



Experiences from Peru: The Moyobamba-Iquitos Transmission Line Project and Associated Substations in the Peruvian Amazon

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Project summary

The transmission line concession and operation contract

In October 2014, ProInversión — at that time the Peruvian government agency that promoted private investment for large state projects — signed a contract for the concession and operation of a 220 kilovolts (kV), 595 km long transmission

line (TL), between Moyobamba and Iquitos, in the northern Peruvian Amazon. This Public-Private Partnership (PPP) was intended to provide electricity from the National Interconnected Electricity System (SEIN) to the city of Iquitos, capital of the Loreto region, which being far away from the closest SEIN electric substation had to generate its own energy. With 520,000 inhabitants, Iquitos is the largest city in the Peruvian Amazon.

The investment was initially set at \$499 million (m) (all values in this work are in 2014 US dollars), and the contract was signed between the Ministry of Energy and Mines (Minem) and Líneas de Transmisión Peruanas S. A. C., a subsidiary of the Spanish group Isolux Corsán. The contract stipulated that electricity consumers in the SEIN should pay Isolux \$75m annually for the amortization of the infrastructure, as well as the line's operation and maintenance during the 30-year concession. This would amount to a total of \$2,240m in today's currency, with a net present value (NPV) of \$674m.

The reasons given by Minem for the construction of the TL were that Iquitos was at that time supplied by an old and polluting thermal power station with high generation costs. However, at that time, the inhabitants of Iquitos were paying less for electricity than those of Cajamarca or Lima, as they were receiving a subsidy paid by SEIN users.

In addition, during this period, the Israeli-owned company Genrent was building a new 80.5 megawatts (MW) thermal power plant in Iquitos, that would use fuel oil n°6. This power plant was meant to stop operating and remain as a cold reserve once the line was commissioned.

Minem's strategy, if it existed, was not very well understood, as the most obvious approach would have been for this new plant to supply Iquitos, for the TL not to be built and for the subsidies to continue. This arrangement would have resulted in lower customer costs, as the Genrent plant was to be much more efficient than the current plant. As the Iquitos electricity market grew, supplementary generation groups could have been added.

Minem did not conduct a cost-benefit analysis beforehand to explore alternatives or to compare the costs of supplying Iquitos through the TL or through the modernized old plant and Genrent's plant, respectively. A medium-sized hydroelectric power plant in Mazán, 33 km from Iquitos, using a branch of the Napo River had been on the books for many years but was not considered.

Additionally, more than 80% of the line's route was intended to run through well-preserved Amazon rainforest, not yet affected by colonization. Therefore, the environmental impact was going to be immense: deforestation, penetration of illegal loggers and land seekers, either for subsistence or to provide land for commercial plantations, like palm oil and cacao, the arrival of informal miners looking for gold, commercial hunters and so on. Native communities living along the chosen route would have been seriously affected.

The line's construction would have also had a highly negative impact on the electricity consumer that was going to pay the final bill, since extrapolating the subsidies based on reasonable growth assumptions for the Iquitos electricity market, in a period of 30 years, they would have amounted to between \$458m and \$523m in NPV, while the payments to Isolux would have added up to \$674m, resulting in a net loss for electricity consumers of between \$105m and \$170m, considering a residual value of the line of \$46m after 30 years.

Isolux increases the price

In 2016, in a loan request to the Inter-American Development Bank, Isolux indicated that the real value of the investment in the line was going to be \$798m. We do not know if this substantial increase was negotiated with the Peruvian government and if addenda to the agreement were stipulated.

Thus, the annual payments to Isolux would have increased from \$75m to \$119m, namely by approximately 60%. This would have in turn increased the net loss to electricity consumers to between \$508m and \$573m in net present value, over the term of the concession.

In 2015, Isolux started the survey for the line construction, which led to hopes of job creation in Moyobamba and Iquitos, places with limited economic activity, and to hopes of getting electricity delivered to the isolated villages along the line.

Eventually, the line was not built due to Isolux Consortium's financial collapse at the international level, but we could say that the average citizen, namely the electricity consumer, was spared a serious economic loss, and that the Amazon forest was also spared serious damage.

Project costs, benefits, and possible alternatives

Potential consumers

The project's stated objective was to supply the Iquitos electricity consumers with cheap and clean electricity. Iquitos is the main city of the Peruvian Amazon with 520,000 inhabitants. It is the capital of the Loreto political region and is a government, commerce and service centre, but it has practically no industry, with the exception of some mechanical workshops that support the declining oil fields of northwestern Peru, and the sawmills that exploit, mainly illegally, the dwindling tropical forests. It receives most of its food and other essential supplies from the Coast¹, but it has no road link to it. Supplies arrive by road from the Coast to the

¹ Geographers traditionally divide Peru in three regions: Coast, Andes, and Forest (Costa, Sierra y Selva).

ports of Yurimaguas on the Huallaga River (3 days away by boat from Iquitos) and Pucallpa on the Ucayali River (5 or 6 days). During the dry season, when rivers are low, the trips may take longer.

In 2015, Electro Oriente, the government company that supplies Iquitos with electricity, had 86,100 customers. Its maximum electric power demand was 55 MW.² Electro Oriente had, at that time, the worst record in Peru among the utilities for power cuts and brown outs, with dire economic consequences for its customers, who used to complain constantly, to no avail.

Iquitos has been a focus for immigration from the Andes and the Coast, so its electric needs were expected to increase. The project did not explore this potential growth. The line was planned to go directly from Moyobamba to Iquitos, without providing electricity to any of the indigenous and settlers' villages on its way. The reason given by Minem was that given the sparse population of the area crossed, with villages of only hundreds or dozens of inhabitants, it was going to be too expensive to build the required substations. When the local population learnt that they were not considered, many villages refused access to their lands for the Isolux survey crews, leading to confrontations.

According to Peruvian law regarding application of International Labour Organization Convention N°169 (Ley de Consulta Previa 29785 of September 7, 2011), when infrastructure projects are going to be developed on indigenous land, the populations must be consulted before the works start. But the same law waived these consultations when the infrastructure project concerned a public service, because, supposedly, it was going to improve the standard of living of the indigenous people.

In the TL case, the Peruvian Ministry of Culture, applying this principle, refused to have these consultations, when, the TL was clearly not going to benefit the indigenous populations, except for those living in Iquitos. The protests of the indigenous organizations were not heeded by the government.

The TL was going to be built to bring electricity from the SEIN. In 2014, the SEIN generation was 53% hydropower, 45% natural gas and 2% from fossil fuels, so it could be considered clean energy. SEIN hydropower came from old power stations, already amortized. Natural gas had a low price fixed by the government, because the exploration that discovered the gas reserves had been done by the Shell company, and Shell, later in association with Mobil, had abandoned the project. The reason was that there was no market for the gas in Peru and the negotiations with the government to export it to Brazil went nowhere. So, Shell decided to leave the country and the government received the gas deposits free of charge. Consequently, the SEIN electricity had the advantage of being cheap and relatively clean.

2 [Electro Oriente S. A. \(2015\)](#)

Iquitos energy supply

In 2010, as had been the case for many years, the Iquitos population suffered from sudden and frequent blackouts, which stopped productive activities and destroyed unprotected electronic equipment. The reasons were old generation, transmission and distribution equipment, and poor management by Electro Oriente, the government-owned local electricity company. The situation improved a little when new Wärtsila diesel generators were installed in 2014. But all the same, the construction of the Moyobamba-Iquitos TL was seen by the population as the final solution for their woes, and this became a strong argument for local politicians.

In 2015, 80% of Iquitos electricity came from old and polluting generators, using heavy residual oil n° 6, and 20% from modern diesel engines. Generation costs were high and fluctuated with the international oil price. However, at that time, the inhabitants of Iquitos were paying less for electricity than those of Cajamarca or Lima, as they were receiving a subsidy paid by SEIN users.

During this period, the Israeli-owned company Genrent was building a new 80.5 MW thermal power plant in Iquitos that would use fuel oil n°6, which would come through a pipeline from the nearby Iquitos refinery. Curiously, this power plant was meant to stop operating and remain as a cold reserve once the line was commissioned. Cold reserves are paid for standing idle, waiting for a system failure, and are remunerated according to their capacity, so the agreement looked like a subsidy for Genrent. The rationality of a cold reserve in Iquitos, far away from the main consumer centres in the SEIN, was never explained by Minem.

Did the TL project benefit from a feasibility study?

As already mentioned, a cost-benefit analysis of the project was never undertaken by Minem. We asked ProInversión about this, and they answered that feasibility studies were not their responsibility but Osinergmin's (the electric regulator). Osinergmin approved the project in February 2014, but never conducted a feasibility study.

By law, the Ministry of Economy and Finances requires feasibility studies for projects that use public funds. In the TL case, the cost-benefit analysis was left to the concessionary that needed it to calculate the required fee. It was never made public.

Extraordinarily, even in 2021, important Peruvian government-sponsored projects do not undergo cost-benefit analysis and do not include previous environmental evaluations. Two existing large projects in the Peruvian Amazon, the Hidrovía Amazónica (Amazon Waterway) and the Iquitos-Saramiriza Highway, are good such examples.

The waterway has had many reviews from the environmental authorities, academia, and indigenous groups, and it is now two years late in implementation. The highway project is 710 km long, through well-preserved primary forests and one of the biggest peat deposits in the world. Peat, if disturbed, is prone to fires that would be exceedingly difficult to extinguish, particularly in a remote Amazon area. The primary forest along its route will be destroyed by immediate colonization, as is happening all over the Amazon. Nevertheless, the Ministry of Transport and Communications and the regional government of Loreto have been relentlessly pushing these projects, without any feasibility studies.

History of the transmission line

The line construction had been initially included in the national transmission lines programme of 2011. The required investment had been grossly undervalued at \$155 million.

In 2014, Minem contracted CESEL, an engineering company, to make a technical appraisal of the project. This was a short document that evaluated the Iquitos electric market and defined things like the type of transmission towers and aluminium conductors to be used. However, as they defined the route only on a map, without surveying it, the results were not particularly useful. No prices or other economic data were mentioned. Nevertheless, it was used by ProInversión to convoke the concession auction.

In our judgement, for a project valued at \$595m, Minem was obliged to make its own cost-benefit analysis, at least to have its own figures to determine if the final consumers were to be benefited or harmed. The assessment is also necessary to define possible alternatives, to calculate the environmental costs and to have data to be able to negotiate with the future concessionary. Possible alternatives were:

- Use the abovementioned Genrent power station to supply electricity to Iquitos, as its contract had been awarded in 2013, one year before the TL concession agreement.
- To build a new power station using natural gas brought from the oil fields in Andoas, 420 km away. The oil fields were flaring their natural gas, thus wasting it and contributing to global warming. Two alternatives were possible: build the power station in Andoas and bring the electricity with a transmission line or bring the gas to Iquitos where it could also be used by industry.
- A photovoltaic plant: in a 2016 auction, the price of energy from a photovoltaic power project in southern Peru was offered as \$47.98/MWh (\$ per megawatt-hour), already cheaper than the fossil fuel alternatives. The rapid technology progress was going to diminish that price very quickly.
- A biomass plant: Iquitos has a bad garbage disposal problem and preliminary studies suggested that a modern landfill could supply enough methane for a 15 MW power station, at least.

- A hydroelectric power station in Mazán, 33 km from Iquitos, using a diversion of the Napo River. Several engineering companies, including Russian and Canadian ones, had previously evaluated this possibility.

Electric tariffs

A transmission system tariff is calculated evaluating the Transmission Annual Cost. It includes the Annuity of the New Replacement Value and the costs of an Efficient Operation and Maintenance of the System. The tariff is paid by all the system's customers, according to the power they consume, and includes the costs of system congestion and transmission losses.

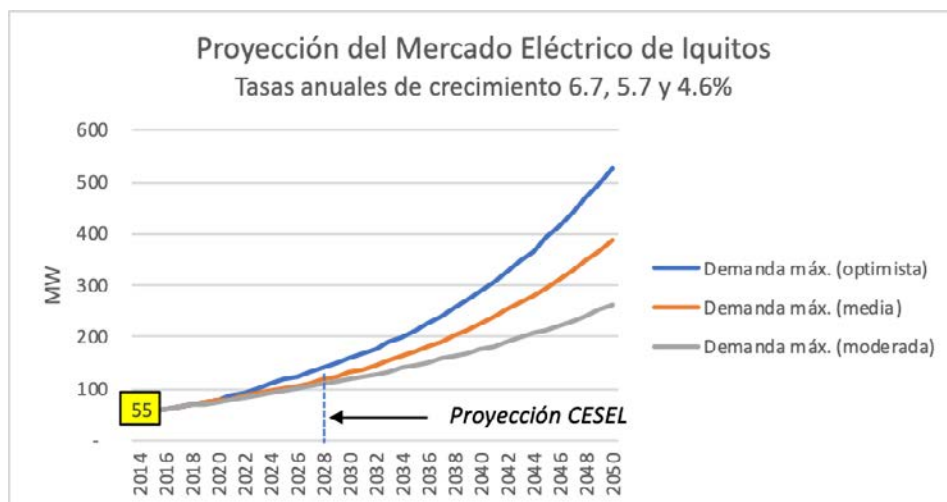
In 2016, the monthly consumption of 100 kWh (kilowatt-hours), at residential tariff, cost, in Peruvian soles (S/.) was 41.21 in Iquitos, 44.24 in Lima, 55.39 in Tarapoto (an Amazonian city connected to the SEIN) and 53.24 in Cajamarca, in the Andes.

Iquitos residents paid less than other regions because, being an isolated area, they receive a subsidy, paid by SEIN consumers. Between 2013 and 2016, Iquitos customers received an average annual subsidy of \$28m.

As the cost of the investment, operation and maintenance of the TL was going to also be paid by the SEIN customers, if that cost was going to be higher than the extrapolated subsidies, all other factors being equal, the TL should not have been considered. The high cost of the TL would have meant higher tariffs for all SEIN customers including those of Iquitos.

Iquitos electric market

Between 2004 and 2015, electric power demand in Iquitos grew at an average of 6% per year. To project the demand for the project's lifetime (5 construction years and 30 operation years) three scenarios were made, with 4.6%, 5.7% and 6.7% annual growth. These hypotheses were based on a previous market study commissioned by Minem and on Electro Oriente's own projections until 2025. After that, it was educated guesswork. It was supposed that the TL would start operating on 1 January 2021 and would continue up to 31 December 2050.



Iquitos Electric Market Growth Hypothesis 2015-2050

Demand annual growth rates considered: 4.6, 5.7 and 6.7%

Source: CESEL market study and own projections.

These demand projections were used to calculate the required subsidies. Discarding the optimistic scenario, because it was unrealistic, subsidies in NPV would have amounted to between \$458m (lower scenario) and \$523m (middle scenario), with a 12% rate of return.

Project description

The transmission line project was for a tension of 220 kV and 150 MVA (mega-volt-amperes) of nominal power capacity. With a power factor of 0.9, it could transport 135 MW of real power, more than double the demand of Iquitos in 2015. It had three conductors and an overhead cable for internet. At present, internet is of notoriously bad quality in Iquitos.

The project included the construction of three new substations, one in Iquitos (to handle 220 kV, 60 kV and 22.9 kV voltages), one in Moyobamba (138 kV, 220 kV and 22.9 kV) and the third, halfway, in Trompeteros (220 kV), in an oil extraction area. The Iquitos and Moyobamba existing substations were going to be expanded. No branches of the line or intermediate substations were considered.

The substations included reactive compensation. This was intended to avoid excessive voltages in the line when operating with a low demand, to improve transmission capacity and to avoid high losses. Losses in the Tucuruí-Macapá-Manaos TL, 1,800 km long in an Amazonian environment in Brazil, have been up to 20%.

A 595 km long line attached to a big network on one side, and with a relatively small load at the other end, can be subjected to significant electric disturbances. A big challenge was to operate and maintain the TL in the Amazonian environment,

with violent rains, high winds during cold spells, muddy roads, and rapidly growing vegetation.

The TL required a minimum 25m wide land strip, covering a total area of 1,480 hectares.

ProInversión auction and the concession contract

In the case of a Public-Private Partnership, to ensure the necessary investments, the state agrees to contracts that have a law status and cannot be unilaterally modified by the government. In the TL case, it was a BOOT contract (build, own, operate and transfer) guaranteeing the investor a constant annual income. Regarding ProInversión auctions, the winner was awarded a contract that stipulated an annualised 12% rate of return plus the operation and maintenance costs, as defined in the offer.

ProInversión held a sealed-bid auction. Only two bids were presented, and the contract was awarded to Consorcio Isolux. It was a 30-year concession, with a required investment of \$499m. The time for the start of the commercial operation was 52 months from the date of the contract signature. The required annual payment by the Peruvian side was \$75m. It included the annuity of the investment cost plus operation and maintenance costs of \$12.6m per year.

Over 30 years, Peruvian electricity consumers were going to pay \$2.24 billion at current prices, with an NPV of \$674m, calculated with a 12% rate of return, as defined by Electric Concessions Law 25844.

The only other bidder was Abengoa, another Spanish company, that required an annual payment of \$86.7m, almost identical to the “secret” ProInversión maximum reference value (\$86.8m). We do not know how ProInversión calculated this value.

Was the Moyobamba-Iquitos TL project beneficial for the Peruvian average electricity consumer?

If Iquitos had continued over the next 30 years as an isolated system, the subsidy costs would have been between \$458m and \$523m. As already mentioned, according to the contract, consumers would have had to pay for \$2.24 billion at current prices, with an NPV of \$674m for the line over 30 years.

	Scenarios	Middle	Low
A	Payments to the concessionnaire	674	674
B	Saved subsidies	523	458
A-B	Electricity consumer loss	151	216
C	TL value after 30 years	46	46
A-B-C	Consumer total loss	105	170

Concession Contract

Economic damage to the electricity consumer

Net present values in million \$ after 30 years

After 30 years, the TL exposed to the hard climate conditions of the Amazon would have had a low residual value, projected to be \$46m. Consequently, the final **economic loss to the SEIN users** would have been between **\$105m and \$170m in NPV**.

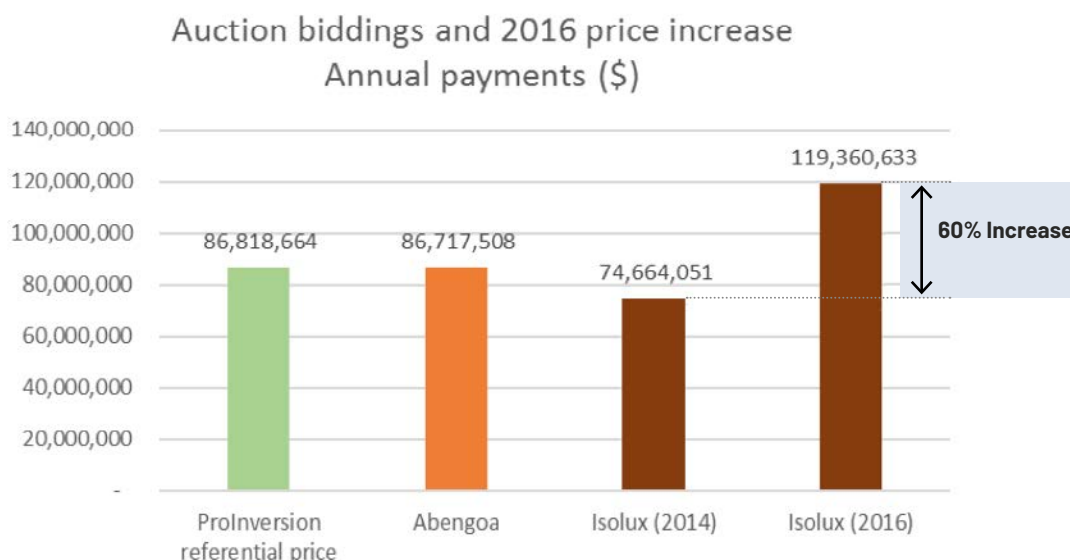
In conclusion, already at the time that the contract was signed, the TL appeared to be a bad deal, without considering its high environmental and social costs. Worse was yet to come.

Isolux increases the price, but the Peruvian government says nothing

In 2016, the web site of the Inter-American Development Bank (IDB) indicated that Isolux had requested a loan and declared that the real value of the investment in the line was going to be \$798m. We do not know if this substantial increase was negotiated with the Peruvian government and if the contract was revised with the corresponding new price. Minem never announced that price increase.

In 2021, we asked Minem officers about this, but they said that they did not know "because the project was already closed". That was at the time of the Odebrecht³ international scandal and revelations of multiple price increases in government contracts that had been negotiated by government officers in exchange for kickbacks.

³ The Brazilian construction company Odebrecht had for years bribed government officials in a dozen Latin American and African countries in exchange for highly profitable contracts. This was well known in Peru in elite circles but not commented on in public. The scandal surfaced when the US Department of Justice launched an enquiry because illegal money had flowed through American banks.



Project Price Increase between 2014 and 2016

Net present values in million \$ after 30 years

Sources: ProInversión and Interamerican Development Bank.

The IDB had been evaluating two loans to Isolux, adding up to \$249m, to finance the project. The project was considered by the IDB as category C, meaning that the expected environmental and social impacts were considered minimal. That seemed very generous for a project that was going to destroy at least eight million tons of tree biomass. In the end, the IDB decided not to finance it.

Total economic damage to the consumer

With the new initial investment fixed at \$798m the new annuity would have been \$119m and consumers would have had to pay Isolux \$3,581 billion at current prices over 30 years, with an NPV of \$1,077 billion.

After the price increase	Million \$
Increased investment annuity	99
Operation and maintenance costs	20
Annual payment to the concessionaire	119

In consequence, after subtracting the residual value of the TL, in 30 years **the total loss to the SEIN electricity users would have been between \$508m and \$573m in NPV.**

	Scenarios	Middle	Low
A	Payments to the concessionaire	1,077	1,077
B	Saved Subsidies	523	458
A-B	Electricity consumer loss	554	619
C	TL value after 30 years	46	46
A-B-C	Consumer total loss	508	573

After the price increase

Economic damage to the electricity consumer (after price increase)

Net present values in million \$ after 30 years

The end of the TL project

In 2016, Isolux Corsán, one of the world's largest builders at the time, with interests in the USA, Brazil, Mexico, India, and Spain, was heavily indebted. In October of that year it had reached an agreement with its creditors to restructure its debt with the support of some of the biggest Spanish banks. But the plan did not work, and the company went into liquidation with a 3,800 billion euros of debt that it could not pay.

That was the end of the TL project, and, at least for now, 24,000 hectares of Amazonian forest have been saved.

Analysis from the environmental point of view: costs and benefits

According to Peruvian law, any important infrastructure development must have an Environmental Impact Assessment (EIA).

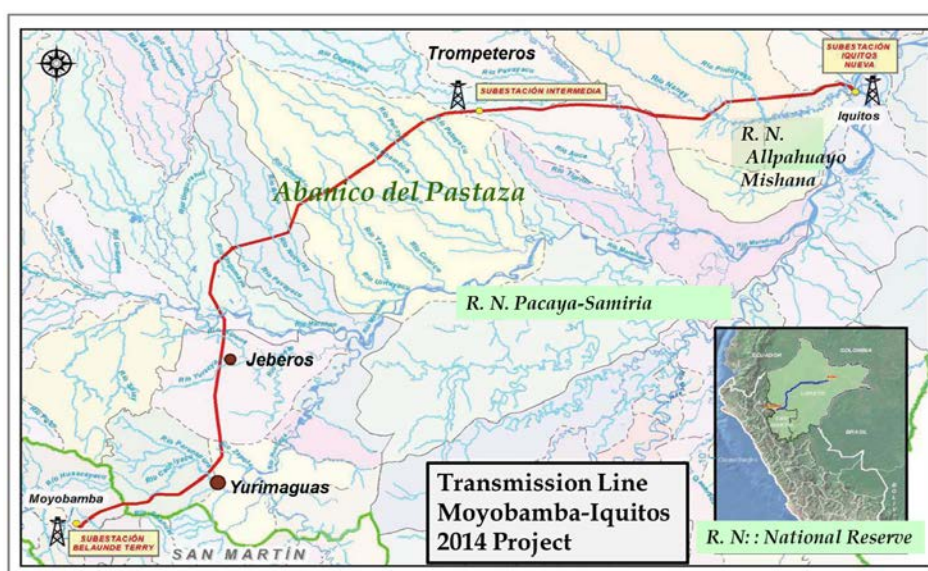
From Moyobamba to Iquitos: the transmission line route

At the beginning of the project, Isolux had the choice between a route along the Marañón river, where some small towns and settlements exist, and another shorter one, through the Abanico del Pastaza (Pastaza River Fan), almost devoid of

population, with the exception of the highly polluted Trompeteros oil fields in the middle.

It selected this second 595 km route, in which approximately 80% of the primary forests are still in good condition. Only the area north of Moyobamba, the oil zone around Trompeteros and the approaches west of Iquitos were already mainly deforested and their biodiversity has already suffered a serious impact. If environmental factors had been considered, the route would have completely avoided the Abanico del Pastaza.

To decide the route, Isolux used the information given in a pre-feasibility study made by a Canadian company for a railway between Iquitos and Yurimaguas. Isolux never made a preliminary survey of the route before bidding in the auction. This lack of information may explain, at least in part, the hefty price increase in 2016.



Transmission Line Moyobamba-Iquitos Project

Source: Isolux.

Abanico del Pastaza (Pastaza River Fan)

The Abanico is the second biggest alluvial fan in the world (the biggest one is in Congo), comprising 60,000 km² (54,000 in Peru and 6,000 in Ecuador). It is formed by alluvia which originated in the volcanoes of the Ecuadorian Andes. The eruptions created “black lands” and a mosaic of ecosystems, with many different types of palm-dominated swamps and different types of vegetation growing in areas subject to flooding in the rainy season, followed by dry spells. Specialized forests and fauna exist in each of the different ecosystems. Consequently, the Abanico has a rich biodiversity.

Big fish populations reproduce in these areas, and when they attain a certain size, they travel to populate other areas of Amazonia. They are essential to maintaining the ichthyological variety of the Marañón and Amazon basins, which are part of complex ecosystems and ultimately feed several hundreds of thousands of humans.

In 2002, the Abanico was recognized by UNESCO as a Ramsar Convention site, meaning that it is an internationally important wetland.



The Pastaza River Fan is the biggest alluvial fan of South America

The Abanico contains extensive peat fields, which cover 38,000 km² and contain about 3,140 billion tons of carbon. Peat deposits are extremely sensitive to fires, and if a fire starts in the dry season, it can go on for months and ravage enormous areas. Consequently, any important intervention in the Abanico, such as the works that were projected for the TL, must be very carefully planned, and monitored. A big fire in the Abanico would contribute significantly to global warming and could be exceedingly difficult to extinguish. Incredibly, the Isolux Environmental Impact Assessment of the TL only dedicated one line to the Abanico.

Road construction

The project planned to open 598 km of new roads in the forest for construction and maintenance of the line. A 595 km long and 50 m wide belt had to be stripped of vegetation on the TL route, to open a space for the transport of 23,500 tons of steel for transmission towers and 5,000 km of cables. Workers' camps, river ports and space for machines manoeuvring would have claimed many more millions

of trees. Heavy machinery would have removed and compacted the soil and earth, and oils would be dumped in the streams, diminishing biodiversity, and leaving a wasteland behind, as can be seen in the Amazon gold and oil fields.

In the Abanico's swampy ground, the roads would have had to be corduroy type (reinforced with small diameter logs, thus increasing deforestation). Other solutions, like the use of planks or geotextiles, would also have had an impact on the soil, tree cover and biodiversity.



Corduroy type forest road

To cross streams, small bridges and embankments would have had to be constructed, cutting stream connectivity, which is vital for the reproduction of aquatic life. All these impacts would have made the TL one of the most destructive projects for the Peruvian Amazon. Large-scale deforestation, such as that involved in this project, would also have had an impact on climate change and forest sustainability that was difficult to evaluate.

Settlers' immigration

Internal immigration in Peru has mainly economic causes. In 2010, the poverty index was 49% in the Sierra (Andean region) and 37% in the Amazonian region, explaining the constant immigration from the Sierra to the Amazon. Coca plantations in the lowlands are also a magnet for the Andean people.

As usual in the Amazon, the new roads connected to the TL project would have paved the way for new settlers from the Andes and the Coast, coca planters, drug traffickers, illegal loggers, illegal miners, commercial hunters and so on. Prospec-

tors would have come looking for new lands for cattle, palm oil, papaya, cacao, and coffee plantations, multiplying large-scale deforestation, land speculation, violence, and social conflicts, as has been the case in many other places in the Amazon basin. Paths would have been opened in the forest to transport cocaine.

Roads would also have been extended as private initiatives, with bulldozers and tractors, to extract wood or open new land. Indigenous people would have been abused and displaced, and both new and old diseases, like malaria and sexually transmitted infections, would have spread among them. Additionally, the influx of settlers would have increased the pressure on the regional governments to build new roads. Roads that were already being built, such as the Yurimaguas-Balsapuerto, the Yurimaguas-Jeberos (which will cross a forest with centuries-old trees that are coveted by illegal loggers) and the Saramiriza-San Lorenzo (that will link Lima to San Lorenzo) would have had to be extended.

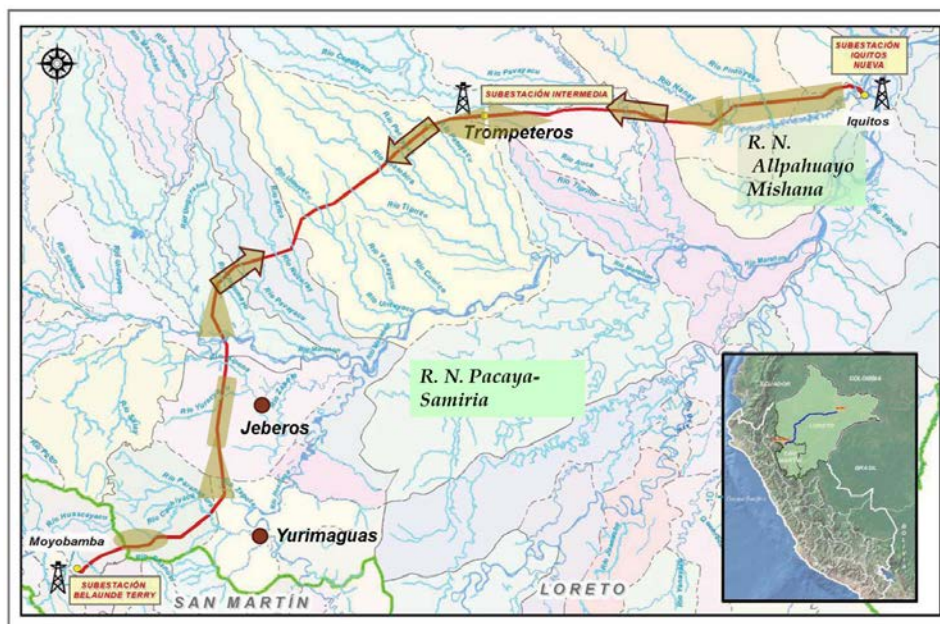
Around San Lorenzo, which lacks a terrestrial link with the coast but is a provincial capital, all valuable trees have already been logged and the river fisheries depleted. A link to the main economic cities of Peru would increase enormously the potential for environmental destruction. As usual in the Amazon, along these new roads, politicians and local authorities would claim big land areas to cut the trees and install plantations. Consequently, the TL project would have had a huge potential to transform and degrade large areas and introduce significant social change: the so called “development” of the Amazon.

Deforestation and carbon emissions

The TL was going to cross 18 different types of forests:

- Scattered semideciduous hill forests
- Isolated ridge forests
- Western Amazonian foothills forests
- Forests in alluvial plains subject to floods by white water rivers
- Riparian forests subject to floods by mixed water rivers
- Riparian forests subject to floods by black water rivers
- Forests in alluvial plains swamps
- Palm forests in alluvial plains swamps
- Plains evergreen forests
- Pastaza alluvial fan evergreen forests
- Plains seasonal evergreen forests
- Sub Andean seasonal evergreen forests
- Sub Andean evergreen forests
- Eastern Andean Yungas (between 200 m and 800 m altitude) rainforests and palm groves
- Complex riparian vegetation of whitewater rivers
- Swampy grasslands of alluvial plains of the Upper Amazon
- Sub Andean Yungas swamp palm groves
- White sands sclerophyll vegetation (*varillales*)

The EIA did not use these forest categories but a much rougher classification, making it impossible to give a value to the ecological damage caused by the TL and its impact on climate change, as the biomass and the carbon content varies according to the forest type. Also, the ecological damage to a certain type of ecosystem causes a chain reaction affecting other related ecosystems, which is sometimes possible to evaluate. As it happens, the EIA did not even attempt to tackle and define these problems.



Expected deforestation along the transmission line

R. N.: Natural Reserve

Source: Own estimations.

In Amazonia, when a new development project is built, like a road or a hydroelectric power station, it triggers immediate immigration to the area by impoverished populations, such as people looking for new businesses and land speculators. This is a self-replicating phenomenon confirmed by experience all over the Amazon. Politicians try to profit from and accelerate the phenomena.

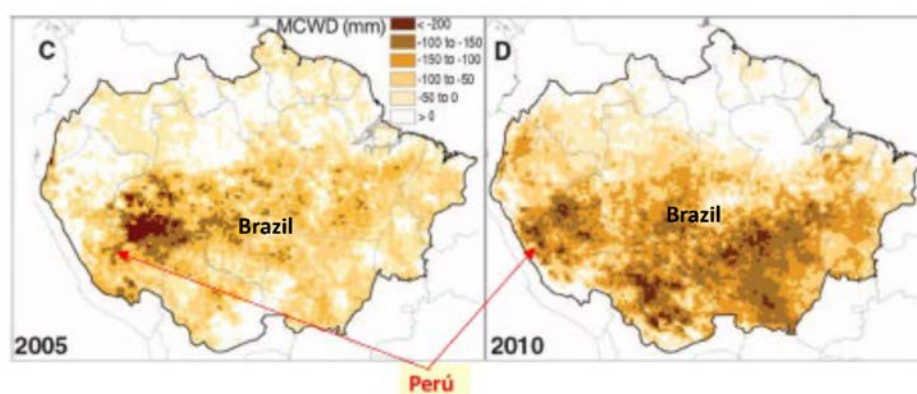
We calculated the possible deforestation by settlers between Moyobamba, Jeberos and the Marañón River and extrapolated those results, in an educated guess, along the whole TL. The result was that 25,000 hectares could be deforested, and eight million tons of tree biomass could be destroyed.

	Surface	Endangered biomass	
		Total	Above ground biomass
	hectares	tons	tons
Affected area along the TL service belt	2,979	1,034,693	785,332
Affected area by settlers between Moyobamba and the Marañón River	9,080	3,153,307	2,393,360
Total Moyobamba-Marañón	12,059	4,188,000	3,178,692
Total area with a high risk of deforestation along the TL	24,461	8,494,978	6,447,688

Above ground biomass carbon in forests	
Average above ground biomass (tons/ha)	264
Carbon in biomass	50%
Total carbon in above ground biomass in areas with high deforestation risk (tons/ha)	132

Forest destruction along the TL would emit about 3.2 million tons of carbon (considering only the above ground biomass) to the atmosphere.

The loss of tree cover would mean drier climates diminishing the flow of streams and rivers. Drier climates, combined with a settler invasion, would mean an increase in the frequency of planned and spontaneous forest fires, with devastating consequences for biodiversity, and the acceleration of climate change. The EIA did not consider the possible impacts of deforestation caused by settler immigration.



Amazon Basin Areas Affected by Severe Droughts in 2005 and 2010

Millions of trees died. Deforestation is an important factor exacerbating droughts

MCWD (mm): Maximum Climatological Water Deficit.

Source: Lewis S. L. *et alia* (2011).

Also, according to “State of the World’s Plants 2016”⁴, approximately 20% of the vascular plants are threatened with extinction and there are 17,000 medicinal plants. A big percentage of them are in the Amazon, particularly in the areas that would have been destroyed by the TL construction.

Impact on biodiversity

The forests on the TL route have some of the highest biodiversity in the world. As the destruction of tropical forests advances, the value of this diversity increases. It is the source of substances with value for humans, such as medicines, food, cosmetics, and raw materials for many industries, as well as for the human knowledge itself.

Tropical forests are also the home of viruses and bacteria that could help or harm human beings. Among 250 emerging new infectious diseases, the origin of many have been traced to tropical forests or their aquatic ecosystems⁵. Deforestation has huge impacts on biodiversity, causing the loss and degradation of multiple habitats. It also impacts local microclimates by creating a multiplying effect, further harming biodiversity. Unfortunately, the EIA did not analyse the potential loss of biodiversity, mentioning only a few species that could be affected, such as the ishpingo tree (*Amburana cearensis*), a sought-after wood, and the scarlet macaw, desired by animal traffickers. The EIA did not mention mammals, reptiles, amphibians, or fish, despite their abundance in the region.

Forest value

Only the costs of deforestation and the loss of biodiversity have been considered above. A finer analysis would require studying the impact on every ecological zone crossed by the TL. We did not consider the impact of deforestation on South American climate. Rains generated by evapotranspiration in the Amazon and transported by updrafts in the eastern side of the Andes irrigate eastern Bolivia, Paraguay, and northern Argentina, which are areas of important agricultural productivity.

We used, in part, the methodology employed in the EIA of the Inambari hydro-power station⁶ (Madre de Dios region). Of course, the forests along the TL route are different, but, because we did not have the data, the Inambari analogy was thought to provide an adequate analytical point of departure.

4 Kew Royal Botanic Gardens (2016). https://stateoftheworldsplants.org/2016/report/sotwp_2016.pdf

5 Morris et al. (2016). Deforestation driven food-web collapse linked to emerging tropical infection disease, *Mycobacterium ulcerans*. Science Advances 2016:2e 1600387.

6 ECSA Ingenieros y EGASUR (2011).

Values were calculated for:

- Medicinal plants: we adopted the value proposed by Simpson, Seijo and Reid (1996) — \$4 per hectare (\$/ha) for the forests of the Upper Amazon.
- Protection against soil erosion: the value calculated by the project “Support to the national strategy for forest development”-FAO-GCP/PER/035 NET-INRENA 2001 was \$227/ha per year.
- Soil quality: the productive capacity of the soil was calculated with the reposition cost of the nutrients for the Brazilian Amazon soils (Medeiros J. S., 1995). The soil quality loss was evaluated at \$7/ha per year.
- Conservation of surface water resources: Amazon forests have an important role for water storage and flow regulation. We used the value calculated in 2005 for the Peru-Ecuador water basin Catamayo-Chira, which gives an average of \$50/ha per year.
- Hunting and fishing: according to a survey for the Inambari hydroelectric project, a family consumed 18 kg of bushmeat per year, which, for 759 families, gave an annual consumption of 14 tons. They also consumed 50 tons of fish in one year. At current prices, the total yearly consumption was \$77,400, equivalent to \$3.47/ha per year.
- Firewood: in Madre de Dios, 70% of the population use firewood for cooking. Supposing that in Loreto, along the TL, the situation is the same, and calculating the opportunity cost of the gathering time, we found a value of \$6.09/ha per year.
- Timber: using the types of forests and tree species that can be used for construction or furniture, it was concluded that in the Inambari area there were 554 m³ of timber per hectare. If half of it could be of commercial use, at the price of \$1.33 per m³ for ordinary wood, as in Puerto Maldonado market, the value of commercial timber would be \$869/ha. This value does not include the value of timber that could be sold as charcoal. The value of firewood and timber along the TL would require a special study, but we did not have the time and means to do it.
- Health and environmental quality: we used the tools proposed by D. Azqueta (1994) to measure the impact on human health of environmental deterioration. We assumed that the morbidity and mortality rates for the workers during the LT construction time (5 years) were the same as those calculated for the construction of the Inambari hydroelectric project, in a similar Amazonian environment. Using health and life insurance values the project cost on human health was calculated as \$19.81/ha per year.
- Biodiversity: there are no studies about biodiversity value in the Peruvian Amazon, but flora and fauna samples in the TL influence area point to their wealth. We used a value calculated by Horton (2003) for the Brazilian Amazon, which was \$2,384/ha.⁷

7 The global study “The economics of ecosystems and biodiversity. Ecological and economic foundations” (Kumar, P. (Ed.), 2010) analyzed 140 studies and found that biodiversity in tropical forests was valued between \$99 and \$25,193 per hectare. The most exhaustive study was done in Gunung Leuser National Park in Sumatra (Indonesia), with a value of \$4,488/ha, twice that of what we are considering for Loreto.

Carbon storage value

After the 2015 COP21 summit in Paris, and because of the pressing threats of global warming, several countries and regions started implementing carbon taxes. Using the values proposed at that time by Canada (for the whole country), by the Canadian province of British Columbia and by the American state of Washington, we proposed a conservative value of \$20/ton of emitted carbon.

As one hectare contains an average of 132 tons of carbon, its carbon storage value would be \$2,636, and the total value of the hectare, including all the services mentioned above and the biodiversity it contains, would have been \$6,206/ha in 2016.

Forest value at 2016 prices	\$/hectare	%
Medicinal plants	4	0.1
Protection against soil erosion	227	3.7
Soil quality	7	0.1
Conservation of surface water resources	50	0.8
Hunting and fishing	3	0.0
Firewood	6	0.1
Timber	869	14.0
Health and environmental quality	20	0.3
Biodiversity	2,384	38.4
Carbon storage	2,636	42.5
TOTAL	6,206	100.0

On 22 November 2021, the carbon trading price in the European market was \$79.79/ton. Considering the loss of value of the US dollar between 2016 and 2021, with a cumulative rate of inflation of 15.8%, the actual hectare price should be \$14,657. The main value of that forest would be its capacity to store carbon to mitigate global warming.



Global Warming and Carbon Trading Prices Surge

Source: Refinitiv; © FT

Forest Value at 2021 prices	\$/hectare	%
Medicinal plants	5	0.03
Protection against soil erosion	263	1.80
Soil quality	8	0.06
Conservation of surface water resources	58	0.40
Hunting and fishing	3	0.02
Firewood	7	0.05
Timber	1,008	6.88
Health and environmental quality	23	0.16
Biodiversity	2.765	18.87
Carbon storage*	10.516	71.75
TOTAL	14.657	100.00

*At a carbon trading price of \$79.79/ton

The 2021 total value of the forests “saved” along the TL route (24,461 ha), because the line was not built, would have been approximately \$359 million.

Cost of the deforestation and loss of biodiversity for Peruvian society

In 2016, the total value of the forests in danger of destruction along the TL would have been \$152 million. This amount would have had to have been absorbed by Peruvian society with no compensation. Those were the immediate costs, but more costs, not accounted for here, would have materialized regarding global warming, land and water pollution, lower river flows, soil erosion, and social conflicts caused by the settlers' invasion. Additionally, there would have been costs related to indigenous people's loss of food sources, with the loss of hunting animals and fish stocks because of work interference with stream connectivity and the intrusion of new fishermen from Iquitos with capital and industrial means.

Something similar had happened before at Rimachi Lake, near the Pastaza River. In the end, the Iquitos fishermen were expelled by the local Candoshi indigenous people, who now control their own fishing stocks.

Isolux valuation of environmental costs

Isolux found, in its EIA economic evaluation, "that the total environmental impact of the line was only to be aesthetic and could affect tourism, but as no tourist ever came to that region, its economic environmental impact was going to be zero".⁸ A rather optimistic and surprising conclusion, in light of the figures presented above.

Analysis from the point of view of an ideal Peruvian state

State economic responsibility

A government which deems itself responsible for the economic welfare of its citizens will try to maximize the economic benefits of its investment projects, PPPs or otherwise, balancing them against the social and environmental welfare of its citizens. This was clearly not the case in the TL project.

Building the TL would have meant an additional cost of \$1,031 billion, over 30 years, for SEIN users. A small part of this amount would have been returned to the Peruvian personnel and service companies working for Isolux, and, perhaps, to the politicians pressing for the line to be constructed. As the figures show, Isolux was going to be the big winner of the deal.

8 Getinsa Ingeniería S. L. (2015). Estudio de impacto ambiental. Tomo IV, p. 25.

The pressure from politicians was obvious at the time, with the explanation that the line was essential for the economic development of Loreto, even though the figures told a different story. Unsurprisingly, ordinary people do not always look at the figures closely where projects such as this are concerned. Candidates to the regional elections all supported the TL, as also supported an absurd project of Iván Vásquez, Loreto governor at that time, to build a fast train to the coast through the same swampy Abanico del Pastaza. He spent several dozen million dollars on this project, that, obviously, went nowhere. Vásquez is, at present (March 2022), in jail, because of corruption charges.

Corruption perception index			2021
	Place	Index	Change
Chile	27	67	0
Colombia	87	39	0
Mexico	124	31	0
Peru	105	36	-5.26
Spain	34	61	-1.61

Place: among 180 countries; Index: from least corrupt (0) to most corrupt (100);

Change: between 2020 and 2021; Source: Transparency International

An efficient Peruvian state would have started by doing a preliminary feasibility study, to calculate the costs and benefits of the project. It would have defined possible alternatives and analysed their social and environmental consequences. This is something that most private companies do (although perhaps not the social and environmental parts, unless obliged to by law) when they are planning a big investment, if they do not want to lose money.

But the Peruvian central government, and even less so the Loreto regional government, were not up to the task because politicians are not necessarily interested in subjects in which they must handle figures and technical concepts, and from which they cannot receive quick personal benefits.

It is interesting to note that while the politicians vocally supported the TL construction, they rarely mentioned the poor administration of Electro Oriente, which had been going on for many years, making life difficult for Iquitos inhabitants. Perhaps they hoped to take some bribes from Isolux, a big international company, while there was no way that Electro Oriente would pay them anything.

Minem's lack of specialists

Minem had well-trained technical staff, but they did not have personnel who understood the environmental consequences of a large project or were familiar with the Amazonian conditions. They had difficulties understanding the impact of a big project on a fragile environment and on people whose lifestyle was completely different from those in Lima.

A significant problem was the high turnover of Minem's officers, who are changed when the minister changes, with the result that new arrivals must learn everything anew. This absurd system is "normal" in government offices. The central government has the means to hire first rate consultants to do feasibility studies, but they rarely do so. Or if they do, as it was the case with the \$250m credit given to the electricity and oil sectors by the IBD, partly to do an economic and environmental study of the probable evolution of the future energy market of Peru, they waste it or they do not use their conclusions in a practical way.

In the TL case, for Minem the project's profitability was based on Isolux business projections. Peru has a legal frame that is supposed to deal with the environmental and social consequences of big infrastructure projects. Government officers, who lacked training and guidelines, had difficulties applying these laws and responding to the claims of the affected communities.

Public information about the project

For external analysts working on the project, information about it was sometimes difficult to obtain. Some information was considered reserved by Minem because it was company property. When in doubt, ministry or regional government officers simply refused to give information. When decisions about projects such as these impact people's lives or the environment, information should be public. Clear rules about transparency of PPP projects should be drafted.

The state and the environment

The Peruvian state has signed many international conventions to protect the Amazon forest. However, contrary to its obligations, it does not do much to protect it. There are several national parks and nature reserves in the Amazon, many which have existed for a long time, but they receive a meagre budget and they do not have enough personnel. Much of these personnel are devoted to their tasks, even if the pay is scant. In many "protected areas", illegal logging, coca plantations and gold mining are thriving.



Indigenous territories and areas prone to deforestation along the TL route

Possible deforestation along the transmission line

Environmental protection has never been a priority for successive Peruvian governments, including the present one. At the 2015 COP21 summit in Paris, Peru committed itself to stop Amazon deforestation by 2020. In 2020, the Peruvian Amazon lost a peak 203,000 hectares, with no reaction or declaration by the Ministry of Environment. The recently elected president of Peru, Pedro Castillo, did not attend the COP26 summit, preferring to go to Bolivia to meet his friend Evo Morales. The Peruvian government did not make any relevant declaration during that meeting. Castillo's Minister of the Environment, at that time, was only a political lobbyist without any knowledge about the multiple environmental problems of Peru.

Since 2010, when the price of gold climbed to \$1,400 per ounce (peaking at \$1,790 in 2012), 150,000 hectares of primary forests in Madre de Dios have been destroyed by illegal mining and thousands of people poisoned by mercury. Of course, the social problem was considerable because 30,000 impoverished peasants descended from the Andes to work there. They received quick financial support from national and international companies to do so; most of the gold goes to Switzerland, and the trade is organized by mafia groups.

The destruction can be clearly seen from the international highway that links Cusco to Brazil and is amply documented on a weekly basis by satellite observation,⁹ the images of which go directly to the Ministry of Environment. But the state

⁹ Monitoring the Andean Amazon Project (MAAP) Amazon deforestation hotspots, <https://www.maaproject.org/2022/amazon-hotspots2021/>

is merely a spectator. Most of these gold traders do not pay any taxes. From 2003 to 2013, cumulated tax evasion from illegal gold mining in Peru was evaluated for the period to be between \$433m and \$1,449m.¹⁰

Mercury poisoning is well documented, and it is now not possible to eat the fish that used to be the main source of protein in Puerto Maldonado, the regional capital of Madre de Dios.

Local government officials profit personally from illegal gold mining, and it regularly finances political candidates (a former president, Alan García, was one such example). They also profit from illegal logging, trafficking in protected animal species, cocaine and so on. It has been estimated that 89% of the logging in the Peruvian Amazon is illegal and uses falsified documents with the complicity of regional government's bureaucracy. The best wood is exported to the USA and China. Because of the lack of government control, the Amazon is a free for all where the most daring can make good money.

On the positive side, the TL Environmental Impact Assessment was subject to thorough reviews, and many comments regarding the project were made by Minem and SENACE (Servicio Nacional de Certificación Ambiental para las Inversiones Sostenibles), a government body charged with reviewing EIAs. Isolux had no opportunity to modify its EIA to adjust to these comments because it collapsed before the process was completed.

The state and indigenous people

The Peruvian constitution states that the government has an obligation to protect indigenous people, who have been subjected to abuse for centuries. The reality is different. In 2021, five indigenous leaders were assassinated trying to protect their land from speculators and coca planters. Despite many complaints, and the fact that the perpetrators are mostly known, no arrests have been made.

As mentioned on page 3, through the Prior Consultation Mechanism (Consulta Previa), indigenous people must be consulted when an important infrastructure project is planned for development in their territory, but public service projects were excepted. Consequently, the government refused to consult them about the TL, even though they would not receive any public services from it. The Ministry of Culture employees, with a curious arrogance, rejected all questions from indigenous organizations about the subject, mirroring a kind of "colonial" relationship between Lima bureaucrats and indigenous populations.

¹⁰ Torres Cuzcano, V. (2014).



Indigenous Groups in the Transmission Line Route

In an extensive area around Trompeteros, along the TL path, oil companies have been polluting indigenous lands for 50 years, with severe consequences for people's health, including a lack of drinking water in one of the areas with the highest rainfall in the world. Attempts to clean the affected areas have mostly been weak and unachieved. Fines given to the companies have not been paid, as they have been fought in the courts or waived after pressure from the companies involved. In 2014, a new law "to encourage foreign investment" waived them.

The trafficking of women has been another consequence of the oil workers migration to the region, as has the spread of imported diseases and malaria. In the TL case, as the project was only at its beginning, the only initial consequence was project rejection by local inhabitants because, as mentioned before, Isolux had not included electrification to the villages.

Isolux's attitude, namely not offering to negotiate with the indigenous people but seeking government support, was also unsurprising. Foreign mining and power companies are used to hiring police escorts when they go into conflictive areas. But as the project progressed, the arrival of outside workers and heavy machinery was certain to escalate conflicts. Had the project continued, as was expected, it would have resulted in extended deforestation where indigenous people obtain their livelihood by hunting and fishing, and in the arrival of settlers, which would have exacerbated those conflicts.

The indigenous group most likely to suffer from the impact of the TL were the Urarina, many still living in traditional ways. After many centuries of escaping the violence and diseases of the missionaries and the *caucheros* (rubber collectors), they have adapted themselves to use the resources of the *aguajales*, the swampy areas of the Abanico where the aguaje palm (*Mauritia flexuosa*) grows and is a source of food, fibre and construction materials. The area provides the group fishing and

hunting grounds. However, their social organization, based on family groups, has shown to be weak to resisting external aggressions from the oil companies and state impositions trying to reorganize their territory to adapt it to its political and educational systems.



Urarina Village in the Limits of the Abanico del Pastaza

Urarina women weave beautiful and complex clothes and mats using aguaje fibre. These are cultural objects, linking the spiritual and material worlds, as well as the present family members with their ancestors.

The state and the Amazon

The Amazonian population has a strong distrust of the central and regional governments. Improved governance and economic development would be key to improving government legitimacy.

The Amazon is 60% of the Peruvian territory, but it is the region most neglected by the Peruvian state. Regional governments, which should be the transmission belts between Lima bureaucracy and those distant (both mentally and physically) and unknown territories, seem more interested in personal profit than in benefitting the local populations. Recently, the governors of Ucayali and Madre de Dios (Amazon regions) have been arrested on corruption charges. They are happy to do planning and studies about their regions if they are financed by external institutions, but they do not apply the results. A good example is Loreto's "Plan de Desarrollo Regional Concertado" (Coordinated Regional Development Plan), approved in 2015 but never used.¹¹

¹¹ Gobierno Regional de Loreto (2015).

But something can be done. For example, the state can simplify the multiple bureaucratic demands required for development projects. Staff could be educated to understand the needs and ways of indigenous people. Governors could listen to indigenous organizations. A model that, perhaps, could be applied to projects in the Amazon is the state-to-state model. In 2021, the government approved development projects to be built with UK and French support. They will be managed independently by those countries, with simplified legal requirements for government acquisitions and staff hiring.

The UK project concerns the reconstruction of infrastructure along the northern coast of Peru, which was destroyed by a 2017 earthquake and still has not been rebuilt five years later. With France it is the reconstruction of the central highway, from Lima to La Oroya, which is long overdue, as it has been planned since at least 2010. This scheme was successfully applied when the UK built the stadiums and residences for the 2019 Pan American Games, which the Peruvian state had not been able to build in time.

These are turnkey contracts that mostly exclude Peruvian companies and staff. So, Peruvians will not profit financially very much or acquire know-how. But they are supposed to be corruption free and to be built without delays. The Pan American Games contract is said to have cost 10% more than if it had been executed by Peruvian companies (around \$400m). Sadly, this is the price to pay to avoid government inefficiency and corruption.

Analysis from the point of view of Peruvian society and gender focus

Peruvian society wants respect and good services that they can afford. But once they elect their political authorities, they are mostly powerless to control them. Sometimes, when there are gross violations of laws, the judiciary, the comptroller, or the auditor general may act; sometimes they are also part of the problem. Peruvian society, in general, does not consider environmental problems to be a priority. They think these issues are too removed from their daily reality. Other times, such as when destructive rains, floods or droughts happen, they think that they are acts of God.

Or they do not see the relationships between their actions and environmental disasters, like deforestation and droughts, or river pollution and fish depopulation.

Low educational levels, poverty and pressing economic needs act as dampers. Impunity is recurrent and makes people despondent. For people in Lima, and for 95% of the politicians, the deforestation of the Amazon is not important. Most of them have never walked in a rainforest and they think that these are idle lands, that would be much better producing soybeans or sustaining cattle for export to

Europe. They think that indigenous people oppose development and that they ought to be “civilized”.

The fact that the effects of environmental destruction may take many years to be perceived contributes to these dynamics. This is reflected in government priorities, social discussions and the daily television and newspaper news, as well as in the manipulation of environmental laws by the government in response to the pressures from powerful economic interest groups.

Gender focus

Amazonian communities along the TL route are mainly of three types: city communities (Iquitos), indigenous communities and mixed rural communities with indigenous, Andean, and coastal inhabitants.



Amazonian Settler Women have a Prominent Role in their Villages Public Life

Turtle meat seller in the Iquitos market

Reliable electricity supply is essential in Iquitos, where thousands of women work out of their homes (in offices, shops, markets, etc.) and who have children to attend to when they go back home in the evening. Electricity supply is sometimes intermittent, because of the aforementioned Electro Oriente deficiencies, and these women had high hopes that the TL was going to solve this problem. Of course, this was not true because Electro Oriente was a problem, which the government and several management teams had not solved in more than a decade.

Practically every woman in the indigenous and mixed communities in the forest wants to have electricity. For people that go early to bed and get up at dawn, even a couple of electric lamps would be helpful to cook meals and for the children to study in the evening. They aspire to a better education that will allow, hopefully, integration to the outer world.

The next two priorities are: a refrigerator to keep fish and bushmeat, instead of smoking or salting it (salt is also expensive in the forest, if there are no salt mines or salty rivers nearby), and a television set, to be connected to the external world if there is a TV signal available.

But the TL was not designed to provide electricity to the villages. The plight of indigenous women in the northern Amazon areas of oil exploitation, for example in Andoas where Petroperú and the American company Occidental arrived in the 1970s, gives a good idea of what happens when dozens or hundreds of workers, practically all of them men, arrive to indigenous villages.¹²

The arrival of the companies was followed by an influx of “mestizo” (mixed blood) traders that established themselves in the camps to sell alcohol and beer to the company workers and the local population. They also sold cheap industrial products, such as noodles, soap, cooking oil, clothes, shoes and so on. In exchange they bought forest products like wood, skins and medicinal plants. Wages paid by the company exacerbated the monetization of the local economy, previously based mainly on barter and communal work. As it was mainly the men who received the money the women became increasingly dependent.

External workers also introduced prostitution to indigenous girls that wanted money to buy a dress or some cheap trinkets. Now, in the oil camps, there are many abandoned girls with children, who are products of their relationships with company workers. Young women are also induced to leave their villages with offers of a good job. In fact, prostitution networks, often led by city women, take them to bars in the gold mining camps of Madre de Dios on this pretext, 2,000 km from their home, where they become sexual slaves.

“Mestizo” women that may work for the company or arrive with the traders do not mix with indigenous women or participate in communal work, a centuries old Peruvian tradition. They prefer to pay a labourer to do their part of the communal work for them. They are not part of the community; they are just passing by. So, the arrival of a foreign company that introduces capitalist relations can cause significant harm to village life.

¹² Belaunde, L. E. (2018).

Conclusions that could be generalized to public-private partnerships in general

The main idea of public-private partnerships is that their final product must benefit the average citizen of the country that is developing the project, in this case Peru.

This requires a relatively efficient and corruption-free state.

Obviously, these two conditions are not met by the Peruvian state, so the question is how to maximize PPP efficacy in this space “as it is”.

- The first condition is that the government should conduct the project feasibility study, prior to the project auction. It must include alternatives and its social and environmental consequences, giving figures that will allow comparison between alternatives and comparison with potential offers. It must be satisfied that the investment of public funds will be repaid with a better quality of the final project.
- Benefits and costs for the ordinary citizen will have to be calculated. The social and environmental factors must be given monetary values, for an easy grasp by the population and the politicians.
- The results of the feasibility study must be accessible to the public.
- Know-how transmission and the adoption of new technologies by the local populations must be a priority.
- The project must be sustainable in the future. The impact of a large project, such as an open pit mine or a hydroelectric dam, should be measured in centuries.
- Projects may have cumulative impacts, after working for a certain amount of time or in conjunction with other projects. These must be evaluated.
- The impacts on climate change, biodiversity, water resources and other environmental variables, like deforestation, must be examined and given an economic value to compare with alternatives.
- The impacts on population health must be evaluated.
- If possible, carbon neutrality must be attained or, at least, approached.
- Projects must have internationally accepted ethical and labour standards.
- Transition to a circular economy must be considered.
- The government must have specialists that understand the project and the structures to manage government responsibilities during its lifetime, about, for example, upgrades to the environmental impact assessment or the final project disposal.
- The government must simplify the bureaucratic rules that apply to projects.
- Populations in the areas affected by the project must be informed about its advantages and risks. In the case of Peru, there is the Transparency Law that must be respected. Transparency helps to control corruption.
- If possible, projects must be inclusive and participative.

- The context in which the project will be developed (for example the Amazon environment) must be described in relation to it.
- Gender issues must be addressed, for example, educational and job opportunities for women, and the eventual impact on their rights.
- When indigenous peoples are present in the project territory, they must be thoroughly informed about it and, if applicable, a Previous Consultation must be carried out. Projects that empower indigenous people must be given priority.

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