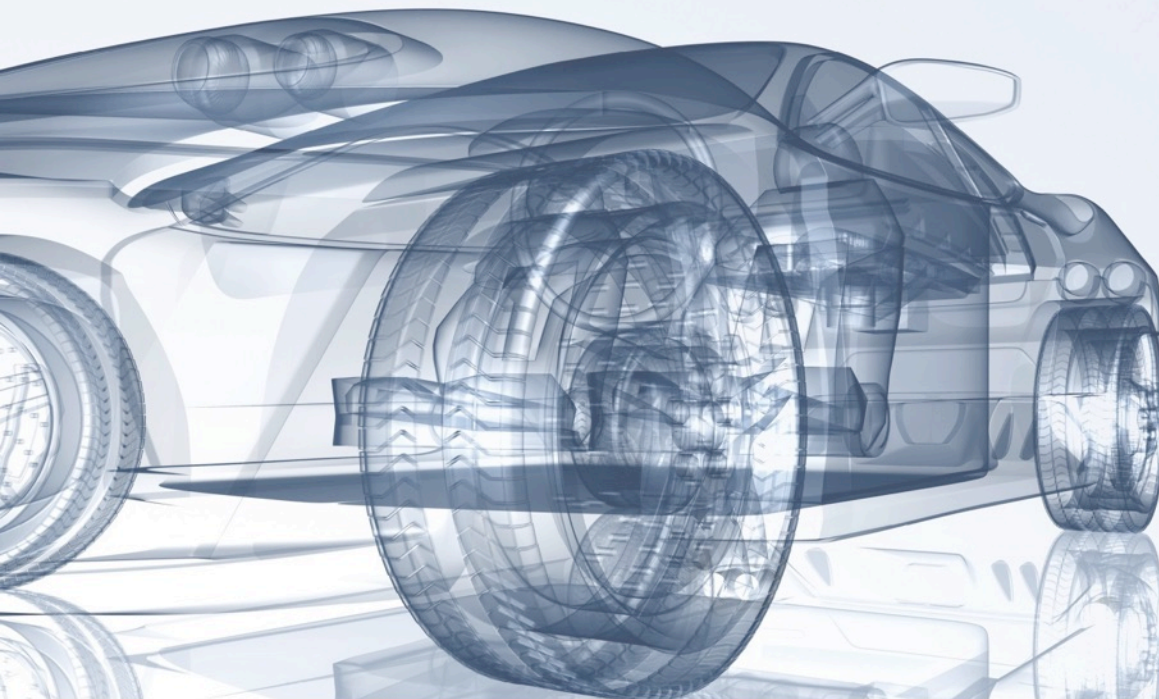


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Method for the Definition of the Optimal Sites for Fast Chargers

Denise Schuler, Giorgio Gabba, Marco Piffaretti, Florian Bislin, Claudio Vittori: Protoscar SA

Remo Müller: WWZ Energie AG

Domenic Lanz: GOTthard FASTcharge AG

Protoscar
CLEAN CAR SHAPERS



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- **The company**

- Protoscar is an independent firm, located in Southern Switzerland, with 11 collaborators, focusing on electric mobility since 1987

- **Our vision**

- On 2050 all the new cars will be powered by an electric motor supplied by renewable energy.



Our references

DAIMLER



HONDA



OPEL



REPOWER



FLUGHAFEN ZÜRICH

ABB

ALPIQ

SIEMENS



FONDATION DES PARKINGS

Classification of charging speeds



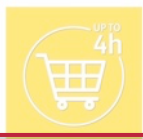
sleep&charge

3-11kW = 16-50 km range / 1 hr of charge



work&charge

3-11kW = 16-50 km range / 1 hr of charge



shop&charge

3-11kW = 16-50 km range / 1 hr of charge



coffee&charge

22kW to 50kW = up 100 km / 0.5 - 1h of charge.



espresso&charge

up to 150kW = up to 100 km range/ 10' charge of



Needs for the development of a method

- Some clients of ours have already a list (“long list”) of possible locations mainly because:
 - they own them
 - they are close to their facilities
 - they look interesting to them
- These potential investors were interested to know:
 - the best locations to get a positive business case
 - the best type of charging station to be used in each site



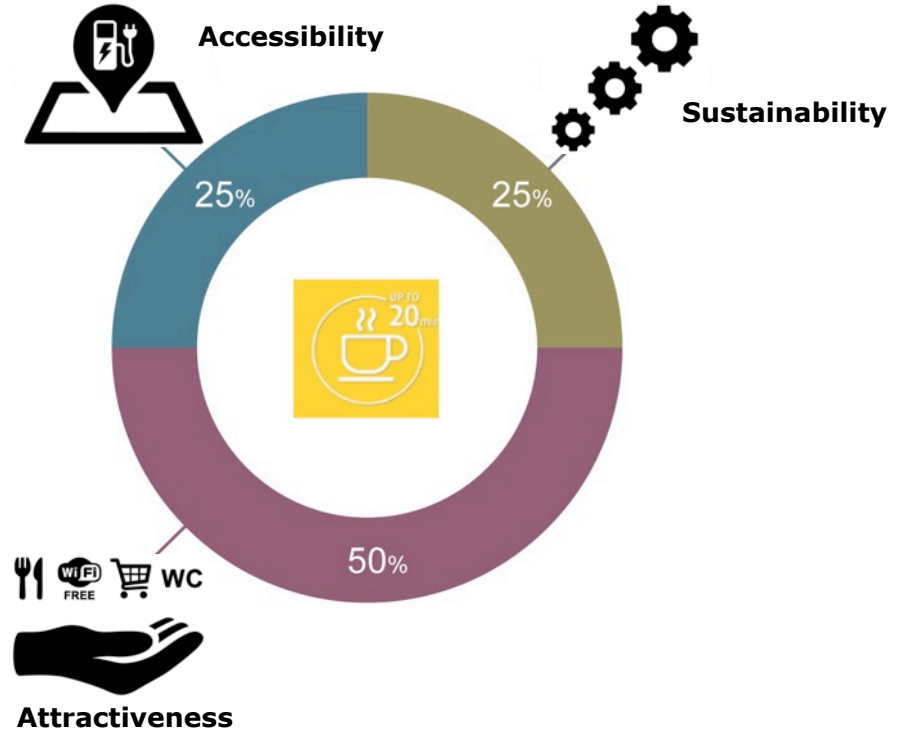
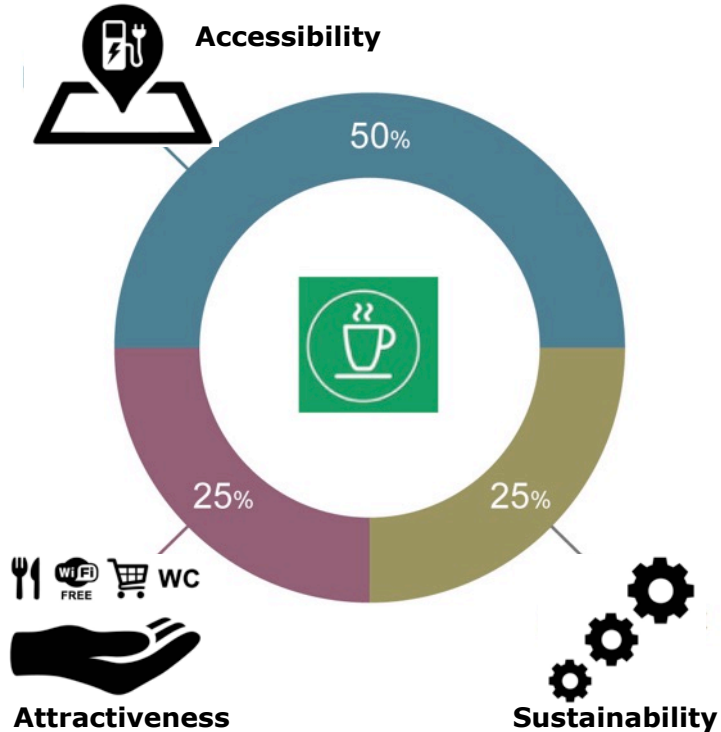
Definition of the criteria

- Each site is evaluated introducing some criteria
- The criteria are grouped in 3 Macro Categories:
 - **Accessibility**, i.e. to what extent the site can catch the traffic flows
 - **Attractiveness**, i.e. degree to which the site is able to offer things to do while the vehicle is charging
 - **Sustainability**, i.e. the potential installation cost, existing and potential competitors






Weighting




- Points are assigned to each criterion but the macro categories are weighted differently:






Accessibility: criteria and points

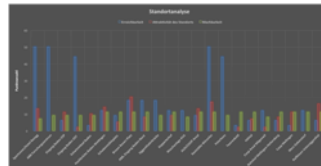
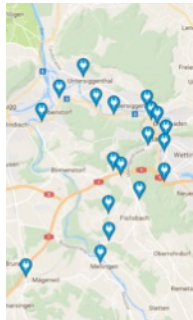
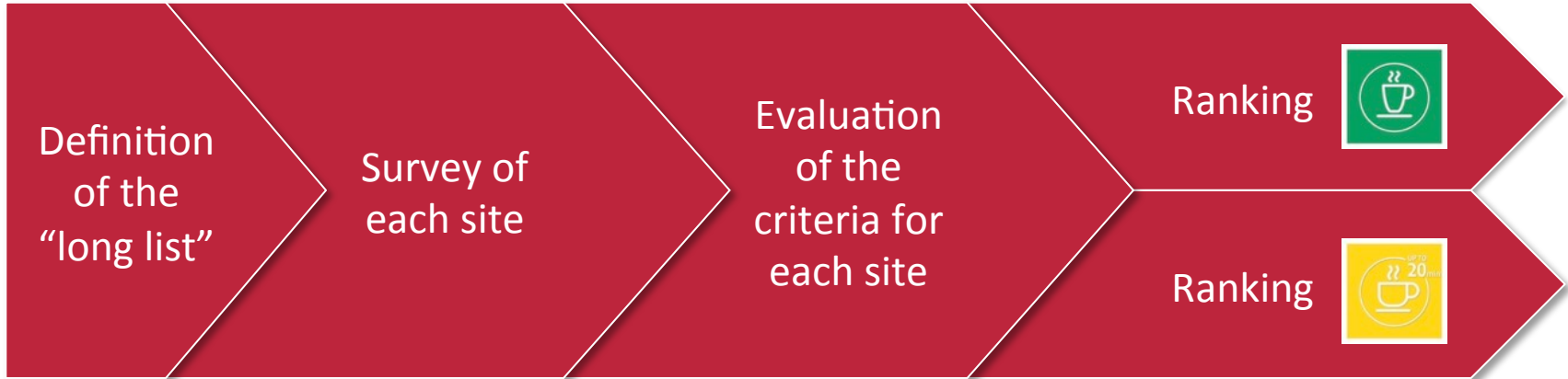
Criteria	Max points		How to assign the points
			
	Total	50	25
Transit vehicles per day	9	10	Maximum if >20'000, 0 if <10'000
Access to main street	6	5	0 if no access and visibility
Visibility from the street	3	5	
Distance to the next motorway entrance	32	5	Maximum if <1km, 0 if >2km

Attractiveness: criteria and points

Criteria 	Max points 	How to assign the points 
Total to be not exceeded	25	50
Restaurant, bar (50-70m)	3	6 Points for each facility
Public toilets (50-70m)	3	6 Max points if at least 1 facility is there
Opening hours (50-70m)	2	4 According the opening hours
Further (50-70m)	2	4 Point assigned for each facility

Sustainability: criteria and points

Criteria	Max points	How to assign the points
	 	
Total	25	
Available power	4	0 if power not enough
Distance from transformer	7	Max if < 30m, 0 if > 150m
Road surface	2	Max if already paved
Expansion possibility of the area	3	Point assigned for each facility
Duration of contract	3	Max if area owned or 30y concession
Distance to other existing fast charger	3	0 if < 0.5km
Distance to existing motorway service areas	3	0 if < 20km










Example












- Site 1: city border, close to the highway entrance, with pretty limited food and shopping opportunities
- Site 2: semi-central position, with several food and shopping opportunities
- Site 3: rest area on the highway with a good offer of food and shopping opportunities










Example: Accessibility score

Criteria	Site 1			Site 2			Site 3		
	 			 			 		
		39	14		13	7		47	20
Transit vehicles per day	13'962	4	4	8'361	0	0	127'024	9	5
Access to main street	No	0	0	No	0	0	Yes	6	5
Visibility from the street	Yes	3	5	Yes	3	5	No	0	0
Distance to the next motorway entrance	400m	32	5	1.7km	10	2	0km	32	10

Example: Attractiveness score

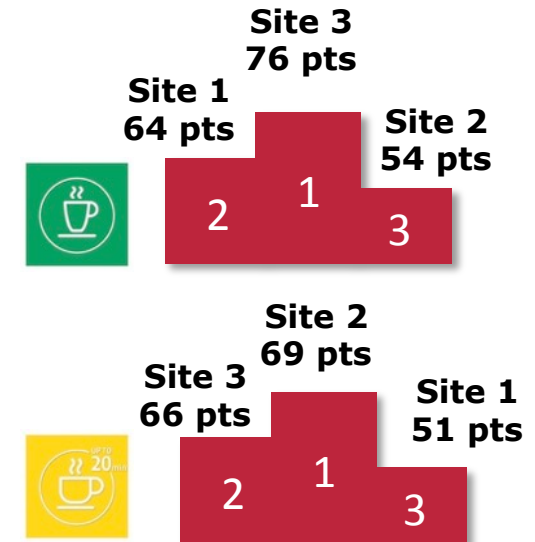
Criteria   FREE   	Site 1	Site 2	Site 3
	 	 	 
	12 24	22 44	17 34
Restaurant, bar (50-70m)	1 3 6	3 9 18	2 6 12
Public toilets (50-70m)	Yes 3 6	Yes 3 6	Yes 3 6
Opening hours (50-70m)	6-23 2 4	5:30-2 4 2 4	7-24 2 4
Further (50-70m)	2 4 8	4 8 16	3 6 12

Example: Sustainability score

 Criteria	Site 1		Site 2		Site 3	
	 		 		 	
	13		18		12	
Available power	Yes	4	Yes	4	No	0
Distance from transformer	120m	2	20m	7	180m	0
Road surface	OK	2	OK	2	OK	2
Expansion	No	0	No	0	Yes	3
Duration of contract	Unlimited	3	Unlimited	3	20 y	2
Distance to other existing FCs	>1km	2	>1km	2	>1km	2
Distance to next rest area	17km	0	15km	0	>20km	3

Example: and the winner is

	Site 1		Site 2		Site 3	
Macro-criteria						
Total	64	51	53	69	76	66
Accessibility	39	14	13	7	47	20
Attractiveness	12	24	22	44	17	34
Sustainability	13		18		12	



Conclusions

- The method was developed to provide answers to the potential investors in fast charging infrastructure, not to study a theoretical way to find the best locations.
- The usual criteria like traffic flow, points of interest close to the location, installation costs (available power and distance to the closest MV/LV stations) were not enough for a location assessment.
- It was necessary to develop a new method including:
 - a way to assess what is the best charging station matching the site characteristics
 - criteria related to the client's long-term business models:
 - impact of current and potential competitors (access and visibility from the main street, distance from other existing or planned charging stations, distance from rest-areas on the highways)
 - possible development of the location (increase the on-site number of charging stations)
 - length of the period that can be used to get a positive ROI (length of the land concession)

Thank you for your attention

