MANAGING ENGINEERING AND CONSTRUCTION PROCESSES

THE NEW PAKYONG AIRPORT (SIKKIM, INDIA)
An impressive application of Maccaferri solutions

2023

Ing Alessandro Cavagni

MACCAFERRI

THE PROBLEM

- By virtue of its lush green topography, with a wide variety of flora-fauna and presence of Himalayas, Sikkim has always been a place of tourist attraction.
- Although, Sikkim has ample scope of tourism development, due to non availability of airport; the direct accessibility does not exist.
- For this reason, a new airport was proposed to be constructed at Pakyong, 33 km from the capital Gangtok.

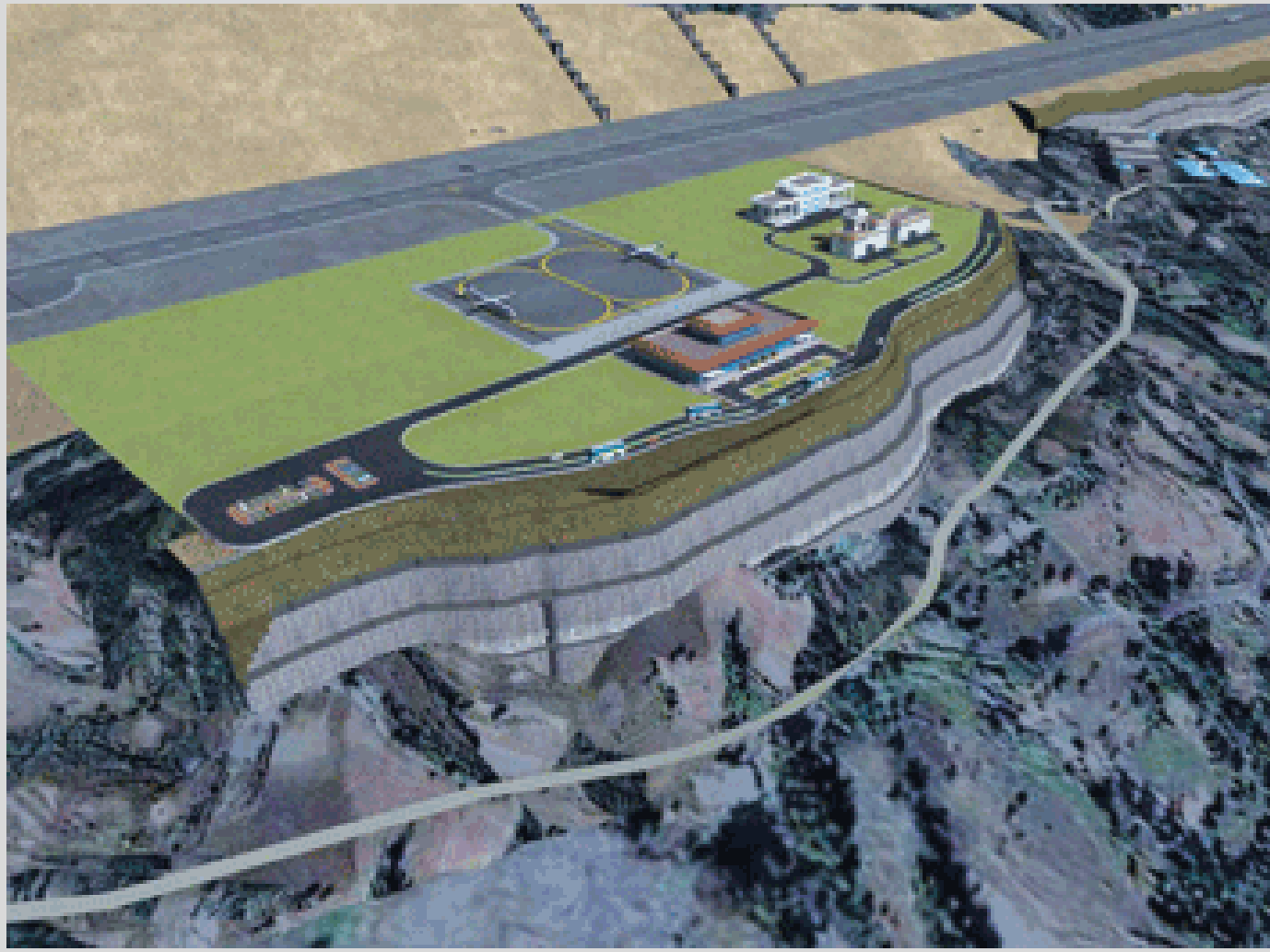
THE PROBLEM

CLIENT
Airport Authority of India

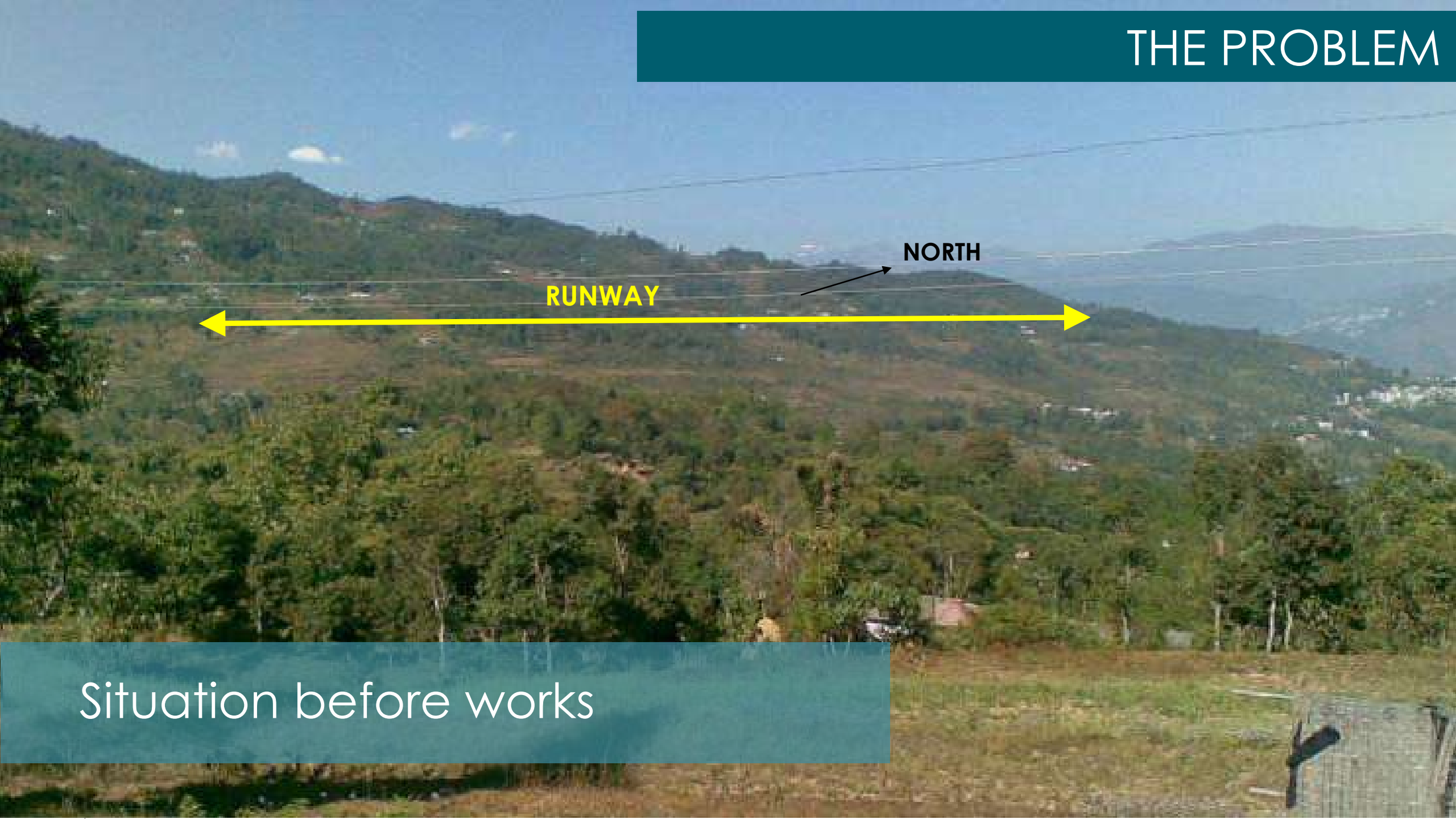
DESIGNER
Mott Mac Donald

CONTRACTOR
Punj Lloyd

Max. Wall Height 80 m



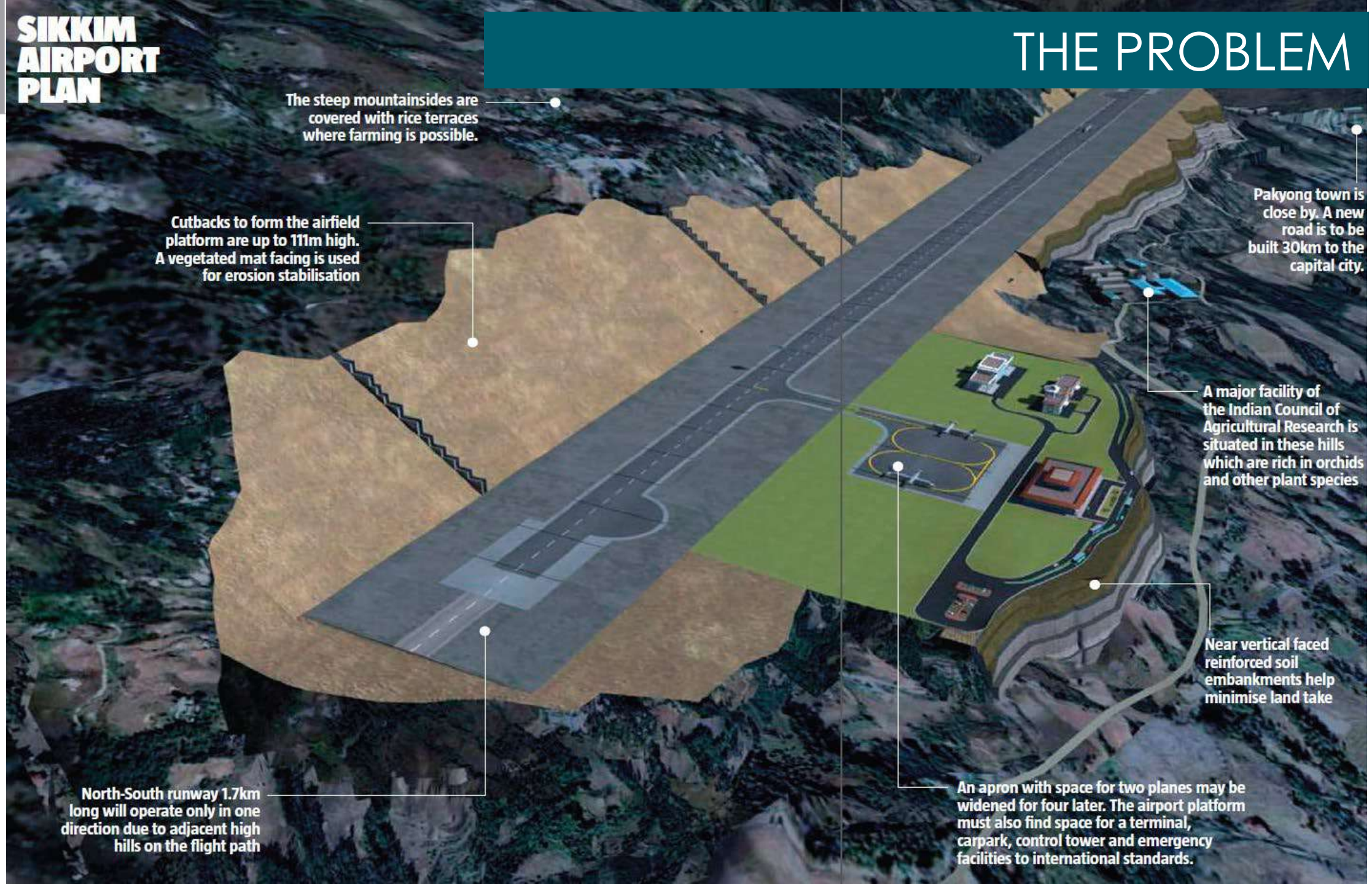
THE PROBLEM



Situation before works

SIKKIM AIRPORT PLAN

THE PROBLEM



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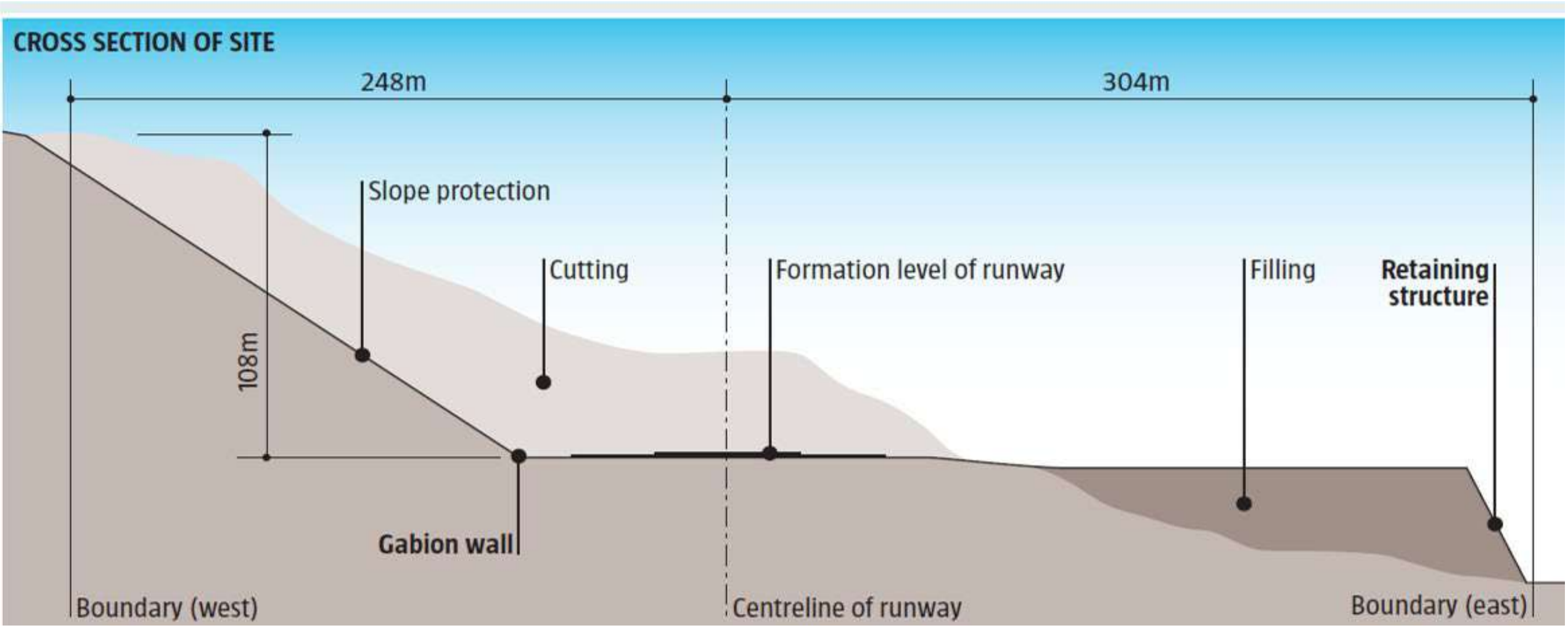

CROSS SECTION OF SITE
248m
304m
Slope protection
Cutting
Formation level of runway
Filling
Retaining structure
108m
Gabion wall
Boundary (west)
Centreline of runway
Boundary (east)

Previous experiences

Autovia Scute Interiore Norte, Portugal – Terramesh System

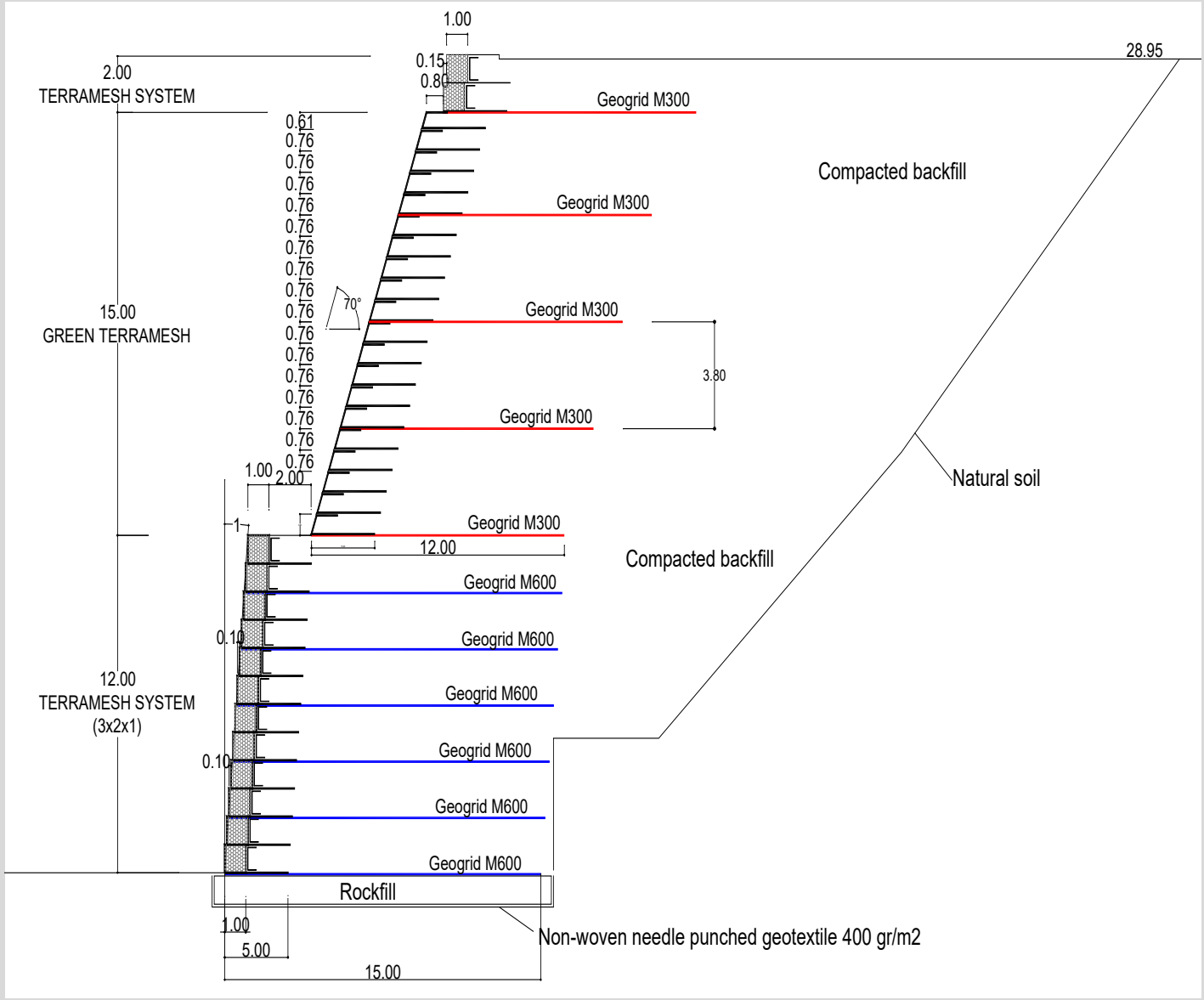
Previous experiences

AUDIT ON 29 m WALL (PORTUGAL)

29 m high wall built in 2001

Both Terramesh System and Green Terramesh were used

Geogrid reinforcement lengths up to 15 m



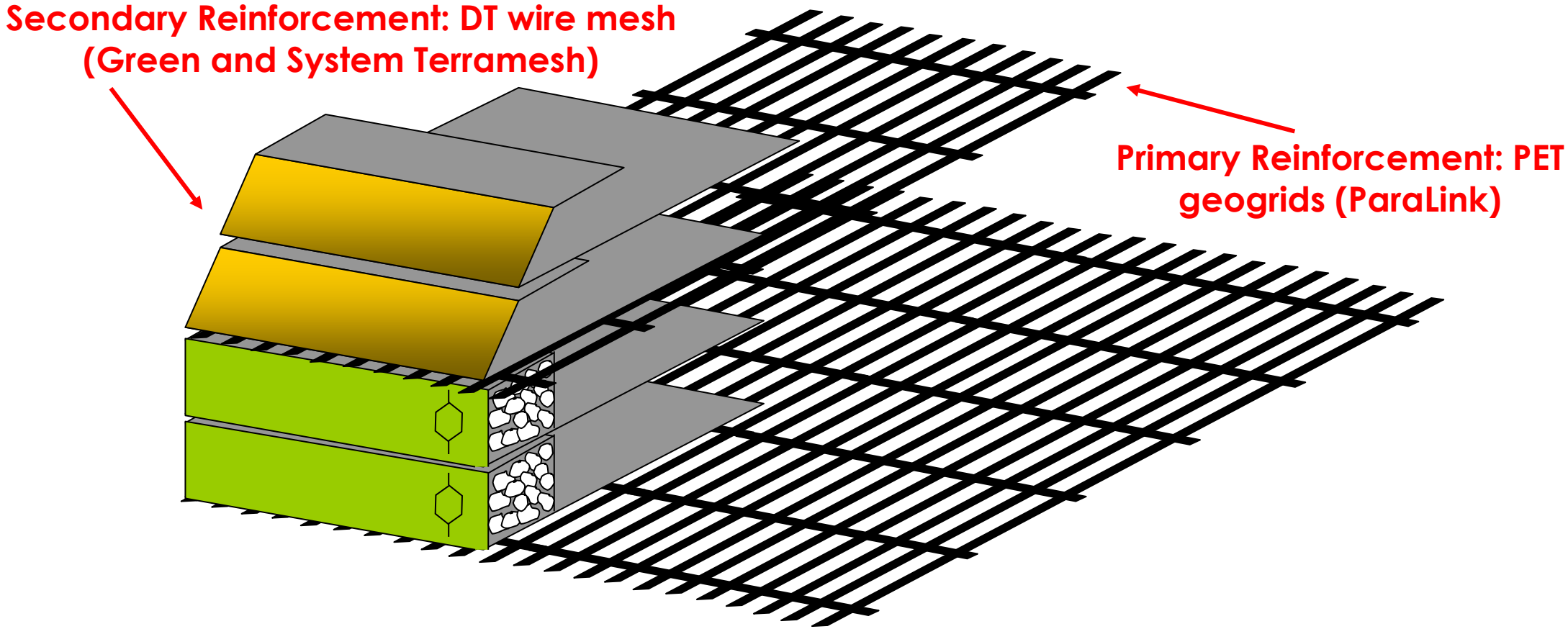
Previous experiences

Leiria, Portugal

Previous experiences

The Leiria wall in 2009 (8 years after construction)

COMPOSITE REINFORCEMENT SYSTEM
COMBINATION OF PRIMARY AND SECONDARY REINFORCEMENTS



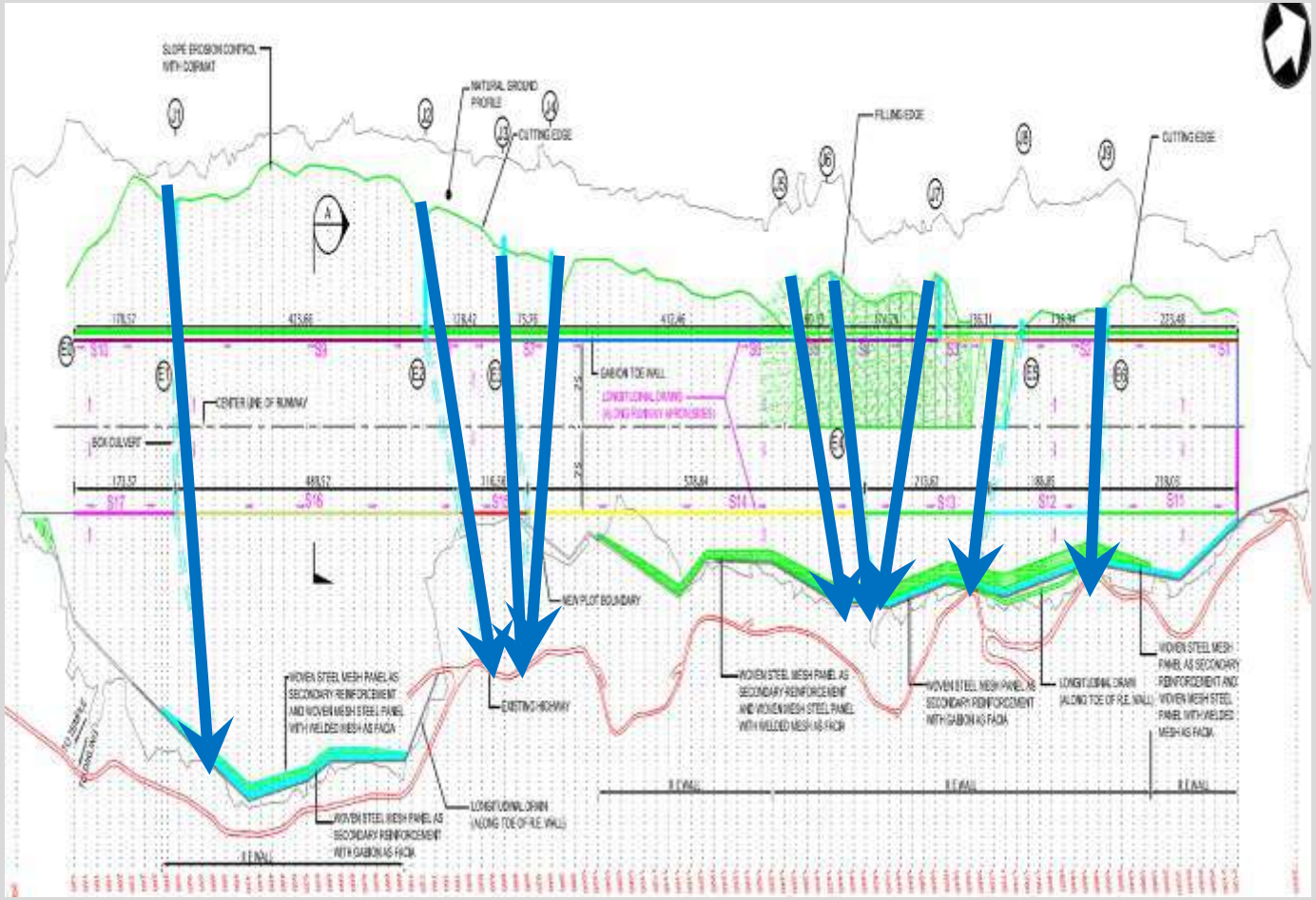
THE MACCAFERRI SOLUTION

DRAINAGE SYSTEMS

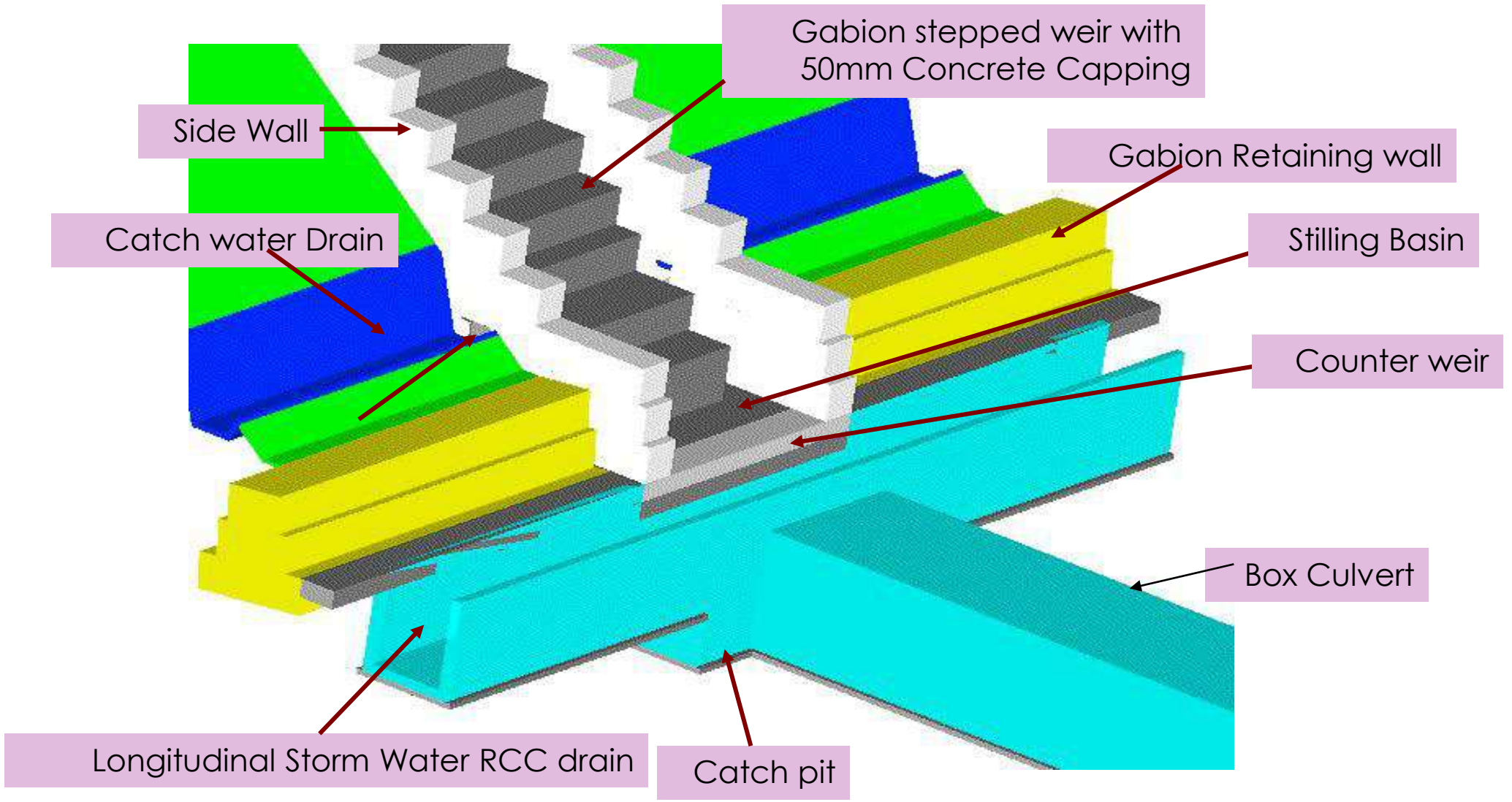
9 Jhoras (Streams) are crossing the runway strip.

Local people are using the water from the Jhoras to meet their day to day water requirement.

Due to heavy rainfall intensity Storm Water Drain design is one of the important aspect of this project



DRAINAGE SYSTEM: DETAIL



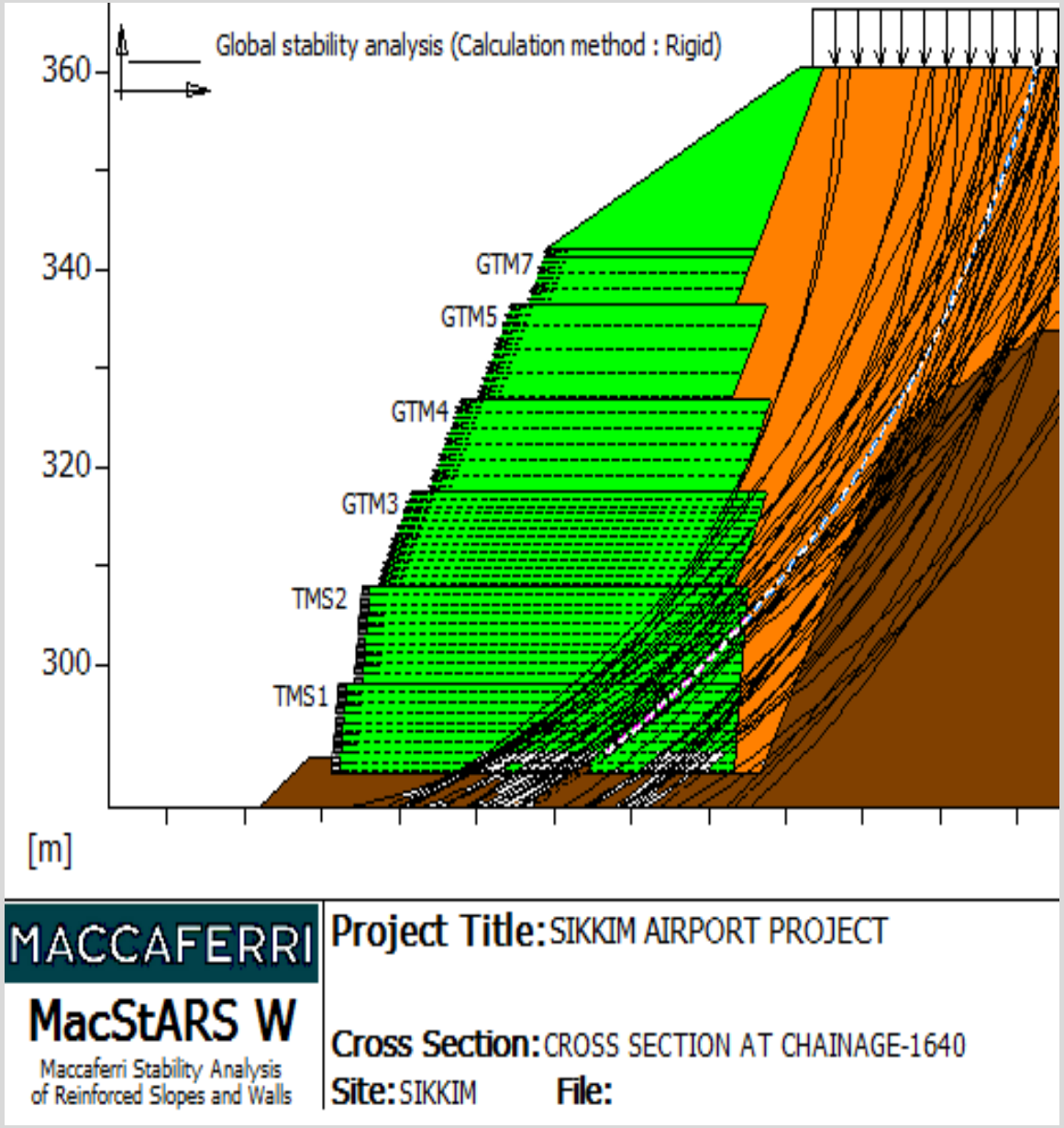
THE MACCAFERRI SOLUTION

WALLS DESIGN

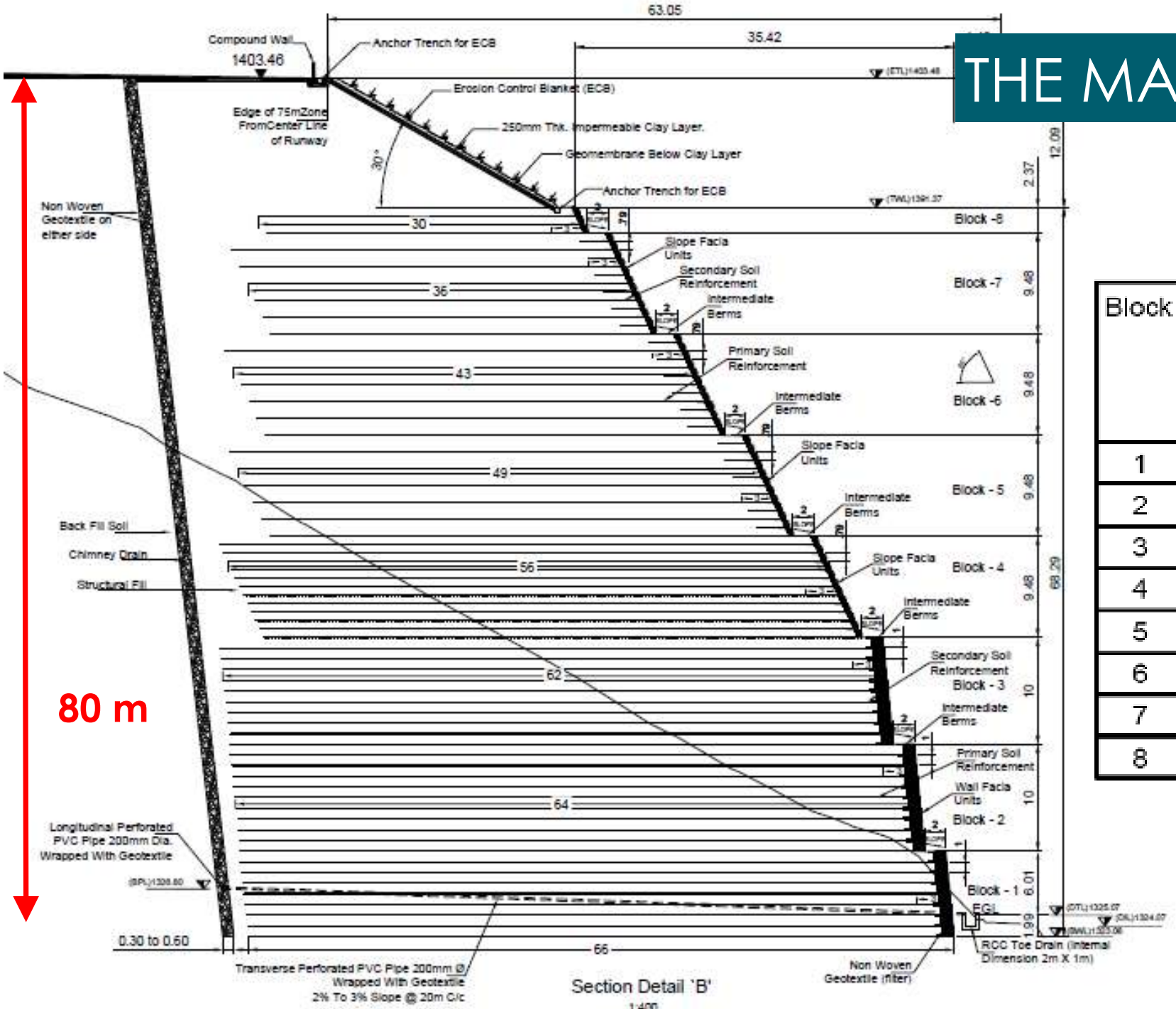
Main design was to BS 8006 for the static design of slopes and walls

Seismic design was complying with the American Federal Highways Administration (FHWA) standards as it is not covered in the British standard.

The MACSTARS Maccaferri software for reinforced soil structures was used for all stability checks



THE MACCAFERRI SOLUTION



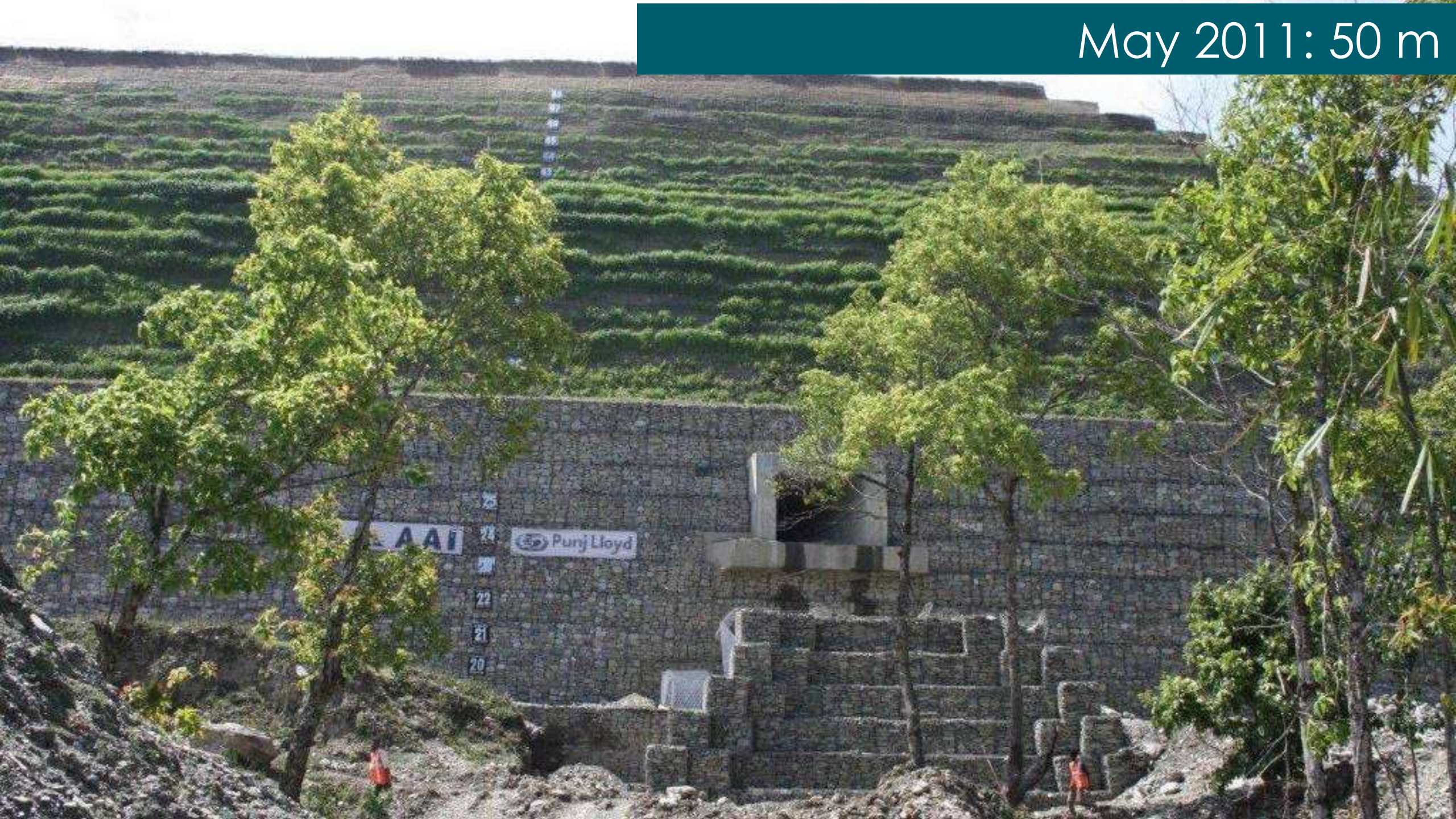
Block	Facia Unit Type	Grade of GG (kN/m)	Block width (m)	Block Height (m)	Vertical Spacing of GG (m)
1	Wall	800	66	8	1.00
2	Wall	800	64	10	1.00
3	Wall	700	62	10	1.00
4	Slope	500	56	9.48	0.79
5	Slope	500	49	9.48	1.58
6	Slope	300	43	9.48	1.58
7	Slope	200	36	9.48	1.58
8	Slope	200	30	2.37	1.58

Works at start: 11/2009

May 2010

July 2010

May 2011: 50 m




February 2015: 60 m


Today: 80 m

The drainage system

Question

Was there any problem during construction?

YES!

Construction problems

During works the following problems had to be solved:

- **Incorrect compaction of the structural fill**
- Incorrect installation of the gabion stones
- Scour protection of the culvert outlets

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The airport today

CNN travel

DESTINATIONS FOOD & DRINK PLAY

India's new Pakyong Airport opens in incredible Himalayan surroundings

Maggie Hiufu Wong, CNN • Updated 26th September 2018

ParaMesh construction, cutting & filling slope and drainage activities are finished.

ParaMesh structures successfully withstood the catastrophic seismic event that happened in Sikkim in September 2011 (Magnitude 6.9), right after the monsoon period which enhances the criticality further.

While most of the other infrastructure failed in Sikkim, ParaMesh structures performed excellent owing to their flexible nature, though the seismic event happened ($kh>0.3$) was higher than the magnitude for which these structures were designed ($kh=0.12$).