

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

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JAHEP ILC Steering Panel<sup>1</sup>

## Introduction

1. The International Linear Collider (ILC) is a large-scale project that requires global cooperation. In Japan, people not only from the academic sector, but also from the political, industrial, business sectors and local communities of the candidate site for construction and its surrounding areas, are now working together to promote the ILC in Japan and are considering the various preparations needed for the realization of the ILC.

International discussions among governments, and politics-industry-government-academia sectors are also ongoing. Among such international activities, clear support for the ILC sited in Japan shown by the US government since the fall of 2019 has become a great driving force for the realization of the ILC.

2. This report summarizes the latest status of such efforts towards the realization of the ILC in various sectors of Japan. We will continue to report the status in future. We hope that this report will be widely shared by the research communities around the world as useful input information for international discussions.
3. On March 7, 2019, at the Linear Collider Board (LCB) meeting held in Tokyo, the Ministry of Education, Culture, Sports, Science and Technology (MEXT) announced the view of the Japanese government regarding the ILC project. Following this, at the LCB meeting held at SLAC in the United States on February 22, 2020, MEXT and the Federation of Diet Members for the ILC reported on the progress of the project, and the Director of the Office of Science of the U.S. Department of Energy gave a speech on the views from U.S. Based on these presentations, the International Committee for Future Accelerators (ICFA) decided to advance the ILC project to the next phase by establishing the ILC International Development Team (IDT) in August 2020, whose mandate is to make preparations to establish the ILC Pre-Laboratory (Pre-Lab)<sup>2</sup>.
4. With the establishment of the IDT, the ILC project has entered the transitional phase towards the ILC Pre-Lab. In order to support and facilitate this transition, the Japan High Energy Physics Committee (HEPC) that represents the Japan Association of High Energy Physicists (JAHEP) established the ILC Steering Panel in October 2020.

*The mandate of the Panel is to lead the high energy physics community to advance the ILC project towards its timely realization, including:*

- *developing coherent promotion strategies and putting them into action,*
- *in promotion of the ILC project, cooperating with other scientific communities, governmental authorities, legislators, corporate leaders, regional governments, media, as well as international communities and authorities,*
- *cooperating closely with the IDT and KEK.*

*The Panel will regularly report its activities to the HEPC. Important decision items will be discussed by the HEPC and shared within the high energy physics community in Japan.*

<sup>1</sup> <http://jahep-ilc.org/en/>

<sup>2</sup> [https://icfa.fnal.gov/wp-content/uploads/ICFA\\_IDT\\_Structure.pdf](https://icfa.fnal.gov/wp-content/uploads/ICFA_IDT_Structure.pdf)

## Political Activities Towards the Realization of the ILC and International Cooperation

5. 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 over 100 Members of the Japanese Diet, out of a total of 710 Members. The Chairperson of the Federation is Hon. Takeo Kawamura, former Chief Cabinet Secretary. Federation members meet frequently 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.
6. 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.

### Realizing the ILC as National Project with Cross-Cutting Policies



(Positions as of Sep. 2018)

7. In February 2019, the Federation and the Committee have jointly approved a resolution urging the Japanese government to host the ILC as a cross-policy national project. The resolution was presented in person to the MEXT Minister and the Minister of State for Science and Technology Policy. In December 2019, they urged to the MEXT Minister again. (For other recent political activities, refer to the LCWS2019 keynote speech by Hon. Ryu Shionoya.<sup>3</sup>)
8. On June 5, 2020, the National Diet (parliament) of Japan passed a bill to extend the Reconstruction Agency. A supplementary resolution, out of a total approximately 25 supplementary resolutions,

<sup>3</sup> [http://epx.phys.tohoku.ac.jp/LCWS2019/documents/LCWS2019\\_Hon.Shionoya\\_Ryu\\_EN.pdf](http://epx.phys.tohoku.ac.jp/LCWS2019/documents/LCWS2019_Hon.Shionoya_Ryu_EN.pdf)

mentioned the ILC project.

*Supplementary Resolution #5 by the House of Representatives (unofficial translation)*

*In cases where international research and development projects, such as the International Linear Collider which will contribute to the creation of a “New Tohoku”, are to be implemented in Japan, coordination and cooperation should be done with relevant organizations so that the projects can be hosted in the disaster-stricken areas.*

*Supplementary Resolution #26 by the House of Councillors (unofficial translation)*

*Since the Tohoku area is the world’s candidate site for the International Linear Collider project, its implementation will contribute, alongside the Fukushima Innovation Coast Framework, to the creation of a “New Tohoku” by becoming a breeding ground for scientific innovation. Therefore, the discussions need to be pushed forward in close coordination with the relevant organizations toward realizing the ILC in Japan.*

9. 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. In February 2020, an intergovernmental meeting was held among Japan, Germany, France and UK to discuss the ILC. In September 2020, the ILC project was explained to the science and technology officers of Europe and the United States embassies in Japan.

### **Key Organizations Promoting the ILC**

10. Within the academic community, the High Energy Accelerator Research Organization (KEK) and university groups are actively promoting the ILC, in cooperation with the international scientific community via the International Development Team (IDT), which was set up in August 2020 by the International Committee for Future Accelerators (ICFA). The ILC Steering Panel was established in October 2020 by the Japan High Energy Physics Committee (HEPC) that represents the Japan Association of High Energy Physicists (JAHEP). The mandate of the Panel is to lead the high energy physics community in Japan to advance the ILC project. (See Figure 1 for the relations among various organizations promoting the ILC.)
11. The industry-academia collaboration is spearheaded by the Advanced Accelerator Association Promoting Science and Technology (AAA)<sup>4</sup>, 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.

<sup>4</sup> <http://aaa-sentan.org/en/>

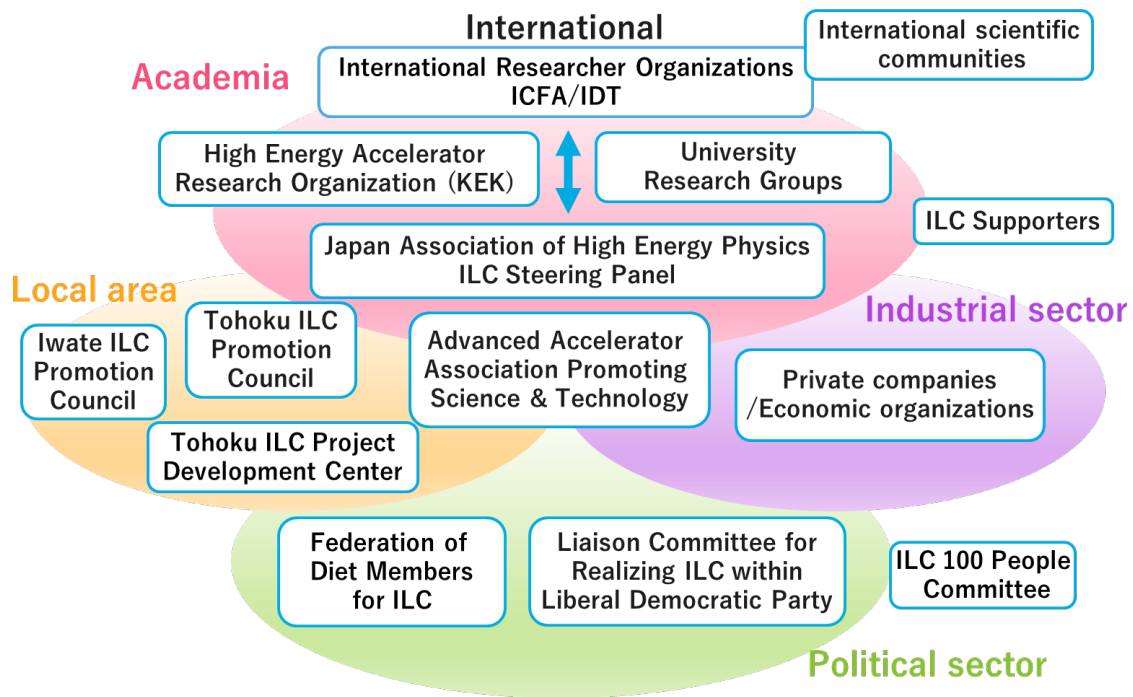


Figure 1: Organizations promoting the ILC.

12. Efforts in the Tohoku Region are coordinated by the Tohoku ILC Promotion Council,<sup>5</sup> which consists of members from academia (10), industries and business (203), and local governments (18). 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). The Tohoku ILC Preparation Office was established under the Tohoku ILC Promotion Council in 2016. In August 2020 with the launch of the IDT, the Tohoku ILC Preparation Office split off from the Tohoku ILC Promotion Council to form the Tohoku ILC Project Development Center<sup>6</sup> (headed by Atsuto Suzuki) with a strengthened alliance of regional industries, academia, and local governments. The Center will address regional issues such as geological and hydrological survey, infrastructure development, and environmental assessment, in more concrete terms.

### Tohoku Region and Activities Promoting the ILC

13. 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 3 GeV 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”).

<sup>5</sup> <https://en.tohoku-ilc.jp/>

<sup>6</sup> <https://tipdc.org/en>

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

14. 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 political efforts for the ILC to be sited in Tohoku, increasing public awareness, preparing for environmental impact assessment, and assessing the readiness of transport and living conditions for international researchers.
15. 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. Attendants of the meetings include Mayors. The latest meetings were held on July 17, Oct. 23, and Dec. 25, 2019.

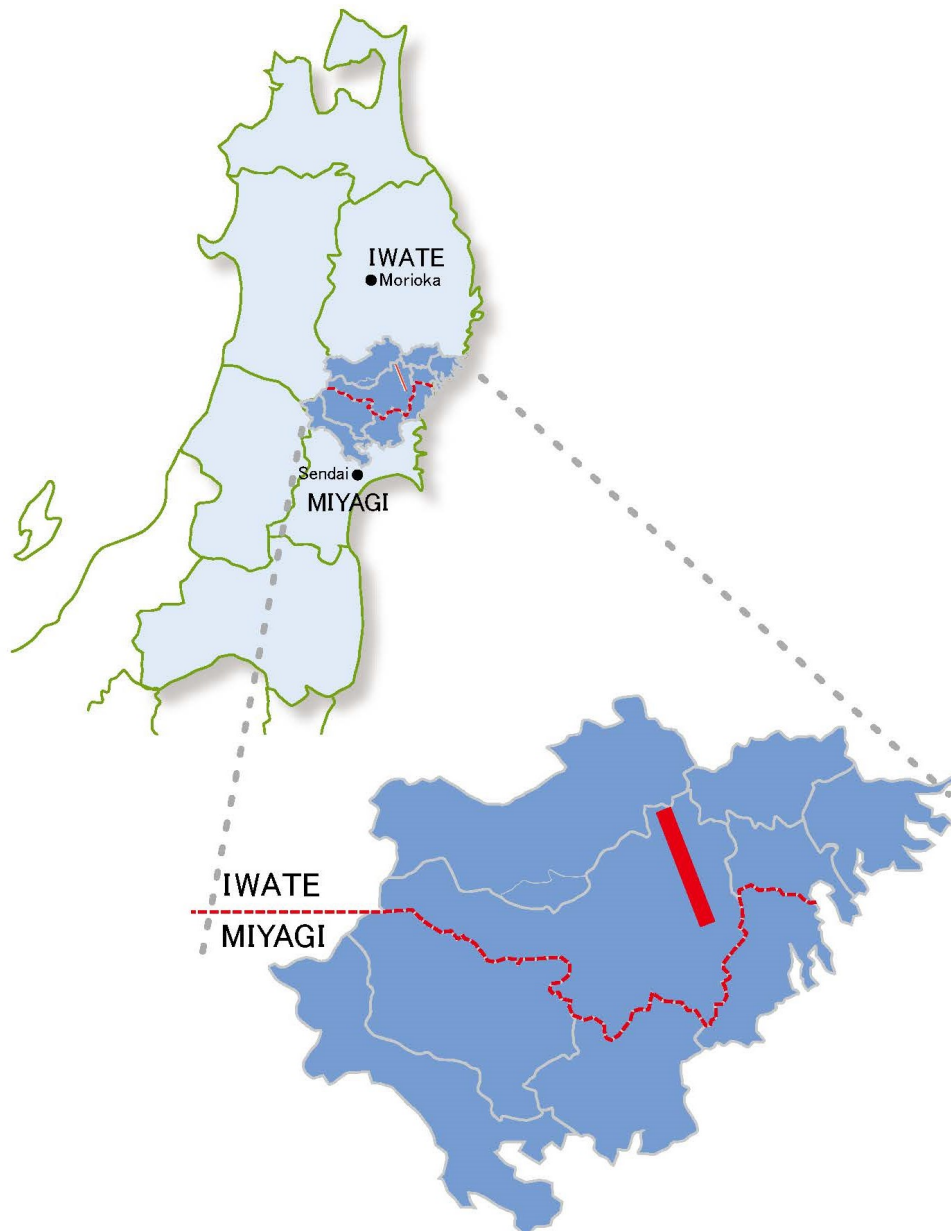


Figure 2: Tohoku Region of Japan. The ILC candidate site in the Kitakami Mountains is indicated by a red line. The red dashed-line shows the border of Iwate and Miyagi prefectures.

16. 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.
17. 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. In June 2020, the Tohoku ILC Promotion Council (Co-chairs Hiroaki Takahashi and Hideo Ohno; Deputy: Takuro Ueda, Executive Vice President of Tohoku University), visited the Liberal Democratic Party (Chair of Executive Council and Chair of Policy Research Council) and the Prime Minister's Office (Deputy Chief Cabinet Secretary) and requested for an early realization of the ILC.

### **Support from Economic Organizations Promoting the ILC**

18. 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." These economic organizations continue to support the ILC.
- In October 2020, the joint declaration to realize the ILC in Japan by the Japan Business Federation and the Tohoku Economic Federation was adopted in their meeting.

### **Support from the General Public**

19. 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 event on March 7th 2019 (EOI by the Japanese government) in 9 biweekly episodes.

20. 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**

21. 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.
22. KEK has organized an Advisory Board since 2019 in which the environmental assessment issues are discussed being assisted by professionals in environmental assessment. They have developed a guideline for the assessment considering the perspectives of the Strategic Environmental Assessment as well as the preliminary survey results by local government. The report will be issued in early 2021.

### **Evaluation of ILC’s Value from the Economic Viewpoint**

23. A task force formed in the AAA Project Promotion Subcommittee reviewed a method to derive the economical ripple effects which was traditionally used in an economic think tank or conjectured by an innovation effect with large indeterminacy, then originally estimated the fundamental effects such as inbound effects and local revitalization. At KEK, the economic effect has been estimated taking into account the social infrastructures and innovation effects inviting expert economists

### **Regional Revitalization and “Global Village Vision”**

24. The National Land Planning Association, an auxiliary organization of the Ministry of Land, Infrastructure, Transport and Tourism, formulated a vision for regional revitalization, which takes into account the current world affairs and global challenges. The report was published in December 2019. 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.

### **Promotion of local industry, support for entering accelerator-related industry for local companies**

25. The Tohoku Economic Federation Business Center has formed a collaborative organization of 7 prefectures (the 6 prefectures in Tohoku + Niigata prefecture), which is aiming to promote to enter the accelerator-related industry for local companies. Coordinators from the industrial technology center or the industrial promotion center in each prefecture have been appointed to carry out activities such as planning various seminars, matching between companies, and provision of the related information.
26. The Tohoku ILC Preparation Office and its successor, Tohoku ILC Project Development Center, offer information and act as liaison to research institutions in order to facilitate local companies to enter the accelerator-related industry working together with the organization described above. In addition, they have been considering utilizing local resources for sustainable development. Among



others, regional industry-government-academia collaborations are considering to construct wooden ILC-related facilities using local wood and developing a new technology to utilize the waste heat from the ILC<sup>7</sup>.

### **Regional Survey, Environmental Assessment, Site-Specific Design**

27. Surveys on ILC sites in Tohoku started in earnest in 2007, and further study was conducted during the evaluation of the ILC candidate sites in 2013, providing information that helped the international research community to select the Kitakami Mountains in Tohoku as the best candidate site. Since then, further detailed geological investigations have been conducted to provide input for the site design.
28. In order to understand the geological conditions in the area where the ILC is expected to be constructed, a 30 km long seismic survey (survey related to the hardness of the bedrock), a 13 km long electrical and electromagnetic survey (survey related to the fractures in the bedrock), and seven borehole investigations in six areas have been conducted. As a result, it is expected that the subsurface bedrock is of good quality and hard. In addition, a preliminary hydrological survey has been carried out to collect basic data for understanding the groundwater movement.
29. The on-site design is being carried out jointly by Tohoku and KEK, in collaboration with the ILC international design team.
30. Considerations for on-site design
  - The location of the central collision point, the layout and elevation of the accelerator tunnel, and the entrance of the access tunnel were studied to develop a facility layout plan. The layout of the accelerator and ground facilities was studied to minimize the length of the access tunnel based on the topography, existing roads, and other conditions.
  - Conducted a study on the rationalization of facility structure based on a field surveys and schematic designs of potential collision points, investigations on the relationship between tunnel depth and ground vibration, access tunnel inclination, experimental facility shafts, and other aspects.
  - Specific design of power, air conditioning and ventilation, water supply and drainage, and cooling water facilities were carried out. Conceptual designs and cost estimates were made for the power distribution system, energy flow in the underground tunnel, all the way down to the backend including the cooling tower.
  - Assuming the number of domestic and overseas manufacturing personnel and the manufacturing schedule, the process of receiving, inspection, storage, and installation was studied, especially for the cryomodule. For components other than accelerators, such as detector instruments, computers, etc., issues were identified, and countermeasures were discussed. The necessary scales to be developed in inland areas and the bay area were evaluated.
31. In FY 2019, the on-site design was compiled as the "Tohoku ILC Facility Plan" and was subjected to a third-party evaluation by the ILC Facility Plan Evaluation Subcommittee of the JSCE Committee on Rock Mechanics. As a result, the "Tohoku ILC Facility Plan" was assessed to be technically feasible and its contents were concluded to be reasonable.
32. The locations for the ILC central campus and the base camp for preparing the construction are being studied. The site, previously owned by NEC Platforms Ltd., located next to the Ichinoseki Station of the Shinkansen bullet train, is considered to be a candidate of the base camp. Other facilities including the division of the facility functions are currently being studied.

<sup>7</sup> [https://www.pasj.jp/web\\_publish/pasj2020/proceedings/PDF/WEPP/WEPP57.pdf](https://www.pasj.jp/web_publish/pasj2020/proceedings/PDF/WEPP/WEPP57.pdf)



<b>Various surveys and preparations performed in the Tohoku Region</b>	
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
Central campus and base camp for construction preparation	Collecting land information assuming a rough location of the central campus

33. 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.

<b>Necessary initiatives in the local region for the ILC</b>	
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**

34. 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.

35. Some oppositions to the project do 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. It has been held 10 times since 2019.
36. 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.

### **Promotion for the academic society**

37. Numerous seminars and symposiums have been held - seminars for neighboring fields: 11 times (a total of 2700 participants), seminars at universities/academic institutes: 95 times (a total of 2250 participants), and symposiums at JPS meetings: 15 times (a total of 2350 participants). Limiting to after 2018, 3 times with a total of 800 participants, 14 times with a total of 250 participants, and 4 times with a total of 450 participants, respectively.
38. Since December 2020, seminars have been held at the universities with the high energy physics laboratory to involve researchers who are working on other HEP projects and developing the related technologies (it was held at Hiroshima Univ. on Dec. 16th and Kyushu Univ. on 18th December 2020). Similar seminars at other universities are being planned.

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