

Strategic Environmental Assessment of the ILC Project
- Summary of the Discussion -

December 28, 2020

High Energy Accelerator Research Organization
ILC Environmental Assessment Advisory Board

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Preface

- Background information and position of this “Summary of the Discussion” -

The International Linear Collider (ILC) project will be the world’s highest-energy electron-positron linear collider, with a length of 20 km and is being promoted through international cooperation. The candidate site under consideration is Japan.

Design activities for the ILC began in 2005 by the Global Design Effort under the agreement of the international community of accelerator science, and the Technical Design Report (TDR) was published in June 2013. At that time, the proposal by the Japanese high energy physics community to host the ILC was strongly supported by the international community. In addition, promotion of hosting the ILC has been growing in Japan, hoping that the construction of the ILC will create an international academic and research city. In response to this situation, the Ministry of Education, Culture, Sports, Science and Technology (MEXT) requested the Science Council of Japan (SCJ) in May 2013 for deliberation on the scientific merit of the ILC project and issues regarding its implementation, to which the SCJ responded in September 2013 with the “Report on the International Linear Collider Project”¹. Responding to the various issues pointed out in the report from SCJ, MEXT established the International Linear Collider (ILC) Advisory Panel (“ILC Advisory Panel”) within the Ministry in June 2014 to evaluate various issues related to the ILC, and published the “Summary of the International Linear Collider (ILC) Advisory Panel’s Discussions to Date”² in June 2015.

In parallel, a new particle expected to be the Higgs boson was discovered at the LHC experiment at CERN in July 2012. Based on the subsequent results from the LHC experiment, the International Committee for Future Accelerators (ICFA) released a statement in November 2017 proposing an optimized design of the ILC as a Higgs factory (about 20 km underground tunnel; 250 GeV center-of-mass energy), which is revised from the TDR design of the ILC (about 30 km underground tunnel; 500 GeV center-of-mass energy).

In order to examine the ICFA’s revised plan, MEXT held discussions at the ILC Advisory Panel and published the “Summary of the ILC Advisory Panel’s Discussions to Date after Revision”³ in July 2018 and requested the SCJ to deliberate the revised plan of the ILC project in the same month.⁴

In response to MEXT’s request, the SCJ established the Deliberation Committee for the Revised Plan of the ILC Project and the Subcommittee for Technology Assessment to discuss the issues and compiled the results as “Assessment of the Revised Plan of International Linear Collider Project”⁵ (“SCJ Report”), which was submitted to MEXT and published in December 2018. The “Executive Summary” in the SCJ Report states, “Judging from the plan and preparatory status of the project presented at the moment, the Science Council of Japan does not reach a consensus to support hosting the 250GeV ILC project in Japan.” Some issues⁶ were also raised regarding environmental considerations and environmental assessment.

MEXT then presented its view on the International Linear Collider⁷ (“MEXT’s View”) in the March 2019 meeting of the Linear Collider Board (“LCB”), which stated that, although MEXT has not reached the decision for hosting the ILC in Japan at this moment, “The ILC project has certain scientific significance in particle physics particularly in the precision measurements of the Higgs boson, and also has possibility in the technological advancement and in its effect on the local community, although the SCJ pointed out some concerns with the ILC project. Therefore, considering the above points, MEXT will continue to discuss the ILC project with other governments while having an interest in the ILC project.”

The High Energy Accelerator Research Organization (KEK) has proceeded to address the issues raised in the above process, especially the SCJ Report and MEXT’s View. In order to obtain external input regarding

1 http://www.scj.go.jp/ja/info/kohyo/pdf/Report_on_ILC_Executive_Summary.pdf

2 https://www.mext.go.jp/component/b_menu/shingi/toushin/_icsFiles/afieldfile/2015/08/05/1360596_3.pdf

3 https://www.mext.go.jp/component/b_menu/shingi/toushin/_icsFiles/afieldfile/2018/09/20/1409220_2_1.pdf

4 <http://www.scj.go.jp/ja/member/iinkai/ILC/pdf/siryu2401-3.pdf>

5 <http://www.scj.go.jp/ja/info/kohyo/pdf/kohyo-24-k273-en.pdf>

6 In SCJ’s report on revised plan of ILC project, refer to the following sections: p.(iii) Impact of hosting the 250GeV ILC on Japanese public and society; p.10, (4) Safety and environmental impact.

7 <https://www.kek.jp/en/newsroom/2019/03/13/2100/>

environmental assessment, the ILC Environmental Assessment Advisory Board (“the Board”) was established under KEK’s ILC Planning Office⁸ in September 2019, with the term ending on March 2020. The Board investigated and summarized various issues such as implementation structure, process, method, and contents of the environmental assessment. Around the time of the Board’s discussion, following the decisions made at the ICFA meetings in February and August 2020⁹, the ILC International Development Team (IDT) was newly established under ICFA to plan for the transition toward the ILC’s preparatory phase. KEK became the host institution of the IDT at the request of ICFA. In response to this change in the situation, the Board was re-established in November 2020. The Board revised its findings based on the new situation and compiled the Summary of Discussion.

The Board studied the required environmental assessment approach based on the following characteristics of the ILC Project.

- i. The project is currently in the pre-preparatory phase, prior to the decision to host the ILC in Japan, and the project implementing body has not been identified.
- ii. The project will be a long-term international collaborative project with a duration of more than 30 years from the start of preparation to the end of the experiment.
- iii. Large-scale construction work, both above and below ground, is to be carried out to set up the experimental facilities, the ILC Laboratory campus, and other facilities.
- iv. The site of the experimental facility must avoid densely populated areas and the ground must be solid.
- v. The maintenance and operation of the experimental facilities will consume a lot of electrical power.
- vi. A symbiotic relationship with local residents must be fostered through town development, as many ILC Laboratory personnel (domestic and international staff and facility users, as well as their families, etc.) will live in the vicinity of the campus.
- vii. Large-scale and continuous investment of resources (budget and human resources) is needed by the national government to construct the experimental facilities and operate the ILC Laboratory, and for the local governments and others to develop and maintain infrastructure such as town development and access roads around the ILC campus.

It was concluded that, in order for a smooth and appropriate promotion of the project, it will be necessary to implement the Strategic Environmental Assessment (“SEA”), which is to be conducted during the decision-making process (strategic phase) up to the project implementation phase, prior to the environmental assessment by the project implementing body at the stage when the project plan takes its shape (Project Phase Assessment). Based on this conclusion, this Summary of the Discussion focuses on applying the concepts of SEA for the environmental assessment of the ILC. The perspective of sustainability, which is gaining increasing attention globally, was considered. The Tokyo 2020 Olympic and Paralympic Games were used in the discussions as a good example of SEA implementation in Japan.

In this Summary of Discussions, the first section outlines the progress of the ILC project, describing the history of the project and the anticipated transition of the project phases. The basic approach to the implementation of the environmental assessment in the ILC project is presented in Sections 2 and 3, outlining respectively the SEA and the Project Phase Assessment. As a supplement to the overview presented in these sections, the key points of the implementation of the two assessments are listed in Appendix 1; the assessment items and concepts to be implemented in the SEA are given in Appendix 2; and the significance and the key points of information exchange between the project implementing body and related parties, which is an important function of environmental assessment, are summarized in Appendix 3.

It will be extremely important to utilize this "Summary of the Discussions" in the promotion of the ILC

⁸ Established at KEK in 2014 to promote the ILC project. The Director General of KEK currently serves as the Office’s Director.

⁹ The ILC International Development Team (IDT) was established under ICFA to plan on the transition toward the Pre-Lab phase of the ILC.

- February Meeting: https://icfa.fnal.gov/wp-content/uploads/ICFA_Statement_22Feb2020.pdf

- August Meeting: https://icfa.fnal.gov/wp-content/uploads/ICFA_IDT_Structure.pdf

project for the environmental assessment process to proceed in a smooth and appropriate manner while ensuring adequate interaction and collaboration with related parties and organizations.

Finally, the Board would like to express its gratitude to the research community and Iwate Prefecture for participating in the Board meetings as observers and providing valuable information and opinions regarding the environmental assessment of ILC from their respective standpoints in preparing this Summary of Discussions.

For the former, Prof. Satoru Yamashita, the University of Tokyo, shared information about the ILC site evaluation studies done by the domestic research community, and for the latter, Mr. Jin Sawata, Director of the ILC promotion Bureau of Iwate Prefecture, and Mr. Junichiro Okita, Chief of the same Bureau (both at the time) shared information about environmental assessment of the ILC project in Iwate Prefecture. The Board wishes to thank them for their inputs, which greatly contributed to the Board's discussion,

1. The International Linear Collider (ILC) Project

(a) Overview

- The International Linear Collider (ILC) is a large-scale research facility which will accelerate electrons and positrons inside a 20-km-long linear accelerator to the world's highest energy for a head-on collision, creating an energy state equivalent to that of the early universe just after the Big Bang. The goal is to study the fundamental laws of the universe through the investigation of the elementary particles created from the collisions.
- Currently, the High Energy Accelerator Research Organization (KEK) is playing a central role in the study under international cooperation on the construction plan of the ILC based on the candidate site in Japan.
- The main facilities, the 20-km-long linear accelerator and detectors, will be installed in an underground tunnel, while the campus building of the ILC Laboratory and the electrical and mechanical equipment for accelerator and detector operation will be installed above ground. Therefore, extensive construction work will be carried out both underground and above ground.
- The ILC will create an international city where a large number of researchers and their families both in and out of the country will live continuously in and around the ILC campus throughout the expected project lifetime until about 2060. Depending on the circumstances, the implementation period may become longer due to the upgrading plan¹⁰.
- The ILC Site Evaluation Committee¹¹ assessed the candidate site for the ILC based on technical and socio-environmental perspectives, and after an international review, the Kitakami site was evaluated to be the best candidate site for the ILC. However, the government is yet to make deliberations concerning the site.
- Although the domestic and international research communities have proposed that Japan hosts the ILC, MEXT has not yet reached the decision regarding hosting the ILC in Japan.

(b) Stepwise transition of the ILC project phase

To address the issues pointed out in the SCJ Report (December 2018) and the MEXT's View (March 2019), KEK established the International Working Group on the ILC project¹² in May 2019, inviting scientific experts worldwide. Based on the Working Group's report on the project implementation from the viewpoints of the researchers, "Recommendations on ILC Project Implementations"¹³ was published by KEK in October of the same year.

As illustrated in Figure 1, the report envisions that the project will be phased in to the following four periods: (1) pre-preparatory phase, (2) main preparatory phase, (3) construction phase, and (4) operation phase. As mentioned in the "Introduction", the transition from (1) pre-preparatory phase to (2) main preparatory phase, *i.e.*, the establishment of the ILC Pre-Lab, is currently under planning by IDT.

➤ Pre-preparatory phase

- The project is currently in this stage. An agreement among research institutions of major countries will trigger the project transition into the next phase, the main preparatory phase.

➤ Main preparatory phase (approx. 4 years)

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¹⁰ Depending on the results of the experiments at the 250 GeV ILC, an upgrade of the ILC accelerator could be conceived, such as increasing the beam energy and/or the luminosity, in order to collect more collision data at higher energies.

¹¹ The ILC Site Evaluation Committee was established in January 2013 under the ILC Strategy Council, which was set up by Japan Association of High Energy Physicists (JAHEP) to discuss the direction and measures to be taken by the high energy physics community to promote the ILC project. The purpose of the ILC Site Evaluation Committee was to evaluate the ILC candidate site based on scientific and academic merits under the responsibility of the researchers.

¹² <https://www.kek.jp/en/newsroom/2019/05/21/1900/>

¹³ <https://www.kek.jp/en/newsroom/2019/10/02/1000/>

- As a first step of the transition into the main preparatory phase, the laboratories participating in the ILC come to an agreement to participate in the activities of the main preparatory phase with the consent of their respective governmental authorities.
 - The responsibilities of the Pre-Lab¹⁴ for advancing the ILC project in the main preparatory phase, including its establishment, mandate, and host laboratory, are to be specified in the above agreement.
 - The Pre-Lab will address the technical tasks toward the construction of the ILC and support the inter-governmental negotiations toward an international agreement to begin construction of the ILC (*i.e.*, establishment of the ILC Laboratory).
 - The decision by the Japanese government on the site selection of the ILC is expected to be made during this phase.
- Construction phase (approx. 9 years)
- The ILC Laboratory is established as the official implementing body via an inter-governmental agreement to begin construction of the ILC, and construction of the ILC begins with the sharing of resources among the participating partners.
- Operation phase (presumed to be approx. 20 years)
- The cost of operating the ILC accelerator is shared among the ILC member states.
 - Experiments are carried out by sharing funding under the framework of experimental collaborations.

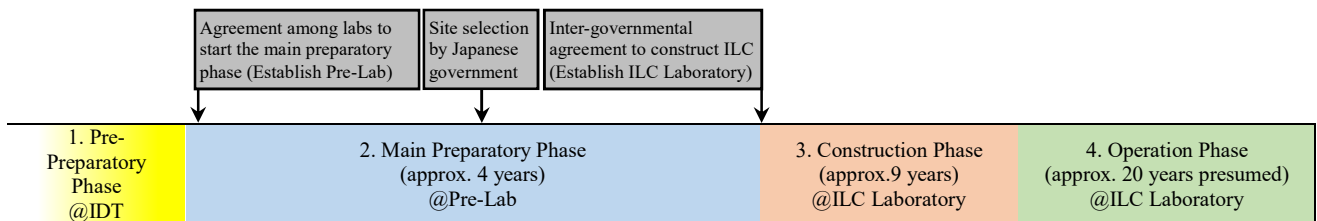


Figure 1: Envisioned phases of the ILC project.

¹⁴ https://www2.kek.jp/ilc/en/docs/Recommendations_on_ILC_Project_Implementation.pdf (see 3.1 Introduction)

2. Basic Approach to Strategic Environmental Assessment in the ILC Project

(a) Necessity of Strategic Environmental Assessment

The ILC project has the following characteristics:

- i. The project is currently in the pre-preparatory phase, prior to the decision to host the ILC in Japan, and the project implementing body has not been identified.
- ii. The project will be a long-term international collaborative project with a duration of more than 30 years from the start of preparation to the end of the experiment.
- iii. Large-scale construction work, both above and below ground, is to be carried out to set up the experimental facilities, the ILC Laboratory campus, and other facilities.
- iv. The site of the experimental facility must avoid densely populated areas and the ground must be solid.
- v. The maintenance and operation of the experimental facilities will consume a lot of electrical power.
- vi. A symbiotic relationship with local residents must be fostered through town development, as many ILC Laboratory personnel (domestic and international staff and facility users, as well as their families, etc.) will live in the vicinity of the campus.
- vii. Large-scale and continuous investment of resources (budget and human resources) is needed by the national government to construct the experimental facilities and operate the ILC Laboratory, and for the local governments and others to develop and maintain infrastructure such as town development and access roads around the ILC campus.

In view of such characteristics, it is desirable to adopt the Strategic Environmental Assessment (“SEA”) as the environmental assessment for the ILC to ensure smooth and appropriate promotion of the project. The SEA is to be conducted during the early phase (policy, planning, or program phase), prior to the Project Phase Assessment, and covers socio-economic impact as well as environmental considerations.

(b) Outline of SEA Implementation

➤ Project implementing body

The SEA is to be carried out by the body having the most complete knowledge of the project and the ability to collect information from various sources. It is considered reasonable and adequate for KEK, which would be the leading research institute if the ILC is to be constructed in Japan, to become the project implementing body for SEA. By stipulating that KEK is the project implementing body of the SEA in the Pre-Lab agreement, the legitimacy of KEK as the project implementing body will be ensured. It is appropriate for KEK, as the project implementing body, to conduct the SEA in collaboration with relevant international institutions, national and local governments, and domestic research institutions.

➤ When to start

The SEA is to start after the establishment of the Pre-Lab in accordance with the memorandum of understanding between the institutes to start the main preparatory phase. For the purpose of starting the construction as soon as possible, the SEA can be started prior to the establishment of the Pre-Lab, if the related parties agree beforehand on KEK's role as the project implementing body of the SEA in the course of the discussions.

➤ Scope and evaluation items

The project as a whole (*e.g.*, experimental facilities, the ILC Laboratory campus, and town development around the campus) is to be included in the scope of the SEA. Matters related to socio-economic impacts are to be included in evaluation items.

➤ Utilization of results

The results of the SEA are to be tiered to the Project Phase Assessment.

- Collaboration with local governments

The SEA, in view of its scope, is to be implemented in cooperation with the local authorities.

- The SEA process linked to the transition of the ILC project phases

The environmental assessment of the ILC project is expected to proceed in conjunction with milestones such as the establishment of the Pre-Lab and the decision on the site by the Japanese government (see Figure 2), and the process toward the start of SEA should proceed in the following manner. KEK will submit the Summary of Discussions to the IDT after receiving it by the Board, which is then made public. As the IDT develops the work plan to be carried out at the Pre-Lab during the main preparatory phase of the ILC, it is expected that policy for conducting environmental assessment will be discussed by the IDT with reference to the recommendations in the Summary of Discussions. Based on the results of the IDT studies, KEK will also obtain advice from experts to compile the “Approach to Environmental Assessment”, which will be made public at an appropriate time.

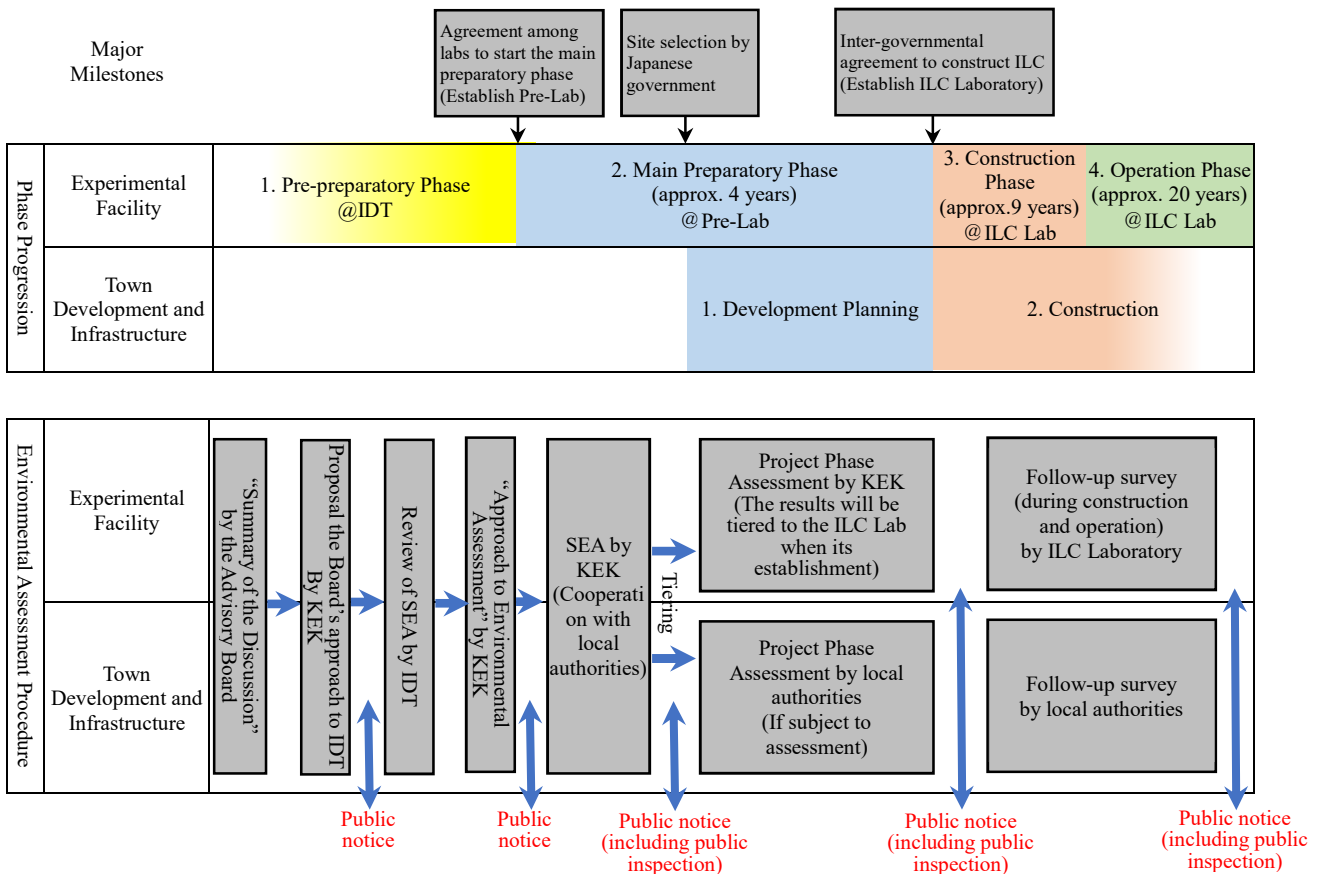


Figure 2: Procedure of Environmental Assessment for the ILC project.

(c) SEAs in the ILC Project: Evaluation Items and Implementation Procedures

➤ Evaluation Items

The evaluation items for SEA need to be selected according to the goals of the SEA evaluation, taking into account the characteristics of the ILC project and the site. For this purpose, as described in section 2(b) above, socio-economic items are included as well as environmental items. Examples of evaluation items based on the characteristics of the ILC project are listed below. The evaluation items for the Tokyo 2020 Olympic and Paralympic Games, which introduced the SEA method, were used as a reference. (See Appendix 2 for the concept of each item.)

Environmental Items	Main environment	Air, water quality and hydrosphere, soil and ground
	Ecosystem	Biological growth and habitat, water cycle, organisms/ecosystems, greenery
	Living environment	Noise, traffic congestion, vibration, odor, communication disruption (radio interference), overshadowing, radiation
	Amenities & culture	Landscape, nature activity sites, pedestrian comfort, historic and cultural sites
	Resources & waste	Water use, waste, and ecomaterials (oil-free)
	Greenhouse gas	Greenhouse gas, energy
Socio-Economic Items	Land use	Land use, regional fragmentation and relocation
	Social activities	Cultural activities
	Participation & collaboration	Communities, environmental awareness
	Safety, sanitation, security	Safety, sanitation, fire and disaster prevention
	Traffic	Traffic congestion, access to public transportation, road safety
	Local industries	Agriculture, forestry and fisheries, commerce and industry, tourism
	Economy	Economic impact, employment

Table 1: Evaluation items based on the characteristics of the ILC project.

➤ Implementation procedure

In April 2007, the Ministry of the Environment formulated and announced the “Guidelines for Strategic Environmental Assessment”^{15,16} based on considerations for a common guideline for SEA. In order to accumulate examples of implementation based on this guideline and to verify its effectiveness, the Ministry encourages the relevant ministries and agencies to implement SEAs based on this guideline with regard to initiatives in the stage of evaluation for items such as the project location and size. Based on this, it is desirable to define the SEA implementation procedure for the ILC project with reference to this guideline, as well as advice from experts

● Information exchange during the SEA implementation process

Information exchange is an important function in environmental assessment. Timely and appropriate information exchange is essential for smooth planning of the ILC project. (See Appendix 3 for the details on the significance of information exchange and key points for implementation.)

Therefore, KEK, which would be the project implementing body of the SEA, will share information at various stages of the assessment and exchange information in a timely and appropriate manner by receiving information and opinions from various people responding to the shared information. Through these interactions, the environmental information possessed by various people will be utilized and a better action plan with environmental considerations will be realized.

¹⁵ <https://www.env.go.jp/press/files/jp/9431.pdf>

¹⁶ <https://www.env.go.jp/press/press.php?serial=8247>

3. Project Phase Assessment and Follow-up Survey

1. Experimental Facility

i. Project Phase Assessment

➤ Necessity of Project Phase Assessment

It is foreseen that the ILC project is not subject to the Environmental Impact Assessment Act and Ordinance. Despite this, it will be necessary to conduct the Project Phase Assessment in accordance with the laws and regulations, considering the fact that the project requires a large budget.

➤ When to start

It should begin as soon as possible after the government's site selection for the ILC. (See Figure 2)

➤ Project implementing body

It is envisioned that the assessment will start after the site selection of the ILC. Since this will be during the Main Preparatory Phase, KEK will conduct the assessment based on the Pre-Lab agreement as is the case for the SEA. After the ILC Laboratory is established, the results of the assessment will be tiered to the ILC Laboratory. It should be confirmed in the inter-governmental agreement for the start of construction (the agreement to establish the ILC Laboratory) that the results of the Project Phase Assessment by KEK are to be tiered as the assessment by the ILC Laboratory.

➤ Implementation guideline

It is foreseen that the Project Phase Assessment of the ILC project is not a legal assessment. To ensure the objectivity and appropriateness of the assessment, it will be conducted in accordance with the implementation guidelines established by an official third party. In this case, the Ministry of Education, Culture, Sports, Science and Technology (MEXT), which is foreseen to be the ministry with jurisdiction over KEK and the ILC project, is preferable as the body to formulate the implementation guidelines. A similar case is "Expo 2005 Aichi" whose implementation body was the Japan Association for the 2005 World Exposition. In this case, the Ministry of International Trade and Industry (now the Ministry of Economy, Trade and Industry), which had jurisdiction over the event, defined the implementation guidelines for the environmental impact assessment and requested the implementation body to conduct the assessment as a ministerial notification.

➤ Tiering of the assessment results

In the inter-governmental agreement for the start of construction, it should be agreed that the results of the SEA by KEK are to be tiered to the Project Phase Assessment by the ILC Laboratory.

ii. Follow-up survey (experimental facility)

As a follow-up to the Project Phase Assessment, a follow-up survey should be conducted during both the construction and operation phases.

2. Project Phase Assessment and Follow-up on Town Development and Infrastructure

On the basis of the Environmental Impact Assessment Law or the ordinance of the local government, the national/local government that will be the project implementation body should appropriately conduct the Project Phase Assessment and follow-up survey as needed.

Appendix 1: Summary Table for the Environmental Assessment for the ILC Project

● Strategic Environmental Assessment (SEA)

When to start	To be started after the establishment of the Pre-Lab.
Project implementing body	KEK, foreseen to be the host laboratory for the Pre-Lab, is preferable.
Scope	The entire project. (Experimental facilities, the ILC Laboratory, town development and infrastructure around the campus.)
Evaluation items	Natural environment and socio-economic impact.
Use of results	The SEA results should be tiered to the Project Phase Assessment.
Collaboration with local authorities	In view of the SEA scope, it will be implemented in cooperation with the local authorities where the project is sited.
Procedure	Use the Ministry of the Environment's "Guidelines for Strategic Environmental Assessment" as a reference.
Information exchange	Refer to Japan Society for Impact Assessment's "The Basics of Information Exchange in Environmental Assessment" to incorporate appropriate environmental considerations.

● Project Phase Assessment and Follow-Up survey

➤ Experimental Facility

Project Phase Assessment	When to start	To be started after the site selection by the Japanese government.
	Project implementing body	KEK, foreseen to be the host laboratory for the Pre-Lab, should take the initiative. After the ILC Laboratory is established, the results of the assessment by KEK are tiered to the ILC Laboratory.
	Implementation guidelines	Since the ILC project is foreseen to be not subject to legal assessment, it should be carried out in accordance with the implementation guidelines established by a public third party. In this case, MEXT, which is expected to be the ministry with jurisdiction over KEK and ILC, is the preferred body for defining the implementation guidelines.
	Tiering of the results	It should be agreed in the inter-governmental agreement for the start of ILC construction that the SEA results by KEK are to be tiered to the Project Phase Assessment by the ILC Laboratory.
Follow-up survey		As a follow-up to the Project Phase Assessment, follow-up surveys will be conducted during both the construction and operation phases.

➤ Town Development and Infrastructure

On the basis of the Environmental Impact Assessment Law or the ordinance of the local government, the national/local government that will be the project implementation body should appropriately conduct the Project Phase Assessment and follow-up survey as needed.

Appendix 2: Evaluation Items and Approaches for the SEA in the ILC Project

Environmental Items	Items to minimize the negative environmental impact of the construction and operation of the ILC Laboratory and surrounding facilities, to improve the environment, and to maintain and enhance the sustainability of the local and global environment. (Note) From the perspective of sustainable use of the environment, the items on resources and radioactive materials were also added.		
	Main environment	Items aimed at ensuring that pollution of natural components of the environment, such as air, water, and soil, is at a level that does not adversely affect human health (residents, researchers and their families, etc.), the living environment, and the natural environment. (Note) Bad odors, noise, and vibrations are considered to affect only the living environment due to the characteristics of the region, and are handled in the living environment.	
		Air	Predict the extent of air pollution from construction equipment, laboratory equipment, vehicles, etc.
		Water/hydroshere	Taking into account the characteristics of the project, the degree of water pollution, etc. and the impact on groundwater will be predicted.
		Soil/ground	Taking into account the characteristics of the project, the possibility of soil contaminant dispersion, topographic and geological alteration, and land subsidence due to excavation work will be predicted.
	Ecosystems	Items aimed at maintaining and regenerating biodiversity and healthy ecosystems.	
		Biological growth and habitat	Predict the effects on the inorganic environmental infrastructure consisting of topography and geology that supports ecosystems.
		Water cycle	Predict the impact of rainwater on groundwater infiltration in terms of maintaining and enhancing the natural water cycle.
		Organisms and ecosystems	Predict the impact on important plants, animals and biodiversity in terms of maintenance and regeneration of organisms and ecosystems that require conservation.
		Greenery	Predict the impact on conservation of biodiversity, landscape and other diverse functions, the amount of greenery that will contribute to the conservation and restoration of the environment (decrease due to logging and other factors and increase due to greening).
	Living environment	Items to minimize disruption to the living environment of local residents.	
		Noise	Predict the impact from noise from construction vehicles, construction work, and the operation of experimental facilities.
		Congestion	Predict the impact of traffic congestion due construction vehicles.
		Vibration	Based on the characteristics of the project, predict the impact of vibration due to construction vehicles during the construction and due to the experimental facilities during the operation.
		Bad odors	Based on the characteristics of the project, predict the impact of bad odors due to construction vehicles during the construction and due to the experimental facilities during the operation.
		Communication disruption (radio interference)	Predict the extent of communication disruption due to the construction and operation of experimental facilities.
		Overshadowing	Predict the obstruction of sunlight to the surrounding area due to the constructed building and other factors.
		Radiation	Predict the amount of radiation generated by the operation of the ILC accelerator and the necessary protection methods.
	Amenities and culture	Items to create a comfortable and stately urban environment.	
		Landscape	Predict the degree of obstruction to the current landscape and the degree of contribution to the formation of a beautiful and stately landscape (focusing mainly on the amount of visible greenery and the current landscape obstruction factors such as utility poles and advertisement signs).
Nature activity sites		Predict the extent of tangible impact (modification, disruption or creation of new ones) on the nature activity sites (parks, green spaces, water bodies) and the intangible impacts on the content of nature contact activities.	
Resources and waste	Items to promote the sustainable use of resources with the aim of creating a recycling-oriented society.		
	Water use	Predict the extent of efforts and contributions to efficient water use, with a focus on rainwater and recycled water use.	

		Waste	Predict the extent of efforts and contributions to reduce waste and promote proper disposal (reduction in incineration and landfill) and proper disposal of excavated soil.
		Ecomaterials (oil-free)	Predict the extent of utilization of ecomaterials such as recycled resources and the resource conservation effects of such utilization in order to promote the recycling of resources.
	Green-house gas	Predict the extent of greenhouse gas reductions in order to prevent global warming and achieve a low-carbon society.	
		Greenhouse gas	Predict the extent of greenhouse gas reductions and the effectiveness of initiatives, with a focus on carbon dioxide. (Note: The effects of renewable energy and vehicle fuel measures are reflected in the reduction of greenhouse gas emissions.)
		Energy	Predict the extent of energy use, which is a major source of greenhouse gases, the extent of renewable energy adoption, the extent of reduction, and the effectiveness of efforts.
Socio-economic items	Items aimed at improving socio-economic sustainability, which is the basis for improving environmental sustainability.		
	Land use	Items aimed at avoiding impact on land use, which is the foundation of local residents' livelihood and economic activities, and to promote the effective use of the land.	
		Land use	Predict the impact on current land use, such as conversion of natural land, and the extent of effective land use, such as the use of unused land.
		Regional fragmentation	Predict the extent of the disruption of living activity network (especially pedestrian traffic network) as a result of constructing facilities, etc.
		Relocation	Predict the extent of relocation of residences, shops, etc. due to constructing facilities.
	Social activities	Items aimed at stimulating cultural activities	
		Cultural activity	Predict the extent to which the ILC experimental facilities and influx of researchers will have an impact (inhibiting and contributing) on the promotion of science and internationalization.
	Participation and collaboration	Items aimed at improving the community's ability to improve the local environment and make it more sustainable.	
		Community	Predict participation in ILC-related cultural activities at local community units in terms of regeneration of local communities.
		Environmental Awareness	Predict the extent of environmental awareness efforts and contributions through ILC as a basis for creating sustainable communities.
	Safety, sanitation, and security	Items aimed at ensuring the safety of the ILC Laboratory site from disasters, safe and secure movement, drinking water, etc. for ILC Laboratory staff and visitors, and the safety of the residents of the surrounding area of the ILC Laboratory.	
		Safety	Predict the degree of safety from hazardous facilities for ILC construction sites and others. Predict the extent to which safe travel for all (barrier-free) is ensured and the stability of the power supply to avoid power outages.
		Sanitation	Predict the safety of food and drink, including the quality of drinking water and chemical residues in food.
		Fire and disaster prevention	Predict the degree of safety from fire, earthquake (earthquake resistance), and tsunami at the ILC Laboratory site.
	Transportation	Traffic congestion	Predict the degree of traffic congestion. Predict the local impact of increased traffic. Predict traffic congestion within an 8 km radius, including the effect of improving traffic flow by building road infrastructure and implementing traffic management.
		Accessibility to public transport	Predict the accessibility of transportation for commuting ILC Laboratory staff and visitors.
		Road safety	Predict the degree to which safe travel (road safety) is ensured for all.
	local industry	Agriculture, forestry and fisheries	Predict the possibility of utilizing products.
		Commerce and industry	Predict the potential of utilizing local commercial and industrial businesses.
		Tourism	Predict the likelihood of tourism to the surrounding area by the ILC Laboratory staff, their families and visitors.
	Economy	Items aimed at delivering economic impact by the ILC Laboratory.	
		Economic impact	Predict the degree and certainty of the economic impact from the ILC Laboratory.
		Employment	Predict the amount of job creation by the ILC Laboratory and the extent of its social impact.

Appendix 3: Basic Concept of Information Exchange in Environmental Assessment

The following statements are taken from ““Basics of Information Exchange in Environmental Assessment’ to incorporate appropriate environmental considerations” (published by the Japan Society for Impact Assessment, July 2014, Ver. 1.00).

Significance
<ul style="list-style-type: none">➤ By exchanging and utilizing information on the environment held by various people in the course of conducting environmental assessments, specific environmental issues and solutions will be clarified.➤ How the information from various people is utilized for environmental considerations can be clarified.➤ The understanding of the project can be deepened through appropriate information exchanges.➤ Information exchange will lead to more appropriate environmental protection. It will also provide an opportunity for project implementor to present their environmental considerations.
The key to effective information exchange
<ul style="list-style-type: none">➤ Disclose the information about the project as much as possible so that specific environmental issues can be identified.➤ Ensure relevant people can be involved in the information exchange considering the geography, organization, and interests.➤ Communicate with a variety of people comprehensively so that they have a good understanding of the project and can understand the information about the environment in which they are interested.➤ The project implementor should be amenable to the information provided by the people and act with flexibility.
Key points for implementation
<ul style="list-style-type: none">➤ The information on the project and its impact on the environment is to be published and disseminated by the project implementor at various stages of the project, such as the planning stage, the design stage for the implementation of environmental assessment, and the stage when surveys and evaluations have been compiled to some extent.➤ Public announcements and dissemination of information will be mainly done in the form of documents, but briefings and the internet should be also used effectively.➤ Various people should attempt to successfully capture the information provided by the project implementor and provide the information appropriately at each stage.➤ It is important for various people to take advantage of opportunities for information exchange on a daily basis so that they can collect and provide information about the environment.➤ Mutual exchange of information is essential to ensure that the flow of information will not be one direction.

Reference A: Proposal to establish the ILC Environmental Assessment Advisory Board

August 28, 2019

Director of the ILC Planning Office

1. Establishment

The ILC Environmental Assessment Advisory Board (hereinafter as "the Board") will be established in the Planning Office for the ILC of the High Energy Accelerator Research Organization.

2. Mandate

The Board will evaluate the environmental assessment study and methodology for the ILC construction candidate site and make recommendations on plans for future efforts.

The Board will report to the Director of the Planning Office for the ILC on the results of the review described in the preceding paragraph.

3. Organization

The Board will consist of two or more experts in environmental assessment.

4. Timeframe

The term of the Board members set forth in the preceding article will be from the date of appointment until March 31, 2020. However, in the event of a vacancy, the term of office of the member filling the vacancy will be the remaining term of office of his or her predecessor.

5. Chair

The Board will have a chair, who will be appointed by the Director of the Planning Office for the ILC from among the Board members.

6. Administration

The administration of the Board will be handled by the Planning Office for the ILC.

7. Others

The Board may require non-Board members to attend Board meetings as needed.

In addition to this provision, other necessary matters regarding the operation of the Board will be determined by the Board.

The Board will be established from September 1, 2019 and will be terminated as of March 31, 2020.

Proposal to establish the ILC Environmental Assessment Advisory Board

November 30, 2020

Director of the ILC Planning Office

1. Establishment

The ILC Environmental Assessment Advisory Board (hereinafter as "the Board") will be established in the ILC Planning Office of the High Energy Accelerator Research Organization.

2. Mandate

The Board will evaluate the environmental assessment study and methodology for the ILC construction candidate site and make recommendations on plans for future efforts.

The Board will report to the Director of the ILC Planning Office on the results of the review described in the preceding paragraph.

3. Organization

The Board will consist of two or more experts in environmental assessment.

4. Chair

The Board will have a chair, who will be appointed by the Director of the ILC Planning Office from among the Board members.

5. Termination

The Board will be terminated by the Director of the ILC Planning Office when its mandate has completed.

6. Administration

The administration of the Board will be handled by the ILC Planning Office.

7. Others

The Board may require non-Board members to attend Board meetings as needed.

In addition to this provision, other necessary matters regarding the operation of the Board will be determined by the Board.

8. Supplementary note

This proposal will be implemented from November 30, 2020 and will cease to be effective as of March 31, 2022.

Reference B: Members of the ILC Environmental Assessment Advisory Board

Tetsuro Uesugi	Senior Managing Director and Director of the Environmental Greenery Research Laboratory, Hibiya Amenis Corporation
Shigeo Nishikizawa	Associate Professor, Faculty of Environment, Social Science and Technology, Tokyo Institute of Technology
Kenichiro Yanagi (Chair)	Professor and Director of the Center for Environmental Law, School of Law, Meiji University

Reference C: Meetings of the ILC Environmental Assessment Advisory Board

The First Meeting of the ILC Environmental Assessment Advisory Board

Date/Time Wednesday, September 4, 2019, 15:00-17:00

Venue Conference Room I, Fukuracia Tokyo Station

Agenda

1. Introduction of members
2. Purpose and Objectives
3. Background and efforts to date
4. Discussion
5. Future meetings

The Second Meeting of the ILC Environmental Assessment Advisory Board

Date/Time Monday, October 21, 2019, 9:00-12:00

Venue Conference Room “Matsunoma”, Hotel Sunroute Ichinoseki, Iwate

Agenda

1. Background and effort to date
2. Discussion on “Summary of the Discussion”
3. How to proceed in the future

The Third Meeting of the ILC Environmental Assessment Advisory Board

Date/Time Tuesday, November 26, 2019, 15:45-17:45

Venue Conference Room G, Fukuracia Marunouchi Oazo, Tokyo

Agenda

1. Discussion on “Summary of the Discussion”
2. Initial Environmental Assessment Items
3. Others

The Fourth Meeting of the ILC Environmental Assessment Advisory Board

Date/Time Monday, December 16, 2019, 14:00-16:00

Venue Conference Room G, Fukuracia Marunouchi Oazo, Tokyo

Agenda

1. Discussion on “Summary of the Discussion”
2. Others

The Fifth Meeting of the ILC Environmental Assessment Advisory Board

Date/Time Monday, November 30, 2020, 10:00-12:00

Venue Online Meeting

Agenda

1. Discussion on “Summary of the Discussion”