

///// Demand-Responsive Transport and Informality: Opportunities and Limits of Formalization /////

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Member Board of Directors



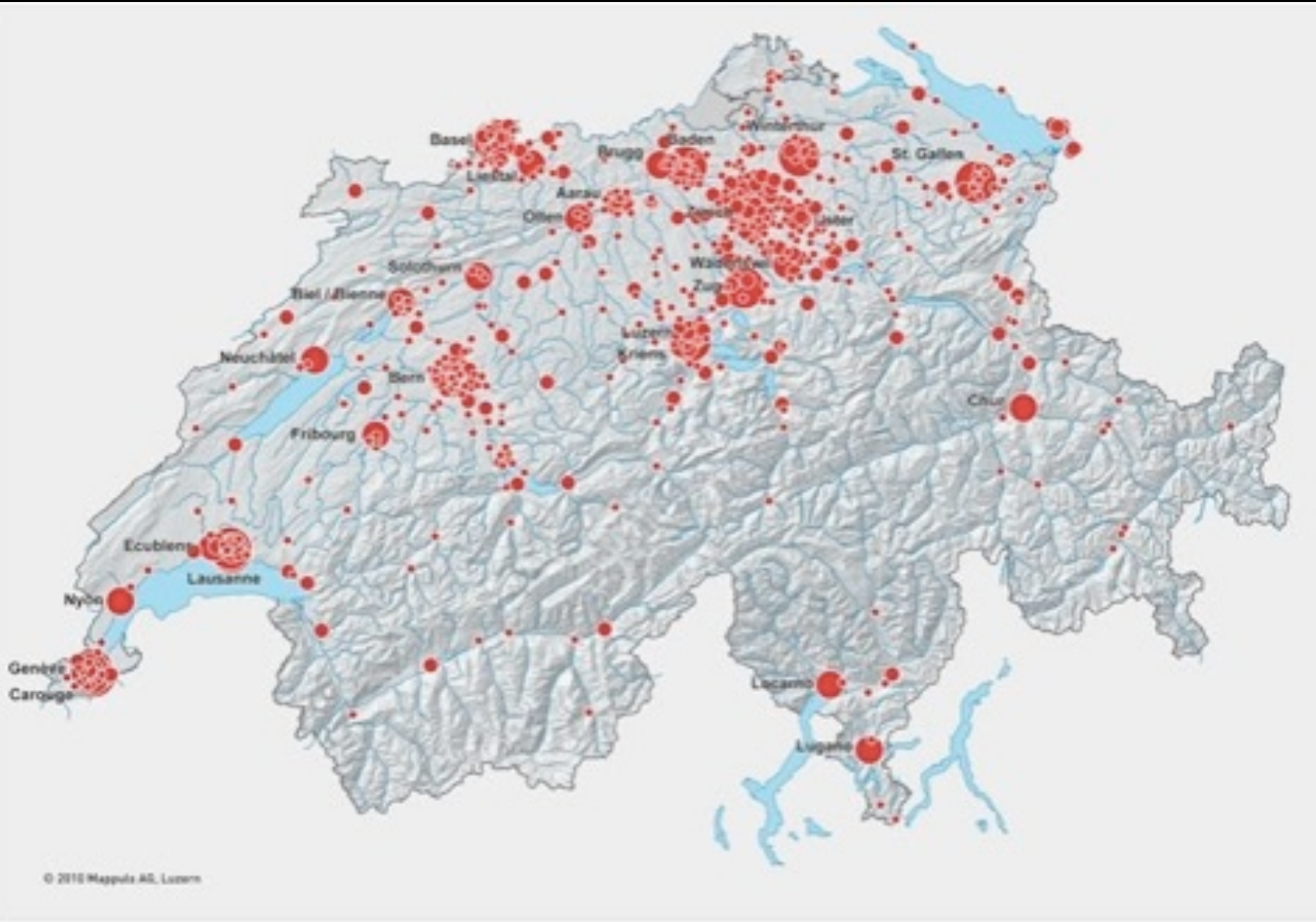
A **Switzerland: Car Sharing fully Integrated with Transit**

// The Swiss Way: Mobility CarSharing Switzerland //



// 3'000 Vehicles in 8 classes....

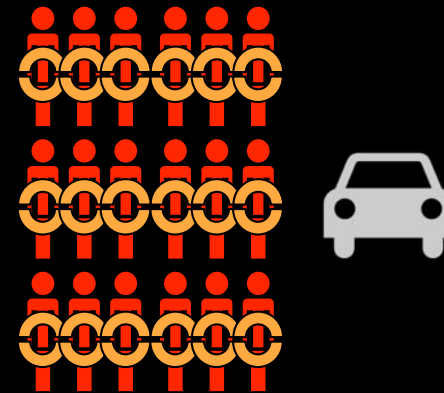
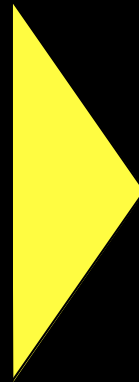
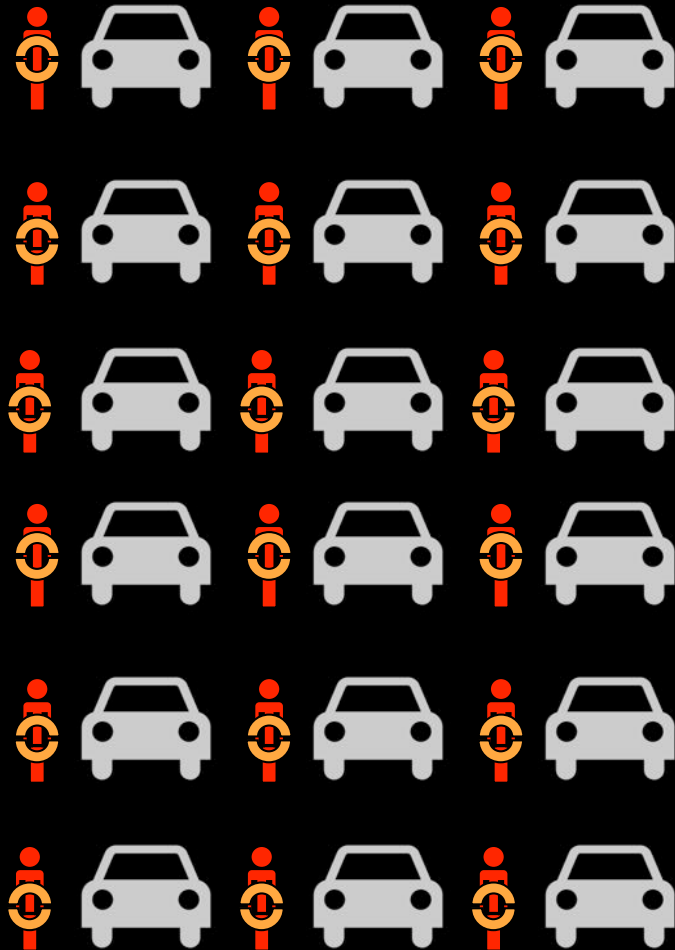
// 1'300 Pods, Nationwide in Switzerland... ///



//...leveraging the Nationwide Rail and Bus Network... //



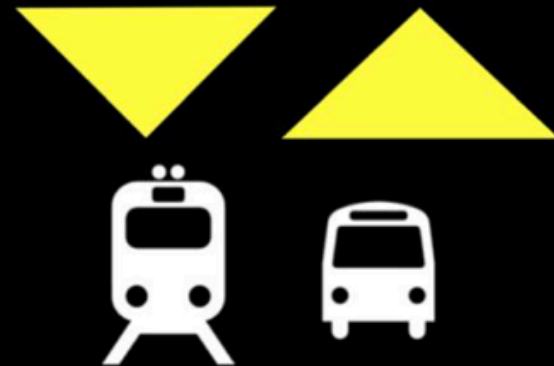
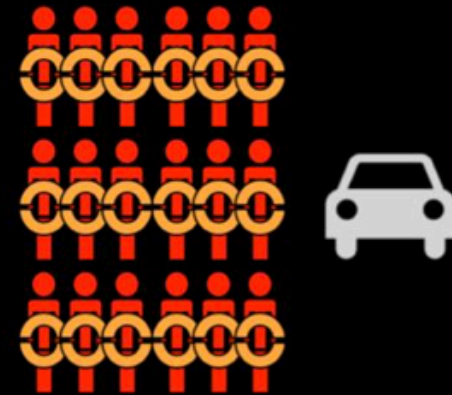
/ Car Sharing: Vehicle Substitution up to 1 : 18 Ratio /



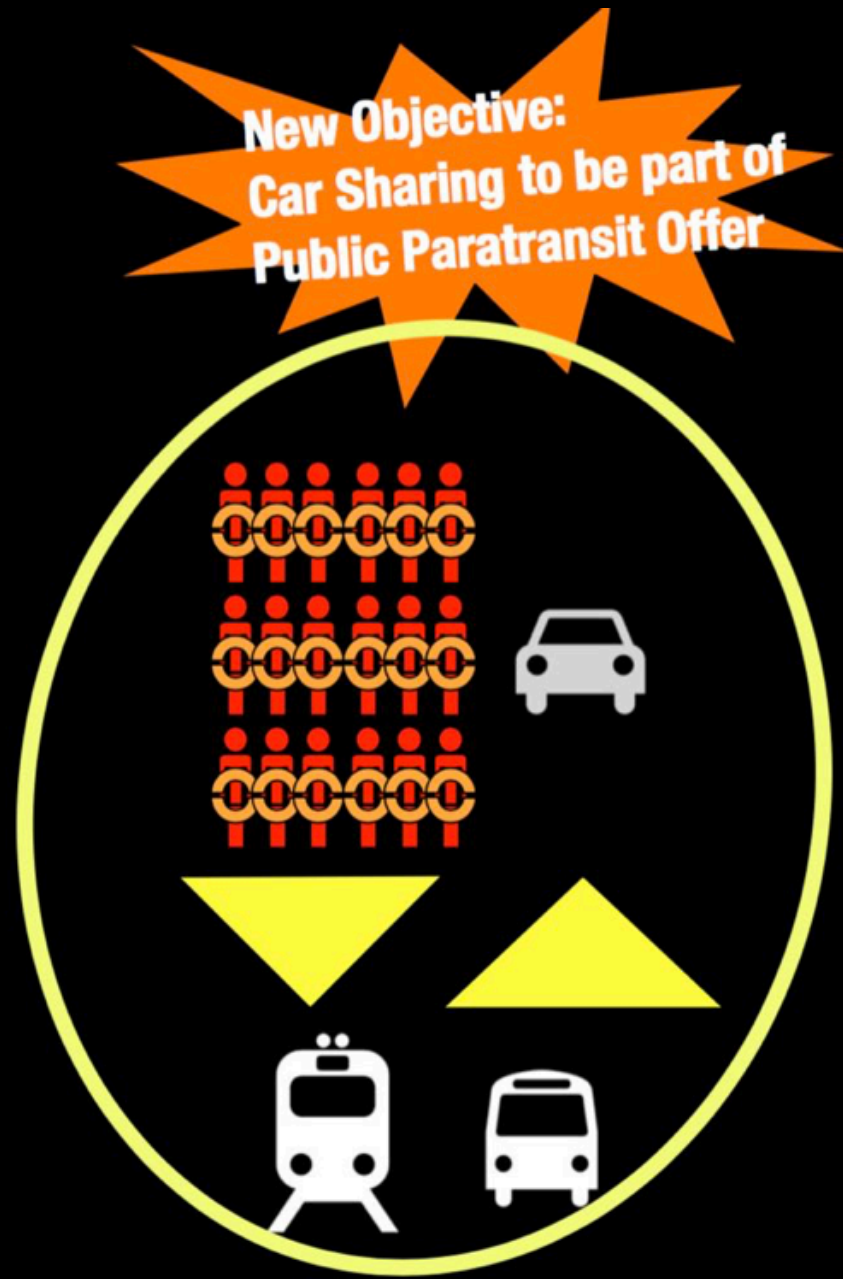
/ Car Sharing: Vehicle Substitution up to 1 : 18 Ratio /



**New Objective:
Car Sharing to be part of
Public Paratransit Offer**

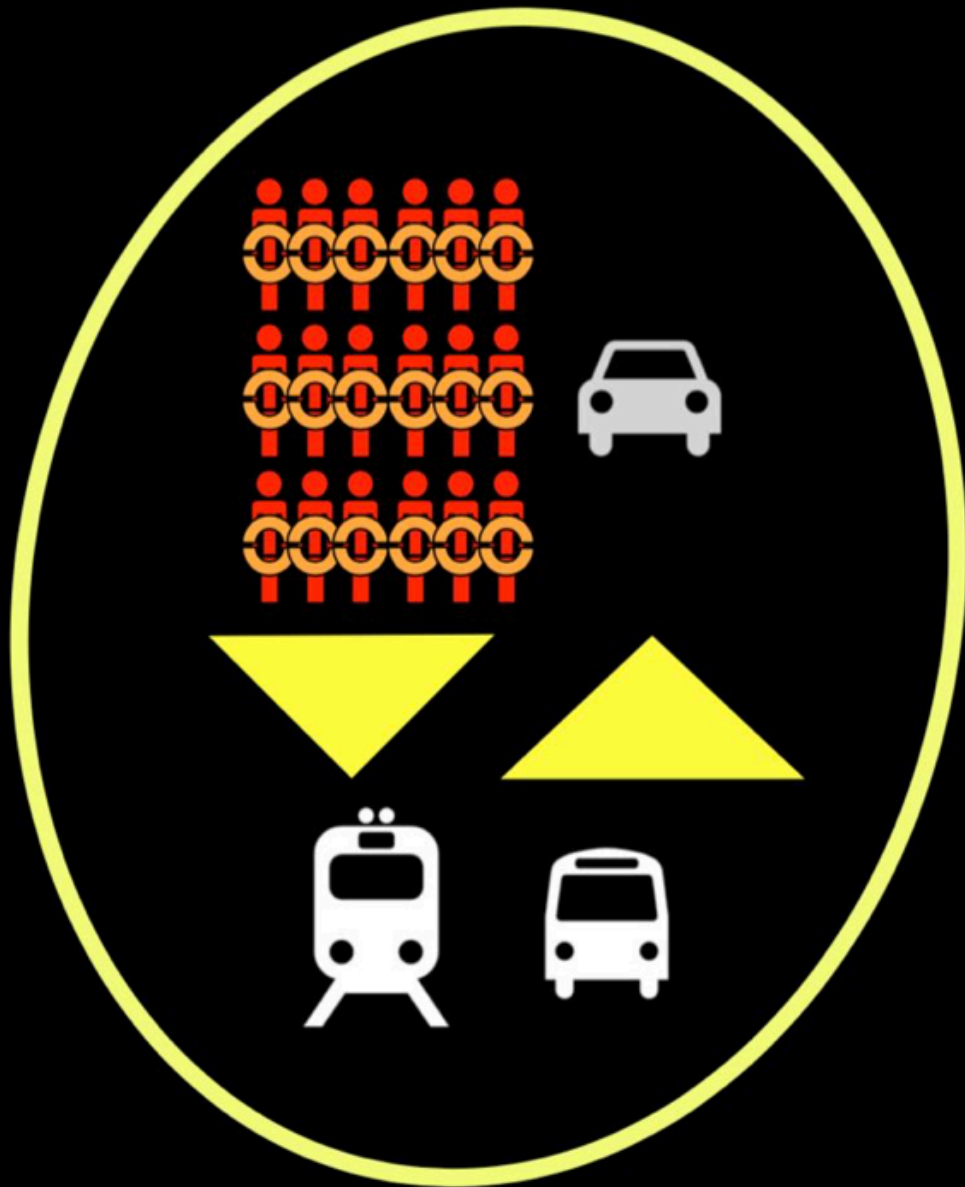


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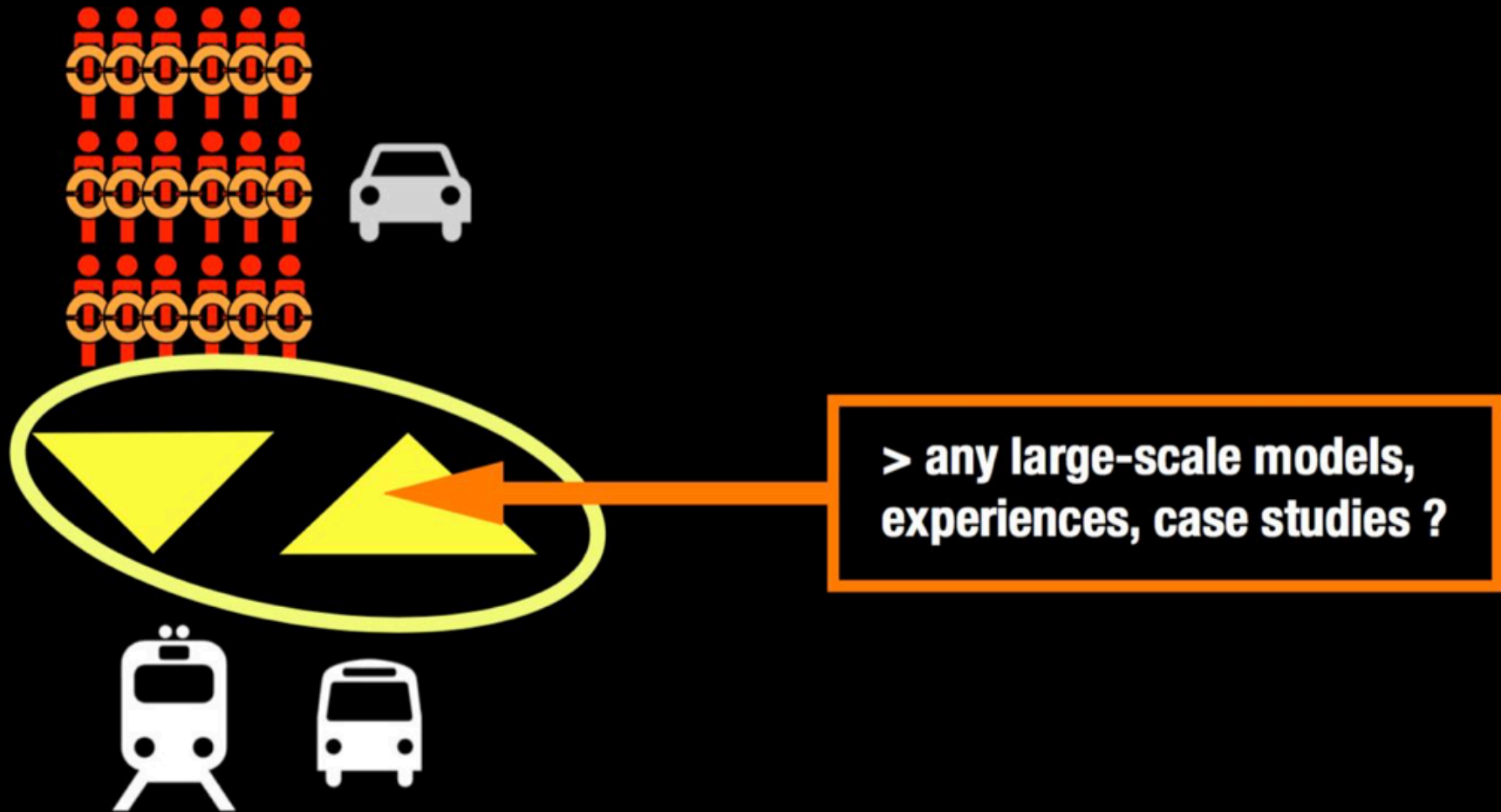


**New Objective:
Car Sharing to be part of
Public Paratransit Offer**

**/ Next Level of Shared Mobility:
Combining Shared Modes and Transit /**



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// Switzerland's National Public Transport System: Full Integration of all Modes – Timetable, Ticketing,... //

Mainline Rail



Private Rail Ops.



Rural / Alpine Bus Services



Water Transport (Lakes)



Cable Transport



Urban Transport (Networks)

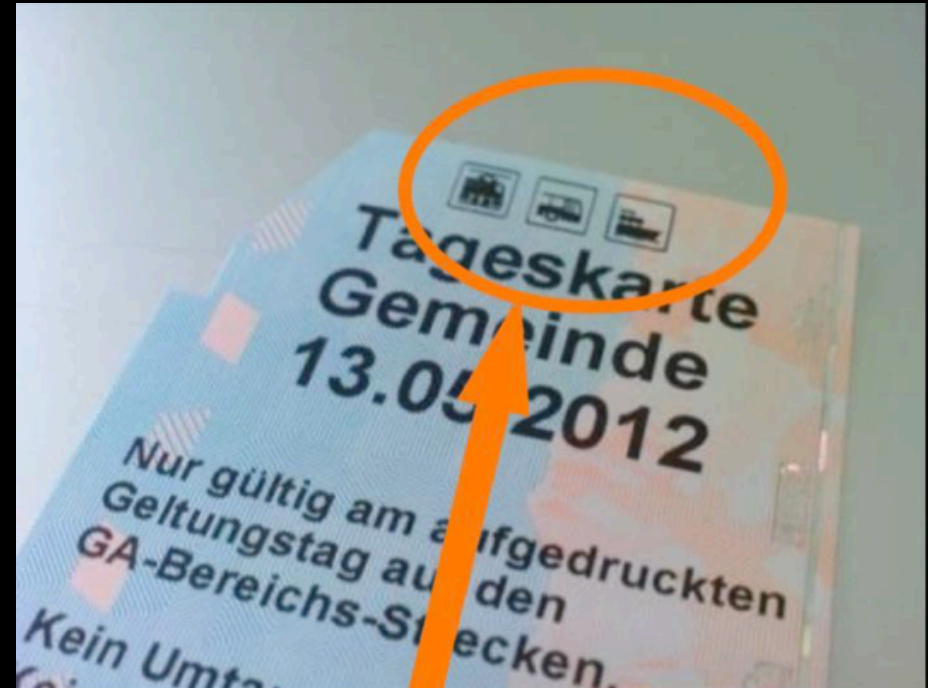


// Core Asset: Simplicity, Ease of Use: One Ticket, one Network, Nationwide //



Fare Media: One Ticket for the Whole Journey, across all Modes

// Nationwide Integrated Ticketing: Simplicity and Ease of Use are Key //



// Full Inclusion of Shared Modes in Customer Value Chain: Fare Media....//



Alles auf einer Karte.



**SwissPass
Fare Media:
Covers Full
Travel Chain –
Public Transit,
CarSharing,
BikeSharing,
Ski, Hiking,
Museums,...**

**// Example for Intermodality:
Mobility Pod – Geneva Airport //**



**<< 300 m to C/I Desks
<< 100 m to Train**

// Example Basel Rail Station:
Reserved Drop-Off Spots for Free-Floating Vehicles //



15 m to Train >>

**// Example Basel EuroAirport:
Reserved Drop-Off Spots for Free-Floating Vehicles //**



50 m to Terminal

// Base for Success:

Intermodality, Cooperation between all Transport Actors //



SEAMLESSNESS

in usability, accessibility, comfort, interchanges, fares, ...

//// Expanding CarSharing Options: Mobility OneWay –Trips between Stations ////



**Leave Car in Different Station than Pickup
Cars are NOT Free-Floating!**

//// Expanding CarSharing Options: Mobility Scooter – FreeFloating in Zurich ////



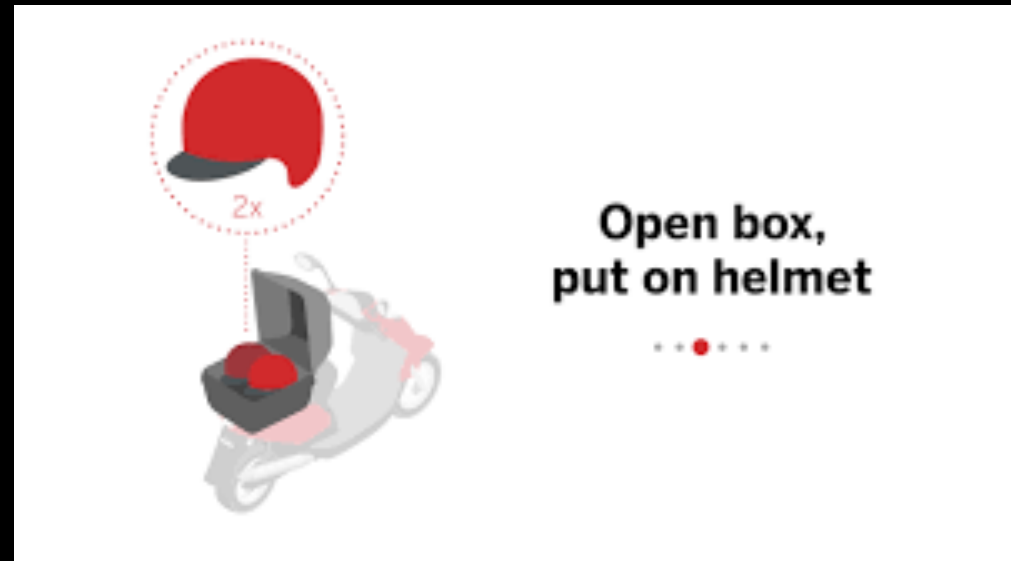
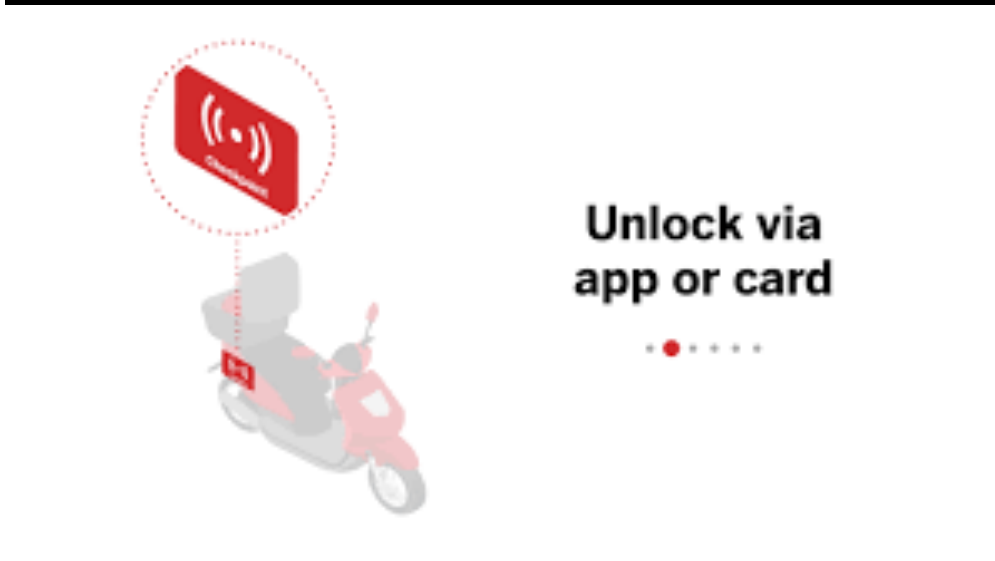
**Launch:
April 2018**

//// Expanding CarSharing Options: Mobility Scooter – FreeFloating in Zurich ////



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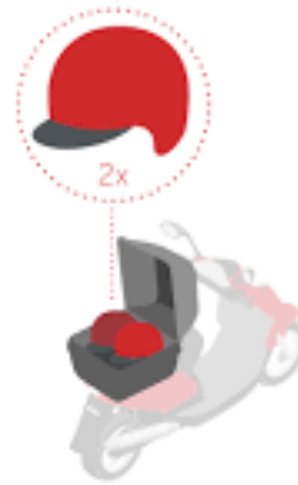


//// Expanding CarSharing Options: Mobility Scooter – Free Parking in Zurich ////

**„Swiss Pass“
Nationwide
Public Transport
Smart Card used to unlock Scooter
(Voice Interface)**



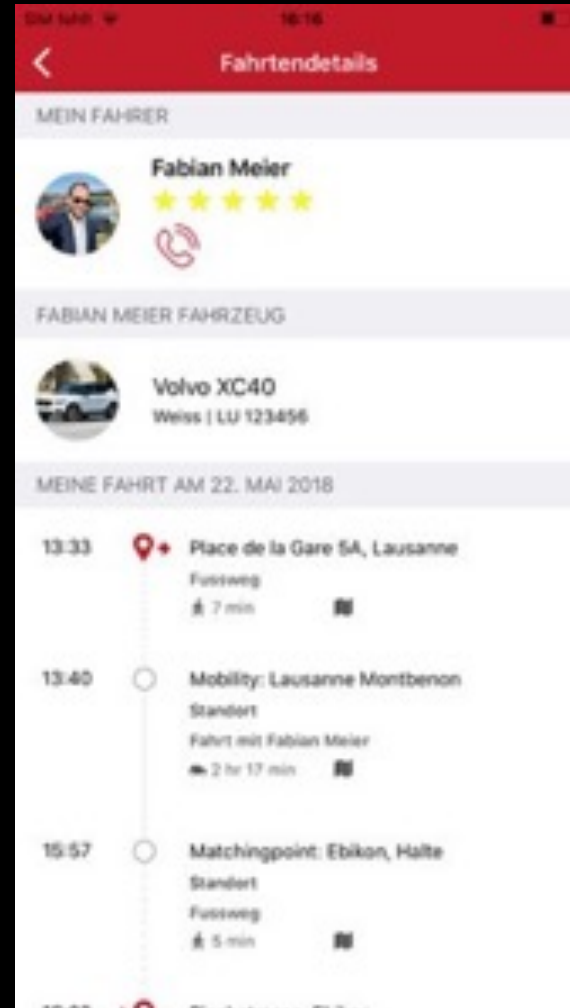
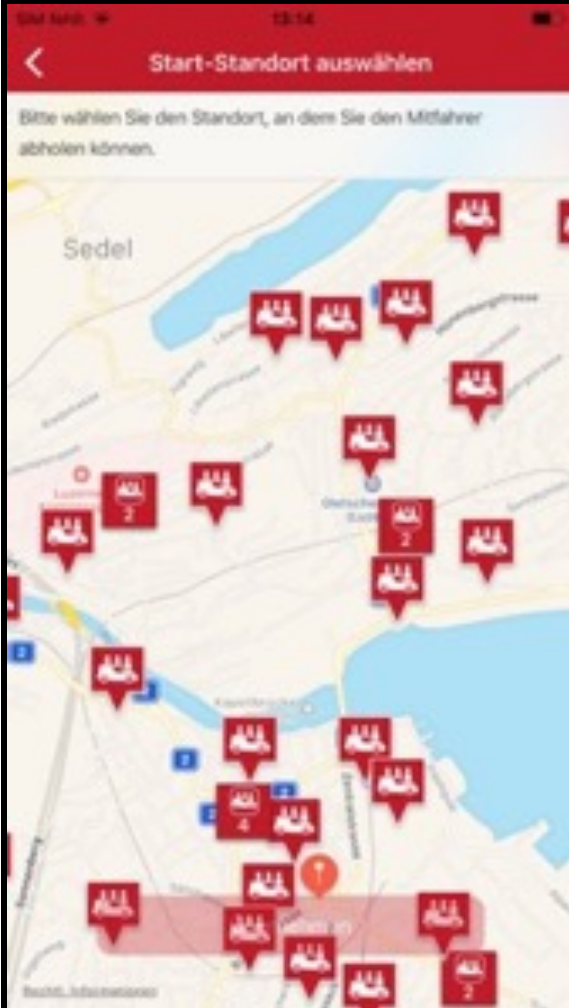
**Unlock via
app or card**



**Open box,
put on helmet**



//// Expanding Options in Non-Dense Territory: Mobility Carpool – Ridesharing, complementing Transit ////



**Launch:
May 2018**

///// Challenge: Rural / Mountain Connectivity /////



**/// CarSharing in Rural Spaces:
Expected and unexpected Challenges ///**



/// The Onward Journey: Challenges Serving Rural Spaces ///



B

The Notion of Informality

//// Safety and Usability Issues, Mafia do Ônibus, Drug Dealers, Road Safety ////



**//// Lack of Personal Safety:
Ônibus 174 Movie ////**



**/// July 2000, Zona Sul: Hostage-Taking on Public Bus # 174
/// 2002: Movie in Cinemas, Cable TV and on DVD**

**//// Kômbis and Vans:
Informal Transit takes over ////**

//// Volkswagen Kombi: 50 years and counting ////



/// Volkswagen do Brasil, São Bernardo do Campo (SP):
still producing approx. 15'000 units per year (ended Dec 2013)

Kômbi:	Price R\$ 38'000	(CHF 14'300)
Fiat Ducato	Price R\$ 78'000	

**//// Volkswagen Kômbi:
a vehicle creates its own mode ////**



**/// „Transportes Piratas“ > Drivers advertise bus route number in
windscreen and pick up passengers anywhere along route**

**/// Due to quality flaws in formal transport: Kômbis used by all social
classes (not only „transport for the poor“)**

**/// Unclear level of user safety (unlawful driving, reported assaults
on passengers)**

//// Kômbis: Governance Intervention > Attempted Formalization in 2007 ////



- /// 7'000 municipal concessions requiring minimal standards**
- /// tied to fixed lines or zones**
- /// enforced by Police**

//// Vans: Kômbi's Tall Brother ////



/// Fiat Ducato and (new) Mercedes Sprinter Vans

/// mostly with a/c

/// catering to same problems (lack of formal transport) with **upmarket** product

//// Just take them out? ////



**/// 40'000 people directly or indirectly employed by Vans and Kômbis
/// MDTA (Movimento em Defeso do Transporte Alternativo) = interest group
/// BRS financed with public money (NOT bus companies) > call for employment
of former Kômbi and Van operators > Social Issue!**

**///// Formality, Informality and Elevated Modes:
Attempts for a Classification /////**

///// Definition of Informal Transport (based on Golub and Cervero 2007) /////

set of typical problems encountered when considering small-scale informal transit operations:

- **Erratic Scheduling and Services** - no fixed timetables or headways
- **Competition "in the market"** - aggressive fighting for customers
- **"Cream Skimming"** - little or no off-peak service because of lower profitability
- **Safety Issues** - overcompetition, lack of driver training, overloading and condition of vehicles
- **Lack of Accountability** - no regulating authority
- **Tax and Fee Evasion** - often an illegal business
- **Labor Abuse** - no working time limits, no minimum wages
- **Inefficient Business Practices** - poor cost control, no vertical organization
- **Inadequate Investments and Insurance** - operation incentives to minimize investments
- **Lack of Capacity** - becomes an issue as soon as operator organizations control market access

/// BUT:

- Current Urban Evolution requires e.g. **massive streams of pedestrians** to be included
> **extend** understanding of informal transport **beyond vehicle-based** transit

//// What is Formal Transportation? ////



/// Regular Intercity Bus, Afghanistan 2011

//// Formal = Paint Scheme? ////



/// Licensed Route Taxis, Addis Ababa 2012: Blending Formal and Informal

- > Existence of mixed modes
- > sector in constant evolution requiring adaptation of definitions
- > Observe and include new modes

//// Formalization: can be switch of mode... ////



**„Up in the Air“ Alternative to Road Transport:
MetroCable, Medellín 2004**

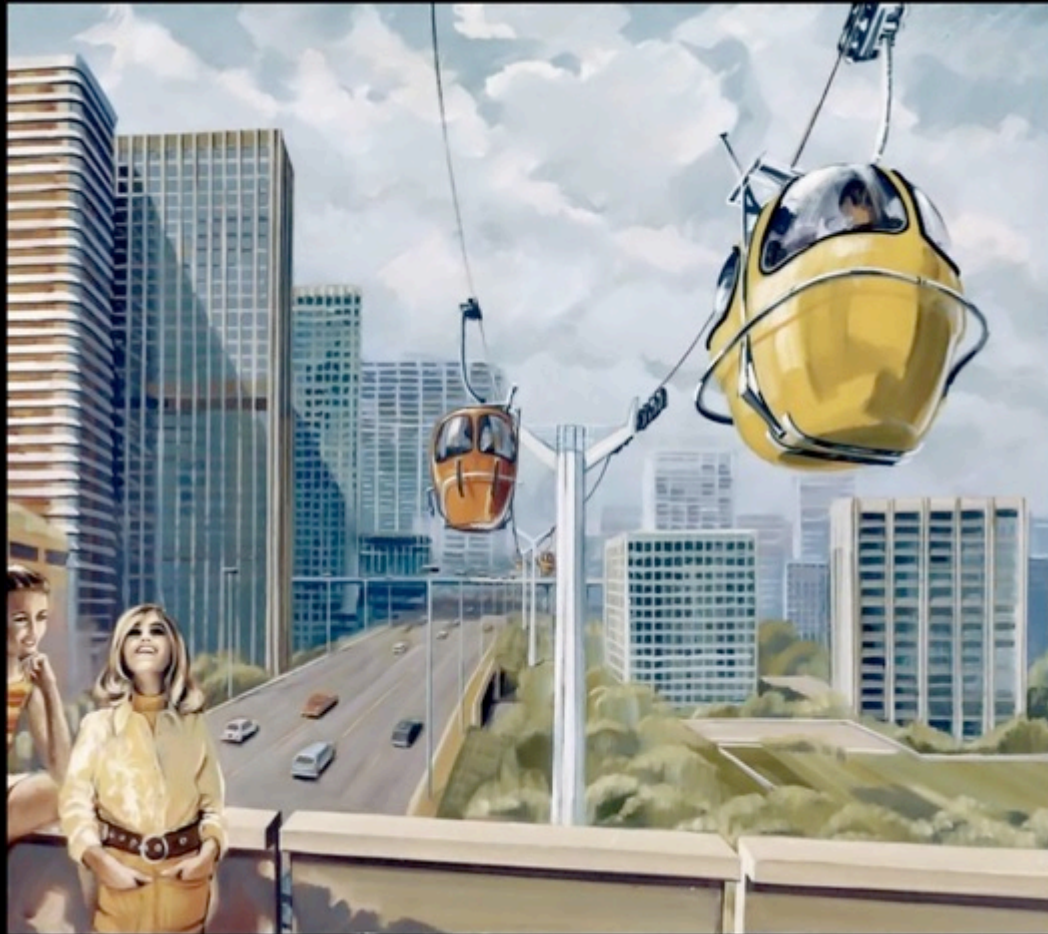
/// Licensed Route Taxis, Addis Ababa 2012: Blending Formal and Informal

////... with great impact on travel quality! ////



/// Transit Times slashed from 90 minutes to 7 minutes

//// The idea is not new... ////



**/// Advertising (1968):
Vision of Cableway as Public
Transport for La Défense:
Pomagalski SP4 „Télécabine
Automatique“**

- > Same motivation: cutting travel times, low-cost establishment of new links**
- > Radically modern, using new materials and fully automated operation**

//// ...Formalization does not require vehicles ////



/// New Uses for Established Technology: Escalator, Medellín, 2011

/// Current Transit Experience: Cumbersome. Example: BART, SF Bay Area, USA ///



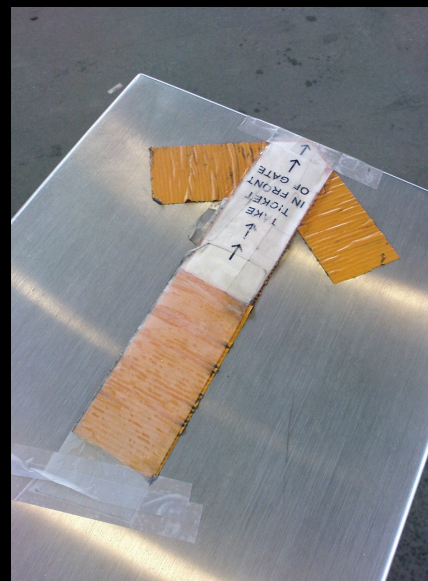
BART Fares

From Oakland Int'l Airport to:

Destination Station	One-Way	Round Trip
12th Street-Oakland	7.95	15.90
16th Street-Albion, SF	10.30	20.60
19th Street-Oakland	7.95	15.90
24th Street-Mission, SF	10.35	20.70
Asby	8.45	16.90
Balboa Park	10.55	21.10
Daly City	7.95	15.90
Castro Valley	8.55	17.10
Civic Center/UN Plaza	10.20	20.40
Coliseum	6.00	12.00
Colma	10.60	21.20
Concord	10.40	20.80
Daly City	10.70	21.40
Downtown Berkeley	8.60	17.20
Dublin/Pleasanton	9.95	19.90
El Cerrito del Norte	9.20	18.40
El Cerrito Plaza	9.05	18.10
Embarcadero	10.20	20.40
Forest	9.85	19.70
Fruitvale	7.95	15.90
Glen Park	10.45	20.90
Hayward	8.55	17.10
Lafayette	9.45	18.90

Excursion Fares: \$5.75
Charged when entering and exiting the same station or when ticket is lost.

Airport Stations: SFO and OAK X
For Oakland International Airport (OAK), the base fare to Oakland Int'l Airport, but not at Coliseum Station. Transfer to the BART station at Coliseum Station for service to Oakland International Airport terminals.



// Quality Transit:
Base for Shared Mobility
offers to thrive

- Complementarity
- Reliability
- Social Acceptance

> Provides Basis for
No-Car / Less-Car Life

B The Notion of Informalityand why it matters

/// ...but no replacement for Formal Offer! ///



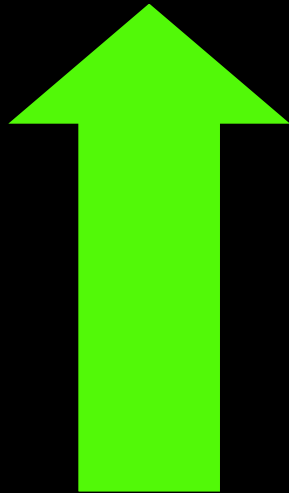
/// Legalized „Kômbi“ (Informal Transport) ///



//// Formalization and Deformalization ////

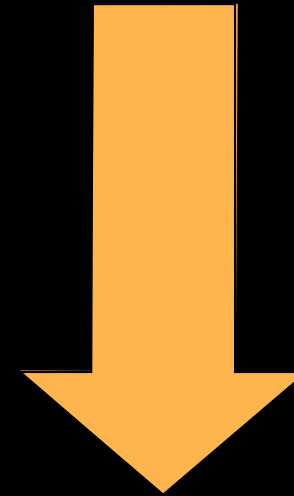
FORMALIZE

- Ramp up Regulation, Governance
- Attribute to Tasks where Strengths provide systemic Advantage
- Integrate into Public Transport Tariff (Fare Media, Data, Maps...)



Illegal / Tolerated Micro-Transit
Shared Taxis
Private/Corporate Transport

**Fixed-Route Bus Transit
outside Rush Hours**
New Fixed-Route Modes
BRT-Mix-Services



DEFORMALIZE

- Introduce Real-Time Tracking
- Adapt Regulations (e.g. Curb Drop-Offs)
- Customize to Passenger Demand
- New Eco-Tools such as Flex-Trolleybus

//// Formalization and Deformalization

Example: Marshrutki ////



INFORMAL

- No Integration or Coordination
- Low Efficiency, no Oversight
- + Highly Flexible
- + Good Knowledge of Local Terrain

FORMAL

- + Integrated and Regulated
- + Real-Time Tracking, Optimized Operations
- + Highly Flexible > Customer Responsive
- + Structured, Flexible Work on Local Terrain

/// New Offers: System Inegration Level - Complement or Competition? ///



**/// New Offers: Has the Problem been Understood?
Pseudo-Solution? First Trial? Does it Scale? ///**



/// Mode Assignment in an AV Age:

What happend to Demand if we REALLY got rid of most cars? ///

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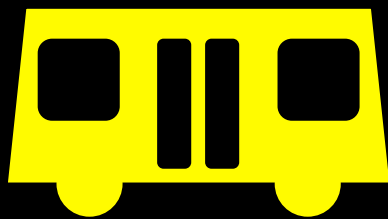
**/// Mode Assignment in an AV Age:
The Dilemma of Vehicle Size ///**



/// Mode Assignment in an AV Age ///



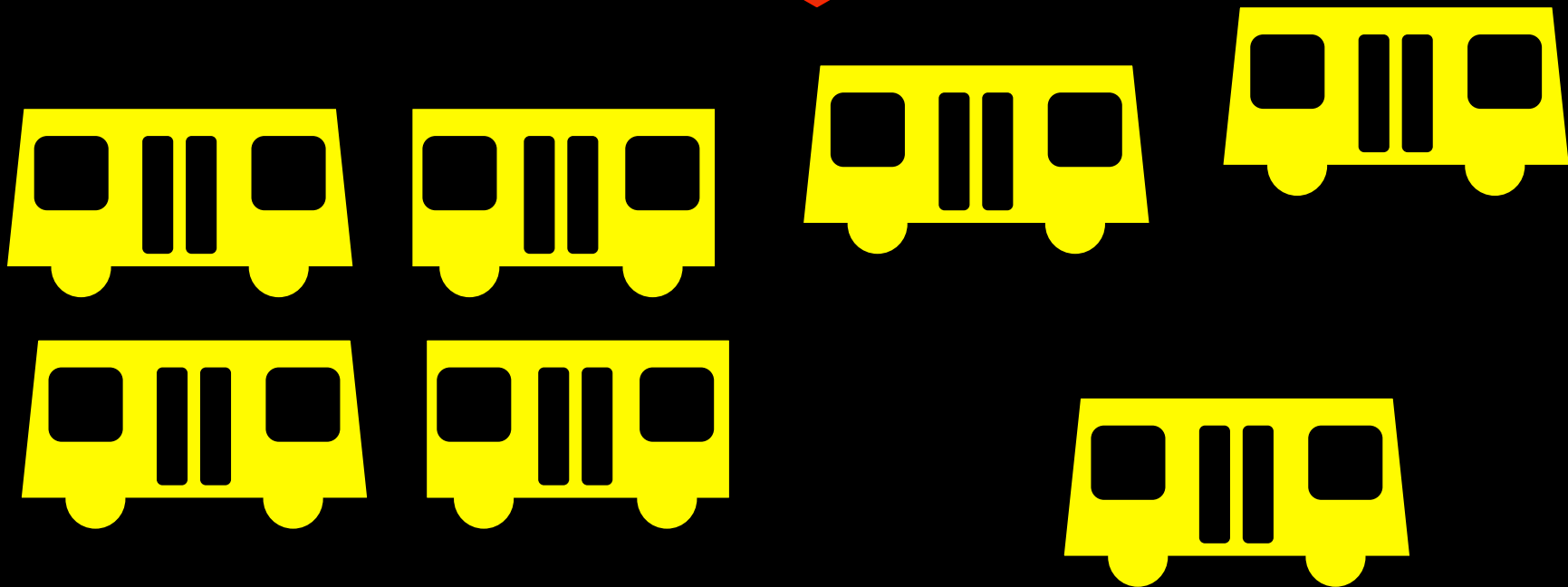
/// Mode Assignment in an AV Age ///



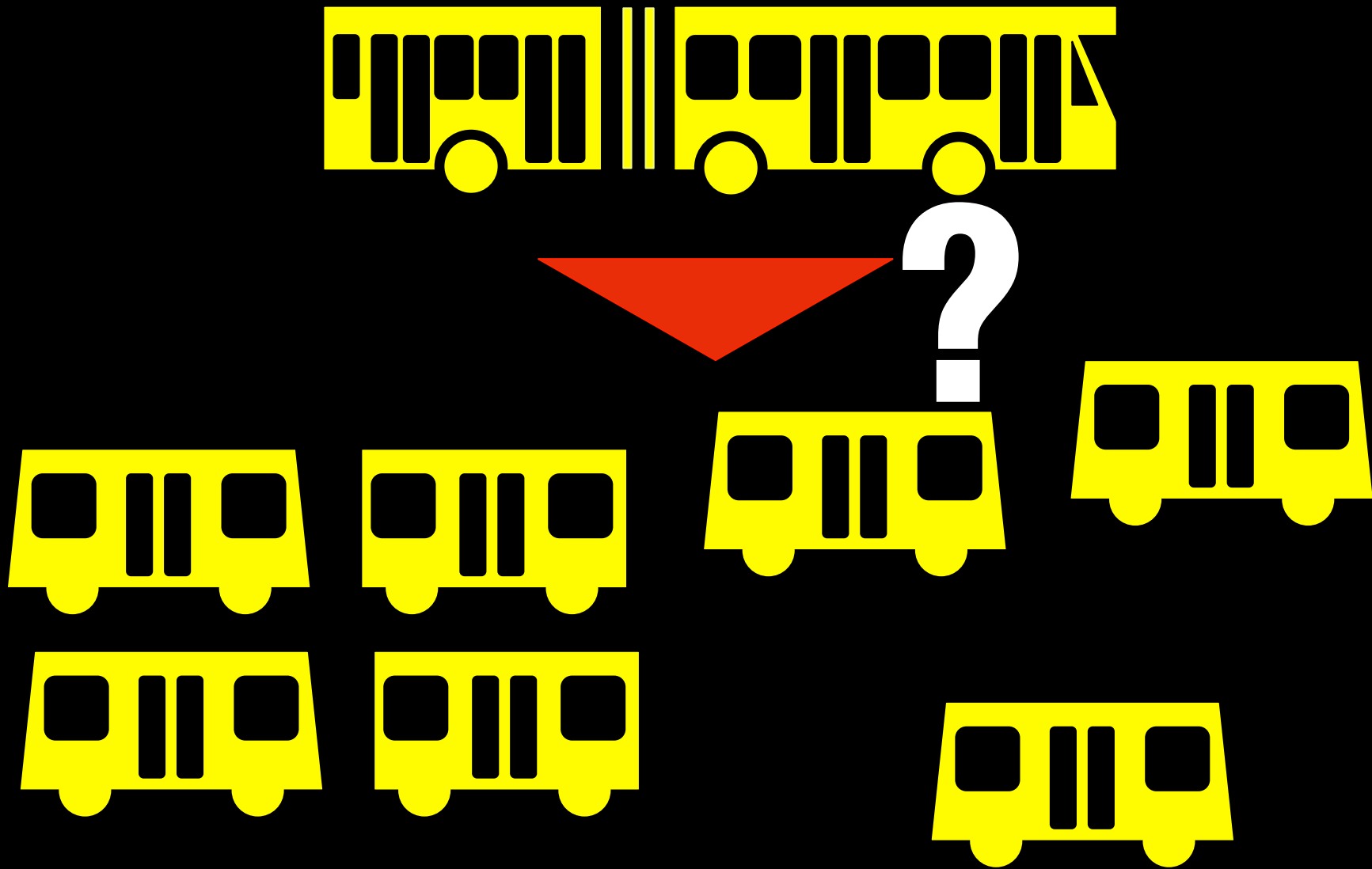
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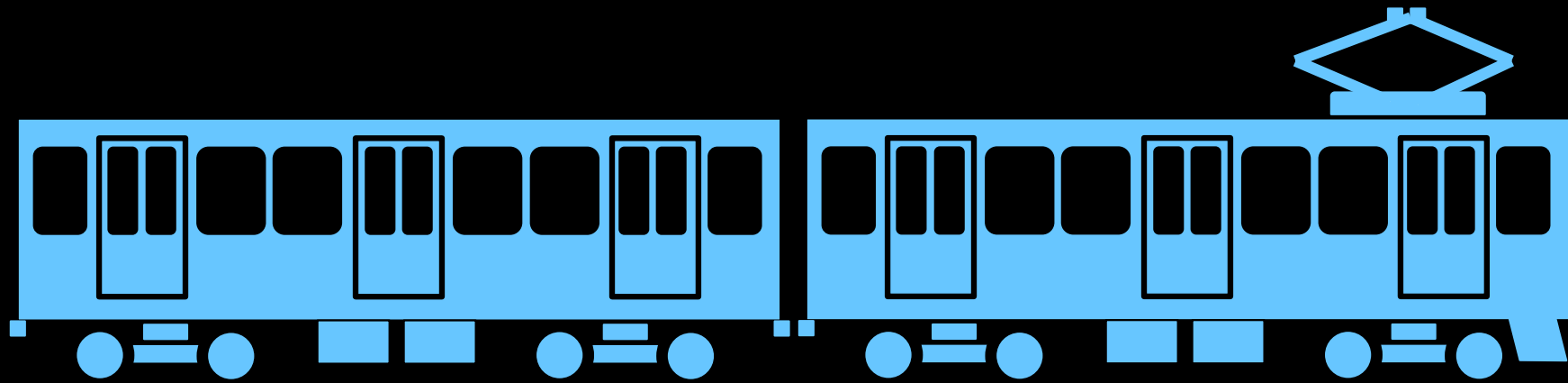
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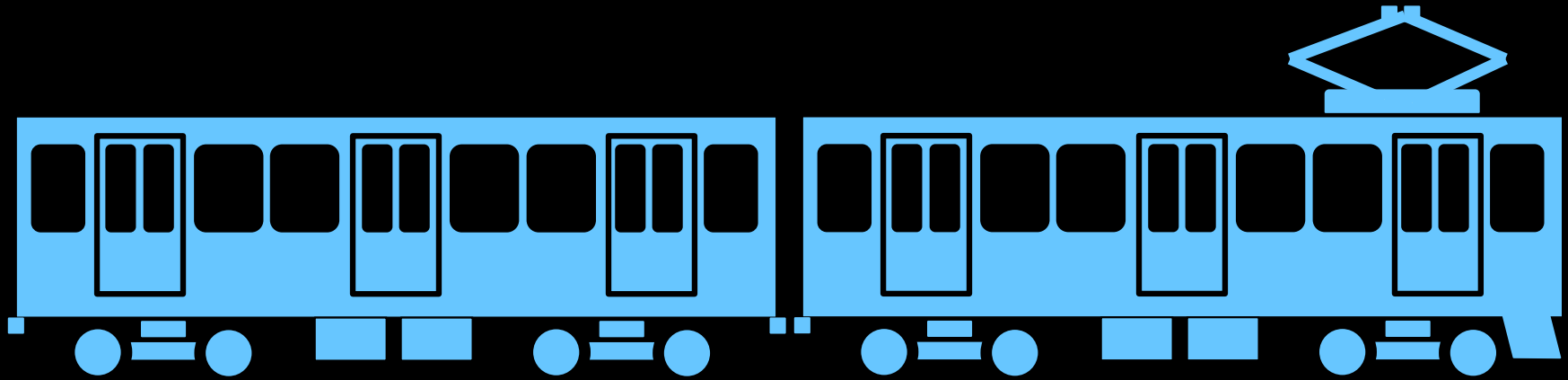
/// Mode Assignment in an AV Age ///



/// Why we need larger AVs ///



/// Why we need larger AVs ///



/// Why we need larger AVs ///



/// Why we need larger AVs ///



/// Personal Rapid Transit (PRT) ///

// Morgantown PRT, University of West Virginia



/ *1975 (Boeing-Vertol)

/ 73 Vehicles (4.75m), 5 stations, 4.2 miles

/ modes:

- On-Demand = Pax Request, Timer 5 Mins after call**
- Schedule = Point-to-Point (Timetable-based ops)**
- Circulation = "Bus" service, Stops at all Stations**

/ ca. 150 service disruptions due to tech failures, 98% reliability (2010)

/ modernization 2015 (Thales), increasing maintenance \$ of guideway (concrete)

/ positive impact on the dynamics of the city have been demonstrated

/// Learning from Informality ///

// From Jitney to Self-Driving Shuttle:



Manila, Philippines (2015)



Zug, CH (2017)

/ How to Formalize the Advantages of Informality?

/ How can the Downsides of Informality be compensated by Technology?

/// From PRT to SDS ///

// Difference PRT („analogue“) to AV-SDS („digital“):

**SDS is a PRT
without guideway.**



/ This is a **Strength**: No parallel Infrastructure System to maintain

/ This is a **Weakness**: Systemic Dependency on the Road Network:
no physical ROW, system risks.

/// PRT: „Hectometric Transport“ ///



Exurbis.com

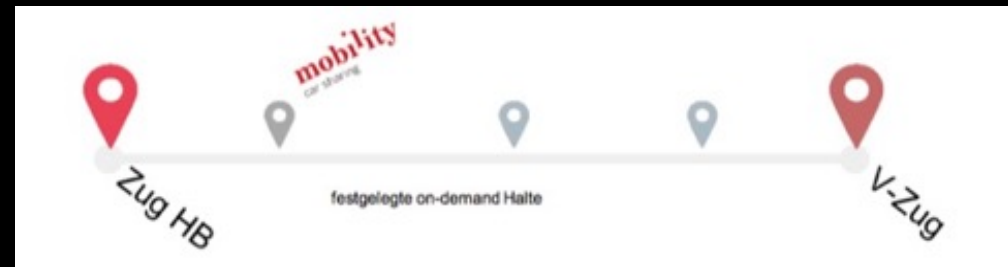
/// Soulé SK (1985), Noisy-le-Grand (F)

/// Post-PRT: Road-Based Shuttles – Operational Logics///

// Implementation Scenario: Leveraging Transit

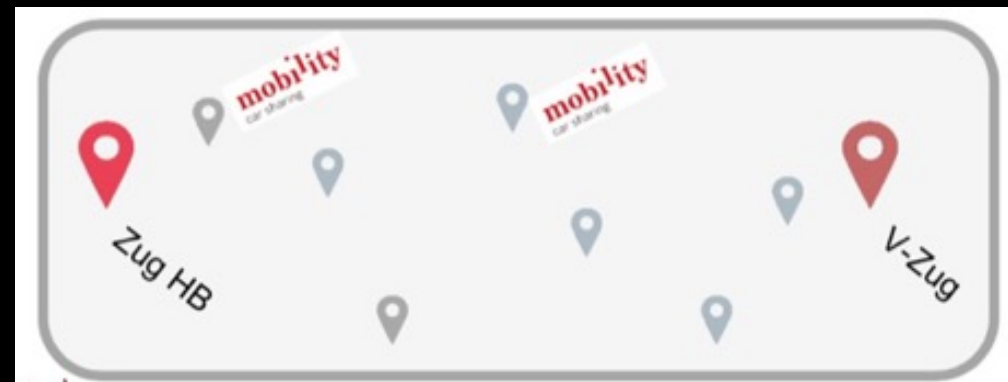
/ 2017: Phase 1

A > B
on-demand Stops



/ 2018: Phase 2

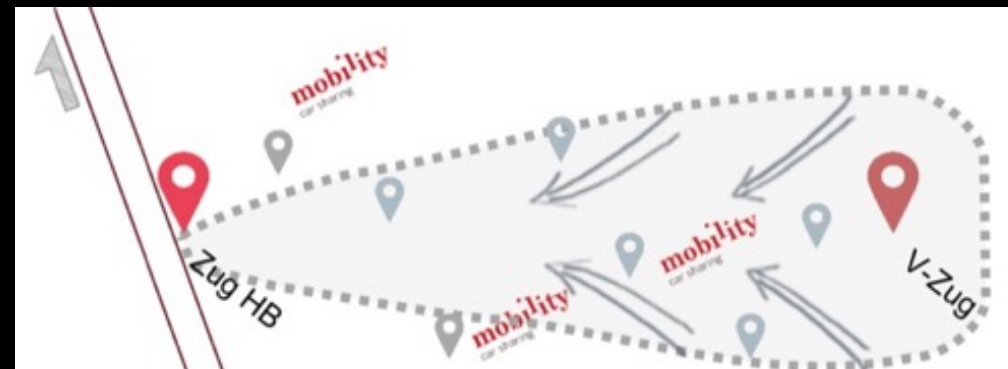
Geofence, Free-Floating
Pax Board after Call



/ 2018: Phase 3

Geofence, Free-Floating
Self-Optimization:

- **Connecting to Trains**
- **Maximising Occupancy**



**//// Challenge of Integrating Modes beyond Apps:
Uncontrolled Invasion of Public Space?
Density? Redistribution? ////**



Singapore: Illegally Parked Shared Bikes

C **Enabling and Steering Informality: The Role of Infrastructure**

//// Curbside replacing Parking:
Transferability Urban <> Rural? ////



Singapore (2017)

//// Pick-Up and Drop-Off: Curbside replaces Parking: First Applications

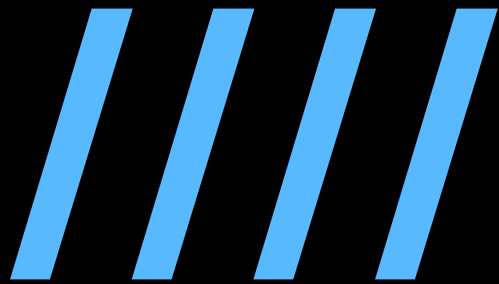


Singapore (2017)

**//// Pick-Up and Drop-Off:
Infrastructure for a Shuttle Age ////**



Singapore (2017)



Disruption

/// Disruption ///

This is a Medaillon.



/// Disruption ///

/ Value: USD 1M > USD 200k
End of Artificial Limitation of Supply....

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/ ...but consider Urban Side:
Pricing of Use of Urban Space – archaic model

/// Disruption ///

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/ Is Disruption a value in itself?

/ Is “Digital” a value in itself?

/ Role of Gig Economy?

> Externalisation of Internal Costs?

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> Externalisation of Internal Costs?

/ Ask the right questions:

- What is dysfunctional and can be disrupted ?**
- What serves a higher interest and should be optimized?**

///// 5 Meta-Drivers of Future Mobility /////

///// Suburbia Rules /////



**/// Urban sprawl: key sustainability inhibitor
greedy for Land, Time, Energy, Lives**

/// Flipping lifestyle drivers: 1960s dreams re-emerging as 2000s nightmares

/// Difficult if not impossible to serve by public transportation

- > Overcoming vicious cycles: call for smart, vehicle-based solutions**
- > Re-thinking territories, spaces, functions**

///// Rising Networks of Green Infrastructure: Data is the New Oil /////



/// infrastructure deployment fostering dependency on private transport

/// Retail as we know it is declining

/// Malls increasingly appearing as dinosaurs of a bygone era

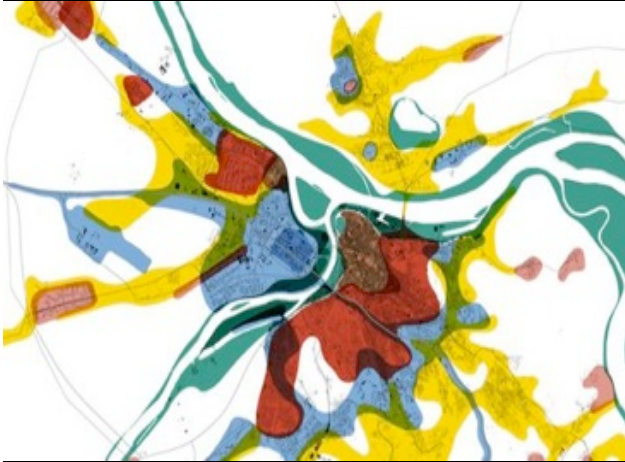
/// IT-driven service economy gradually taking over

> Understanding future urban mobility is understanding retail and services

> the urban vehicle of the future is the delivery van

> Need to re-consider the political economy of urban territories

///// Informality /////



/// approx. 90% of Mexico City built by non-architects

/// deficits in governance as main drivers for emergence of informal urbanism

/// retro-fitting infrastructure is a major headache

- > formalization of informal transport and deformalization of formal transport**
- > transport interventions are always urban interventions (change in paradigm)**
- > calls for thorough understanding of socio-economic conditions of inhabitants**

///// Social Housing, Densification, Urban Tensions /////



/// Economic gradients, negative outlook > planned or unplanned migratory movements

/// Urban dwellers, Land Flight:

- Drivers:** **Lack of basic resources**
- Lack of political stability**
- Lack of infrastructure - education, health, utilities**

/// Cultural and ethnic diversities > integration needs thoughtful, active support

/// Access to mobility as a basic necessity

//// Adaptive Technologies: Quick Wins for the Global South ////



- /// adapting and re-assigning technologies
- /// example of urban cable cars: not a new idea, but performant as part of mix of transport offers
- > key issue: bridging the last mile
- > performing solutions will be cross-modal and integrative
- > highly tailored to local context

D **It's Suburbia, Stupid !** **And the Rural Space !**

/// **most traffic issues CITIES FIGHT WITH do not originate in dense inner cities, but in suburbia / office parks / ...**

> the unloved child of urbanism

/// **address it and fix it:**

> Recognize Infrastructural Deficits

/// **danger of flipping suburbs, "Detroitization"**

> "Gilets Jaunes" mvmt ignited by transport deficits

> Political Stability is at Stake !

///// Cost of Regional Presence /////

Mobility CarSharing Cooperative spends

\$ 500'000

a year on loss-making regional pods

= „Service Public“

///// Trigger: Tax on Diesel Fuel /////



E Towards hybrid Models in Service Delivery

/// Take the best in Service Delivery and Integrate...

- from TNCs,**
- from upscale Taxi services,**
- from Northern European DRT services**
- from Rail Station and Airport Design**
- from Comfort Travel Environments**
- from Operational and IRROP experiences**

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Attention:

Hyper-Critical Moment!

**Service Level and Customer Service Failures let
External Competitors win (e.g. Automobile Industry)**

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/// What tools can help redevelop Suburban and Rural Spaces?

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> Peter Thiel
> *How do these checks and balances have to be designed
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**/// What can Transit learn from Uber and Lyft?
> Customer Focus, Simplicity and Ease of Use**

/// New, expanded Customer Focus ///

// Oscar Munoz, United Continental Holdings (CEO United Airlines):

**„We need to
de-Stress the
Travel Lifestyle“**

///// Thank you /////



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