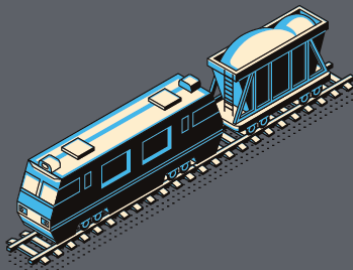# JST | SEGURIDAD EN EL TRANSPORTE

DOCUMENT FOR THE 15TH ILCAD CONGRESS

Situation of agro-industrial level crossings in Argentina and the intervention of the JST

National Department of Railway Occurrences Investigation

Year 2023

primero la gente

Ministerio de Transporte
Argentina

Transport Safety Board

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ABOUT THE TRANSPORT SAFETY BOARD

The Transport Safety Board (Junta de Seguridad en el Transporte, JST) is a decentralized agency, created in 2019 by Law 27514. It is under the orbit of the National Ministry of Transport, with economic-financial autarchy, its own legal entity, and capacity to act in the field of public and private law. Its mission is to contribute to transport safety through the investigation of accidents, conducting studies and issuing recommendations and suggested effective actions.

In accordance with Resolution 170/2018, Law 27514, and General Law of Argentine Railways 2873, investigations and safety studies are strictly technical, and their information and documentation must not generate presumption of fault or administrative, civil or criminal liability.

LIST OF [SPANISH] ACRONYMS AND ABBREVIATIONS

AMBA: Buenos Aires Metropolitan Area

BCyL: Belgrano Cargas y Logística

CCR: Communication and Response Center

COL-V: collisions with vehicles

DNISF: National Department of Railway Occurrences Investigation

DNV: National Traffic Administration

FEPSA: Ferroexpreso Pampeano Sociedad Anónima

ILCAD: International Level Crossing Awareness Day

JST: Junta de Seguridad en el Transporte (Transport Safety Board)

LB: Belgrano Line

LSM: San Martín Line

LU: Urquiza Line

NCA S.A.: Nuevo Central Argentino Sociedad Anónima

PAN: level crossing

RN: National Route

RP: Provincial Route

SEIS: Interactive Occurrences Statistics System

SETOP: Secretary of State for Transport and Public Works

GIS: Geographic Information System

TAC: Trenes Argentinos Cargas

UIC: International Union of Railways

UNR: National University of Rosario

UTN: National Technological University

INTRODUCTION

The JST has been invited by the International Union of Railways (UIC) to take part in its 15th annual *Level Crossing Awareness Day*[1] in June 2023. This time, the event's overarching topic will be the agricultural and industrial crossings.

The National Department of Railway Occurrences Investigation (DNISF), pertaining to the JST, has been carrying out a comprehensive analysis of the level crossings of Argentina since 2021; addressing the high percentage of accidents that occur in these critical points of the railway system[2]. Through field survey work and the analysis of the physical and operational conditions of railway and pedestrian crossings both urban and rural, it seeks to generate safety documents that include achievable mitigation measures, in order to reduce the rate of occurrences.

The first part of this document, which was created by the team of analysts from the DNISF's Area of Studies and Statistics, includes a brief historical overview of the railway routes in Argentina, the regulations that typify urban and rural crossings, a georeferencing of level crossings on National and Provincial Routes and the agro-industrial poles. In addition, it gives three case studies that the JST is currently developing while also providing statistical data on incidents that occurred at the level crossings examined.

The second part contains information on the momentum of Law 15387, which was passed by the provincial legislature of Buenos Aires and established the "Week of Awareness on the Railway Level Crossings" in the months of July each year. Additionally, it provides pertinent information regarding the proposed large-scale campaign for 2023 and describes the "Level Crossing Awareness Campaign" that the agency has been working on in collaboration with other public, private, and civil society players.

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[1] The ILCAD initiative is spearheaded by UIC with the support of the rail community around the world to raise awareness among users about the risks at level crossings. See: https://www.ilcad.org/ilcad/launch-conference

[2] According to the latest estimate made by the DNISF based on information provided by the Interactive Statistical System of Occurrences (SEIS) of the JST, 55% of rail accidents in 2022 occurred at level crossings.

PART 1. SITUATIONAL OF AGRO-INDUSTRIAL LEVEL CROSSINGS

1.1.   Brief overview of the Argentine rail network

Argentina's first railway line was opened in 1857. The section initially measured 9.8 km and marked the beginning of the national railway network. By the early 1890s, the railway network was 9397 km long. The State began to lay lines between provincial capitals, such as the narrow-gauge line from Córdoba to Tucumán, Salta and Jujuy (UTN, Haedo Regional Faculty, 2012).

The first Railways Administration was established in 1891 with the approval of National Railways Law 2863. The new legislation established the guidelines for the preservation, oversight, and maintenance of railroad equipment in addition to ruling in regard to concessions, connections across networks, and tariff variations. National and regional railways were also typified then.

Figure 1. Evolution of the Argentine railway network 1910
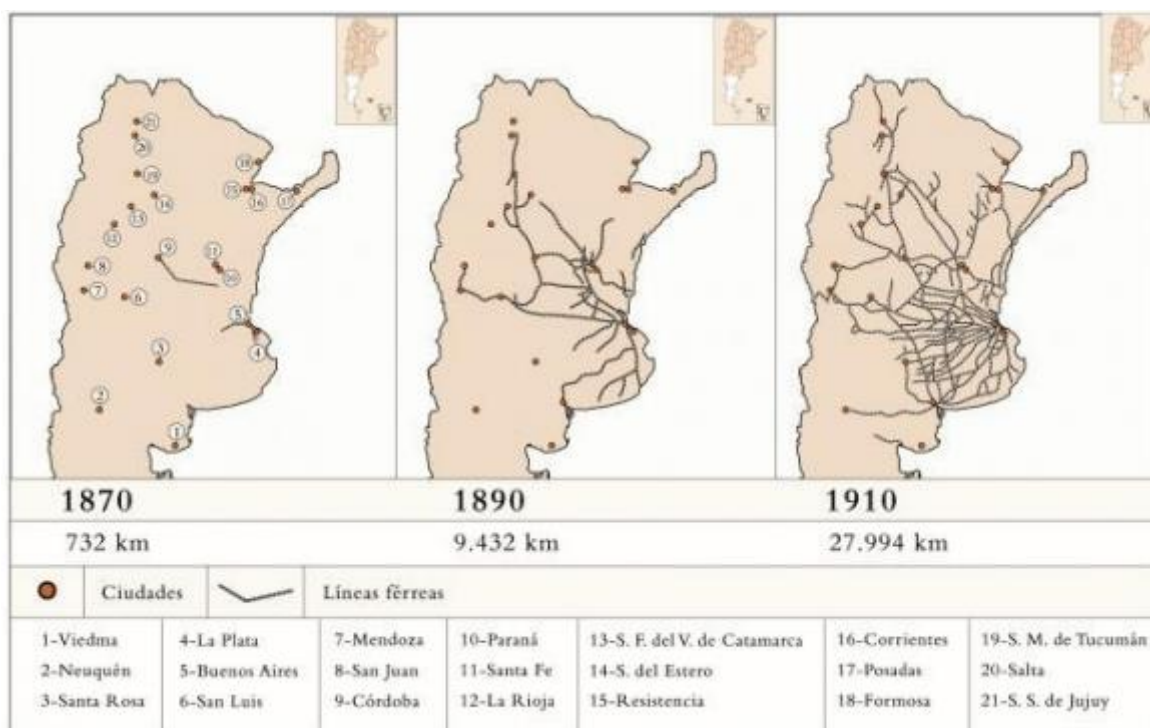
Source: Ministry of Education, UTN (2012)

A fan-shaped fabric concentrating in Buenos Aires was consolidated up to 1910. This transformation took place on multiple levels. In terms of politics, it aided in the quickening of the national organizing process. Socially, it encouraged mass mobilization of people over great distances with significant time savings. Urbanistically, it favored the emergence of new towns while relocating those that had experienced their heydays in the colonial economies. It also split the nation into geographical areas with varying degrees of development, favoring mostly the provinces of the Central region and the Autonomous City of Buenos Aires.

Economically speaking, it facilitated the placement of raw materials in overseas ports and domestic markets, along with the introduction of goods from abroad.

In the mid-twentieth century, Argentina had the longest railway line layout in Latin America. A total of 36,400 km of railroads were counted in 1923, and 41,066 km in 1932.

All private lines were nationalized between 1946 and 1948, falling under the purview of the Argentine State Railway Company (EFEA, later Ferrocarriles Argentinos). Over 16 million passengers and approximately 10,035,468 t/km of freight were moved throughout those years, with an average distance of 475 km.

The railway network as it appeared on the 1910's chart had not significantly modified by 1949. The national government at the time implemented the founding adjustments to link communities between one another. During the National Reorganization Process, which began in Argentina in 1976, the railway network was sharply reduced. During this time, more tracks were lifted, and branches were closed, while the emphasis was placed on the development of automotive transport.

The national government at the time started a huge privatization process during the end of the 1980s and the beginning of the 1990s, which included Ferrocarriles Argentinos, the country's national railway business, along with other public utilities (telephone, gas, electricity, drinking water, etc.). Cargo and passenger services were tendered, and the obligation for interurban passenger services was given to provincial governments, most of which were unable to continue providing these services.

The national railway system was slowly and gradually reactivated over the first decade of the twenty-first century. The policy of reactivating passenger and freight railroads, renovating and enhancing railway infrastructure, and incorporating technology and services was formed by the approval of Law 27132 in 2015. The nation currently has more than 15,000 active level crossings and 23,304 kilometers of functional railways. For the year 2022, 12.084.096.644 t/km of transported cargo were recorded.

1.2. Classification of Crossings in Argentina

The regulations for road and railroad crossings are compiled in the Secretary of State for Transport and Public Work Resolution 7/1981 (hereinafter, SETOP 7/81). Its reach encompasses all currently used crossings as well as those that are slated for construction, regardless of who is patrimonially or legally liable for them.

This law divides railroad crossings into urban and rural areas based on where they are located. When cadastral plans reveal that an area is divided into minimal blocks with a surface area between streets of 1.5 hectares or less, the area is regarded as an urban area.

Urban crossings are rated based on the characteristics of the urban and railway networks they cross as well as the unique circumstances of the area of passage. For this, the nomenclature of the road and rail networks, visibility, vehicular traffic, and the slopes of the roads and railways are all taken into consideration.

The following nomenclature [Spanish acronyms] is used to categorize the railway network:

- RMP: Metropolitan Passenger Network of the City of Buenos Aires.
- RTR 1: Special Trunk Network.
- RTR 2: Trunk Network of less importance than the special trunk network.
- RF 1: sections of the primary interregional and secondary networks, whose transit reaches or exceeds 10 trains per day.
- RF 2: sections of the principal interregional and minor networks that transit at least 10 trains per day.
- RTD: Railway Network with Traffic on Demand and industrial or private branches.

The nomenclature used to identify the urban road network [in Spanish acronyms] is as follows:

- RAU: Urban Motorway Network. These are the highways, with total access control.
- RPU: Urban Primary Network. Streets and avenues of the urban fabric, which channel significant volumes of traffic and are equipped with infrastructure to improve the capacity and average speed of circulation.
- MSW: Urban Secondary Network. are the streets that complement the Urban Primary Network.

varied crossings may have varied levels of signaling, manual or automatic barriers, sound-and-light traffic signals, passive signaling, or no signaling at all.

The regulations mandate that the railroad maintain an up-to-date list of all crossings with the following information:

- Location of the crossing within the railway system: railway line, branch, and progressive rail.

- Location of the intersection with the roadway system: National or Provincial Route, progressive road, community road, district or department, province, name of the street or urban avenue, and locality.

- Crossing classification: urban or rural

- Type of existing crossing and signaling crossing on different level, manual or automatic barriers, sound-light traffic lights, passive signaling, and/or without regular signaling.

The [Manual of Horizontal Signaling of the National Traffic Administration](#) approved by Resolution 2501/2012, defines the urban area as a non-rural area. While the rural area is defined as that destined for agricultural-livestock exploitation or natural resources and which is not an urban area.

Although level crossings in Argentina are classified as divided into urban and rural crossings in accordance with SETP 7/81 standards, for the purposes of this study, industrial and agricultural level crossings are referred to as those that cross National Routes (RN) and Provincial Routes (RP) and are near agro-industrial development centers (plants, mills, agricultural industry, hydrocarbons, ports, etc.).

1.3. Georeferencing of Level Crossings in the National Territory

According to data provided by the different operating companies of passenger and cargo services and public actors of the railway system, Argentina currently has 23,304 km of operational tracks and 13,843 level crossings, of which 1122 are in the Metropolitan Area of Buenos Aires (AMBA)[3] and the rest is distributed in the different Argentine provinces.

The AMBA is made up of the districts of the City of Buenos Aires and 40 municipalities of the province of Buenos Aires. It occupies a territory of approximately 3833 km^2 and concentrates 35% of the national population, being the most populated geographical area of the country and historically configured as the central nucleus of the Argentine urban system. At the same time, it is the only region in the country with circulation of metropolitan trains.

In order to locate the active level crossings on the map of Argentina, the crossings in National (RN) and Provincial (RP) Routes were georeferenced with the Google Maps tool.

**Figure 2. Level crossings of active branches in RN and RP**

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[3] View Rail Transport Statistics in https://www.argentina.gob.ar/transporte/cnrt/estadisticas-ferroviarias
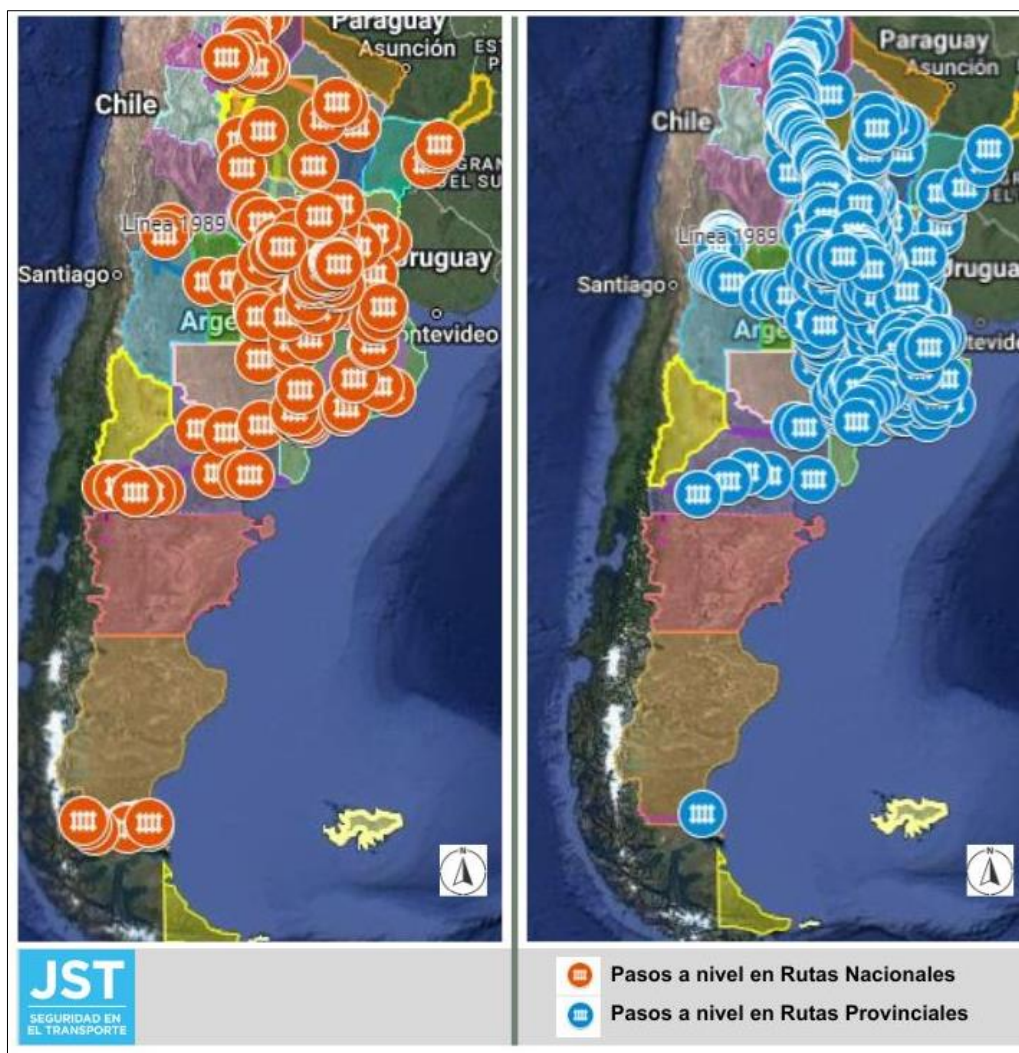
Source: JST based on National Traffic Administration (DNV) GIS data, 2023

When the PANs (level crossings) are counted by province, a higher level of concentration of crossings is observed in the Central region (Córdoba, Santa Fe and Entre Ríos, and province of Buenos Aires).

Graph 1. Number of level crossings in RN and PR by province
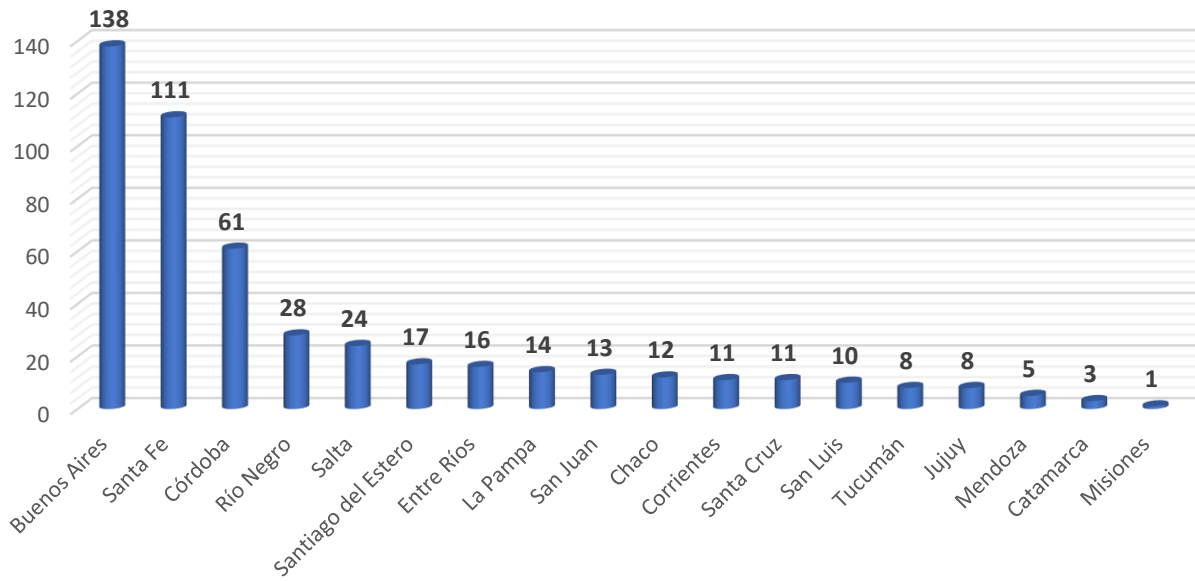
Source: SEIS, 2023

**Figure 3. Active level crossings in RN and PR of the Central Region**
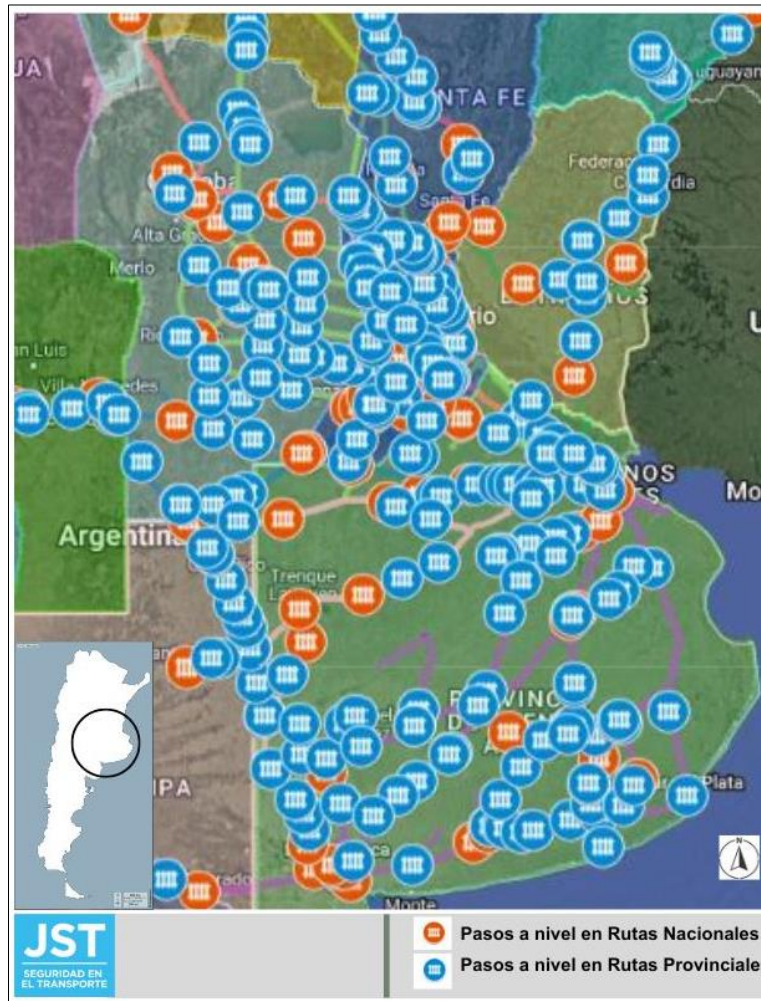
Source: JST based on DNV GIS data, 2023

1.4. Occurrences at RN and RP level crossings

The provinces with the highest concentration of level crossings were those that registered the highest number of collisions of trains with vehicles, according to data on the number of level crossings in RN and RP by province and the number of events registered by the Interactive Occurrences Statistics System (SEIS in its Spanish acronym) between January 2021 and January 2023.

Graph 2. Number of collisions with vehicles at level crossings (RN+RP) by province
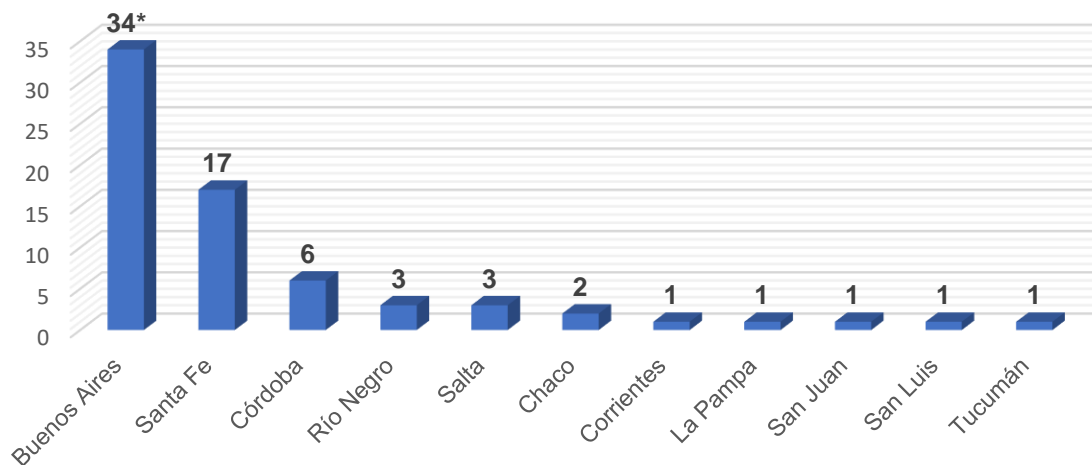
*Of the 34 occurrences recorded in the province of Buenos Aires, 26 correspond to the Metropolitan Area (AMBA).
Source: Interactive Occurrences Statistics System (SEIS), 2023

1.5. Georeferencing of agro-industrial poles in Argentina

The Argentine railway was developed to support an agro-export-based economy, which had an impact on the national regionalization, as was indicated in the historical overview. The Central region, which encompasses the Autonomous City of Buenos Aires and the provinces of Buenos Aires, Córdoba, Entre Ríos, and Santa Fe, where the axis of urban and port industry is located,[4] is one of the productive areas that benefited most from the railroad lines.

According to the historical perspective, the Argentine railway was built to serve an agro-export-based economy, which had an effect on national regionalization. One of the productive areas that benefited the most from the railway lines is the Central region, which includes the Autonomous City of Buenos Aires and the provinces of Buenos Aires, Córdoba, Entre Ríos, and Santa Fe. This area is the axis of urban and port industry.

In order to identify the poles of productive development on the Argentine map, a georreterencing[5] of the agro-industrial sectors close to active railway branches (within a maximum distance of 3 km) was conducted. Ports, bus terminals and dump sites were also

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[4] The Ministry of Economy of the Nation, to study the productive configuration and the evolution of the economic activity of the country, in addition to the regions mentioned, identifies the region of Cuyo, conformed by the provinces of Mendoza, San Luis and San Juan, the Argentine Northwest, which includes the provinces of Jujuy, Salta, Tucumán, La Rioja and Catamarca, the Argentine Northeast, made up of the provinces of Chaco, Corrientes, Formosa and Misiones; and Patagonia, which brings together the provinces of La Pampa, Chubut, Neuquén, Río Negro, Santa Cruz and Tierra del Fuego.

[5] The procedure was carried out based on information published on the website of the Ministry of Economy of the Nation.
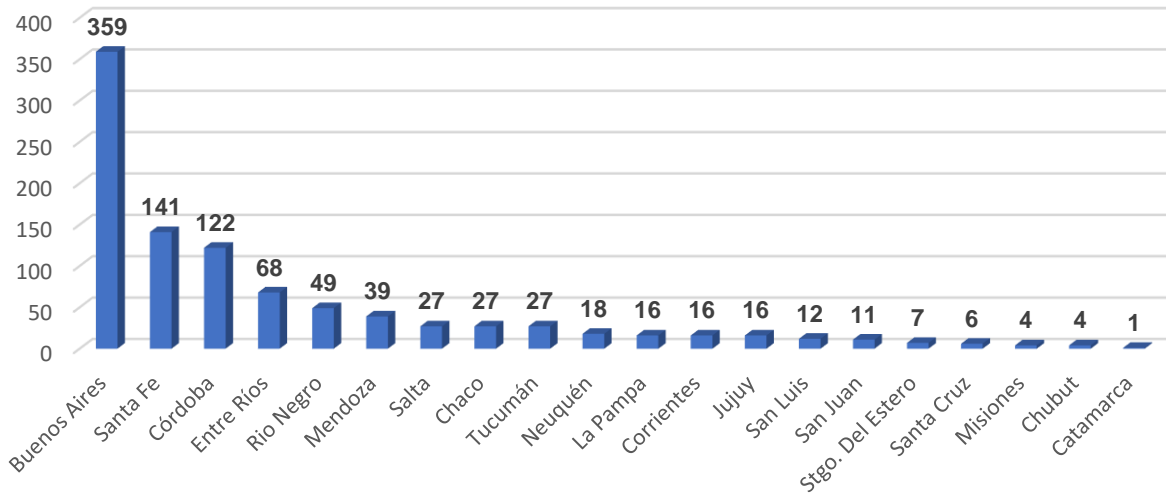
included using the same criterion to assess the volume of passenger and cargo traffic that interacts at these poles.

Figure 4. Georeferencing of productive development and transport poles
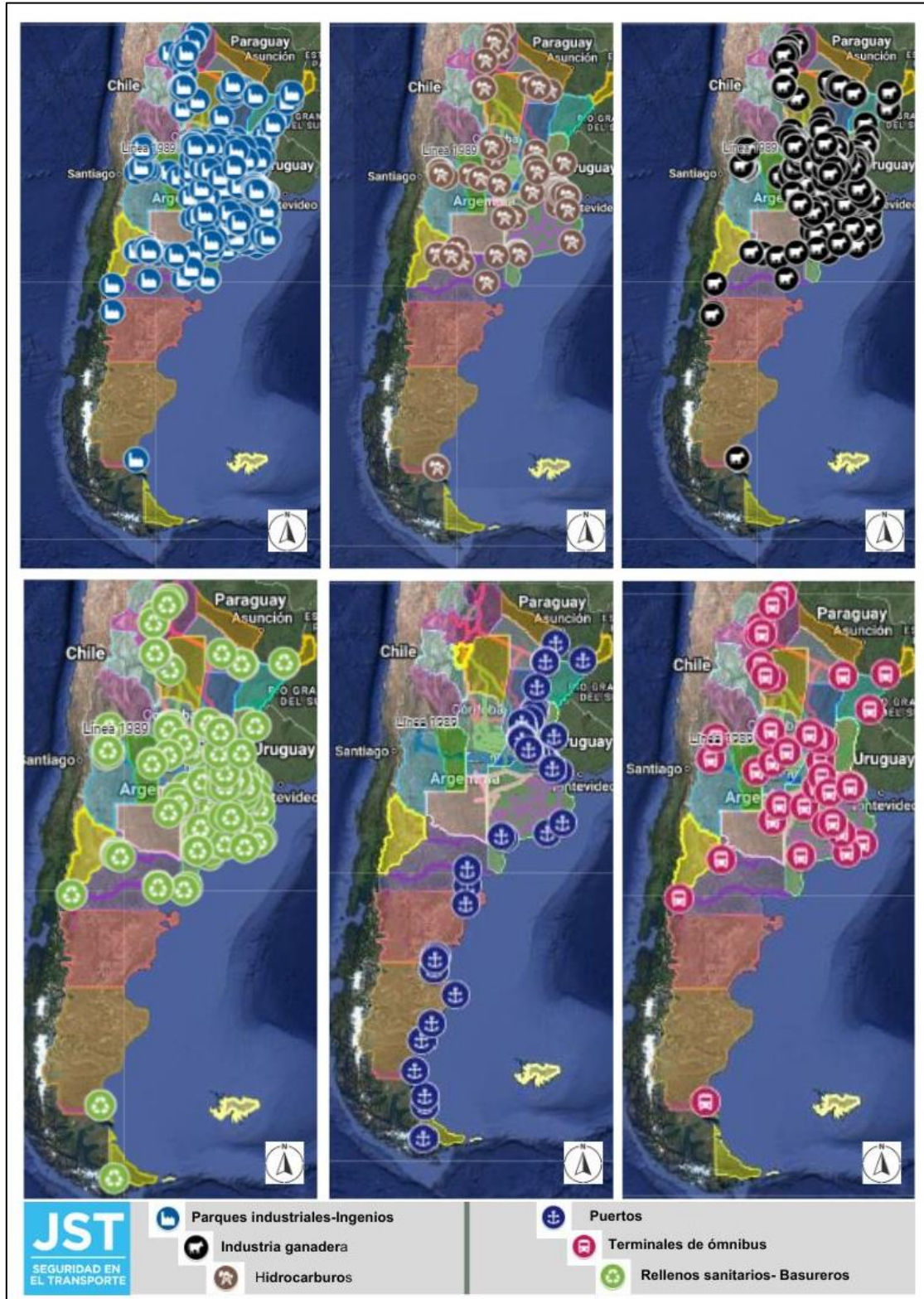
Source: JST based on data from the National Ministry of Economy, 2023

Figure 3. Industrial parks and mills + livestock industry + hydrocarbons. Totals per province

Source: JST based on data from the National Ministry of Economy, 2023

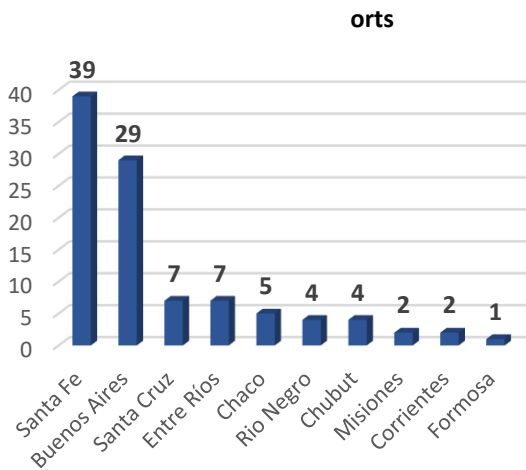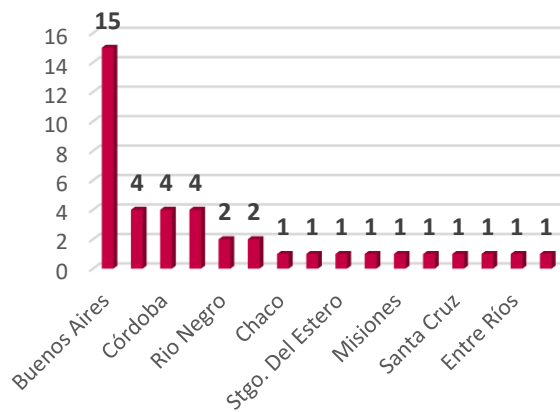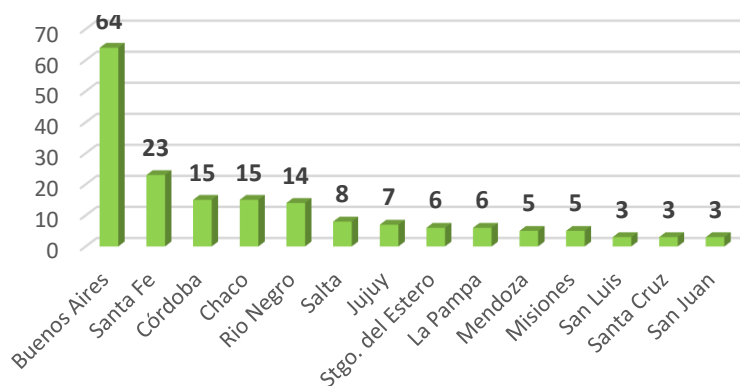**orts**

Figure 5. Bus terminals

Landfills and dump c

Source (Graphs 4, 5, and 6): JST based on data from the National Ministry of Economy, 2023

The poles of large-scale productive development, as well as the port areas, bus terminals, and dump centers, are concentrated in the Central region, as shown in the previous graphs. Also, Figure 4 shows that this region has the largest number of level crossings on both

National and Provincial Routes and is where most of the train and vehicle collisions occur at railroad crossings (Graph 2).

1.6.　Cargo train occurrences

The number of railroad events reported by cargo service operating businesses in the various provinces of the national territory can be analyzed to bring safety and economic growth into perspective.

There are currently four cargo transport operating companies in Argentina: three privately managed companies, Ferroexpreso Pampeano S.A., Ferrosur Roca S.A., and Nuevo Central Argentina S.A., and one publicly managed company, Belgrano Cargas y Logística, also known as Trenes Argentinos Cargas (TAC), which runs three transport lines, Urquiza (LU), San Martín (LSM), and Belgrano (LB).

**Table 1. Cargo service providers, provinces and line kilometers they operate**

Operator	Provinces	Line kilometers
Ferrosur Roca S.A.	Buenos Aires, Río Negro, Neuquén and La Pampa	2907 km
Nuevo Central Argentino S.A. (NCA)	Buenos Aires, Cordoba, Santa Fe	4500 km
Ferroexpreso Pampeano S.A. (FEPSA)	Buenos Aires, Santa Fe, La Pampa	5100 km
Belgrano Cargas y Logística (TAC)	LSM-Buenos Aires, Santa Fe, Córdoba, San Luis, San Juan, Mendoza LU-Buenos Aires, Entre Ríos, Corrientes, Misiones LB-Buenos Aires, Córdoba, Santiago del Estero, Tucumán, Chaco, Formosa, Catamarca, La Rioja, Salta	9100 km

Source: JST, based on information provided by operating companies, 2023

In 2022, cargo service companies transported a total of 24,435,370.45 t/km.

tons.
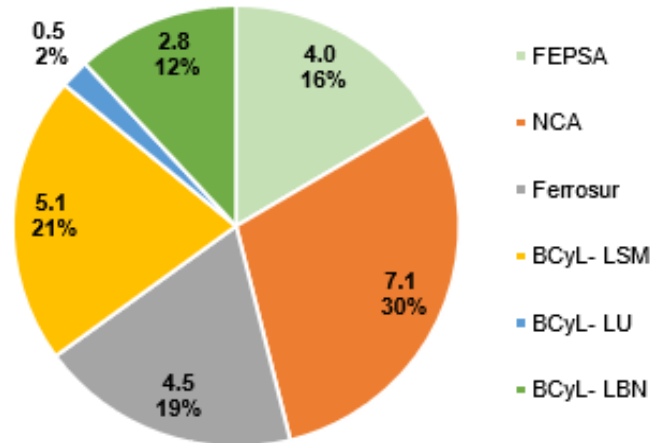
Source: JST based on CNRT data, 2022

The BCyL company transported 8,418,271 tons in 2022, which according to data from the Ministry of Transport is 35% of the total cargo transported (t/km) by service operating companies.

Given the foregoing, it is crucial to keep track of the number of occurrences that running organizations have reported, by province, in 2022.

Source: Interactive Occurrences Statistics System (SEIS), 2022
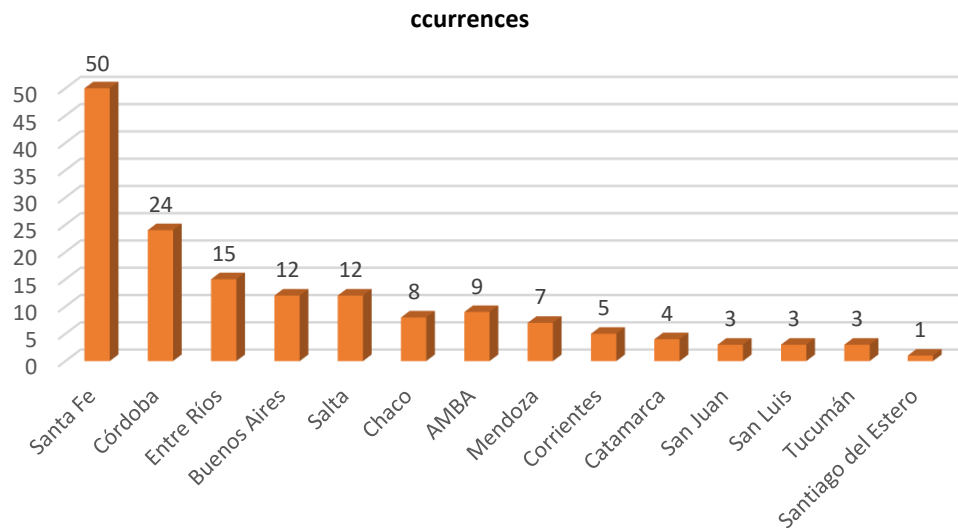
ccurrences

ccurrences
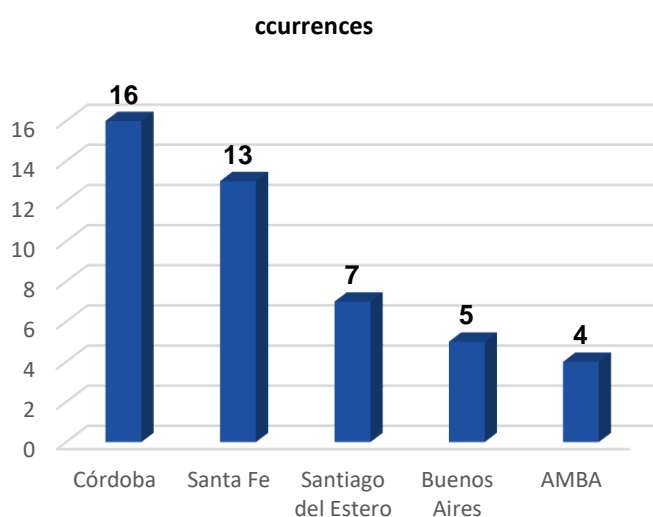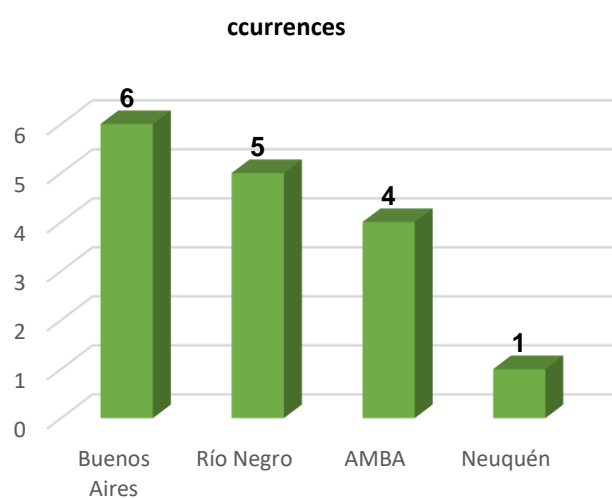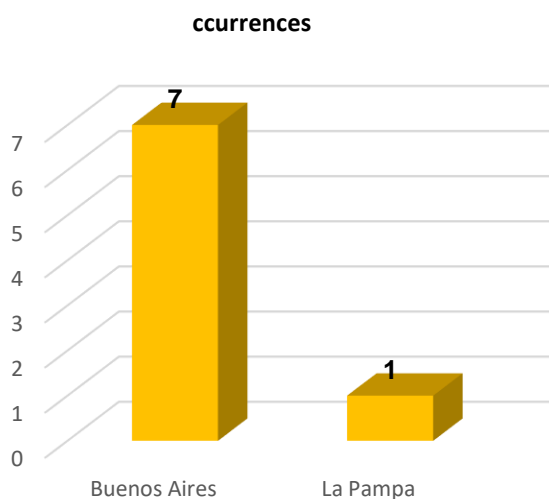
ccurrences

Source (Figures 9, 10 and 11): Interactive Occurrences Statistics System (SEIS), 2022

The Central region and the Buenos Aires Metropolitan Area (AMBA) were the regions with the largest number of cargo train occurrences in 2022, as can be inferred from the graphs. The company that recorded the most events during the research year was BCyL. 110 train occurrences in the company's operations between the AMBA region and the provinces of Buenos Aires, Córdoba, Santa Fe, and Entre Ríos—the areas with the highest concentration of agro-industrial poles and crossings in RN and RP—were recorded in the Interactive Occurrences Statistics System database. Of these 110 incidents, 32% related to vehicle crashes (Col-v) at level crossings.

The safety studies for agro-industrial level crossings that the DNISF is currently creating are listed below.

1.7.   Safety Studies. Occurrences at agroindustrial level crossings

The DNISF developed the Interactive Statistical System of Occurrences (SEIS) and the Interactive Maps of Events as two tools for data processing and information production in the railway mode. The JST compiles and verifies each recorded occurrence, despite the fact that they come from multiple sources (including the same operating firms, social networks, etc.). When potential latent faults in the railway system are identified, the event data is stored into this database, and using a number of automatic algorithms, alerts are sent to the direction of investigations to determine whether the events warrant further investigation or study.

Following signals from the SEIS in 2022, two Safety Studies were started on events at agro-industrial level crossings, one in particular at the request of an operational firm. In all three instances, risk management was carried out, which entails considering a combination of occurrence probability and harm severity to determine the tolerability of the corresponding risk. In response, field surveys were conducted to gather information on the state of the impacted level crossings.

Surveys involve taking pictures of the crossing's passive vertical and horizontal signage. This information is then checked against current regulations. The width of the road, the separation between vertical signs, and the island circuit are all measured and documented in turn. Additionally calculated are the visibility rhombus, frequency of vehicular traffic, and the angle between the road and the rails. High-resolution cameras, odometers, goniometers, and stopwatches are employed for this purpose.

1.7.1   Level crossings in the town of Cintra, Córdoba Province

Due to the frequency of collisions with cars at several level crossings of Provincial Route 3, detected in the town of Cintra between August 2021 and May 2022, an ESO (EX-2022-68110493--APN-JST#MTR) was begun in July 2022. In this case, SEIS issued an orange alert.

The agriculture and dairy industries dominate this town. It is a part of the Villa Mara dairy basin and features an industrial park that is thoughtfully positioned on the railroad and road access routes to the town.

Development

After the corresponding risk management was finished, a field survey of the three Provincial Route 3 level crossings in question was carried out. The photos below illustrate the survey forms for active and passive signaling (horizontal and vertical), as well as photographic samples.

Level crossing 1. Access to Cintra Cemetery

SEÑALIZACIÓN ACTIVA EN EL PASO A NIVEL		SI	NO
Barrera Automática *(Indicar si coincide con Línea de Detención)*			X
Barrera Manual *(Indicar si coincide con Línea de Detención y si es operada en forma Remota)*			X
Fonoluminosa *(Indicar si es solo fonoluminosa y estado de funcionamiento)*			X
Aproximación a P.A.N. – Señal P.41 *(Fondo amarillo, orla y símbolo negro; A no menos de 30m de la Barrera)*			X
Cruz de San Andrés – Señal P.42 *(En coincidencia con Línea de Detención de Vehículos / Barrera)*			X
Prohibido Estacionar – Señal R.5 *Cruces Urbanos: Aprox. A 30 m del conjunto de señales P.40 y R21*			X
Limite Velocidad 30 km/h – Señal R.21 *Cruces Urbanos: A no menos de 30 m de la Señal P.42*			X

Source: data collected during the survey, JST, 2022

SEÑALIZACIÓN PASIVA EN EL PASO A NIVEL		SI	NO
Cruz de San Andrés – Señal P.42 *(En coincidencia con Línea de Detención de Vehículos)*			X
Peligro Tren – Señal CP.11 *(Si se cruza más de una vía; señal conjuntamente con P.42)*			X
Vía + Cruz – Señal P.40 *(Fondo amarillo, orla y símbolo negro)*			X
Limite Velocidad 30 km/h – Señal R.21 *Cruces Urbanos: A no menos de 30 m de la Señal P.42*			X
Prohibido Estacionar – Señal R.5 *Cruces Urbanos: Aprox. A 30 m del conjunto de señales P.40 y R21*			X

Source: data collected during the survey, JST, 2022

Figure 5. View of the Level Crossing in the SOUTH direction

Fuente: JST, 2022

Level crossing 2. Boulevard San Martin in Cintra

SEÑALIZACIÓN ACTIVA EN EL PASO A NIVEL	SI	NO
Barrera Automática (Indicar si coincide con Línea de Detención)		X
Barrera Manual (Indicar si coincide con Línea de Detención y si es operada en forma Remota)		X
Fonoluminosa (Indicar si es solo fonoluminosa y estado de funcionamiento)		X
Aproximación a P.A.N. – Señal P.41 (Fondo amarillo, orla y símbolo negro; A no menos de 30m de la Barrera)		X
Cruz de San Andrés – Señal P.42 (En coincidencia con Línea de Detención de Vehículos / Barrera)		X
Prohibido Estacionar – Señal R.5 Cruces Urbanos: Aprox. A 30 m del conjunto de señales P.40 y R21		X
Limite Velocidad 30 km/h – Señal R.21 Cruces Urbanos: A no menos de 30 m de la Señal P.42		X

Source: data collected during the survey, JST, 2022

SEÑALIZACIÓN PASIVA EN EL PASO A NIVEL	SI	NO	OBSERVACIONES
Cruz de San Andrés – Señal P.42 (En coincidencia con Línea de Detención de Vehículos)	✔		Reemplazada c/ S. P.3. (no coincide)
Peligro Tren – Señal CP.11 (Si se cruza más de una vía; señal conjuntamente con P.42)		X	No requerido, vía sencilla.
Vía + Cruz – Señal P.40 (Fondo amarillo, orla y símbolo negro)		X	
Limite Velocidad 30 km/h – Señal R.21 Cruces Urbanos: A no menos de 30 m de la Señal P.42		X	
Prohibido Estacionar – Señal R.5 Cruces Urbanos: Aprox. A 30 m del conjunto de señales P.40 y R21		X	

Source: data collected during the survey, JST, 2022

Figure 6. View of the Level Crossing in the NORTH direction and the Cintra Industrial Park sign

Source: JST, 2022

Level crossing 3. Provincial Route 3

SEÑALIZACIÓN ACTIVA EN EL PASO A NIVEL		SI	NO
Barrera Automática (Indicar si coincide con Línea de Detención)			X
Barrera Manual (Indicar si coincide con Línea de Detención y si es operada en forma Remota)			X
Fonoluminosa (Indicar si es solo fonoluminosa y estado de funcionamiento)			X
Aproximación a P.A.N. – Señal P.41 (Fondo amarillo, orla y símbolo negro; A no menos de 30m de la Barrera)			X
Cruz de San Andrés – Señal P.42 (En coincidencia con Línea de Detención de Vehículos / Barrera)			X
Prohibido Estacionar – Señal R.5 Cruces Urbanos: Aprox. A 30 m del conjunto de señales P.40 y R21			X
Limite Velocidad 30 km/h – Señal R.21 Cruces Urbanos: A no menos de 30 m de la Señal P.42			X

Source: data collected during the survey, JST, 2022

SEÑALIZACIÓN PASIVA EN EL PASO A NIVEL		SI	NO	OBSERVACIONES
Cruz de San Andrés – Señal P.42 *(En coincidencia con Línea de Detención de Vehículos)*		✔		Reemplazada c/ S. P.3, (no coincide)
Peligro Tren – Señal CP.11 *(Si se cruza más de una vía; señal conjuntamente con P.42)*			✗	No requerido, vía sencilla.
Vía + Cruz – Señal P.40 *(Fondo amarillo, orla y símbolo negro)*		✔		En conjunto c/ S. P.1 (ambos sentid.)
Limite Velocidad 30 km/h – Señal R.21 *Cruces Urbanos: A no menos de 30 m de la Señal P.42*		✔		Rpzd. c/ S. 20km/h (ambos sentidos)
Prohibido Estacionar – Señal R.5 *Cruces Urbanos: Aprox. A 30 m del conjunto de señales P.40 y R21*			✗	

Source: data collected during the survey, JST, 2022

Figure 7. View of the level crossing, ascending direction of RP 3

Source: JST, 2023

Study status

Analysis of the information gathered is now underway.

1.7.2. Level crossings in Port General San Martín, Santa Fe Province

The study on level crossings near Port General San Martín, like the previous case, was prompted by the detection of a recurrence of events that had been noted by the by the CCR

of the JST. As a result, the SEIS statictic system generated a series of alerts, which led to the opening of a file (EX-2022-82005390-APN-DNEYMA#JST) on August 8, 2022.

Port General San Martín is a part of the 27,559 km^2 Rosario Metropolitan Region (RMR). A significant portion of the nation's production of cereal, oilseeds, oil, fuel, hydrocarbons, minerals, chemicals, and petrochemicals leaves from this region, making it one of the most significant industrial areas in the province (Pellegrini, *et al.*, 2013).

Development

After carrying out the corresponding risk management, through which the risk was considered "unacceptable under the existing circumstances", the surveys were planned within a radius of 200 meters from the town of Puerto General San Martín, taking as center the circumference located at the intersection of Presidente Juan Domingo Perón and Irigoyen streets where there are four level crossings.

Figure 8. Area where risk management is being carried out
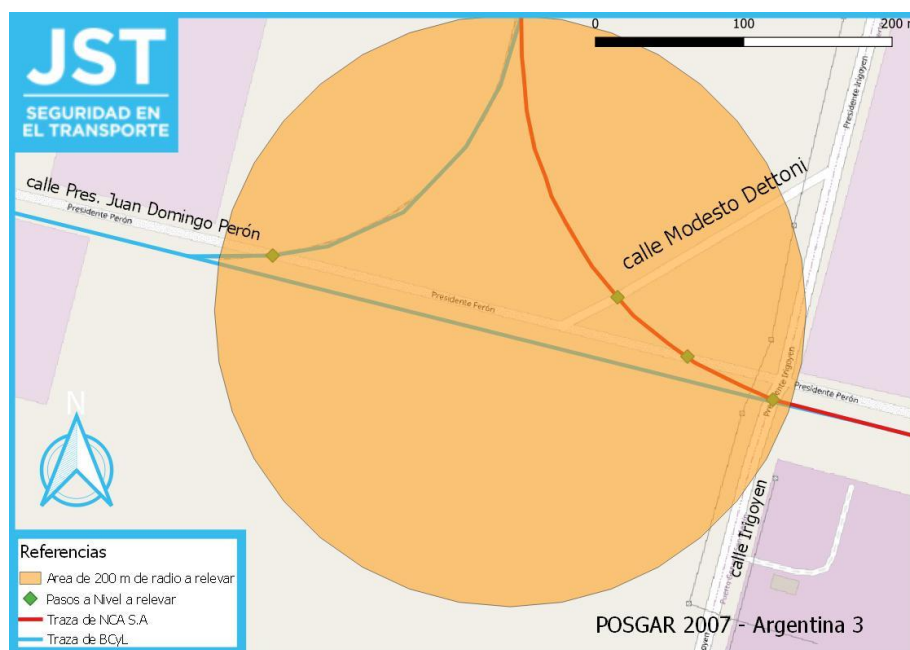
Fuente: JST, 2022

Figure 9. Visibility diamond of level crossings
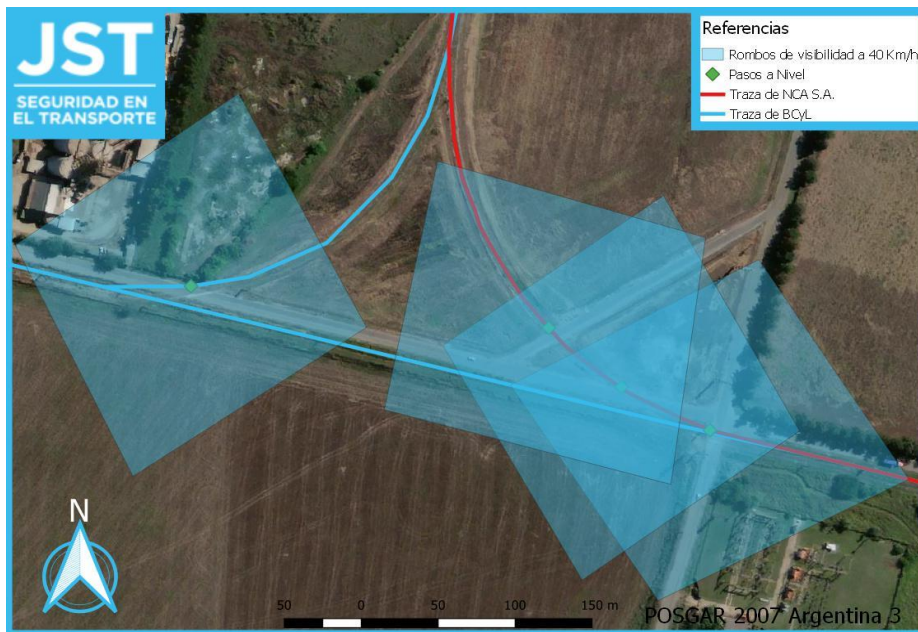
Fuente: JST, 2022

Figure 10. Level crossing of Pte. Juan Domingo Perón street

Fuente: JST, 2022

Study status

The study is in the survey stage.

1.7.3. Rufino level crossing, province of Santa Fe

In August 2022, the operating company BCyL asked the JST for collaboration to carry out a survey and analysis of the current situation of the PAN located at km 428 of the RN 7, belonging to branch 54 of the San Martín Line, which connects the towns of Rufino, Bouchard and Huinca Renancó. The request was directly linked to the accident that occurred on August 21, 2022 between a train and a truck at the aforementioned level crossing, which caused a fatality.

On that occasion, authorities of the Municipality of Rufino addressed the company BCyL, highlighting the situation of "extreme danger for road safety" in which the level crossing of the RN 7 is located, considering the possible absence of the corresponding signage. At the request of BCyL, the JST considered it appropriate to initiate an ESO to comprehensively analyze the situation of the level crossing in question. The file (EX-2023-02030044-APN-JST#MTR) was opened on January 3, 2023.

Rufino has an agricultural productive profile, with SMEs dedicated mainly to agricultural and food services. It also has a growing industrial area.

Development

After the opening of the file, a survey of the level crossing of RN 7 in Rufino was scheduled and carried out. During the process, photographs were taken, measurements were recorded, and forms were completed with information about the place. Also, within the methodological design, an unstructured interview with the BCyL safety representative was contemplated.

Table 2. Characteristics of the surveyed area

Characteristics	Description
Date of survey	12/02/2023
Time of the survey	10:15
Surveyed place	Rufino, province of Santa Fe
Geographical reference	-34.270851, -62.752509
Line	Saint Martin
Branch	54
Progressive	km 4
Road	Unique
Track quantity	1
Type of track	Simple
Circulation	Ascending and descending
Trail gauge	1676 mm
Electrification	No
Between stations	Rufino and Cañada Seca

Type of level crossing	Rural
Accessibility	Public crossing
Road structure	Renovated asphalt with rail bed
Type of rail network	Interregional and secondary primary network (RF2- less than 10 trains per day)
Type of road network	Urban primary network (RPU- streets and avenues, urban fabric)
Observations: level crossing with two-way circulation (east-west). When high temperatures are recorded in the area, the branch interrupts its operation. The section of track where the level crossing is located is renovated. The section before and after the level crossing has no renovations.	

Source: JST, 2023

Table 3. Characteristics of Surveyed PAN

Feature	Description
Width of the road	7.8 m
Stop line. U=5m/R=6m (from the inner flank of the rail to the stopping line)	Doesn't have
Braking zone (in accordance with signs P.40 and R.21, approx. 30m)	Doesn't have
Distance to the first street or avenue from the stop line (left)	35, 94 m (west side)
Distance to the first street or avenue from the stop line (right)	31.59 m (east side)
Barrier system (coinciding with stop line)	Doesn't have
Total barrier assembly time (if there is a barrier)	Doesn't have
Long circuit of island track	35 m

Fuente: JST, 2023

Images of the forms of the survey of active and passive signage (horizontal and vertical) and photographic samples can be seen next.

SEÑALIZACIÓN ACTIVA Y PASIVA EN PASO A NIVEL CON BARRERA	SI	NO	OBSERVACIONES
Barrera Automática *(Indicar si coincide con Línea de Detención)*		X	No tiene barrera física. El sistema de señalamiento esta operativo.
Barrera Manual *(Indicar si coincide con Línea de Detención y si es operada en forma Remota)*		X	
Fonoluminosa *(Indicar si es solo fonoluminosa y estado de funcionamiento)*	✓		
Aproximación a P.A.N. – Señal P.41 *(Fondo amarillo, orla y símbolo negro; A no menos de 30m de la Barrera)*		X	Ausente en ambas calles laterales.
Cruz de San Andrés – Señal P.42 *(En coincidencia con Línea de Detención de Vehículos / Barrera)*	✓		
Prohibido Estacionar – Señal R.5 *Cruces Urbanos: Aprox. A 30 m del conjunto de señales P.40 y R21*	✓		
Limite Velocidad 30 km/h – Señal R.21 *Cruces Urbanos: A no menos de 30 m de la Señal P.42*	✓		

Source: data collected during the survey. JST elaboration, 2023

VISIBILIDAD			VERIFICA	
	URBANO	RURAL	SI	NO
a)Angulo de Intersección		82°	✓	
b)Cant. de m sin intersección con otra vía pública desde Línea de Detención (Min. 16 m)		■		
c)Cant. de Calles que cruzan sobre el mismo P.A.N.	1	■	✓	
d)Obstáculos permanentes a la visión sobre plano de observación		NO	✓	
e)Cant. de Calles dentro del Rombo de Visibilidad (Inspección Visual)		3		X
f)Separación entre rieles externos (Máximo 15 m)		1.676mm	✓	
g)P.A.N. dentro de Sector destinado a Detención y/o Maniobras		NO		X
h)Circulación de más de dos trenes a la vez		NO		X
i)Velocidad de los Trenes mayor a 60 km/h		■		
j)Cruce con el FFCC a menos de 40 km/h		■		
k)Semáforos en el cruce y/o calles que intersectan el cruce		■		X
INDICE DE RIESGO CALCULADO (Solo P.A.N. Rurales) $R = V.T. \dfrac{1}{sen\,\alpha} .A.B.C$ (Verifica ≤ 12.000)	■			X
TMDA (Transito Medio Diario Anual)	4100			
Cantidad de Trenes Diarios	2			
PENDIENTES				
Pendiente de la vía hasta 600 m a ambos lados del cruce es menor a 10 ‰			✓	
Pendiente del camino vial menor al 3%			✓	

Source: data collected during the survey. JST elaboration, 2023

Figure 11. Map of the surveyed area and visibility rhombus of the level crossing
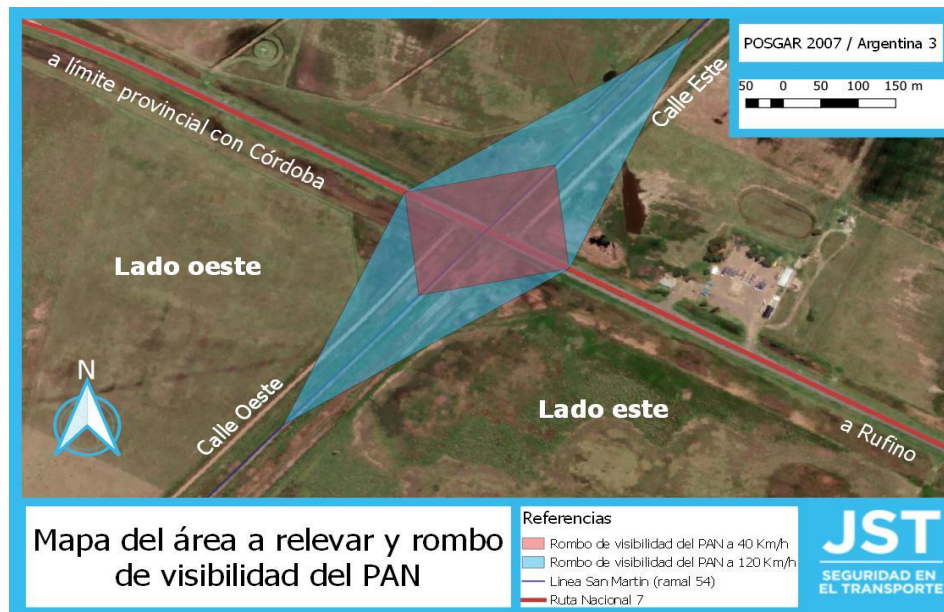
Fuente: JST, 2023

Study status

The document is in the closing stage. Preliminary findings are presented a posteriori.

Regarding the passive signaling required at rural level crossings, according to SETOP 7/81:

- Vertical road signs meet the minimum requirements:
  - Vertical St. Andrew's Cross (Sign p.3)
  - Railway crossing warning with prevention panel (Signal P.1 with Signal P.2)
  - Speed limitation (R.15 signal)
  - No parking (Sign R.8)
  - The horizontal signage is missing in its entirety, it does not have:
  - Transit separator (H.14 signal)
  - Stop Line (H.4 Signal)
  - Horizontal St. Andrew's Cross (Sign H.13)

According to the DNV Vertical Signaling Manual (2017):

- The Crossroads sign (P.24(a)) is not adequate on both the east and west sides of the level crossing.

- The correct signs are Crossroads (side junction) (P.24(b)) and Crossroads (T-junction) (P.24(d))

General indication:

- The soundlight signal is operational on both sides.

Regarding the visibility of the level crossing:

- 250 m from the junction there is a dining room serving as a regular stop for automotive transport workers. Vehicles are regularly parked, obstructing the rhombus of visibility.

- On both the east and west sides of the level crossing, two streets or side roads were detected. Both lead into the visibility rhombus, therefore, visibility does not conform to the parameters established by the SETOP 7/81 standards.

PART 2. AWARENESS ACTIONS AT LEVEL CROSSINGS

This part of the document details the "Level Crossing Awareness Campaign" that the agency has been developing, in coordination with public, private and civil society actors. Information is also provided on the impulse of Law 15387 promulgated by the legislature of the province of Buenos Aires, to establish in the month of July of each year the "Week of Awareness on the Railway Level Crossings". Finally, information on the massive campaign proposal for the year 2023 is detailed.

2.1. Actions implemented

2.1.1. Sanction of Law 15.387 "Awareness Week on Railway Level Crossings"

On October 27, 2022, the legislature of the province of Buenos Aires sanctioned Law 15387, through which the second week of June of each year was declared as the "Awareness Week on Railway Level Crossings", in accordance with the *International Level Crossing Awareness Day*. The project presented was based on the data and statistical analysis of the study "Integral approach to level crossings" of the JST, initiated in 2021.

2.1.2. Collaborative Network

For the carrying out of the studies on level crossings, a collaborative network was formed with an interdisciplinary approach to deploy awareness actions. This is currently integrated by:
- Ministry of Transport of the Nation
- Ministry of Transport of the Province of Buenos Aires
- Ministry of Health of the Nation
- Operating companies
- Railway guilds
- Civil society organizations
    - Madres del Dolor
    - CAS *(Suicide Care Center)*
    - Aiken Foundation
    - Santa Maria Spiritual Center
    - Escenarios Saludables *(Healthy Scenarios)*
    - SOS Anonymous Friend

2.1.3. Awareness day at level crossings

Within the framework of the "International Level Crossing Awareness Day", the JST held an awareness day together with the actors of the aforementioned collaborative network, such as the Suicide Assistance Center, Healthy Scenarios and the Santa María Spiritual Center.

The interventions were carried out at different level crossings in the province of Buenos Aires: PAN 25 de Mayo (Merlo), PAN Del Tejar (La Matanza) and PAN Güemes (Ramos Mejía). In

order to promote the culture of safety and to raise awareness among the population about good practices for traveling through railway crossings, JST technical staff disseminated graphic material with information of interest to pedestrians and private vehicle drivers.

Figure 12. Brochures delivered to pedestrians and vehicle drivers in awareness day

Fuente: JST, 2022

Figure 13. Awareness Day in level crossings in AMBA

Fuente: JST, 2022

2.1.4. Training in schools

The agency also carried out training and campaigns to prevent railway accidents in educational establishments near stations or tracks where urban trains, long-distance passenger and cargo trains circulate. The main target audiences were primary and secondary school students, teachers, parents and school authorities.

Trainings are intended to:

- Promote the involvement of the community in the proper use and care of the public transport system.

- Achieve a multidirectional and effective interaction between works, compliance with standards and education.

- Install basic concepts of safe behavior in the field of public transport, focusing on those sectors most exposed to the risks inherent to the activity.

- Promote teamwork, collaborative, multidisciplinary and multisectoral, aligned with the safe transport policy promoted by the JST.

Figure 14. Training at School No. 1204 "Ingeniero E. Mosconi" in Villa Gobernador Gálvez, Santa Fe

Source: JST, 2022

2.1.5. Participation in the awareness campaign carried out by the cargo company Ferroexpreso Pampeano S.A.

The JST participated in an awareness day about the crossing at level crossings in the Trenque Lauquen Municipality of the province of Buenos Aires, organized by the company Ferroexpreso Pampeano (FEPSA). Within the framework of the event, the company made a donation of prevention materials, such as San Andrés Crosses and reflective studs.

Figure 15. Awareness day with FEPSA in the Municipality of Trenque Lauquen

Fuente: JST, 2022

In addition, technical staff of the JST made a brief presentation on the "Level Crossing Awareness Campaign" that is carried out with the collaborative network of public, private and civil society actors.

The agency also participated with FEPSA in an awareness talk on level crossings at School No. 1 "Domingo Faustino Sarmiento" in the town of Coronel Suarez, Buenos Aires.

2.2.   Planning the Level Crossing Awareness Campaign in 2023

The general goal of the campaign in 2023 is to carry out educational activities and encourage constructive actions to support a culture of prevention and awareness about safe crossing at level crossings, to reduce the risks present in these crucial areas of the railway system and help improve safety at the federal level.

2.2.1. Specific objectives

- Provide information and knowledge about the risks existing at level crossings.
- Disseminate a culture of safety at level crossings by involving DNISF agents and collaborative network organizations in the planned tasks.

2.2.2. Methodology

- Hand delivery of flyers at strategic points of the railway network.
- Media dissemination.
- Involvement of organizations of the collaborative network to raise awareness and generate greater impact.

2.2.3. Strategic points of the campaign at the federal level

Provinces of Buenos Aires, Santa Fe, Córdoba, Corrientes, Río Negro, Mendoza, Salta, Chaco and Chubut.

2.2.4. Strategic points of the campaign in the AMBA

- Mitre Line header. Hotel Area: Retiro
- Header Line San Martín. Hotel Area: Retiro
- Header Belgrano Norte Line. Hotel Area: Retiro
- Header Tren de la Costa. Hotel Area: Olivos
- Urquiza Line header. Hotel Area: Federico Lacroze
- Roca Line header. Hotel Area: Plaza Constitución
- Header Belgrano Sur Line. Hotel Area: New Pompeii
- Header Sarmiento Line. Location: Eleven

References

Bibliography

National Traffic Administration. *Manual of Horizontal Signaling* (2012). https://www.argentina.gob.ar/sites/default/files/msh-2013-dnv1.pdf

Ministry of Education. National Technological University (2012). *Brief History of the Argentine Railways. Its construction, its destruction, its importance, and recovery project.* URL: https://www.cin.edu.ar/descargas/asuntosacademicos/art.%2043/INGENIERIA%20FERRO VIARIA/26-02-13%20Ferroviaria%20-%20Cap%20III.pdf

Pellegrini, J.L., Castagna, A., Liendo, M., & Martínez, A. (2013). Characterization of the industrial structure of the San Lorenzo-Puerto General San Martín area. Document presented at the Conference "Research in the Faculty of Economic Sciences and Statistics" of the UNR. November 2013. URL: https://rephip.unr.edu.ar/bitstream/handle/2133/17437/Pellegrini%2CCastagna%2CLiendo %2CMartinez_caracterizaci%C3%B3n%20industria.pdf?sequence=3&isAllowed=y

Official websites

Productive Reports (n.d.). *Regional Economic Report 2022*. National Ministry of Economy. https://www.argentina.gob.ar/economia/politicaeconomica/regionalysectorial/economiasregi onales

Trenes Argentinos Cargas. *Record two-month period for Trenes Argentinos Cargas (March 20, 2323).* Ministry of Transport. https://www.argentina.gob.ar/noticias/bimestre-record-para-trenes-argentinos-cargas

Regulations

Resolution 7 of 1981 [Secretary of State for Transport and Public Works] https://www.argentina.gob.ar/sites/default/files/setop_7-81.pdf