

## Activity Status Report of Tohoku ILC Project Development Center

### I. Background of Specific Efforts in Tohoku

#### 1. From Tohoku ILC Preparation Office to Tohoku ILC Project Development Center

Since it was necessary to study the outline of ILC site issues in advance in the Tohoku region, which is the candidate domestic construction site, before the Japanese government started a specific study related to the domestic site of the International Linear Collider (ILC), the Tohoku ILC Preparation Office was established under the Tohoku ILC Promotion Council on June 14, 2016.

In addition to formulating the Tohoku Master Plan, the Tohoku ILC Preparation Office has been studying specialized facility and equipment for the Kitakami site, as well as measures to strengthen industrial competitiveness using the ILC as an opportunity.

During this period, the International Committee for Future Accelerators (ICFA) decided to establish the IDT (ILC International Promotion Team) to prepare a written proposal for the ILC Preparation Laboratory. In response to these movements, the Tohoku ILC Preparation Office was reorganized on August 6, 2020, and the Tohoku ILC Project Development Center was established in order to further accelerate a regional led study.

#### 2. Background of efforts in Tohoku as a candidate site in the world

The southern part of the Kitakami Mountains, which spans from Iwate Prefecture to Miyagi Prefecture in the Tohoku region, has a series of granite bedrock sites and was an ILC construction candidate site. Through the following background, it became a candidate site of the world.

##### (1) ILC location evaluation by researchers in Japan (2013)

In August 2013, the ILC Site Evaluation Committee, made up of researchers in Japan, announced its study result, evaluating the Kitakami site as the most suitable ILC domestic candidate site, and this evaluation result was also supported internationally.

Since then, an international researcher community (LCC/Linear Collider Collaboration) has been working together to promote the plant as a candidate construction site of the world.

##### (2) Background of formulation of rough design proposal for local specifications in Tohoku

###### a. Geological survey

Since 2009, Iwate Prefecture, Tohoku University, and other organizations have conducted geological surveys, such as boring surveys, and elastic wave exploration and have confirmed that the bedrock is in good condition.

###### b. Design proposal

In 2013, the International Collaborative Design Team (GDE/Global Design Effort) formulated the 500 GeV ILC Technical Design Report (ILC Technical Design Report: ILC TDR), and the ICFA subsequently recommended the specifications of 250 GeV in November 2017.

The Tohoku ILC Preparation Office set up a specialized working group, which specialized in the Kitakami site based on the specifications, took into account the unique conditions of the construction candidate site, and compiled the underground facility rough design, construction plan, and

construction cost rough estimate as the Tohoku ILC Civil Engineering Plan (2020),\*1 and the result was passed on to the Tohoku ILC Project Development Center.

\*1 See Page 8 for the Tohoku ILC Civil Engineering Plan (2020).

\*2 In the written proposal by the ILC Preparation Laboratory (approved by the ICFA, published on June 2, 2021), the content is based on the assumption that civil engineering design will be conducted in the Kitakami Mountains of Tohoku.

## II. Organization of Tohoku ILC Project Development Center

### 1. Establishment

August 6, 2020

### 2. Director

Atsuto Suzuki (President of Iwate Prefectural University)

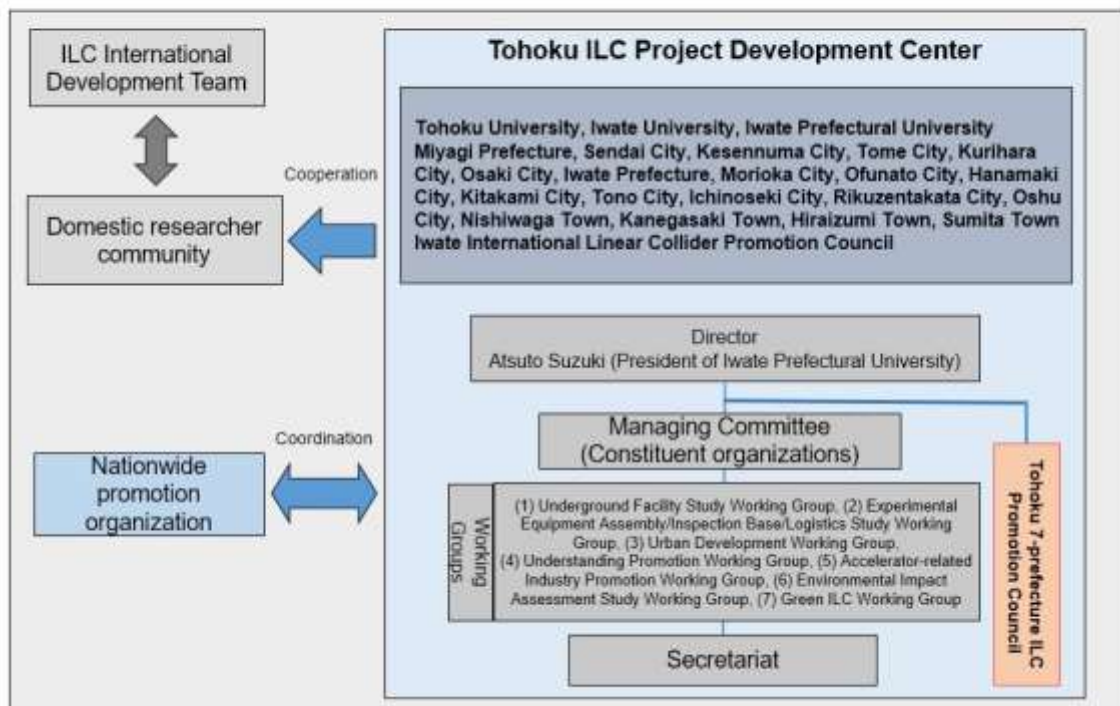
### 3. Purpose

The purpose is to cooperate with the researcher community and proceed with regional led specific studies, such as acceptance environmental improvement of the ILC.

### 4. Constituent organizations

Tohoku University, Iwate University, Iwate Prefectural University, Miyagi Prefecture, Iwate Prefecture, Sendai City, Kesenuma City, Tome City, Kurihara City, Osaki City, Morioka City, Ofunato City, Hanamaki City, Kitakami City, Tono City, Ichinoseki City, Rikuzentakata City, Oshu City, Nishiwaga Town, Kanegasaki Town, Hiraizumi Town, Sumita Town, and Iwate International Linear Collider Promotion Council

## Organizational Chart of Tohoku ILC Project Development Center



### III. Activities of Tohoku ILC Project Development Center

#### 1. General assembly

Approval of project reports and financial statements, decision on project plans (drafts) and budgets (drafts)

#### 2. Holding of managing committee

Discussion, information sharing regarding the center operation, and important projects (with the department/section managers in charge of the constituent organizations). The committee was held three times in FY 2022.

#### 3. Tohoku 7-prefecture ILC Promotion Council (Managing Committee)

The council is made up of the department managers (section managers) in charge of the ILC from seven Tohoku prefectures. Sharing information on the ILC promotion status (Managing committee: September 1, 2022)

#### 4. Project scale (Project cost)

Total membership fee: 24,300,000 yen (Member contribution)

#### IV. Projects (Working Group Activities) of Tohoku ILC Project Development Center

The Tohoku ILC Project Development Center established working groups for each of the following study themes.

1. Topographic and geological survey and facility layout study
2. Research/study of logistics/assembly bases
3. Study for urban development and acceptance environmental improvement
4. Activities to promote understanding by local residents
5. Promotion of accelerator-related industries
6. Study of natural environment survey
7. Green ILC

Each theme is explained below.

## 1. Topographic and geological survey and facility layout study

### (1) Working group in charge

Underground facility study group (Head of working group: Takashi Kyoya [Professor of Tohoku University])

### (2) Activities

- For the ILC facility layout, in addition to site conditions, such as geology/topography, rivers, roads, and buildings, it is important to fully consider the future land use of the area and the impacts on the surrounding environment, such as the landscape, nature, noise, and vibration.
- For this reason, as a construction candidate site, compiling of the facility layout proposal that takes into consideration the impacts on the local community regarding the following matters is conducted in stages.
  - Compiling of survey results of geology
  - Study of ILC facility plan
  - Site issue study (Buried cultural properties etc.)
- In addition, the following joint research is conducted with Tohoku University by utilizing the boring tunnels (FY 2022–2023). See page 6 for details.
  - Obtaining rock body information and studying the feasibility of the facility layout proposalThe joint research is conducted with the Institute of Fluid Science, Tohoku University.

### (3) FY 2022 settlement amount

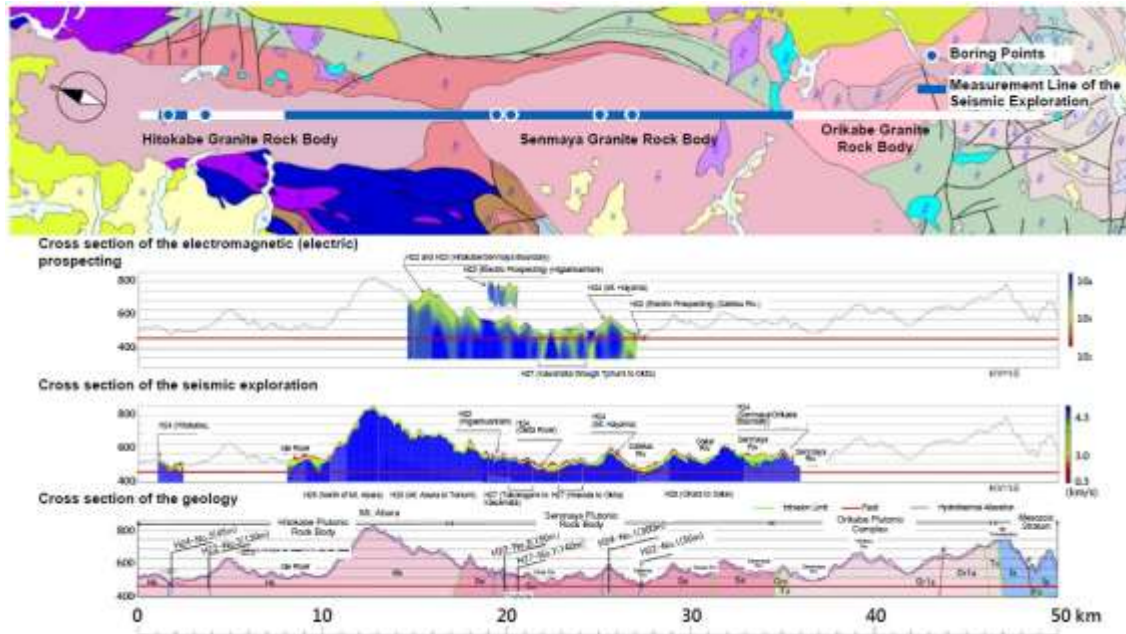
5,598,000 yen

### ◆ Statures of topographical/geological surveys around ILC construction candidate site to date

Electromagnetic exploration (status of bedrock cracks), elastic wave exploration (status of bedrock hardness), boring survey (rock type/property), borehole camera (direct viewing of boring tunnel inner wall), indoor rock test, fluorescent X-ray analysis, and constant spring water amount prediction have been conducted.

## Compiling of topographical/geological surveys around ILC construction candidates

- Electromagnetic exploration (bedrock cracks), elastic wave exploration (bedrock hardness), boring survey (rock type), borehole camera (direct viewing of boring tunnel inner wall), indoor rock test, fluorescent X-ray analysis, and constant spring water amount prediction



- Hard bedrock of good quality spreads underground.

- Accelerator construction site: Inside a granite belt → 50 km long

As a result, the following points were confirmed.

- Hard bedrock of good quality spreads underground.
- The accelerator construction site extends over 50 km within a granite belt.

### ◆ Joint research with Tohoku University

From FY 2022 to 2023, joint research between the Tohoku ILC Project Development Center and Tohoku University has been conducted and the geological information near the collision point is being obtained. In addition, boring is conducted by the NEDO (New Energy and Industrial Technology Development Organization).

## Procurement of Geological Information through Joint Research with Tohoku University FY 2022–2023

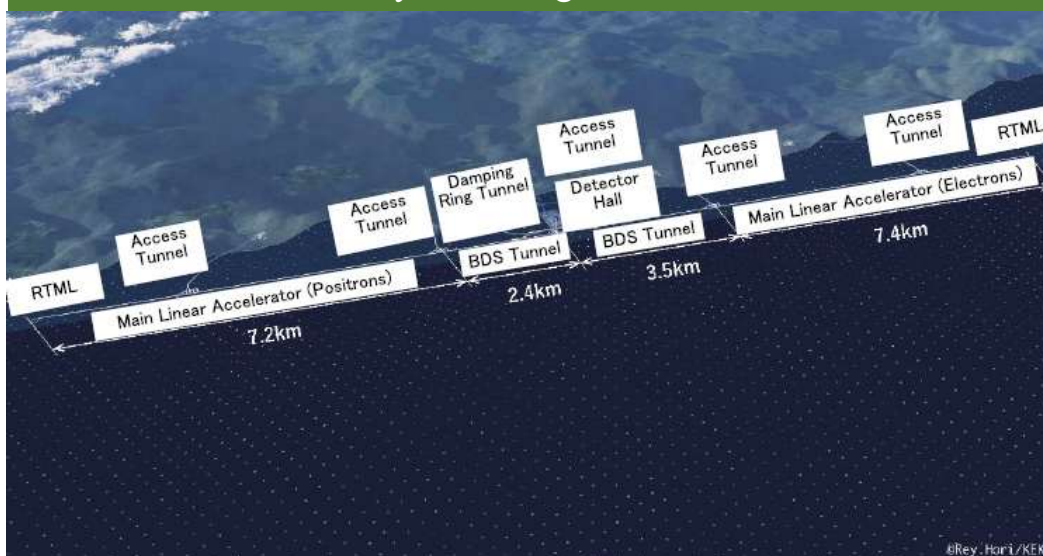


- Boring by NEDO project



- ◆ Study status of overall underground facility layout and connection with the ground surface
  - Study of facility layout under the restricted conditions of underground facility
  - Interaction Point (IP) (Vertical tunnel: Securement of depth and hard rock part)
  - Access Tunnel (AT) (Inclined tunnel: Slope angle, length of the tunnel)
  - Securement of the required area of above-ground part. Lowering of construction cost
  - Connection with local infrastructure (roads, electricity, water)
  - Avoidance of large cost increase specific to the Kitakami site

### Study of Underground Plan

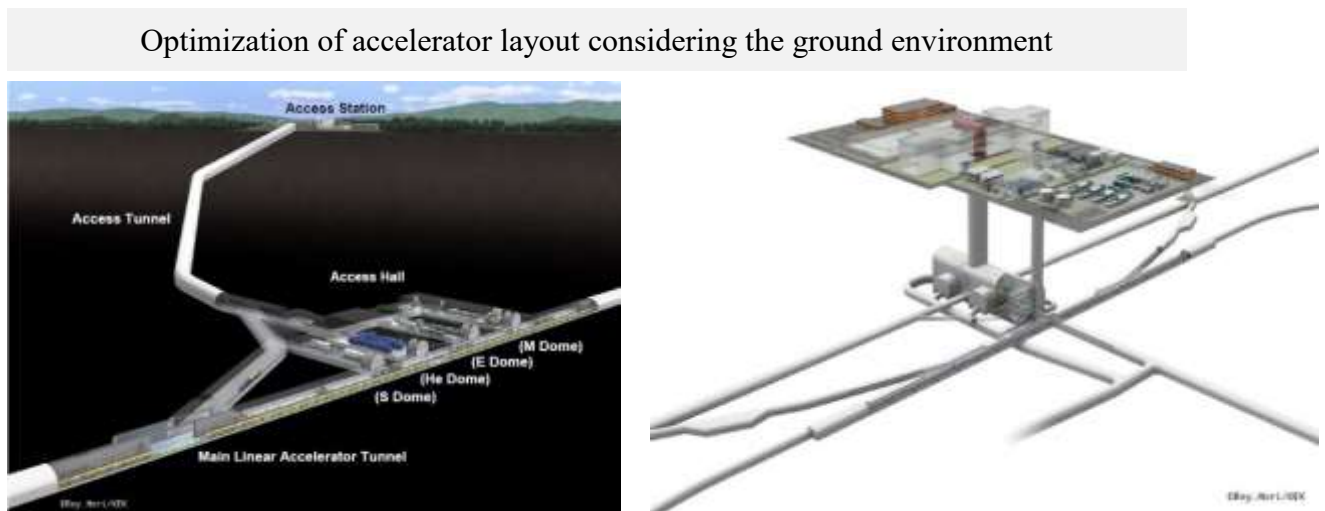


◆ Optimization of accelerator layout considering the ground environment

For the layout of underground facility construction, it is important to optimize the layout while paying attention to minimize the impacts on local residents/local life and avoid the impacts on buried cultural properties and rare flora and fauna.

At the four aboveground access stations connected to the tunnel, an extra high-voltage substation, helium refrigeration facility, carry-in equipment building, and cooling water/air conditioning building will be installed.

From the interaction point campus candidate site (IP site), it will be connected to the underground large cavity hall of the detector via the two vertical tunnels.



◆ Example of specific study of facility layout proposal (Update work of Tohoku ILC Civil Engineering Plan [2020])

The Tohoku ILC Civil Engineering Plan (2020) was published in 2020. This plan took into account the unique conditions of the construction candidate site in addition to the ILC TDR specifications and compiled the underground facility rough design, construction plan, and construction cost rough estimate.

The cost estimation was based on the following criteria.

- Ministry of Land, Infrastructure, Transport and Tourism: Civil Engineering Work Cost Estimation Standards (FY 2014 Edition), Construction Machinery Loss Charge Table (FY 2014 Edition), Construction Price and Estimation Materials (August FY 2014), and Public Works Design Labor Unit Price (FY 2014 Edition)

Regarding the Tohoku ILC Civil Engineering Plan (2020), the ILC Civil Engineering Plan Evaluation Subcommittee of the Committee on Rock Mechanics of the Japan Society of Civil Engineers evaluated the Tohoku ILC Civil Engineering Plan (March 2020) and concluded that the Civil Engineering Plan ensured technical feasibility and its contents were appropriate.

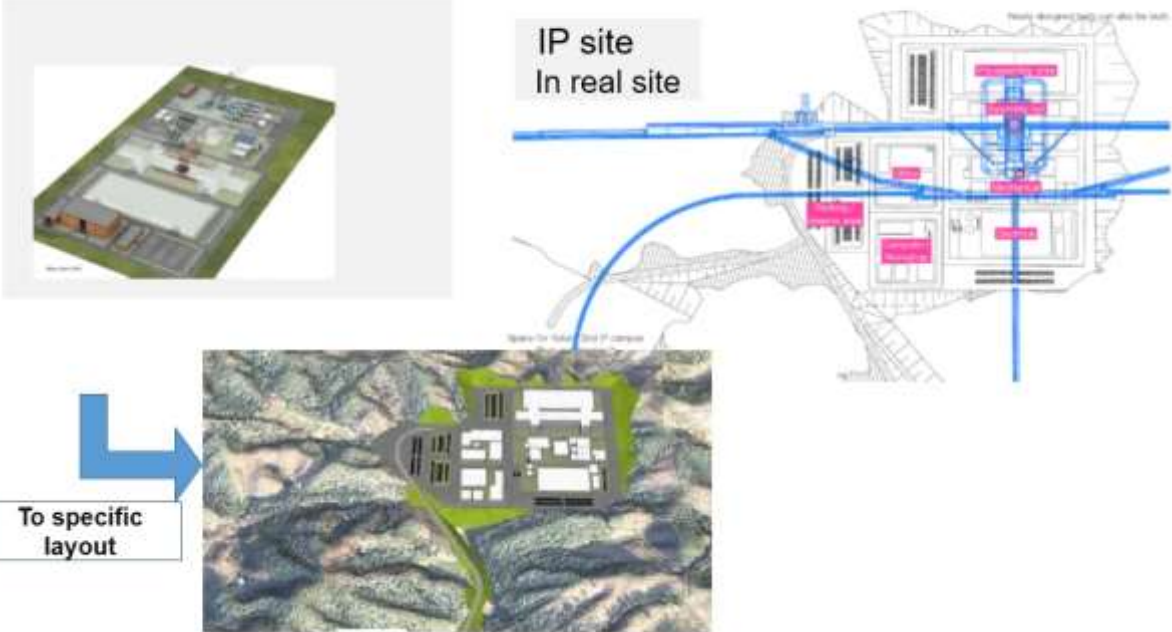
◆ Update work of Tohoku ILC Civil Engineering Plan (2020)

Subsequently, the specific layout of the impact point site (IP site) and the aboveground parts of the four access tunnels were studied more deeply in accordance with the actual topography. Some of the study results



of the IP site are shown below.

### Example of Specific Study of Facility Layout Proposal (Update work of Tohoku ILC Civil Engineering Plan\*)



## 2. Research/study of logistics/assembly bases

### (1) Working group in charge

Study working group on experimental equipment assembly/inspection base and logistics (Head of working group: Hitoshi Hayano [Visiting Professor of Iwate University])

### (2) Activities

- Study of transportation routes on ILC large equipment transportation and extraction of problems by equipment
- Studying the economic efficiency of dealing with transportation issues, reviewing the manufacturing process of equipment, and investigating the possibility of alternative proposals, such as divided transportation and on-site assembly

[Example of large equipment]

- Large solenoid coil for ILC detector (1/3 divided size)

L = 8500 mm, W = 7936 mm, H = 3606 mm, 90 t per unit

- Cold box for ILC accelerator helium refrigerator

L = 14000 mm, W = 3500 mm, H = 4000 mm, 50.5 t per unit

- Study of logistics by port utilization and measures to solve the issues
- Creation of 3D concept drawings for ILC assembly/test and inspection facilities

### (3) FY 2022 settlement amount

1,465,000 yen

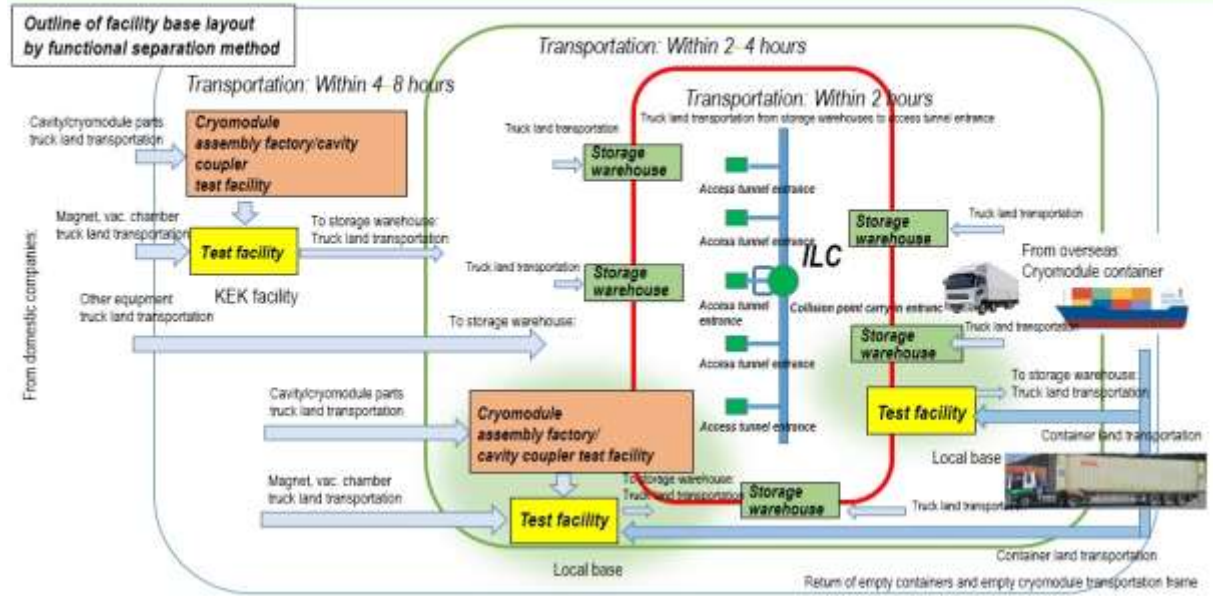
## ◆ Concept of expected local accelerator manufacturing/inspection/storage base

At the construction candidate site, cryomodules transported mainly from overseas by container ship are inspected and tested at the test facility and then stored in the storage warehouse.

It is assumed that it will take two to four hours from the ILC to the port and within two hours from the ILC to the test facility and storage warehouse.

For the domestic units, in addition to utilization of the test facility at the KEK for the cryomodule assembly factory/cavity coupler test facility, use of the test facility near the ILC is assumed.

## Expected Local Accelerator Manufacturing/Inspection/Storage Base



◆ Investigation and study of expected transportation routes

The cryomodule can be transported with a 45-foot container without any problems, but problems are expected with large equipment. For this reason, the following points are mainly studied.

- Started the study of obstacles on transportation roads for the detector solenoid after on-site winding
- Restudy of transportation road obstacles and access tunnel passage of the helium refrigerator cold box



◆ Creation of illustrations of ILC local test facility base

Specific conceptual drawings (CG) of the test facilities, storage facilities, and local winding factory for detector solenoids were created.

### Creation of Illustrations of ILC Local Test Facility Base

Specific conceptual drawings of the test facilities, storage facilities, and local winding factory for detector solenoids were created.



Outside the building

Cryomodule test facility building:  
Conceptual drawing



Inside the building

◆ Quantity of cryomodules

There are 906 cryomodules in total at the ILC.

A total of 302 units each from Europe and North America, and 302 units from Asia are expected.

For seven years until the tunnels are completed, the modules will be transported in the order they are completed and stored near the site. This quantity requires 28,000 m<sup>2</sup> of storage space (warehouse).

Installation in the tunnel and incorporation into the accelerator will be conducted in two years at a pace of about nine units per week.

An example of the study as a test, inspection, and logistics base for the cryomodules is shown below.

- As for the Nagahama/Yamaguchi District of Ofunato Port, Iwate Prefecture is proceeding with port improvement work.
- The area of the land developed is 5.3 ha, and the distance to the container terminal is about 4.5 km.
- The industrial site in the district is one of the candidate sites for the logistics base (logistics hub) in the ILC construction due to its vast area, proximity to the quay, tsunami protection measures, and the distance to the ILC construction candidate site.

## Utilization Study of Nagahama/Yamaguchi District Industrial Park

### Ofunato Port

Great potential as a logistics base  
in ILC construction

#### Nagahama/Yamaguchi District Industrial Land

Advantage of land close to the wharf and industrial site  
Advantage of time easy to carry-in and carry-out



### 3. Study for urban development and acceptance environmental improvement

#### (1) Working group in charge

Urban development study working group (Head of working group: Atsuto Suzuki [President of Iwate Prefectural University])

#### (2) Activities

- Research on the model case of urban development at the opportunity of the ILC is conducted.
- The main study contents include the residential environment, energy utilization, formation of multicultural society, impacts on residents' life, environment and socioeconomics, and process/local system for acceptance.
- From FY 2021 to 2022, joint research by Iwate University, the Advanced Accelerator Association Promoting Science & Technology (AAA), and the Tohoku ILC Project Development Center were conducted.

[Study method]

Five themes were set. For each theme, research and study were mainly conducted by the research collaborators from 7 AAA member companies, and by the working members of urban development practitioners from 17 center member cities and towns, Miyagi Prefecture, Iwate Prefecture, and Iwate University, and an urban development case proposal was formulated.

- Wide-ranging interviews with the member cities and towns were conducted, and a model case that summarizes each theme was compiled.

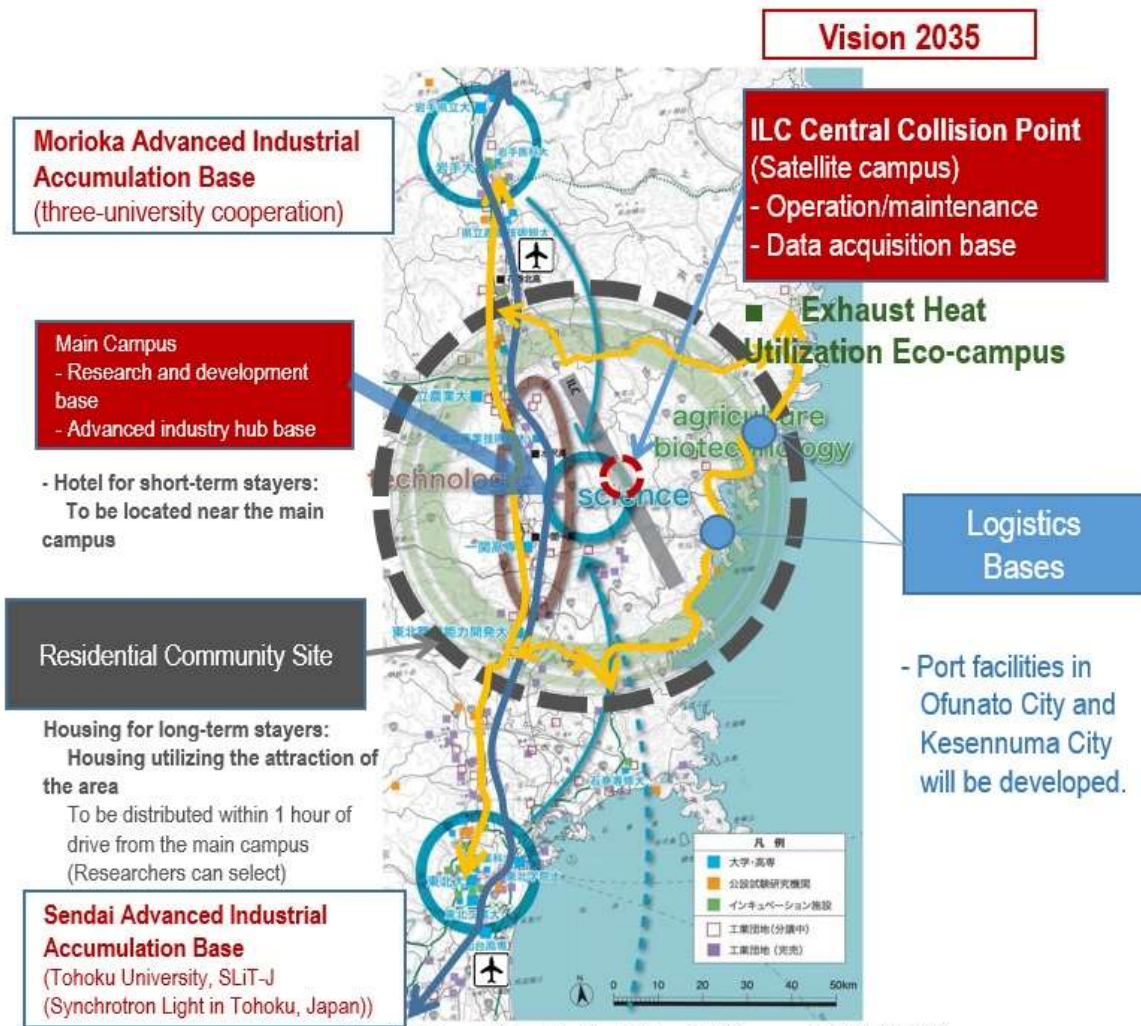
#### (3) FY 2022 settlement amount

5,452,000 yen

#### ◆ Direction of activities of the urban development working group

The AAA formulated a vision for urban development from Morioka City in Iwate Prefecture to Sendai City in Miyagi Prefecture at the opportunity of the ILC as Vision 2035, assuming that the ILC will be operational in 2035. Therefore, this idea was used for the basis for the joint research.

- The satellite campus will be located at the ILC collision point and serve as an operation, maintenance and data acquisition base.
- The main campus will be located near the ILC and serve as a research and development base and an advanced industry hub base.
- Hotels for short-term stayers will be located near the main campus.
- Housing for long-term stayers utilizing the attraction of the area, which can be selected by researchers, will be located within a one-hour drive from the main campus.



◆ **Concept of ILC urban development in joint research**

Aiming to urban development that continues to evolve together with the region by effectively utilizing rich natural and local resources in response to social demands, such as SDGs and carbon neutrality, and working on advanced technologies, such as the introduction of Society 5.0

1) Green ILC - Recycling-oriented urban development that coexists with forests and nature

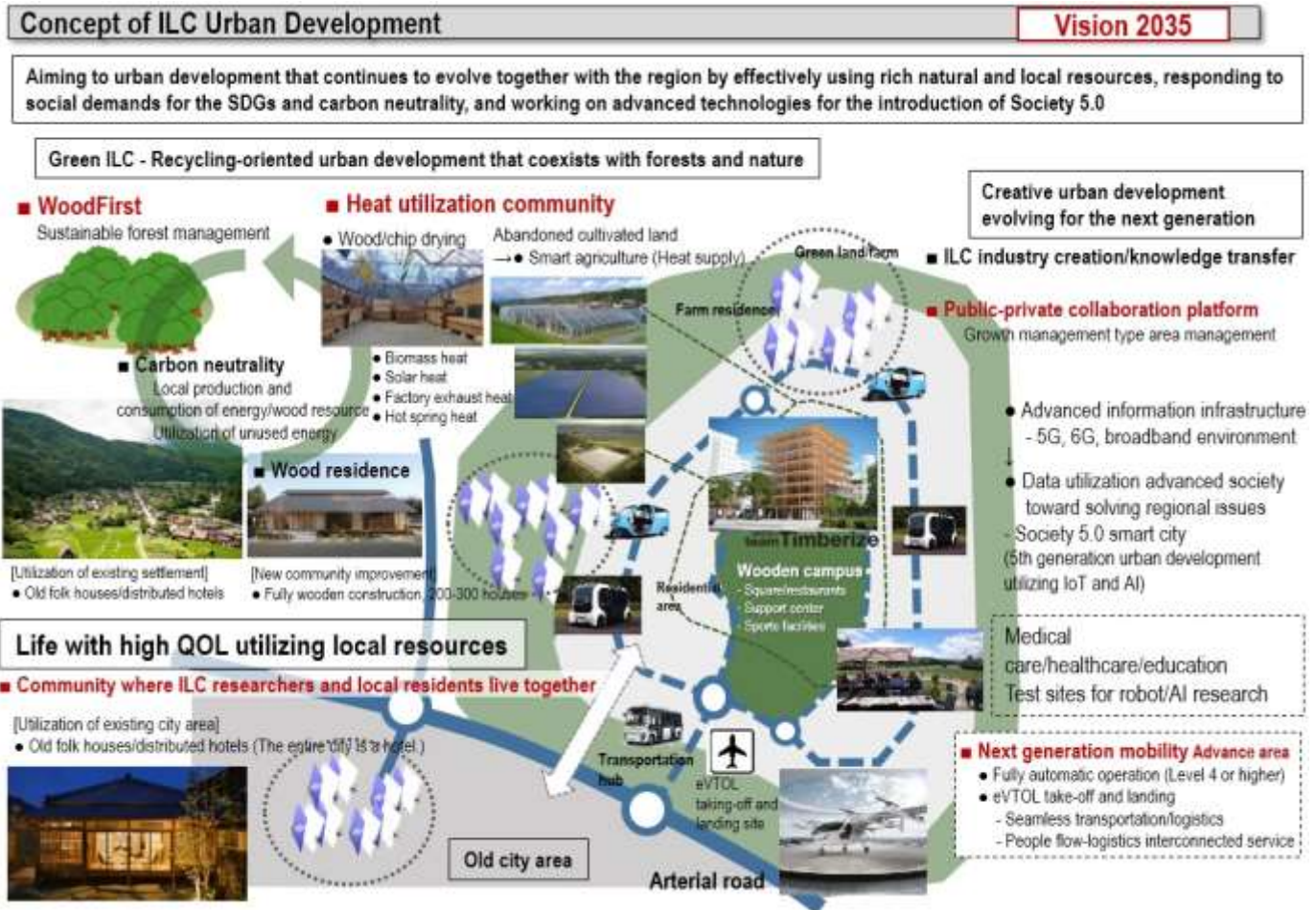
- WoodFirst: Sustainable forest management, fully wooden construction, and 200-300 houses
- Heat utilization community, wood/chip drying, abandoned cultivated land →● Smart agriculture (heat supply)
- Aiming for carbon neutrality, biomass heat, solar heat, factory exhaust heat, and hot spring heat are utilized

2) New community improvement

- Life with high QOL utilizing local resources: Community where ILC researchers and local residents live together and old folk houses/distributed hotels use the existing city area (The entire city is a hotel.)

3) Creative urban development evolving for the next generation: **Public-private collaboration platform**  
(Growth management type area management)

- Next generation mobility advance area (fully automatic operation, eVTOL take-off and landing, seamless transportation/logistics, and people flow/logistics interconnected service)



◆ Status of efforts in FY 2022

- Extracted issues and narrowed down themes from the efforts in FY 2021 to set the study themes for this fiscal year.
- Deepening the study with research cooperation from Iwate University
- Building momentum to invite the ILC

[Outline of efforts for the themes]

- Residential community: Municipality hearing, workshop implementation, residential model outline proposal, conceptual CG creation, forum for the public, and press releases
- Regional development platform: Exchange of opinions with local stakeholders, planning of area management organization (area setting and modality of specialized support organization)
- Next generation mobility: Candidate site/planning proposal for mobility demonstration, logistics drone (utilizing the sky above rivers etc.)
- Exhaust heat utilization: Clean center, utilization models of hot spring exhaust heat and woody biomass surplus heat for industrial promotion
- WoodFirst: Public-private collaboration scheme for forest industry, mechanisms for independence/development (public subsidies from the country, etc., monetization measures)



#### **4. Activities to promote understanding by local residents**

##### **(1) Working group in charge**

**ILC understanding promotion working group** (Head of working group: Shinya Narita [Professor of Iwate University])

##### **(2) Activities**

- ILC explanatory seminars to explain to local residents the significance of the ILC, recent status of the ILC plan, management/operation of the ILC research institutes, energy utilization, safety management were held.
- Maintenance of the Tohoku ILC Project Development Center website, updating and reprinting of public relations materials

[Holding status of ILC explanatory seminars]

- Ofunato City: Feb. 4, 2023 (Sat) @ Seapal Ofunato (Ofunato City), General public: 61 persons
- Ichinoseki City: Feb. 5, 2023 (Sun) @ Okita Citizen Center (Ichinoseki City), Okita District Promotion Association: 35 persons
- Kesenuma City: Feb. 18, 2023 (Sat) @ One 10 Office Building of Kesenuma City Hall, General public: 60 persons

##### **(3) FY 2022 settlement amount**

512,000 yen

## 5. Promotion of accelerator-related industries

### (1) Working group in charge

**Accelerator-related industry promotion working group** (Head of working group: Masakazu Yoshioka [Visiting Professor of Iwate University])

### (2) Activities

- Matching, business expansion, R&D support, and other activities by public research and testing institutes and industrial support organizations in the Tohoku region and their coordinators
- Pursuing the possibility of partnering with companies in Tohoku, Kanto and western Japan that have experience in accelerator-related technologies.
- Efforts to participate in the construction of synchrotron radiation facilities such as Tohoku Next-Generation Synchrotron Radiation Facility (NanoTerasu) and SPring8-II.
- Participation in ILC-related development projects centered on KEK, especially in the work packages defined by the International Technology Network.
- Organize joint research with KEK, university researchers, and local companies to participate in new developments, such as the development of high-performance superconducting accelerator cavities and production of girders by casting for accelerator components.
- Monitor the possibility of modification/improvement plans for accelerator projects in operation, such as J-PARC and Super-KEKB.

### (3) FY 2022 settlement amount

1,048,000 yen

## ◆ Activities to support entry into accelerator-related industries

- (i) Aobayama synchrotron light undulator (Company A, local company B)
- (ii) ILC positron source/collimator (Local company C, company D, local company E, Iwate Industry Promotion Center) & cooling water unit (Local company E, etc.)
- (iii) Casting type accelerator equipment mount (Local company F, Ichinoseki College [National Institute of Technology], South Iwate Research Center of Technology, etc.)
- (iv) Development of SRF linac by Nb<sub>3</sub>Sn bronze method (Company G in Tohoku, KEK, Tohoku University, etc.)
- (v) HASCLAY synchrotron light trial use @ SPring 8 & Kyusyu synchrotron light (Iwate University, local company H, AIST, company I, etc.)

### ➤ Status of joint holding of seminars by collaborative organizations

- Seminars related to ILC Technology, (The list of results for 2022 and 2023 is shown below)  
Co-hosting seminars with the Iwate Accelerator-related Industry Research Group  
Secretariat: Iwate Industry Promotion Center
- ILC Technology Challenge (hands-on training in accelerator-related technologies)

### FY 2022

- 1st: Jun. 1, 2022 [Efforts for wind power generation, efforts for transportation]
- 2nd: Aug. 25, 2022 [Overview of Tohoku Synchrotron Light / NanoTerasu, synchrotron light

utilization]

- 3rd: Oct. 24, 2022 [Joining technology, accelerator technology, positron source development]
- 4th: Jan. 18, 2023 [Ganges River purification project using accelerator, High-temperature superconducting RF (Radio Frequency Acceleration), plating technology]
- 5th: Mar. 28, 2023 [Wide-area medical care and medical DX, disaster and medical care, medical accelerator]

FY 2023

- 1st: Jun. 1, 2023 [History of the ILC, Introduction of Accelerator-related Orders Received by Companies]
- 2nd: Aug. 10, 2023 [Physics and technology of the J-PARC, Introduction of Accelerator-related Orders Received by Companies]
- 3rd: Sept. 9, 2023 [Industrial Applications of Synchrotron Radiation Facilities]

#### 6. Study on natural environment survey

##### (1) Working group in charge

Environmental impact study working group (Head of working group: Shinya Narita [Professor of Iwate University])

##### (2) Activities

- Information collection of strategic environmental assessment\*(to be conducted by the KEK)  
Strategic environmental assessment: Environmental assessment that evaluates not only environmental impacts but also social /economic impacts at the early decision-making stage when drafting the plan
- Investigation and study of methods, measures to predict the impacts on the natural environment such as groundwater (in collaboration with the Underground Facility Study Working Group)  
Joint research with Tohoku University (Project from FY 2022 to 2023)  
Based on the past survey reports and the Tohoku ILC Civil Engineering Plan, selection of watersheds to be prioritized for surveys and the formulation of survey plans, including the implementation details of hydrological surveys

##### (2) FY 2022 settlement amount

3,300,000 yen

## 7. Green ILC

### (1) Working group in charge

**Green ILC study working group** (Head of working group: Masakazu Yoshioka [Visiting Professor of Iwate University])

### (2) Activities

- There is an international consensus that large accelerator facilities, not just ILCs, must be designed for sustainability over their life cycles.
- During construction, CO<sub>2</sub> emissions from the manufacture of concrete and steel products and from the operation of heavy construction equipment must be considered.
- During operation, CO<sub>2</sub> emissions from the generation of electricity used should be considered.
- Japan's policy goal is to become carbon neutral by 2050, and the way to achieve this goal is to reduce CO<sub>2</sub> emissions, increase CO<sub>2</sub> absorption by forests and seaweed, and use as much wood as possible in all buildings.
- In this way, CO<sub>2</sub> emissions and absorption will be offset by 2050.
- As a region with a candidate ILC site, we must work with the community in line with this national policy.
- The Tohoku region, especially Iwate Prefecture, is blessed with sustainable energy.
- This working group has been working with local companies to promote green carbon (CO<sub>2</sub> absorption by forests), blue carbon (CO<sub>2</sub> absorption by seaweed beds in coastal areas), and wood construction of ILC-related facilities to fix CO<sub>2</sub> for the long term.
- These activities will continue to be pursued vigorously.
- In Europe, electricity from renewable energy sources is increasing rapidly, and in Scandinavia, the share is already over 70%.
- On the other hand, in the Tohoku region, for example, the share is only slightly above 20%.
- In the future, it will be necessary to cooperate with local electric power companies, basic municipalities, prefectures, and the national government in efforts to promote the spread of renewable electricity.
- Research on the recovery of low-grade waste heat from ILC by HASClay and its effective use for agriculture and other purposes is progressing well through industry-government-academia collaboration among Iwate University, companies, AIST, and Iwate Prefecture.
- Field tests of heat storage by hot spring heat utilization and heat radiation in strawberry greenhouses in Morioka City have been completed with good results.
- Scientific analysis of the heat storage and desorption mechanism using synchrotron radiation, which was being conducted in parallel, is also progressing smoothly.
- A plan to move on to a larger-scale social implementation test is now under planning
- Green ILC seminars (In FY 2022, seminars on the efforts for carbon neutrality by forestry promotion in collaboration with the related organizations were held.)

Sep. 7, 2022: Ichinoseki Cultural Center (Forestry and carbon neutrality (1))

Feb. 10, 2022: Ichinohe-cho Community Center (Forestry and carbon neutrality (2))

Jun. 31, 2022: Hirono Chomin Bunka Hall (Fisheries and carbon neutrality)

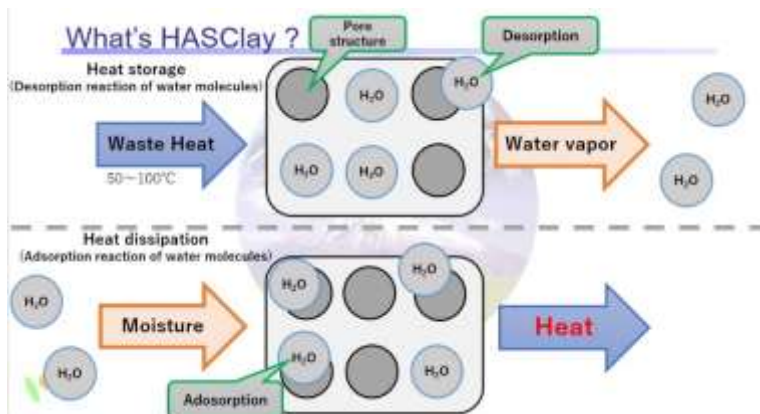
### (3) FY 2022 settlement amount

488,000 yen

- ◆ Expansion from the efforts for Green ILC to the efforts for carbon neutrality  
Visualization of the numerical target with an eye on the 2050 carbon neutrality goal
  - Assuming the peak power of the ILC is 120 megawatts and the annual power consumption is 700 million kilowatt hours (according to the operating hours)
  - When using the 2021 CO<sub>2</sub> emission conversion factor of 0.482 kilograms CO<sub>2</sub>/kilowatt hour, the annual CO<sub>2</sub> emission of the ILC will be 337 kilotons.
- **Example of the efforts for Green ILC**  
[Joint research for recycling of ILC operation exhaust heat using adsorption heat storage material]
  - Heat storage process: Utilizes the heat of hot spring water to store heat (dry) in HASCLAY
  - Heat release process: In a strawberry greenhouse, the heat is released from HASCLAY to use it for heating at night.

## Example of the effort for Green ILC

### Recycling of ILC operation exhaust heat using adsorption heat storage material



### Demonstration tests to achieve commercialization



## 8. Publication of Guideline Series

Collaboration with the Iwate International Linear Collider Promotion Council

- ◆ Management and Operation Guidelines for International Linear Collider (ILC) Research Institution
- ◆ Local Bases for ILC Accelerator Assembly, Maintenance and Storage
- ◆ Energy Flow Used in the ILC: From Electric Power Inlet to Thermal Energy Outlet
- ◆ Green ILC
- ◆ Survey Report on Innovation and Economic Ripple Effect Brought by Inviting the International Linear Collider to Japan (Summary Version)
- ◆ Safety Control of the ILC
- ◆ Value and Future Brought by Inviting the ILC to Japan
- ◆ ILC Tohoku Master Plan - Aiming for Development of Tohoku at the Opportunity of International Linear Collider Construction - (Summary Version)

### Publication of Guideline Series

