

# THE VISIONARIES

The evolution of the traffic control centre

## EMBRACING CHANGE

Kevin Borrás talks to IRD CEO Terry Bergan

## VEHICLE-TO-EVERYTHING

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# Share and share a bike

The fourth generation of bike-sharing systems is around the corner. **José F. Papí, Pablo García and Riccardo La Longa** discuss a future-proof system that could render the rest obsolete

As little as a decade ago, bike-sharing was an afterthought in most cities' mobility plans — if it was even considered at all. This began to change in 2005, with the launch of Velo'v in Lyon (France). With dedicated bike racks, smart cards, and a fee structure that encourages short-term rentals, Velo'v was the first scheme to bring all these elements together, and at scale. The system was fully embraced by residents becoming a significant presence — and immediately imitated.

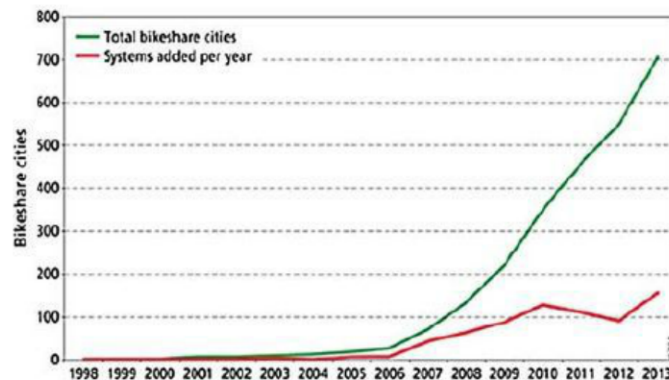
Fast-forward 10 years, bike-sharing systems have grown from 13 in 2004 to more than 850 globally. The 2015 research survey and analysis "Bikeshare: A Review of Recent Literature" provides an overview of the state of the market on bike-sharing programmes.

The countries with the greatest number of bike-share systems are China (237), Italy (114) and Spain (113). It is clear that the deployment of the so-called 'third generation' bike-sharing systems in recent years has been rapid; however, one wonders if it is now approaching market saturation.

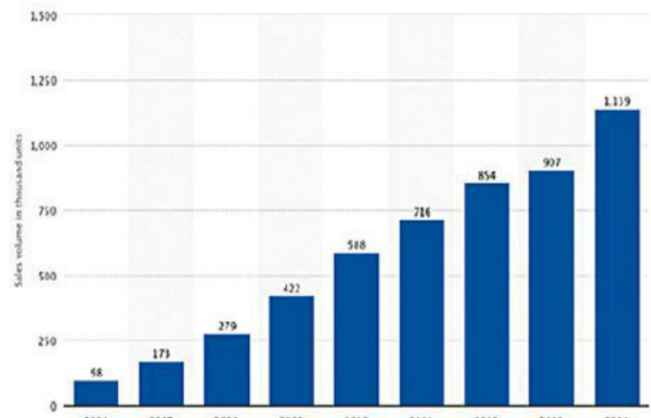
## A SATURATED MARKET READY TO MAKE A LEAP FORWARD

One could say that investing in electric bikes is investing in Smart Cities. Figure 2 shows the number of electric bikes sold in the European Union between 2006 and 2014, in thousands of units. Sales of e-bikes grew steadily each year growing from 98,000 units in 2006 to 1,139,000 units in 2014 (astounding growth in just eight years!). These figures are coupled with the outstanding projected sales of electric bicycles worldwide in 2018 (by that date some 42.4 million electric bikes are forecast to be sold in China alone).

Despite these remarkable figures, the integration of electro-mobility in day-to-day transport is still an issue to be solved by the



**Figure 1: Total bike-sharing cities (2013)**



**Figure 2: Electric bike sales, in 1,000s of unit (2006-2014)**

fourth generation of bike-sharing systems.

Electric bike-sharing systems are lagging behind these numbers. In Europe, only Madrid (Spain) and Copenhagen (Denmark) are well-known. In the US, the University of Tennessee-Knoxville launched a small system on its campus in 2012 that ran for just a year. On a positive note, more cities are moving towards electric bike-sharing systems, Rotterdam (Netherlands) appeared as the latest example in February 2016.

Two main challenges need to be addressed to boost bike-sharing systems, the first being how to optimise and satisfy an often unpredictable, asymmetric and fluctuating demand throughout the day.

With a limited number of available bikes and parking racks at any bike station, factors such as weather conditions or events in the city cause irregular or asymmetric rental demands and flow of bikes.

Challenging topographies are usually linked with the non-existence of bike sharing systems; this comes out as the second challenge impacting demand stagnation for third-generation bike-sharing systems. Living in cities like Porto (Portugal), Prague (Czech Republic), Edinburgh (Scotland), Bergamo (Italy) or Lausanne (Switzerland), the hilly terrain is a barrier to using a bike in your day-to-day mobility. Elderly, people with a lower level of fitness or even

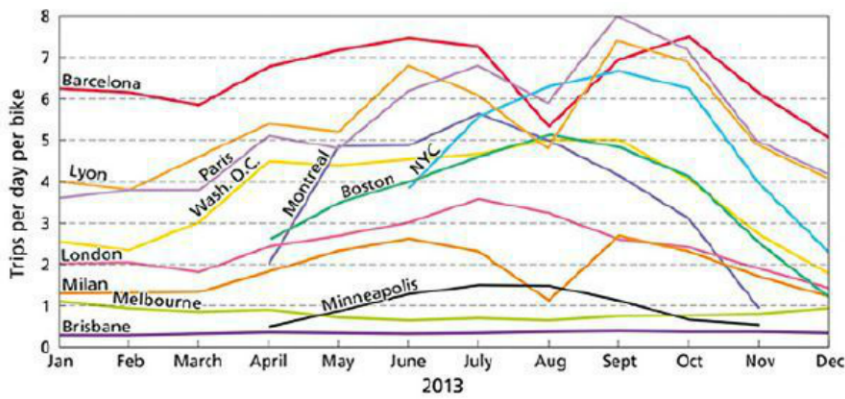


Figure 3: Trips per day for several bike-sharing systems across the world for 2013

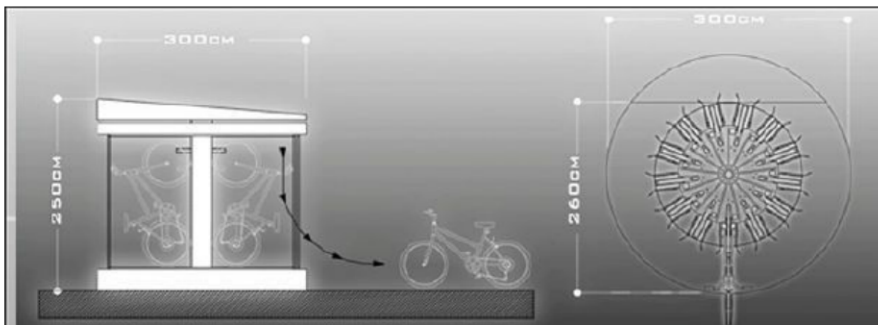


Figure 4: e-Hub Design (I)

commuters not willing to sweat on their way to work are potential missed users by the standard bike sharing systems (as they usually favour the car).

#### WHAT IF BIKE SUPPLY COULD BE ADAPTED TO THE ACTUAL DEMAND?

In the quest for a future-proof solution, Green Action S.r.l., an Italian SME specialised in micro-mobility, has partnered with S3Innovation, an Estonian-based technology firm, to bring to the market the Electric HUB 360° (e-Hub), a fourth-generation bike-sharing system creating a 'mobile' network of electric bike stations in urban environments.

The e-Hub is the first electric bike-sharing system in the world that integrates other types of electric mobility (i.e. e-car charging) while making it possible to deploy a network of 'hubs' providing for a range of additional uses: i) integration of security cameras, ii) solar panels to charge e-bikes and e-car batteries, iii) public lighting and iv) advertisements.

The system (now in a pre-commercial stage, see prototype in Figure 4) allows up to 13 e-bikes (or standard bikes) and in the future will allow integrating hydrogen-fuel-cell e-bikes, able to travel 100 km on a single 1-minute charge.



Figure 5: e-Hub Physical Prototype

The technology optimises by 80 per cent the usage of bike-sharing systems, as each e-Hub is adaptable to demand patterns (in other words, easily moveable with a medium-sized truck). In this regard, an e-Hub system would be able to make more 'hubs' available during high demand periods (spring and summer), and at the same time reduce the numbers during low-demand seasons (i.e. winter and August). Moreover, e-Hubs could be removed all together during winter months and exploited in a more suitable location for a few months (i.e. during an exhibition). And all this is done at no cost for new infrastructure.

e-Hub as the reference of the fourth-generation bike-sharing systems

The system, adaptable to the real-time demand, is conceived as the 'final' solution to the current limitations of today's third-generation bike-sharing systems: the e-Hub prevents bike thefts and doubles the number of bike parking racks offered in each station, at the same time reducing the public space occupied by third-generation bike-sharing stations.

In addition, the e-Hub allows charging up to four electric cars (current bike-sharing systems don't offer e-car charging). In the long term, the e-Hub aims to support the release of the e-transport card, a unique card allowing the user to enjoy all electric vehicles available in a Smart City.

Emerging from the need to reinvent current models of bike-sharing, the e-Hub will act as a 'dynamic booster' of electric mobility in Smart Cities, bringing the definitive e-answer integrating electric bikes + electric cars.

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