Photo by Aleksejs Bergmanis from Pexels (2017)

POLICY BRIEF:

Developing Climate-Resilient Infrastructure in Peru

A PERU CASE STUDY

WINROCK INTERNATIONAL

Private Investment for Enhanced Resilience project


Devastating floods in Peru linked to El Niño in 2017 (image: BBC, 2021)

Overview

Extreme weather events in Peru interrupt public services and damage commercial and residential infrastructure, which in turn increase operating and maintenance costs, reduce revenues, and can decrease the service-life of infrastructure assets. Private infrastructure developers, banks, insurance companies, government agencies, and other infrastructure stakeholders have begun to consider climate impacts because they pose substantial operational, financial, reputational, and managerial risks. However, overcoming such risks poses many challenges, including climate resilience integration, and the need to address limited awareness of climate-related impacts and how to mitigate them.

To address these obstacles, the Private Investment for Enhanced Resilience (PIER) project engaged ProInversión (a Peruvian government agency that promotes investment) and COFIDE (the Development Bank of Peru) to build capacity around climate resilience. PIER evaluated climate-related physical risks for a wastewater treatment plant and a toll road, and developed a financial model analyzing two scenarios to enhance resilience for the toll road. The methodology used to assess climate risks, called Rapid Climate Risk Assessment, proved a simple yet effective tool, and could easily be incorporated into official infrastructure development guidelines. The financial model developed for COFIDE suggests that investment in climate resilience is likely to positively affect the operations and profitability of infrastructure concessions.

Background

Infrastructure in Peru and many Latin American countries is extremely vulnerable to climate change. Around 67% of disasters in Peru are linked to climate hazards (PUCP 2011) and the El Niño and La Niña climate patterns. These disasters affect millions of residents, especially the poorest and most vulnerable groups in society. Droughts, landslides, coastal and riverine floods, as well as intense rainfall are common climate-related hazards that interrupt public services and damage commercial and residential infrastructure. As a result, infrastructure operators, managers, and financers experience increased operating and maintenance costs, and reduced revenues. Some infrastructure also requires more frequent repairs and upgrades due to reduced service-life caused by extreme weather events. In 2017 alone, damage caused by severe flooding in Peru increased the cost of reconstruction to almost $8 billion (VOA News 2017), and one million people suffered damages linked to El Niño (Santillan 2017). With more intense, prolonged, and frequent events, climate adaptation measures in infrastructure will be essential to ensure that Peru protects its development gains and closes its infrastructure gap.

The Peruvian government has made a significant effort in recent years to incorporate planning for climate change and its impacts into policies across sectors. The federal government enacted the Climate Change Framework Law (No. 30754), along with its corresponding bylaws, and Peru's National Adaptation Plan Towards 2050, a technical working document, to inform Peru's strategy to combat climate change. Current climate adaptation priorities include water, agriculture, forestry, health, tourism, and transportation (Gestion 2021), with few explicit references to climate adaptation for infrastructure.

Private infrastructure developers, banks, insurance companies, government agencies, and other infrastructure stakeholders face additional challenges to integrate climate resilience into planning and decision-making. Those include limited awareness of the effects of climate variability and climate change; lack of clarity on the options to reduce climate risks and increase climate resilience; and inexperience in estimating climate adaptation costs and benefits. These gaps complicate efforts to increase infrastructure resilience.

In response, the PIER project engaged ProInversión (Peru's private investment agency within the Ministry of Economy and Finance), COFIDE (the leading national development bank), and other public and private partners to build institutional capacity around climate resilience and incorporate climate risk assessments in infrastructure projects. During the first phase, PIER forged strong relationships with each institution through training and workshops with technical and managerial staff to understand specific challenges and raise climate-resilience awareness.

This built trust and increased staff skills for the second phase of the project, which involved designing and implementing the two interventions discussed in this brief: 1) the ProInversión collaboration that applied a climate risk assessment methodology to a wastewater treatment plant and 2) the COFIDE collaboration that applied a climate risk assessment and financial analysis to a toll road.

ProInversión Collaboration: Apply Climate Risk Assessment Methodology to a Puerto Maldonado Wastewater Treatment Plant

Climate Risk in Partnerships

Reliance on public-private partnerships (PPPs) to finance, design, build, and operate public services has become popular in low- and middle-income countries. This is due to their ability to stimulate private participation in fiscally-restricted environments with low public investment capacity (ESAN 2019). In Peru, PPP investments reached USD $7.7 billion in 2014 (MEF 2021), about 4%of the country's Gross Domestic Product for the year, mainly for infrastructure projects in the energy, transportation, communications, water, and sanitation sectors.

PPP mechanisms are inherently complex. Involved parties must coordinate in a timely manner and agree on risk management, with risks identified and mitigation measures assigned based on each partner's ability to bear them. Climate-related risks represent an additional layer of complexity when assigning risk responsibility, especially considering that current PPP mechanisms are not designed around climate-resilient principles, and both the public and private sectors still lack substantial experience managing climate risks.

Investment decisions made at the outset of the process will affect a project's life cycle, even beyond the term of the PPP. If climate risks are not addressed in the initial infrastructure design stage, infrastructure assets and operations could be severely threatened and unable to withstand future hydrometeorological hazards. Retrofitting infrastructure after it has been built is possible, but is proven not to be cost-effective (PPIAF 2016). It is therefore important to assess climate risks early to identify potential concerns and create a risk management strategy. These strategies should be "no-regret," meaning that they are flexible and allow for future modifications and upgrades to account for the uncertainty prevalent in climate risk assessments and climate resilience alternatives.

Approach – ProInversión Collaboration

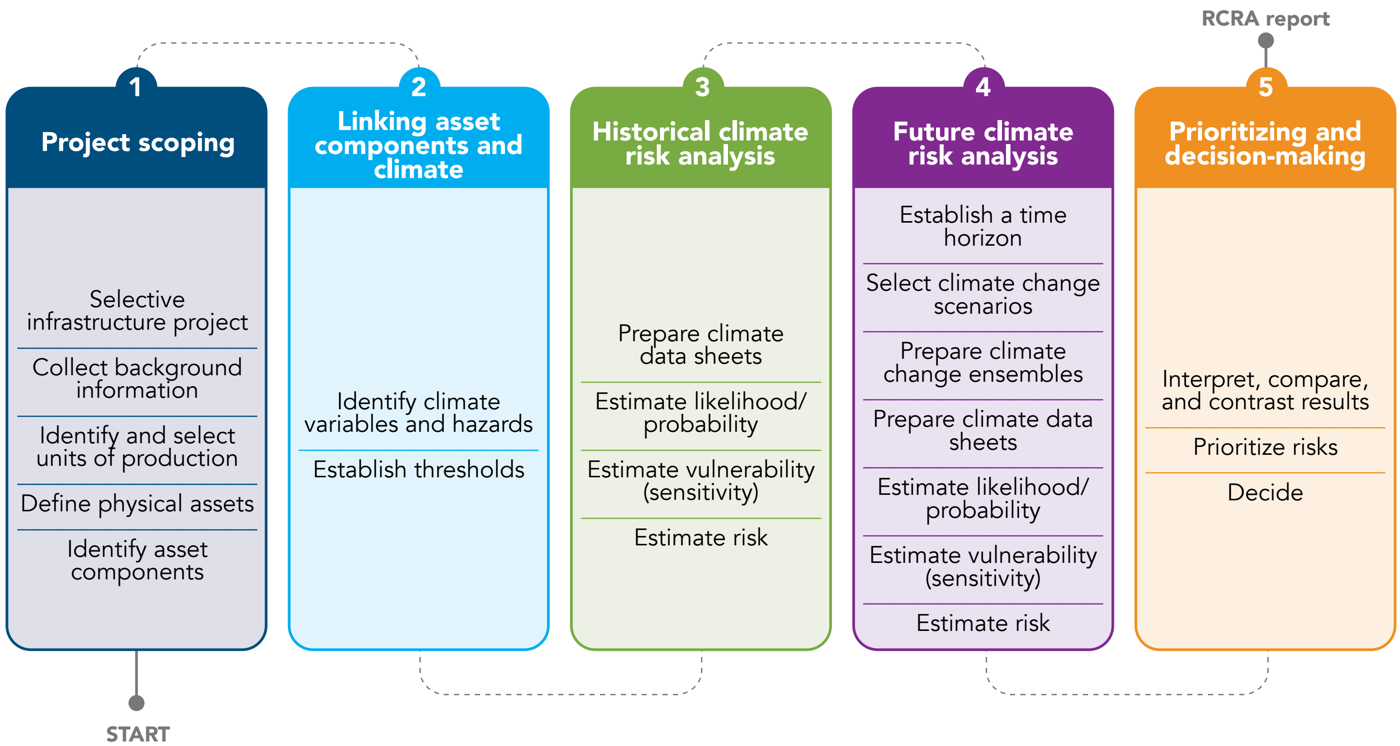
To overcome limited awareness of climate-related impacts and lack of clarity on how to assess and reduce them, PIER partnered with ProInversión, an agency under Peru's Ministry of Economy and Finance that is responsible for three investment mechanisms: PPPs, projects in assets, and taxes for infrastructure. PIER provided technical support to build institutional capacity to manage climate risks and policy support to institutionalize climate risks in the PPP process.

As a first step to promote climate resilience in ProInversión's PPP pipeline, PIER designed a Rapid Climate Risk Assessment (RCRA) methodology. This tool enables developers to understand the physical risks that infrastructure projects could face during the PPP term or life of the project due to climate change, and to respond accordingly.

The RCRA methodology included ProInversión's requirements to identify, describe, quantify, and prioritize risks for PPP risk evaluations. Upon completion of an RCRA for an infrastructure project, decision-makers have three options: 1) carry out a more detailed climate analysis due to inconclusive results from the rapid assessment, 2) proceed with the original infrastructure design for climate risks ranked as "low" in the RCRA, and 3) identify and evaluate adaptation measures for climate risks ranked as "high" in the RCRA.[1]

1 The decision to accept or reject the results from the RCRA will depend on the parties' risk tolerance and confidence in available data.

RAPID CLIMATE RISK ASSESSMENT METHODOLOGY DEVELOPED FOR THE PRIVATE INVESTMENT FOR ENHANCED RESILIENCE PROJECT



The RCRA methodology, developed by Winrock International, draws from the experience of the German Corporation for International Cooperation, the Asian Development Bank, the World Bank Group, the Public Infrastructure Engineering Vulnerability Committee, the United Nations, and the members of the Task Force on Climate-related Financial Disclosures. The methodology is characterized by the following principles:

- incorporating scenario-based analyses
- evaluating physical impact on infrastructure
- producing qualitative/quantitative results
- focusing on the project's essential physical assets and operations
- expressing risk as a function of hazard, exposure, and vulnerability.

The figure below provides the steps followed to conduct the risk assessment.

Results – ProInversión's Collaboration

To test the methodology's effectiveness, coherence, and replicability, PIER applied the RCRA to the Chapajal Wastewater Treatment Plant (CWWTP), a project in ProInversión's pipeline currently in the "structuring" phase — where investment, operation, and maintenance mechanisms are determined. The team benefited from a wealth of technical data collected in the initial PPP phases (i.e., planning, programming, and formulation).

Based on the RCRA's historical risk assessment (using 1960–2020 data), the wastewater plant's asset components were assessed to be at "low" climate risk from the considered hazards — namely extreme temperatures (heat, cold spells, and frosts), flooding (fluvial and pluvial), and gullies produced by erosion. The future risk assessment modeled two-time horizons, the PPP term (2043) and the project's full life cycle (2070), that also revealed "low" climate risk. In the short-term, climate hazard intensity-duration-frequency is not expected to differ significantly from historical data. For the long-term, climate changes were not considered a threat to the original location and plant design proposed by ProInversión, even though climate models suggested increments in the intensity-duration-frequency of high temperatures, precipitation, and flooding.

THE CHAPAJAL WASTEWATER TREATMENT PLANT IS PART OF A LARGER PROJECT TO IMPROVE THE SEWAGE SYSTEM IN PUERTO MALDONADO (IMAGE: ANDINA, 2020).

Although the assessment's results indicate that climate adaptation measures are not critical to the investment to ensure smooth operations within the PPP agreement's time frame, PIER recommended validating assumptions, limitations, and analyses with other government entities and local experts. The Madre de Dios Department, where the treatment plant will be located, has a dearth of data compared to other regions in Peru, so further validation through expert judgment is essential before confirming that climate risk is, in fact, "low."

Policy Lessons and Recommendations

Development and pilot application of the RCRA helped address an important challenge to incorporation of climate risk and adaptation measures in infrastructure PPPs, and generated several lessons learned:

RCRA methodology is a simple yet effective tool for ProInversión to assess risk across its portfolio. As a result of the pilot application to the CWWTP, the agency is assessing how to incorporate the RCRA methodology into its PPP guidelines. This decision is a vital step forward, but to maintain momentum, all partners working on climate resilience are encouraged to follow up on progress and institutional capacity-building.

Data sharing within government can improve climate risk assessments. One challenge faced by PIER while training staff on climate risks and conducting the CWWTP pilot was the lack of homogeneous and complete data across Peru. For example, the Ministry of Agriculture previously developed and tested a similar climate risk methodology for irrigation infrastructure projects (MINAGRI 2019), providing multiple levels of granularity in results due to differences in regional data availability. An opportunity now exists to integrate data and share information between ministries to offer more homogeneous assessments regardless of region or type of infrastructure. Next steps include sharing and systematizing data between ministries, and agreeing on the PPP development phase where RCRAs could be incorporated, according to their quality and relevance.

Adaptation measures and climate risk considerations are usually more cost-effective when incorporated in the design phase, rather than retrofitting existing infrastructure. Since climate risk was determined to be low for the CWWTP, PIER did not propose adaptation measures for the plant's design. Where climate risks warrant adaptation measures, the agency could build a financial model to assess feasible adaptation scenarios, as described in the section below on COFIDE.

Identification and prioritization of climate risks is a steppingstone for climate risk management in infrastructure. To ensure that climate risks are adequately addressed and managed in a PPP contract, the agreement's structure requires flexibility and explicit mention of climate. In the short-term, ProInversión could review contractual language to determine if changes are needed to force majeure, insurance, and relief and compensation clauses. However, these traditional risk management mechanisms have limitations (Sundararajan and Suriyagoda 2016). With a long-term vision, ProInversión could consider an active management approach where climate risk data is regularly collected and evaluated to change PPP terms at pre-agreed points throughout the PPP term – or when climate-related impacts call for attention. Information derived from the RCRA can inform this process.

Additional financial resources could be required to implement adaptation measures. ProInversión and its private counterparts need to mobilize and leverage resources to cover climate adaptation costs. Finance requirements will vary, but climate risk assessments, such as the RCRA approach, are essential to initiate discussions with lenders and demonstrate commitment to climate adaptation. Peru has made progress in multiple sectors to mobilize climate finance and the incorporation of climate risk principles and guidelines will only strengthen these activities.

COFIDE Collaboration: Incorporate Climate Risk Assessments/Financial Modeling in Project Finance for Highway Toll Road

Climate Risks and the Financial Sector

Climate-related hazards can damage physical assets and interrupt supply chains, which in turn increase expenditures, reduce revenues, trigger insurance claims, and threaten cash-flow and the financial solvency of affected businesses. As a result, financial institutions including banks, pension funds, and insurance companies face credit, financial, strategic, and operational risks (Stenek, Amado, and Connell 2010) from climate-related hazards. Beyond these immediate risks, financial institutions are also concerned about long-term effects on development and global financial stability. Those include economic performance, environmental/social outcomes, and collaboration with the private sector (Financial Stability Board 2020).

Financial institutions around the world have begun to incorporate climate risks and other considerations, including Environmental, Social, and Corporate Governance (ESG) standards, but they still face significant challenges. Though historical climate data is now widely used especially among insurance companies and risk assessment teams within banks, the use of climatic projections and future scenarios remains limited. Staff within financial institutions lack expertise in assessing climate-related risks, and building teams with such expertise and capacity is not yet a short-term priority.

This absence of urgency is related to what Mark Carney, former Governor of the Bank of England, refers to as the "tragedy of the horizon" (Carney 2015); in other words, a misalignment between financial forecasts (short-term) and climatic projections (medium- to long-term). However, climate change impacts are rapidly catching up with financial forecasts, as demonstrated in the cautionary tale of California-based Pacific Gas and Electric Co. The company went bankrupt in 2019 after protracted droughts intensified wildfires caused by deficiencies in the utility's own electric grid. The fires killed more than 100 people and caused extensive infrastructure damage (Roth 2020). The tragic event will forever be remembered by families who lost loved ones. It has also gone down in history as "the first climate-change bankruptcy" (Gold 2019).

In Latin America, financial institutions are likely to encounter increasingly difficult hurdles to climate risk integration if financial regulators and supervisors fail to develop guidance or promote incentives to do so. Recognizing this, in Peru, the Superintendency of Banks, Pensions, and Insurance has prioritized climate awareness and development of a common understanding of its relationship to financial systems, resulting in the adoption and promotion of international ESG standards. Nonetheless, the Superintendency's approach does not explicitly address climate change, and falls short of modeling risks and producing scenario analyses (Frisari et al. 2019). Both steps are recognized by the Financial Stability Board's Task Force on Climate-related Financial Disclosures as essential for integration.

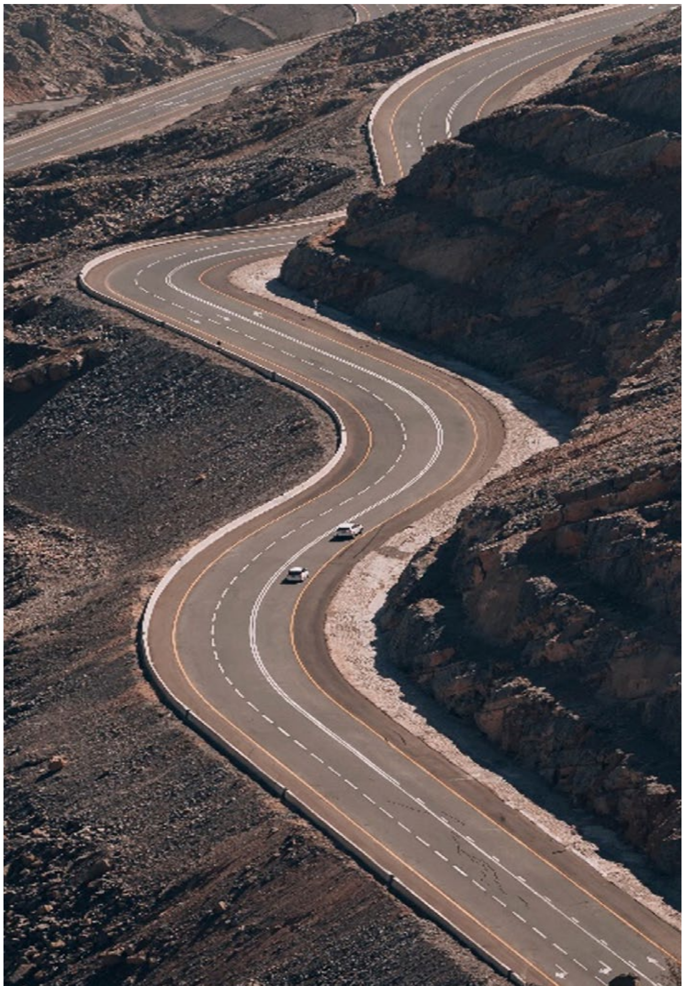
Approach – COFIDE Collaboration

To respond to some of these challenges, PIER entered into a collaborative agreement with COFIDE — Peru's leading development financial institution — to demonstrate a pathway to mainstream climate risk assessment. The objective is for COFIDE and eventually other financial institutions in Peru to develop strategies, policies, and procedures to identify, quantify, evaluate, and integrate climate-related impacts on project bottom lines and understand how climate resilience measures can be included in the short- (i.e., debt repayment) and long-term (i.e., concession period and project life cycle) perspectives of lenders and borrowers. In 2019, PIER presented the concept of mainstreaming climate risk assessment in financial institutions focusing on the credit evaluation cycle. To demonstrate a pathway for implementation, PIER evaluated one of COFIDE's current projects and provided recommendations on climate adaptation alternatives and ways to manage credit impacts from climate change. PIER adapted the RCRA approach to generate science-based recommendations, described below in Table 1.

TABLE 1. SCIENCE-BASED RECOMMENDATIONS

Project scoping	COFIDE is developing a PPP to refinance and expand a highway toll road. This project was chosen for the analysis because of the substantial data available to inform evaluation.
Historical climate risk analysis	PIER gathered historical data from various official sources and collected background information from both COFIDE and the concessionaire. PIER identified and characterized the most relevant hazards and climate variables, as well as evidence of their impact on infrastructure in the project's area of influence.
Future climate risk analysis	PIER conducted two distinct but closely related climate risk assessments: one from a macro-perspective (i.e., evaluating the highway in segments for each region), and the other from a micro-perspective (i.e., evaluating asset components within each road segment).[2]
Prioritization and decision-making	PIER compared historical and future climate risk analyses side-by-side to detect changes in risk levels. Based on these results, PIER highlighted the most prominent hazards and identified highway segments and asset components with the highest climate risk.
Identification of climate adaptation measures	In the final step, PIER focused on the highway segment with the highest climate risk and identified a series of climate adaptation measures and estimated their respective costs. With support from Climate Finance Advisors — a consulting firm that works at the nexus of private investment and climate change — PIER developed a financial model that examines the impact of relevant climate-related hazards on the road and structured three distinct scenarios for COFIDE's syndicated loan.

2 The framework for this evaluation was based on Winrock's RCRA methodology, discussed above, and adapted to include a risk multi-criteria analysis developed by Peru's National Estimation, Prevention, and Disaster Risk Reduction Center.



Highways in Peru are vulnerable to climate hazards—such as intense precipitation and flooding, high temperatures, and landslides (image: Bence Sandor Sztrecska on Unsplash, 2011).

Results – COFIDE Collaboration

Interviews conducted at the beginning of the project revealed that COFIDE staff are aware of climate risk in Peru, but not necessarily in relation to COFIDE as an institution. COFIDE staff assumed that climate risk due diligence was conducted as part of the bank's mandate to follow ESG standards, and that COFIDE responds to climate risk through an ESG policy. However, though an ESG policy is required by law, it only applies to projects over USD $10 million and does not specifically address climate change. ESG criteria evaluate the impact of an investment on its sphere of influence, whereas climate risk considerations assess the impact of climate change on the investment and its stakeholders.

Overall, COFIDE lacks institutional expertise and so far, has demonstrated only limited knowledge of approaches to integrate climate-related risks into the investment decision-making process.

To respond to these gaps, PIER conducted training on the importance of integrating climate considerations in COFIDE's credit evaluation cycle, and helped develop a roadmap to evaluate climate risks. The business case to invest in climate adaptation measures was strengthened and became more compelling for COFIDE after the highway toll road was analyzed.

Historical climate risk analyses identified two hazards: high temperatures and intense precipitation. The latter was more significant and linked to an extraordinary El Niño in 2017. Evidence collected from field visits suggested the potential for high temperatures to produce fissures, cracks, and pavement warping and curling. Unusual rain events produce flooding, erosion, and landslides that interrupt transportation services, damage infrastructure (e.g., collapsed bridges), and obstruct access to surrounding communities.

Future climate risk analyses pointed toward an increase in climate risk related to high temperatures along certain segments of the highway. Flooding was a consistent risk across the entire highway, but one segment showed higher risk. Although climate projections from official sources suggest a slight reduction in precipitation over the next decade, the analysis showed risk from flooding was still high.

Recommended alternatives to address climate-related risk included "hard" solutions, such as the use of temperature-resistant asphalt and building side ditches, drainage systems, and weirs; and "soft" solutions, such as monitoring and maintenance schemes, such as cleaning out canals, sewers, and drainage systems on an annual basis.

Building on this analysis, PIER developed a financial model focusing on the highway segment with highest risk associated to the El Niño phenomenon, and produced three scenarios: 1) base case; 2) manage; and 3) build. The results showed that under the base case scenario (business-as-usual), the highway would still be exposed and vulnerable to El Niño-related hazards with the potential to damage assets and negatively affect revenue. The manage scenario is characterized by higher annual operation expenditures, while the build scenario calls for immediate capital investments in adaptation (Table 2). In both cases, an increase in revenue and cash flow is expected against the base case. As is the case with most financial models, the discount rate played a key role in determining the project's net present value. The number of months of road interruption due to El Niño and the price growth of insurance premiums over the rate of inflation were also fundamental sources of variation in the net present value. However, given the reduction in climate risk for the manage and build scenarios, a reduction in insurance payments should be expected.

The climate risk and financial analysis was well received by both COFIDE and the concessionaire, who intend to negotiate better insurance premia and incorporate climate resilience in the investment decision-making process.

TABLE 2. IMPACT OF FINANCIAL VARIABLES/METRICS ON

THREE MODEL SCENARIOS: BASE CASE, WHICH DOES NOT ACCOUNT FOR CLIMATE CHANGE, AND MANAGE AND BUILD SCENARIOS, WHICH DO ACCOUNT FOR CLIMATE CHANGE.

Variable/Metric	Base Case Scenario*	Manage Scenario	Build Scenario
OPEX[3]	No changes for 2021–2040	• Soft solutions • Higher annual investment to increase resilience based on the CRER[4]	No changes
CAPEX[5]	Baseline	No changes	• Hard solutions • Investment to build side ditches, drainage systems, and weirs to decrease flooding impact • Adaptation measures around 7% of the value of the project
Impact from climate-related risks (extraordinary El Niño)	Higher impact on physical assets as hazards are likely to become more intense, prolonged, and frequent	Lower impact on physical assets due to additional OPEX investment	Lower impact on physical assets due to additional CAPEX investment
Financial impact (impact on cash flow NPV)[6]	Baseline	• Revenue: shorter business interruptions (10%) • Cost: insurance cost savings (4%) • Net impact: present value of cash flows from 2021–2040 (+4%)	• Revenue: shorter business interruptions (18%) • Cost: insurance cost savings (9%) • Net impact: present value of cash flows from 2021–2040 (+6%)
Debt Service Coverage Ratio[7] **(6-year loan)**	Below required ratio	Above required ratio	Above required ratio

**Scenarios are independent and therefore interactions are not directly additive. For example, a combined manage and build scenario does not result in a net impact of +10% in net cash flows from 2021–2040.*

Policy Lessons and Recommendations

The main lessons produced from the analysis of the highway toll road example and interaction with the bank's staff were:

Investment in resilience is likely to positively affect the operations and profitability of infrastructure concessions. A climate risk assessment should be integral to the design, finance, and operation stages of infrastructure projects, whether they are brown- or green-field. Incorporating financial impacts from climate risks can help identify a series of options to manage risks in a cost-effective fashion, as demonstrated in the COFIDE highway example.

Climate risk is an urgent credit risk for COFIDE as climate hazards can cause higher and unexpected fluctuations in revenue, costs, and asset value. Climate risks should be identified as early as possible in the financing cycle to enable consideration of the best options available to manage those risks in the most cost-effective way. COFIDE and the concessionaire could be made more aware of climate risks, since the analysis presented above only covers one segment of the highway.

3 OPEX. Operating expenses required to conduct daily business, such as rent and maintenance.
4 CRER. Climate Risk Evaluation Report.
5 CAPEX. Capital expenditures refer to acquired assets providing benefits beyond the fiscal year, such as equipment and buildings.
6 NPV. Net Present Value is the difference between cash inflows and outflows for a given period.
7 DSCR. Indicator used to measure the ability of an entity to pay debt obligations.

Transferring the burden of climate risks to insurance companies cannot be the only adaptation measure. In the short-term, procuring insurance services to cover climate risks is a logical approach, especially in situations where developers and lenders do not have the capacity to assess and manage climate risks. In the long-term, however, transferring risk could become more challenging as insurance companies realize the threat of climate change and consequently increase premiums or exclude coverage. Climate insurance is a sensible option but should be considered in conjunction with "hard" and "soft" strategies, as noted previously.

Tangible examples and case studies help financial institutions and infrastructure developers realize the urgent need for climate resilience; however, the "tragedy of the horizon" persists. Some groups are willing to take on more risk than others, but generally, early investments are more cost-effective than retrofitting. This does not mean all investments must be made at the beginning — a modular approach can be taken. Progressive and "no-regret" adaptation measures can be incorporated throughout the life of the project and will depend on the ability and willingness of sponsors, lenders and concessioning authorities to accommodate mid-cycle changes.

The "tragedy of the commons" is present in infrastructure resilience because a multitude of stakeholders creates collective responsibility. All parties involved in infrastructure development are responsible but should contribute in proportion to their abilities. For many financial institutions and other infrastructure developers, being pioneers is seen as a disadvantage where climate adaptation considerations result in additional costs and reduced competitiveness. What is not usually mentioned is that pioneering also represents a first-mover advantage, allowing developers and financial institutions to explore, build internal capacity and processes, and set course rather than having to catch up with other early starters (Denton and Perrella 2021).

Final Recommendations to Integrate Climate Adaptation into the Infrastructure Investment Cycle

Beyond incorporation of climate risk assessments in PPP guidelines and project finance, additional emphasis should be placed on the overall infrastructure investment management process. Three broad recommendations stem from the project's interventions with ProInversión and COFIDE:

Institutionalize climate principles in national and regional infrastructure planning phases. Current eligibility criteria for multi-annual infrastructure investment plans in Peru do not consider climate-related criteria. While individual projects should conduct climate risk assessments and consider climate adaptation measures, Peruvian national, regional, and local governments should plan and prioritize project-types and geographies based on climate risk factors to achieve systemic resilience and robust decision-making.

Create an enabling environment for collaboration. The integration of climate risk assessments and climate principles could face opposition from both the public and private sectors if climate requirements translate into additional transaction and project-related costs. In order to avoid potential first-mover disadvantages for bidders who are willing to innovate, government agencies can establish fair and equitable requirements for all bidders and financial institutions, without favoring anyone.

Establish climate risk monitoring and evaluation systems. Climate risk management does not end when climate adaptation measures are implemented. Standard operation and maintenance, accounting, and financial activities within the infrastructure project's operating life are encouraged to incorporate climate-related indicators and measurement frameworks. These allow for adaptive management and improved climate risk assessments for current and future projects. Monitoring carried out during the operation phase of a project would lead to lessons to improve future projects and adjust the two previous points.

References

Andina. 2020. "ProInversión: PTAR Puerto Maldonado Atrae Interés de Inversionistas," Nov. 23, 2020. https://andina.pe/agencia/noticia-proinversion-ptar-puerto-maldonado-atrae-interes-inversionistas-822487.aspx.

BBC. 2021. Qué Es "El Niño Costero" Que Está Afectando a Perú y Ecuador y Por Qué Puede Ser El Indicador de Un Fenómeno Meteorológico a Escala Planetaria. https://www.bbc.com/mundo/noticias-america-latina-39259721.

Carney, Mark. 2015. "Breaking the Tragedy of the Horizon—Climate Change and Financial Stability—Speech by Mark Carney." Bank of England. https://www.bankofengland.co.uk/speech/2015/breaking-the-tragedy-of-the-horizon-climate-change-and-financial-stability.

Denton, Michael and Jeffrey Perrella. 2021. "How US Banks Are Addressing Climate Risk and Sustainability." Moody's Analytics. https://www.moodysanalytics.com/articles/2021/how-us-banks-are-addressing-climate-risk.

ESAN. 2019. "¿Por Qué Son Importantes Las APP En El Perú?" ESAN. https://www.esan.edu.pe/apuntes-empresariales/2019/09/por-que-son-importantes-las-app-en-el-peru/.

Financial Stability Board. 2020. "The Implications of Climate Change for Financial Stability." Basel, Switzerland: Financial Stability Board. https://www.fsb.org/wp-content/uploads/P231120.pdf.

Frisari, Gianleo, Matias Gallardo, Chiemi Nakano, Victor Cardenas, and Pierre Monnin. 2019. "Climate Risk and Financial Systems of Latin America Regulatory, Supervisory and Industry Practices in the Region and Beyond." Technical Note IDB-TN-01823. Inter-American Development Bank. https://publications.iadb.org/publications/english/document/Climate_Risk_and_Financial_Systems_of_Latin_America_Regulatory_Supervisory_and_Industry_Practices_in_the_Region_and_Beyond.pdf.

Gestion. 2021. "Perú Aprueba Plan Nacional de Adaptación al Cambio Climático Hacia El 2050." Gestion, June 9, 2021, sec. Peru. https://gestion.pe/peru/peru-aprueba-plan-nacional-de-adaptacion-al-cambio-climatico-hacia-el-2050-noticia/.

Gold, Russell. 2019. "PG&E: The First Climate-Change Bankruptcy, Probably Not the Last." The Wall Street Journal, Jan. 18, 2019, sec. Business. https://www.wsj.com/articles/pg-e-wildfires-and-the-first-climate-change-bankruptcy-11547820006.

MEF. 2021. "Estadísticas de Inversión." MEF. https://www.mef.gob.pe/es/?option=com_content&language=es-ES-&Itemid=100907&lang=es-ES&view=article&id=3968.

MINAGRI. 2019. Elaboración de Lineamientos Para La Incorporación de La Gestión Del Riesgo En Un Contexto de Cambio Climático En Los Proyectos de Inversión Relacionados a Agua Para Riego En El Marco Del Invierte.Pe. Vol. 0484-2019-MINAGRI. https://cdn.www.gob.pe/uploads/document/file/1302759/Lineamientos%20para%20la%20Incorporaci%C3%B3n%20de%20la%20Gesti%C3%B3n%20del%20Riesgo%20en%20un%20Contexto%20de%20Cambio%20Clim%C3%A1tico%20en%20los%20Proyectos%20de%20Inversi%C3%B3n.pdf.

PPIAF. 2016. "Emerging Trends in Mainstreaming Climate Resilience in Large Scale, Multi-Sector Infrastructure PPPs." Washington DC: The World Bank. https://library.pppknowledgelab.org/PPIAF/documents/2874/download.

PUCP. 2011. "Cambio Climático Pone En Riesgo Desarrollo Del Perú." PUCP. https://www.pucp.edu.pe/climadecambios/noticias/cambio-climatico-pone-en-riesgo-desarrollo-del-peru/.

Roth, Sammy. 2020. "Meet the New PG&E. It Looks a Lot like the Old PG&E." Los Angeles Times, June 17, 2020, sec. Climate and Environment. https://www.latimes.com/environment/story/2020-06-17/pge-bankruptcy-new-pge-looks-like-old-pge.

Santillan, Victor. 2017. "A Climate-Responsible Peru: A Force for Recovery and Growth." NAP Global Network. https://napglobalnetwork.org/2017/05/climate-responsible-peru-force-recovery-growth/.

Stenek, Vladimir, Jean Christophe Amado, and Richenda Connell. 2010. "Climate Risk and Financial Institutions Challenges and Opportunities." International Finance Corporation. https://www.ifc.org/wps/wcm/connect/fe18be47-a0cc-4b5d-a134-078a995ce8bd/ClimateRisk_FinancialInstitutions.pdf?MOD=AJPERES&CVID=n48iBMz.

Sundararajan, Satheesh, and Nuwan Suriyagoda. 2016. "Climate Risks and Resilience in Infrastructure PPPs: Issues to Be Considered." PPIAF. https://ppiaf.org/documents/2870/download.

VOA News. 2017. "Peru Raises Cost of Post-Floods Rebuilding to Nearly $8B." VOA News, September 6, 2017, sec. The Americas. https://www.voanews.com/a/peru-raises-cost-of-post-floods-rebuilding-to-nearly-eight-billion-dollars-/4018169.html.

Private Investment for Enhanced Resilience

PIER is a 5-year (October 2017– August 2022) technical assistance project, funded by the United States DOS, that aims to address barriers the private sector faces to increasing investment in climate-resilience activities in 12 developing countries. The objective of PIER's technical assistance is to influence enabling environments for investments that reduce long-term environmental risks while increasing resilience in development sectors prioritized by counterpart communities.