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Participatory Mapping to Disrupt Unjust Urban Trajectories in Lima

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Additional information is available at the end of the chapter

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Abstract

This chapter shares the experience of two action research projects ReMap Lima and cLIMA sin Riego, where mapping has been used with three main objectives: to make visible what is otherwise 'invisible'; to open up dialogue between different stakeholders in the city and to arrive at concrete actions, collectively negotiated between citizens and policy makers. Two case study sites were chosen in Lima, Peru: Barrios Altos (BA) in the historic centre and José Carlos Mariátegui (JCM) at the edge of the city. The approach adopted applies a participatory action methodology based on grounded applications and advanced technologies for community-led mapping and visualisation. The chapter reflects upon three interrelated sites of the mapping process: the reading, writing and audiencing of maps and explores how these can provide opportunities to break away from the polar positions often established between Claimant/ marginalised group and the state, thus aiming to contribute to a process of spatial co-learning across typically confronted actors. The two case studies show different possibilities for interrogating the city to provide a spatially and socially grounded way of co-producing knowledge for action that can contribute to the planning of just urban futures.

Keywords: Participatory mapping, Counter-mapping, Drones, Spatial justice, Critical cartography, Urban Global South, Lima

1. Introduction

Acknowledging that maps plays a key role in urban planning and the design and implementation of policies, a critical engagement with the 'work' they do, how they operate and how they come to be made, is important. In many cities across the Global South, the use of maps in decision-

making is increasing. Although maps are often seen as technical means, a shift to positioning them as political devices brings to view the political economy and the unequal development landscape that characterises these cities.

In Lima, the state is investing considerable resources in the production of cartographic information. However, this production is predominantly linked to particular projects or mega-infrastructure developments, making evident the fragmented cartographic landscape of the city where certain areas are over-mapped while others remain under-mapped.

For several decades, Lima has developed through land invasions rather than formal planning [1, 2]. Since the 1940s, the city has undergone an explosive demographic growth to reach an estimated 9 million population in 2015. This process has been underpinned by the inability of city authorities to keep up with the required provision of housing and basic services and also accurately record the extent of Lima. Although a detailed updated overall map of the city does not exist, certain areas have been recurrently mapped supporting dominant visions of how the city is and should develop.

We understand maps as 'neither neutral nor unproblematic with respect to representation, positionality, and partiality of knowledge' (p. 101 in Ref. [3]). Because maps are statements that support the actualisation of ideas [4–6], there is a close relationship between the way in which space is framed and the actions that are given potential with this framing. In this sense, hegemonic representations of how the city should develop can play a role in fostering exclusionary socio-environmental processes. We hereby seek to contribute to the growing critical cartographic and development planning literature to understand how and under what conditions mapping can support socially and environmentally just processes and outcomes.

Much has been written about how maps are part and parcel of dispossession and control, but also resistance. Of particular weight, due to the number of academic contributions, is the link made between map-making and hegemony of the state that dominates map production [7, 8]. An insightful addition to this body of the literature is the notion of 'unmapping' as a form of control. Roy [9], in her article on informality, argues that systems of deregulation and unmapping are interlinked and that regimes of urban governance often operate through them. She explores how state purposefully leaves the peri-urban areas of Calcutta unmapped because doing so allows considerable 'territorialized flexibility to alter land use, deploy eminent domain, and to acquire land' (p. 81 in Ref. [9]). Thus, 'unmapping' can be interpreted as a means of control as well as accumulation.

In recent years, there has been a growing literature in development planning focussing on the role of mapping as a tool for resistance in response to the marginalising authoritative maps produced by state agencies. Here, mapping is adopted as a tactic to enhance the negotiation capacity of excluded groups when fighting towards just processes of recognition and equitable distribution of resources [3]. Several scholars have explored how the mapping of indigenous territories has been used to bolster the legitimacy of customary claims over resources in legal battles [10, 11]. In the urban context, grassroots actors are adopting mapping as a means to contest evictions and relocations [12] and to claim their entitlement to services and urban infrastructure [13, 14].

These accounts can be understood as various forms of ‘counter-mapping’: a term pioneered by Peluso and defined by Harris and Hazen as ‘any effort that fundamentally questions the assumptions or biases of cartographic conventions, that challenges power effects of mapping, or that engages in mapping in ways that upset power relations’ (p. 115 in Ref. [3]). One of the dominant aspects in counter-mapping is the fundamental polar positions established between the ‘us’ (the claimant and marginalised group) against the ‘them’ (the state). This contributes to very long battles where the power and action space is constantly struggled over. Moreover, counter-mapping does not preclude participation and indeed it can solely be expert-led [15].

This chapter explores the possibility of opening up participation in counter-mapping to include a wide range of actors in two research projects led by the authors: ReMap Lima¹ and cLIMA sin Riesgo². Adopting a Participatory Action Research methodology that promotes the ‘plurality of knowledges’, the mapping process is explored as an opportunity for spatial co-learning through an incremental process of network building among ordinary citizens, planners, policy makers, researchers, and advocates. Adapting Rose’s visual methodologies approach [18], the chapter explores how new possibilities for transformative change might be created through three interrelated sites in the mapping process: *reading*, *writing* and *audiencing of maps* [19].

Two case study sites are chosen: Barrios Altos (BA) in the historic centre of Lima and José Carlos Mariátegui (JCM) at the edge of the city. These two neighbourhoods are contrasting not only because of their geographic location but also because the centre has been over-mapped, while the periphery has been rarely recorded through official mapping efforts. Thus, these two areas capture distinct processes of cartographic marginalisation: those of misrepresentation and omission.

2. An overview of the case studies

2.1. Barrios Altos in the historic centre

Barrios Altos (BA) is a deprived and overcrowded area which experienced a steady decline in the living conditions since the 1970s due to a general lack of public and private investment. Local dwellers, mostly impoverished tenants, face the risk of health problems related to inadequate basic services, the structural collapse of buildings and frequent fires caused by precarious electricity connections. Despite being declared a UNESCO world heritage site in 1991, the area is undergoing rapid changes propelled by an illegal land market (**Figure 1**). Due

¹ ReMap Lima is an 18 month project led by the authors that began in November 2013 to interrogate the nature of cartographic representations of marginalised neighbourhoods in Lima. In addition, the project explored the possibilities of opening up the writing of maps to ordinary citizens through the adoption of grounded applications and advanced technologies for community-led mapping and visualisation. For more information, see Ref. [16].

² Building on ReMap Lima, cLIMA sin Riesgo was launched in February 2015 with support from Climate and Development Knowledge Network (CDKN). This action-research project focusses on everyday risks that often go unnoticed, examining how they are produced, where they accumulate and who they affect. It evaluates the public and private investments that are made to cope with and mitigate risk and seeks to produce knowledge and co-funding mechanisms to disrupt urban risk cycles (for more information, see Ref. [17]).

to its strategic location at the geographic centre of the city, and in close proximity to several planned infrastructure projects as well as the central market of Metropolitan Lima, the land is in high demand. Land traffickers use various techniques from coercion to violence to take possession of residential properties and illegally changing them to more profitable uses such as storage facilities for the central market (**Figure 2**). In this way, many of the historic buildings are quietly converted while keeping the facades intact, where new structures are erected replacing the antique interiors. This process affects negatively the built environment eroding the cultural heritage and leading to the eviction of many vulnerable inhabitants who have lived there for generations. These processes are somewhat ‘invisible’ as they are often physically hidden from the street and tolerated by the Municipal authorities.



Figure 1. A building in Barrios Altos marked as ‘Property under litigation’, a sign that illustrates the disputes and conflict with land traffickers posing as owners. Source: Photo by Rita Lambert.

Over time, the city centre has been repeatedly mapped from different perspectives. Existing thematic maps produced by government agencies depict Barrios Altos as a poor zone, overcrowded, with high criminality and at risk of physical collapse. These thematic maps are compiled by PROLIMA, a special municipal body in charge of the strategic vision for the renovation of the historic centre and the Masterplan 2025 [20]. They substantiate the argument for the demolition of 40% of the area [21] and its renovation through private investment which would capitalise on the cultural heritage but in effect lead to gentrification [22, 23].

An interview with the former architect of the plan for the historic centre reveals the assumptions underpinning the mapping of the area to substantiate current redevelopment plans:

‘This area is like a black hole, it is difficult to extract information, as it is difficult to access ... Moreover, many properties are not registered. Not everything can be mapped. We have limited capacity so we concentrated our efforts on certain parts and we second guess what happens in other parts’ (interview with the head architects of PROLIMA, May 2014).



Figure 2. The storage facilities that violate the building height restrictions for the historic centre and come to replace the old structures within an area deemed of monumental value. Source: Photo by Rita Lambert.

Most of the illegal land use changes into storage facilities are not recorded by official maps. Moreover, when representing risk, institutional maps mainly take into account the construction materials of the buildings and the probability of their collapse in the event of an earthquake, thereby disregarding other man-made risks (**Figure 3**).

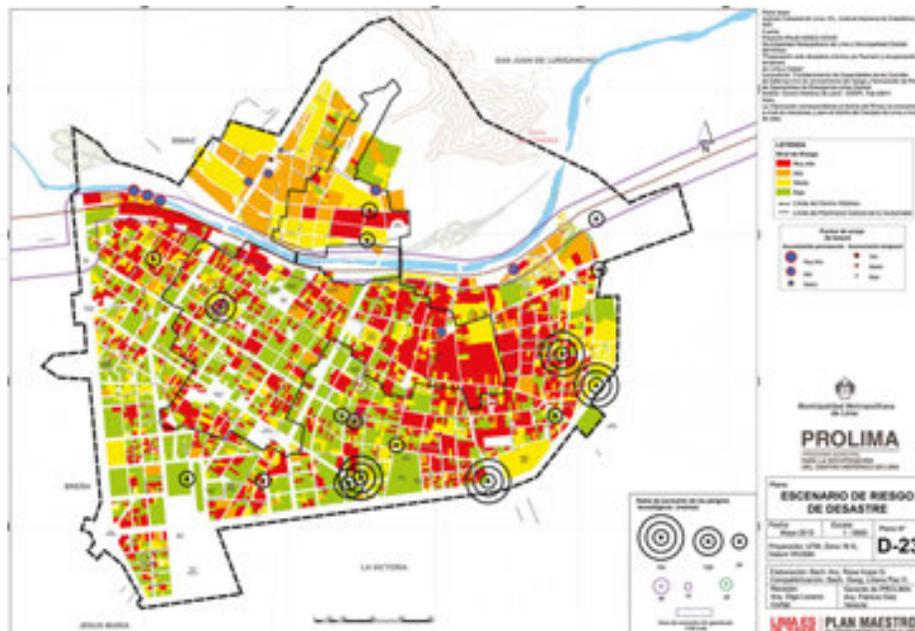


Figure 3. Map showing the scenario of risk of disaster in the event of an earthquake. The map depicts most of Barrios Altos in red at the highest risk of physical collapse. Source: PROLIMA 2013.

Official maps of the area do not consider the daily risks that threaten the most vulnerable segments of the local population, such as fires due to sparks created from exposed cables compounded by the flammable materials held in the storage facilities, or the spread of epidemics due to lack of adequate water and sanitation. For example, a diagnostic map from the public water utility company SEDAPAL portrays this area as well serviced with potable water (**Figure 4**). However, the last infrastructure investments made in this area date back to 1970 (interview with SEDAPAL, May 2015), and the infrastructure is old and prone to leakages. This leads to the contamination of potable water as well as the weakening of the traditional adobe building structures due to the humidity generated. Furthermore, not all households are serviced with potable water. One house, that used to accommodate a single family, is now typically subdivided to accommodate several families of tenants, who, in many cases, rely on a single water point in the courtyard of the *quinta* or multi-family housing unit. In some instances, water is rationed by the inhabitants themselves, as they often rely on one metre and share the bill.

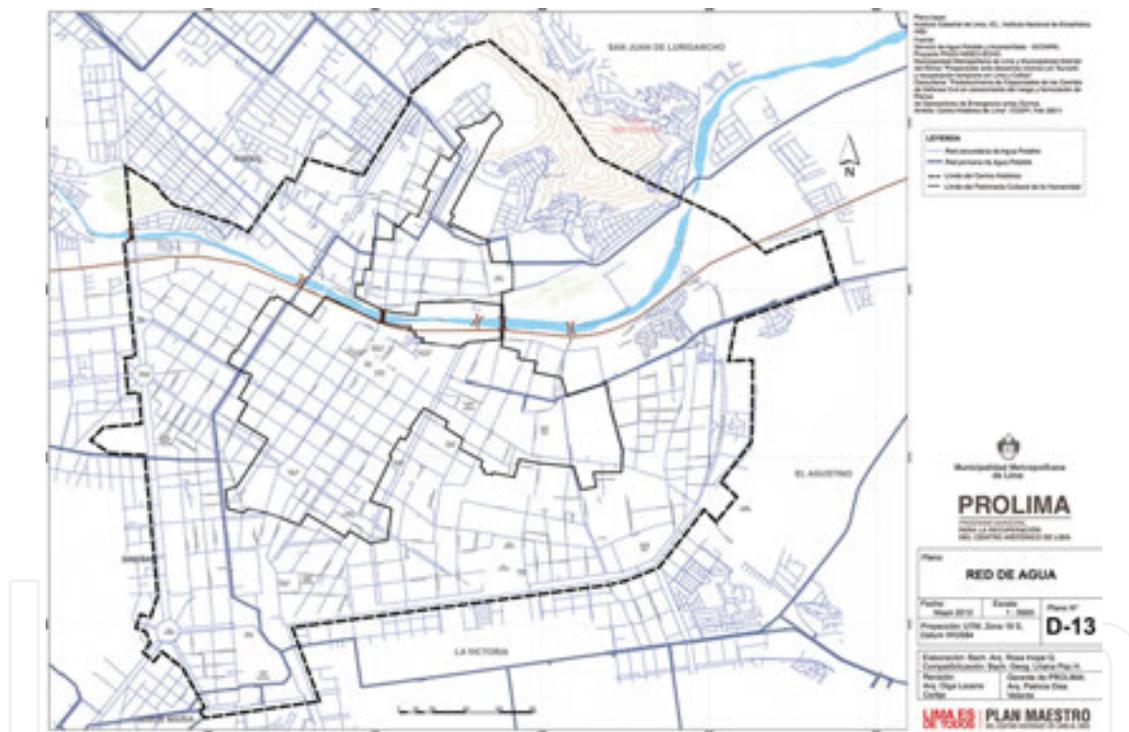


Figure 4. SEDAPAL map showing an extensive water network in the whole historic centre, portraying the area as well serviced with potable water but in effect hiding the reality of many residents who do not enjoy individual water connections. Source: PROLIMA 2013.

This type of map conceals the severity of the problem, funnelling public investments elsewhere whilst thousands of residents struggle to access water in an area considered the foundation of the city of Lima. Although the historic centre has been over-mapped through time and is, at the moment, at the centre of government projects, everyday risks are rendered invisible. Moreover, because the renovation of the area remains a top-down endeavour with the diagnostic and proposal stages removed from the reality experienced by tenants on the ground

and with no active intervention to stop the negative processes, the loss of the cultural heritage, which includes its people, is rapidly occurring. The vacuum in effective management, the lack of a robust diagnosis of the lived reality in the area and the exclusion of inhabitants from participating in decision-making processes to redevelop the area, limit the scope of urban renovation projects and programmes.

2.2. José Carlos Mariátegui at the periphery of the city

In the absence of a national housing policy and affordable land in the central areas of Lima, the urban poor are forced to occupy informal settlements on the steep slopes at the city's edge. Many of these areas coincide with the local ravine ecosystem or '*Lomas Costeras*': an essential ecological infrastructure for recharging the aquifers that guarantee water for Lima and regulate the effects of climate variability. Located in San Juan de Lurigancho, the most populated and poorest district of Lima, José Carlos Mariátegui (JCM) is one of these areas and was established in the 1990s through a first wave of invasions. Constituted by various settlements, each working within its own boundary, JCM suffers from uncoordinated actions and fragmented planning, which contribute to the production and reproduction of conditions of risk for the local dwellers (Figures 5 and 6).



Figure 5. The continuous occupation of the steep slopes in JCM leads to the production and reproduction of risks and the increased vulnerability of the inhabitants. Source: Photo by Rita Lambert.



Figure 6. As people flatten the plots to then build their house, they contribute to the instability of the slope and increase the risk for others. Source: Photo by Rita Lambert.

Overall, the area is rapidly urbanising with the continuous influx of people. Moreover, large-scale land traffickers operate here to capitalise on the barren areas of land upslope by opening up new roads, dividing the land into plots and selling them off. The never-ending occupation of the steep slope is exacerbating the vulnerability of the population, as access to basic services becomes ever more difficult for those located in the upper part and the increased instability of the slope worsens the risk of rockfalls and structural collapse of retaining walls.

In contrast with BA, JCM is under-mapped with few and often outdated maps produced by municipal authorities and Civil Defence. These maps only partially capture the risks that threaten the area and exclude the newly established settlements, as these have emerged after the stipulated cutoff date of 31 December 2004 for formal land titling by the National Government. As the residents consolidate these settlements under precarious physical and legal conditions, they are often excluded from public plans and investments to improve housing, basic services and social facilities.

In order to gain official recognition from the district government, local community organisations—also known as *Agrupación Familiar* (AF)³—hire professional topographers to produce schematic plans of their own settlements, which are then submitted to the local municipality (**Figure 7**). Only once these plans have been certified by the latter, can the inhabitants begin the process of requesting basic services such as water and electricity.

³ An AF is a community organisation that governs by the facts all collective affairs in the neighbourhood and operates as the interface with governmental institutions and programmes, as well as with neighbouring settlements and informal land traffickers.

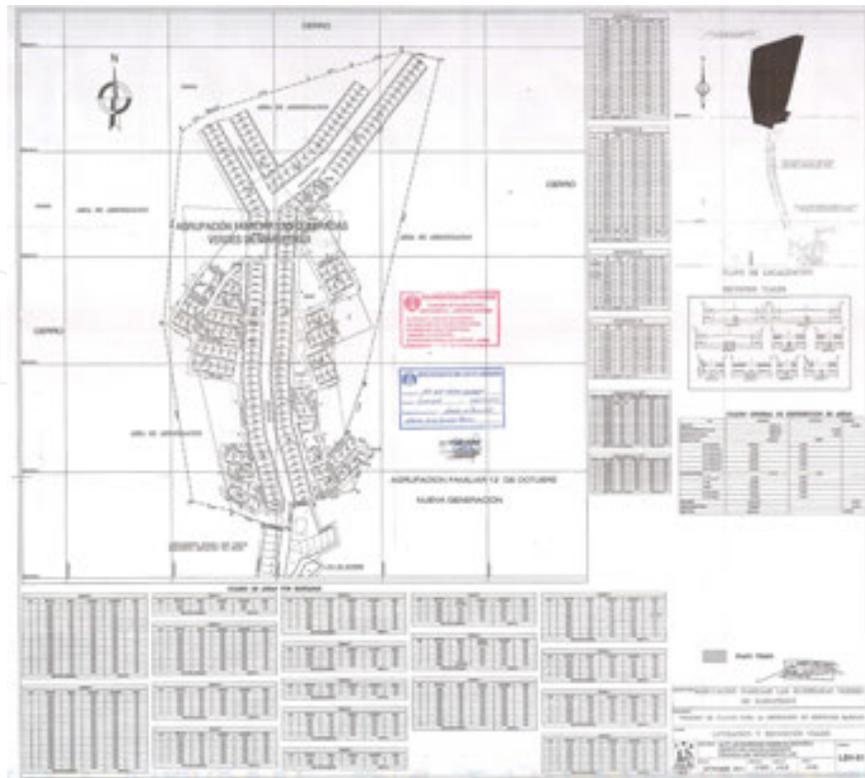


Figure 7. An example of a certified map. Source: Quebrada Verde, JCM.



Figure 8. The vertical staircases of JCM are planned and built in such a way that they increasing the risk of accidental falls. Source: Photo by Rita Lambert.

These plans or maps are diagrammatic and lack any details of the context, such as adjacent settlements or contour lines. They represent the terrain as flat, thereby failing to record the risks associated with the occupation of the steep slopes. The lines on the map are directly transposed onto the ground, demarcating the plots that will soon be occupied. In most cases, the layout works against the contour lines making it difficult to access the plots through the resultant steep stairs and paths and increasing the risk of accidental falls (**Figure 8**).

These plans are also used by community organisations to subdivide plots further up slope. In the absence of public recognition and investments, the selling of new plots carved out of the slopes is often regarded as the only viable financial source to improve the liveability of the most consolidated parts of the settlement. In short, these abstract plans do not reflect the challenges associated with the exponentially increasing risks produced by the urbanisation of the area.

Landing in these conflict-ridden contexts, the research projects ReMap Lima and cLIMA sin Riesgo built upon an existing network of partner organisations and local community groups with whom the authors established a productive working relationship in 2012, in support of existing processes for transformative change. These projects have a strong mapping component where the reading, writing and audiencing stages are used to improve the spatial knowledge of these areas and to identify how risk is distributed and with what consequences for the most vulnerable. Besides the ambition of producing robust evidence and counter-map how these areas are represented, the mapping process is designed to bring together various stakeholders from state authorities, local communities, academics, NGOs, and to open up critical reflection and foster the design of integrated responses and co-financing mechanisms to reduce and prevent risk.

3. Sites of participatory mapping

3.1. The site of reading

The reading of maps refers to the critical questioning of 'who' maps and what is included/excluded. Focussing on official maps that dominate the framing of particular areas helps to bring into view who and what is left 'off the map' and why. This interrogation contributes to the examination of the socio-environmental power struggles at play and the actions that are justified through cartographic devices. The process of reading maps as texts that bring forth particular arguments [24, 25] facilitates the identification of those cartographic devices to be rewritten to contest hegemonic representations. Recent literature has provided valuable insights into how maps work, arguing that maps are not fixed representations but are rather in constant flux, as each encounter with a map produces new meanings and engagements with the world [26]. Although reading is subjective, we contend that a collective reflective position can be attained when the reading of maps is a debated process.

The projects seek to create such spaces for critical reflection to interrogate why certain representations and ways of mapping are stabilised, what consequences these might have and

how new possibilities can be imagined for more inclusive representations that can effectively contribute to breaking risk accumulation cycles. For example, cLIMA sin Riesgo facilitated several forums bringing together public entities who work on disaster risk management, preservation of cultural heritage, urban regeneration, infrastructural service provision, urban development planning and land use zoning. One of the objectives was to contrast and evaluate the different methodologies adopted by these organisations to map risk.

The discussion confirmed that everyday risks and episodic disasters are often disregarded. Most institutions define risk management strategies, relying on sectoral statistics and often outdated and non-georeferenced data. Agreeing that this approach limits a comprehensive understanding of the spatial distribution of risk and its accumulation over time and also hinders the design of effective structural solutions, participants agreed on the importance of reconsidering how risks are cartographically captured. Moreover, public institutions confirmed that they rely mostly on scientific studies and the prediction of large-scale disasters as principal tools to identify and visualise risk on official maps. Last, but not least, they acknowledged the need to take into account everyday risks to enable a prospective approach to risk management and prevention.

However, the established official way of mapping risk overlooks the potential of knowledge co-production through participatory mapping processes in the identification of small-scale hazards. Integrating interdisciplinary and inter-institutional platforms into the mapping process has proven to be effective in bridging the 'them' and 'us' divide and questioning the entrenched institutional modes of framing risk as well as marginalised areas and how they are cartographically represented.



Figure 9. The aerial photographs produced by the drones were used in various workshops and focus groups, with local dwellers actively engaging in their critical reading. Source: Photo by Rita Lambert.

Moreover, the production of robust data that make visible many of the otherwise 'invisible' changes occurring in the study areas creates more traction to address such changes.

In February 2014, the ReMap Lima project started with the production of high resolution 2D and 3D images captured through drones. The unregulated environment in Lima regarding the use of drones made it possible to produce these images. As one of the co-investigators notes, this would not have been possible to do in London and such a high resolution image cannot be attained (interview with Andy Hudson-Smith, June 2015). Although there is controversy regarding the application of drones, as they are typically associated with military use and surveillance, if used sensitively, they can help advance the visualisation of recurrently disregarded realities. We could not rely on satellite images because they were outdated and did not provide the level of detail required to analyse and capture dynamic ongoing changes. The images produced were highly revealing and easier to read than any other drawn map, particularly for the inhabitants that had never seen their neighbourhood from this perspective (**Figure 9**). A new reading of the areas could be attained through two important factors: the level of detail captured, and the scale jump which the bird's-eye view provided.

In BA, the view from above made visible the otherwise 'unseen' processes occurring behind both conserved and deteriorating facades. This included the storage facilities and the buildings, which had experienced eviction (**Figure 10**). Moreover, from the 3D digital model, one could discern the violation of building height restrictions stipulated for the historic centre, which occur behind facades that mask such processes (**Figure 11**).



Figure 10. Close-up detail on the 2D image of BA showing the eviction of one multi-family housing unit, Isaias Clivio. Source: ReMap Lima.



Figure 11. 3D point cloud produced with the drone to show building heights in BA. Source: ReMap Lima.

In JCM, the high-quality images exposed the different practices adopted by land traffickers, such as the tracing of plots to be urbanised and the opening up of new roads. Unlike the maps produced by the AFs, the 3D image revealed the topography and the risk produced by the continuous urbanisation of the steep slopes. Furthermore, this image captured the whole ravine, showing the shifting borders and the loss of ecological infrastructure as the *lomas* are encroached (**Figure 12**). It also made evident the disjunctures between the various settlements, raising awareness of the ravine as a system which needs consolidated planning efforts at a larger scale. As a JCM inhabitant and mapper notes:

'People often don't know what is happening at the back of their own settlement ... Working with this technology has meant that a lot of information was gathered about the risk areas. With the drone images, the leaders realised that new roads were being opened and they started to pay attention to the matter, raising awareness of their community and promoting the planning and safeguarding of open spaces' (interview with JCM inhabitant, May 2015).



Figure 12. 3D point cloud of JCM. Source: ReMap Lima.

The production of cartographic images that can be easily read is crucial to engage local dwellers and gives them a sense of empowerment. As one of the local partners and co-investigator notes

in the case of BA: *'for the neighbours, having this aerial photo, is like having the urban block in their hands... it has given a lot of information... the mapping process has helped to strengthen social organisation'* (interview with Silvia de los Rios, July 2015).

01-3D scanning using drones

SenseFly eBee drones were used to capture aerial images, as well as point clouds with the height of building and terrain.



02-Generation of Mesh

Using a 3D computer program (Rhino), the point cloud was triangulated and converted into a mesh.



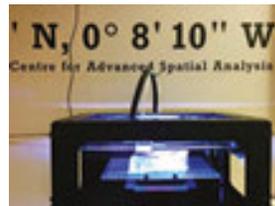
03-Digital Modeling

Based on the 3D mesh, the buildings were modeled in detail. The heights were provided by the mesh whilst the details of the buildings were taken from the 2D aerial images.



04-3D printing

The digital file produced was 3D printed in ABS plastic with a 3D Maker-Bot. As this is an automated process, it permits the completion of models in a short period of time.



05-Final details on the physical model

To make it easier to identify buildings, photographs of the facades were adjoined to the models and the aerial images were used as a base.



06-Projection on physical models.

Various variables collected were projected onto the models to facilitate their reading.

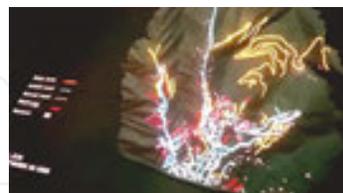


Table 1. The process from the drone image capture to the printing of 3D models for planning for real workshops.

Table 1 explains the process adopted to use the drone data to make physical models that can be used in planning for real workshops with community groups. Being able to produce various outputs—from a model of the whole ravine in JCM which can be handheld to a large aerial image where people can immerse themselves—helped to grasp the spatiality of problems at various scales and to guide discussions about the scale of action required, as well as informing the site of writing of new maps.

3.2. The site of writing

The site of writing focuses on the collective decision of what to map, how to map and towards what end. It also encompasses the actual process of data gathering in the field and its representation on maps. The writing process began with a discussion of 'why to map' together with community mappers comprised of women and men inhabitants and community leaders from the two areas. Mapping was identified by the participants as a means to document and denounce otherwise invisible practices. It was also seen as a strategic activity to understand trends and ongoing processes of change by institutions and real estate developers. Moreover, the process was also seen as a useful means to identify the social and material resources of a neighbourhood and to promote strategic interventions.

Subsequently, transect walks were designed together with local dwellers (**Figure 13**), and the variables to be recorded were also agreed. A manual, as well as a digital process, was used to gather the data (**Figure 14**).



Figure 13. The mappers of BA collecting information during the transect walk. Source: Photo by Rita Lambert.

The manual process involved the use of the drone images as base maps and the annotation of relevant information identified through the transect walks. The map was completed with the stories, experiences and knowledge of local dwellers through photographs and short-filmed

interviews, which were keyed into online maps. In parallel, the digital process used a number of open source mobile phone applications such as Epicollect+, MyTracks and Twitter⁴, which helped the systematic data collection, and the speedy integration of the georeferenced surveys in Quantum GIS. We organised training workshops in order for participants to learn how to use these programmes and to visualise the information gathered. Although there was differential engagement among community mappers due to the agility required to work with such technologies, the main aim of these workshops was to allow everyone involved to become familiar with the way the technology works and its possibilities. The capacities required within each of the mapping teams were flexible enough to allow different roles to be comfortably filled by participants.



Figure 14. Preparing for the transect walk together with community mappers. Source: Photo by Flora Roumpani.

For cLIMA sin Riesgo, a total of 700 georeferenced surveys were undertaken at different scales, including information at the household level in both areas, at the block and multi-family housing unit level in BA, and at the settlement level in JCM. The survey questionnaires contain social and economic aspects such as the local dwellers' individual and collective capacity to save and investments made to mitigate risk. The questionnaires also recorded physical aspects such as living conditions, construction materials and the type and state of available infrastructure and services, as well as the specific hazard that affect each area. This knowledge complements scientific and sectoral studies, determining with more precision the location of physical threats and revealing other sources of risk and vulnerabilities. Moreover, it allows an under-

⁴ Epicollect+ provided the recording of a number of variables in a survey format at point location; MyTracks was useful for line tracing, and Twitter was experimented with as a real-time collector ideal for purposes of emergency reporting.

standing of the inhabitants' perception of risk and the identification of the capacities required to respond to these risks effectively and preventively.

The information-gathering process in the field promoted the interaction of community mappers with a large number of women and men dwelling in both areas. In the case of JCM, mapping across settlements was important to establish new social relations, reflect collectively upon common problems and discuss ways to consolidate efforts, halt urban expansion and plan this area. The mapping process was articulated to a series of capacity-building workshops run by CENCA (Instituto de Desarrollo Urbano), a progressive NGO and partner in cLIMA sin Riesgo with a long-established presence in the area. The entire process helped raise awareness and strengthen local capacities and encouraged the participation of community leaders and local inhabitants. This process was particularly targeted towards young people, who were trained as community mappers, enabling them to gain a better understanding of the reality affecting their own neighbourhoods. In BA, the leaders took the opportunity to reach out to their neighbours, explaining the importance of self-enumeration and mapping, not only to make visible the conditions in which they live but also as a means to strengthen social organisation and collective action. As stated by two of the mappers in BA:

'They [those involved in ReMap Lima] began mapping from the air and then we walked from door to door. As community leaders, we became aware of many problems: lack of water services, lack of electricity, collapsed sewerage pipes. Despite being in the modern era, we still live precariously' (interview with local leader and BA mapper, May 2015).

'The mapping process was useful to me and the other mappers and helped us to understand the reality of the neighbourhood. For us tenants, the project helped us to see that we have to organise ourselves to fight for better housing conditions' (interview with BA mapper, May 2015).

3.3. The site of audiencing

The site of audiencing involves making collective decisions on who should see the maps, where they should be displayed and how to frame new interpretations emanating from the contrasting of existing and newly written maps. A cyclical process is thereby established as one moves back to the site of reading, evaluating the meanings that emerge from new written maps.

An important consideration concerns the exposure of sensitive information, particularly when working with vulnerable and highly contested territories such as BA and JCM. In both areas, if misappropriated, the data collected could be used against its intended aims and further promote land trafficking. Because the mapping process includes government institutions and various actors, which might have multiple and overlapping identities (for example, a local leader might have vested interests to engage in the pirate subdivision of plots), issues of co-option and questions of who owns the process and the Information need careful consideration [27].

Foreseeing how the cartographic information produced could be misappropriated and by whom is an important aspect of counter-mapping. As demonstrated by various scholars, serious questions are raised regarding the unintended negative consequences of counter-mapping [10, 11, 28, 29]. In the two projects discussed, the researchers from UCL and the

partner NGO hold the bulk of the sensitive information. However, as sharing what emerged throughout the research process is strategically important to expand the network of allies and advocates and provide a learning platform, various forums were devised. On the one hand, workshops, exhibitions and international conferences⁵ provided the space to attract a wide audience, including community-based organisations, government institutions, academics, activists and even remote mappers.⁶ On the other hand, we provided an online platform to share non-confidential qualitative and quantitative information produced throughout the research. This takes the form of a publicly accessible 'Online Story Maps' hosted by (ESRI) digital platform (**Figure 15**). These maps offer a nuanced reading of the actual conditions shaping urban risk and allow those involved in the research, as well as other audiences, to understand how risk accumulation cycles operate, thus enabling a reframed diagnosis of the process of urbanisation in risk, but without disclosing information that could potentially exacerbate such process.

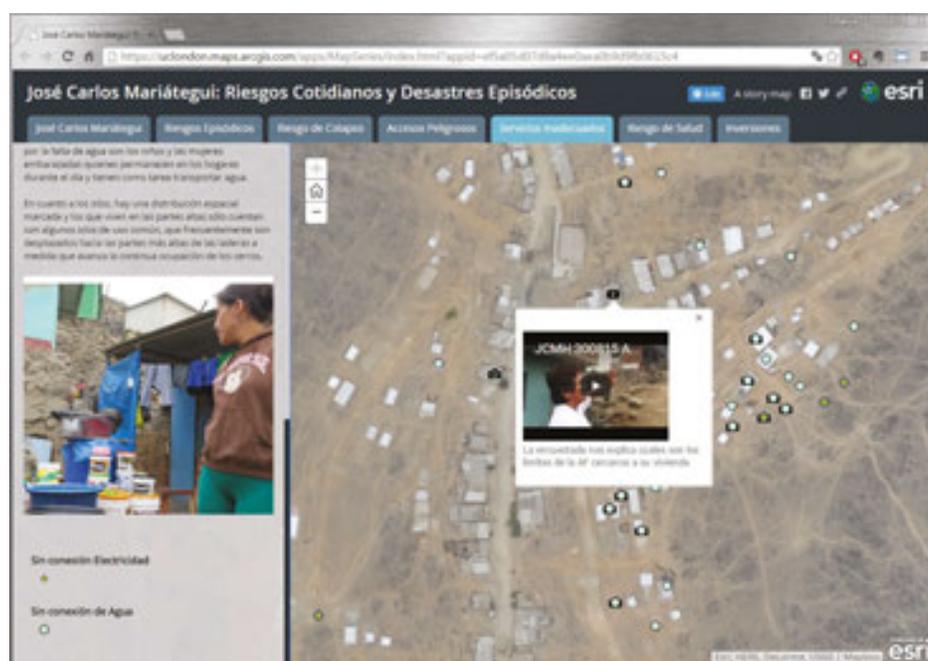


Figure 15. Online story map publicly available can be easily navigated to apprehend: (1) the different causes of everyday risk and episodic disasters; (2) where and why potential impacts manifest; (3) who is affected, why and where; (4) the relationship between different types of risk; and (5) the actions and investments made to mitigate or reduce risk.

Displaying the information with a clear narrative, which includes photographs and video testimonies from local dwellers, and structuring the information under different themes for

⁵ The projects were exhibited at the COP21 in Lima, public exhibitions in London (The Building Centre, July 2015) and at various sites in Lima since November 2015, reaching over 3000 visitors. Moreover, they were presented at various conferences including: GISRUK Leeds 15–17 April 2015 and Foro Centro Vivo, Lima 28 April 2016.

⁶ The projects drew in the unforeseen involvement of remote mappers. Within three days that the 2D drone image was donated to OpenStreetMap, mappers from afar staked their piece of the earth. JCM was traced discerning the dirt roads, staircases and building structured. Examining Lima on OpenStreetMap, one sees that this is the only area in the periphery that has been mapped with such detail.

each area, guide viewers in the reading of these maps, reframing the problematic and the actions that need to be taken. All the while providing credible quantitative evidence accompanied by the actual voices of those living in that reality, the online story maps move away from using strict cartographic conventions. They thus suspend the need to 'appropriate the state's techniques and manner of representation to bolster the legitimacy [of claims]' (p. 384 in Ref. [10]), which reveal but inherently abstract, efface and omit [11, 10, 30]. Many negative unintended consequences of counter-mapping (especially of indigenous territories) have been attributed to the 'forced' adoption of the cartographic conventions in order for the information not to be dismissed in dialogue with authorities.

4. Concluding remarks

The two action-research projects examined in this chapter have provided an invaluable experimentation space to push new possibilities for the spatial analysis of marginalised areas that are altogether omitted or misrepresented in official maps. It has also shown how the articulation of different types of knowledge throughout the mapping process can offer a more precise and comprehensive spatial and social diagnosis.

The three sites of mapping, reading writing and audiencing, show different opportunities for how one can interrogate the city and provide a spatially and socially grounded way of producing knowledge for action. Besides enabling the creation of legitimate and robust evidence for the understanding of risk, these sites play different roles in facilitating co-learning and the co-production of knowledge through an incremental process of network building among local dwellers, researchers, planners and advocates. These three sites are not only interrelated but also iterative.

Reaching beyond the local site of map production by those putting forward their claims, the chapter shows that it is possible and effective for counter-mapping initiatives to consider at points the inclusion of the very institutions that play a role in propagating the dominant framings of the areas. Also, one cannot strictly pertain to the hegemony of the state and see institutions that constitute it, as a solid impenetrable unit. The research reveals that officials have the capacity and the will to reflect on what needs to be changed and aspire to work towards more socially and spatially just outcomes. More needs to be done on this front to open up spaces for collective reflection and to move beyond the everyday constraints that might limit such opportunities, as one official notes: *'we are so busy earning a living, we have no time or energy to think about how and why things could be different ... we do what has been done because it is less trouble ... but if we have a chance to stop and think, anything is possible'* (interview with official from Civil Defence, October 2015). Overall the challenge is always to sustain and scale up multiple engagements and carve new avenues for those excluded in the city to have a voice in urban policy and planning issues and conceptions. Notwithstanding that knowledge production is a site of power struggles, using the mapping process to foster a political space for dialogue, can open-up new opportunities to coordinate the transformative actions required to interrupt unjust urban trajectories.

With respect to scaling up, there have been some advancements made in cLIMA sin riesgo, propelled to a large extent by the mapping process, that relate to the setting up of local observatories⁷. These are platforms devised with local communities and institutions that will continue monitoring through mapping how risk operates and how it can be addressed.

On another note, ensuring that the mapping from the air using drones and mapping from the ground with community mappers goes hand in hand was a crucial aspect for the demystification of technology. The articulations of various mapping methods served the very practical purpose of enabling local dwellers to have accessible means to engage with the problematic and analyse it at different scales, raising awareness and critical reflection and promoting alternative framings and imaginations of the future. As the potential impact of such technologies in these kinds of contexts is still unknown, it is crucial to critically evaluate the potentials and limitations of such tools in advancing grassroots practices and claims for resistance.

In our experience, one has to acknowledge the role that the technology itself and innovative visualisations can play in fostering progressive and constructive iterations in the reading, writing and audiencing of maps; whether this is linked to the possibility of grounding such methods to enable local dwellers to become active players in the use and construction of cartographic devices, or by attracting the attention of institutions to seek more efficient ways to capture how cities change and why. The participation of citizens in state mapping initiatives can be problematic if it is only a means for the efficient and cheap collection of data. Although questions of co-optation are still present, the writing of inclusive representations of the city is an avenue towards the planning of more socially and environmentally just cities. Towards this end, counter-mapping, together with other processes, can play a key role in fostering genuine commitment towards participation in knowledge production and spatial co-learning.

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⁷ In BA the observatory brings together the Ministry of Culture, Ministry of Housing, UNESCO, Municipality of Lima, amongst others to work on (1) a deeper diagnosis of the situation, (2) a way of responding to emergencies and (3) the design and implementation of regeneration projects [31, 32].

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