

The Most Widespread Traffic Control Strategy You've Never Heard Of: Traffic-Restricted Zones in Italy

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Many cities, even those with exemplary mass transit, are struggling with the adverse impacts of too many automobiles within their dense city centers. Road user charges and urban pricing are increasingly common throughout the developed world to address this problem, although their primary goals range widely from financing new infrastructure to reducing automobile congestion to reducing environmental degradation.¹ A related but separate concept, which is very common in European cities, is the pedestrian-only street where all motorized traffic is prohibited. The purpose of this article is to acquaint readers with the Italian approach to limit traffic in the city center known as *Zona a Traffico Limitato* (ZTL), or traffic-limited zones.

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Background on Area-Based or Cordon-Based Traffic Restrictions

While tolls or link-based charges predate the automobile, a more modern form of traffic management is to restrict automobiles within a defined area or zone of a city. A review of the literature reveals several terms and variations on the concept: auto-restricted zones, city center access control, cordon pricing, cordon tolls, area licensing schemes, congestion charge zones, congestion pricing, road pricing, urban pricing, and traffic-limited zones. Singapore is acknowledged to have implemented the first such modern road pricing system, an area-based user charge, whose aim was to reduce congestion.^{2,3} Norway is credited with pioneering area-based tolls to cross all city borders, (e.g. Bergen, Trondheim, Oslo);⁴ the primary goal was to finance new infrastructure. The most well-known congestion pricing scheme may be London's Congestion Charge Zones (CCZ) which, while studied and planned for over a decade, was finally implemented in 2003.⁵ Its primary goal is congestion reduction. A different approach is the strategy developed in Italy, which simply restricts certain traffic; no tolls or charges are imposed. The primary goal is to improve livability within the city center which excessive car traffic had degraded.

The various concepts and applications of traffic-restricted cordoned areas fall into three basic categories, often accompanied by temporal variations (i.e. rules vary by time of day and/or day of week):

1. **Pricing:** Any vehicle may enter the cordoned area but a toll or fee is charged for all vehicles entering the zone. This strategy is used in cities both large (Singapore, London) and small (Valletta, Malta; Znojno, Czech Republic). Certain vehicles may be exempted from the fee; for example in Valletta, Malta, residents, motorcyclists, electric vehicles, and disabled persons are exempt.⁶

2. **Random Assignment:** The general public is allowed on a lottery or alternating basis, e.g. only odd or even license plates are allowed on any given day. Cities using the odd/even scheme include Athens and Mexico City. However, in some instances, as in Mexico City, citizens scammed the system by having two cars or illegally using two license plates.⁷
3. **Vehicle Types:** Only certain vehicles, e.g. residents and taxis are allowed to enter the zone. Each city determines eligibility for the permits and the hours of the restrictions. All other vehicles are simply not permitted during the effective hours.

This third strategy has spread all across Italy and is now present in at least 200 cities. The remainder of this paper will describe the history, function, and effectiveness of Italy's restricted traffic zones, hereafter referred to as ZTL for the Italian term.

What is a ZTL?

The distinctive quality of ZTLs is that they restrict which vehicles can enter, but they do not prohibit all cars, as in pedestrian zones, and you cannot buy your way in, as with tolls or congestion pricing. The primary goal is livability not revenue.

In a ZTL, only authorized motor vehicles may enter and only certain vehicle categories can receive authorization. Typically, residents and vehicles transporting disabled people have unlimited access as well as community-serving vehicles such as buses, emergency vehicles and taxis. Most cities allow motorcycles and motor scooters. Delivery vehicles typically have access during a specified window of time.

The primary reason for ZTLs is to reduce the intrusion of the automobiles in historic city centers, and reduce cars' secondary

Table 1 Hours and Authorized Vehicles for ZTLs in Selected Italian Cities

City	Size of ZTL (2013)	Additional Authorized Users *	Hours of Restriction	Hours Delivery Vehicles are Permitted
Rome (7 distinct zones)	7.5 sq km	Buses	Varies by zone: 24 hours /day; 23:00–3:00 Fridays & Saturdays	20:00–10:00 and 14:00–16:00
Brescia	1.09 sq km	Buses	8:00-16:00	6:30–10:30 and 14:00–15:30
Milan	15.2 sq km	Electric vehicles	Vehicles exceeding 7.5 m: M-F 7:30–19:30	Electric and low polluting trucks- no limits; all others: 7:00–9:30 and 14:00–19:30
Turin	2.7 sq km	Buses	Varies by zone: 24 hours per day; M-F 7:30–10:30; M-F 19:00–7:30	10:30–16:00 or 10:30–12:30
Naples	3.3 sq km	Buses	Varies by zone: 9:00 to 18:00 or 23:00–3:00	8:00–10:00 and 14:00–16:00
Bologna (3 distinct zones)	3.2 sq km	Buses, car-sharing vehicles, hotel customer's vehicles	7:00–20:00	6:00–7:30 and 14:30–16:30;

* In addition to residents, taxis, motorcycles, motorscooters, bicycles, emergency vehicles, and vehicles transporting disabled persons.

Note: 1 sq. km. = 0.39 sq. mi.; 1 m. = 3.25 ft

Source: Michelle DeRobertis, ISFORT, city websites, and the following website: www.accessibilitacentrstorici.it.

impacts of air pollution and noise, thereby improving the quality of life for those who live and work in the city center. Other acknowledged benefits are: reduced traffic congestion, improved transit travel times, improved pedestrian safety and improved bicyclists' mobility. Over time, ZTLs have also been implemented within suburban residential areas. ZTLs have similar goals to traffic calming strategies intended to reduce cut-through traffic but: a) they are a defined area instead of a single street, and b) instead of physical barriers, which make access difficult for all, nonresidents are outright prohibited.

Each city determines its own list of authorized vehicles, the time periods of restriction, and exemptions for deliveries. The variations between cities is illustrated in Table 1. Some cities create other restrictions; for example, the city of Nardó, Puglia prohibits vehicles that weigh more than 1.5 metric tons and one of Turin's zones prohibits vehicles with a height exceeding 11.5 feet (3.5 m). Turin initially had a two concentric zones with different restrictions for the inner and outer zones; in 2009, this two-tiered system was abandoned and the stricter rules were applied to the entire ZTL.



Figure 1 Typical narrow Italian medieval street (Gallipoli, Puglia).

Origin Of The ZTL

Many European cities have historical centers that date back to medieval times where streets are extremely narrow, e.g. 10–20 feet from building face to building face. Many of these ancient zones remain pedestrian-only (for example in Genoa and Ferrara), while others allow cars albeit at very slow speeds given that there may only be 15 feet between buildings (Figure 1). Nevertheless, many city centers permitted cars and by the 1960s, according to Alberto Croce (unpublished data) in his 2013 paper “Zones de Trafic Limité,” most city centers had become overrun with cars, and many piazzas had become parking lots. In response, cities gradually began banning cars from piazzas as Sienna did in 1962. In 1973, to restore the serenity of its historic center, Bologna introduced strategies to manage traffic. This was challenged by residents but ultimately approved by referendum in 1984. Three months after the referendum, on

September 24, 1984, Bologna adopted a new local act “New rules for circulation in the center,” which limited traffic on some streets. This was one of the first manifestations of a ZTL. Other sources have cited Rome or Mantova as the first city to introduce a ZTL. Another early effort was in Milan in 1985: approved by referendum in September 1985, it established control at the entrances to the historical center, monitored by police officers, from 7:00–10:00 a.m. This was modified in September 1986 to 7:30–11:30 a.m. and expanded again in September 1988 to 7:30 a.m.–6:00 p.m.⁸

In 1989, the ZTL was incorporated into the Italian Highway Code, (Codice della Strada, CdS) which was amended to add a definition of ZTL, specify who had the authority to implement them, set the fines for violating them, and other related text.⁹ In addition, the CdS amendments included the reasons that a city might want to implement a ZTL, including to prevent pollution and to protect the artistic, natural and environmental heritage of the city centers.¹⁰

The 1989 CdS explicitly gave mayors the authority to implement ZTLs and pedestrian-only areas. To establish a ZTL, the mayor simply signs a decree establishing the zone.¹¹ This expanded existing mayoral authority to control which vehicles may use which roads, where parking is permitted and also to close roads for the public health such as when PM concentration is too high.¹⁰ In 1992, the Highway Code was revised to change authority from the mayor alone to the mayor and his deputy mayors. One drawback is that the next mayor can undo all or part of the ZTL. But in the 25-year history, very few have been reduced or eliminated; in fact most have increased in size since their initial formation.

Expansion to Other Italian Cities

In 1989, the City of Rome established its first ZTL as shown in Figure 2.¹² The historical city center had become extremely overrun with automobiles and city officials determined that valuable

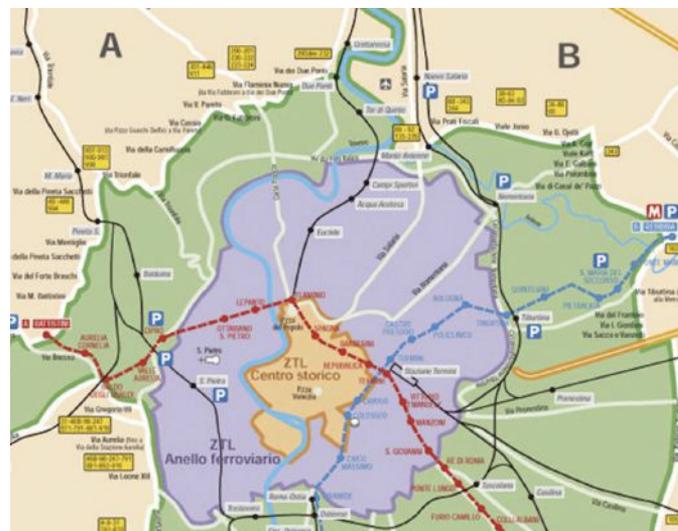


Figure 2. Rome's original ZTL (interior orange) and later expansion (violet).

archeological sites such as the Forum and the Coliseum were being degraded by the mere presence of the abundance of automobiles. (See Figure 3.) Rome first established the boundaries of the ZTL by installing signs, which, not surprisingly, were difficult to enforce. In 1994, they tried physical gates staffed by police officers, who had the authority to fine violators. Rome then replaced police officers with video cameras and in 2001 they implemented electronic control using license plate recognition software.¹³ In 2015, Rome has a total of 1.6 sq. mi. (4.2 sq. km.) of ZTLs in seven distinct zones, each with its own rules and hours.¹⁴

Genoa also established a ZTL in 1989 as did Firenze in 1990. In the 1990s the ZTL concept quickly spread to cities across Italy. In the 2000s, the number and size of ZTLs continued to expand. For example, between 2008 and 2013, Bari's zone more than doubled and Florence's ZTL increased by 15 percent, an increase of 0.22 sq. mi. (0.57 sq. km.) and Milan's ZTL increased in size by 70 percent, which added 6 sq. km. Milan, Palermo, Roma and Florence currently have the largest ZTLs in terms of absolute size, (15.2, 7.7, 7.5 and 5.1 sq. km. respectively), but when expressed as a percentage of the total city surface area, the top three cities are Bergamo, (12.3 percent), Milan (8.4 percent) and Palermo (4.8 percent).¹⁵



Figure 3. Piazza Plebiscito used as a parking lot.

Although it is unknown exactly how many cities have implemented ZTLs, there are so many that entrepreneurs have developed a website / smart phone application so that drivers can check to see if a city has a ZTL and to determine its specific rules and hours.¹⁶ This app lists about 200 Italian cities which vary from large cities such as Rome (population 2.5 million) and Milan (1.5 million), to medium-sized cities like Brescia (190,000) and Ferrara (130,000), to tiny towns in the Alps like Moena (3,000).

ZTL Signs and Pavement Markings and Enforcement

The boundaries of the traffic limited zones are clearly marked with signs. (See Figure 4.) Some cities use pavement markings as well

(see Figure 5), but others think pavement markings degrade the historical integrity of the city center. The signs indicate the hours that the restrictions are in effect and which cars are permitted to enter. Typically, delivery trucks are permitted during a reduced window of time, which is also clearly indicated. Some signs indicate that the area is under surveillance.

Technology has made enforcement easier. The first electronic controls were installed in Bologna on October 1, 1994, (Alberto Croce, unpublished data). Rome began electronically monitoring in 2001 and Turin has electronically-monitored its ZTL since 2004.¹⁷



Figure 4. Entry sign at ZTL in Brescia.



Figure 5. Pavement marking at entrance to ZTL in Turin.

Because ZTLs rely on signs and enforcement rather than on physical measures such as barriers or street redesign, they are easy and cheap to implement. Enforcement, however, was very time-consuming and difficult until the advent of electronic technology. This equipment is now the most expensive part of implementing ZTLs. Cities typically finance the capital cost with the revenue received from fines. For example the City of Brescia began electronic monitoring in January 1, 2007. Cameras were installed at twelve locations at a total cost of €615,000. Brescia receives sufficient revenue from fines such that the equipment will be paid off easily. (Personal communication between author Tira and the City of Brescia). After the equipment is paid for, the CdS allows cities to keep the fine revenue, but it must be spent on road safety improvements or traffic management.

Effectiveness of ZTLs

Few cities have quantitatively evaluated the effectiveness of ZTLs on air quality, traffic safety, or even traffic volumes. The fact that ZTLs are established by mayoral decree means that ZTLs might not have been anticipated much in advance of implementation, so no “before” data was collected. Rome’s ZTL was established in 1989 and evaluated in subsequent years. In 2004 the introduction of cameras at the 23 gates in 1999 was evaluated and found to have achieved the following:

- Overall reduction in traffic of 13 percent. The total number of vehicles entering per day decreased from 147,000 vehicles to 127,000 on weekdays, and from 121,000 to 113,000 on Saturdays;¹⁸
- Air pollution was reduced, except for PM;¹⁰
- Overall travel speeds for buses increased;
- Reduction in delivery-vehicle volume from 13,000 to 10,000; and
- An increase in daily trips by motorcycles / motor scooters and an increase in walking.

In addition, before electronic control, enforcement involved 80 police officers per day to staff the gates for all the shifts. After, only 16 police personnel are needed to evaluate the photographs

of violators. An unintended side effect was that motorcycle/motor scooter ownership in Rome increased from 400,000 to 600,000 from 1996 to 2004, since they were an authorized class of vehicle.

In 2014, Rome again evaluated the effectiveness of ZTLs on several criteria and determined there was the following:¹⁹

- Decrease in car trips (-5.0%);
- Increase of public transport travels (+3.6%); and
- Increase of pedestrian and cycling trips (+1.5%).

Conclusion/Status Today

While there is no systematic record of how many towns and cities in Italy have ZTLs, (there are 8,000 towns and cities, 2,000 with population above 5,000), it is known that ZTLs have been not only tried but retained and expanded in cities of all sizes since their inception in the 1980s. For the past twelve years, an Italian private research company, Superior Institute for Training and Research in Transportation, has documented the size of ZTLs in the 110 provincial capital cities; almost all have ZTLs and the vast majority have increased in size over time.²⁰ In addition, ZTLs are being used for additional purposes than the original one of preservation of historical integrity. For example, Rome and Naples have one

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or more ZTLs that are in effect in the late night-time only, from approximately 11:00 p.m. to 3:00 a.m.; the purpose is to reduce traffic and noise problems related to the nightclub scene and to reduce cruising for drugs and other illegal activity, respectively. At least one ZTL, in Milan, has morphed into congestion pricing. The City of Rome's latest Urban Transportation Plan, 2014, suggested that Rome study charging fees to enter the ZTL.

It is worth mentioning that acceptance from local businesses is always difficult, as the local merchants perceive a link between automobile traffic and sales, just as American storeowners do. Nevertheless, ZTLs are very flexible tools able to cope with different and changing needs since access is never prevented with physical permanent treatments, as is the case with many traffic calming measures.

It remains to be seen whether ZTLs or the related but distinct concept of congestion pricing can be politically acceptable in the USA.²¹ San Francisco, CA, USA has floated the idea of congestion pricing for parts of its downtown; this would be above and beyond the bridge tolls on the Golden Gate and Bay Bridges which already impose \$4 to \$6 tolls at two of the three main entrances to San Francisco.²² Political and public sentiment against changing the status quo have stymied any progress on this effort. **itej**

References

1. Lemoine, Caroline. Urban Pricing In Paris: Lessons To Be Learned From Abroad. *Association for European Transport*, 2009.
2. Ibid.
3. Eliasson, Jonas and Mattias Lundberg. *Road Pricing in Urban Areas*. Vagverket (Swedish National Road Administration (SNRA)), VV Publication 2002:136E. January, 2003. (Copublished in English by SNRA and T & E).
4. Ibid.
5. Ieromonachou, Petros, Stephen Potter and James P. Warren. Evaluation of the Implementation Process of Urban Road Pricing Schemes in the United Kingdom and Italy. *European Transport \ Trasporti Europei* n. 32, 2006, pp.49-68.
6. Carreno, Michael. *Controlled Vehicle Access, Valletta Malta*. European Local Transportation Information Service, www.eltis.org, Study 1610, May 11, 2007.
7. Davis, Lucas W. The Effect of Driving Restrictions on Air Quality in Mexico City. *Journal of Political Economy*, vol. 116 (1), 2008, pp. 38-81.
8. City of Milan, Italy / Comune di Milano, Italia. *Piano Urbano del Traffico/ Urban Transportation Plan (PUT)*, 1995.
9. Codice della Strada/Italian Highway Code. Titolo 1, Articolo 3 and 7, 1989.
10. Ibid. Articolo 7.9, 1992.
11. Ibid.
12. Comune di Roma/ City of Rome, Italy. *Piano Urbano del Traffico/Urban Transportation Plan (PUT)*, 2004.
13. Antonucci, E., F. Garzia and G. M. Veca. Automatic Vehicles Access Control System of the Historical Centre of Rome. Presented at The Sustainable City 2002 - Urban Regeneration and Sustainability, Segovia, Spain, 3-5 July, 2002.
14. City of Rome. City website on Zone a Traffico Limitato: www.agenziamobilita.roma.it/it/servizi/orari-ztl/. Accessed March 15, 2015.
15. *12 Rapporto Sulla Mobilità in Italia, Rapporto finale*. Istituto Superiore Di Formazione E Ricerca Per I Trasporti (ISFORT, Institute for Training and Research in Transportation, a private research institute funded by National Bank for Communications Foundation and the national railway). www.isfort.it. Cagliari, Italy. November 13, 2015.
16. Website and smart phone application available at www.accessibilitacentristorici.it.
17. Antonucci, E. Op. Cit.
18. City of Rome, Italy. *Piano Urbano del Traffico/Urban Transportation Plan (PUT)*, 2004.
19. City of Rome, Italy. *Piano Urbano del Traffico/Urban Transportation Plan (PUT)*, 2014.
20. *12 Rapporto Sulla Mobilità in Italia, Rapporto finale*. Op. Cit.
21. Author DeRobertis is currently designing a Ph.D. dissertation under the direction of author Tira on evaluating the effectiveness of ZTLs. They welcome your ideas on what to consider that may be of value to an American application or in evaluating "livability." You may contact them at m.derobertis@unibs.it.
22. San Francisco County Transportation Authority. Mobility, Access and Pricing Study. San Francisco CA. 2010. www.sfcta.org/transportation-planning-and-studies/congestion-management/mobility-access-and-pricing-study-home.



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