Impact of high capacity and overweight vehicles on infrastructure and cost benefit assessment

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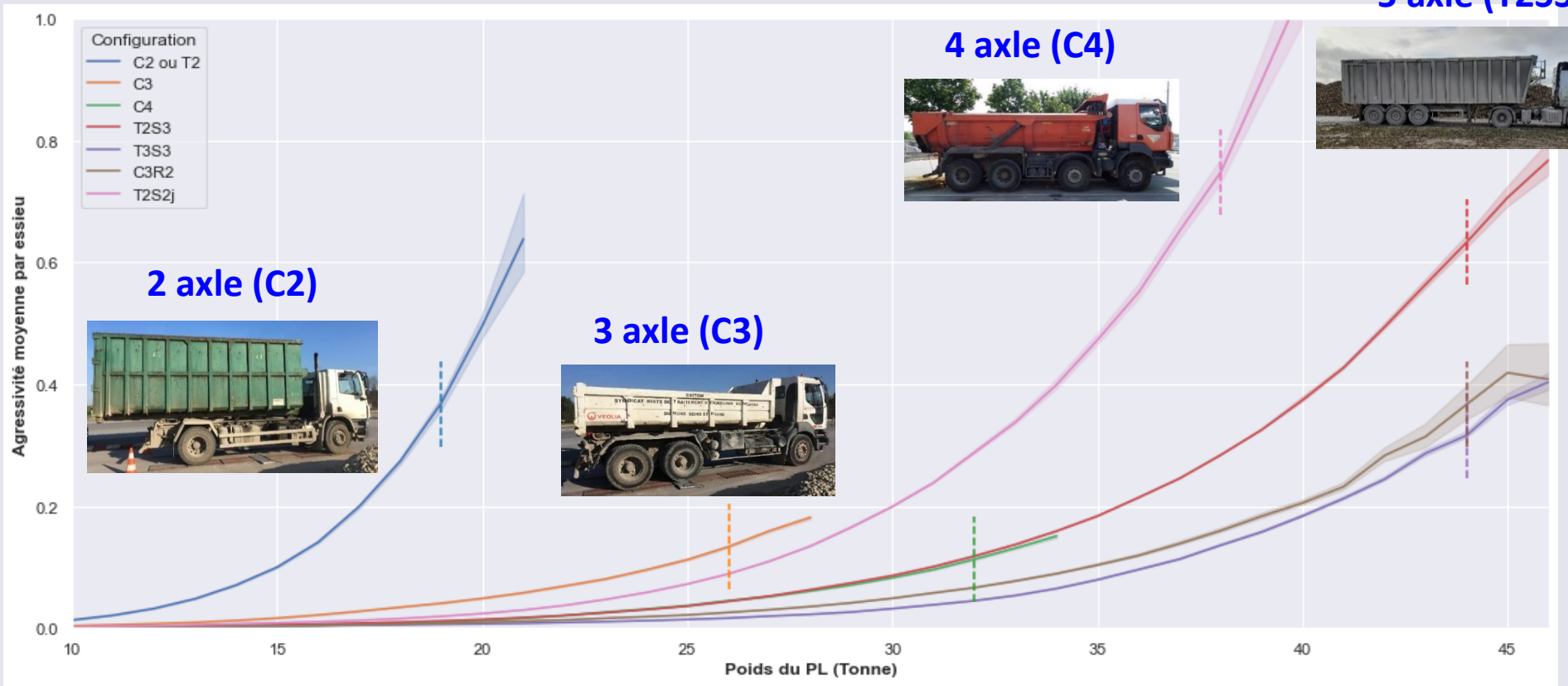
Issues and challenges for pavements

- Large mileage (France: 1,100,000 km), asset of 2,000 Bn €
  (250 Bn € for National roads and motorways (20,000 km)
- Pavement = 40% of the road cost per km
- Maintenance cost (France): 13.5 Bn €/year
- 2012: France 1st for the quality of the road network (among 141 countries), 2019: 18th due to a lack of means and money for maintenance
- Combination of increased traffic volume (but during the COVID) and individual loads (load factors) + climate change
- Grey debt increasing for the next generation → National conference on transport infrastructures financing in 2025 *(Ph Tabarot, Min. of Transport)*

Aggressiveness as per silhouette

Asphalt pavement

(designed for 500 to 1000 trucks/day/dir)



2 axle (C2)

3 axle (C3)

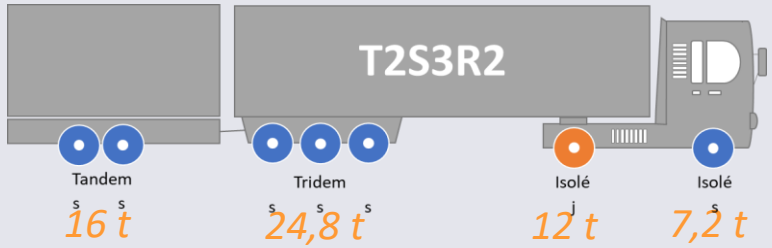
4 axle (C4)

5 axle (T2S3)

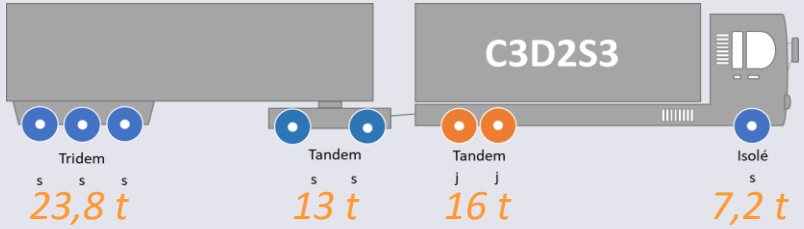
6 axle (T3S3)

Impact of EMS (HCVs)

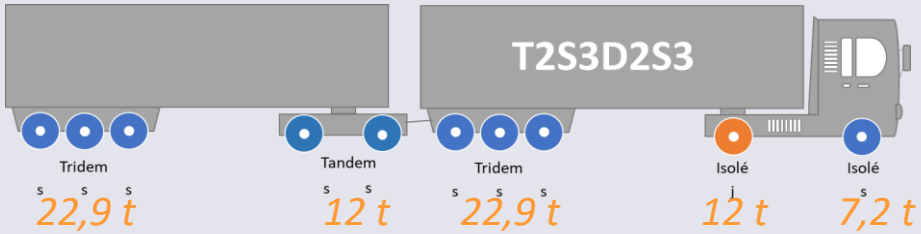
EMS 1 (60 tons – 7 axles)



EMS 1 (60 tons – 8 axles)



EMS 2 (76 tons – 10 axles)



Aggressiveness per ton

	Asphalt pavement *(designed for 500 to 1000 trucks/day/dir.)*		Semi-rigid pavement	
	40 t	*44 t*	*40 t*	*44 t*
EMS 1 (60 tons – 7 axles)	+16%	-9%	+35%	-21%
EMS 1 (60 tons – 8 axles)	-28%	-43%	-31%	-60%
EMS 2 (76 tons – 10 axles)	-11%	-30%	-31%	-60%

Issues and challenges for bridges

- Bridges < 0.5% of the road network mileage…
- …but app. 5% of the asset value (in France: 100 Bn € out of 2000 Bn €)
- Critical sections of breaches crossing : closure ⇒ long detour
- Bridge rebuilding may take 1 to 3 years (excluding studies)
- A collapse can results in several (dozen) fatalities (Genoa = 43 fatalities)
- Bridge stock aging (EU: 86 years), steadily increasing since WW2, 12 to 14% of bridges in poor conditions, 4,000 (2%) in critical conditions
- Increasing traffic and loads: traffic x10 in 30 years, loads x2 in 80 years
- ⇒ increasing risks, and lack of maintenance budget (FR: -400 M€/yr)

Misleading Information

- **Users (carriers)**: a bridge should accept all traffic loads (incl. overloads), obsolescence with respect to the initial design is not acceptable…
- **Bridge owners**: neglect the maintenance of bridges on secondary network, several bridges are “inherited”, missing periodic maintenance
- Bridge wears are not always easy to detect, lack of skill for inspection and diagnosis, above all for old bridges (small local authorities and secondary network $\Rightarrow$ worst situation)
- Some failures and collapses do not “warn”, low or few early warning signs without detailed investigation and instrumentation

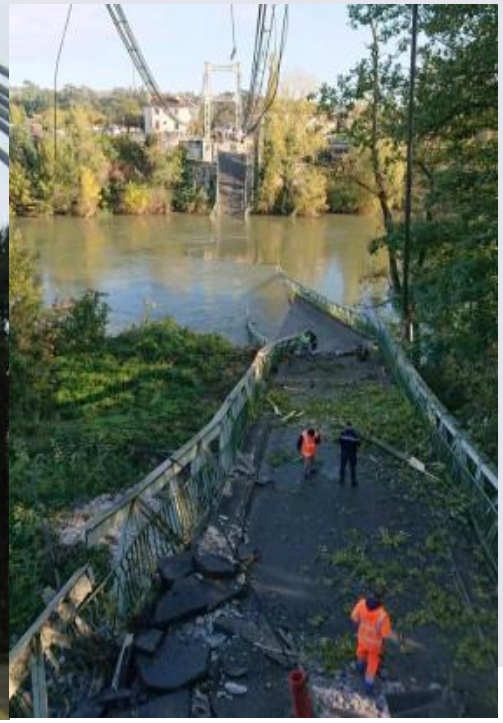
Complicating Factors

- Overload habits: nothing happens, so everything's fine ⇒ overloads are getting worse, bigger and more frequent over time without preventive or punitive actions.
- Road signs about load limits are not taken seriously and/or not respected, especially because of high safety factors…
- …and they are not well known: = GVW for maximum authorized weight NOT current weight

- Misunderstanding of overloads by some carriers
- Non-dedicated HGV guidance systems (Waze, TomTom…)

Bridge Collapse under high Overloads

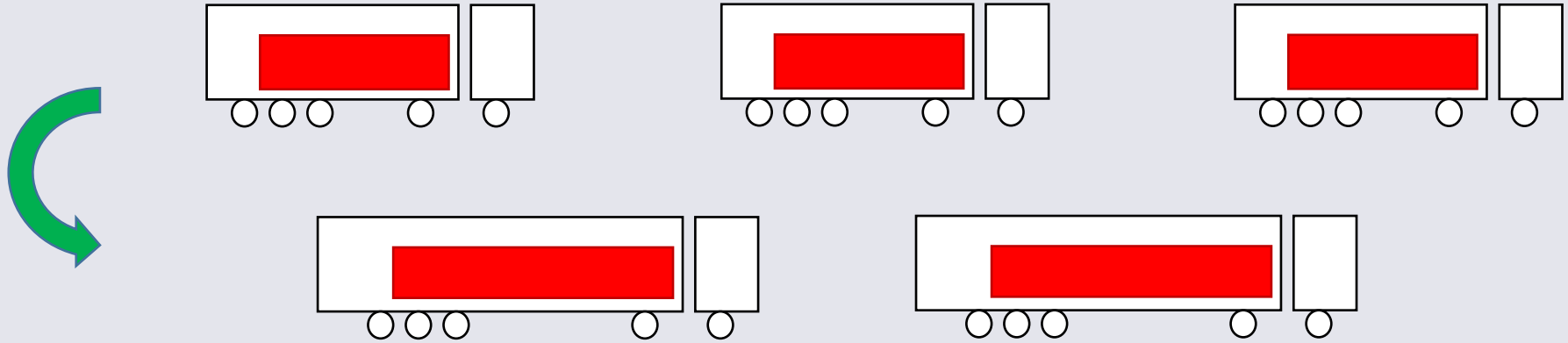
Mirepoix, France, 8 November, 2019



Annone, Italy, 28 October 2016

The “naïve” business model

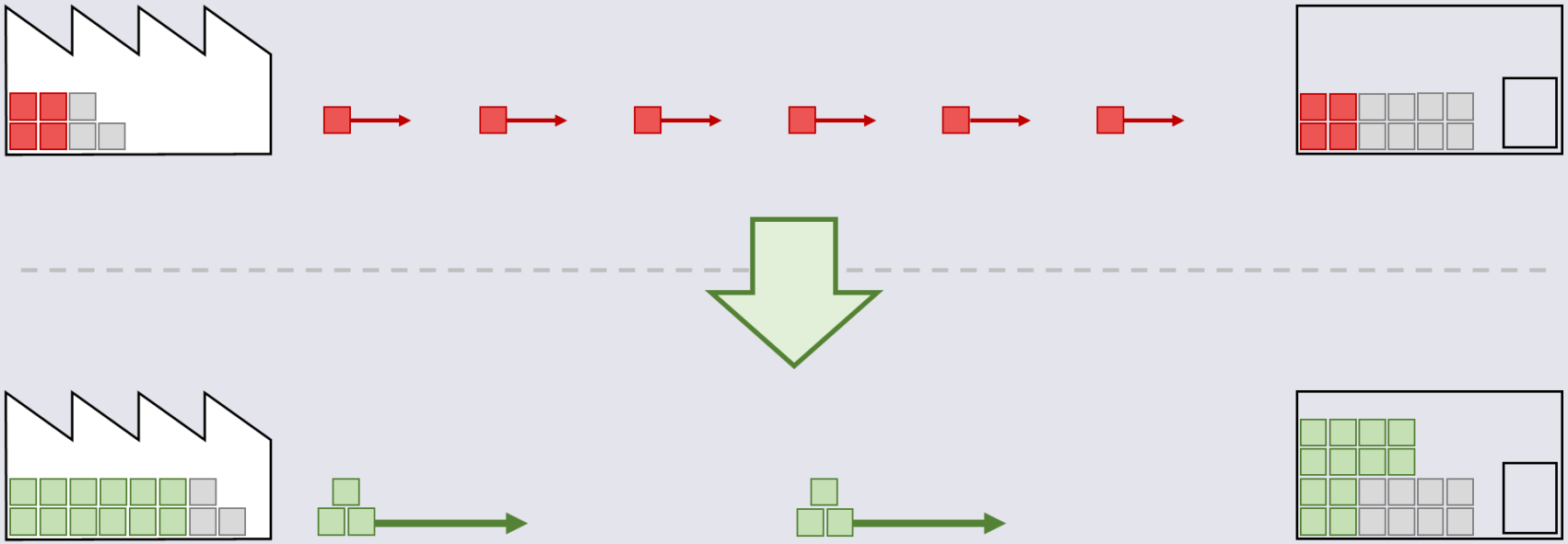
- The costs (€/t.km) and fuel consumption decrease with the vehicle capacity



- …if the load factor remains unchanged, and only for the transport costs only
- Increasing the load factor is a common lever for decarbonisation

It is more complicated (1/2)

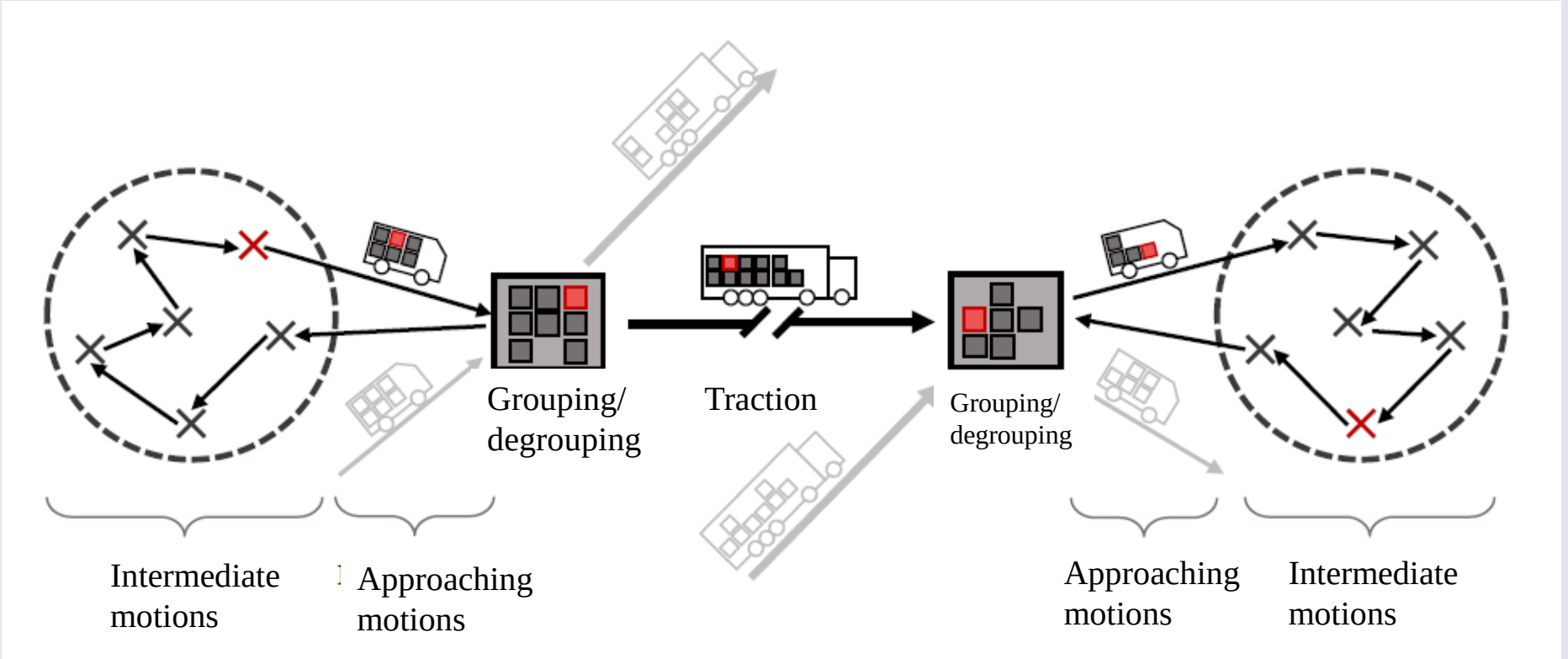
- Release of the constraint without grouping



Benefits: financial (in the most favourable cases), environmental (idem)
Locks: increase of storage costs, loss of flexibility of the logistic chain, loss of satisfaction

It is more complicated (2/2)

- Release of the constraint with grouping



Conclusions

- Benefit of high capacity vehicles:
  - Direct benefit for carriers, if compatible with the logistics
  - Otherwise transport efficiency benefit, if compatible with the expected service level
  - Relative and partial benefit
- Impact for the society:
  - Potential environmental benefit…
  - … but costly for infrastructure
  - High overloads are dangerous, above all for bridges, and no benefit!

Thank you for your attention!

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