LCWS2021
INTERNATIONAL WORKSHOP ON FUTURE LINEAR COLLIDERS

International Workshop on Future Linear Colliders, LCWS2021

Activities of

Iwate Prefectural University

Atsuto Suzuki

Outline

1. From Preparation to Construction Design/Plan for the ILC in Tohoku
2. Civil Engineering
3. Electric and Hydraulic Power Sources
4. ILC Central Campus
5. Environmental Assessment
6. Regional Bases for Production, Performance, Maintenance and Storage of Accelerator/Detector Equipment
7. Social Infrastructure toward the ILC Acceptance
8. Summary

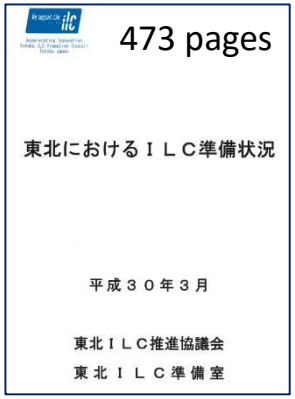
1. From Preparation to Construction Design/Plan for the ILC in Tohoku

June 14th, 2016

① Built : ILC Tohoku Preparation Office

Missions :

- Summarize key-issues required in the Tohoku region for the ILC project
- Foster full of motivation in the Tohoku region for constructing the ILC



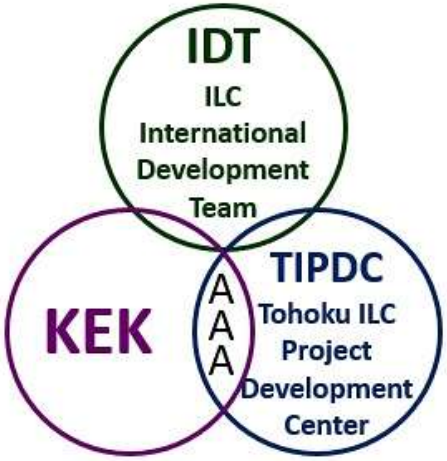
booklets of key-issues

August 6th, 2021

② Launched : Tohoku ILC Project Development Center (TIPDC)

Missions :

- Finalize regional detailed plans for the ILC Project
- Finalize local decision issues for constructing the ILC
- Take activities with a **closer link** to **IDT**, **KEK** and **AAA**

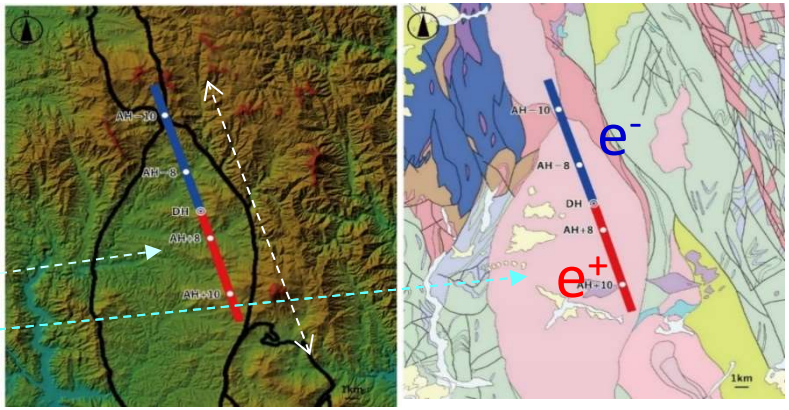


AAA: Advanced Accelerator Association promoting Science & Technology

2. Civil Engineering

① ILC Location

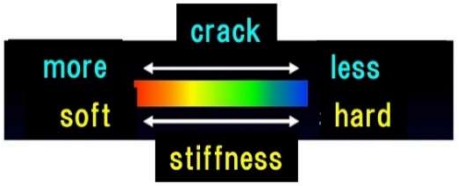
ILC accelerator area : inside the granite rock bodies
→ inside black curves (left)
→ in the pink color (right)
→ possible up to 50 km

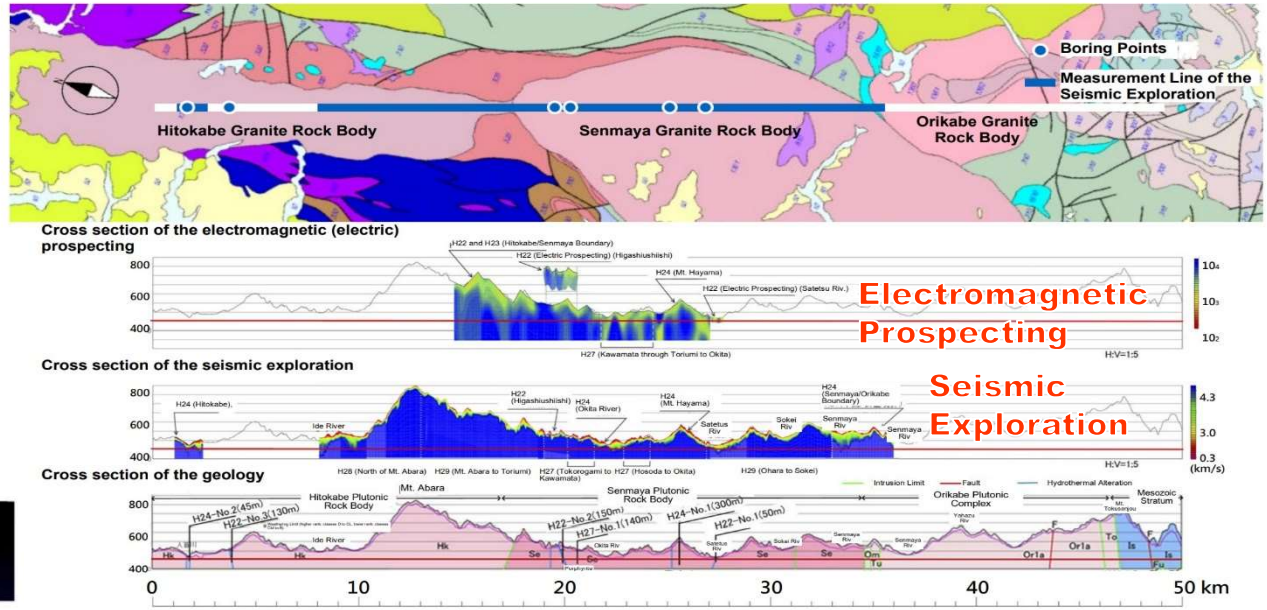


→ On-going jobs : Optimal accelerator placement, considering surface environment, land-use and land-acquisition

② Geological Surveys

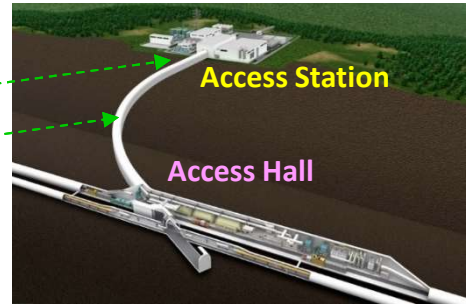
- Electric Prospecting (crack)
- Seismic Exploration (stiffness)
- Boring Survey
- Borehole Camera
- Measurement of Initial Stress of the Ground





→ no issues from previous surveys

→ requiring : additional surveys around access tunnel head and access tunnel inside for detailed designing



3. Electric and Hydraulic Power Sources

① Electrical Equipment

- Input : Tohoku Electric Co., Mizusawa Station (154 kV)
  → 15 km west from ILC Central
- Transformer : 2 lines (164 Mw)
- Receiving : ILC Extra-High Voltage Substation
  (→ 66kV) identical design with J-PARC
- ILC Generation : Cogeneration System (LNG)
  ～10% of 164 MW (ILC peak power)
  identical design with RIKEN-CGS

→ Final Design & Cost Estimation

② Industrial (Cooling) Water

- Baseline Design
  → Requirement : 5,000～7,000 tons/day
  → Source : Constant Underground Spring Water inside the ILC Tunnel (underground water rate ～ 20,000 tons/day in Japan)
  → Data of road tunnels in the Kitakami area << 20,000 tons/day

⇩

- Candidate Backup Water Source
  → 2 lines (～20 km/～5 km apart from ILC)
  → Cost estimation of facilities : water source, water supply facility, preparation facility, receive facility

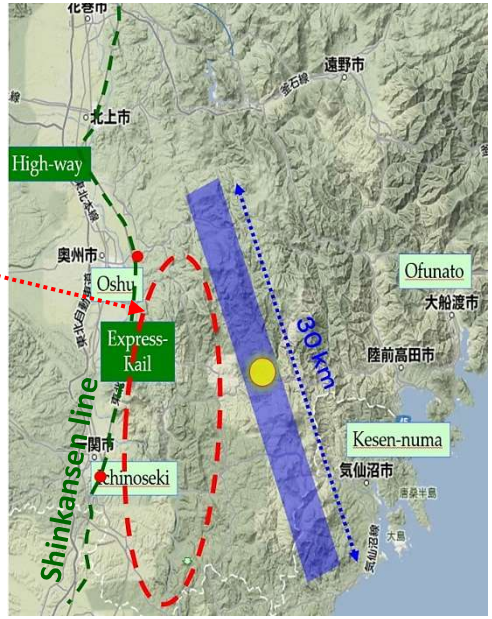
4. ILC Central Campus

① Requirements

- Area > 25 ha
- Distance from collision point < 30 km
- Additional area for future～ 100 hc within 15 km of the central campus
- Housing facilities for researchers and their families < ～30 km of the central campus
- Support system from local business, government, and academia with achievements of outreach activities, etc.

- Recommendation (ILC Site Assessment Council, 2013) : along the Shinkansen line, which has the convenience of access to Sendai and Tokyo

Main Campus Candidate Area



② Evaluation Items

- Environment
- Electric Power
- Water Supply
- Sewage /Drainage
- Access Road
- Rare Plant / Endangered Animals
- Buried Cultural Properties
- Land use ratio (forest, agricultural land, residential land, other)
- Public/private land ratio
- Transfer permits
- Number of landowners
- Distance to collision point (km)
- Travel time by car (min) (Actual time)
- Distance from main station Time by car (min)
- Central Campus Project and Maintenance Costs
- ・・・

Evaluation Process : Done

Possible Scenario for Decision Process :

- When : …..
- Who : …..
- How : …..

5. Environmental Assessment

① Basic Policy

- Iwate/Miyagi Prefecture : Environmental Impact Assessment Act and the Environmental Impact Assessment Ordinance
- Ministry of the Environment : Strategic Environmental Assessment (SEA)

Evaluation items based on the characteristics of the ILC project

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 (radiointerference), 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
	Trafiic	Traffic congestion, access to public transportation, road safety
	Local industries	Agriculture, forestry and fisheries, commerce and industry, tourism
	Economy	Economic impact, employment

② Assessment Implementing Body

- Unit to implement the ILC facility plan

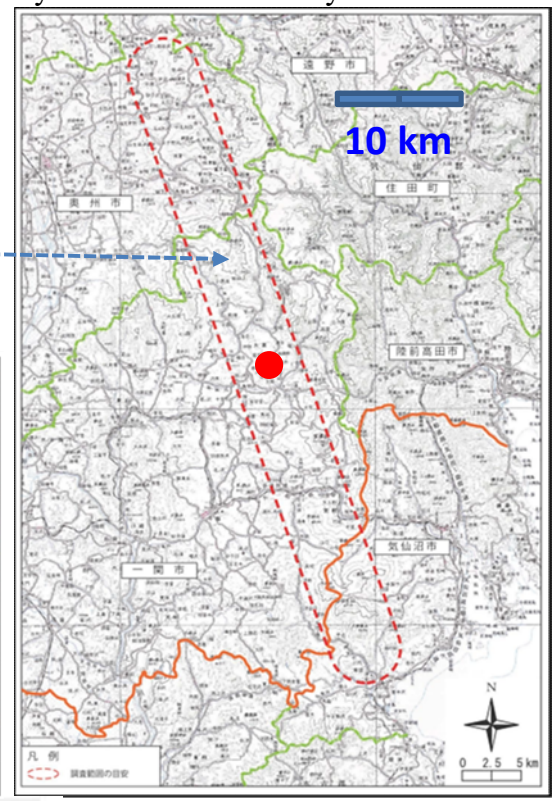
  = KEK → Pre-Lab. → ILC Lab.

  +

  Local Governments

③ Preparatory Survey by Local Government

Surveyed Area surrounded by red dashed line

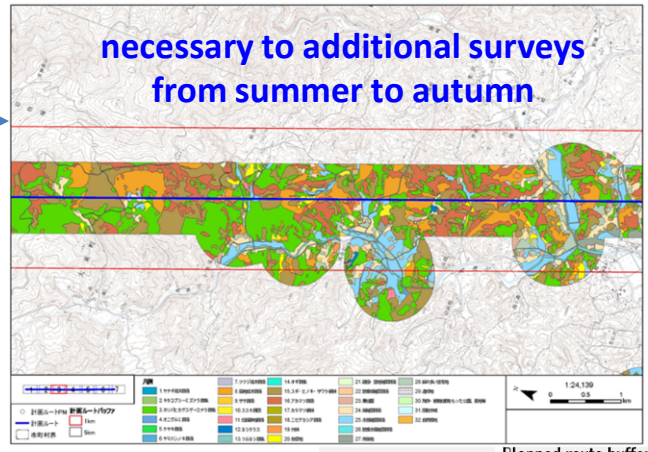


Iwate Prefecture

- carried out "Natural environment survey" related to the area of the ILC tunnel route
- formulated "Environmental impact assessment method (original draft)" that is expected to be carried out by the ILC implementing body

Overview of some results

- Vegetation map
- Natural environmental information map



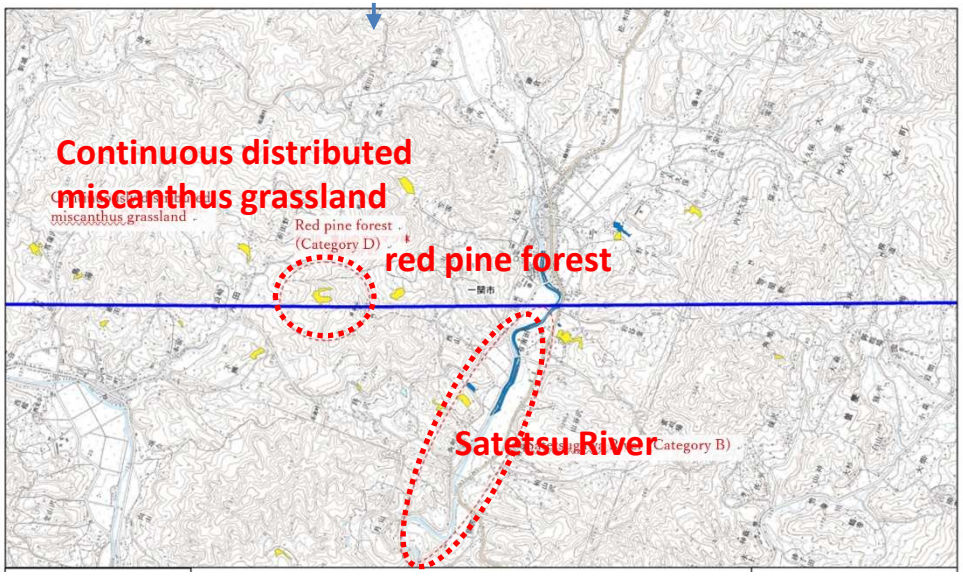
Planned route buffer

Planned route

1km

5km

Issues to be considered when constructing the ILC tunnel.



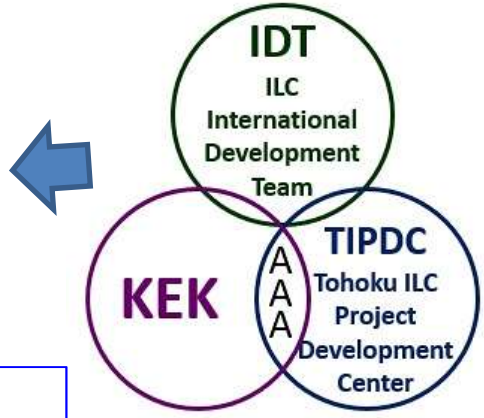
- Survey of raptors

  continuous surveys are required

ノスリ（H26.1.22 撮影）

写真 2.2-1 定点調査実施状況

6. Regional Bases for Production, Performance Assessment, Maintenance and Storage of Accelerator/Detector Equipment



① Basic Plan

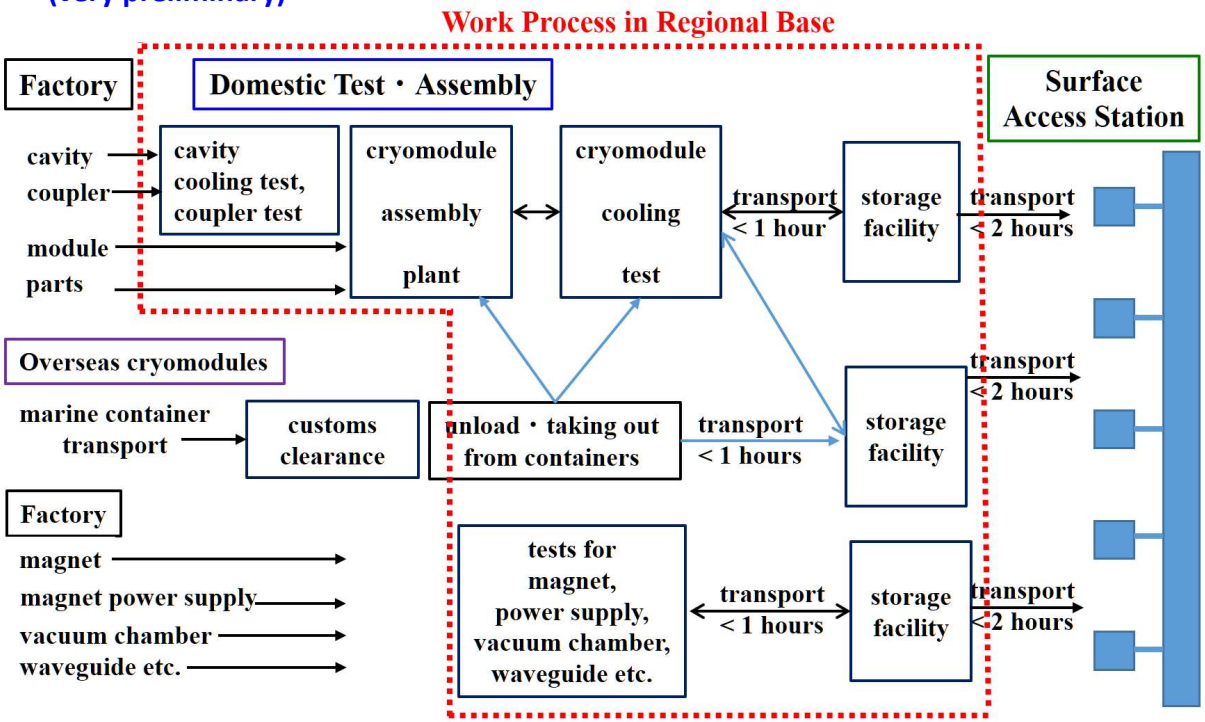
- Clarifying the manufacture-sharing of accelerator and detector equipment

Component
Accelerator tunnel construction
Infrastructure equipment (electricity, water, air conditioning, lighting, communications, cranes, transport vehicles, alarms, etc.)
Helium Refrigeration Equipment
LINAC: Cryomodules
LINAC: High Power RF
LINAC: LLRF and control system
LINAC: Normal Conducting Beamline
Damping Ring
Final Focus (BDS, dumpline)
Beam Dump, Collimators, Muon Shield, etc.
Polarized Electron Source
Positron Source (Undulator, target, capture)(
Radiation Safety System, Admission Management
Accelerator Control System
Equipment for Cavity and Cryomodule Testing and Storage
Testing and Storage Equipment for Normal Conducting Component
Accelerator: Installation
Accelerator: Wiring and Piping
Accelerator: Alignment

← example of international role sharing from manufacturing to installation of accelerator equipment

Regional Base of Accelerator Facilities

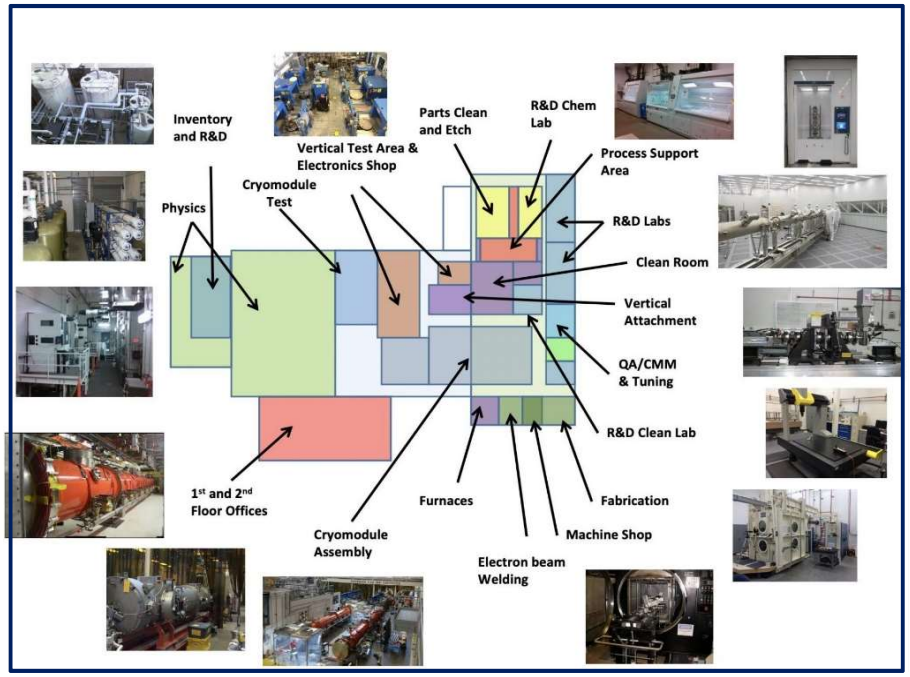
(very preliminary)



Reliable/Viable Design : Essential

KEK-COI

Jefferson Lab



Euro-XFEL

② Detector Bases

Collision Point Surface-Campus

7. Social Infrastructure toward the ILC Acceptance

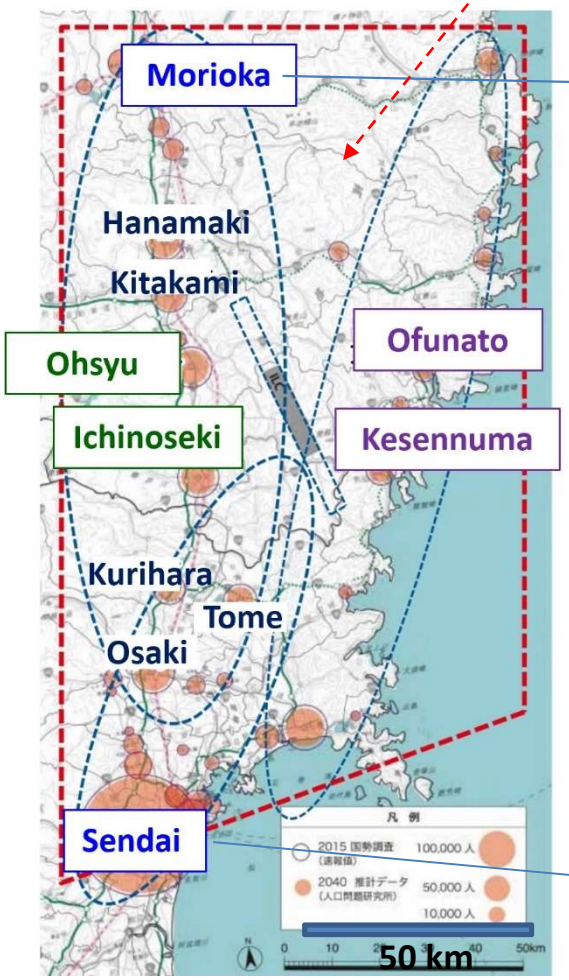
① Basic Policy

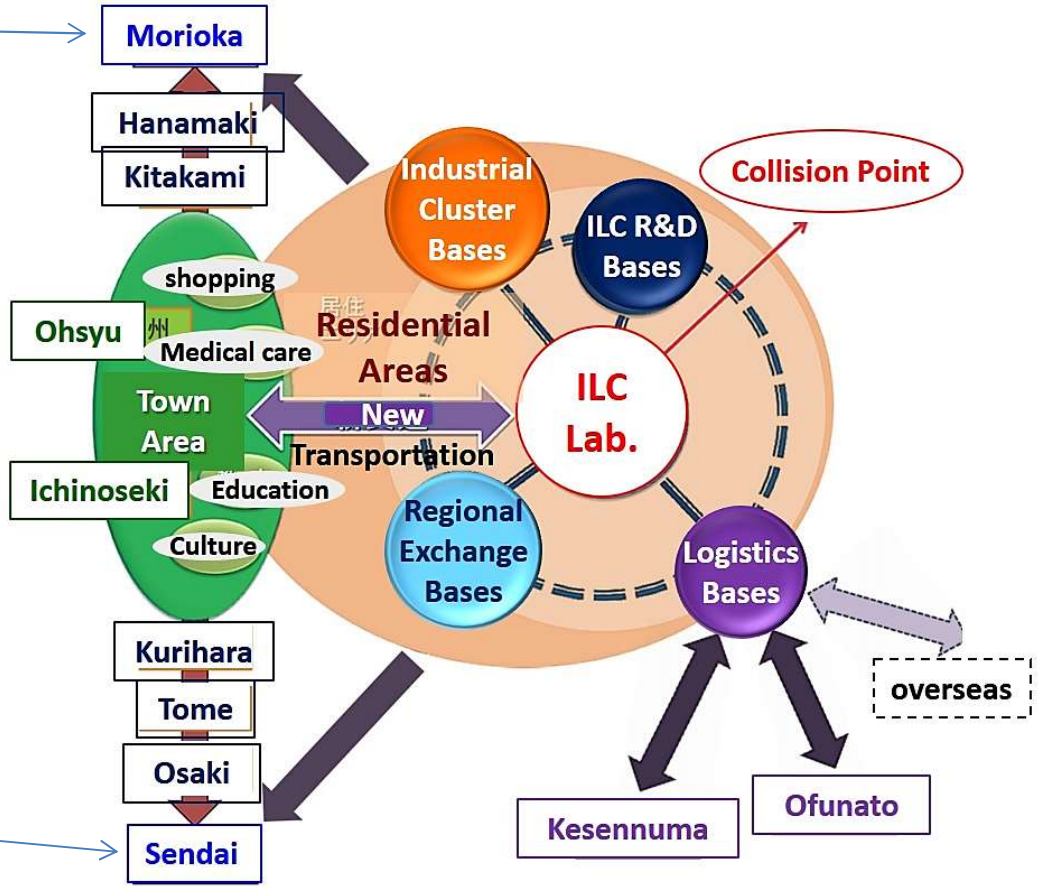
Wide regional revitalization for the ILC acceptance,

- utilizing social infrastructures along Sendai to Morioka (～160 km)

&

- developing Residential Zones, Regional Exchange Bases, Advanced Industrial Cluster Bases, ILC R&D Bases and Logistic Bases





② Logistic Bases

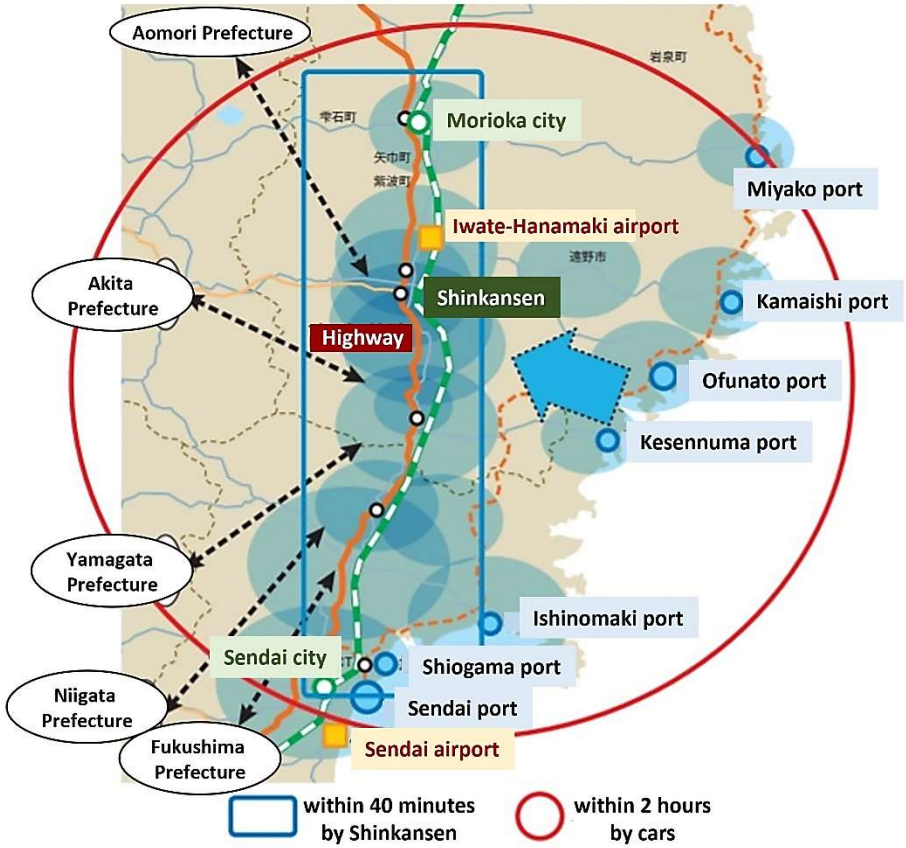
- Logistic Route : major domestic ports, ports near the ILC campus, express ways, other major roads

- Check items for transporting large-scale equipment : a cryomodule (up to 15 m) or a solenoid coil (up to 65 tons)
  - → Narrow Sections of Road
  - → Fragile Bridges
  - → Low Pedestrian Bridges or Tunnels

Basic Investigation : Done

More detailed investigation, based on the candidate local logistic bases

Transportation Infrastructure & Utilization



8. Summary