

# Urban Mobility in Vitória in Times of Pandemics: Considerations about the Cycle Road System

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**Abstract:** Mobility is among the urban issues that most affect the population's quality of life. The complexity inherent to mobility requires the development and application of methods and tools that enable a better understanding of their interrelationships. In this sense, the use of indicators is important for the analysis of current mobility conditions, as well as allowing the monitoring of the impact of public policies and the evolution of certain phenomena and actions. Thus, the objective is to study the cycling modal in urban mobility in the city of Vitória, Espírito Santo, during the period of the new coronavirus pandemic, through the application of two indicators: the cycling network increase and the traffic accident reduction. It is considered that the demand for the use of public transport and motor vehicles has decreased due to social isolation. The methodology includes a literature review on the studied subject; urban mobility indicators selection; data collection from public agencies; and analysis of the results. The results reveal that indicators are required to support the proposition of public policies, targeting of actions, identification of areas in need of investments and mainly can reflect the pandemic influence on urban mobility.

**Key words:** Bikes, mobility indicators, active transport.

## 1. Introduction

As indicated by Machado [1], mobility refers to the ability to move between different places of activities. It involves both people and cargo and needs rolling stock, in the case of land vehicles, in addition to the transport system or simply the user's feet.

For a better understanding of mobility, it is necessary to go back to history and remember that humanity originated from homo sapiens, more than 500,000 years ago, when it started to stand upright and walk. Later, the invention of the wheel was, without a doubt, a great facilitator for people's lives, who started using it to transport people and cargo. However, the

first bicycle only appeared in the year 1493, while the first steam-powered vehicle only appeared in 1769 [2]. The fossil fuel autonomous vehicle, on the other hand, only appeared at the beginning of the 20th century, which has been widely accepted and expanded to the present day.

According to Rubim [3], more than 50% of households in Brazil have a car in their garages. In fact, the Brazilian vehicle fleet has been growing since the incentive policy adopted by the government in the 1930s. According to the Brazilian Institute of Geography and Statistics [4], in 11 years, the increase in the number of cars in the country was 69.7%, while a Brazilian population grew by only 8.9% in the same period. In Vitória, capital of Espírito Santo, the fleet grew 30.2% and the population 11.6%. However, owning a car is only a small part of the mobility problem in big cities, aggravated by everyday and excessive use of the vehicle [5].

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Regardless of the means of transport used: collective or individual, motorized or not, according to Gomide and Galindo [6], urban mobility can be understood as a condition for the movement of people and goods through the city. Furthermore, mobility requires planning related to urban development, traffic problems, availability and the circulation process of the urban population. Therefore, it concerns the needs involving the means of transport, parking areas, vehicle congestion, among others [7].

The current situation of contamination by COVID-19 strongly influences the habits and mobility of Brazilians, due to measures and protocols to prevent contagion to the population, hence the need to verify the extent to which urban mobility in current times of social isolation was affected and look for a correlation with earlier times. According to Transformações [8], the need for quarantine in cities has changed street landscapes and will undoubtedly lead to a long-term change in urban mobility. In places where it was possible to resume some activities, actions were taken to prevent the increase in new cases. Many actions were carried out experimentally, but with the possibility of showing positive results and proving to be effective in the long term.

Among the measures to contain the virus transmission, non-pharmaceutical interventions have been the main strategy to contain the pandemic advance while vaccination is not widely available. As a result of these activities, “[...] activities, gains and social, as what are the routine parts of urban areas, were modified, culminating in the cessation of retail, leisure and school activities, and barriers at a local and regional scale” [9]. In relation to transport, there were also relevant changes such as the preference for individual transport in relation to collective transport [10].

The WHO (World Health Organization) recommends using a bicycle during a pandemic, as it is the individual and safest mobility vehicle for travel

during this period. In this context, many cities take advantage of the moment to accelerate actions to promote active mobility, with the creation of new bike paths in order to encourage a safe resumption of activities [11].

There are good reasons for governments to promote cycling as it is socially, environmentally and economically sustainable. Furthermore, cycling is viable for both short trips and medium-distance trips that are too long to be covered on foot [12].

In view of this perspective and considering the city of Vitória as the location for this study, we seek to analyze a situation in the city’s cycling system and what the impacts of the pandemic on this modal were.

## 2. Urban Mobility Scenario in the Pandemic

During the pandemic, many city governments took steps to encourage and increase the use of bicycles, including support from state and national governments in some cases. Thus, many cities expanded their cycling structure in 2020 [13].

The Peruvian capital of Lima, according to Transformações [14], decided to temporarily increase the cycling network by 301 km, which could be permanently implemented in the future. In Europe, Paris made available 650 km of cycle paths to allow the city to reopen. In Milan, one of the most polluted cities in Italy and the center of the country’s coronavirus outbreak, the use of bicycles not only allows people to move, but also prevents pollution from returning to previous levels. Additionally, during the pandemic, some countries such as Colombia, China, Germany, Ireland and the United Kingdom saw a significant increase in cycle path traffic. In the United States, Philadelphia bike lanes have increased 471% due to restrictions to contain the spread of the virus, causing residents to sign a petition requesting the expansion of space for cyclists.

Some cities in Brazil, such as São Paulo, Porto Alegre, Campinas and Salvador, have also adopted

tactical urbanization measures, which can translate into lasting changes in public places, these measures give people more security and promote the right to the city. With greater pedestrian and bicycle traffic, cities are expected to become more inclusive after the pandemic—which in addition to socializing urban spaces, also benefits local commercial activities [15].

Transport is a social right guaranteed to all Brazilians by the Federal Constitution, therefore, even during periods of social isolation, governments have the responsibility to ensure that the means of transport works normally for those who work to face health and provide basic services to the population [16].

An important point is that the economically vulnerable population often cannot adopt the distance measures—which can generate losses in their income—due to the instability and informality of work activities. Allied to this, the distance between their homes and the place where they work forces this group to face daily crowded transport even during the pandemic [17]. Thus, public policies aimed at this population are needed, so that they can move around in a safer way.

According to Rodrigues [18], the State has a fundamental role in consolidating these public policies and bicycles can play a key role in urban requalification. In the Brazilian scenario, few cities have directed efforts towards the implementation of cycle paths and cycle lanes [19]. On the other hand, in the city of Vitória in Espírito Santo, the health crisis pushed forward some cycling plans that had been stopped for years.

According to Bracarense and Oliveira [20], more infrastructure for active transport has been considered as an alternative to avoid the use of individual motorized transport as it is more sustainable, increasing air quality, in addition to promoting physical activity for cyclists, that is, causing a positive impact on society's life.

### **3. Implementation of Cycle Routes in Times of Pandemics in the City of Vitória**

As indicated by Faustini [21], the Municipality of Vitória, through the Department of Transport, Traffic and Urban Infrastructure (Setran), created a working group to propose new options for circulation in the city during and after the pandemic/social isolation. Also participating in this group are the secretariats for City Development (Sedec), Works and Housing (Semohab), the Services Center and the CDTIV (Vitória Development, Tourism and Innovation Company), with the objective of seeking alternative forms of circulation, mainly for cyclists and pedestrians, to be implemented after the period of social isolation.

Changes in the movement of people, urban mobility and the way of using the means of transport have changed, and it is necessary to innovate. In countries that experienced the pandemic before us, measures to adapt to the movement of people are being adopted. Not crowding becomes a basic and necessary rule. Based on these new guidelines, we will think together about more actions that encourage and offer safety to pedestrians, cyclists and drivers who pass through Vitória [22].

After confirming the first cases of coronaviruses in the city of Vitória, Mayor Luciano Rezende, on March 22, 2020, decided to suspend the bicycle paths in the capital until the end of the month, in order to prevent the spread of the virus. Similarly, the leisure street had also been suspended since the 18th of the same month. Meanwhile, in recent months, the working group has proposed a new urban circulation plan, namely the implementation of cycle paths. As Vitória has a 37 km cycling network, in addition to meeting this demand for cyclists, there was interest in increasing the network of bicycles to encourage their use during the pandemic [23]. Naturally, due to the urgent need to implement extensions for the cycling network, the way to implement it was through the cycle routes.



**Fig. 1** First route chosen to receive flagged cyclization in Goiabeiras.

Source: elaborated by the authors (2020).

Unlike bicycle lanes<sup>1</sup>, cycle lanes<sup>2</sup> and shared sidewalks<sup>3</sup>, on cycle routes<sup>4</sup>, lanes with special signs are shared between cars and cyclists—who have priority and can move to the front of the vehicle in the middle of the lane, as shown in Fig. 1.

#### 4. Cycle Road Mode Indicators

Mobility indicators are tools that make it possible to carry out measures that lead to an understanding of the context of cities, so that the problems and potential that exist in cities are highlighted [24]. Through these

indicators, therefore, it is possible to adopt effective strategies for the promotion of public policies.

Considering the cycling modal, the following indicators were evaluated: evolution of the cycling network in Vitória and number of pedestrians. Based on this information, the impact of the pandemic on the respective modal can be analyzed. The increase in the number of shared bicycles and their respective stations was also evaluated.

One of the changes in the city in the period in question was the implantation of Cycle Routes. According to Pimentel [25], by implementing a safe speed zone of 30 km/h, the cycle path may not only improve the safety of pedestrians and cyclists, but also increase connectivity in the current structure of cycle paths and thus contribute to reducing the number of accidents and increasing user safety. For this, it must have identification signs on the ground, as well as outstretched arms and wooden stakes indicating the cyclists, as shown in Figs. 2 and 3. These signs indicate the priority of movement of the cyclist, which is defined in the Traffic Code Brazilian.

<sup>1</sup> Bicycle lane: lane for the exclusive use of bicycles and other cycles, with physical segregation from common traffic.

<sup>2</sup> Cycling lane: part of the carriageway, sidewalk or construction site intended for the exclusive circulation of cycles, delimited by specific signs.

<sup>3</sup> Shared sidewalk: space on the sidewalk or central median, intended for the simultaneous use of pedestrians, wheelchair users and mounted cyclists, with pedestrian priority, provided that it is properly signposted.

<sup>4</sup> Cycling route or bicycle route: lane with reduced maximum speed, characteristics of low traffic volume and specific signage, indicating the sharing of road space between motor vehicles and bicycles, creating favorable conditions for their circulation, interconnecting cycle lanes, cycle lanes and points of interest.



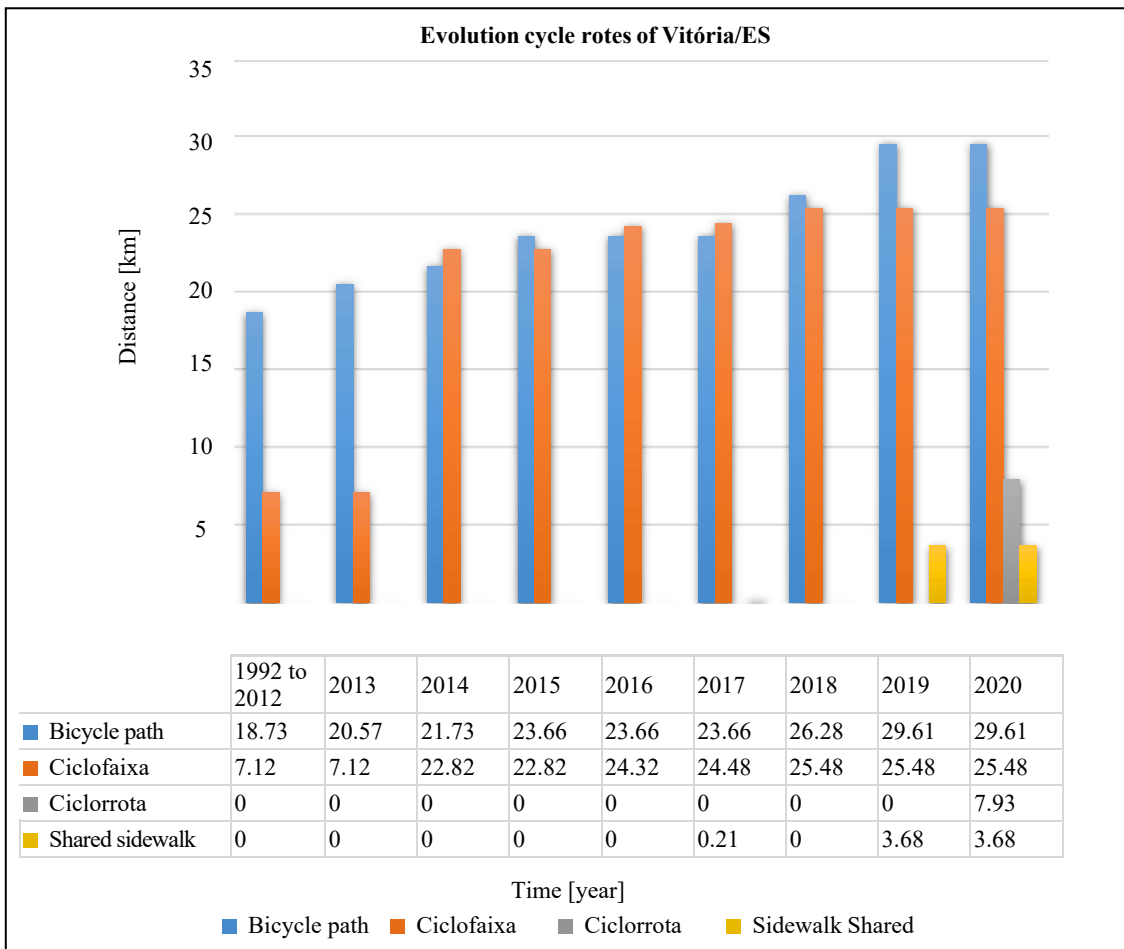
**Fig. 2** Cycle route signaling in Jardim da Penha.  
Source: elaborated by the authors (2020).



**Fig. 3** Cycle route signaling in Goiabeiras.  
Source: elaborated by the authors (2020).

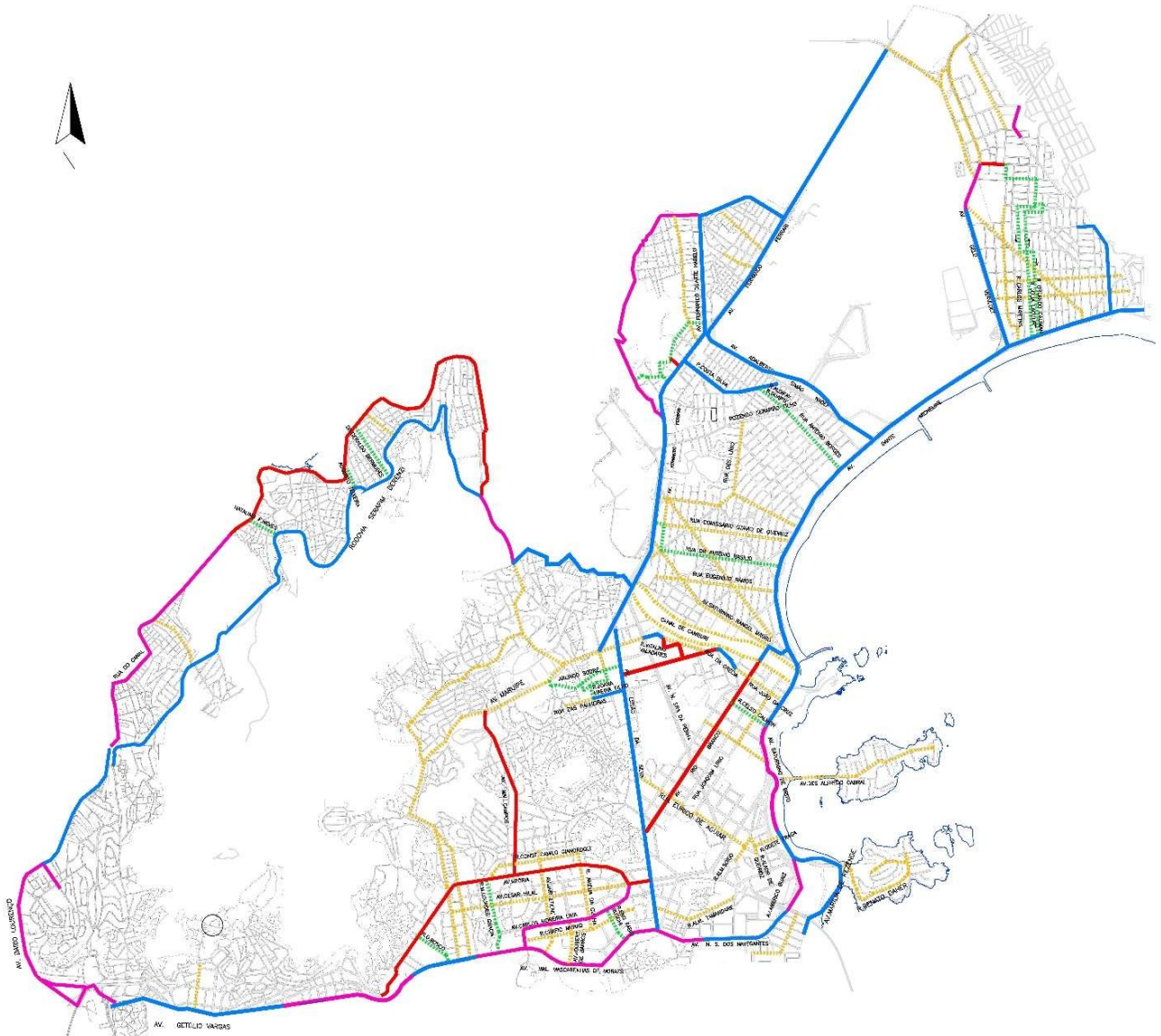
The city's neighborhoods covered by the cycle route were Goiabeiras, Jardim Camburi, Fort São João, Ilha de Santa Maria and Bento Ferreira, totaling 7.93 km of cycle routes installed, a value that already exceeds the extension of shared sidewalks, integrating the cycle network, as the Fig. 4.

The map in Fig. 5 shows the map of the cycling network with the location of each of these stretches of cycle paths, cycle routes and cycle lanes implemented, as well as the stretches to be designed and, in the future, implemented. In Fig. 6 there is the legend for understanding the map, as well as the data referring to








**Fig. 4 Indicator 1: Evolution of Vitória’s cycle network.**

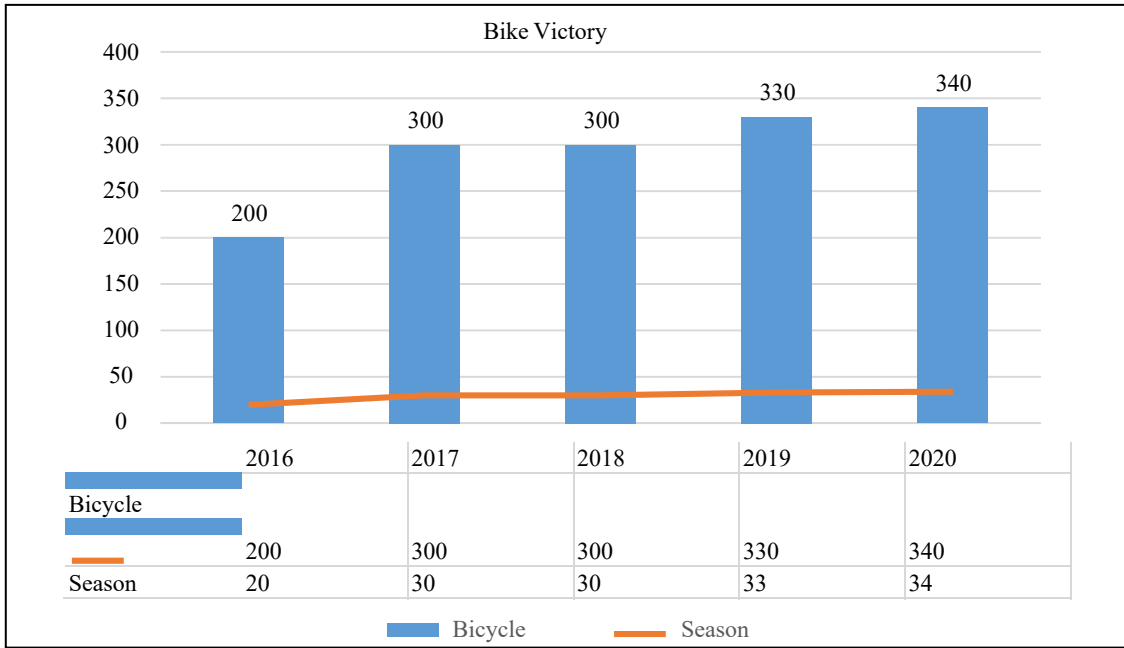
Source: elaborated by authors (2020) with base in Town Hall Municipal of Victory (2020).



**Fig. 5 Map of Vitória's cycle network.**  
Source: City Hall of Vitória (2020).

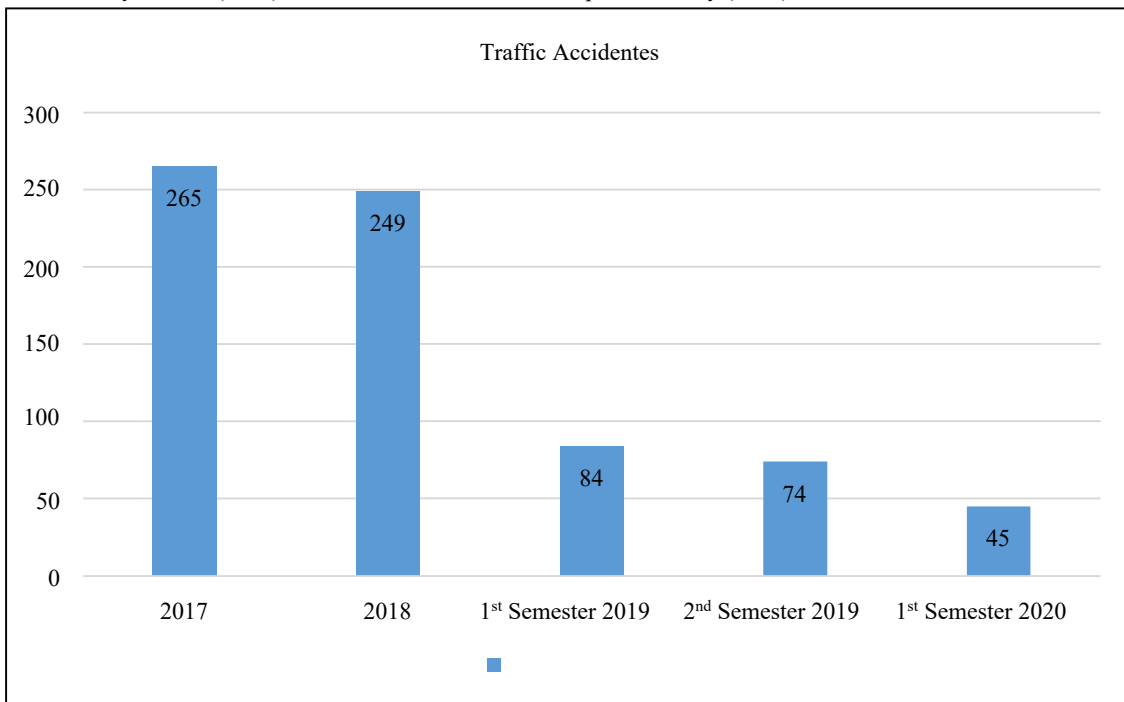
	cycle paths/cycle lane implemented	38.195,00m
	cycle paths/cycle lane construction planned	13.823,95m
	cycle paths/cycle lane projected	14.990,99m
	cycle paths/cycle lane in project	45.578,00m
	cycle route planned	11.017,00m

**Fig. 6 Legend for understanding the map of Vitória's cycle network.**  
Source: Prepared by the authors (2020) based on The City Hall of Vitória (2020).



**Fig. 7 Indicator 2: Number of stations and shared bicycles.**

Source: elaborated by authors (2020) with base in Town Hall Municipal of Vitória (2020).



**Fig. 8 Indicator 3: Number of traffic accidents of the type of hit-and-run.**

Source: prepared by the authors (2020) based on the State Secretariat of Public Security (2020).

the extension of all sections. The evolution trend in the cycling modal is evident, as well as the expansion of this structure to serve new areas.

Also contemplating the analysis of the cycle modal in times of pandemic, Fig. 7 indicates a small increase

in the number of bicycles shared in 2020. Fig. 8 also shows an appreciable reduction in the number of pedestrians run over in the 1st half of 2020, given the isolation conditions observed, when compared to the historical series of previous periods.



## 5. Results and Discussion

The use of bicycles directly depends on the urban space, so that cycle lanes can significantly increase the traffic of shared bicycles in an area, in addition, the connectivity between the cycling modal plays a fundamental role as it facilitates the journey between different points of a city [26]. Another important point is that many utility bicycle trips that were lost during the pandemic will likely be recovered [27]. Thus, also considering the stretches of cycle path, cycle lane and cycle route in the city of Vitória to be implemented, an increase in the number of cyclists is expected. Therefore, shared bicycles would play a fundamental role in meeting this demand, as long as their cost remains low to be attractive and there are more stations, serving other locations. On the other hand, according to the indicators, it is noted that both the increase in shared bicycles and stations was minimal. Thus, it is necessary that the availability of such a service is expanded, following the evolution of the cycling infrastructure.

With regard to pedestrian accidents, so that such numbers do not increase, considering a greater number of cyclists, it is necessary that the cycling structure is adequate. In other words, in cycle lane locations, mainly, there are physical barriers that separate cyclists from vehicles, providing safety and preventing accidents. Similarly, on cycle routes, signaling must be done properly and the maximum speed must be compatible with the traffic of motor vehicles and bicycles.

An urban planning that is based on accessibility, taking into account the integration between the location of activities, transport and land use, allows more efficient solutions for access to daily activities, enabling the targeting of public policies that serve the vulnerable population. In this context, it is important that the evolution of the cycling modal considers these factors, as the mobility and accessibility conditions of this group are the most unfavorable.

It is noticeable, therefore, that bicycles can play a fundamental role in the mobility conditions of the city, as long as the infrastructure is adequate, providing safety to users and serving other locations, and that the offer of shared bicycles is expanded, also serving new areas.

## 6. Final Considerations

Mobility and urban accessibility are objects of current concern, and of great importance, for managers and organizations related to recent themes in urban policies and programs.

The result obtained from the analysis of two selected indicators for urban mobility contributes somehow to reflections and possible directions of public policies and monitoring, planning and management programs for urban mobility in Vitória. In fact, it was found that the reduction in motor vehicle traffic since 2019, and the implementation of cycle routes in 2020, contributed to a significant reduction in the number of traffic accidents in the city. Therefore, it is essential, for the period of social isolation and even after, that the active mode of transport is encouraged, through the implementation of other stretches of bike paths, and the general improvement of urban infrastructure that provides better circulation for pedestrians and cyclists. Thus, indirectly, the use of individual motor vehicles may be discouraged and, mainly, contribute to the mitigation of contagion by the coronavirus in the present.

In a post-pandemic scenario, the cycling modal is an effective alternative for transport, as it is more sustainable and has a low cost. In addition, a better-developed cycling infrastructure encourages the use of bicycles, so that this type of transport can be used at the expense of motor vehicles, which would reduce not only traffic and congestion, but also air pollution.

Finally, it is evident that the indicators are essential tools for the development of public policies, so that it

becomes possible to establish relationships between some aspects and analyze whether the planning has been carried out in the most adequate way.

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