



University of St.Gallen

Institute for Mobility



Toyota
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Listen to the Residents!

How to develop successful and sustainable urban mobility concepts

Mobility Behavior and Needs in Nascent Urban Quarters

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From insight to impact.

4 research objectives guide through the project



Mobility behavior & demographics

Assess the mobility behavior in nascent urban quarters to provide a current picture of the residents' mobility usage



Mobility needs

Identify relevant mobility needs for nascent urban quarters as a basis for the next objective



Mobility needs-based clusters

Build clusters of people based on different needs profiles. This is done to understand what drives the residents' mobility behavior and how their needs can be addressed when designing new forms of mobility and marketing the services



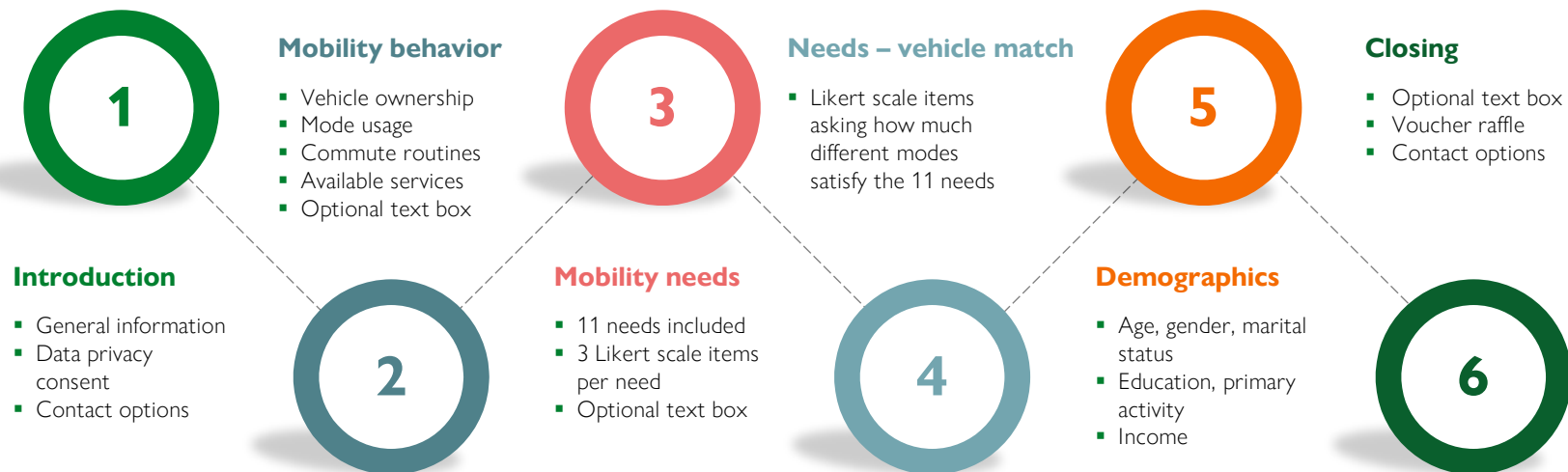
Match of transport modes to clusters

Match the identified clusters with the assessment of different transport modes to judge which offerings would be best suited to serve the residents

The final questionnaire comprises six parts covering the 4 research objectives

Development process

- Items partly taken from the literature and partly created internally
- Two pre-tests were carried out to test and refine the questionnaire
- Final questionnaire is comprised of six parts:



Having distributed the questionnaire in three quarters, 410 valid responses were obtained



Freiam

754 distributed flyers
126 valid responses



Seestadt

1,585 distributed flyers
128 valid responses



HafenCity

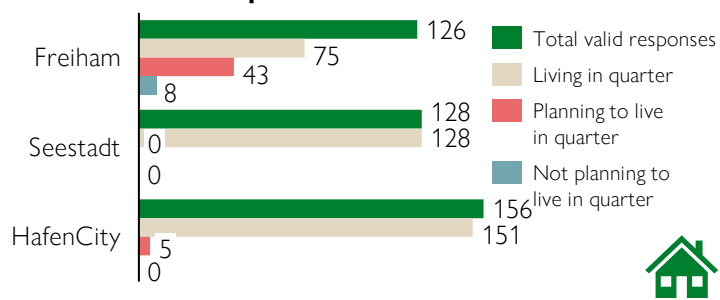
1,546 distributed flyers
156 valid responses

410 valid responses

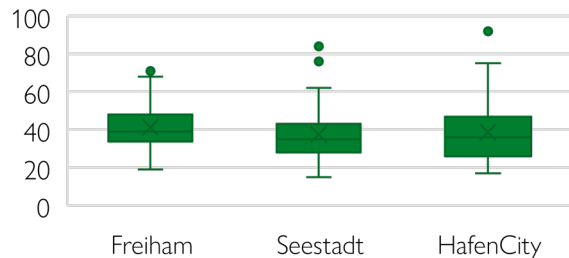
obtained during study period May 29 to June 29, 2022

Demographics are distributed similarly across quarters [1/2]

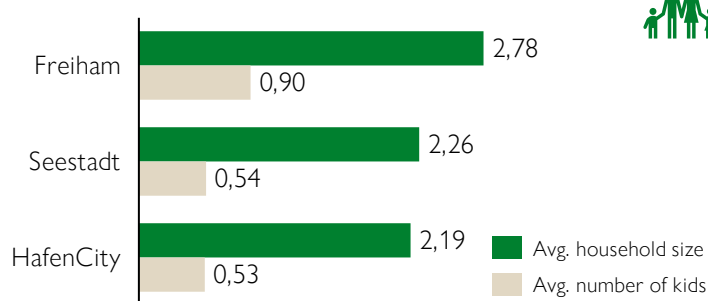
Total responses & residence location



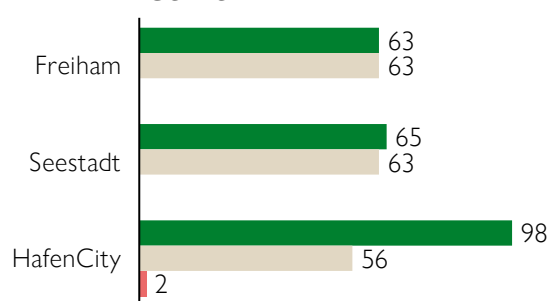
Age distribution



Household size & number of kids



Gender



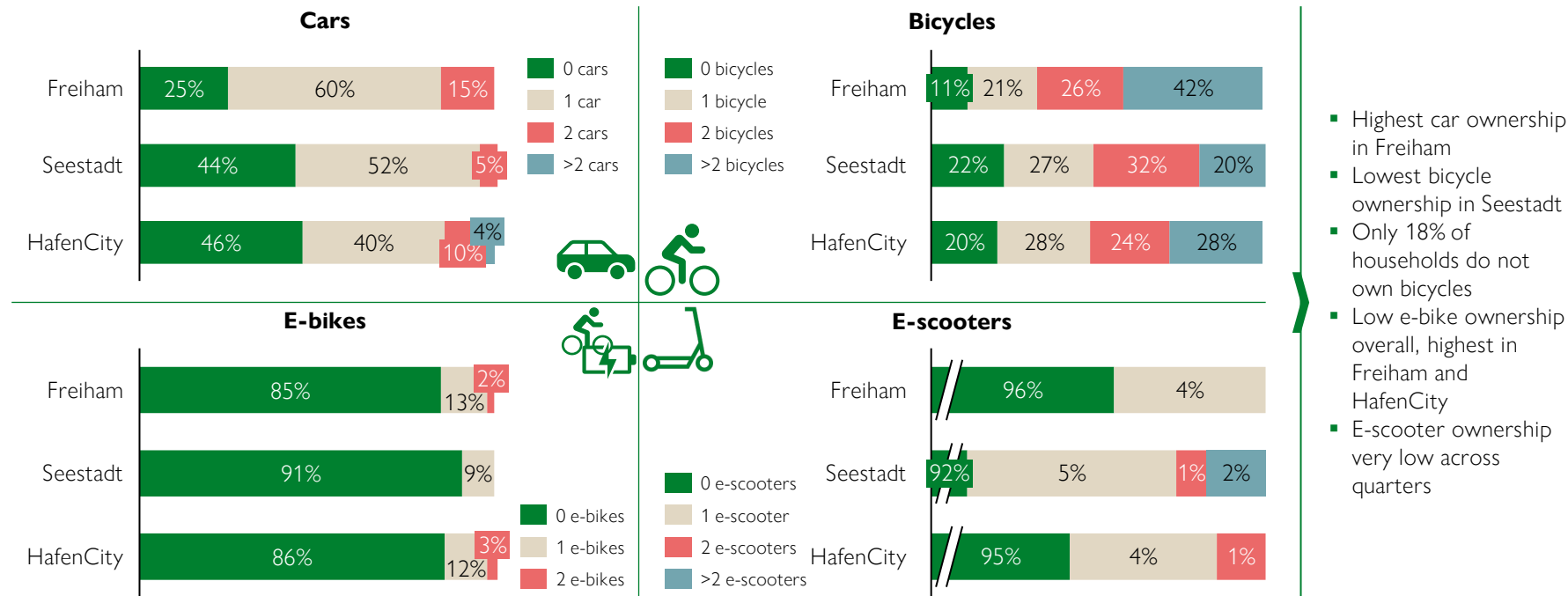
- Very diverse sample
- Well distributed across ages and genders
- 40% of respondents in Freiham not (yet) living in Freiham
- Participants' ages range from 15 to 92
- Freiham has largest household sizes and most kids per household

Demographics are distributed similarly across quarters [2/2]

		Freiham	Seestadt	HafenCity	Overall
	Single	20% ¹	33%	39%	31%
	Married	58%	36%	36%	43%
	Living together	15%	22%	14%	17%
	Apprenticeship	7%	6%	4%	6%
	High school	13%	22%	22%	20%
	University	66%	67%	65%	66%
	Employed	75%	73%	59%	68%
	Self-employed	9%	6%	13%	10%
	Student	1%	13%	15%	10%
	<= 1.000€	4%	3%	11%	6%
	1.001 – 2.000€	7%	15%	15%	13%
	5.001 – 10.000€	29%	13%	26%	23%
	> 10.000€	2%	1%	4%	2%

- Least single and most married people in Freiham
- 2/3 of respondents have a university degree
- >2/3 are employed, most entrepreneurs in HafenCity
- Almost no students in Freiham
- Incomes similarly distributed, lowest in Seestadt

Vehicle ownership differs strongly by quarter for cars, bicycles, e-bikes, and e-scooters



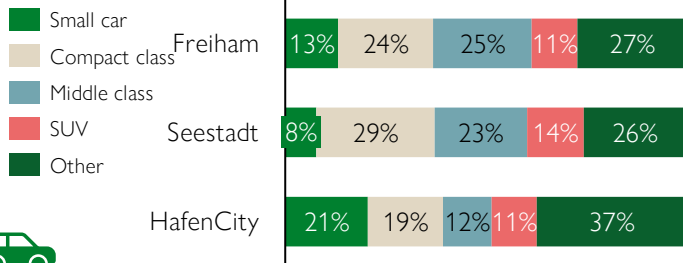
Freiham has the most cars per person and only 10% of the cars are hybrid or electric

Number of cars per quarter

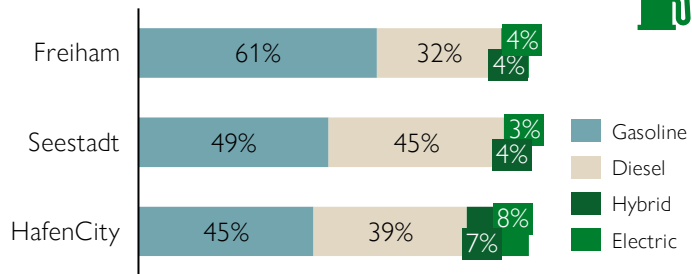
	Freiham	Seestadt	HafenCity
Total # of cars	114	78	107
Respondents	126	128	156
Cars / respondent	0.90	0.61	0.67



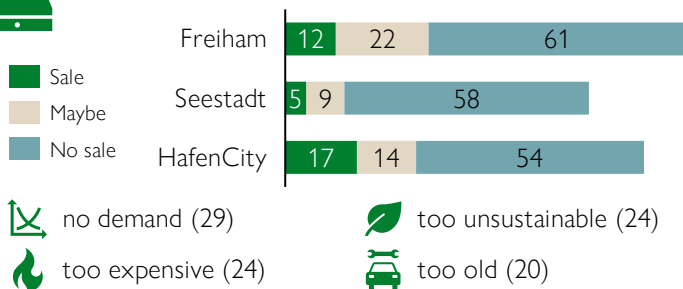
Car types



Engine types



Car sale intentions and reasons¹



- 299 cars in total, resulting in 0.72 cars per participant (410)
- 10% of cars hybrid or electric
- Most cars compact and middle class
- Small cars represent ~1/5 in HafenCity
- 16% aim to sell their cars
- "No demand" most mentioned reason for selling a car

Own car is used most in Freiham while Seestadt leads for public transport and HafenCity for shared mobility usage

		Freiham	Seestadt	HafenCity
	Bus	Medium →	Highest ↗	Lowest ↘
	S-bahn & subway	Lowest ↘	Highest ↗	Medium →
	Own bicycle	High ↗	Medium →	High ↗
	Bicycle sharing	Very low ↘	Low ↘	Highest ↗
	E-scooter sharing	Low ↘	Very low ↘	Highest ↗
	Walking	Lowest ↘	Highest ↗	High ↗
	Own car	Highest ↗	Lowest ↘	Medium →
	Car sharing	Medium →	Lowest ↘	Highest ↗

- Mode usage depends a lot on the location of the quarter and its mobility offerings
- Most used: Car in Freiham, public transport in Seestadt, and sharing in HafenCity

Respondents desire a range of further and improved mobility offerings for the quarters

Freiham

- Subway station (44)
- Car sharing (19)
- Tram station (16)
- Higher frequency of s-bahn (11)
- EV charging stations (7)
- Bicycle lanes (7)
- E-scooter sharing (5)



Seestadt

- Tram station (15)
- Higher frequency of subway (11)
- Car sharing (8)
- S-bahn station (5)



HafenCity

- Car parking spots (15)
- Bus lines and stops (14)
- Ferry stop (12)
- Car sharing (10)
- Bike sharing station (9)
- EV charging stations (6)
- Bicycle lanes (6)



- 59 different offerings demanded with 350 votes overall
- Many people know of plans for, e.g., new subway station in Freiham but demand faster implementation
- High desires for more reliable and frequent public transport

Out of 30 identified mobility needs, 11 were deemed to be analyzed in the three quarters



Experience: well-being, entertainment, experience, effort, simple/easy to use, orientation, luggage storage



Safety: privacy, safety, personal space, transparency



Economic: monetary costs, payment mode and rhythm



Social: social recognition, aesthetics, brand, community cohesion, social contact, equal treatment



Sustainability: sustainability, health



Time: journey time, fast/short transfer time, close to residence/door-to-door service



Independence: reliability, control, independence, flexibility, spontaneously available, selection

	Factor										
	1	2	3	4	5	6	7	8	9	10	11
Effort 1						0.623					
Effort 2						0.861					
Effort 3						0.790					
Time 1			0.639								
Time 2			0.912								
Time 3			0.794								
Flexibility 1				0.584							
Flexibility 2				0.863							
Flexibility 3				0.841							
Health 1								0.812			
Health 2								0.964			
Health 3								0.322			
Monetary costs 1			0.902								
Monetary costs 2			0.835								
Monetary costs 3			0.609								
Sustainability 1		0.880									
Sustainability 2		0.700									
Sustainability 3		0.926									
Orientation 1										0.461	
Orientation 2										0.533	
Orientation 3										0.860	
Safety 1	0.771										
Safety 2	0.957										
Safety 3	0.861										
Social recognition 1									0.448		
Social recognition 2									0.875		
Social recognition 3									0.753		
Entertainment 1						0.607					
Entertainment 2						0.907					
Entertainment 3						0.806					
Reliability 1								0.779			
Reliability 2								0.648			
Reliability 3								0.775			

- 30 mobility needs discovered in the literature
- Reduction through expert interviews and 2 pre-tests
- Final selection is comprised of 11 mobility needs
- Each need has 3 Likert scale items that load well in the exploratory factor analysis

Reliability, effort, and safety are the most important needs and the ratings do not vary much by quarter

Importance of the need



Reliability (6.36)¹

Effort (5.87)

Safety (5.59)

Flexibility (5.53)

Health (5.36)

Time (5.34)

Sustainability (5.03)

Monetary costs (4.22)

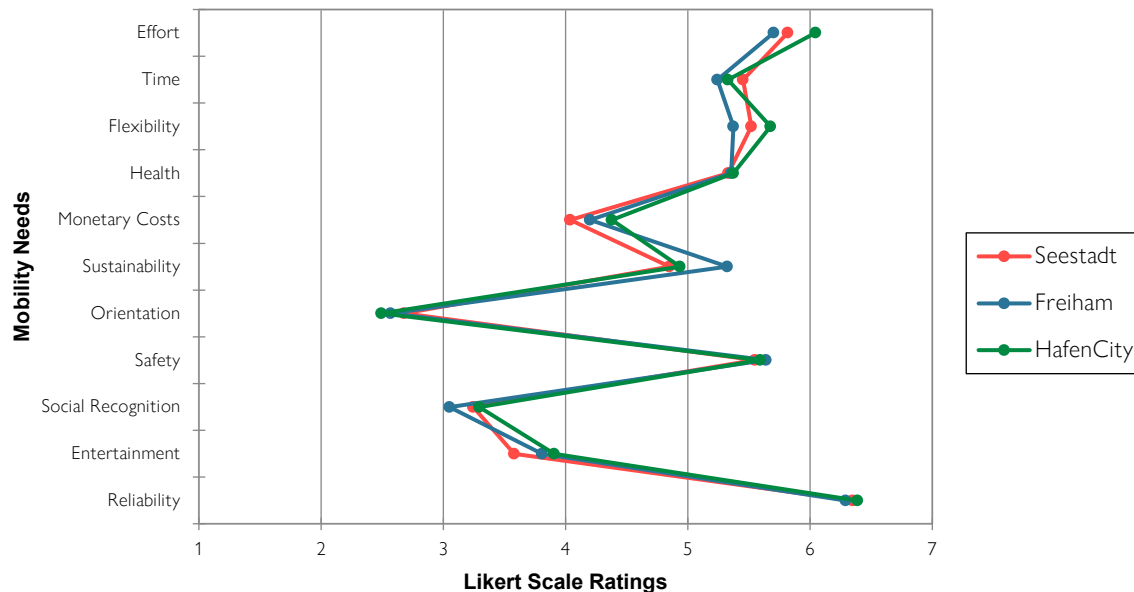
Entertainment (3.77)



Social recognition (3.20)

Orientation (2.58)

Average rating per quarter



5 clearly interpretable clusters result from Ward's method and the k-means clustering algorithm

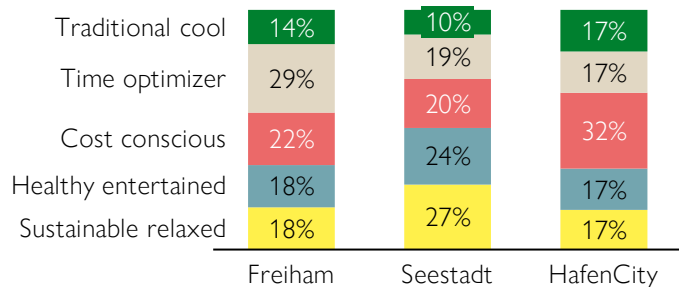
Need	Mean values of clusters				
	Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5
	Traditional cool	Time optimizer	Cost conscious	Healthy entertained	Sustainable relaxed
Effort	5.83	5.99	6.11	5.33	3.92
Time	5.23	6.01	5.61	5.42	3.36
Flexibility	5.60	5.89	5.61	5.47	5.01
Health	5.25	5.35	5.94	6.00	5.82
Monetary costs	3.92	2.94	6.01	4.81	3.38
Sustainability	2.19	3.20	4.53	5.30	5.38
Orientation	3.49	3.30	2.36	2.55	2.62
Safety	5.42	5.33	5.67	5.63	5.09
Social recognition	3.57	2.39	2.80	3.26	2.14
Entertainment	4.98	1.98	2.12	5.26	1.99
Reliability	6.47	6.49	6.28	6.23	6.03
Size	14%	21%	25%	19%	20%

Coloring: Green means the respective mobility need is highly important for the cluster while red indicates low importance

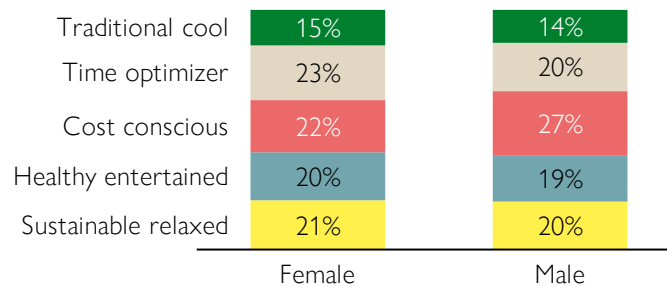
- **Traditional cool:** Highest needs for orientation and social recognition while disregarding health and sustainability
- **Time optimizer:** Willing to sacrifice money and sustainability if effort and travel time can be minimized
- **Cost conscious:** Costs, health, and safety highly valued while entertainment and social recognition rather unimportant
- **Healthy entertained:** Health and entertainment highly important while other needs are balanced
- **Sustainable relaxed:** Willing to sacrifice time, effort, and costs for sustainable mobility

Demographics and vehicle ownership of the clusters in the 5-cluster solution

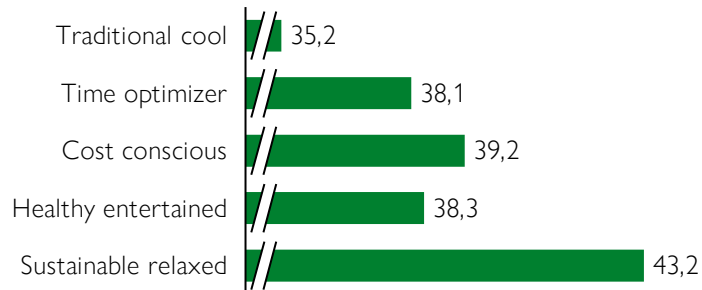
Distribution of clusters per quarter



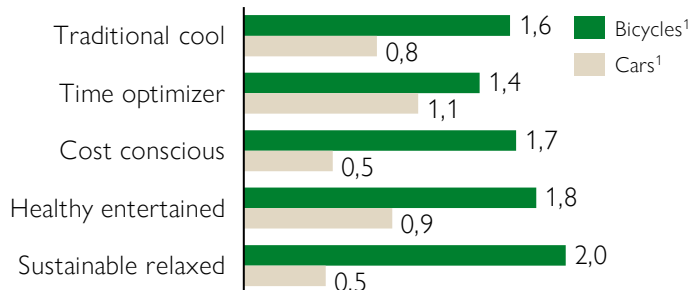
Distribution of clusters per gender



Average age per cluster



Vehicle ownership per cluster



- Distribution of clusters similar across quarters
- Most time optimizers in Freiham, sustainable relaxed and healthy entertained in Seestadt, and traditional cool and cost conscious in HafenCity
- Similar distribution of clusters across genders
- Traditional cool is youngest cluster and sustainable relaxed oldest
- Vehicle ownership differs largely by cluster

Implications for developing successful and sustainable mobility concepts for nascent urban quarters



Provide infrastructure early

- Facilitate adoption process by providing sustainable transportation infrastructure right from the beginning
- Especially important: biking and public transport infrastructure



Facilitate sustainable mobility, especially commuting

- Provide many access points for public transport
- Facilitate easy and frictionless mode switch for multimodal commuting journeys



Communicate thoroughly

- Communicate well the intentions, especially if, e.g., tram station will only be added in 10 years
- People mostly use internet sources but also quarter services if well implemented and accessible



Cooperation is key

- The future of mobility is about including various stakeholders in development and operating processes
- For seamless mobility, all stakeholders must be involved



Focus on residents' needs

- Reliability, effort, and safety are the most important needs
- Orientation, social recognition, and entertainment are the lowest rated
- Address behavior decisive needs during communication



Use clusters as basis for services

- Since needs vary by clusters, focus on characteristics of each cluster when establishing mobility services
- Create bundles according to clusters' needs



Push transport modes that satisfy the clusters' needs

- Provide excellent biking and walking infrastructure as corresponding modes suit all clusters the most
- Deprioritize modes such as e-scooter sharing that fit clusters the least or fit modes' characteristics to needs



Simultaneous developments

- To enable a sustainable adoption of new mobility measures, various urban quarter elements must be implemented simultaneously
- For example, housing, mobility infrastructure, and supermarkets



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