

Inefficient Interurban Connection: Modernisation of the Paso Bravo Bridge

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Summary: The Paso Bravo bridge located in Feliciano Atencio, Entre Ríos, suffers from poor maintenance and obsolete infrastructure, causing safety risks and traffic congestion. This project proposes modernizing the bridge using recycled materials like high-density polyethylene and polystyrene, inspired by the Easter Dawyck Bridge in Scotland. Despite initial costs, the solution offers long-term benefits such as reduced maintenance, lower emissions, and improved traffic flow, enhancing safety and fostering economic development in the region. The expected impact of this project is mainly to analyse a way to improve the quality of life and safety of people while preserving the environment.

Keywords: Sustainable construction, bridge modernisation, interurban connection.

Resumen: El puente Paso Bravo ubicado en Atencio Feliciano, Entre Ríos, está en mal estado por falta de mantenimiento y su infraestructura obsoleta, lo que provoca riesgos de seguridad y congestión. Este proyecto propone modernizar el puente usando materiales reciclados, como polietileno de alta densidad y poliestireno, inspirado en el puente Easter Dawyck en Escocia. A pesar de los costos iniciales, la solución ofrece beneficios a largo plazo como menor mantenimiento, menores emisiones y mejor flujo de tráfico, mejorando la seguridad y el desarrollo económico de la región. El impacto esperado de este proyecto es principalmente el análisis de un modo de mejorar la calidad de vida y seguridad de los ciudadanos y preservar el ambiente.

Palabras clave: construcción sustentable, modernización de un puente, conexión interurbana.

I. INTRODUCTION

In the town of Atencio, located in the Feliciano district, there has long been a problem that the authorities have not yet solved. The Paso Bravo bridge, which is crucial for the high traffic of people from the area and beyond, is in poor condition and is now obsolete. This has created major inconveniences and safety problems for residents. The poor condition of the bridge and its outdated structure have caused significant disruptions.

The "Paso Bravo" bridge is very important as it connects a police station with the N°21 Fragata Sarmiento School. This bridge facilitates the connection between the city and the rural areas, being the main route between the two towns. This proximity helps to reduce fuel consumption, making it a vital link for the community.

There is another road connecting the two towns, but it is significantly longer, adding approximately two hours to the journey. The present state of the *Paso Bravo* bridge presents

a critical problem that requires urgent attention to ensure the safety and comfort of residents.

The purpose of the project is to address the issue of the operation and maintenance of the bridge located on National Route 28, connecting the cities of Atencio and San José de Feliciano. To fulfill this aim, a solution that can be implemented will be explored and explained, involving the use of construction methods and eco-friendly materials.

In order to achieve the goal of this work, first, the location of the problem is briefly described. Next, the problem of bridge construction and maintenance is presented and discussed. Then, some scenes are described that help to visualise the problematic situation. Subsequently, the causes and consequences of the problem are identified and analysed. Next, the solution to address the problem is discussed. Finally, the strengths and weaknesses of the proposal are presented. The expected impact of this project is mainly to analyse a way to improve the quality of life and safety of people while preserving the environment.

II. PROBLEM DEFINITION AND ANALYSIS: INEFFICIENT INTERURBAN CONNECTION

This section analyses the problem of interurban connection in the *Paso Bravo* bridge area. To understand this problem, first, it is necessary to describe its context.

A. Description of the Context

Fig.1 shows the map of the Feliciano department, which is separated by small districts. It has about 20,000 inhabitants in these districts. Two of these districts are linked by a bridge on route N°28. This is the bridge that is presented in this project in order to modernize it to make it safer to use.



Fig. 1. Feliciano city map.

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Fig. 2 shows a red line marking the area where the problem is located. The San José de Feliciano district is the most important part of the city as it is the most populated place and where people buy their goods and other supplies. On the other hand, the Atencio district, which is shown in a darker color in Fig. 2 is another important district in Feliciano due to its contribution to cattle raising.



Fig. 2. Location of the bridge

Fig. 3 shows the bridge in need of modernization to put an end to the problems suffered by people due to the difficulties it presents. The structure is 6 meters high and 100 meters long.



Fig. 3. Bridge that joins Atencio and San José de Feliciano.

B. Problem Statement

The *Paso Bravo* bridge, which connects the towns of Atencio and San José de Feliciano, is in an advanced state of lack of maintenance, hindering traffic flow and posing a significant safety risk to residents. The ageing structure and narrow lanes not only cause frequent traffic jams, but also increase the likelihood of accidents. This situation severely affects daily transport and the local economy, which is why it is urgent to modernise the bridge to ensure a safe and efficient connection.

C. Description of Scenes that Help Picture the Problematic Situation

Fig. 4 shows the old bridge located in *Paso Bravo*, Feliciano. To the right of the picture, the rusted metal structure of the bridge stands out, with its beams and crossbeams showing signs of wear and tear and deterioration due to the passage of time. In the background, the landscape is predominantly rural, with fields and low vegetation

stretching towards the horizon. Lack of maintenance is evident in the rusted parts, highlighting the need for urgent repairs to ensure safe crossing.



Fig. 4. Bridge in Paso Bravo Feliciano with visible rust and wear.

Fig. 5 presents a surface view of the bridge at Paso Bravo, Feliciano. In the centre of the picture, the pavement is visibly damaged, with numerous potholes and water accumulation due to recent rains. The side railings of the bridge, as in the first picture, show signs of corrosion. In the background, the road is visible extending in a straight line, indicating that this bridge is an important road for vehicular traffic. The condition of the pavement and the metal structure suggest a considerable danger to vehicles travelling across this bridge, especially in adverse weather conditions.



Fig. 5. Damaged surface of the bridge in Paso Bravo, Feliciano.

D. Identification and analysis of causes or factors that give rise to the problem

There is a significant problem with the *Paso Bravo* bridge as it suffers from serious deterioration and maintenance issues. This problem arises due to several key factors.

One reason for this situation is that there has been a lack of regular maintenance over the years. This has allowed natural wear and tear to progress unchecked, weakening the bridge structure and making it more vulnerable to failures.

Another reason connected with this problem is the ageing infrastructure. The bridge was constructed decades ago and was not designed to withstand the current traffic volume or the weight of modern vehicles. The structural obsolescence, combined with materials that have exceeded their useful life, contributes significantly to the current state of disrepair.

A further factor related to this issue is the significant increase in traffic load. The demographic and economic growth in the towns of Atencio and San José de Feliciano has led to a rise in vehicle flow, which the bridge is not designed to support. This has accelerated the wear and tear on the structure and increased the frequency of congestion and safety issues.

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E. Identification and Description of the Consequences

There are main consequences of the problem of inefficient interurban connection. The main consequence of this situation is that the safety risks associated with the bridge have become significant. The weakened parts of the structure could fail at any moment, putting both drivers and pedestrians in danger.

As a result, traffic congestion has become a frequent consequence. The narrow lanes and inadequate infrastructure cause regular traffic jams, especially during peak hours, which increases stress and frustration among drivers.

Another consequence related to this problem is the economic impact on the region. Delays in the transportation of goods and people negatively affect local businesses, increasing operational costs and reducing efficiency. This weakens the region competitiveness and hinders its economic development.

III. THE WAY FORWARD: MODERNISATION OF THE PASO BRAVO BRIDGE

A. Problem Approach

The Paso Bravo bridge, which links the towns of Atencio and San José de Feliciano, is in poor conditions due to poor maintenance over the years. A possible solution is the modernisation of the bridge, using a sustainable construction method like the one used in Scotland, in the Easter Dawyck Bridge Project, designed and developed by Vertech Ltd. [1].

Its construction implements the use of recycled high-density polyethylene, which is combined with polystyrene. This is a more durable material than wood and requires no maintenance. Most importantly, it is fully recycled and recyclable. Fig. 6 shows the idea of the bridge.

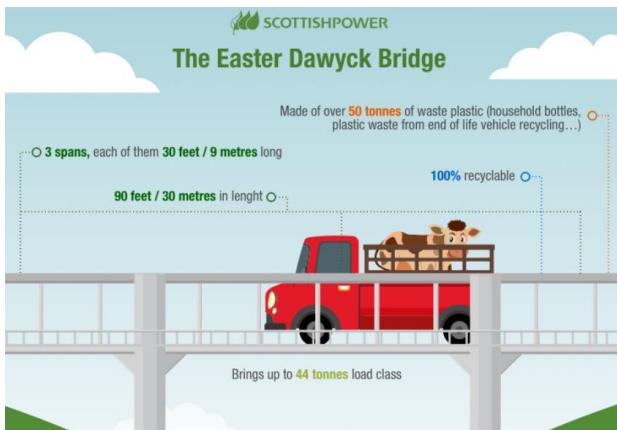


Fig. 6. Easter Dawyck Bridge, in Scotland

The construction method is quite simple because its material consists of prefabricated planks, which are supported on the bridge piers, which have a maximum spacing of 9 metres. The planks are then simply assembled. Fig. 7 shows the construction of the bridge in Scotland.



Fig. 7. Method of construction

B. Strengths and Weaknesses of the Proposal

This construction method has several advantages and disadvantages. This section focuses on the advantages first.

Firstly, it uses more than 50 tons of waste and supports more than 40 tons of traffic, as it is made of recycled material. This considerably reduces the carbon footprint.

In addition, due to the materials and the way this bridge would be built, no maintenance is required. This means that the total cost of the work is much lower than the conventional one.

As well as this, its construction method is simple. This lowers construction costs because the materials are prefabricated to size, as Fig. 8 shows.



Fig. 8. Planks used in this construction.

The disadvantages of this work in the area of Atencio, Feliciano are a few. This work discusses three of them.

The high initial cost of the work is the first disadvantage. As it is not a conventional construction, it is necessary to buy all the materials before the construction.

Secondly, the manufacture of the materials is needed. This requires a company that has the knowledge of the manufacturing methods of the pieces.

Finally, recycled materials are gaining popularity, but they are not always accepted in large-scale projects. This is due to the lack of long-term studies on their performance in various climatic and loading conditions.

IV. CONCLUSION

In conclusion, building an Easter Dawyck style ecological bridge between the town of Atencio and the city of San Jose de Feliciano is a way to help nature and to improve the traffic flow of the towns as well. The construction of an ecological bridge would improve traffic between the two places and it would also use ecological features to lessen environmental damage.

This new bridge may facilitate the smooth movement of people and machinery and may also help the economic

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growth of the whole area. The advantages of this type of construction are the reduction of carbon emissions during construction, as well as lower maintenance costs.

This project has detailed the positive impact of the construction of this ecological bridge, providing examples of similar projects that have been implemented in other countries, and the expected results which would benefit the citizens of Atencio and San José de Feliciano both economically and socially.

REFERENCES

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The present project is a skills integration activity in Inglés I at Universidad Tecnológica Nacional, Facultad Regional Paraná, carried out by EFL engineering students. The yearlong project requires students to delve into a problem in the city where they live and to address it by means of a simple project in English. Should the reader have any questions regarding this work, please contact Graciela Yugdar Tófaló, Senior Lecturer, at gyugdar@frp.utn.edu.ar.