Sidewalk Accessibility in the US and Mexico: Policies, Tools, and A Preliminary Case Study

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Abstract
We examine US and Mexico disability rights legislation and its relevance to accessible pedestrian infrastructure, provide an overview of civic tools for sidewalk mapping and assessment in Mexico, and describe the initial deployment of one such tool, Project Sidewalk, into two Mexican cities.

Author Keywords
Urban accessibility, sidewalks, policy, civic tools, Mexico

Introduction
In the US, sidewalks have been shown to offer public health, economic, environmental, and accessibility benefits [9,17]; however, few studies have examined sidewalks in developing regions. In this workshop paper, we provide an overview of US and Mexico disability rights legislation and its relevance to accessible pedestrian infrastructure. Within this context, we highlight efforts in Mexico to map and assess sidewalks and describe the initial deployment of one such tool, Project Sidewalk, into two Mexican cities (Fig. 1–4). We close by enumerating key challenges.

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Background
Sidewalks play a crucial role in a city's urban mobility and quality of life. They can provide a safe space for pedestrians, help interconnect mass transit services, and also serve as unique public spaces for food, commerce, and leisure [15]. In Mexico, 55% of school commuters and 23% of workers travel by walking or rolling [32]; however, an alarming 44% of traffic-related deaths are pedestrian—often due to poor or non-existent pedestrian infrastructure. For people with disabilities, safe and accessible sidewalks can be even more important, affecting independence [25], quality of life [16], and overall physical activity [2]. The quality of sidewalks is, therefore, crucial to ensuring people's accessibility and mobility rights. Below, we provide brief historical overviews of disability rights legislation and sidewalk policies in the US and Mexico.

US Policy and Accessible Sidewalks
Spurred by returning WWI veterans with injuries, initial US disability policies focused on employment and rehabilitation services [11]. By the 1960s, however, the disability rights movement helped reframe disability not as a problem of mind or body but as a socially constructed form of societal oppression [7]. Bolstered by these efforts, the Rehabilitation Act of 1973 was passed, stating that no qualified individual with a disability should be excluded from or denied benefits of any program receiving federal

Fig. 1: The Project Sidewalk labeling interface (in English) showing a labeled street scene in Azcapotzalco, MX with a curb ramp (green label), a missing curb ramp (red), and a tree and pole in the middle of a narrow sidewalk (blue).

Fig. 2: The Project Sidewalk interface (in Spanish) showing narrow sidewalks with surface problems (orange labels) and physical obstacles (blue labels) in Azcapotzalco, MX. Screenshot from Twitter @Gari01234.

assistance (Section 504). It was not until the landmark *Americans with Disabilities Act* (ADA) in 1990, however, that protections were extended beyond the government sector. Critically, the ADA recognized the minority status of Americans with disabilities—modelled after the *Civil Rights Act* of 1964—and required places of "public accommodation", including sidewalks, to provide people with disabilities appropriate aids or services [1].

Together, the Rehabilitation Act and the ADA regulate the accessibility of public rights-of-way and facilities in the US [36]; however, they do not define the specific accessible design requirements themselves. For this, the US employs the *US Access Board*—an independent federal agency [34,35]. For pedestrian infrastructure specifically, the Access Board specifies technical requirements for sidewalks, including a minimum 1.5m (5ft) passing width, a maximum 5% grade, and curb ramps at intersections—requirements that have helped inform the design of our interactive civic tools.

Mexico Policy and Accessible Sidewalks

Like the US, disability-related policies in Mexico began in the mid-20th century. In 1944, *Ley del Seguro Social*[1] was passed to protect workers injured by occupational hazards followed by broader social assistance programs in 1977 (DIF[2]). It was not until 2005, however, that the first national law was signed to specifically protect the rights of individuals with disabilities, called *Ley General de las Personas con Discapacidad*[3] [23]. This law mandated the creation of a federal agency, the *Consejo Nacional para las Personas con Discapacidades*[4] (CONADIS), charged with guiding and monitoring disability related programs throughout other government agencies.

In 2011, Mexico passed more comprehensive disability rights legislation, called the *Ley General para la Inclusión de las Personas con Discapacidad*[5] (with significant revisions in 2018) [24]. Like the ADA, this law guarantees the rights of people with disabilities and promotes, protects, and ensures the inclusion of disabled citizens in society. While sidewalks ("banquetas") are not mentioned, the law stipulates that public spaces and urban environments should be accessible and those that are not should be progressively updated. Similar to US law, Mexican legislation does not specifically enumerate technical design requirements; however, in 2019, design guidelines were published for street-level projects[6] [31]. Some city governments have gone beyond federal policy. For example, since 2016, Mexico City has passed a series of local legislation and guidelines to improve public transit and sidewalks for safety and accessibility [3–5].

Important Policies but a Lack of Tools and Accountability

While the disability rights legislation and accessible design requirements in both countries demonstrate commendable progress, there remains a lack of tools, data, and open standards for tracking sidewalks, their topology, and their accessibility [8,29]. Consequently, it is difficult to assess sidewalk development and ensure compliance with recent legislation. Typically, in the US, large-scale sidewalk accessibility renovations occur only in response to civil rights litigation such as in New York [12], Seattle [10], and Los Angeles [27]. For example, in response to a lawsuit, LA recently pledged $1.3 billion to fix broken sidewalks and address accessibility problems—estimating that over 40% of the city was affected [27]. Accessibility audits are also expensive: Seattle paid $700,000 to survey just the curb ramps in the city [10]—again in response to a lawsuit.

[1] Social Security Law
[2] Sistema Nacional para el Desarrollo Integral de la Familia
[3] General Law of Persons with Disabilities
[4] National Council for Persons with Disabilities
[5] General Law for the Inclusion of Persons with Disabilities
[6] It is not clear if these are enforceable standards like in the US

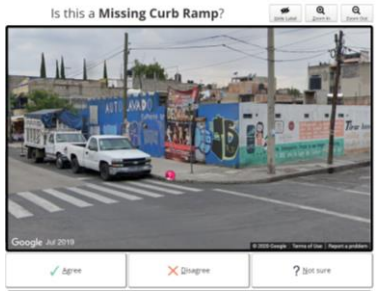

Fig. 3: In addition to sidewalk *labeling* missions, Project Sidewalk users are also given *validation* missions to verify labels from other users. Shown above, a user is asked to verify a *missing curb ramp* label (which is correctly placed in this case).

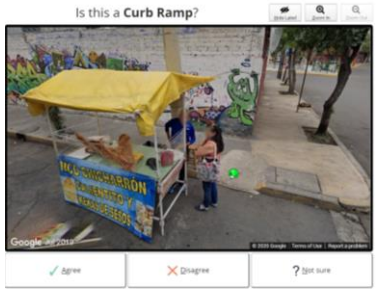

Fig. 4: Another validation interface example. Here, a user validates a curb ramp label, which again is correct, but the pathway is partially obstructed by a food stand. Pop-up markets are a strong part of Mexican culture and provide an important informal economy; however, they can present unique accessibility challenges on sidewalks and streets.

Sidewalk Data and Civic Tools in Mexico

Given the recency of pedestrian and sidewalk accessibility policies in Mexico, there is a growing movement of activists and tools. In 2010, Mexico conducted a national housing inventory, which included physically surveying sidewalks across 40 cities (1,129,728 blocks in total) and released the data publicly [13]. They found that 33% of blocks had full sidewalk coverage, 36% had partial coverage, and 27% were without sidewalks [22]; however, the survey did not collect data on nor analyze accessibility-related features such as sidewalk surfaces and curb ramps.

In addition to government efforts, grassroots organizations and NGOs have conducted pedestrian infrastructure audits, typically using paper forms and on-site inspections. For example, *Caminito de La Escuela* provides paper forms for citizens to evaluate pedestrian environments around schools, including sidewalks, crosswalks, and vehicular traffic [18]. Similarly, *La Banqueta se Respeta* collects data on sidewalk quality via in-person, paper-based mapping exercises—and use the resulting data to influence public policies [19]. Others take a more direct activist approach, such as *Grupo Salvando Vidas Oaxaca* who document and fix sidewalk problems on their own [9]—reminiscent of the 1970s DIY ramp activists in the US [12]

Most relevant to our work are interactive civic tools that rely on crowdsourcing such as *Mapatón* for bus routes [26], *Supercívicos* for documenting public infrastructure as a citizen journalist [37], and *Mapeatón* for sidewalk accessibility [6]. Mapeatón is a community mapping project: volunteers upload geo-referenced photos/videos of sidewalk journeys to Mapillary, particularly when using wheelchairs or pushing strollers (similar to *JourneyCam* [28] in the UK). In general, while these on-site physical inspection techniques provide the "gold standard" for pedestrian infrastructure audits, they can be expensive, logistically difficult to manage, and limit both *who* can supply data and *how* much data each individual can supply.

Project Sidewalk in Mexico: A Case Study

In our work, we are exploring complementary sidewalk auditing approaches that are fast, low-cost, and scalable using a combination of remote crowdsourcing, machine learning, and online map imagery. Our most recent tool, called *Project Sidewalk*, enables online crowdworkers to remotely label sidewalks and find and identify accessibility problems by *virtually* walking through city streets in Google Street View (Fig. 1-4). Rather than relying solely on local populations, our potential user pool scales to anyone with an Internet connection and a web browser. In a 2018 pilot deployment, 1,400 users from across the world virtually audited 2,934+ km of Washington DC streets, providing 255,000 sidewalk accessibility labels with 92% accuracy [30]. We have now expanded to three more US cities: Seattle, WA, Newberg, OR, and Columbus, OH. Project Sidewalk and all collected data is fully open and accessible at http://projectsidewalk.io/api.

In early 2020, we were contacted by *Liga Peatonal* ("Pedestrian League")—an NGO focused on pedestrian improvements to increase the safety and accessibility of public spaces in Mexico—to explore deploying Project Sidewalk in Mexico. Working closely with their staff, we have been translating Project Sidewalk's interfaces into Spanish, adding locale-specific label tags, and co-brainstorming Mexico-dependent features. As a start, we deployed Project Sidewalk into two major metropolitan areas: the Azcapotzalco municipality in Mexico City (population 400,000; 33.6 km^2) and San Pedro Garza García (SPGG) in Monterrey (population 122,000; 69.4 km^2). While the Azcapotzalco deployment is grassroots, we are working directly with the local government in SPGG—the mayor helped launch the site in August 2020 [33].

Thus far, we have collected 10,313 sidewalk accessibility labels across 115.9km (72 miles) of streets in Azcapotzalco and SPGG (Table 1). While our deployments are ongoing and our analysis preliminary, we found that sidewalk

	Users	Total km Complete	Total Labels
Seattle, WA	1,626	1,618.1	92,591
Columbus, OH	278	195.8	17,590
Newberg, OR	204	224.6	16,076
Azcapotzalco, MX	255	80.7	5,864
SPGG, MX	269	35.2	4,442

Table 1: The number of users, total km audited, and sidewalk accessibility labels collected across five Project Sidewalk sites.

	Curb Ramp	Missing Curb Ramp	Missing Sidew.	Obstcle	Surface Probl.
Seattle, WA	1.5 (0.7)	3.8 (1.0)	4 (0.8)	3.2 (1.1)	2.9 (0.9)
Colum., OH	1.4 (0.7)	3.8 (1.2)	4.1 (1.1)	2.2 (1.4)	2.1 (1.0)
Newb., OR	1.5 (0.7)	3.9 (1.0)	3.9 (0.9)	3.1 (1.1)	2.7 (1.0)
Azcapo., MX	2.8 (1.4)	4.7 (0.6)	4.6 (0.8)	4.1 (1.0)	3.6 (1.2)
SPGG., MX	2.8 (1.4)	4.4 (0.9)	4.5 (0.9)	4 (0.9)	3.6 (1.1)

Table 2: The average severity ratings for curb ramps, missing curb ramps, missing sidewalks, obstacles, and surface problems. Ratings are 1-5 (5 is worst). Standard deviations are in parentheses.

Fig. 5: Example curb ramps in Mexico rated as poor quality.

accessibility issues in both Mexican cities were both more common and rated worse, on average, than labels of the same type in our three most recent US deployments (Table 2). For example, there are 2.5 surface problems per 100m in Azcapotzalco *vs.* 0.6/100m in Seattle and 1.4/100m in Columbus, and the average curb ramp was rated as a 2.8 severity *vs.* 1.5 in the other cities (higher is worse).

Discussion and Conclusion

In this workshop paper, we described civic tools for sidewalks in Mexico, including two initial Project Sidewalk deployments, and the surrounding socio-political context regulating accessible design. Below, we enumerate key challenges co-identified by our cross-regional team.

Data for advocacy and change. While there is a recent push towards open data and evidenced-based decision making in Mexico (*e.g.,* the *Agencia de Innovación Pública* in Mexico City), we believe our work with SPGG is the first collaboration between a local government and a pedestrian-related crowdsourcing tool in Mexico. This collaboration is similar to Project Sidewalk's Newberg deployment where we worked with community activists and the city government. Here, Project Sidewalk's data was used to successfully lobby for new sidewalk-related funding programs (see visualization). Similarly, SPGG plans to use Project Sidewalk data to inform public policy, assess and triage problems, and as an outreach tool to involve citizens. However, as we describe in our recent CSCW paper [29], the design, availability, use, and maintenance of sidewalks are shaped not just by policy but by socio-cultural influences and competing funding priorities.

Who participates? As a remote tool, *anyone* on the Internet can contribute to Project Sidewalk; however non-local users may lack cultural awareness and miss or misidentify problems. Moreover, the reliance on technology itself can be exclusionary. In Mexico, 43% of the population uses a computer and 66% have a smartphone [14]. Liga Peatonal recently suggested creating paper "audit" forms for some members in their community (to be manually filled out and entered into the Project Sidewalk database). To reduce the need for a computer, we have also been increasingly adding smartphone-related features.

Why participate? To engage users, Liga Peatonal hosts virtual mapathons and advertises on social media [20,21] but sustaining participation is challenging. From informal conversations, most registered users are committed pedestrian or disability rights enthusiasts; however, Project Sidewalk itself currently has no specific features to support community building or a shared sense of social participation—which both our partners in the US and Mexico have requested (*e.g.,* discussion forums, leaderboards). In some cities (DC and Seattle), we have employed paid crowdworkers from Mechanical Turk—which allows us to quickly audit large areas—but requires external funding and does not draw upon local citizens.

The need for mixed-methods. To fully assess sidewalk infrastructure, its use, and barriers to change, we suggest a mixed-methods approach, including ethnographic observation of sidewalk usage, interviews and surveys of key stakeholders, and an examination of federal and local legislation and policy. As a complement, Project Sidewalk's data affords both geo-spatial quantitative analyses—similar to that presented in Table 2—as well as qualitative examinations of the image-based labels—for example, to discover and taxonomize the types of problems in a city. We have found that the images themselves are powerful and help contextualize the numerical analyses (Fig. 5).

In closing, our overarching aim is to develop new low-cost and scalable sidewalk tracking tools that support evidence-based advocacy and policymaking, provide government accountability, and enable new pedestrian tools. With the Spanish-based version of Project Sidewalk and our collaborators at Liga Peatonal, we have an

opportunity to explore deployments in other regions in Central and South America. At the workshop, we look forward to discussing this possibility and pedestrian-related civic tools more generally in the US, Mexico, and beyond.

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