



# Future Linear Colliders Carbon Footprint Study

21/10/2022

With reference to specification document:

2789006 V.1

EDMS: <https://edms.cern.ch/document/2789006/1>



# Assessment/Scope



- Assessment of the carbon footprint of future tunnel construction.
- To cover all underground civil engineering works.

## Whole life cycle carbon assessment

Tunnel Asset (including access shafts)	km	m	m	m <sup>2</sup>	m <sup>2</sup>	m <sup>2</sup>	tonnes CO <sub>2</sub> e			
	length	internal diameter	lining thickness	invert concrete fill	separation wall	deck	CEM1 C35/45	70% GGBS C35/45	reduction in embodied carbon	
380GeV Drive Beam machine	12.1	5.6	0.4	4.8	0	0	60,000	26,000	57%	34,000
380 GeV Klystron machine	11.5	10	0.5	15.05	8.54	4.5	201,000	85,000	58%	116,000
1.5 TeV machine	29.6	5.6	0.4	4.8	0	0	146,000	62,000	58%	84,000
3 TeV machine	50.7	5.6	0.4	4.8	0	0	250,000	106,000	58%	144,000

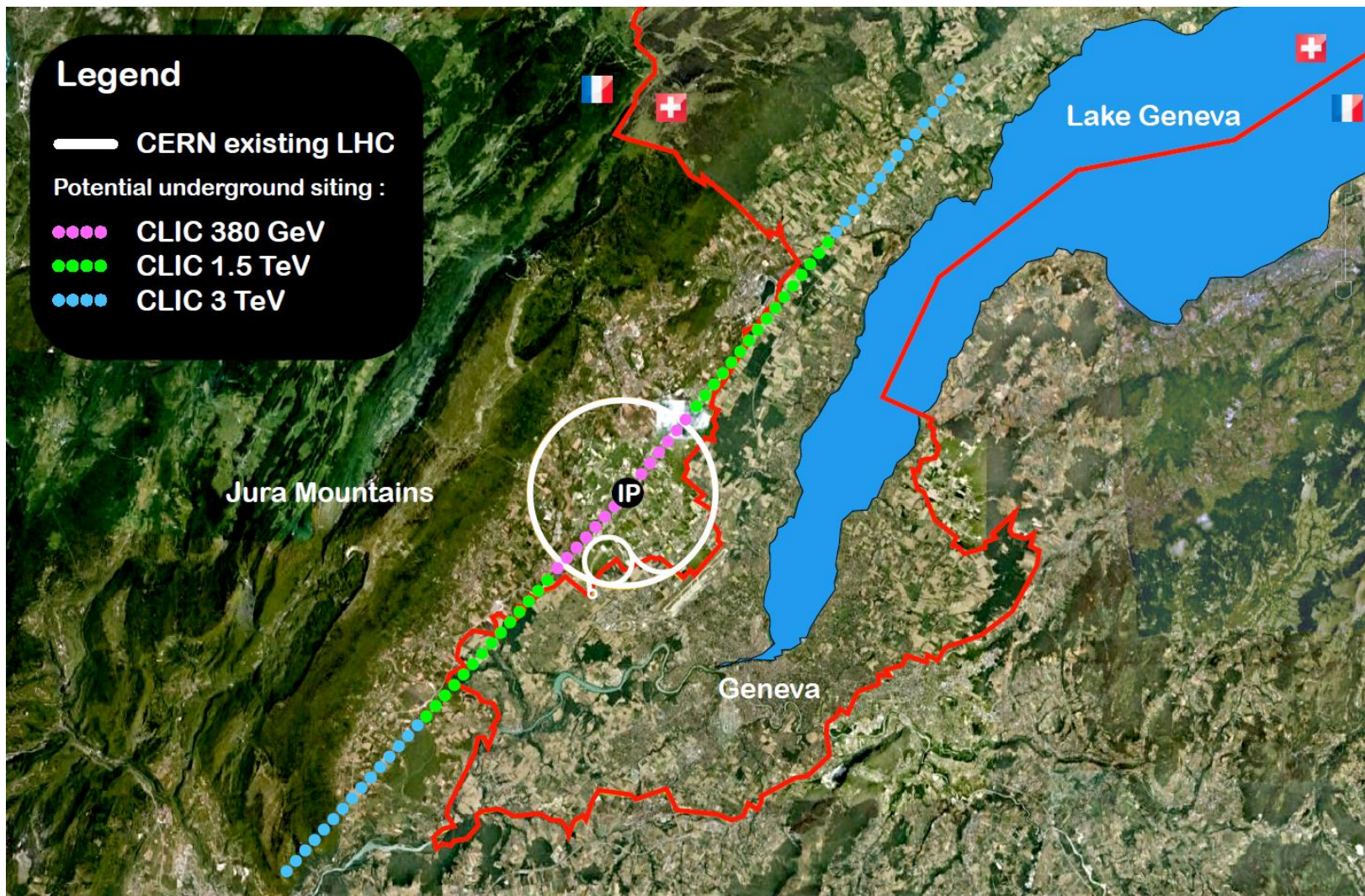
tunnel			shaft no	depth (m)
3 TeV	380 GeV		1	135
			2	135
			3	112
	1.5 TeV		4	125
			5	72
			6	108
			7	125
			8	88
			9	110
			10	147
			11	180

References:

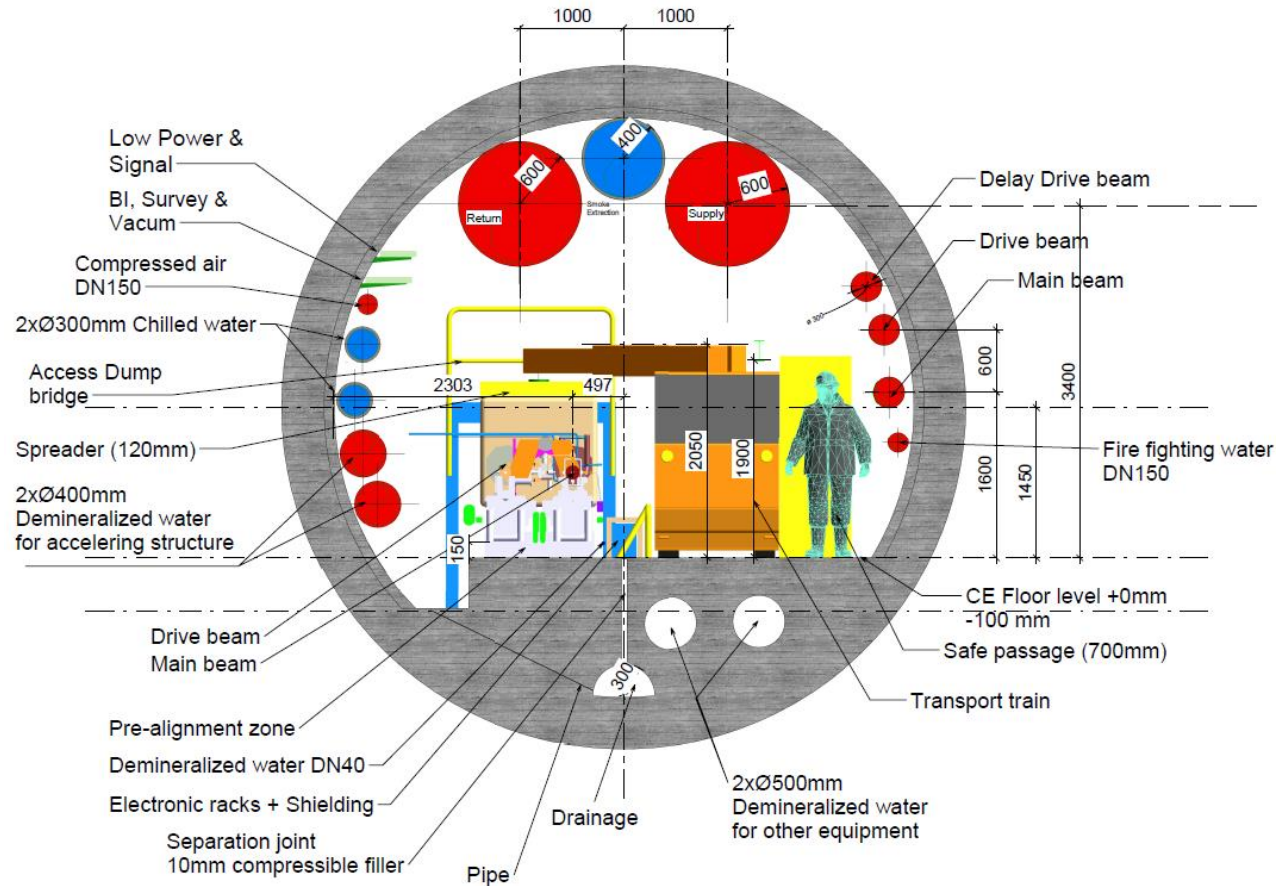
- Project Implementation Plan 20 Dec 2018
- Conceptual Design Report 10 Oct 2012

# CLIC Overview

## Geneva

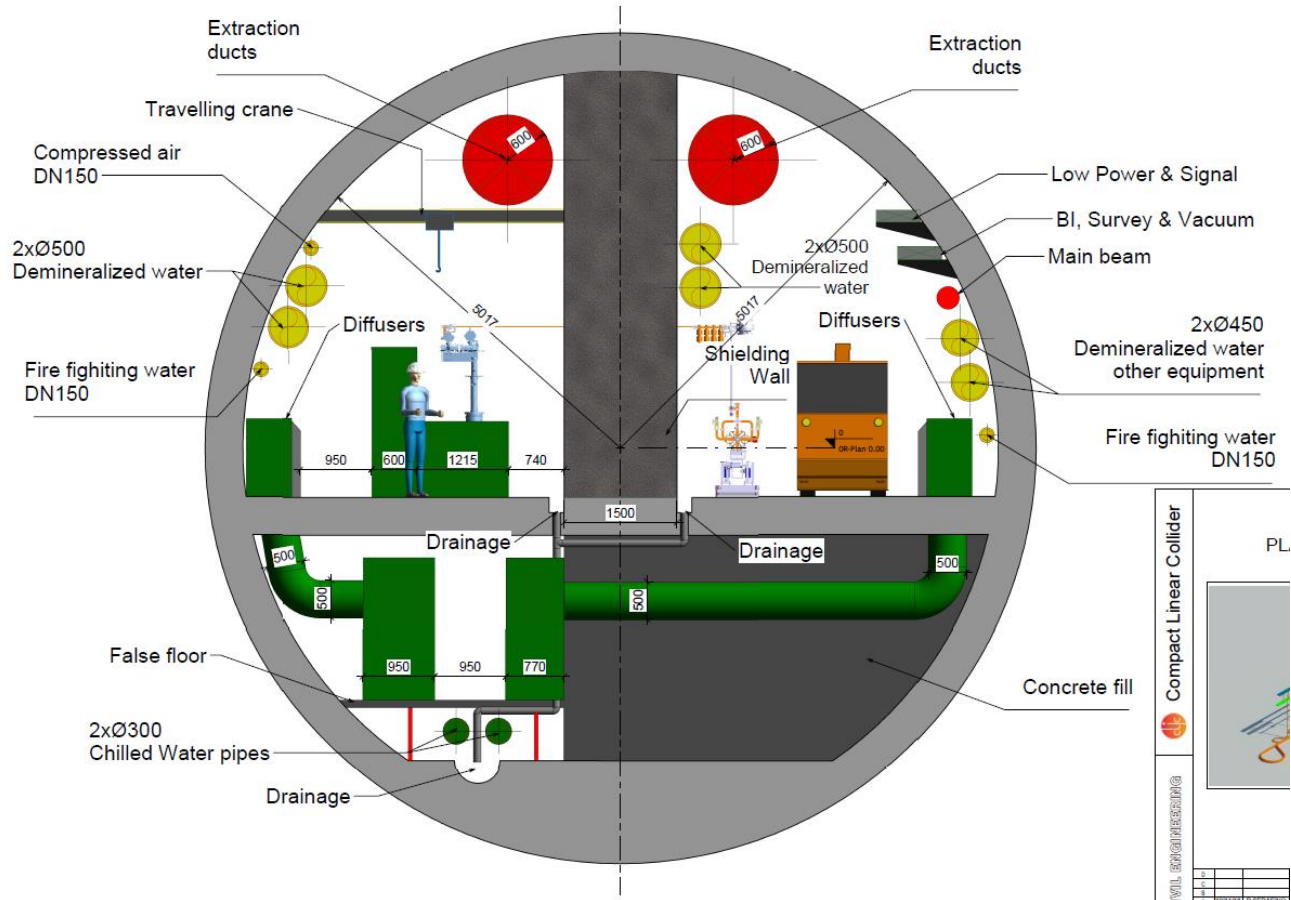


# CLIC Drive Beam Cross Section



Extract from CLIC PIP 2019  
Drive Beam Option 5.6m internal diameter

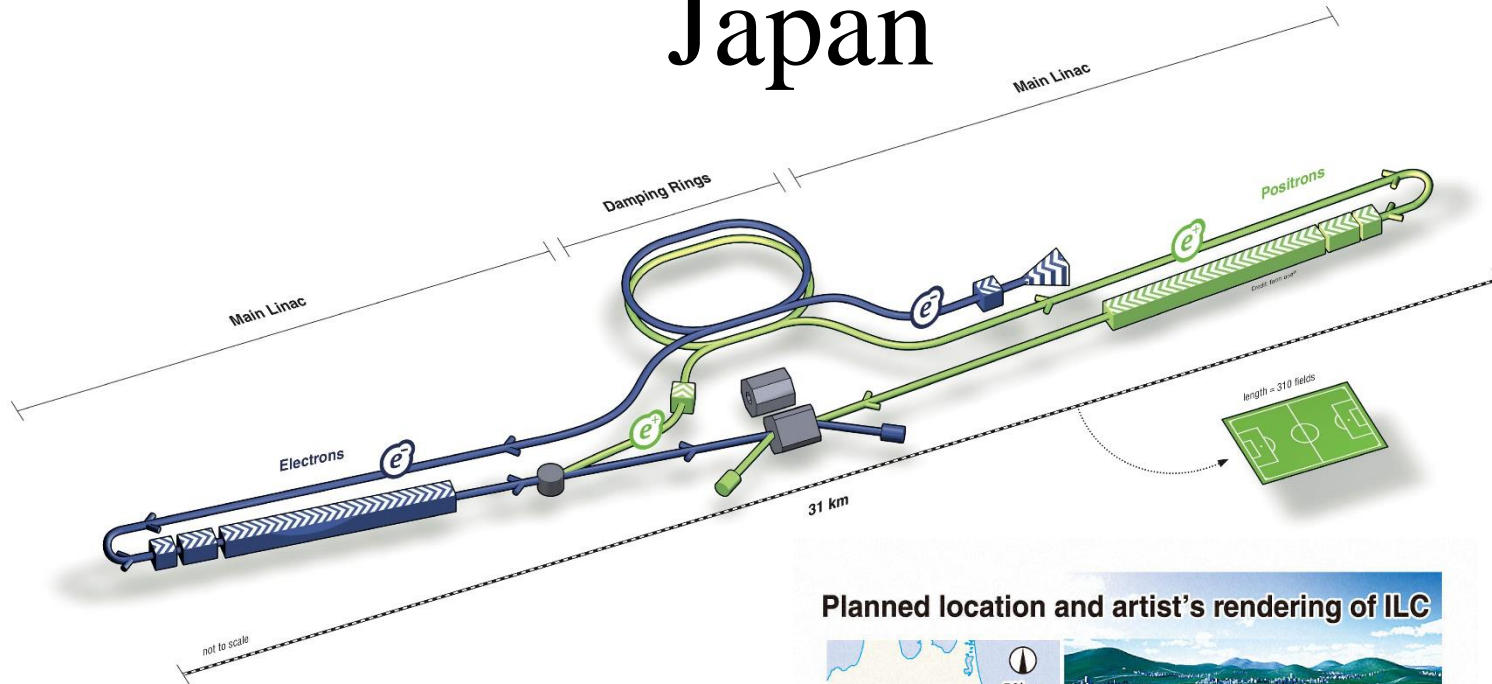
# CLIC Klystron Cross Section



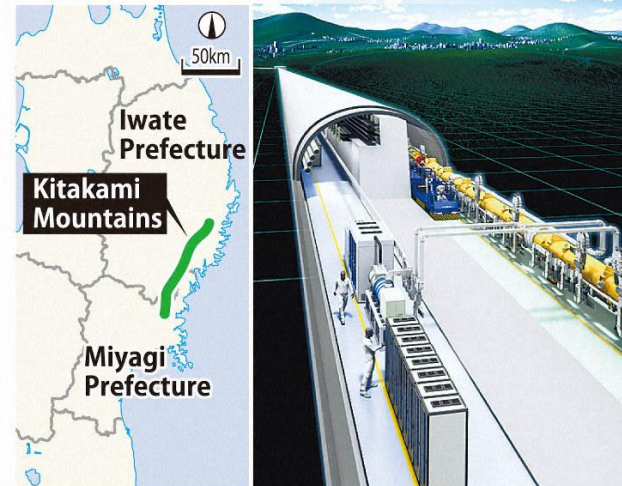
Extract from CLIC PIP 2019  
10 m internal diameter and 1.5 m thick shielding wall

# ILC Overview

## Japan



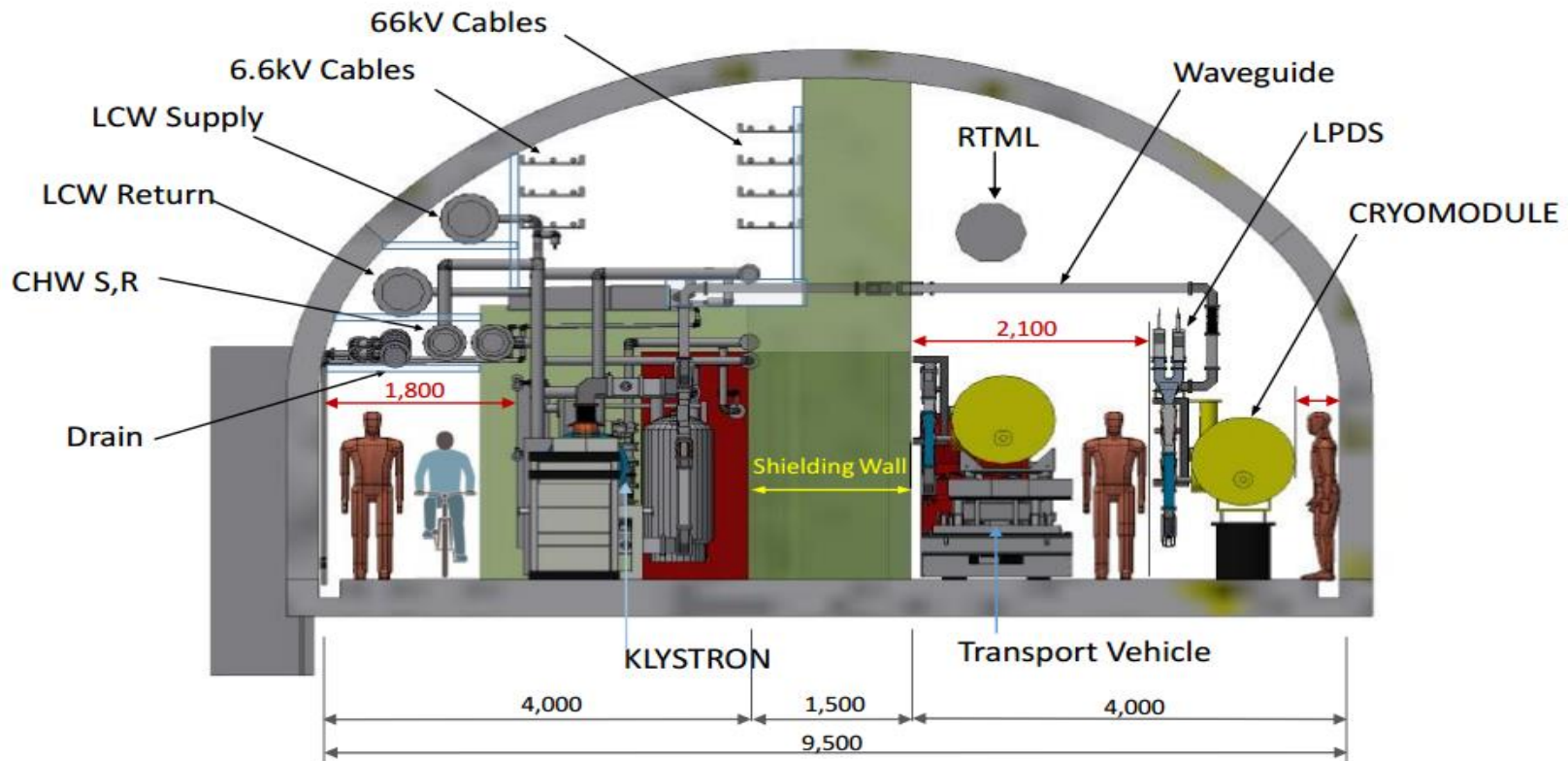
Planned location and artist's rendering of ILC



Artist's rendering provided by the Linear Collider Collaboration

# ILC

## Cross Section



Extract from ILC Change Request 2016  
 9.5m wide tunnel and 1.5m thick shielding wall





# Deliverables



- 4 or 5 online progress meetings with CERN as and when required.
- Possible meeting at Linear Collider workshop to present study findings, SLAC San Francisco.
- Interim report by March 2023, outlining progress.
- Final technical report end of May 2023.