Peruvian Public School Project – Feasibility Study Report

Executive Summary

Please find below a description of the on-site feasibility assessment of the envisaged APESEG-IDF Peruvian School Insurance Project. Our assessment focused on finding responses with regards to the political, technical, and legal/regulatory feasibility of implementing an insurance program for the public schools in Peru.

The on-site feasibility assessment was undertaken during the week of July 29th, 2019, by specialists from the Peruvian Insurance Association, Apeseg, a provider of artificial intelligence-based software solutions, Picsure, along with reinsurers AXA XL and Munich Re.

In short, we achieved the objectives we set out for the study:

- To identify necessary additional project stakeholders;
- To identify the necessary activities, milestones, outputs and outcomes for the four components;
- To enable the project team to define and plan the necessary resources in terms of expertise, time and money and the best owner for the respective activities.
- To achieve a "target picture" for a future insurance scheme for Peru's public schools, its insurance solution, its legal and technical set-up, its critical stakeholders and its budget needs.

All this expanded knowledge will/ is flowing into the planning of the project and development of the project proposal.

In terms of key tasks, we were able to establish:

- That there is pre-assigned budget source in Peru´s National Budget, under which the budget line 0068,could be used to fund premium. Although government officials, who we interviewed with, expressed that the budget size could be increased and consider items, such as insurance premium, the government clearly stated that their current challenge is not economical, but people resources and slow processes. After two years of El Niño Costero event that destroyed more that 1000 public schools, none of the schools have been reconstructed yet, although the government had the funds to cover for the loss, proving that some inefficiencies in the reconstruction processes exist.
- That decisions on budget size and allocation are made between August and December
- Both the Ministry of Economy and Finance and Ministry of Education are interested in the benefits the project – including specific claims management processes that will contribute to accelerate the reconstruction efforts, if the insurance program includes not only indemnity payment but the actual reconstruction of the destroyed schools, as well as providing temporary modules for pupils, when necessarily.

We met with relevant stakeholders from the public sector, the private sector and science, including government officials from the Ministry of Economy and Finance and the Ministry of Education, the local regulator SBS, local insurance companies, experts in the areas of earthquake risk analysis from the Catholic University and from the seismic research group of CISMID, as well as legal experts from DLA Piper in Lima. In addition, four different structure building types of public schools in the greater Lima area were visited. *See list of meeting partners in the appendix*.

The meetings were extremely informative and provided important insights on specific aspects to consider when shaping the project, such as data and modeling needs; lessons learnt from failed school rebuilding efforts after recent disaster events (Coastal El Niño 2017); the variability of different types of school buildings across the country; plans to build and refurbish schools in the upcoming

years; existing budget lines for investments in school infrastructure and possibly also for premium financing; specific aspects of claims handling/ remediation processes, which all would need to be addressed. These insights provide guidance to shape the project work in a way that meets the requirements of the public sector and the legal and regulatory requirements, while keeping the insurability of schools technically feasible.

As to the **political feasibility** we noted that the Ministry of Education and equally, the Ministry of Economy and Finance, expressed strong interest in the project. In order to get a more formal feed-back about the view of the government on the suggested school insurance project, APSEG has submitted a formal letter and project briefing note to the Minister of Education. We expect a formal feedback in the course of September as a proof point for the political feasibility of the project. *See carta formal in the appendix to this note.*

As to the **legal** and **regulatory feasibility**: The regulator (SBS) was supportive to the objective of the project, while outlining legal- and regulatory requirements critical for the creation of an insurance scheme for public schools in Peru (it is for instance difficult to establish pools as own legal entities in Peru as it is in conflict with the anti-trust regulation in Peru; however, co-insurance for example in the form of virtual consortium, is allowed). Nevertheless the existence of insurance programs provided by Peruvian insurance companies for government assets (e.g. national heritage buildings, etc.) can be considered as a proof point that the insurance of public assets is generally compliant with Peruvian laws and regulation. DLA Piper Lima, a law firm providing legal and regulatory advisory to Peruvian insurance companies, offered support for finding a solution for the intended insurance program in full compliance with the legal and regulatory framework conditions in Peru.

As to the **technical feasibility,** we assessed the availability of information about the current status of Peruvian schools. In that context we met with the Department of Statistics from MINEDU, a risk assessment team from the Catholic University and the seismic research group CISMED showing openness to share data and information and to contribute to envisaged additional assessment of the Peruvian school risk.

Also, in a session with insurance company members of APESEG, representatives from the local insurance sector expressed strong interest in the project. How the contributions can be incorporated in the project design needs to be further discussed. APESEG has also initiated a dialogue with its members to mobilize the contributions from domestic insurance companies for the benefit of achieving the project objectives; they have confirmed their interest on supporting the project.

Other private sector companies, such as construction companies involved in the construction of public school modules could not be met during the visit. The involvement of the construction industry in the project – e.g. in determining alternatives to a monetary settlement of claims – will be subject to the project implementation itself.

Project stakeholders

Stakeholder list			
Axa XL	Claudia Thyme, Marilena Rodriguez	Components 1 to 4	- International project lead and project management / contributions to all components according to activity planning
Munich Re	Michael Roth, Wilhelm Morales, Anna Schutin	Components 1 to 4	- Support for project lead and project management of Axa XL / contributions to all components according to activity planning
APESEG	Eduardo Moron,	Components 1 to 4	- Domestic project lead and project management / contributions to all components according to activity

	Renato Bedoya		planning
JBA	(Alex Shao, Iain Willis tbd.)	Component 1	- Catastrophic flood modelling
GEM	(John Schneider, Paul Henshaw, Vitor Silva tbd.)	Component 1	- Catastrophic quake modelling
PICSURE	Enrico Bollini	Component 1 and 2	- Development of a smart phone app (front end) and back end solution for exposure on-boarding and paper less claims handling
Other crucial project stakeholders (political, research, private sector)			
Research Group of Engineers / **Catholic University** (GERDIS Group – Pontif. Univ. Católica del Perú / PUCP)	**Sandra Santa Cruz** (Professor of Civil Engineering & consultant**)**	Component 1 (Understanding risk)	- Current construction costs of new school buildings (different building types) - Assessment of repair costs for different levels of damage - Determination of vulnerability functions for the different buildings - Determination of the level of damage that is corresponding to a "full loss" - Determination of volumetric unit costs per building type - Cooperation with students from PUCP to collect data for training AI by Picsure
(**CISMID** – Centro Peruano-Japonés de Investigaciones Sísmicas y Mitigación de Desastres) (Research)	**Carlos Zavala** (Director of CISMID), **Miguel Diaz** (Research Director of CISMID) **Roger Reina**	Component 1	- Current construction costs of new school buildings (different building types) - Assessment of repair costs for different levels of damage - Determination of vulnerability functions for the different buildings - Determination of the level of damage that is corresponding to a "full loss" - Determination of volumetric unit costs per building type (As PUCP)
(political) Ministry of Education (**MinEDU**) Financial Planning & Infrastructure Investment	**Patricia Alvarado** (Lead: Planning and Investment Unit)	Component 1	- Current construction costs of new school buildings (different building types) - Assessment of repair costs for different levels of damage - Aligning the scope of to be insured schools with MinEDU's plan to refurbish / retrofit and build new schools
(political) Ministry of Education (**MinEDU**) Department of Statistics	Head of Statistics Office: **Claudia Paoloa Lisboa**	Component 1 Component 3 (Claims)	- Recent census data - Issues associated to the census data - Determination of most critical elements informing about the legal / proprietary status physical condition of school buildings to be reflected in the approach taken by

	Vasquez clisboa@minedu.gob.pe + Ricardo Chihuam de la Cruz		PICSURE to on-board exposure data using a smart phone application as well as for the later purpose of loss identification and assessment after an insured event.
(political) Ministry of Education (**MinEDU**) Financial Planning & Infrastructure Investment	**Patricia Alvarado** (Lead: Planning and Investment Unit)	Component 1 Component 3	- Understand costs for fixing schools, for retrofitting schools as well as to construct new schools - Align governmental school investment program with insurance program - Find solutions to accelerate "response" by combining the contracting of construction companies for reconstruction and repair works with the insurance program - Represent MinEDU in a project steering committee
(political) Ministry of Economy and Finance (**MEF**)	**Maria Antonietta Alva** (National Director of the Public Budget) **Jose Carlos Chavez** (Secretary of the Strategic Planning in MinEDU) **Patricia Balbuena** (Manager of the Delivery Unit of the Minister Council)	Component 1, Component 2 (insurance solution), Component 3, Component 4 (organizational set-up)	- Maria Antonietta Alva has been nominated the new Minister of Finance for Peru. We hope to involve Maria Antonietta also in the project in the future keeping her updated about project progress across all components as well as to make decisions on how to deal with the project results - Jose Carlos Chavez has been nominated as new Vice-Minister of Finance for Peru. Given his background from MinEDU is perfectly suited to support the project and to help to "orient" the project in the right direction - MoF is playing together with the MinEDU a leading role as representatives of the "demand side" being the beneficiary of the results outputs.
(private) **APESEG Members** Domestic insurance company	**Chubb** - Max Castillo - Luis Acosta **La Positiva** - Gonzalo Valdez - Tomé Pedroso **El Pacifico** - David Rey **MAPFRE** - Jose Sarmiento	Component 1, 2, 3 and 4	- APESEG members will be the insurers of the pool of public assets to be insured. They are represented by APESEG but should equally proactively contribute to the components 1 to 4: - Understanding the risk: To share exposure and loss data from existing insurance solutions for public assets in Peru. Revisit results of catastrophic quake and flood loss modelling. - Insurance solution: To formulate a risk appetite for the risk taken by the domestic insurance market and the proportion of the risk to be transferred to international reinsurance. To contribute to the formulation of the insurance and slip wording applicable in Peru. - Claims: To support the insurance program with domestic claims handling know-how and loss adjusters (from Peru and the region). To review and possibly equally test paperless, smart phone based solutions for an efficient claims handling.

			- Organizational set-up: To support the development and implementation of the necessary organizational set-up for the envisaged co-insurance program, incl. a claims handling entity to be hosted by APESEG.
(political) **SBS** (Insurance Regulator) Superintendencia de Banca, Seguros y AFP	**Carlos Izaguirre** (General Intendent of Insurance) **Carla Ciappe** (Reinsurance Intendent)	Component 1, 2, 3 and 4	- Understanding the risk: SBS is currently working on a domestic catastrophic risk model. SBS will be highly interested in the results of JBA's and GEM's modelling work. SBS can be very supportive to the project. SBS risk view can be compared with JBA and GEM risk view. - Insurance solution: SBS will have to approve insurance solution (most likely) / or (at least) be asked by the government to review an insurance solutions suggested. - Claims: SBS will have to approve the claims handling approach suggested (in particular the smart phone front end and back end solution as well as the ex-ante contracting of construction companies. - Organizational set-up: SBS will have to approve the approach taken for setting up a co-insurance mechanism for Peru.
(private) **DLA Piper**	**Nelly Espinoza** Associate Nespinoza@DLApiper.pe	Component 2, 3 and 4	- Legal support for aspects related to "insurance solution", "claims" and the "organizational set-up" of the co-insurance mechanism.

Government interest

Both the Ministry of Economy and Finance and the Ministry of Education (MINEDU) officials expressed interest in the project, and especially the know-how it would contribute to their teams in specific areas. They requested a letter and a high-level description of the project in order to issue a letter confirming their support to project implementation. The letter and high-level project description provided are attached (*see carta formal in the appendix*); we are expecting this confirmation in writing.

Local insurers' views

Representatives from four insurance companies fundamentally expressed their support in principle to the project, or specifically encouraged the team to drive implementation of the project for the benefit of Peru. They shared insights from their experience insuring public assets which will be valuable to feed into the project. These included challenges and recommendations related to:

- Public sector's ability to fund retentions when a claim occurs.
- Public sector procurement processes.
- Possible reputational risk and pressure on insurers to pay for damages even if not covered, driven by media visibility.
- Loss adjustment: changes made recently in Peru to facilitate entry of foreign adjustors in case of a catastrophe and other options to access damage evaluation resources locally.

Findings on Component 1. Risk modelling and mapping

The on-site school visits and the discussions with Peruvian experts revealed that the insurance of the pool of school buildings seems to be generally feasible. The challenge will be how to deal with school buildings that do not have a clear ownership, are not built on government owned land, or have been build prior to 1997 with poor building standards and building materials being particularly weak.

One of the solutions currently discussed would be not a pure indemnity solution. One suggestion (to be further assessed) would be to define a particular reconstruction value (volumetric reconstruction value) for destroyed and/or damaged schools, regardless of the original construction material and design.

During the feasibility study we tested Picsure's technology for evaluating school buildings with image recognition technologies. Despite the fact that the algorithm needs further training, it seems technically feasible to develop a smart phone application for the exposure assessment as well as for the claims assessment later on. Moreover, the discussions with the Department of Statistics revealed that the regular surveys of schools (Censo Educativo) are extremely costly and prone to a lack of consistency. The application of Picsure's technology could be a very efficient alternative for the current approach.

Also, during the feasibility study, we also identified that the Census information provides the coordinates of each school. It is means we could consider during the risk modelling the exact location of the buildings.

The definition of vulnerabilities or fragilities will be done during the full project in collaboration with Catholic University, CISMID and GEM. Aspart of the full project, we would need to discuss a new vulnerability in terms of pay-out patterns that could be compatible with the loss protocol and claims processes. During the development of vulnerabilities, it would be necessary to calibrate them by using historical losses. These losses could be provided by MINEDU or the National Statistical Institute (INEI).

In terms of vulnerability development, the Catholic University and CISMID have worked in different projects in the past on seismic risk for South America and Retrofitting projects for schools in Peru, which we will incorporate into our analysisRetrofitting measurements and new construction will be considered during the vulnerability task, while the differences in climate zones would be a factor to be also considered for the estimation of costs. In addition, we found out that MINEDU have worked on some prototypes for the temporary modules to be deployed after a natural catastrophe emergency, so that pupils can continue their education during the reconstruction process. We would be analyzing on how to include the different prototypes construction, delivery and other costs, according to the geographic zone in the country, so that can be part of the insurance payout after a disaster event.

In summary, it was found that a project to use insurance to make the public schools in Peru more resilient is feasible. Once we have received a confirmative formal feed-back from MINEDU, we want to start the work on a full project proposal to be submitted to ISF by mid-November.

Additional specific findings and commentary are outlined below.

Access to local technical partners

- The team met with the risk research and analysis unit of Peru's Catholic University (GERDIS Group), who have conducted risk analysis and studies for hospitals, schools & low-cost housing in Peru, as well as with CISMID, the Peruvian-Japanese seismic research center, who is the go to and trusted institution that provides studies on seismic zones and infrastructure vulnerability in the country. However, all their work has been focused only on EQ risk and specifically in Lima. For the project, this team could be valuable partners for the technical work of vulnerability assessments (but not for the perils), e.g. providing access also to their engineering students to deploy them for field work.
- Both through GERDIS, CISMID and through MINEDU, the team also identified public entities conducting risk evaluation, which may also be able to contribute to the project. These include e.g.:

- CENEPRED (Centro Nacional de Estimación, Prevención y Reducción del Riesgo de Desastres), a public entity dedicated to risk evaluation, prevention and mitigation.
- INDECI (National Institute of Civil Defense) which provides technical advice for preparation, response and reconstruction and also post loss disaster management.
- SENAMI (Servicio Nacional de Metereologia e Hidrologia), the national hydro-meteoroloical institute.
- Other regional universities which have graduate engineering programs.

Access to international technical partners

For the risk modelling, which includes the calculation of PMLs and AALs, considering financial terms, we have identified two providers:

- JBA For Flood Modeling
- Global Earthquake Model, for earthquake modeling

The definition of resources and time for risk modelling and mapping, would be defined in the documentation of the full proposal.

Use of technology – Picsure

The Picsure software which the team tested in Peru enables object detection including building characteristics and value (once the software is “trained”), damage, as well as fraud detection. The software was tested in the greater Lima area only. The project proposal will include integration of this technology to permit an efficient assessment process of the exposures as well as to enable an efficient and swift claims management in the aftermath of natural disaster events destroying / damaging public schools. See detailed report from the Picsure test on the ground in Lima, attached. The technical focus on the project of Picsure is as follows:

Challengue.

> The available data for school buildings are not up to date. The current condition of the school buildings is not documented. The building data in the underlying database of Peru's public schools are inconsistent. The building structures of the school buildings are partially incompletely documented or do not exist. In order of a qualified assessment of the insurance risk, you need the latest, high-quality data, for example on building structures and the location of school buildings, which are currently only available in inadequate form. Need to classify the possibilities of a cooperation with the University of Lima for the development of a valid data basis clarification of data quality from studies of the University of Lima.

Requirements for the Picsure Tool:

> Test of already available Picsure technologies, such as object recognition, fraud detection, geo-mapping, satellite data evaluation for the future development of a global claims handling platform for climate disasters. To do a proof of concept to collecting data of public schools like geolocation data, recognising building conditions, building types, numbers of stories, calculation of the building area, pre damages, etc. Providing an easy-to-use digital tool that can be operated by school staff and experts as well. The further claims management platform based on Picsure technology must represent high availability and supports the whole claims administration process for different stakeholders of the project.

Expected results from Picsure:

> The expectation of the feasibility study in view of Picsure is to get an overview of the status quo of Picsure technology with regard to the creation of a future claims handling platform. The summary and assessment of the analysis results of the Picsure Platform to determine what we have and what we need to develop further depends on the requirements for Picsure. The results of the analysis are collected in the file „Technical Report Building Analysis Peru v2“.

Potential benefits of Picsure:

Picsure enables the creation of a consistent database of building insurance risks using automated data and image analysis methods. The company holds a comprehensive tool collection for building an effective, highly automated claims handling platform.

The following Picsure platform components can be used for data collection and preparation for the future claims handling platform:

1. On-boarding app

Picsure offers its mobile app framework for building a functional on-boarding app (Android, iOS) for the integration of individual content in order to enable up-to-date inventories of school buildings. The app should accept building photos for categorisation building types, collect and process extended data (e.g. year of construction) of public schools, document previous damages and the condition of the buildings and record further usable data for school operation. The app should be well structured and easy to use by untrained people (e.g. directors, teachers, other staff), for example by means of a survey or integrated chatbot solution in the typical local language. The app will be a hybrid solution of human input and automated machine solutions.

2. Claims analytics app

Picsure offers its mobile App-Framework to build a functional claims analytics app (Android, iOS) for the integration of individual content to enable a fast damage analysis in case of a disaster scenario. The app should record and document damage to buildings in order to be able to make a subsequent assessment of the damage amount. The app should be well structured and easy to use by experts as well as untrained persons (e.g. directors, teachers, other personnel), for example by means of a survey or an integrated chatbot solution in the typical national language. The app will be a hybrid solution of human input and automated machine solutions.

3. AI backend platform

Picsure is developing an efficient, global claims handling platform to achieve a high degree of automation in the claims handling of climate risks. The following Picsure technologies are used:

- Object Recognition, for the determination of building structures
- Object Recognition, to determine the condition of the building
- Object Recognition, for the determination of previous damages
- Fraud Detection, detects possible manipulations of images or duplicates of image material by means of image forensics.
- Geolocation, to determine the location of the buildings (latitude, longitude, altitude above the sea level)
- Geomapping, for address generation
- Remote Sensing on satellite data, for calculation of the building area
- 3D modelling, for the calculation of the converted space on the basis of the building area and number of floors
- Creating a data model based on the FEMA template

4. Claims administration frontend

Picsure provides a claims administration frontend for the claim manager. The frontend will be a software-as-a-service platform to administrate the school data and claims management process.

Findings on component 2 – risk pricing, structuring and claims

State of the Schools and MINEDU resources

The Ministry of Education has a series of departments which drive evaluation of the state of the schools as well as planning and execution of retro-fitting and reconstruction; the teams seem

knowledgeable and dedicated. 90% of their budget is dedicated to infrastructure; more than 1000 schools need to be re-built alone as a result of the damages from Coastal El Niño damages in 2017 (see also *Technical Evaluation* below)

They outlined their main challenges to be:

Own limited operational resources (manpower).

- Lack of information about the existing pool of public schools and currently very complex, time consuming, costly and failure prone surveys (censo educativo).
- Public sector procedures from tendering to execution of reconstruction.
- Very slow rehabilitation and reconstruction after natural disaster events.
- Significant loss costs (e.g. in the context of the El Nino Costal)

Accordingly, some of their priorities include:

- Prioritization of the schools to be repaired/ reconstructed.
- The use of technology to support effective registry of the schools and of damages.
- The project including an intervention plan in case of emergencies that helps to identify the damages (loss adjusting) quickly.
- A better/ more strict selection of contractors for repair/ reconstruction work.
- Guidelines to carry out the repair processes in an agile way and taking care of the quality of the construction of the works that are done.

While the availability of budgets for financing reconstruction seems to be not the most important challenge, it became clear to the team that the government is particularly interested in using insurance as an instrument to enhance the efficiency of managing the hydro-meteorological and geophysical risks associated to the Peruvian school sector, by enhancing the understanding of the risk, by determining clear standards for the evaluation of loss and for speeding up the rehabilitation and reconstruction in the aftermath of natural disasters.

Build back better

Peru is placing a high priority on improving the building quality of their schools either through retro-fitting (limited) or reconstruction (plans are in place and being implemented). Hence there is an express interest in considering this aspect as part of the project and the insurance solution.

Risk Quality

Of the total number of schools, there is an important percentage that would not be insurable traditionally, given their status and/or their high vulnerability. These could be classified as uninsurable and not be included in the program. However, there is an option to present insurance alternatives that can involve differential deductibles, accepted coinsurance, higher rates / premiums, limits and / or combinations thereof. One of the approaches, as mentioned in the executive summary, would be to determine volumetric unit costs for the reconstruction of different standard school types. On that basis an insurance program could be developed that enables the incorporation of a maximum number of school buildings in Peru and sets incentives for a rapid reconstruction and/or retrofitting of schools in vulnerable condition. The approach would be not purely indemnity based but would incorporate “betterments”. When the government retrofits any school, it can go from having the "special" conditions to the general ones. (*see expert opinion of Munich Re Corporate Underwriting expert in the appendix*)

Total Insured Value

As mentioned above, we envisage to determine volumetric unit costs for different school types that correspond to the reconstruction or replacement value of the schools with construction characteristics that comply with current regulations. These values may change according to the construction type and/or location of the school. These values will work as a basis for the calculation of insurable

amounts as well as for the quantification of losses. Therefore it will be necessary to calculate the **cost of reconstruction** per square meter using the new building standards, according to the different types of construction. The other important variable to determine the Total Insured Value is the **area** of the schools . The source for this information will be the Censo and the reconciliation of the information included in the data base is part of the project. Having both the Cost of Reconstruction and the areas per school we will be able to calculate the Total Insured Value.

In case that losses affect any of the schools with sub-standard construction characteristics (ex. Adobe), they may be indemnified at replacement value as long as the insured value has been calculated based on the reconstruction values properly established. The analysis of this alternative insurance coverage must be include the analysis.

Insurable interest

There is a challenge regarding the ownership of some schools due to donated properties and/or self-building of schools by the population, which means that deeds of ownership are missing. This is not uncommon in Peru, but the MINEDU is running a project to establish ownership of those schools wherever possible. This will need to be considered as insurance conditions are defined (e.g. should make expressly clear that there are MINEDU-owned properties and others for which the insured is responsible but no the legal owner). Additionally, this issue needs to be considered in the analysis of claims attention, because this situation can lead to the impossibility of the government to settle a claim related to properties that not belong to them.

Cat exposures

As part of the pricing analysis it will play an important role the catastrophic (earthquake and flood) modeling analysis. It will provide a catalogue of losses under a probabilistic scope. This analysis will be a driver to propose the limit that under a safe scenario will assure an enough protection in case of an event. The modeling is an important tool that will allow us to analice the exposures and maximum losses under different probabilistic scenarios, and therefore is an important tool for taking decisions about the scope of the coverage. As mentioned before we will use JBA for flood modeling and GEM for Earthquake modeling.

The outputs of the models will helpus as well in the analysis of non-traditional insurance solutions like parametrics.

In order to achieve an adequate modeling of the CAT exposure it is necessary to have the complete information of the schools. Modeling information will require by school: a) Location coordinates; b) occupancy type; c) detailed construction type (including material); d) construction year; e) number of stories and f) constructed area (per story, total) (to establish the TIV).

Scope of coverage

Coverage scope will need to be defined from the point of view of the risks and the assets covered.

Discussions with the ministries showed that their main concerns relate to earthquake (especially in the city of Lima), floods and flash floods. Other coverages in addition to the property insurance program, other associated coverages can be analyzed, such as third party liability and surety. However, the inclusion of perils additional to CAT may have repercussions from the point of view of claims management by frequency and complexity of the product.

Regarding insured assets, in principle it should likely be only the buildings.

The simpler the coverage we propose, the easier it should be to comply with government expectations at a rational cost. Also, the insurance product must be technically sustainable over time and we must ensure it to be of interest to the local insurance market and off course to the reinsurance market as well.

As part of the insurance analysis we will need

- to prepare different scenarios that could change from (a) covering all the schools, it does not matter the type of construction and/or building condition, up to one that could (b) include only the

schools with the adequate construction type and a good building condition. In the option (a) the TIV must be bigger than in (b) in which we roughly estimate the 25% of the total insurance value of (a).

Option A	*Option B*
Total Insurance Value will include all the schools	*The total Insurance Value will be calculate only including the schools that comply with the actual / new construction standards*
COR will correspond to the new building standards for sub-standard buildings	*COR will correspond to the reconstruction cost of the affected buildings*
The rate must reflect the wider scope of the coverage.	*The rate will be more in line with the market rates for schools.*
Different scenarios of deductibles and /or retentions of the governmental stakeholders including different scenarios. (*)	*Different scenarios of deductibles and /or retentions of the governmental stakeholders including different scenarios. (*)*

(*) In the Peruvian market, the deductible by event for catastrophic coverage's used to be between 1% and 3% of the insurable value of the affected properties, with a minimum that could vary in a wide range. This minimum is the retention of the government. The retention varies inverse to the premium, at much retention less premium.

EQ vulnerability assessment, conclusions

The schools with construction year after 1997 are built with better seismic standards, so their seismic vulnerability is low. It is evident that new seismic measurements have been incorporated in the design and construction of new schools, like the isolation of walls inside the reinforced concrete frames in order to avoid, in particular cases, the short column effect during a seismic event.

Based on the results of this team's survey and local expert opinion (CISMID, Catholic University), the schools built before 1997 (pre-1997) have a high seismic vulnerability: presence of short columns, very low resistance of concrete (f'c<160 kg/cm2), construction without quality control (self-build), low quality of materials, no maintenance (degradation due to moisture, marks of rust in light metal roof or structural joints) and no seismic building code enforcement.

In terms of seismic risk modelling, the seismic vulnerability for schools built before 1997 should be assume accordingly and would be high. This means that the average annual loss and the premium would be high as well. Particularly, for those schools located at the coast. In the Andes region and Amazonas, the seismic rate is not as high as in the coast.

In order to reduce the vulnerability of pre-1997 schools, retrofitting techniques have been suggested by CISMID and MINEDU. However, there are some disadvantages for applying those techniques:

- It requires additional construction measurements.
- There is no standard retrofitting technique for all schools.
- In many cases, the very low, poor quality of the concrete or masonry makes the retrofitting useless. It is better to build a new school instead of retrofitting.

In order to offer an efficient insurance program, the following phases should be completed:

1. Description of risks should be done. This means a complete and detailed database of schools is required, with the following information at least: Per building in each school: a) coordinates, b) detailed construction type (including material), c) construction year, d) number of stories, e) constructed area (per story, total).
2. Estimation of replacement cost or reconstruction cost considering code upgrade: per region and construction type.
3. Definition of a loss protocol and payments for making it simple and efficient. This has an effect also in the risk modelling.

The three points above form the basis for the necessary work on the understanding of the risk component in the envisaged school project.

Claims and re-construction (operational aspects)

Achieving a more effective reconstruction process for when schools are destroyed or damaged beyond repair is one of the main motivational agents that are identified by the government within the added value of insurance. At the same time, it is one of the complex challenges because the project will need to address how public sector procurement and tendering processes can be considered but also either modified or fully circumvented, for example with an insurers' consortium driving the reconstruction, possibly together with a construction companies' consortium in the context of the settlement of claims. This has been done before in Peru and learnings can be gained from this experience.

Besides the very restrictive law for public sector procurement, which can be a challenge, there is a lot of scrutiny from the government on the construction sector, specifically how they gain public contracts, given the recent Lava Jato corruption scandal and the cartel-like conspiracy that involved a bunch of construction companies the previous year in Peru and had the entire construction market at stake. This included a close review of insurance sector (surety line of business) by local regulators. Since it is , it is not possible and not recommended to provide specific names in advance for construction companies that may engage in the reconstruction efforts for public schools, we would include in our project what is needed to have the construction companies be pre-engaged before a disaster, given the country´s public bidding process and context.

Therefore, it is especially important to engage all the stakeholders that may be part of the solution and to understand the dynamics of government operations and the relationships between the different entities. Finally, in the scenario of having an agent such as a consortium in charge of the administration of the reconstruction process, the cost of the same must be considered within the costs of the insurance program / the costs associated to this approach would have to be ex-ante financed by the risk transfer solution.

Estimate of the Cost of insuring the Public Schools

Following the previous comments, it results challenging to establish an estimated premium because there will be a long way to achieve the final scenarios. In order, to prepare the estimation the Economic evaluation of educational building stock of the World Bank estimates a total insurance value of USD8.4 Billion. Based on this amount, for the scenario of the Option A, we can consider a rate of 4 per mil that drives to an annual premium of USD33.6M. This amount could be change depending on the different variables that could be take in to consideration to establish the insurance options.

Findings on component 3 – legal and regulatory environment

To find the relevant indicative information that would serve as the basis to determine further work to be conducted as part of the project, we asked relevant questions of the following bodies:

- **SBS** (Insurance Regulator) – Superintendencia de Banca, Seguros y AFP
- **MinEDU** (Ministry of Education): Financial Planning & Infrastructure Investment Unit
- **DLA Piper** (Global lawyers' company with offices in Peru)
- **Apeseg** (Peruvian Association of Insurers) – Its member insurers that provides earthquake and property coverages.

SBS / The regulator' views

The regulator was supportive of the project and stressed the priority of ensuring there is active competition in the market. He also outlined that:

- Coinsurance is allowed in Peru. The scheme can be structured as a co-insurance program (as in the case of the private pension system).
- SBS to make sure that the insurance scheme promotes competition, transparency and opportunity for all players interested on the risk.
- Pools are out of the question, as INDECOPI (*Instituto Nacional de Defensa de la Competencia y de la Protección de la Propiedad Intelectua*l; agency which protects competition and IP laws in Peru, and addresses consumer protection) would never allow it. Anything different would require a change in the law.

The regulator, also highlighted that the law that guides the government's procurement can be a big challenge in the context of claims handling.

The local lawyers confirmed this but shared that some usual practices can sometimes be challenged

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Findings on component 4 – legal, organizational and administrative set-up

Currently it is not allowed in Peru for insurers to establish an insurance pool. However, coinsurance is allowed in Peru, provided that the insurers come together only as a "virtual consortium", without creating the consortium as a legal entity.

The reason provided for not allowing pools, is ensuring that there is competition in the market. While re regulator sees promoting competition as a top priority, insurance regulation does not prohibit pools, but rather it is the agency which protects competition and intellectual property (INDECOPI), which does not allow it.

Peru is a relatively small insurance market; it has a total of 20 insurance companies, of which seven are composites, 8 focus exclusively on non-life and five do only life business. This helps to explain the focus on encouraging competition.

Feasible legal structures:

Through the SBS Rule 4985-2013, insurers that offers group disability, survivor and burial expenses coverages, provided under the private pension fund system (SPP), can participate in a tender process organized by the Private Pension Fund Administrators (AFPs). The tender process allows insurers to "win" one or maximum two fractions of the entire insurance business in the SPP, through a group policy, and allow several insurers to participate on the risk. This would be seen as a kind of coinsurance scheme, as the fractions represents the proportion to gain premiums and pay claims, but in this particular case in the SPP, there is no insurer leader.

In order to secure operational efficiencies, a centralized operational unit was created in APESEG in 2013 (the Survivor and Disability Department - DIS) to handle premiums, claims and establishment of reserves for those insurers that won the business and participate in the group disability, survivor and burial expenses cover (known as SISCO), provided under the SPP. As part of the project, we would analyze if a similar insurance back office structure can be applied for the public schools insurance program. This structure will allow local insurers to participate in a public tender process and obtain a portion of the business. If this is possible, we will look into the creation of an operational unit within APESEG to handle premiums, claims and reserves referred to the insurance program for public schools. Once this administrative set up is in place, this unit may also serve to administer future insurance programs for other public assets, such as Hospitals.

APENDIX – List of meetings

Entity	Persons
Ministry of Economy and Finance	Maria Antonieta Alva (National Director of Public Budget)
National Ministry Council (Presidencia del Consejo de Ministros - PCM)	Patricia Balbuena (Manager of the Delivery Unit at the Ministry Council)
Ministry of Education (MINEDU):	
Office of Strategic Planning	Jose Carlos Chavez (Director of Strategic Planning)
Statistics Unit	Claudia Paola Lisboa (Head of Statistics)
	Ricardo Chihuan de la Cruz (Statistics)
Financial Planning and Infrastructure Investment	Patricia Alvarado (Director)
National Program for Educational Infraestructure - PRONIED	Elizabeth Añaños (PRONIED Director)
Infrastructure Investment and Titularization	Cecilia Balcazar (Director)
Insurers	
Chubb (local insurer)	Max Castillo (P&C VP)
	Luis Acosta (P&C underwriter)
La Positiva (local insurer)	Gonzalo Valdez (P&C VP)
	Tome Pedroso (Risks and Operations VP)
MAPFRE (local insurer)	Jose Sarmiento (P&C Manager)
El Pacifico (local insurer)	David Rey (P&C Underwriter director)
Science/ research	
Peruvian-Japanese Seismic Research and Disaster Mitigation Center (CISMID)	Carlos Zavala (CISMID Director)
	Miguel Diaz (Research Director)
	Roger Reina
Research Group of Engineers / Catholic University (GERDIS Group – Pontif. Univ. Católica del Perú / PUCP)	Sandra Santa Cruz (GERDIS Group coordinator, Civil Engineer main professor at PUCP, Consultant)
Regulation and legal	
Superintendencia de Banca, Seguros y AFP (SBS – Local Insurance regulator)	Carlos Izaguirre (Insurance Superintendent)
	Carla Chiappe (Reinsurance Intendent)
DLA PIPER (global law firm)	Sergio Barbosa (Partner)
	Nelly Espinoza (Associate)
Public sector partners	
Deutsche Gesellschaft für Internationale Zusammenarbeit (German Cooperation – GIZ)	Ulrich Krammenschneider (Resident Peru Director)

Attachments

1. List of Major Findings from Meetings
2. Technical Report on Image Recognition Test/ Building Analysis from onsite school visits; Picsure, Enrico Bolloni
3. Building Survey Report from onsite visits; Munich Re, Wilhelm Rodriguez
4. Carta Formal – Letter to the MINEDU, includes a high-level project description