

# LIMA Programme

## Road Construction

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NOT IF, BUT HOW



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and Construction  
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Image: Munich Re

# 01

## Introduction



Source: mauritius images / Westend61 / Cameron Davidson

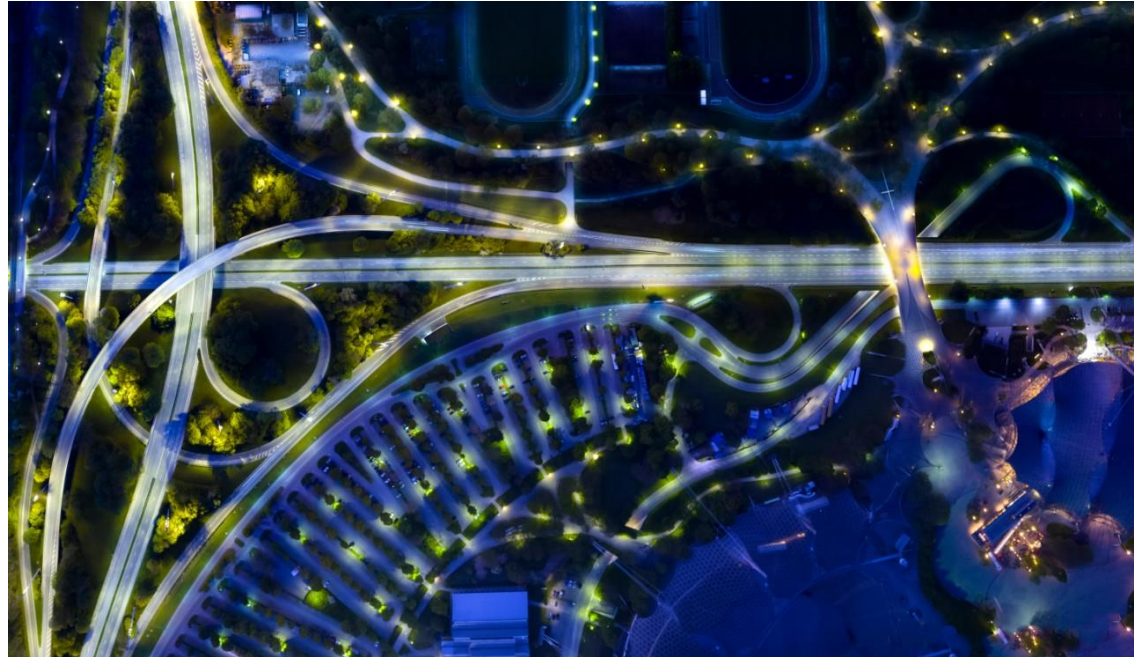
The movement of people and goods is fundamental to economic and social prosperity everywhere.

And when it comes to movement, roads are the most essential and basic form of transport there is, as they knit all other transport modes together.

They are the first and the last mile of every movement, be it of people or goods.

Source: IRU

- **Roads**
- Railways
- Bridges
- Tunnels
- Water supply
- Sewer
- Electrical Grids
- Telecommunication
- Airports
- .....

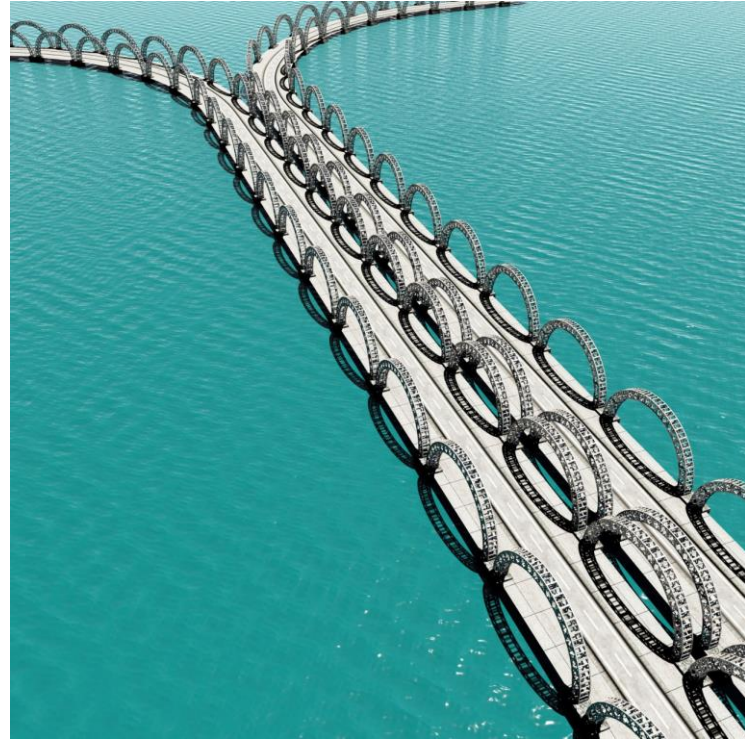


Source: Malorny / Getty Images

# Introduction

## Project and Insurance set-up

- **Public investment**
- **Public Privat Partnership (PPP)**
- **Privat investment**
  
- **Owner controlled**
- **Contractor controlled**



Source: nicholashan / iStockphot



Image: Munich Re

# 01

## Technical Details and Construction Methods

# Technical Details and Construction Methods

## Development and Special Features

- Complex structures often including tunnels, bridges, water management systems, etc.
- Linear projects over long distances
- Roads are directly connected to the ground / surface
- Large amounts of earthworks possible
- Highly exposed to weather, climate and natural hazards
- Very machinery intensive construction method (Fire Exposure)
- Logistical challenge – Supply of material and equipment.
- Can be exposed to public traffic

Similar for Railway lines and Runways



# Technical Details and Construction Methods

## Types of construction

Gravel  
Road

Cobble-  
stone  
Pavement

Concrete  
Pavement

Asphalt  
Pavement

# Technical Details and Construction Methods

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Gravel  
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### How to build a road ? - Construction steps

- **Investigate:** actual locations of pipes / supply lines (known/unknown)
- Preparation of construction / **site clearance**
- Removal of top soil
- **Earthworks**, cuttings and sloping
- Putting **drainage** in place
- Compaction of sub base if required **soil improvement** or exchange
- Placing of **frost protection layer / sub base**
- Placing of **base course**
- Placing of **wearing course**

# Technical Details and Construction Methods

## Design and Construction



Undersaturation



Optimum moisture content



Source: MR

Oversaturation

# Technical Details and Construction Methods

## Elements of roads

### Substructure – earthwork / supporting structure

- Ground soil / sub base / cuttings / embankments
- Water drainage
- Soil improvement (grouting) / stabilization / exchange
- Embankment

Similar to railway tracks and airport runways

# Technical Details and Construction Methods

## Elements of roads

### Superstructure – base course, covering, wearing course, paving

- Frost protection layer
- Base course
  - Gravel, crushed stones
  - Asphalt or concrete layer
- Wearing course
  - Binding course - asphalt or concrete layer
  - Stone sett (block) pavement including bedding / cobble pavement

# Technical Details and Construction Methods

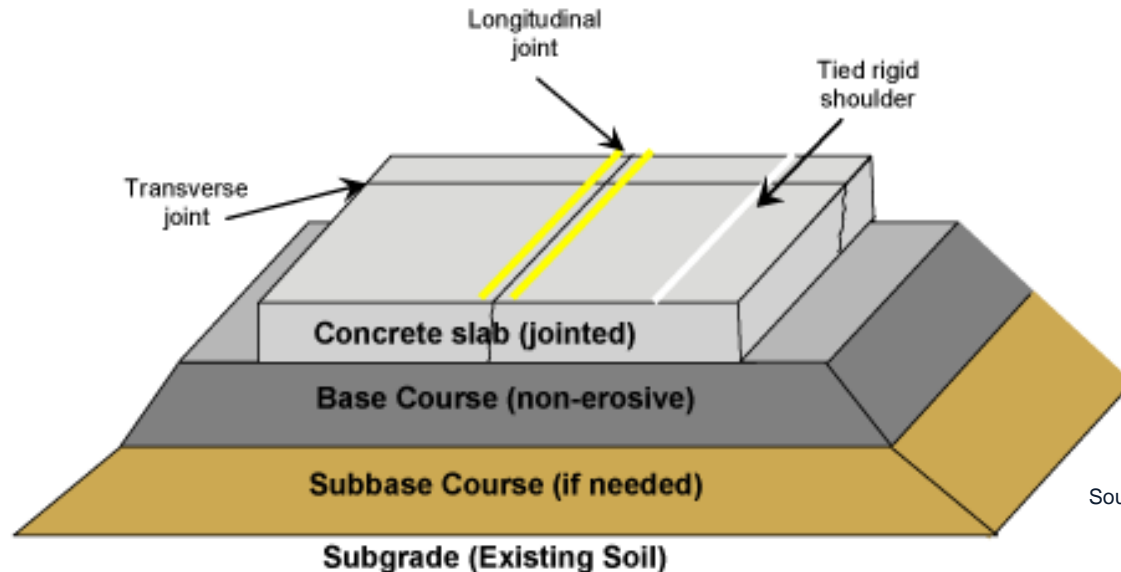
## Design and Construction

### Cross section of a Highway – Asphalt Pavement

# Technical Details and Construction Methods

## Design and Construction

### Cross section of a Highway – Concrete Asphalt Pavement



Source: The Constructor



# Technical Details and Construction Methods

## Trends



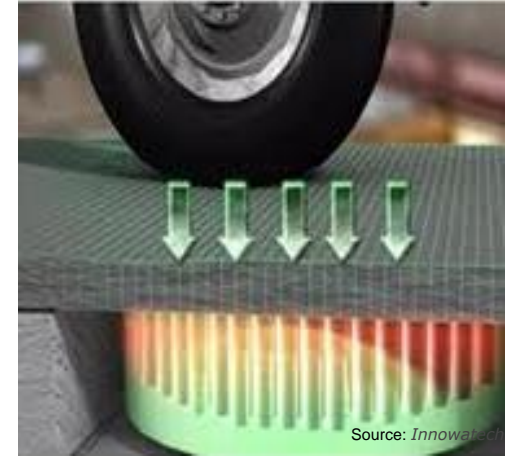
Source: The Construction

Automated Construction  
Equipment



Source: ailwayfx / stock.adobe.com

Intelligent Transport Systems  
(ITS)



Source: InnovaTech

Piezoelectric roads



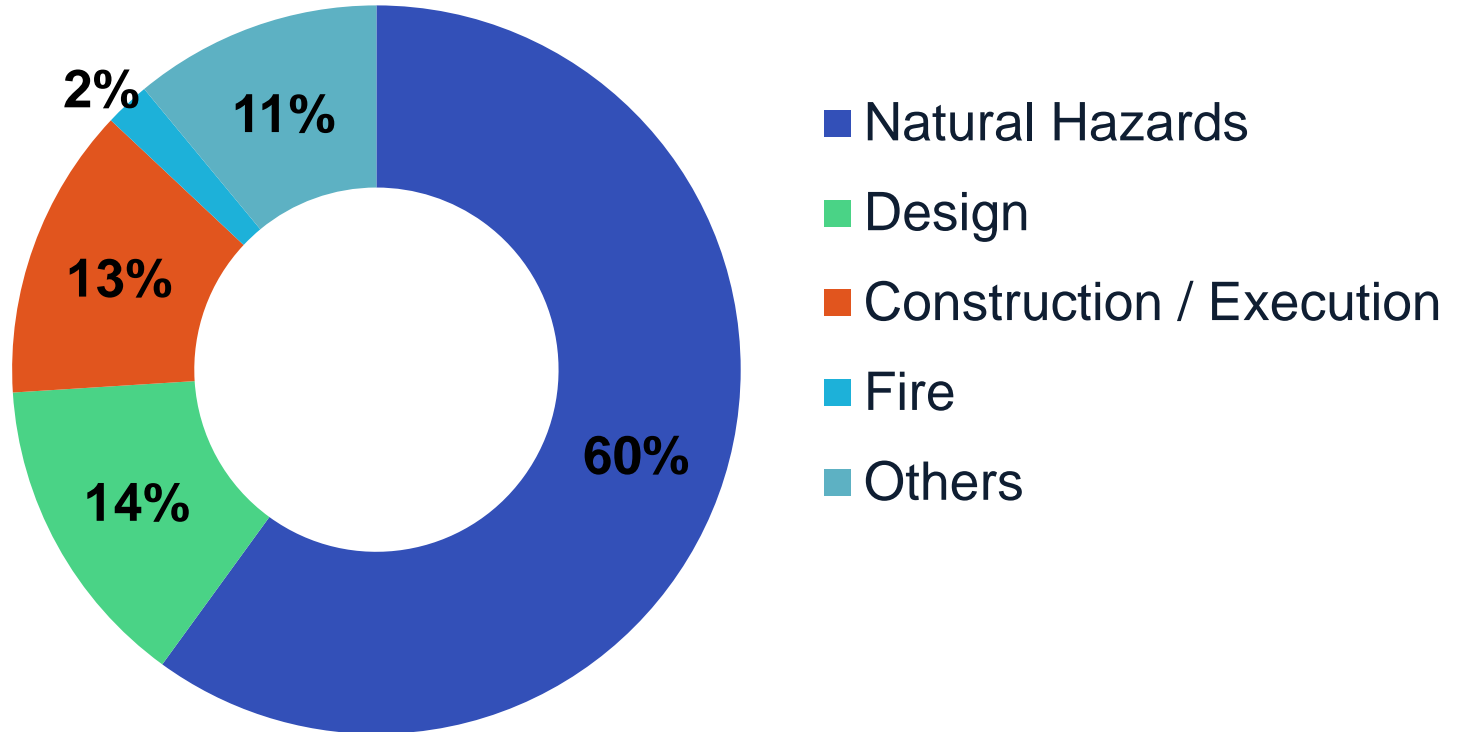
Image: Munich Re

# 03

## Major Challenges and Loss Examples

# Major Challenges and Loss Examples

## Main Exposures / Hazards



# Major Challenges and Loss Examples

## Main Exposures / Hazards

### Natural Hazards

- Flood / Inundation / Heavy Rainfall
- Hurricane / Typhoon / Windstorm / (Sand and other materials)
- Earthquake
- Tsunami (Close to coast)

# Major Challenges and Loss Examples

## Loss Examples

Flood in Germany

# Major Challenges and Loss Examples

## Loss Examples

Flood in Germany

# Major Challenges and Loss Examples

## Loss Examples

Earthquake in Japan

# Major Challenges and Loss Examples

## Loss Examples

Earthquake in Chile



# Major Challenges and Loss Examples

## Loss Examples

### Earthquake in Chile

# Major Challenges and Loss Examples

## Loss Examples

Hurricane Jeanne, Florida

# Major Challenges and Loss Examples

## Loss Examples

Cyclone Gonu, Oman

# Major Challenges and Loss Examples

## Loss Examples

Cyclone Gonu, Oman

# Major Challenges and Loss Examples

## Main Exposures / Hazards

### Natural Hazards

- Landslides
- Frost and heat
- Geographical and geological situation

# Major Challenges and Loss Examples

## Loss Examples

# Major Challenges and Loss Examples

## Loss Examples

Spain

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Brazil

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Switzerland

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South Italy

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Taiwan

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# Major Challenges and Loss Examples

## Loss Examples



Source: [Cracked black asphalt road](#)



# Major Challenges and Loss Examples

## Loss Examples

# Major Challenges and Loss Examples

## Main Exposures / Hazards

### Other Hazards

- Quality of workmanship and material used
- Lack in compaction (water content / bad workmanship / material)
- Length of roads under construction (section limit)
- Time schedule of construction (raining season / frozen ground)
- Traffic during construction (TPL exposure / safety / accidents)
- Housekeeping at construction site / Experience of construction company
- Design – dimension of drainage
- Fire? (site installations / stores / workshops / machinery)



Image: Munich Re

# 04

## Underwriting

### Required Information:

1. SI (Sum Insured) / break down of SI / required scope of cover /sublimits
2. Company / description of works / construction method / type of road
3. Location and natural hazards
4. Geological situation / topography of site and surrounding area
5. Time schedule / layout of site installations
6. Design and construction companies / loss history
7. Alignment of road / layout drawings and cross sections
8. Section lengths / sections handed over after completion

# Roads

## Underwriting

- Climatic – rainfall, weather
- Soil/geological situation / topography of site and surrounding area
- Alignment/route of road / layout drawings and cross sections
- Section lengths / sections handed over after completion

# Roads

## Underwriting

- SI (Sum Insured) / break down of SI / required scope of cover /sublimits
- Description of works / construction method / type of road
- Location and natural hazards
- Time schedule / layout of site installations

# Underwriting

## Terms & Conditions based on what is covered

Bridges

Tunnels

Roads

Dams

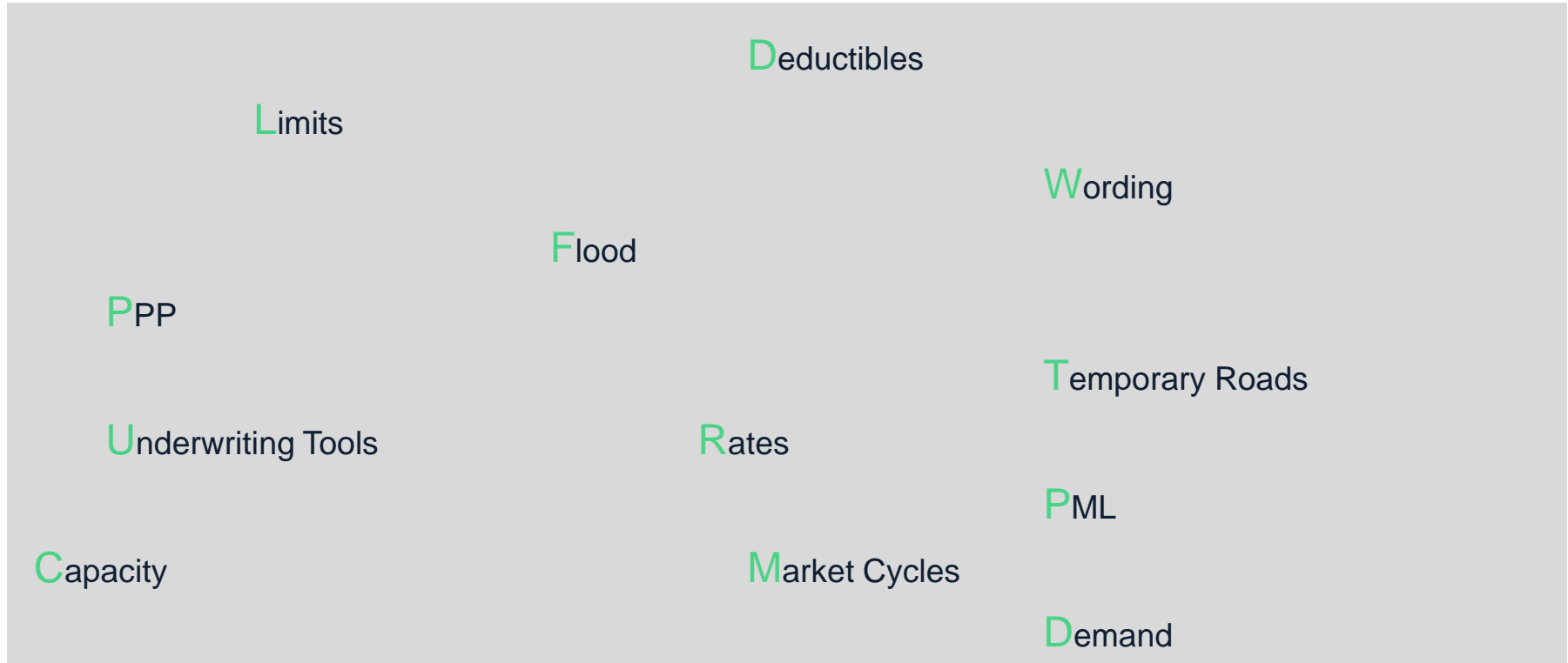
## MR Policies and Endorsements

| Most important Endorsements                 | CPI       | CAR       | CEAR                   |
|---|-----------|-----------|------------------------|
| 1. Time Schedule/deviations                 |           | Endo 1260 | Endo 005<br>Endo 14005 |
| 2. Section Limit                            | Endo 1248 | Endo 106  | Endo 14106             |
| 3. Underground services and facilities      | Endo 1262 | Endo 102  | Endo 14102             |
| 4. Safety measures flood/inundation(20yr)   | Endo 1265 | Endo 110  | Endo 14110             |
| 5. Open trenches, pipes, cables, etc.       | Endo 1264 | Endo 117  | Endo 14117             |
| 6. Removal of debris from landslides(in xs) | Endo 1235 | Endo 111  |                        |



### Survey Reports and Site visits

1. General info
2. Executive Summary
3. Situation & Progress on Site
4. Exposures & Hazards (on site, workshops, stores, offices, etc. ...)
5. Loss prevention measures in place?
6. Recommendations
7. Pictures



Thank you for your attention!

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Thomas Kibet

NOT IF, BUT HOW

