Defining Resilience in the Asphalt Sector

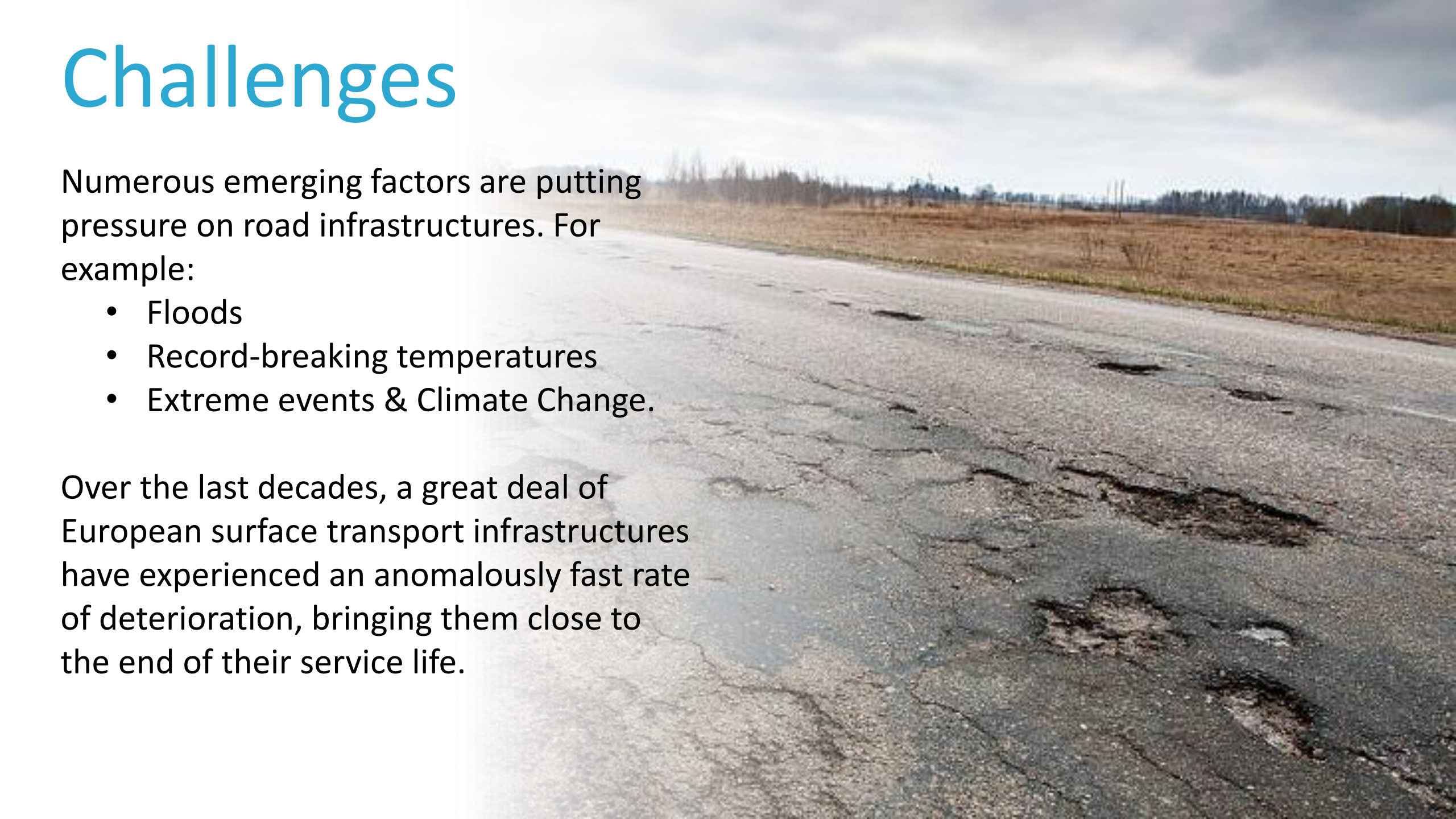
Dr. Breixo Gomez
European Asphalt Pavement Association (EAPA)

Challenges

Numerous emerging factors are putting pressure on road infrastructures. For example:

- Floods
- Record-breaking temperatures
- Extreme events & Climate Change.

Over the last decades, a great deal of European surface transport infrastructures have experienced an anomalously fast rate of deterioration, bringing them close to the end of their service life.



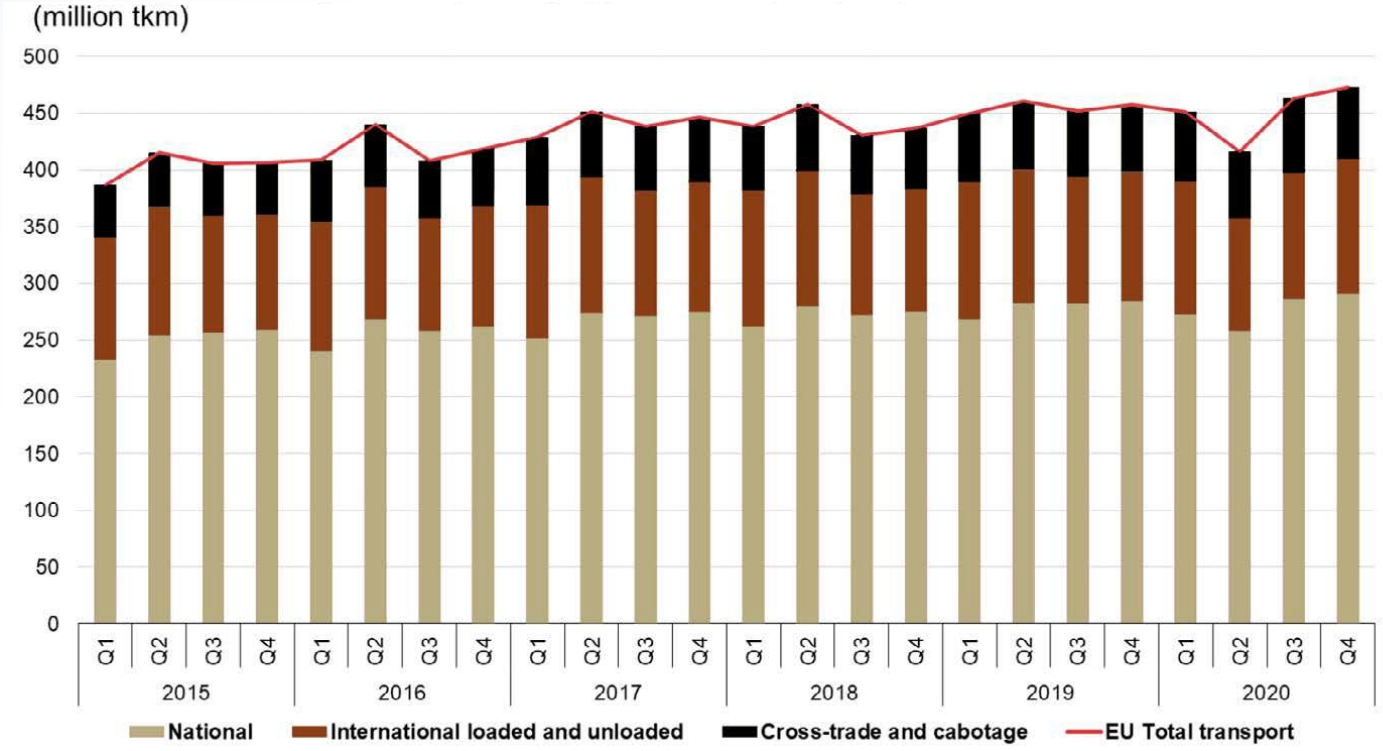
Challenges

Increasing traffic

Traffic demands keep increasing.

Eurostat: road freight transport in the EU-28 countries increased by 23.7% from 2015 to 2021.

With the exception of the years of EU economic crisis and the second quarter of 2020 due to the Covid pandemic, this increasing trend has been present for decades.



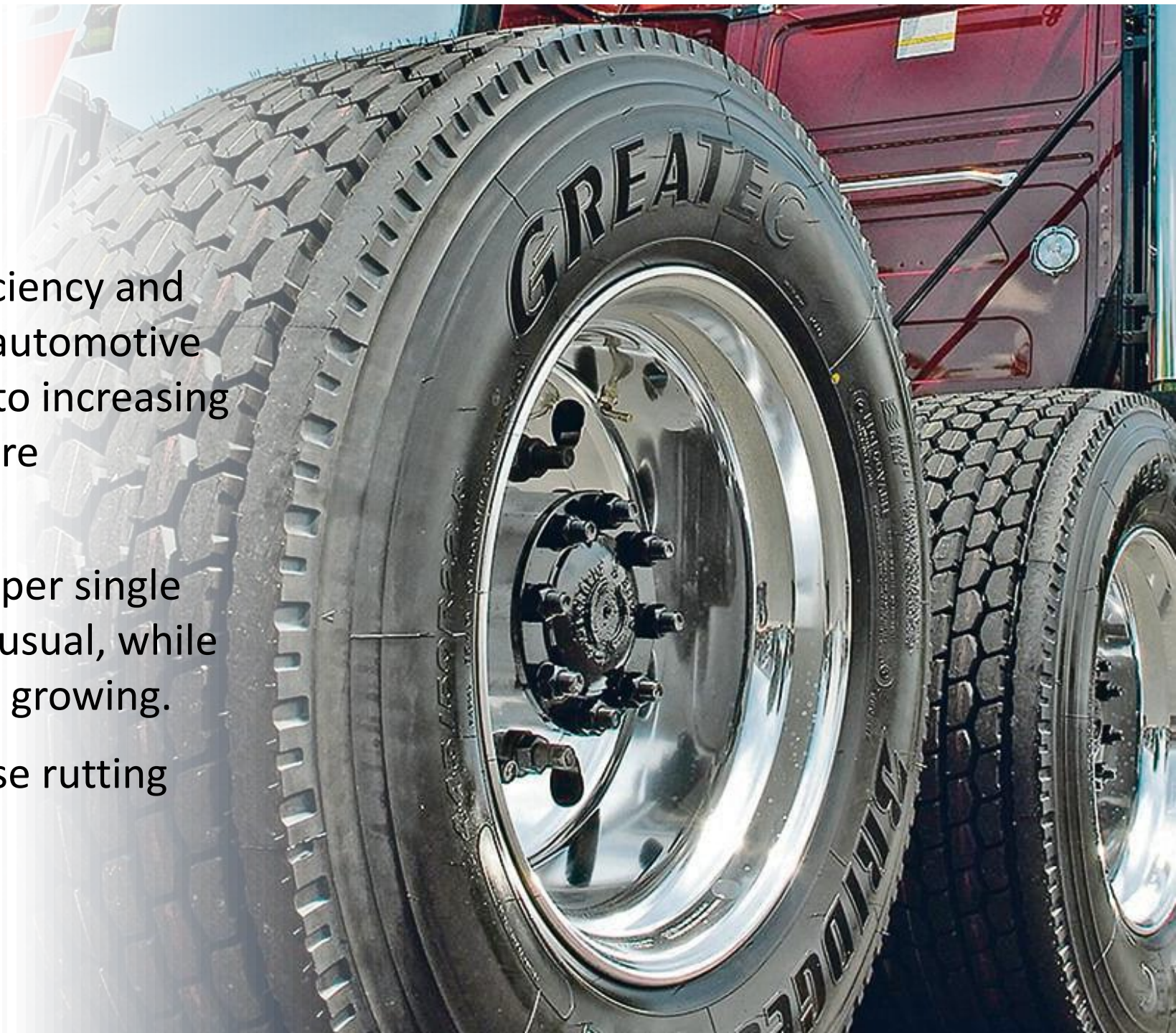
Challenges

Heavy vehicles

Improvements in transport efficiency and technical developments in the automotive industry have also contributed to increasing axle loading as well as higher tyre pressures.

Greater use of high-pressure super single tyres is getting more and more usual, while the total weight of trucks keeps growing.

This has the potential to increase rutting and fatigue cracking.



New road users

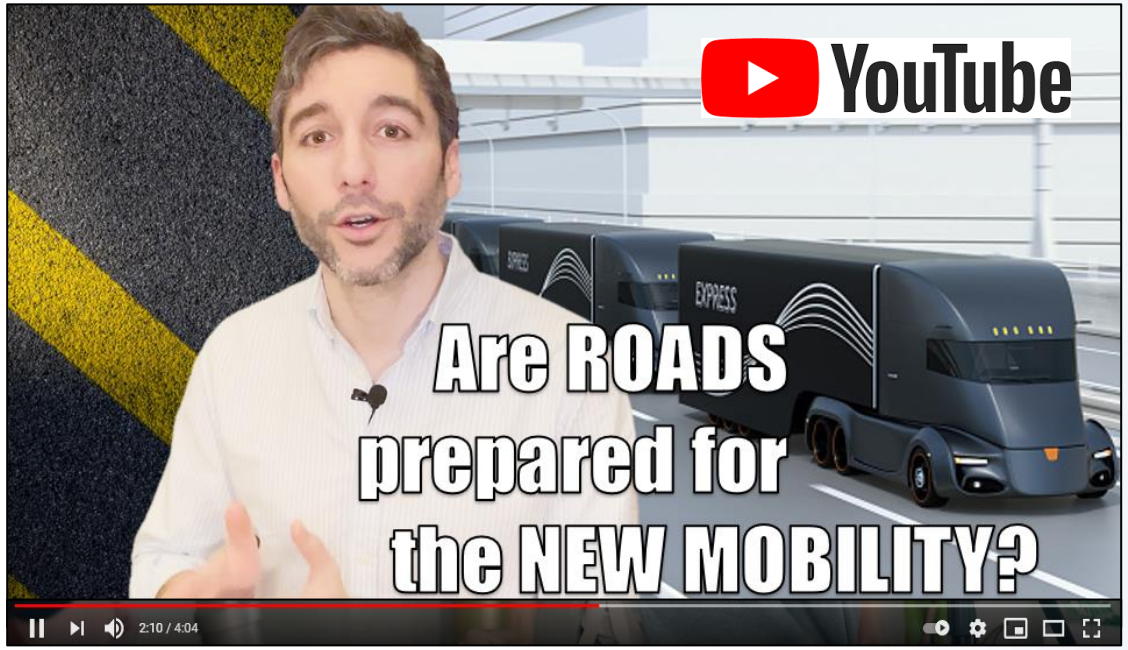
Unfavourable scenario + the arrival of new types of vehicles:

- Autonomous vehicles
- Electric vehicles
- High-capacity vehicles

Expected to be among the main tools of humanity to reduce transport emissions and increase road safety.

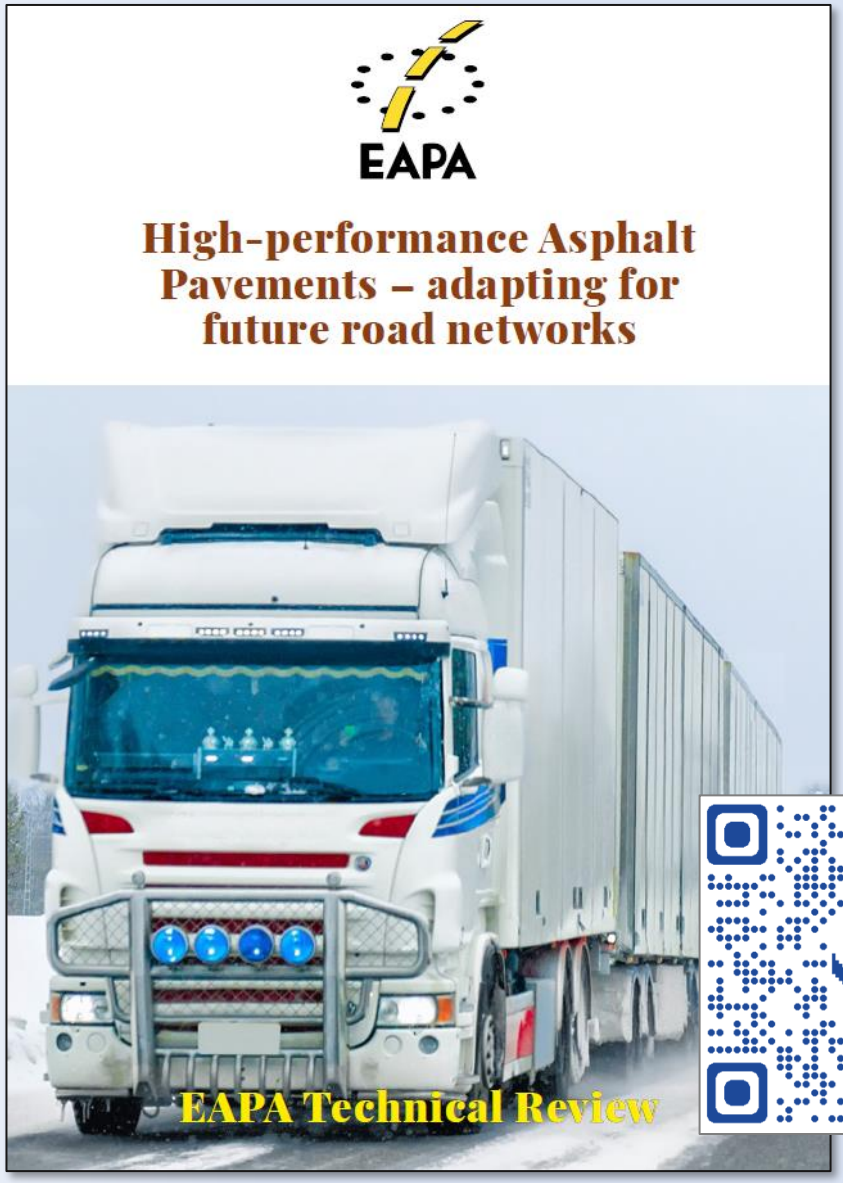
Might also worsen the distress produced on our road infrastructures accelerating road pavement deterioration over time.

Are we prepared?



Generation αsphalt – The challenge of adapting roads to electric, automated and heavy-duty vehicles

https://www.youtube.com/watch?v=rEQpYWv71nk



https://eapa.org/eapa-position-papers/

European policy

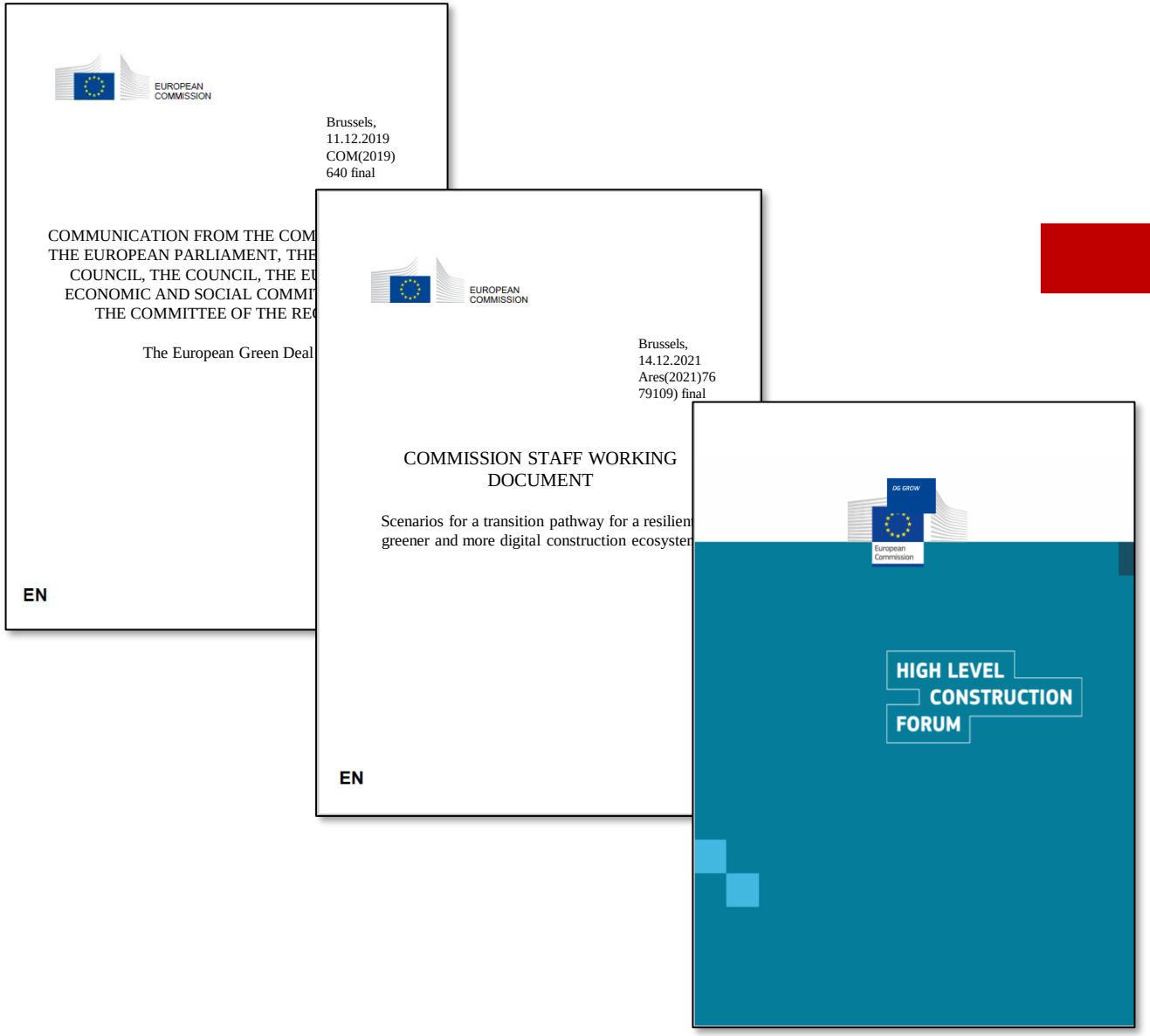
The bad state of road surfaces leads to higher fuel/electricity consumption, vehicle and road maintenance costs, emissions and delays in travel time.

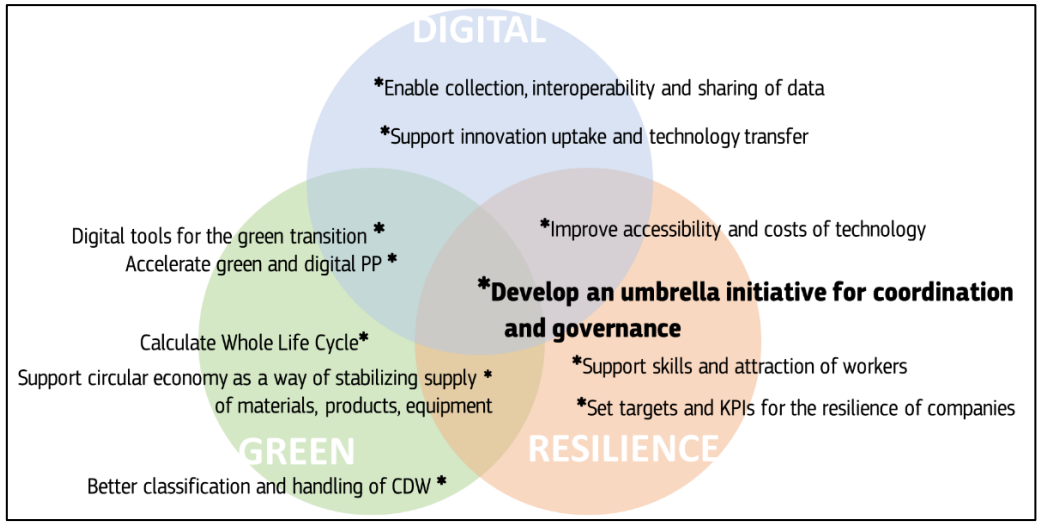
Therefore, in order to meet EU requirements, roads must be durable and require minimum maintenance operations and traffic disruptions.

In other words, roads must be “resilient”.

European policy

European policy





We may expect in the future:

- EU Procurement trends similar to GPP, Circular Economy, Taxonomy, etc.
- Public contracts awarded on the basis of resilience KPIs, etc.

What is resilience?

According to Wikipedia:

1. *the capacity to recover quickly from difficulties; toughness.*
2. *the ability of a substance or object to spring back into shape; elasticity.*

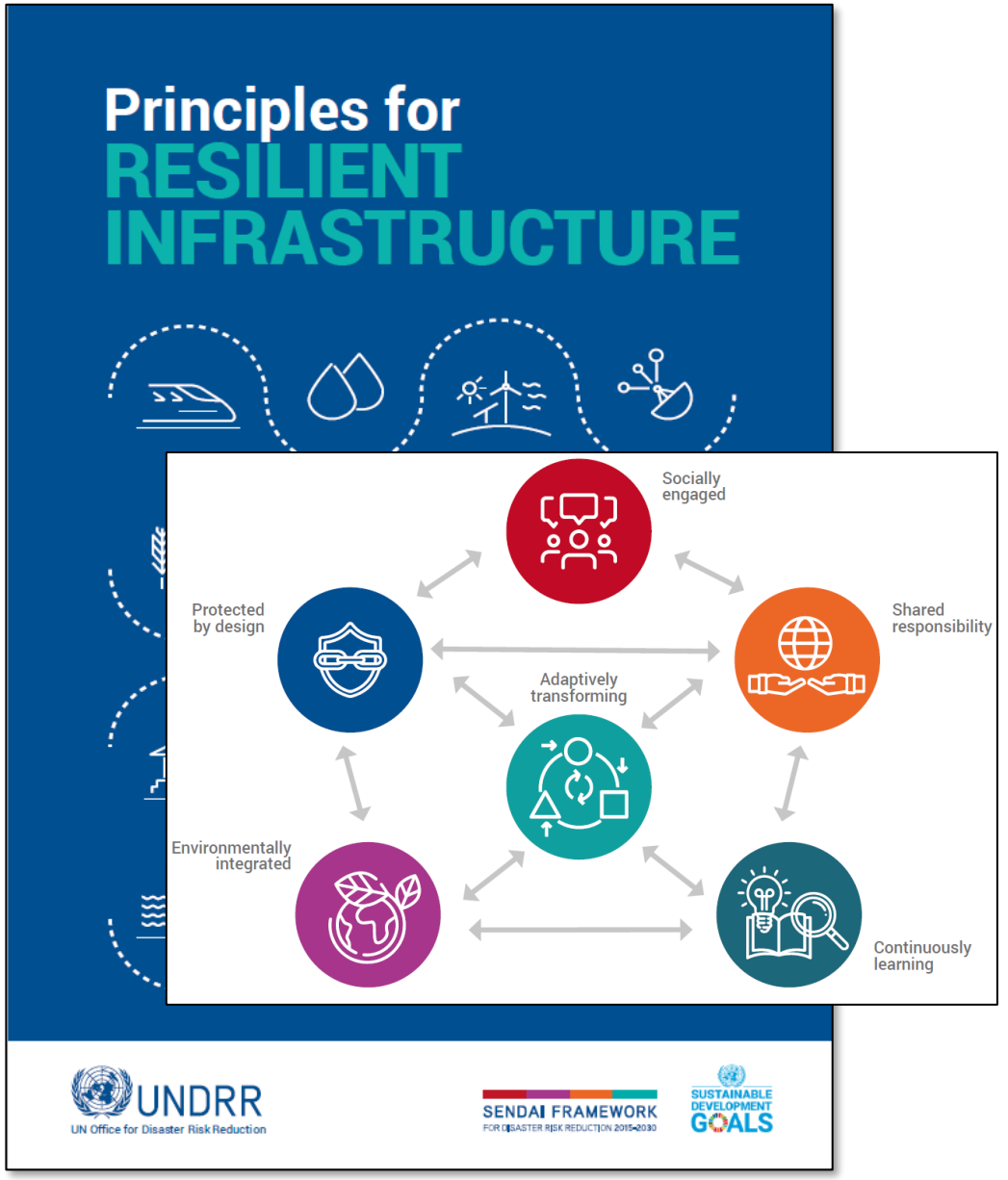
Asphalt has always been (visco)elastic. An EN test even exists for an indirect assessment of ‘Resilient’ Modulus (EN12697-26 – Stiffness).

But climate change means that asphalts and roads will have to recover quickly with more extremes of difficulties.

What is resilience ?

According to the United Nations (Office for Disaster Risk Reduction):

> *"**Infrastructure Resilience** is the timely and efficient prevention, absorption, recovery, adaptation, and transformation of national infrastructure's essential structures and functions, which have been exposed to hazards. Implementing resilience across all disruption phases should be done through collaborative risk and uncertainty management, multi-hazard assessment, and methods that embrace the systemic nature of national infrastructure.*



What is resilience ?

According to the Permanent International Association of Road Congresses (PIARC):

> *“Capacity of a social, economic or ecological system to face a disturbance, a tendency or a disturbing event, by reacting or by reorganizing itself in such a way as to preserve its essential function, its identity and its structure while retaining its faculties of adaptation, learning and/or transformation”.*

PIARC

WORLD ROAD ASSOCIATION
MONDIALE DE LA ROUTE
AIPCR PIARC

What can we do?

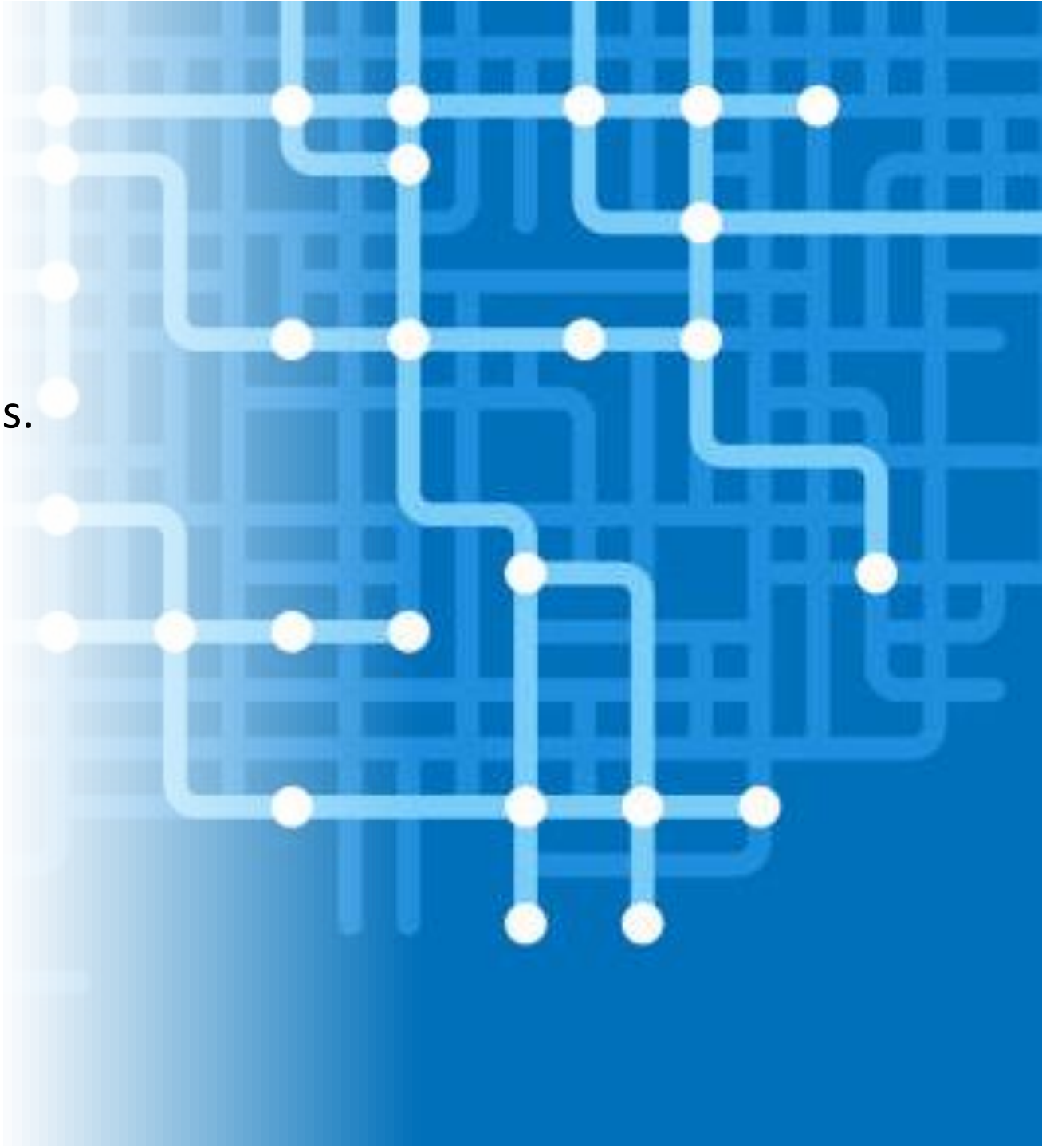
Mitigate impacts:

- Decarbonize processes (plant & equipment) – e.g. fuel switching
- Temperature reduction (WMAs)
- Lower carbon components (bitumen, additives, etc.)
- Circular Economy (re-use & recycle)
- Extend durability to reduce maintenance.
- Mixture design
- Etc.

What can we do?

Adapt:

- Test methods that assess performance based on “traditional” (climate) conditions.
- Performance declarations should also indicate constancy of performance as a proxy for durability (no single test for durability).
- Mix design, raw materials, manufacturing processes, etc. to future failure mechanisms.
- Standards will need to be dynamically developed (currently numerous restrictions).



What can we do?

Protect:

- The resilience of roads is also connected to other parts of them as a system, e.g. drainage.
- Poor or insufficient drainage will impact on structural performance of all layers – unbound, foundations and bound layers.
- Can also be considered in terms of ‘service levels’ e.g. closing a road (or limiting vehicle use until flood water subsides, damage is assessed and repairs are made: is that acceptable (and for how long) to users ?

What can we do?

As a sector:

- The pandemic showed that our industry was resilient and adapted quickly to different necessary ways of working.
- Resilience against supply chain disruptions (wars, economics, etc.), new regulations, cyberattacks, etc.
- But we have an ageing workforce and it is difficult to attract young people.
- New exciting period for digitalization and automation. But the new workforce still needs to appreciate and understand the “product”.

What can we do?

As society:

- Mitigate climate change to minimise impact on roads (and materials).
- Reduce human impact on the road (e.g. driving behaviour).
- Political action, e.g. if we cannot adapt enough, service may be compromised and travel start to look different (time of day, regulated, taxed, permitted use, etc.).
- New threats: deliberate attack, cyber security of control systems (road, operations, autonomous driving), protestors.

Conclusions

Resilience is a combination of mitigation and adaptation.

Different levels must be considered: material, pavement, infrastructure, sector, society.

Solutions will need to be collaboratively developed and delivered, with shared risk.

Start from Net resilience gains, not just impact reduction.

EAPA

Thank you!

breixo@eapa.org

@B_GomezMeijide

Breixo Gomez Meijide