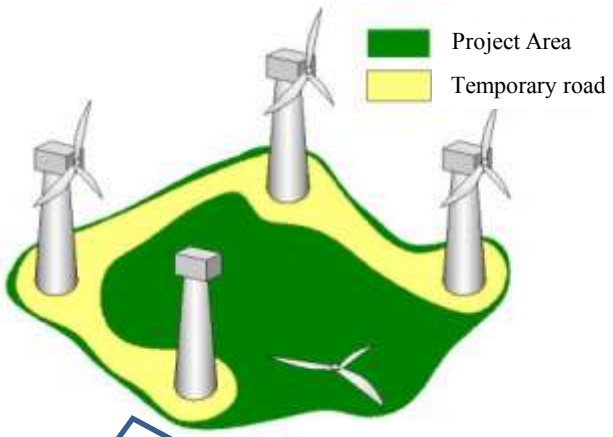
- Criteria of EIA requirement based on area characteristics:
  - ➢As a Class 2 project, screening appropriate to the conditions of the area should be carried out.
  - ➢If the characteristics of the region require certain measures, they should be carried out based on local ordinances.
- Projects less than Criteria of EIA requirement:

  Even if projects are less than the criteria of EIA requirement indicated by the law or ordinances, voluntary EIA should be actively carried out.

6. Basic Concept on Project Area and Item Selection of EIA Study

<Project Area of EIAs>

<Example of Conventional Project Area of EIAs for Wind Power Generation Plants>



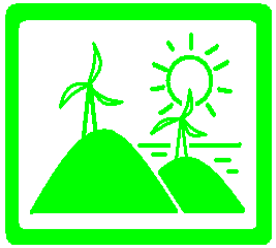
Source: NEDO Manual

In addition, access roads and waste soil disposal sites should also be included, the same as with other power generation projects.

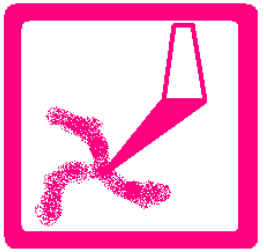
- Environmental impacts that occur during construction should also be evaluated (not only impacts during operation).
- Municipalities of potential environmental impact should be determined in more expanded area to carry out public hearings.

<Specific Examples of Assessment Items>

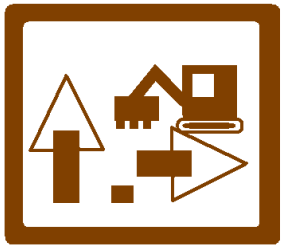
Noise, low-frequency sound



Landscape



Shadow flicker



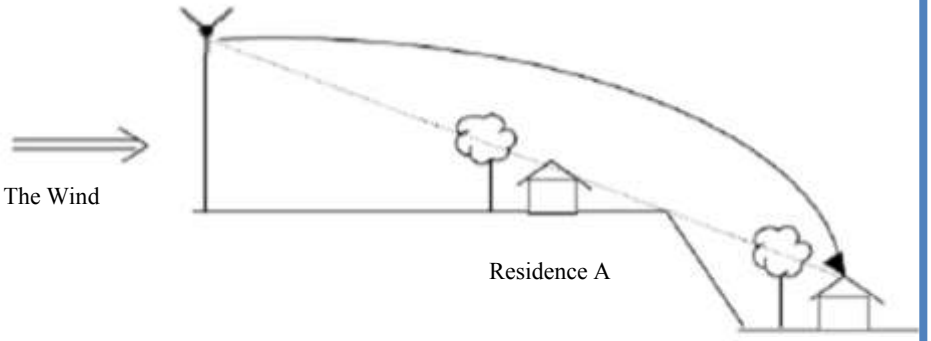
Plants, animals and Ecosystems

It is important to narrow down the assessment items depending on the area characteristics, and to conduct effective and efficient EIAs.

7. Basic Concept on Baseline Survey, Prediction, and Assessment Methods (1/2)

(1) Noise, Low-frequency sound

Since the natural sound from the wind reaching Residence B is softer than A, it should be included in the locations for survey and prediction.

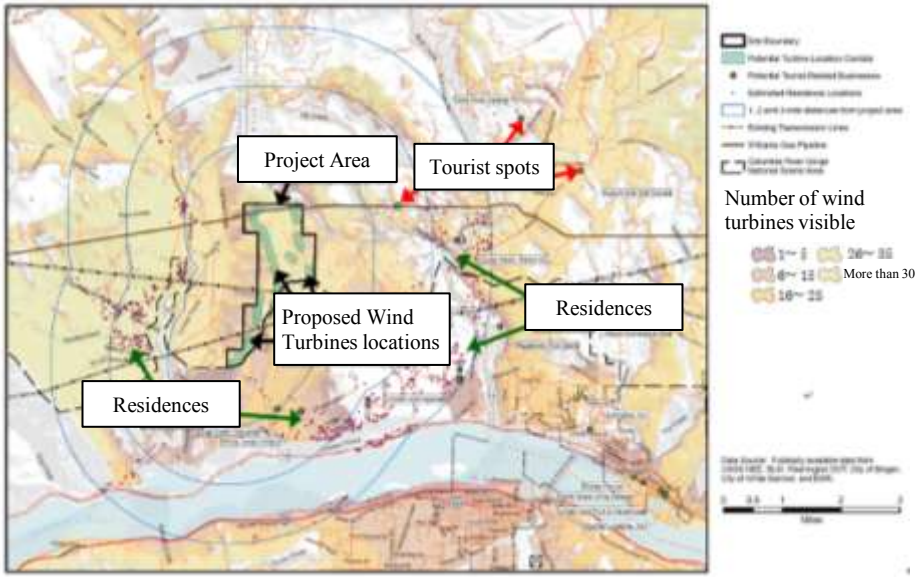


Source: Environmental Impact Assessment Guide for Wind Power Generation (France)

- Survey method: Measurement of A-weighted and C-weighted sound pressure levels, and of sound pressure levels at each 1/3 octave band.
- Prediction method: Carry out for wind conditions with maximum level of impact.
- Assessment method:
  - ➢Analyze how much noise level will increase over current conditions.
  - ➢Evaluate adjustment of installation locations , changes in rated output, etc.
- Follow-up monitoring: As necessary, monitor the status of noise and low-frequency sound generation, sound reaching local residences, and impacts on local citizens, and consider appropriate mitigation measures.

(2) Landscape

Example: Prediction of Visible Turbines from Residences



Source: Whistling Ridge Energy Project（USA）

- Study area: If there are natural parks in the vicinity, evaluate impacts to the visual landscape as seen from these key viewing areas.
- Investigate historical or cultural landscape resources that are integrated with the natural environment.
- Mitigation measures: Consider locations, height, color, etc. of wind power generation facilities.

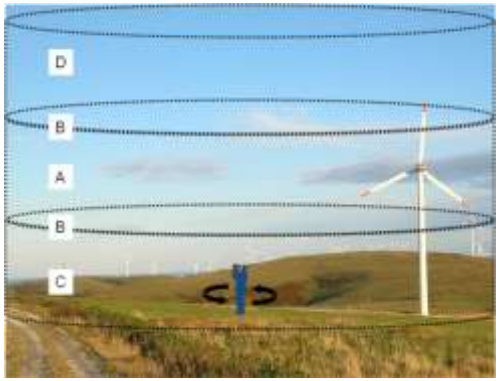
7. Basic Concept on Baseline Survey, Prediction, and Assessment Methods (2/2)

(3) Animals, plants and ecosystems

- Survey period:
  Obtain information from all seasons.
- Survey method:
  Carry out site surveys using methods depending on the characteristics of individual animals/plants and ecosystems.

- Mitigation measures:
  When planting, avoid using exotic species and instead use species native to the area.
- Follow-up monitoring:
  As necessary, understand the conditions and consider appropriate measures based on the monitoring results.

Example of Flight Space Investigation for Bird Strikes



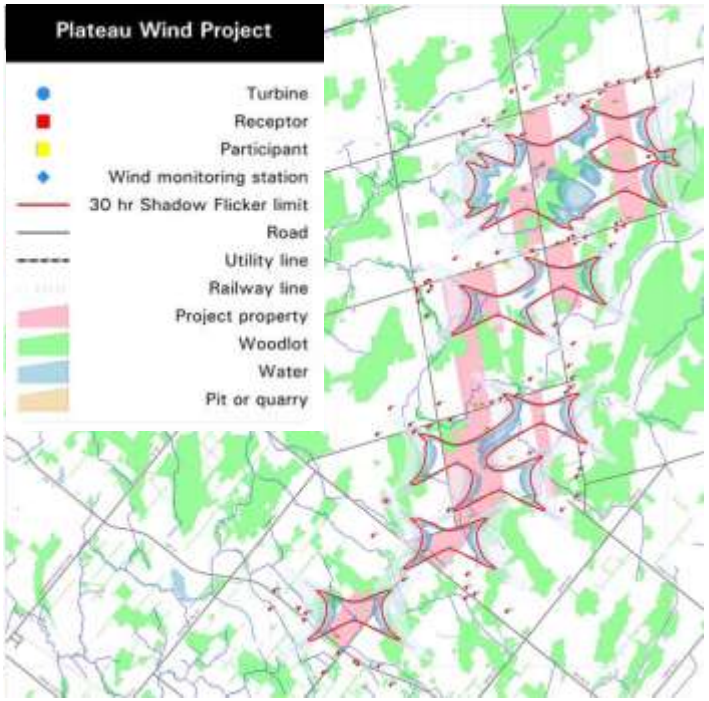
Source: Ministry of the Environment

Example of Impacts for Prediction and Assessment

Direct Impacts	Indirect Impacts
• Disappearance and isolation of habitats and growing environments of flora & fauna due to land alteration • Bird strikes	• Interference with migration routes of bird species, etc. • Contamination of water body due to land alteration

(4) Shadow flicker

Example of Predicted Limit of 30 Hours per Year of Shadow Flicker



Source: Gray Highlands Plateau Wind Farm (Canada)

- Mitigation measures:
  - ➢Changes in facility location or number of turbines
  - ➢Shutdown during time periods in which shadow flicker would occur
  - ➢Optically block shadows (such as curtains or plantings) etc.

8. Future Challenges

< Collection and Utilization of EIA-Related Information >

The national government should promote collection and utilization of ecosystem-related and other information, and while securing a certain level, should accelerate and facilitate EIA process,

Collection and analysis of the follow-up monitoring data, and training of personnel to conduct EIAs of wind power generation projects, will be required.

< Technology Development >

Development of technology to eliminate or reduce noise, etc.

< EIAs for Offshore Wind Power Generation Projects >

Accumulation of further knowledge of offshore wind power generation projects, and application of examples in foreign countries.

Source: Ministry of the Environment

- Adjacent projects whose construction schedules do not overlap: In the screening process, even if adjacent projects do not overlap in construction schedule, appropriate measures should be examined to consider them as an "integrated project".
- Demolition of wind power facilities: Demolition and other activities during the operation phase are exempt from the EIA law; however, depending on necessity, appropriate measures concerning the landscape should be considered, while referring to examples in foreign countries.
- EIAs for power transmission lines: Appropriate measures for transmission line towers and existing power lines should be taken in accordance with local ordinances.

9. Conclusion

- Complaints over various environmental impacts concerning wind power generation including the facilities have led to numerous cases where construction was rendered unable to proceed. By adding them to the target projects that require mandatory EIAs under law, however, transparent EIAs can be assured, understanding of citizens can be further enhanced, and sound installation of wind power facilities in harmony with the environment can be promoted.
- Wind power projects, since stricter selection and narrowing down of their EIAs is possible, as a promotion of renewable energy source and as a global warming prevention measures, are strongly desired.
- Although wind power is in the spotlight as a clean energy source, its image in certain regions shows signs of having worsened. By ensuring efficient and appropriate EIAs, it is anticipated that it will reclaim its rightful position as an important source of clean energy.

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