

Recent Progress Towards the Realization of the ILC in Japan:
Cooperative Efforts by Academia, Industry, and Local Region

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Introduction

1. The International Linear Collider (ILC) is a next-generation large-scale international project in particle physics. Efforts aiming to realize the ILC in Japan have been ongoing for over 15 years. At present, many people from various sectors, including scientists, politicians, industry members, business circles, and local communities, are proactively working together towards the realization of the ILC.
2. This document summarizes the recent progress towards the realization of the ILC in various sectors of Japan in order to inform the international strategy discussions, such as the European Strategy for Particle Physics Update.
3. On March 7, 2019, at the Linear Collider Board meeting held in Tokyo, the Ministry of Education, Culture, Sports, Science and Technology (MEXT) announced the position of the Japanese government regarding the ILC project. Refer to another document for details of the actions by the Japanese government subsequent to this event.

Political Activities Towards the Realization of the ILC and International Cooperation

4. The Federation of Diet Members for the ILC (“Federation”), formed in 2006, is a non-partisan group of parliamentarians aiming to realize the ILC in Japan as an international project. The group consists of about 130 Members of the Japanese Diet, out of a total of 707 Members. The Chairperson of the Federation is Hon. Takeo Kawamura, former Chief Cabinet Secretary. Federation members meet frequently at an average of once per month to discuss the strategies to push for the ILC. The Federation is continuously urging the Japanese government to make a favorable decision on the ILC project. With regard to the international discussions, Federation members have interacted closely with legislative and executive members of potential partner countries to discuss the ILC project. These political efforts are closely coordinated with government ministries and agencies, academia, industries, and local regions.

Key Members of the Federation of Diet Members for the ILC		
Name	Position within Federation	Other positions
Hon. Takeo KAWAMURA	Chair	Former Chief Cabinet Secretary; Former MEXT Minister
Hon. Shunichi SUZUKI	Vice Chair	Chairperson of General Affairs (LDP); Former Minister for the Tokyo Olympic and Paralympic Games; Former Minister of the Environment
Hon. Ryu SHIONOYA	Director General	Former MEXT Minister

5. In 2018, the Liaison Committee for Realizing the ILC (“Committee”) was formed within the Liberal Democratic Party (of the ruling coalition), chaired by Hon. Takeo Kawamura. The Committee aims to realize the ILC by elevating the project as a national priority across various important policies.
6. In February 2019, the Federation and the Committee have jointly approved a resolution urging the Japanese government to host the ILC in Japan. The resolution was presented in person to the MEXT Minister and the Minister of State for Science and Technology Policy. (For other recent political

activities, refer to the LCWS2019 keynote speech by Hon. Ryu Shionoya.¹⁾

7. Federation members visited the United States (2013~) and Europe (2016~) numerous times in order to discuss the ILC with high-level government officials and parliamentary members. Discussions have also been held on the occasion of their visits to Japan. Recent visits from the US include two high-level officials from the Department of Energy (DOE). From Europe, parliamentary members from Germany and France have visited Japan to discuss the ILC project; they have also toured the ILC candidate site and its neighboring areas in the Tohoku region.

Dignitaries who recently visited Japan to discuss the ILC project		
Country	Name	Date
US	Paul Dabbar, DOE Under Secretary for Science	October 2018
	Chris Fall, DOE Office of Science Director	October 2019
Germany	Stefan Kaufmann, Member of the Bundestag	October 2018, etc.
France	Olivier Becht, Member of the National Assembly and others (3 National Assembly members total)	November 2018, etc.

Key Organizations Promoting the ILC

8. Within the academic community, the High Energy Accelerator Research Organization (KEK) and members of various universities are actively promoting the ILC, in cooperation with the international scientific community via the Linear Collider Board and the Linear Collider Collaboration. (See Figure 1 for the relations among various organizations promoting the ILC.)
9. The industry-academia collaboration is spearheaded by the Advanced Accelerator Association Promoting Science and Technology (AAA)², whose members include over 100 companies and over 40 academic institutes. The Chairperson is Takashi Nishioka, former CEO of Mitsubishi Heavy Industries. AAA has supported the delegation of Federation members to the United States and Europe by providing financial and logistical support. AAA is also actively engaging in technological R&D, developing clean technologies for ILC (“Green ILC”) from the viewpoint of sustainable development goals, such as heat recovery technology, wood utilization, and solar energy use.

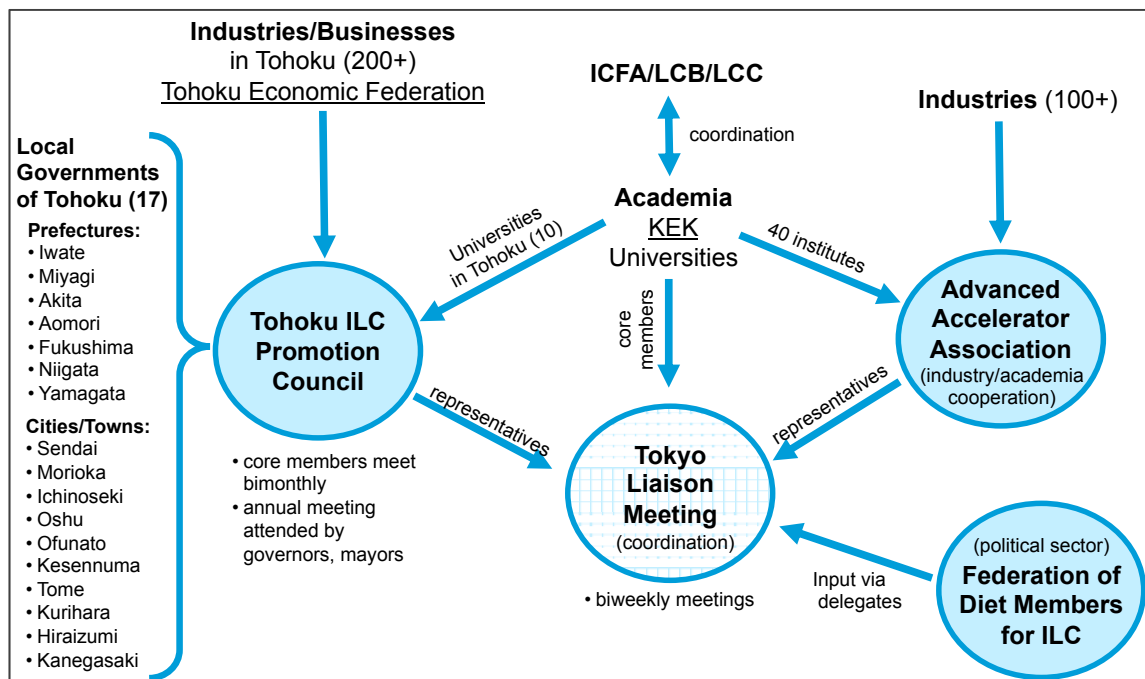


Figure 1: Organizations promoting the ILC.

¹ http://epx.phys.tohoku.ac.jp/LCWS2019/documents/LCWS2019_Hon.Shionoya_Ryu_EN.pdf

² <http://aaa-sentan.org/en/>

10. Efforts in the Tohoku Region are coordinated by the Tohoku ILC Promotion Council,³ which consists of members from academia (10), industries and business (202), and local governments (17). The Co-chairs are Hideo Ohno, President of Tohoku University, and Hiroaki Takahashi, Honorary Chairperson of the Tohoku Economic Federation. Its Annual Meetings are attended by Prefectural Governors (2) and Mayors (6). Executive members meet bimonthly; the latest meetings were held on June 11, July 24, Oct. 17, and Dec. 6.

Tohoku Region and Activities Promoting the ILC

11. The Tohoku Region consists of 6 prefectures including Iwate and Miyagi. The total land area and population of the region are roughly the same level as those of Switzerland. The Tohoku Region possesses an abundance of natural scenery with its own Japanese culture specific to the Tohoku Region. At the same time, there is deep understanding and love for science and technology among the Tohoku people. Currently, there are two accelerator projects under construction in the Tohoku Region: (1) Next Generation 3GeV Synchrotron Radiation Facility in Miyagi Prefecture, and (2) East Japan Heavy Ion Center, at the Faculty of Medicine in Yamagata University. The Tohoku Region has suffered great damages from the Great East Japan Earthquake of 2011. Reconstruction efforts are currently in full swing to build a better Tohoku Region with an eye to the future (“Build Back a Better Tohoku”).

	Tohoku Region (6 Prefectures)	Switzerland (for reference)
Land area	66,950 km ²	41,280 km ²
Population	8.682 mil	8.556 mil

12. The Iwate Prefectural Government upgraded its main organization for ILC promotion in June 2019 from the “ILC Promotion Office” to the “ILC Promotion Bureau”, with a total of 48 people assigned. It has a Planning and Management Division and Project Development Division. Activities include promoting the ILC, increasing public awareness, preparing for environmental impact assessment, and assessing the readiness of transport and living conditions for international researchers.
13. The ILC Liaison Council of Southern Iwate and Northern Miyagi has started in July 2019. (See Figure 2 for the area map.) The members are the ILC promoting bodies of the neighboring area, including the local governments. Members of the council include Mayors. The latest meetings were held on July 17, Oct. 23, and Dec. 25 (planned).
14. Resolutions urging for the realization of the ILC have passed at many levels of local governments:
- The Hokkaido/Tohoku Prefectural Governors’ Association (8 Prefectures) passed a resolution on Oct. 2018 urging the Japanese government to realize the ILC, from the viewpoint of creating an international center for science, technology, and innovation and regional revitalization.
 - The Tohoku Mayors’ Association has passed a special resolution in May 2018 urging Japan to realize the ILC.
 - The Hokkaido/Tohoku Prefectural Assembly Chairpersons’ Association and the Prefectural Assembly of each of the 6 Prefectures in the Tohoku Region have all separately passed resolutions supporting the ILC.
 - The Iwate Prefectural Assembly and the Miyagi Prefectural Assembly are working together to urge the national government to realize the ILC, which is a first time feat that two assembly bodies from different prefectures have worked for a common goal.

³ <http://www.tohoku-ilc.jp/en/>

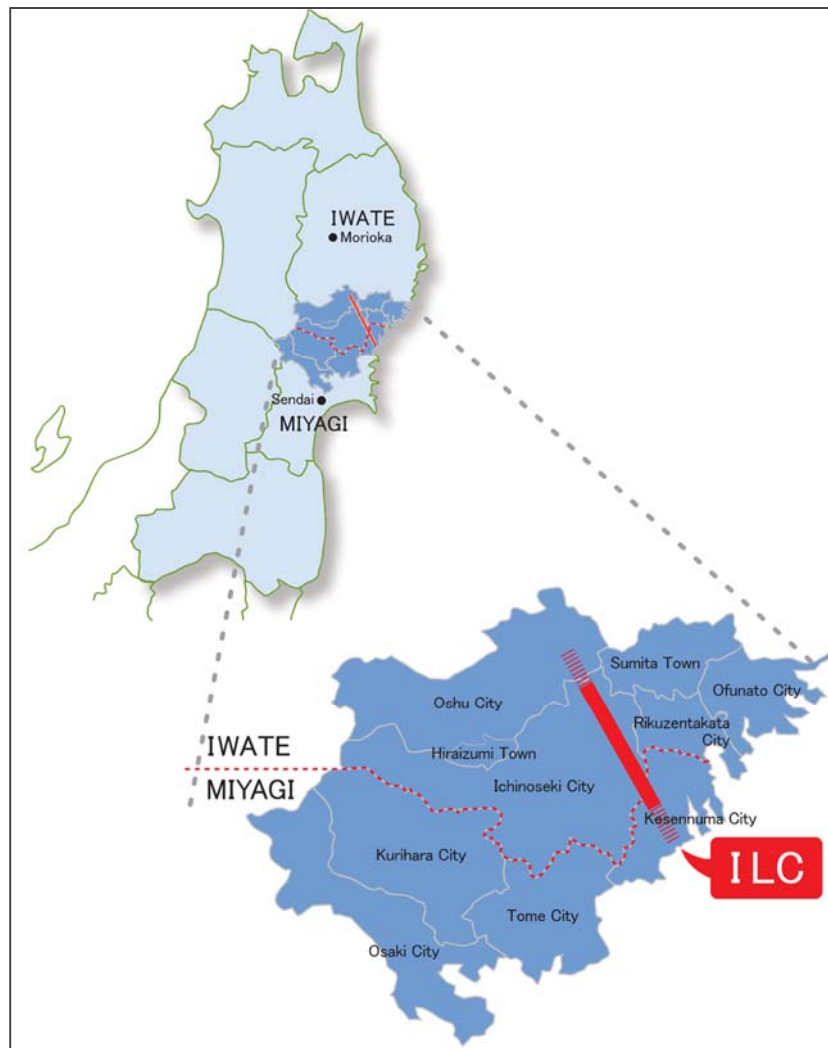


Figure 2: Tohoku Region of Japan. The ILC candidate site in the Kitakami Mountains is indicated by a red line. The neighboring municipalities are shown. (Figure by courtesy of Ichinoseki City.)

15. In June 2019, many representatives from the Tohoku Region jointly urged the national government to realize the ILC. The representatives included the Tohoku ILC Promotion Council (Chairperson Hiroaki Takahashi, Executive Member Kunihisa Yamura, Executive Member Atsuto Suzuki), the Hokkaido/Tohoku Governors' Association (Iwate Governor Takuya Tasso), the Hokkaido/Tohoku Prefectural Assembly Chairpersons' Association (Iwate Assembly Chairperson Junichi Sasaki), the Tohoku Mayor's Association (Morioka City Mayor Hiroaki Tanifuji, etc.) and others. They visited the Prime Minister's Office, the Ministry of Education, Sports, Science and Technology, the Ministry of Land, Infrastructure, Transport and Transportation, and the Reconstruction Agency. They submitted their request in person urging for the realization of the ILC to the Chief Cabinet Officer and the Ministers.

Support from Economic Organizations Promoting the ILC

16. The three major economic organizations in Japan (Japan Business Federation, Japan Chamber of Commerce and Industry, and Japan Association of Corporate Executives) released a joint statement in February 2019 supporting the realization of the ILC. The statement describes the ILC as "Asia's first large international facility in science and technology, which will attract a few thousand top-grade researchers and accumulate the state-of-the-art technology from around the world." It urges the Japanese government to "ask the relevant countries to start the international negotiations." The economic organizations continue to support the ILC.

Support from the General Public

17. The “Committee of 100 for the ILC” was formed in June 2018, consisting of influential business and cultural people, supporting the realization of the ILC. The leading founding member is Hiroya Masuda, former Governor of Iwate Prefecture and former Minister for Internal Affairs and Communications. Members from the organization are making policy proposals that include the ILC as a central component. Other members are evaluating the economic significance of the ILC. One member, Kenshi Hirokane, is a prominent manga artist, whose hit serial comic “*Chairman Kosaku Shima*” recently portrayed the contemporary ILC activities surrounding the March 7 event in 9 biweekly episodes.
18. The “ILC Supporters”, formed in April 2018, is a group of ILC enthusiasts consisting of 61 well-known creators from various industries such as animation, video games, publishing, and entertainment industries, and over 320,000 supporters from the general public. The founder of the organization is Mamoru Oshii, who is renowned worldwide as the director for the “*Ghost in the Shell*” animated films. The group sees the ILC as a beacon of hope that will help restore Japan’s prominence in science and technology.

Preparation for Environmental Assessment

19. KEK is organizing the preparation for the Environmental Assessment in the Preparation Phase and the Implementation Phase, assisted by professionals in environmental assessment.

Evaluation of ILC’s Value from the Economic Viewpoint

20. KEK is inviting economists to evaluate from the economic effect of the ILC taking into account the social infrastructures and innovation effects.

Regional Revitalization and “Global Village Vision”

21. The National Land Planning Association, an auxiliary organization of the Ministry of Land, Infrastructure, Transport and Tourism, is working to formulate a vision for regional revitalization, which takes into account the current world affairs and global challenges. The “Global Village Vision” is a policy proposal which is built around the ILC, taking advantage of its characteristics as an aggregator of researchers regardless of their country, race, or religion, which will tackle a wide range of issues in society that go beyond particle physics.

Regional Survey, Environmental Assessment, Site-Specific Design

22. Various surveys for the ILC have been carried out for over 10 years. Surveys in the Tohoku Region began in earnest in 2007. During the site selection process in 2013, more surveys were performed. Through the site selection process, the international community of scientists has selected the Kitakami Mountains in the Tohoku Region as the most suitable candidate site for the ILC. More detailed surveys have been performed from 2014 onwards which provided inputs for the site-specific design of the ILC.
23. The Tohoku ILC Promotion Council and KEK jointly produced a site-specific design for the ILC that satisfies the international design of the ILC. A third-party review is currently being conducted by the Japan Society of Civil Engineers in the Committee for Rock Mechanics. The Subcommittee for the Evaluation of the ILC Technology was set up in July 2019, which is scheduled to conclude by the end of 2019.
24. For the site-specific design of the ILC, the following items were considered.
 - Cost evaluation was performed for the access tunnels, accelerator tunnels, experimental hall, and drainage tunnels. Studies were performed such as the field survey and conceptual design of the interaction point, the relation between tunnel depth and seismic motion, the inclination of access tunnels, vertical access shafts for experiments, and streamlining of facility structures.
 - The best candidates were chosen for the following three items: the accelerator tunnel’s position,

azimuth, and altitude; site for the central interaction region; and accelerator access tunnel positions. The optimal placement of the access tunnels and surface facilities were studied taking into account the constraints from terrain and public roads so that the length of the access tunnels becomes minimum.

- Concrete designs were made for electricity, air conditioning and ventilation, water supply and drainage, cooling water facilities, and the placement of relevant surface and underground facilities. Conceptual designs and cost estimation were performed for the power distribution systems and the energy flow of the underground tunnels, including backends such as cooling towers, which contributed to the revised ILC design (2017) by providing data via KEK and LCC.
- Concerning cryomodules and related components, the processes of receiving, testing, storing, and installing into the tunnels were studied taking into account the actual quantities and schedule of domestic and overseas production for the ILC. Potential issues and measures were studied concerning non-accelerator components, detectors, and computing, in terms of the scale of preparation needed in the inland and seaport areas around the candidate site.

25. The geological conditions of the candidate ILC construction area were studied using electromagnetic survey (for rock fractures) and elastic-wave survey (for rock hardness) along the entire length of 20 km. The results showed that hard bedrock spans in the underground area. Hydrological surveys were also performed in order to collect basic information such as the underground waterflow at river-crossing points.
26. In the Tohoku Region, basic surveys were performed during 2013-2014 in preparation for the environmental impact assessment. The impact of the ILC construction on the natural environment was evaluated taking into account the necessary electric power, excavation volume, and safety of the beam dumps.
27. The locations for the ILC central campus and the base camp for preparing the construction are being studied in the Tohoku Region by request from the LCC. The Tohoku side has proposed an ex-factory site, previously owned by NEC Corporation, located next to the Ichinoseki Station for the Shinkansen bullet train, to be used as the site for the base camp. Other facilities including the division of the facility functions are currently being studied.

Various surveys and preparations performed in the Tohoku Region	
Facilities	Facility placement plan (surface access points; interaction point)
	Site-specific civil engineering design and cost evaluation
	Site-specific facility design and cost evaluation
Construction	Seismic survey; electromagnetic survey; boring survey; aerial laser survey; lineament survey; rock tests; chemical analysis
	Hydrological survey
	Microtremor survey
	Road traffic vibration survey; fluvial vibration survey
Infrastructure	Transport survey (seaport; roads)
	Electric power survey
	Clean water and industrial water survey
Environmental Assessment	Land utilization survey
	Land ownership survey
	Natural environment survey
	Social infrastructure survey
	Synergy with local governments' policymaking
Region	Central campus and base camp for construction preparation

28. The necessary regional initiatives have been studied and identified, such as social infrastructures, regional characteristics, and readiness in accepting newcomers. It is assumed that their

implementation will be shared by the ILC Laboratory, the local governments, and the private sector.

Necessary initiatives in the local region for the ILC	
Residence and accommodation	Accommodation booking; assistance for residence finding and leasing contracts; etc.
Childcare and education	Daycare centers with international support; building new international schools; etc.
Healthcare and insurance	Healthcare services with international support; assistance for enrolling in medical insurance; etc.
Daily support	Creating one-stop service centers with international support; etc.
Finance and payment	Ease of opening a bank account for non-Japanese; increase convenience; etc.
Daily transportation	Commuting buses to the ILC Laboratory; assistance in obtaining driver's license; etc.
Shopping and dining	Local supermarket with international support; etc.
Culture and entertainment	Expanding recreational facilities; etc.
Visa and residency status	Simplifying procedures for residence status; etc.
Employment and participation	Assistance for finding jobs for family members of researchers; etc.

Increasing Public Awareness

29. In Tohoku Region, promotional activities aimed at increasing the awareness of the project are actively being held targeting elementary and middle school students and adults. The attendance of public lectures and other events amounts to a total of over 10,000 people every year. Concerning informing the public about potential risks, lectures and briefings are held and information handouts are distributed on this subject. Nationwide events are held and promotions at overseas conferences are carried out to increase the awareness both in and out of the country.
30. Some oppositions to the project exist. A civilian group wrote letters to the Science Council of Japan's ILC Evaluation Committee, citing concerns about the risk of tritium produced in the beam dumps. Efforts to increase the understanding of risk management have since been further strengthened, with briefings specializing in risk management being held on a bimonthly basis.
31. Organizations promoting the ILC have recently produced a joint promotional video to increase the public awareness of the project. A nationwide distribution is coordinated through handing out media discs and via websites and social networking sites.

Acknowledgments

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