

Public Polices in Railways:

The Railway Network in Douro Region

Políticas Públicas en los Ferrocarriles:

La Red Ferroviaria de la Región del Douro.

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Resumen

El cierre de la red de ferrocarriles del Douro empezó en 1988 con el Plano de Modernização e Reconversão dos Caminhos-de-Ferro (Plan de Modernización y Reconversión de los Ferrocarriles). En las últimas dos décadas y varios planes para los ferrocarriles portugueses, solamente 179 de los 578 kilómetros de la red ferroviaria del Douro tienen servicio. La metodología usada en el trabajo es de carácter cualitativa y se presentan como casos de estudios la línea de Douro y sus ramales de vía estrecha Tâmega, Corgo, Tua y Sabor. Nuestra investigación tiene como principal objetivo caracterizar y describir las razones que llevaron al cierre de la gran mayoría de estos Itinerarios ferroviarios en las regiones de Trás-os-Montes y Douro.

Palabras-Clave: Política Pública; Ferrocarriles Regionales; Región del Douro

Abstract

The closure of the Douro Region railway network began in 1988 with the Plano de Modernização e Reconversão dos Caminhos-de-Ferro 1988-94 (Railways Modernization and Reconversion Plan 1988-94). In the last two decades and after several strategic plans for the Portuguese railway sector, only 179 of the 578 kilometres that formed the Douro Region railway network have still commercial services. Our investigation work has as cases studies the Douro Line and its narrowed gauge tributaries Tâmega, Corgo, Tua and Sabor Lines. The methodology is based on qualitative research and the main goal of our investigation is to understand, describe and explain the reasons that lead to the closure of the majority of these regional lines that served the Trás-os-Montes and Douro regions.

Keywords: Public policy; Regional Railways; Douro Region

1. Introduction

The Douro Line is a regional railway which ensured a longitudinal linkage between the coast, since Porto - Campanhã, and the interior, until the Spanish village of La Fuente de San Esteban. Nevertheless, besides having provided an international linkage, through Barca d'Alva, the line was connected with others that served the regions situated further North of the Douro Region. The narrowed Tâmega, Corgo, Tua and Sabor Lines as well as the Douro Line formed the Douro railway network, which assumed a determinant role in regional mobility and development of Trás-os-Montes, Tâmega, Basto and Douro regions by reducing its secular isolation and promoting territorial cohesion. In 1988, the approval of the *Plano de Modernização e Reconversão dos Caminhos-de-Ferro* (Railways Modernization and Reconversion Plan) led to the beginning of Douro railway network closure. In 2011, the appearance of the new *Plano Estratégico dos Transportes* (Strategic Plan for Transports) turned definite a set of temporary closures, determined two years before. Nowadays, only 179 of the 578 kilometres which formed the Douro railway network remain with commercial services.

The suppressions were particularly severe in all narrowed-gauge lines. In few more than two decades, the original 387 kilometres of this sub-network were reduced to the 16 kilometres of the Tua Line between Cachão, Mirandela and Carvalhais. The aim of the present article is to identify and describe the reasons that lead to the closure of the majority of the Douro railway network. As study cases, we selected the Douro Line and its tributaries: Tâmega, Corgo, Tua and Sabor Lines. In our work, we have made a literature review to the concept of Public Policy, the importance of railways as public service as well as a presentation and description of the main strategies and plans for the Portuguese network. We used a qualitative methodology and for each case study we have made a final synthesis. At the end we presented the final considerations.

2. Literature Review

2.1 The Public Policy

Parsons (1995) stresses that before starting to discuss the public policy concept, we need to consider “what we mean by the idea of ‘public’”. According to the author, the ‘public policy’ has simply “to do with those spheres which are so designated as ‘public’”. Thus, by another words, we are assuming “there is a sphere or domain of life which is not private or purely individual, but held in common” (Parsons, 1995: 3). Therefore, it can be said Parsons highlights the “necessity of bordering the public activity field and the private activity field” (Chenrim, 2008: 5).

Furthermore, for Parsons (1995: 3), the public concept includes the “dimension of human activity which is regarded as requiring governmental or social regulation or intervention, or at least common action”. This reality is applied in different sectors such as education, health, mobility and transport networks (railways and motorways). This action is taken not only so that the common good interests can be safeguarded but also so that the market imperfections can be corrected (Chenrim, 2008: 3). Nevertheless, the dichotomy between the ‘public’ and the ‘private’ is not recent.

However, the demarcation between the ‘public’ and the ‘private’ has only started to be clearer defined since the end of the 70’s (Chenrim, 2008: 4-5), with the emergence of the public choice theory.

2.2 The Importance of the Railways

Dahl and Lindblom (1992: 140) sustained “the major resource is man himself” and his “claims to food, medical care or education”. Hence, the importance of the public transport seems to be forgotten in their works. In fact, Watters II (2007) has considered “economics as a discipline only slightly predates the railways”. For the author, railways are “often seen as an instrument of public policy”, not only to “combat auto congestion and pollution” but also to substitute “trucks for freight trains”.

Furthermore, as long as railways are said to play a “strong social role”, they should be seen as an important “public service”, which works as an “economic activity catalyst”. If railways are understood as an “important exogenous factor for the regional development”, they are able not only to “guarantee the sustainable mobility” but also to “stimulate activities with multiplicative power” (Pires, 2014: 30).

Judt was probably one of the authors who had better considered the importance of transports, particularly the railways, in the society organization. For Judt, the public transport “is not just as another service”. In fact, more than “carrying people from point A to point B”, the railways are “a collective project with an individual benefit” (Judt, 2010b: 199). As long as they have “generated sociability”, their appearance has allowed the emergence of the “public life” concept (Judt and Snyder, 2012: 333). In this idea, there are included not only aspects such as “public places, public access or public premises” but also the concept of “public transport” (Judt and Snyder, 2012: 333).

According to Judt, as long as railways are “eternally contemporaneous”, a country without an efficient railway network can be considered “undeveloped”. The author also refers that “railways are an essential economic activity and also an essential public service” as well as the “railways stations and their provided services to the smallest community are a symptom and a symbol of the society” (2010b). For Judt (2010a; 2010b), as long as railways are indeed a “public” and a “social” service, treating them as “a business” reveals “not understanding their nature”.

3. Policies and Strategic Railway Plans in Portugal

3.1 The *Decreto 18.190*

The necessity to have a transversal linkage that connect Tâmega, Corgo, Tua and Sabor Lines came down not only in order to cut the isolation between these railway stretches but also in order to improve commercial services by reducing transshipments and the inconvenient of passengers to take a longer route via Douro Line, if they want to change from one of the Tâmega Line to the Tua Line, as an example.

Therefore, in order to solve these problem, it was thought to create a transversal line, which could “establish the linkage” with the four narrowed-gauge railway stretches. This new itinerary would cross the center of Trás-os-Montes region in a direct link to the littoral. Furthermore, it would be possible not only to reach easily the Minho region lines but also to arrive faster to the city of Porto and to the Leixões Port. The first attempt to build this transversal stretch was done in the beginning of the 20th Century, but without success. However, the transversal line project would reborn almost three decades later, in 1930, with the *Decreto 18.190*. At that time, it was understood this railway stretch should not be postponed (Sousa, 1934; 1936).

The 1930’s Portuguese government document, the *Decreto 18.190*, established the construction of several lines in both Trás-os-Montes and Douro regions. The Basto Line

would provide the linkage between Guimarães, Tâmega and Corgo Lines, the Valpaços Transversal would connect both Corgo and Tua Lines and the Chacim Transversal the linkage between Tua and Sabor Lines. However, even though the *Decreto 18.190* referred the construction of several lines, none of them started to be built. Meanwhile, the ascension of a dictatorial government led to the cut of almost all railway investments (Pereira, 2009).

Therefore, as long as few lines would be built until the premature conclusion of the Portuguese railway network, concretized in 1949 with the inauguration of the Celorico de Basto - Arco de Baúlhe and of the Cabeço de Vide - Portalegre stretches, the Trás-os-Montes Transversal would never be constructed. Hence, the Portuguese railway network would know no significant alterations until the 80's.

3.2 Plano de Modernização e Reconversão dos Caminhos-de-Ferro

In 1988, the portuguese government presented the *Plano de Modernização e Reconversão dos Caminhos-de-Ferro 1988-94* (Railway Modernization and Reconversion Plan 1988-94). The main goal of the document was to “recover the railway public service”, by ensuring “commercial dynamics”, “costs rationalization” and “safety levels increase”. According to the plan, the Portuguese railway network was “aged”, “old-fashioned” and “degraded”, a result from a “prolonged insufficiency of investments” which led to “losses in the quality service”. In addition, there were 2090 kilometres which “had never suffered any type of beneficiation”. Therefore, their conservation costs were considered “very high”, especially in the narrowed-gauge railway stretches. In order to avoid accidents, CP had been reducing the running velocities. The plan also referred the maintenance and modernization of the railway network would be an “enormous material and human resources waste”, with no “economic and social benefits”.

The secondary railway network, in which were included all the four narrowed-gauge railway stretches considered in this work, would only receive 0,2% of the total funds forecasted between 1988 and 1994. Therefore, there were only expected roughly less than €1.5m to those itineraries for a seven years period. These lines, which were said to have “no national interest”, should be “partially” or “totally” closed. While rail transportation should be reduced, many stations should be closed.

Hence, the conclusions of the plan appointed for the establishment of an alternative bus service in the lines which should be closed. However, these future suppressions should be “properly justified” and should not imply “losses for the population” (MOPTC, 1988).

In 1990, Portuguese operator CP - Comboios de Portugal understood it was not possible to “maintain railway stretches without market perspectives and in full degradation state” (CP, 1990). Later, in 1992, CP continued to refer that no “hesitations” could exist if it was indeed wanted to “eliminate one of the negative factors which has affected most the rail exploration: the provision of services with no economic or social interest” (CP, 1992). In conclusion, between 1979 and 1995 there were abandoned 901 of the 3644 kilometres that formed the Portuguese railway network. The narrowed-gauge railway stretches were the most affected, especially the ones that served the Douro region (Cipriano, 1995).

3.3 The Strategic Guidelines for the Rail Sector 2006

In 2006, the Portuguese government presented the *Orientações Estratégicas para o Sector Ferroviário* (Strategic Guidelines for the Rail Sector). The document appoints

several guidelines for the rail network, something that had not happened for decades in Portugal. The document refers railway infrastructure should be developed in the future to respond several challenges, such as regional affirmation, promotion of economic and social cohesion and the enrichment of the Portuguese territory.

Until 2015, the idea was to increase the network density and ridership. It was recognized the lack of coverage of the rail network especially when compared with Spain. The plan continues with the guidelines of the past concerning regional railways. Instead of reopening lines or stretches as well as the modernization of regional rail services, the document appoints to its rationalization (MOPTC, 2006).

3.4 Strategic Plan for Transports 2011-2015

A new austerity politics emerged in the Europe in the beginning of 2010. Hence, Portugal was forced to adopt a set of Stability and Growth Plans, as member of the EU and the Euro Zone. The *Portuguese Memorandum of Understanding* forecasted the “review” of the “railway network dimension”, in order to “increase” the “financial sustainability” of the sector.

The Portuguese government presented proposals in order to introduce another cut in the railway network. In 2011, the new *Plano Estratégico dos Transportes 2011-2015* (Strategic Plan for Transports) decided the closure of lines and stretches of the Portuguese rail network.

The document recognized the “heavy fixed costs structure” of the railway sector. The “financial disequilibrium” could be explained by a “very low cost coverage tax through the operational revenues”, especially in some of the regional lines, which presented an “extremely low” demand level. The plan also supported it was possible to “compare directly” the efficiency level between railway and motorway, in Tâmega, Corgo, Tua and Figueira da Foz Lines and the population mobility could be fulfilled through an alternative bus service (Ministério da Economia e do Emprego, 2011). However, these alternative bus services would soon disappear, after CP having said it was thinking it should not continue to transport passengers in buses (Cipriano, 2011b).

3.5 FERROVIA 2020 Plan

Presented in February 2016, the *Plano de Investimentos em Infraestruturas - Ferrovia 2020* (Investments Plan in Infrastructures - Railways 2020) is the follow up of the PETI3+ plan, presented by the previous government. This document defines several investments priorities for the Portuguese rail network and is expected to receive an important support by EU funds. The investments are especially focused in the existent network and do not include the reopening of regional lines or stretches. For the Douro Line is expected not only a €14.2m investment in the electrification between Caíde and Marco de Canaveses, but also a €46.6m investment in the electrification between Marco de Canaveses and Régua (MPI, 2016).

4. Methodology

The nature of our analysis made us to use in our investigation work a qualitative data, which is not said to “study many cases”.

In fact, rather than a “statistics representation”, a “social representation” is mainly supposed (Guerra, 2006: 40). The study object is the Douro Railway network, formed by the Douro Line

and the four narrowed regional lines - Tâmega, Corgo, Tua and Sabor Lines. We were able to consider five case studies, which could provide us an “intensive” and a “deep” analysis (Guerra, 2006). The main goal of our research is to understand and analyze why the Douro railway network was almost closed with the exception of the Douro Line between Porto and Pocinho, and the Tua Line between Cachão, Mirandela and Carvalhais. However, its future remains uncertain.

The Douro railway network shared interesting characteristics and we were able to find a “sample by homogeneity”, where it is wanted to “study a homogeneous group”. Hence, our sample was composed by “multiple cases”, as it is “sociologically more frequent”. One important aspect of qualitative research appoints for the fact that qualitative information considers “the diversity is demanded”, instead of the “homogeneity” (Guerra, 2006).

4.1 Data collect

In the investigation work we used documental analysis to collect information and data, through academic works, 1930’s Portuguese government document - the *Decreto 18.190*, strategic and government plans for the Portuguese rail transportation, CP, REFER and Infraestruturas de Portugal annual reports, studies, and others publications, several historical documents and newspaper articles with special emphasize to Público Journal. According to Quivy and Campenhoudt (1998), documental analysis is considered as an important technique for data collection because allow to find abundant and trustful information. In our investigation, we also used quantitative data. We were able to evaluate the investment performed in the Douro railway network, thanks to the information given by Infraestruturas de Portugal and we also presented the ridership evolution thanks to the data provided by CP and Metro de Mirandela, even though it was impossible to collect information about ridership in the Douro Line.

5. Case Studies

5.1 Douro Line

The Douro Line is a 191,665 kilometres Iberian-gauge railway, which connected Ermesinde (Valongo municipality) to Barca d’Alva (Figueira de Castelo Rodrigo municipality). During many centuries, the Douro River had been regarded as an “important communication link” (Aroso, 2005) as long as it was the unique access way to the surrounding region. However, the paradigm would start to change with the opening of the North Line until Vila Nova de Gaia, in 1864 (Silva, 2008: 11).

The aim of the Douro Line was to introduce a “big lever to the progress of this poor region”, which was also seen as a “big wealth producer” (Pereira, 2009). The construction of the first 29,560 kilometres took three years, between 1872 and 1875 (Aroso, 2005). Since then, the Douro Line would be progressively extended, for the five next years, with no doubts about the outline. However, the arrival to Pinhão, in 1880, showed the first argument between the engineers. In fact, while some considered the Douro Line should inflect further North, once the Tua station was reached, until the frontier, through Bragança, other sustained the Douro Line should follow the Douro River, until the frontier, placed in Barca d’Alva (Beira et al., 2012). Followed this last option, this railway itinerary would arrive to the terminal station, placed in Barca d’Alva, seven years later, in 1887.

The Douro Line was considered the “trunk”, from where derived a “series of parallel itineraries,

its tributaries” (Sousa, 1903). Between 1911 and 1988, four narrowed-gauge railway stretches were working in the region: the Tâmega Line, which began in Livração, the Corgo Line, which departed from Régua, the Tua Line, which was initiated in Tua, and the Sabor Line, which was started in Pocinho. In 1968, the Douro Line showed already a heterogeneous infrastructure. Actually, as long as it was becoming closer to the frontier, the running conditions were getting worst. By that time, “ideal velocities” (Gazeta dos Caminhos-de-Ferro, 1968) were already a mirage between Tua and Barca d’Alva.

According to Aroso (2003), this railway degradation, associated with a ridership retraction, implied the suppression of the Spanish international linkage, between La Fregeneda and La Fuente de San Esteban, on 1st January 1985. After being argued this closure had brought high losses for the Douro Line, Portugal would also deactivate its international linkage, between Pocinho and Barca d’Alva less than four years later, on 18th October 1988.

A project to abbreviate this railway itinerary to Régua existed already in 1995. However, Alijó Municipality argued that there would be an “incalculable loss for the populations” if this plan was taken (Cipriano, 1995). This threat would reappear 15 years later, by the time the fourth Stability and Growth Plan was presented. Nevertheless, the Douro Line would remain opened until Pocinho to avoid a harsh damage in the tourism development in a World Heritage region (Cipriano, 2011a).

The rail plan “Ferrovia 2020” of the Portuguese government appoints for a €14.2m investment in the electrification of the Douro Line between Caíde and Marco de Canaveses and later €46.6m in the electrification of the Marco de Canaveses - Régua stretch. It is expected that both projects could be supported by EU funds (Infraestruturas de Portugal, 2016).

A study from Infraestruturas de Portugal appoints for the reopening of the Douro Line until Barca d’Alva (near Spanish border) as an alternative route to the Beira Alta Line and which would allow to approximate Leixões Port to Spain. Closed in 1988, the renovation of the Pocinho - Barca D’Alva stretch is estimated in €43m, if electrified, and in €30m, if not electrified. Nevertheless, an additional investment between €87m and €119m would be needed in order to reopen the international linkage in Spanish territory. However, these investments could have EU funds through the Interreg Program. The reopening of the international stretch would allow not only the linkage to Francisco de Sá Carneiro Airport to the Spanish high speed network in Salamanca by train, but also the promotion of World Heritage places such as Porto, Douro Wine Region, Côa Valley and Salamanca. In the study, the Tâmega Line reopening between Amarante and Livração and the Sabor Line reactivation between Pocinho and Carvalhal is also appointed (Cipriano, 2017).

5.1.1 Timetables and Investments

In 1983, there were three daily journeys between Porto - Campanhã and Barca d’Alva. A trip along these 199,504 kilometres took 5 hours and 30 minutes. Five years after, when the Pocinho - Barca d’Alva linkage was suppressed, a journey along the entire Douro Line took 5 hours and 39 minutes (Cipriano, 2009a). In 1983, there were also three daily trips between Porto - Campanhã and Pocinho. It was necessary to spend 4 hours and 23 minutes in order to travel along these 171,522 kilometres by that time. Almost two and a half decades later, there were also three daily journeys between Porto - Campanhã and Pocinho. In 2007, the trip took 3 hours and 15 minutes.

In spite of the efforts, the time journey between Porto - Campanhã and Régua has only decreased few more than 15 minutes in almost two and a half decades. These insufficient improvements, which confirm a constant postponement of the investment, led to the finish of the Intercidades service in the Douro Line on 12th March 2006 (Público, 2006). Furthermore, some journeys are penalized between 10 and 30 minutes with a

transshipment in Régua (Cipriano, 2012).

The most relevant investments in the Douro Line were resumed to the first 37,570 kilometres. Actually, the duplication and the electrification of this railway itinerary were progressively done, firstly until Cête, in September 1999, and secondly until Caíde, in November 2002 (Cipriano & Coentrão, 2007). Nowadays, IP is developing a 13,954 kilometres electrification, until Marco de Canaveses. The so promised duplication, forecasted for the Caíde - Marco de Canaveses stretch, were the Douro Line still present a “high suburban pending” (Aroso, 2003: 114), will not be done.

The running conditions still become worst as long as we get closer to the frontier. Therefore, the older tracks and the worst railway ties can be found between Pinhão and Pocinho (Cipriano, 2009b). In order to avoid negative surprises, a team was moved to Régua, with the aim of executing an “integral renovation” of the railway stretch, between Régua and Pocinho. Nevertheless, that team would unexpectedly abandon the place (Aroso, 2003). Between 2006 and 2013, IP has invested few less than €66m in the Douro Line.

5.1.2 Ridership

It was not possible to collect ridership number in the Douro Line. Nevertheless, we were able to find that ridership in 2005 was 880.000 passengers and 1.070.000 passengers in 2006 (MOPTC, 2006). By that time, the number of passengers and tourists transported in the Douro Line was said to be “growing significantly” (Aroso, 2005).

Final Synthesis

It was argued the closure of the Spanish international linkage, on 1st January 1985, had brought high losses for the Douro Line (Aroso, 2003: 127). Therefore, the suppression of the Pocinho - Barca d’Alva linkage would occur less than four years later, on 18th October 1988.

Furthermore, despite having been invested several million of Euros in the first Douro Line kilometres, the time journey between Porto - Campanhã and Régua has only decreased few more than 15 minutes in almost two and a half decades. Besides these insufficient improvements, no solution which could avoid the mandatory transshipments for travelling in Tâmega, Corgo, Tua and Sabor Lines was found. Combined with disconcerted timetables, the transshipments could constitute another important disincentive to the use of the railway (Cipriano, 2012).

It must not be forgotten all the itineraries work in network. Therefore, by one hand, as long as the Douro Line has not presented the ideal running conditions, the four narrowed-gauge railway stretches could not work properly. Nevertheless, by another hand, with the closure of the distributor linkages, the collector line stopped to be fed. All in all, this “corollary” demonstrates the railways had clearly lost their importance in the Douro region (Cipriano, 2012). However, future could be bright if the electrification arrives until Régua and the international linkage with Spain is reopened. This could also revamp the rest of Douro rail network.

5.2 Tâmega Line

The Tâmega Line is 51,474 kilometres non-electrified narrow gauge railway, which connected Livração (Marco de Canaveses municipality) to Arco de Baúlhe (Cabeceiras de Basto municipality). Built in single track, the line was born as an important Douro Line ramification, which allowed the linkage of the Alto Tâmega region to the longitudinal

railway line, by crossing the Baixo Tâmega (Garcias, 2008). The first stretch between Livração and Amarante opened to commercial services on 21st March 1909.

After almost 41 years, the train finally arrived to Basto Centre region only on 15th January 1949 when Tâmega Line reached Arco de Baúlhe (Aroso, 2003). The *Decreto 18.190* published in 1930, approved the Tâmega Line linkage with both Corgo and Guimarães Lines, but construction never started.

In 1978, a CP's feasibility study for the Tâmega Line characterized the regional economic structure as "predominantly agricultural" and, therefore, as long as the "population mobility" was not stimulated, there was no "high potential traffic volume". Running conditions were described as "rather unfavourable", due to the "high number of small ray curves and of high inclination slopes". Furthermore, the rail infrastructure was "bad in more than 25% of its extension". Timetables were considered "not adapted to the population necessities", which forced the search of "other transport means".

Rolling stock had "evident tiredness", as long as it presented not only a "very discomfoting" condition but also a "frequent damage". After these conclusions, CP recognized that new investments would be necessary in the short-term, not only in rolling stock but also in infrastructure. They also admitted the savings which would result from the railway closure would "not be very significant". All in all, the "unique possible way" to reduce the "line deficit" was the implementation of a "radical change in the running scheme", so that the "respective costs" could be "minimized" (CP, 1978).

In September 1984, a document signed among the Ministry of the Social Equipment and the municipalities of Amarante, Celorico de Basto, Mondim de Basto and Cabeceiras de Basto forecasted the building of a road, between Amarante and Arco de Baúlhe (Cipriano, 1995). In 1988, with the approval of the *Plano de Modernização e Reconversão dos Caminhos-de-Ferro*, the Amarante-Arco de Baúlhe link would be abandoned on 1st January 1990 and the train would be substituted by an alternative bus service (CP, 1990).

In 1995, apart from the Arco de Baúlhe station, all the others stations have already been abandoned and the alternative bus service had already been suppressed (Cipriano, 1995). Commercial services will be only maintained between Amarante and Livração. On 24th March 2009, the Portuguese government announced the Tâmega Line closure, only three days after its centenary commemorations, due to lack of safety. This measure is a consequence of a more careful monitoring started to be done in the Portuguese railway network, few months after the fourth and last Tua Line accident (Cipriano, 2009b). CP justified this suspension with an "urgent infra-structure intervention necessity" (Costa, 2010).

In order to give no reaction time to the population, mayors and opposition, the Government and REFER preferred a "surprise-effect" for the Tâmega Line closure. It should be added the Livração railway employees were also not previously advised (2009c). A €14m investment was announced one day after the Tâmega Line closure. Even though this amount was sufficient to allow an "authentic rebuilding", it was not explained if the Tâmega Line would be converted to Iberian-gauge, which would turn possible a direct connection with the Douro Line (Cipriano 2009d), an idea highlighted by Amarante municipality, which also suggested the transformation of Douro Line until Marco de Canaveses into a suburban and electrified rail service, an investment that could increase ridership (Repórter do Marão, 2006). In June 2009, a €36.9m investment for both Tâmega and Corgo Lines (also closed on 24th March 2009) was authorized. Rehabilitation and modernization works will improve quality service and would turn the line safer and reduce maintenance costs (Costa, 2010).

Works started in 2009 but in the end of the year it was stressed the Tâmega Line could not reopen before the beginning of 2011. However, a "new contention scenario" appeared in 2010,

with the austerity imposed by the Stability and Growth Plans and the Tâmega Line reopening started to be compromised.

Even though the Government has “promised” its rehabilitation, REFER was said to have been not authorized to spend €33.3m in Tâmega and Corgo Lines modernization (Cipriano, 2009e). These “rumors” would be confirmed on 17th June 2010, when REFER informed the investment would be cancelled.

In 2011, with the new government and with the approval of the new *Plano Estratégico dos Transportes*, the Tâmega Line reactivation processed was expected to be suspended. In January 2012, the line is deactivated and the alternative bus service established between Livração and Amarante in March 2009 was also suppressed (Cipriano, 2011). While in December 2014, Amarante Municipality was working in the Tâmega Line conversion in Iberian-gauge stretch between Livração and Amarante (Amarante Municipality, 2015), in April 2017 the Municipality was planning to introduce a Bus Rapid Transport (BRT) system in these 13 kilometres (Amarante Municipality, 2017).

In April 2013, after four years of inactivity, one of the two LRV2000 units, also designated as CP’s 9500 series, travelled to the Vouga Line in order to do some tests. However, a new derailment confirmed the inadequacies of this rolling stock. These light rail vehicles started commercial services in the Tâmega Line in July 2002. They came to substitute the NOHAB railcars built in the 40’s and they are a result of a refurbishment made from railcars bought to Yugoslavia in 1976 (CP, 1995). After the Tua Line accident, in 2008, some doubts about this rolling stock have appeared. Therefore, the Tâmega Line and the Corgo Line service suspension started to be considered (Cipriano, 2008). In April 2015, five LRV2000 units were sold to Peru (A Verdade, 2015).

Recently, a study developed by Infraestruturas de Portugal refers the possibility of convert the 13 kilometres between Amarante and Livração in Iberian-gauge. The necessary investment is estimated in €37.5m (Cipriano, 2017).

5.2.1 Timetables and Investments

In 1983, there were five daily journeys between Livração and Arco de Baulhe. At that time, the end to end journey along the 51,474 kilometres took 2 hours and 5 minutes. Meanwhile, in 1983, there were six daily trips between Livração and Amarante. The train took approximately 31 minutes to travel along the 12,770 kilometres stretch. In 2007, the daily journeys number between Livração and Amarante had increased to eight. By that time, the end to end journey was 26 minutes. A €14m investment plan was appointed for the Tâmega Line modernization. However, between 2006 and 2013, IP has only invested few more than €4.1m. More than 90% of this amount was applied between 2009 and 2010. Thus, more than €3.8m were up to now wasted.

5.2.2 Ridership

62.985 passengers traveled in 1931, between Livração and Chapa, but this number was considered “exiguous”. On 1st January 1990, almost 40 kilometres of the Tâmega Line were closed to commercial services and meanwhile it was introduced an alternative bus service between Amarante and Arco de Baulhe. However, in spite of the disappearance of the train in this stretch, the railway itinerary demand has not decrease.

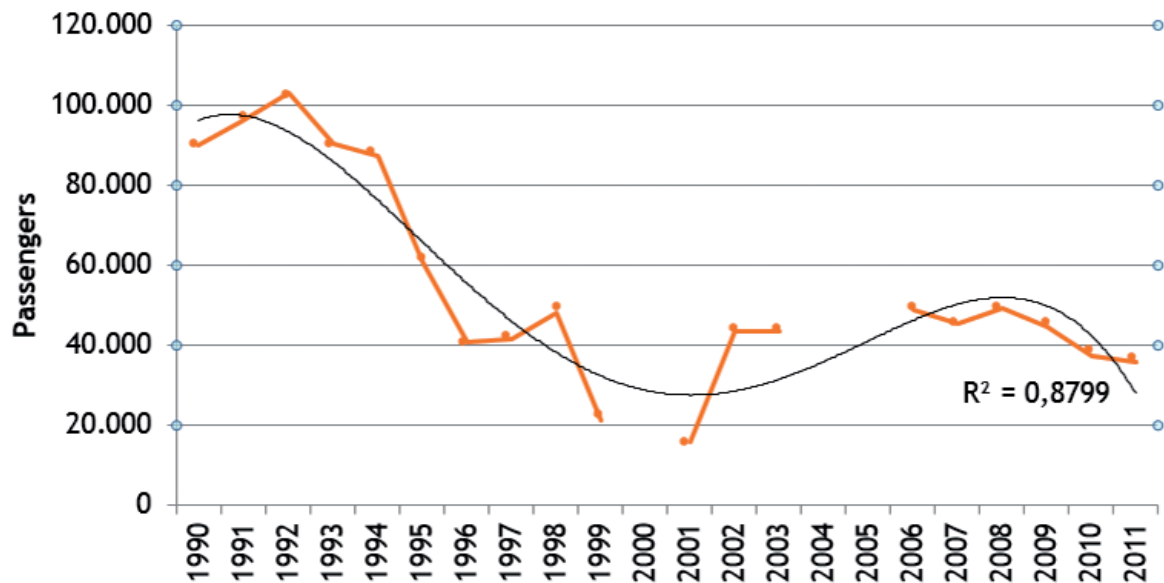


Figure 1: Ridership evolution in the Tâmega Line between 1990 and 2011. Source: CP.

According to Figure 1, in 1990, the Tâmega Line had transported 90.031 passengers and, in the following year, 96.192 passengers travelled along the railway line. Ridership still increased in 1992, with 102.937 passengers. In the two following years, Tâmega Line demand decreased slightly. However, in 1995, by the time the alternative bus service had already been suppressed, the railway started to lose an important number of passengers.

Between 1994 and 1996, Tâmega Line ridership dropped more than 50%, from 87.507 to 40.788 passengers, even though there had been a shy recovery, not only in 1997 but also in 1998.

However, the regional railway continued to lose passengers until 2001, when only 15.814 passengers were transported between Livração and Amarante. Therefore, between 1992 and 2001, Tâmega Line ridership dropped by 82%. 2002 showed signs of significant recovering with 43.646 passengers. This result will remain until 2008, when 49.250 passengers had travelled between Livração and Amarante. Thus, between 2001 and 2008, Tâmega Line ridership increased by 211%.

After rail closure in March 2009, demand continued showing good results, despite having been registered a minimal decreased. 44.850 passengers traveled between Livração and Amarante in 2009 and 37.490 passengers in the following year. In 2011, the last with alternative bus service, 35.940 passengers had still travelled in the Tâmega Line. Therefore, as long as the railway line had been transporting many more passengers between 2009 and 2011 than between 1999 and 2001, the alternative bus service suspension is incomprehensive.

To verify our analysis, the linear tendency tool can be used. In this case, when a polynomial regression of order four is applied, a R^2 almost equal to 88% can be obtained. This tool sustains the demand started to decrease in 1991, when the concavity has changed, after a very brief recovery period, between 1990 and 1991. Then, the linear tendency tool confirms that Tâmega Line ridership decrease has finished in 2001. According to this tool, after an eight years' recovery period, demand would start to fall in 2009, by the time the alternative bus service was introduced between Livração and Amarante.

5.2.3 Final Synthesis

The Tâmega Line is an unfinished project. In fact, the closest Douro region narrowed-gauge railway stretch to the littoral had never connected to both Guimarães Line and Corgo Line.

Furthermore, it was never found a solution which could avoid the obligatory transshipment in Livração between the Douro Line and the Tâmega Line.

The 1978 CP feasibility study concluded timetables were not adapted to passenger's needs and sustained infrastructure was in bad conditions. Years later, and after the accidents in the Tua Line, doubts concerning rolling stock emerged and served as motive to suspend commercial services in both Tâmega and Corgo Lines. Nowadays, the line is abandoned and the project to convert it in Iberian-gauge railway between the Douro Line and Amarante never started.

5.3 Corgo Line

With 96,167 kilometres, the Corgo Line connected Régua (Douro Region; Vila Real Municipality) to the city of Chaves. Its construction surged as a “natural idea” just “few time after” the Douro Line arrival to Régua. Train arrived at Vila Real on 12th May 1906 and Chaves on 28th August 1921 (Torres, 1958). Both linkages with Tâmega Line and Spain were considered and the expansion further south until Vila Franca das Naves was predicted. The 1930 *Decreto 18.190* continued to forecast the Corgo Line expansion further North, until the Spanish border but would be definitely abandoned years later. Further South, the decree continued to expect the expansion not only until Vila Franca das Naves but also until Pinhel. The Régua - Lamego narrowed stretch started to be constructed in the beginning of the 30's (Sousa, 1934) but years later the project would be abandoned.

In March 1968, a CP feasibility study for the Corgo Line characterized it as “essentially regional”. As long as its activity was described as “high”, many of the trains “should serve the maximum number of stations and of stopping places”. Nevertheless, many were the concerns related with the Corgo Line profitability.

In fact, the creation of semi-direct trains, in order to serve quickly the five main stations, was suggested. According to the study, this measure could change “visibly” the profitability of the passengers traffic. Furthermore, the “compression” of employees was also mentioned.

However, in order to fulfill this second measure, it would be necessary to “close stations”, which could “eventually thwart” the Corgo Line regional function. Finally, an “adequate timetable study” was also advised. Despite having suggested this set of measures, CP sustained the Corgo Line deficit was “certain and inevitable”. Actually, it was stressed, by one hand, the modifications in the “commercial running” or in the “industrial running” would not be “viable”, as long as the necessary investments were “considerable”. By another hand, the current conditions “would never allow to satisfy” the regional transport necessities. Having these considerations in mind, CP argued to have “no interest” in prosecuting with the Corgo Line running “in the current conditions”. Hence, the “most advantageous solution” was to “close the line”. Meanwhile, it should be established an alternative bus service, which would not “practically affect the public” (CP, 1968).

With the appearance of the *Plano de Modernização e Reconversão dos Caminhos-de-Ferro*, the Corgo Line would be closed between Vila Real and Chaves on 1st January

1990. However, the main passenger share was precisely placed between these stations. It should be stressed the Chaves Municipality had not participated in the negotiations which led to the partial suppression of the line (Cipriano, 1995). Meanwhile, an alternative bus service, between Vila Real and Chaves, was initiated (CP, 1990). In 1995, the service was suspended. As in the other cases, the main winners were the bus companies.

Years later, on 24th March 2009, CP suspended commercial services due to an “urgent infra-structure intervention necessity” (Costa, 2010). One day after the Corgo Line closure, a €26m investment was announced and in March 2009, it was stated the works would start in four months (Cipriano, 2009d). By the end of the year, important works were already made but Corgo Line could not reopen before the beginning of 2011, as long as the narrowed-gauge railway ties were being difficult to find (Cipriano, 2009f).

Since the middle of the 90’s, Corgo Line was being served by LRV 2000 railcars CP 9500 series, in order to modernize services and comfort. After the fourth and last Tua Line accident, some doubts about this rolling stock have appeared. Therefore, the Corgo Line and the Tâmega Line service suspension started to be considered (Cipriano, 2008). A “new contention scenario” appeared in 2010, with the Stability and Growth Plans. The “rumors” which pointed for the works suspension were confirmed on 17th June 2010, when REFER informed the investment would be cancelled (Costa, 2010). In 2011, with the *Plano Estratégico dos Transportes* approval, Corgo Line was definitely closed. In January 2012, the alternative bus service established between Régua and Vila Real in March 2009 was also suppressed.

Vila Real district capital is the only portuguese university city without train. Therefore, Vila Real Municipality want to reactivate the Corgo Line, between Régua and Vila Real, but a new financial support, created by the Government or by the EU, is absolutely necessary in order to concretize these desires. Until there, the Municipality is planning to transform the Régua - Vila Real stretch in a greenway.

5.3.1 Timetables and Investments

In 1983, there were four daily journeys between Régua and Chaves. At that time, the end to end journey took 3 hours and 20 minutes. Meanwhile, in 1983, there were five daily journeys between Régua and Vila Real. The train took approximately 54 minutes to travel between both cities. Therefore, while it was necessary to wait 3 hours and 26 minutes to go from Porto to Vila Real, it would be needed to spend 7 hours and 1 minute to go from Lisboa to Vila Real, by that time (MOPTC, 1988). In 2007, the number of daily journeys between Régua and Vila Real remained equal to five. By that time, the train took the same 54 minutes to link these stations.

A €26m investment was promised for the Corgo Line rebuilding. However, between 2006 and 2013, IP has only invested few less than 6,8 million of Euros in this railway itinerary. More than 85% of this amount was applied in the works which took place between 2009 and 2010. Thus, more than 5,8 million of Euros were up to now wasted.

5.3.2 Ridership

On 1st January 1990, Corgo line Lost 70 kilometres and the connection to the important city of Chaves. By that time, in order to substitute the train, an alternative bus service was established. Nevertheless, contrarily to what happened in the Tâmega Line, the introduction of the alternative bus service would not lock the Corgo Line demand reduction.



Figure 2: Ridership evolution in the Corgo Line between 1990 and 2011. Source: CP.

According to Figure 2, ridership in 1990 was 119.842 passengers. Demand would start to decrease continuously, especially since 1993. In fact, whereas 103.609 passengers were moved, in that year, only 88.300 were transported between Régua and Chaves, in 1994. In the following year, by the time the alternative bus service had already been suppressed, ridership was 50.412 passengers. This continuous demand fall would persist until 1999 with only 30.102 passengers. Therefore, between 1990 and 1999 ridership decreased by 75%.

A recovery period was registered with 46.290 passengers in 2002 but demand would drop again with 33.047 passengers, in 2004. Since then, ridership would start a sustainable recovery period, which would persist until 2008, when 71.940 passengers had travelled between Régua and Vila Real. Thus, between 2004 and 2008, ridership had increased by 118%. It should be added this recovery achieves 139% between 1999 and 2008.

The introduction of an alternative bus service in 2009 between Régua and Vila Real, as well as happened in the 90's between Vila Real and Chaves, would be followed by a demand decrease. 59.380 passengers travelled in 2009 but in the following year the number dropped to 49.270 passengers.

In 2011, the last year with the alternative bus service, ridership was 46.880 passengers. As it happened in the Tâmega Line, this line had also been transporting many more passengers between 2009 and 2011 than between 1999 and 2001 or even in 2004. Hence, the alternative bus service suspension can be said to be incomprehensive.

To verify our analysis, the linear tendency tool can be used. When a polynomial regression of order four is applied, a R^2 greater to 92% can be obtained for the Corgo Line case. This tool sustains the demand started to decrease even before 1990, when the concavity has changed. Then, the linear tendency tool confirms that Corgo Line ridership decreasing has finished in 2000. After a nine years' recovery period, ridership would start to fall again in 2009, by the time the alternative bus service was introduced. This idea is confirmed by the linear tendency tool.

5.3.3 Final Synthesis

As we were able to highlight, no solution which could avoid the mandatory transshipment in Régua between the Douro Line and the Corgo Line was found. Besides this inconvenience, the passengers were obliged to spend 3 hours and 20 minutes on board of the Corgo Line. Neither the advised “adequate timetable study” was promoted nor the recommended creation of semi-direct trains was established. In 1968, it was already acknowledged the Corgo Line conditions “would never allow to satisfy” the regional transport necessities. Later, the appearance of a *newer* rolling stock was a motive that led to the Corgo Line suppression. In fact, the “asymmetric” LRV2000 series was probably in the origin of two of the four Tua Line accidents (REFER, 2008). We can conclude that in order to avoid new incidents, it was decided to close both Corgo and Tâmega Lines, due to rolling stock inadequacy.

5.4 Tua Line

The Tua Line was the first narrowed-gauge railway stretch built in the Douro region. With 133,768 kilometres extension, the line connected Foz-Tua (Carrazeda de Ansiães Municipality) to the city of Bragança. Construction works started on 1884 and the train arrived “triumphally” at Mirandela on 29th September 1887. The first branch crosses a very difficult and hardly terrain, only surpassed with the construction of several tunnels and viaducts (Cardoso & Machado, 2008). In the beginning of the 20th Century, it was understood “no other” railway itinerary was presenting “a so high development” in Portugal. Considerations such as this one were in the basis of the Tua Line extension further North and the train would arrive to Bragança, on 1st December 1906 (Gazeta dos Caminhos-de-Ferro, 1902). However, the Tua Line was never concluded. Expansion further North of Bragança until Quadramil iron mines and the Spanish village of Puebla de Sanabria was considered (Sousa, 1935). The linkage to the Dão Line via Viseu was also predicted but none of the extensions happened.

In January 1970, a CP feasibility study suggested the Tua Line suppression, as long as the “running financial results” were “rather unfavourable”. Nevertheless, it was recognized the Tua Line closure could “compromise the systematic regional valorization”. Actually, even this feasibility study acknowledged a “weak density” not only of “regional roads” but also of “regional automobiles”. Therefore, it was recommended to promote not only a “bigger rationalization of the current line exploration system”, with “no important investments”, but also a “more active commercial action”, in order to catch a “bigger traffic”.

In 1985, a protocol signed between the Minister of the Social Equipment and the mayors of the region forecasted again the Tua Line suppression. The municipalities agreed with the reduction of the number of trains, with the closure of the stations and with the introduction of the Simplified Exploration Regime (Cipriano, 1995).

The following years brought a harsh *attack* to the regional railways. After a new timetable disconcertion, the Mirandela - Macedo de Cavaleiros stretch would be closed on 15th December 1991 (Garcias, 2008), in order to fulfil the *Plano de Modernização e Reconversão dos Caminhos-de-Ferro* guidelines. Nevertheless, two days after, on 17th December 1991, a derailment in the small village of Sortes, would lead to the closure of the Macedo de Cavaleiros - Bragança stretch (Cipriano, 2008a). Meanwhile, in order to substitute the train, an alternative bus service had already been created.

However, the Mirandela - Bragança linkage in which were spent €1.5m in 1991 (Rodrigues, 2008), would be definitely closed in the daybreak of 13th to 14th October 1992 when

surprisingly, CP removed the rolling stock from Bragança station to the Mirandela depot. The alternative bus service would disappear along the second half of the 90's. At that time, a €60m investment plan was considered for the Bragança-Mirandela stretch, in order to improve and modernize commercial services. However, the idea didn't go forward (Pires, 2014).

Years later, on 28th July 1995, the creation of the regional operator *Metropolitano de Mirandela S.A.* allowed the reopening of the 4 km stretch between Mirandela and Carvalhais. This change led to the introduction of new rolling stock composed by refurbished railcars - The LRV 2000 units or CP 9500 series which would be introduced in the entire Tua Line in 2001 (CP, 1995).

Between 2007 and 2008, four accidents took place in the Tua Line. The first one, which occurred on 12th February 2007, would be caused by a stone sliding (LNEC, 2007), while the second accident, which took place on 10th April 2008, was explained by the fall of "two or three" stones. The third accident occurred on 6th June 2008, and was justified by a problem in the train, which "jumped of the tracks after a small curve, in a stretch "recently intervened" (Refer, 2008). The fourth and last accident would occur on 22nd August 2008. According to the Swiss Federal Railways (SBB CFF), factors such as the "scale", "warping", poor infrastructure conditions and maladjusted rolling stock were probably in the origin of the derailment.

In November 2008, a "set" of actions which would guarantee not only the "global recovery" but also the "safety improvement" of the Tua Line was presented by the Portuguese government. By that time, the reopening of the Tua-Cachão linkage was forecasted for March 2009 (Pinto, 2008). Nevertheless, with the approval of the Tua Dam construction in May 2009, the first 21 kilometres of the Tua Line would definitely become underwater. A Mobility Plan was presented in order to substitute the train. Investment solutions were also presented for the reconnection of the Tua Line to the Douro Line. A new stretch could cost between 40 and €300m (Pires, 2014).

However, in 2010, REFER requested to the Portuguese Government the Tua Line disqualification from the railway network, by arguing it wanted to have no more responsibilities in this railway stretch. According to REFER, it was necessary to know if the "public transport necessities" could not be satisfied "in more affordable and more efficient conditions" in the places served by the Tua Line "through the implementation or the reinforcement of other transport means". REFER moved six years backwards in order to conclude "the social and economic minimum values" were not fulfilled in order to "maintain the public railway service". In fact, on average, in the first quarter of 2004 each running has only moved nine passengers.

Nevertheless, REFER recognized no demand studies were done in order to evaluate the potential market of the Tua Line (Cipriano, 2010). The disqualification would only be approved in 2016 (Damião, 2016), by the time the Tua Dam was concluded. Nowadays, the Mobility Plan for the Tua Valley is slowly moving forward, and most of the 134 kilometres of the Tua Line are abandoned.

5.4.1 Timetables and Investments

In 1980, there were four daily journeys between Tua and Bragança. At that time, a trip along the 133,768 kilometres of the Tua Line took 4 hours and 17 minutes. Meanwhile, there were six daily trips between Tua and Mirandela. The train took approximately 1 hour and 33 minutes to travel between these 54,092 kilometres.

Therefore, it was necessary to wait 7 hours and 12 minutes from Porto and 10 hours and 53 minutes from Lisboa in order to reach Bragança by train (MOPTC, 1988). The number

of daily journeys between Tua and Mirandela would drop from five to three in 2001. Six years after, in 2007, when three daily trips were still done between these stations, the train took 1 hour and 34 minutes in order to link Tua to Mirandela. With the introduction of a new velocity limit, after the 12th February 2007 accident, the time journey would increase to 1 hour and 50 minutes. Meanwhile, the number of daily trips between Tua and Mirandela would also drop from three to two (Cipriano, 2008a). Between 2000 and 2005, REFER has invested few less than €2m in the Tua Line. The interventions executed after the 25th April 2000 incident have consumed almost 50% of this amount. Only few more than €3.5m were invested in the Tua Line between 2006 and 2013. Even with the four accidents, this amount is smaller than the one which was applied not only in the Tâmega Line but also in the Corgo Line.

5.4.2 Ridership

In 1992, the Tua Line lost almost 80 km with the closure of the stretch between Bragança, Macedo de Cavaleiros and Mirandela, which are the main villages of Trás-os-Montes Region and the ones that have more population. This measure had huge and negative consequences in Tua Line ridership.

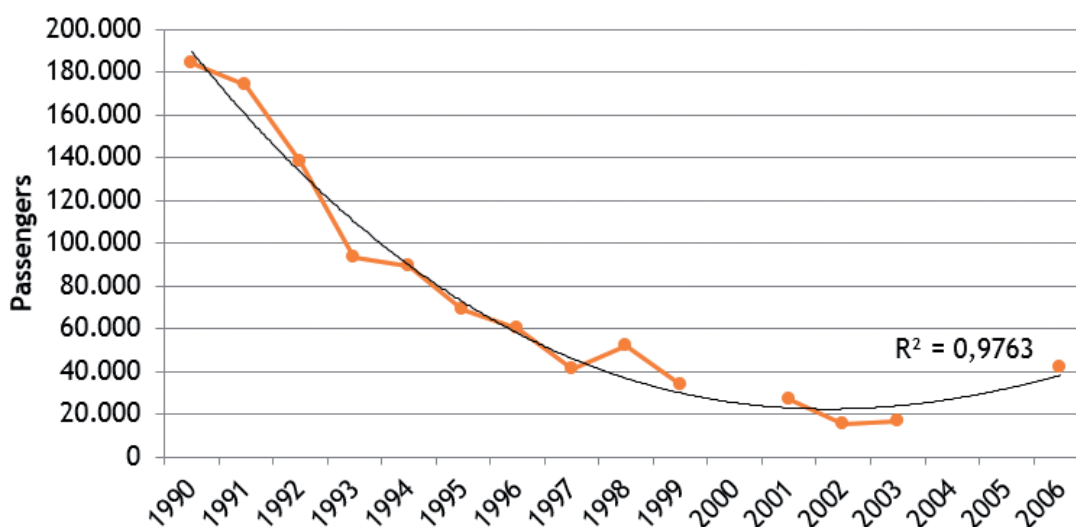


Figure 3: Ridership evolution in the Tua Line between 1990 and 2006. Source: CP.

According to Figure 3, in 1990, Tua Line demand was 184.388 passengers. Since then and after being suppressed both Mirandela - Macedo de Cavaleiros and Macedo de Cavaleiros - Bragança linkages, ridership would continuously decrease until 1997. Between 1990 and 2002, demand has decreased by 92%. However, ridership would start to increase in 2002. At that time LRV 2000 railcars started commercial services, which led to the suppression of two daily journeys between Tua and Mirandela. As long as 41.905 passengers travelled in 2006, the demand had increased by 178% in only four years.

Our analysis can be verified with the linear tendency tool. Actually, when a polynomial regression of order two is applied, a R^2 greater to 97% can be obtained. Furthermore, this tool confirms the tendency in the Tua Line demand decrease has finished in 2002, when the concavity has changed.

The high number of constraints occurred in the Tua Line since 2007 forced us to stop

our linear tendency analysis in 2006. Nevertheless, we were able to collect data after this year. In 2007, the railway stretch demand decreased by almost 50% when compared to 2006 with only 21.466 passengers. It should be expected a new huge fall in the demand with the seriousness of the 12th February 2007 accident. However, surprisingly, the passengers and the tourists continued to travel along the Tua Line. Hence, in 2008, when three more accidents took place, 36.440 passengers travelled in the line. The Mirandela - Carvalhais urban linkage was not considered in this analysis. Nevertheless, we were able to collect data for this stretch thanks to the support of Metro de Mirandela. Thus, while 66.285 passengers travelled in 2013 between Mirandela and Carvalhais, in 2014 ridership was 110.717 passengers. This 67% increase confirms that the Tua Line continues to be an indispensable transport mean for the local population.

5.4.3 Final Synthesis

It was never found a solution which could avoid the obligatory transshipment in Tua between the Douro Line and the Tua Line. In addition, the timetables were progressively disconcerted and journeys were suppressed.

Actually, the number of daily journeys between Tua and Mirandela has dropped from six to two, in roughly two and a half decades. Thanks to the persistent reduction of the running velocities, it was necessary to spend 1 hour and 50 minutes in order to cover the 54,092 kilometres between Tua and Mirandela. Besides all these inadequacies, the connection between the Douro Line and the Tua Line was said to be “not articulated” (Simão, 2009: 64). Thus, the utilization of the train until Porto, through the Douro Line, became progressively even less interesting and competitive.

The Tua Line achieved an extremely low maintenance level. In the 80's, the Mirandela - Bragança linkage still presented the original railway tracks (Pires, 2014). In addition, the installation of a stone sliding detection system and the implementation of reception and dissipation energy boxes, which could probably have avoided two of the four Tua Line accidents, were never promoted. The persistent disinvestment has also affected the rolling stock. Actually, the “lightness” of the LRV 2000 railcars was probably in the origin of two of the four Tua Line accidents. Therefore, we can conclude the inadequacies of this rolling stock were in the basis of both Tâmega and Corgo Line suppressions.

5.5 Sabor Line

Sabor Line was the remotest Douro region narrowed-gauge railway stretch (Torres, 1958). With 105,291 kilometres, the line connected Pocinho (Foz Côa Municipality) to Miranda / Duas Igrejas (Miranda do Douro Municipality). Its construction started in 1903 but the first 33,473 kilometres, between Pocinho and Carviçais, only opened to commercial services on 17th September 1911. The train arrived at Miranda/Duas Igrejas on 22nd May 1938 (Cardoso & Machado, 2008). Sabor Line is known for the 540 metres gap along 25 kilometres of continuous rise, before reaching Felgar, which is the longest railway ramp in Portugal. The construction of a stretch until Vimioso, crossing the important agricultural zone of Vilarica Valley and international linkage with the Spanish city of Zamora were considered.

With the *Decreto 18.190*, published in 1930, the linkage with Spain would be definitely abandoned. Nevertheless, the arrival to Vimioso was approved and continued to be expected. In addition, the document sustained the expansion further South until the Beira Baixa region. In spite of its importance, Sabor Line extensions never happened.

In October 1971, CP concluded a feasibility study for the Sabor Line. The conclusions

appoint that the line was the most peripheral railway stretch, which only served three villages with “some local dimension”: Torre de Moncorvo, Mogadouro and Miranda do Douro, but only Torre de Moncorvo had a station in its urban core so that an “outline correction” was recommended. The study also referred the great majority of the population worked in agriculture, an aspect that affected negatively the “demand structure” and the journeys had frequently an “occasional character”. In addition, an “appreciable part” of them was still done in “animal traction vehicles”, in a region where the roads were “scarce” and where the “depopulation process” did not “contribute for the existence of a significant demand”. Thus, it could be concluded the “undoubted stagnation” and the “difficult diversification” of the local economic activities constituted a barrier to the appearance of “new traffics”. The study also referred the “low intensity” of ridership was due to the “bad quality service”, predominance of primary activities, low regional per capita income and tendency for the depopulation.

Other factors explained the Sabor Line decline. Bad infrastructure conditions and rolling stock allowed the “local bus companies” to have a “better concurrence position” than the train. In addition, the Sabor Line “rather high” production costs could only be “substantially reduced with high investments”, whose “reimbursement would practically be impossible”.

Despite being acknowledged an investment “necessity”, especially in rolling stock and infrastructure renewal, it was understood this spending would bring “additional amortization and interest charges rather accentuated”. Furthermore, it was pointed the “current and foreseeable regional development level” would not justify the “duplication of the existing services”.

Therefore, as long as the “running financial results” were “rather unfavorable”, the Sabor Line closure was advised. In this particular case, it was understood the railway suppression would not “compromise the systematic regional valorization”. In fact, it was pointed the Sabor region was “sufficiently provided of roads”, which presented also “better outlines” than the railway. If the Sabor Line remained working, a “systematic transport degradation”, which would lead not only to a “progressive traffic reduction” but also to the “exploration deficit aggravation”, should be expected. In addition, it was pointed “it would be difficult to introduce some rationalization measures in the current running system”. Therefore, the appearance of an alternative bus service would allow to provide a “more adequate” and a “less expensive” service than the one ensured by the train.

This feasibility study, probably the most severe of all the four which were produced by CP, showed the Sabor Line was especially threatened. Actually, the first closure fear would appear in September 1979. Nevertheless, by that time, the popular reaction would be so “violent” that there would be used “beanpoles” and “agricultural implements” (Garcias, 2008). Despite having been able to save “their train”, the inhabitants would not be able to avoid the Sabor Line state “of agony”.

In 1980, there was only one daily running between Pocinho and Miranda / Duas Igrejas. Furthermore, by that time, it was already established an alternative bus service along the entire Sabor Line, which took less 24 minutes than the train. Passengers service closure would be concretized in March 1984, when Torre de Moncorvo, Mirandela, Bragança and Vimioso municipalities agreed to close Sabor Line. As counterparty, the document signed among them expected to pave some roads and to build a bridge over the Angueira River (Cipriano, 1995).

Concerning freight trains, they would remain even after 1984. However, with the approval of the *Plano de Modernização e Reversão dos Caminhos-de-Ferro*, the

Sabor Line would close definitely on 1st August 1988. Years after, the silos and the mines would also be deactivated.

At the same time, it was created a new regional bus company, which provided the linkage between Freixo de Espada à Cinta and its railway station, placed 16 kilometres further away from the village center. Nowadays Sabor Line is mostly abandoned and part of the line is converted in a greenway. A new study developed by Infraestruturas de Portugal appoints for the revival of the Pocinho-Carvalhal link which would allow the ore transportation from Moncorvo mines directly to the Douro Line. The 23km renovation is estimated in €30m (Cipriano, 2017).

5.5.1 Timetables and Investments

In 1980, there was only one daily journey between Pocinho and Miranda / Duas Igrejas. By that time, the end to end journey along the 105,291 kilometres took 3 hours and 24 minutes. Meanwhile, there were two daily journeys between Pocinho and Mogadouro. The journey took approximately 2 hours and 30 minutes between these two stations. Concerning investments, as long as the Sabor Line was definitely closed in 1988, no investments were done since then.

5.5.2 Ridership

In 1984, when commercial services closed in Sabor Line, an alternative bus service was already being established. Therefore, the demand modesty levels should not surprise us.

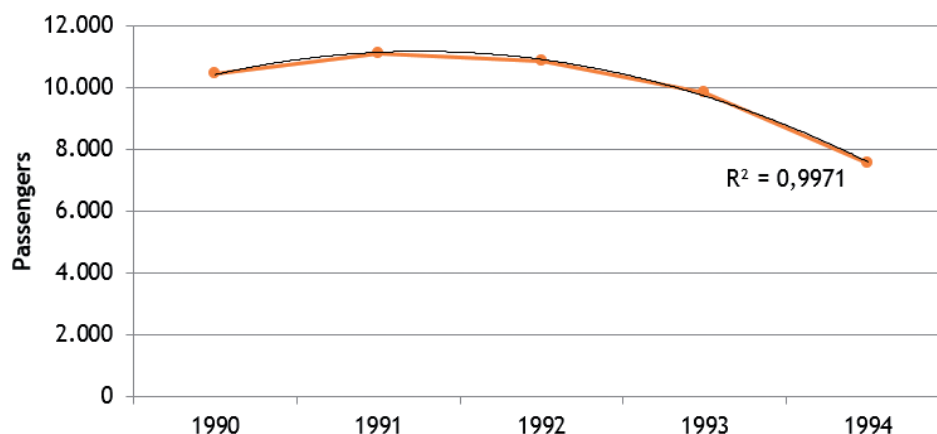


Figure 4: Ridership evolution in Sabor Line between 1990 and 1994. Source: CP.

According to Figure 1, between 1990 and 1992, few more than 10.000 passengers had travelled between Pocinho and Miranda / Duas Igrejas. The demand decrease, initiated between 1991 and 1992, would get even worse in the two following years. In fact, while 9.851 passengers would be transported, in 1993, only 7.549 passengers would travel in the Sabor Line, in the following year. Few later, the alternative bus service was suppressed.

To verify our analysis, the linear tendency tool can be used. In the Sabor Line case, the application of a polynomial regression of order two is enough to obtain a R^2 greater to 99%. This tool sustains, with no surprise, the demand started to decrease in 1991, when the concavity has changed.

5.5.3 Final Synthesis

The Sabor Line is an unfinished rail project. Actually, rather than arriving to Vimioso, the remotest Douro region narrowed-gauge railway itinerary ended in Miranda / Duas Igrejas, 11 kilometres further away from the urban core of Miranda do Douro. In addition, no solution which could avoid the mandatory transshipment in Pocinho between the Douro Line and the Sabor Line was found.

Other severe inadequacies were presented by the remotest Douro region narrowed-gauge railway stretch. In fact, the Sabor Line expansion further Northeast, along the final kilometres, was said to be “apparently subordinated” to the “easiest” way (Cardoso & Machado, 2008). However, among the municipalities served by the Sabor Line, only Torre de Moncorvo had a station in the urban core. Finally, both infrastructure and rolling stock conditions were less competitive than the local bus companies. Actually, even the alternative bus service, already established in 1980, was 24 minutes faster than the train. As long as the recommended “outline correction” was never promoted, the Sabor Line harsh weaknesses could not be surpassed.

6. Final Considerations

The “low” traffic of the Tâmega, Corgo, Tua and Sabor Lines was already acknowledged by the time of their project but this characteristic was not considered an impediment for their construction. However, throughout almost an entire century, they were remitted to an unquestionable high disinvestment level. In fact, the lack of planning and political will seems to be evident in Portugal, where railways are considered a spent, not an investment.

It is often argued that low demand levels explain railway closures, especially in rural areas. However, as we were able to stress and conclude, ridership started to decrease after the introduction of modifications in railway commercial services. In fact, the main passenger share was precisely placed between the linkages suppressed in the beginning of the 90's, at least in both Corgo and Tua Lines. The appearance of an alternative bus service has also contributed for ridership reduction. The conjugation of these two factors led to a demand decline never inferior than 75% along the 90's .

Nevertheless, it must not be forgotten the Tâmega, Corgo and Tua Lines were registering a sustainable recovery period of their demand since the beginning of the 00's. Actually, in a scarce number of years, ridership has more than doubled in all these three narrowed-gauge railway itineraries, even with no demand studies in order to evaluate their potential market.

We can also conclude that other factors rather than low demand levels can explain the Douro railway network closure. We are able to stress that the incompleteness of the **Portuguese railway network had influence**. Despite having been launched an ambitious railway project in 1930, which would allow the conclusion of the Portuguese railway

network, the ascension of a dictatorial government would lead to the cut of almost all of the railway investments. Hence, the conclusion of the Portuguese railway network would prematurely occur in 1949.

Other fact is the **isolation of the distributor stretches from the collector itinerary.**

As we were able to describe, the Tâmega, Corgo, Tua and Sabor Lines came down sensibly parallel until the Douro Line and no connection was built between these four narrowed-gauge railway stretches. The Trás-os-Montes Transversal never started to be built. Passengers were obliged to take an enormous route if they want to use a different line. This fact associated with the necessity of **transshipments** was a huge limitation to improve commercial services and allowed to demotivate people from using the train.

Another aspect was the **timetables disarrangement.** It was already acknowledged the timetables were not adapted to the population necessities in 1978. Despite having being advised an adequate timetable study, it was progressively promoted not only the disconcertion but also the cut of timetables and journeys.

The reduction of running velocities was another important fact, which is connected to the lack of investment and modernization. The **extremely low maintenance level** and infrastructure abandonment got evident especially since the end of the 60's. Hence, so that the accidents could be avoided, running velocities have been progressively reduced. In the Tua Line, where the velocity could not surpass the 20 kilometres per hour in some stretches, trains needed to change their velocity more than 45 times in the 80's. By that period, in order to reach Bragança by train, it was necessary to wait 7 hours and 12 minutes from Porto and 10 hours and 53 minutes from Lisboa.

Rolling stock inadequacy was another aspect to be considered. As we were able to discuss, the Tâmega, Corgo and Tua Lines rolling stock, formed by LRV 2000 railcars since the beginning of the 00's, was a result of the refurbishment of the CP's 9700 series. Doubts about this rolling stock would appear after the fourth Tua Line accident. Subsequently, a more careful monitoring would be one of the motives that lead to both Tâmega and Corgo Lines suppression.

We can conclude the suppression of the railway itineraries cannot be justified by their low demand levels but by the scarce investment. Actually, by one hand, the secondary railway network has only received 0,2% of the total funds forecasted between 1988 and 1994.

By another hand, the investments were frequently only done in emergence situations. In fact, the repair costs of the 25th April 2000 incident have consumed almost 50% of the investment performed between 2000 and 2005 in the Tua Line.

Furthermore, the Portuguese government has only promoted a requalification of both Tâmega and Corgo Lines after having received a report which announced as "worrying" their condition. Nevertheless, as long as these works were never concluded, €9.6m were up to now wasted in these two railway lines. According to all of these aspects and the state of art of the Portuguese regional railways, we consider the national railway network suffered from lack of well-management in the last 25 years.

Our investigation work presented some limitations. Actually, as long as the contacting process with the entities responsible for the Portuguese railways has been very tardy, obtaining the necessary data and information for the realization of this study has been extremely difficult. We wished we were able to present not only the ridership in the Douro Line but also the investment performed per year in the other case studies.

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