

A Cross-Border Railway Bridge Non-Reconstruction: Actor-Network Analysis of its Design, Non-Development, and Non-Action

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Abstract. We describe the story of the railway missing links, particularly of the cross-border railway bridge in the Mura-Drava-Rails network. Eight railway lines formed this railway network from 1857 to 1924. We introduce our research with the historical case of design and innovation development of the semi-parabolic railway bridges. The central time frame of this paper is delimited to the post-second world war years to the present. With actor-network analysis, we describe the non-development and non-action in the two cross-border railway regional lines, each with its missing link. These two missing links in an estimated length of twelve railway kilometres prevent the network from being reformed. Additionally, we draw insights from urban studies, development studies, and machine theory. We followed the logic of the non-reconstruction of the railway bridge on the border of the former Yugoslavia with the Republic of Austria and the rationalisation of the passenger railway transport in the former country in 1968 on the one side. That is how we tried to understand also the commissioning of the cross-border road bridge between the two countries over the Mura river only a year later, in 1969, on the other side. We had to broaden our research perspective to all the railway border crossing od today's Slovenia with Austria, Hungary, and Italy. By mapping these railway border crossings, we were able to describe the strategic intent of the former country, which was to close the majority of the railway borders crossing—seven out of ten railway border crossings existing before the second world war—on its northern borders.

1 Introduction

We wish to describe the story of the railway bridges' design, non-development, and sustainability across the Mura and Drava river regions in four countries: Austria, Slovenia, Croatia, and Hungary. While we will describe key developments of the railway lines along the Mura and Drava from its construction and openings on, the central time frame of this paper is the post-second world war years to the present.

Along the Mura and Drava regions, eight railway lines form a railway network that we will call Mura-Drava-Rails (hereafter MDR) network. The first railway line in Mura and Drava regions opened in 1857 (Verginella, 1997). By 1924, when the last railway line from Ormož to Ljutomer and Murska Sobota opened (Smodiš, 2004), the MDR network had been completed.

Table 1: Railway lines that form the Mura-Drava-Rails network

Railway line	Estimated length [km]
[—Wien—]Graz—Leibnitz—Maribor—Pragersko[—Ljubljana—Trieste]	84
—Maribor—Ruše—[Klagenfurt—]	13
—Pragersko—Čakovec—Kotoriba—Nagykanizsa—	147
[—Zaprešič—]Varaždin—Čakovec—	13
—Spielfeld-Straß—Bad Radkersburg—Gornja Radgona—Ljutomer—	60
—Čakovec—Lendava—Rédics—Lenti—	34
—Zalalövö—Hodoš—Murska Sobota—	50
—Ormož—Ljutomer—Murska Sobota—	39
	440

In the estimation and calculation of the length of the MDR network, we took Graz as the starting point of the railway line that otherwise spans from Vienna to Trieste and Pragersko as its end station. In the length estimation of the Maribor—Klagenfurt railway line, we took into our account only the part from Maribor to Ruše. Ruše was namely the end station of this line in the 1960s after the former Yugoslavia rationalized the passenger railway traffic. In the railway line Zaprešič —Varaždin—Čakovec, we considered in our calculation of MDR network length the part from Varaždin to Čakovec, because this is the part connected with the Mura and Drava rivers.

Our research interest is focused on two of these eight railway lines of the MDR network. Each of these two lines has a missing link that prevents the MDR network from fully functioning again. One is the Radgona railway line from Spielfeld-Straß to Bad Radkersburg, Gornja Radgona, and its final destination Ljutomer. The other one is the railway line from Čakovec to Lendava. The missing link in the former line is the railway bridge over the Mura river that the German Army mined in April 1945 (Steindy et al. 2020; Balažic Peček, 2016) and the missing link on the later railway line is the dismantled border railway track between Lendava and Rédics. Presumably, authorities in former Yugoslavia had dismantled that railway track on today's border between Slovenia and Hungary. These two missing links in an estimated length of twelve railway kilometres prevent the MDR network from being formed, reformed, and performing in its entirety again. Our research aims to understand the non-development and non-actions of actors involved in (non)operating the MDR network.

2 Literature Survey

In architecture, the classic parable of “architecture's power to control and generate the order” was discussed around the bridges that Robert Moses built in the United States of America (USA) in the 1920s (Yaneva, 2018, p. 1). The Moses’ approach to building bridges was criticized by Caro (1974 p 318 in Matthewman, 2011, p. 74) and Winner,

who argued that technology is supposed to be to be means to end, but it becomes the ends of means (1980, p. 229 in Matthewman, 2011, p. 74). Both Moses and Winner agree on the idea that problems or political issues could be solved by constructing or settling the concrete and steel (Matthewman, 2011, p. 75). Joerges argued that Caro and Winner are just plain wrong (1999 in Matthewman, 2011, p. 78). Matthewman concludes the heated debate that “Moses’ bridges facilitated the rapid movement of one social class but led to immobility of another” (2011, p. 82). Focus of our paper is though specifically connected to the railway bridges. Historically, innovation, development and design of railway bridges took place predominantly in the 19th century. That is why we need to say something more about this as well.

Material innovation of the railway bridges in the 19th century—from cast iron to wrought iron—enabled different types of systems to be put in place, some of which were repeated several times and some of which were single layout. The further development of the shapes of iron lattice girders showed the endeavour to move away from the rigid structure of the parallel girder and instead to produce outlines of more aesthetic effect through the parabolic or circular curvature of the top chord (Pottgießer, 1985). In the last decade of the 19th century, the era of railway bridges built completely out of steel began. First such railway bridge was constructed in Scotland—built from patented innovation called Siemens-Martin steel—for the Forth Bridge, which is still in use (Blanc, Mcevoy and Plank, 1993). Mild steel was used in many other semi-parabolic railway bridges, including the railway bridge over the Mura river on which we focus in our paper.

Although the before-mentioned series of material innovation is by itself worth scripting with the lense of Actor-Network Theory (ANT), we will now shift our attention to the theoretical basis of this research. We will try to draw together insights from science and technology studies, particularly through the development of ANT, which is responsible “for opening anthropology up to large technical ensembles” (Fisch, 2018, p. 14). Additionally, we will draw insights from urban studies, development studies, and machine theory.

It is obvious that war as a catastrophe brings with it its consequences—in our case mined and dismantled bridge. Like Bender, we will ask ourselves how much of our bridge case resulted from human inaction in “a variety of relevant networks” (2011, p. 305)? Bender sees the promise of ANT in “many points of intervention of various sorts” and additionally supports an inclusive, practical, and incremental approach to ANT scholarship. Not least, Benders sees the role of ANT in “politics that brings together act, causation, and responsibility” (2011, p. 319). In Bender's reading of ANT, it seems possible—through his analysis of Cronon's *Nature's Metropolis: Chicago and the Great West*—to fully acknowledge hierarchies of power and authority (2011, p. 307). That is

how Bender is challenging Latour's insistence on keeping the social flat. Latour namely insists on the principle of democracy between actants (Harman, 2009, p. 17).

Science and Technology Studies (STS) in general draws on the non-dualist, non-substantialism approach to the interaction of things as co-constitutive processes, similarly as machine thinkers do (Fish, 2018, p. 8). Fish argues that in many respects and in many fundamental concepts STS cannot be separated from machine thinking. Following Fish's argument, machine theory insists on a fundamental incommensurability between human and machine (2018, p. 8). With machine theory, Fish derives the conclusion that railway was not just a machine, but "it was the first iteration of the emergent machinic ecology" (2018, p. 10).

3 Approach

We will use ANT to form an actor-network of the analysed cross-border railway bridge and the missing cross-border track of the border railway line. We will apply a weak ANT approach in our analysis, following Bender's questioning of the value of using weak ANT in urban studies (2010, p. 317).

While we will follow the process of design, daily use, and maintenance, as Yanevya (2017, p. 2-3) suggested, our main focus is to describe the non-development and non-action, represented in the non-reconstruction of the railway cross-border Mura river bridge in question. It is what Bender sees as one of the virtues of ANT "that a non-action requires as much explanation as an action" (2010, p. 316). With our approach, we will also try to answer the dilemma if the causal logic of ANT evacuates responsibility, as Bender has asked himself (2011, p. 305).

Additionally, in our actor-network analysis, we will *think the train*. It is an approach originally developed by LaMarre, who encourages us to "approach the evolution of a technological ensemble such as the railroad from the perspective of its generative relations", but it was Fish who has developed the phrase "thinking the train" (2018, p. 14). We will describe human and machine *non-interaction* because our important focus is on the non-action of the actants involved in the MDR network. Our description will come out of reading Fish who has focused on "human and machine interaction" (2018, p. 9–10) in his perspective of Tokyo's commuter train network.

4 Implications

In the following sections, we will describe the formed actor-network. It was obvious in the past as it is obvious in the present that politics is commissioning the bridges.

Structure, design, material, and its innovation must follow the economic capabilities and even more importantly gain the trust of commissioners. Only few of the authors have described the non-reconstruction of the mined infrastructure, in our case railway bridge.

In solving the puzzle of the non-reconstruction of this cross-border railway bridge one fact is immensely interesting. Former Yugoslavia and Republic of Austria *did* commission and solemnly opened the cross-border *road* bridge over the Mura river in 1969 (www.kultprotur.si, 2019), only several dozen meters away from the location of the railway bridge. All this happened a year after former Yugoslavia in 1968 rationalised the passenger railway transport. During this infamous rationalisation, authorities in former Yugoslavia abandoned the passenger railway transport on the railway line from Ljutomer to Gornja Radgona (Gimnazija Franca Miklošiča Ljutomer, 2013). What were the reasons for such a strategic decision by authorities and other actors in former Yugoslavia? On the one hand, they stopped the railway passenger transport to the city on the border with Austria, while on the other side, they knew they would open the road bridge next year. Did authorities see the *car* as advanced technology in 1968, that is worth the effort and investment into the new bridge? Was the road bridge economically more viable? Or is there another logic to follow?

4.1 Actor-Network: Former Yugoslavia-the Republic of Austria Regional Border Transport after World War II until the Cold War

In following the logic of non-reconstruction of the railway bridge and abandoning the cross-border regional railway passenger transport, Fish is offering us one possible explanation. First, large-scale infrastructure—as is any railway infrastructure, including the MDR network—“can be mediums of time and space that traverse borders, cities, and culturally distinct regions to allow for the movement of people and things; at the same time, they can be a form of a place (or “non-place”) with its own spatiotemporal character” (2018, p. 15–16). This is where one possible explanation for the non-reconstruction of the railway bridge over the Mura river could lie.

Mura and Drava rivers—as is any other river—are connecting people and objects through borders, cities, and regions with bridges as their critical links. The Republic of Austria dismantled its half of the railway bridge in 1947. Former Yugoslavia followed only in 1955 (www.styria-mobile.at, 2014). Additionally—at the height of the Cold War and the beginning of the economic crisis due to new custom provisions with Western-European countries in 1968 (Klasić, 2015, p. 46)—former Yugoslavia even abandoned the railway passenger traffic to the border with Austria. But both countries did build a cross-border street bridge on the other hand. It seems that security reasons prevailed for the former Yugoslavia, as illegal crossing the border over the Mura river between both countries immediately after the second world war was well documented and rather

mass activity (Rihtarič, 2016). And leaving the country officially by car was a well-controlled and complicated process, as we know that even getting a passport in former Yugoslavia was far from being granted to everyone. This could be—although rather unusual—a possible way to address the problem of people—and with them the workforce—leaving the country. Stopping people from getting by train near the border, with the excuse of going on holidays to the well-known spa in Radenci and from there illegally over the border.

So, there is no action by both countries to rebuild what would be a cross border railway bridge, connecting again two cities divided after the second world war. Furthermore, former Yugoslavia restricted the passenger railway transport to the border. Additionally, former Yugoslavia knew it would have to face a rapid export decline to Western Europe in 1968 (Klasić, 2015, p. 46), but it still kept the railway border crossings to the East—in our case to Hungary—*closed*. Not only did they dismantle the railway line with the border to Hungary in Lendava after the second world war. They abolished and dismantled the other railway crossing with Hungary in 1968, from Puconci to Hodoš (but not from Murska Sobota to Puconci because they did transport freight from Puconci to Ruše by railway). In today's view, it is a challenge to even describe—what else to find reasonable arguments—of all these decisions, abandonment, dismantlement and non-action regarding the railway lines and cross-border railway bridge in MDR network.

Let's take the argument further. It is Fish who argues that large-scale, technical transport infrastructure discourages dwelling and enables mobility while it tends to be inhabited by indeterminate publics that are temporally manifest in various forms of communication and technologies (2018, p. 16). We know from our own experience that car use was rather rare until the end of the 1970s, what else in the 1960s in the former Yugoslavia. In this case of the MDR network, authorities did allow freight railway transport, but only inside the borders, closing the railway crossing and even dismantling the railway tracks to the East with Hungary and not re-forming the railway connections with Austria by re-building the railway bridge over the Mura river. Which had a logic to the degree that freight railway transport is more economically viable than regional passenger railway transport. But why not completely re-enable *cross-border* railway transport, at least for economic reasons to the East. Obviously, political and security reasons prevailed. What we wish to say, it seems that former Yugoslavia with its non-decision to reconstruct the railway bridge over the Mura river encouraged dwelling and disabled mobility of all. And the Republic of Austria could not rebuild the railway bridge alone—because the Mura river that this railway bridge was crossing was now the border, marking not only the border of two countries, but also dividing once a city into two new cities—so it had to be satisfied with the new road bridge.

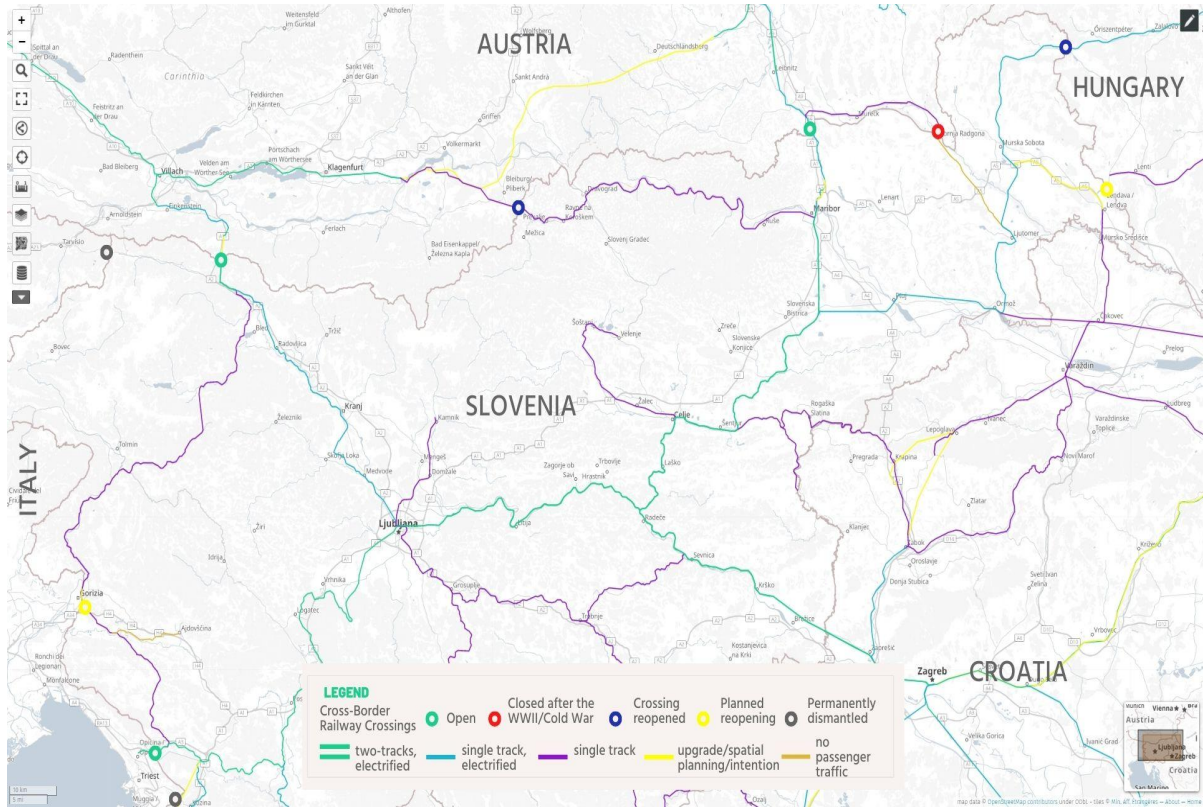
Finally, Fish sees large-scale technical infrastructure as “systems of systems, formed in a fusion of mechanical, electrical, and informational technologies that ground our daily lives but often remain unseen and unacknowledged” (2018, p. 16). In our case it really seems that the railway bridge was unseen and unacknowledged, as obviously, no one saw it as the critical, missing link to reconstruct not only one railway line in its whole but the whole MDR network in today’s four neighbouring European Union countries.

5 Conclusions and Recommendations

We will conclude our actor-network analysis in a rather Foucaultian manner, with the issue of control of the cross-border movement at the border of today's Slovenia with its three neighbouring countries—Austria, Hungary, and Italy. These countries formed the northern border of the former Yugoslavia. Before the second world war started, that border had ten railway border crossings. Four on the border of today’s Slovenia with Italy: Trieste/Hrpelje-Kozina, Sežana/Villa Opicina, Nova Gorica/Gorizia and Rateče/Tarvisio, four on the border with Austria: Jesenice/Villach, Prevalje/Bleiburg, Šentilj/Spielfed-Strass, and Gornja Radgona/Bad Radkersburg and two on the border with Hungary: Hodoš/Zalalövő and Lendava/Rédics.

We have mapped all these ten railway crossings, of which the Trieste/Hrpelje-Kozina and Rateče/Tarvisio borders railway tracks and crossings were completely dismantled in former Yugoslavia and don’t exist anymore. According to available sources, former Yugoslavia kept only three railway border crossings by the end of the 1960s. One on the border with Italy: Sežana/Villa Opicina, and two on the border with Austria: Jesenice/Villach and Šentilj/Spielfed-Strass. Former Yugoslavia closed both railway border crossings on today’s border of Slovenia and Hungary.

Fig. 1: Mapped railway network of Slovenia, with marked railway border crossings in Hungary, Austria, and Italy.



We took a broader perspective of the non-development and non-action of reconstructing the cross-border railway bridge over the Mura river. It seems that non-development and non-action in former Yugoslavia was part of a planned dismantlement or strategic intent. The intent was obviously to keep only a few exits and entrances—be that for railway passengers or freight—, in or out of the former country. The situation for cross-border railway passenger transport has even rapidly decreased in Slovenia and other countries in Western Balkans (Brezina et al., 2018). Both countries, former Yugoslavia and the Republic of Austria did agree on building a new cross-border road bridge, in 1969. In recent years in Slovenia some of the cross-border railway crossings did re-open. On the border with Austria: Prevalje/Bleiburg, marked on the map with dark blue colour. Additionally, Slovenia plans two more railway border crossing re-openings. On the western Slovenian border with Italy: Nova Gorica/Gorizia and on the eastern Slovenian border with Hungary: Lendava/Rédics, both marked yellow on the map.

Former Yugoslavia stopped the cross-border passenger railway transport with its infamous rationalisation of railway transport. It seems that authorities were able to implement this rationalisation—not only abandoning the passenger’s railway transport but also dismantling some regional railway border tracks—by the end of 1968. For the

purpose of our research, we were not able (yet) to obtain official documents confirming and detailing this rationalisation of railway transport. Its side effects were definitely rather unusual, and we know about them from the personal experience of one of the authors of this paper, who spent his youth in the city of Ljutomer, near the border of former Yugoslavia and today's Slovenia with Austria.

In the former socialist country, citizens near the border had special local border passes. Supply of some groceries—such as coffee and chocolate—was rather scarce or expensive or both. That is why the cross-border smuggling of coffee and chocolate was part of monthly or even weekly family trips by car—in order not to raise suspicion as adults-only trips—from Ljutomer to Bad Radkersburg. It would require another analysis of shopping tourism if reconstruction of the railway bridge would enable regular shopping trips *en masse* to this part of Austria—as it was practiced on the only railway border crossing of the former Yugoslavia with Italy, to Trieste (Mikula, 2010, p. 218). Nevertheless, with actor-network analysis, we were able to trace some logic behind it. We cannot confirm that causal logic of ANT evacuates responsibility, but actor-network analysis proved useful in describing the non-development and non-action of the infrastructure non-reconstruction.

In explaining the metaphysics of Latour, Harman sees the logic as "a logistics in which some translations are better supplied with food and ammunition than others, and thereby prevail for a time." (Harman, 2009, p. 26). Car and the street bridge prevail over a train and a railway bridge for the last few decades, not only for a time. From today's perspective non-decision to reconstruct a railway bridge definitely had its social, economic, and possibly other consequences and possible side effects. It also seems evident from today's perspective that car transport was strongly favoured if we analyse the closings of the railway border crossings in the Mura and Drava river regions. But we realised, we had to take into account the bigger picture, including other railway borders crossing in the whole of Slovenia in times of the former country.

Further research in this direction would be possible by obtaining access to the mentioned infamous railway transport rationalisation documentation.

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