3° Forum Internazionale
OICE SUL BIM

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Associazione delle organizzazioni di ingegneria di architettura e di consulenza tecnico-economica
CONFINDUSTRIA

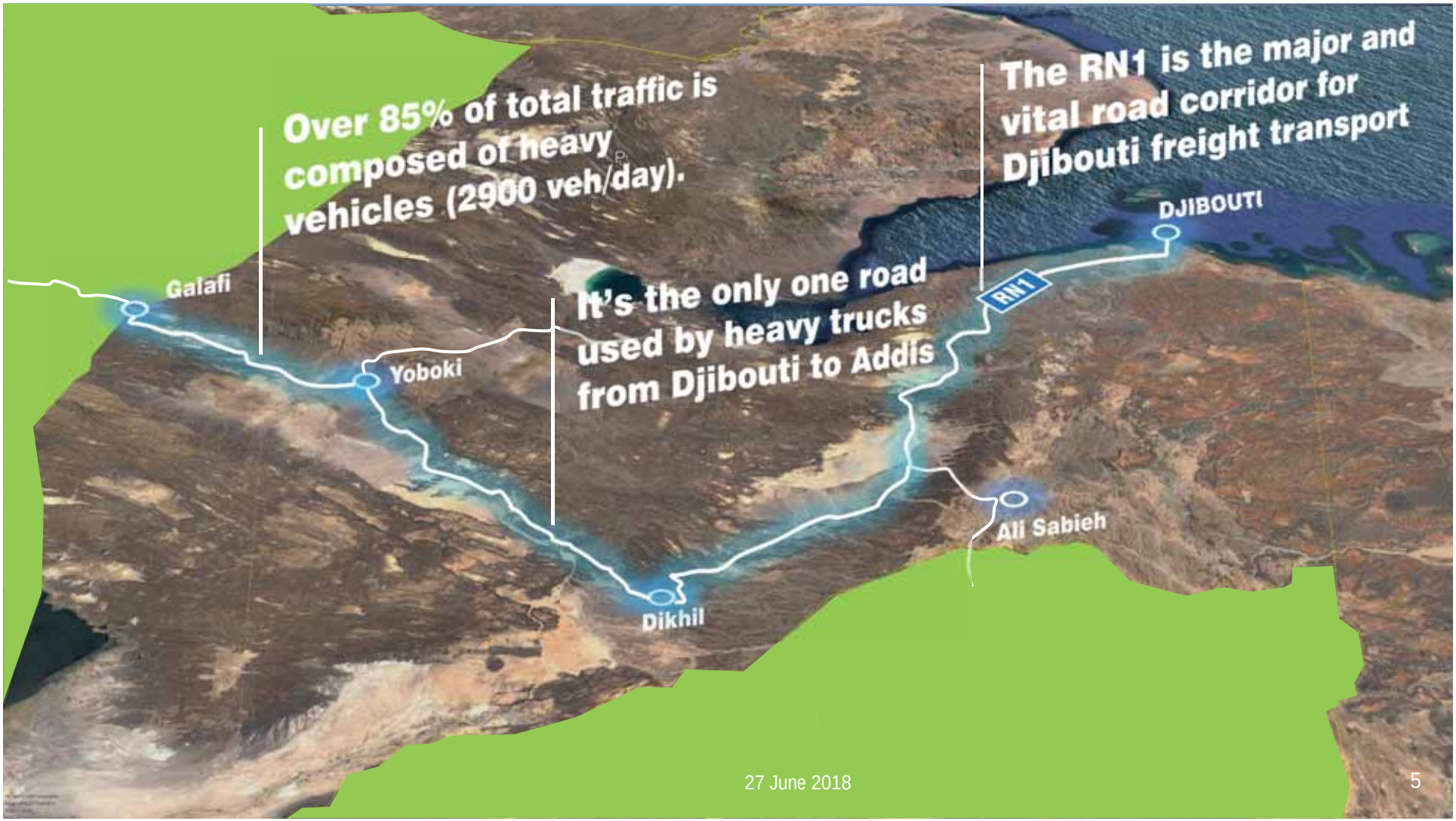

BIM FOR INFRASTRUCTURE
An international experience of a private Consultant

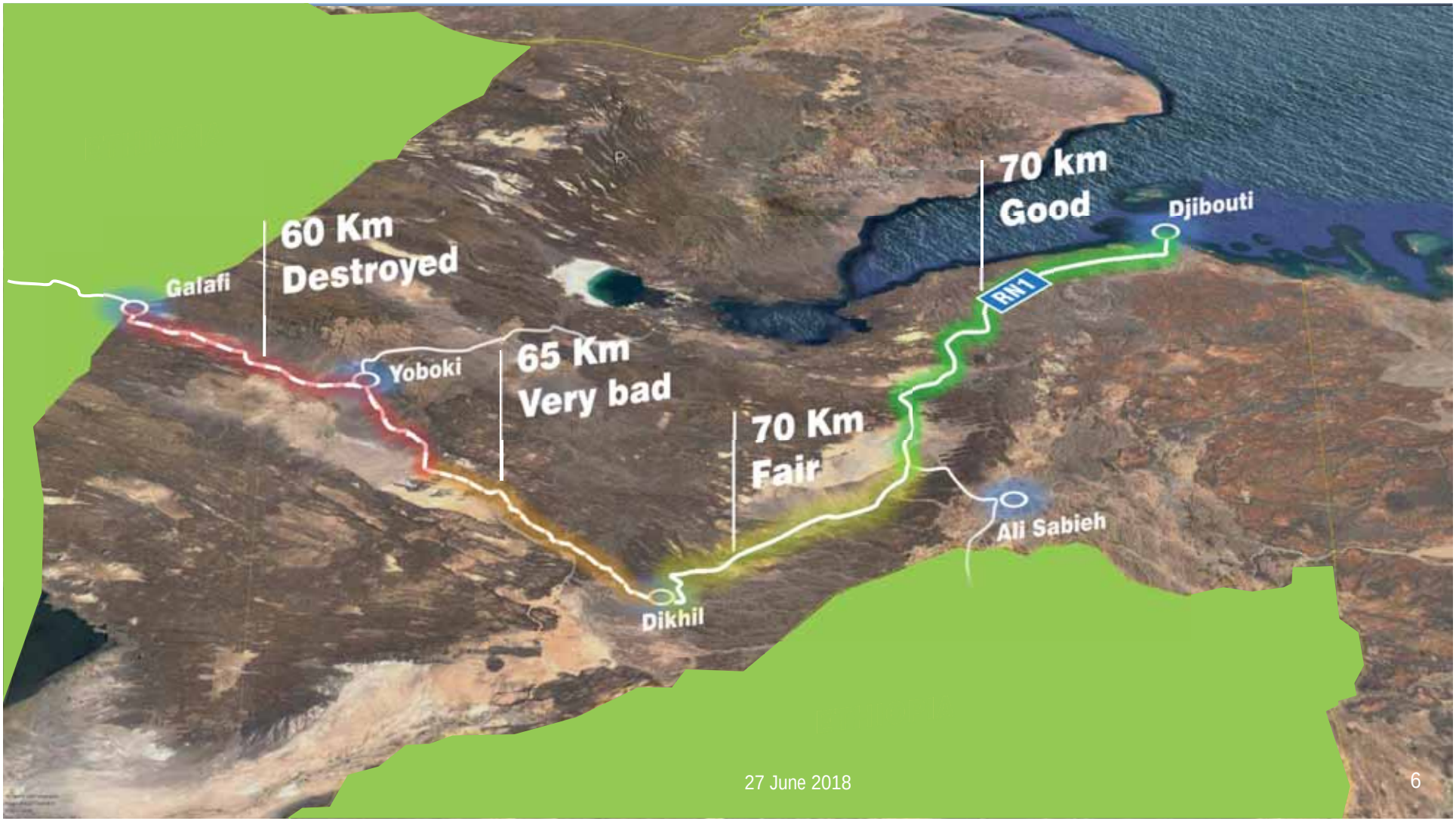

THE PROJECT

A REGIONAL INTEGRATION

Djibouti is considered as the natural gateway of Ethiopia, which - being a landlocked country with a population of over 100 million and with the fastest-growing economy in Africa at annual rates above 10% - depends heavily on transport and cross-border accesses of the Port of Djibouti for its import-export activities.

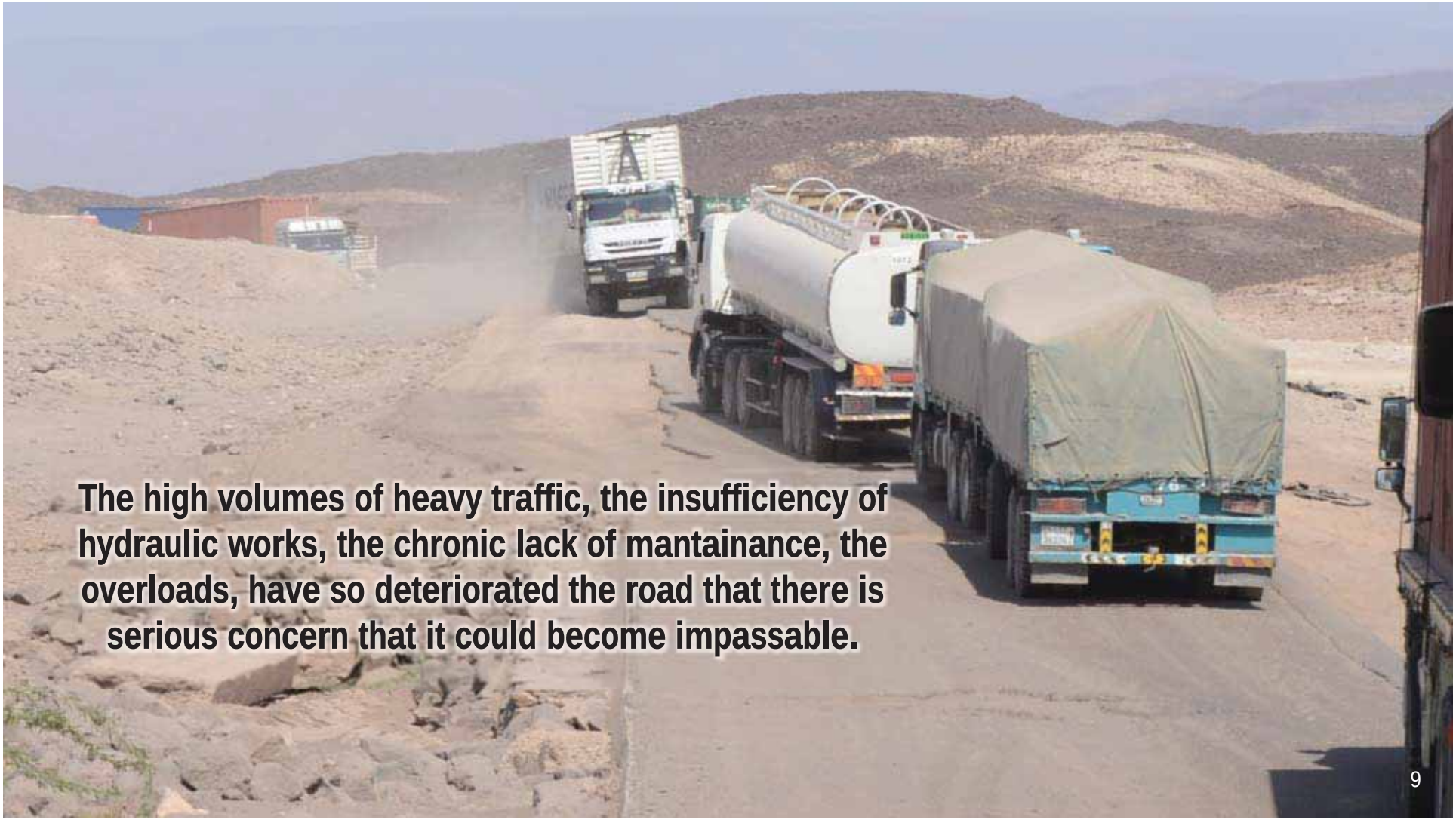
Over 95% of the goods imported into and exported out of Ethiopia, transit through the ports of the city of Djibouti and along the road corridor that connects it to Ethiopia.

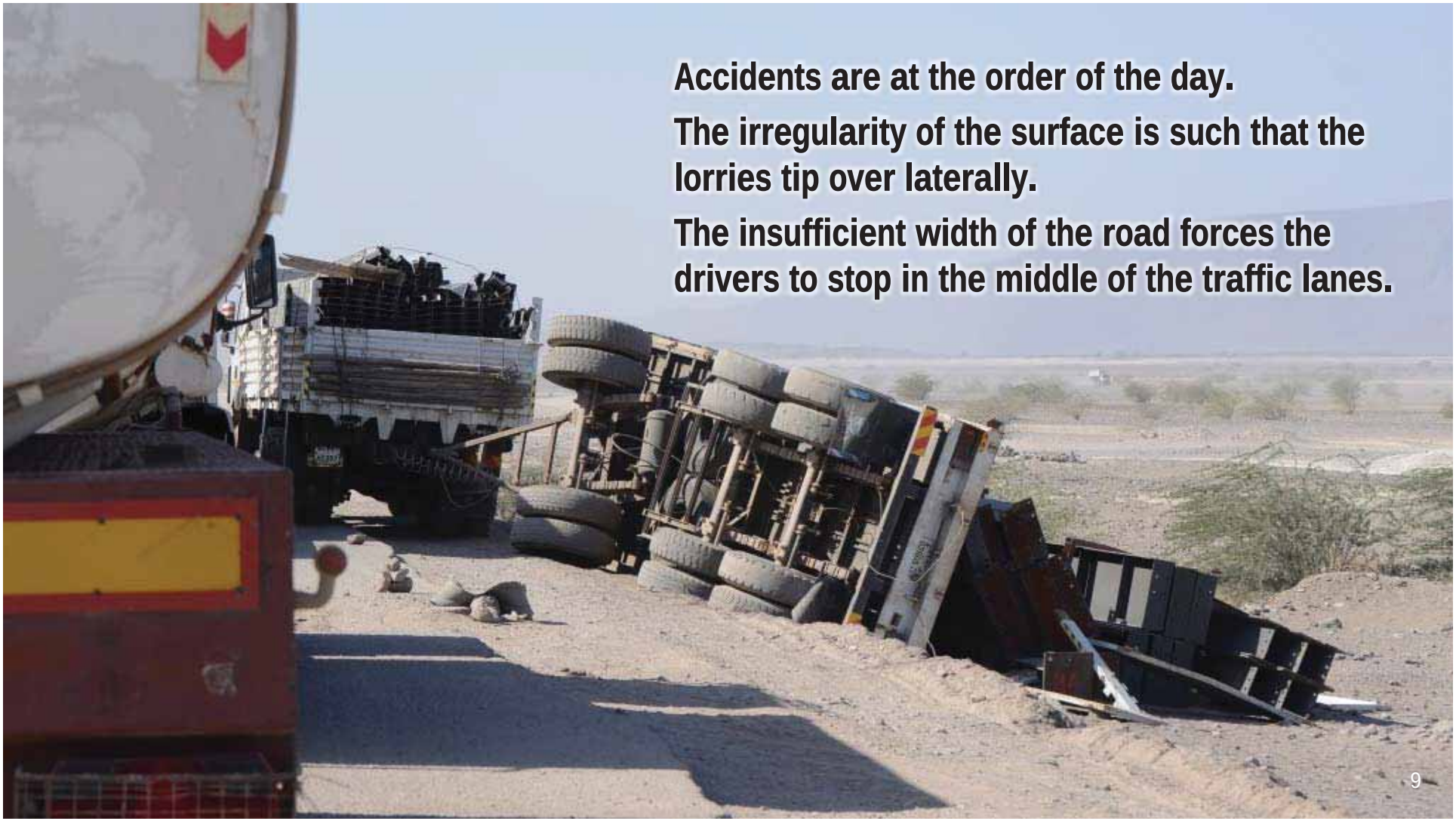

Over 85% of total traffic is composed of heavy vehicles (2900 veh/day).
It's the only one road used by heavy trucks from Djibouti to Addis
The RN1 is the major and vital road corridor for Djibouti freight transport
Galafi
Yoboki
Dikhil
Ali Sabieh
DJIBOUTI
RN1


70 km
Good
Djibouti
RN1
60 Km
Destroyed
Galafi
Yoboki
65 Km
Very bad
70 Km
Fair
Ali Sabieh
Dikhil

ROAD CONDITIONS AT PRESENT

The current condition of RN1 road is dramatic.


The high volumes of heavy traffic, the insufficiency of hydraulic works, the chronic lack of mantainance, the overloads, have so deteriorated the road that there is serious concern that it could become impassable.


Accidents are at the order of the day.
The irregularity of the surface is such that the lorries tip over laterally.
The insufficient width of the road forces the drivers to stop in the middle of the traffic lanes.


Sometimes drivers try to ford anyway,
often resulting in accidents.
In case of rain events the road becomes
impassable.
The road passes directly into riverbeds
with submersible slabs ("*radier*")

THE REQUEST:

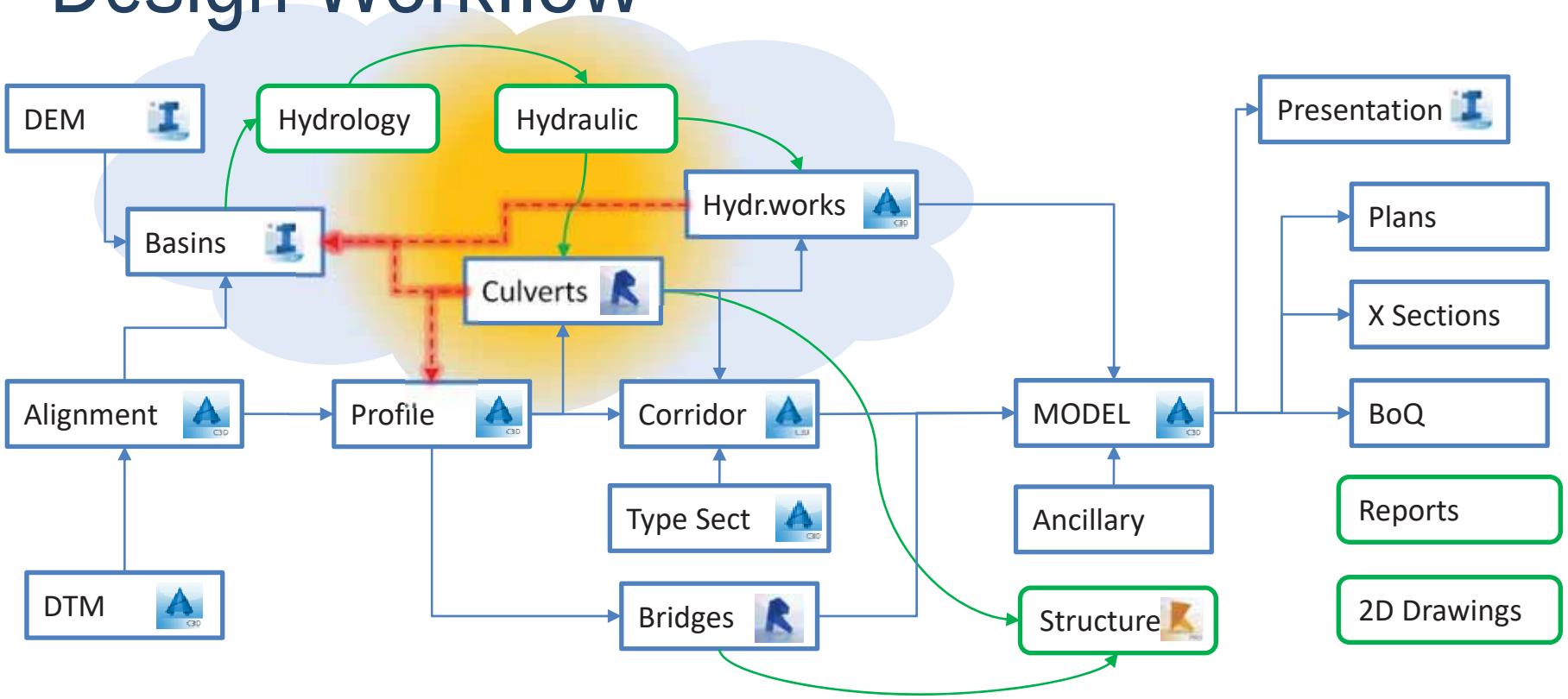
PREPARE THE FINAL DESIGN OF 60KM IN 1,5 MONTHS


PROJECT EXECUTION PROCESS

PLANNING

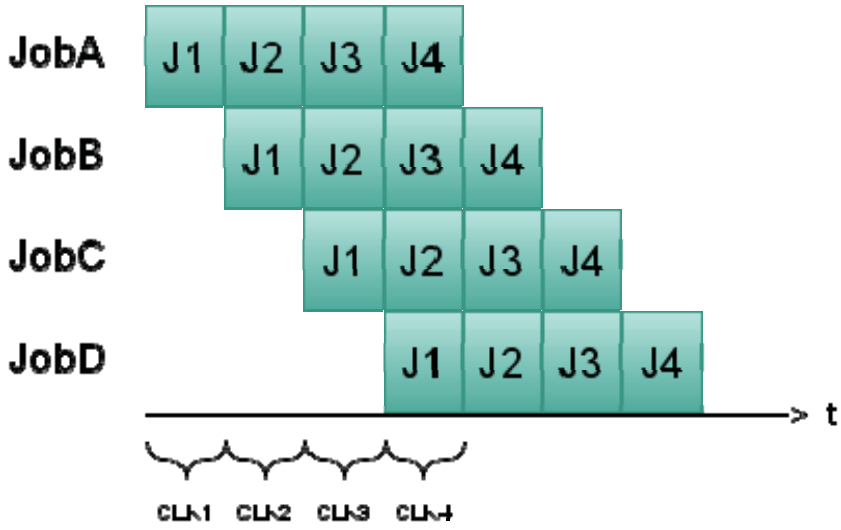
- Design BIM Project Execution Process:
  - Define the tasks supported by BIM along with information exchange
  - Define the information content and the level of detail
  - Define the responsible party for each task/exchange

Design Workflow



PLANNING

The rigid time constraints lead to adopt a «pipelined» organization and workflow.



Vertical Breakdown (by Task)

Alignment

Profiles

Hydraulic

Structures

Signalization

BoQ

Drawings

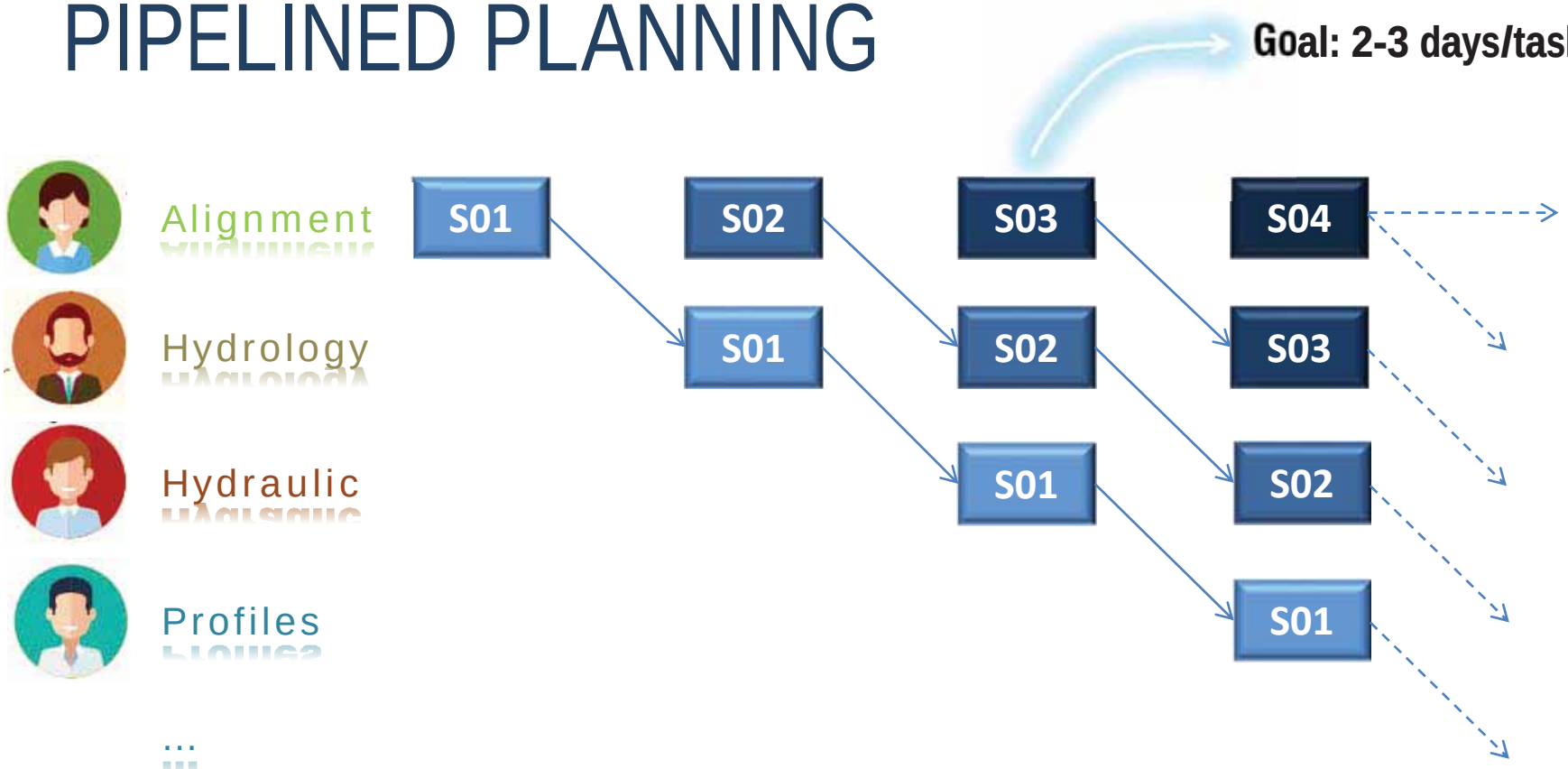
Hydrology

Horizontal Breakdown

The project has been subdivided into 12 SECTIONS approx. 5km long.

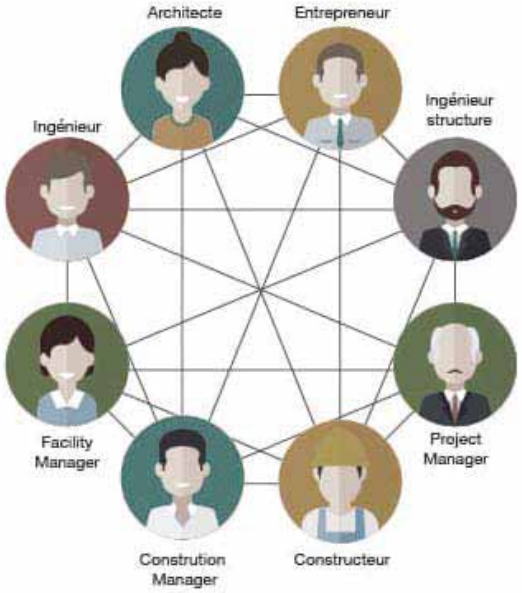
(Also dictated by the need to limit the size of the single DTM and the design model)

PIPELINED PLANNING

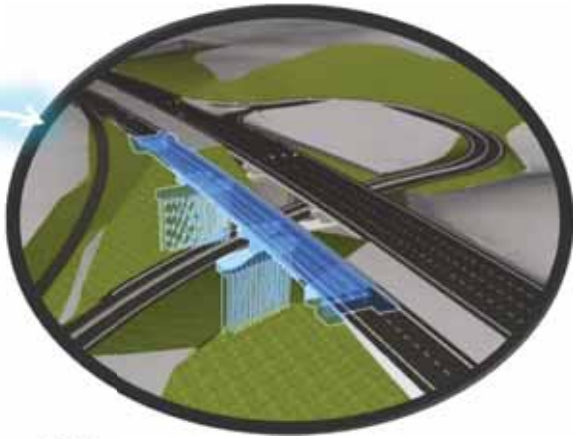


BIM Approach

2D design workflow



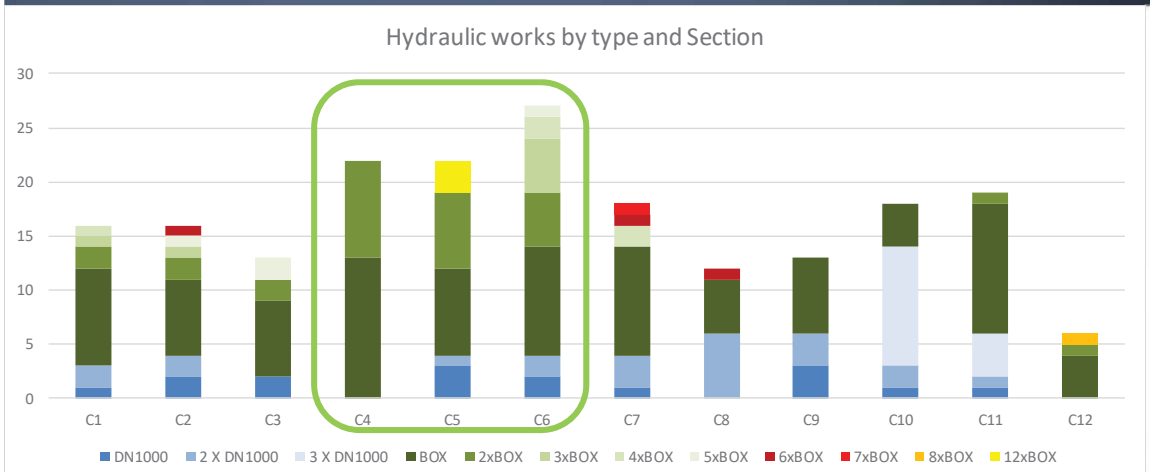
BIM Interoperability

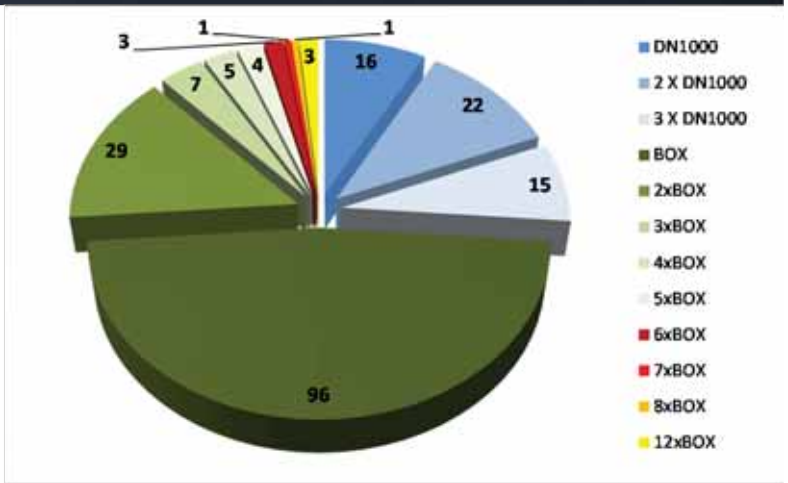


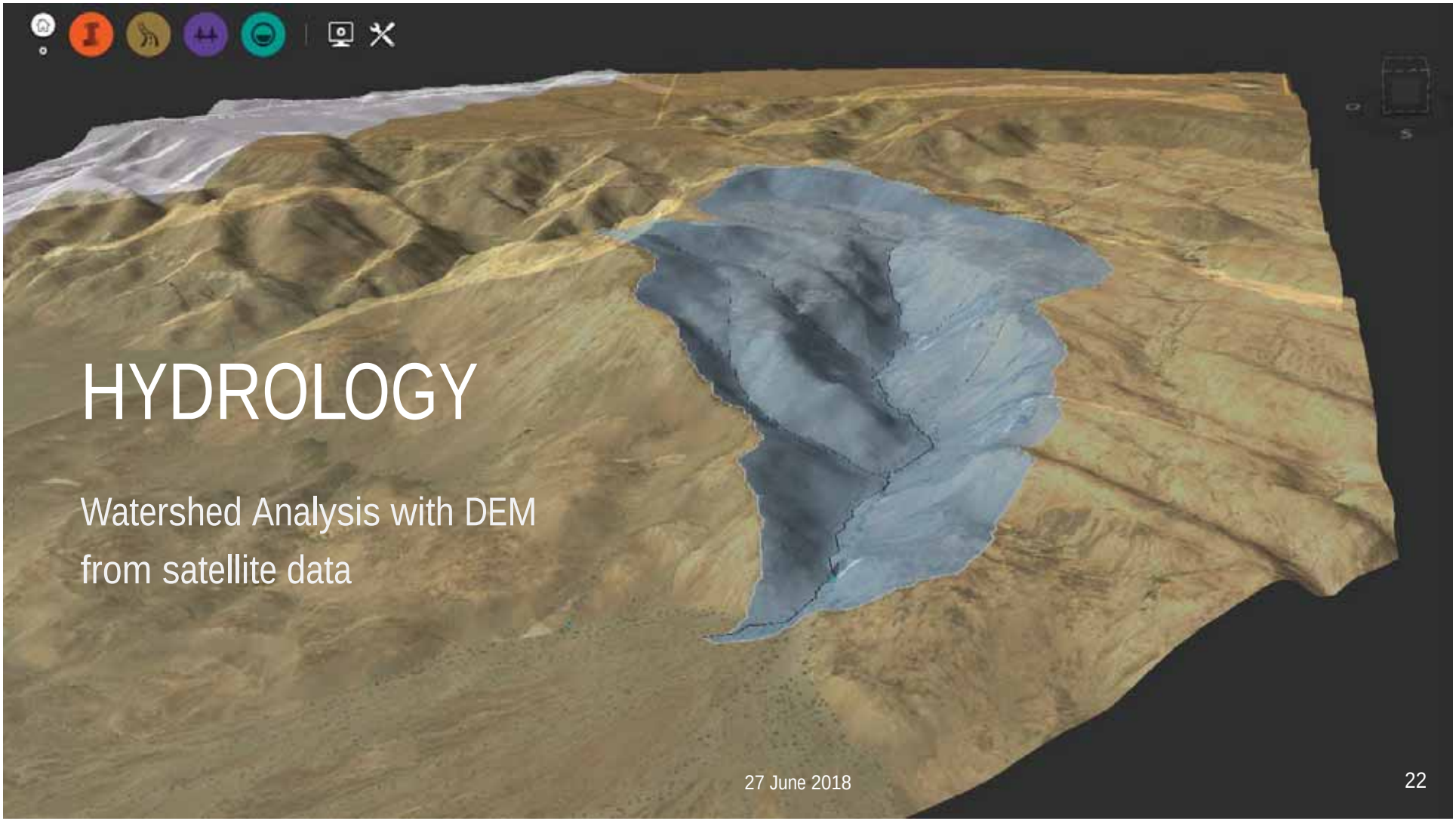
3D georeferenced model of all project elements

DRAINAGE STRUCTURES

The study involves the design of 221 drainage structures, either pipe culverts or reinforced concrete box culverts for a total length of 7.400m.



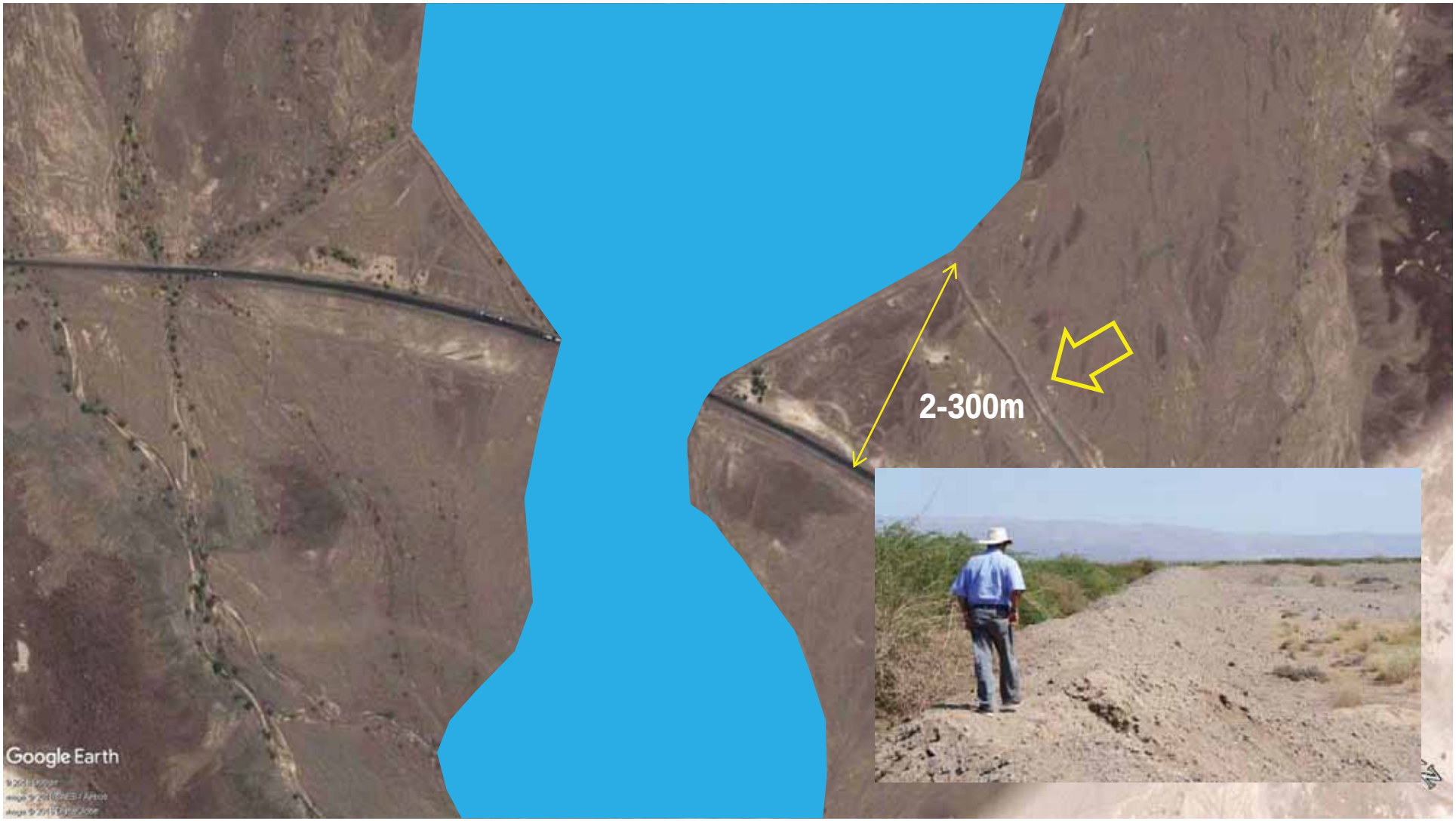




HYDROLOGY

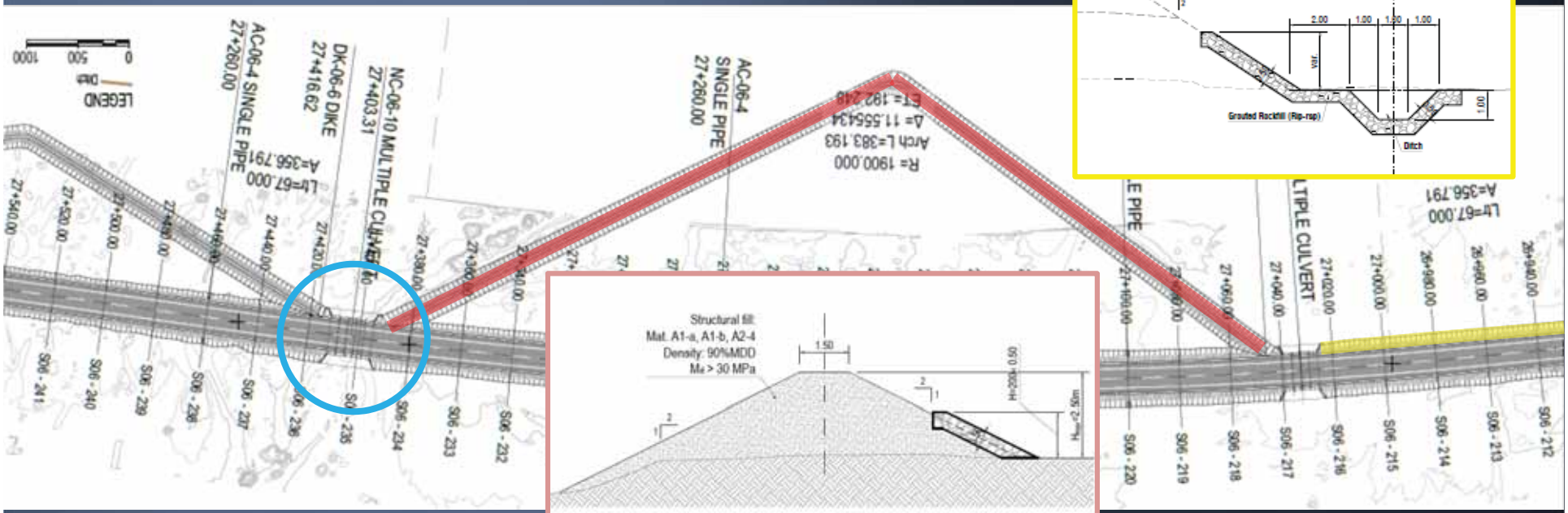
Watershed Analysis with DEM
from satellite data

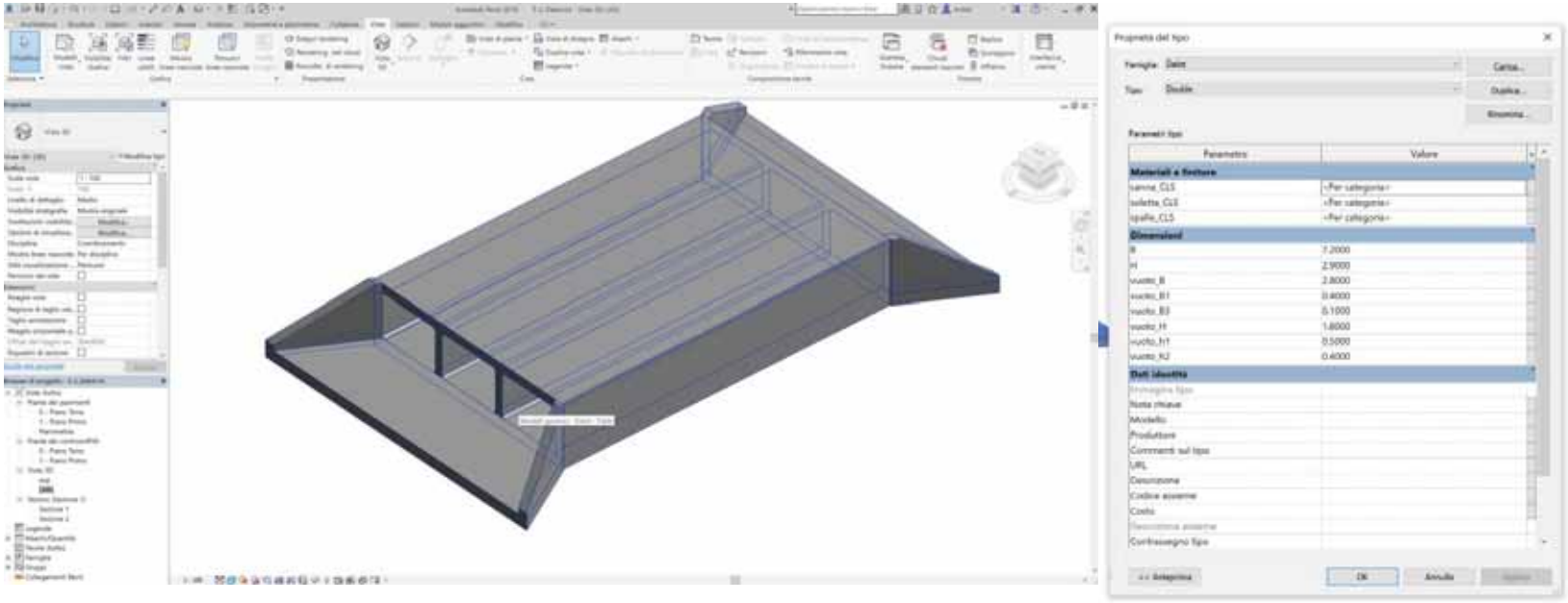

5 km
Defined watercourse
Overland flow
Yoboki


2-300m
Google Earth

HYDRAULIC PROTECTION WORKS

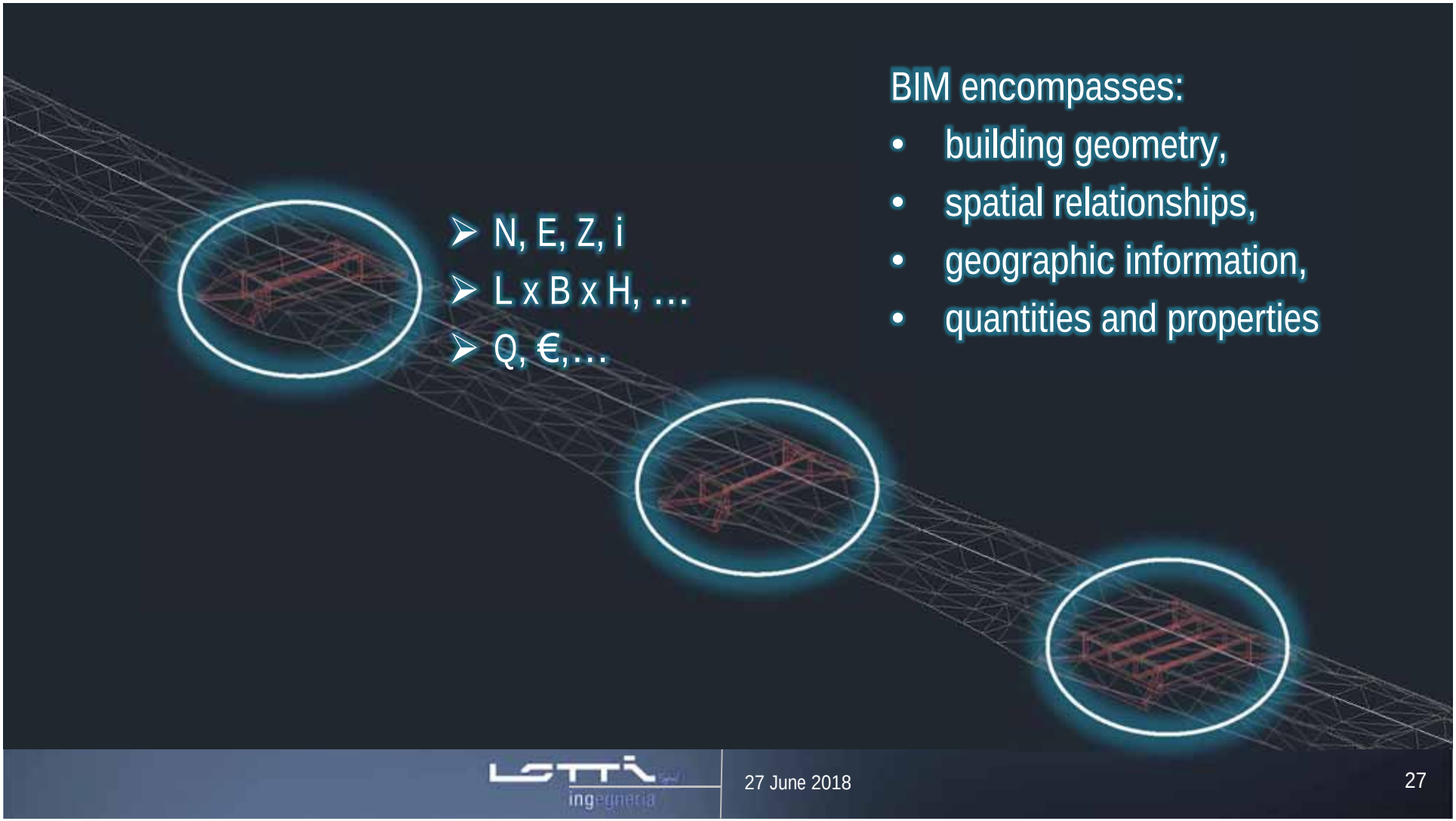
A synergic comprehensive system of protection works has been designed.

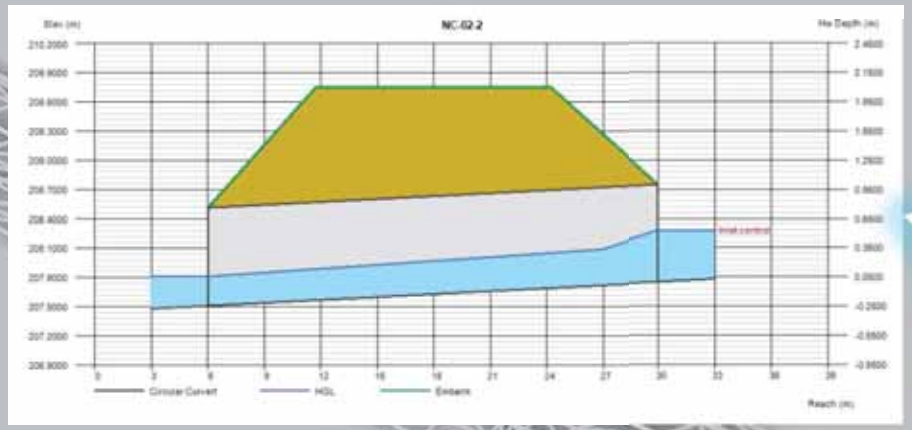


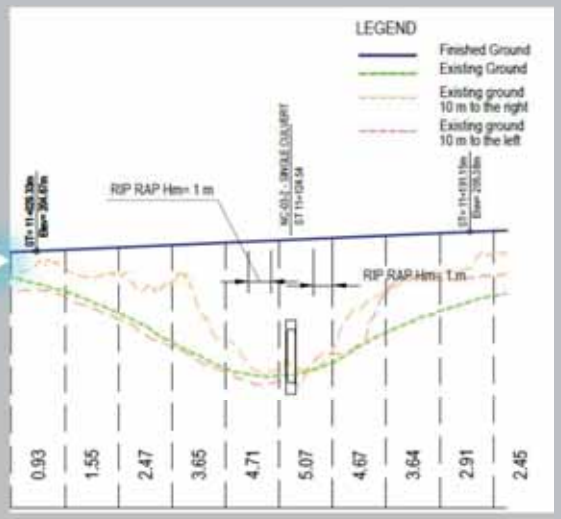


All culverts have been modeled starting from a parametric family.

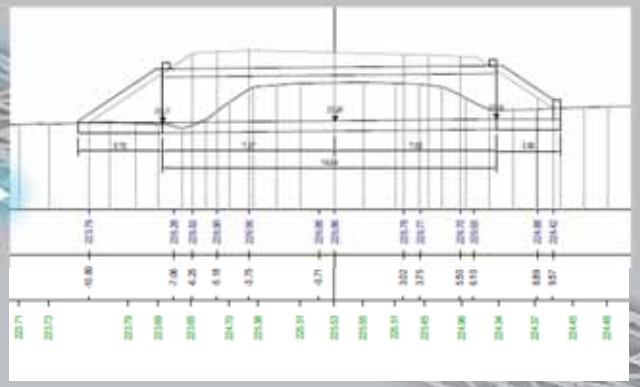
Each structure is a 3D object with geometrical parameters and its geographical position.


➢ N, E, Z, i
➢ L x B x H, …
➢ Q, €,…
BIM encompasses:
• building geometry,
• spatial relationships,
• geographic information,
• quantities and properties


NC-02 2
Circular Culvert
HGL
Embank
Reach (m)


LEGEND
Finished Ground
Existing Ground
Existing ground 10 m to the right
Existing ground 10 m to the left
RIP RAP Hm= 1 m
RIP RAP Hm= 1 m
0.93
1.55
2.47
3.65
4.71
5.07
4.67
3.64
2.91
2.45


Autodesk Robot Structural Analysis Professional 2018
Autore:
Indirizzo:
File:
Progetto: Struttura




Geometry and data can be exchanged
with other Applications

WHAT HAVE WE LEARNED?

- BIM is not a software, is a process
- Virtual elimination of latencies
- High organizational flexibility

- Steep learning curve
- Initial investments needed (HW, SW, training)
- Hard to find expertise in infrastructural BIM

comprehensive
engineering
for a sustainable
future

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