Environmental Assessment Policy for Vertiport Project

Environmental Assessment Policy for Vertiport Project Table of Contents

(1) About this policy

(1) 1. Objectives and status of this document

■Vertiport, a takeoff and landing site for eVTOLs

Under the Civil Aeronautics Act of Japan, a vertiport is categorized as a kind of heliport.
As with heliports, they are subject to environmental assessment depending on each ordinances of local government in Japan.
eVTOLs are considered to have different characteristics from helicopters and require assessment tailored to their characteristics.

The status of this document

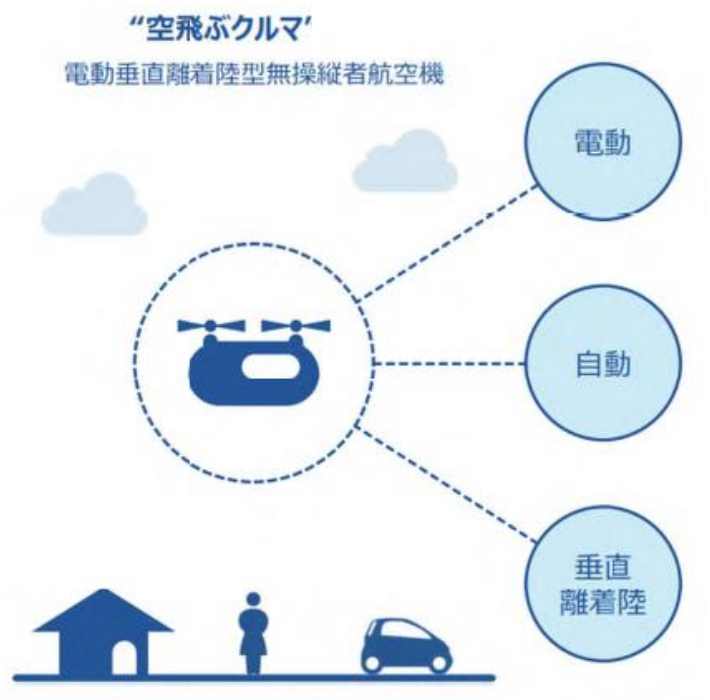
This document presents certain ideas on the study items, forecasting and evaluation methods, etc. for EIA study for the Vertiport project, based on the characteristics on environmental impact of the eVTOL.
At the time this policy was formulated, the aircraft was still under development, eVTOLs had not yet been realized except in some cases, and the information that could be collected was quite limited. Therefore, this document is only a presentation of ideas based on information that could be collected at this moment, and it is assumed that the direction will be appropriately revised in accordance with future progress in the social implementation of eVTOLs.

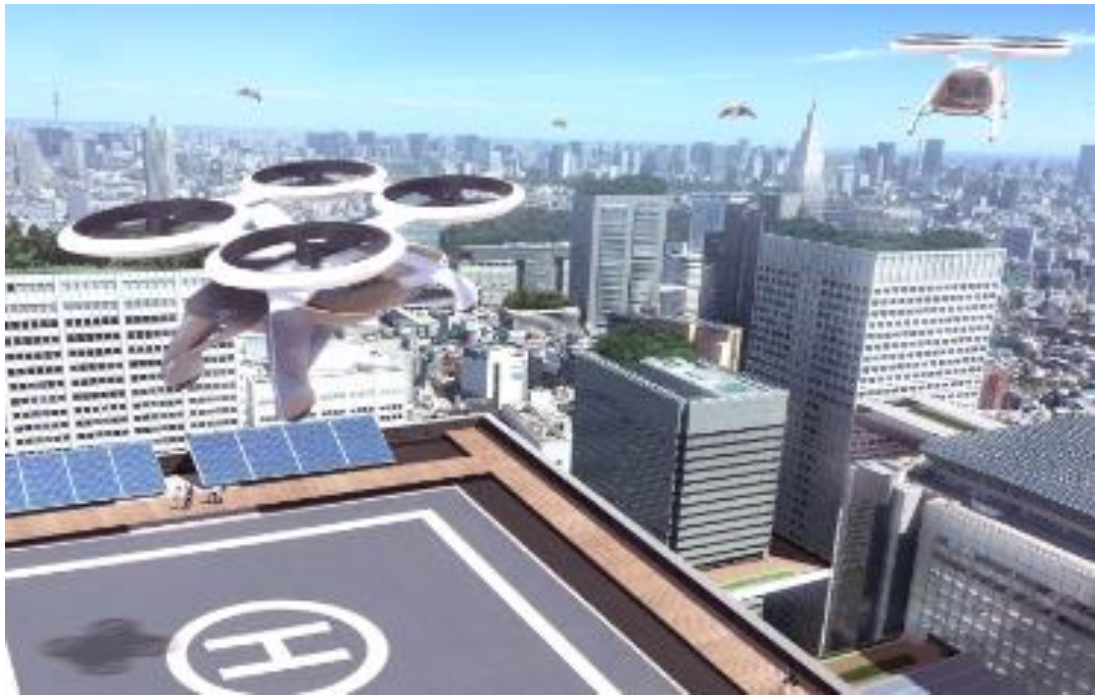
*All items related to eVTOLs in this policy, including those not mentioned, are based on the Concept of Operations for Advanced Air Mobility (ConOps for AAM), a public-private consortium for a revolution in air mobility.

(2) Outline of the target project

(2) 1. About eVTOLs and Vertiport

The term “soratobu kuruma" is defined as "an easy-to-use, sustainable, next-generation means of air transportation that is made possible by electrification, automation, and other aeronautical technologies, as well as by vertical takeoff and landing and other modes of operation. In other countries, it is called Advanced Air Mobility (AAM) or Urban Air Mobility (UAM), and this policy also follows this definition (eVTOL* is used in this document).
eVTOL is categorized as an aircraft under the Civil Aeronautics Act of Japan, and therefore, in accordance with Article 79 of the Act, its port must, in principle, be at "airports" licensed by the Ministry of Land, Infrastructure, Transport and Tourism. Vertiport" is one of these "airports, etc." and is a type of "heliport" that is dedicated to vertical takeoff and landing aircraft.

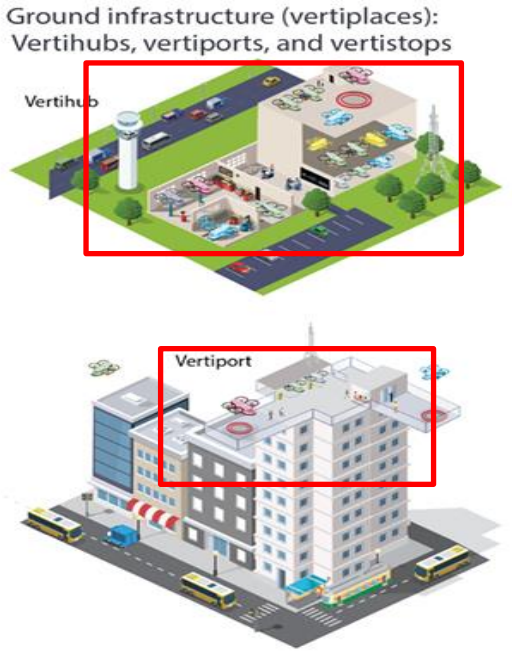




“soratobu kuruma” are not necessarily limited to electric vehicles; hybrid vehicles with internal combustion engines and hydrogen fuel cells are also being contemplated. However, at the time this policy was formulated, most of the information that could be collected was for eVTOLs, so this policy focuses on eVTOLs.

(2) 2. About Vertiport

Vertiport may vary widely in size, depending on the role it is required to play and the facilities it is equipped to provide. The following is a summary of the maintenance image for each type of Vertiport as defined by NASA.



Source: Deloitte analysis.

Vertihub

- Facilities in the largest category
- Extensive maintenance, repair and overhaul (MRO) capabilities
- It will have passenger facilities similar to those at an airport, including retail facilities and passenger screening facilities, as needed.

Vertiport

- Compared to Vertihub, Vertiport does not have a heavy overhaul (MRO) facility
- Vertiport will have multiple pads, but one or two main takeoff/landing areas
- Energy infrastructure needs are high, but not as high as Vertihub, limited to fast charging and battery replacement

Vertistop

- The smallest element of the Vertiport network
- Includes one takeoff and landing area with one or two pads
- Assumption that overhaul (MRO) facilities are scarce or non-existent

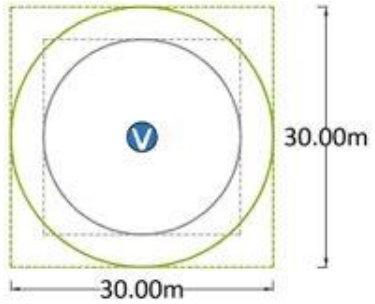
From "NATIONAL AERONAUTICS AND SPACE ADMINISTRATION Advanced Air Mobility (AAM) Vertiport Automation Trade Study

(2) 2. About Vertiport

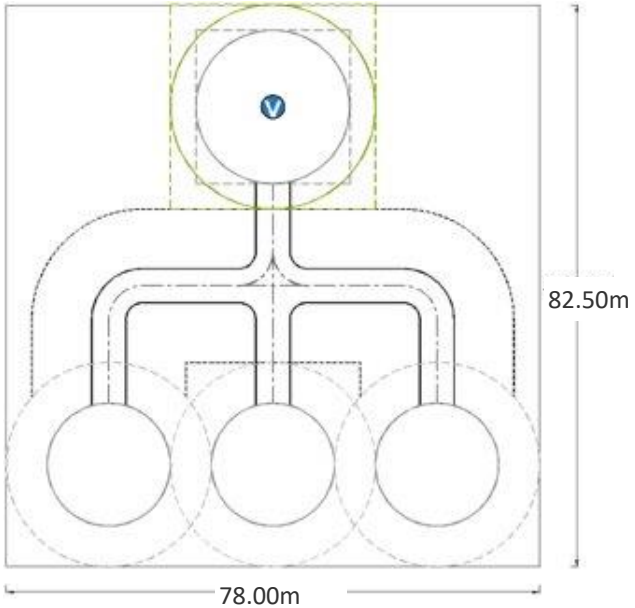
■The scale of VP (Assuming D value = 15 m)

Below is an estimate of the scale of the VP. As the number of FATOs and stands increases, the size of VPs will also increase. In addition, if recharging facilities and other facilities other than those assumed in each pattern are developed based on location conditions, constraints, operational methods, etc., the scale of the recharging facilities and other facilities is also expected to increase.

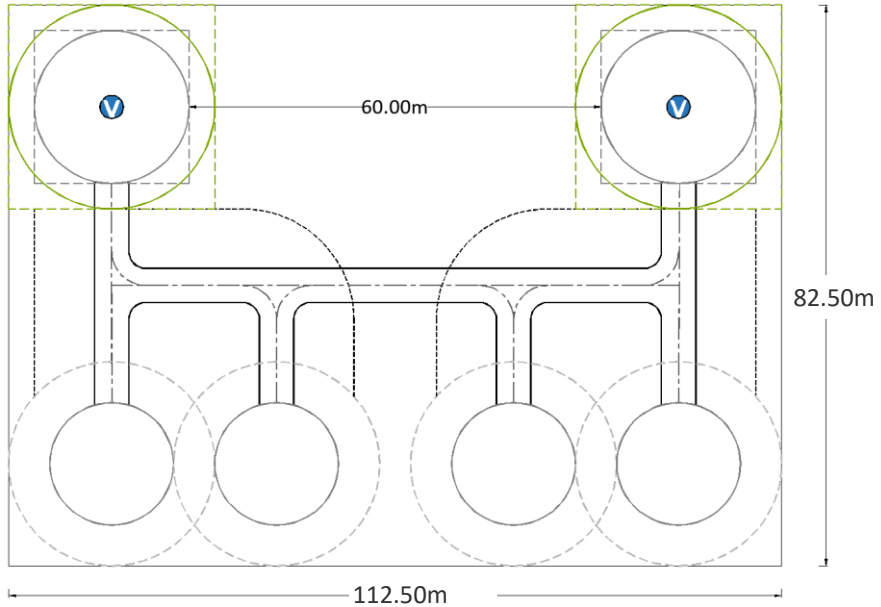
Pattern 1: Approx. 900m2~.
FATO 1 facility



Pattern 2: approx. 6,400m2~.
FATO 1 facility
3 stand facilities



Pattern 3: approx. 9,300m2~.
FATO 2 facilities
Four stand facilities



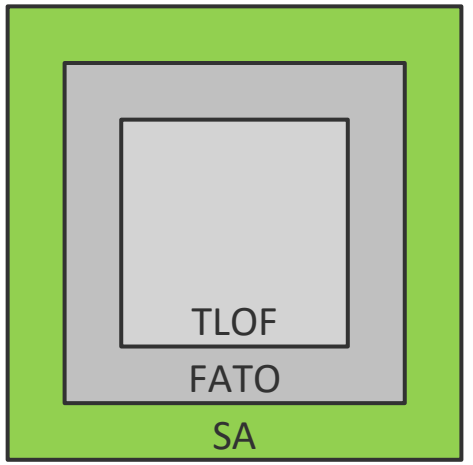
*All of the above assume the case where a Safety Area that should be set up outside of FATO and FATO is set up as a structure.

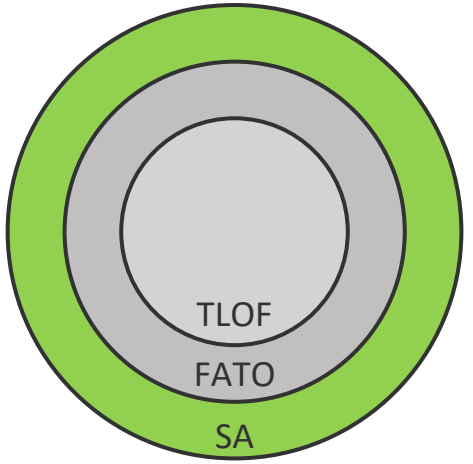
Sample layouts were created with reference to the Planning & Design Guidelines for Vertiport (December 2023, Civil Aviation Bureau, Ministry of Land, Infrastructure, Transport and Tourism)

(2) 2. About Vertiport

■ Outline of Vertiport (Planning & Design guidelines)

Facilities, etc.	terms	VP Maintenance Guidelines
TLOF: Touch-down and Lift-Off area	earth	Dimensions specified in AFM, etc., or 0.83 D, whichever is greater
	overhead structure	Dimensions specified in AFM, etc., or 1.0 D, whichever is greater
FATO: Final Approach and Take-Off area	Length & Width	Dimensions specified in AFM, etc., or 1.5D, whichever is greater
SA: Safety Area	width	Greater than 3.0 m or 0.25 D from FATO edge
station (e.g. gas station)	D-value based	Diameter 1.2 D
	airframe dimension base (Assuming ground driving)	Clearance according to VTOL aircraft dimensions + overall fuselage width
Stand protection area	D-value based	0.4 D from outer edge of stand
Taxiway width		At least twice the width of the accretion device
Taxiway strip width	free-floating (train, bus, etc.)	At least 1.5 times the maximum fuselage width
	Hovering movement	At least twice the maximum fuselage width





*D: Diameter of the smallest circle surrounding the projected plane of the aircraft

AFM: Flight Regulations

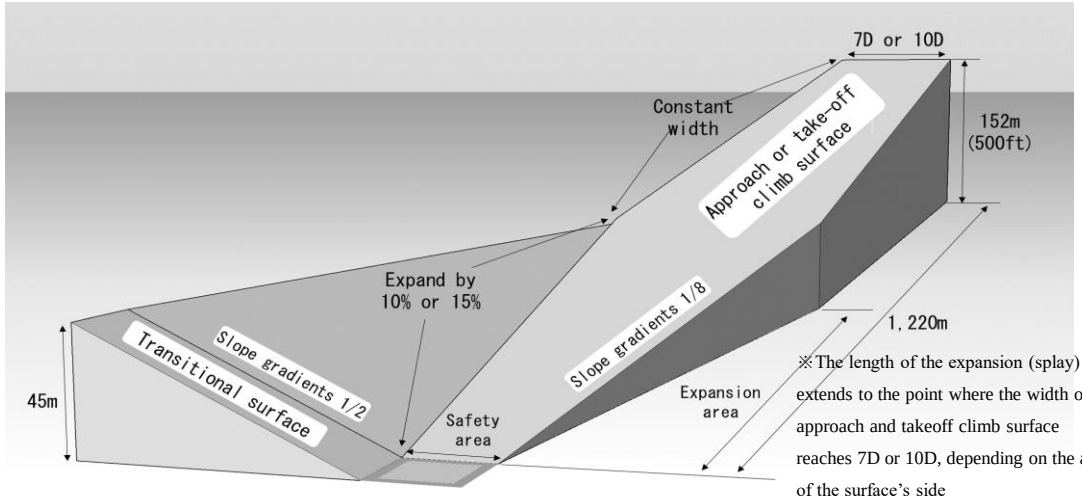
Planning & Design Guidelines for Vertiport (December 2023, Civil Aviation Bureau, Ministry of Land, Infrastructure, Transport and Tourism)

(2) 2. About Vertiport

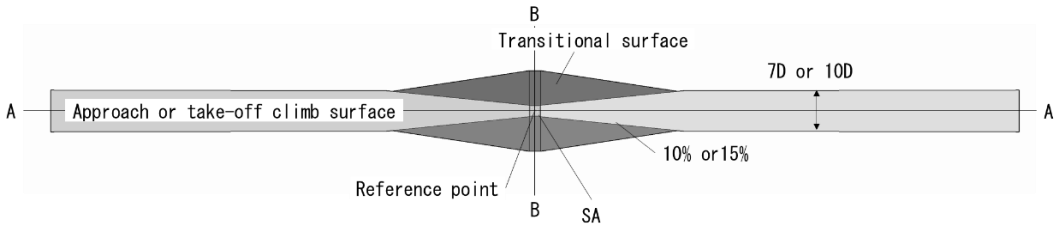
■ Outline of Vertiport (Planning & Design guidelines)

Table 3.1.1 Dimensions and Slopes of the Obstacle Limitation Surfaces

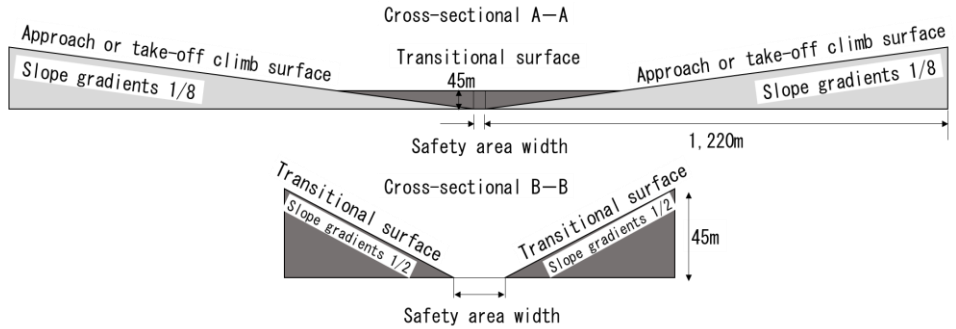
Operating conditions	Approach and takeoff climb surfaces						Transitional Surface	
	Length of projected plane	Width of inner base	Max. width	Splay angle of the width against center line of approach/takeoff climb surface	Horizontal slope gradient	Height of the edge	Horizontal slope gradient	Height from FATO elevation
Daytime only	1,220m	Same width as SA	7D Value	10%	1/8	152.5m	1/2	45m
Including nighttime			10D Value	15%				



(a) Isometric view of approach or takeoff climb surface and transitional surface



(b) Plan view of approach or takeoff climb surface and transitional surface



(c) Cross-sectional view of approach or takeoff climb surface and transitional surface

Vertiport Maintenance Guidelines (December 2023, Civil Aviation Bureau, Ministry of Land, Infrastructure, Transport and Tourism)

(2) 3. Organize noise characteristics, etc.

■ Aircraft types and noise characteristics by each type

The range, cruise speed, and size of the aircraft tend to vary by aircraft type, but are comparable or lower than those of helicopters.

The noise level is expected to be lower than a helicopter.

Table Noise characteristics by aircraft type

Airframe type	summary	Example of aircraft manufacturer	cruising range	cruising speed	Airframe weight	Overall width of fuselage (D value)	Published noise level*.
Multicopter type	An aircraft with multiple propellers for both ascent and flight. No wings.	SkyDrive(Japan) Volocopter (Germany) Ehang (China)	approximately 15 ~35 km	Approx. 100 ～130 km/h (~130 km/h)	Approximately 900 ～1,400 kg	approximately 11 ~13 m	at cruise Less than 65dBA During takeoff, landing and hover 65 to 75 dBA max.
Vectored thrust type	A fixed-wing aircraft that uses the same propeller for both ascent and flight, and changes propeller direction during ascent and flight. Also called a tilt rotor.	Joby Aviation (U.S.) Archer Aviation (U.S.) Vertical Aerospace (UK) Lilium Jet (Germany) Wisk Aero (U.S.)	Approximately 160 ~300 km	Approx. 240 ～320 km/h	Approximately 900 ～1,400 kg	approximately 11 ~15 m	
Lift & cruise type	It has fixed wings and uses different propellers for ascent and flight, and the propellers are fixed.	Beta Technologies (U.S.) Eve Embraer (Brazil) teTra Aviation(Japan) Airbus (France)	Approximately 80 ~ 460 km	Approx. 120 ~250 km/h	Approx. 1,800 ～3,200 kg	Approx. 15 m	
(Reference) helicopter	For twin turbine	-	Approx. 420 ~780km	Approx. 230~. 291km/h	Approx. 2,980 ~6400kg	Main rotor blade diameter Approx. 10.2-14m	the skies 84-96.1 (EPNLdB)

*Only the figures that are published are shown.

(2) 3. Organize noise characteristics, etc.

■Evaluation of aircraft noise around airports (environmental qauality standards for aircraft noise)

For the evaluation index (standard) related to noise around airports, energy-based evaluation values have been adopted for both overseas and Japan. (On the other hand, aircraft noise certification is evaluated using EPNL values that take "noisiness" into account.

Table Assessment of Noise around Airports

subject of an investigation	Standards, etc.	valuation basis
Japan	Environmental Quality Standards for Aircraft Noise (Environment Agency of Japan Notification No. 154, December 27, 1973, amended in 2007)	Category I (areas used exclusively for residential purposes) 57dB or less Category II (other than I, preservation of normal life) 62dB or less The day--evening-night average sound level (Lden)
Reference ICAO/ Guidance on the Balanced Approach to Aircraft Noise Management	Assembly resolution A37-18: Consolidated statement of continuing ICAO policies and Practices related to environmental protection (Sep.-Oct. 2010)	[Chapter 3]:Assessment of the noise situation at an airport Lden (day-night average sound level) *No specific reference values are indicated. The following applications are illustrated as case studies Residential area 60-65 dB Agriculture/Industry 65-70dB Airport-related activities 75 dB and above
Reference US/CFR 14 Part 150: Airport Noise Compatibility Planning	Appendix A: Noise Exposure Maps Part A, Sec. A150.5 Noise measurement procedures & equipment	[Appendix A]: Noise Exposure Maps Part B, Sec. A 150.101 Table-1 (Annual) Land Use Conformance by Ldn. Example: Residence other than mobile or lodging Less than 65 dB-Ldn Public service facilities 65-70 dB-Ldn

(3) Selection of the items for environmental assessment Study

(3) 1. Environmental impact assessment items

When a Vertiport (hereinafter referred to as "VP") is subject to EIA study, it is not a project subject as per the Environmental Impact Assessment Act (airport), but a project subject to the EIA study under the Ordinance of local government, and the scale to which it is subject is determined by each ordinance.
The categories of impact factors in EIA study are as follows, and in the installation of VPs, they are generally considered to be as shown in the column of detailed items, although they differ in each ordinance.

Table Environmental impact factors for each phase

Cause of Impact Category	Subtitle
Construction phase	Temporary impact from construction of land development, etc. Operation of construction equipment Operation of vehicles used to transport materials and machinery
Operation phase	Presence of VP Aircraft Operation Use of VP's facilities

(3) 2. Item selection in "Construction phase"

■ Item selection (construction phase)

Referring to examples of similar heliport projects and considering the project scale, few environmental items are selected during construction.
However, if the project scale is larger then the usual case, it is necessary to consider the selection of items for the implementation of the construction.

Explanation and Supplemental Information
■Reasons for selection of "Construction phase"
There are only 3 out of 9 cases (see reference) were projects selected for impact assessment study items related to "construction phase" among the cases of existing EIA report for heliport project.
The projects in the three cases are listed below, all of which are large scale.
Although the project scale of VP is unknown at this stage, it is considered to be the same or less than that of the existing heliport, and therefore, the selection of environmental impact assessment items for "construction phase" is basically unnecessary.
However, items that are considered necessary according to the regional characteristics of each municipality should be considered for selection regardless of the project scale.

Table Summary of projects for which assessment items related to "construction phase" have been selected (see reference material for project summaries in each case)

(data) item	Case No. 2	Case No. 4	Case No. 5
Business Overview	Heliport installation project involving reclamation of public watersheds	Rotor blade function relocation project	Helicopter Landing Strip Relocation Project (Voluntary Assessment)
Business Scale	Approx. 15 ha	Approx. 9 ha	Diameter 45m x 6 locations

(3) 2. Item selection in "Construction phase"

Explanation and supplemental information

■When construction work involves a certain large area

In the case of a project has a certain large area as shown in the case study, it is necessary to consider the selection of items for implementation of the project, taking into account the degree of impact of the project.

The selection of items shall be considered based on the circumstances of each ordinance and the characteristics of the project, with reference to the items listed below.

Table Selection Items for Cases Involving Construction Work on a Certainly Large Area

(data) item	Construction		
	Temporary impact from construction of land development, etc.	Impact from the construction machinery	Impact from the construction vehicles which used to material transportation
Air quality		note 1	note 1
Noise and Vibration		note 1	note 1
Water pollution	note 1		
Soil contamination	note 1		
Topographical and geological impacts	note 1		
Flora	note 2 (supplementary information)		
Fauna	note 2 (supplementary information)		
Ecosystem	note 2 (supplementary information)		
Solid waste	note 1		
Greenhouse gas	note 1		

*1 In cases where construction work is exceeding a certain amount of large area, this item should be considered for selection.

*2 If there are the area such as natural parks, places where habitats of valuable wildlife habitats have been confirmed, scenic spots, etc. which are should be protected and some project impact might be expected, this item should be considered for selection.

Notes of *1:

Some of the projects covered by each ordinance are determined by the size of the area and other factors, and it is considered necessary to consider the impact during construction if the project involves at least an area of development larger than those sizes.

Example:

For Okinawa Prefecture Land development 20 ha or more is eligible

Kanagawa Prefecture Housing land development 20 hectares or more is subject to

In the case of Osaka Prefecture Development activities 50 ha or more are subject to

In Yokohama City Urbanized area 20 ha or more

Within the urbanization control area 10 ha or more

(3) 2. Item selection in "Construction phase"

Explanation and supplemental information

■ Summary of each item

For each environmental element, the study, prediction, and evaluation will be conducted according to the classification of factors that will be affected by the implementation of the construction.

Table Summary of studies, forecasts, and assessments of EIA study items (construction phase)

EIA study items	Cause of Impact Category	summary
Air quality	Operation of construction equipment Construction Vehicle Driving	Investigate, predict, and evaluate the impact of nitrogen dioxide, suspended particulate matter, and other emissions from construction work (operation of construction equipment and driving of construction vehicles) on the area around the project site and other areas.
Noise and Vibration	Operation of construction equipment Construction Vehicle Driving	Investigate, predict, and evaluate the impact of noise and vibration from the construction work (operation of construction equipment and driving of construction vehicles) on the area surrounding the project site and other areas.
Water pollution	Construction of land development, etc.	Investigate, predict, and evaluate the impact of water pollution, such as turbid water, as a result of the implementation of construction work.
Soil contamination	Construction of land development, etc.	Investigate, predict, and evaluate the impact of soil contamination as a result of construction activities.
Topographical and geological impacts	Construction of land development, etc.	Investigate, predict, and evaluate the effects of topographic and geologic modifications that are considered significant for the construction work.
Solid waste	Construction of land development, etc.	Study, forecast, and evaluate the impact of waste and overburden generated as a result of construction activities.
greenhouse gas	Construction of land development, etc.	Investigate, forecast, and evaluate the impact of greenhouse gases generated by the operation of construction equipment and other activities from the construction work.

*As for the Flora and fauna, and Ecosystems are described in selection of items in operation phase on page 19.

(3) 3. Selection of items in operation phase

■ **Item selection (operation phase)**

Of the items selected in the similar heliport case study, "noise" was selected as an impact item, taking into account the characteristics of eVTOL, and "air quality," "odor," and "radio wave shadowing" were not selected as items.

Explanation and supplemental information

Noise is selected because it has been selected in all of the following heliport cases, and noise may also be generated by eVTOL.

Air quality and offensive odor are not selected because the aircraft is electrically powered and does not emit air pollutants.

Radio wave shadowing is not selected because it is considered unlikely that the aircraft will block TV signals.

In addition, items that are considered necessary according to the regional characteristics of each municipality should be considered for selection, regardless of the heliport examples below.

Table Examples of selected items for operation phase environmental impact assessment (see reference material for project outline of each case)

EIA study items	Subcategory	Case No. 1	№2	№3	№4	№5	№6	№7	№8	№9
Air quality			✓		✓					
Noise		✓	✓	✓	✓	✓	✓	✓	✓	✓
Infra sound			✓	✓	✓		✓			✓
Radio wave shadowing		✓						✓	✓	✓
Offensive odor			✓					✓		
Fauna			✓		✓	✓				
Flora					✓	✓				
Ecosystem			✓		✓	✓				
Landscape					✓					
Zones for recreational activities where people can access the natural environment					✓					
Greenhouse gas	Carbon dioxide				✓					
	Green house gases other than carbon dioxide				✓					
Disaster management		✓							✓	✓

(3) 3. Selection of items in operation phase

■ Item selection (Operation phase)

In selecting "flora", "fauna", "ecosystems", "bird strikes" ("fauna" in operation), "landscape", and "zones for recreational activities", consideration should be given to the surrounding environment of the porject site.

Commentary and Supplemental Information

■Consider selection based on the surrounding environment

Since VPs are expected to be installed in a various areas, from urban areas to city centers, rural areas, and remote islands, necessary items will be selected based on each ordinance and according to the surrounding environment.

Table Items to be selected according to the surrounding environment, etc.

(data) item	(Existence and use of land or structures)		
	Presence of VP	Aircraft Operation	Use of VP's facilities
Noise		✓	
Infra sound		*3	
Flora	* 2 (supplementary information)		
Fauna	* 2 (supplementary information)	* 2 (supplementary information)	
Ecosystem	* 2 (supplementary information)		
Landscape	* 2 (supplementary information)		
Zones for recreational activities where people can access the natural environment	* 2 (supplementary information)		
Greenhouse gas		*3	*3

2 If there are locations in and around the project site that are considered to require consideration with respect to the item in question in the existing data, and if the item is considered to have an impact, the selection of the item in question will be considered.

Explanation and supplemental information

The "areas that need to be considered" are assumed to be areas that clearly need to be considered, such as natural parks, areas where habitats of valuable wildlife have been confirmed in the existing data survey, and scenic spots, etc.

(e.g., areas with varying size requirements in ordinances)

In the Environmental Impact Assessment Ordinance of Saitama prefecture, Fauna and ecosystems are to be selected for heliports in "natural areas" (natural areas: areas where a variety of wildlife habitats such as forests and wetlands live and grow, and other areas with rich natural environments).

Bird strikes should be considered not only in areas with natural environments, but also in urban areas where there is information on nesting of rare bird speciesfrom the secondary data source, if necessary.

3: Items requiring attention are listed on pages 21-22.

(3) 3. Selection of items in Operation phase"

Explanation and supplemental information
Summary of each item
The study, prediction, and evaluation of each EIA study items shall be conducted according to the classification of factors affecting during operation phase.

Table Summary of studies, forecasts, and assessments of each environmental element (existence and use of land or structures)

EIA study items	Cause of Impact Category	summary
Noise	Aircraft Operation	Investigate, forecast, and evaluate the impact of noise from aircraft operations on the project site and surrounding area.
Flora (including terrestrial and marine areas)	Presence of VP	Investigate, predict, and evaluate the impact of the presence of VPs on plants and their communities growing in the surrounding area.
Animal (including land and sea areas)	Presence of VP	Investigate, predict, and evaluate the impact of the presence of VPs on the animals that inhabit the surrounding area.
Fauna (Bird strike)	Aircraft Operation	Investigate, predict, and evaluate the impact of aircraft operations on bird flight and breeding activity.
Ecosystem	Presence of VP	Investigate, predict, and evaluate the impact of the presence of VPs on the surrounding ecosystem.
Landscape	Presence of VP	Study, predict, and evaluate the impact of the VP's presence on the surrounding landscape.
Zones for recreational activities where people can access the natural environment	Presence of VP	Investigate, predict, and evaluate the impact of the presence of VPs on the surrounding area and on the opportunities for people to interact with nature.

*Excluding items marked as "*3" on the previous page (infra sound and greenhouse gases).

(3) 3. Selection of items in Operation phase"

■ **Animals (bird strike)**

Compared to other mobiles, it cannot be said that the possibility of generating bird strikes is low, so selection should be considered according to the surrounding environment and other factors.

Explanation and supplemental information
The frequency of bird strikes is assumed to vary depending on the vertical angle and speed of takeoff and landing, the size of the aircraft, and the frequency of takeoffs and landings.
The size and speed of the aircraft are expected to be similar to or less than those of a helicopter.
For angles during takeoff and landing, it is required to maintain a restricted surface (see p. 9), and for flight altitude, it is required to maintain at least the minimum safe altitude specified by the Civil Aeronautics Law.
Although it is assumed that the aircraft will fly at the same or lower altitude as helicopters for takeoff and landing, it is unclear at this time how the aircraft will be operated in actual operations.

Based on the above, it cannot be said that eVTOLs are less likely to cause bird strikes than helicopters at this time and should be selected as an item to be examined for its impact, if necessary.

(3) 4. Items requiring attention (low frequency)

■ Items requiring attention (infrasound)

Given the characteristics of the eVTOL aircraft, the possibility of low-frequency sound cannot be ruled out, but it is unclear whether all aircraft generate low-frequency sound, as the frequency characteristics generated vary from aircraft to aircraft.
It is difficult to ascertain the extent of the impact caused by the generation of infrasound at present.
Since there is insufficient material to determine whether or not selection is necessary, it cannot be determined to be unnecessary under this policy at this time.

Explanation and supplemental information
In a multicopter type aircraft, multiple rotor blades are driven at different speeds. Sounds with slightly different frequencies may produce a buzz (Beat).
It is thought that it is possible to control the rotational speed that causes the whirring in a vector thrust type aircraft, but it is assumed that such measures may be difficult to implement in other types of aircraft.
At this point in time, when the actual equipment has not been implemented, it is not known what frequency range and what level of infrasound is generated by each eVTOL aircraft, and therefore the degree of impact caused by infrasound cannot be determined.
The above indicates that there are many unknowns regarding whether or not low-frequency sound is generated, and if so, the extent of the impact, and therefore, a new study of this item is required after the development and implementation of each aircraft has progressed and the characteristics in the low-frequency sound range have been determined.

(3) 4. Items requiring attention (greenhouse gases)

Items requiring attention (greenhouse gases)
The eVTOLs covered by this policy are electric, and therefore do not emit greenhouse gases in operation.
On the other hand, some environmental assessments do not consider only emissions from the aircraft, but also the impact of greenhouse gases produced in the process of generating the electricity used.
At this point in time, there is little clarity regarding the power supply methods of each VP and the use of renewable energy sources, and the amount of electricity used by each aircraft is unknown. Therefore, there is insufficient material to determine whether or not selection is necessary at this point in time, so it cannot be determined that it is unnecessary under this policy.

Explanation & supplemental information
In the "Greenhouse Gas Emissions Calculation and Reporting Manual (Ver. 4.9) (April 2023) (Ministry of the Environment)," etc., the amount of CO2 emissions to be calculated is defined as "energy from the use of fuel and electricity supplied by others.
Although greenhouse gases are not specified by ministerial ordinance in environmental assessments for other mobility projects (roads, railroads, airports, etc.), some recent examples of environmental impact statements have examined the effects of greenhouse gases.
In the future, when the method of electricity supply and the degree of utilization of renewable energy sources in VPs, as well as the amount of electricity used in each aircraft, are clarified and the degree of impact on greenhouse gases is determined, this item will need to be examined again.

(3) 5. Others

■Safety

In some municipalities, "safety" is set as an assessment item in the assessment.
The term "safety" here refers to safety related to the operation of the aircraft (i.e., the effects of crashes, etc.).
For eVTOL operations, it is a prerequisite for the business that safety is ensured through operational standards and aircraft certification.
Considering the case of heliports as a si,ilar project, "safety" is not selected as an assessment item.
However, it should be noted that the safety of eVTOL operations is a matter of strong concern to local residents, and therefore, sufficient explanation is required.

Explanation and supplemental information
Out of the 20 municipalities that have EIA ordinance which is targeting the heliport project, 6 municipalities have "safety" as an item, but the content is related to hazardous materials and traffic (automobiles) safety.
In some EIA study had conducted predictive evaluations of the safety of helicopter operations in Kanagawa Prefecture and Yokohama City previously, but the predictions were based on safety standards and operational standards.(The current technical guidelines established by Kanagawa Prefecture and Yokohama City do not include any mention of "operational safety").
One of the requirement on airworthiness certificate is that the design must be able to ensure safety even after collisions with birds that may occur during flight.

(3) 5. Others

Of the 20 municipalities with heliports, only 6 have "safety" as an item, and the contents are related to hazardous materials and traffic (automobiles).

Table Summary of "safety" items in each ordinance

(data) item	Contents
Kanagawa prefecture	1 Hazardous Substances, etc. Safety regarding the following substances, etc. (1) Hazardous substances as defined in Article 2, Paragraph 7 of the Fire Defense Law (Law No. 186 of 1948) (2) High pressure gas as defined in Article 2 of the High Pressure Gas Safety Law (Law No. 204 of 1951) (3) Poisonous and Deleterious Substances Control Law (Law No. 303 of 1950) Specified Poisonous Substances2 Traffic safety in the area that changes due to the concentration of motor vehicle traffic in the traffic enforcement area.
Saitama City	Ensure safety against flammable liquids, flammable gases, toxic gases, specified chemical substances, radioactive substances, and other hazardous materials (hereinafter referred to as "hazardous materials, etc.")
Yokohama City	**Land stability: Slope collapse, ground deformation, etc. caused by land alteration or natural disasters such as earthquakes Flooding: (1) Flooding and inundation caused by changes in water volume due to land alteration (2) Inundation of facilities used by unspecified number of people Fire and explosion: (1) Fire and explosion caused by operation of facilities and equipment (2) Fire and explosion caused by natural disasters such as earthquakes (2) Secondary disasters such as fires and explosions caused by natural disasters such as earthquakes Leakage of hazardous materials: (1) Leakage of hazardous materials resulting from the operation of facilities and equipment (2) Secondary disasters such as leakage of hazardous materials caused by natural disasters such as earthquakes**
Sagamihara City	**Hazardous materials: Effects of leakage of hazardous materials, etc. due to implementation of the subject project Traffic congestion: Effects of traffic conditions due to concentration of vehicles, etc. due to implementation of the subject project Traffic safety: Effects of traffic safety on school routes, etc. due to implementation of the subject project**
Osaka City	Prevent traffic congestion caused by automobile traffic generated by the project, and ensure the safety of pedestrians, including the elderly and people with disabilities, and improve convenience and comfort.
Sakai City	**High-pressure gas Hazardous materials Traffic**

■ Characteristics and influencing factors according to the project location

If special considerations are required for the surrounding area, consider bird strikes if on rooftops or adjacent to existing airfields, and if on the ground, consider animals, plants, ecosystems, landscaping, and places for human-nature contact activities.
In the case of above-ground type VPs that involve the development of new land, consideration must be given during construction if the scale of the project is large.

Table Arrangement of environmental impact assessment items according to the project site location

project site	feature	under construction	post-service	For areas where consideration is needed
Rooftop Adjacent to existing	Installed on the roof of an existing building Adjacent to existing airfield, etc.	In principle, no selection	noise	Fauna(including bird strikes)
Ground (Small scale)	Ground level installation with new land development	In principle, no selection	noise	Fauna(including bird strikes), Flora, ecosystems, landscapes, and Zones for recreational activities
Ground (Large scale)	Ground level installation with new land development Construction work on a certain large area (e.g., the size subject to assessment under the area requirements set by each municipality, etc.)	Air quality, noise and vibration, water pollution, soil contamination, topography and geology, solid waste, greenhouse gases	noise	Fauna(including bird strikes), Flora, ecosystems, landscapes, and Zones for recreational activities

Excluding items marked as "*3" on p. 18 (infrasound and greenhouse gases).

(4) Research, forecasting, and evaluation methods

(4) 1. Basic approach to survey, forecasting, and evaluation methods

■ Research, forecasting, and evaluation methods

The basic survey, forecasting, and evaluation methods will be based on the technical guidelines for environmental impact assessment in the ministerial ordinances and each ordinance, as well as existing examples.

Explanation and supplemental information
Since the impact of VP during construction and operation is expected to be similar to that of other subject projects, it is possible to consider that the same methods of investigation, prediction, and evaluation can be used to study the impact of the project based on the environmental impact technical guidelines and existing examples of each ordinance.
However, the new mobility vehicles which are expected to implement in near future need to be considered with regard to "noise" and "animals (bird strikes)" after they are put into service due to their unique characteristics.

(4) 2. Items requiring attention (noise)

■ Methodology for Investigating Noise from Aircraft Operations

Depending on the situation, the following survey items will be considered
Environmental noise: Measurements are taken to determine the current noise level at the location of the target of conservation, such as a dwelling.
Noise associated with the actual aircraft: Measured when the noise characteristics of the aircraft to be employed are not yet known.
Measurement of actual aircraft flight noise or measurement of aircraft power level, etc. may be considered.

Explanation and supplemental information
The "The order on Environmental Impact Assessment of Aerodromes and Airports, and Guidelines for Selecting a Reasonable Method for Investigating, Predicting and Evaluating the Environmental Impact of Aerodromes and Airports, and Guidelines for Environmental Conservation Measures" (Ministry of Transport Order No. 36, 1998) stipulates that environmental noise measurements shall be conducted when establishing new aerodromes and airports.
Since VPs may be constructed around existing airfields due to its transportation characteristics, it is better to measure the noise level of airfields for the purpose of understanding the current environmental noise at locations where aircraft noise is predominant as the surrounding environment.
The data required for the noise associated with the actual equipment should be considered in an integrated manner with the forecasting method, since the data required will differ depending on the forecasting method employed.

Example: If simulation is to be performed, it is necessary to understand the power level by frequency, directivity data, etc.

Reference] Summary of surveys in other cases (heliports) (see reference materials for project overviews of each case)

case No.	Business name	Survey Summary		
		Basic Survey Methodology	Survey area/point	Survey period, etc.
1	Kanagawa Prefectural Police Headquarters Rooftop Heliport Installation Project (1991)	Environmental noise (L50): Method specified in "Method for measuring noise level" (JIS Z 8731)	Up to approx. 800m from the proposed site	7:00-18:10
2	Omura Air Base Development Project (tentative name) (2010)	Environmental noise: "Environmental Standards for Noise", "JIS Z 8731". Aircraft noise (original sound): "JIS Z 8731 WECPNL: "Environmental Standards for Aircraft Noise.	Max. 260m from the proposed site	Environmental noise: Winter, 24 hours Aircraft noise (original sound): Summer, 12 hours Same (WECPNL): winter and spring, 24 hours x 7 days
3	Osaka 6th Regional Government Building (tentative name) Heliport Installation Project (2021)	Environmental noise: "Environmental Standards for Noise", "JIS Z 8731". Helicopter test flights: "Environmental Standards for Aircraft Noise Helicopter standby: "JIS Z 8731	Up to approximately 1,800 m from the proposed site	Environmental noise: 24 hours (once each weekday and holiday) Helicopter noise: 1 hour each
4	Fukuoka Airport Rotary Wing Function Relocation Project (2008)	Environmental noise: "JIS Z 8731 Aircraft noise: "JIS Z 8731", "Aircraft Noise Measurement and Evaluation Manual Flight survey of actual aircraft: Same as above	Maximum of approx. 3,800m from the proposed site	Environmental noise: 24 hours (once each weekday and holiday) Aircraft noise: summer and winter, 24 hours x 7 days Actual flight survey: once in summer and once in fall
6	2025 Japan International Exposition (2022)	Environmental Noise: "Environmental Standards for Noise	Up to approximately 2,000 m from the proposed site	24 hours (once each weekday and holiday)

(4) 2. Items requiring attention (noise)

■A Method for Prediction of Noise Prediction for Aircraft Operations

The prediction method should be set appropriately based on existing examples, taking into consideration the noise characteristics of the eVTOL aircraft, its power level, and the area of impact (flight path).

Explanation and supplemental information

Since the ministerial ordinance pertaining to airfields does not specify a forecasting method, a certain policy is provided with reference to existing cases.

Noise prediction models used in past cases of aircraft noise (including fixed-wing aircraft) are shown below, and can be broadly classified into three categories.

If a simplified method using the distance attenuation formula for point sources is used, it is desirable to establish certain technical standards for prediction conditions and methods to ensure accuracy.

Existing segment models and simulation models can be used, but the challenge is to develop models that are compatible with eVTOL.

It is necessary to establish a system that enables operators to collect and accumulate noise data from actual equipment that can be used for prediction.

Table Existing main forecasting methods

technique	summary	remarks
Distance decay formula for point source	Simplified model: Sound from a moving point source is calculated by attenuating the distance to the prediction point.	Often used for environmental assessment of domestic heliports Directionality, etc. are not considered.
segment model	Practical model: The flight path is divided into a number of finite-length segments, and the noise energy from each segment is summed to calculate the value at the predicted point.	This model is basically used in the forecasting of fixed-wing aircraft. (Below is an example model) U.S.A.: AEDT (Aviation Environmental Design Tool) managed by FAA Domestic: JCAB model (Civil Aviation Bureau model)
Simulation Model	Detailed model: Calculated by placing sound sources densely over the flight path. Used to perform more detailed calculations.	In the case of assessments, it can be difficult to set conditions. (Below is an example model) U.S.A.: AAM (Advanced Acoustic Model) used (managed by Volpe) NORAH (Europe: for rotary-wing aircraft), sonAir (Switzerland: developed by a national institution), and other models exist.

[Reference] Summary of forecasts in other cases (heliports) (see reference materials for project overviews of each case)

case No.	Business name	forecasting method		
		Basic Forecasting Techniques	Forecasted area/point	Prediction conditions
1	Kanagawa Prefectural Police Headquarters Rooftop Heliport Installation Project (1991)	Noise from helicopter operations when in service [day-evening-night average sound level (Lden)]. Calculated based on the forecasting formula provided in the "Provisional Guidelines for the Environmental Preservation of Small Aerodromes".	Current survey area/point	Flight Routes and Flight Rates Number of operations and operating hours Flight method Power level, peak level, single shot noise exposure level
2	Omura Air Base Improvement Project (tentative name) (2010)	Weighted Equivalent Continuous Perceived Noise Level (WECPNL) due to aircraft operations Calculated according to the formula shown in "Environmental Standards for Aircraft Noise	Public-Private Boundary of Facilities	Aircraft type Aircraft operating location and number of aircraft Operating hours Power Level
3	Osaka 6th Regional Government Building (tentative name) Heliport Installation Project (2021)	Noise levels associated with helicopter operations [time-of-day corrected equivalent noise level (Lden) Numerical calculation with distance decay formula	Survey sites and additional environmental protection facility locations	Power Level Flight frequency, flight model
4	Fukuoka Airport Rotary Wing Function Relocation Project (2008)	Aircraft noise from helicopter operations (Lden) Calculated using the "Ministry of Land, Infrastructure, Transport and Tourism Model" or a prediction formula based on sound propagation theory.	Survey Area	Flight path Prediction study case Power Level
6	2025 Japan International Exposition (2022)	Noise levels generated by helicopter operations [time-of-day corrected equivalent noise level (Lden) Numerical calculation with distance attenuation formula from point source	Environmental Preservation Facility Location	Acoustic Specifications (Power Levels) Flight routes and patterns

(4) 2. Items requiring attention (noise)

■**Evaluation Methodology**

Regarding the evaluation of consistency with standards or targets, at this time, it is considered that each municipality is subject to existing "environmental standards for aircraft noise" and other standards adopted by the respective municipality.

Explanation and supplemental information
The VP is to be developed as an airport, etc., and is expected to be subject to the existing "environmental standards for aircraft noise" and other standards adopted by each municipality.
Lden is adopted in the environmental standard for aircraft noise. This index is the equivalent daily noise level weighted by time of day, evening, and night.
As the implementation and use of eVTOL progresses and knowledge of eVTOL noise accumulates, it may be necessary to consider and revise the standards that should be applied around VPs.

(4) 2. Items requiring attention (noise)

【Reference】 Summary of evaluation in other cases (heliports) (Please refer to the reference material for an overview of the projects in each case)

Case No.	Business name	Evaluation Methodology
1	Kanagawa Prefectural Police Headquarters Rooftop Heliport Installation Project (December 1990)	Evaluation Indicators Guideline values as indicated in the "Provisional Guideline for the Environmental Preservation of Small Aerodromes
2	Omura Air Base Development Project (tentative name) (March 2010)	Evaluation Item Evaluation for avoidance or reduction Consideration of consistency with standards or goals The environmental standard values are compared with the environmental standard values indicated in "Environmental Standards for Aircraft Noise.
3	Osaka 6th Regional Government Building (tentative name) Heliport Installation Project (April 2021)	The environmental standard for aircraft noise shall be satisfied. The project must not hinder the achievement and maintenance of the goals of the Osaka City Environmental Basic Plan. Consideration shall be given to environmental conservation to minimize impact on the environment.
4	Fukuoka Airport Rotary Wing Function Relocation Project (March, 2008)	Evaluation items and methods Assessment of Avoidance or Reduction of Environmental Impact Evaluation of consistency with standards or targets for environmental preservation by Fukuoka City, Fukuoka Prefecture, or the national government Comparison of the predicted results with the "Environmental Standards for Noise
6	2025 Japan International Exposition (June 2022)	Evaluation Indicators Consideration shall be given to environmental conservation to minimize impact on the environment. (2) There shall be no obstacles to achieving and maintaining the environmental standards set forth in the Basic Environmental Law. Conform to the regulatory standards set forth in the Noise Regulation Law and the Osaka Prefectural Ordinance on Preservation of Living Environment. The project must not hinder the achievement and maintenance of the goals of the Osaka City Environmental Basic Plan.

(4) 2. Items requiring attention (animals (bird strike))

■About animal (bird strike) survey, forecasting, and evaluation methods

Survey methods will be used to determine the flight altitude and flight paths of birds as a general survey method.
The prediction method is based on the superposition of the route and altitude with the main flying space of birds, ecological information, and flying method, referring to past heliport cases, to predict the impact of collision with the aircraft.
The evaluation method is to assess whether the impact can be avoided or reduced by the forecasted results and associated environmental conservation measures.

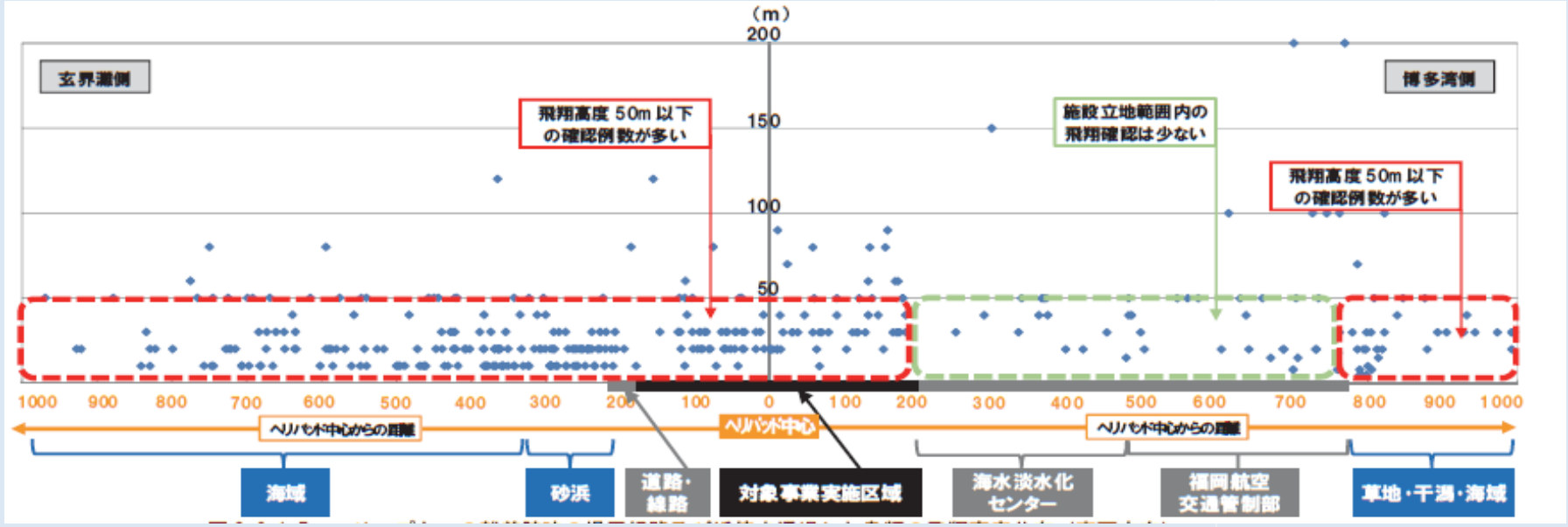
Explanation and supplemental information
In order to use the method of overlapping with the flight path of the aircraft in the prediction, the important point to be noted in the survey method in the past assessment cases is "understanding of the flight altitude and flight path".
Past heliport cases have been qualitative predictions regarding bird strikes.
In wind power projects, models to calculate collision probability are being studied, and similar studies are expected to be conducted for VP installation projects, such as the construction of quantitative models.
In the case of urban areas, it may be possible to survey and predict nesting sites of rare birds that are known from existing data.
The evaluation method is considered to be the same as that used in previous heliport assessment cases.
In addition, based on recent assessments of other projects such as wind power, etc., flying animals other than birds shall be taken into account as necessary.

■Study on animals (bird strike), forecasting methods Case study collection (heliport assessment case study)

In addition to the usual bird surveys, flight height and migration route surveys were conducted.
Flying height tends to be less than 50 m, and less in areas where facilities are located.

Table Summary of Field Investigation in Case No. 4 (1)

Contents	on-the-spot investigation
Case No. 4 Fukuoka Airport Rotary Wing Feature relocation project	■Bird fauna and migration routes Line census method, fixed-point observation method, arbitrary observation method, nighttime survey, flight altitude and path

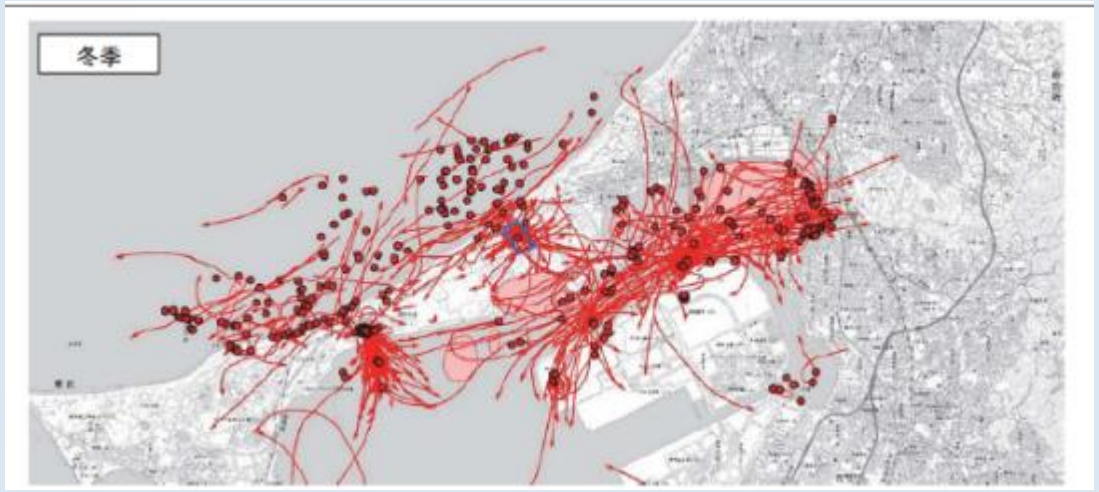


Example of flying height

■Study on animals (bird strike), forecasting methods Case study collection (heliport assessment case study)

Table Summary of Field Investigation in Case No. 4 (2)

Contents	on-the-spot investigation
Case No. 4 Fukuoka Airport Rotary Wing Feature relocation project	■Bird fauna and migration routes Line census method, fixed-point observation method, arbitrary observation method, nighttime survey, flight altitude and path



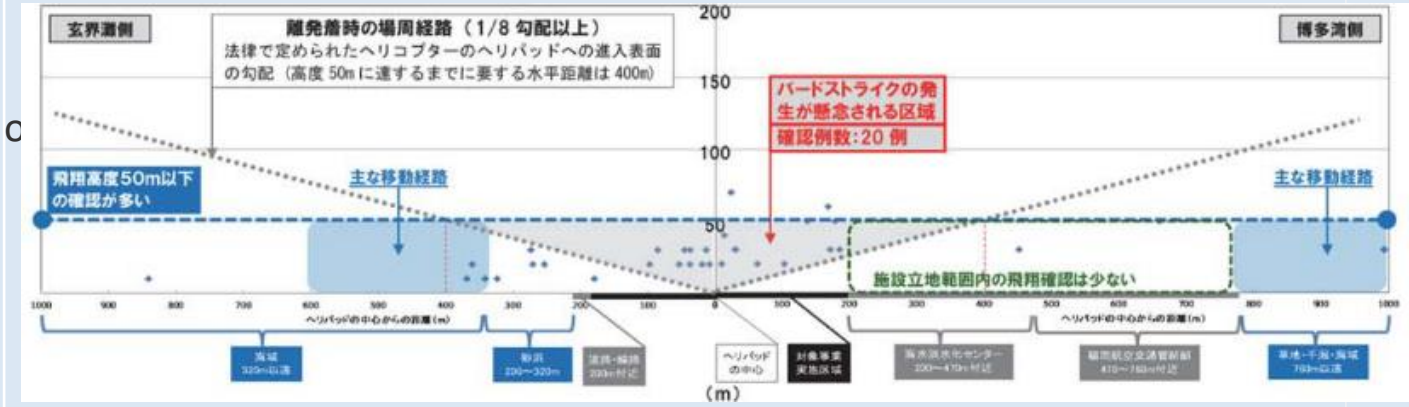
Example of flight path

■Study on animals (bird strike), forecasting methods Case study collection (heliport assessment case study)

Table Summary of Predictions in Case No. 4

Contents	prediction
Case No. 4 Fukuoka Airport Rotary Wing Feature relocation project	[Prediction results Helicopter operations - qualitative assessment of the impact of helicopter collisions (bird strikes) The number of flights should be low, focusing on areas below 50 m where there is a lot of flying and where bird strike is a concern (above the 1/8 slope). (2) The number of flights within the existing facility location tends to be small. Patrols or operational adjustments shall be made according to the flight status of birds. C

Major migration routes of birds (North-south flight)



Relationship between flight altitude and field circumference path of birds during takeoff and landing (north-south flight)

(5) Others

(5) 1. About the advisory committee

The following members of the advisory committee held a meeting to compile this policy.

(Committee member) ◎: Chairperson of the study group

Wataru Kitamura Associate Professor, Tokyo City University Faculty of Environmental Studies Department of Restoration Ecology and Built Environment
Graduate School of Environmental and Information Studies Environmental and Information Studies

Naoaki Shinohara Director, Airport Promotion & Environment Support Organization (Airport Support Organization) /
Director, Aviation Environment Research Center

Masaaki Hiroe Director, Kobayashi Institute of Science

Kenichiro Yanagi Professor Emeritus, Meiji University

(Relevant ministries and agencies)

Next Generation Air Mobility Policy Office, Aircraft Weapons and Space Industry Division, Manufacturing Industries Bureau, Ministry of Economy, Trade and Industry

Airport Planning Division, Civil Aviation Bureau, Ministry of Land, Infrastructure, Transport and Tourism
Aviation Strategy Office, Civil Aviation Bureau
Unmanned Aircraft Safety Division, Civil Aviation Bureau

Environmental Impact Assessment Division, Minister's Secretariat, Ministry of the Environment
Office of Environmental Pollution Control, Environmental Management Division, Water and Air Quality Bureau
Mobility and Environment Division, Water and Air Quality Bureau

(Observer)

Takatoshi Yokota Chief, Noise and Vibration Laboratory, Kobayashi Institute of Science

Muneyasu Nakazawa Senior Researcher, Aviation Environment Research Center, Airport Promotion and Environment Support Organization

Koji Takahashi Deputy Chief Researcher, Aviation Environment Research Center, Airport Promotion and Environment Support Organization

Tokyo Metropolitan, Yamanashi prefecture, Mie prefecture, Osaka prefecture, Hyogo prefecture, Ehime prefecture

Niigata City, Fujikawa Town, Shima City, Osaka City, Kobe City, Niihama City

(Secretariat)

Nippon Koei Co. ,Ltd.

(5) 2. Reference materials

№	Project name	Ploject location	Type of the project	The airfield site area	landing zone	runway	Other	Project owner
1	Rooftop of Kanagawa Prefectural Police Headquarters Building Heliport Installation Project (Evaluation report: 1991)	Yokohama City, Kanagawa Prefecture	New airfield (rooftop type)	759.6m2	Length 18m Width 15m	Length 18m Width 15m	helipad Length 32.46m Width 23.40m	Kanagawa prefecture (Kantou area)
2	Omura Air Base Improvement Project (tentative name) (Evaluation report: 2010)	Omura City, Nagasaki	Reclamation of public waters (Establishment of airfield)	Approx. 15 ha	Approx. 2 ha （Hovering area)	-	-	Kyushu Defense Bureau
3	Osaka 6th Regional Government Building (tentative name) Heliport Installation Project (Evaluation report: 2021)	Osaka City, Osaka	Rooftop Heliport	Approx. 3,600m2	Length 24m Width 24m	Length 24m Width 24m	-	PFI Osaka No.6 Government office building complex Co.
4	Fukuoka Airport Rotary Wing Function Relocation Project (Evaluation report: 2008)	Fukuoka City, Fukuoka Prefecture	Establishment of airfields and their facilities	Approx. 9 ha	-	Length 35m Width 30m	taxiway Length 171m Width 9.1m	Osaka Aviation Bureau, Kyushu Land Consolidation
5	Northern Training Area Helicopter Landing Zone Relocation Project (tentative name) (Evaluation report: 2007) (Voluntary Assessment)	Kunigami Village, Higashi Village, Okinawa Prefecture	Helicopter Landing Strip Relocation	-	Diameter 45m x 6 locations	-	-	Okinawa Defense Bureau (Defense)
6	2025 Japan International Exposition (Evaluation report: 2022)	Osaka City, Osaka	Projects involving development activities, etc.	-	-	-	landing port	(Japan Association for the International Exposition, 2025
7	Yokohama Heliport Project (Evaluation report: 1980)	Yokohama City, Kanagawa Prefecture	Establishment of airfield (Plains)	Approx. 6 ha	Length 47m Width 34m	Length 17m Width 17m	-	City of Yokohama
8	Yokohama Maritime Disaster Prevention Base Non-Public Heliport Improvement Project (Evaluation report: 1996)	Yokohama City, Kanagawa Prefecture	Establishment of airfield (Plains)	Approx. 2 ha	Length 25m Width 20m	Length 25m Width 20m	-	Third District Japan Coast Guard Headquarters (formerly Maritime Safety Agency)
9	Seibu Shin-Yokohama Non-Public Heliport Development Project (Evaluation report: 2000)	Yokohama City, Kanagawa Prefecture	New airfield (Rooftop)	900m2	Length 19.2m Width 16.1m	Length 19.2m Width 16.1m	-	Seibu Railway Co.