Ander Audikana, LaSUR EPFL, ander.audikana@epfl.ch
Emmanuel Ravalet, LaSUR EPFL
Virginie Baranger, LaSUR EPFL

Implementing bikesharing systems in medium and small cities: evidence from the Swiss experience

Introduction

Since early 2000s, bikesharing systems have been extensively diffused across the globe. These systems enable bicycles to be picked up at any self-serve bicycle station and returned to any other station (Midgley, 2011). In contrast with ancient systems, the bikesharing systems developed over the 2000s have incorporated information technology and are currently running with smartcards and electronic bicycle locking. In 2010, Shaheen et al. estimated that there were 100 bikesharing programs in approximately 125 cities with more than 139,300 bicycles. In 2011, Midgley estimated that 375 programs were in operation (nearly 50 per cent in Europe) using around 236,000 bicycles (nearly 50 per cent in Asia). It can be concluded that modern bikesharing systems have attired strong attention from different public authorities and that new programs will be launched in the future. However, although different impacts are frequently invoked, such as the reduction of congestion, multimodality or health benefits, the consequences of bikesharing systems are not well established. Based on a literature review of peer-reviewed and grey work, Fishman et al. (2013) conclude, for example, that bikesharing systems did not favored modal shift from private car to the bike. Ravalet and Bussière (2012) show that bikesharing systems should not be considered a panacea for policies supporting bike use in the city.

Due to the extension and mediatic impact related to the implementation of some systems in large urban areas, such as the Velib program in Paris, bikesharing has been frequently considered as a metropolitan mobility services. However, bikesharing systems are largely developed in medium to small size urban areas in countries such Italy and Spain. Indeed, the first city implementing a system using smartcard technology was Rennes in France. Thus, Parkes et al. (2013) show that bikesharing systems are highly adaptable to different contexts which explains their rapid diffusion. However, the challenges facing medium or small urban areas in implementing and managing bikesharing systems are considerably different. More precisely, some scholars suggest that in smaller urban areas, “local authorities have to deal with a much more complex situation, and the system doesn’t always meet the success which was expected” (Richard and Jouannot, 2014). Those authors consider that small cities may face a dilemma between trying to introduce improvement measures or, more radically, reconsider the whole system.

These paper seeks to further investigate the challenges related to the implementation of bikesharing systems in medium and small cities. This paper investigates the Swiss case. In Switzerland, three bikesharing systems are currently in operation (PubliBike; Velospot and Nextbike) involving around forty municipalities. Although some of the municipalities are located inside metropolitan areas, most of them have less than 20.000 inhabitants. Thus, the Swiss bikesharing system is an interesting case in order to analyze the implementation of these systems in small urban areas. In addition, the Swiss bikesharing system has been partially conceived as integrated network in order to allow users to use bikes of different sites across the country. This configuration can be essential in order to understand the evolution of the Swiss system and its attractiveness for users (in terms of network effect).

We envisage different methodological approaches. A historical-institutional perspective will show how the Swiss bikesharing system have evolved since its conception. We will particularly interested in understanding how a policy transfer (of bikesharing) have occurred across different cities. A second approach will allow to analyze the results in terms of usage rates and operating results based on the case analysis of selected small municipalities. These data will be provided by the three main Swiss operators.

1. Evolution of Bikesharing in Switzerland

Early bikesharing systems in Switzerland have been promoted by different local associations since the middle of 1990's in collaboration with local authorities. The first city were such a system was developed was Zurich in 1994 by the association Zürich rollt. Subsequently, bikesharing systems were launched in other Swiss cities by similar associations under the nationwide network Suisse Roule (Switzerland rides): Bern rollt (1999), Genèveroule (2001), Thun rollt (2002), Lausanne Roule (2003), Neuchâtelroule (2005) or Valaisroule (2009). These systems include free bike loan and bike rental services (in some cases electric bikes are also proposed) along with technical and maintenance assistance for cyclists. Overall, they are part of a social strategy seeking to train jobseekers to reintegrate them into the primary labor market.
On December 2009, the association Lausanne Roule (Lausanne Rides) creates the private limited liability corporate entity "Velopass". Previously, "Lausanne Rides" had operated bike loan services in the cities of Lausanne, Renens and Vevey. Velopass sought to create a nationwide bikesharing system, ensure the compatibility between different cities and systems, and to propose common services in order to facilitate the installation of networks (Velopass 2011). It developed bike rental services based on automatized stations and unique nationwide subscription, and covered different cities and areas of the French-speaking Switzerland and the city of Lugano. Different associations, actively involved in social integration, and companies were in charge of the operation of each local network. Over the year 2010, the Velopass system evolved from 2 to 7 networks and from 15 to 47 stations. By the end of 2012, the system counted 11 networks, 91 stations, 900 bikes and 12.000 subscribers (Velopass 2013). 8 networks were sponsored by private sector, mainly cantonal banks.

On Mai 2012, Velopass was acquired by CarPostal, subsidiary bus company of the Swiss Post. Velopass and CarPostal collaborated since November 2010 in the operation of the bike-sharing network of the city of Sion. CarPostal, together with the Swiss Federal Railways and

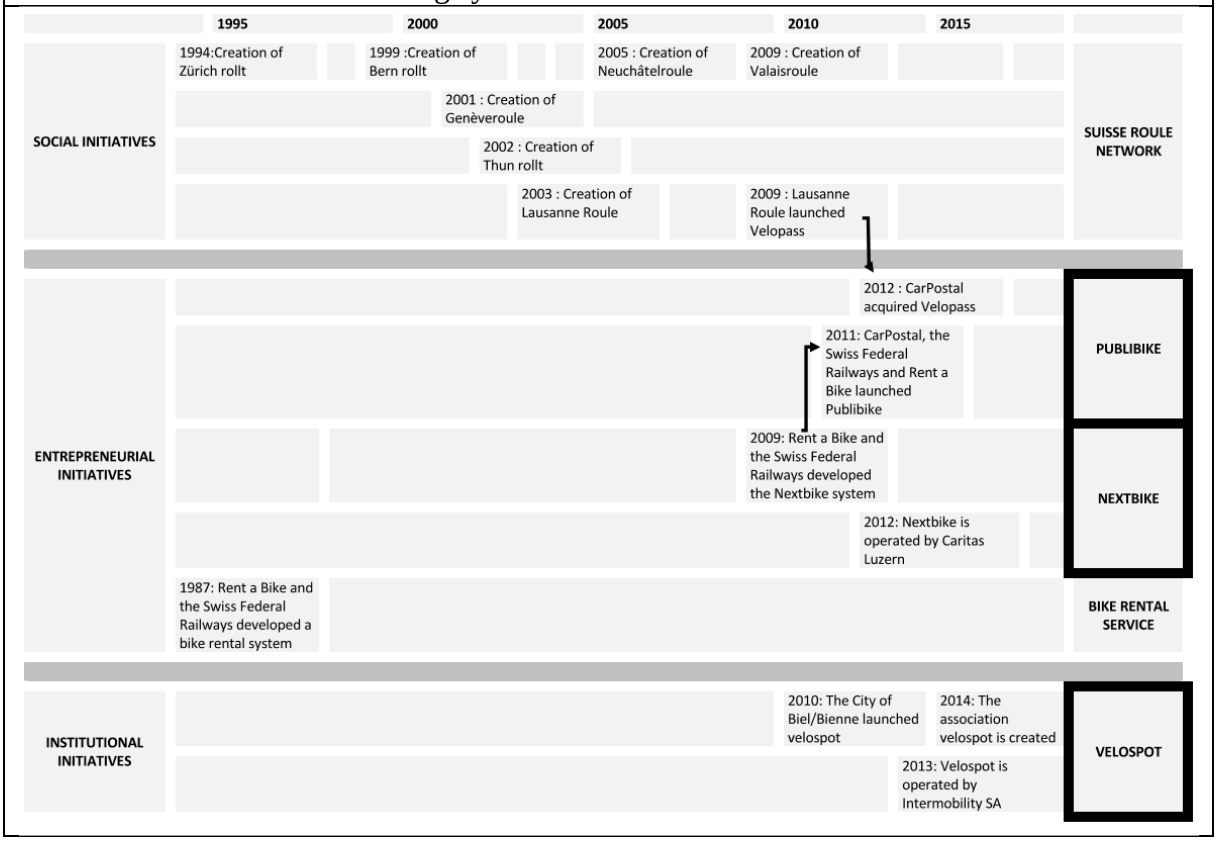
the company Rent a Bike[1], launched on August 2011 the bikesharing system called Publibike with the implementation of the initial network in Luzern. Publibike was conceived as a part of an intermodal strategy in order to ensure the "last kilometer" of the mobility chain in combination with the additional public transport services. In 2012, Publibike disposed 9 bikesharing networks and around 70 bikes (including some electric bikes) in German-Speaking Switzerland and the Jura area. A year later, Publibike proposed a unique subscription giving access to 1000 bikes and e-bikes distributed along the 100 stations of the two former systems. In 2014, Publibike become a public limited company, subsidiary of CarPostal.

The Publibike system must be considered directly linked to a previous collaboration between Rent a Bike and the Swiss Federal Railways. Between 2009 and 2012, these two entities developed the Nextbike system, a product originally developed in Germany, in 25 train stations and 15 touristic facilities located in central Switzerland. In 2012, Rent a Bike decided to get out of the project. The system was then operating only in the cities of Luzern and Sursee and the operation of the system was taken over by Caritas Luzern.

In 2010, the city of Biel/Bienne launched a new bikesharing system called velospot. Together with different local firms and high schools, the city decided to develop a new system better adapted to local needs. The system sought to propose a daily mobility service to local population encouraging the use of the bike. Maintenance tasks were attributed to a social enterprise dependent of the professional insertion office of the city. Private local sponsorship was also reached with the store chain Manor. In 2011, the network counted 9 stations and 30 bikes. In 2013, the operating rights of velospot were acquired by Intermobility SA which is since then in charge of the commercialization of the system. Subsequently, several cities have adopted and developed the velospot system: Neuchâtel (2013), Thun (2014), La Chaux-de-Fonds (2014) and Le Locle (2014). In 2014, the association velospot is created by these cities in order to coordinate the different offers, exchange experiences between members and address common petitions to Intermobility.

[1] Previously to the creation of Publibike, Rent a Bike, in collaboration with the Swiss Federal Railways has developed a bike rental system since 1987 allowing to rent a bike in train stations. Subsequently, new partners have been involved (private railways, hotels, youth hostels, campings, etc.) in the project and electric bikes have been also introduced. In 2012, Rent a Bike disposed 4500 bikes at 200 rental points in Switzerland. This service is mostly oriented to leisure and touristic activities.

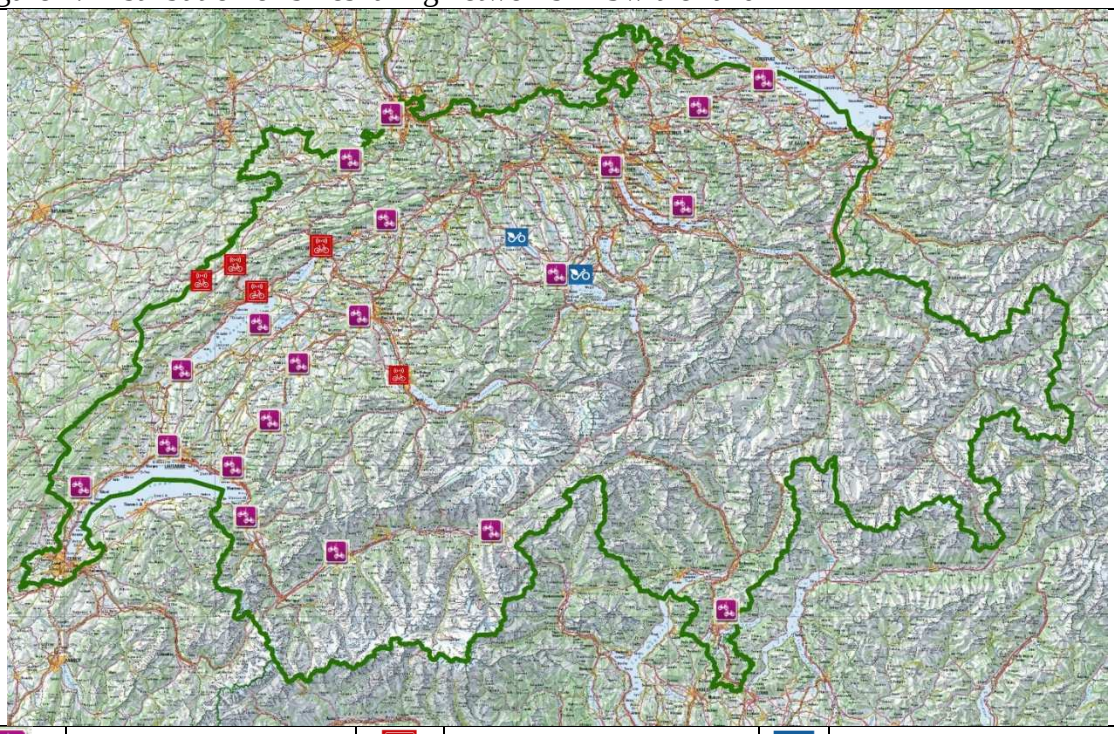
Table 1. Evolution of bikesharing systems in Switzerland



2. Description of Existing Bikesharing System

This section provides a more detailed description of the three IT based bikesharing systems operating in Switzerland: Publibike, Nextbike and Velospot. The bike loan services provided by some associations of the Suisse Roule Network and the bike rental services proposed by the CFF and Rent a Bike are not considered.

Figure 1. Distribution of bikesharing networks in Switzerland



	Publibike		Velospot		Nextbike

Publibike

On January 2015, Publibike counted 122 bike stations and more than 1.100 bikes distributed across the country. There were 21 Publibike networks in operation. The system is specially developed in French speaking Switzerland, while its implementation in German speaking Switzerland is incipient. It operates bikes and e-bikes which can be hire from one self-service station and return them to a different station. Three different rental systems composed the Publibike system. The System I consists of a terminal with touch screen where the subscriber can be identified and can proceed to remove and return the bike. In the System IIa (developed for the first phase of the former Velopass system) the identification can be completed in each docking station, and a central terminal provides additional information (nearest stations, sales points). For the return of the bike the user needs to place its card on the card reader. The System IIb (developed for a second phase of the former Velopass system) is similar to the previous one, except that the bike can be placed in the docking station without using the card.

Publibike offers different types of memberships. A personal annual membership for individuals (for the use of all or one Publibike network); a transmissible annual business membership for companies, hotels, municipalities, schools and any other institution (for the use of all or one Publibike network), and a daily membership for 24 hours (DayBike) and variable duration subscription (QuickBike) on one Publibike network. The subscription mode varies depending on the type of annual membership (individuals or business) and the rental system. Annual and DayBike subscribers are provided by a customer card, while QuickBike subscribers receive a code. Special rates also exist for other subscribers, employees or students of some stakeholders which has concluded a partnership with Publibike.

Table 2. Publibike's fare system						
	Annual Membership				Daily membership	
	Individuals		Business			
	SwissBike	RegioBike	Swiss BusinessBike	Regional BusinessBike	DayBike*	QuickBike**
Order mode	Website	Website	By email	By email	Sales points and website	By smartphone
Annual membership rates	CHF 60 + CHF 10 one-off fee	CHF 25-35 + CHF 10 one-off fee	CHF 80 + CHF 10 one-off free	CHF 45-55 + CHF 10 one-off free		
Hourly rate	0-30 minutes : Free Additional hour : CHF 2 (4 E-bike) Maximum price per day : CHF 20 (40 E-bike) Overnight price: CHF 0,50 (1 E-bike)				24 hours: CHF 10	1 hour: CHF 6 (CHF 12 E-Bike) 2 hours: CHF 6 (CHF 12 E-Bike) 3 hours: CHF 9 (CHF 18 E-Bike) 4 hours: CHF 12 (CHF 24 E-Bike) 5 hours: CHF 15 (CHF 30 E-Bike) 6 hours: CHF 18 (CHF 36 E-Bike) 7-24 hours: CHF 20 (CHF 40 E-Bike)
* Available in networks of System IIa and System IIb **Available in networks of System I						
Source: https://www.publibike.ch/						

Velospot

The velospot system is currently operating in five Swiss cities: Biel/Bienne, La Chaux-de-Fonds, Le Locle, Neuchâtel and Thoune[2]. Velospot is characterized by its relatively low hard-infrastructure needs as bikes are not physically locked to terminals, but electronically self-locked around classic bike stations. A short range digital radio links the station with bikes. Users need a customer card to hire and return a bike. Its promotors consider that this model is less expensive and better adapted to the Swiss context and they advocate to transfer this model to other cities. In 2015, velospot counted 166 stations and 520 bikes.

Even if technically integrated, velospot rates and services vary from one city to another. In Bienne and Thun, hourly rates encourage short trips, while in Neuchatel, La Chaux-de-Fonds et Le Locle, the system is more flexibly conceived to allow long term rentals periods (from 2 to 10 hours). In Neuchatel, the bikesharing service is combined with a bike rental service.

Table 3. Velospot's fare system					
	Bienne	**Neuchatel**	**La Chaux-de-Fonds**	**Le Locle**	**Thun**
FLAT RATES					
Order mode	Sales points	Sales points	Sales points	Sales points	Sales points
Flat hourly rate		CHF 2 + CHF 20 caution (4 hours)	CHF 2 + CHF 20 caution (4 hours)	CHF 2 + CHF 20 caution (4 hours)	CHF 5 + CHF 20 caution (5 hours)

[2] In May 2015, Velospt was launched in test phase in the city of Geneva.

Flat daily rate	CHF 10 + CHF 20 caution	CHF 6 + CHF 20 caution	CHF 6 + CHF 20 caution	CHF 6 + CHF 20 caution	CHF 10 + CHF 20 caution
MEMBERSHIP					
Order mode	Sales points and website	Sales points and website	Sales points and website	Sales points and website	Sales points and website
Annual membership	CHF 60	CHF 60	CHF 30*	CHF 30*	CHF 60
Annual business membership	1 card: CHF 60 2 cards: CHF 115 3 cards: CHF 170 5 cards: CHF 270	1 card: CHF 60 2 cards: CHF 115 3 cards: CHF 170 5 cards: CHF 270	1 card: CHF 30 2 cards: CHF 55 3 cards: CHF 80 5 cards: CHF 120	1 card: CHF 30 2 cards: CHF 55 3 cards: CHF 80 5 cards: CHF 120	1 card: CHF 60 2 cards: CHF 115 3 cards: CHF 170 5 cards: CHF 270
Global membership	Annual membership: CHF 90 Annual business membership: CHF 260 (3 cards)				
Hourly rate	0-30 minutes: Free Additional hour: CHF 2 (24 hours max.)	0-10 hours: Free Additional hour: CHF 2 (24 hours max.)	0-2 hours: Free Additional hour: CHF 2 (24 hours max.)	0-2 hours: Free Additional hour: CHF 2 (24 hours max.)	0-30 minutes: Free Additional hour: CHF 2 (24 hours max.)
Hour forfeit	5 hours: CHF 10 10 hours: CHF 18 20 hours: CHF 35	5 hours: CHF 10 10 hours: CHF 18 20 hours: CHF 35	5 hours: CHF 10 10 hours: CHF 18 20 hours: CHF 35	5 hours: CHF 10 10 hours: CHF 18 20 hours: CHF 35	5 hours: CHF 10 10 hours: CHF 18 20 hours: CHF 35
* Available from 1rst April to 31 October					

Nextbike

Nextbike is operating in Luzern's conurbation and the city of Sursee where 65 and 10 stations have been implemented respectively. Around 250 bikes are currently in service in these two cities. In Luzern, the main season is from the March to November, but around 50 bikes are available through winter. In Sursee, there is no bike during winter. To access the system, an initial registration is needed online, via app or via the hotline. A license plate number of a bike must be entered via mobile phone (via hotline or app) to receive a numeric code and open the lock of the bike. To return the bike, the user needs to park the bike in a station, lock the wheel and re-contact the service (via hotline or app) to report the bike. The registration is free and CHF 2 are charged for each hour with maximum daily rate of CHF 20. In addition, there is an annual membership of CHF 50 including two daily rides of 60 minutes each one. Business membership is also offer to firms.

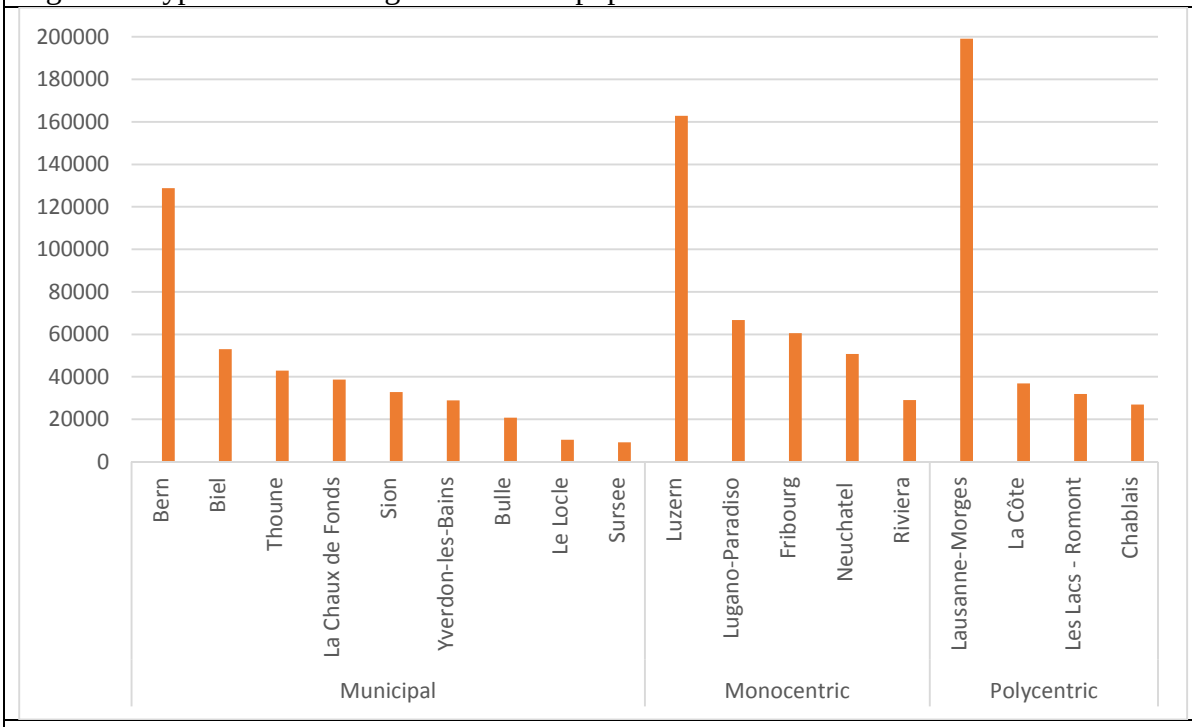
Table 4. Nextbike's fare system

	Annual Membership (March-November)		Registration
	Individuals	Business	
Order mode	Website, hotline	By email	Website, hotline
Annual membership rates	CHF 50 (2 rides x 60 minutes for day)	Up to 200 employees: on demand From 200 employees: CHF 900 From 500 employees: CHF 1,700 From 1,000 employees: CHF 3,400 From1,500 employees: CHF 5,100 From 2,000 employees: CHF 6,800 From 2,500 employees: CHF 8,500 From 3,000 employees: CHF 10,200	Free

Hourly rate	CHF 2	[redacted]	CHF 2
Daily rate	CHF 20	[redacted]	CHF 20

Bikesharing systems have been implemented in different municipalities whose population counted environ 1,800,000 (2013) inhabitants representing more than 20% of Swiss population. If we exclude the municipalities where only one station is currently in operation[3], the population living in municipalities equipped by a bikesharing system represents around 1,030,000 inhabitants. Thus, in terms of population living in municipalities where a bikesharing system has been implemented, the smallest network has been implemented in conurbations including less than 10,000 inhabitants (velospot network in Le Locle) and the largest one in conurbations including almost 200,000 inhabitants (Publibike network in Lausanne-Morges), while the average population for each bikesharing network is around 60,000 inhabitants. Only three networks cover a population of more than 80,000 inhabitants. Three types of networks can be distinguished depending on how stations are distributed across space: municipal, monocentric and polycentric (Figure). In the first model, all stations of the network are located within a unique municipal perimeter. Monocentric networks are structured around a main municipality. Finally, polycentric networks include several urban centers without a clear hegemonic municipality structuring the system.

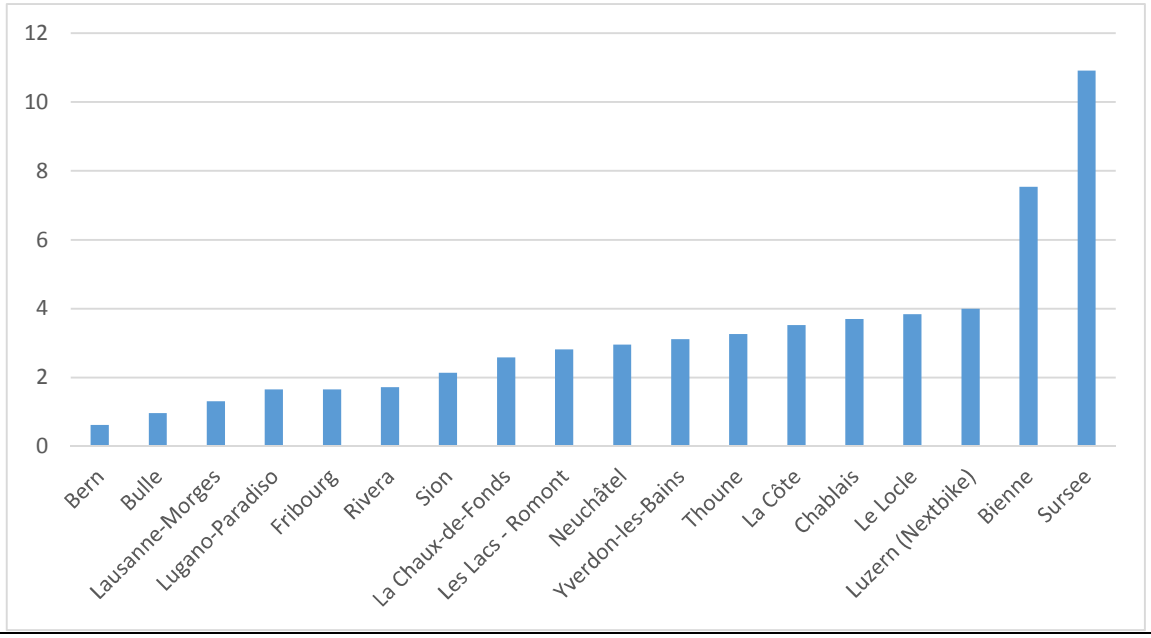
Figure 2. Type of bikesharing network and population served



The density of networks differs from one case to another. Overall, there are less than four stations for 10,000 inhabitants, except in the municipalities of Bienne (Velospot) and Sursee (Nextbike) where there are 7 and 10 stations for 10,000 inhabitants respectively. The first four networks with the highest level of station density correspond to Nextbike and Velospot systems. The highest density of stations for the Publibike system correspond to two polycentric networks.

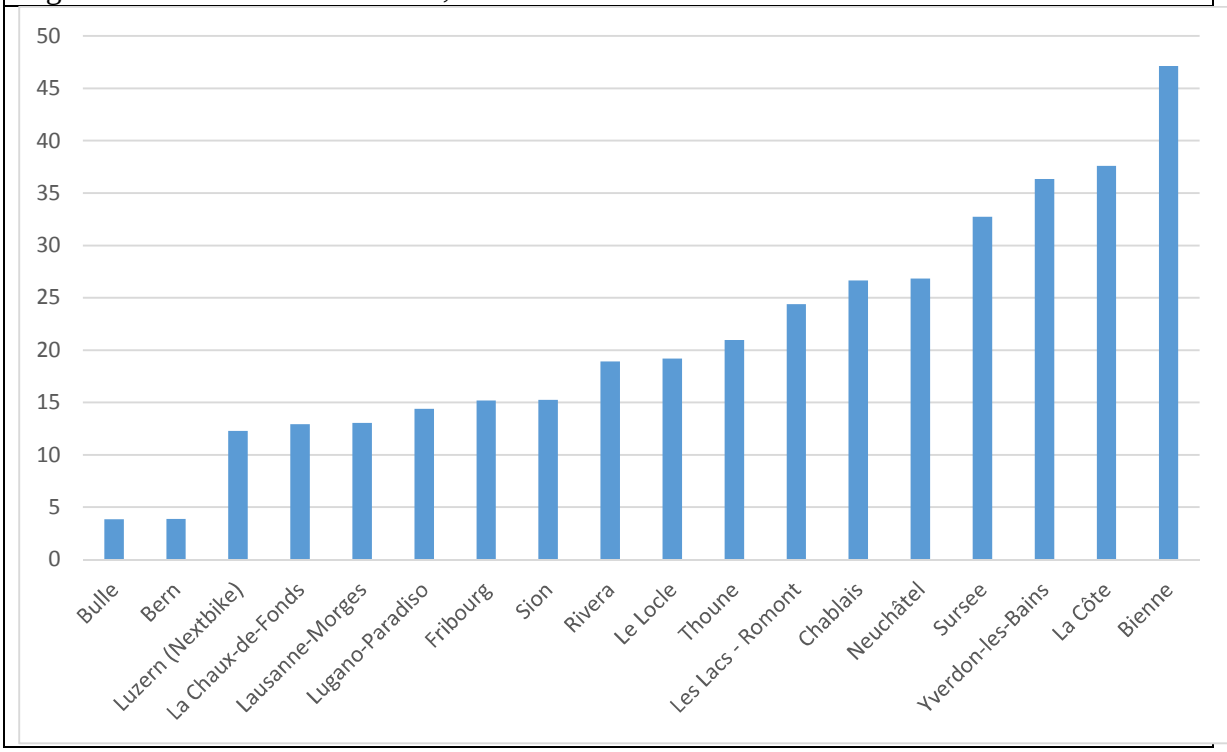
[3] Solothurn, Delémont, Basel, Brig, Winterthur, Frauenfeld, Kreuzlingen, Rapperswil and Zurich.

Figure 3. Number of stations for 10,000 inhabitants



If measured in terms of the number of bikes for inhabitants, the density of different networks varies considerably. The density of bikes in largest cities and conurbations such as Bern, Luzern and Lausanne-Morges, but also Lugano-Paradiso and Fribourg, are lower compared with small cities and conurbations. In terms of bike density, no fundamental differences exist between the three different bikesharing systems.

Figure 4. Number of bikes for 10,000 inhabitants



3. Use of Bikesharing Systems

In 2014, the number of bike loans for Publibike and Velospot was almost equivalent with around 170,000 loans per year, despite the differences in the number of networks (21 Publibike versus 5 Velospot). This suggests that the use of some Publibike networks are relatively low. In the Publibike system, the networks of Lausanne-Morges, Lugano-Paradiso, La Côte and Yverdon-les-Bains include the most number of loans, while in the Velospot system, third quarts of the loans are realized in the city of Bienne. Networks where the density of bikes is relatively high (Bienne, La Côte, Yverdon-les-Bains and Neuchâtel) the number of loans is also high.

Figure 5. Number of bike loans

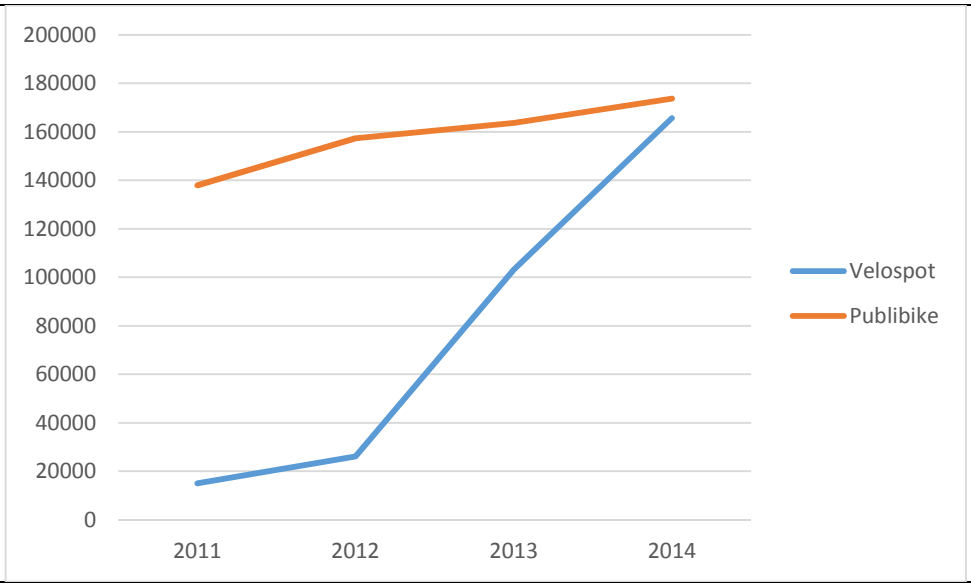
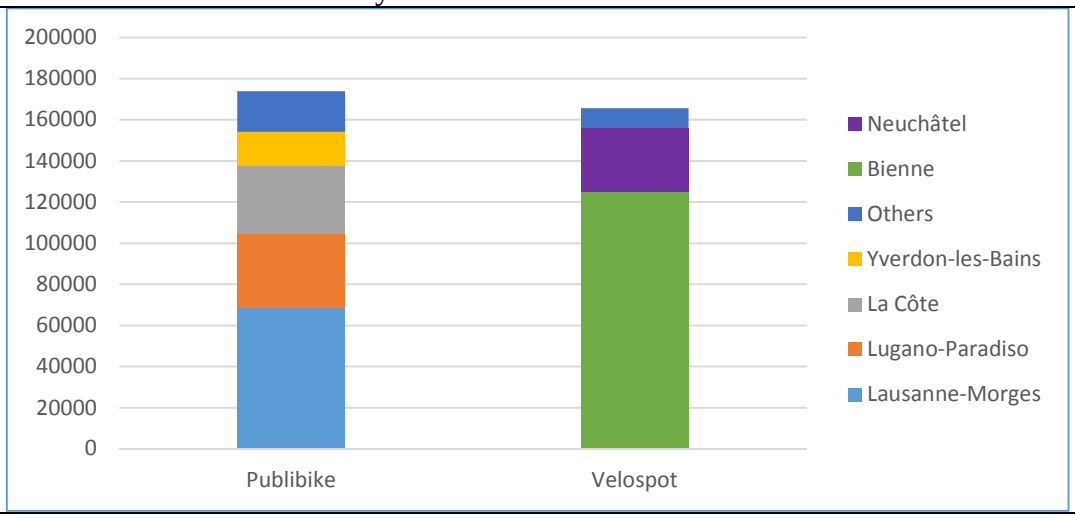
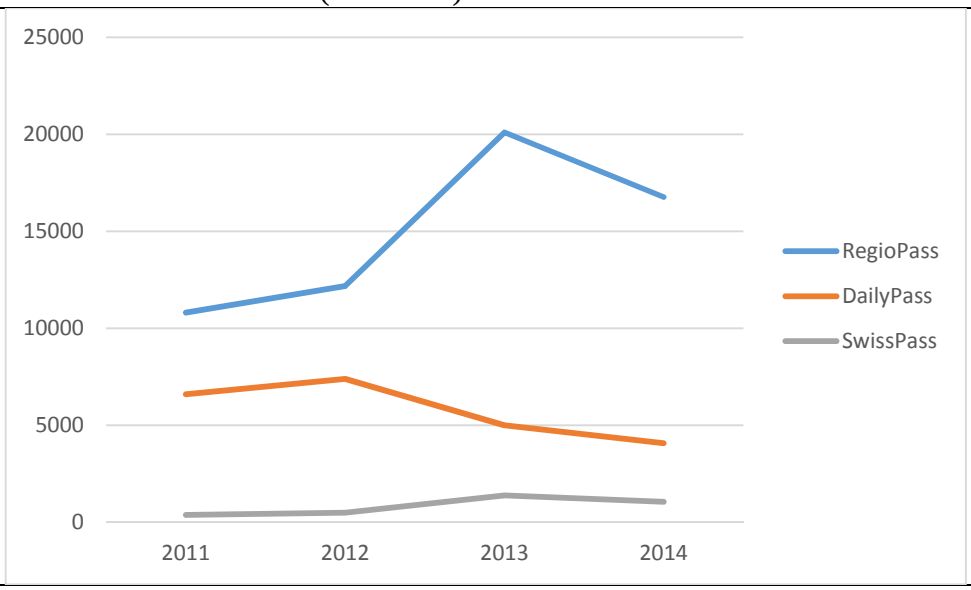


Figure 6. Number of bike loans by network



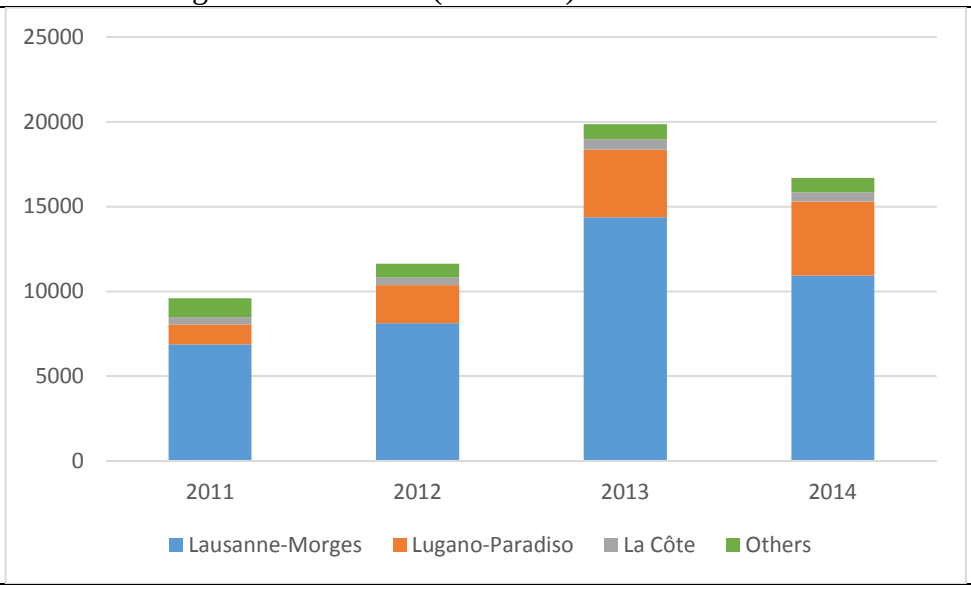
In 2014, there were 17,822 subscribers to the Publibike system distributed between 1,055 subscriptions at national level (SwissPass) and 16,767 regional subscribers possessing a RegioPass for an individual network. The number of RegioPasses increased by 60% between 2011 and 2014. On the contrary, the number of DailyPasses decreased by 40% in the same period.

Figure 7. Number of subscribers (Publibike)



In 2014, two-thirds of the total Publibike regional subscribers correspond to the Lausanne-Morges network (10,928). Almost all subscribers of this network were students who were subscribed to the University Campus sub-network of Lausanne. The number of regional subscribers for all other seven networks was less than 900 in 2014, and in five of them (Sion, Les Lacs – Romont, Bulle, Yverdon-les-Bains and Fribourg) the number of subscribers decreased between 2011 and 2014.

Figure 8. Number of regional subscribers (Publibike)



For the Velospot system, considering only the Networks of Bienne and Neuchatel, the number of individual subscribers have evolved from 597 in 2012 to 1,700 in 2014.

Local focus: the examples of Bienne and Sion

We summarize in this section the results issued from two survey concerning bikesharing systems in the cities of Bienne (Velospot) and Sion (Publibike). The Velospot system in Bienne can be considered a successful case in terms of use and public perception with an increasing number of subscribers each year. On the contrary, the number of subscribers and users of the Publibike system in Sion is relatively low.

The conurbation area of Bienne counts around 100,000 inhabitants, 55,000 of them living in the city of Bienne. The Velospot system was implemented in 2012. In 2014, the network counts 40 stations and around 250 bikes, and there were 125,000 bike loans over the year. The station and bike density of the network of Bienne is the second highest and the highest of Switzerland respectively. In 2014, there were almost 1,200 subscribers in the network of Bienne.

In 2014, a survey was conducted by Velospot Bienne among 500 users of the system. 83,8% of users have acquired a private subscription which is used several times a week to go to school or to work (39,6%) and to conduct leisure activities (38,8%). 65% of respondents use the system at least one time per week. Trips made by Velospot bikes replace trips previously carried out by public transport (41,6%), personal bike (18,3%) and walk (24,1%). Only 10,2% of trips made by Velospot bikes replace car trips.

Overall, the level of satisfaction of users concerning Velospot bikes is high. 44,4% and 51,8% of respondents declared to be “completely” or “quite” satisfied. 50% of respondents have encountered some technical problems, while 32,5% of them declared to have no problem. 64,9% of respondents are satisfied with the density of the network and the localization of stations. The subscription rate is considered to be correct (73.7%), even cheap (19.8%).

Sion, the capital of the Canton of Valais, is a medium-size city counting around 30,000 inhabitants. There are around 70,000 inhabitants and 44,000 jobs in the conurbation area. Overall, the population of Sion is car dependent and the motorization rate of the area is high. A Publibike network was implemented in 2011. In 2014, the network counts seven stations located in the city center and 50 bikes (around 15 bikes per 10,000 inhabitants). No stations exist in the peripheral area and in the industrial sector in the south of the city. The number of regional subscribers to the Sion’s Publibike system decreased from 360 to 108 between 2011 and 2014. The number of loans also fell down during the same period from 4,000 to 1,708 loans per year.

A survey launched in 2015[4] provides some evidence of attitudes concerning the Sion’s Publibike system. Overall, the image of the bike is very positive among inhabitants of the conurbation. 60% of respondents have a bike, 60% of those living in the city of Sion, 72% in peri-urban plains and 48% in the peri-urban hills. The Publibike system is widely known among respondents: 89% of respondents living the city of Sion and 80% respondents in the peri-urban area know about the system. However, 47% of respondents affirm to ignore or fairly know the localization of stations. 17% of respondents consider the rate system to be correct, while 76% have no opinion.

The subscription rate is very low with only 0,4% of respondents having a subscription, and

[4] The Canton of Valais, the City of Sion and Car Postal sponsored a survey carried out by the Urban Sociology Laboratory of the EPFL. The survey, completed early 2015, was addressed to around 1,000 inhabitants of the conurbation.

95% of respondents admitting never using the system. Subscribers interviewed are between 35 and 54 years old, and live in the municipality of Sion. The reasons evoked by respondents living in the city of Sion not to use the system are preference for personal bike, meteorological conditions, absence of stations and risks related of parking availability. The reasons evoked by respondents living in peripheral areas are absence of stations, meteorological conditions, lack of knowledge of the system, risk of accident, distance or physical effort.

The difference in terms of use between the bikesharing systems in Bienne and Sion seem to be associated to two main factors: the degree of development of the network and the existing modal patterns in each territory. On the one hand, the Velospot network in Bienne has been largely developed which results in a high level offer compared to the Publibike system in Sion. On the other hand, the predominance of car trips in Sion explains the limited number of users of Publibike system, since bikesharing systems replace mostly trips previously made by soft modes or public transport.

Conclusion:

The implementation and development process of Bikesharing in Switzerland shows a great complexity. As in other contexts, Bikesharing systems have been developed in Switzerland as new mobility services to improve the quality of public transport and soft modes. They have certainly contributed to make bikes visible in urban areas and to improve the image and attitudes towards this mode of transport. However, their economic sustainability is not guaranteed everywhere and innovative and complementary transport policies are required.

The Swiss bikesharing system can be characterized by three distinctive elements. Firstly, the development of different bikesharing systems is oriented towards the constitution of an integrated network at national level. The achievement of this objective is for now only partial, since different services are currently in operation, including different territories and technologies. However, due to the size of the country and the cities served by bikesharing systems, the development of additional networks required an integrative perspective in order to maximize the benefices of the solutions proposed. The development of Publibike system, for example, lies on the ability of national level stakeholders (Car Postal and CFF) to promote and transfer bikesharing systems in/to different territories. Nevertheless, a network oriented strategy can in some cases be risky, since local specificities in terms of territorial configuration or modal patterns may be underestimated. In this context, some local networks of the Publibike system, such as in Sion, face important limitations.

Secondly, the Swiss bikesharing system results from a diversity of initiatives involving public authorities, entrepreneurial actors and socially-oriented associations. Bikesharing system respond not only to the environmental objectives promoted by institutional actors in terms of sustainability, but also to social and economic objectives. Associations working for social inclusion remain essential actors in order to assure the operation of the three different systems. From the economic point of view, bikesharing system respond to publicity purposes, are integrated under the marketing strategies of firms and contribute to technological innovation. This diversity of actors and objectives shows that bikesharing is not reducible to a mobility issue.

The Swiss bikesharing context is also a scenario for technological innovation and competition between different operators. The case of Velospot is an example of innovative adaptation of the principles of bikesharing to the Swiss territorial context. The possible future implementation of a Velospot network in Geneva will test the ability of this system to respond to metropolitan exigencies. With only two networks in operation, Nextbike shows the limits to

transfer a bikesharing solution into Switzerland without a long-term partnership with local stakeholders. Publibike seeks to improve the operation model of bikesharing through the future development of Zurich network. This situation suggests that innovative solutions will also developed in this country for the years coming.

Bibliography:

Fishman, E, S. Washington, and N. Haworth. 2013. “Bike Share: A Synthesis of the Literature.” *Transport Reviews* 33 (2): 148–65. doi:10.1080/01441647.2013.775612.

Midgley, P. 2011. “Bicycle-sharing Systems: Enhancing Sustainable Mobility in Urban Areas.” United Nations Department of Economic and Social Affairs, New York. http://www.un.org/esa/dsd/resources/res_pdfs/csd-19/BackgroundPaper8-P.Midgley-Bicycle.pdf

Parkes, S. D., G. Marsden, S. A. Shaheen, and A. P. Cohen. 2013. “Understanding the Diffusion of Public Bikesharing Systems: Evidence from Europe and North America.” *Journal of Transport Geography* 31 (July): 94–103. doi:10.1016/j.jtrangeo.2013.06.003.

Ravalet, E., and Y. Bussière. 2012. “Les systèmes de vélos en libre-service expliquent-ils le retour du vélo en ville ?” *Recherche Transports Sécurité* 28 (1): 15–24. doi:10.1007/s13547-011-0020-6.

Richard, O., and T. Jouannot. 2014. “Bike Sharing Systems: Part of Public Policies on Sustainable Mobility.” In : http://trid.trb.org/view.aspx?id=1320234.