Hyperloop – Next Generation Logistics

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epicenterproject.eu

- The basics of Hyperloop
- State-of–the Art
- Logistics Use Cases

Institute of Hyperloop Technology
Emden | Leer | Oldenburg | Lathen

Carl von Ossietzky Universität Oldenburg

University of Applied Sciences HOCHSCHULE EMDEN·LEER

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www.youtube.com/watch?v=i0NwZGaPZdw&t=2s

Transportation → Green Deal

Reducing the GHG emissions from transport by 90% by 2050

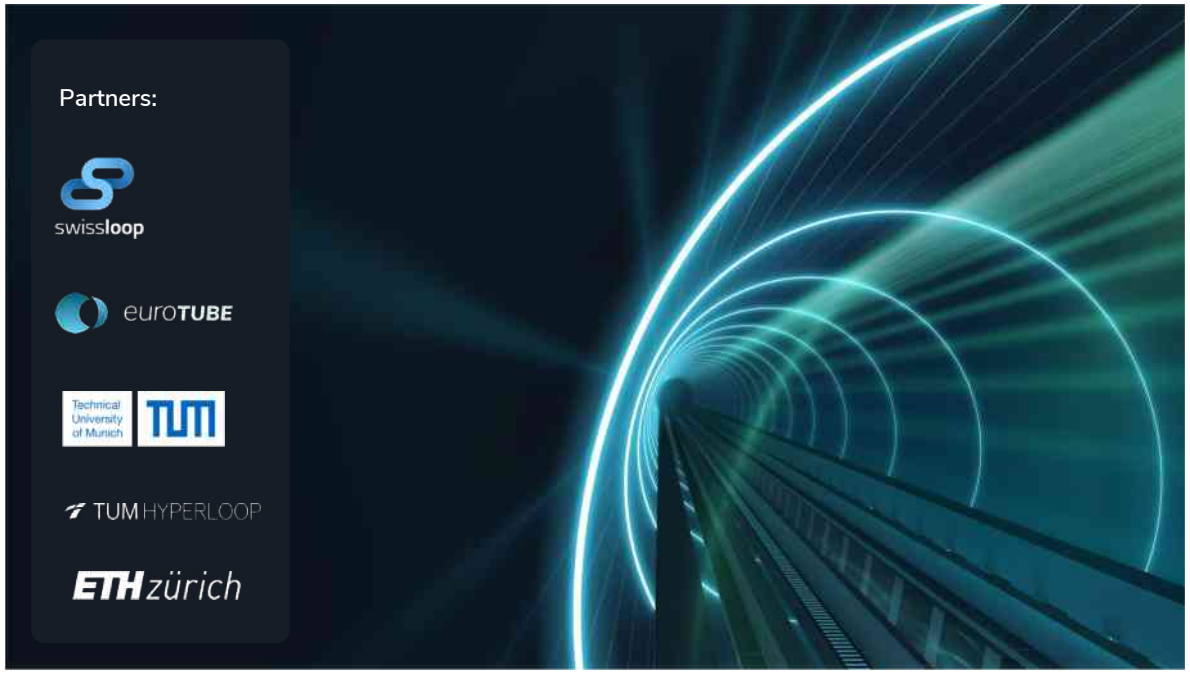
www.eea.europa.eu/publications/rail-and-waterborne-transport/rail-and-waterborne-best

The last barrier of efficient transport

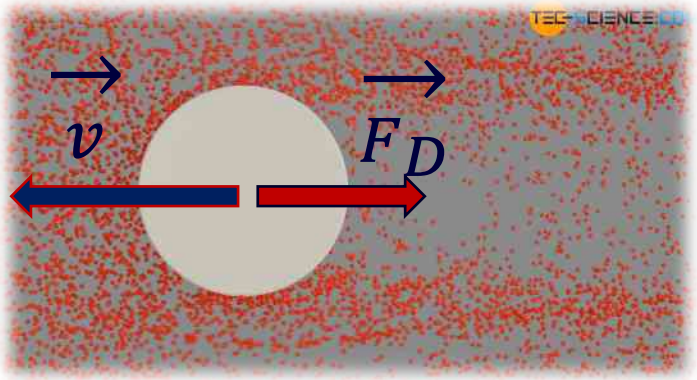
$v_{max} = 603\ {}^{km}/_{h}$
Shinkansen L0 (jap. 新幹線L0系電車)

www.youtube.com/watch?v=ElUE5T-siWg

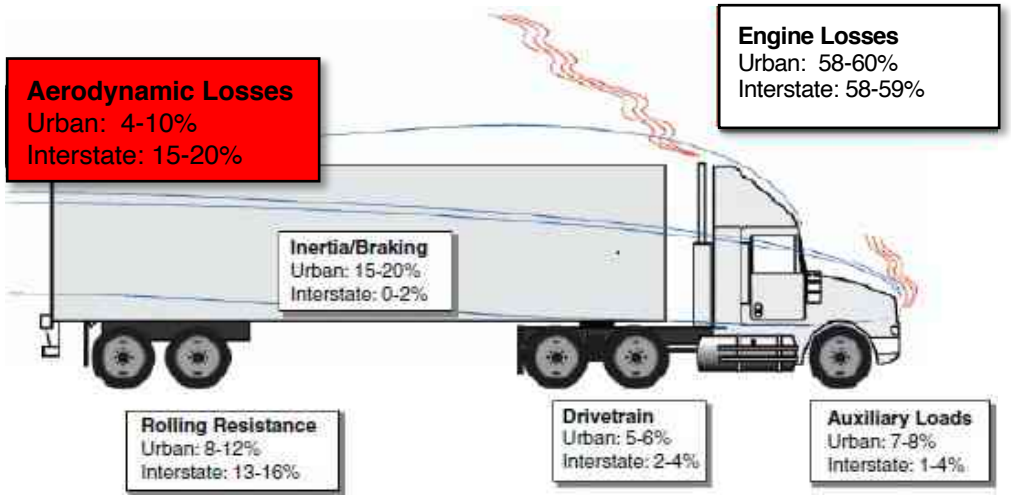
supersonic, e.g. $v_{max} > 1080\ {}^{km}/_{h}$
MagLev 2.0: Hyperloop Tube Transport



The nub of the matter



https://www.tec-science.com/mechanics/gases-and-liquids/flow-separation-boundary-layer-separation/

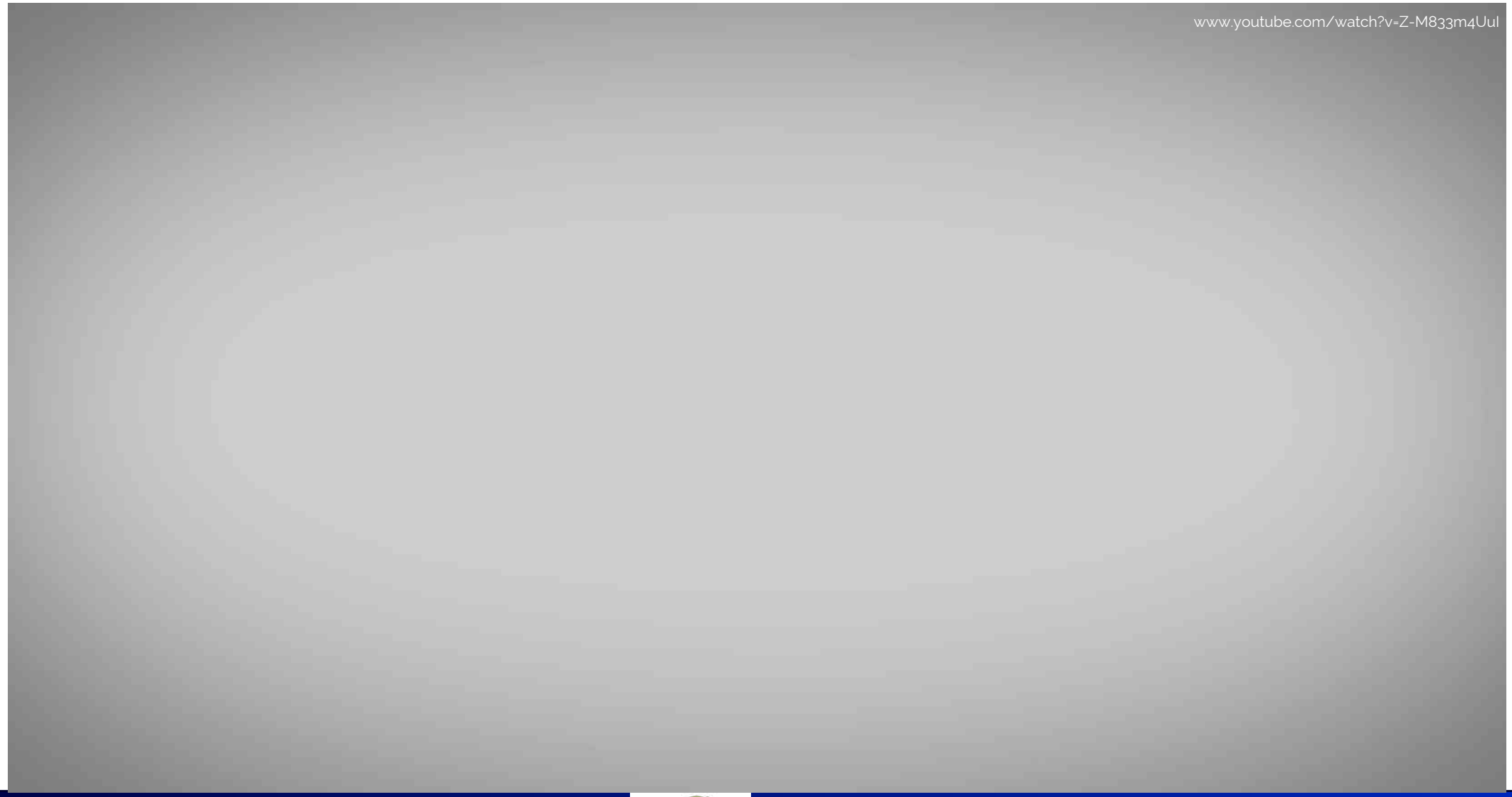


https://www.nap.edu/openbook/21784/xhtml/images/img-102.jpg

https://www.youtube.com/watch?v=HueZgS-UtiY

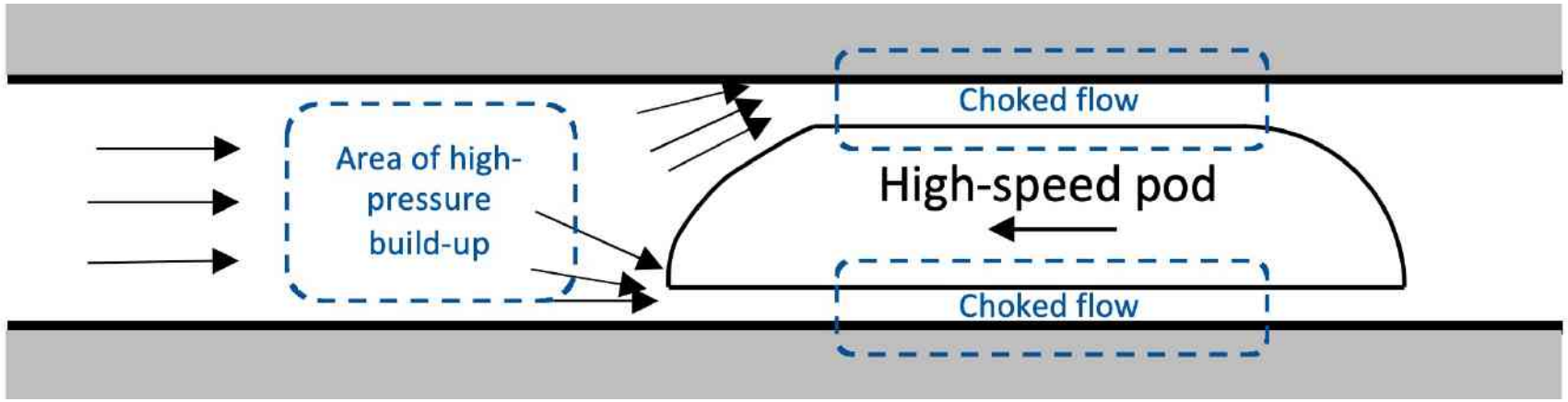
$v_{NTG} \sim 400\ {}^{km}/_{h} \Rightarrow E_{loss} > 83\%$ *due to air friction*

Hyperloop – The idea

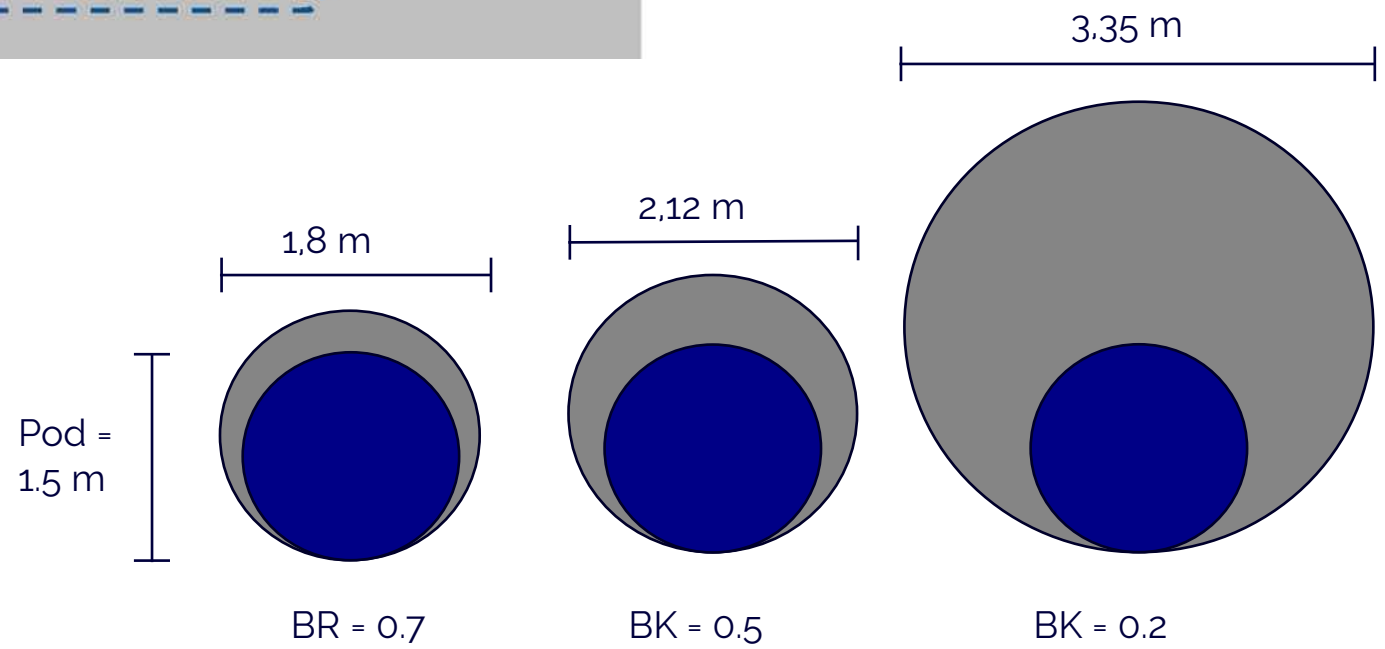


Hyperloop Competition, LA

Aerodynamics – Blockage ratio



Aditya Bose and Vimal K. Viswanathan: Mitigating the Piston Effect in High-Speed Hyperloop Transportation: A Study on the Use of Aerofoils 2021



Pressure ~ 1-10 mbar
BR 0.6

Hyperloop in production logistics

Logistics hub relocated out of plant site /city

- Standardized containers
- Automated operation 24/7
- Reduction of
  - Public road traffic volume
  - Green House Gases, CO_2
  - Pollutants
  - Noise & light
  - Energy consumption

Implementation of new logistics approaches

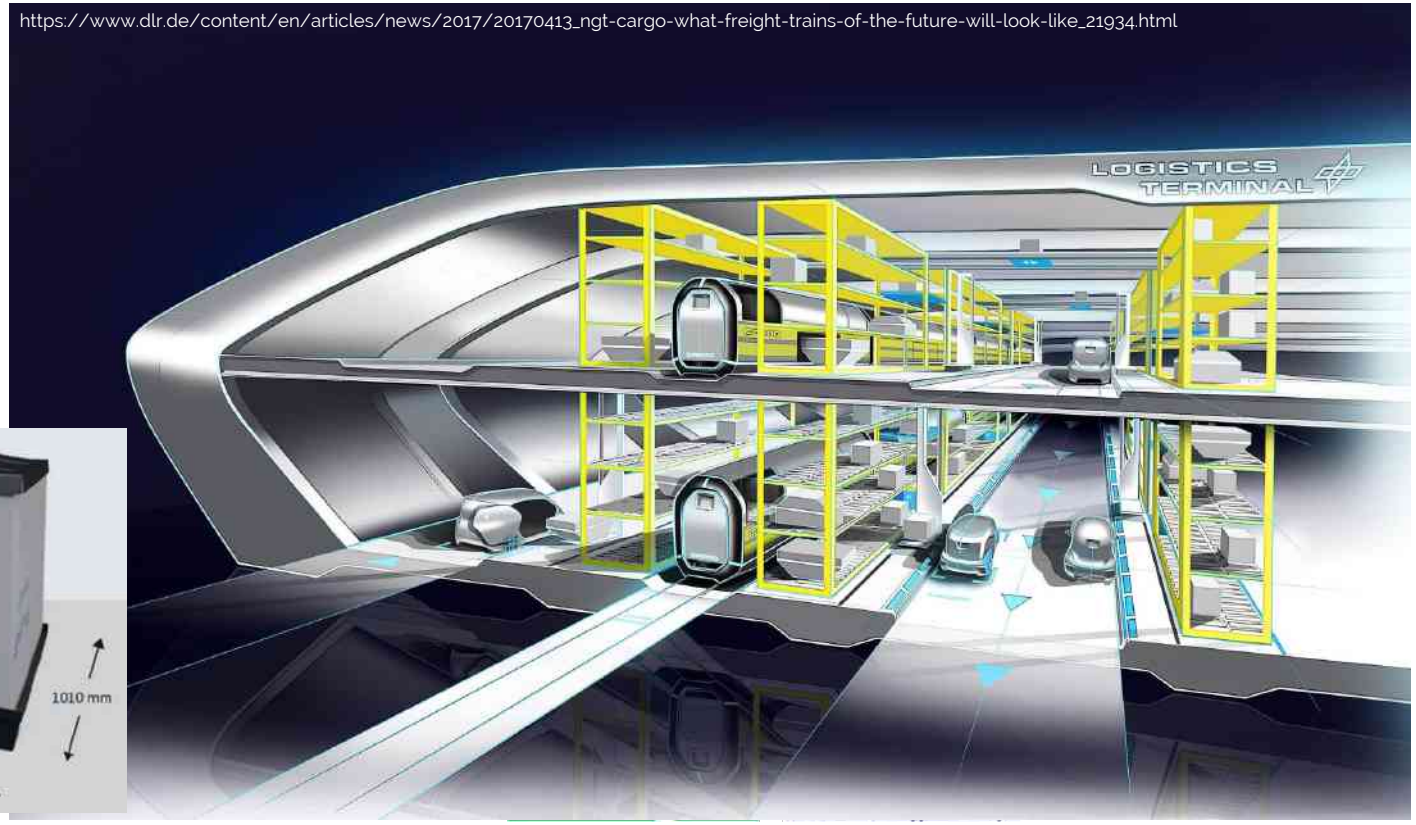
Intermodal transportation

- Resource optimized route planning
- Autonomous platforms
- Automated loading / unloading
- Hyperloop

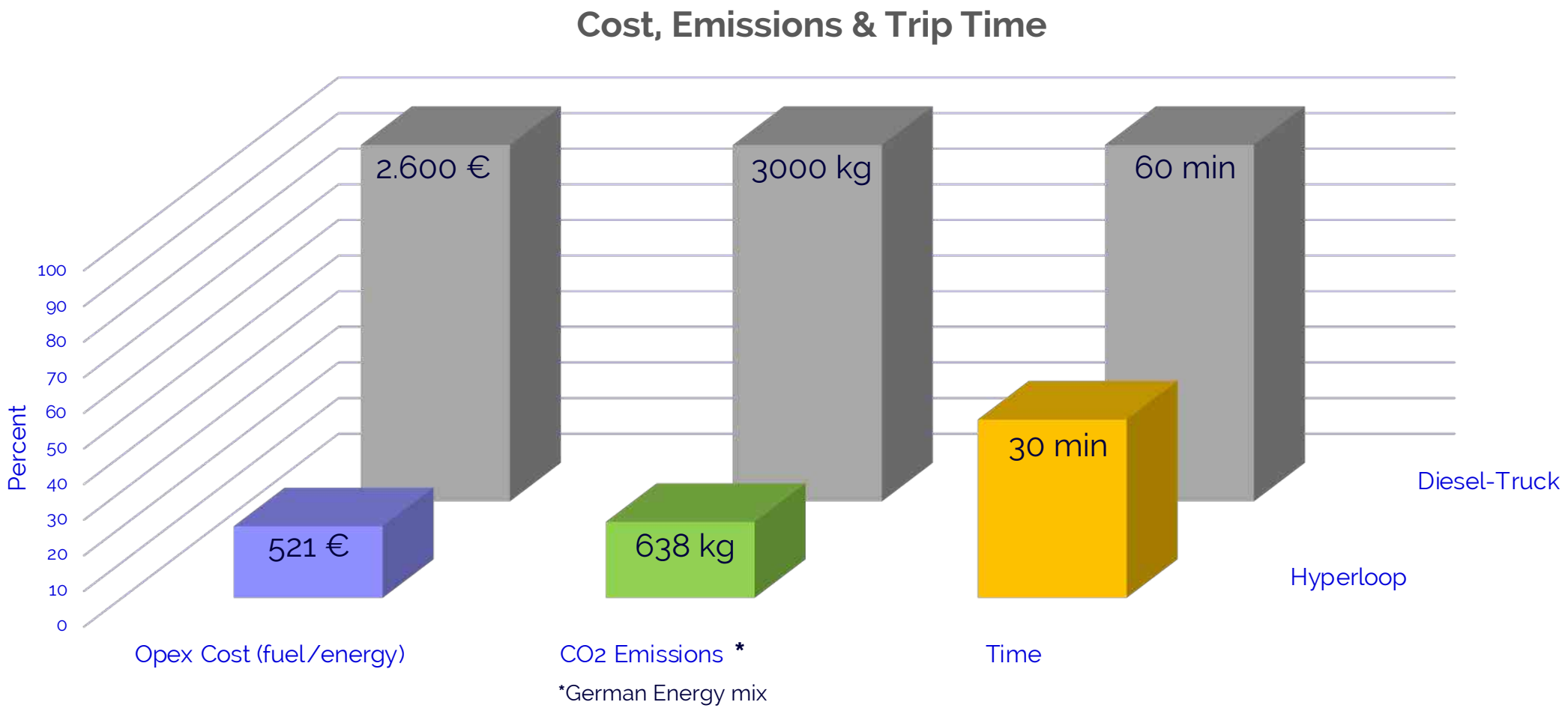
Demonstrator - Industrial use case

Source: GVZe Wolfburg & tbnlr-gmbh

- LSP = consolidation center/cross docking
- Case study: LSP -> Plant transport via Hyperloop



Benefits of Hyperloop ePI-Node



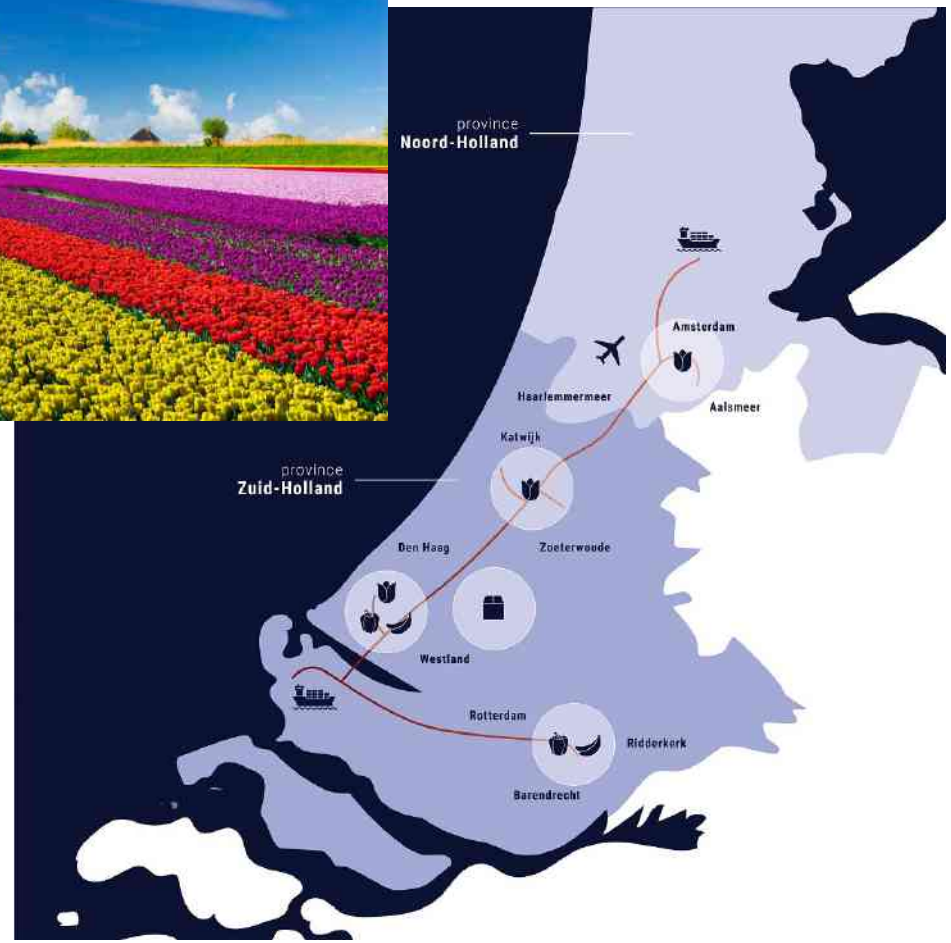
Additionally: no fine dust, automated, closed system

New Silk Road – Long Distance Land Transport

Hardt Hyperloop Development Program

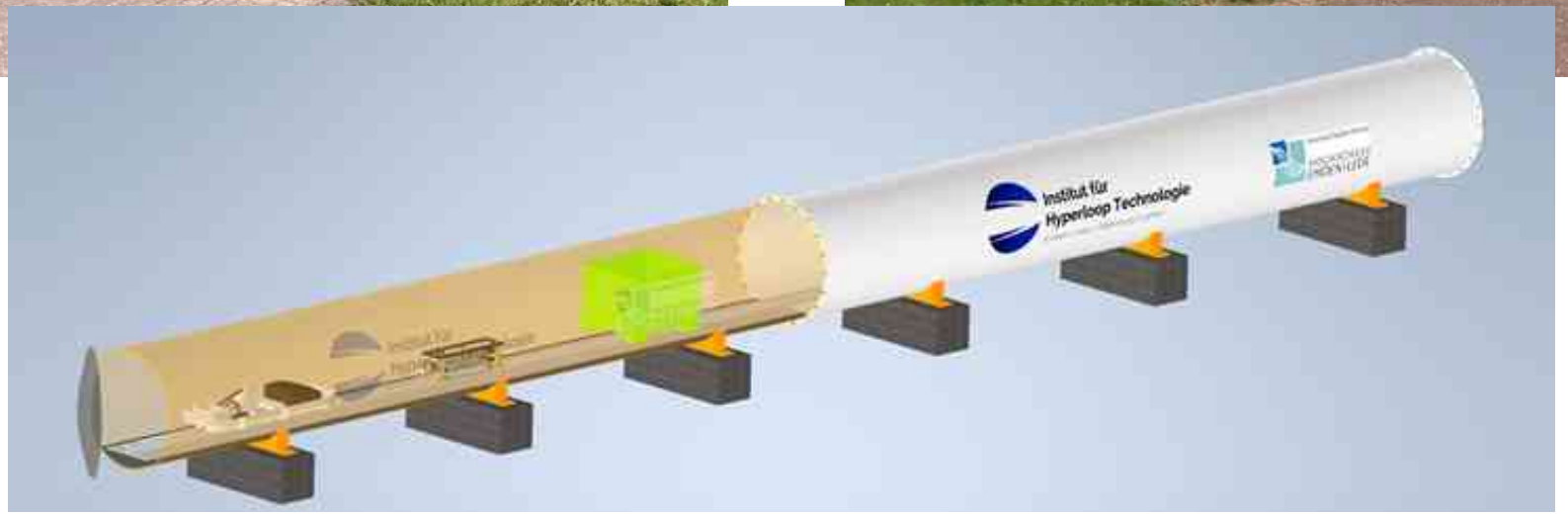
HDP, NL

- ✓ Feasibility of Hyperloop
- ✓ Test & Validate
- ✓ Identify future prospects
- ✓ Transporting Tulips in the region



https://hardt.global

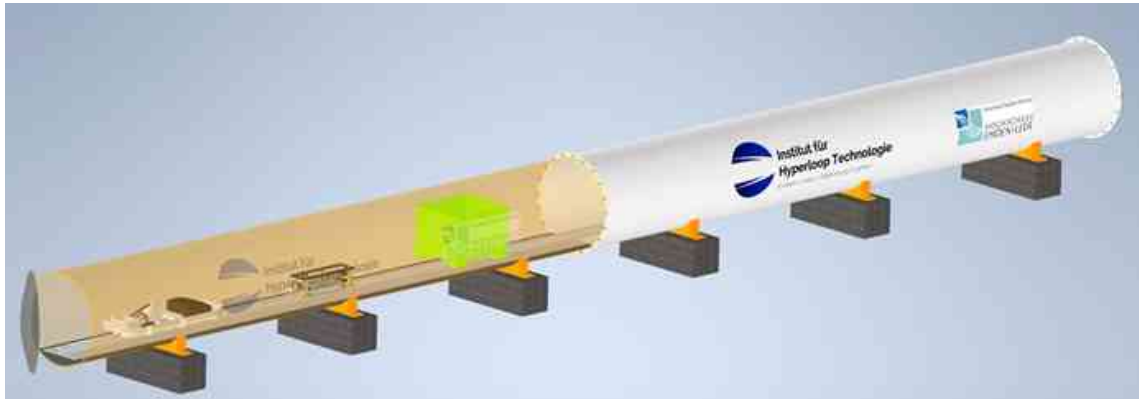
Hyperloop Facility @ Emden

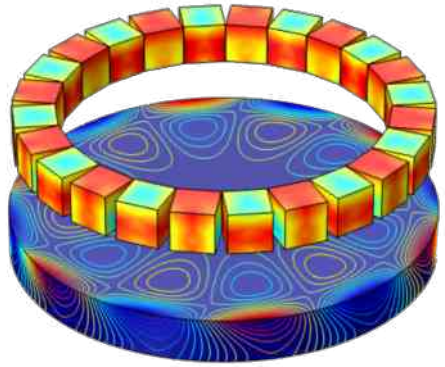


Hyperloop Research

Research Projects

- Simulation & modeling
- Laboratory scale
- Test infrastructure





European Hyperloop Open Network

Academia, Industry, SMEs & public stakeholders

European Hyperloop Technology Center

Large Scale Research Infrastructure

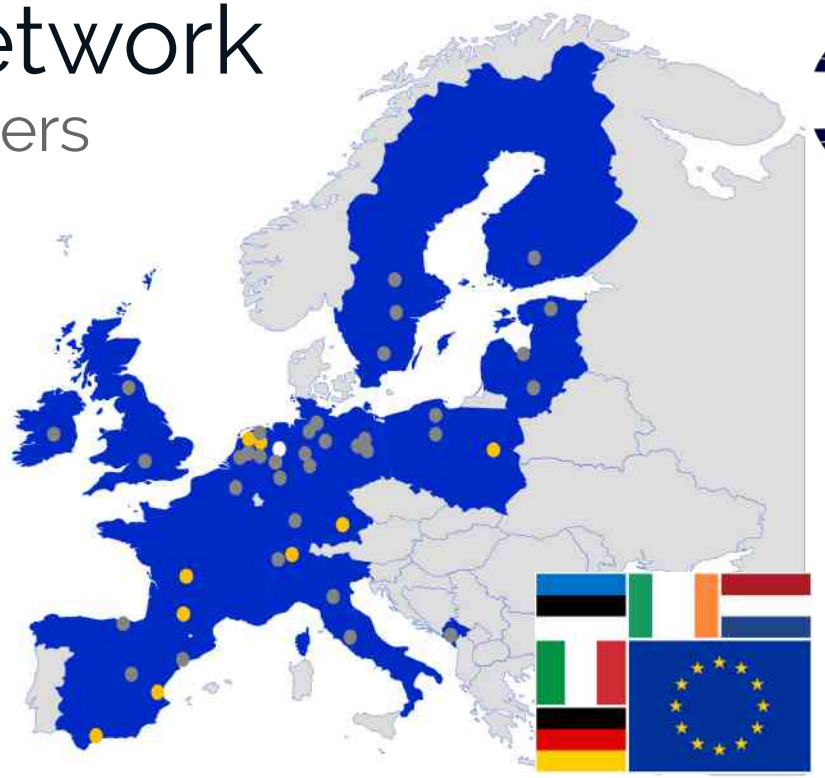
ePIcenter

Impact of new technologies and trade routes

hyperloop development program

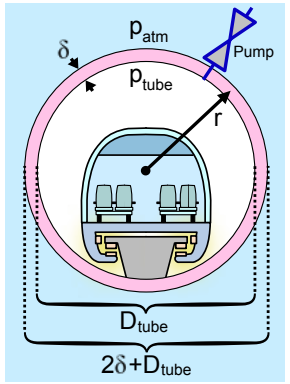
Hyperloop Development Program

European Hyperloop Roadmap

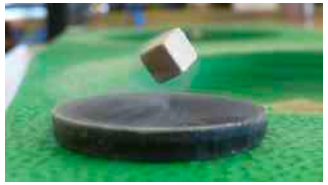


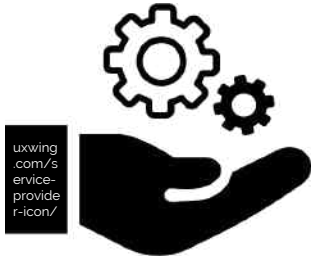
Key Features of Hyperloop

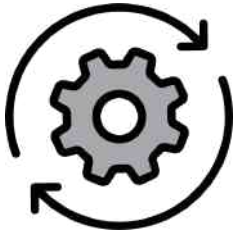
- Low pressure tube
- Pressurized pod
- Levitating (no roll friction, mechanically decoupled)
- Less wear => less vibrations
- Automated & controlled
- Energy & cost saving



Nøland, Jonas Kristiansen. (2021). Prospects and Challenges of the Hyperloop Transportation System: A Systematic Technology Review. IEEE Access. 9. 28439-28458. 10.1109/ACCESS.2021.3057788.







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