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THINK [TECH]

**What role can AI and technology play in
the transformation of Munich's
transportation system?**

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Introducing
ThinkTech

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01 — [Introducing ThinkTech]

Gabriel



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Conscious Coders

October 2017

Kick-start Environment Group

November 2020



November 2019

Founding of ThinkTech e.V.

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What? Provide impartial view and insights to policy makers and broader public

Why? We see both dangers and huge potential in technology

How? Interdisciplinary working groups

Who? Students from both TUM + LMU + young professionals

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01___[Broad range of topics]

THINK[TECH]

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THINK
ENVIRONMENT



THINK
FAIRNESS



THINK
DISARMAMENT



THINK
HEALTHCARE



THINK
DEMOCRACY

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Main questions:

What role can digitization play in sustainability?

How can we ensure the positive impact of digitization on the environment?

What possibilities do Data Science and Machine Learning open up for us?

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02 ___ [Environmental problems]



+ **Global warming:** Already 1°C higher average temperature than before Industrial Revolution because of greenhouse gas (GHG) emissions

- Impact on sea levels and climatic patterns around the world
- Majority (~75%) of global GHG emissions due to energy demands
- Significant GHG emissions due to the transportation sector
- Within the transportation sector road transportation makes up about 75% of the energy demand (IEA, 2016)

Pollution: transportation causes air pollution with adverse health effects that shorten life expectancy

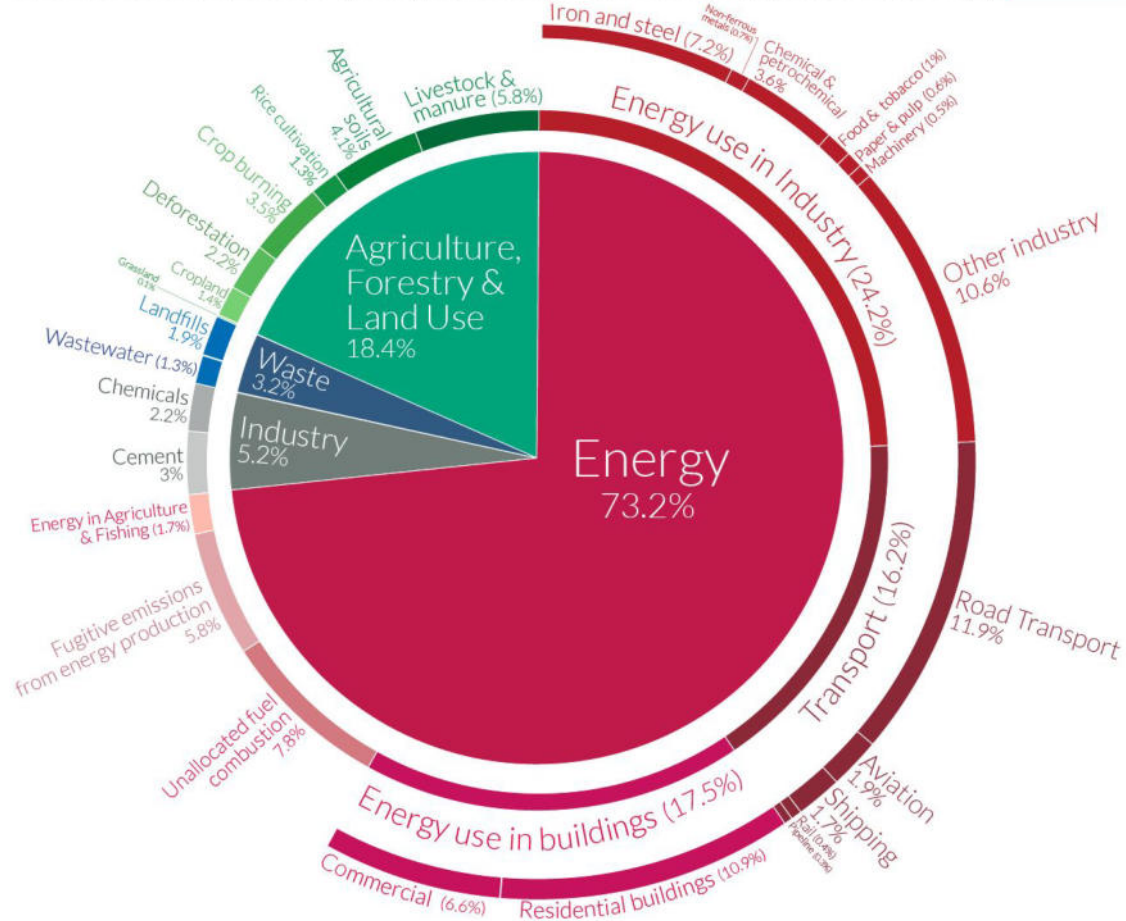
- Accelerated lung aging. Decreasing lung Capacity and function
- Increased cardiovascular diseases

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Global greenhouse gas emissions by sector

This is shown for the year 2016 – global greenhouse gas emissions were 49.4 billion tonnes CO₂eq.



European Green Deal _ [HOW EU aims to be climate neutral in 2050]

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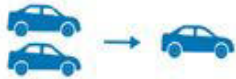
<https://matical.com/the-european-green-deal-a-climate-neutral-continent-by-2050/>

03 — [Technological Solutions]



POSSIBLE SOLUTION_____ [MACHINE LEARNING SOLUTIONS]

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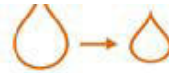
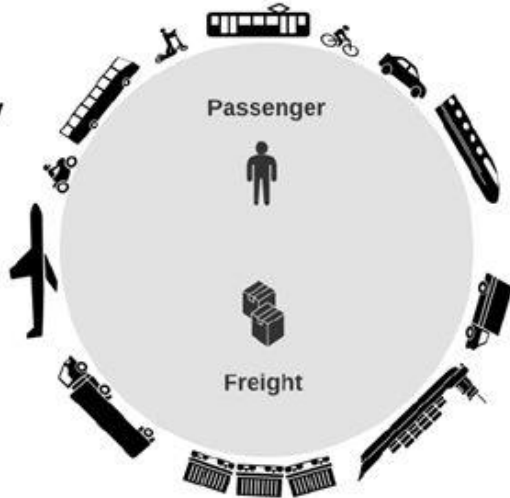
Reducing transportation activity

Analyzing data
Remote sensing
Forecasting
Freight consolidation
Alternatives to transport



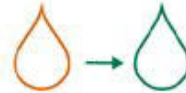
Modal shift

Consumer choices
Coordinating modes
Bike share rebalancing
Predictive maintenance
Enforcing regulation



Vehicle efficiency

Designing for efficiency
Detecting loading inefficiency
3-D printing
Autonomous vehicles



Alternative fuels

Research and development



Electric vehicles

Charging patterns
Charge scheduling
Congestion management
Vehicle-to-grid algorithms
Battery energy management
Battery R&D

→ Machine learning can be used as a tool to **optimize** transportation flows and technology



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Idea: Drones for delivery services

- **Positive effect:**
economy, congestion and does not need aging infrastructure
- **Problems:**
Collisions, privacy concern, smuggling, terrorist attack

More environmentally friendly?

- Can reduce CO2 emissions and other air pollutants
- BUT only under certain conditions
- Emissions along the logistics chain: extra warehousing, batteries
- Threat to wildlife
- Noise pollution

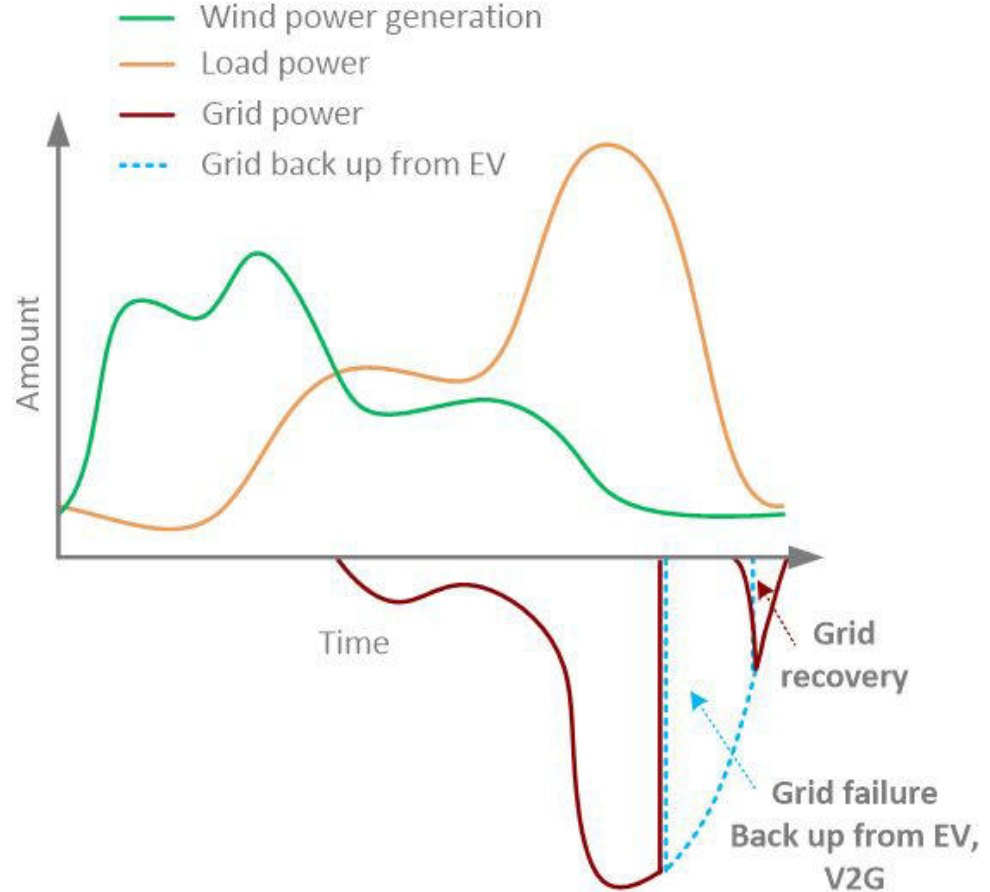
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POSSIBLE SOLUTION____ [Electric cars]

+ [Smart Charging]

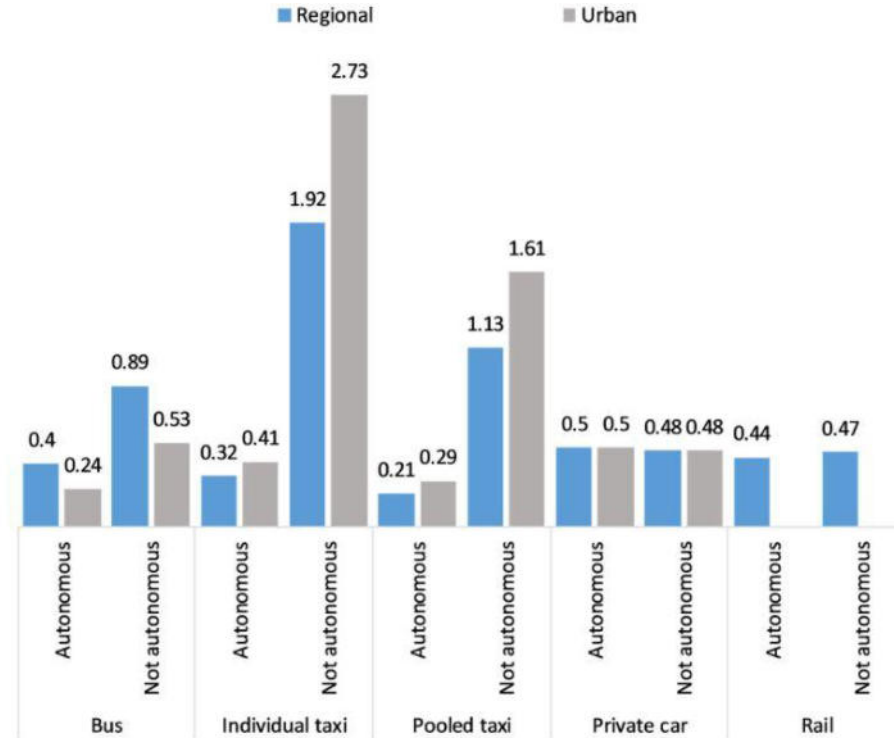
- Reduce the peak demand
- Renewable Energy
- V2x principle
- Battery swap



POSSIBLE SOLUTION_____ [Autonomous Driving]

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- Less Emissions: as most driverless vehicles are fully electric.
- Autonomous cars use significantly less energy while driving compared with vehicles driven by a human.
- Fewer cars per household which will lead to fewer cars on the roads.
- Less accidents – Less car production



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Examples:

- Transportation during and after big events
- Calculation of delay in public transportation, which increases taxi and car sharing
- Route optimization and spotting problem areas in waste collection

1) Bassolas et al. "Scaling in the recovery of urban transportation systems from massive events" *scientific Reports* 2020, 10, 2746

<https://www.nature.com/articles/s41598-020-59576-1>

2) Martin et al. "The Influence of Public Transport Delays on Mobility on Demand Services". *Electronics* 2021, 10, 379

<https://doi.org/10.3390/Electronics10040379>

3) Medvedev et al. "Waste management as an IoT- enabled service in smart cities" (2015) In: Balandin S., Andreev S., Koucheryavy Y. (eds) Internet of Things, Smart Spaces, and Next Generation Networks and Systems. ruSMART 2015, NEW2AN 2015. Lecture Notes in Computer Science, vol 9247. Springer, Cham. https://doi.org/10.1007/978-3-319-23126-6_10

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LET'S DISCUSS 06___ [DISCUSSION QUESTIONS]

<https://flinga.fi/s/F6KSXJQ>

Introduce yourself and make your point

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 - What do you think about public transport in Munich? What could be improved?
 - Do we need more technology or less?
 - How could we reduce car travel?
 - Should the center of Munich become car free?
 - Should Munich focus on electric cars?
 - Should we use drones?
 - How can we make car sharing more attractive, is that a good method?

