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Vélo Mondial

VULNERABLE, YET SUSTAINABLE

'Mobility for vulnerable road users worldwide'

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SUMMARY

This paper focuses on road safety for sustainable modes, namely non-motorized transports. To tackle with this topic, we consider the mobility reflection as the sine qua none condition. Even though 90 % of road injuries occur in developing countries, sustainable mobility and public transport passengers represents 90 % of them. 2020 forecasts are quite alarming as these figures may increase by 65 % while safety will increase in high-income countries. Nowadays, sustainable mobility users suffer of barriers effects created by policies toward road motorized transport. Hence, sustainable mobility became less safe and less competitive. A sustainable solution could be low speeds with consistent road designs in order to get an equilibrate force balance between all road users.

RESUMÉ

Ce document traite de la mobilité des usagers vulnérables de la route dans le monde, principalement les usagers des modes non motorisés. Nous analyserons plus précisément la sécurité et le confort pendant le déplacement. Alors même que 90 % des accidents de la route ont lieu dans les pays en développement, 90 % d'entre eux concernent les usagers de la route les plus vulnérables que sont les piétons, les cyclistes et les usagers des transports en commun. Et la tendance ne devrait pas s'inverser puisque le nombre d'accidents devrait augmenter de 65 % en 2020 dans ces pays alors que, dans le même temps, la sécurité routière est en progression dans les pays riches. Les effets de coupures créés par les politiques en faveur des modes motorisés ont diminué la compétitivité et la sécurité des modes durables, situation qui pourraient perdurer dans les pays en développement. Pour que l'usage de ces modes soit de nouveau sécurisé et confortable, la voirie et l'espace public dans son ensemble doivent être conçus en prenant en compte les besoins des usagers de chaque mode de transport. Par exemple, une réduction des vitesses automobiles dans les centres villes grâce à une conception réfléchie des infrastructures permettrait un meilleur partage de l'espace public.

INTRODUCTION

Around 1.2 millions deaths and between 20 and 50 millions injuries worldwide in 2002! Road traffic safety is nowadays a major public issue. If casualties decrease in high-income countries, 2020 forecast for low and middle-income countries are very pessimistic whereas they already represent 90 % of victims [1]. Vulnerable road users are those who travel without any integral body protections, who cannot drive and person with reduced mobility: parents with pushchairs, children, elder people and people with motor, visual, auditory or cognitive disabilities. There are two kinds of mean of transport used by vulnerable road users:

- Motorised transport users: car drivers and passengers, motorcycle riders, mopeds and public transport customers

- Non motorised transport users, also named self driven transport, human powered transport or sustainable mobility: pedestrians, cyclists, roller or child scooter

Even if we are aware of the increasing risk for motorized riders, we focus only on the second group. Why? Firstly, soft means users do not often expose themselves to the high speeds that motorized means can. Secondly, the willingness of sustainable mobility users to choose the shortest way, even when it is dangerous, is much higher as they do not want to make needless or superfluous efforts. In a way, they save their own physical energy needed to move.

Non-motorized transport and particularly bicycle have to face to a paradox. A greater part of people would use it, if only it was safer. However, cycling risks decrease if the cycling modal split increases [2, 3]. This paradox highlights the need of a safe and comfortable transport supply to increase the use, and reach a high level of security. To understand better the needs of human powered transport, we will expose the individual and the public advantages to increase sustainable mobility. Then, we will understand the need to implement a transport supply that fit with the natural behaviour of sustainable mobility users. Finally, we will focus on the condition to success needed to implement such policies.

1 TOWARDS A SUSTAINABLE MOBILITY?

Nowadays, the global warming, the dwindling of some natural energy resources, the negatives external effects of motorized vehicles and the urban sprawl compel to the development of alternative mobility approaches, particularly as alternatives for the car. As defined on the forum of the automobile and the society: “sustainable mobility is the ability to meet the needs of society to move freely, gain access, communicate, trade and establish relationships without sacrificing other essential human or ecological values, today or in the future” [4]. In this way, sustainable mobility, particularly cycling, contribute on many points to a sustainable mobility.

1.1 Vulnerable mobility, yet sustainable!

From the economic point of view, sustainable mobility enables a decrease of the individual mobility budget, an increase of spending within city centres shops and an efficiency of public investments. Firstly, sustainable mobility use is low cost way of moving as no paying license is required, vehicles are quite cheap and the energy use comes as part of the individual daily food consumption. Cycling increases the mobility thanks to its autonomy and is a fast door-to-door mode on proximity trips, around 5 kilometres according to the country. This is mainly relevant for developing countries where walking is often the only available mode of transport [4]. Moreover, working conditions could be less painful and non-motorized 2 or more wheelers could increase the productivity in low and middle-income countries. For instance, bicycle enables to carry five times more goods, notably for water head carriers. Secondly, despite of existing prejudices, sustainable mobility users spend more money in city centres than car drivers do [5, 6 7]. Thirdly, sustainable mobility public investments are unitary cheaper for parking than car [5] or public transport trips [8]. Moreover, the urban space needed for parking and moving in lower than for motorized transport [2]. Even if most mobility external effects are mainly positives, might saving their life is not economically efficiently. In fact, a whole economy gets benefits of negative effects of motorized mobility. For instance, costs of road crashes on average are equivalent to 1 or 2% of the GDP [9]. In France, a research program called PREDIT is currently starting to bring a whole road safety economic analysis [10]. If saving lives could lead to economical losses, incentives to decrease it are advocated toward a human and more ethic way.

From the social point of view, walking is the human natural way of moving and almost anybody can ride a bike. The public space management toward non-motorised transports leads to a more convivial environment. Then, sustainable mobility is individually healthy. Users are physical active and breathe in less traffic related air pollutants than car drivers [2]. For the public health, it contributes to a decrease in polluted emissions. In addition, the risk generated by sustainable mobility to other road users is almost null compared to how motorized transport can hurt other road users.

From the environmental point of view, sustainable mobility use is a zero-fuel, zero-emission, and almost zero noise mode of transportation. The development of these means of transport would ensure car congestion relief, oil energy saved and less energy needs.

Let us focus now on the current use and the road safety for self-driven modes.

1.2 Use of sustainable mobility in the world.

First of all, following data could not be compared as they have been collected in many different ways: short term/long term surveys, manual or automatic accounting technical, seriousness, estimation or forecast, population sample, kind of trips, separation between non motorised and motorised two wheelers, record of walking as a mean of moving …). The following figures have to be read as order of magnitude of the current use of sustainable mobility on Earth:

- In Africa and Asia, it represents appreciatively half of all trips, mainly walking [11].

- In China in 1995, cycling and walking represented both more than 30 % of trips [12].
- In Japan, the bicycle modal split was 14% in 2002 - 2003 [13].
- In Delhi in India, more than 50 % of the trips are achieved by foot or by bicycle.
- Only 2% ride the bicycle in Egypt predominantly for cultural or religious reasons [14].
- In USA, 9 % of trips are made by foot and only 1 % by bicycle in 2001 [15].
- In Europe, the bicycle modal share is around 5 and 10 % [13] and the pedestrians' one is between 15 and 30 % [9]. The Netherlands with 27 % and Denmark with 18 % of all trips are leaders of the most friendly bicycle countries.

In average, Dutch, Danish and Chinese people ride 1 000 km a year whereas American and Spanish ride only 24 km a year [16].

We just want to highlight the main trends and show that some countries succeed in reaching a high level of sustainable mobility use. Indeed, cycling is more popular and safer where it had been encouraged by investment [17].

1.3 Road safety of sustainable mobility in the world.

As usually said, cycling and walking are more dangerous modes of transport than driving a car. Nevertheless, is the safety comparison relevant only if all trips are concerned, is not it? Globally, non-motorised transports mainly use public transport for long trips. In the same time, car drivers are captive of the car use for all kind of trips. As mass transports are safe in high-income countries, the "cocktail transport"[1] is safer than the car use [18]. However, mass transport security conditions in developing countries are often deplorable due to overburden or timeworn vehicles.

1.3.1 Figures

As for the modal split, following data are not comparable and have to be read as order of magnitude. Moreover, figures are often under reporter when accidents do not required police or health services checking [18].

Even though 90 % of road injuries occur in developing countries, vulnerable road users and public transport passengers represent 90 % of them. Forecasts are quite alarming as these figures may increase by 65 % while safety will increase in high-income countries. Males are mainly concerned as well as elderly people. These last are less resistant and cannot easily adapt their speed and their trajectory to the trough flows.

[1] The mean of transport chosen mainly depends on the distance of the trips. For instance in metropolitan cities, people walk to buy is newspaper, cycle for the city centre trips, use the public transport for city-suburb trips and the car to carry people or good and to reach areas where there a low or no public transport supply.

Urban pedestrians account for 55 to 70 % of deaths in low and middle-income countries [19] whereas they only represent 15 % in Europe [9]. In China, 70 % of the 100 000 yearly deaths were sustainable mobility users of which 38% cyclists [12]. We have to point out that private motorized transports are not the only responsible. In Kenya, pedestrians' shocks involve as much as car, bus, taxi or trucks.

1.3.2 Analyses

A report of the OECD ranks the main reasons of road accidents [31]:

- Inappropriate speeds, which are prejudicial to non-motorized transport.
- Dinking & driving increase dangerous motorized behaviours. Nevertheless, alcohol also affects pedestrians. 20 to 30 % of Australian pedestrians killed exceeded 0.15g/dl. Around 60 % of South African pedestrians killed were drunk and 48 % of pedestrians killed in United Kingdom.
- Not wearing seat-belts,
- Young people behaviours. If young people's probability to be killed is higher, it is mainly due to hazardous behaviours and considering their weak level of mastering the skill of driving a car.
- Insufficiently safe design: The insufficiency safe design of infrastructure means that design is not well adapted to mobility flows, particularly to sustainable mobility.

Even if corruption could make it weak or unfair, law enforcement to the fourth reasons could partly modify behaviours [19]. Rather controls, we consider the road design as the best prevention policy to reduce the risks and the gravity of road accident. For that matter, countries that implemented bicycle policies record the highest safety level [18, 21].

One of the main differences between "South" and "North" countries is the experience in road safety, particularly for the health service access. Low and middle-income countries have no or not enough adequate health services to tackle road injuries as high-income countries can. Of great concern is the time passed between the accident and the first assistance as well as the available material.

Then, the access to health care services is linked to the income. In Ghana, only 27 % of people injured in road crashes received hospital treatments [26]. In the same town, pedestrians' injuries risks are higher for less privileged socioeconomic groups than for affluent groups [10, 20]. The growing motorization in developing countries would increase the gap between poor and rich and the vulnerability of sustainable mobility users too.

1.3.3 Consequences

Road injuries, the ninth leading cause of the annual Disability Adjusted Life Years lost for low income and middle-income countries in 1990 would become the third leading cause after ischemic heart disease and unipolar major depression [20].

Casualties affect injured or killed people themselves and lives of their relatives. Injuries decrease individual earning capacities during the time of convalescence or more for long time physical disabilities [20]. Added to that, spending on health care services or burial ceremonies often damages social situations. Some children become orphans.

Regarding to these information, a deep attention have to be urgently paid to vulnerable road users worldwide by providing them safer mobility conditions to improve the quality of life toward a sustainable world. These needs are strengthened by the increasing population that would generate more mobility flows and by the ageing process that would lead to more vulnerable road users.

2 A BETTER NON MOTORIZED MOBILITY SUPPLY FOR A HIGHER SAFETY

Understand the modal choice process and behaviours of vulnerable road users are the unavoidable steps to reach a higher safety. After that, a master plan could be implemented by acting both on supply and demand of mobility.

2.1 Understand the modal choice and current behaviour

2.1.1 The modal choice

The modal choice is interconnected to the individual position in the cycle of life (child, single, parent, worker, retired) and to the external space – time (political, economical, social, technological situations and existing transport networks…). It results in a complex individual decisional process depending on [23]:

- The activities' choice, their frequencies and their location.
- The transport budget.
- The moving capacities: physical, license, level of master and mean of transport accessibility.
- Habits.
- Perception (safe, ecologic, fast…).
- The needs to carry people or good
- Past experience

The way that people do live their trip is often under estimate. The degree of satisfaction of using a mode mainly depends on the individual resources used ….

- Physical: efforts to provide and the capacity to transport people or good.
- Cognitive: to drive or be driven.
- Emotional: convenient with the individual philosophy (Ex: ecology matters).

- Financial: cost of investment, of the driving licence, of use and of maintenance.
- Time: speed performance, reliability and autonomy.

… And on the way of re-appropriation of the travel time (Table 1) in a:

- Productive way: optimisation of the time use by making tasks that will not need to be done later.
- Mental transition way: the time is use to relax and make a transition between two places.
- Social moment way: be alone or share a life's time with relatives, unknown people or other living being.

Table 1: Feedbacks and time re appropriation ways for pedestrians and cyclists

Human powered modes	Feedbacks	Time Re-appropriation	Activities that can be done
By Bike	To drive a vehicle, to chose his trajectory To go fast, to take risks, to be autonomous To make physical activity, to be tired, to sweat, to be wet To enjoy the urban or rural landscape, To stop wherever and whenever.	Productive	To phone with a free hand kit, to practice physical activity, to listen to news on radio, to plan
		Mental transition	To dream, to listen to music or distraction broadcast on radio, to be lost in his mind
		Social moment	To be alone, To speak with other cyclists or with children seat on the bike, to speak with pedestrians when the ride is slower or stopped, to phone with a friend
By foot	To be free hand, to chose his trajectory, To feel safe or not To enjoy the urban or rural landscape, To sweat, to be tired To feel a common human	Productive	To work as planning or having a discussion, to phone, to read for learning (news, books…), to listen to radio (news, cultural (broadcasting), to drink, to eat. To practice physical activity
		Mental transition	To dream, to listen to music, to read for slipping by time (novel, comics…), to smoke, to observe around.
		Social moment	To be alone, to speak with other moving or parked pedestrians or cyclists, to phone with friends.

Depending on resources used, daily sustainable mobility is competitive on short trips, proximity trips. 30 % of car trips in Europe are fewer than 3 kilometres and there are 50 % fewer than 5 kilometres [2]. The potential development of sustainable mobility is real even if some of these trips are included in a mobility chain. However, certain chains could be a combination of human powered modes and public transport. Once the modal choice made, the road users has several itineraries to reach the final destination.

2.1.2 Understand the itinerary choice.

Whatever the legal framework, sustainable mobility itinerary choice is often based on what they think the shortest way is. Cyclist's and pedestrian's comfort is to go on and look freely around him and not be always focus on potholes, pavements, stairs, dog mess, water ponds. Of course, they have to get information about the trajectory of other people flows to adapt them.

As the degree of hardness increases with distance, slope climbs or speeds change, it is so crucial to decrease natural and artificial barriers effects [8, 24]. We list some actions to cancel it:

- Avoid too much raised and slope pavements or stairs to enter in buildings improves the accessibility of disabled people and people who drive good transport wheels vehicles (bins, pushchair, cart …).
- Create pedestrian or/and cyclist ways through, under or over motorized transport networks (highways or railways) (high-speed roads, railways or transportation multimodal hubs unable to link different districts.
- Implement "give way" rather than stops or traffic lights in local interest streets. It improves the flowing, compel motorised modes users to decrease their speeds on crossroad and reduce the efforts of cyclists to stop and go every crossroad. At nights or when the traffic is low, orange blinker could have the same effects.
- Implement safe areas in front of traffic lights. In this way, car drivers get information on the cyclist himself and his direction. Hence, they are more alert.
- Build footbridges enable to cross waterways for sustainable modes.
- Build guides alongside stairs enable to push bikes instead of carrying them.
- Implement a street lighting along pedestrians' ways to feel more secure.

Once the sustainable mobility almost universal behaviour is understood, it is possible to complete an adequate mobility supply that needs to be backed up by soft information.

2.2 The transport supply

The mobility supply is a complex system composed by a legal framework, infrastructure, by the public space planning, vehicles and services.

2.2.1 The legal framework

The legal framework is mainly composed of taxes on polluted vehicles or for parking spaces and of regulation as transport planning rule, new bicycles security components, bicycle parking space in new constructions, accessibility rules for person with disabilities. Aware that theses public interventions has an important

impact on the supply, we focus one rule: the traffic law. This regulation governs the people and goods flows, mainly on the road.

In opposition to Scandinavian or Germanium countries, related traffic laws are rarely strictly respected in Latin or many low and middle-income countries. Let us taken an example: the pedestrian's traffic light is red and there is no car on the road. if the pedestrian were German, he would wait the green light. If he were French, he would cross because he does not feel the need to wait for no traffic reason. In many countries, road traffic laws have been created around the car use and do not fit with sustainable mobility behaviours. We do consider relevant the fact that people behave in function of their individual needs and the crossed environment.

We consider the Belgium traffic law as the most promising law that integrates a new speed balance between all road users is implemented. We could translate as "street law" compare to the French "road law". Speed limitations in cities are 30 km/h. Cyclists can almost use all "one way streets for cars" which decreases the length of trips. Hence, they take the shortest way lawfully. Pedestrians are allowed to cross the road wherever they want instead of going to the zebra crossing.

If law enforcement is required for speeds control, alcohol, drugs or non respect of red lights, behaviours could be better oriented by infrastructure design and related signalizations. Police officers presence in the street could avoid "street accident" between pedestrians.

2.2.2 The public space planning

The public space is a three-dimension space. Functions of the street have to be related to aspects in which sustainable mobility users, rural and urban structures/ architectures play a main role [28].

The urban landscape

The urban landscape is constituted by fire lanes of all means of transport, the street furniture, natural or artificial background as rivers, hills or buildings and people/ vehicles marking or moving. As self driven mean of transports are less complex to drive and go slower than motorised drivers, cyclists and pedestrians are more available to feel the cities and strengthen the local identity. They could be strollers, even for daily trips. In addition, the urban landscape could even influence the itinerary choice.

The infrastructure design

The design of the space, between the buildings, is the transport's supply for non-motorised transport, as well as for motorised modes.

Road design has been deeply influenced by the motorization and congestion models that consider 45 - 50 km/h as the speeds that optimize the motorized traffic. The main consequence is the separation of the public realm between motorized vehicles and other road users: the vulnerable ones. Hence, it creates barrier effects that sustainable mobility users still suffer (*see 2.1.2*). Nevertheless, the question is: Shall we optimise the motorised traffic or all the mobility flows? By improving road design and put lower speed limitations consistent with all road users' behaviours and traffic

flows, safety is better achieved. The first step is to identify the flows related to the activities of the street, of the district or of the road. Then, the road network could be classified in two main categories: mixed or separated.

In local street and districts where motorised flows are low, two combined measures could lead to the creation of mixed areas as in 30 km/h zones, meeting areas[2] or Woornerf:

- Low speed increases the field of vision and decreases the reaction time. Hence, sustainable mobility can cross safer roads as the probability to be killed is lower [2, 20 and 25]. As the speed difference between modes, cyclists get the legitimacy back to ride on the middle of the street. This way is more safe than between parking cars and passing cars.

- To make speed limitations respected, infrastructure designs have to be consistent. First, the number of lanes has to be low. Hence, car drivers cannot go fast because they are afraid to damage their vehicle. Then, some infrastructures compel car drivers to slow down as island, slow point, protected parking or green area, roundabouts, road narrowing, rumble strips or speed bumps [2, 25,26] urge drivers to go slower. In Zurich in Switzerland, there are automatic controls in the 30 km/h zones and the car drivers could see his speeds display on a board to increase is awareness. The first 10 days, the fines were fictive.

Within these conditions, care of motorized transports toward sustainable mobility is complete. Moreover, pedestrians and cyclists cohabitation is successful as they can easily avoid each other, which is not often the case on pavements or cycle tracks. Some evaluations of 30 km/h zones show that these kinds of measure have a direct positive impact on safety. In Graz, the first city with a wide urban concept of 30 km/h zone, there was an increase of 20 % of trips by bikes between 1990 and 1998 although accidents decrease 1988 and 1996 [27]. A decrease of 48 % of casualties has been observed in The Hague (The Netherlands), of 39 % in Toulouse (France) and of 50 % in Nantes (France) within 30 km/h zone [25].

When transit flows are important, road users could be *separated* for comfort and safety reasons. It mainly concerns main urban roads and rural roads. In these cases in urban areas, it is often recommended to put traffic lights to enable pedestrian to cross safely. In Copenhagen, the building of cycle tracks resulted in a decrease of 35% of injuries. For rural roads, separated alongside the main carriage way have to be built where speeds differences are too high. At each crossroad, the cyclists and pedestrian network have to be continued to change easily of direction. The Netherlands and Germany show good examples of rural roads. The link between urban and interurban networks is also relevant for tourist itinerary as promoted in the European project INTERREG. The development of interurban public transport lines is also a good alternative to reach faster and safer the final destination.

As a finely woven bicycle network is not easy to maintain, it is recommended from an economic point of view to build high quality cycle paths on the mains roads and put 30 km/h zones in living street and district.

[2] "Zone de rencontre » in French

The surfacing

The quality of the surfacing of roads, pedestrians and cyclists lanes directly contribute to the comfort and the safety during the travel. Their conception has to facilitate the cleaning and their maintenance. It is important to avoid gravel, holes, cobblestones as well as water ponds or the misshapenness due to roots of trees.

The surfacing choice also depends on the users. The nature and the colour represent information. For instance, bicycles lanes could be painted on crossroad to show to the other public space users the likely presence of cyclists. In urban areas, several types of surfacing help visual disable people to locate the different areas of the street: side walks, motorised roads.

The urban furniture

it helps to give directions and to park. Roads signs or lanes signs give information on the itinerary at each crossroad. The information given is the direction, the mean of transport concerned, the time or the distance to reach it.

Cyclists who try to minimise their efforts avoid being pedestrians and parking their bike as closes as possible to the final destination. Hence, the racks have to spread in a maximum of areas in the city. They have to be resistant against theft and be easily visible to contribute to the urban landscape and be easily identified by the cyclists. In Muenchen, shopkeepers put their own racks with the name of their shops to attract customers. In Rotterdam, there are boxes on the street for private parking when buildings do not have any places.

For pedestrians, sitting is usually more comfortable than standing up. Hence, benches or fortune seats are a part of the parking supply for pedestrians. Bus shelters provide also a protection against climatic conditions.

2.2.3 Vehicles

The characteristics and the quality of all vehicles influence the safety prevention of drivers and of all roads users. First, vehicles need to have good breaks, wheels with good stickiness lights to be visible and components to show directions to other public realm users. This last need specifically but not exclusively is required on rural roads like in Africa where bikes often share roads with motor vehicles during night time without road lighting [29]. Nowadays, motorized vehicles are more and more designed to limit damage to limit pedestrians' collision impact.

If shoes have nowadays become an esthetical object, their primary function is still to minimise painful due to the surfacing.

Cyclists have to choose bicycles that fit in with their master of driven and find ways to keep it in a good shape and to lock it. To make the access to bicycles easier, the price of bicycles has to be accessible. As it is a sustainable mobility mode, we could imagine decrease of taxes or/and removal of importation restrictions [30].

2.2.4 Services

We consider two kinds of services: transport and health services.

Transports services

Main breaks to bicycle use as theft, property, maintenance and parking can be overcome within services. Rental systems are distinct if they are very short term as public bikes [8], short term (Vélostations, OV-Fiets), middle term or long term for students, among others customers. Maintenance services, paying in shops, could be cheap in some associations. In Lyon in France, an association provides tools and advice to repair his bike in autonomy. For people with limited mobility, on demand transport services spread their accessibility.

Public health services

As human errors occur, it is required to anticipate it by carrying out health cares services that can deal with traffic injuries. First health cares have to be done as soon as possible after the accident. Hence, improving communication ways as mobile phone could be effective. Then police officers or firefighters who are likely to arrive first on the crash area point have to be trained in consequence. After that, health care services need adapted materials, which are costly. However, road accident materials could be used for other health cares. Added to these services, re-education and foot doctor contribute to the human body equilibrium, a required condition for comfortable human powered travels.

2.3 Soft information back up mobility supply.

Once the mobility supply is organized, soft information as awareness campaigns or training can encourage behaviours toward sustainable mobility.

2.3.1 Mobility awareness and safety prevention campaigns

Mobility awareness and safety prevention campaigns aim to modify the attitudes of people by promoting sustainable mobility. Speaking about the future impacts of using a mean of transport increase the awareness but it does not lead to a modal report. In order that citizens climb the last stair of the behaviour theory, campaigns have to focus on the immediate satisfaction of using a mode (*report to 2.1*). That is why, we consider that campaigns on the rapidity, on the autonomy, on the re appropriation of the travel time or on likely satisfactions could be more successful. In some big companies, actions aim to decrease the use of the car for home to work travels. There are individual and group discussions with the employees to find alternatives.

Additionally, it could be campaigns towards a better share of the public space by explaining the required respect between all road users or how they could communicate between each other. The city of Lorient, in French Brittany, has recorded a very educational movie to explain the news moving conditions in the city centre. Prevention campaigns to avoid dangerous behaviours like alcohol abuse, speeding, drug uses or being tired and driving are also required.

2.3.2 Training

Despite if, bike ownership is higher than car ownership in many countries; bikes are less used even though more people would like to use it [14]. The perception of the

risks strongly depends on the level of mastering a vehicle in flows of people and goods.

“There is no bad weather, only bad clothes!” Having the right equipment that fits weather conditions puts the sustainable mobility users is a part of the master of sustainable mobility. Hence, cyclists and pedestrians are in better comfort to travel (ex: gloves, bonnet, parka, bob…) and a higher safety (ex: reflective strip).

Nowadays, helmets are compulsory only in Australia. Wearing helmets would reduce head injuries by 63 % and loss of consciousness by 86 %. No particular results have been recorded here, except a decrease of a use of bicycles [21, 31]. Hence, we could ask if the head is the part of the body the most concerned by injuries. However, children certainly need helmets, as there are less resistant and master less the drive of bicycle.

Mastering a means of transport varies on habits created by experience within the traffic. If traffic training for car drivers is often establish, traffic training for pedestrians and cyclists is very poor or not available. Learning how to adapt the right speed at the right moment is an indispensable step towards a high use of sustainable mobility. This know-how demands experience could start on the way to school (Pedibus initiatives) or at school. If in France, children learn in teaching circuit, in Denmark they ride in the real traffic, which is more propitious to a daily use. Recently, the city of Odense, within an EU initiative CIVITAS, has created an interactive cycle simulator to help children to anticipate unpredictable events. Foreign language versions are currently running [32]. If there is no training cession, another way to learn is to ride or walk with others who daily cycle or walk.

Additionally, training of all motorized users should pay more attention to share the road with vulnerable users and increase their reflexes towards non-protected people. It should be include in motorised driver licence process. The fact, that these people and their relatives are partly or fully pedestrians in some of their trips, strengthens it.

To conclude, infrastructure design and speed limitation have to be consistent with soft means of transport users and adapted to all the public space users. Moreover, communication and training enable a better know-how of moving, improve safety condition and increase positive representations. Nevertheless, safer and more comfortable mobility conditions for sustainable mobility users cannot appear without any public master plans, because public authorities deal with the public space planning.

3 CONDITIONS TO SUCCESS

Planning mobility for vulnerable road users has been done in several cities as Amsterdam, Geneva, Odense, Tokyo or Bogotá… and lead to positive results. We have learned from Dutch cities that an increase of bicycle use required [33]:

- A control of the urban sprawl with a land planning strategy that mix the different kinds of activities (residential, services, employment) that decrease the daily distances to travel,

- Drastic conditions against car parking (reduction of allocated space, high pricing policy),

- A bicycle master plan. We could add a pedestrian master plan as in Geneva.

Three main conditions have to be fulfilled to reach safety targets: the political willingness, policies have to fit with the local context and the need to have funding and human manpowered to implement those policies [1, 20].

3.1 Politics willingness

Involvement of politicians is the main impediment to improve mobility conditions as all master plans need their signs to unblock funds [34]. Although implementation of effective measures is a long time frame, measures are often non popular on the short term which match with electoral time frames. Politicians have to be volunteer and courageous. The communication with the citizens, as public consultation is a key element of the success of a policy.

Two ways could be imagined to prompt them to take measures in favour of vulnerable road users. Firstly, it is the implementation of a national policy [13]. Due to the subsidiary rule in Europe, national policy is not meant to lead the local authorities but to create of favourable framework to the development of an economy around sustainable mobility. This transversal action has to involved many ministries in the mobility and safety conditions: transport, education and professional training, tourism, environment, public order, health, shaper industry and research with specialised institutions as INRETS in France or TRIPP in India. If there no national policy, it is not a sufficient argue to not develop bicycle and foot trips. On the contrary, it is a possibility for the politicians to be precursor.

Secondly, lobbies have to show to politicians how they could get more votes by improving mobility conditions, road safety and the public life environment. To analyze the safety economic circuit enable to identify the keys actors who potentially suffer of road injuries. For instance, households with children or elder parents would appreciate safety measures for their vulnerable relatives. In fact, 73 % of Europeans were in favour of cyclists' promotion instead of the car in 1999 [2]. In Lyon in France, the improvement of the quality of pedestrians' ways close to the living place was the first need of household in the transport field.

The example of the city of Graz is striking. The implementation of the 30 km/h zone in Graz was agreed by 58 %. Two years later, 80 % of those interviewed were satisfied! Globally, public authorities have to create a social and economical culture for a better mobility and safety. The implementation of a public bikes service does stimulate a dynamic for the citizens in this way. But, which entity will be in charge of this case?

3.2 Measures have to fit with the local context.

As mobility occurs in a particular space time, policies have to be consistent to the local context. Planning local mobility and improve safety is a transversal policy that concerns several sectors:

- Public authorities that deal with public space and diverse networks, with public order, with land use, with transport network and with architecture protection.

- The shop keepers

- The school and the parents

- The citizens and the associations' delegates

- The transport operators (public transport, taxis, public bikes…)

Create a link between these partners is the aim of working group for the security as Vision Zero in Sweden, Sustainable Safety in The Netherlands and Settle urban safety management in England [20, 35]. If they decide targets and ways to reach it together, safety measures are more likely to get supports, resources and to be effectively implemented. We consider that all urban transport supply on the public ground has to concern the same territory.

3.3 Funding and human expertise sources

If local authorities often do not have the knowledge, the expertise and funding to implement sustainable mobility policies in house, many institutions or international programs have been created to provide them expertise:

- World Governmental Organization like the World Bank, the World Health Organization, UNESCO or United Nations Programs.

- Non Governmental organization like Velo Mondial (Movers for mobility), I-ce (Locomotives or Bicycle Partnership Program) or ICLEI.

- Dissemination of researches projects on the EU level like SPICYCLES, BYPAD or NICHES for the bikes and PROMISING and PROMPT for pedestrians. On the French level, there is the PREDIT program and the CERTU, a public institution provide official manuals.

- International conferences like Velo Mondial, Velo-city, World Road Congress of PIARC or Walk 21 conferences.

- Public authorities associations as "Club des Villes cyclables" or GART in France

Then, technicians of local authorities dispose of a policies panel with their advantages and their disadvantage. Thanks to the policy chosen, they can encourage a sustainable local dynamic within a socio-economic circuit to get more citizens involved.

CONCLUSION

Considering the spread action field of this topic, we did not have the pretension to show an exhaustive worldwide overview of mobility practise and safety. Added to that, our though is deep linked to French and European experiences and we could not have read the worldwide literature available. More than figures, we tried to show a way of thinking for better attention towards the safety and the moving and parking comfort of sustainable mobility. Once again, we insist on the need to elaborate policy that fits with the natural behaviours of human powered transport.

Usually neglected, non-motorized transports networks have to be planned as well as motorised transports networks to improve the quality of life. This awareness is incontrovertible, mainly in developing countries where mobility and safety needs will increase in the next decades. Their use could be competitive on certain trips and answer to many issue of the XXI century. Further economical, mobility, safety and well-being assessments of 30 km/h speed areas or meeting areas in cities would sustain argue for shared areas and human powered mobility.

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