



## Cooperation for Sustainable Development: a University Transport Model

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**Abstract** The transportation system generally contributes with the largest share of Greenhouse Gases Emissions (GHG) among economic activities, which includes the high level of gas emissions from the transport system in the GHG Inventory from Higher Education Institutions (HEI). Guided by its socio-environmental agenda, the Pontifical Catholic University of Rio de Janeiro (PUC-Rio), has sought to implement integrated programs to encourage the use of alternative transportation in order to mitigate the impacts of urban mobility on the atmosphere since 2010. Free parking and shower facilities for cyclists, as well as pedestrian friendly sites and limited vehicle parking area inside the campus are some of the welcomed interventions implemented by PUC-Rio. In addition, the institution has collaborated technically with the public authorities to enable the arrival of good quality mass transportation to the University neighborhood. Even facing limited mass public transportation in the surroundings of the main campus, PUC-Rio has implemented a series of transportation initiatives that rely on the commitment and partnership of its community (students, professors and staff), who strongly support new solutions for sustainable development and contribute to the improvement of PUC-Rio transportation performance.

### Keyword:

sustainable campus, university transportation initiative, PUC-Rio

## 1. Introduction

Sustainable transport system in universities consists of a series of measures that encourage the use of alternative modes of low environmental impact that discourage the use of private motor vehicles. Some examples of alternative measures include incentives to encourage walking, cycling, and using mass public transport, as well as options for ride sharing. In addition, restricting parking areas and increasing the price of parking are two of the most frequently used policies in densely populated areas, such as urban university campuses [1].

Although HEIs have unique transport needs [2], the proactive educational environment of university campuses are ideal for propagating sustainability and helping to reshape society's transportation patterns. The university community is generally very diverse, made up of people from different backgrounds, income and lifestyles, all of whom come together to study and work. In addition, the undergraduate student class tends to be more receptive to new ideas, rendering it favorable to establishing friendly urban environments for cyclists and pedestrians, if properly oriented [1].

This article describes and discusses the sustainable mobility practices implemented on the main campus of PUC-Rio. The University and its Socio-environmental Policy are briefly described in section 2. The third section shows the initiatives for PUC-Rio transport in recent years, and the last section presents a summary of the University's experience in mobility and a reflection on the next steps for continued progress.

## 2. PUC-Rio and the Environmental Agenda

Founded in 1940, the Pontifical Catholic University of Rio de Janeiro (PUC-Rio) is a non-profit, philanthropic and higher education community institution with the mission to produce and propagate knowledge from teaching, research and extension activities. In addition, PUC-Rio is a pioneering institution in the inclusion of sustainable development principles into its institutional policy, taking full advantage of the natural environment of its campus for educating and implementing various programs for the benefit of society-at-large, including elementary school students in the surrounding public schools.

With approximately 1,500 faculty members and researchers, the University has 24 Departments organized in four academic centers: the Center of Theology and Human Sciences, the Center of Social Sciences, the Center of Science and Technology, and the Center of Biomedical Sciences. PUC-Rio offers 36 Bachelors Programs and 26 Graduate Research Programs for 13,000 undergraduate students, 2,500 graduate students and 7,000 continuing education students [3].

The main campus is located in the Gávea neighborhood, in the southern region of the city of Rio de Janeiro, the second largest city in Brazil and the sixth largest in Latin America. The Campus is surrounded by the Atlantic Rain Forest (Fig. 1) and within the buffer zone of the Tijuca National Park, one of the largest urban forests in the world. It is also located in the hydrographic basin of Rainha River, which crosses areas of different urban occupations, including *favelas*, before reaching the University Campus and flows into the sea in the Leblon neighborhood [4].

The Campus is provided with complete infrastructure, including computer centers and free internet access; libraries; restaurants, bookstore; and cultural and community service projects. Its Tinguá Campus is a rural site for ecological research and pedagogical activities.



Figure 1. Gávea Campus, PUC-Rio.

In 1999, the Interdisciplinary Center for the Environment (NIMA) was created by the University to bring a multidisciplinary perspective to socio-environmental topics, aggregating the diverse knowledge from various teaching and research activities [5]. The nucleus contributed to the advancement of discussions on socio-environmental issues with the local community, the institutionalization of an environmental policy to guide the University in implementing a Sustainable Campus and in promoting social actions for the common good of its community and the society as a whole.

In 2009, the development of the PUC-Rio Environmental Agenda institutionalized a sustainability plan for the University, the first Brazilian university to adopt a management instrument for university socio-environmental sustainability. The document launched in 2010 addressed nine themes to achieve its objectives: Atmosphere, Biodiversity, Water, Energy, Materials, Waste and Environmental Education [6].

Moreover, the Encyclical Letter *Laudato Si* issued by Pope Francis, aimed to raise awareness and encourage Christians to reflect upon the need to care for the common home, the planet Earth. The initiative further encouraged Catholic Universities to teach and research for sustainable development. At the PUC-Rio, it culminated in the environmental policy review process that had already been instituted in 2009, adding social and environmental concepts to expand the topics of the documents [7]. The new Socio-Environmental Agenda, which is in the final stage for approval, covers six basic topics: Water, Biodiversity, Energy, Waste, Living spaces, and Mobility; and five cross-sectional topics: Education, Health, Communication, Information and Technology and Resilience to climate change [4].

### **3. PUC-Rio transport Initiatives**

PUC-Rio Environmental Agenda is an institutional and collective document that aims to make the University sustainable through guidelines and goals the short, medium and long term. The environmental management plan elaborated in the Agenda was organized in thematic guidelines and targets. Among the seven main topics covered in the document, the topic “atmosphere” stands out. One of the guidelines that make up this topic is the implementation of integrated programs to encourage the use of alternative transport by the university community (Zero-Emission Vehicle Policy on Campus), such as ride-sharing, public transport and bicycles, in order to reduce greenhouse gases (GHGs) emissions. Among the goals of the guidelines are:

1. To perform awareness campaigns on the use of alternative and low CO<sub>2</sub> transport;
2. To implement a ride-sharing system, with the support of the Vice-Dean of Community Affairs and Campus Services;
3. To implement a differentiated charging system for the parking lot in order to discourage GHG emissions;
4. Expand the capacity of the University's bicycle racks.

Unlike some universities where the abundant use of motor vehicles is necessary to circulate within the Campus due to the long distances traveled internally, the main Campus of PUC-Rio has an area of approximately 2,68 km<sup>2</sup>, making it easily covered by foot. With the exception of the Tinguá Unit area, which is located in an environmental heritage reserve in the metropolitan region of Rio de Janeiro, other complementary units of the university, such as the *Instituto de Odontologia* and the *Centro Loyola de Fé e Cultura*, are also within short distances, in the same neighborhood.

In this context, many of the measures adopted to promote sustainable transport at the University encourage students and staff to use low GHG-emitting public transportation to commute to the University. Around Campus, the University seeks to ensure safe, inclusive and accessible sidewalks and paths for all. In 2019, the rate between the total number of vehicles circulating on campus and the total population of the university was 0.10.

Some of the campus initiatives to meet the environmental policy in the area of mobility are:

### 3.1 Transport services

PUC-Rio offers transport services for teachers, employees and students. There are two buses that make collective transport for employees who live longer distances, and minivans with a capacity for 12 people that circulate throughout the day between the main campus and the complementary units of the university, making approximately 30 rides per day. Inside the Campus there is signage identifying the stops of collective vehicles and schedule information is made virtually via the PUC-Rio community platform (Fig. 2).



Figure 2. Shuttle services and staff bus stop.

### 3.2 Limited Parking Area

One of the first measures implemented on the Campus after institutionalizing the University's environmental policy was with regard to the collection of vehicle parking fees. The price charged for parking increased from R\$5.00 to R\$10.00, as an attempt to discourage students and staff from using the private vehicles.

In 2019, 1,800 vehicles and 120 motorcycles circulated within the campus daily. The actions implemented to limit parking areas within the campus in the past 3 years have resulted in a decrease in 30% the areas intended for parking within the campus. The percentage of the parking area in relation to the total campus area is 3.02% as shown in Figure 2.



Figure 3. PUC-Rio parking areas in total campus area.

### 3.3 Carona Solidária (*Carsharing*)

As a way to encourage actions to reduce the impact of transport systems under the Environmental Agenda of 2010 / 2011, the University created the Car-sharing program, which offered free parking to cars arriving at PUC-Rio with more than one person, encouraging students and employees to share rides.

In addition, other initiatives related to vehicle sharing, free rides or similar actions to improve urban mobility and the quality of life of the PUC-Rio community, were developed by the students themselves, using simple technologies, such as the commonly-used social networks. For example, in 2016 an application was created by students to facilitate the sharing of taxis between university users with similar routes and destinations.

### 3.4 Use of Bicycles

The measures that encourage the use of bicycles as a means of transport are very well accepted by the PUC-Rio community, due to both adhesion on the part of the students and to the increased access to cycling infrastructure. All routes along the PUC-Rio Campus are suitable for shared use by cyclists and pedestrians. There is a speed limit established for cars on all internal streets, in order to allow the shared use of internal roads. In addition, the University offers showers in the sports gym for use by cyclists who feel the need to clean themselves before starting their daily activities on Campus.

The demand of campus users for infrastructure for this mode is historic at PUC-Rio. Since 1986, students access the campus by bicycle and set up a place to park bicycles. Later, this place became the official bike rack on the campus, which opened in 2008 with spaces for a total of 170 bicycles. It was renovated in 2016 to increase the number of vacancies and gained a coverage structure (Fig. 4). In the same year, an exclusive bicycle rack was also created for electric bicycles.





Figure 4. Free bicycle racks

### 3.5 Pedestrian Paths

To ensure the safety of pedestrians on the Campus, in addition to the sidewalks exclusively for pedestrians, there are shared-use routes with divisions between vehicle access and pedestrian crossing. As an example of functionality and comfort for walking on campus, in the PUC-Rio Business School (IAG) building, pedestrian crossings have canopies to facilitate walking between buildings on rainy days. In addition, there are accesses with ramps and tactile floors for pedestrians with physical and visual disabilities in all the buildings of the University. Vehicle speed limits and street lighting were also instituted to favor pedestrian traffic on the Campus (Fig. 5).



Figure 5. Signs of pedestrian priority and covered paths

### 3.6 Urban Transport

Since its creation, PUC-Rio has actively participated in developing public policies that contribute to the well-being of society and to the improvement of urban infrastructure in its surroundings. In the 1990s, the Urban Bus Terminal of PUC-Rio was installed, with seven bus lines, six of which are municipal and one intercity, located in front of the main entrance of the Gávea Campus, making public transportation to the University viable.

Moreover, PUC-Rio is participating with technical collaboration to finish the Gavea subway construction, which will enable mass transit to reach the proximity of the main Campus. The Rio de Janeiro metro line expansion project, which includes the Gávea station,

was designed and partially executed for the 2016 Olympic Games; however, the construction work was subsequently halted after the event.

In 2019, PUC-Rio, together with other governmental organizations, produced a document with the purpose of presenting a diagnosis on the current conditions of the Gávea Station and proposing engineering measures to minimize the existing risks [8].

#### 4. Conclusion

PUC-Rio has continuously sought a Sustainable Campus. The University has institutionalized innovative socio-environmental measures along several lines, besides transportation, reconciling the needs of society and the University's students, teachers and employees with preserving the environment, while overcoming the challenges and limitations of local socioeconomic conditions. In this context, the University's commitment to social and environmental ethics is reflected in its environmental policy, in the campus facilities, and above all, in the educational activities, research and extension courses.

In terms of transport, the University has adopted initiatives on campus, such as those mentioned in this article, which have been accepted and incorporated by its community, thereby transforming the local culture. Some measures related to technological innovation, however, still do not apply to the Brazilian reality, such as implementing a battery charging station for electric vehicles, which is a practice already seen in universities in developed countries, University campuses are uniquely placed to disseminate sustainability and help reshape society's standards. The performance of PUC-Rio regarding transport and in implementing a Sustainable Campus is largely due to the cooperation of its community. For this reason, even though it is considered the role of the university to incorporate sustainable transport as a permanent aspect of operational management, it is undeniable that the success of the implemented measures is largely a merit of the environmental awareness and the active engagement of the university community.

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