

Shared spaces in Canada: an evaluation of their applicability using focus-groups

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Paper prepared for presentation
at the Geometric Design – Present Challenges Session

of the 2014 Conference of the
Transportation Association of Canada
Montréal, Québec

Acknowledgment:

The authors wish to acknowledge the financial support of Transports Québec (Ministry of Transportation of Québec)

Abstract:

Traffic conflicts between pedestrians, cyclists and motorized vehicles are handled with stop signs, traffic lights, pedestrian crossings and bicycle tracks and lanes. If these traffic management measures are still present in most 30km/h or reduced speed zones, they are not part of a shared space type of street, named “zone de rencontre” (ZR). In such a zone, motorized vehicles and vulnerable users share the same infrastructure, and pedestrian have priority over vehicles and can cross anywhere on the designated section. After years of try-outs, this concept was officially accepted in Switzerland (2002) and is now spreading in Europe. It is also raising interest among traffic planners in North America. The Ministry of Transportation of Quebec asked Polytechnique Montreal to evaluate the safety outcomes and the applicability of this concept in a Canadian traffic context, considering all aspects (roadway design, winter maintenance, driving culture and our roadway Code).

Since ZR are not yet implemented in Canada, it was decided to present European cases to Canadian experts to judge the applicability of the concept. Experts were consulted through a series of 13 focus-group held cities of various sizes, gathering just over 223 experts. A special attention was drawn on ZR in a context where a high number of pedestrian interacts with high traffic volumes. Videos and photos from specific cases were shown to experts. Design, environment and traffic conditions were judged for their applicability in a Canadian context.

One of the main finding is that the vast majority of experts and officials are willing to introduce, in the Highway Safety Code a “caution principle”, considering that all users must pay attention to other users, especially the most vulnerable ones. Experts also believed that pedestrians and bicyclists should have priority over motorized vehicles. They agreed that ZR could be introduced, but inside a pilot-project frame, since there is comprehensive fear around the concept, especially for pedestrians visually impaired. Linear central refuges for pedestrian, allowing crossing in a two-step sequence, was found an interesting design solution for two-lane roadways, since it reduces speeds and it is forgiving for vulnerable users. Finally, since ZR are not known by the general public, it is necessary to develop an information campaign for all roadway users if such zone are to be implemented.

Background

Traffic conflicts between pedestrians, cyclists and motorized vehicles are handled with stop signs, traffic lights, pedestrian crossings and bicycle tracks and lanes. If these traffic management measures are still present in most 30km/h or reduced speed zones, they are not part of a shared space type of street, named “zone de rencontre” (ZR). In such a zone, motorized vehicles and vulnerable users share the same infrastructure, and pedestrian have priority over vehicles and can cross anywhere on the designated section. After years of try-outs, this concept was officially accepted in Switzerland in 2002 (1) and is now spreading in Europe (2-4). It is also raising interest among traffic planners in North America but is considered not yet sufficient for the mobility impaired (5). The Ministry of Transportation of Quebec asked Polytechnique Montreal to evaluate the safety outcomes and the applicability of this concept in a Canadian traffic context, considering all aspects (roadway design, winter maintenance, driving culture and our roadway Code).

Objectives

The main objective of this paper is to evaluate the applicability of the ZR concept in a Canadian context considering at once the safety and the mobility of vulnerable users, the northern climate and the North American legal context (rules of the road).

The technical objective of this paper, related to the hypothesis, is to evaluate the potential effect of a group discussion, with added value from video inputs, on the general perceptions of specialists.

Hypothesis

It is hypothesized that with a context-sensitive presentation, including photos and especially videos, as well as interventions from the participants, people could better understand the ZR concept and therefore possibly changing their opinion about the concept. This hypothesis comes with several discussions with experts arguing that the ZR concept can hardly be explained by words or even pictures. Since it is a dynamic concept, where pedestrians and vehicles are constantly negotiating their right of way, with a pedestrian priority, the only way to understand it or to have an idea on the feasibility in North America would either be to see it live or on videos.

Methods

Since the ZR concept remains unknown, nor implemented or officially defined or authorized in Canada, it is quite hard to evaluate its applicability. Therefore, it was decided to evaluate it through a series of focus-groups. Specialists and representatives of associations from different backgrounds were invited. Engineers, urban planners, architects, universal design specialists, policeman, managers of winter maintenance and fire rescue teams, user group representatives such as cyclist, visually impaired, hard of hearing and deaf, wheelchair user, youth, senior, were all invited to the round table. A total of 13 focus-groups were held in 11 cities with a population ranging from 38 000 to 1 000 000 habitants. Those small, medium-sized and metropolitan cities were: Montréal, Québec, Longueuil, Drummondville, Victoriaville, Saint-Jean-sur-Richelieu, Saint-Hyacinthe, Granby, Sorel-Tracy, Châteauguay and Salaberry-de-Valleyfield.

Two-hundred and twenty-three participants ($n=223$) took place in a 3-hour session to discuss several topics related to cycling and pedestrian safety. During the session, a special attention was drawn on the ZR concept and on long central refuges, designed to cross streets in a two-step sequence. Three ZR concepts from Germany were presented: Duisburg, Speyer and Brühl. All were located in downtown-core, and both account high pedestrian and traffic volumes, even after the ZR was built. Videos and photos were shown to participants and a brief context of the before and after situations was explained. The main variables exposed in the before/after context were posted speed, operating speed, traffic volume, number of lanes and length of the zone.

To judge the applicability of the ZR concept, nine questions were asked before and after the session. All participants had a response card for answering the questions. This card was linked to the presentation's software, allowing to record the individual results and to display the group results "live". To avoid any peer-effect in the answers applying to the ZR concept, results were not shown to participants in both the before and after questionnaire specific to the ZR concept. For the rest of the discussion, group results were shown to the group, once everybody had answered. Group results were shown to the group for the three ZR study-cases. When the group answer was shown, everyone could have a clear picture of the other participant's perceptions. The reason to keep anonymous the final nine "after" questions, applying to the ZR concept, is to let participants feel free to either change their mind, or stick to their original ideas.

All participants were asked to complete, once back at the office, a detailed Web questionnaire. However, since questionnaires are still at the compilation stage, these results will be discussed in future papers. Same thing for all the others safety topics related to cyclists and pedestrian during the focus-group, they will be addressed in other publications.

Results

Before and after questions on ZR concept

A large majority of experts and officials believed the ZR concept is applicable in a Canadian context on certain streets. A significant difference was found (T-Test; $p<0.01$) on answers given after the session (92.4 %), compared to the answers given before the session begun (74.1%). Table 1 gives all before and after results, with significant changes of perceptions being highlighted by a significant p on the T-Test.

Table 1 Before and after answers on the ZR concept applicability (n=223)

Question on the ZR concept	Participants agreeing on applicability (%)		T-Test $p < 0.05$
	Before	After	
Do you think the ZR concept is applicable in Quebec, on specific streets?	74.1	92.4	0.01
In a ZR concept, do you think pedestrian priority is applicable?	85.5	89.9	NS
In a ZR concept, is it applicable to let pedestrian walk and cross wherever on the infrastructure?	47.7	70.3	0.01
In a ZR concept, is it applicable to let conflicts be solved by courtesy and eye contact?	60.6	73.2	0.01
In a ZR concept, is it applicable to have an operating speed lowered at 20 km/h?	76.4	86.2	NS
In a ZR concept, is it applicable to have no signalization or markings inside the zone, only signs when entering/leaving the zone?	55.0	59.7	NS
In a ZR concept, is it applicable to have no stop signs or traffic lights?	52.1	77.4	0.01
In a ZR concept, is it applicable to have no crosswalks?	68.2	76.1	NS
In a ZR concept, is it applicable to have no sidewalk and to have an at-grade infrastructure?	74.0	76.0	NS

Experts strongly believe that it is possible to officially warrant priority to pedestrian over vehicles, in a ZR concept (89.9%). No significant difference was found on before and after proportions, thus telling how important was and remains this belief.

One of the main turn-over relates to the possibility of letting pedestrian occupying the whole “shared infrastructure”, and to let them cross freely wherever they want. One fourth of all participants changed their mind, realizing that the ZR section is in fact a very large crosswalk. Instead of having a 2- or 3-meters wide crosswalk, it is extended to 75 to 125 meters.

A large consensus was noted around the feasibility of achieving an operating speed of 20 km/h, with thorough and effective design of a ZR.

Approximately three thirds of participants agreed on removal or absence of stop signs, traffic lights, crosswalks and conventional sidewalks to comply with the ZR concept. Although sidewalks as we know them in general (concrete and high height) are to be avoided, everyone agrees that a certain type of separate and protected corridor, detectable by the blinds and visually impaired, are needed, in order to give a safer zone to the most vulnerable or unsafe pedestrians. Removal of means to stop car traffic (signs or lights) was seen as hardly applicable at the beginning of the focus-group, but a significant 25% change of perception was noted after the session.

Surprisingly, the absence of general signalization such as marking seemed less applicable (59.7%) than the removal of stop signs and traffic lights (77.4%). It could be assumed that a “naked street” type of layout is not part of our scheme when it comes to street design.

Finally, to completely rely on communication and courtesy as a mean of crossing, instead of crosswalks or crossing lights, was judged applicable by 73.2% of participants. Although this proportion measured at the end of the session reveals a significant change in the participant’s perception, the first statement explained in each group was: “ how can a blind person make eye-contact?” For blind and visually impaired persons, the experienced difficulties to cross road is a great problem. To consider the specific problems of blinds or visually impaired in ZRs would mean to have, at least, the same kind of design considerations than on conventional uncontrolled crosswalks (with no lights, only markings). This would lead to the installation of tactile pavements, high contrasts and textures that are detectable at points of crossing where car drivers would necessarily stop. Another solution could also be to add and eye-intelligent camera alerting a blind pedestrian when traffic has stopped. The lack of guidance devices in vast and opened pedestrian spaces is a well-known problem for the blinds and visually impaired, and it deals with consideration of this specific need that architects should always have in mind. Crossings for the blinds and visually impaired is a different than general orientation in a pedestrian area. It necessarily involves interaction with vehicles, so it should be addressed with the same scope as crossings are in other parts of the city.

General questions

One of the main finding is that most experts (90.4%) are willing to introduce, in the Highway Safety Code of Quebec, a “caution principle” (*“principe de prudence”*), considering that all users must pay attention to other users, especially the most vulnerable ones. Some participants were wondering why this principle was not already in the Code, while others mentioned that it is sometimes hard to distinguish between a “dangerous action” and “being cautious”.

When answering the question: “ who should have priority in an urban road sharing scheme”, the sum of all participants made it clear that it should be given to pedestrian with mobility impairment, then pedestrians and cyclists, and finally to cars and heavy vehicle drivers. Figure 1 shows the ranking of the five different user groups, for the Montreal’s focus-group, where 5 points were given to the user group judged most important, then 4 points to the second most important, and so on.

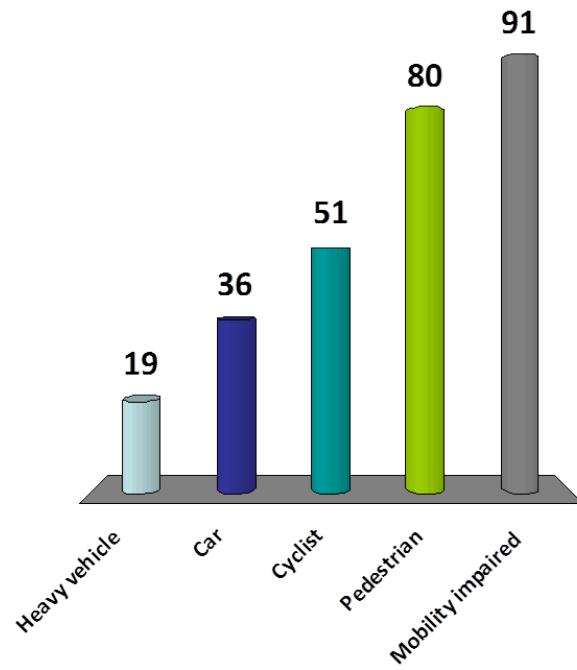


Figure 1 User's priority defined by participants in Montreal, Quebec.

Case #1- ZR concept: Duisburg, Germany

In Duisburg, Germany, a city of 500 000 inhabitants, the Landfermannstraße in front of the Opera Square (Opernplatz) was redesigned in a ZR (Table 2). Posted speed was lowered to 6-8 km/h (default walking speed in Germany). This arterial street previously had two lanes in each direction and left turning lanes (Figure 2). Now the space allocated to vehicles was reduced to the minimum (Figure 3). A 30 km/h zone surrounds each side of this 100 to 125 m long corridor.

Table 2 Design and environmental conditions of case #1 before and after the ZR implementation

Street parameter/condition	Before	After
Posted speed (km/h)	50	6-8
Operating speed (km/h)	?	?
Average daily traffic (veh./day)	?	14 000
Length of the zone (m)	100	100
Number of lanes	6	2

One amazing thing about the Duisburg case is the high rate of compliance to pedestrian priority, even though 14 000 vehicles are passing through the zone each day (Figure 4). Vehicles are riding through the zone very slowly, as one could even jump in a moving car, and this is probably why 75 % of the experts rated this concept applicable to Canada during focus-groups, after seeing videos of how it works.



Figure 3 After situation (Duisburg, Germany)

Figure 2 Before situation (Duisburg, Germany)



Figure 4 Car drivers yield almost instantly to pedestrians in Opernplatz ZR (Duisburg, Germany)

Case #2- ZR concept: Speyer, Germany

In Speyer, Germany, a city of 50 000 habitants, the Domplatz was transformed into a ZR, surrounded on both ends by a 30 km/h zone and also by a pedestrian area in front of the Dome (Table 3). Texture of the pavement is similar in all these zones; the only demarcation comes from the bollards, well-separated and not useful to blinds or visually impaired (Figure 5). Again here, without having real values of

measured speeds, it was obvious that it was very low. Pedestrian stood still in the center of the shared zone for several seconds without being threat by motorists. The reason for this success is probably the high ratio of pedestrian/vehicles, since there are about 10 000 to 15 000 pedestrian occupying this place every day, twice as much as cars. In the focus-groups, 62% of participants thought this concept could be applicable to our North American context. The main reason why it would not be is the evident lack of guidance for the most vulnerable users.

Table 3 Design and environmental conditions of case #2 before and after the ZR implementation

Street parameter/condition	Before	After
Posted speed (km/h)	50	6-8
Operating speed (km/h)	?	?
Average daily traffic (veh./day)	?	7 000
Length of the zone (m)	300	300
Number of lanes	4	2



Figure 5 The ZR in Domplatz has a very high pedestrian/car ratio (Speyer, Germany)

Case #3- ZR concept: Brühl, Germany

The ZR concept deployed in Brühl, Germany (population of 45 000 habitants), was the least popular amongst the focus-group participants. The applicability rate was 45%. People did not like the general layout, stating that the big white squares over darker grey tiles were confusing (Figure 6). Nevertheless, this was done on purpose, to break former rules of delineation that normally induce faster driving. Our classical schemes and expectations are straight lines. But this is exactly what the ZR concept tries to

avoid. In order to reduce speed, one possible solution is to get rid of the corridor effect, to place the driver in a more alert mode. The Brühl concept achieved significant speed reductions. The whole zone used to be a roundabout where operating speed was very high, leading to a high number of car-car and car-pedestrian accidents. With the introduction of the ZR concept, mean operating speed was cut by half, from 50 km/h to 25 km/h (Table 4). But the concept fails in some aspects as no detectable lining is provided and a fence had to be placed along the bollard lines, moving away pedestrian and preventing them to cross in the zone considered more unsafe. This explains how the original design might not have included open public space with terraces too nearby.

Table 4 Design and environmental conditions of case #3 before and after the ZR implementation

Street parameter/condition	Before	After
Posted speed (km/h)	50	6-8
Operating speed (km/h)	50	25
Average daily traffic (veh./day)	9 000	9 000
Length of the zone (m)	300	300
Number of lanes	4	2



Figure 6 In Brühl, Germany, operating speed was reduced by redesigning a roundabout into a ZR

Case #4- central refuge: Köniz, Switzerland

In Köniz, Switzerland, a city of 40 000 habitants, the Schwarzenburgstrasse was redesigned on 300 meters, as a 30 km/h zone with two lanes taken away to enlarge sidewalks and to include a wide central refuge (Figure 7). This experience proved it is possible to keep a high traffic volume in a section by slowing down vehicles and removing traffic lights. Instead of moving fast, then stop, moving fast again, then stop again, cars now go across the whole zone with in a “slow flow”. A 300 meters long central refuge is available to pedestrians, who can now cross the street in a two-step sequence.



Figure 7 Wide sidewalks and central reserve in Köniz, Switzerland, replacing two lanes on a busy street

Although speed was reduced, no negative effect was shifted to car drivers by this concept (Table 5). It emphasizes on reducing the frustrations coming from the ever-activated red lights at pedestrian crossings. Inversely, pedestrian no longer have to wait several seconds for a green phase to cross. Instead of blocking the whole street with constantly activated crossing lights by pedestrians, they are asked to cross at any time, but implying they have priority over cars “by courtesy”, and by caution principle (Figure 8-9). No matter the time of the day, drivers in the vast majority yield to pedestrians.

Table 5 Design and environmental conditions of case #4 before and after the central refuge

Street parameter/condition	Before	After
Posted speed (km/h)	50	30
Operating speed (km/h)	?	30
Average daily traffic (veh./day)	16 000	16 000
Length of the zone (m)	300	300
Number of lanes	4	2



Figure 8 Crossing in a two-step sequence allows to concentrate on one direction at a time (Köniz, Switzerland)



Figure 9 A high pedestrian/car ratio is always an indication to car drivers that they must yield to pedestrians (Köniz, Switzerland)

The Köniz case, as it was presented during the focus-group, was judged applicable by 85 % of the participants, making it the best applicable scenario amongst the six study cases. Tactile pavements were installed in Köniz but improvements could be made if it would be rebuilt. Also snow clearance could be a problem as lighting poles and concrete obstacles are placed along the refuge.

Case #5- central refuge: Ulm, Germany

In Ulm, Germany, a city of 120 000 habitants, the Neue Strasse was rebuilt on a stretch of 250 meters (Table 6) with the objective to make the downtown core a more livable place, and a safer street for soft modes, which are predominant at certain hours (Figure 10). A deviation road was previously built outside the city in early 1990's and traffic dropped from 35 000 to 22 000 vehicles per day. But this was not enough. To address the accident problem and to give back public space to citizens, the municipality designed this central refuge. They removed traffic lights for pedestrians but as they were not sure if the Federal Government or the population would adhere to the concept, they placed all the wiring connections underneath the street just in case they would have to place back the controlled crosswalks. Two lanes were taken away (one in each direction) leaving lots of free space for enlarged sidewalks and a new central refuge (Figure 11-12). In locations where pedestrian flow is more important, a concrete protection was added. The demarcation between the roadway and the sidewalk is detectable and easy to pass over (2.5 to 3 cm). Traffic volume significantly dropped after the zone had been rebuilt.



Figure 10 Safety of cyclists and pedestrians is a priority for the municipal officials of Ulm, Germany

Table 6 Design and environmental conditions of case #5 before and after the central refuge

Street parameter/condition	Before	After
Posted speed (km/h)	50	30
Operating speed (km/h)	50	30
Average daily traffic (veh./day)	22 000	13 000
Length of the zone (m)	250	250
Number of lanes	4	2

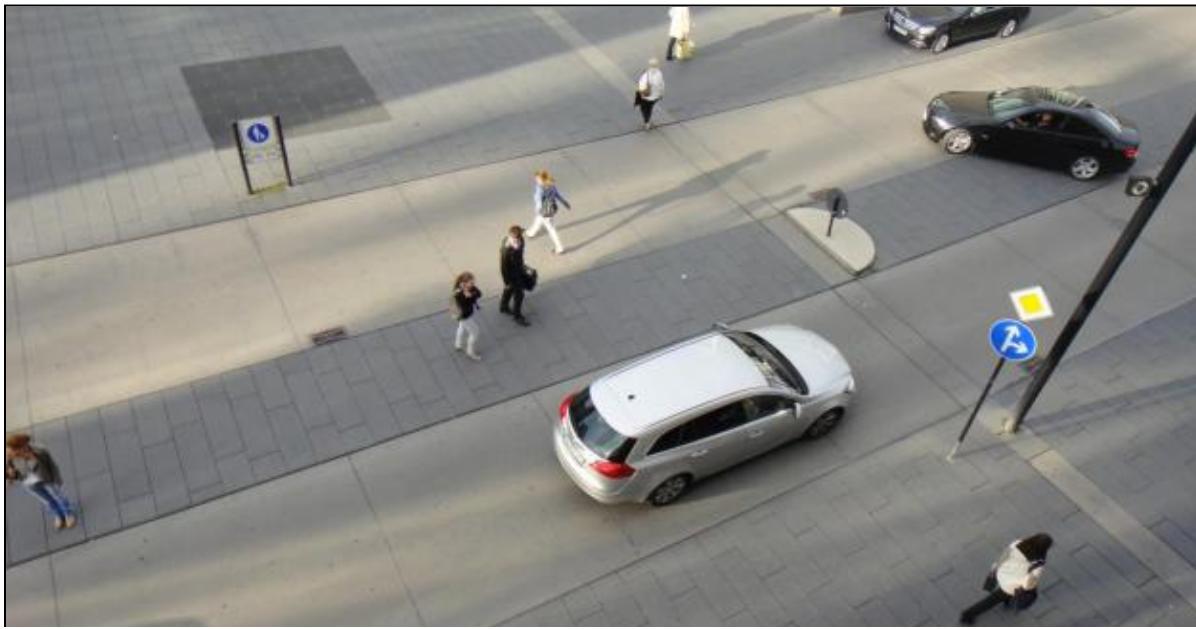


Figure 11 Two lanes were removed for central refuge and sidewalks enlargement (Ulm, Germany)



Figure 12 No injury accident for two years was the condition for this pilot-project to become permanent

The Ulm study-case was found applicable by 81% of the participants. They liked the design, the architectural aspects and the potential ease to maintain it in winter time. Although it looks a bit like shared space or ZR concept, it seemed more close to what we are used to see in North America. Improvements for the blinds and visually impaired could also be planned to facilitate the crossing.

Case #6- central refuge: Thun, Switzerland

In Thun, Switzerland, a city of 42 000 habitants, crosswalks creating congestion were replaced by a “virtual” central refuge (Figure 13). This is probably the most look-alike scenario in Switzerland that relates to the North American context, with lots of parked cars on the side of the road. But this central refuge offers no protection, nor detection for the blinds and the visually impaired pedestrians. It entirely relies on the good will of car drivers to stop for pedestrians, which could not always be a significant element to trust in Quebec. Nevertheless, it was estimated applicable here by 82% of the focus-groups participants.

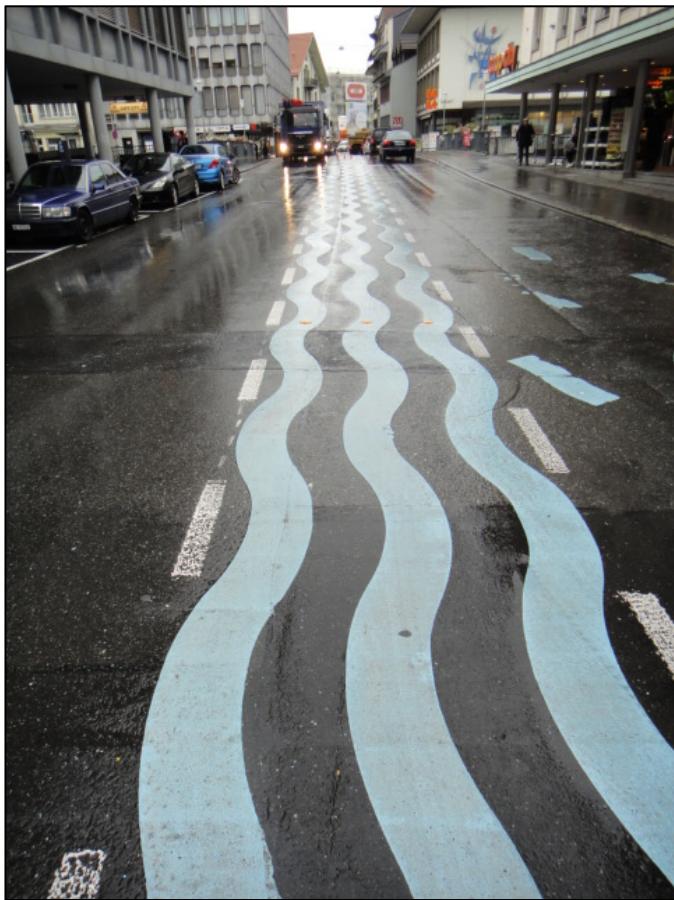


Figure 13 In Thun, Switzerland, a central refuge was preferred to crosswalks that created congestion

Conclusion

The focus-groups showed willingness, even amongst municipal officers, to shift the paradigm from car centric to soft mode oriented. Instead of partial considerations for vulnerable users, municipalities should start a design process with the most vulnerable in mind, and accommodate cars afterwards. This might seem ideological but they were the fact expressed quite evidently in any of the thirteen focus-

group. It was clearly addressed that a caution principle should be added to the Highway Safety Code, preventing all drivers to pay special attention to vulnerable users. Also, in the way we design streets in urban areas, participants stated that cyclists should have priority over motorized vehicles, and pedestrians should have the absolute priority over all other types of users, with a special consideration for pedestrian with reduced mobility.

Regarding “zones de rencontre”, the ZR concept was gaining interest amongst participants as they had time to understand more clearly the concept with videos and a brief explanation of the municipality involvement. At the end, 92% of participants thought that a XZR could be introduced in their municipality, but they said it would only be possible in very specific areas, and at precise conditions, (high pedestrian/car ratio), with a design that would induce very low speeds, and that would allow blinds and the visually impaired to circulate adequately in this environment.

Considering all these facts and the comments received in the focus-groups, it would be relevant to implement a ZR inside a pilot-project frame, since there is still comprehensive fear around the concept, especially for visually impaired pedestrians. Central refuge for pedestrians on two-lane roadways was noted as an interesting and applicable solution by a majority of participants. It has three major advantages: safety from speed reduction, forgiveness for vulnerable users (two-step crossing) and keeping traffic flow at the same rate, since reduced speeds are combined with the absence of long crosswalk light-phases. Again the main concern is to design properly for the blinds and the visually impaired. Technological solutions implemented at certain locations of the refuge should be experimented in further studies.

Finally, since the ZR concept and the linear refuges are not known by the public, it would be necessary, if such zones are implemented, to develop an information campaign in parallel to the pilot-project.

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