

# The future of bicycle

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The circumstances foreseen in the global economic and environmental evolution of the coming years suggest a framework of complex relations full of tensions which necessarily favour the introduction of some important changes in the current way of operating of the most developed societies. The changes that will occur in mobility will be among the most significant and will favour greater use of the bicycle, especially in urban networks.

The price of the barrel of oil, its repercussion on the cost of all kinds of basic essentials and the unpostponable need to move decisively towards a more sustainable world, will be the main elements responsible. The price of crude, irrespective of the speculative moments as a defensive security which fluctuate and are not long-lasting, will have a sustained (not sustainable) upwards trend as a result of the increase in demand, thanks to an increased number of people now having levels of consumption more in line with the more developed part of the world (without, of course, it being possible to attribute direct and negative responsibility to them in the distribution of this and other natural resources). Consequently, although new unexploited oil reserves are confirmed, and with majority opinion among scientists and oil companies warning that we have already gone beyond the planet's *peak oil*<sup>1</sup>, a greater relative scarcity and an upwards price of the raw material in question should be foreseen. Thus, as is being observed now and probably also in the coming years, it will have an upwards effect on the price of many basic essentials (basic food products, ...) whether speculatively, or due to the relative part of the product linked to oil by-products or due to the mobility associated with any product (local distribution, logistics, ...).

Within mobility, the scenario described would have an unequal effect depending on the energy source of propulsion (electricity, natural gas, diesel oil, benzene...), but oil by-products, either directly or indirectly, have an important effect on the production chain and are significant in private transport systems, where the bicycle, either promoted publicly (bicing, vélo...)<sup>2</sup> or by private initiative, will play an increasingly important role.

Likewise, independently of appreciations and valuations of what should be done to make the world more sustainable, and to put a stop to the causes of climate change, the European Commission on the Environment has been stating since 1992 that it considers transport to be the individual cause which contributes the most to environmental pollution. Territories in general and especially cities, where most episodes of atmospheric pollution are concentrated, will have to work hard to add corrective and replacement measures to current ones in order to tend toward a reduction of the environmental impact of their (our) activities, but, as the European Union and other existing international organizations which deal with the issues of mobility and the environment remind us, from among the spectrum of measures that need to be taken, those concerning sustainable mobility, based on walking, public transport and the use of non-motorized vehicles (like the bicycle) will be the main ones. Therefore, those territories which are getting ready with more environment-friendly and less oil-dependent mobility alternatives, will be able to survive with fewer problems in the era of shortage or lack of oil than those which have not strived to avoid the dependency on cars. It is in this global context that national and local bicycle policies should be included as an integral part and in which this article is circumscribed.

## **GREATER BICYCLE USE**

The bicycle undoubtedly meets all the essential requirements mentioned in the introduction of where we should be heading in sustainable mobility, as it is a non-polluting transport type (clean and silent), affordable (cheap to produce, acquire and maintain) and healthy (maintains muscle and cardiovascular tone). But for the bicycle to have a good presence and daily use it is necessary to have a project specifically designed for its introduction and promotion and, at the same time, coordinated with the mobility network already existing so as to favour intermodality. Just as the existing territorial mobility basically starts from territorial planning designed for the car (road network) and, although to a lesser extent, for public transport (railway and bus network), we now need to do the same for the bicycle if we want to incorporate it decisively into the mobility systems.

Brave and significant political decisions need to be made, and a strategy needs to be established (as a sum of sectorial and territorial strategies), that is to say a National Strategic Bicycle Plan, which will be expressed differently depending on the part of the territory where it is applied and the introduction objectives that are pursued. For bicycle use, we need to define a basic network across the entire territory which is for leisure, sport or daily use. They are all necessary, but if we focus on compulsory mobility, that is to say on the daily mobility to go

to work, to school, or to university... there are some parameters which are especially important.

Population density per hectare is a noteworthy indicator. It is considered that journeys by bicycle begin to be effective above 35 people per hectare<sup>3</sup> and that the greater the density the more effective the bicycle policies for daily use (not for Sunday, leisure or sport use). In general, the characteristics of the cities and towns of the Catalan Countries correspond to the Mediterranean model and, therefore, they are dense, compact and continuous municipalities (the bigger they are, the more they fulfil these conditions), which favours bicycle use. These three concepts, in general, can be extrapolated to cover the whole territory, which is a good predisposition for bicycle use. The distance of the journeys is also important: the bicycle is especially suited to short to medium daily travel, both as regards the distance to cover and the time taken by the journey. In Catalonia, and thanks to the aforementioned territorial planning, between 60% and 90% of the journeys which take place are of less than 8 km<sup>4</sup>, the great majority within town centres and, consequently, they tend to fulfil the so-called "Marchetti constant"<sup>5</sup>, which indicates that the average amount of time spent travelling per day in the world, by whatever means of transport, is around one hour. Thus, the distance and the time taken to travel by bicycle can be significantly promoted if there is good intermodality and easy access to good levels of public transport services and of connectivity. To complete the prior parameters it is also necessary to take into account the low economic cost represented by buying and maintaining a bicycle as a transport vehicle and, therefore, cost is not a limiting factor, and neither is world bicycle production<sup>6</sup> which during 2007 was of 130 million units, the highest in history and which, therefore, is not a limiting factor for its availability. Furthermore, the energy expense per passenger/kilometre is the most efficient<sup>7</sup> (within the very efficient means of transport, which only include the bicycle, walking, and double-decker buses). For all these reasons, the average growth, both in purchase and use, of the bicycle in Catalonia, has increased in a sustained manner, by an annual 5% in the last 5 years. No great difficulties are therefore detected among the generic parameters. On the contrary, it appears that in the global and national context it is a good time to trust in bicycle use, so that it increases its relative weight among the daily journeys which take place. It is just necessary to make a planning effort which, from the outset, will involve an economic effort although, compared with other mobility systems, it will be much smaller.

## Strategic Bicycle Plan<sup>8</sup>

The bicycle has great potential as a tool of mobility. To develop it fully, a specific strategic plan needs to be established. This plan, in order to be expressed with all its capacities, should be included suitably within other plans and programmes which are already considered within the context of mobility, and which have their own legislative frameworks, which in the case of Catalonia are very rich<sup>9</sup>. We will thus succeed in obtaining suitable planning for all the country's mobility.

In my opinion, the main, specific, axes on which we should work to promote and encourage use of the bicycle as a means of transport are:

**Infrastructures** are the most determinant strategic axis of all when it comes to promoting bicycle use. On the one hand, with a few very notable exceptions in view of their design and quality, the network of cycle routes existing must improve its adaptability and, on the other hand, new cycle paths need to be created to extend the network. These routes should be planned in lanes segregated from motor vehicles on already existing roads, taking advantage of old disused roads, the routes of old railway lines or city streets, with the aim of creating routes especially adapted to bicycle traffic, duly signposted and with guarantees of use by bicycle users.

The sum of these two criteria (improvement of adaptability and creation of new routes) will lead to the extension of the bicycle network throughout the territory. The definitive bicycle network, though, in addition to the extension, should be constituted using specific use criteria and territorial criteria. Among the former that I have defined, those of use, it is worth establishing a cycle network which incorporates the sports bicycle, the leisure bicycle and the one for daily use. The sports bicycle, both the mountain bike and especially the one for the road, have a notable importance on the road networks at weekends and significantly affect safety, the coexistence of uses and the accident rate which has to be improved. With the non-sports leisure bicycle, on the current green routes already available (whether or not asphalted), and the Mountain Bike<sup>10</sup> mainly on forest tracks and rural paths, a significant increase in use is occurring and they need to be given more services, coherence and continuity, while considering the growing need, here too, to improve the coexistence of uses. These two types of bicycle use are sufficiently important in themselves to require a specific reflection and to design their own plan, a map of environmental, landscape, tourist, sports and heritage circuits which, moreover, are also linked to the cities. But it is the daily network, for compulsory mobility, in which the bicycle is taken each day instead of a private vehicle with a combustion engine to travel a few kilometres, where the emphasis has to be placed for bicycle use to be able to occupy an important place in the daily transport of people. This means paying great attention to the town centres (I will discuss this in more detail

below) and, as I mentioned at the beginning of the article, also to the interurban routes which connect dense town centres with a reasonable time taken for mobility travel which is comparable with international standards. All three of these aspects related to uses should be expressed territorially and, thus, a national, regional and municipal network for bicycles should be established. In short, the sum of the three types of use mentioned above and of these three territorial levels, is what should define the overall design of the bicycle network in our country.

The **national bicycle network**, through the creation or adaptation of sufficient infrastructures for use by cyclists, should have a basic network with the aim of defining major bicycle routes, that is to say the main axes of the country, along which to travel, in a continuous manner and as an alternative to the vehicles with fuels made from oil by-products, between two main locations of our geography. This basic network needs to be enriched with a more precisely and densely developed regional network which focuses on the delimitation of this territorial framework and which is based on the most frequent and most adequate journeys which take place. And, likewise, the municipalities should have their own network which completes the denseness of the overall network and gives it coherence. Indeed, the municipal networks, as I already mentioned above, are the ones most frequently used and play a fundamental and determinant role in daily bicycle use. It is therefore worth making a series of considerations. The municipal networks should be the densest and should enjoy the conditions necessary to replace private journeys using combustion engines. They should be based on segregated cycle lanes, although it is not always possible to create them without an urban modification in the area where the cycle lane is going to be introduced. This is not always easy, above all if the road infrastructure for bicycle use is not constructed parallel to the planning of a new area, or within an urban remodelling of a specific part of the city, but rather in an already developed space, such as for example an old quarter. When it is not possible to create a segregated cycle lane, in order to allow different types of transport to coexist, priority should be given to the weakest mobility systems over the strongest, and therefore priority should be given to the pedestrian over the cyclist, and to the latter over any type of motor vehicle. In this respect, urban traffic-calming measures, inverted priority zones in mobility and the so-called thirty zones are effective measures to reduce the speed of traffic on the roads. This leads to less acoustic aggressiveness and less emission of gaseous and particulate pollutants<sup>11</sup>, which gives greater quality of life and comfort during journeys, but in relation to mobility it is also the most appropriate decision in order to have an extensive cycle network, that is to say to be able to go everywhere within the city by bike as, despite the effort made by different cities in the Catalan Countries<sup>12</sup>, the network of cycle lanes will never cover all the areas of a city, but rather will only define a basic network in the city. It should be added that the excellent response to measures to encourage the

public rental of bicycles, as demonstrated by the introduction of the biking service in Barcelona<sup>13</sup>, will mean that this system of bicycle promotion and use quickly extends to the country's big and medium-sized municipalities, collapsing the infrastructures if, on the one hand, the cycle lanes are not increased significantly and, on the other hand, the traffic-calming measures, 30 zones and inverted priority zones are not extended in a discretionary manner throughout the city.

This network of cycle lanes, like the one of interurban routes, should be planned with its own master plan in order to give the network coherence, a homogenous image and signposting, connectivity between the routes and to promote the integration of this network with those of a more general sphere. This should be obtained with direct connections, but also by connecting with other means of transport which aid interconnectivity or intermodality.

**Interconnectivity** is a fundamental criterion to encourage bicycle use and optimization of the infrastructures existing, as it allows an increase in the distance of the destinations that it is possible to reach and represents an important saving in time for medium-long distances or those with complex orography. Among the actions to be carried out in this sphere, we can highlight the need to aid the adaptation of spaces in public transport (train, tram, bus and metro) stations for the installation of specific bicycle parking spaces. Indeed, in Barcelona, the initial spirit of the planning and distribution of biking stations was precisely to be able to combine public transport and the bicycle in order to reach the final destination and, thus, both extend the useful distance of the public transport stations, and encourage bicycle use.

In addition to the installation of **parking spaces**, to encourage intermodality it is also necessary to take into account the adaptation of all kinds of accesses for bicycles (stations with steps, ...) and the adaptation of public transport vehicles to carry bicycles, either on the outside (for example on buses which have routes through very difficult places<sup>14</sup>) or inside the coaches of trains, adapting specific spaces or incorporating specific facilities to carry bicycles. In addition to the availability of spaces, it is also necessary to add the acceptance of bicycles on public transport. In this sphere, the legislation existing to travel with a bicycle on the trains of the Ferrocarrils de la Generalitat, Suburban lines, Tram or Metro is, in this order, broadly permitted but, as I mentioned earlier, on buses it is either forbidden or it is very limited, and this should be modified in order to improve the adaptation of public transport to bicycle use. The combination of public transport and bicycle is not just important because it improves their intermodality, but also because it helps to define a more convenient model of city and of country for people, less polluted, where the importance of public spaces is measured by people and not by private transport vehicles.

In addition to parking spaces at, for example, train stations as a deterrent, where you can leave the bicycle and take public transport, and the public rental bicycle (bicing) stations to promote intermodality, it is also necessary to consider the infrastructures of parking spaces for the users of private bicycles. Surface-level public parking spaces for private use tend to be very effective simple inverted U-shaped street furniture which have as a counterpoint that they compete for public space with the ease of movement of pedestrians on the pavements. Despite the opportunity that they represent, the number necessary to cover demand, especially if sensibly it is not permitted to use other supports<sup>15</sup> such as trees, traffic lights, benches... is sufficiently high not to consider this possibility as the only solution in municipalities in which the daily use of bicycles is frequent. In this respect, the surface-level parking spaces which are not specific (for example in a railway station) need to be moved to the road like for motorbikes or cars, while designing a minimum and attractive infrastructure. At the same time, new buildings or the old ones which allow it, in accordance with the architects, should design and have available a small space to park bicycles systematically. Likewise, private car parks should reserve a certain number of spaces for bicycles proportional to their capacity, as is already done in some cities in public car parks and which have had great success in their use thanks to the low rental price and to their location next to the security guards, thus representing a very satisfactory security level.

**Security** is a very polyhedral concept and undoubtedly another of the determinant factors for bicycle users. As for the cyclist, the most determinant factor is a reduction in the accident rate<sup>16</sup> and this is closely related to the type of design and quality of the cycle track. Segregated cycle tracks – that is to say those which do not share traffic spaces with any other vehicle – and which are well-signposted, have very low accident rates, and should therefore be the priority ones. But security is also related to the use of measures protecting the user, such as a helmet, which in my opinion should be compulsory for all ages and for all uses. We should also consider the security of the property, as we have already done with safe surface-level parking spaces, and safe and supervised spaces in underground car parks. In this respect, there is a direct relationship with the purchase of folding bicycles and their use in the city thanks to the unbeatable security indices that this represents. Despite everything, faced with a possible theft, we should also consider having an element identifying the bicycle with the owner as a security measure for the property. There are different possibilities to identify a bicycle, but some of them are not very satisfactory, such as registration numbers or the frame number, which are easy to remove or vandalize. To have good identification, it is necessary to use a secure system which gives the user guarantees that it cannot be manipulated, such as the high-technology stickers that are used in some cities (Barcelona has carried out a pilot test) or the studs incorporated into the bicycle chassis. These systems do, however, require the preparation of a database and

therefore of the corresponding police coordination in order to be effective. Despite the effort that this represents, both for cyclists and for the public authorities, the creation of a public and national register or database of bicycle owners should be one of the clear objectives of an ambitious bicycle promotion policy offering guarantees. It is, however, clear that we also need to talk about security vis-à-vis pedestrians. At present there are many regular bicycle users with insurance, but very few sporadic users have it. Insurance is important for the cyclist, who may have an accident with another vehicle, as it protects them, but it is essential for the pedestrian who often feels defenceless and unprotected in the face of an incident with a cyclist. This is also an essential aspect to avoid unnecessary conflicts of coexistence between cyclists and pedestrians and to offer everyone more security on using the roads.

There is a last aspect of security which it is worth mentioning in particular, in view of its importance and history: highway **education**, but also education in general. Often, when we think about riding a bike, we demand less from ourselves than with other vehicles. We tend to recall those idyllic and relaxed summer rides of not so long ago. But riding a bike in a city or on a main road is not the same. It requires a certain preparation and not losing one's cool in the face of the attitude of uncivil people of more or less arrogant tendencies depending on the size of the vehicle they are driving. We therefore need to systematize highway education programmes in schools and among those who are not at this stage of their life. In schools, we need to lay the foundations for good driving and work on behaviours which represent a perception of the risk and overcome it. Among the others, we should include information and adequate means of behaviour towards the bicycle (and other transport systems) on learning to drive motor vehicles and in the subsequent revisions, in order to encourage respect, patience, awareness and co-existence with cyclists. Both cyclists and those who are not should be required to comply with the highway code and give preferential respect to pedestrians.

There is, however, another more global sense to education, based on information, which is to become aware of the importance of mobility in our lives, both in terms of time and of economic costs, of the repercussion of mobility on the consumption of non-renewable natural resources on a human scale if it does not take place by non-motorized means, and of the environmental repercussions that this represents for the human species and the rest of the planet's living creatures. This is probably the most noteworthy aspect of education on mobility, because it is the one that makes people become aware of the significance of their decision on choosing one or another main transport system during their life.

The effort in education should be accompanied by a decisive will to **disseminate and promote** bicycle use, as has been taught. This means that, on the one hand, the public authorities need to foresee different general

promotion actions and campaigns in favour of bicycle use as a regular and daily means of transport and, on the other hand, they need to be coordinated, to create participation channels and to share alliances with the civil organizations which focus their activity on this means of transport, giving them support and carrying out an adequate dissemination and promotion of their activities. In general, regular bicycle users tend to be passionate defenders of its use (not like those who use other means of transport who tend to play down its importance), but undoubtedly those who do not use it have substantial doubts about the importance of bikes in general mobility. It is thus necessary to promote another perception of the bicycle and to explain its advantages both for its users and for those who are not, in relation to environmental quality in terms of a reduction in noise and atmospheric pollution.

Throughout the description that I have been making in this text, I have mentioned different measures and actions which, in the public structure of a country, correspond to different departments of the same administration (for example infrastructures, security, education, ...) or to different administrations (national, regional and municipal network, ...). For these actions to be efficient, a public management body of a transverse character should be established and should be provided with a sufficient budget to carry out its task. These types of transverse bodies aimed at the management, promotion, execution, control and monitoring of a strategic plan or of a specific aspect thereof, do not tend to be easy to create and develop, but the sphere of mobility is where they occur most frequently and, therefore, where it is known how to act well. The need to create a new body already indicates the deficiencies that currently exist, but above all the importance and urgency to continue producing substantial changes in the policy of mobility. We need perspectives on the transformation from dependence on the car to more environment-friendly systems. If a city is designed thinking of the car, the latter increases to the detriment of public transport, the bicycle and walking. If we think of pedestrians, bicycles and public transport, the latter increase, cars decrease and more inhabitable environments are obtained. A good design of mobility, of use of public spaces and of ground use, designed for people and attractive for everyone, leads to meeting spaces which turn cities into more pleasant places. The bicycle helps to make a more human city.

If, finally, we ask ourselves why, all of a sudden, we are considering, now and not before, almost worldwide, beyond the unequal traditional use of the bicycle, the recovery of this ancient transport system with promotional measures, with the installation of bicycles for public rental, such as the biking service, creating new political and management structures... it would be difficult to reply with more than the fact that the time has passed when there were enough natural resources to use wastefully and the environment had sufficient buffer capacity to absorb the gases emitted into the atmosphere. Human civilization based on progress involves the optimization of resources, ensuring they are not wasted,

saving them as much as possible, distributing them in an intelligent manner in accordance with the places where they are still essential and adopting a simpler system of life.

## NOTES

1. Various authors, although it is worth highlighting, in view of his origin, the report by Jeroen van den Veer, Executive Director of Royal Dutch Shell (2007). See also the ASPO report (The Association For the Study of Peak Oil and Gas. 2008)
2. The name adopted by the public bicycle services depends on the municipalities where they are implemented: biking in Barcelona, Vélib in Paris, Vélo in Lyons, Sevici in Seville, Stockholm City Bikes, d-Bizi in San Sebastián, Bysykkel in Oslo and Bizi Zaragoza.
3. J. Kenworthy and F. Laube. The Millennium Cities Database for Sustainable Transport. See also European Transport Conference. Strasbourg. 2006.
4. First Catalan Bicycle Congress. Barcelona. 2006
5. C. Marchetti. Anthropological Invariants in Travel Behavior. 1994

6. World Watch Institute, Bike Europe, Global Insight, Bicycle Retailer and Industry News, Reproduced in Earth Policy Institute.

7. Energy efficiency ranking. Association for the Promotion of Public Transport. <http://www.laptp.org>

8. In June 2006 the Department of Town and Country Planning and Public Works of the Generalitat de Catalunya, through its Mobility Secretary (M. Nadal), presented a Strategic Bicycle Plan which unfortunately was not implemented. At present, the same department and person are about to present another one updated for the period 2008-2012. Barcelona City Council, through the Civic Bicycle and Pedestrian Commission (chaired by the author of the article) approved a Strategic Plan for the city of Barcelona.

9. The Mobility Law of the Generalitat de Catalunya considers different plans including the National Mobility Directives (2006) which are of special interest in this case, and the Transport Infrastructure Plan of Catalonia (2006).

10. Some of the green routes of Catalonia, such as the 3 in Girona or the 2 in Tarragona, are very noteworthy in view of their function and design. Both in the Balearic Islands (235 Km), and in the Land of Valencia (230 Km) there is also a good development. Also in the case of the mountain bike centres and circuits of all the Catalan Countries.

11. Fuel consumption in the city is higher at higher than at lower speeds. The reason is that cars are used more at a higher average speed and that vehicles are used less at a lower average speed. This argument is developed in The Transport Energy Trade-off: fuel efficient traffic versus fuel efficient cities, P.Newman and J.Kenworthy.

12. The cities of Barcelona (125 Km of urban cycle lanes, plus some 40 Km of the green ring route executed or tendered), of Valencia (62 Km urban), Girona-Salt, Lleida (12 km), Sabadell (25Km urban), Tarragona (15 Km) and Reus (17 Km) are among the hardest-working in this respect. Specific information can be found on the websites of these town councils.

13. The bicing system was passed in the Civic Bicycle and Pedestrian Commission (2006), chaired by the author of the article. Terrassa also has a bicycle rental system called Ambicia't.

14. Various Scandinavian and American cities such as San Francisco and Seattle have a regulation for the adaptation of public transport vehicles, adding specific external supports to carry bicycles, which does not exist in Catalonia, preventing this from being possible.

15. The pedestrian and vehicle traffic by-law of Barcelona (28 February 2007) does not explicitly allow the use of most street furniture to park (lock) bicycles.

16. According to data from the Analysis of highway safety data 2007 of Barcelona City Council, the accident rate of the bicycle has increased in the last year. However, it should be taken into account that, in general terms, the bicycle is a very safe means of transport and that the increase in users in Barcelona has grown exponentially in recent years.