



Responsible Land Governance: Towards an Evidence Based Approach

ANNUAL WORLD BANK CONFERENCE ON LAND AND POVERTY
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(FORMALIZING) INFORMAL HOUSING: ADDRESSING THE ELEPHANT IN THE ROOM

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Abstract

In the next 20 years, the world would need to build as much urban housing as was built in the past 6,000 years. Incremental and self-construction of homes, which normally are not registered and do not comply with building codes, will continue to be the *de-facto* most important housing solution around the developing world. The existence of a fast, low-cost and transparent process for the regularization of informal constructions could play a key role in (i) incentivizing homeowners to invest their resources in upgrading their properties; (ii) increasing the property tax base for local governments; (iii) growing the demand for credit for home improvement; (iv) creating an attractive market base of housing units that comply with minimum standards for insurance companies; and (iv) granting legal security and giving families the opportunity to make the best possible use of their most important—and sometimes only—asset. In this paper we show the legal and economic viability for the introduction of a program for the formalization of self-built homes in Lima, Peru and provide guidelines for how it could be replicated in other Latin American countries.

Key Words: housing, informal settlements, property rights, cadastres, household asset formation, construction licenses



1. Incremental housing: the *de-facto* most important housing solution in developing countries

The supply of affordable and adequate housing has been overwhelmed by the demand of the millions of rural poor that have migrated to cities in hopes of accessing better education, healthcare and jobs. According to UN estimates, the urban population of the developing world alone will increase from 2.7 billion in the year 2011 to 5.1 billion by 2050 (UN 2012). The world's urban footprint is expected to double or triple by 2030, with an additional 2 billion people arriving in urban areas globally (Angel et al. 2011). This implies a pressing need for housing and land and consequent urban expansion. According to Goether (2010), we have 20 years to build as much urban housing as was built in the past 6,000 years, demanding for a different scale and speed.

Current demand for housing stands at one billion new homes worldwide by 2025, costing US \$650 billion per year.¹ As governments have failed to provide affordable and legal alternatives for housing, newcomers have no alternative but to informally occupy government and private land in cities and start self-building progressively their homes funded by their savings and one loan or two. Incremental housing can be defined as a gradual step-by-step process in which building components are appended or improved by owner-builders as funding, time, or materials become available. The majority of self-help building is based on the savings capacity and labor of households and communities. Sometimes, it is complemented with a short-term credit from microfinance institutions or providers of building materials.

2. The problem: high physical and legal vulnerability

It is estimated that around 1 billion people around the world live in slums or informal settlements, where the prevalence of sub-standard quality of housing increases the vulnerability to disasters. This number is likely to increase to 2.5 billion people by 2020. The number of slum dwellers in the developing world has experienced a 28 percent increase over the past 14 years.² On average, the housing sector

¹ UN-Habitat. 2016. Urbanization and Development: Emerging Futures. World Cities Report 2016.

² UN-Habitat Global Urban Indicators Database, 2015.



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experiences a larger qualitative deficit than a quantitative deficit. In 2010, around 980 million urban households lacked adequate housing.³ Today, affordable housing is inadequate and adequate housing remains unaffordable, especially for the urban poor.⁴

Table 1. Population living in slums (% of urban population)

Country Name	2005	2014
Argentina	26.2	16.7
Bolivia	50.4	43.5
Brazil	29.0	22.3
Colombia	17.9	13.1
Costa Rica	10.9	5.5
Dominican Republic	17.6	12.1
Ecuador	21.5	36.0
Guatemala	42.9	34.5
Haiti	70.1	74.4
Honduras	34.9	27.5
Mexico	14.4	11.1
Panama	23.0	25.8
Peru	36.1	34.2
Latin America & Caribbean	25.4	20.5

Source: UN HABITAT.

Currently, one in three families in LAC live in dwellings that are either unsuitable for habitation or are built with poor materials and lack basic infrastructure services. Overall, the regional landscape is mixed, with some countries like Nicaragua, Bolivia and Peru facing housing deficits that roughly double regional averages at 78%, 75% and 72% respectively.⁵ Other countries such as Brazil, Colombia and in Central America have closed the gap on quantitative deficits, but still have important qualitative shortages (including dwellings with no legal titles, walls made from discarded materials such as cardboard, dirt floors and lack of access to potable water and sewage systems) to bridge. The high vulnerability of informal

³ UN-Habitat, 2016.

⁴ UN-Habitat. 31 May 2015. Habitat III Issue Paper #20 on Housing.

⁵ Inter-American Development Bank. 2012. Room for Development: Housing Markets in Latin America and the Caribbean.



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housing to natural disaster makes it evident the importance on investing in building new homes better and retrofitting existing ones, even if they are built incrementally by families.

LAC, for instance, concentrates one of the highest relative risks from seismic activity, with most earthquake losses generally occurring in the housing sector. In the aftermath of the 7.0 magnitude earthquake in Haiti in 2010, 70 percent of assets losses were related to housing. If a country like Peru were hit by an 8.0 degree earthquake, an estimated 80 percent of potential economic losses would involve housing. In the 22-year period between 1990 and 2011, minimum losses in the housing sector for 16 countries in LAC were estimated to be US\$53 billion.⁶ Of the proportion of homes completely destroyed in this same period, 54 percent were associated with seismic events, and the majority of these losses were concentrated in El Salvador, Colombia and Peru. Other regions of the world also experienced important losses in the housing sector due to earthquakes. Over half a million homes were completely destroyed by the two major earthquakes in Nepal in April and May 2015⁷, and more than 6 million homes (860,000 of which were urban) were destroyed or significantly damaged by the 8.0 earthquake in China's Sichuan Province in 2008.⁸

In the developing world, the vulnerability of housing to earthquakes is greatly amplified by the informal nature of much of the housing stock and its location (for example, when they are located in geologically unstable areas where construction is not recommended). These informal or substandard housing units have generally been built without any engineered design, architectural input or considerations for geologic factors related to potential hazards such as landslides. Building codes, when they exist, are not enforced. Construction practices prioritize economy over security. The result is a pool housing units that is highly vulnerable to various hazards.

Given that no government in the developing world could afford to subsidize or outsource the construction of enough new housing units to meet the current demand, self-construction is the only realistic way many urban residents can get a roof over their heads.

This is an opportunity for governments: instead of wasting resources to fight informality, they could embrace its complexity and potential for saving lives. We know governments have not been able to provide safe housing solutions for the majority of inhabitants in peri-urban areas. We know there is an urgent need

⁶ Impacto de los desastres en América Latina y el Caribe, 1990-2011: Tendencias y estadísticas para 16 países. (2013). UNISDR.

⁷ Government of Nepal. 2015. Nepal Earthquake 2015: Post Disaster Needs Assessment.

⁸ GFDRR. Supporting Resilient Post-earthquake Recovery in China. https://www.gfdr.org/sites/gfdr/files/publication/Pillar_5_Project_Highlights_Supporting_Post-earthquake_Recovery_in_China_0.pdf



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to take action to prevent imminent disasters in settlements built on steep slopes. But we also know it is socially, politically and economically unfeasible to just call for enforcement of the law and ask municipalities to demolish all irregularly built homes.

We face an apparent paradox: a large share of peri-urban settlements were built outside the controls of the formal systems who are deemed to ensure the compliance with safety and health standards. How can a solution be designed to apply risk reduction or mitigation measures after the homes have been built?. Even more, how investments for risk reduction could be sustainably channeled in areas where homes are owned by citizens who cannot show property titles?

Another side of the challenge is how to cover the costs of building regularization. In surveys and focus groups with dwellers of informal settlements, a typical response of a homeowner living in a hazard-prone area to the question “Why haven’t you regularized your construction?” is, “I live from payday to payday and I simply can’t”. Meanwhile, hedonic prices model show in different regions that property formalization accounts to up to 50% of the positive impact of slum upgrading programs over property prices.

We believe that the promise of the potential protection of the most important – or only – family asset combined with the simplification of the formalization process could play a key role in bringing billions of dollars of assets into the formal economy, increasing property tax revenue, boosting the rental market and incentivizing homeowners to invest in retrofitting their properties. The impact of such an action should not be underestimated: according to the World Bank, in Colombia, Guatemala, Mexico, and Peru combined, families spend US\$84 billion in housing every year.

Table 2. Annual Household Consumption (US\$ Million)

	Housing	Total
Bolivia	1,732.87	10,375.53
Brazil	46,768.51	748,586.76
Colombia	21,037.26	102,310.57
El Salvador	315.88	4,230.98
Guatemala	3,629.19	20,025.12
Mexico	50,454.93	189,875.31
Peru	9,266.68	46,937.19

Source: World Bank



3. The challenge: how to design policies for risk mitigation in informal urban settlements with limited information.

The key is to develop tools to better understand the diverse nature of informal property and design solutions to address the distinct needs of the different types of informal buildings and informal tenure.

If we analyze the existing housing built in many settlements in Latin American countries, while a great share of the main cities was built informally and sometimes in hazard areas, not all settlements are located in unstable soil, or the location risks can be mitigated if appropriate measures are implemented. By the same token, whereas most of the buildings in informal areas were erected without building licenses, it does not mean that all them have fatal structural problems. If you walk the streets of informal settlements in any Peruvian or Latin American city, you will find that one settlement has different zones with varied levels of physical security: some blocks are built in flat areas close to the main roads, whereas some other blocks occupy increasingly sloping areas. A trained eye can also identify that some homes show sound structures to adapt to the terrain whereas others lack proper basements or are built with unconfined masonry walls.

There exist an important international experience and instruments to assess and implement mitigation measures, for both zones within settlements and for individual homes. The problem is first, that it is highly costly –or at least it appears to be—to determine with precision which areas require what mitigation measures, which homes can be regularized and which ones cannot. Second, there exist legal and institutional restrictions that make regularization cumbersome and expensive. Third, the available technical solutions for reinforcement or retrofit are expensive and inaccessible.

As it is explained in the following sections, the proposal is a process led by governments with the support of private sector actors to i) use available information technology to classify by levels of risk vulnerability the regularizable areas within settlements, and classify regularizable homes within those areas ii) provide a menu of simplified land tenure and building regularization products adjusted to the specific needs of previously established prevalent typologies, iii) bring closer available financing from government programs and private actors.



A relevant analogy for the proposed solution can be found in the use of nanotechnology in biological research (manipulating properties and structures at the nanoscale, often involving dimensions that are just tiny fractions of the width of the human hair) for the development of targeted drug therapies or “smart drugs”. Instead of traditional chemotherapy that sweeps good and bad cells, targeted drug therapies are designed to operate on specific cells and have already shown to cause fewer side effects ⁹. The only solution for addressing the hazards of informal housing was just send the bulldozers and eradicate them. History has proven this unfeasible and unnecessary for the areas within informal settlements that can be upgraded. The solution we propose is a process to deliver a menu of combined tenure and building formalization products. These products are specifically targeted for pre-established prevalent types of informal dwellings. A critical component of the solution is a massive physical risk assessment methodology to identify where the different pre-established types are located.

4. The lack of urban cadasters in Peru: the failure of the “one size fits all” approach

If we are proposing a solution for the high physical vulnerability of cities, the first reaction would be “let’s find the response in the existing cadasters”, where an inventory of the land and its occupants should be available. In this section we will describe the current situation of urban cadasters in Peru.

In Peru, urban cadasters are managed by municipal governments ¹⁰. 530 of a total 1840 municipalities, are urban municipalities with more than 50,000 inhabitants. Very few of them are able to build and maintain cadastral information. According to the Land Governance Assessment Framework, in Peru the main consequences of the lack of cadasters are ¹¹:

- The lack of land information systems hinders the cities capacities to produce planning instruments to anticipate urban growth. Decisions related to urban development are made in ad-hoc manner, reacting mainly to economic and political pressures. As a result, urban

⁹ Project of Emerging Nanotechnologies. <http://www.nanotechproject.org/inventories/medicine/>

¹⁰ The 25 Regional Governments maintain rural cadasters under the supervision of the Ministry of Agriculture. Other public agencies establish concessionary rights through so called “resource cadasters,” which record geographic information, limitations of use, and interest over resources regarding mining and forest concessions, the natural protected areas, and archaeological sites.

¹¹ Endo, V. (2013). Marco de Evaluación de la Gobernanza de la Tierra en el Perú LGAF 2013. Volumen 1. World Bank. Retrieved Feb 20, 2016 from http://siteresources.worldbank.org/INT/LGA/Resources/LGAF_Peru_2013_10_29.pdf.



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- growth is uncontrolled and driven by informal factors (invasions and illegal subdivisions in periphery areas)
- Property tax administration is weak in most municipalities. A handful of rich municipal districts with functioning and well-maintained cadasters do have procedures – and the specialized staff – in place to collect property taxes and enforce payment. In poor districts, however, there is no collection capacity and the few resources they do have are devoted to collecting property tax payments from formal industries and commercial areas.
 - Limited management of public land for housing and infrastructure. It is estimated that the inventory of state property has yet to reach 30% of the total, which largely explains the poor protection and management of state property.
 - The Property Registry has a large cadastral information deficit creating insecurity. Of an estimated 8.5 million properties with an index card in the Property Registry, almost half lack cadastral information. The result is a high incidence of overlapping rights that give rise to frequent boundary disputes, increase transaction costs, and undermine the Registry's reputation for providing security.

To address the problem of fragmentation of functions and the dispersion of land-related databases, in 2004 Law N° 28294 was passed to create the National Integrated Cadastral and Property Information System (SNCP by its acronym in Spanish). The objective was to regulate the integration and unification of standards, nomenclature, and technical processes of Peru's different cadastral entities. The SNCP system envisions the creation of a multipurpose cadaster with a strong focus on the inter-relation of the cadaster and the property registry. To this end, the SNCP creates an institutional structure and a process to integrate the different sources of information into a new, centralized Cadastral Data Base that, would be equally accessible to public agencies and private agents alike.

That integration process should gradually take place once the agencies responsible for generating cadaster information (district municipalities in urban areas, but regional governments for rural areas, and specialized agencies for resource management such as forests, protected areas or mining) homogenize the production, administration, maintenance and updating of information according to the system's technical standards. The SNCP Technical Secretariat should act as a gatekeeper, assessing that agencies have complied with those standards and a given area can be formally incorporated to the national system.



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After 17 years of SNCP was created, the result is 60 technical standards enacted but only a handful municipalities formally incorporated into the national system.

Why did the SNCP multipurpose model fail in Peru? A study carried out by Alarco, Endo and Triveno (2016) concluded that the main problems are the municipalities' lack of resources and incentives.

“The underlying problem is that the SNCP model was designed without considering the heterogeneity of the needs and capacities of Peru’s local governments. Under the pretense of building a single multipurpose cadaster serving both rural and urban areas, large and small cities, SNCP designed “a gold standard” for cadaster that is impossible to achieve: not only does it force Peru’s more than 530 urban municipalities to take on a major institutional reform project without providing any technical or financial support, but it also asks them to follow a model that is too expensive to build and maintain; takes too long to implement; and is generally much more than they really need to execute their cadaster, urban planning and property tax collection goals.”

5. Legal and institutional restrictions: regularization of tenure and building licensing procedures in Peru

Security of title is a condition for investments and a necessary condition for the development of insurance markets: citizens tend to limit investment in their homes when they risk eviction or have no assurance they will stay, governments are limited in their ability to provide subsidies for home improvement to beneficiaries who cannot prove ownership, and private financial institutions cannot take property as collateral. On the other hand, building licensing procedures set the standards for what the official system considers safe homes and is a pre-requisite to register title over the construction. In this section we will analyze the existing legal and institutional framework for regularizing title, regularizing a building license and register the building in the property registry.

In Peru, the large-scale formalization programs carried out since the late 90 s regularized 2.5 million urban properties in the periphery of main cities, however the program’s goal was to formalize the plot but not the building. Although the beneficiaries of formalization programs already occupied their self-built homes, the government decision was to focus on the regularization of title for the soil only, expecting that the newly regularized owners would apply to municipalities to regularize the unlicensed buildings. According to a recent study produced by COFOPRI applying surveys in 12 settlements in Lima, less than 20% of all formalized owners declare they have also registered the building.



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The common practice in peri-urban settlements is that the initial settlers build the first floor to live and over time the second and subsequent floors are occupied by their siblings. In a recent survey by COFOPRI in a sample of settlements, 30% of houses show 2 floors and 13% more than 2 floors. 23% of houses with more than one floor have independent accesses. Then the lack of registration of buildings prevent that physically independent units within a plot to be registered as separate properties. Many times it also restricts access to government financed loans for home improvement.

From the point of view of governance, municipalities lack information of buildings in their jurisdiction restricting their ability to collect property taxes to finance services, to have effective land use plans and to design and implement disaster prevention measures.

On the other hand, the high transaction costs reduce incentives to stay within the formal system, and therefore transfers (purchases or inheritances), subdivisions and other changes are not brought to the registry. As a result, after the mass scale formalization programs carried out the past 20 years in Peru, a great share of formalized owners slipped back to informality. Depending of the time of formalization the incidence of informal transfers tends to be higher, due to unrecorded purchases, inheritances and subdivisions. According to COFOPRI surveys 40% of formalized properties have already slip back to informality.

5.1. Description of Building regularization procedures and transaction costs. In Peru, as in most Latin American countries, a pre-condition for registration of buildings is the regularization of the building license. In the formal sector, the owner first applies for a building license, then carries out the construction and when the municipal authority checks that the actual construction complied with the approved license, the owner can register the building. Most of homes in peri-urban settlements are built without a building license, so to register the building in the registry it is necessary to apply for a regularization license. In the following section we will describe the procedures to get a building license, and the procedure to regularized a building constructed without license.

- **Licenses for new constructions.** Issuing of building licenses is a municipal function which requires prior proof of title and compliance with zoning and building standards including certification of structural steadiness, preparation of architecture, electric and water/sewage plans, among other requirements. Peru has carried out several efforts for simplifying the building license procedures to promote the construction industry. Law



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29090, defines four categories of constructions (A, B, C, D). The simpler categories –e.g houses of less than 120 m²- can be automatically approved with private professional's certification of compliance with the regulations; whereas the more complex categories – homes with more than 1 floor, commercial venues, etc. - require previous control by Technical Commission integrated by public and private delegates. Relevant authorities cannot ask for more requirements than those explicitly established in the law, and if the time legally established to respond expires, the application is considered automatically approved by “silencio administrativo positivo”. Although administrative simplification measures have been implemented, for the common citizen living in a peri-urban settlement the complexity and costs of complying with the legal and technical requirements make it prohibitive to apply for building licenses.

There are two different processes for regularizing constructions built without building licenses:

- **Regularization of building license through private professionals and notaries** (for buildings erected before 1999). The special regime established by Law 27157, allows housing units located in already consolidated areas (i.e. areas which have water, sewage and electricity services) built before 1999 to be regularized by a certified private professional, who verifies and takes responsibility of the compliance with existing regulations. The professional send the standardized forms and plans directly to the Property Registry, without any previous control by the municipality. The law allows integrating the regularization of title by adverse possession declared by a notary and the regularization of the building may be achieved through the same process. Once the title is registered, the Public Registry notifies the municipality for control purposes.
- **Regularization of buildings through municipalities** (for buildings erected between 1999 – 2010). Law 29090 establishes a simplified and short procedure for the regularization of the buildings erected without license after 1999 and before 2010. The application, accompanied by the corresponding legal documentation of tenure and the plans, is then revised by the municipality through a desk and field inspection. The procedure establishes a 15 days period for the municipality to check the veracity of the documentation presented, including site visits.



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According to a recent analysis made by COFOPRI in Lima, the process for regularizing a building license through private professional and notaries takes 23 working days and cost 3019 soles (around USD\$ 343). The regularization process before the Municipality may take 66 working days and cost 3099 soles (around USD \$ 968). These estimates are based on the assumption that the certified professional verifies that the building complies with all the technical standards set by the building codes and that the applicant can procure updated property title and tax receipts.

Table 3. Building formalization processes in Peru.

Building formalization process (Duration – days- and costs)

VIA MUNICIPALIDAD											
PROPIETARIO					MUNICIPALIDAD			SUNARP		TOTAL	
Actividad	Averiguar requisitos (deberá contar con Licencia de Construcción)	Regularización de la Licencia de Construcción	Solicitud de parámetros urbanísticos y de alineamiento de calles	Solicitud de copia literal	Elaboración de planos por Ingeniero/Arquitecto inscrito en el Índice de Verificadores, llenado del FUE (Formulario Único de Edificación)	Presentación del expediente a la municipalidad	Inspección del predio	Observaciones encontradas por técnico de la municipalidad	Presentación del expediente a RR.PP.		Pago de la liquidación del expediente (de acuerdo al costo de la construcción del predio)
Costos (en soles)		80	100	30	2,000	200	50		39	600	3,099
DÍAS ÚTILES	1	7	7	1	3		30	7		10	66
VIA NOTARIA											
PROPIETARIO				NOTARIO		SUNARP		Total			
Actividad	Averiguar requisitos	Solicitud de parámetros urbanísticos y de alineamiento de calles	Solicitud de copia literal	Elaboración de planos por Ingeniero/Arquitecto inscrito en el Índice de Verificadores, llenado del FUE (Formulario Único de Edificación)	Legalización notarial de firmas (propietario y profesional contratado)	Presentación del expediente a RR.PP.	Pago de la liquidación del expediente (de acuerdo al costo de la construcción del predio)				
Costos (en soles)		100	30	2,000	250	39	600	3,019			
DÍAS ÚTILES	1	7	1	3	1		10	23			

Fuente: Municipalidad de Comas y Ate Vitarte

Source: COFOPRI

5.2. Description of title regularization procedures.

Due to high transaction costs, a significant share of the 2.5 million formalized urban owners who received titles from COFOPRI, did not bring their transactions to the registry. As it was mentioned, approximately 40% of a sample of settlements reported informal transfers.



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The regularization of individual titles depends on the possibility of getting the voluntary participation of the legally registered owner. When this is not possible, a judicial procedure can cure the defect of title. Use of notarial procedures incorporated in Peruvian legislation would produce faster results and partnerships with notaries to bundle applications would reduce costs. The specific typologies are:

- a) **Obtaining title from a private legal owner.** This a very common situation in peri-urban areas where the property is acquired through a legitimate transfer from the registered owner, however without following the requirements to bring such transfer to the registry (i.e. contract authorized by a licensed lawyer, notarization of the document, payment of taxes and application for registration in the Public Registry). When the urban landholder manages to identify the legal owner, the parties may sign a notarized purchase contract and bring it to the registry. Typically the landholder has difficulties locating the legal owner or her successors, since some may have travelled abroad or deceased without leaving a will.
- b) **Obtaining title from a public entity.** Public land for private use (i.e. not designated for public use such as parks, beaches or river banks) can be divested through competitive bidding processes at commercial value. Exceptionally, the holder of public land can apply for a process by which the managing agency (from central, regional or municipal government) declares that the conditions established for direct purchase apply. The procedure involves preparation of plans, compilation of legal documentation, publications to protect eventual third parties interest, site inspections, valuation at commercial value, and registration after the payment is effected. Sometimes the agency in charge of managing the land (a municipal government, for example) can issue an extraordinary order to sell the land at a lower value in light of social considerations.
- c) **Repairing defect of title through 5 years adverse possession.** A landholder who acquired the land in good faith but her title has a defect that prevents registration (for example was acquired from a non-owner, or by one of multiple co owners), can repair the defect of her title through a judicial procedure of adverse possession, proving that she has been in continuous, public, peaceful and acting as an owner (i.e. without recognizing other person's right) possession for 5 years. The procedure requires compilation of legal information on the preexistence of parcel records, preparation of plans with UTM coordinates, publications to protect eventual third parties interests, and site inspections. The judicial resolution can therefore be brought to the registry.
- d) **Repairing absence of material title through "título supletorio".** A landholder who legally acquired the property but lacks material document to register it into her name, can ask the judge to produce a material title to bring to the registry. The procedure is similar to adverse possession.



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- e) **Conforming a new title through 10 years adverse possession.** A landholder who has been in been in continuous, public, peaceful possession, and acting as an owner for 10 years, legally acquires property even if his possession is in bad faith (i.e. knowing that there exists other legal owner). The procedure to declare such acquisition and produce a registrable title is similar to the 5 years adverse possession.
- f) **Notarial processes.** Over the years, Peruvian policies towards administrative simplification have created a series of laws to provide transparency and predictability to administrative procedures. As part of these efforts, notaries have been empowered to carry out a series of procedures reserved for judicial activity in the past. Directly relevant to urban land formalization are the notarial procedures for the declaration of adverse possession, titulo supletorio, declaration of legal heirs, among others.

These are simplified procedures that can declare a legal right in short time, provided there is no opposition from a third party. In the case of opposition, the procedure aborts and has to be completed before a judge.

Depending on which of the previously described situations lies an informal owner, it will be more or less difficult and costly to formalize the tenure situation. It is noteworthy that these legal procedures for formalization have been designed as individual processes. However, since this is a widespread obstacle affecting millions of citizens, a systematic approach would reduce unit costs by applying economies of scale and would bring significant social benefits.

6. Economic incentives

What poor homeowner - never mind developer, bank, credit bureau or government agency - has any incentive to invest in safer housing and reinforced concrete without evidence of secure, legal ownership and the possibility of getting credit?

While in developed economies (where insurance purchases are mandated) the prospect of lower premiums gives owners an economic incentive to invest in mitigation, in less developed economies insurance against catastrophes generally is not required. Without the savings from lower premiums, even if residents had access to reasonable cost financing, they would have little economic incentive to borrow the money to invest in mitigating a risk with a probability that they largely underestimate.



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We argue that it might be possible, nonetheless, to use the prospect of more rapid formalization of informal construction (to grant higher levels of legal security or to allow owners to make better economic use of their assets) to induce residents living in informal housing to invest in upgrading their properties, creating market opportunities for private sector (banks or microfinance institutions that could channel home improvement credits and insurance companies that could cover homes that comply with minimum standards) and offering governments the possibility of leveraging resources to mitigate hazard risks, while at the same time creating the conditions of legal and physical security to the most valuable asset most families have in the developing world (their homes) and the strengthening of the rental markets.

7. The solution: combining spatial analysis to design innovative housing formalization procedures and retrofit options

The proposed solution is a combination of legal and institutional intervention along with a low-cost and scalable method to assess and provide retrofit services. It encompasses four components geared towards integrating regularization of titles and building licenses with retrofit.

7.1. Assessing risk at micro-scale using available data through new technology

In the absence of current municipal cadasters, how to identify at a micro-scale what areas within informal settlements are eligible for formalization and what areas not? Despite the fact that informal settlements were built under the radar of official records, there exist a lot of available information that properly combined can provide the response.

Seismic vulnerability studies. There exists an array of seismic vulnerability studies carried out in Peru at the district level. Actually, a specific program in charge of the Peruvian Geophysics Institute (Instituto Geofísico del Perú)¹² finance the production of Seismic-Geotechnical Zoning Studies for urban areas. These studies combine geological aspects including soil classification, land morphology, and the dynamic of seismic activities over time to characterize risk prone urban zones (See Figure 1). The purpose of these studies is to promote mitigation and response actions, however their use is limited to central government initiatives triggered usually when disasters

¹² Since 2012 there exist a Result - Oriented Budget Program called “Vulnerability Reduction and Emergency Response for Disasters” under which Seismic Geo-Technical Zoning studies are carried out.
<http://portal.igp.gob.pe/informes-sismicos-especiales>

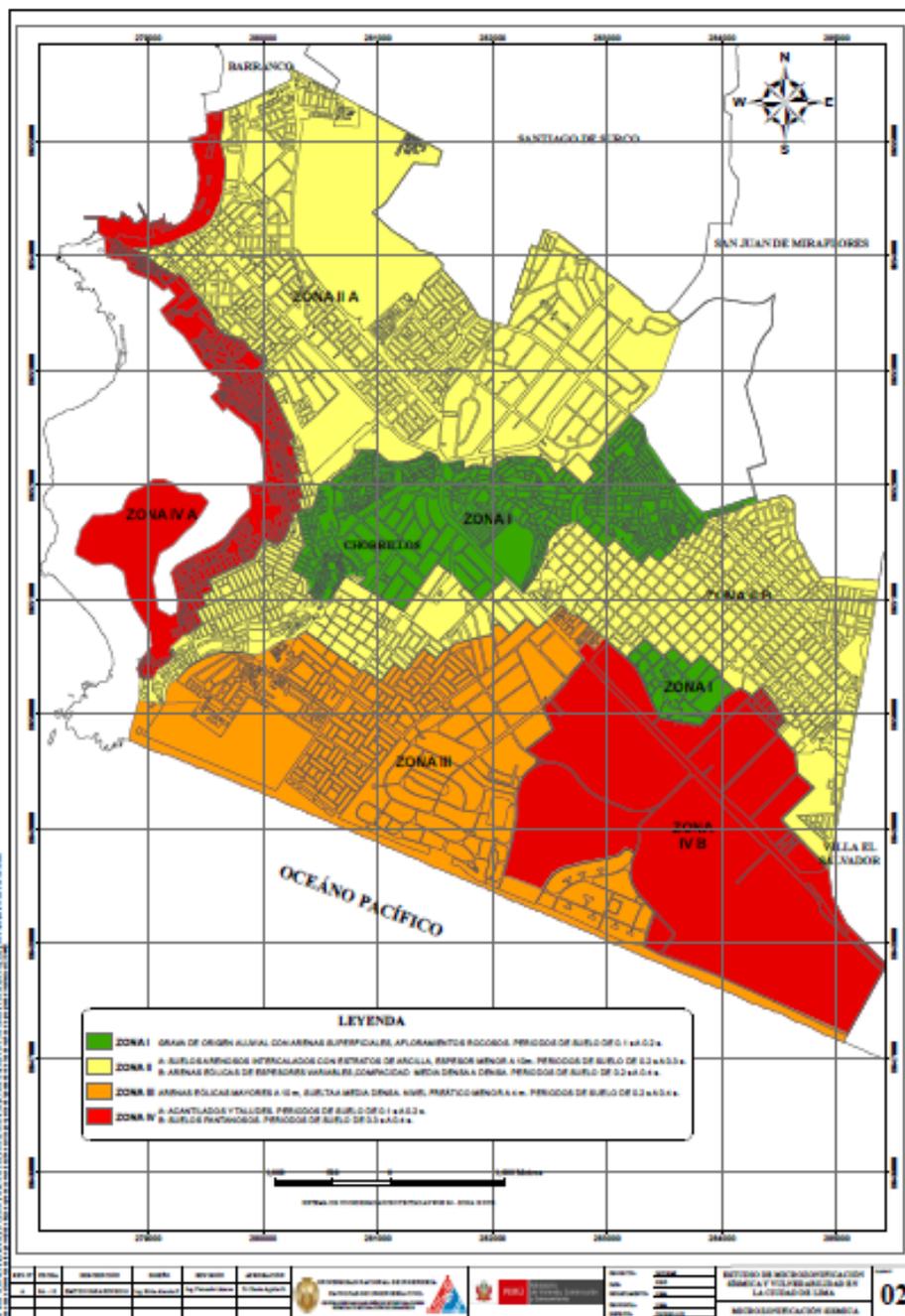


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have already happened. Recently, these Seismic-Geotechnical Zoning Studies have served as a basis for the design of a structural reinforcement subsidies program (see 7.4 below)



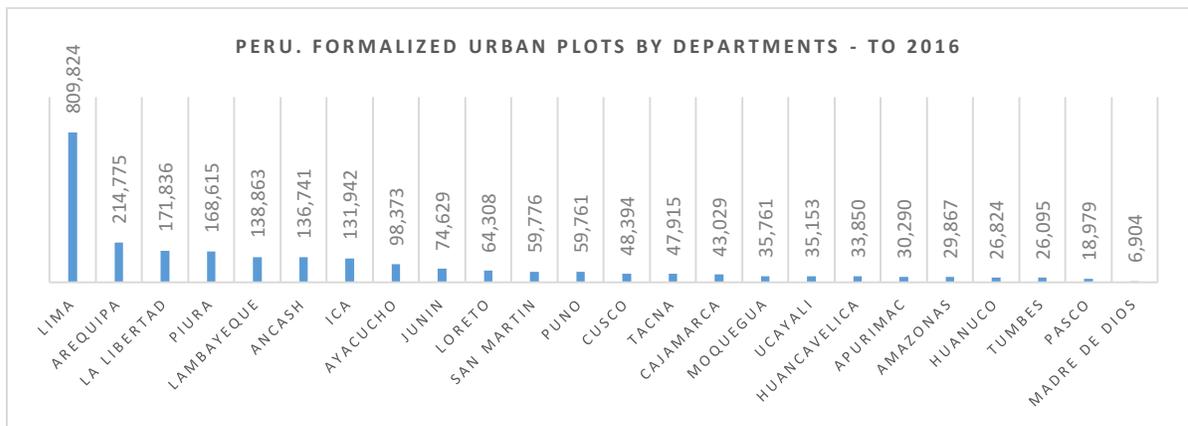
Source: Universidad Nacional de Ingeniería, Centro Peruano Japonés de Investigaciones Sísmicas y Mitigación de Desastres. Ministerio de vivienda.

http://eudora.vivienda.gob.pe/OBSERVATORIO/Documentos/EstudiosyAsistencia/Estudios/MicrozonificacionSismicaLima/Chorrillos/INFORME_MICROZONIFICACION_SISMICA_CHORRILLOS.pdf



Parcel level formalization plans. The urban land formalization programs carried out since 1996 to 2016 produced parcel level plans of 2.5 million formalized plots throughout the country. These plans show the geo-referenced boundaries of the settlement, the outline of blocks and streets, and identify each of the parcels within. This is a very important resource that was used for the purpose of producing property titles for the land only, so they do not show the buildings, and has not been updated since.

Figure 2. Peru. Formalized Urban Plots by Departments.



Source: COFOPRI

Cadastral surveys. COFOPRI, the national urban formalization authority has also carried out different initiatives of cadastral surveys in urban areas covering 855,000 urban plots in 176 municipalities (COFOPRI). These urban cadaster surveys capture not only the characteristics of the plot but also the buildings features for taxation purposes. For different reasons these cadastral surveys were not properly transferred to local governments¹³ but hold valuable geo-referenced information that waits to be used. Other urban cadaster databases directly built by 41 municipalities account for other 547,000 urban cadastral units. (Secretaría Técnica del SNCP). In

¹³ A 2012 study revealed that only half of the municipalities were using the cadaster information developed by COFOPRI led projects, but only to make specific queries, and even those had not integrated the cadastral data for tax collection purposes. Cabrejos Polo, Jorge (2012)



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sum, there exist cadastral surveys for 1.4 million urban plots in 217 municipalities throughout the country, however with very limited use.

Municipal tax rolls. District municipalities of more than 50,000 plots, although do not have complete cadasters, have produced tax rolls covering the consolidated areas of their jurisdictions (typically the commercial and more affluent areas). Although these tax rolls are limited in coverage and the geographic information they contain may not be accurate and is usually outdated, they hold very relevant information about what taxpayers have declared as their land property and its physical characteristics (built area, number of floors, materials used, etc.) The fact that this information is used for the declaration of property taxes paid yearly make it very relevant because it accounts as self-declaration by the owner and is subject to municipal control.

Other geographic information. It is noteworthy that ortophotomaps exist for most of the urban municipalities covered by the cadastral surveys. Although these plans have been produced in different years, they are of a sufficient scale to to identify parcel boundaries and number of floors.

So far, we have described how information about informal settlements exist, although is dispersed, some pieces are outdated and showing different attributes. Well, modern technology allows combining datasets, complement them with recent satellite imagery when needed, and produce thematic maps showing areas (i.e. groups of blocks) where the seismic geo-technical zoning is shown along with the urban landscape characteristics like availability of electricity, water and sewage services, building densification, etc. Moreover, available socio-economic information from census data can be factored to identify income levels by block. Data from water and electricity providers can show availability and consumption, etc.

The results from this analysis is not meant to be conclusive, but sufficient for preliminary characterization of areas of intervention and for preparation of reference base maps useful for planning field visits. For instance, the analysis would be able to show geo-referenced maps describing: i) areas of very high risk where the only option is to prepare reallocation strategies; ii) areas of manageable risk where mitigation measures are viable; iii) areas of low risk in compliance with safety standards. Data from the available tax roll plans would be described in the reference base maps.



7.2. Design of a portfolio of products combining regularization (of title and building) with implementation of retrofit and a plan for further home improvement

Following the categories described in Section 5, the specific legal obstacles and the available remedies for formalizing title can be standardized. Although the variance of the possible situations may seem inestimable, as specific information is gathered, the patterns of most common situations will be identified. Therefore, a suite of “formalization of title products” can be defined and its general costs estimated. Of course, the specific cost for the product applicable to a particular case will have variations that can only be calculated when the details of the case is known. For example, the cost of a transfer from a deceased owner will be higher if the registered owner was not one but three persons, not all present in the house. However this can only be revealed when an analysis of the registered information and a questionnaire is taken.

Similarly, the most common structural risks affecting informal homes allow designing a portfolio of retrofit solutions. As an example, a Micro Zoning Seismic report prepared by CISMID for La Molina district in Lima, included the analysis of a sample of representative buildings within the distinct zones. The study identifies as the most common applicable retrofit solutions: i) reinforcement of existing masonry walls with size or section deficiency, ii) reinforcement of concrete columns, iii) reinforcement of existing column shoe, and iv) inclusion of concrete walls from existing columns (CISMID 2010). Again, the specific cost applicable for a given case can only be calculated when a professional assesses the specific situation. In Colombia, a very interesting experience and a Manual for Assessment and Seismic Reinforcement has been developed by Build Change. The Manual has been approved by the Permanent Advisory Committee for the Seismic-Resistant Constructions in 2015, and sets the criteria and parameters for the assessment, along with information about constructive methods and reinforcement.¹⁴

As it will be explained further in 7.3. , the assessment of the structural risks at individual level herewith proposed would be performed in successive stages. In a first stage a general characterization will be done based on direct observation by the staff gathering data for the

¹⁴ Manual de Evaluación y Reforzamiento Sísmico para Reducción de Vulnerabilidad en Viviendas. Build Change. <http://www.buildchange.org/resources/retrofitting-guides/>



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cadastral survey. In a second, more profound inspection, a detailed assessment and budget will be prepared.

The specific product applicable for a particular urban property will be a combination of regularization of title, regularization of building and retrofit. In the best case scenario, the owner who was formalized by COFOPRI still lives in her property and the building was constructed without license but complying with the technical standards. In this case the applicable product would be only the regularization of building. If the home has more than one independent floors, the regularization of building license would allow bringing to the registry two or more independent property units. An example of a complex scenario, is that the original titled parcel has now been subdivided and informally transferred, a building requiring reinforcement has been constructed and therefore a retrofit investment is necessary to mitigate risks and regularize the building license prior to the registration. Many combinations of situations will apply in practice, but the unit costs of each tailor-made product is able to be estimated.

The regularization of title and bringing the construction to the registry open opportunities for owners to use the registered property as collateral to implement a home improvement plan. A big share of homeowners in peri-urban areas have plans to expand their homes, to host their children in upper floors or to rent rooms or apartments. The housing deficit can find a new source of supply if the millions of one floor homes located in already serviced areas find a way to finance vertical expansion.

7.3. Characterize the settlement at parcel level: carry out a risk-oriented cadaster survey to identify demand for combined title and building regularization with retrofit.

How identifying the specific needs and demand from the citizens? The proposal is to carry out a risk-assessment oriented cadastral survey. The cadastral survey would be designed following a Fit For Purpose Land Administration approach¹⁵ therefore it would not try to comply with the “golden standard” of the Peruvian SNCP, especially regarding the boundary coordinates requirements. This cadastral survey would focus on gathering sufficient information to define i)

¹⁵ The Fit For Purpose Land Administration Approach “calls for a flexible and pragmatic approach rather than requirements imposed through rigid regulations, demands for spatial accuracy and systems that may be unsustainable for less developed countries ...” Enemark, S et al. (2014).



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tenure situation (i.e. the data of the occupants and their tenure condition to define which product of formalization applies), ii) main physical features (i.e. number of floors, m2 of built area), and iii) risk assessment.

Following the proposal of the Minimal Viable Cadaster¹⁶, the projected process make use of the pre-existing information as explained in 7.1. above and reduces costs by refining data capture in successive stages.

In the first stage, with the reference base map and through external observation, the differences between the information on the tax assessment roll and the data observed on site are marked. Although this cadastral survey is risk-reduction oriented, the authority the municipality holds to carry out tax audits is useful to make mandatory the collaboration of the landowners.

From the risk assessment perspective, the inspector identifies the incidence of the structural risk factors for each building. From the tax management control perspective, the output is the classification of three categories of properties: a) concurred plots, where the declared information matches the assessment roll; b) undervalued plots, where the taxpayer declared information is incomplete (not as well built or improved as declared or an obvious change of use e.g. from residential to commercial); and c) omitted plots, where the taxpayer has not declared the existence of a property which is not included in the assessment roll.

The risk data gathered in the first stage is then processed and allows to identify the location - within the previously defined risk micro-zones - of individual buildings affected by structural risk factors. This data may be used to plan the next stage.

In the second stage, the households are visited and inspected to produce a more in depth risk assessment and the cost estimation of the applicable remedy. This in depth risk assessment would produce a “**certificate of risk inspection**” which may declare the home as complying with the structural standards, or may describe the necessary reinforcement measures.

The concept of the certificate of risk inspection has been taken from the experience developed in Colombia and brought to legislation through Decree 1469¹⁷, where the reform allows for the

¹⁶ Endo, Alarco, Triveno (2016)

¹⁷ Decreto 1469 de 2010, modificado por el Decreto 1077 de 2015 (Cap 4)



certificate to have the same legal effects as the building license. According to the Colombian legislation, the certificate or “Acto de Reconocimiento de la Edificación” may be used for the applicants for government home improvement financing programs. When the certificate identifies the need of carry out reinforcement works, the owner has 2 years to execute them (6 years if the municipal authority provide assistance for the retrofit works).

The tax assessment data provides the municipal government with the authority to initiate a tax audit over those undervalued and omitted plots identified. As part of the tax audit, the second visit to the house is also used to complete the information about physical features. The orthophoto serves as a reference to reduce the cost of data gathering. During this inspection, the owner can respond a questionnaire and provide evidence to complete a legal assessment and identify the specific tenure regularization product required for title formalization.

7.4. Design of the intervention: financing of combined title and building regularization with retrofit

The cadastral database complemented with the diagnostic of the formalization requirements and the retrofit needs (crystallized in a “certification of risk inspection”), allows for the identification of the legal route necessary to formalize titles and buildings, the identification of the structural reinforcement needs, and the overall cost of each of the applicable solutions.

The available information may be used to design different types of intervention. Depending on the socio-economic characteristics of the potential beneficiaries and the availability of resources, for some areas the solution would be direct subsidy of the formalization / retrofit package, for others a simplified and low-cost regularization of title product would be offered as a first stage to apply for home improvement financing. This is not a proposition for a single type of intervention, but for targeted interventions adapted to the characteristics of the demand, the available resources and the policy priorities. Although the big numbers show “the informal sector” as a uniform set of those who developed cities at the margins of the legal system, the model here proposed allows to have, at a low cost, information at the parcel level of the specific needs and costs required to formalize and reinforce homes. Consistently with the pace with which citizens build their homes in the informal sector, the solutions can also be incrementally applied over long periods of time.



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The current legislation in Peru allows for private sector simplified formalization of title schemes. The cost of the services can be significantly reduced if a critical mass of cases was clustered to take advantage of economies of scale.

It is worthy describing the existing government program for the granting of subsidies for retrofit in Peru. The BVVRS (Subsidy for the Protection of Seismic Risk Vulnerable Housing) is a non-refundable subsidy addressed to poor households, for structural reinforcement interventions on houses located in seismic vulnerable areas of built in fragile conditions. The Ministry of Housing, Construction and Sanitation (MVCS) manages the subsidy and uses Seismic Micro-zonification studies. The MVCS designs the products and designate the municipalities where the subsidies are offered. The potential beneficiary needs to be owner of the house, be classified as poor by SISFOH (Household Focalization System, managed by the Ministry of Social Inclusion). A qualified private construction company is designated to promote, and manage the retrofit projects. The value of the subsidy is between USD\$ 3,750 and USD \$7,343 for areas between 12m² and 25 m². From October 2014 to 2016, a total of 2,223 subsidies were granted for a value of (USD 951,182) in 10 districts in Metropolitan Lima.

According to a recent report from MVCS, the main obstacles for this program are: a) social problems like the presence of gangs and high incidence of crime in certain areas and a lack of trust from beneficiaries; b) difficulties to qualify the applicants due to informality of titles (deceased registered owners with pending declaration of succession, inability to formalize irregular transfers and subdivisions), c) the cost of retrofit exceeds the available fund or is technically unfeasible. It is also reported that almost 40% of granted subsidies have not been executed due to difficulties of the assigned construction company to provide a letter of credit before disbursement of funds. A serious problem is that the specific assessment of the intervention is produced only after the subsidy has been granted. In other words, the mismatch between the supply and demand is only known after the transaction cost to grant the subsidy has been executed.

The proposed process would prevent the difficulties of direct subsidies programs as the the Peruvian retrofit BVVRS because the specific demand and a good estimate of its costs would be known in advance.



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8. Conclusion.

For families, the housing stock is its most valuable—and sometimes only—assets. Given government budget constraints and that housing policies tend to focus on incentivizing the acquisition of new housing units with a mortgage, families with informal jobs or without the access to a mortgage, are forced to build their homes incrementally, frequently not according to minimal building standards. In the event of a disaster, the largest pool of private assets in developing countries becomes a huge contingent liability to governments.

We propose to realign the incentives of homeowners and authorities to start mapping the existing risk in the housing stock and combining private and public resources to mitigate the risk—when possible. As a result, lives could be saved and eventually assets could be preserved, reducing significantly the government's contingent liability. This solution is relevant for homeowners that aspire to a regularized property to protect it and transfer it to future generations or to take out economic benefit from it. The proposed scheme could also help government to leverage private resources (Peruvian households invest in housing in one year what housing programs invest in more than one decade) to mitigate a risk for which they do not have coverage. It is worth noting that because of its private nature, governments tend to have coverages only for public assets (like schools, hospitals, airports, etc).

The main obstacles that stand in the way are the costs and time involved in regularization process, and the lack of information to plan adequate interventions. Today, they are. With our simplified process, we expect to take them to A and B.

Lastly, for a country that was once a pioneer in massive formalization, the regularization of constructions could be a way to relaunch COFOPRI, an organization that was designed for centralized, massive formalization and cannot manage to adjusted to changes in demand.

The good news is that COFOPRI is reviewing its vision and preparing proposals to lead the formalization of houses through newly designed simplified procedures.



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