Transport policy in the age of autonomous vehicles

Technische Universität Dresden

Transitioning to shared electric automated mobility: The need for a transport policy shock

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DLR

Presentation outline

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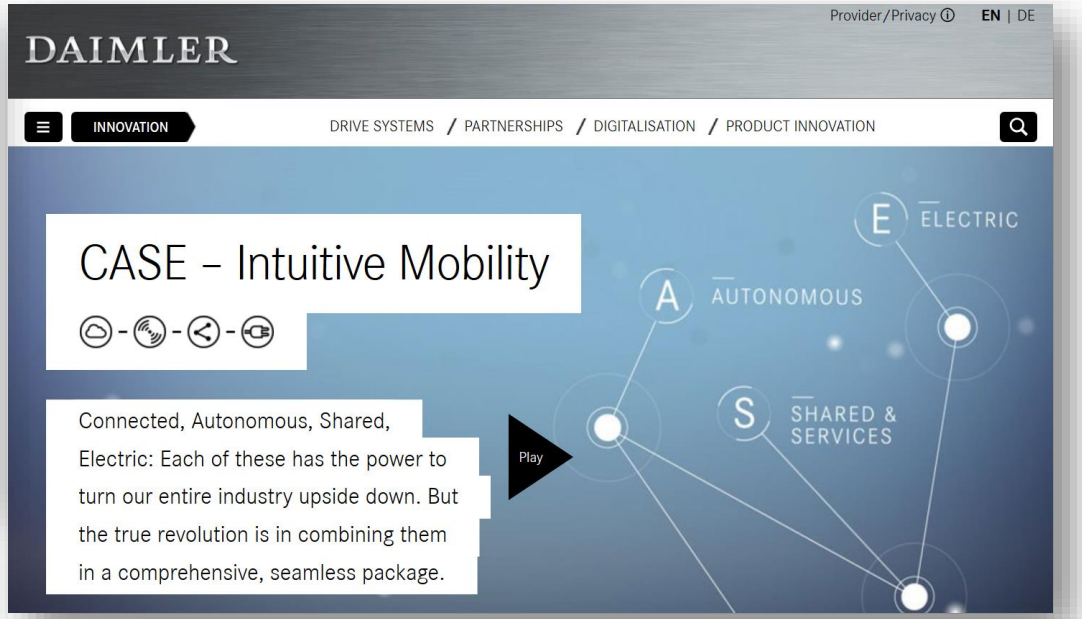
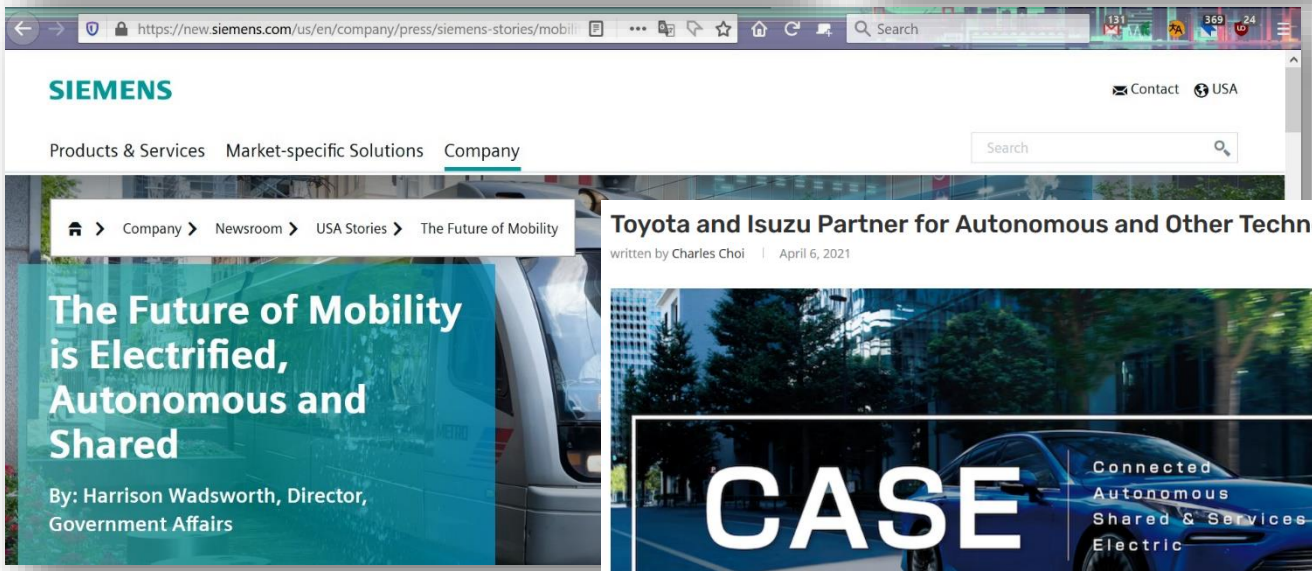
1. Introduction

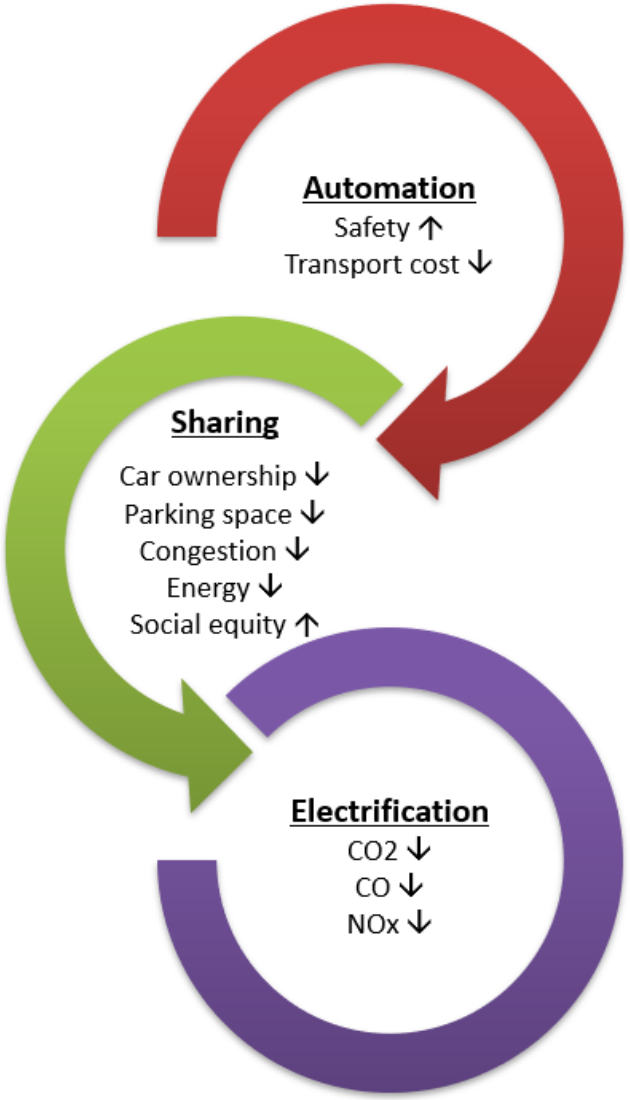
Three revolutions of automobility (electric-shared-automated): market and policy

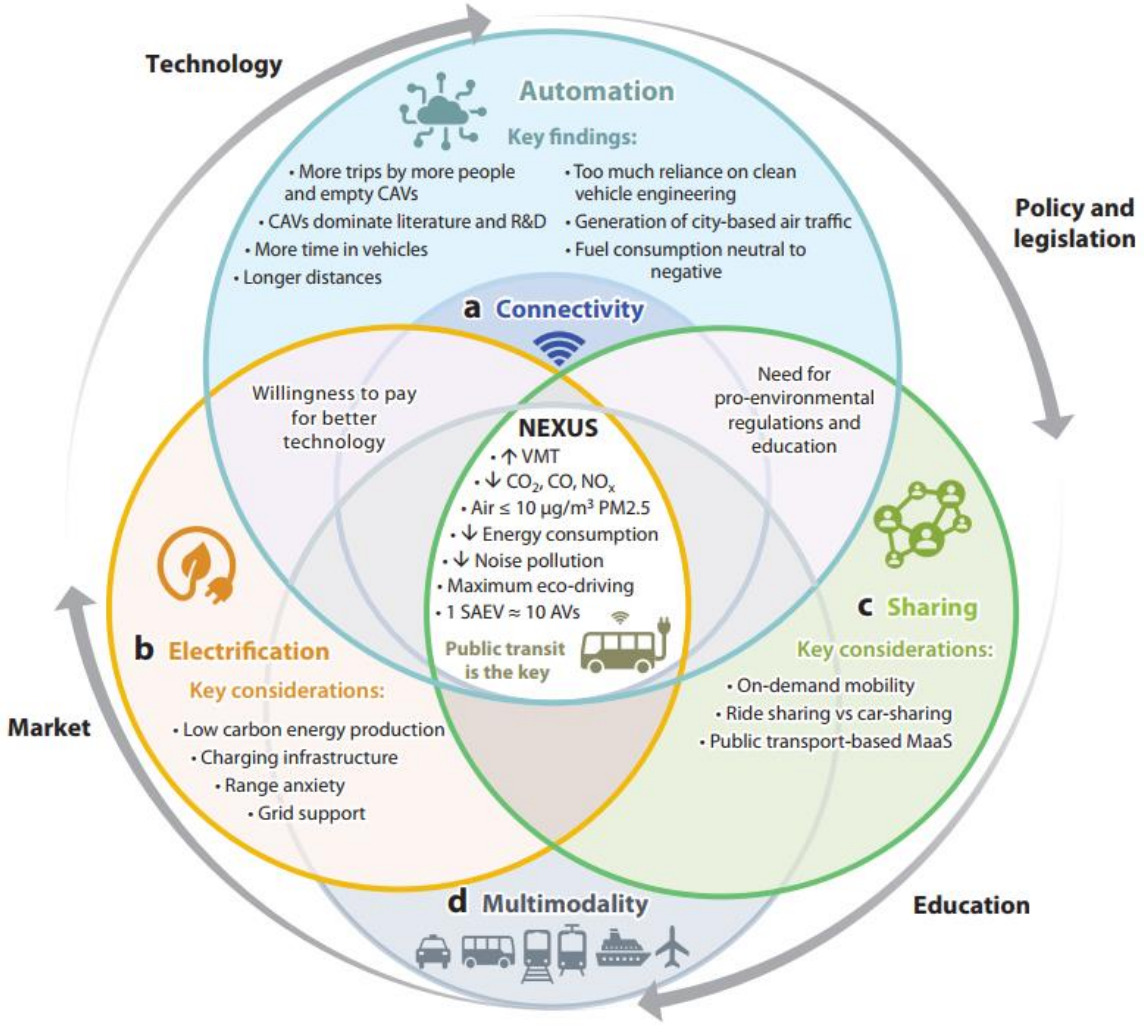




1. Introduction

Three revolutions of automobility (electric-shared-automated): scientific evidence





(Milakis, van Arem, van Wee, 2017; Milakis & Müller, 2021; Nikitas, Thomopoulos, Milakis, 2021)

1. Introduction

To what extent the current private automobility regime will be reconfigured into a private electric automated automobility regime or substituted by a shared (particularly pooled) electric automated automobility regime?

2. Method

Step 1

Conceptual model based on the multi-level theoretical perspective of technological transitions: niche, regime, landscape levels (Geels, 2002):

- Timing (e.g., state of niche-developments).
- Nature (e.g., reinforcing or disrupting impact) of the emerging transition of private automobility regime.

Step 2

Review the relevant literature that underpins this conceptual model at each analytical level:

- Niche level: business landscape and prospects of the shared (pooled) mobility market.
- Regime level: key actors' (i.e., vehicle manufacturers, users and societal groups and public authorities) preferences and motivations towards shared (solo and pooled) electric AVs.
- Landscape level: type and intensity of pressures to the private automobility regime from different actors.

2. Methods

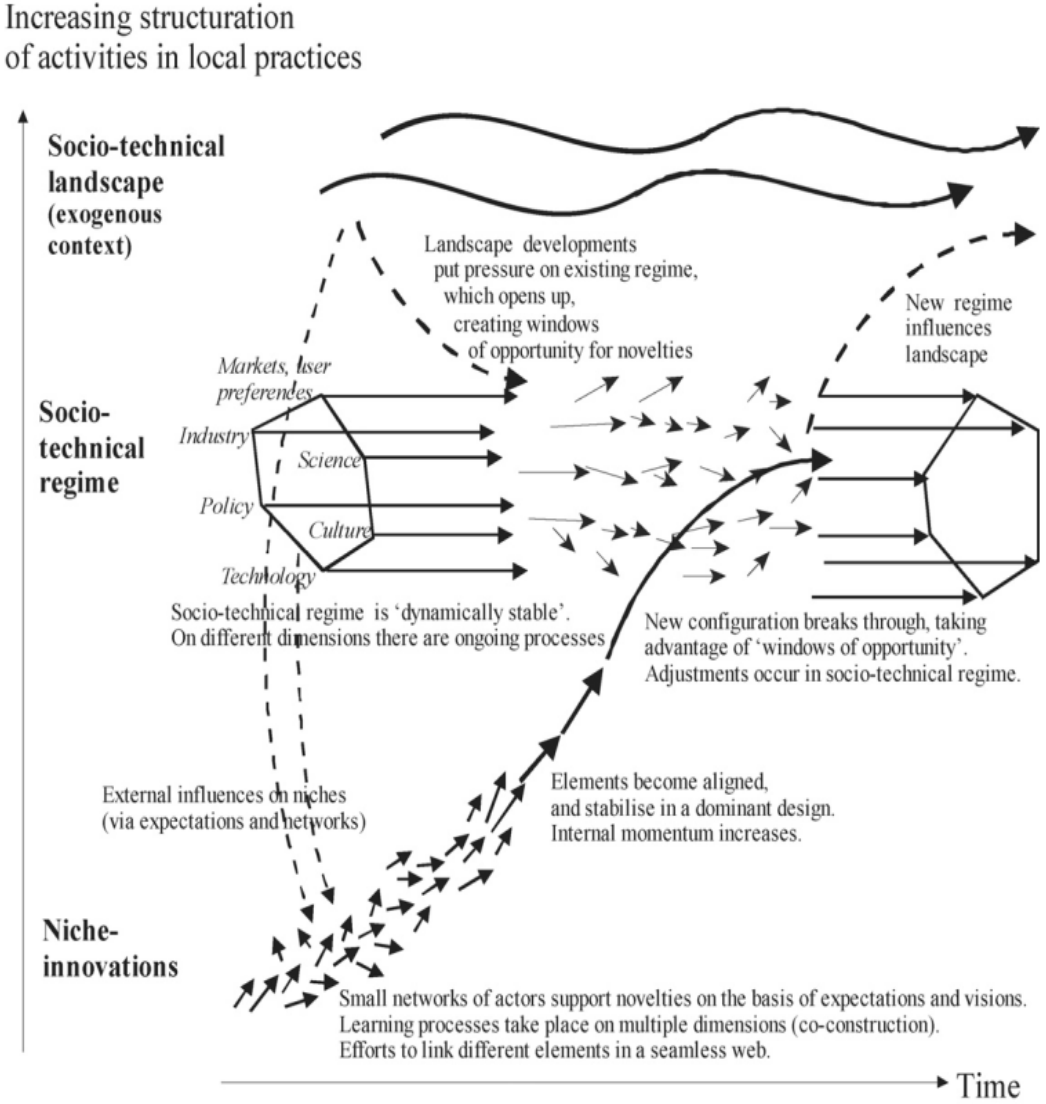


Figure 1: The multi-level perspective on technological transitions.

Transition pathway	Niche readiness	Regime impact	Landscape pressure
Transformation	Not sufficiently developed	Reinforced	Moderate
Reconfiguration	Sufficiently developed	Reinforced	Moderate
De-/Re-alignment	Not sufficiently developed	Disrupted	Divergent, large, sudden
Substitution	Sufficiently developed	Disrupted	Divergent, large, sudden

Table 1: Variation of niche readiness, regime reaction and landscape pressure intensity in the four technological transition pathways.

(Geels & Schot, 2007)

3. Conceptual model

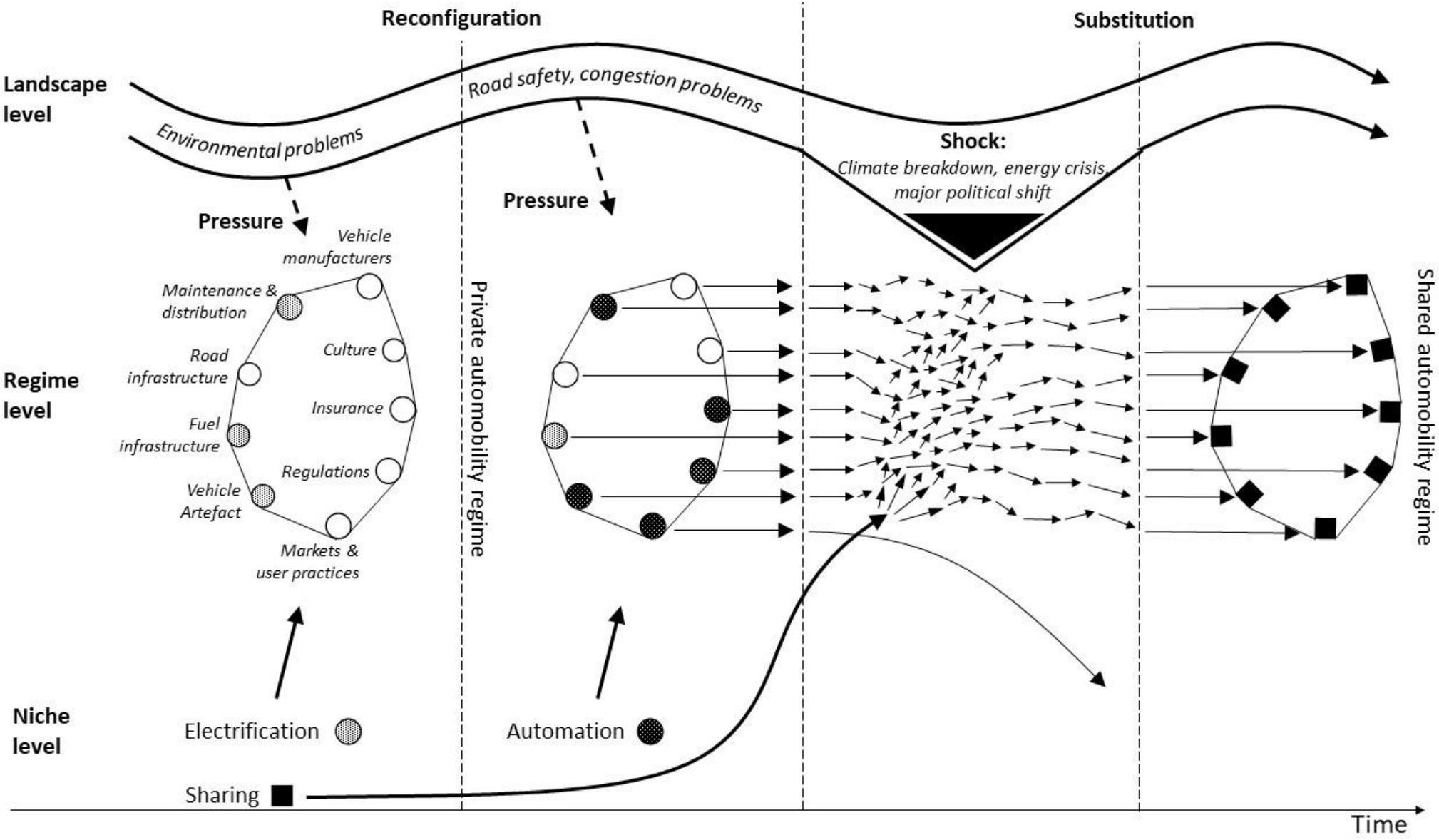
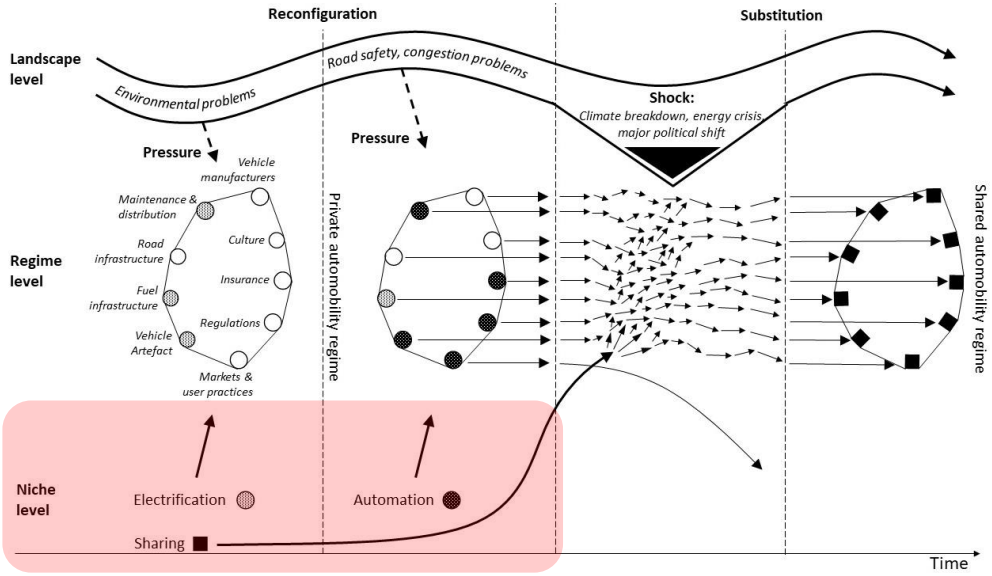


Figure 2: Conceptual model of the possible transition pathways of the private automobility regime.

(Milakis & Seibert, 2023)

4. Analysis
Niche level

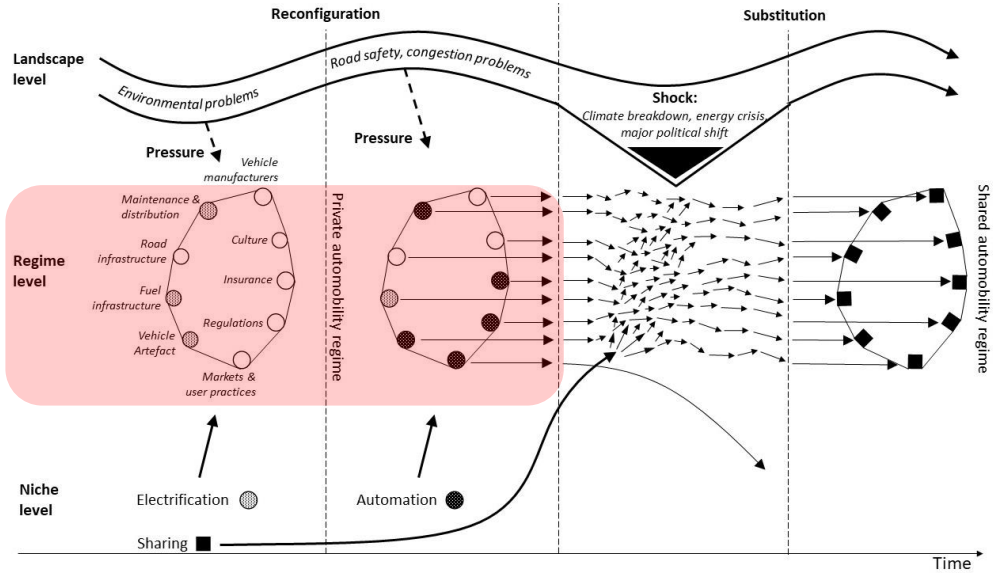
- On-demand ride-pooling market: niche in the transport market.
- Major OEMs: business model diversification, mobility providers (Daimler with Via and moovel; Ford with Chariot and Transloc). Gradually withdrew after 2010 (small fleet size, AVs distant, bond with private cars, not good match with public transport authorities).
- The ride-pooling market: emerging phase (about 500 services running), with B2G projects dominating and B2C projects disappearing (Foljanty, 2022).
- B2G projects: USA, Germany and Japan; funded for 12 months; small fleets less than 10 vehicles.



4. Analysis

Regime level: Vehicle Manufacturers

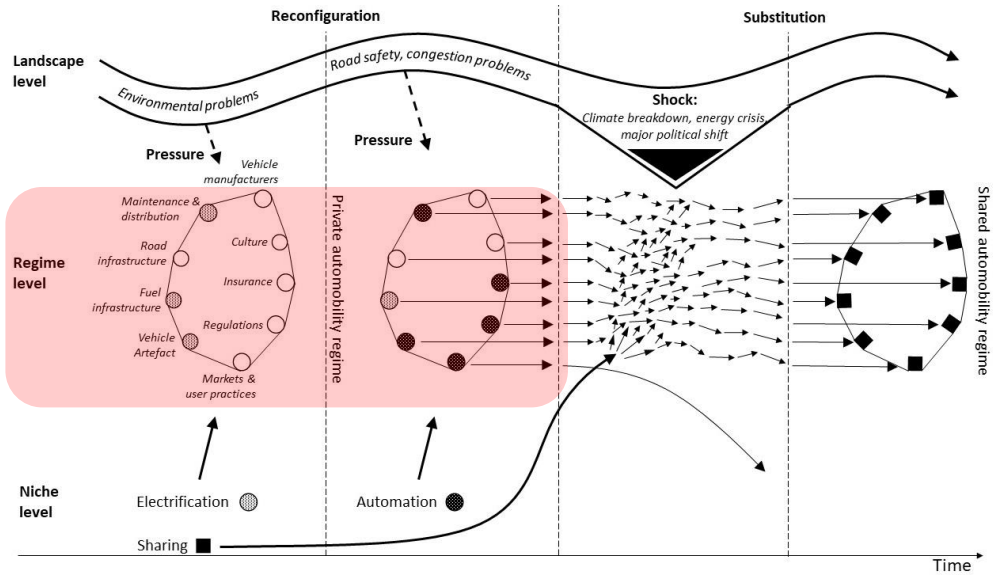
- Vehicle manufacturers shift towards electric powertrains; limited plans for shared mobility.
- Increased shared mobility: decline in vehicle sales in the private segment (1 free-floating shared car reduces: new sales by 3 vehicles per year Schmidt (2020), associated with 2.1 to 5.3 sold old cars in Germany, Jochem et al., 2020).
- Substantial expansion of shared automated mobility services: commercial clients could change from "friendly competitors" to "threatening competitors" which could put pressure on vehicle prices.



4. Analysis

Regime level: Users and societal groups (instrumental factors)

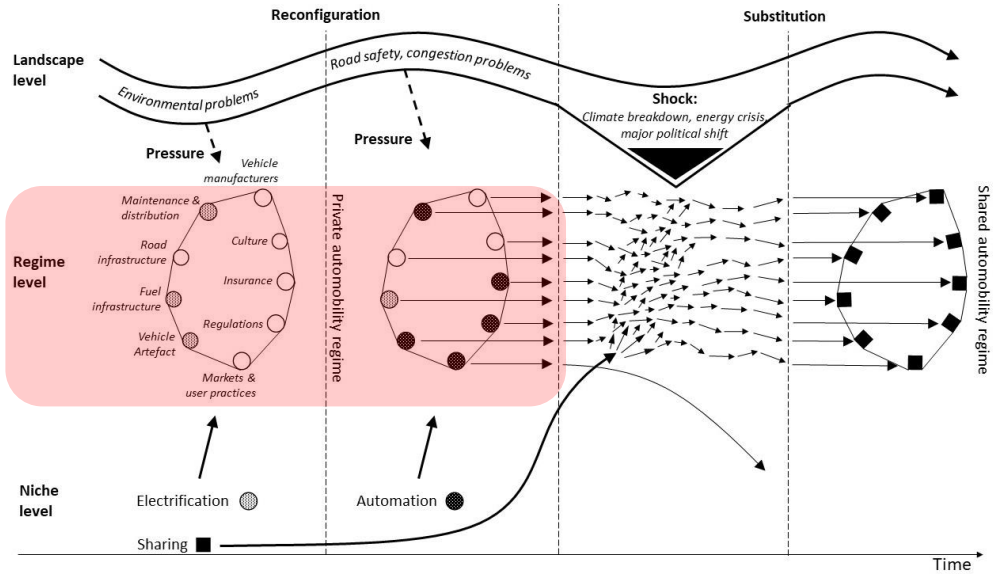
- Travel cost, comfort, and travel time: critical determinants of mode choice, including ride-pooling, in the AVs era.
- The total cost of ownership for private AVs (ca. 0.2 €/Km) is lower than shared AVs (solo and pooled; ca. 0.3 €/Km) (Bösch et al., 2018)
- Car ownership together with time usefulness balance out travel cost benefits of shared automated mobility options (Wadud and Mattioli, 2021; Wadud and Chintakayala, 2021).



4. Analysis

Regime level: Users and societal groups (affective factors)

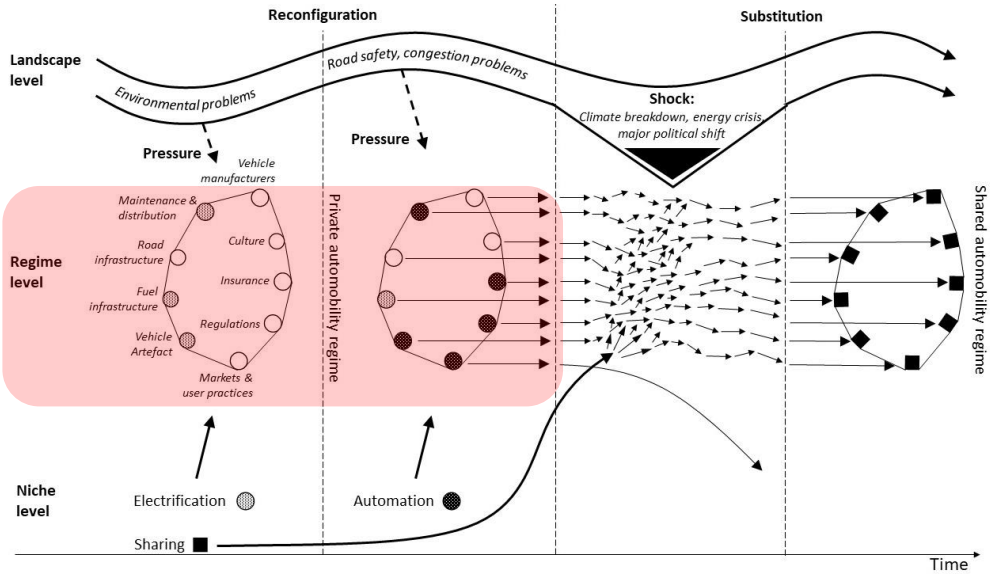
- The preference for private ownership of AVs is largely driven by:
  -the inherent attractiveness of ownership (convenience, independence, habit/inertia, private space),
  -the aversion to sharing (inconvenience, privacy concerns, insecurity, discomfort).
- Shared mobility habits: rather fragile and less ingrained compared to habits of car ownership (Doody et al., 2021).



4. Analysis

Regime level: Users and societal groups (symbolic factors)

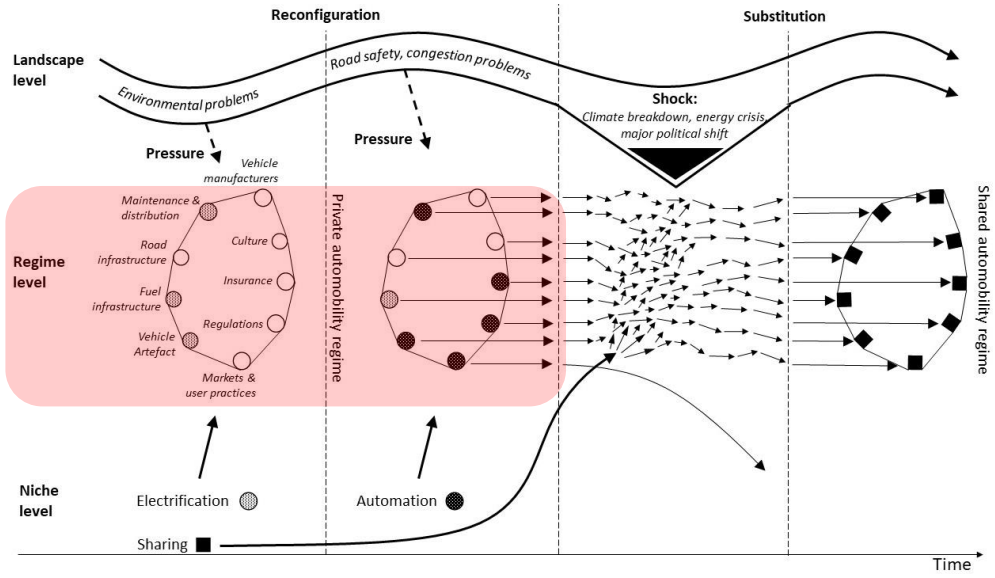
- Car ownership and use: deeply embedded in society as a hegemonic ideology that informs people's sense of identity and status (socio-economic status, subjective identity, superiority, proprietorship, individuality, and masculinity) (Mohammadzadeh, 2021).
- Symbolic dimensions of car ownership: likely to be maintained or strengthened by vehicle electrification and automation and weakened by shared mobility (Sovacool and Axsen, 2018).



4. Analysis

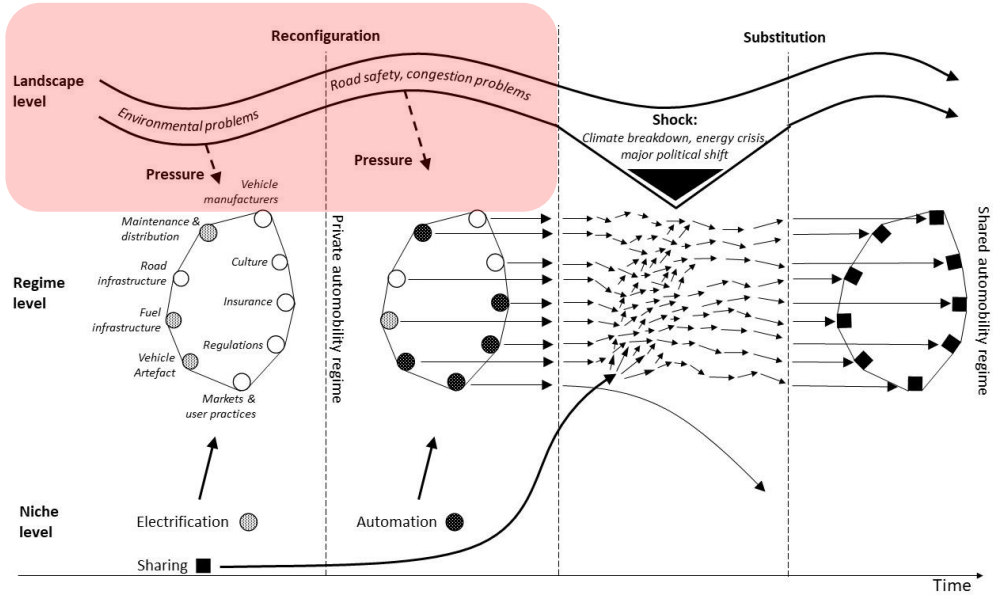
Regime level: Public authorities

- Public authorities face challenges and lag in governing the transition towards shared AVs.
- Potential loss or reconsideration of transportation-related revenues: sales and property taxes, license plate and registration fees, parking tickets, and traffic fines.
- Complex governance landscape: negotiations with a complex network of new actors and structural changes in administration.



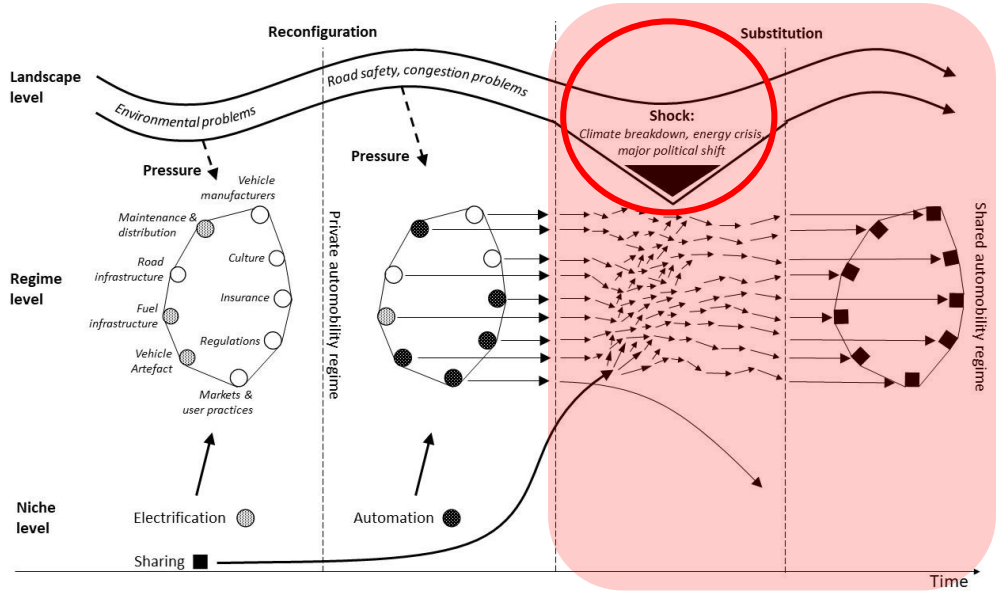
4. Analysis
Landscape level

- Private automobility regime: moderate pressure from the socio-technical landscape (citizens, national transport policy strategies, OEM's reports), primarily due to safety, congestion, and environmental problems in the transport sector.
- Vehicle electrification and automation: regime's effective response.
- Landscape pressures: enhancement of social equity, improvement of public health and well-being, reclamation of urban space, reduction of urban sprawl, and promotion of active lifestyles are considered milder.



5. The policy shock

- Substitution pathway of private automobility towards a shared automobility regime: “shock”, “avalanche change”, “disruptive change”.
- Substantial pressure on the regime: climate breakdown, severe energy crisis, significant political shift in favor of collective mobility (policy shock).
- Policy shock (macroeconomics): unexpected changes (monetary policy, fiscal policy, trade policy) in government policy that can have a significant impact on the economy.
- Impact depends: initial state of the economy, the magnitude and timing of the shock, and the response of households and businesses.



5. The policy shock

Transport Policy Shock		Magnitude		
		Low	**Medium**	**High**
Type	**Economic**	**Congestion pricing:** higher fees for SOVs, discounts for ride-pooling vehicles. Cost-effective, attractive ride-pooling services (lower travel time, congestion)	**High gas taxes:** high gas taxes or carbon taxes. Cost-effective ride-pooling services (longer commutes).	**Free or heavily subsidized ride-pooling services:** companies and individuals, especially for low-income or disadvantaged populations. Affordable ride-pooling services.
	Infrastructural	**Reduced parking availability:** urban areas. Attractive ride-pooling services.	**Zoning restrictions:** limit available parking in newly constructed buildings and require a minimum number of ride-pooling spots. Attractive ride-pooling services.	**Reduced road infrastructure:** reducing the number of lanes on certain roads for private vehicles and replace them with dedicated ride-pooling lanes. Attractive ride-pooling services (lower travel time, congestion).
	Regulatory	**Public transportation partnerships:** partner with ride-pooling companies to integrate their services with existing high capacity public transportation systems. Enhanced accessibility and affordability for users.	**Ride-pooling mandates:** trips to public events or business districts must be done through ride-pooling services. Captive market, efficient and effective ride-pooling services.	**Car ownership restrictions:** limit the number of cars that individuals are allowed to own in urban areas. Attractive ride-pooling services.
	Marketing			
	Education			
	Technology			
	Social			

Note: unanticipated implications, timing, and packaging of policies.

6. Conclusions

- Shared electric AVs: silver bullet for the sustainable transition of automobility; evidence suggests that the most likely transition pathway will involve a majority of privately-owned electric AVs.
- Niche level: shared mobility is still in an early emerging phase.
- Regime level: key stakeholders (i.e., vehicle manufacturers, users and society groups, public authorities) could resist a shift from private to shared automated electric automated mobility due to concerns about sales, competition, and user preferences, revenue losses, complex transition.
- Landscape level: main pressure related to safety, congestion, and environment; the private automobility regime reacts by automating/electrifying fleets. Landscape pressures addressed by a shift towards shared mobility services are seen as milder and less influential to the regime.
- A critical landscape-level shock could open up a pathway to a shared electric automated automobility regime; further research is needed to investigate the shock-conditions that may trigger such a transition.

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