

The hecatomb of the La Linea tunnel

La hecatombe del túnel de La Línea

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The La Línea tunnel is one of the largest civil works projects ever undertaken in the country. We could say that it is the most efficient in terms of other works, but of course, we live in Colombia, a country full of corruption. This makes most of the civil works splash in over costs and delays as it is the tunnel of La Línea. In this article, we summarize what the work has been, and we focus more on the delays and failures of this work, and what has produced them. We relate the catastrophe to this work as it is a synonym of the former because it is a great catastrophe. This work, which makes the country and all Colombians look bad, gives us to understand how the country is, and that if we don't put an end to this filth called corruption, everything will be a hecatomb.

Keywords: Budget, contractors, corruption, delays, failures, infrastructure, roads

El túnel de La Línea es una de las obras civiles más grandes que se han hecho en el país. Podríamos decir que es la más eficiente en cuanto a otras obras, pero claro vivimos en Colombia, un país lleno de corrupción. Esto hace que la mayoría de las obras civiles resulte salpicada en sobre costos y retrasos como lo es el túnel de La Línea. En este artículo resumimos lo que ha sido la obra, y nos enfocamos más que todo en los retrasos y fallas de esta obra, y que los han producido. Relacionamos la hecatombe con esta obra ya que es un sinónimo de aquella, porque es una gran catástrofe. Esta obra, que hace quedar mal al país y a todos los colombianos, nos da a entender cómo está el país, y que si no damos fin a esa mugre llamada corrupción, todo será una hecatombe.

Palabras clave: Contratistas, corrupción, fallas, infraestructura, presupuesto, retrasos, vías

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Introduction

One of the great internal problems of most countries that cost millions of dollars a year, involve crimes such as corruption, bribery and other types of influence within governments and entities responsible for contracting works and public good projects (Cirilovic, Vajdic, Mladenovic, & Queiroz, 2014; Limam, 2012; Rose, 2008; Walcher, Stempkowski, & Apfalter, 2012). These problems are seen even more in societies with little respect for the common good, with instruments of vigilance in the hands of people not suited to the positions and great concentrations of money in few hands (Andreescu, 2016; Clem, 2011; Herath, 2015; Loomis, 2010; Meduri & Annamalai, 2013).

The La Línea tunnel is a civil construction project located in the departments of Tolima and Quindío. This work consists of the main tunnel of 29.5 km, 21 bridges, 24 viaducts, 2 depressed and an initial budget in 2004 (the year when it began to be realized) of 629,000 million pesos, but that up to the moment has ascended to \$1.27 billion Colombian pesos. The bidding process and subsequent award for the execution were granted to the consortium Segundo Centenario by the National Government in 2008, and it was intended to be completed in July 2014. In principle, no delays were expected in the work, but now it is expected that this work was delivered in November this year and that by 2018 it will be fully operational.

The director of INVIAS (National Institute of Roads), Carlos García Montes, informed that it is expected that the crossing of the central mountain range (La Línea tunnel) will be delivered on November 30th, 2017 and that it will be fully operational in the first period of 2018 when the five contracts that make up one of the most ambitious mega-projects currently underway in the country should be completed.

In recent public statements, the Intertunnel consortium has said: "We as engineers think that they will have to honor this commitment and deliver the work to the country in 12 months".

Description of the project

The La Línea tunnel is one of the most important road projects being executed in Colombia, since it is the road that aims to facilitate traffic on National Route 40 (a route that crosses the country from East to West from Buena Aventura to Puerto Carreño), hence its importance. This will make the country's capitals more connected to the sea ports located in Buena Aventura, which will generate more profits for the country (Fig. 1).

This project is divided into four modules and six sections.

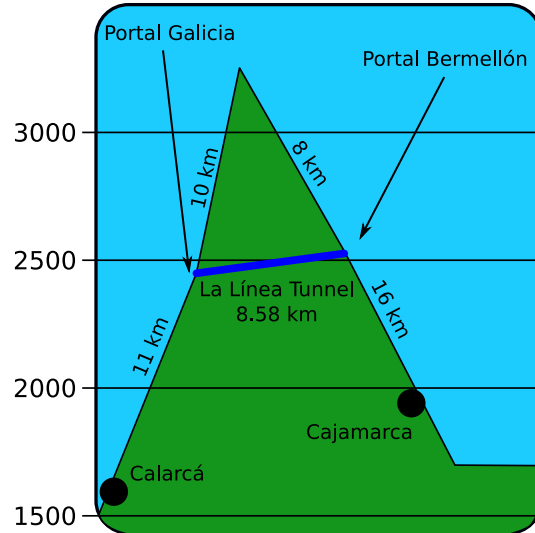


Figure 1. La Línea Tunnel profile.

Modules

The following is a list of the progress made by each according to information from INVIAS. The first module is the main tunnel of 8.6 km that has several fronts in which the progress is different. Here the different fronts and their level of progress will be presented.

- Fault treatment 66%.
- The concrete lining of the tunnel walls 60%.
- Paving of the track 27%.

The second module, which has 8.89 km of construction for the second roadway, has 13 bridges, and the percentage of progress is as follows.

- Bridge raising has a progress level of 88%.
- Annexed works at 96%.

The third module includes 11 bridges and five tunnels, which have a progress level of 80%. The fourth module includes annexed works and the completion of other alternative routes, which is only 58% complete. These include the Pilotó Tunnel and a tunnel parallel to the main one.

We can say that in the total of the work it is necessary to complete 46% of annexed works, 32% of the lifting of bridges and tunnels, 40% of concrete resentment in the tunnels, 34% of the treatment of faults and 73% of paving in the track of the first module. What makes us think that this work has not been executed normally because of the failures and promises that have put the country in bad reviews.

Sections

- Section 1: Buenaventura - Buga (Invias, 2013).
- Section 2: Buga - La Paila (in concession).
- Section 3: La Paila - Armenia - Calarcá (in concession).

- Section 4: Calarcá - Cajamarca (of which La Línea Tunnel is part).
- Section 5: Cajamarca - Girardot (in concession).
- Section 6: Girardot - Bogotá (in concession).

Carlos Collins, the first contractor of the La Línea tunnel at the age of 77, and a well-known infrastructure builder in Colombia, with the Segundo Centenario temporary union, is fighting a battle against the state for the breach of contract. To complete 12% of the project, contractors Conconcretó and Carlos Solarte won the tender. It must be said that Carlos Collins had budgeted for the remaining 12% \$255 billion and not \$363 billion proposed by the new contractors (Fig. 2).

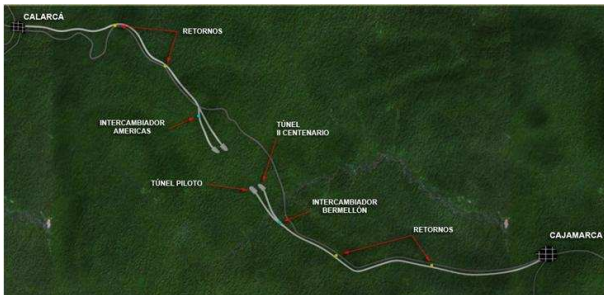


Figure 2. La Línea tunnel (Invias, 2013).

The construction of the site in the advance that it was would not be reversed. On July 13, 2007, the Infrastructure Guild sent a letter to Andrés Uriel Gallego, dismayed at the error this would imply, and proposing to analyze a second option, to bet on two one-way twin tunnels. The reason was reduced to issues of competitiveness, the fact of having two tunnels would not only guarantee greater vehicle capacity but would also be compatible with the double roadway scheme planned for the Bogotá-Buenaventura corridor.

There was no response to this letter. The country's engineers insisted on studying the possibility of inviting tenders for the construction of two tunnels in a single contract. They also proposed to Gallego to have public-private participation given the interest of local and foreign investors. The union asked to verify the budget of the work rigorously, including the sections of the double roadway between Cajamarca and Calarcá, contemplated in the project by the decision of the Government. The union concluded that the project in its entirety (the two tunnels plus the sections of the second roadway) bordered the 1.2 billion pesos with a value of 2007, that value was less than what the bidding proposed.

As the years went by, something gave the play a new lease of life. It happened during the government of Andrés Pastrana when the president created the Conpes 3084 in 2000, which authorized the Nation to contract external credits up to 218 million dollars to finance the tunnel and build it at 2,520 meters above sea level. However, this proposal drowned and was not carried out. It was not because

of money issues, but because of the lack of performance guarantee policies to support the idea. This scenario revealed what a hecatomb this tunnel was. Then the government of Alvaro Uribe Velez came to take control of the work. The Minister of Transport at that time, Andrés Uriel Gallego, announced, in agreement with the Japanese years ago, the decision to build the tunnel in the highest part of the mountain range, which would be "less tedious" (Fig. 3).



Figure 3. La Línea construction (Ejatlas, 2016).

The pilot tunnel

The pilot tunnel, with a final length of 8.5 km and a diameter of 4.4 m, parallel to the main tunnel, is a rescue work, which is part of the Segundo Centenario Tunnels. It was built to establish the geological risk of the area and determine the process of execution of the tunnel.

Benefits of the pilot tunnel

- Quantification of geological risk, such as failures, characterization, yields, etc.
- Lower costs of the main tunnels at the design level.
- Knowledge of hydrogeology, stabilization of equipotential flow lines, stable infiltration flows.
- Higher performance due to better knowledge and drained conditions.
- Different excavation fronts of the first Main Tunnel.
- Pre-treatment of identified fault zones.
- Better planning and programming of material and machinery supply.
- Benefit of the Pilot Tunnel, as a rescue tunnel.
- Discarding of volcanic incidence.

Main factors affecting the civil works

This work has presented delays in the Quindío due to the liquidation of the insurance company Cónдор that issued the policies of the fulfillment of the work. The problem began when the Calarcá aqueduct system presented contamination

in its waters, geological faults that were thought not to be so great.

In November 2015 a geological fault in the pilot tunnel reached greater delays than those mentioned above since, also, it must be taken into account that the work is close to the Machin volcano in Tolima, which causes this instability.

According to Carlos Collins, a former contractor of the work, there was another factor due to the trucker's strike that stopped the project from being carried out for 60 days. The last one was generated in December 2015, when the Quindío Regional Autonomous Corporation (CRQ) found that the permits approved to INVIAS, for the execution of the external works, were not in order (Fig. 4).



Figure 4. Works in the La Linea tunnel (El Espectador, 2017).

Factors affecting road works in Colombia

The president of the Colombian Society of Engineers, Daniel Florez Perez, and of the Colombian Chamber of Infrastructure, Juan Martin Caicedo, take as the most important factors affecting road works in the country the following:

1. Insufficient studies and project designs. To be able to advance the contracting of civil works, before the bidding process, the public entity must have basic engineering information.
2. Lack of infrastructure planning. Problems due to poor planning or clarity of land use or infrastructure.
3. Deficiency in the elaboration of budgets for public works. The more information and detail in the study and designs prior to the work, the less uncertainty there is in the final cost.
4. Delays in meeting the obligations of social and environmental management in the projects. Environmental and social management inconveniences which affect communities and create social or environmental impacts from the project under construction, such as untimely debris management.

5. Delays in the acquisition of land for the projects. The delay in the purchase and delivery of project land is one of the main factors affecting the delay in road works.

6. Lack of inter-institutional coordination. The delay in the processing of licenses and permits of contracting entities such as environmental authorities suffer delays, taking much more than the required time and in many cases the extra cost for the elaboration of the work.

7. Deficiencies in social management with communities. Social management in construction projects is very deficient. This generates the discontent of social groups that can turn into protests that end up affecting the execution of the project.

8. Distortion of the work of the auditing office. Contracting and public entities rely on audits to generate more paperwork, value to the project, and strengthen coordination between the contractor and the contracting party.

Colombia in road infrastructure

Colombia currently lags in terms of road infrastructure by more than 30 years. Speaking of roads, it is 30% below the level it should be. Globally, Colombia ranks 126th in terms of national road infrastructure in 2016, being one of the worst qualified countries, not only in Latin America but worldwide. This year it climbed 16 places from 126th to 110th.

Similarly, in 2017, Colombia has built 2,350 kilometers of dual carriageways, while in 2014 it was 1,796 kilometers, 2,052 kilometers in 2015, and 2,293 kilometers in 2016 (table 1).

Table 1
Road Infrastructure quality ranking (Sectorial, 2014).

Country	Rank	Rating
France	1	6.50
Chile	23	5.60
Panama	49	4.50
Mexico	50	4.50
Ecuador	53	4.40
Peru	100	3.11
Bolivia	101	3.10
Argentina	106	3.00
Brazil	123	2.70
Colombia	126	2.60

Occupational safety for workers in civil works in Colombia

Workers who work in civil works are exposed to risks such as exposure to cold, heat, and extreme temperatures,

this is because most of the time they are working outdoors. Also, they must perform work at high altitudes that puts them at great risk, and they may suffer a fall. They work with equipment, some of which are dangerous if you do not have prior knowledge of how to operate the equipment. Sometimes they suffer from fatigue as they have shifts of up to 12 hours. They work near heavy machinery, which can cause them to be slightly deafened by the loud noise of the machines. Finally, in Colombia, the occupational safety of the workers needs to be put into context, both by the construction companies and by the workers themselves who are exposed (Fig. 5).



Figure 5. Protests by workers in the La Línea tunnel (El Tiempo, 2014).

The problems that the mega work had due to budget and environmental policies have made this work to have many delays. To make a comparison, the main environmental problems that occurred in the construction of Colombian tunnels and the environmental delays of the La Línea tunnel are discussed.

Frequent environmental problems in road tunnel construction

The main environmental conditions, common to any construction process, generated or induced by a road tunnel project, are the effects on fauna, flora, landscape, soil, water, air, as well as the social and health effects due to pollution (environmental contamination by industrial waste) and other harmful materials.

Affects to the fauna. The most common effects on the fauna in a civil work are basic problems in the face of the need to build there the original habitat of the fauna.

Affectations to the flora. This type of affectations is the removal of the flora (plants, trees, excavations, and deformations of mountain systems, etc.), which is done according to the environmental policies in force for the execution of the work.

Effect on water sources. The most common effects on water sources are in the pollution, elimination, and consumption of lakes, wetlands, rivers, etc.

surrounding the work in progress. This is done by resolving and obtaining environmental permits for the execution of this work.

Airborne affectations. The effects on the air surrounding the work in progress are pollution, the production of high-impact odors, and the production of harmful gase

Affectations to the community surrounding the work.

Breathing problems in children and the elderly due to pollution, possible deterioration of the structures of the houses surrounding the tracks, mobility problems in terms of partial or total closure of the tracks, among others.

Environmental problems in the La Línea tunnel

The works in La Línea, besides the budget problem, have also suspended work due to environmental damage.

Contamination of water sources. It was given by the bad process of elimination of industrial residues, and its contamination to the hydric sources. Concrete cases include San Rafael Creek, La Gata Creek, and the El Salado tributary, which caused INVIAS to suspend discharges in several areas of Calcará.

La Gata stream. In March 2007, the Corporación Autónoma Regional del Quindío granted a five-year discharge permit over La Gata stream to the partner Conlínea, and although it was granted to INVÍAS in 2009, it expired in 2012 and has not been renewed.

El Salado stream. More than 80 thousand inhabitants of Calarcá (Quindío) lost the El Salado stream, the main water source that supplied their aqueduct.

High investments in water recovery. \$8,622,155,911 Colombian pesos were used, which corresponds to approximately 1% of the budget of the value of the contract used for water recovery and management. This budget was used for domestic wastewater treatment, soil erosion, environmental training for communities, etc.

Budget problems in the La Línea tunnel

In addition to the environmental problems, there are budget delays. Complaints by dozens of workers who claim to have fallen ill as a result of the construction work, investigations, legal proceedings, fines, and sanctions that have not managed to stop the damage caused in Quindío.

There are legal problems regarding the omission of the cessation of permits for discharges into water sources and their pollution which expired in 2012. The remaining works are 3 km of the lining of the main tunnel, nine bridges with average progress of 70%, and four short tunnels.

The Superior Council of Fiscal Policy approved \$133 billion of the 2018 INVIAS term to open the contract to finish the remaining 12% of the Line's tunnel, which would be awarded on June 13, 2017.

Lawsuits were filed for the violation of the collective rights and the environment of the inhabitants of Calarcá. The Defender of the People in Quindío, Piedad Correal Rubiano, filed a popular action that the Administrative Court of Quindío admitted and ruled in 2012, against INVIAS and the contractor of the tunnel works, UTSC, for the pollution generated in the creeks.

On April 15, 2014, the Unión Temporal Segundo Centenario, represented by Carlos Collins, filed an arbitration claim with the Arbitration and Conciliation Center of the Bogotá Chamber of Commerce against the Instituto Nacional de Vías INVIAS (National Institute of Railways), to obtain recognition of the price difference it had to assume as a result of a change in the material used for lining the tunnel of La Línea.

The completion of the remaining works is based on five contracts and a technical, legal and financial analysis, in which INVIAS did not accept the request for extension made by the Unión Temporal Segundo Centenario (UTSC), whose contract expired on 30 November 2016, the date agreed for the completion of the works.

Machinery was sold to guarantee payment to 87 former workers of the Carlos Collins S.A. consortium of the Segundo Centenario temporary union, due to the insolvency after the judicial liquidation of the construction company. Also, in July 2017 there is a cost overrun of 363 billion Colombian pesos more than 57% of the initial cost.

Works attached to the tunnel

These are the advances in terms of the annexed works for access to the main tunnel, which cost 45,468 million Colombian pesos (Fig. 6).

- Estrella tunnel: 326.5m (100%) finished.
- Robles tunnel: 841.40m (95.08%).
- Los Chorros Tunnel: 209.20m (33.96%).
- Estrella bridge 1: progress is made on the bridge plate.
- Estrella bridge 3: provisional embankments were formed.
- Robles bridge 2: progress was made in the assembly of beams for the construction of the slab.
- Alaska bridge: progress has been made in the assembly of beams for the construction of the slab.

At present, the Abbreviated Selection process was opened for the contracting of the Studies and Designs, Social, Property and Environmental Management, Construction and Operation of the Project "Crossing the Central Mountain Range: II Centenary Tunnels - Line Tunnel and Second Calarcá Roadway - Cajamarca", worth \$703,000 million.



Figure 6. Works attached to the tunnel (Icconstructores, 2017).

Contractors

The formation of the Unión Temporal Segundo Centenario consortium is as follows: Condux S.A. de CV, Constructora Herreña Fronpeca, Constructora Carlos Collins S.A., Álvarez y Collins S.A., Promotora Montecarlos Vías S.A., Túneles de Colombia S.A., Construirte Ltda., Gayco S.A., Tecnicíviles S.A., HyH Arquitectura S.A., and Miguel Camilo Castillo Huertas. The Minister of Transport, Andrés Uriel Gallego Henao and the Director General of the National Roads Institute, Daniel Andrés García, awarded the contract to the consortium Unión Temporal Segundo Centenario.

The consortium is made up of two Spanish companies, one Mexican and eight Colombian, and obtained a score of 1,000 points in the order of eligibility, by offering to execute the four modules into which the work is divided, for a value of \$629,052'989,746 in the period established by the entity of 70 months.

INVIAS, due to the non-compliance of contracts of the works contemplated in contract 3460 of 2008, by the contractors of the temporary union Segundo Centenario, finished on November 30, 2016, and not extended, is looking for new contractors and the generation of a new contract. The Superior Council of Fiscal Policy (Confis), for the year 2018 approves a future term that grants 133,000 million pesos, to contract the execution of 12% of the remaining works for the tunnel. For this it has \$249,000 million, said the General Director of the National Roads Institute, Carlos García Montes.

The Minister of Transport, Jorge Eduardo Rojas, and through INVIAS, requested, on behalf of the National Government to Confis, the approval of \$144,000 million for 2018 to complete these works, therefore the remaining \$11,000 million to complete the required budget of \$249,000 million, will come from national resources of the present period (Figs. 7 and 8).

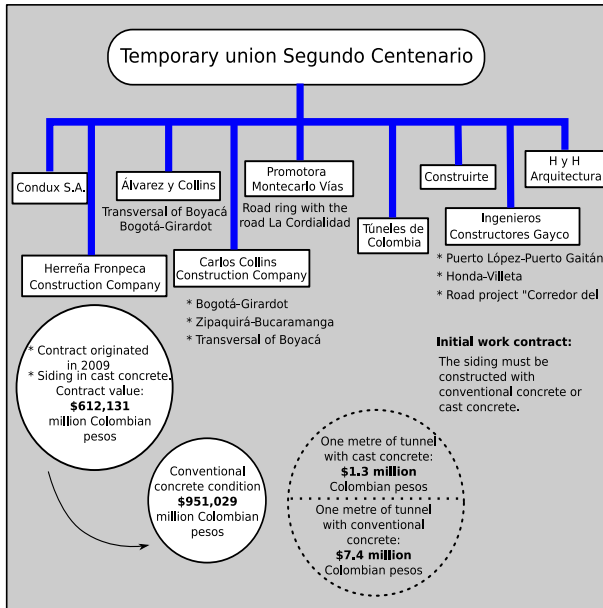


Figure 7. Radiography of the tunnel.

The Intertunnel Consortium was the winner within the framework of the process CMA-DO-GTL-090-2016, whose purpose is the audit for the completion of the project Crossing the Central Mountain Range - Line Tunnel and Second Calarcá-Cajamarca Roadway. This was announced by the Ministry of Transport through INVIAS.

The Intertunnel consortium is made up of the firms R&Q ingeniería Colombia S.A, with 40% (Chile), Saitec branch Colombia with 30% (Spain), and Joyco S.A.S with 30% (Colombia). The company competed with 11 other companies, and with it, the national government completed the awarding process for the completion of 12% of the remaining works for this project.

INVIAS awarded the Consortium the execution of the works for which it submitted a bid for \$224,407 million, and not the \$249,000 million agreed by Carlos Collins. Thus, the contractor Intertunnel with this contract will be in charge of almost \$250,000 million, which will be distributed as follows: \$62,000 for geological faults, \$21,000 for short tunnels, \$50,000 for remaining viaducts, \$56,000 for the tunnel lining, \$24,000 for paving, and \$36,000 for open-air works.

The General Director of INVIAS, Carlos García, asked for speed in the works to finish them as soon as possible and



Figure 8. Projects at risk due to expiration (La Republica, 2017).

underlined that the commitment of the Entity is to finish the projects that it is in charge of.

Value of the work

The cost of the project, initially agreed in approximately 629 billion pesos, as of July 2017 has already exceeded that value, being in the order of 1.27 trillion pesos. Also, there are different additional to add as the settlements and demands. The Control Office is going to take action on the case by going to the Public Prosecutor's Office, as these values are lacking in fines, environmental damage, and observations made by the auditor of the work. The control office says the deadline, which expired on November 30 last year, was extended by 39 months, a 50 percent extension. These changes affect the execution of the work and the budgeting of equipment for it.

The control office says that it will continue this project until it is finished, which is why it summarized that the La Línea tunnel project is going to cost more and take longer than expected.

Problems with workers in the La Línea tunnel

In this work, several problems have arisen in which the main protagonists are the workers. The problems range from delays in salary payments to deaths. Within 45 days, the

workers were not paid, causing more than a hundred workers to go on strike and block the Pan-American Highway. To solve this problem, the mayor of Calarcá at that time, Juan Carlos Giraldo, intervened so that the workers would retract and reach an agreement, in order to make the contract valid.

In August 2011 a worker was killed and two others injured in the Alpes 1 sector, when they were drilling a part of the central mountain range, and doing other work. At that time a landslide came over them, burying several workers. Miraculously, some of them escaped unharmed, and the two injured were taken to the Santa Lucia de Cajamarca hospital. These problems are due to the poor organization in terms of occupational risks, and the lack of training to be able to avoid this case of emergency.

The lack of compliance with contracts, geological faults, and environmental problems, are the causes of this work that have a delay of four years.

Contract

Contract No. 3460 of 2008 by the contractors Unión Temporal Segundo Centenario, led by Carlos Collins Espoleta, had as its objective the study and design of social management of property and environment, construction and operation of the project "crossing the central mountain range: tunnels of the II centenary - tunnel of the line and second roadway Calarcá - Cajamarca". The term to comply with this contract was 70 months (eight months of papers, 46 months of the construction stage, and 16 months for maintenance, from the date of commencement of the contract on April 14, 2009. The contract was signed for a value of 629,052,989,746 Colombian pesos.

Contractual non-compliance

INVIAS declared the partial breach by the contractors of the Temporary Union Segundo Centenario. According to INVIAS, during the execution of the contract for the La Línea tunnel, in September 2014, the controller recommended the initiation of administrative proceedings to sanction the alleged serious breach of obligations and to declare the expiration of Contract No. 3460 of 2008. In addition to the above, INVIAS, guaranteeing the contractor's right to due process and defense in the respective auditor's report, reached agreements, and it was even necessary to reschedule the work schedule. Therefore, the UTSC must pay at least 16,133 million pesos, because according to the INVIAS institute, the contract was not fulfilled due to environmental failures and the non-delivery of the work in the mentioned period (70 months).

The environmental licence

In the 2008 contract, the environmental license is ordinary, i.e. it does not include the permits, concessions, and

authorizations for the use of natural resources required for the project, such as the execution of activities such as the exploitation of sources of materials, disposal of excess material from excavations, exploitation of water sources, whether surface or underground, temporary or permanent occupation of watercourses, dumping, etc. These permits must be managed and obtained from the environmental authorities in the area of jurisdiction by the contractors.

In March 2007, the Corporación Autónoma Regional del Quindío granted a five-year discharge permit for the La Gata stream to the partner, and although it was granted to INVIAS in 2009, it expired in 2012 and was not renewed, but the discharge continued during 2013. The Council of State confirmed the ruling of the Quindío Administrative Court declaring INVIAS, the National Environmental Licensing Agency (Anla), the Quindío Regional Autonomous Corporation (CRQ), the intervening consortium and the company in charge of the construction of the La Línea tunnel responsible for the environmental damage caused by the lack of compliance and the contamination of the La Gata stream and the El Salado affluent.

This demand was for the maintenance of the water and its good use, so it was decided to use more than 1% of the value of the contract for the purification of these water sources of Quindío. The analysis of the evidence reveals that the contamination comes from the construction of viaducts, poor management of sludge, stagnation of wastewater, and earthworks on the double roadway Calarcá - Cajamarca. The main sector affected is the El Salado viaduct, because there has been concrete leakage during the construction of the infrastructure, which is dumped in the San Rafael stream.

The most affected by this lawsuit are the contractors, UTSC and INVIAS, since one is in charge of carrying out the environmental licenses and the other is responsible for evaluation, control, prevention, and monitoring. The Corporación Autónoma Regional del Quindío (CRQ) found that the permits approved to INVIAS, to carry out the external works, were not in order.

Payment of salaries

To guarantee the payment of salaries, social benefits, and compensations of the personnel that the Contractor is to use for the execution of the Contract, a value equivalent to five percent (5%) of the Contract Value, with a validity of 9 years, was held. This was not complied with, and the payment to 87 former workers of the consortium Carlos Collins S.A. of the temporary union of Segundo Centenario had to be supported with the sale of machinery, generating extra costs to the work.

INVIAS and contractor

Carlos Collins claims that only 76% was delivered to carry out the 88% that today make up the work, but INVIAS contradicts him, saying that in the contracts it appears that more than that 88% was delivered. Also, the contractor assures that there were cost overruns and delays due to the value of materials and stoppages presented in Quindío.

Extensions for Carlos Collins

According to INVIAS, as it has been stated in the follow-up process agreed between the Government and the businessman Carlos Collins, the legal representative of the contractor firm, Unión Temporal Segundo Centenario, the execution of the works was being carried out. Therefore, Carlos Collins requested extensions for the completion of the work, since the problem was budgetary, and it was expected that the work would be completed by the date stipulated by a conciliation agreement of March 2016 between the Ministry of Transport and the contractor. This agreement resulted in the project receiving 327 billion pesos from different sources. Of these resources, the contractor contributed 30 billion pesos, and a beneficiary was established, which would manage the resources. This would allow the construction of the missing bridges and tunnels, and conclude the works before November 30th, 2016. But after four extensions issued, INVIAS decided not to grant a fifth, since it was not sure the completion of this in the four months requested by the contractor because the monthly progress was less than 1%. INVIAS, stated that the reasons for this decision were the impossibility of finishing the construction of the work in the foreseen time of construction, the lack of economic resources, and materials to finish the work, as well as noncompliance with environmental and technical specifications.

The builder requested a first extension of four months in March 2012, then three months in October 2012, 12 months in September 2013 and 20 months in April 2015. Previously the work had taken 46 months, which in principle was set for 85 months.

Geological faults

The La Línea tunnel is made up of eight geological faults, noticed by the Veeduría Técnica Especializada. Among them are La Gata, La Soledad, and El Viento. The most difficult to control are in Quindío. These faults imply support and concrete injection to guarantee safety in the tunnel. The contractor, by not attending to all the faults, helped delay the work (Fig. 9).

The report also pointed out that after the lining of the II Centenary Tunnel, some stretches of the tunnel are covered by infiltrated water. This also has to do with the poor environmental management of this work. Therefore, Orjuela,



Figure 9. Water pollution from the construction site (Cronica del Quindío, 2017).

president of the Society of Engineers of Quindío, warned the contractor UTSC to correct this situation and to verify the waterproofing procedure because this cannot happen in the tunnel after the conclusion of the works.

The mountain where the La Línea tunnel will be built, which will connect central Colombia to the Pacific more quickly, as it is in an area affected by geological faults and close to the Machín volcano in the central mountain range, is a work that is being transformed every day and requires permanent monitoring. In addition to these faults, the central mountain range has weaknesses and fractures, where the material is very loose since it is composed of metamorphic rocks reworked and at some point, could affect the structure of the tunnel, such as the arches and the stabilization itself.

Collapses in the tunnel

In the maintenance of the La Línea tunnel, the National Institute of Roads (INVIAS) is working hard with machinery and personnel from the depletable amount contract to restore the passage on the Cajamarca-Calarcá (Alto de La Línea) road, affected by several landslides after the increase in rainfall in that part of the country. According to García Montes, general director of INVIAS, in Tolima they worked with a backhoe, four dump trucks, and a loader, while on the Quindío side they had two backhoes, two loaders, and four dump trucks, to attend to the emergency (Fig. 10).

Carlos added that, also, the respective road administration and the group of micro-entrepreneurs under his charge are involved, to achieve in the shortest time possible the removal of the landslides that interrupt the passage at the height of kilometers 36, 38, 39 and 40.

New contract for the completion of the tunnel

The Intertunnel consortium is still on track to deliver the works in December 2018, but the delay in the publication of the process to choose the new contractor put at risk that this



Figure 10. Work to enable the passage through La Línea (Invias, 2017).

commitment could be achieved. The process to choose the new contractor was based on the fact that nobody wanted to take the risk of finishing the tunnel due to three problems: time, resources, and environmental license.

The UTSC, whose contract expired on November 30, 2016, after being granted four extensions that represented an additional 39 months, delivers the project with an 88 percent progress, so the Intertunnel consortium will have an official budget of more than \$238 billion, and will have an execution period of 12 months.

A geological fault in 2015 in the pilot tunnel reached greater proportions than the environmental ones. A zone of geological instability found was greater than had been reported, thus extending the delay of the work by six months.

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