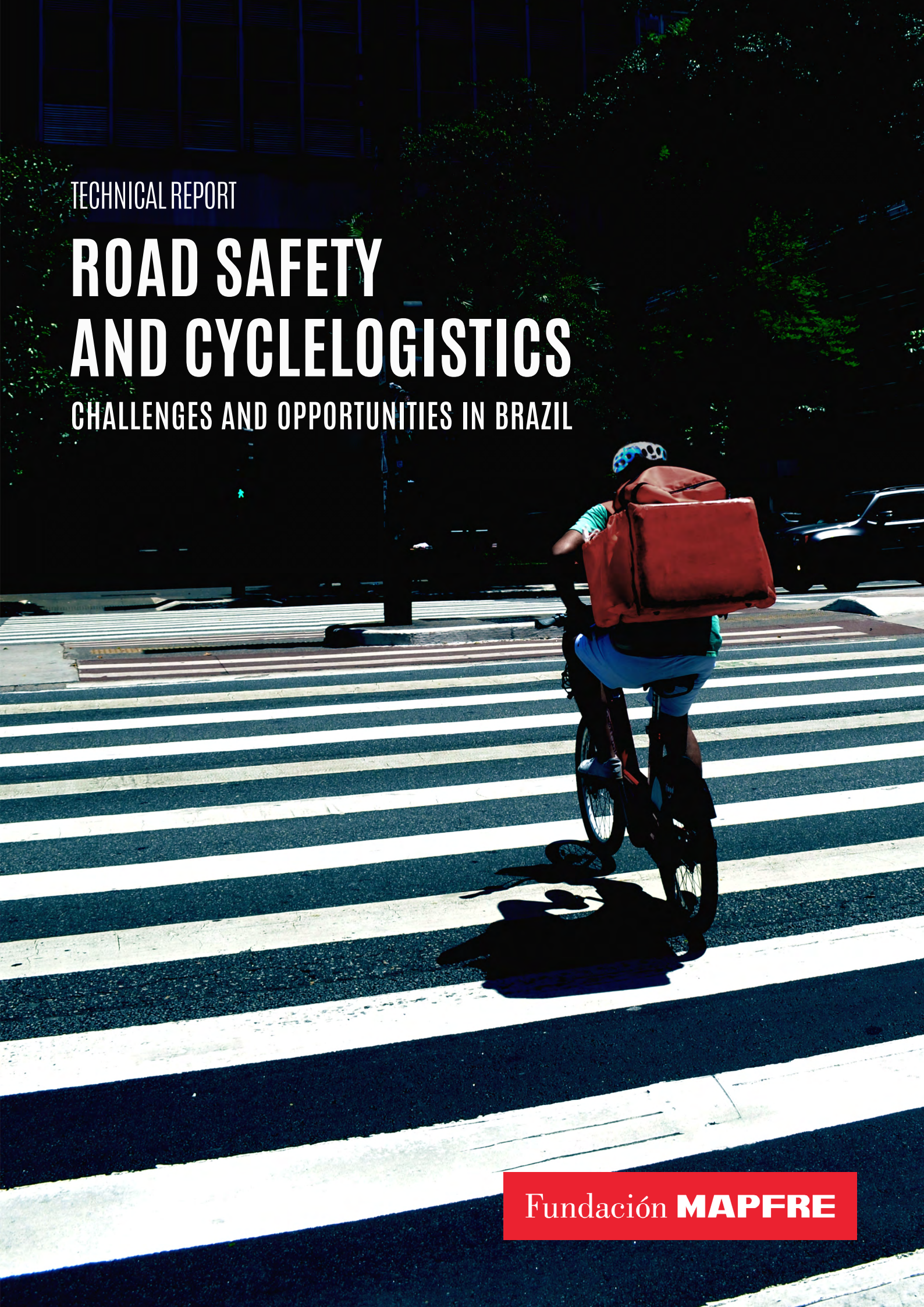
TECHNICAL REPORT

ROAD SAFETY AND CYCLELOGISTICS

CHALLENGES AND OPPORTUNITIES IN BRAZIL



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PRO URB PROGRAMA DE PÓS-GRADUAÇÃO EM URBANISMO

LABMOB Laboratório de Mobilidade Sustentável

Source: Jéssica Lucena, 2021.

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RESUMO EXECUTIVO

O presente estudo apresenta um diagnóstico sobre a ciclologística no Brasil através da lente da segurança viária, buscando uma compreensão sistêmica das questões que interpelam esse ecossistema. As informações coletadas mostram a perspectiva dos entregadores-ciclistas sobre a percepção de segurança viária em seus deslocamentos e condições de trabalho. O estudo também tem como objetivo identificar boas práticas de segurança viária nas atividades de ciclologística desenvolvidas por agentes privados e seus reflexos nas dinâmicas de trabalho dos entregadores, além de contribuir para o embasamento de novas políticas públicas e regulamentações voltadas para a ciclologística. O estudo foi desenvolvido pelo Laboratório de Mobilidade Sustentável (LABMOB), do Programa de Pós-Graduação em Urbanismo (PROURB), da Universidade Federal do Rio de Janeiro (UFRJ), com apoio da Fundación MAPFRE.

Os dados foram coletados mediante aplicação de questionário estruturado, respondido por 336 entregadores que utilizam bicicletas elétricas pertencentes a sistemas de compartilhamento em São Paulo (SP). As entrevistas em profundidade[1] com entregadores e representantes de empresas e coletivos, acompanhamento etnográfico com entregadores, caracterização viárias de ruas indicadas por mais e menos seguras, e contagens de ciclistas nas ruas indicadas foram avaliados dentro de estudos de caso feitos em Curitiba (PR), Fortaleza (CE) e São Paulo (SP).

Em geral, os entregadores são jovens (de até 30 anos), pretos ou pardos, com média escolaridade, que se deslocam até o trabalho por meio de transporte público ou bicicleta. As condições de trabalho e inadequação da cidade às suas necessidades de deslocamento são questões indicadas por esses trabalhadores, que ocupam cerca de um terço de seus dias trabalhando nas ruas sob o pedal.

A maioria dos participantes afirma ter algum tipo de medo em relação à profissão, como sinistros de trânsito, furtos e assaltos, furto de bicicleta, sensação de vulnerabilidade em relação aos veículos motorizados e agressão física. A alta taxa de indicação de "medos" acompanha uma baixa taxa de seguridade social, considerando seguros de saúde, vida e odontológico.

Todos já se envolveram em sinistros de trânsito ou presenciaram algum acontecimento do tipo, e isso influenciou seus comportamentos durante os deslocamentos. A maioria dos sinistros relatados ocorreu por desatenção ou falta de educação envolvendo carros. O "estar visível" perante os carros se mostrou uma importante preocupação dos entregadores para evitar sinistros de trânsito.

As análises dos dados coletados mostram que ainda existem desafios a superar em frentes relacionadas à temática, como condições de trabalho dos entregadores, infraestrutura viária urbana pertinente às atividades ciclologísticas, acesso a veículos e equipamentos, falta de regulamentação específica e políticas públicas voltadas à categoria.

Por fim, o estudo propõe ações que visam a trazer soluções para os desafios identificados e que se relacionam também às questões sobre operação, políticas públicas e regulamentação e produção e divulgação intensivas de conhecimento e dados sobre a ciclologística e segurança viária. Devido ao caráter sistêmico e abrangente das dificuldades mapeadas, recomenda-se que as ações sejam desenvolvidas de forma participativa, incentivando o diálogo entre os atores envolvidos na segurança e ciclologística no país.

Fonte: Doug Oliveira / Ciclolguaçu, 2021.

1 *Ao longo do relatório são indicadas citações diretas de falas das pessoas entrevistadas porém estas falas não necessariamente refletem o posicionamento da Fundación MAPFRE com relação ao tema. A Fundación MAPFRE é responsável pelo fomento financeiro a pesquisas desse caráter, objetivando a redução e até mesmo a não ocorrência de sinistros e mortes em decorrência do trânsito.*

EXECUTIVE SUMMARY

This technical report presents a diagnosis of cyclelogistics in Brazil through the lenses of road safety. Moreover, it identifies relevant aspects in bike couriers' traveling journeys from a systemic understanding of the issues challenging this environment. The collected data reveal how the bike couriers - the main actor - perceive road safety in their traveling journeys and working conditions. Additionally, the report aims to identify good cyclelogistic practices developed by private actors, and how they affect the work dynamics of bike couriers while contributing to the development of new public policies and regulations for cyclelogistics. The research was carried out by the Laboratório de Mobilidade Sustentável (LABMOB), of the Postgraduate Program in Urbanism (PROURB) of the Federal University of Rio de Janeiro (UFRJ), with support from Fundación MAPFRE.

The data was collected through a structured questionnaire applied to 336 bike couriers who use electric bicycles from a sharing platform to work in the city of São Paulo (SP). Furthermore, case studies were conducted in Curitiba (PR), Fortaleza (CE) and São Paulo (SP). The case studies allowed for in-depth interviews[1] with bike couriers and spokespeople of companies and collectives, ethnographic monitoring with bike couriers, road classification of predetermined streets from more to less safe, and counts of cyclists on the predetermined streets.

On average, the bike couriers are young (up to 30 years old), black or brown-skinned people, with intermediary educational level, and who travel to work by public transport or bicycles. The bike couriers, who spend around one-third of their days traveling through the city, highlight the working conditions and inadequacy of the city for their work.

Most respondents say they are afraid of their profession due to reasons such as traffic accidents, theft and robbery, bicycle theft, vulnerability in relation to motor vehicles and fear of physical violence. Despite the high rate of fearness, there is a low rate of safety provided, when considering health, life and dental insurances available to the bike courier.

Moreover, every single bike courier has been involved in traffic accidents or has witnessed such an event, which influenced their behavior when traveling as a bike courier. Most of the reported accidents occurred due to a lack of attention or education from cars involved in the situation. An important concern for bike couriers to avoid traffic accidents is making themselves visible.

The analysis of the data demonstrates that several challenges still need to be overcome in different areas of cyclelogistics. Examples are the working conditions of bikes, urban road infrastructure relevant to cycling activities, access to cycling vehicles and equipment, and lack of tailored regulations and public policies aimed at this working class.

Finally, the study proposes a series of actions aimed at developing solutions to the identified challenges. These actions relate to the matter of operation, public policies and regulation, and the extensive production and sharing of knowledge and data on cyclelogistics and road safety. Due to the systemic and comprehensive nature of the identified issues, it is recommended for actions to be designed in a participatory process, fostering dialogue among the actors involved in security and cyclelogistics within the country.

The content of this technical report is structured in six chapters: i) introduction; ii) methodology; iii) conceptual framework; iv) results and analyses; v) best practices and recommendations; vi) final considerations.

1 *Throughout the report, direct quotes from the speeches of the people interviewed are indicated, but these statements do not necessarily reflect Fundación MAPFRE's position on the subject. Fundación MAPFRE is responsible for financially promoting research of this nature, with the aim of reducing and even preventing accidents and deaths resulting from traffic.*

RESUMEN EJECUTIVO

El presente estudio presenta un diagnóstico sobre la ciclologística en Brasil a través de la lente de la seguridad vial, buscando una comprensión sistémica de las cuestiones que interpelan este ecosistema. Las informaciones recolectadas muestran la perspectiva de los repartidores-ciclistas sobre la percepción de seguridad vial en sus desplazamientos y condiciones laborales. El estudio también tiene como objetivo identificar buenas prácticas de seguridad vial en las actividades de ciclologística desarrolladas por agentes privados y sus reflejos en las dinámicas de trabajo de los repartidores, además de contribuir para el embasamiento de nuevas políticas públicas y reglamentaciones direccionadas a la ciclologística. El estudio fue desarrollado por el Laboratorio de Movilidad Sostenible (LABMOB – Laboratório de Mobilidade Sustentável, en portugués), del Programa de Posgrado en Urbanismo (PROURB), de la Universidad Federal de Río de Janeiro (UFRJ), con apoyo de la Fundación MAPFRE.

Los datos fueron recolectados mediante aplicación de cuestionario estructurado, respondido por 336 repartidores que utilizan bicicletas eléctricas pertenecientes a sistemas compartidos en São Paulo (SP). Las entrevistas en profundidad[1] con repartidores y representantes de empresas y colectivos, el seguimiento etnográfico con repartidores, la caracterización vial de calles indicadas como más y menos seguras, y el conteo de ciclistas en las calles indicadas fueron evaluados dentro de estudios de caso realizados en Curitiba (PR), Fortaleza (CE) y São Paulo (SP).

En general, los repartidores son jóvenes (de hasta 30 años), negros o mestizos, con media escolaridad, que se desplazan hasta el trabajo en transporte público o en bicicleta. Las condiciones laborales y la inadecuación de la ciudad a sus necesidades de desplazamiento son cuestiones indicadas por estos trabajadores, que ocupan cerca de un tercio de sus días trabajando en las calles bajo el pedal.

La mayoría de los participantes afirma tener algún tipo de miedo con relación a la profesión, como siniestros de tránsito, hurtos y asaltos, hurto de bicicleta, sensación de vulnerabilidad con relación a los vehículos motorizados y agresión física. La alta tasa de indicación de "miedos" acompaña una baja tasa de seguridad social, considerando seguros de salud, vida y odontológico.

Todos ya se han involucrado en siniestros de tránsito o han presenciado algún acontecimiento similar, y esto ha influenciado sus comportamientos durante los desplazamientos. La mayoría de los siniestros relatados ha sucedido por desatención o falta de educación relacionadas a los coches. O "estar visible" ante los coches se ha convertido en una importante preocupación de los repartidores para evitar siniestros de tránsito.

Los análisis de los datos recolectados muestran que aún existen retos a superar en frentes relacionados a la temática, como condiciones laborales de los repartidores, infraestructura vial urbana pertinente a las actividades ciclologísticas, acceso a vehículos y equipos, falta de reglamentación específica y políticas públicas direccionadas a la categoría.

Por fin, el estudio propone acciones que visan traer soluciones para los desafíos identificados y que se relacionan también a las cuestiones sobre operación, políticas públicas y reglamentación y producción y difusión intensivas de conocimiento y datos sobre la ciclologística y seguridad vial. Debido al carácter sistémico y amplio de las dificultades mapeadas, se recomienda que las acciones sean desarrolladas de forma participativa, incentivando el diálogo entre los actores involucrados en la seguridad y ciclologística en el país.

Fuente: Adriana Marmo, 2021.

1 *A lo largo del informe son indicadas citas directas de las personas entrevistadas, sin embargo, estos discursos no necesariamente reflejan el posicionamiento de la Fundación MAPFRE con relación al tema. La Fundación MAPFRE es responsable por el fomento financiero a investigaciones de este carácter, objetivando desde la reducción hasta la no incidencia de siniestros y muertes en consecuencia del tránsito.*

APRESENTAÇÃO DO ESTUDO

Sábado à tarde, a noite chegando e continua chovendo. Com esse tempo não dá vontade de sair! Por isso decidimos curtir um filme com a família, na tranquilidade e segurança de casa. E já que vivemos na correria a semana toda, e queremos descansar, vamos pedir a comida em um restaurante aqui perto e esperar o entregador de bicicleta chegar com o pedido. Ou estamos isolados em casa por causa da pandemia, precisando de um remédio; então fazemos a compra pelo aplicativo para que a farmácia entregue a encomenda em casa. Ou estamos no trabalho e temos que mandar um documento urgente, então decidimos usar uma alternativa sustentável: pedimos que um entregador-ciclista faça o serviço.

Em qualquer desses casos, a questão é que um trabalhador usando uma bicicleta percorre a cidade para realizar a tarefa, muitas vezes aceitando altos níveis de risco viário. A percepção de insegurança nas vias, combinada com outros riscos da profissão, e a ausência de apoio ou segurança no trabalho causam um impacto direto na decisão de permanecer na profissão, e são poucos os trabalhadores que consideram continuar nela em longo prazo. Além disso, 67% dos entregadores afirmam sentir algum medo com relação ao seu trabalho e 87% reconhecem ter medo de sofrer um sinistro no trânsito.

A Fundación MAPFRE, em parceria com o Laboratório de Mobilidade Sustentável (LABMOB) e o programa de pós-graduação da Universidade Federal do Rio de Janeiro, quis conhecer a visão dos próprios trabalhadores- ciclistas, com foco em sua segurança viária, e aprender com as boas práticas de seis empresas brasileiras. O resultado é um dos maiores trabalhos de pesquisa em nível mundial, se não o maior até momento, com o qual podemos aprender não apenas no Brasil, mas em todos os países do mundo onde o setor de ciclologística teve um crescimento exponencial: o estudo indica que o número de ciclistas entregadores de comida com bolsas térmicas aumentou mais de 5 vezes entre 2018 e 2019 em algumas áreas do Brasil, enquanto outras pesquisas sugerem que entre esses dois anos o número de entregadores autônomos teria dobrado no Brasil.

A temática não é nova para a Fundación MAPFRE, pois há anos estamos desenvolvendo e coletando materiais para melhorar a segurança dos entregadores-ciclistas ou *riders* ou *bikers*, algumas vezes em colaboração com empresas líderes do setor na Espanha. Todas essas informações estão disponíveis em: https://www.seguridadvialenlaempresa.com/publicaciones-recursos/recursos-materiales/.

A metodologia do estudo combinou diferentes ferramentas, como pesquisas com um total de 336 entregadores-ciclistas da cidade de São Paulo (SP) (24 deles mulheres), entrevistas em profundidade e acompanhamentos etnográficos de 12 entregadores (incluindo uma mulher) de seis organizações que operam nas cidades de São Paulo (SP) , Curitiba (PR) e Fortaleza (CE), entrevistas em profundidade com 6 dos responsáveis pelas referidas empresas e associações, análise desse mesmo número de casos práticos, dois workshops com a participação de 24 pessoas e entidades diretamente relacionadas com a ciclologística e sua segurança viária, revisão bibliográfica, etc.

A primeira conclusão é que o ecossistema da ciclologística conta com uma grande variedade de organizações: desde empresas de entrega com uso exclusivo de bicicletas ou empresas com veículos diversos, incluindo bicicletas, até oficinas de bicicletas ou empresas de aluguel de bicicletas elétricas, que também oferecem diferentes tipos de serviços de apoio aos trabalhadores desse setor, empresas locais que têm serviços de entrega para seus produtos e, por último, associações informais de mulheres entregadoras e outros coletivos.

A segunda conclusão é a variedade das relações de trabalho existente: trabalhadores com contrato por tempo indeterminado, além de outros tipos de contratação, e aqueles que trabalham como autônomos mediante várias plataformas ou aplicativos de entrega ou distribuição. A relação de trabalho, como foi possível verificar, determina o tipo de cobertura social e de saúde, e a realidade é que um número considerável desses trabalhadores não tem, no Brasil e provavelmente em muitos outros países, cobertura em caso de doença, lesão durante o trabalho, danos à bicicleta (sua ferramenta de trabalho), etc.

O estudo definiu cinco dimensões que impactam as condições em que a ciclologística, e sua segurança, é desenvolvida: os próprios entregadores ou trabalhadores ciclistas; as bicicletas e os equipamentos de segurança; as empresas ou os coletivos e associações; a infraestrutura urbana e, por último, a legislação e as políticas públicas. No total, foram analisados mais de 50 indicadores ou parâmetros. Por sua vez, a análise dos casos práticos permitiu identificar as boas práticas do setor no Brasil; práticas que são, além do mais, totalmente exportáveis para outros países.

Tudo isso tornou possível a elaboração de um autêntico guia para a segurança dos entregadores que usam bicicleta e patinetes elétricos (outro modo de deslocamento igualmente emergente nos últimos anos, se não meses). E este guia é provavelmente a maior contribuição concreta desse trabalho promovido pela Fundación MAPFRE no Brasil.

A seguir, destaco alguns dos principais aspectos de cada uma das dimensões mencionadas e convido vocês a lerem o resumo do estudo, ou sua versão completa, a fim de conhecerem plenamente a riqueza de suas contribuições e suas conclusões e recomendações.

Fonte: Jéssica Lucena, 2021.

1. Entregadores ou trabalhadores ciclistas

A. Todos os trabalhadores deveriam receber treinamento básico sobre a legislação de trânsito, direitos trabalhistas e, no trânsito, mecânica e manutenção da bicicleta, alimentação saudável (o custo e a disponibilidade de lugares e horários para a alimentação são aspectos muito importantes para esses trabalhadores e, de fato, alguns entrevistados relatam "passar o dia sem comer direito", para não mencionar a hidratação adequada), etc.

B. Todos os trabalhadores deveriam ter acesso aos mesmos direitos básicos que os outros trabalhadores no mesmo setor e em outros setores. Sua remuneração deveria ser justa e digna. Chama muito a atenção que 85% do trabalhadores-ciclistas entrevistados em São Paulo (SP) não contavam com nenhum tipo de seguro pessoal, ao mesmo tempo que 35% deles já haviam sofrido alguma queda ou acidente (apesar de, em média, só trabalharem há cinco meses como entregadores-ciclistas, o que significa que não é descabido pensar que no decorrer de um ano, doze meses, a grande maioria poderia estar exposta a uma queda ou sinistro de trânsito). No caso das mulheres, cuja amostra é muito reduzida, 58% já se envolveram em alguma queda ou acidente. De todos os sinistros sofridos pelos entregadores, 63% tiveram lesões leves, enquanto 14% lesões graves. Dos entrevistados em profundidade, 87% afirmaram sentir medo de sofrer um acidente de trânsito. E 100% dos 336 ciclistas entrevistados indicaram ter mudado sua maneira de circular após sofrerem um acidente, sendo mais defensivos.

2. Bicicletas e o equipamento de segurança

A. As bicicletas elétricas proporcionam uma segurança extra e reduzem o cansaço, permitindo jornadas mais longas e interagir no trânsito motorizado com maior fluidez. Em trajetos com menos de 3 km, a bicicleta elétrica pode até superar as motocicletas em termos de eficiência.

B. Para entregas volumosas, é recomendável o uso de bicicletas específicas para carga.

C. Os reparos e a manutenção periódica das bicicletas deveriam ser facilitados: redes de oficinas, manual para que os próprios ciclistas façam a manutenção básica, etc.

D. O capacete de ciclista deveria ser universal. Entre os mais de 300 entrevistados em São Paulo (SP) , 42% indicaram que usam o capacete. A definição de bicicleta elétrica realizada pelo Conselho Nacional de Trânsito brasileiro estabelece

o uso obrigatório de capacete por parte dos ciclistas usuários de bicicletas elétricas. Em São Paulo (SP) , um automóvel esteve envolvido em 36% dos sinistros sofridos por entregadores e em 34%, uma porcentagem semelhante à anterior, não houve nenhum outro veículo envolvido; as motos estiveram envolvidas em 6% das colisões. A segunda dessas três porcentagens coincide com dados recentes da Espanha: na cidade, 41% dos ciclistas mortos perderam a vida em quedas sem o envolvimento de outros veículos, conforme indicado no relatório de estratégia de segurança viária 2021-2030.

E. O mesmo para os elementos de visibilidade: luzes refletivas sobre a bicicleta e roupas de alta visibilidade. A roupa de alta visibilidade e a visibilidade proporcionada pelas mochilas ou bolsas de transporte constituem elementos de proteção do ciclista. Entre os mais de 300 entrevistados na cidade de São Paulo (SP) , 22% indicaram que já usam roupa refletiva ou fluorescente.

F. Agasalhos e roupa para a chuva são outros dos elementos básicos.

G. O uso de espelhos retrovisores é outro dos elementos de segurança usados pelos trabalhadores da ciclologística no Brasil. A definição de bicicletas elétricas do Conselho Nacional de Trânsito brasileiro indica que elas devem ter espelhos retrovisores em ambos os lados. Sua divulgação deveria ser incentivada em outras áreas ou países.

H. Deve ser levada em consideração a ergonomia dos sistemas de transporte da mercadoria: peso, centro de gravidade, tamanho, aerodinâmica, fixação no corpo, movimentos durante os deslocamentos, visibilidade, etc.

I. Não deveria ser permitido o uso de fones de ouvido. Por outro lado, alguns ciclistas utilizam pequenas caixas de som como forma de tornar sua presença mais visível (nesse caso, audível) para os outros usuários das vias.

3. Empresas, aplicativos, coletivos ou associações e suas relações com os trabalhadores-ciclistas

A. A pressão do tempo é um fator determinante. Os esquemas de retribuição baseados na combinação de distância e tempo podem ser mais seguros do que aqueles com base unicamente no tempo e no número de entregas. Poderiam ser desenvolvidos aplicativos que calculassem o tempo seguro para o deslocamento e não atribuir novos pedidos até que esse tempo fosse cumprido.

B. No caso das plataformas ou aplicativos, eles também têm um impacto muito significativo na segurança dos ciclistas e os critérios de funcionamento, distribuição de entregas, design e operação da interface, etc. deveriam ser definidos a fim de reduzir os riscos.

C. O número e distância para as entregas deveria ser gerenciado com critérios de segurança e saúde no trabalho. A distância percorrida pelos entrevistados em São Paulo (SP) é, em média, de 19,6 km, embora em alguns casos supere os 70 km. O número médio de entregas diárias é de 18 (dezoito), e em alguns casos muito maior! Os doze entrevistados em profundidade indicaram uma jornada média de 7 horas por dia.

D. A determinação das rotas deveria ser realizada tendo em conta critérios de segurança. A distribuição de entregas em áreas conhecidas pelos entregadores parece ser um elemento de proteção; a experiência e a capacidade dos ciclistas deveriam ser igualmente levadas em consideração para esse trabalho.

E. Os pontos de apoio aos entregadores-ciclistas são fundamentais: áreas de descanso, banheiros e chuveiros, áreas para reparos, manutenção e armazenamento de bicicletas, etc.

F. As organizações deveriam contar com sistemas de coleta de dados de sinistros para uma posterior análise e uso em ações de prevenção e segurança viária.

G. Sempre que possível, as organizações deveriam oferecer treinamento aos seus entregadores-ciclistas sobre as temáticas antes mencionadas. Também deveria oferecer apoio ou orientação em caso de sinistro.

4. Infraestrutura urbana

A. A infraestrutura segregada, como vias para bicicletas, aumenta a percepção de segurança da maioria dos entregadores-ciclistas entrevistados (93% preferem pedalar em ciclovias ou ciclofaixas). Porém, a presença de pedestres nessas vias também é mencionada como perigosa.

B. As vias calmas, com baixos limites de velocidade ou com menor velocidade de circulação de veículos motorizados, proporcionam uma maior sensação de segurança aos ciclistas. A gestão da velocidade é um dos pilares básicos do sistema seguro no trânsito.

C. A manutenção, conectividade e capilaridade da infraestrutura segregada são igualmente essenciais para sua segurança e usabilidade: o mesmo buraco, que é quase imperceptível para o ocupante de um automóvel, pode causar a queda de um ciclista.

D. Outro fator da via determinante para a segurança dos trajetos é sua iluminação, conforme indicado por 97% dos ciclistas entrevistados.

E. Melhorar a segurança dos ciclistas nas interseções.

F. As áreas de estacionamento seguro para bicicletas também são muito importantes: em edifícios de escritórios, residenciais, junto a oficinas de bicicleta ou pontos de apoio para ciclistas, na entrada de áreas para pedestres, etc. Outros elementos do mobiliário urbano também podem melhorar as condições de trabalho dos entregadores-ciclistas.

G. Deveria ser desenvolvida uma rede de pontos de apoio para os ciclistas e mapas com a localização desses pontos (além de rotas seguras para ciclistas): oficinas de reparação de bicicletas, pontos com ar para encher o pneu da bicicleta, restaurantes com ofertas para entregadores-ciclistas, etc.

5. Legislação e políticas públicas

A. Reconhecimento das políticas públicas de mobilidade e logística, entre outras, do papel da ciclologística na vida urbana, na economia, na segurança viária, etc.

B. O setor da ciclologística, como um todo, deveria adotar o Objetivo Zero vítimas fatais e graves e o enfoque do Sistema Seguro. Não é aceitável trocar vida e saúde por rapidez e rentabilidade ou por qualquer outro parâmetro: o bem maior é a vida das pessoas.

C. O ensino do ciclismo seguro deveria ser obrigatório no ensino fundamental e médio de todos os países.

D. Aulas ou percursos voluntários de bicicleta deveriam ser oferecidos a todas as pessoas que quisessem ter acesso à carteira de habilitação de veículos motorizados (automóveis, motocicletas, vans, caminhões, ônibus, etc.) para que elas pudessem criar empatia e conhecer em primeira mão os riscos a que os ciclistas estão expostos. A Fundación MAPFRE fez essa proposta há cerca de três anos.

E. O acesso a bicicletas de qualidade (incluindo as elétricas, cargueiras, etc.) deveria ser incentivado, assim como a fabricação local desse tipo de veículos e todos seus acessórios. Várias regiões da Espanha já contam com programas de apoio para a aquisição de bicicletas elétricas no âmbito de suas políticas de mobilidade sustentável e como parte de programas nacionais de incentivos. O estudo menciona o exemplo da Comunidade de Madri, que subsidia a compra de até cinco bicicletas elétricas por profissionais autônomos e microempresas.

F. O roubo de bicicletas continua a ser um problema público e trabalhista, e deveria ser combatido com várias medidas, como o cadastro das bicicletas, o combate à venda on-line de bicicletas roubadas ou seus elementos, etc.

G. Campanhas de divulgação das vantagens sociais e cidadãs desse tipo de distribuição urbana de mercadorias. Campanhas de conscientização e segurança viária: respeito mútuo, principais riscos, como agir em caso de sinistro, etc. Um exemplo dessas campanhas poderia ser a realizada em 2021 pela Fundación MAPFRE e a empresa de ônibus ALSA[2].

H. Criar sistemas centralizados de coleta de dados de sinistros com entregadores-ciclistas, como um meio para definir ações específicas de melhoria.

I. Estabelecer canais de diálogo e troca de boas práticas entre todos os atores do setor da ciclologística: autoridades, empresas, plataformas, trabalhadores, especialistas em design urbano e de bicicletas, pesquisadores e técnicos em segurança viária, etc.

J. Monitoramento das normas de circulação e segurança viária.

2 *https://road-safety-charter.ec.europa.eu/charter-across-europe/member-events/angulos-muertos_es*

Com relação às boas práticas, destacam-se as seguintes:

A. Todas as empresas e coletivos do setor da ciclologística são, por si só, uma boa prática pela sua contribuição à mobilidade sustentável e à ausência de emissões relevantes nos deslocamentos de seus entregadores.

B. A empresa de impacto social Bicicletaria Cultural, uma oficina de bicicletas que, além de reparos (alguns gratuitos), também oferece diversos serviços de apoio aos entregadores-ciclistas: áreas de descanso, chuveiros, áreas de almoço, para recarga de celulares, manutenção de bicicletas, etc. A empresa também proporciona apoio aos seus entregadores em caso de sinistro.

C. O projeto iFood Pedal de aluguel de bicicletas elétricas para trabalhadores da ciclologística conta com diversos pontos de distribuição de bicicletas onde, além dos serviços de apoio, também disponibiliza micro-ondas, álcool em gel, bebedouros, etc. O iFood Pedal oferece uma série de programas de capacitação *on-line* gratuitos para seus entregadores (iniciativa Pedal Responsa), além de seguros de saúde ou acidentes. Os alunos que terminam o programa de formação recebem um kit com camiseta de alta visibilidade, um carregador de celular, uma jaqueta corta vento, garrafinha personalizada, etc.

D. A Carbono Zero Courier, uma "empresa com propósito" como ela mesmo se define, oferece a todos seus *bikers* contratados um seguro de sinistros, invalidez e morte. Também oferece a manutenção das bicicletas a preço de custo, equipamentos de segurança também a preço de custo e, eventualmente, sorteios do referido equipamento. O uso do capacete é obrigatório nessa empresa e os entregadores devem passar por uma capacitação inicial.

E. A empresa Sem CO2 Entregas, de Curitiba (PR), oferece sistemas de remuneração baseados na quilometragem e não no número de entregas ou no tempo de entrega. Essa empresa realiza a manutenção de suas bicicletas cada cinco ou seis meses.

F. A empresa Disk Água FP realiza uma manutenção preventiva todas as semanas.

G. A empresa Tele Entregas oferece capacete, óculos, cadeado, luzes, campainha e espelho retrovisor aos seus entregadores.

H. O coletivo informal Señoritas Courier proporciona apoio a seus integrantes no dia a dia e em situações especiais ou críticas. Além dos diversos serviços oferecidos a seus membros, o coletivo também conta com um fundo solidário para apoio em situações ou necessidades específicas de seus membros. O coletivo também elabora mapas de espaços públicos ou privados que podem servir de pontos de apoio para suas trabalhadoras, bem como de restaurantes com preços acessíveis para esse coletivo. O uso do capacete é obrigatório no coletivo. A distribuição das entregas ou rotas leva em consideração o conhecimento das entregadoras sobre as áreas de entrega. É estabelecido um limite diário de quilômetros e procura-se equilibrar as entregas entre as trabalhadoras. O peso da carga a ser transportada fica limitado ao fato de ser uma mochila, uma bolsa ou caixas de transporte.

I. A cidade de São Paulo (SP) recentemente aprovou uma política municipal de ciclologística (ainda não está em vigor) que obriga as empresas de logística, entregas, aplicativos, etc. a disponibilizar dados para auxiliar na gestão dessa atividade, além de oferecer cursos de formação e uma infraestrutura mínima para os entregadores-ciclistas.

J. O estado de São Paulo (SP) incluiu a educação viária como conteúdo obrigatório nas escolas.

K. Outro recente projeto de lei em São Paulo (SP) (projeto de lei nº 358/2021) tem como objetivo que as empresas que oferecem serviços de entrega por meio de aplicativos ou plataformas digitais ofereçam um seguro de vida coletivo para os entregadores-ciclistas ou motociclistas.

L. Em Fortaleza (CE) foi instalado um sistema automatizado para o controle eletrônico de invasão de ciclovias por outros tipos de veículos. Essa mesma cidade conta com a iniciativa municipal "Ponto do Entregador", que visa oferecer serviços a todos os tipos de entregadores, incluindo ações educativas e a realização de curso de pilotagem segura, entrega de capacetes, luzes, etc. A cidade também instalou parapés (servem como suporte de pé e mão para o ciclista se apoiar ao parar em um semáforo) a fim de que os entregadores possam esperar a luz verde com mais comodidade.

M. Sistema de registro voluntário de sinistros do estado do Paraná (BATEU - Boletim de Acidente de Trânsito Eletrônico Unificado).

N. O projeto "Viver de Bike", desenvolvido pelo Instituto Aromeiazero, oferece formação em empreendedorismo relacionado com a bicicleta, incluindo gestão financeira, mecânica e manutenção, segurança da bicicleta, etc.[3]

O. O evento "Bora de bike, Recife?", organizado pela prefeitura dessa cidade, mediante o qual os entregadores recebem orientação e elementos de proteção, como uma jaqueta de cores vivas, um kit de primeiros socorros, ferramentas, um manual de manutenção da bicicleta, etc.[4]

P. A empresa Cargoroo[5] de aluguel de bicicletas cargueiras elétricas nos Países Baixos.

Q. A União Europeia planeja obrigar todas as empresas de plataformas ou aplicativos a regularizarem os vínculos trabalhistas com seus entregadores (ciclistas, motociclistas e todos os outros).

Gostaria de terminar este prefácio agradecendo aos funcionários e clientes da MAPFRE por tornarem possível este estudo e todas as atividades da Fundación MAPFRE. E lembrem-se, quando vocês fizerem seu próximo pedido deem ao entregador tempo suficiente para um deslocamento sem estresse e com segurança. Com esta pesquisa esperamos ter contribuído para reduzir os riscos e os medos a que estão expostos os trabalhadores e trabalhadoras da ciclologística.

Jesús Monclús

Diretor de Prevenção e Segurança Viária
da Fundación MAPFRE

3 *https://www.fundacionmapfre.org/premios-ayudas/premios/premios-fundacion-mapfre-innovacion-social/tendencias/emergencia-recuperacion-bicicleta/*

4 *http://www2.recife.pe.gov.br/noticias/17/08/2021/pcr-realiza-evento-para-ciclistas-entregadores-nesta-quarta-feira-18*

5 *https://cargoroo.l/n/cargoroos-winter-store-sustainable-gifts-for-the-holidays/*

Fonte: Jéssica Lucena, 2021.

STUDY PRESENTATION

Lazy Saturday afternoon, sunset is on the horizon. To top it off, it starts raining. Such awful weather doesn't make us feel like going out. A family movie night at our home sweet home is what we pick. As we've been rushing all week, we'd better take this time off to rest. So, what about ordering some food from the nearby restaurant? The delivery cyclist is going to bring the meal right away. But, again, as we're self-quarantined, suddenly, we might be running out of medication. So, we shop for medicines through the app. The drugstore will send them home quickly! Or, again, let's suppose a situation at the office when we must get a document sent to somebody. So, a sustainable alternative mode of delivery is the fastest way to accomplish it: "let's have the job done by a delivery cyclist!", we conclude.

In either case, a worker riding a bicycle travels across the city to achieve the order, often subjected to high-leveled road hazards. The perception of insecurity, the risks associated with the cycle delivery profession, and the lack of support or security during the journey often influence the decision to remain in the industry. As a result, few workers consider continuing as delivery cyclists in the long term. Sixty-seven percent of them express fear performing their duties, and 87% reveal being afraid of suffering road traffic injuries.

In the face of this context, Fundación MAPFRE, in partnership with the Sustainable Mobility Laboratory (Laboratório de Mobilidade Sustentável, LABMOB) and the Urbanism postgraduate program from the Federal University of Rio de Janeiro, examined the cyclist workers' self-perspective on road safety and the good practices learned by six Brazilian companies in the industry. The result is one of the most extensive investigations worldwide (if not the largest so far). As a result, we can learn about the reality of cities where the Cyclelogistics sector has grown exponentially. For example, the study demonstrates that the number of cyclists delivering with thermally insulated bags increased more than five times between 2018 and 2019 in some regions of Brazil. Furthermore, other data suggests that the number of self-employed delivery cyclists two-folded in the meantime.

The subject is not unknown for Fundación MAPFRE. We've developed materials to improve the safest ways for cyclists (or couriers) to work for years. In addition, we've often collaborated with leading companies in the industry in Spain to gather data. All this information is available on this website.

The study methodology mixed different tools for data collection. First, an all-out survey of 336 delivery cyclists in the city of São Paulo (24 of them were ladies). Second, in-depth interviews and ethnographic follow-ups were conducted with 12 delivery cyclists (11 men, one woman) from six organizations in São Paulo, Curitiba, and Fortaleza. Third, in-depth interviews with six managers from the companies above. Finally, study cases, two workshops with 24 participants and entities related to the Cyclelogistics industry and road safety, literature review, etc.

The first finding is that the Cyclelogistics ecosystem encloses many organizations. From bicycles-only delivery companies to courier businesses using diverse modes (beyond bicycles). From bicycle repair shops to e-bike rental companies, which also provide different types of support services for cyclist-workers. Besides, from local companies to informal associations of women delivery workers and other collectives.

The second finding is the variety of existing work relationships, especially open-ended contracts. And also self-working cyclists for delivery apps. It was possible to demonstrate that the employment relationship determines having social and health insurance or not. The reality is that many delivery cyclists don't own insurance in case of sickness, injury during labor, bicycle damages (their primary work tool), etc. It probably happens in many other countries beyond Brazil.

The study defined five dimensions that influence the conditions in which Cyclelogistics (and its safety conditions) are designed: the profile of delivery cyclists; bicycles and safety equipment; delivery-related companies or collectives and associations; urban infrastructure; and, finally, legislation and public policies. In total, more than 50 indicators or parameters were analyzed. Finally, case studies and good, replicable practices in other countries were shared.

Such efforts made it possible to create an authentic guide for the safety of delivery workers who ride bicycles and electric scooters. By the way, scooters are another mode of transportation that emerged in recent years, if not months. Then, this present guide is probably the most significant concrete contribution promoted by Fundación MAPFRE in Brazil.

Following, I spotlight some of the main aspects of each dimension. Besides, I kindly request you to read the executive summary and its complete version to fully appreciate the richness of its findings, conclusions, and recommendations.

Fonte: Jéssica Lucena, 2021.

1. Delivery workers or cyclists:

A. All workers should receive basic training on traffic legislation, labor rights, and the Brazilian Traffic Code. In addition to mechanics and bicycle maintenance and access to healthy eating conditions. The cost and availability of good dining places are essential for these workers. Some reported "going through the day without eating healthy," not to mention adequate hydration.

B. All workers should have access to the same fundamental rights as other workers. Remuneration must be fairer and more dignified. It's striking that 85% of the delivery cyclists interviewed in São Paulo (SP) didn't own personal insurance. At the same time, 35% of them had already fallen off the bike or were involved in an accident. On the other hand, they've been working as delivery cyclists for less than five months. This data shows it's reasonable to state that the vast majority might be subjected to traffic accidents in a year.

C. Regarding women, 58% reported having fallen off the bicycle or crashed. Of all courier claims, 63% suffered minor injuries, while 14% were severely injured. Of those interviewed in-depth, 87% said they were afraid of traffic claims. And all 336 cyclists interviewed indicated they became more defensive after experiencing an accident while riding.

2. Bicycles and safety equipment:

A. Electric bicycles are safer to ride and reduce tiredness, allowing for longer journeys and more positive interaction between cyclists and drivers. The electric bike can even outperform motorcycles in terms of efficiency up to 3km-journeys;

B. For bulky deliveries, specific cargo bikes are recommended;

C. Repairs and periodic maintenance should be facilitated through networks of workshops, manuals for cyclists to carry out essential bike maintenance, etc.

D. Cycling helmets must be universal. Among the more than 300 respondents in São Paulo, 42% indicated wearing a helmet. The definition of an electric bicycle assembled by the Brazilian National Traffic Council establishes the mandatory use of helmets by cyclists riding electric bicycles. In São Paulo, a car was involved in 36% of claims suffered by couriers, and in 34%, there was no other mode of transportation involved. Motorcycles were entangled in 6% of collisions with them. The second data coincides with recent data from Spain: 41% of cyclists had their lives killed by falling off the bike without involving other vehicles, as indicated in the 2021-2030 Road Safety Strategy Report;

E. Visibility elements also must be universal, such as reflective accessories and high-visibility clothing. The effect provided by colorful, fluorescent backpacks and carrying bags protects delivery cyclists from not being seen. Among the more than 300 respondents in the city of São Paulo (SP), 22% indicated wearing this high-visibility clothing;

F. Coats and rain gear are two other essential elements;

G. Rear-view mirrors improve safety. The Brazilian National Traffic Council's definition of electric bicycles recommends keeping rear-view mirrors on both sides. Such recommendations must be incentivized in other countries;

H. Ergonomics must be taken into account: weight, gravity center, size, aerodynamics, body movements during riding, visibility, etc.;

I. Headphones should not be allowed during the rides. Nevertheless, some delivery cyclists use small speakers to make their presence more audible to drivers.

3. Companies, apps, unions, or associations and their relationships with delivery cyclists

A. Time efficiency is a factor that puts pressure on cyclists to be productive. Compensation schemes based on the combination of "distance and time" may be safer than those based solely on time and the number of deliveries performed. It's recommended to develop schemes that calculate the adequate time to accomplish a delivery safely, assuring that new orders won't come up to workers until the safe period is completed;

B. Platforms or apps also have a very significant impact on cyclists' safety. The operating criteria, delivery distribution, interface design, among others, should be defined previously to lessen risks;

C. According to occupational safety and health criteria, the quantity and distance traveled for deliveries should be managed. The distance traveled by respondents in São Paulo (SP) is 19.6 km. However, in some cases, it might exceed 70 km. The average number of daily deliveries is 18, which might be higher! The 12 in-depth respondents indicated working 7 hours a day averagely;

D. The determination of routes should take safety criteria into account. Being assigned to perform deliveries in areas previously known sounds safer and more rewarding to cyclists. It must also be taken into account for planning deliveries arrangement;

E. Spots for cyclists to rest and recharge in between runs are essential: they must offer toilets and showers, mechanics, power plugs, bicycle storage, etc.;

F. Organizations should keep systems for collecting data on claims for further analysis and use in prevention and road safety actions;

G. Whenever possible, organizations should offer training on the topics mentioned above. They should also provide support or guidance when a traffic crash claim gets in.

4. Urban infrastructure

A. Segregated bicycle infrastructure increases the safety perception (93% prefer to ride on bicycle lanes). However, pedestrians crossing or walking by cycling lanes is mentioned as dangerous for cycling safely;

B. Calmer, low-speed roads provide a greater sense of safeness. Speed management is one of the fundamental pillars of the traffic safety system;

C. Quality, connectivity, and capillarity of segregated bike infrastructure are equally essential for cyclists' safety. A hole in the asphalt may be invisible and harmless to drivers. Still, it may cause a cyclist to fall off.

D. Public lighting is crucial for route safety, as indicated by 97% of cyclists interviewed;

E. Intersections should be taken into consideration as safety-sensitive areas;

F. Providing secure parking for bicycles is meaningful in office buildings, residential buildings, next to bicycle shops or rest spots for cyclists, etc. Adequate street furniture can also improve the working conditions;

G. Rest spots and safe routes must be geo-referenced and divulged to workers. Besides, bicycle repair shops should be guaranteed to cyclists inflate the bicycle tire, dine-ins granting special discounts for delivery cyclists, etc.

5. Legislation and public policies

A. Legitimation of public policies on mobility and logistics, among others, the role of cycle logistics in urban life, the economy, road safety, etc.;

B. The cycle logistics sector should adopt the Vision Zero/Safe Systems approach. It's not acceptable to exchange life and health for speed, profitability, or other parameters. The most significant interest to seek is preserving people's lives;

C. Teaching safe cycling should be mandatory in primary and secondary education in all countries;

D. Classes or voluntary cycling tours should be offered to all people applying for a driving license to learn the risks cyclists are exposed to. Fundación MAPFRE addressed this proposal about three years ago;

E. Access to the best bike brands (including electric, freighter, etc.) should be encouraged. The local manufacturing of vehicles and accessories should be facilitated as well. Several regions in Spain count on support programs for purchasing electric bicycles as part of their sustainable mobility policies and national incentive programs. The study mentions the example of the Community of Madrid, which subsidizes the purchase of up to five electric bicycles by self-employed professionals and micro-enterprises;

F. Bicycle theft remains a public issue. It should be tackled by avoiding the online purchase of stolen bikes, among other measures;

G. Campaigns to publicize the social and citizen benefits of bike deliveries. Awareness and road safety campaigns: mutual respect, main risks, behavior when a bike crash happens, etc. The primary reference is a campaign carried out in 2021 by Fundación MAPFRE and the bus company ALSA[2].

H. Create centralized claim data collection systems with delivery cyclists as a means to define specific improvement actions;

I. Establish channels for dialogue and exchange of good practices between all actors in the industry: authorities, companies, platforms, workers, specialists in urban and bicycle design, researchers and technicians in road safety, etc.;

J. Monitoring of traffic and road safety rules.

Regarding the best practices, we spotlight the following ones:

A. All companies and collectives in the industry are good practice because they contribute to emission-free, sustainable mobility;

B. The social impact company Bicicletaria Cultural is essential to mention as an excellent practice to be followed. It's a bicycle repair shop that, in addition to repairs (some free of charge), also offers various support services for delivery cyclists: rest spots, showers, dining tables, cell phone charging, bicycle maintenance, etc. The company also provides support when accidents happen;

C. The iFood Pedal project for renting electric bicycles has several bicycle distribution points for cyclist couriers. In addition, it also provides microwaves, hand sanitizer, drinking fountains, a series of free online training programs (i.e., Pedal Responsa initiative), and health or accident insurance. Students who complete the training program receive a kit with a high-visibility t-shirt, a cell phone charger, a windbreaker, and a personalized bottle.

D. The company Tele Entregas offers a helmet, glasses, padlock, lights, bell, and rear-view mirror;

E. The informal collective Señoritas Courier supports delivery women-cyclists in all cases. In addition to the various services offered to its members, the collective also has a solidarity fund to support specific situations or needs. The collective also provides maps indicating public or private spaces to rest and recharge and affordable restaurants. Helmet use is mandatory. The distribution of deliveries or routes considers the delivery women's acquaintance with the delivery areas. A daily limit of kilometers is established, and the company seeks to balance deliveries among workers. The weight of the load to be transported is limited to the fact that they only ride with a backpack, bag, or transport boxes;

F. The city of São Paulo (SP) recently approved a municipal Cyclelogistics policy (not yet in force) that obliges logistics, delivery, and apps to make data available publicly, in addition to offering training courses and a minimum infrastructure for couriers-cyclists;

2 *https://road-safety-charter.ec.europa.eu/charter-across-europe/member-events/angulos-muertos_es*

G. The state of São Paulo (SP) included road education as a mandatory content to be taught at schools;

H. Another recent bill in São Paulo (SP) (Bill No. 358/2021) aims for companies that offer delivery services through apps or digital platforms to offer collective life insurance for cyclists and motorcyclists;

I. In Fortaleza (CE), an automated system monitors when a vehicle invades a bike path. Fortaleza also provides the initiative "Ponto do Entregador," which aims to offer services to all types of delivery cyclists, including educational activities and a safe riding course. The city has also installed "footrests" (they serve as support for the cyclist to lean on when stopping at a traffic light) so that they can wait for the green light more comfortably;

J. Voluntary claims registration system in the state of Paraná (BATEU - Unified Electronic Traffic Accident Bulletin);

K. The "Viver de Bike" project, developed by Instituto Aromeiazero, offers training in entrepreneurship related to the bicycle, including financial management, mechanics and maintenance, bicycle safety, etc. [3]

L. The event "Bora de bike, Recife?", organized by the city of Recife, offers guidance and protection accessories to cyclists, such as a brightly colored jacket, a first-aid kit, tools, a bicycle maintenance manual, among others; [4]

M. The Cargoroo[5] electric cargo bike rental company in the Netherlands is an example of good practice;

N. The European Union plans to oblige all platform or app companies to regularize their labor ties accordingly with the law (cyclists, motorcyclists, and everyone else).

I would like to end this foreword by thanking MAPFRE employees and customers for making this study and all the activities of Fundación MAPFRE conceivable. And remember: when placing your next order, give the delivery cyclist enough time for a stress-free and safe ride. We hope to have contributed to reducing the risks and fears to which cycle logistics workers are subjected with this study.

Jesús Monclús

Director of Prevention and Road Safety
at Fundación MAPFRE

3 *https://www.fundacionmapfre.org/premios-ayudas/premios/premios-fundacion-mapfre-innovacion-social/tendencias/emergencia-recuperacion-bicicleta/*

4 *http://www2.recife.pe.gov.br/noticias/17/08/2021/pcr-realiza-evento-para-ciclistas-entregadores-nesta-quarta-feira-18*

5 *https://argoroo.l/n/cargoroos-winter-store-sustainable-gifts-for-the-holidays/*

Fonte: Jéssica Lucena, 2021.

PRESENTACIÓN DEL ESTUDIO

Es sábado por la tarde. Está oscureciendo y no apetece salir de casa porque llueve y, además, hace incluso algo de frío. Hemos optado por ver una película en familia en la tranquilidad y la seguridad de nuestro hogar. Como hemos trabajado duro a lo largo de toda la semana y necesitamos descansar, pedimos la cena a un local de la zona y, como ya hemos empezado a ver la película, solicitamos que un repartidor en bicicleta nos lo lleve a casa. O quizás estamos confinados en nuestro domicilio por la COVID-19 y necesitamos que nos envíen algún medicamento desde la farmacia, por lo que acudimos a una plataforma online para el envío. O estamos en nuestro trabajo y hemos de entregar un trabajo sin perder ni un segundo y optamos por una empresa de mensajería en bicicleta por ser más sostenible.

En cualquiera de los casos anteriores, la cuestión es que un trabajador en bicicleta se desplaza por la ciudad para realizar ese servicio, ese trabajo, y a menudo aceptando altos niveles de riesgo vial. La percepción de inseguridad vial, combinada con otros riesgos de la profesión y la ausencia de apoyos o seguridad laboral tienen un impacto directo en la decisión de permanencia en la profesión, y son pocos los trabajadores que se plantean continuar en esta profesión a largo plazo. El 67% afirma sentir algún miedo en su trabajo y, de estos, el 87% reconoce que tiene miedo a sufrir un siniestro de tránsito.

Fundación MAPFRE, en colaboración con el Laboratório de Mobilidade Sustantável (LABMOB) brasileño y el Programa de Pós-Graduação de la Universidad Federal de Rio de Janeiro, ha querido conocer la visión de los propios trabajadores ciclistas, centrando el foco en su seguridad vial, y aprender de las buenas prácticas de un total de seis empresas en dicho país. Y el resultado es uno de los mayores trabajos de investigación a nivel mundial, sino el mayor hasta la fecha, del cual podemos aprender no sólo en Brasil sino en todos los países del mundo en donde el sector de la ciclologística haya experimentado un crecimiento exponencial: el estudio indica que el número de ciclistas repartidores de comida con bolsas térmicas se ha multiplicado por más de 5 solo entre los años 2018 y 2019 en algunas zonas de Brasil, mientras que otras investigaciones apuntan a que entre esos dos años el número de trabajadores autónomos repartidos se había duplicado en dicho país.

La temática no es nueva en Fundación MAPFRE, ya que llevamos años desarrollando y recopilando materiales para la mejora de la seguridad de repartidores ciclistas o riders o bikers, en ocasiones en colaboración con destacadas empresas del sector en España. Toda la información está disponible en https://www.seguridadvialenlaempresa.com/publicaciones-recursos/recursos-materiales/.

La metodología de esta investigación ha combinado distintas herramientas como encuestas sobre un total de 336 entregadores ciclistas de Sao Paulo (24 de ellos, mujeres), entrevistas en profundidad y acompañamientos etnográficos de otros 12 entregadores (incluida una mujer) asociados a seis organizaciones que operan en las ciudades de Sao Paulo, Curitiba y Fortaleza, entrevistas en profundidad a seis de los responsables de dichas empresas y asociaciones, análisis de ese mismo número de casos prácticos, dos talleres en donde han participado un total de 24 personas y entidades directamente relacionadas con la ciclologística y su seguridad vial, revisión bibliográfica, etc.

La primera conclusión es que el ecosistema de la ciclologística cuenta con una gran variedad de organizaciones. Desde empresas de reparto a través exclusivamente de bicicletas, o de empresas con variedad de vehículos entre los que se encuentran las bicicletas, hasta talleres de bicicletas o empresas de alquiler de bicicletas eléctricas que también ofrecen distintos tipos de servicio de apoyo a los trabajadores de este sector, negocios de proximidad que cuentan con servicios de entrega de sus productos y, por último, asociaciones informales de repartidoras mujeres y otros colectivos. La segunda conclusión es la variedad de relaciones laborales existentes entre los trabajadores: los hay en plantilla con contratos fijos, trabajando por cuenta ajena con otros tipos de contratos, y los hay que son trabajadores autónomos conectados a diversas plataformas o apps de entrega o mensajería. La relación laboral, como se ha podido comprobar, determina el tipo de coberturas sociales y sanitarias y la realidad es que un número considerable de estos trabajadores carece, en Brasil y probablemente en otros muchos países, de coberturas en caso de enfermedad, lesión durante su trabajo, daños en la bicicleta (su herramienta de trabajo), etc.

El estudio ha definido cinco dimensiones clave que impactan en las condiciones en las que se desarrolla la ciclologística y su seguridad: los propios entregadores o trabajadores ciclistas, la bicicleta y el equipamiento de seguridad, las empresas o los colectivos y asociaciones, la infraestructura urbana y, por último, la legislación y las políticas públicas. En total se han analizado más de 50 indicadores o parámetros. Por su parte, el análisis de los casos prácticos ha permitido identificar buenas prácticas en el sector en Brasil; prácticas que son, por otro lado, totalmente exportables a otros países.

Todo lo anterior permite elaborar una auténtica hoja de ruta para la seguridad de los repartidores en bicicleta y patinetes eléctricos (otro modo de desplazamiento igualmente emergente en estos últimos años, por no decir meses). Y esta hoja de ruta probablemente sea la mayor aportación concreta de este trabajo impulsado por Fundación MAPFRE en Brasil. A continuación, destaco algunos de los aspectos clave en cada una de las dimensiones citadas, si bien les urjo a que lean el resumen del estudio o su versión completa para conocer en su totalidad la riqueza de sus aportaciones y sus conclusiones y recomendaciones.

Fonte: Jéssica Lucena, 2021.

1. Entregadores o trabajadores ciclistas

A. Todos los trabajadores deberían recibir formación básica sobre legislación de tráfico, derechos laborales y en el tráfico, mecánica y mantenimiento de la bicicleta, alimentación saludable (el coste y la disponibilidad de lugares y horarios para comer son aspectos muy determinantes en estos trabajadores y, de hecho, algunos entrevistados relatan "pasar el día sin alimentarse adecuadamente", por no citar la hidratación adecuada), etc.

B. Todos los trabajadores deberían tener acceso a los mismos derechos básicos que el resto de trabajadores en el mismo sector y en otros sectores. Su remuneración debería ser justa y digna. Resulta muy llamativo que el 85% de los trabajadores ciclistas entrevistados en Sao Paulo no disponía de ningún tipo de seguro personal, mientras que el 35% de ellos ya había sufrido alguna caída o algún siniestro (a pesar de que, de media, sólo llevaban cinco meses como repartidores ciclistas, lo que quiere decir que no es descabellado pensar que a lo largo de un año, doce meses, la gran mayoría puede estar expuesta o una caída o siniestro de tráfico). En el caso de las mujeres, cuya muestra es muy reducida, el 58% se había visto implicada en alguna caída o siniestro. El 63% de todos los siniestros sufridos por los repartidores resultó en lesiones leves, mientras que un 14% ocasionó lesiones graves. El 87 de los entrevistados en profundidad indican sentir miedo por sufrir algún siniestro de tráfico. El 100% de los 336 ciclistas entrevistados indican haber cambiado su forma de circular, haciéndola más defensiva, después de sufrir un siniestro.

2. Bicicletas y el equipamiento de seguridad

A. Las bicicletas eléctricas aportan un plus de seguridad y reducen el cansancio, permitiendo hacer jornadas más largas e interactuar con el tráfico motorizado con mayor fluidez. En trayectos de menos de 3 km, la bicicleta eléctrica puede incluso superar en eficiencia a las motocicletas.

B. Para entregar voluminosas, es recomendable el uso de bicicletas específicas de carga.

C. Debería facilitarse las reparaciones y el mantenimiento periódico de las bicicletas: redes de talleres, guías para que los propios ciclistas realicen el mantenimiento básico, etc.

D. El casco de ciclista debería ser universal. El 42% de los más de 300 entrevistados en Sao Paulo indican que ya lo utilizan. La definición de bicicletas eléctricas del Consejo Nacional de

Tránsito de Brasil establece el uso obligatorio de casco de ciclistas usuarios de bicis eléctricas. En el 36% de los siniestros sufridos por los repartidores de Sao Paulo estuvo implicado un automóvil; en el 34%, una proporción similar a la anterior, no estuvo implicado ningún otro vehículo; las motos estuvieron implicadas en el 6% de las colisiones. El segundo de estos tres porcentajes coincide con un reciente dato español: en España, por ejemplo, el 41% de los ciclistas fallecidos en ciudad pierde su vida en caídas sin implicación de otros vehículos, según se indica en el borrador de estrategia de seguridad vial 2021-2030).

E. Lo mismo de elementos de visibilidad: luces, reflectantes sobre la bicicleta y prendas de vestir de alta visibilidad. La ropa de alta visibilidad, junto a visibilidad que proporcionan las mochilas o bolsas de transporte constituyen elementos de protección del ciclista. El 22% de los más de 300 entrevistados en Sao Paulo indican que ya utilizan ropa reflectante o fluorescente.

F. La ropa de abrigo y para la lluvia es otros de los elementos básicos.

G. El uso de retrovisores es otro de los elementos de seguridad utilizados por los trabajadores de la ciclologística en Brasil. La definición de bicicletas eléctricas del Consejo Nacional de Tránsito de Brasil indica que éstas deben llevar espejos retrovisores a ambos lados. Debería explorarse su promoción en otros ámbitos o países.

H. Hay que considerar la ergonomía de los sistemas de transporte de la mercancía: peso, centro de gravedad, tamaño, aerodinámica, sujeción al cuerpo, movimientos durante los desplazamientos, visibilidad, etc.

I. El uso de auriculares no debería permitirse. Por otro lado, algunos ciclistas utilizan pequeños altavoces como vía de hacer su presencia más visible (en este caso, audible) a otros usuarios de las vías.

3. Empresas, plataformas, colectivos o asociaciones y sus relaciones con los trabajadores ciclistas

A. La presión por los horarios es un factor determinante. Los esquemas de retribución basados en combinación de distancia y tiempo pueden ser más seguros que aquellos basados únicamente en el tiempo y el número de entregas. Podrían diseñarse aplicaciones que calculen el tiempo seguro de desplazamiento y no asignen nuevos pedidos hasta que se cumpla dicho tiempo.

B. En caso de utilizarse plataformas o apps, éstas también tienen un impacto muy significativo en la seguridad de los ciclistas y deberían definirse criterios de funcionamiento, reparto de entregas, diseño y operación de la interfaz, etc. para reducir riesgos.

C. Debería gestionarse con criterios de seguridad y salud en el trabajo el número y distancia de las entregas. La distancia media recorrida por los y las entrevistadas en Sao Paulo es de 19,6 km, aunque en algunos casos se superan los 70 km. ¡El número medio de entregas diarias se sitúa en... 18 (dieciocho), siendo en algunos casos incluso muy superior! Los doce entrevistados en profundidad indican jornadas medias de 7 horas al día.

D. La determinación de rutas debería realizarse teniendo en cuenta criterios de seguridad. La asignación de entregas en zonas conocidas por los repartidores parece ser un elemento de protección; la experiencia y las capacidades de los ciclistas deberían ser igualmente tenidas en cuenta en dicha asignación.

E. Los puntos de apoyo a los trabajadores ciclistas con fundamentales: zonas de descanso, baños y duchas, zona de reparación, mantenimiento y almacenamiento de bicicletas, etc.

F. Las organizaciones deberían habilitar sistemas de recopilación de datos de siniestros, para su posterior análisis y utilización en acciones de prevención y seguridad vial.

G. Siempre que sea posible, las organizaciones deberían ofrecer formación a sus trabajadores ciclistas y en las temáticas citadas más arriba. También debería ofrecerse apoyo u orientación en caso de siniestro.

4. Infraestructura urbana

A. La infraestructura segregada como carriles bici aumenta la seguridad percibida de la mayoría de los trabajadores ciclistas entrevistados (el 93% está de prefieren pedalear en carriles bici). Pero la presencia de peatones en dichas vías también es citada como peligrosa.

B. Las vías calmadas, con bajos límites de velocidad o con menor velocidad de circulación de los

vehículos a motor proporcionan una mayor sensación de seguridad a los ciclistas. La gestión de la velocidad es uno de los pilares básicos del sistema seguro en el tráfico.

C. El mantenimiento, conectividad y capilaridad de la infraestructura segregada son igualmente claves para su seguridad y usabilidad: el mismo bache que para el ocupante de un automóvil apenas es perceptible puede provocar la caída de un ciclista.

D. Otro factor de la vía determinante para la seguridad de los trayectos es su iluminación, según indica el 975 de los ciclistas entrevistados.

E. Mejora de la seguridad de ciclistas en las intersecciones.

F. Las zonas de aparcamiento seguro para bicicletas son también muy importantes: en edificios de oficinas, residenciales, junto a talleres de bicicleteas o puntos de apoyo a ciclistas, a la entrada de zonas peatonales, etc. Otros elementos de mobiliario urbano también pueden mejorar las condiciones de trabajo de los repartidores ciclistas.

G. Debería generarse una red de puntos de apoyo para ciclistas, y deberían generarse mapas con la ubicación de dichos puntos (además de rutas seguras para ciclistas): talleres de reparación de bicicletas, puntos con aire para inflar las ruedas, restaurantes con ofertas para trabajadores ciclistas, etc.

5. Legislación y las políticas públicas

A. Reconocimiento de las políticas públicas de movilidad y logística, entre otras, del papel de la ciclologística en la vida urbana, la economía, la seguridad vial...

B. El sector de la ciclologística en su conjunto debería adoptar el Objetivo Cero víctimas mortales y graves y el enfoque de Sistema Seguro. No es aceptable intercambiar vida y salud ni por rapidez, rentabilidad ni por ningún otro parámetro: el bien fundamental es la vida de las personas.

C. La enseñanza del ciclismo seguro debería ser obligatoria en la educación primeria y secundaria en todos los países.

D. Debería ofrecerse a todas las personas que acceden a permisos de conducción de vehículos motorizados (automóviles, motocicletas, furgonetas, camiones, autobuses...) clases o recorridos en bicicleta voluntarios para así poder empatizar y conocer de primera mano los riesgos a los que están expuestos los ciclistas. Fundación MAPFRE ha realizó esta propuesta hace aproximadamente tres años.

E. Debería favorecerse el acceso a bicicletas de calidad (incluidas eléctricas, de carga, etc), incluido el fomento del tejido de fabricación local de este tipo de vehículos y todos sus accesorios. Varias regiones en España cuentan ya con programas de apoyo a la adquisición de bicicletas eléctricas en el marco de sus políticas de movilidad sostenible y como parte de programas nacionales de incentivos. El estudio cita el ejemplo de la Comunidad de Madrid, que ofrece subsidios a la compra de hasta 5 bicicletas eléctricas por parte de profesionales autónomos y microempresas.

F. El robo de bicicletas continúa representando un problema ciudadano y laboral y deberían ser abordado con diversas medidas como registro de bicicletas, lucha contra la venta online de bicicletas robadas o sus elementos, etc.

G. Campañas de divulgación de las ventajas sociales y ciudadanas de este tipo de distribución urbana de mercancías. Campañas de concienciación y seguridad vial: respeto mutuo, riesgos principales, actuación en caso de siniestro... Un ejemplo de estas campañas puede ser la realizada en 2021 por Fundación MAPFRE y la empresa de autobuses ALSA[2].

H. Creación de sistemas centralizados de recopilación de datos de siniestros de trabajadores ciclistas, como vía para definir actuaciones de mejora concretas.

I. Establecimiento de vías de diálogo e intercambio de buenas prácticas entre todos los actores del sector de la ciclologística: autoridades, empresas, plataformas, trabajadores, expertos en diseño urbano y de bicicletas, investigadores y técnicos en seguridad vial, etc.

J. Supervisión de las normas de circulación y seguridad vial.

En cuanto a las buenas prácticas, merece la pena destacar las siguientes:

A. Todas las empresas y colectivos del sector de la ciclologística son, en sí mismos, una buena práctica por su contribución a la movilidad

2 *https://road-safety-charter.ec.europa.eu/charter-across-europe/member-events/angulos-muertos_es*

sostenible y la ausencia de emisiones relevantes en los desplazamientos de sus repartidores.

B. La empresa de impacto social Bicicletaria Cultural, un taller de bicicletas que, además de las reparaciones (algunas gratuitas), ofrece diversos servicios de apoyo a los trabajadores ciclistas: zonas de descanso, duchas, zonas para almorzar, para cargar los teléfonos móviles, mantenimiento de bicicletas, etc. La empresa también proporciona apoyo a sus repartidores en caso de siniestro.

C. La empresa iFood Pedal de alquiler de bicicletas eléctricas para trabajadores de la ciclologística, la cual cuenta con diversos puntos de reparto de bicis que también ofrecen los citados servicios de apoyo, además de microondas, gel alcohólico, fuentes de agua.... iFood Pedal ofrece igualmente diversos programas gratuitos de formación online a sus repartidores (iniciativa Pedal Responsa), así como planes de seguros de salud o lesiones. A los alumnos que finalizan el programa formativo se les entrega un kit con camiseta de alta visibilidad, un cargador de móvil, una chaqueta cortavientos, una botella para la bicicleta...

D. La "empresa con propósito", como se define a sí misma, Carbono Zero Courier ofrece a todos sus bikers contratados un seguro de siniestros, invalidez y muerte. También ofrece mantenimiento de las bicis a precio de coste; equipamiento de seguridad también a precio de coste y, en ocasiones, sorteos de dicho equipamiento. El uso del casco es obligatorio en esta empresa. Los repartidores deben pasar por una formación inicial.

E. La empresa Sem CO2 Entregas en Curitiba ofrece sistemas de remuneración basados en kilometraje y no en número de entregas o en tiempo de entrega. Esta empresa realiza el mantenimiento de sus bicicletas cada 5 ó 6 meses.

F. La empresa Disk Água FP realiza mantenimiento preventivo todas las semanas.

G. La empresa Tele-entrega ofrece a sus repartidores casco, gafas, candado, luces, timbre y espejo retrovisor.

H. El colectivo Señoritas Courier, asociación informal cuyo objetivo es proporcionar a sus integrantes apoyo en el día a día y en situaciones especiales o críticas. Además de diversos servicios a sus miembros, el colectivo cuente con un fondo solidario para apoyar situaciones o necesidades puntuales de los mismos. También elaboran mapas de espacio públicos o privados que pueden servir de puntos de apoyo para las trabajadoras, así como de restaurantes con precios accesibles para el colectivo. El uso del casco es obligatorio en el colectivo. La asignación de entregas o rutas tiene en cuenta el conocimiento de las repartidoras de las zonas de reparto. Se establece un límite diario de kilómetros y se busca equilibrar las entregas entre las trabajadoras. Se limita el peso de la carga a transportar en función de si se trata de una mochila, un bag o cajones de tranporte.

I. La ciudad de Sao Paulo ha aprobado recientemente una política municipal de ciclologística (aunque aún no ha entrado en vigor) que exige a las empresas de logística, entregas, plataformas y apps... que recopilen y compartan con la municipalidad datos para la gestión de esta actividad y que ofrezcan cursos de formación y una infraestructura mínima para los repartidores ciclistas.

J. El estado de Sao Paulo ha incluido la educación vial como contenidos obligatorios en las escuelas.

K. Otro reciente proyecto de ley en Sao Paulo (Projeto de Lei nº 358/2021) propone que las empresas que prestan servicios de entrega a través de una aplicación o plataforma ofrezcan un seguro de vida colectivo para los repartidores ciclistas o motociclistas.

L. En Fortaleza, sistema automatizado para para el control electrónico de la invasión de carriles bici por otros tipos de vehículos. En esta misma ciudad, iniciativa municipal de "Puntos de entregadores" en donde se ofrecen servicios a todo tipo de repartidos, incluidas acciones educativas, cursos de conducción segura, entrega de cascos, luces... La ciudad ha instalado apoyapiés y apoyabrazos para ciclistas junto a las líneas de detención de semáforos, de modo que éstos y éstas puedan esperar la luz verde con mayor comodidad.

M. Sistema de registro voluntario de siniestros del estado de Paraná (BATEU, Boletim de Acidente de Trãnsito Electrõnico Unificado).

N. El proyecto "Viver de bike" o "Vivir de la bici" desarrollado por el Instituto AroMeiae meia Zero ofrece formación en emprendimiento relacionado con la bicicleta, incluyendo gestión financiera, mecánica y mantenimiento, seguridad en bici, etc.[3]

O. Programa "Bora de bike, Recife", organizado por la prefectura de dicha ciudad, mediante el cual los repartidos reciben formación y elementos de protección como el caso, una chaqueta de colores vivos, un kit de primeros auxilios, herramientas, un manual de mantenimiento de la bicicleta, etc.[4]

P. La empresa Cargoroo[5] de alquiler de bicicletas eléctricas de carga en Países Bajos..

Q. La Unión Europea prevé obligar a todas las empresas de plataformas o aplicativos que regularicen sus vínculos laborales son sus entregadores (ciclistas, motociclistas y todos los demás).

Gostaria de terminar este prefácio agradecendo aos funcionários e clientes da MAPFRE por tornarem possível este estudo e todas as atividades da Fundación MAPFRE. E lembrem-se, quando vocês fizerem seu próximo pedido deem ao entregador tempo suficiente para um deslocamento sem estresse e com segurança. Com esta pesquisa esperamos ter contribuído para reduzir os riscos e os medos a que estão expostos os trabalhadores e trabalhadoras da ciclologística.

Jesús Monclús

Director de Prevención y Seguridad Vial
de Fundación MAPFRE

3 *https://www.fundacionmapfre.org/premios-ayudas/premios/premios-fundacion-mapfre-innovacion-social/tendencias/emergencia-recuperacion-bicicleta/*

4 *http://www2.recife.pe.gov.br/noticias/17/08/2021/pcr-realiza-evento-para-ciclistas-entregadores-nesta-quarta-feira-18*

5 *https://cargoroo.l/n/cargoroos-winter-store-sustainable-gifts-for-the-holidays/*

Fonte: Jéssica Lucena, 2021.

LIST OF ACRONYMS

ABRAMET BRAZILIAN ASSOCIATION OF TRAFFIC MEDICINE

B2B BUSINESS TO BUSINESS

BC2 BUSINESS TO CONSUMER

CEBRAP BRAZILIAN CENTER FOR ANALYSIS AND PLANNING

CLT CONSOLIDATION OF LABOR LAWS

CTB BRAZILIAN TRAFFIC CODE

DAS DOCUMENT FOR NATIONAL TAX COLLECTION

INSS NATIONAL INSTITUTE OF SOCIAL SECURITY

IPEA INSTITUTE FOR APPLIED ECONOMIC RESEARCH

ITDP INSTITUTE FOR TRANSPORTATION AND DEVELOPMENT POLICY

MEI INDIVIDUAL MICRO ENTREPRENEUR

ODS SUSTAINABLE DEVELOPMENT GOALS

ONSV NATIONAL ROAD SAFETY OBSERVATORY

ONU UNITED NATIONS

PNMU NATIONAL POLICY FOR URBAN MOBILITY

SESI INDUSTRY SOCIAL SERVICE

SUS UNIFIED PUBLIC HEALTH SYSTEM

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1 INTRODUCTION

Cyclelogistics is a relatively emerging concept used to define delivery services through the use of bicycles or tricycles as a mode of transport. In the face of the challenges of decarbonizing transport in cities, cyclelogistics has the advantages of being more sustainable than traditional fossil fuel-based logistics (motorcycles, trucks, and vans), more economical and still generate employment and income opportunities. The population formally or informally employed in cyclelogistic activities is commonly referred to as delivery cyclists, or bike couriers, and has been growing year by year.

Between 2019 and 2020 (when the delivery sector grew by more than 94%), Brazilian cities saw an increase in the number of bike couriers sharing lanes of road space with cars, buses, and motorcycles, riding on sidewalks and/or on bike lanes and tracks in areas served by this type of infrastructure. Today, they are easily recognized as cycling workers by their clothing and accessories.

Therefore, cycling has been an inexorable opportunity for the energy transition of cities in the delivery sector, which is fundamental to urban livelihood. However, there are urban and social challenges for the safe and responsible consolidation of this logistics sector. The incorporation of the bicycle into the transportation agenda of Brazilian cities has progressed since the last decade. However, road safety for cyclists is still a factor that keeps them vulnerable in traffic along with pedestrians. According to data published by Estado de S. Paulo, in August 2020, more than 8 thousand cyclists have died in traffic in the last decade and the number of accidents has increased by 45% in seven years[6].

This issue is even more sensitive for delivery cyclists, who spend a large part of their day

on-site (meaning, in traffic) and often do not have life insurance or formal employment relationships. The dramatic context of the global health crisis has intensified the deceleration of the Brazilian economy, ongoing since 2015, expanding self-employment. According to the Institute for Applied Economic Research (Ipea), between 2018 and 2019, the number of self-employed people working with delivery had increased 104.2%[7].

The issue of road safety is key for governments to provide adequate conditions for the growth of cyclelogistics, but especially for the quality of life of delivery cyclists. A survey conducted by the Labor Reform Study and Monitoring Network (Remir Trabalho) indicates that 52% of delivery cyclists work at least nine hours every day of the week[8]. Depending on the type of vehicle they use, these are exhausting journeys as they demand continuous physical effort.

It is also worth noting that their health risks are not only related to road safety, but also respiratory safety. Delivery cyclists are exposed to increased inhalation of air impacted by particulate matter, one of the most common pollutants in the transportation corridors they cycle along to reach delivery destinations.

That said, bike couriers must be in the core business of companies dedicated to cyclelogistics. Energy transition and economic efficiency in the logistics sector will only be fruitful if they are integrated with the improvement of working conditions of this group of workers who, as a general rule, are part of the most vulnerable populations: blacks, browns and periphery residents.

The concept of Vision Zero is timely to ensure road safety for this group of workers. Its main premise is that no death in traffic is acceptable. According to the concept, human life is the main priority in transport planning and the reduction of accidents is possible through proper urban planning.

According to traditional road safety policies, users are held responsible for accidents, disregarding the influence of other elements of the system on the ability to circulate, such as road infrastructure. As a systemic approach, Visão Zero transfers responsibility for these traffic accidents to those who design urban spaces, observing the causes of road safety issues in order to create a safe mobility system.

In short, Vision Zero considers that human errors are inevitable, but traffic deaths and injuries are not. Therefore, the road system needs to be designed so that the effects of human errors on the streets do not result in deaths. This approach advocates for shared responsibility considering the participation of governments, the private sector and civil society. Mobility security measures must also consider actions such as public education, training of the actors involved, regulation and inspection.

According to the World Health Organization (WHO), traffic accidents are the eighth leading cause of death in the world, and the main one among children and young people from 5 to 29 years old. Annually, more than one million lives are lost in traffic accidents, with 90% of these deaths occurring in low- and middle-income countries. According to data from the Ministry of Health[9] 30,168 people died as a result of traffic in Brazil in 2019.

Given this context, the relevance of this study lies in its task to understand, in a systemic way, the relevant aspects of road safety for delivery cyclists in Brazilian cities. The scope of this work places the bike couriers in the cyclelogistics ecosystem in Brazilian cities.

In this systemic approach, the cyclelogistics ecosystem guided by road safety has as main actors the bike couriers, logistics companies and delivery apps, and the public authorities. The public road space is treated as a work location and a work instrument, respectively, indispensable for delivery cyclists to fully conduct their activities.

This report was developed by the Sustainable Mobility Laboratory (LABMOB), of the Graduate Program in Urban Studies (PROURB), of the Federal University of Rio de Janeiro (UFRJ), with

6 *https://summitmobilidade.estadao.com.br/guia-do-transporte-urbano/por-que-o-atropelamento-de-ciclistas-disparou-no-brasil/*

7 *https://mercadoeconsumo.com.br/2019/07/24/numero-de-entregadores-cresce-1042-devido-ao-desemprego/*

8 *https://www.bbc.com/portuguese/brasil-52564246*

9 *http://tabnet.datasus.gov.br/cgi/tabcgi.exe?sim/cnv/obt10uf.def*

support from Fundación MAPFRE, and its main objective was to explore relevant aspects of road safety in the flow of bike couriers in Brazilian cities. For this, we sought to understand issues that impact the road safety of delivery cyclists.

Five dimensions that form the cyclelogistics ecosystem were established from the perspective of road safety in Brazilian cities, used in the systematization of the questions inherent to the research: a) bike couriers; b) bicycle and equipment; c) companies, collectives and apps; d) urban infrastructure and e) legislation and public policy.

This is an exploratory study on a topic that has not yet been addressed in Brazil, so it would be useful to raise and answer questions, such as: "what are the profiles of these professionals?", "what are their respective relationships with road safety" and "what good practices can be considered exemplary in the Brazilian context?".

To answer these questions, the following objectives were defined:

Identify and analyze the main factors in a systemic environment related to daily safety in the cyclelogistics ecosystem;

Identify and analyze the main factors in a systemic environment related to daily safety in the cyclelogistics ecosystem;

- Identify and analyze the main factors in a systemic environment related to daily safety in the cyclelogistics ecosystem;
- Characterize the profiles of bike couriers in Brazil and their respective relationships with road safety;
- Map good cyclelogistic practices developed by public (legislation, etc.) and private agents (business models, working conditions, etc.) in Brazil;
- Identify good practices related to work dynamics and road safety for bike couriers in Brazilian cities;
- Indicate recommendations to improve road safety for these delivery cyclists.

The study developed exploratory research that analyzed the bike couriers ecosystem through a qualitative-quantitative triangulation with primary and secondary data. Data were obtained through a combination of instruments described in the methodology chapter.

The content of this report is structured in 06 chapters: After this introduction, chapter 02 presents the methodology adopted throughout the research. Chapter 03 brings a brief debate on the concepts of cyclelogistics and road safety, referenced in recent academic literature. Chapter 04 brings the results and analyzes, structured by the used dimensions, survey and case studies. In chapter 05, good practices and recommendations are presented. Finally, the report delivers its final considerations in chapter 06. Bibliographic references, appendices and annexes complete the content of this document.

Figure 1 - Bike courier in São Paulo (SP)

Source: Jéssica Lucena, 2021

2 METHODOLOGY

This exploratory research sought to investigate the central theme of the relationship between road safety and cyclelogistics through the triangulation of primary and secondary quali-quantitative data, collected with different methodological instruments. For each section of the study, methodological procedures and specific instruments were adopted and indicated respectively.

Exploratory research results in greater familiarity with the phenomenon to be investigated, in order to achieve better understanding and precision on the topic (THEODORSON; THEODORSON, 1970 apud PIOVESAN; TEMPORINI, 1995). It contributes to the choice of the most appropriate methods and to determine which issues require more detailed analysis. In addition, it indicates the difficulties, potentials, sensitivities, and areas of resistance to be encountered during the process of data collection and analysis. This study could be carried out using different techniques, considering the incipient universe of the theme of road safety for cycling delivery observed in Brazil.

To build the conceptual foundation of the study, in order to explain the main concepts of the research and contextualize the status of cyclelogistics in Brazil, secondary data were collected through a systematic literature review to define key concepts such as road safety, cyclelogistics, safety perception, working conditions, incentive policies; benchmarking on scientific research on road safety and cyclelogistics; and analysis of consolidated data from partners about accidents involving cyclists.

Primary and secondary data were collected in three cities in different regions of Brazil (Curitiba-PR, Fortaleza-CE and São Paulo-SP) in order to investigate the profile of delivery

cyclists, the road safety aspects related to their working conditions, the built environment for their mobility, and to track and analyze good corporate and public policy practices. This was done through case studies with delivery men and women, companies and collectives related to cycling, a survey, documentary and bibliographic research.

The instruments used to obtain primary data were: qualitative-quantitative questionnaire with delivery cyclists linked to apps in São Paulo (SP); in-depth interviews with delivery cyclists, companies and collectives, ethnographic monitoring during delivery routes, characterization of road space and counting of cyclists in Curitiba (PR), Fortaleza (CE) and São Paulo (SP).

- Qualitative-quantitative questionnaire with delivery cyclists linked to apps in São Paulo (SP);
- In-depth interviews with delivery cyclists, companies and collectives;
- Ethnographic monitoring during delivery route;
- Characterization of road space;
- Counting of cyclists in Curitiba (PR), Fortaleza (CE) and São Paulo (SP).

Source: Author's elaboration.

Secondary data were collected from documentary and bibliographic research to gather information about the national and municipal legislation of the cities, best practices related to cyclelogistics, and road safety in Brazil and worldwide.

Synthesis of methodology and field calendar:

AUGUST / 2021

Development of the methodology

Defining the spacial frame (Curitiba, Fortaleza and São Paulo)

Defining strategic partnerships

Literature review

SEPTEMBER THROUGH OCTOBER/ 2021

1st progress pannel of the Road safety and cyclelogistics study

Refining dimension and indicator choices

development of the case studies

documentary research

Pilot study application (21/11 to 23/11)

Start of fieldwork activities (29/11)

- Conduction of case studies (Curitiba...)
- Survey application

NOVEMBER THROUGH DECEMBER / 2021

End of fieldwork activities (19/11)

Primary and secondary data analysis

2nd progress pannel of the Road safety and cyclelogistics study

Source: Author's elaboration.

2.1 Global observers

Since the construction of its conceptual foundations, this research sought to adopt perspectives that were aligned to the work developed by strategic institutional partners that deal with the ecosystem of cyclelogistics and road safety in Brazil. The research was developed in constant dialogue with these partners, here referred to as global observers of the research. The invited and participating institutions are: Aliança Bike, Bike Amiga, Bike Anjo, Instituto Cordial, the National Observatory for Road Safety, Transporte Ativo, Vital Strategies and WRI.

Through the collaboration of these observers, follow-up panels were held with their respective expert representatives. These panels occurred at two distinct moments throughout the evolution of the research: the first, for a debate about the methodological design of the study and the second, to present preliminary results and to conduct a survey of good practices and recommendations.

Follow-up panels

The first follow-up panel of the study took place on September 3, 2021, held online, with the participation of the global observers in order to review and validate the study's methodology.

This first panel presented the research design and its proposed methodology, focusing on indicators and primary data collection instruments, followed by a dynamic discussion with suggestions regarding the dimensions and indicators adopted.

After the LABMOB team's presentation, the guests were able to present their initial considerations about the objectives, expected impacts and research methods. The dimensions were revisited and the group was asked to make their considerations about the indicators, adding new ones, commenting on the existing ones and, finally, marking two indicators from each dimension that they considered the most relevant to the research objectives, considering the ease of data collection and greater reliability of the data.

Table 01 - Global observers that participated of the follow-up panels

Institution	Representative(s)	Position(s)
Aliança Bike	Daniel Guth	Executive Director
Bike Anjo Recife	Bárbara Barbosa	Bike angel
Bike é Legal	Renata Falzoni	Founder
Instituto Cordial	Luis Fernando Meyer	Operations Director
Observatório Nacional de Segurança Viária	André Igarashi	Researcher
Transporte Ativo	José Lobo	President
Vital Strategies	Hannah Aruschin Beatriz Rodrigues	Project manager and Urban Design Coordinator
WRI Brasil	Paula Santos	Active mobility manager

With the purpose of presenting the preliminary results and collecting recommendations and best practices, the second follow-up panel took place on December 6th, 2021, also on-line and with the participation of global observers.

The panel consisted in the presentation of the applied methodology and preliminary results of the survey and case studies, focusing on identifying correlations between variables to be used. This moment of suggestions was followed by a survey of good practices related to the dimensions used in the study. As in the first panel, all the representatives received support material with the content of the presentation, as a way to prepare for the event. At the end, a round of questions and answers was held regarding the dynamics that were carried out. Once again the global observer institutions reiterated the relevance and quality of the research.

Figure 2 - Cyclist using bike lanes in Fortaleza (CE).

Source: Adriana Marmo, 2021.

2.2 Dimensions and indicators

A systemic approach was adopted due to the possibility of exploring the interdisciplinarity required by the complexity of the research theme. The definition of system refers to the interaction between the parts, here called dimensions, and the whole, from the understanding of complex and non-linear dynamics in the defined ecosystem. Through the systemic approach, we tried to understand the phenomena in a way that is close to their realities, considering their characteristics and contexts, here called indicators and dimensions.

From the understanding of the so-called cyclelogistics ecosystem, we sought to define the parts that compose it in order to structure the systemic analysis of the topic. It is understood that the five dimensions considered in this research contemplate the issues inherent to the conjuncture of the object of study. This ecosystem is also composed of several characteristic items, here designated as indicators. These indicators are fundamental to the research because they turn data into information that is essential to achieve the proposed objectives. Despite the intersection of several of the indicators addressed in the research that could be included in more than one dimension, we adopted the methodological stance of separating them among the five dimensions adopted:

Bike couriers

This is the target audience of the study. This dimension seeks to understand the profile of these workers, their relationship with the bicycle, their employment relationships, their perception of road safety as cyclists and professionals whose workspace is the street, their involvement in traffic accidents, and their perception of their occupation.

Bicycles and equipment

This dimension addresses the main work tool of delivery workers, in addition to accessories that help in efficiency and safety during the journey. These are the instruments that insert couriers into the physical environment, and their characteristics directly interfere with road safety conditions. This dimension takes into account questions about types, use, and conditions of bicycles and equipment for bike couriers and cyclelogistics.

Companies and collectives

These are the organizations that group the delivery cyclists and with which they are linked through various contracts. The companies can be specialized in logistics and bike courier, by app or retail. The good practices of these organizations collaborate to positively impact road safety and the working conditions of delivery cyclists.

Urban infrastructure

This dimension deals with the characteristics of the workplace of delivery cyclists. The state of this public road space provides the relationships and dynamics that design road safety conditions, including aspects related to road traffic conditions and rules. This dimension seeks to understand the suitability of the built environment for cyclists, bicycles and cyclelogistics, considering users' risk perceptions based on road characteristics.

Legislation and public policy

Looking at cyclelogistics through the lens of road safety, with the premise of Visão Zero and shared responsibility for traffic accidents, strengthens the role of legislation and public policy in the constitution of road space and working conditions for the category. This dimension addresses the interface of cyclelogistics and road safety with the public administration, surveying the instruments by which the state can impact the working conditions of delivery cyclists and road safety through legislation, regulation, tax incentives, and campaigns.

Dimension indicators - Delivery cyclists:

Gender;

Color of skin / ethny;

Age;

Education level;

Place of residence;

Location of work;

Previous occupation;

Experience with cyclelogistics;

Way of transportation to the workplace;

Hours of work and daily deliveries;

Ownership of work equipment;

Fears related to the occupation;

Personal insurance;

Involvement in accidents;

Behaviour during journeys.

Dimension indicators - Bicycles and equipment:

Type and technology of the bicycle used;

Accessories and equipment used;

Cargo transport accessories;

Use of earphones/speaker;

Body signs and personal protection elements;

Technical problems with equipment;

Equipment maintenance.

Dimension indicators - Companies and collectives:

Nature of the company or collective;

Internal legislation of companies or collectives;

Types of hiring professionals;

Incentives for road safety, urban and road education;

Educational actions and campaigns;

Professional training;

Insurance;

Social responsibility and work rights;

Benefits and legal support for delivery cyclists;

Challenges of corporate policies;

Monitoring and evaluation policies.

Dimension indicators - Urban infrastructure:

Existence of a cyclelogistics structure;

Preference for bicycle facilities;

Lane width and pedaling comfort;

Lighting;

Speed of cars;

Orientation signs;

Quality of pavement;

direction of the road;

Visibility at intersections;

Obstacles on the road;

Volume of vehicle flow;

On-street parking;

Perception of safety by areas of the city;

Previous involvement in accidents.

Dimension indicators - Legislation and public policy:

Regulation of cyclelogistic activity;

Public policies to encourage cyclelogistics;

Public policies for road safety;

Educational and monitoring actions.

2.3 Choice of spatial delimitation

In order to characterize and understand the profile of bike couriers, their perceptions of road safety and their involvement in accidents, a survey was conducted with a sample of delivery cyclists from apps using electric bicycles in the city of São Paulo (SP). This group of workers linked to apps - digital platforms - has gained more relevance in recent years and especially with the Covid-19 pandemic. Due to technical limitations that conditioned the choice of location for its application, the survey was only conducted only in São Paulo (SP), a large urban center where there is significant incidence of this activity.

For a comprehensive understanding, and taking into account the specificities of Brazilian geography, three medium or large cities in the South, Southeast and Northeast of the country were selected for case studies: Curitiba (PR), Fortaleza (CE) and São Paulo (SP). These cities were selected considering their relevance in the national and especially regional scenarios, regarding cyclelogistics and road safety.

The five dimensions were addressed in two selected case studies in each of the cities. These case studies seek a qualitative understanding of the cyclelogistics and road safety ecosystem through the analysis of the indicators adopted in the study.

2.4 Primary and secondary data collection

2.4.1 Survey[10] São Paulo (SP)

In order to investigate the profile of delivery cyclists linked to apps and the main aspects and issues concerning working conditions and road safety, a survey was developed and applied. Given the size of the population and the purpose of data collection, a survey is efficient because it is a way to collect information about the characteristics, actions, or opinions of a large group of people.

Sampling

The population universe was defined as the bike couriers who used the iFood Pedal program and the sample was defined at 300 of these users. From information prior to the survey, it was estimated that the universe of delivery cyclists registered in the project already exceeds 13,000 people (iFood)[11].

With this information, the margin of error stipulated for the survey is 5% with a 95% confidence level. The bike couriers who use the iFood pedal program are concentrated in four pick-up points: Largo da Batata, Ponto Augusta, Itaim Bibi and Ponto Moema. In order to capture the regional representation of the universe of users and avoid sampling biases, we first stratified the sample based on these bicycle pick-up locations. Therefore, the division of the sample of 300 interviews was done following the proportion of the previous availability of bicycles from these four points, and was defined as follows:

- Augusta: 88 interviews (44 in the morning, 44 in the afternoon)
- Largo da Batata: 88 interviews (44 in the morning, 44 in the afternoon)
- Moema: 71 interviews (26 in the morning, 27 in the afternoon)
- Itaim Bibi: 53 interviews (235 in the morning, 36 in the afternoon)

A common problem in sampling designs for surveys like this is, first, not guaranteeing a

10 *Survey is a quantitative research method that seeks to obtain data about a certain group of people by means of a research instrument, usually a questionnaire.*

11 *Internal administrative data made available by TemBici and IFood.*

random sample and, second, not guaranteeing that all individuals in the universe have an equal probability of being approached[12].

To minimize response biases, the approach strategy for the application of the survey was to conduct small lotteries at the locations. At the beginning of each period, the first person to be approached was to be drawn according to his or her location in line, by drawing a number 1 to 10, and the next were those 2 people after the first. This strategy was possible because the delivery-workers received passwords or waited in line to be able to pick up the bicycles at the beginning of each delivery period. So, for example, if the number drawn in the morning at a certain point was 4, the first person to be approached in that period would be the 4th person in line, the next ones would be the 7th, 10th, 13th, and so on. In case one of those people in the sequence denied the application, the next person in line would be approached. The strategy was repeated for each new collection period and for each approach point specified above.

Figure 3 - Location of the points of withdrawal of electric bicycles and application of the questionnaire, in São Paulo (SP).

Source: Author's elaboration.

It was determined that a different strategy should be used to approach women. Since this universe was much smaller than that of male delivery-workers, according to the data previously obtained, all women found at the points could be approached, without the need to draw lots. Although it was not done randomly, it was important to consider this minority group in the research. The lack of previous data prevented a more adequate sampling plan to connect with this group. Therefore, the interpretation of the gender variable needed to be done more carefully in terms of statistical generalizations.

Why use the iFood Pedal

Initially, the universe defined for the survey would be any bike courier working through an app, who used their own or shared bicycles. However, after a series of theoretical discussions, it was concluded that in order to answer the research questions, it would be necessary to establish a more focused and defined universe.

The interests and dynamics of a population universe of "any bike courier" would have little to contribute in terms of "construct validity"[13]. Sometimes it is better to have a smaller, better-defined target group in which the concepts (constructs) make more sense and from which more accurate learnings are possible.

For example, it can make a very relevant difference to deal with bike couriers who work with their own bicycles than with couriers who are part of a vehicle rental program, such as those of iFood pedal. The delivery cyclists with their own bikes have interests, opinions, equipment conditions, work relationships, etc., that are very different from the delivery-worker

12 *In cases of different probabilities, it should be known by design what the differences in probabilities are so that one can re-estimate parameters by means of sample weights.*

13 *Construct validity is a term used to refer to the quality of the instrument for measuring the variable it is intended to investigate.*

in a shared bicycle program. Therefore, in theoretical terms, it is necessary to differentiate these workers and make the sampling options that make the most sense. Therefore, it was decided to choose the members of the iFood Pedal program.

The program offers the electric bicycle rental service, exclusive to its delivery users. The program arises from research carried out with delivery cyclists and from the understanding of actions that facilitate the daily life of users of the bicycle sharing system in São Paulo (SP). E-bike rentals provide couriers with access to expensive equipment[14] and all the conveniences that equipment provides to the cyclist. By having assisted pedaling[15] and an average autonomy of 60 km, the electric bike allows for longer trips in less time. The program also provides the convenience of not having to cycle long distances from home to major delivery district[16].

In addition, the fact that we do not have accurate data on the number of these "any" bike couriers in the city of São Paulo (SP) contributed to the decision of defining a statistically accurate sample, which is also why we chose to reduce the universe of this stage of the study. In a second moment it was possible, through the responsible companies, to have access to some data from the Bike Sampa and iFood Pedal programs. With this, it was decided to adopt as a universe those delivery-workers who used the bicycles of such programs during work. The pilot application was carried out and, from the results, it was decided to reduce the universe to one with a greater degree of control of the variables.

Finally, the survey universe was defined as the delivery-workers registered in the iFood Pedal who were using the program's bicycle. The choice of such a universe was due to the possibility of statistical control of the sample, since it had access to the total number of users and the geographic distribution of available bicycles. The iFood Pedal program has four support points, where registered delivery cyclists go to pick up and return their electric bicycles. Therefore, with data on the number of bicycles available in each of these locations and the times that most couriers are gathered at those points, it was possible to precisely define the sample quotas and the times of application of the survey in the field.

14 *According to the 2021 Bulletin of Electric Bicycle Market by Aliança Bike's , the average price of electric bicycles was calculated at R$ 5,900.00 in the Brazilian market.*

15 *Assisted pedaling (pedelec) is the distinguishing feature of the electric bicycle. When pedaling, the system drives the motor, allowing greater propulsion with less effort.*

16 *https://ifood.tembici.com.br*

Figure 4 -Pilot application of the survey in São Paulo (SP).

Source: Jéssica Lucena, 2021

Survey structure

The 31 questions in the questionnaire were divided into seven blocks (Figure 05): (1) perceptions of road safety, (2) involvement in accidents, (3) changes in the city, (4) fears, (5) accessories, (6) job aspects, (7) socio-demographic profile. In order to facilitate its application and the data processing during the analyses, closed-ended questions were adopted. As in the interview script with couriers, the questions referring to the sociodemographic profile were the last to be answered to avoid exhaustion of the respondents before the questions that required more reasoning.

The first block presents statements based on urban infrastructure indicators and aspects related to cyclists' perception of road safety: bike lane preference, visibility, road comfort, vehicle speed, street lighting, traffic signaling, counterflow riding, and road intersections. These questions differ from the others by presenting statements and asking for responses in agreement scale format: (a) Agree, (b) Disagree, (c) Neither Agree nor Disagree, and (d) Don't know how to answer. The branching logic includes additional questions for the "yes" answer to the question about involvement in accidents while using the electric bicycle, for the sake of event characterization information: place, time, people involved, and severity. The full model of the applied questionnaire is in Appendix A.

Pilot

The objective of the pilot was to test the questions and the time to apply the questionnaire, to test the universe and the interview locations outside the support points, and to verify in the field, through observation and collection of information with delivery cyclists and employees of the support points, which were the peak hours of those locations and what times the delivery cyclists would have time to answer the questionnaire. The pilot was also essential to test the sampling plan strategies, especially the feasibility of stratifying the sample by bicycle delivery locations and random approaches in the field.

Before defining the final population universe of the survey, a pilot application of the questionnaire was done with a larger universe: the delivery cyclists who use the Bike Sampa and iFood Pedal programs. The test application was done in 3 days, in the morning, afternoon and evening periods, and in 3 locations:

- Thursday (21.10.21) from 10:30am to 12pm at Largo da Batata pickup point and from 12:00pm to 1:00pm at Rua Augusta pickup point;
- Thursday (21.10.21) from 10:30am to 12pm at Largo da Batata pickup point and from 12:00pm to 1:00pm at Rua Augusta pickup point;
- Saturday (23.10.21) from 11am to 1pm at Rua Augusta support point.

Regarding the universe and the places of application, the result of the pilot showed that those who used the Bike Sampa bicycles did not stay close to the pick up stations, but close to the restaurants, waiting for calls from the apps and dispersed in groups along the streets of the establishments. It was also noticed that these delivery workers close to the restaurants were less willing to answer the questionnaire than those approached at the iFood Pedal support point, because they were already within the working hours and could receive an order from the app at any time. Therefore, their spatial dispersion, distant from the stations where they picked up the bicycles, and their lower availability to answer the questionnaire made the controlled application of the survey in the field more complex.

Regarding the schedules, it was verified that the distribution of bicycles at the points started at 10:30 in the morning and from 5:30 in the afternoon. After removing the bicycle, the delivery worker could use it for up to 4 hours. As the number of available bicycles was smaller than the number of registered workers, the bicycles were distributed on a first come first served basis. Therefore, the hours for survey application were defined based on these pick-up and return times.

SURVEY QUESTIONNAIRE -APP DELIVERY CYCLISTS

BLOCK 01 – PERCEPTIONS OF ROAD SAFETY

P01 If possible, would you prefer to ride on a bike lane/cycle track?

RAMIFICATION P01.01 For what reasons would you not prefer to cycle on a path with a bike lane / cycle track, if you have the option?

P02 Being visible to other vehicles is an important factor for my safety as a cyclist.

P03 On a street shared with other vehicles, the wider the lane, the safer I feel.

P04 The faster the car(s) move next to me the less safe I feel.

P05 Streets with many vehicles driving by me make me more insecure.

P06 A well-lit street gives me a sense of safety.

P07 The stripes painted on the street are important for my cycling safety.

P08 Cars parked on the street make me feel unsafe.

P09 I feel unsafe cycling on the wrong side of the road.

P10 I am more careful at intersections for fear of traffic claims.

BLOCK 02 – INVOLVEMENT IN TRAFFIC CLAIMS

P11 Have you ever been involved in a traffic claim while making deliveries using one of the electric bicycles?

RAMIFICATION P11.01 If yes, considering your last claim, how serious was it?

RAMIFICATION P11.02 Did this claim involve another vehicle(s) or pedestrian(s)?

RAMIFICATION P11.03 Do you remember the location of the claim?

BLOCK 03 – CHANGES IN THE CITY

P12 Thinking about your safety when commuting with an electric bicycle during work, which points would you like to see changed in relation to the city of São Paulo?

BLOCK 04 – FEAR

P13 What do you fear in your day-to-day work?

BLOCK 05 – ACCESSORIES

P14 What accessories do you use during work?

P15 Do you use any kind of audio accessory connected to your cell phone?

BLOCK 06 – WORK ASPECTS

P16 What is your main type of transportation to the bicycle pickup point?

P17 In which neighborhood is the majority of your deliveries (destination)?

P18 What days and times do you usually work?

P19 Using the electric bicycle how many deliveries per day do you make on average?

P20 Do you have any kind of personal insurance?

P21 How long have you been riding electric bicycles?

BLOCK 07 – SOCIODEMOGRAPHIC PROFILE

P22 What is your age?

P23 What gender do you identify with?

P24 What race/ color/ ethnicity do you identify with?

P25 What is your education level?

P26 In what city/ neighborhood do you live?

Figure 05 - Questions from the questionnaire applied in the survey in São Paulo (SP). Complete model in Appendix A.

Conducting the application

The questionnaire used was operationalized through the SurveyMonkey platform and applied with the use of tablets. The application was carried out between October 29 and November 9, in two periods of the day: in the morning, from 9:30 am to 12:00 pm, and in the afternoon, from 2:30 pm to 6:00 pm, as indicated in the sampling plan.

For the morning pickup, the bike couriers usually arrive at the points around 9:30am, where they organize themselves in lines made with their bags, which give way to their owners as soon as the distribution of bikes starts at 10:30am. Right after the pickup, some delivery people remain at the points until they start taking orders from the apps, which happens most often between 11:30am and 12:00pm.

In the afternoon, the organization of the delivery workers starts at 2:30 pm, and it is done in different ways at each point. In the Augusta and Moema spots, numbered tickets are distributed to the workers who are called by them at 5:30pm. In Largo da Batata and Itaim Bibi, from 2:30pm onwards, the workers are organized on a list in which they leave their names in order of arrival, and are called at distribution time. The survey application in this period of the day was made in the gap between the beginning of the "queues" and the removal of the bicycles, a time in which some delivery workers take to have lunch, rest, recharge their cell phones, etc. Approaching workers at these moments minimized the refusals to answer the survey, which confers greater statistical credibility to the results.

In the end, 336 delivery workers were interviewed, distributed in the application points previously defined (Figure 06).

Figure 6 -Distribution of responses by place of application.

Source: Author's elaboration

2.4.2 Case studies – Curitiba (PR), Fortaleza (CE) and São Paulo (SP):

All case studies selected are part of the transportation category for delivery services, sales or distribution of goods within the cyclelogistics economic sector (LABMOB, 2020). Within this category there are different types of services that vary according to the role of the cyclist in the logistics operation and by the type of demanding economic activity - industry, retail or generic deliveries. The cyclist may be responsible only for the delivery and transport of the goods (i.e., with no employment relationship with any company, working only on demand). In other cases, the cyclist may be an employee or even the owner of the company (usually micro-enterprises) that manages the distribution, sale or delivery by bicycle and/or tricycle.

Two case studies were conducted in the city of Curitiba (PR):

- Sem C02 Entregas Ecológicas: a bike courier service company, it was one of the pioneers in the sector of cyclelogistics and emission-free deliveries in Curitiba (PR) and is currently one of the few operating in the city.
- Bicicletaria Cultural: a company that provides support space for cycling and cyclists that has been operating since 2011 with social impact.

Two case studies were conducted in the city of Fortaleza (CE):

- Disk Água FP: Retail cycling delivery company and beverage distributor for 10 years. Deliveries of gallons of water and gas cylinders are representative of neighborhood trade in the city.
- Tele Entregas: company specialized in fast urban delivery logistics since 1986, including electric bikes for deliveries.

Two case studies were conducted in the city of São Paulo (SP):

- Señoritas Courier: Informal collective of women and LGBTQIA+ delivery cyclists founded in 2017.
- Carbono Zero Courier: delivery company with bike courier and electric vehicle service, active since 2010.

Each conducted case study included the following research tools for primary data collection:

In-depth interviews

The collection of primary data in the case studies included in-depth interviews. These interviews aimed to deepen the understanding about the working conditions of delivery cyclists and the daily dynamics of the category, focusing on aspects of road safety. In addition, the interviews sought to collect narratives of experiences that illustrate the exercise of cyclelogistics in the case study cities. In addition to the two delivery cyclists of each case, representatives of the companies and collectives also participated in interviews.

The 12 interviews with delivery cyclists followed a same semi-structured script (Appendix B - Interview script with delivery cyclists) and were conducted either virtually or in person, depending on the case and the availability of each person interviewed. The 6 interviews conducted with representatives of the companies and collectives also followed a semi-structured script (Appendix C - Interview script with companies and collective representatives) and were conducted either virtually or in person. All interviewees were informed about the research objectives and consented both to the recording and to the use of the data collected.

It is important to make an observation about the use of the term "accident" in data collection instruments with third parties. The substitution of the term "traffic accident" has already occurred in Spanish (siniestro) and English (crash) and was standardized in Portuguese by ABNT at the end of 2020. NBR 10697 determines the adoption of the term "traffic claim"[17] in research and statistical reports on the subject. We adopted the position of using the colloquially known term "accident" in the instruments (interviews and questionnaires) applied with a lay public, to facilitate the understanding and response of the participants.

17 *NBR 10697 indicates that traffic claim corresponds to all events that result in damage to the vehicle or its cargo and/or in injuries to people and/or animals, and that may bring material damage or harm to traffic, the road or the environment, in which at least one of the parties is in motion on land roads or in areas open to the public.*

The questions in the interview script to be conducted with bike couriers were divided into eight blocks: (1) introduction of the delivery worker, (2) relationship with bicycle and occupation, (3) work routine, (4) relationship with work and perception of the occupation, (5) bicycle and equipment, (6) perception of safety, (7) involvement in claims, (8) profile and closure. In this case, the socio demographic survey was the last part to be answered to avoid wearing out the respondents before the questions that required more reasoning.

The questions in block 06 about perception of safety differ from the others by presenting statements and requesting answers in the format of five Likert-type scales with a rating from 1 to 5, where 1 is equivalent to strongly disagree and 5 to strongly agree. There are eleven statements based on elements that may interfere with the respondents' perception of security. Next, still in the same block of questions, hypothetical scenarios were presented and the respondents were asked to indicate their level of safety facing the scenario (see Appendix D). The answers followed the same format of five Likert-type scales adopted in the previous questions.

The questions in the interview script with the companies and collectives representatives were divided into nine blocks: (1) the company / collective, (2) benefits, (3) bike and equipment, (4) delivery logistics, (5) safety, (6) claims, (7) education, (8) best practices, challenges and perspectives, (9) conclusion.

The data gathered from the interviews were considered in the analyses presented in chapter 04. In qualitative research, quotes from the interview excerpts[18] are important, to lend credibility to the analyses. For ethical reasons and in an attempt to preserve the anonymity of the interviewees, pseudonyms were used.

18 *The opinions of the interviewees do not necessarily reflect Fundación MAPFRE's position on cyclelogistics and road safety.*

Figure 7 - Delivery cyclist is accompanied by researcher in Curitiba (PR).

Source: Doug Oliveira / Ciclolguaçu, 2021

Ethnographic follow-up

Ethnographic research studies perception and behavior patterns in people's daily routines. It is through data collection and participant-observation, guided by the questioning sense and the experience of the ethnographer[19], that the follow-up of delivery workers was conducted.

Through the sharing of experiences, circumstances and activities, research considers it possible to observe situations and behaviors of a group of people that is being studied. The process of participant observation requires gaining the trust of the subject involved, sensitivity in relating to people, familiarity with the issues being investigated, and the ability to be a good listener. For these reasons, the follow-ups were carried out with a person who had been previously interviewed, since there was already contact between the researcher and the cyclist. The goal of the follow-up is to visualize, in practice, matters of behavior and perceptions of cyclists. To observe possible contradictions in the speeches and capture additional information to that reported in the interviews.

In a conversation prior to the follow-up, the researchers sought to understand the cyclist's routine of deliveries and routes, and what are the busiest times, shifts and the length of routes. During the follow-up, the researchers were instructed to observe and examine the cyclist's behavior, especially regarding: characterization of the deliveries, routes, behavior with the built environment, conflicts and perceptions of comfort and road safety. All routes taken were tracked, mapped and photographed[20].

19 *The term "ethnographer" is used to refer to the person who conducts the ethnographic follow-up; that is, the researcher.*

20 *Although they reflect reality, the photos do not necessarily present the recommendations about the use of preventive equipment for cycling.*

Figure 8 - Researcher performing ethnographic follow-up with a delivery cyclist in Curitiba (PR).

Source: Doug Oliveira / Ciclolguaçu, 2021

Characterization of the road space

At the end of the follow-up, the volunteers were asked to indicate 1 section of the route taken where they felt more secure and 1 section where he/she felt less secure. In order not to interfere with the follow-up and the reports of the person escorted, these indications and questionings were made at the end of the route. A road characterization was done on each section indicated as safest and least safe, by each delivery person.

The purpose of the characterization is to create road profiles of the indicated sections, at the block scale, and relate road characteristics with perceptions of road safety attributed by the cyclists. This research tool is directly related to the indicators of the dimension "Urban infrastructure", since it seeks to understand which elements of the environment interfere in the users perception of safety.

Some of the variables raised in the characterization were: block length, sidewalk width, carriageway width, physical permeability, land use, road direction, regulated speed, paving type, paving conditions, presence of physical obstacles, street lighting, horizontal signaling, vertical signaling, presence of vehicle parked on the road, road topography, street shading and presence of trees, motor vehicle traffic volume, visibility at intersections, conflicts at intersections, conflicts at roundabouts, number of entryways for motor vehicles, preferred location for on-street cycling, parking availability for bicycles, availability of bicycle facilities, presence of bike lanes, connections to bicycle networks, protection of the bike lane. The complete table with all variables and description of the data to be surveyed is in Appendix E.

Countings

On the same stretches indicated by the delivery drivers as the most and least safe, counts of cyclists and other vehicles were taken, in addition to the road characterization. The objective of the counts was to contribute to the characterization of the road by measuring the volume of bicycles, characterizing users and observing the behavior of cyclists on the road.

We collected the number of cyclists, bike couriers, gender, position of the cyclist on the road and other vehicles on the road. It was considered as a response in the category of 'bike couriers' cyclists who use bags/cargo carriers or other accessories that configure cyclelogistics service. When counting the flow of motorized vehicles, we specified the type of vehicle (car, motorcycle, van, bus) in each direction (in the case of a two-way street). The counting time for bicycles and cyclists was 30 minutes, while for other vehicles it was 5 minutes. The counts were performed during rush hours, on a weekday. The data collected through the application of this research tool are presented in the chapter on analysis and results, in the Urban Infrastructure dimension.

Figure 9 - Bike courier using the bike lane in the central area of Curitiba (PR).

Source: Doug Oliveira / Ciclolguaçu, 2021

3 CONCEPTUAL FRAMEWORK

3.1 ACTIVE MOBILITY

Active mobility is the type of mobility that assumes that the energy of the means of motion of a given subject is provided by the subject himself (ANDRADE, LINKE, 2017). It makes use of human energy itself as a driving force. Thus, the traveler himself or herself becomes the agent responsible for his displacement in time and space, without any motorization. These displacements can be on foot or mediated by mechanical equipment, such as bicycles and scooters. In Brazil, the National Policy for Urban Mobility (PNMU - Law No. 12,587, 2012) and the Brazilian Traffic Code (CTB - Law No. 9,503, 1997) address this type of mobility as "non-motorized modes," or in the case of the bicycle, "human propelled vehicles."

One must also consider the case of equipment with light electric power, the micromodals, which mix active mobility with some motorization and are left out of the CTB (micromodals are between "automotive equipment" and "human propelled" equipment). New modes are emerging to subsidize the delivery of goods and services, which count on the support of bicycles and tricycles, electric or not, that make up the cyclelogistics chain.

3.2 CYCLELOGISTICS

Cyclelogistic activities are related to the use of mechanical or micromodal equipment (bicycles, scooters, tricycles, etc.) to perform logistics activities. Thus, *"the bicycle equipped with baskets and cargo carriers can provide transportation of products, services, tools, or act as a means of transportation for professionals in their working hours"* (LABMOB, ALIANÇA BIKE, 2018).

Since logistics advocates for efficiency and organization of deliveries, cyclelogistics involves the bicycle in the circuit of transport, loading,

delivery, sale and distribution of consumer goods. Bicycles have been an important alternative for the transportation of goods and passengers, with successive technical and technological innovations (NUNES, 2017). Thus, there are great expectations of increasing the use of bicycles in the logistics sector (ALIANÇA BIKE, 2021).

Within the cyclelogistics universe, there are some distinctions. One can divide it into two broad categories - the use of the bicycle/micromodals for the transportation, delivery, sale or distribution of consumer goods (i) and for the worker/service provider's own commuting (ii).

In the first case (i), goods and services have their distribution/sale organized by cyclists who rely on bicycles/micromodals to perform this activity, regardless of the nature of their hiring (employee, self-employed, outsourced, etc.). In the second (ii), service providers use the bicycle/micromodal to commute and perform their work.

Still considering these two categories, for the first of them (i) - where the transportation of delivery services, sales or distribution of goods occurs - there is the subdivision of trip types: bike courier (point-to-point deliveries made by companies or self-employed people), app deliveries (point-to-point deliveries, B2B or B2C, made by independent deliverers mediated by apps, retail deliveries (delivery of goods made by the company's own employees), and sale of goods or products (made by salespeople, employees or micro-entrepreneurs).

For the second category (ii) - where the transportation of professionals providing various other services occurs - there is a subdivision into two types: support transportation for urban maintenance services (provided by public and private employees) and the employee's own transportation by bicycles (point to point by the technician or employee).

Benefits for mobility and last mile logistics

There are great advantages of bicycle and tricycle use in dense urban areas, which are mostly the centralities of Brazilian cities. Currently, Brazil has seen an increase in the number of bike couriers, app and retail deliveries made by bicycles and micromodals (ESTADÃO, 2021). Bicycles and tricycles, due to their size and agility, end up fitting with great capillarity in these dense spaces thus reducing delivery times.

Last mile deliveries[21] - the most costly and complex delivery operation (ALIANÇA BIKE, 2021) - have been performed preferably by bicycles in several countries besides Brazil. The "last mile" logistics stage is, according to research, the most expensive, complex, and with the biggest carbon footprint within the distribution logistics chain (GAVAERS; VAN DE VOORDE; VANELSLANDER, 2014). These negative aspects are even greater in dense urban environments.

In addition, many urban centers impose circulation restrictions on motorized traffic. Thus, cyclelogistics provides agility and shorter times for last-mile deliveries, since bicycles have fewer traffic restrictions, are easier to stop, are smaller, make more efficient use of public road space, and are not dependent on traffic circumstances.

Another important aspect is the decrease in carbon footprint from the adoption of a sustainable vehicle. The use of the bicycle "creates positive impacts" in mitigating the problems arising from climate change, according to the UN (2019). This aspect is in line with the Sustainable Development Goals 2030 (SDG 2030), a commitment signed by 193 countries, including Brazil.

Finally, the World Cycling Alliance points out that "making transportation more sustainable is critically important for humanity and the planet," so increasing cycling at all levels helps achieve the SDG 2030 targets[22].

21 *The term "last mile delivery" represents the movement of a product from the distribution center to the final recipient, i.e., to delivery to the customer.*

22 *https://ecf.com/what-we-do/global-cycling-policies/voluntary-commitment-un*

Initiatives

Given its great potential, there are several cyclelogistics initiatives in Brazil, in different business models. A study by Aliança Bike with LABMOB (2020) identified at least 63 companies operating in the cyclelogistics industry in Brazil. There are companies that offer delivery service, such as Carbono Zero Courier, which operates in the city of São Paulo since 2010 and EcoBike Courier, a franchising company, that has been present in cities in the South, Southeast and Midwest of Brazil since 2011.

In this field, there are proposals such as BDOO, a platform that connects delivery cyclists and companies, being an "independent platform, 100% transactional, connecting delivery cyclists, logistics operators, marketplaces, and suppliers of vehicles and services", with great potential for cyclelogistics.

There is a "considerable increase in the number of cyclists who use the bicycle as a means of locomotion and work, so that it is not possible to neglect the phenomenon of cyclelogistics and micrologistics when the subject is urban mobility by bicycle. To get an idea, in one year, from 2018 to 2019, there are estimates of a more than 5-fold increase in the number of cyclists with thermal bags on the largest cycling axis in use in the country".

Eduardo Altheman

There are also initiatives from large consortium companies, such as iFood Pedal, which has teamed up with Tembici to offer "low-cost plans that provide electric and traditional bikes, support points for charging your cell phone, heating your lunch box, or going to the bathroom between deliveries, as well as development courses.

It is possible to see the increase in the use of cyclelogistics because of several factors. There is a growing search for the decarbonization of the economy, where companies seek to be more sustainable; the agility that these cyclelogistics services add to distribution and delivery services; the decrease in costs, and above all, there has been an increase in home deliveries due to the Covid 19[23].

According to Eduardo Altheman, there is a "considerable increase in the number of cyclists who use the bicycle as a means of locomotion and work, so that it is not possible to neglect the phenomenon of cyclelogistics and micrologistics when the subject is urban mobility by bicycle. To get an idea, in one year, from 2018 to 2019, there are estimates of a more than 5-fold increase in the number of cyclists with thermal bags on the largest cycling axis in use in the country," (2021, p. 71).

In recent years, important studies with the purpose of mapping and better understanding this sector in Brazil have been published. In January 2011, ITDP Brasil and the NGO Transporte Ativo conducted the study "Counting Commercial Establishments with Bicycle Deliveries in Copacabana"[24]. In February 2015, again ITDP Brasil and the NGO Transporte Ativo, with the support of the British Embassy, expanded the previous study to nine neighborhoods, entitled "The bicycle in the commerce of Rio de Janeiro - Counting Commercial Establishments with Deliveries by Bicycle"[25]. In April 2020, the Bike Alliance, together with LABMOB, launched the study "Cyclelogistics in Brazil"[26]. In October 2020, PROMOB-e, together with LABMOB and Aliança Bike, launched the study Cyclelogistics: bicycle deliveries in the last mile[27] (October 2020).

The studies above point to the increase in cyclelogistics activities in Brazil in recent years. Several factors contribute to this fact: the increase in the number of cyclelogistics companies; the competitive advantages that these companies have in the urban center of large metropolises; the adoption of cyclelogistics measures by large companies, such as Dafiti and B2W[28], for example; and finally, the increase in the number of app-mediated deliveries, especially during the Covid-19 pandemic in the years 2020 and 2021.

23 https://oglobo.globo.com/epoca/guilherme-amado/cresce-uso-de-bicicletas-para-delivery-na-pandemia-24679504
24 http://www.ta.org.br/contagens/carga.pdf
25 http://itdpbrasil.org.br/wp-content/uploads/2015/03/Bicicletas-de-Carga-Completo-PDF.pdf
26 https://aliancabike.org.br/wp-content/uploads/docs/2020/06/ciclologistica-brasil-relatiorio-tecnico.pdf
27 https://d48dfd69-7d3d-4433-9cfa-77df92702958.filesusr.com/ugd/371d4f_726a8e2a75174f1594f344c2d18fccba.pdf
28 https://revistamundologistica.com.br/noticias/b2w-digital-ja-fez-1-milhao-de-entregas-com-bicicletas

3.3 ROAD SAFETY AND BICYCLES

Road safety refers to the set of rules and standards that ensure the movement of people, buses, cars, bicycles and micromodal vehicles on streets, avenues and highways, and its main objective is the prevention of traffic accidents, starting from the harmonious relationship between people, vehicles and roads. According to the National Road Safety Observatory (ONSV), an integrated vision is sought to develop actions that effectively contribute to the reduction of the high rates of traffic accidents in the country.

Currently, several policies seek to reduce accidents and increase the capacity of urban infrastructure to ensure traffic safety at all levels. In addition, urban infrastructure is being adapted to achieve goal 11 of the SDGs 2030 - Sustainable Cities and Communities, which requires safe traffic.

In Brazil, since the 1988 Constitution, there has been a growing organization and regulation of traffic and urban mobility (ANTP, 2017). Since 2001, the Statute of Cities recommends that cities carry out a "Master Plan for Transportation and Mobility, which among other aspects, provided for the monitoring of the various ways of transportation, respecting local specificities and the prioritization of the collective over the individual, of non-motorized modes and pedestrians." (NETO; GALINDO, 2013, p. 1).

In 2012, the National Policy on Urban Mobility - PNMU was approved, which established the parameters for urban mobility in the national territory. This policy established mobility parameters such as universal accessibility, efficiency in displacements, integration with urban development policies (sanitation, housing, etc.), reduction of inequalities and democratic management. In 2015, the right to transportation became a social right in Brazil.

Despite the many advances, Brazil still suffers from high rates of traffic accidents and deaths. The large commuting movements in the largest cities, excessive traffic jams, low awareness of traffic laws, little enforcement and high speeds are factors that when combined, create a problematic scenario that places Brazil in fifth position among the countries with the highest number of traffic accidents worldwide (IPEA, 2021).

All these problems are also associated with infrastructure conditions, which are mostly precarious. This problem is even greater for cyclists and pedestrians, with sidewalks with terrible maintenance and lack of cycling infrastructure, as pointed out in the program Calçada Cilada (2014).

In 2015, there were a total of 38651 traffic deaths in Brazil, from which 6298 were pedestrians (16.3%) and 1311 were cyclists (3.4%). When we look at motorcyclists, the picture is even more dramatic: 12,126 of them lost their lives that year, representing 31.4% of total deaths.

In the case of bicycle mobility, the Brazilian Association of Traffic Medicine (Abramet) has published data on the increase in serious bicycle accidents in Brazil in August 2021. According to the association, the number of medical care involving cyclists grew 30% in the first five months of 2021, compared to the same period in 2020 (ABRAMET, 2021).

Given the greater vulnerability of pedestrians and cyclists in traffic, the study shows that "compared to someone traveling in a car, a person on a bicycle is eight times more likely to die". Part of this problem is that urban cyclists share space with motorized vehicles in areas without traffic moderation and where the existing road infrastructure prioritizes the car, since there is a shortage of bicycle infrastructure in Brazilian cities. Furthermore, there is a huge gap in accident prevention claims when it comes to cyclists and motorized traffic.

A good road system presupposes a systemic and complete approach to cycling safety. Increasing road safety, both real (translated by measuring numbers and calculating accident statistics) and perceived (a subjective dimension, considering personal experiences, and which is related to the presence of cycling infrastructure, protection from motorized traffic, urban safety, lighting, etc.), is considered one of the main factors to increase bicycle use in the urban environment (PUCHER; DIJKSTRA 2003). These two aspects of real and perceived safety can also be translated as objective and subjective safety (HEINEN; VAN WEE; MAAT, 2010).

Table 02 - Traffic deaths in Brazil in 2015.

	Pedestrian	Bicycle	Motorcycle	Motor Vehicle	Trucks/ Buses	N/D	Total
North	681 (10,66%)	91 (4,73%)	1.239 (39,64%)	519 (17,55%)	63 (2,76%)	826 (25,25%)	3.419 (100,00%)
Northeast	1.604 (10,58%)	296 (2,72%)	4.902 (51,64%)	2.178 (11,44%)	153 (1,79%)	3.058 (21,83%)	12.191 (100,00%)
Midwest	543 (13,97%)	192 (7,50%)	1.283 (35,29%)	1.170 (32,50%)	145 (4,41%)	736 (6,32%)	4.069 (100,00%)
Southeast	3.057 (15,13%)	470 (3,23%)	3.219 (22,60%)	3.395 (40,43%)	342 (3,05%)	2.425 (15,56%)	12.908 (100,00%)
South	1.094 (19,87%)	262 (4,11%)	1.483 (24,98%)	1.916 (29,42%)	271 (3,10%)	1.038 (18,52%)	6.064 (100,00%)

Source: own elaboration based on IRIS data (ONSV Statistics Portal). Available at: http://iris.onsv.org.br/iris-beta/#/. Accessed in Dec/ 2021.

There is also an important correlation between cycling safety related to the quality of interaction with other means of transportation, as well as the quality of the built environment and the provision of infrastructure (RIETVELD; DANIEL, 2004). For PELZER (2010), the dimensions of the physical environment interact with the social built dimension, so that prevention, legislation, enforcement and good practices go hand in hand.

In Brazil, a study about cycling safety pointed out that several surveys reached similar conclusions about the great insecurity of urban cyclists (CANABARRO; LINDEN, 2019), and the biggest problems they face are the risk of being run over and robbery (SOUZA; SANCHES; FERREIRA, 2013).

Based on the Brazilian reality, the promotion of cyclelogistics, by increasing the number of cyclists on the streets, also gives way for a change in this picture. There is much room for improvement in Brazilian cities, both in the built environment and in information, prevention, monitoring, and traffic education policies.

The scope of the research situates delivery cyclists in the cyclelogistics ecosystem in Brazilian cities, under the premise of Vision Zero: an approach that advocates that no traffic deaths or injuries are acceptable. Delivery cyclists are essential to change the patterns of logistics and urban mobility, and to boost a market with growth potential. The Vision Zero concept is a set of road safety ideas created and adopted in Sweden in 1997. With the aim of reducing traffic fatalities, its main premise that no premature death in traffic is acceptable should be the guide for the various actions of decision-makers involved in this universe.

In this sense, there are many paths to be taken in order to improve road safety. The most important of them, applied in many places around the world, is redesigning streets[29] and infrastructure to slow down traffic and favor cyclists and pedestrians.

29 *https://www1.folha.uol.com.br/cotidiano/2021/02/tendencia-mundial-redesenho-de-ruas-vira-foco-tambem-em-sp-para-desacelerar-transito.shtml*

Furthermore, it is mandatory to promote this discussion in Brazil since it is recent and quite incipient. The topics of bicycle mobility and road safety for cyclists is underexplored (DIGIOIA et al. 2017). Another field with great potential for study and information is the perception of safety from the perspective of cyclists (MINARELLI, 2020; ALTHEMAN, 2021), especially when taking into account the number of studies on the same subject with drivers of motorized vehicles (VWGMAN; ZHANG; DIJKSTRA, 2012).

Studies like these are important to ensure that delivery cyclists and the people organized around cyclelogistics are safer and have access to better infrastructure for low-carbon deliveries.

Figure 10 - Conflict between delivery cyclist and car in São Paulo (SP).

Source: Douglas Farias, 2021

4

RESULTS AND ANALYSES

The delivery cyclist ecosystem was analyzed in five dimensions: a) delivery cyclists; b) bicycle and equipment; c) companies, collectives and apps; d) urban infrastructure; e) legislation and public policies.

Each dimension presents its respective indicators and results for the composition of the analyses. It is acknowledged here that the indicators used do intersect with each other and may eventually be articulated to one or another dimension. However, for a methodological criteria, each indicator will be addressed in the five dimensions and later analyzed in a systematic way.

Each section corresponding to the dimensions is structured in a tripartite way. The first part presents the results concerning the survey conducted with delivery cyclists linked to electric bicycle rental apps in the city of São Paulo (SP). In the second part, analyses are presented regarding the case studies carried out in Curitiba (PR), Fortaleza (CE), and São Paulo (SP). Finally, the third part synthesizes the findings of the survey and case studies.

As part of the case studies, 18 in-depth interviews were conducted with delivery drivers and representatives of companies and collectives. These interviews were key to understanding issues related to the road safety of bikers[30] in cities.

Systematic analyses of the narratives recorded through the interviews made it possible to answer questions raised in all dimensions addressed. The topics discussed with the interviewees were based on the indicators established to characterize the road safety ecosystem of delivery cyclists.

30 *Biker as a synonym for delivery cyclist.*

4.1 DELIVERY-CYCLISTS

The analyses of the **delivery cyclists** dimension were developed from the triangulation of primary and secondary data collected through three collection instruments. The objective was to investigate the perception of road safety of these workers.

The first methodological instrument applied was a quali-quantitative structured questionnaire (survey) with app delivery cyclists in the city of São Paulo (SP). The second instrument was the application of in-depth interviews with delivery cyclists in the three cities selected for the case studies: Curitiba (PR), Fortaleza (CE) and São Paulo (SP). Additionally, ethnographic follow-ups were conducted with six delivery cyclists during their workday in these cities.

Finally, the third instrument used were case studies with companies and collectives in the delivery business. The following participated: in Curitiba (PR), Bicicletaria Cultural and Sem CO2 Entregas; in Fortaleza (CE), Disk Água FP and Tele-Entrega; and in São Paulo (SP), Carbono Zero Courier and Señoritas Courier.

The results of the survey and of the research in each city will be detailed in the following sections. In this dimension, for data collection in all instruments, the following indicators were considered:

1. Gender;
2. Race/ Ethnic group;
3. Age;
4. Education;
5. Home address;
6. Workplace address;
7. Previous occupation;
8. Experience with cyclelogistics;
9. Way of transportation to the workplace;
10. Work hours and daily deliveries;
11. Ownership of work equipment;
12. Concerns regarding the occupation;
13. Personal insurance;
14. Involvement in accidents;
15. Behavior during trips.

Figure 11- Delivery worker in Fortaleza (CE).
Source: Adriana Marmo, 2021.

4.1.1 Survey São Paulo (SP)

The survey applied in the city of São Paulo (SP) collected data directly from delivery cyclists who use the iFood Pedal electric bicycles. The information allowed us to trace their socioeconomic profile to better understand their relationship with the occupation. This research instrument was also able to extract opinions and perceptions of delivery cyclists about different aspects related to their road safety during journeys.

This first section focuses on socioeconomic profile aspects of the workforce that uses the iFood Pedal program. It also addresses aspects related to their work routine, including data on involvement in traffic claims.

The results show that bikers in this group are mostly male, black[31], and young, up to 30 years old. Due to the high participation (92%) of men, the patterns and perceptions identified in the survey refer to a mostly male audience and therefore do not correspond to possible gender issues faced by female delivery cyclists.

Regarding education and place of residence, 56% of delivery cyclists have completed high school and only 4% have completed higher education. Most of the people interviewed live mostly in three neighborhoods in the South Zone of São Paulo (SP): Capão Redondo, Grajaú and Jardim Ângela. According to the Centro de Estudos da Metrópole[32] (Center for metropolitan studies) platform, maintained by the University of São Paulo (USP), these are three of the neighborhoods with the lowest household income in the municipality and one of the most distant from the expanded center.

The group interviewed has been using electric bicycles for a relatively short time (five months on average), considering that the iFood Pedal program had been operating for a year in São Paulo (SP), making an average of 18 deliveries per day. They arrive at the iFood Pedal pickup points mostly by public transportation.

The days of the week that they said they work the most are Fridays, Thursdays and Saturdays. During the weekend, the demand during night shifts increases.

The vast majority (80%) are afraid of having a crash at work and 34% feel vulnerable when approaching motorized vehicles. In contrast, 85% have no personal insurance - health, dental or life insurance - and about one-third (35%) have been involved in falls or claims.

In this last group in particular, they were asked how their last involvement in accidents or falls had occurred. It was possible for them to choose to answer more than one of the available alternatives:

- 63% were slightly injured,
- 36% had witnessed a crash involving a car
- 63% had a crash when riding out of a bicycle lane (on shared streets)
- 45% were involved in claims during the night shift.

31 *The adopted convention (IBGE) considers blacks to be those who self-declare as black or brown, therefore the black population is considered the sum of black and brown people.*

32 *http://200.144.244.157:8000/resolution/*

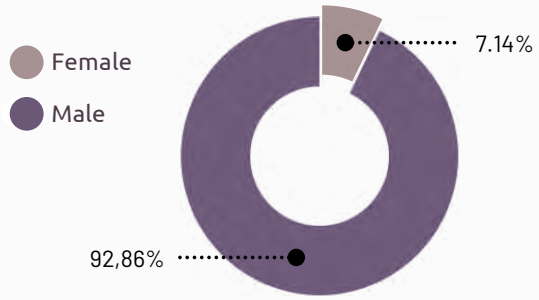
Socioeconomic Profile of Delivery-Cyclists

The delivery cyclists who use the iFood Pedal electric bikes identify mostly as males (92%). Of the 336 respondents, only 24 (7%) identify as females. Regarding color, race or ethnicity, 39% consider themselves brown, 29% black, and 27% white. The study also identified indigenous persons and Asians, both groups representing together less than 5% of the people interviewed.

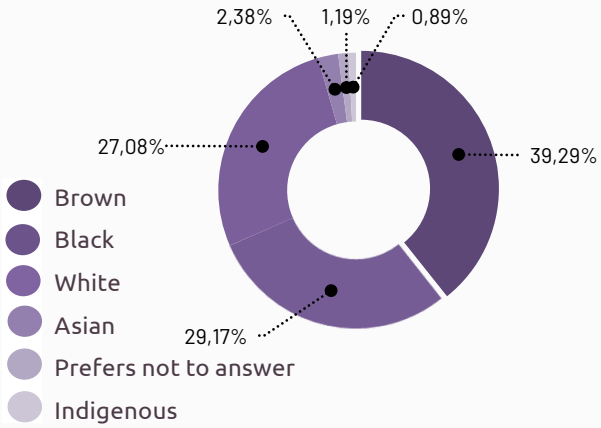
These delivery cyclists are quite young and have an average age of 26 years old. In the sample distribution, 76% are up to 30 years old, from which 46% are between 21 and 30 years old, and almost a third (30%) are under 20 years old. Regarding education, possibly due to the average age of the group, a low level of qualification was identified - only 4% have completed higher education, for example. More than half of the respondents (56%) have completed high school, followed by those with incomplete High School (22%), and in third place, incomplete higher education (10%).

The research tool also sought to survey the place of residence of these delivery cyclists. The table below shows the neighborhoods highlighted among the respondents, i.e., those that appeared in 10 or more answers, representing at least 5% of the sample. The first three highlighted neighborhoods are in the South Zone of São Paulo (SP) and, as mentioned earlier, are regions of low household income in relation to the city.

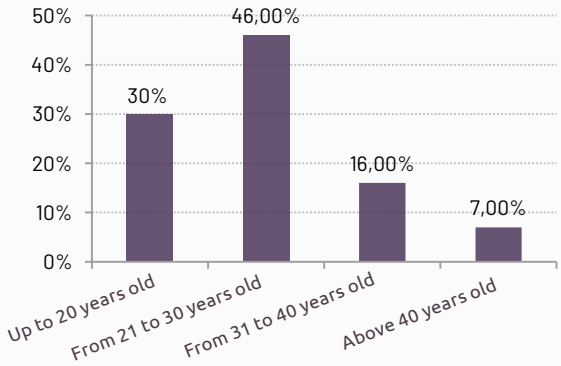
Graph 1 - Which gender do you identify with (n=336)



Graph 2 - Which race/color/ethnicity do you identify with? (n=336)



Graph 3: What is your age? (n=336)



Graph 4- What is your education level? (n=336)

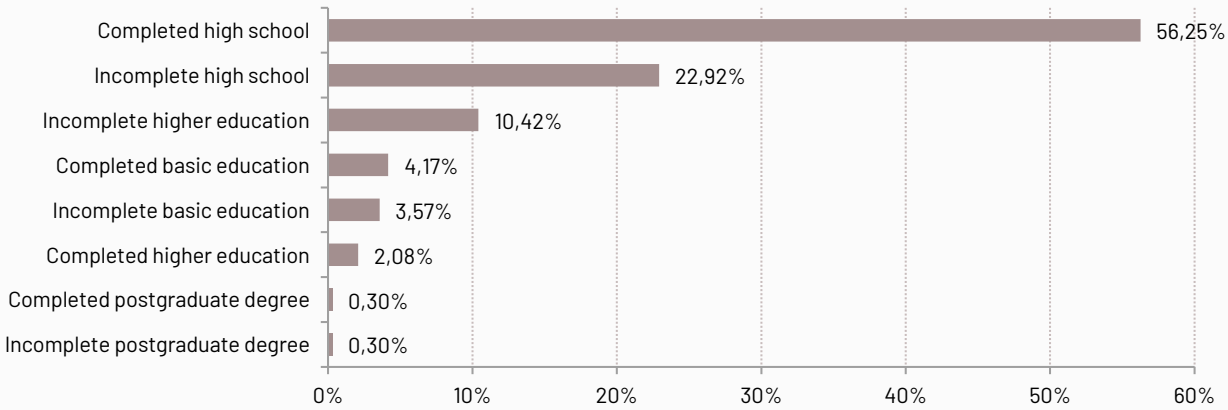


Table 3 - Neighborhoods and regions highlighted in the question about residence location

Neighborhood	Zone - São Paulo (SP)	Nº of answers	Percentage of respondents
Capão Redondo	South Zone	34	15%
Grajaú	South Zone	27	12%
Jardim Ângela	South Zone	25	11%
Butantã	West Zone	12	5%
Taboão da Serra	Metropolitan region	11	5%

Delivery cyclists and their work routine

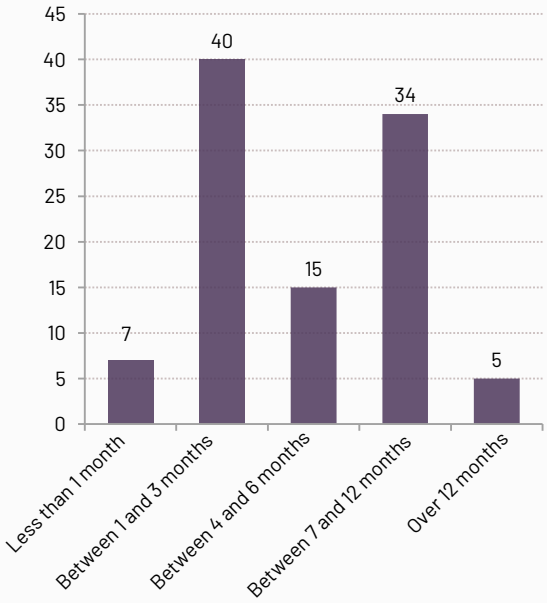
Bicycle deliveries increased considerably with the Covid-19 pandemic given the restrictions on movement and operation of urban services. The significant growth of food delivery through digital platforms was noticeable. It is estimated that between March and April 2020 there was a 155% increase in the number of new users (customers)[33]. Therefore, it can be said that the boom in app deliveries is a recent phenomenon, strongly influenced by the pandemic. In addition, the iFood Pedal program is also a relatively recent project which began its operation in October 2020 in the city of São Paulo (SP).

Given this background, it was expected that the length of time that bike couriers had been using electric bicycles would not be so significant. The graph below shows that 62% of them had been riding electric bicycles for a maximum of 6 months. Followed by those who had been using electric bicycles between 7 months and 1 year (34%)[34].

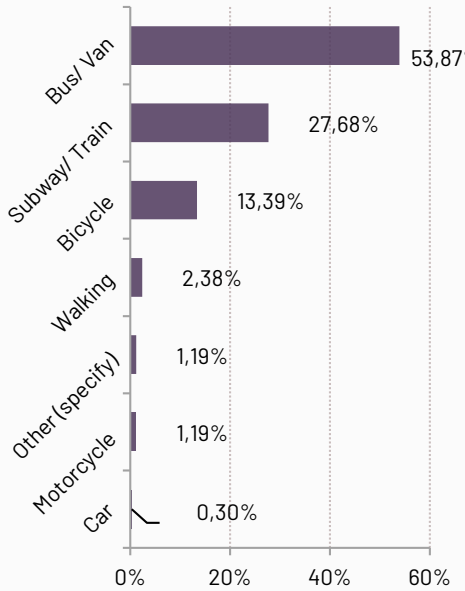
Delivery cyclists travel mostly (81%) by public transportation to the four bicycle pickup points - Augusta, Faria Lima, Moema, and Itaim Bibi. More than half (53%) arrive by bus or minibus, followed by those who arrive by subway or train (27%) and bicycle (13%). One hypothesis regarding those who arrive by bicycle is that, even if they have their own, the choice of using the iFood Pedal vehicles is related to the assistance of the electric model.

The chart below shows the days and times that bike couriers usually work throughout the week.

Graph 5 - Time working with electric bicycles (n=336)



Graph 6 - Means of transportation to the bicycle pick-up point (n=336)

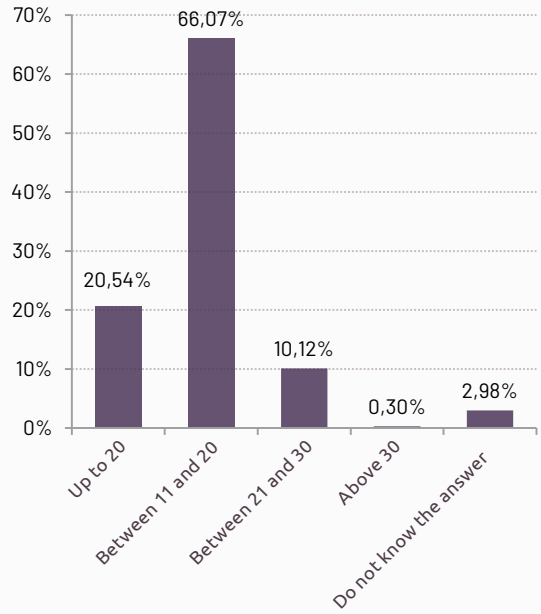


Regarding the days of the week, Friday stands out in all shifts, followed by Thursday and Saturday - morning, afternoon and evening shifts were highlighted in these three days. Sunday is the quietest day for deliveries. The volume of deliveries is similar on Mondays, Tuesdays and Wednesdays. In the early hours, the most intense demand happens on Saturdays, and is less intense on Mondays.

As for the working hours, on weekdays the morning shift has a slightly higher frequency of demands. Weekends are the only days that the night shift has a slightly higher frequency compared to the other shifts.

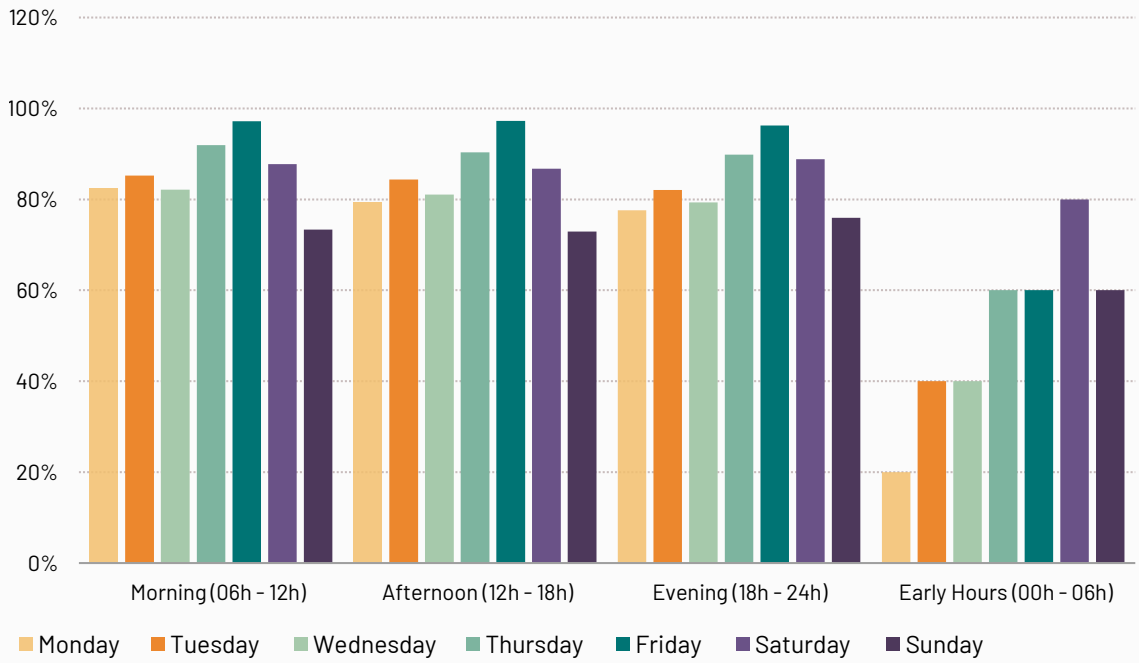
Delivery cyclists make an average of 18 deliveries per day. The chart below shows that 66% responded that they make between 11 and 20 deliveries a day, followed by those who make up to 10 deliveries (20%) and between 21 and 30 deliveries (10%).

Graph 8 - Using the electric bicycle how many deliveries do you make per day, on average? (n=336)



Delivery cyclists make an average of 18 deliveries per day, where 66% responded that they make between 11 and 20 deliveries a day.

Graph 7 - What days and hours do you usually work? (n=336)

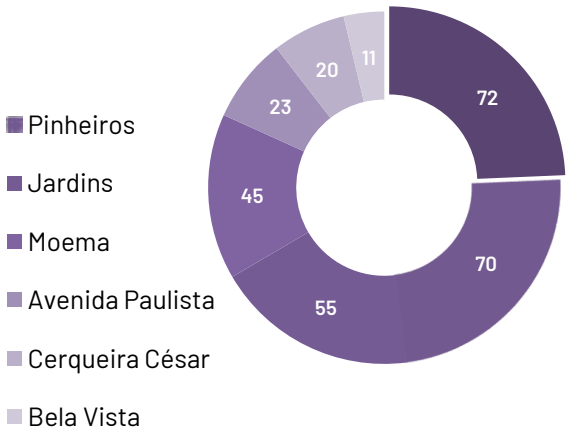


33 *USP Newspaper. Delivery transformed trend into necessity and continues to grow. Available at: https://jornal.usp.br/atualidades/delivery-transformou-tendencia-em-necessidade-e-con tinua-em-crescimento/ Accessed in November 5, 2021.*

34 *A small number, 16 out of 336 respondents, indicated that they had been using them for over 1 year, with 3 indicating that they had been using the electric bikes for 2 years. These respondents may have confused the answer with their length of time working as a delivery cyclist.*

The delivery cyclists were asked about which neighborhood is the most frequent destination for the deliveries. Among the 28 neighborhoods indicated in the answers, seven stand out (graph 09): Itaim Bibi, Pinheiros, Jardins, Moema, Avenida Paulista, Cerqueira César and Bela Vista. Together, they account for about 84% of the indicated volume of deliveries. Note that these neighborhoods are located near the pickup points for the electric bicycles: Augusta, Faria Lima, Moema, and Itaim Bibi.

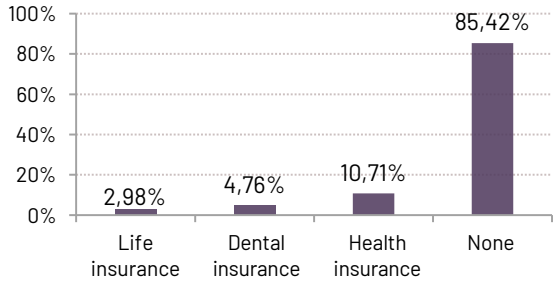
Graph 9 - Currently, in which neighborhood do you make most of your deliveries (destination)? (n=336)



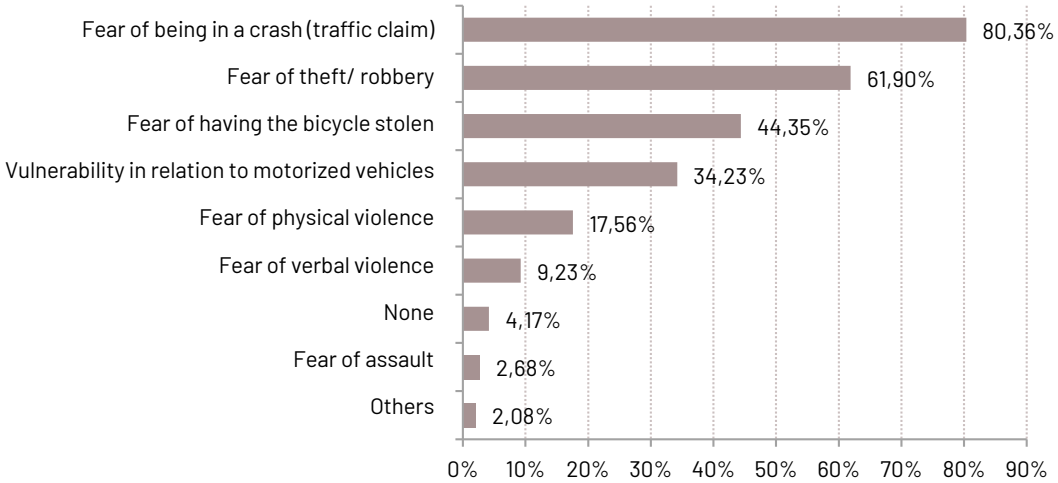
The survey also identified qualitative perceptions of these workers about, for example, a possible feeling of fear during the workday. The vast majority (80%) indicated that one of their main fears is being involved in some traffic crash. Other common fears are related to theft and robbery (61%), including the bicycle (44%), which is their work tool. In addition, they also claimed a feeling of vulnerability in relation to motorized vehicles (34%). It is important to remember that this group is mostly male (92%) and, therefore, the "fears" reported here refer to this gendered view within the occupation.

Some of the fears indicated in the graph above, such as fear of traffic claims, vulnerability to motorized vehicles and fear of physical violence may also be related to a lack of personal, health, dental, and life insurance. The majority (85%) of delivery cyclists do not have any of these personal insurances, leaving them to their own devices.The analyses on "Bicycles and Equipment" in this section show which are the accessories most used by these workers in their daily activities. Here it is worth noting that in addition to the "bag" (the standard app backpacks used by almost 100% of respondents), 42% indicated using a helmet during their commutes.

Graph 11 - Do you have any kind of personal insurance? (n=336)



Graph 10 - What fears do you have in your day-to-day work? (n=336)



Involvement in traffic claims

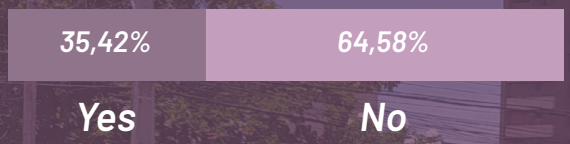
Despite the low percentage of insurance coverage for these workers, about one-third (35%) have been involved in some crash or traffic claim while riding an electric bike. Considering that this is a group that had only been using the bicycle for a short time - on average 5 months - this rate is even more relevant.

The survey investigated the severity and conditions of the last crash or traffic claim experienced by the respondents. With regard to severity, in most cases (63%) bike couriers were slightly injured, followed by those who were not at all injured (21%), while at least 14% said they were seriously injured. Regarding conditions, many respondents mentioned the presence of potholes on roads as one of the main factors that hindered safe travel in these situations. In about one-third (36%) of the cases cars were involved, and in almost two-thirds (63%) the delivery cyclists were riding on shared streets - compared to only 12% of traffic claims on bike lanes. Finally, most of these episodes occurred in the evening (45%), followed by the afternoon shift (36%) and only 9% of claims in the morning.

The fourth part of this chapter addresses analyses related to "Urban Infrastructure". The points (in the city of São Paulo - SP) that delivery cyclists would like to see changed to improve their perception of safety while commuting with an electric bicycle are indicated in Graph 17. Most of the results presented here relate to road conditions, including the presence of road infrastructure, such as expansion on bike lanes and paths, lighting, and sidewalk quality. One factor that stood out (35%) was the desire to provide more support points, in addition to the existing ones maintained by iFood Pedal. Delivery cyclists often spend the whole day on the streets without a place to eat, go to the bathroom, recharge their cell phones, or even rest. If there were more support points scattered around the city, the working conditions would be alleviated.

Graph 12 - Involvement in claims

HAVE YOU EVER BEEN INVOLVED IN A TRAFFIC ACCIDENT WHILE RIDING AN ELECTRIC BICYCLE? (N=336)



Graph 13 - Severity of the claim.

IF YES, CONSIDERING YOUR LAST ACCIDENT, HOW SERIOUS WAS IT? (N=119)

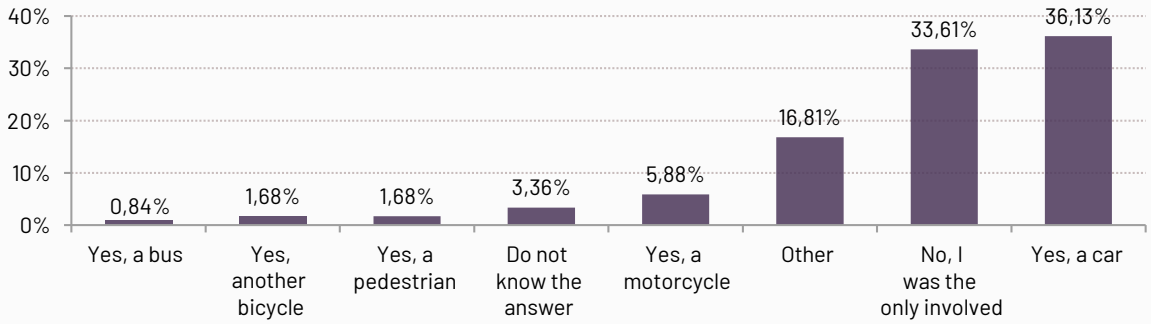
45%

45% OF THE CRASHES AND CLAIMS OCCURRED AT NIGHT SHIFTS

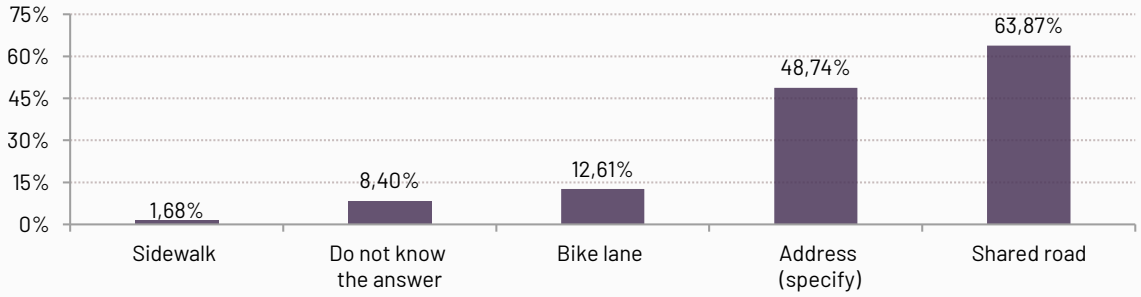
Figure 12 - Highlights on the theme

Source: Elaborated by the author

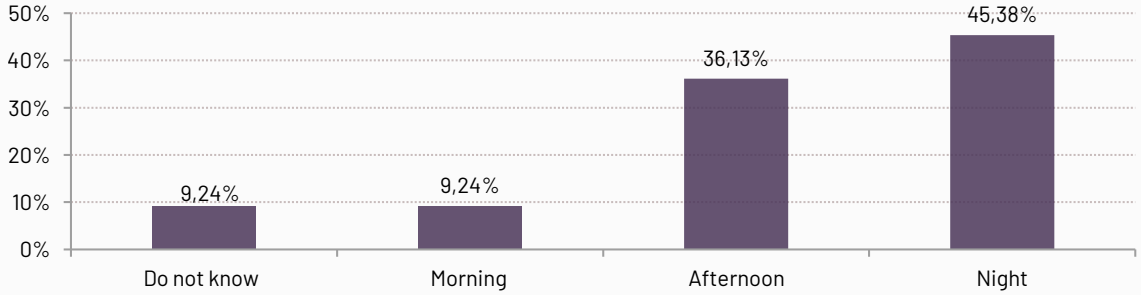
Graph 14 - Involvement of third parties in the reported claims (n=119)



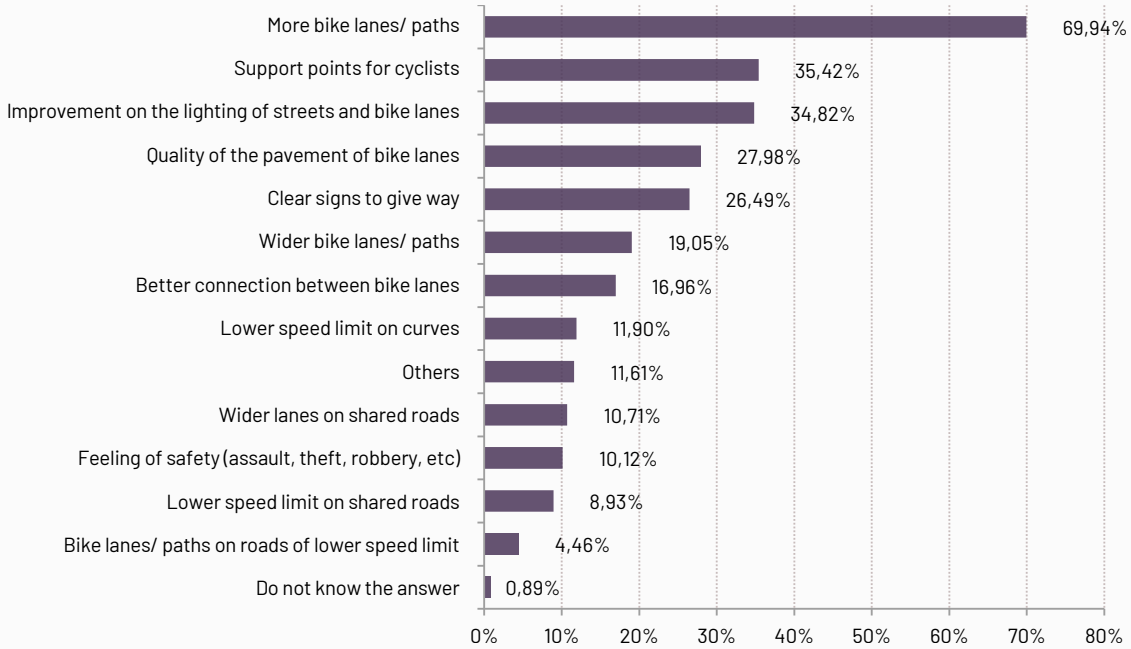
Graph 15 - Place where the reported claim occurred (n=119)



Graph 16 - Time when the reported claim occurred (n=119)



Graph 17- Desired changes regarding the city of São Paulo (SP). (n=336)



Cross-references with the variable "involvement in traffic claims"

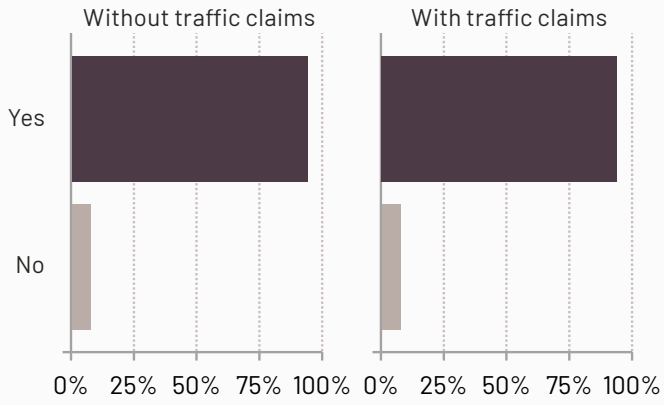
In the following analyses, ANOVA tests are used to capture whether there are any statistical relationships in crosses of variables. The ANOVA test, although simple, is quite powerful. It is used to compare statistical differences between categorical variables, as is the case for most of the variables in this study.

What is the intention? Consider the categorical variable "Has been involved in a traffic claim before". This is a categorical variable because it assumes "Yes" and "No" responses, and there is no numerical ordering between the two levels of response. We sought to find out if this variable has a statistical relationship with, for example, the "use of bike lanes/ paths", which can also be coded as a "yes" and "no" variable. The intuition of the ANOVA model is to compare the proportions of "Yes" and "No" responses on the two variables and test whether there is a statistical difference at these variable levels.

In the following chart (Graph 18), we can see that among delivery cyclists who have never been involved in a crash, more than 90% responded "Yes" to a preference for using bicycle lanes. Among those who have been involved in traffic claims, the proportions of responses are almost the same (more than 90% answering "Yes" to episodes involving bicycle lanes).

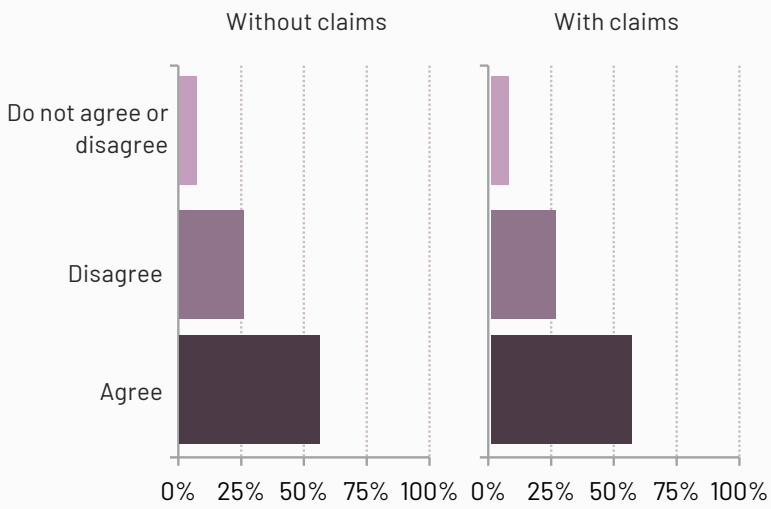
The ANOVA test compares the intersections of responses and reports whether there are statistically significant differences. The defining metric is the p-value indicated at the top of the graphs. If the p-value falls below 0.05, then one can conclude with the statistical hypothesis test that there is indeed a difference. Otherwise, the conclusion is that no difference can be claimed. Therefore, as the p-value of this first test is 0.8, it is concluded that there is no difference in the levels of the responses. Most likely, there is no relationship between having been involved in accidents and having some preference for using the bicycle lane. In fact, there is very little variation in bike lane preference, as almost all respondents said they preferred to ride on bike lanes. This indicates that even among delivery cyclists who have never been involved in a crash, riding in the bike lane is seen as a great advantage for them.

Graph 18- If possible, would you prefer to ride on a bike lane/ path? (P-value ANOVA test: 0,807)



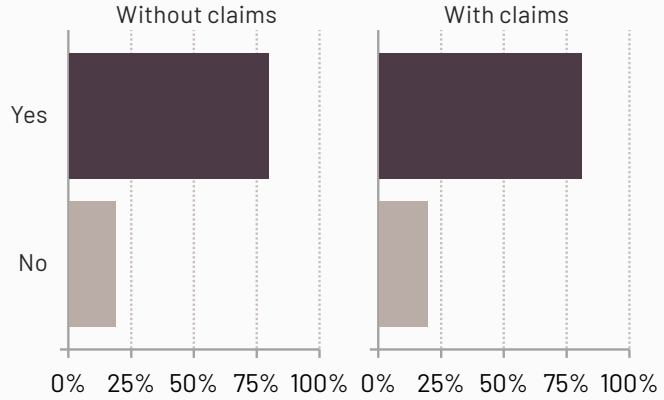
For the question "I feel unsafe riding on the wrong side of the road: do you agree or disagree?", again, there was no statistical difference (p-value above 5%). The responses are very similar between those who were involved in accidents and those who were not involved (Graph 19). Among those who were involved in accidents and those who were not, 29% feel safe riding on the counterflow . This indicates that previous involvement in a claim does not necessarily change the behavior of these delivery cyclists in terms of their preference of whether or not to ride on the counterflow[35]. The response distributions are very similar for the two types of people.

Graph 19- I feel unsafe riding on the wrong side of the road: do you agree or disagree? (P-value ANOVA test: 0.929)

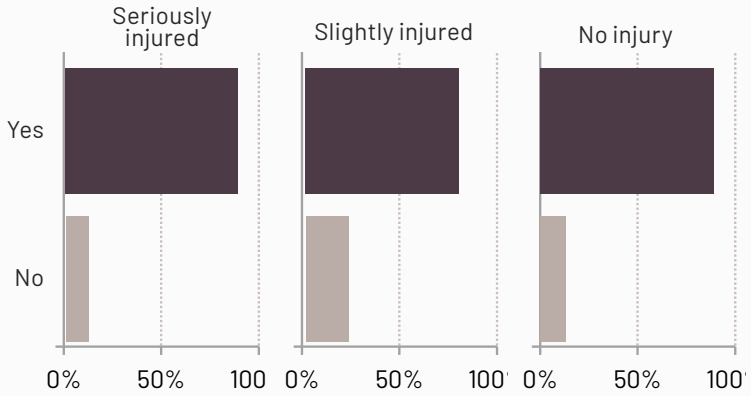


35 *Cycling on the counterflow does not mean it is a safe cycling attitude.*

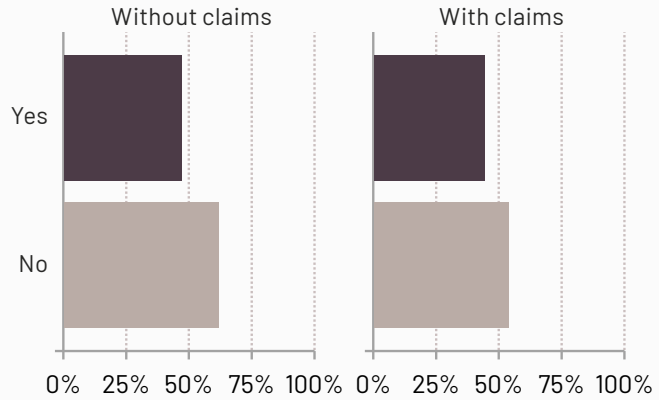
Graph 20 - In your day-to-day work, what fears do you have? Indicate up to 03 issues that you consider the main ones (P-value ANOVA test: 0.6)



Graph 21- Comparison of responses about "feeling afraid" among delivery cyclists who characterized the severity of the last crash in which they were involved. (P-value ANOVA test: 0.377)



Graph 22- Comparison on the use of helmet and lights. (P-value ANOVA test: 0.489)



The conclusion of the ANOVA statistical test is that there is no statistical difference in the distribution of the crossover (Graph 20). Therefore, there is no statistically significant correlation between having been involved in a claim and being afraid of being involved in traffic claims during the journey. This is probably because many people are already naturally afraid of having a crash, regardless of previous involvement. The distribution makes this clear in the following graph. In fact, only about 20% of the people interviewed reported not having this fear (20.3% among those who have never been involved in an accident and 18.5% among those who have).

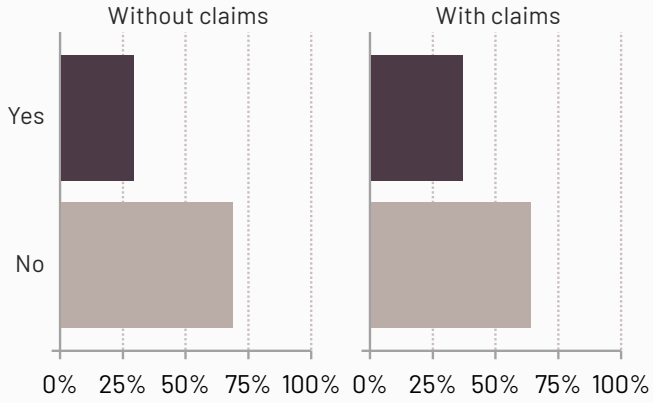
It is also possible to make the same analysis about "feeling afraid", but this time only among those who have already been involved in claims. In this case, the idea is to check if for different severities of claims, the answers vary. Below, graph 21 shows this distribution. However, the findings endorse the previous ones, with the particularity that severity does not clearly influence "feeling afraid". An important note is that by partially employing the sample (delivery cyclists who have suffered accidents), the statistics become less precise. Therefore, it is more challenging to draw conclusions in these cases given the risk of incurring false negative results (type II error in statistical language).

Again, crossing with the "claim" variable does not seem to indicate statistically different distributions (Graph 22). Although to the "naked eye" the graphs indicate some difference in the proportions of responses, the ANOVA test showed no significant variation. In fact, having been involved in a claim seems to be "insensitive" to the use of these safety accessories. In addition, it was found that a significant portion of the bike couriers do not wear a helmet or use a safety light during the day.

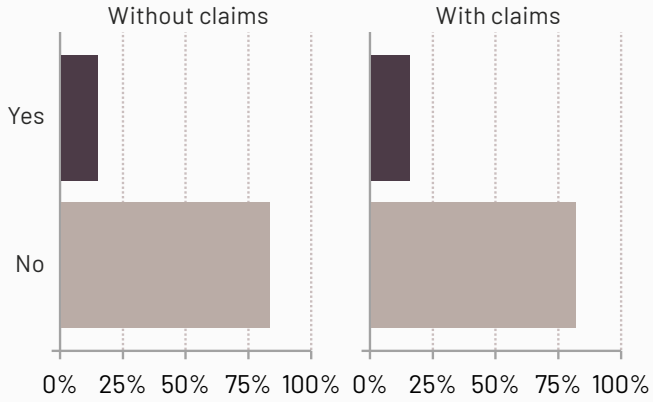
Observing the use of an audio accessory connected to mobile phones, the test presented results closer to the existence of statistical difference. It can be seen that among those who were involved in accidents, there is a higher level of affirmative answers for the use of audio accessories. The proportions are not very similar, and this can be seen in the graph (Graph 23). Even so, the statistical conclusion is that there is no relevant difference. This may be because, in fact, there is no relationship between the variables, or because the sample size (around 300 respondents) is not sufficient to accurately estimate this difference. Only by increasing the sample size would it be possible to obtain a more precise conclusion (without risk of false negative). In any case, there is a small indication that this variable needs to be better studied in the future.

Since the percentage of respondents who said they had some kind of personal insurance is very low, it is clear that this variable is poorly correlated with claims. The ANOVA test, therefore, shows no difference (Graph 24).

Graph 23- Comparison of responses about the use of audio accessories connected to a mobile phone among respondents to the question about involvement in traffic claims. (P-value ANOVA test: 0.273)



Graph 24 - Comparison of responses on insurance ownership among respondents to the question about involvement in traffic claims. (P-value ANOVA test: 0.595)



Gender variable

In defining the sample universe, a special strategy was adopted to approach and consider all the women found at the points, as it was considered essential to gather as much information as possible about this group. According to data from previous surveys, the number of female bike couriers is much lower than the number of male bike couriers. This proportion was confirmed by the results of the survey. As seen previously, only 7% of the sample identifies with the female gender (24 women).

This section aims to analyze the survey results through the gender filter, also looking for correlations and particularities between the answers given by the male majority. It is acknowledged that the sample considered in this filter is small and cannot be understood as representative of the population of female delivery cyclists as a whole. Thus, generalizations should be evaluated with caution.

Profile of female delivery cyclists and their work routine

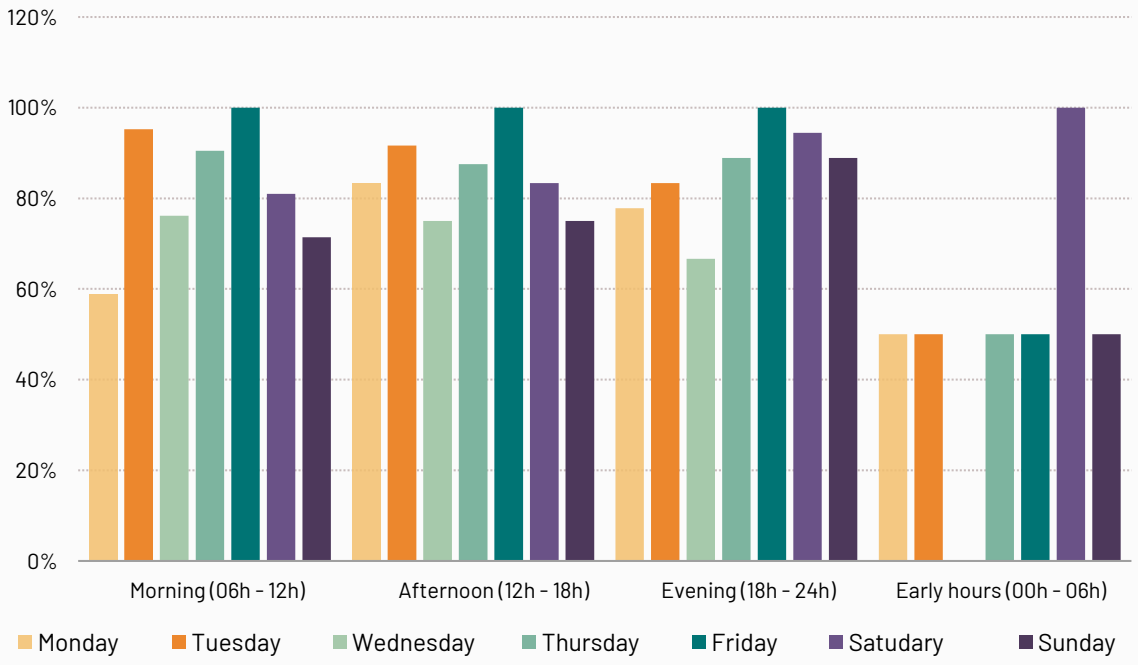
Regarding color, race or ethnicity, 42% of the female delivery cyclists said they were brown, 34% black, and 21% white. The remaining 3% preferred not to respond. These delivery workers follow the average age range of the total group; however, for the female group, the average age is 24 years old. Only 12.5% are over 30 years old. Regarding education, 50% of them have completed high school, followed by incomplete higher education (37.5%), and incomplete high school (8%). Access to complete higher education represents the reality of only 1 delivery cyclist.

The women get to the pick-up locations mostly using public transportation as their main mode of transport. 71% of them arrive at the drop-off points by bus or minibus, followed by 17% who arrive by subway or train. Other answers indicate the use of cars (4%), motorcycles (4%), and walking (4%). This data, even though it cannot be generalized to all delivery companies, is in line with data from São Paulo Transporte S/A, released in May 2021[36]. The research surveyed the profile of public bus transportation users and found that 57% of them are women (especially young, poor, black and brown).

In relation to the days of the week and times of work indicated by the delivery cyclists, the morning and afternoon shifts between Mondays and Wednesdays stand out. As of Thursdays, the busiest times of the day are the afternoon and evening shifts. Graph 25 shows the distribution by days and shifts. Friday afternoon stands out as the work day and shift most cited by all respondents, respectively.

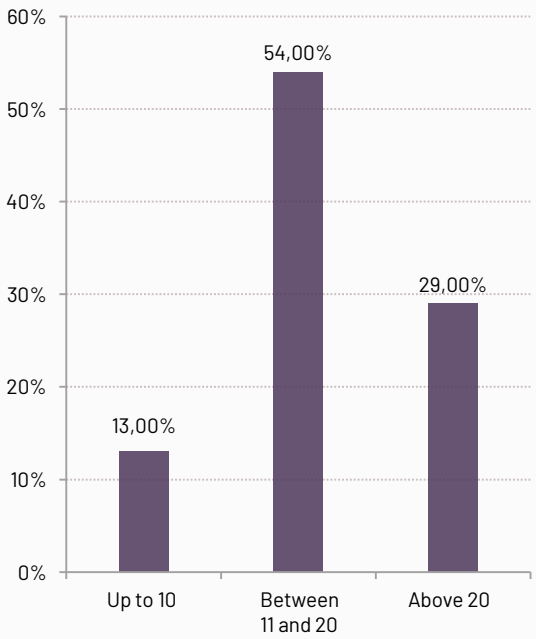
36 *https://mobilitas.lat/2021/06/08/uma-pesquisa-da-empresa-publica-que-administra-o-transporte-coletivo-de-sao-paulo-brasil-indica-que-as-mulheres-sao-maioria-entre-os-passageiros-dos-onibus-urbanos-e-tem-menor-possibilidade-de-adota/*

Graph 25 - Distribution of answers about which days and times you usually work (n=24)



In addition, the respondents make an average of 14 deliveries per day. Compared to the total sample of respondents, this average is slightly lower than the total average. Chart 26 shows that 54% of female respondents said they make between 11 and 20 deliveries a day, followed by those who make up to 10 deliveries (29%), and finally those between 21 and 30 deliveries (13%).

Graph 26 - Average number of daily deliveries by female respondents (n=24)



The respondents were asked to indicate up to three options regarding their fears in their daily lives. The most frequently mentioned were theft/theft/burglary, traffic claims, and vulnerability in relation to motorized vehicles. Physical violence and harassment/ assault came next.

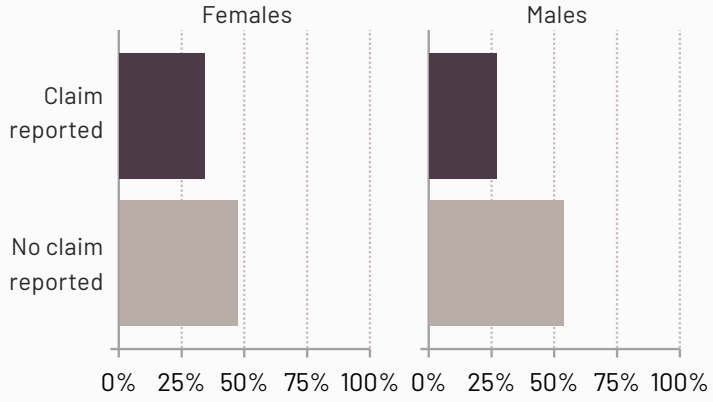
As indicated earlier, some of the fears stated by the male respondents in the survey, such as being involved in traffic claims, feeling vulnerable to motorized vehicles, and fear of physical assault, may also be related to their lack of personal, health, dental, and life insurance. The majority (79%) of delivery women stated that they did not have any type of personal insurance.

Involvement in traffic claims and correlations

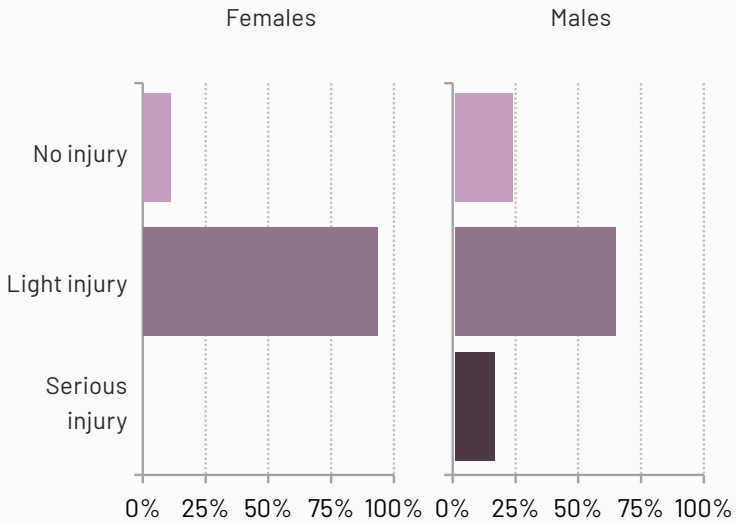
Despite the low percentage of insurance coverage, more than half (58%) of these workers have been involved in some kind of crash or traffic claim while riding their electric bicycle.

Next, we will present correlations between gender and involvement in traffic claims, observing the results obtained for the corresponding questions. Again, it is important to note that the statistical analyses presented are based on a very small sample size for this

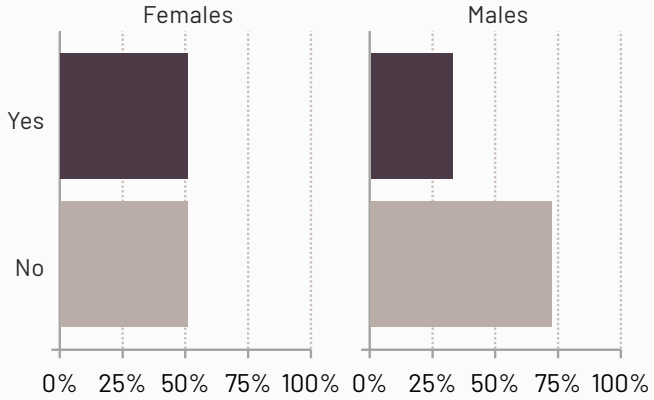
Graph 27- Comparison of responses about involvement in a traffic claim between male and female respondents. (P-value ANOVA test: 0.506)



Graph 28 - Comparison of responses on severity of claim between respondents to the question about involvement in claims. (P-value ANOVA test: 0.189)



Graph 29 - Comparison of responses on the use of audio accessories connected to a mobile phone among respondents to the question on involvement in traffic claims, by gender. (P-value ANOVA test: 0.06)



specific aspect. Any conclusions need to be further evaluated at the risk of false negatives.

Comparison by gender within the group of workers who have been involved in claims

At first glance, female delivery cyclists suffer as many traffic claims as male delivery cyclists, as the ANOVA test indicates no differences in the distributions (Graph 27). As for the severity of claims, women seem to experience lighter incidentes, as none reported having suffered anything serious during the journey (Graph 28).

Looking at the use of audio accessories connected to a mobile phone, the distribution of responses by gender is substantially different. Although the p-value of the ANOVA test is a little above 5%, it is quite reasonable to point out a statistically significant difference between genders (Graph 29). At least the p-value is below the 10% threshold, which is usually accepted as a relevant parameter in social and behavioral sciences[37]. The substantial conclusion is that female bike couriers tend to use proportionally more audio accessories than male workers. For the ANOVA test, even with a small sample size, the result is robust. However, this does not exclude the fact that, still, the sample of women is small and may not be representative of the population as a whole.

37 *In the biological sciences, sometimes even 5% is not acceptable.*

4.1.2 Case studies

PROFILE

The interviews were designed to collect data that would allow us to trace the socio-demographic profiles of the respondents. Through the interviews, it was also possible to raise aspects related to their work routine, to investigate opinions and perceptions regarding road safety and previous involvement in traffic claims, in addition to the possession of health or life insurance.

From the group of respondents it was possible to interview only one woman, who works for the Señoritas Courier collective, here identified as Júlia. Due to the high incidence of men in this universe, it is important to emphasize that the patterns and perceptions identified through this case study refer to a mostly male public. The bonds of the interviewees with the companies and collectives considered in this research are distinct. In the group, there were respondents who work exclusively for the companies, as well as respondents who work with several micrological apps. In the case of Bicicletaria Cultural, in Curitiba (PR), we interviewed two delivery cyclists who are linked to apps, Miguel and Pedro, and use the structure of the bikes' garage/ shop as a support point for their routine. The bonds between the interviewees and the companies/collectives are indicated throughout the other sections of the dimension.

Next, we present a mini profile of each respondent from the delivery cyclist group in the three case studies. Table 04 presents a summary of the sociodemographic data collected.

Table 04- Sociodemographic profile of the participating delivery-workers

Curitiba (PR)	Name (fictitious)	*Samuel*	*Davi*	*Miguel*	*Pedro*
	Age	43	35	28	40
	Gender	Male	Male	Male	Male
	Race/ Ethnicity	White	White	White	Negro
	Education	Postgraduate degree	Completed Higher Education	Incomplete Higher Education	Incomplete Higher Education
	Place of residence	Santa Cândida, Curitiba	Vista Alegra, Curitiba	Tingui, Curitiba	Centro, Curitiba
	Employment relationship	Bike Courier at Sem CO2 Entregas	Bike Courier at Sem CO2 Entregas. Also works for apps	Bike Courier who uses Bicicletaria Cultural as support point. Eventually works with apps	App bike courier who uses Bicicletaria Cultural as support point
Fortaleza (CE)	Name (fictitious)	Gabriel	Cícero	Fábio	Gil
	Age	24	28	21	20
	Gender	Male	Male	Male	Male
	Race/ Ethnicity	Black	White	Black	Black
	Education	Incomplete Basic Education	Completed Basic Education	Completed Basic Education	Completed Basic Education
	Place of residence	Iracema, Fortaleza	Jacarecanga, Fortaleza	Pedras, Fortaleza	Vicente Pizon, Fortaleza
	Employment relationship	Bike courier at the company Disk Água FP	Bike courier at the company Disk Água FP	Bike courier at the company Tele Entrega	Bike courier at the company Tele Entrega
São Paulo (SP)	Name (fictitious)	Júlia	Ariel	Mário	Roberto
	Age	24	24	52	42
	Gender	Femenino	Male	Male	Male
	Race/ Ethnicity	White	Black	Black	Black
	Education	Higher Education degree	Incomplete Higher Education	Completed Basic Education	Completed High School
	Place of residence	Pirituba, São Paulo	Jardim Rizzo, São Paulo	Osasco	Osasco
	Employment relationship	Bike courier at Señoritas Courier collective	Bike courier at Señoritas Courier collective	Bike courier at the company Carbono Zero	Bike courier at the company Carbono Zero

RELATIONSHIP WITH BICYCLE AND OCCUPATION

In order to draw a profile of the interviewees, they were asked about their relationship with the bicycle and with their occupation, if this current job was their first experience with cyclelogistics and how long they had been working as a bike courier. We sought to understand if their job as bike couriers was exclusive or if it was combined with another occupation. They were also asked about their previous occupation and, finally, about their motivation to work as a delivery cyclist.

CURITIBA (PR)

As an adept of cycling since childhood, **Samuel** started working with cyclelogistics in early 2018 through an app that connected interested parties to bike courier services. The current job is not his first experience as a bike courier. His main motivation for seeking the job was the lack of space in the job market linked to biology. Previously, Samuel worked with environmental education.

Davi started cycling out of necessity to go to university, and working as a delivery cyclist was motivated by financial need. He was looking for an option that allowed flexibility in his schedule and his first experience, also with a delivery app, was 4 years ago. When he realized he wasn't making enough money, he decided to invest in an electric bike to increase productivity. Currently, besides making deliveries with his electric bike, he also sells custom models. Before he has also worked with translations, web design and art design.

Miguel's first experience as a delivery cyclist came from a collaborative cyclelogistics app in Curitiba (PR), five years ago. After some time he had been using the bicycle as a means of transportation, in 2016 he decided to make it a work tool, combining his love for cycling with a possible source of income. Previous occupations include experiences with hotel management, insurance companies and towing services.

Working with delivery apps since 2020, this was **Pedro**'s first experience as a delivery cyclist. The search for the job was motivated by financial issues. He had recently moved to Curitiba (PR) to study Geology at UFPR, and needed an income to cover basic expenses. With the social distancing measures, there were not many job opportunities. Thus, Pedro started making deliveries through an app. Before living in Curitiba (PR), he worked as a real estate agent in Campinas (SP).

FORTALEZA (CE)

Gabriel has been cycling since he was a child and has been working with delivery for 10 years, that is, since he was 14. He has had experience making deliveries with a motorcycle, but only for a short time, because he says he prefers using a bicycle. His motivation to work in cyclelogistics was financial. He has not had any other occupation besides being a delivery man.

Cícero has also been cycling since he was a child, initially only for fun. As a wroker, he has between five and six years of experience with deliveries. Motivated by financial issues, he started working on a recommendation from an acquaintance and today he says he really enjoys his occupation. In the past he has worked with various services near his house.

Like Gabriel and Cícero, **Fábio**'s relationship with the bicycle began as a child. His work with deliveries at Tele Entrega is his first experience with cyclelogistics, where he has been for five months, cycling daily. Fábio used to work with freight and removals services, and motivated by the influence of his stepfather, who also worked at the company, he sought an opportunity as a bike courier.

Currently **Gil** cycles only for work, and as a child he used to cycle for fun. The job at Tele Entrega, which he started two months ago, is not his first experience with logistics or cyclelogistics. Two years ago, before his current position, Gil worked with deliveries through an app, using bicycles and motorcycles. According to him, the occupation runs in the family, as his brothers and father are also delivery workers. In addition to working with deliveries, Gil is an assistant at the Department of Justice.

SÃO PAULO (SP)

For **Júlia**, her work with the collective is her first experience as a delivery cyclist, where she has been working since 2018. She reports that until the period of social distancing caused by the Covid-19 pandemic the work was more sporadic, and that from the first moment of lockdown the amount of work increased. The main motivation for working with deliveries was financial. Working as a delivery cyclist used to be an extra income to her job as a waitress, and now it is her main source of income.

Ariel has been working with bicycle deliveries for two years, and before his current link with the collective he used to make deliveries through apps. He has had experiences with iFood and Uber. His motivation for this job combines his love for cycling with his financial needs. Ariel was satisfied with his occupation, despite some problems with rude drivers. Before working as a bike courier, he was a salesman and a volunteer at a private school.

Working as a bike courier at Carbono Zero for three years now, this is **Mário**'s first experience with cyclelogistics. Before he worked as a product analyst and was not satisfied. When he had problems with his own car and started to use a bicycle as a means of transportation, he decided he would work with something involving bicycles. While doing research on cyclelogistics he discovered Carbono Zero and has been working for the company ever since. For Mario, working as a bike courier allows him to combine a source of income with mental and physical health as well as the environmental contribution, which are the factors that motivated him to change jobs.

Roberto started working with cyclelogistics in 1995 as a messenger who delivered newspapers in Vitória, Espírito Santo. He has been working at Carbono Zero for 4 months. His motivation for changing his job from being an app driver to a bike courier was a health issue. His convictions about health, pollution, and quality of life are aligned with the company's premises, so he is happy with the work and the workplace. Before this job, Roberto also worked as a travel consultant in another company.

WORK ROUTINE

Regarding the work routine of the interviewees, the research sought to understand the distribution of work hours throughout the week combined with other activities performed in their daily lives. The health crisis aggravated the issue of food insecurity of the Brazilian population, and in view of this context it is necessary to understand how the work routine of these people impacts the quality of access to food. Their place of residence and their consequent commute from home to work and back exerts a significant influence on the routine of these delivery workers. Within the interview script, we sought to understand how these journeys are performed and what is their impact on the work day.

CURITIBA (PR)

Samuel works with deliveries from Sunday to Sunday, out of financial necessity. The workload varies according to demand and to the number of customers for the week, and on average he works between 4 and 6 hours a day. In general, Samuel leaves for work at 10 am and has no fixed routine, eating lunch wherever possible according to the day. He makes deliveries for a restaurant until 1:30 pm. After working for the restaurant, which is a fixed client of the company, he continues making deliveries to other clients. Samuel makes all the trips using his bicycle.

Davi tries to work Mondays through Fridays and has no fixed schedule on weekends. According to him, those who deliver by app work with daily or weekly earning goals, so the distribution of the workload varies according to the achievement of these goals. Every day, Davi combines his delivery job with a mechanic and bicycle shop that he commands. He prioritizes making deliveries at lunchtime, because the app's algorithm benefits delivery cyclists with higher scores, so he gets a higher demand for deliveries. Usually, by working during lunchtime he can meet his daily goal and move on to his second job. When he doesn't reach his goal, he also makes deliveries at night.

Miguel makes deliveries from Monday to Friday, always during business hours, from 8am to 6pm. According to Miguel, as he doesn't work exclusively with apps, he can have a scheduled routine based on the demands of fixed customers. He has contracts with several companies and also makes random deliveries. One of his fixed clients is a restaurant located 20 minutes by bike from his home, where he is responsible for lunchtime deliveries. It is in this restaurant where he usually eats lunch between routes.

To conciliate studies with work, **Pedro** claims to have reduced schedules compared to other app delivery cyclists. Working daily, from Sunday to Sunday, he usually accepts deliveries from 11am

FORTALEZA (CE)

Gabriel works Monday through Saturday, on average eight hours a day. On Saturdays the hours are reduced (8am to 4pm), while during the week he works until 6pm. Currently, he lives in the same place as the establishment and does not have to commute to another location. Because he lives and works near the beach, Gabriel goes to the beach to surf before and after work.

Cícero also makes deliveries for Disk Água FP from Monday to Saturday, from 8am to 5pm. During this period he has a one-hour lunch break, so he works eight hours a day. To get to work, Cícero rides about 6 km from his house using his own bike, and when he arrives he parks his bike to use one from the company during work.

At Tele Entrega, **Fábio** works 7 hours a day from Monday to Saturday, always starting at 1 pm since he stays home in the morning to take care of his son. As he says he lives far from his workplace, about 18 km away, he goes by bus to his mother's house, where he keeps his work bicycle and from there he rides to the delivery point, a pharmacy in the Aldeota neighborhood.

Compared to his coworker, **Gil** has a different routine because he combines deliveries by bike, from 3:30 pm to 10:30 pm with another job in the morning shift where he uses a motorcycle, with no fixed schedule. Gil cycles to his workplace, which is approximately 6 km from his home.

SÃO PAULO (SP)

Júlia combines her work as a delivery cyclist with her studies in the city center of São Paulo (SP). She cycles to university every morning and at the end of classes she rides to work. The pickup place for deliveries varies according to the demand, but usually it is in the city center. She uses her bicycles as her main means of transportation for her commutes, both for work and personal purposes. Her work schedule also varies from week to week, so there are weeks when she works every weekday while there are weeks when she works only three days. Júlia usually makes deliveries in the center, west zone and north zone of São Paulo (SP). There is no fixed time to go home as it depends on the day and on the final location of the last delivery. The workload is also related to the demand of deliveries, being on average four hours a day, plus two hours of commuting home. Her work and study routines sometimes prevented her from planning and preparing lunch for the week in advance, so she would cycle all day without eating which compromised her health in early 2021. When she is able to prepare and carry a lunch box, she said she prefers to eat after she finishes her deliveries in the afternoon. Julia raised the observation that food is not something affordable for delivery cyclists, and that they often make several meal deliveries, but spend the day without eating properly.

In addition to working at Señoritas, **Ariel** makes deliveries for another collective at lunchtime, so he manages his work and university activities, which are currently in virtual mode. Every day he leaves home in the morning and makes lunch deliveries until around 2 pm, when he has lunch at the restaurant he works for. In the afternoon he makes the deliveries from Señoritas, which varies daily. According to Ariel, Thursdays and Fridays are the days of highest demand for deliveries. He returns home between 6pm and 8pm, depending on the flow of deliveries and the location of the final point of the last delivery. He tries to

38 https://exame.com/brasil/pela-1a-vez-em-17-anos-mais-de-50-nao-tem-seguranca-alimentar-no-brasil/

Curitiba (PR) continuation

to 2pm and then from 6pm to 8:30pm / 9pm. When he is not working, he is at home studying. Pedro lives in the city center, so as soon as he leaves home with his bike he activates the app to accept delivery requests. He has subscribed to more than one app and uses them interchangeably. He also lives close to the Bicicletaria, about 4 km away. His lunch varies through the week, sometimes he eats at home, sometimes at Bicicletaria Cultural, which provides social meals. He tries to have his other meals at home. He determines his workload, on average 6 hours a day, by seeking to make the largest number of deliveries, since he works at the peak hours for orders. According to his perception, by working these specific hours one can make many deliveries without getting too worn out: *"I know some delivery workers who make deliveries all day long because they do it as an occupation and so on"*.

São Paulo (SP) continuation

dedicate the evenings to his studies. His workload varies daily, but has an average of seven hours a day. Ariel's main means of transportation and work equipment is his bicycle.

Even without a fixed schedule, **Mário** usually works from Monday to Friday, on average twelve hours a day. For him, working on a bicycle provides freedom to stipulate the start time and the daily workload. He usually starts to work between 7:30 and 8 am and leaves at 8:00 p.m., with breaks for meals as he sees fit. He uses his own bicycle to get to his workplace, and from there he uses the company's bicycle to work.

Roberto doesn't have a fixed schedule either, but he tries to beat his delivery goals every day. He works from Monday to Friday, sometimes Saturday, doing an average of 8 hours a day, not counting his commuting time from home to work: he cycles 15 km from Osasco. His daily rate depends on the supply of routes and on his physical energy. According to him, working as MEI (individual micro entrepreneur) allows him to have flexibility, which is something he likes. Regarding his food, Roberto usually packs his lunch from home and occasionally stops to eat at some establishment.

Figure 13 - Delivery woman during her work routine in São Paulo (SP)

Source: Douglas Farias, 2021.

FEARS AND SAFETY

During the interviews, questions were raised about the perceptions of the workers in relation to issues regarding fear in their daily lives. We tried to understand if these fears are present in their work routine, and if so, to evaluate the defense, combat, and adaptation strategies that were adopted. The vulnerability to these fears may be related to ownership of insurance, whether health, life, dental, etc. The access to protection and care, through insurance, and the various types of fears associated with the exercise of the functions of a delivery cyclist are influential factors in relation to keeping the occupation.

CURITIBA (PR)

Samuel intends to return to work in his field of training. Even though he finds it rewarding to work as a cyclist he prefers to work with education, besides the physical energy required to work as a biker. He indicated several fears related to the occupation, considering physical integrity, exposure to different forms of violence, lack of assistance, vulnerability, and fear of getting involved in traffic claims. Samuel reported having physical therapy sessions due to traffic claims he suffered while cycling, including being run over by a car. He believes that the country's economic scenario is making people more nervous and insecure, where we live in a *"cycle of desperation for the need to survive"*. He also indicated being afraid of theft and robbery, and highlights his concern about increased taxes on bicycles. When asked about having any insurance, he replied that he does not have any kind of protection.

For **Davi**, working with delivery is something temporary due to the absence of labor rights or economic guarantee, and because of the physical wear and tear. Thinking long term, he prefers to have another occupation. He intends to continue selling electric bicycles, motivated to help other delivery cyclists, because he understands the reality of the work: *"my focus is the delivery cyclist because I know how much they suffer"*. When asked about fears regarding the occupation, Davi said he is afraid of accidents and robberies. According to Davi, simply by being in the traffic one is automatically subject to risk. He mentioned that he made adaptations to the electric bike with the purpose of reducing risks while in traffic. Regarding having some kind of insurance he indicates having life insurance, because *"it is mandatory to join the app"*[39] and he contributes to social security (INSS) through the monthly contribution payment (DAS) for being MEI (individual micro entrepreneur).

Miguel intends to continue working with cyclelogistics, but investing in the

FORTALEZA (CE)

Gabriel intends to continue working as a delivery cyclist because he likes his job. Not having a closed routine is a positive point for him, as well as the possibility to meet different people and always talk to them. In terms of fear, he said he is afraid of being in an accident because of irresponsible people in traffic. He is mostly afraid of situations involving drivers who don't respect the red light, who park illegally on the bicycle lane and don't signal the conversions. As for having some kind of insurance, he said he does not own any.

Cícero also intends to continue working as a delivery cyclist because he is used to it and he enjoys the routine. He indicated that what he likes most about the job is the possibility to work in the street, to see and to interact with people. He stated that he has no fears regarding the occupation, nor does he indicate having any type of insurance.

Fábio has no plans to change jobs, as he considers his job peaceful in a calm and good environment. When asked about fears, he pointed out *"I'm only afraid of traffic and robbery, really"*. The fear related to public security appears in Fábio's speech. He could not answer the question about personal insurance and believes that the company does not offer any protection, because when he started working no information about insurance was provided.

Like the other colleagues interviewed, **Gil** intends to keep working with delivery because he likes the occupation and finds it pleasant to work with a bicycle. He made a comparison about his dissatisfaction when working with an app but using a motorcycle, where he was robbed and had no assistance provided: *"I was robbed and they didn't even ask if I was okay"*. Gil also has concerns about public safety; "being robbed" appears as his greatest fear. In relation to traffic claims, *"I'm not very afraid, I'm cautious and I have God's help"*. He indicated that he doesn't have any life, health or any other type of insurance, relying only on the public health system.

SÃO PAULO (SP)

Despite believing in the bicycle as a sustainable and ecological alternative for logistics, **Júlia** does not intend to continue working as a delivery cyclist in the coming years. She plans to continue in the cycling business, but not in her current function, because she understands that her body will not withstand for many years the effort required to cycle 70km a day making deliveries. When asked about having any fears related to her occupation, she confirmed having all those previously mentioned: physical integrity, several types of violence, lack of assistance, vulnerability, and traffic accidents. Julia says she is afraid of dying every day; *"I will arrive voiceless in class because I have to yell so much in traffic"*, since accidents involving cyclists and delivery workers are recurrent. Júlia stated that all kinds of violence are present in her routine. Even in the face of exposure to violence, she believes in resistance as a way to change and build a more humane city. When asked about insurance, Julia indicated that she only has a life insurance policy, linked to her bank, which will favor a beneficiary in the event of her death. She counts on SUS in case she needs medical attention.

Like Júlia, **Ariel** intends to continue working with cyclelogistics but is still not sure if he will continue as a bike courier. Currently Ariel is also studying programming with the intention of contributing to the creation of a collaborative platform for cyclelogistics. Ariel's idea is to cooperate for a fair and equal pay for bikers unlike what happens with the apps, which are *"suppressing rights"*, according to him. Regarding his fears, Ariel summarizes: *"being a delivery cyclist is to hope that every day you get home alive [...] because nobody respects the bicycle"*. He sees that the city of São Paulo (SP) was consolidated in a car-centric system that does not absorb the preference for bicycles, only favoring cars. About insurance, Ariel has only a dental plan, but with little coverage.

Considering his bike courier job as

39 *To have their registration cleared to work as an app delivery cyclist.*

Curitiba (PR) continuation

expansion of his delivery company. His idea is to provide customized bicycles for the job (with a larger cargo capacity to optimize routes) and to hire delivery workers to use them. When asked about fears related to the profession, he indicated that his only fear is running out of battery power in the middle of the deliveries. Miguel points out that he has life insurance and was able to insure his bicycle, including the batteries, which he said was something difficult to get. He does not have health or dental insurance and when necessary he relies on SUS (Brazil's universal public health system).

Pedro sees his work with deliveries as something temporary, until he has to return to classes in person next year. He intends to earn money another way because he will not have time to make deliveries, considering that his undergraduate course is full-time. Pedro says he is afraid of the traffic and justifies some of his actions by his fear of accidents: *"I am afraid of car accidents, afraid that a car might hit me, so I don't even cycle on the street, only on the sidewalk. I don't cycle on the street gutter, only on the bike lane"*. For Pedro, there is little awareness and respect for cyclists in Curitiba (PR), as well as little signage in general. He mentions a lack of speed regulations on busy roads and even a lack of indication of the direction of roads which, associated with little respect for cyclists on the part of drivers, makes him feel unsafe. Pedro also reported fear of being assaulted, as he is aware of frequent incidents with other delivery cyclists. He doesn't have any insurance, relying only on SUS.

São Paulo (SP) continuation

the best option of the moment, Mário intends to keep working with deliveries since it offers peacefulness to his daily life and allows him to aggregate money, body, mind, and environment benefits. Regarding his fears at work Mário says that, because of his age, he has already learned a lot and prefers not to think about traffic claims: *"you can't keep paranoid that something is going to happen to you"*. He recognizes that incidents can happen but that respect in traffic must be practiced daily, also by cyclists. When asked about insurance, Mario said that Carbono Zero provides free life, health, and dental insurance.

Like Mário, **Roberto** intends to continue cycling, but wishes to combine it with another job. He likes to cycle and to be paid for doing what he likes, which are reasons for his decision. According to Roberto, risks are present in any place and in any situation, but they are not a reason to quit the job. About having some fear related to the work, Roberto says he is a little afraid of other people in traffic. For him, respect goes two ways and if you show respect, you are respected in return. He tries to be as courteous as possible to get the same back. About insurance and protection, Roberto mentioned that recently all MEI (individual micro entrepreneur) bikers have insurance coverage for medical and dental care, and assistance with temporary leave from work, permanent disability, accidental life insurance, and funeral assistance

SUPPORT AND PROTECTION

From the reports in the previous sections, it is possible to observe that fears of different kinds are present in the daily lives of delivery workers and are related to the performance of their activities. We asked about the expectations of support from the collectives and companies so that the bikers feel safer as workers and cyclists, and what they believe the companies or collectives can do for their safety.

CURITIBA (PR)

From **Samuel**'s perspective, offering a support network and communication structure is the main point that the company (Sem CO2 Deliveries) can offer so that he feels safe as a professional cyclist. For **Davi** there is little that Sem CO2 deliveries can do, because the responsibility for road safety belongs to the city government and the urban project they develop. Still from the perspective of public power responsibility, Davi also argues that the company can contribute with awareness campaigns, made from the perspective of cyclists.

Miguel, a user of Bicicletaria Cultural, highlights the services offered by the bike place with support for basic maintenance of cyclists. He says it would be interesting for Bicicletaria Cultural to multiply the offer of support points with mechanics available in the city. For **Pedro**, Bicicletaria Cultural can intervene with the City Hall and competent traffic agencies to request awareness campaigns and more actions in favor of cyclists: *"handing out some pamphlets in the city center for drivers... oh, respect the cyclist, I would gladly be a volunteer for that"*. Another issue indirectly mentioned by Pedro is that of support networks. The delivery cyclists use a communication network through which they help each other and provide assistance whenever necessary. He pointed out the case of a bike courier who was robbed and had his bike stolen, and the other delivery workers chipped in for a bag and a new bike to help their colleague.

FORTALEZA (CE)

Gabriel and **Cícero** made mentions of issues related to work equipment. Gabriel believes that providing a spine protector would be enough for protection for him as a worker and cyclist. On the other hand, Cícero points out the need for more frequent bicycle inspections, since having problems with the equipment during the routes can make them vulnerable.

Fábio and **Gil** understand that their fears are associated with public security, which is something that cannot be solved through actions from their company.

SÃO PAULO (SP)

For **Júlia** and **Ariel**, the collective already provides the support that is possible within its limits, offering autonomy and security. In the payment distribution, a part of it is destined to a "collective box", where the money is saved for collective causes such as material for the maintenance of the bicycles, for helping someone with problems or involved in claims. Ariel reinforces the financial and psychological support provided by his fellow members in times of need: *"the fact that it's a collective already takes off a lot of weight, because being a bike courier is a very lonely job. You're alone on the bike, and knowing that you have a support network you can count on... If something goes wrong, I know I can call these people here and it will be okay. I am not alone. It's already a big help"*.

Mário e **Roberto** agree that the company already uses the possible resources to encourage and guide the workers in terms of safety. In Mário's view, the company takes safe cycling as a priority, offering courses and training as well as monitoring. Roberto agrees but believes that the company could collaborate in awareness campaigns for society in general.

ROUTE DEFINITION

From the understanding of the fears indicated by the interviewees, the research sought to capture perceptions of safety that may be related to various strategies adopted to ensure wellbeing, consciously or unconsciously.

"Safety perception is the ability of a person to recognize and be mindful, evaluating and improving their behaviors and attitudes in order to avoid an exposure to the risk of traffic claims" (Diniz, 2019, p.13). In this research, questions regarding safety perception were asked in order to understand aspects regarding road safety with respect to elements of the delivery cyclist ecosystem, from the understanding that safety perception is a factor that affects the level of risk that each person tends to take in decision making.

First, we sought to understand how the routes of the deliveries to be made are defined, in an attempt to understand what road safety measures are adopted: what are the criteria adopted in this route definition and who is responsible for defining it. If the routes are drawn up by the bike couriers themselves, they are in control and can answer directly about the decisive factors. If the routes are drawn up by others, the delivery workers will probably need to adopt strategies within the routes imposed on them to protect themselves if they do not feel safe.

CURITIBA (PR)

In general, since he has fixed clients, **Samuel**'s routes don't vary much and he receives them with defined directions. On the occasions that he has autonomy to define the route, he indicated that he prioritizes those with less time or distance. In his work with restaurants, Samuel tries to take the shortest route to be able to deliver more meals. According to him, *"at this moment safety is put in second place, unfortunately"*, differently from the delivery of documents where he works per kilometer and not per hour.

Working mainly with apps, **Davi** sequentially receives delivery demands sent by the app itself. Registered in more than one, he chooses one per day and accepts the demands sent. According to him, deliveries with cyclists are distributed within a radius of up to 5 km (cyclist - delivery point location).

Working with apps and fixed customers, **Miguel** has control over his activities and routes. Based on the demands of fixed customers, he manages the deliveries himself and prepares the route through a software *("the delivery")*. Except for food deliveries, Miguel works with a delivery time of up to two working days. According to him, this helps him to optimize the routes created.

FORTALEZA (CE)

In general, **Gabriel** gets his routes already set. However, sometimes he also defines some routes. He said he always prioritizes routes with which he is already familiar with the streets.

Cícero values maximum optimization of time and points out that he always chooses the fastest route. He receives the destinations and defines the delivery routes.

Fábio receives the delivery address and uses the map on his mobile phone to define the route. He always chooses the fastest route, aiming to make as many deliveries as possible during his working hours. He also indicated that he receives some deliveries with indication mark, which are destinations to be prioritized in the route definition.

Gil has total autonomy in defining his routes and seeks efficiency. He stated that he chooses *"a logical order of deliveries"*, prioritizing the fastest routes. Gil did not indicate an average number of deliveries made daily.

SÃO PAULO (SP)

Júlia receives the list with the delivery addresses and draws the routes using Google Maps in order to ride as few kilometers as possible. She does not necessarily follow paths that have a bike lane. She prefers to follow paths that she already knows and seeks to optimize the last delivery location, in order to be closer to her residence, reducing her commuting time when returning home.

Like Júlia, **Ariel** receives the deliveries addresses and defines his route based on the lowest mileage, always checking Google Maps for the estimated time between locations. Besides distance and time, he prioritizes riding on known roads and those with less steep slopes.

Mário indicates that the delivery routes elaborated by the company aim at the optimization of displacements and the grouping of destinations per region of the city. At the end, the bike couriers receive centralized routes and consent to the distribution.

For **Roberto**, the important thing is to beat the target of deliveries established for the day, considering that the route is not defined by him but established by the company's operations sector and distributed to the workers by order of arrival. In

Curitiba (PR) continuation

Regarding the definition of the routes, **Pedro** says he doesn't have much autonomy because he works with an app, so he receives the trips only with the indication of distance and final delivery address. After receiving the offers, he evaluates the distance and the final location and decides whether to accept it or not. When he can identify that the destination is in an unsafe place, he prefers not to accept the trip. He says he prefers to make trips of no more than 3 km: *"because this way I can make deliveries faster and make other deliveries as well. Sometimes I cycle very far away, you end up spending a lot of time and you earn the same amount of money in a very long trip, but you can earn more by running much closer and then doing another one".*

São Paulo (SP) continuation

his opinion, a bad route is one that has many hills.

Figure 14-Cyclist-cyclist on route using the bicycle lane in Curitiba(PR).

Source: Doug Oliveira / Ciclolguaçu, 2021

4.1.3 DIMENSION SYNTHESIS

In this dimension we sought to collect data on the socio-demographic profile of the workers and on aspects related to their work routine, besides data on involvement in traffic claims and perceptions of road safety.

Data from the survey conducted in São Paulo (SP) with bike couriers using electric bicycles indicate the following:

- Group mostly composed of men (92%), brown (39%) or black (29%), and young people - 76% up to 30 years old (30% up to 20 years old);
- As for the level of education, 56% have completed high school and only 4% have completed university;
- Three neighborhoods in the South Zone of São Paulo (SP) were highlighted as places of residence of many workers (Capão Redondo, Grajaú and Jardim Ângela);
- The average distance traveled from these neighborhoods to the Augusta bicycle pickup point is 19.6 km;
- These commutes happen predominantly by public transport;
- Most of them work on Fridays, Thursdays and Saturdays, and during the weekend the movement on the night shift increases;
- The average number of deliveries per day was 18;
- They have been using electric bikes for a relatively short time, five months on average;
- 85% have no personal insurance;
- 35% have been involved in traffic claims or claims and considering their last occasion, most (63%) were slightly injured, about one-third (36%) witnessed a claim involving a car, almost three-thirds (63%) were off the bike paths - on shared streets - and almost half (45%) were on the night shift.

The gender-filtered analysis shows that:

- The 24 female delivery cyclists in this group are mostly brown (42%) or black (34%) and young women with an average age of 24;
- Regarding the education of the 24 delivery women, 50% have completed high school, and only 4% have completed college;
- The 24 delivery cyclists arrive at the iFood Pedal pickup points mostly (88%) using public transportation;
- Their work frequency is higher in the afternoon shift, especially on Fridays and Saturdays;

The 24 delivery cyclists indicate fear of theft/ robbery/ assault, fear of traffic accidents, and fear of vulnerability to motorized vehicles;

In contrast, 79% of them have no personal insurance - health, dental, or life insurance - and 58% have been involved in traffic claims or traffic accidents;

Through the crossings and correlation comparing gender and involvement in claims, it was possible to highlight that women suffer as many claims as men.

Aggregating the data obtained in the six case studies carried out in Brazilian cities, we arrived at different results from those found in the survey. Considering the 12 people interviewed, we have a group:

Mostly men (92%), brown (41%) or black (41%), and young - with an average age of 31 years;

In this group, 25% have had access to higher education and 33% have completed basic education;

About work routine, all of them work at least from Mondays to Fridays; from this group, 50% also work on Saturdays and 25% also on Sundays;

The average workload is 7 hours a day;

Considering the group of interviewees, half of them combine their workload as a bike courier with other activities, professional and/or academic;

They all use the bicycle as a means of transportation, as well as a work tool;

When asked about their relationship with cyclelogistics, 41% said it is their first professional experience working in the field;

The motivations vary and include financial reasons, lifestyle improvement, enjoying the activity/ occupation, lack of space in another job market;

75% intend to continue working with cyclelogistics, either as a bike courier or in another cycling-related position, and 25% consider it something temporary;

Of the 67% who said they felt some kind of fear about work, 87% said they were afraid of traffic claims, in addition to fear of theft/ robbery;

Of the 12 respondents, 50% have some kind of personal insurance, and from these, 41% have life insurance from the bank and 16% have dental insurance;

Despite the low percentage of insurance coverage among these workers, all of the respondents have been involved in some crash or traffic claim or have witnessed claims involving cyclists;

All point to a change in behavior after witnessing or being involved in an claim.

About the behavioral and safety perception aspects, the following stands out:

- The change of behavior and adaptation of patterns as a strategy for defense and prevention of claims indicated by all;
- The little or no trust in the drivers;
- The need to be seen and noticed by the drivers. This includes riding on the counterflow and using sonorous resources - speakers and whistles;
- Increased sense of safety when cycling through familiar places and negative impact in places where they had negative experiences;
- From the perspective of Júlia, the only female delivery cyclist interviewed, streets with women and children are an indication of safety, and the strong male presence causes her discomfort and insecurity.
- All indicated a change in behavior and adaptation of patterns as a strategy for defense and prevention of claims.

4.2 BICYCLES AND EQUIPMENT

Similar to the analyses of the previous dimension, the considerations for the **Bicycles and equipment** dimension were also developed based on the triangulation of primary and secondary data collected through three collection instruments. The objective was to observe issues related to the main work tools used by the delivery workers: their bicycles, equipment, and accessories.

The first instrument applied was a quali-quantitative structured survey with app delivery cyclists in the city of São Paulo (SP). The results of the survey and the research in each city are detailed in the following sections.

The second instrument was the application of an in-depth interview script with delivery cyclists in the three cities selected for the case studies: Curitiba (PR), Fortaleza (CE) and São Paulo (SP).

Finally, the third instrument was a case study with companies and collectives in the delivery business. The following establishments participated in the study: in Curitiba (PR), Bicicletaria Cultural and Sem CO2 Entregas; in Fortaleza (CE) Disk Água FP and Tele-Entrega; and in São Paulo (SP), Carbono Zero Courier and Señoritas Courier.

The following indicators were considered for data collection in all instruments applied in this dimension:

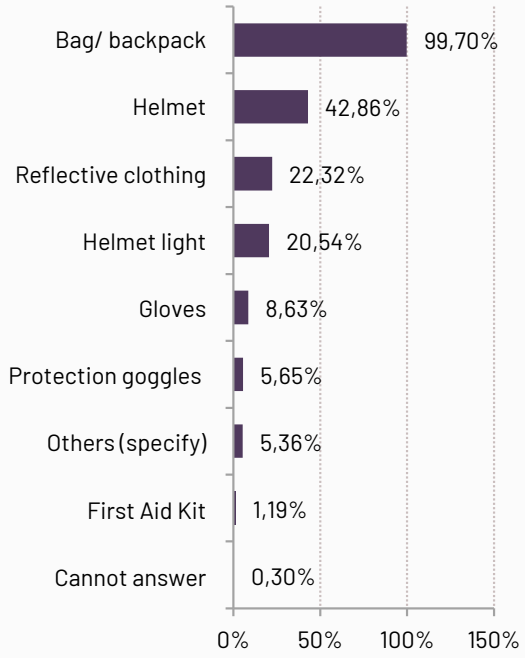
1. Nature of the company or collective;
2. Internal legislation of the companies or collective;
3. Types of professional hiring;
4. Incentives for road safety, urban and traffic education;
5. Educational actions and campaigns;
6. Professional training;
7. Insurance;
8. Social responsibility and labor rights;
9. Benefits and legal support for bike couriers;
10. Challenges of corporate policies;
11. Monitoring and evaluation policies.

4.2.1 Survey São Paulo (SP)

Questions regarding the equipment and accessories used by delivery cyclists who use the iFood Pedal electric bicycles were also addressed in the survey applied in the city of São Paulo (SP).

The main accessory, used by almost 100% of the respondents, is the "bag" (backpack) for storing food and products to be transported by the workers. Regarding the use of helmets, the rate of use of this accessory did not reach half of the respondents – 42% indicated that they wear a helmet during work. Almost a quarter (22%) said they use reflective clothing. This practice can be related to the importance of feeling visible for their safety, a factor mentioned from different perspectives in the interviews and also in the survey.

Graph 30- What accessories do you use during work?



About two-thirds of the delivery cyclists said they do not use any type of audio while working, followed by more than a quarter (29%) who use headphones during their commutes (Graph 31). This question sought to understand which habits and accessories could cause distractions to workers in traffic and, in consequence, impact their road safety.

Graph 31- Do you use any kind of audio accessory connected to your cell phone?

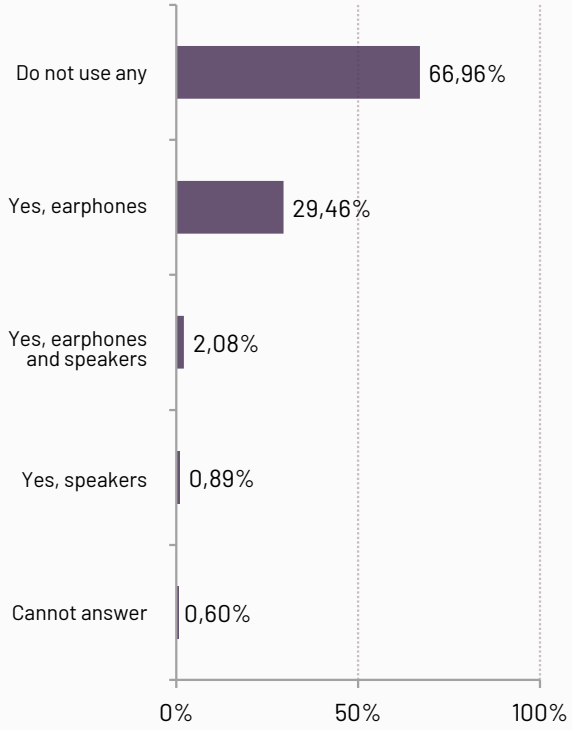


Figure 15 - iFood Pedal's electric bike.

Source: iFood Pedal

Contextualizing the aspects related to the bicycles and equipment of the iFood Pedal plan, it is important to highlight that the users of this plan can use the electric bicycles for a maximum of two periods of up to 4 hours, per day. In between using the electric bicycles, these users can also use the conventional bicycles from the BikeSampa sharing system. However, it is important to emphasize that the survey focused on the experiences related to the use of electric bicycles.

There are 500 electric bicycles available only for users of the iFood Pedal plan, in São Paulo (Figure 15). Specifically about the bicycles, the publicly disclosed information indicates that they are pedal-assisted electric bicycles, i.e., the motor is activated when the bicycle is pedaled, with no accelerator. According to Figueiredo (2021), the models have a 24 rim with 2.125 tires and drum brakes with Shimano Nexus 3-speed hub, and their battery autonomy is up to 60 km with speed limited to 25 km/h. On the bike's panel it is possible to fit a mobile phone next to the battery level indicator.

As for accessories, the bikes also have a rear-view mirror, a bell, and an on-board computer – the LED flashlights are automatic and start blinking when the bike is moving.

The fact that the bicycles are robust and that they are electric plays a considerable help to users in order to overcome slopes and perform more trips throughout the day, since São Paulo (SP) is a city of rugged and steep terrain. All maintenance and adjustments are made by the responsible companies at the pick-up and delivery points of the electric bikes, which operate daily.

Pedal Responsa is an educational content of the plan, made available online to all delivery cyclists and free of charge. The contents of the courses include explanations about traffic laws, road behavior and safety equipment. Those who complete the courses receive accessories such as UV shirts, portable chargers, windbreaker jackets and personalized bottles.

4.2.2 Case studies

RELATIONSHIP WITH BICYCLES

We sought to understand the relationship between the delivery cyclists and their bicycles by asking questions about how they started using them and how long they have been cycling (either as a hobby, leisure, means of transportation or occupation). The goal of these questions was to understand the cyclists' experience with different models of bicycles and with riding in the city.

CURITIBA (PR)

Samuel has been riding since childhood and is familiar with other types of bicycles, from heavier and simpler models to lighter ones, besides the one he currently uses for deliveries. Davi started cycling as a means of transportation to university and soon started making deliveries as a form of income. Today, besides making deliveries, he also sells and improves electric bicycles.

Miguel's relationship with bicycles started early and since childhood he has had an easy time with them. As a teenager, he started to use them as a means of transportation and has worked as a bicycle mechanic. Pedro's relationship with bicycles started later in life, when he moved to Curitiba (PR) in 2020 and soon after he started working as a bike courier.

FORTALEZA (CE)

Gabriel also cycles since childhood and says he has tried to use a motorcycle, but could not get used to it and went back to using the bike as a means of transportation and work. Cícero used to cycle as a child and for about 5 years has used the bicycle as a work tool at Disk Água FP.

Gil and **Fábio** also used the bicycle as children and recently started to use it for deliveries at Tele-Entrega.

SÃO PAULO (SP)

Even though he learned to ride a bike as a child, **Ariel** only established his relationship with the bicycle when he moved to a seaside city and started to use it as his only means of transportation. Júlia bought a bicycle to replace the long and unsafe wait for public transportation in the early morning hours and started using it for all her trips.

When **Roberto** was 15 years old, he worked as a newspaper delivery boy using a bicycle in his hometown. Both Roberto and **Mário** used to use their cars to commute to their former jobs, but after having problems with their vehicles, they started using bicycles for their commutes.

Figure 16 - Cyclist locking a bicycle in Curitiba (PR)

Source: Doug Oliveira, 2021.

BICYCLES AND WORK ROUTINE

This part of the study sought to understand how bicycles and accessories are included in the work routine of the bike couriers. Bike couriers and representatives were interviewed and asked questions about types of bicycles, ownership and satisfaction with the equipment used by the bike couriers, the relationship and care of the company/collective with the bike couriers equipment and the adequacy of the equipment to the services provided. The answers given by the bike couriers and representatives of the companies and collectives are shown below.

CURITIBA (PR)

Samuel uses a Caloi 100 bicycle to make deliveries, but he intends to change it soon because he considers it to be quite old.

Davi customized a 4-horsepower electric bicycle and says he is satisfied with the equipment. The cyclist believes that it is very important to choose the appropriate bike for the activity to be performed. In his opinion, the common belief that mountain bikes are suitable for any situation is a mistake. For Davi, the electric bike is a safety item because it allows the bike courier to ride as if they were a professional cyclist, and therefore less exposed to risk. His equipment helps him make more deliveries in less time and gives him more time for other activities in his day. The bike courier says that bike care is important and that this is a factor that influences his daily delivery goals.

Sem CO2 Entregas

Sem CO2 uses mountain bikes in its fleet due to their robustness and suitability for the area where they operate. If necessary, the company also lends these bicycles to the delivery workers who use their own bicycles. Regarding accessories, the company lends or helps workers to buy padlocks, light and sound signaling accessories. Uniforms and bags for transportation are provided, and protection elements such as helmets, gloves, and goggles are not, but it is suggested that the workers use them. According to the company representative, the fleet models are suitable for

FORTALEZA (CE)

Gabriel uses a company-owned cargo bicycle and considers it suitable for the job. He makes an observation about problems in the tires and the welds from the overweight applied to the bike to make deliveries of gallons of water. For him, working with a cargo bike with a front carrying case would be more suitable. **Cícero** also uses a cargo bike provided by the company, and although he is satisfied, he believes that it would be better to have some specific support for the water containers in the back. In his routine, Cícero uses his bike to go and come back from work, where he leaves it parked in the store while he makes deliveries with the company's bike.

Disk Água FP

The four bicycles used for deliveries are all cargo bikes, non-electric, and belong to Disk Água FP itself. One of the bicycles has a specific support for water bottles and can carry five of them. On the other three bicycles, the bottles are transported in boxes installed on the front and back of the bicycle, which allow four gallons to be carried. Padlocks and chains are provided to the workers along with the bicycles. For the company's representative, the bicycles are suitable for the service because they are robust and specific for the transported goods. The preventive maintenance is done weekly by the representative and the bike couriers, while the technical problems are less frequent and usually related to brake adjustment and repair of flat tires.

Gil always uses the electric bicycle provided by Tele-Entrega, for work

SÃO PAULO (SP)

Júlia Júlia owns two bicycles, a speed and a mountain bike, and says that the components are not the best available, requiring constant maintenance. According to her, if the bikes have their maintenance up to date, they will meet her needs well. **Ariel** also owns two bicycles, a fixed wheel and a 26 wheel. He says he is satisfied with both, but believes that the 26 wheel requires more maintenance of the components.

The bicycles are chosen according to the deliveries that will be made that day. The type of delivery is also criteria for defining the accessory used: bag or backpack for transportation or a crate attached to the bike. Júlia has installed a crate on her mountain bike and Ariel on his 26 wheel, which they use for bulkier or heavier deliveries. For smaller or lighter deliveries Júlia uses her speed bike and Ariel uses his fixed bike, equipped with their respective bags. For Ariel, when the deliveries are in regions with many climbs and slopes, it is more comfortable to use his 26 wheel instead of the fixed gear, because the gears make the cycling easier.

Señoritas Courier

Regarding the maintenance of the delivery workers' own bikes, Señoritas Courier has a reserve fund and every year decides together with the workers how these savings will be invested. The collective does not have its own fleet of bicycles yet, but for them, the ideal would be to have a fleet from the collective as it would give the same pedal conditions to

Curitiba (PR) continuation

the deliveries they make and they undergo technical maintenance every 5 or 6 months. If a bike courier needs technical services for his or her own bike, it is taken to the same bike shop and paid for separately by the company.

To make his deliveries **Miguel** uses a Long John electric cargo bike equipped with a trunk, purchased from a cyclelogistics company. The bike was adapted with two motors and Miguel is very satisfied with it. He believes that it has more power than is necessary for the services he performs today. **Pedro** also uses his own conventional bicycle to work and even though he says he is satisfied with the current model, he believes that a 29-inch would be ,pre suitable to perform his services.

Bicicletaria Cultural

Bicicletaria Cultural offers a place for delivery workers to store their own bikes, and pays the costs of a new one in case of theft on site. If the delivery worker needs a new bicycle, the company has community bicycles that are available for a loan for R$185,00, for a period of 4 months. According to the company's representative, these are simple and used bicycles with gears, iron frame, and they are used but revised and come out in good condition. The company offers free minor repairs if needed, and a new maintenance check is done on the bikes when they are returned. Bicicletaria Cultural does not offer safety accessories to the workers yet, but is considering giving a basic kit to the people who borrow the bicycles. And the transport items are left up to the cyclists, who take the parts back when they return the bicycles.

FORTALEZA (CE) continuation

and for commuting. **Fábio** also uses the same model of bicycle, provided by the company, but outside working hours he keeps it at his mother's house, located near the delivery distribution center. For Gil, the battery could have a longer life span, while Fabio believes that the tires could be more resistant to punctures.

Tele-entrega

Tele Entregas uses electric bicycles of the brand Pedalla Gioia in its fleet. For the company's representative there are no disadvantages in the model they use because besides being electric, they are light and allow the cyclist to cycle even if the battery runs out. For the company representative, electric bicycles are very important for mobility issues and he believes that they are the future. The company provides a helmet, glasses, padlock and chain, lights, bell, rear-view mirror, and uniform without reflectives to the delivery cyclists. The transport accessories used on the bicycles are trunks with a capacity of 80 liters. The company does not use bags for transportation because, according to the company's representative, he does not consider them good accessories and does not want his bike couriers to carry weight on their backs. Preventive maintenance is done by the company's maintenance team. They had technical problems with the model used on their original tires, but were all changed. In cases of flat tires, the company picks up the bicycle with a car and the repair is done by the team.

São Paulo (SP) continuation

the bikers and would allow them to do the same type of maintenance. As for accessories, the cooperative does not provide any at this time, but its internal legislation states that the care of the bicycles and accessories will be the responsibility of the cooperative, as soon as it is established. Currently it counts on a support network that helps with donations when necessary. Señoritas Courier, although the maintenance and repair of the female delivery cyclists has not yet been established as a benefit, has a part of the collective's fund that can be used for such services, if voted by the team.

Although he has his own bike, **Mário** uses the Long John type cargo bicycle owned by Carbono Zero. He says he is satisfied with the bike and does not believe there is a better option for a cargo one, which in addition to giving him greater security, makes him more visible to other vehicles due to its size. Of the interviewees from São Paulo (SP), Mário is the only one who uses a cargo bike, in which the bike's trunk allows the delivery worker to carry all the deliveries of the day without having to return to the base during the workday for recharging. **Roberto**, on the other hand, uses his own bike, a caiçara type, and is not completely satisfied with it due to the weight of the frame material.

Carbono Zero Courier

Carbono Zero offers a maintenance service, to the delivery workers' own bicycles, at cost, at a bicycle repair shop with which it has an agreement. Some of the company's workers use their own bicycles and others use bicycles provided by the company, which can be conventional, cargo or electric bicycles. For Carbono Zero's representative, the advantages and disadvantages of each model are:

São Paulo (SP) continuation

Figure 17.1 - Speed bicycle.

Source: bikexchange.com

Figure 17.2 - Mountain bike.

Source: bikexchange.com

Figure 17.3 - Long John cargo bicycle.

Source: EcoCase

Figure 17.4 - Long tail cargo bike.

Source: Portal Bikes

- The conventional bicycles may have some kind of luggage rack or can be used with backpacks and although they carry less volume than a cargo, they are more agile;
- The Long John cargo models have a large trunk, which allows the transportation of a larger volume of cargo and enables the bike courier to carry all the deliveries for the day without the need to return to the base for reloading, but is disadvantageous in regions with steep terrain;
- The electric bicycles are used because they are more convenient to cyclists in some types of deliveries, such as those of heavier loads; for the company, this model of bicycle can bring more people to this job market, but it is still a very expensive product.

Regarding the bicycle, cyclist or transport accessories, the company sells some at cost and has daily campaigns to raffle other accessories to those cyclists who excel in deliveries. The company performs periodic preventive maintenance on its bicycles at parner bike shops, and also advises delivery cyclists to do this on their own bicycles, offering the service at cost in the same locations. The frequency of technical issues varies according to the use of each cyclist, and if necessary, bike couriers who have problems on their own bicycles can use one from the company.

TECHNICAL ISSUES

In order to learn about technical issues and their implications for road safety, the interviewees were asked about the frequency of technical problems and the need for maintenance of the bicycles used for deliveries. From this information we can make presumptions about expenses, equipment safety and, consequently, traffic claim prevention.

CURITIBA (PR)

For **Samuel**'s bicycle, basic and simple maintenance is done by his wife, while more complex maintenance is done at a bicycle repair shop and he estimates having monthly expenses. Davi does weekly preventive maintenance on his electric bicycle, including changing the brake pads, due to the intense use of the bicycle. According to him, there is minimal maintenance required.

Miguel does weekly preventive maintenance on his electric Long John. The delivery worker himself does the basic maintenance, such as adjusting brakes, shifting gears or changing tires. Pedro says that he does preventive maintenance every two weeks because his bike has simpler parts. Most of these checkups are in the spokes of the bicycle wheels because Pedro, for safety reasons, prefers to ride on the sidewalks which are very irregular, according to him. The brake checkup is done every 6 months.

FORTALEZA (CE)

Gabriel indicated having frequent issues with broken welds, while for Cícero the most common issues are with the axle, brakes, and flat tires.

Gil said he has never had problems with his electric bike, while **Fábio** says he has had about 3 or 4 flat tires.

SÃO PAULO (SP)

Júlia does maintenance every six months and the most affected parts are the central movement and the wheels, which need to be aligned due to the pavement condition of the roads. Ariel does his own repairs on his fixed gear bike, but he says that his 26-inch needs quarterly maintenance because it has more components.

Roberto makes monthly repairs on the brakes and tires as he has experience with mechanics, so he does weekly preventive maintenance on his caiçara bike. Mário makes deliveries with the company's bicycle, and says that the wear and tear is common and there's periodic maintenance.

Figure 18 - Delivery worker takes care of the equipment used in Fortaleza (CE).

Source: Adriana Marmo, 2021.

ACCESORIES

In the interviews, the respondents were asked about the accessories used during deliveries, trying to understand which ones they used, the comfort, how practical they are and how they are important for the cyclists' road safety. We considered as accessories: baggage rack, bags, bicycle protection elements (lock, chain, etc.), light signaling (reflectors and lights), sound devices (horn, bell, etc.), rear view mirror, body signaling (specific clothing), protection elements (helmet, gloves, gloggles, etc.). Regarding the use of sound devices, such as speakers or headphones, the interviewees indicated whether these devices hinder their perceptions while cycling.

CURITIBA (PR)

As accessories for cargo transportation, **Samuel** uses a baggage rack, a delivery bag and a backpack. On his bike he has lighting and sound signaling accessories, and he feels the need to install a rear view mirror. He carries a raincoat, uses reflective tape on his legs, and says he always uses a helmet: *"Helmet always! I never cycle without one, it has saved me several times when I fall or get run over"*. Samuel uses a headset only in some parts of the city, or usually when he is on a bike path or a quiet road, but he says he uses it only in one ear in order to keep his attention in traffic.

Davi considers that ordinary delivery bags are like parachutes and cause a lot of air resistance, so he has made his own bag that folds up and avoids the effect. For heavier loads he uses a saddlebag. On his electric bike he uses a cover for the batteries, a footrest, lights, a horn, and carries a padlock and a kit for repairing the tires. He also uses a helmet and carries a raincoat. Regarding the headphones, he considers them dangerous, because they prevent him from hearing the traffic, but he uses a bone conduction headphone, which he says does not prevent him from hearing the sound around him.

Miguel uses a cargo bike, so deliveries are transported in the trunk. On his bicycle he uses a rear view mirror, light signaling and carries a repair kit and padlock. For himself, he uses a helmet, goggles, raincoat and windbreaker when necessary, and he emphasized that he uses and thinks it is important

FORTALEZA (CE)

Gabriel's bicycle has specific holders for bottles of water gallons, with capacity for 5 units, while Cícero's bike has two boxes, one front and one rear, which together accommodate 4 bottles. Both agree that headphones take their attention off the traffic and Gabriel indicates that he uses them only after the last delivery of the day and only in one ear, while Cícero does not use them.

Fábio and **Gil**'s bicycles have trunks for carrying their loads, a rearview mirror, a bell and light signaling. They wear a helmet, uniform and carry a chain and a padlock. In addition, Gil also wears boots.

SÃO PAULO (SP)

In the cases of **Júlia** and **Ariel**, they both have two bicycles: in one of them, the cargo is carried in baggage racks or adapted crates and in the regular bike, deliveries are carried in transport bags or large backpacks. For large deliveries, Júlia uses a crate installed on her mountain bike and Ariel uses a baggage rack and a crate installed on her 26-inch bicycle. For smaller deliveries, Júlia uses her speed bike and Ariel uses her fixed gear bike, and they carry the packages in square delivery bags or backpacks.

Júlia reported no preference for either of the two load-carrying accessories, but feels that drivers, especially those on motorcycles, tend to respect her more in traffic when she is using the bag. Ariel preferred to use the bike with the crate to avoid carrying back weight with the bag or backpack.

For Júlia, the square bags (which are the most commonly used) are not suitable for cycle-deliveries and are unsafe due to its shape and size: the cyclist is unable to look back turning only the head and is forced to turn the whole body. For her, *"the bag was planned by a person who never made deliveries in their life"*. The use of a helmet is mandatory in the collective.

Júlia and Ariel, as a strategy to be "visible" to the other vehicles, play loud music on speakers so that the bicycles, which make no noise in the traffic, are noticed as they approach.

The cargo bike used by **Mário** already

Curitiba (PR) continuation

to wear light clothing to be more visible to other vehicles. The cyclist indicates that he does not use headphones for safety reasons. He usually rides on the road next to the traffic at about 25km/h, so he believes it is necessary to be very attentive.

Pedro uses a bag as a transport accessory, wears a helmet and carries warm clothing. He doesn't have any light and sound signaling accessories yet, but he wants to install them soon. He also doesn't use headphones for safety reasons, and is afraid of not being able to hear car horns, for example.

São Paulo (SP) continuation

had its own trunk, but the cyclist still uses a backpack to carry smaller packages for faster deliveries and thus optimize his time. Roberto adapted his caiçara bicycle with a crate in which he carries the packages for the deliveries.

According to Carbono Zero rules, the use of a helmet is mandatory under penalty of suspension for a few days for delivery cyclists who ride without it during work.

Figure 19 - Delivery cyclist in São Paulo (SP).

Source: Jéssica Lucena, 2021.

BICYCLE AND COMPANY LOGISTICS

This section of the study analyzed how bicycles and accessories relate to the logistics of the companies and the collectives. Questions were made regarding the definition of the delivery routes adopted, as well as the indications regarding these routes and how the distribution of the deliveries among the bike couriers is done. The answers given by the delivery cyclists and representatives of the companies and collectives are presented below.

CURITIBA (PR)

In the case of Sem CO2 Deliveries and Bicicletaria Cultural, the logistical issues do not specifically relate to aspects of the work equipment used by the delivery cyclists, but are related to other issues.

FORTALEZA (CE)

At Tele-Entrega the definition of the routes is done through apps and when the delivery radius is greater than 5 km, the company considers it more efficient to use a motorcycle instead of a bicycle.

The other logistics aspects of both companies are not directly related to bicycles and equipment.

SÃO PAULO (SP)

The distribution of deliveries at Señoritas Courier is done according to the region where the delivery women live to try and keep them close to home, and therefore, the knowledge they have of those regions is also taken into account. Every week there is a verification of the mileage covered by each delivery woman, in an attempt to maintain a balanced average among the cyclists.

For Carbono Zero, two of the points for the definition and distribution of routes are the experience of the cyclist and the knowledge and familiarity in serving those regions.

In the logistics of Señoritas Courier and Carbono Zero, the issue of bicycles and equipment, as work tools, are treated together with issues of the bike couriers. The bicycle aspects are not evaluated individually; the organizations plan deliveries according to the carrying capacity of the bicycle, cargo equipment, and also the cyclist.

Figure 20 - Delivery cyclist in Fortaleza(CE).
Source: Adriana Marmo, 2021.

FEAR RELATED TO SAFETY AND TO THE OCCUPATION

The delivery cyclists were asked about their fears regarding the occupation, while the companies and collectives were asked how the road safety aspects are involved in the journeys of their cyclists. In this dimension, we sought to understand the relationship of these aspects with the bicycles and equipment used. Below, we present the answers given by the bike couriers and representatives of the companies and collectives.

CURITIBA (PR)

Samuel points out that wearing a helmet has saved him several times in falls and traffic claims. He uses earphones only in some parts of the city, or usually when he is on a bike lane or a quiet road, but he says he uses it in only one ear to keep his attention in traffic.

Davi considers that ordinary delivery bags are like a parachute and cause too much air resistance, so he made his own bag.

Miguel thinks it is important to wear light-colored clothing to be more visible to other vehicles. The cyclist does not wear headphones for safety reasons.

Pedro always wears a helmet and carries warm clothing. He does not have light and sound signaling accessories yet, but he wants to install them soon.

FORTALEZA (CE)

The fears reported by **Gabriel** are not specifically related to bicycles or equipment, and Cícero says he has no fears related to the profession. In Disk Água FP's view, ensuring frequent maintenance of the bicycles, so that they are always in good condition and avoid traffic claims, is what can be done to make its delivery workers feel safer as cyclists.

Gil and **Fábio** are afraid of theft and robbery of their personal property and work equipment. Gil considers himself to be cautious and therefore not afraid of claims, while Fábio indicates that he is afraid of collisions and traffic claims.

SÃO PAULO (SP)

For **Ariel** and **Júlia**, when it comes to their fears regarding the occupation, the concern that refers to work equipment is the vulnerability of a bicycle in relation to other vehicles. For Ariel, the city's road logic, both in the construction of the urban space and in the drivers' behavior, makes the bicycle a vulnerable element in the traffic: *"To be a delivery person is to hope every day to get back home alive, and to be a delivery person on a bike, even more! Because nobody respects the bicycle, nobody! The city of São Paulo (SP) was built up in a car-centric system, it was built for cars"*.

Roberto and **Mário** said that their occupation does not cause them fear because of their age and the respect they try to maintain for other vehicles. For Carbono Zero, one of the important factors for the road safety of delivery cyclists is the use of helmets, which is mandatory for all of the workers.

EQUIPMENT AND TRAFFIC CLAIMS

This section of the study addressed the relationship of the equipment and accessories used in the reports of claims in which the bike couriers may have been involved. We also verified the damage caused to the equipment, in the cases of traffic claims. Below are the answers given by the bike couriers and representatives of the companies and collectives.

CURITIBA (PR)

Samuel did not report damage to his bicycle in his most recent claims, but in one of the cases (the most serious one) the driver intentionally knocked him down by leaning her vehicle against the cyclist's bag. The delivery worker had his two arms fractured.

Davi, in his last claim, was riding his electric bicycle and fell on his own on a curve, because he was speeding and his wheel skidded.

Miguel says he uses defensive cycling and therefore has not experienced serious or relevant claims, but he reported two situations in which other cyclists, by their carelessness, collided with his cargo bike, which suffered less impact for being heavier than the other bicycles involved.

In **Pedro**'s most recent traffic claim situation, he was able to brake in time before the impact of the collision, but still sprained his front wheel and the driver involved left without offering assistance.

FORTALEZA (CE)

Gabriel and **Cícero** were never involved in traffic claims.

Gil crashed into a vehicle that was going the wrong way. He was not injured, but his bicycle was bent and the driver did not pay for the repair.

Fábio has never been in this situation.

SÃO PAULO (SP)

In one of his previous claims, **Ariel** was hit by a car while using a fixed-gear bicycle, which was damaged and needed repairs. His helmet was also damaged. After the event, the driver involved was able to get a donation of a 26" frame bicycle. Ariel started to use both bikes and realized the importance of wearing a helmet, according to he stated.

In her most recent claim, **Julia**'s bicycle back wheel was damaged, and on a previous occasion, the situation was more serious and damaged both wheels. The cyclist says that collisions between vehicles are more easily solved than those between cars/motorcycles/buses and bicycles. For her, in claims between two cars, those involved are used to following a series of settlement procedures between the parties, whereas when it involves bicycles, there is no usual "protocol" and the cyclist is often left helpless.

Roberto and **Mário** reported not having been in relevant claim situations during deliveries.

BEST PRACTICES, CHALLENGES AND PERSPECTIVES

In this sections, the interviewees were asked questions about what they consider good practices of the organizations and about improvements or incentives that facilitate the operation of bicycle deliveries. The perspective was the relationship with bicycles and equipment. Below are the answers given by the representatives of the companies and collectives.

CURITIBA (PR)

For the representative of **Sem CO2 Entregas**, their best practices related to bicycles and accessories are the use of uniforms and bags with the company logo, which give visibility both to the company and to cycling as a whole. According to the representative, bicycle delivery services are still little known.

One of the bestpractices of **Bicicletaria Cultural** is the local production of clothing for cyclists, such as reflective jackets and raincoats for the delivery community, as well as the also the collection of shoes and clothing for them. Another of their best practices, but which is still in project, will be a mechanics training so that the cyclists can have autonomy.

FORTALEZA (CE)

For the representative of **Disk Água FP**, a tricycle model with a transport box in the front would be safer and more efficient for transporting more cargo.

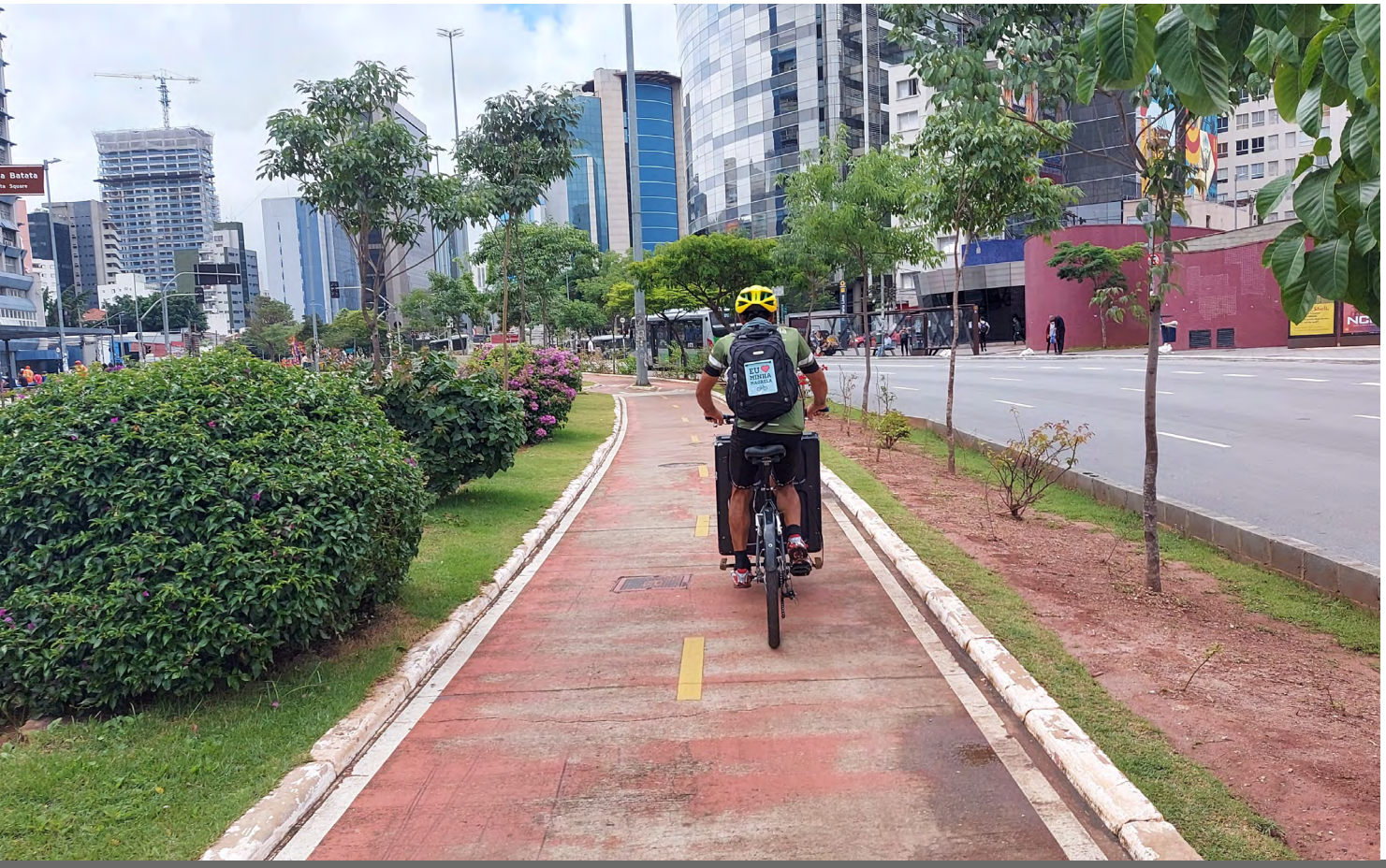
The other reports from the companies about good practices, challenges and perspectives were not related to bicycles and accessories, and are presented in the dimension Companies and Collectives.

SÃO PAULO (SP)

Señoritas Courier's best practices related to work tools is the control of the weight carried by the couriers on their bicycles and accessories. The company limits the weight to be carried according to the transport equipment that will be used. Boxes can carry up to 10kg, delivery bags up to 6kg, and ordinary backpacks up to 4kg.

Carbono Zero's best practices in relation to equipment are the use of vehicles free of carbon emissions, always having bike couriers in uniform, and the use of a lottery for the distribution of accessories to the delivery workers who stand out.

Figure 21 - Bike courier in São Paulo (SP)



Source: Douglas Farias, 2021.

4.2.3 SÍNTESIS DE LA DIMENSIÓN

In this dimension, the study sought to collect data on bicycles, equipment and accessories used by delivery cyclists, in the survey and case studies.

Data from the survey conducted in São Paulo (SP) with delivery cyclists using electric bicycles indicate that:

- The use of pedal-assisted electric bicycles allows for greater convenience during the workday;
- 100% of the bicycles have rear-view mirror, bell, on-board computer and flashlights;
- The main accessory, used by 99.7% of the respondents, is the delivery bag (backpack) for storing the food and products to be transported;
- Regarding the use of helmets, only 42% indicated that they wear a helmet during their work;
- Almost a quarter (22%) said they wear reflective clothing; this pratice can be related to the importance of feeling visible for their safety;
- A quarter (29%) of the bike couriers use headphones during their commutes;
- Cross-referencing the use of audio accessories and involvement in claims, there is a slight indication that this variable needs to be further studied in the future;
- On headphone or speaker use, the robust conclusion is that women tend to use proportionally more audio accessories than men.

Aggregating the data obtained in the six case studies carried out in Brazilian cities, we have different results from those found in the survey. Considering the 12 people interviewed:

- 66% use conventional bicycles and 34% use an electric ones;
- 58% use their own bicycles and 42% work using company bicycles;
- All said they were satisfied and pleased with the bicycle used, despite some observations about what could be improved;
- 83% use a helmet, and only 2 from Fortaleza (CE) do not use them;
- Some of the other accessories most often mentioned by bike couriers were lights, crate, bag, backpack, bell;
- As for the use of headphones and speakers, the majority said they do not use headsets for safety reasons, because they "take away the attention" needed when moving;
- Some bike couriers use the speaker as a resource to be notices;

66% of the bike couriers had their bicycle damaged in traffic claims;

Part of the initiatives of the companies and collectives to make their bike couriers feel safer involve trainings on how to ride a bicycle and also basic notions of bike mechanics and repairs.

4.3 COMPANIES, COLLECTIVES AND APPS

The analyses of the dimension "Companies, collectives and apps" were developed from the triangulation of primary and secondary data collected through two data collection instruments. The goal was to explore characteristics of the management and operation of delivery companies, collectives and apps, and their relationship with delivery cyclists, with emphasis on issues that connect with the central theme of the study, road safety.

The first instrument was a documentary research, which considered bibliographic and statistical elements. The secondary data surveyed sought to contextualize the iFood Pedal plan and what they offer to delivery cyclists.

The second instrument was a case study with companies and collectives in the delivery business. The following organizations participated in the part of the study: in Curitiba (PR), Bicicletaria Cultural and Sem CO2 Entregas; in Fortaleza (CE), Disk Água FP and Tele-Entrega; and in São Paulo (SP), Carbono Zero Courier and Señoritas Courier.

For data collection in all instruments, the following indicators were considered in this dimension:

1. Nature of the company or collective;
2. Internal legislation of the companies or collective;
3. Types of professional hiring;
4. Incentives for road safety, urban and traffic education;
5. Educational actions and campaigns;
6. Professional training;
7. Insurance;
8. Social responsibility and labor rights;
9. Benefits and legal support for delivery cyclists;
10. Challenges of corporate policies;
11. Monitoring and evaluation policies.

4.3.1 Survey São Paulo (SP)

iFood Pedal is an electric bike rental service exclusively for delivery cyclists and was developed by iFood in partnership with Tembici. Delivery cyclists can access the service through the iFood app for delivery workers. Thus, the workers who wish to use the service need to register on the platform and then follow the company's terms and conditions of use, upon registration approval.

According to these terms and conditions, which any category of delivery worker is subject to, the delivery workers are independent professionals, there is no employment relationship between them and the Platform, and no exclusivity is required, i.e. they may make deliveries to any other foodtech platforms simultaneously. And as independent professionals, according to the terms and conditions of use, they are responsible for *"their operating costs, expenses, fees, contributions and taxes related to the maintenance of their activities"*.

The platform provides weekly or monthly plans for delivery workers, which allow up to two 4-hour trips per day with electric bikes or with conventional Itaú bikes and give access to iFood Pedal support points.

The company makes some benefits available to its delivery partners, such as a health benefits plan, personal traffic claim insurance (considering delivery routes and commuting), a qualification course in partnership with SESI, and Delivery de Vantagens, a club of benefits and discounts.

In addition to the supply of bicycles, the plan offers support points for bike couriers and the Pedal Responsa educational initiative. The electric bicycles make it easier for the delivery cyclists to move around and help them cover longer distances and steep paths with less physical effort, providing greater accessibility.

The support points are spaces where the bike couriers have access to bathrooms, lockers, microwave ovens for their meals, drinking water, wifi connection, and sockets for recharging mobile phones. In São Paulo (SP) there are two complete support points, one on Augusta Street and another in the Moema neighborhood. The demand for support infrastructure for cyclists was identified in the survey (graph 17) and in the interviews conducted in the case studies of this research, in agreement with results previously identified by Minarelli (2020) and Altheman (2021).

Pedal Responsa is a formative content that seeks to train the registered bike couriers through a course developed in partnership with the Aromeiazero Institute, about care and responsibilities in the day-to-day work. Through online classes, the delivery cyclists receive orientation about road safety issues, the use of electric bicycles, health care, COVID-19 prevention protocols, and communication with customers during delivery. At the end of the course, the delivery cyclist receives a certificate of completion and an accessory kit.

According to the companies, the space at the support points and the Pedal Responsa training course, in addition to occasional lectures at the support points, are ways to take care of the bike couriers' safety.

Figure 22 - Delivery-biker in Fortaleza (CE)

Source: Adriana Marmo, 2021.

4.3.2 Case studies

PROFILE AND CHARACTERIZATIN OF THE COMPANY/ COLLECTIVE

Curitiba (PR) - Sem CO2 Entregas Ecológicas

The company, classified under the Simples Nacional, has been making deliveries of exams, documents and for notary and bank services since 2013. According to the representative, who has been working in cyclelogistics for 10 years (since 2011), the founders of the company have always enjoyed cycling and this was one of the main reasons for opening a business in this field.

The representative interviewed at this company held a management position at the time. It is important to indicate that the representative in question also makes bicycle deliveries for the company and that the interview was conducted in a bicycle store, which is the support point for its employees.

The company once had eight employees, but in the period that the interview was carried out, it was operating with only three employees and a low volume of deliveries. According to the representative, the Covid-19 pandemic was responsible for about 70% loss in delivery volume.

Curitiba (PR) - Bicicletaria Cultural

Bicicletaria Cultural is a social impact company and has been operating for 10 years (since 2011). The company is a support space for cycling and cyclists, where they provide parking, showers, lockers, mechanical services, tools for those who want to make their own repairs, and community bicycles are provided for loans of up to 4 months, upon payment of the value of the technical checkup. They also offer mechanics courses to give workers more autonomy and empowerment, according to the representative, and have a cultural program.

Fortaleza (CE) - Disk Água

Disk Água FP is a retail company that sells drinks, mainly water, and has also become a grocery store since the beginning of the pandemic. It has been making deliveries by bicycle for 10 years (since 2011) and delivers any products sold in the establishment. The interviewee is the owner of the company and operates as MEI (Inidividual Micro Enterpreneur).

The motivation to make deliveries by bicycle arose when he started offering the service because it was the most viable and economical means, and although today he has a motorcycle in his fleet, the bicycle continues to be the most viable. The determining factor for choosing this type of delivery was the low cost, which, according to the owner, is still today the greatest economic advantage given the high price of fuel.

During the pandemic the volume of deliveries increased and the company, which had two bike couriers, now has four workers and included a motorcycle in its fleet. Today, besides the motorcycle, it has a fleet of four cargo bikes.

Fortaleza (CE) - Tele Entrega

The company started making deliveries by electric bicycles in August 2020 and falls under the limited liability company model (LTDA). Its main activity is to carry out quick urban delivery of products for companies, company address change, or trips - the deliveries made strictly for companies that have existing contracts. The company's fleet has several vehicles, from electric bicycles to ¾ trucks (VUC category - Urban Cargo Vehicle). The interviewee is the owner of this company.

São Paulo (SP) - Señoritas Courier

Señoritas Courier is an informal collective of women and LGBTQIA+ delivery cyclists founded between 2017 and 2018. When necessary, the formalization of the collective's service provision and delivery activities is done through invoices generated by the founder's MEI (Individual Micro Enterpreneur) or by the delivery cyclists themselves.

According to the interviewee, she is interested in formalizing the collective as a cooperative and would like to encourage and assist all the delivery cyclists to formalize their status of Individual Micro Entrepreneurs (MEIs) to ensure their social security. At the time of the interview, the collective had seven bike couriers in its crew and 15 standby workers for times of peak demand. During the peak of the pandemic, the number of delivery workers reached 25. With the improvement in the number of cases and vaccination, the number of customers seeking the service decreased - for example, customers who used to request deliveries nearby now feel safe to do this service themselves.

The interview was conducted with the founder of the collective, who is also a delivery cyclist. She indicated that she founded the collective out of a passion for cycling and a recognition of the positive social and economic impact of this activity for female workers. The initial idea was to pass on services that came to the interviewee to other women cyclists who needed supplementary income with a job that offered flexibility, and also to people from the LGBTQIA+ community who suffered prejudice and faced difficulties in finding hiring opportunities. According to the interviewee, during the founding process, she even considered turning the project into an app,

Curitiba (PR) continuation

According to the representative in regard to the delivery service, at the height of the pandemic the company was selling meals every two weeks on Saturdays at lunchtime. A group of delivery cyclists who were being served by the bike shop, in return, would help the company by delivering these meals. In November 2021, when the interview was conducted, the company was receiving a smaller number of bike couriers and therefore only had two cyclists.

Also, according to the representative, the motivation for choosing bicycles as a form of delivery is because it is an economical and equitable vehicle for which no qualification is required and, therefore, potentially ensures that a large number of people have access to opportunities.

For him, some of the disadvantages of using bicycles are related to the few insurance guarantees offered to the delivery workers, who have no one to turn to in case of claims and have no labor guarantees in these cases. Another disadvantage is that it requires a greater effort by the employer to have an adequate separation of the distances that cyclists can travel, avoiding longer distances that must be covered by motorized vehicles. The advantages are that the bicycle has lower maintenance costs and, thinking about road safety, less destructive potential than motor vehicles.

Fortaleza (CE) continuation

The efficiency of the electric bicycle was the main motivation for the company to include this mode of transportation in its fleet. In addition, the innovative character of cycling was also cited as a determining factor for the choice. According to the company representative, within a radius of up to 3 km the performance of the bicycle is similar, and in some situations it even exceeds the performance of the motorcycle.

The risk of theft was the only disadvantage of bicycle delivery indicated by the interviewee, who even claimed to have already lost a fleet vehicle, stolen directly from the house of one of the employees - they can make their commute home-work-home with the bicycle fom the company. The indicated the advantages of using electric bicycles for deliveries which include its efficiency for fast deliveries, such as those from fast food restaurants and in regions with a high density of commercial and business use, and the low cost for deliveries in the pharmaceutical industry.

At the time of the interview, the company had 60 electric bicycles of the "Tele-entrega" brand in the implementation phase, and already had 30 delivery cyclists operating the deliveries to pharmacies, fast food, and auto parts stores.

The electric bicycle arrived in the company's fleet during the Covid-19 pandemic. At that time, according to the company representative's perception, this mode of transportation gained more "space," despite some prejudice mainly in the logistics sector.

São Paulo (SP) continuation

but chose to keep it as a collective group to value the bond and create a support network for these people.

The interviewee sees the bicycle as a sustainable option that does not produce noise or contribute to urban pollution. In addition, it avoids traffic jams and is an efficient way to transport small loads. A disadvantage pointed out was the high price of cargo bicycle models specialized for cargo transportation and the difficulty to make long distance deliveries by bicycle.

São Paulo (SP) - Carbono Zero

Carbono Zero Courier is a delivery company that uses bicycles and electric vehicles. The company, founded in 2010, delivers products, food and documents. Their service is offered for municipal, intercity, and interstate deliveries. According to the interviewed representative, the company's motivations for making deliveries by bicycle is due to the company's purposes, which was created to improve the world and, therefore, since its foundation, does not use any vehicle that emits greenhouse gases.

One of the determining factors for choosing the bicycle as a form of delivery is the relationship with sustainability. The company uses sustainability as part of its essence. According to the interviewee, the company works together the terms of the sustainability tripod: financial, social, and environmental.

For the interviewee, one of the advantages of the bicycle and one of the motivations for the company to continue growing is that, because it is an "old" and widespread vehicle, it is easy for several people to know how to ride. The disadvantage, on the other hand, is the difficulty in getting qualified labor, people who want and are able to dedicate themselves to it, and that the bicycle

São Paulo (SP) continuation

is still not seen as a work tool by some people.

At the time of the interview, the company had a fleet of over 200 delivery workers, in addition to those who worked with motorcycles and electric vans. At the beginning of the pandemic, in 2020, there was a large increase in the volume of deliveries by bicycle (about 40%) and with the easing of trade restrictions there was a reduction in volume in relation to that first moment, but remained high. When the interview was conducted, the company made approximately 100,000 deliveries per month using bicycles and electric vehicles.

Figure 23 - Bicycles and equipment.
Source: Jéssica Lucena, 2021.

LOGISTICS OPERATION

Curitiba (PR) - Sem CO2 Entregas Ecológicas

The company representative indicated that he believes employees make around 5 deliveries each day. The team makes deliveries on demand, cycling to the place of origin and transporting the document, or product, to the destination, with an organic distribution from the point of origin of the first delivery. Many times, customers request a specific delivery cyclist.

The company and the delivery cyclists use the Google Maps app to set the routes, mainly to ensure that the bike couriers cover different areas of the city. The representative indicated that an orientation regarding employee safety is provided to assess the need to change the route indicated by the app. There is no charge for a shorter delivery time, and the interviewee stated that this is a measure that also increases the safety of the bike couriers, since they are not rushed to make the deliveries.

Curitiba (PR) - Bicicletaria Cultural

At the time of the interview, the company was only making a few deliveries through two bike couriers. At an earlier time, when the company was delivering meals every other week on Saturdays, the delivery cyclists, who also worked for apps, delivered for the company at the off-peak hours of the apps. They would take turns with each other and do one route each.

Fortaleza (CE) - Disk Água

According to the owner, an average of 100 gallons of water are delivered per day, which is done in an average of 70 to 80 trips, resulting in about 20 trips per delivery worker. The products are stored and collected at the company's headquarters. The trips are defined according to the proximity of the delivery locations, and the route is defined by the delivery workers themselves, without any interference from the company to indicate the route. The distribution of the deliveries among the cyclists is done in order of arrival.

Fortaleza (CE) - Tele Entrega

According to the interviewee, there are on average 18 daily deliveries per bike coureir, and the peak was 28 deliveries in a single day. Deliveries are made on demand and on a first-come, first-served basis. The products are collected directly from the client companies and they themselves enter the delivery destinations in a logistics management app, controlled by Tele Entrega. If the client company indicates a destination in a radius greater than 5 km, Tele Entrega indicates a motorcycle to make the route so that the customer's performance is not affected – since, according to the interviewee, the radius of around 3 km is the most suitable for electric bicycles.

São Paulo (SP) - Señoritas Courier

In the month of October, prior to the interview, the bike couriers made an average of three deliveries per day. The deliveries are made on demand, collecting the product directly from the customer and taking it to the end customer. The distribution is made based on the delivery location and the location of the delivery cyclists, seeking to respect a daily mileage limit and balanced deliveries among the network. In addition, the collective also refers the coverage of some urban areas to specific delivery companies.

The delivery cyclists indicate their availability of days and times of the week to the collective. Then, the deliveries are distributed, according to demand, to those who are available on that day and time. For this reason, there is a list of standby delivery workers.

São Paulo (SP) - Carbono Zero *Courier*

According to the interviewee, when the interview was carried out each delivery cyclist made an average of 60 deliveries per day. The products are sent by the customers, or transported by electric van from a carrier, and arrive at one of the 3 operation bases of the company, located in the west and east zones of São Paulo (SP) and in Santo André in the Paulista ABC. At the bases, they are organized and separated for delivery. Some services also leave directly from the client, as in the case of offices, pharmacies, notary's offices, and a few restaurants.

The delivery routes are organized according to the bike's load capacity and the cyclist's experience. The routes are separated by the company's operations sector. In general, the routes are distributed

São Paulo (SP) continuation

according to the bike courier's experience in serving that region, but in cases of difficult areas, with steeper roads, a rotation can be made among the cyclists. No indications are given about the routes, the bike couriers ride them according to their profile and pedaling performance.

Figure 24 - Bike courier in São Paulo (SP)

Source: Jéssica Lucena, 2021.

BICYCLES AND EQUIPMENT

Curitiba (PR) - Sem CO2 Entregas Ecológicas

According to the company representative, the mountain bike (MTB) model is the most suitable, more "robust" in the words of the interviewee, to carry out deliveries in the company's area of operation. One of the advantages identified, for urban deliveries, is the ease of climbing on curbs when necessary.

No standard maintenance routine was indicated for the company's staff. The representative who was interviews stated that he does maintenance on his personal bicycle every six months to avoid any maintenance problems. Regarding their employees, the company guarantees the maintenance and repair of the bicycles they use during working hours. In case of any problem with the bicycle during the delivery cyclists' working hours, the company lends them another bicycle so they can continue their activities.

The company provides padlocks for employees and helps them buy (or borrow) signaling accessories and a bicycle horn. The use of helmet, goggles, gloves, rear view mirror is only suggested. Regarding specific accessories for transporting products, the only ones provided are delivery bags, of the standard model used for deliveries, and other traditional backpack models.

Curitiba (PR) - Bicicletaria Cultural

According to the company representative, the mountain bike (MTB) model is the most suitable, more "robust" in the words of the interviewee, to carry out deliveries in the company's area of operation. One of the advantages identified, for urban deliveries, is the ease of climbing on curbs when necessary.

Fortaleza (CE) - Disk Água FP

The bicycles uses non-electric cargo bikes and, according to the interviewee, they are of a strong model which can take a lot of load and remain stable. A padlock and chain are supplied with the bicycle. Of the four bicycles, one of them has a specific cargo transport accessory for gallons of water and the other three are equipped with two crates installed one in the front and one in the back.

Preventive maintenance is performed weekly by the interviewee and the delivery workers themselves. The interviewee did not report the frequency of technical problems, but said that in general, problems related to brake adjustment and tire repair are frequent.

Fortaleza (CE) - Tele Entrega

The electric bicycle model used by the company, the Gioia model of the Pedalla[MK2] brand, was purposely chosen by the company's owner. According to him, the fact that it is a lightweight model and that it is possible to cycle even without a battery are advantages of this model. However, the interviewee indicated that it was necessary to change the original tires of all electric bicycles in the fleet.

Besides the bicycle, owned by the company, accessories such as helmet, glasses, padlock, chain, flashlight, bell, rear-view mirror, and uniform without reflective stripes are also offered. In relation to cargo transport, the company adds a "trunk" with a capacity of 80 liters, but weight is restricted to 25 kg for their employees.

Preventive maintenance is performed by an internal team of the

São Paulo (SP) - Señoritas Courier

The bicycles and equipment are owned by the delivery cyclists, and they are responsible for them. They use different models of bicycles; fixed gear, speed, mountain bike (MTB), with the support of backpacks, saddlebags or luggage racks with crates to transport the products. The maintenance is also the responsibility of each delivery cyclist, however, in some situations when it is mutual agreement, the collective helps with some repairs with the money available in its reserve fund.

The representative indicated that, in her perception, the models and accessories are in general not ideal to perform the activity, but that the collective guides the workers to carry what is more appropriate for their vehicle and equipment – for example, controlling the weight carried in the backpacks and luggage racks. She said that if there were conditions, the ideal would be to have a fleet of the collective, with the same bike model so that all the workers have the same working conditions and facilitate the maintenance of the fleet.

São Paulo (SP) - Carbono Zero Courier

The bicycles used for deliveries may belong to the company or the cyclist himself. CLT couriers use company bicycles and MEI couriers use their own bicycles, but they can also use one the company. Delivery cyclists own bicycles come in a variety of models, while the company has conventional, cargo, and conventional electric bicycles.

The cargo transport accessories vary according to the bike and to the cyclist, and can be a trunk, in the case of the cargo box, baggage

Curitiba (PR) continuation

No standard maintenance routine was indicated for the company's staff. The representative who was interviews stated that he does maintenance on his personal bicycle every six months to avoid any maintenance problems. Regarding their employees, the company guarantees the maintenance and repair of the bicycles they use during working hours. In case of any problem with the bicycle during the delivery cyclists' working hours, the company lends them another bicycle so they can continue their activities.

The company provides padlocks for employees and helps them buy (or borrow) signaling accessories and a bicycle horn. The use of helmet, goggles, gloves, rear view mirror is only suggested. Regarding specific accessories for transporting products, the only ones provided are delivery bags, of the standard model used for deliveries, and other traditional backpack models.

Fortaleza (CE) continuation

company. In case of any unforeseen event, such as a flat tire, a company car will pick up the bicycle and the delivery cyclist to have the repair done at the company's headquarters.

São Paulo (SP) continuation

rack, saddlebags, backpack, etc. The company provides the uniform and does not provide other accessories, but sells some of them at cost price to the cyclists in case they do not have them, and also holds raffles of accessories among the cyclists who make the highest number of deliveries. The use of the helmet is part of the company's regulations and is mandatory for all bike couriers, who are suspended if they do not comply.

The frequency of maintenance was not indicated, but it was said that the maintenance of the company's equipment is periodic and done at a bicycle repair store. Bike couriers who use their own bicycles can take them to these same bicycle shops and they are charged the cost price.

Figure 25 - Adaptations for cargo transportation, Fortaleza (CE)

Source: Adriana Marmo, 2021.

BENEFITS AND RELATIONSHIP WITH THE DELIVERY-CYCLISTS

Curitiba (PR) - Sem C02 Entregas Ecológicas

In relation to the way of hiring these delivery cyclists, despite having worked with labor contracts (CLT) at the time of the interview the payments were being made through daily rates, supported by the guarantee of transportation and meal vouchers. The company's bicycle shop is used as a support point for the workers. There was no mention of providing any health, dental, or life insurance for the delivery cyclists, or insurance for their bicycles or equipment.

Curitiba (PR) - Bicicletaria Cultural

Bicicletaria Cultural has a bicycle storage area with shower facilities, lockers, seating area, cell phone charging stations, a place to eat, a bicycle maintenance area, and a monitored bicycle storage area for bicycles outside of working hours. The company does not provide insurance for the delivery workers' own bicycles, but if they use the bike storage facility outside of working hours, the company will pay for the cost of a new bike in case of theft.

During the pandemic, they started serving vegetarian lunch boxes to delivery cyclists for a R$5 donation or for free to those in vulnerable situations. Because of the offer of the solidary lunches, a large number of bike couriers started to go to the space of the Bicicletaria Cultural to exchange experiences and organize themselves in WhatsApp groups. The company then began to collect these experiences and seek public policy solutions through city councilors and state deputies.

The bike couriers who help the company are not hired and the company does not offer labor benefits yet, but it intends to hire

Fortaleza (CE) - Disk Água FP

The company has four bike couriers; three are permanent employees and one is paid for the day. According to the owner, of the fixed employees only one is a CLT (has a work contract), due to the MEI nature of the business. The company provides food for employees at their workplace and does not provide transportation vouchers, because most live nearby. No health, dental, or life insurance is offered.

Fortaleza (CE) - Tele Entrega

All the delivery cyclists are hired under a work contract (CLT) and receive all the benefits guaranteed by this form of hiring - health insurance, life insurance, dental care, and meal vouchers. In addition, the company also provides safety equipment and tools, such as helmets, a uniform for greater visibility and the electric bicycle, which is owned by the company.

The company, which has a fixed headquarters, indicated that this location is not commonly used as a support point by its employees. The company only hires employees who live close to the delivery area as a way to reduce the commute home-work-home and decrease the probability of claims on these commutes. Besides, they don't ride during the night shift due to the insecurity of cycling at night. According to the interviewee, there has never been a fatal claim among the company's many cyclists.

São Paulo (SP) - Señoritas Courier

and the collective, nor are benefits offered. However, to become part of the network, it is necessary to go through training, evaluation, and testing to verify the ability of the delivery cyclist to perform the activity safely and autonomously. The network's main support point is the residence of the founder of the collective, where the bike couriers show up on a daily basis and referred to as the collective's "HQ" (for Headquarters).

The relationship between the collective and the bike couriers of the network is one of transparency. They know the value of the deliveries and they keep 70% of the value, and the remaining 30% goes to the collective for administrative and operational expenses, and also for a savings fund to cover any incident or unexpected situations with the cargo transported, or with the workers' bicycles, or to invest on improvements that are decided by the group during the collective's meetings.

São Paulo (SP) - Carbono Zero Courier

Carbono Zero hires its bike couriers under a work contract (CLT) or individual micro entrepreneur regime (MEI). The company has more than 200 delivery workers (using bicycles and electric vehicles) and of these more than 80 are registered cyclists. Some of the MEI delivery workers have other jobs and work for the company as a way to supplement their income, since in this contracting regime the deliveryworkers have flexibility of days and hours.

The CLT delivery workers have all the benefits determined by the union, and in addition to these, they

Curitiba (PR) continuation

per diem and provide benefits such as life insurance, food assistance, etc.

Figure 26 - Delivery cyclist in Fortaleza (CE)
Source: Adriana Marmo, 2021.

São Paulo (SP) continuation

also have medical assistance. MEI delivery workers also have benefits; the company has developed, together with an insurance company, an insurance policy that protects these delivery workers in case of health problems or claims. According to the interviewee, this was a pilot project of the insurance company with Carbono Zero, and it is the only cyclelogistics company to offer it. According to the interviewee, *"cycling is not just pedaling without commitment, cycling is not just leisure, it is work, so as work it has to be treated, within a labor regime."*

The company's three bases serve as support points for the workers, providing them a kitchen, a pantry, bathrooms and an area for resting.

Some of the cyclists under MEI regime make deliveries using their own bicycles. The company does not have insurance for this equipment, but offers the services of the bicycle shop partnered with Carbono Zero at cost.

ROAD SAFETY

Curitiba (PR) - Sem CO2 Entregas Ecológicas

The routes taken by delivery cyclists are, in general, defined by the app routes and most do not occur in places with cycling infrastructure. They are done on shared roads, and most of the time following the route of motor vehicle traffic. However, the representative indicated that if the route shown in the app passes near a road with bike lane, the guidance is to give preference to these roads.

The representative pointed out some good practices for road safety during the bicycle delivery route, from his perception. He mentioned that some appropriate measures to improve road safety are: cycling in the direction of motor vehicle traffic, signalizing when making turns, and prioritizing slower bike lanes and shared lanes with lower speed limit. Roads with higher speed limit were indicated as more dangerous. However, when there is a bike lane in these locations, the interviewee believes that the route becomes safer for the delivery worker despite the high speed.

Bairro Alto and neighborhoods in the metropolitan area were indicated as the most unsafe neighborhoods in terms of road safety according to the interviewee's perspective. The lack of education and respect from drivers of motorized vehicles was pointed out as one of the factors for this perception. The neighborhood of São José was indicated as a very safe place because of the high number of bike lanes.

Curitiba (PR) - Bicicletaria Cultural

For the company representative, some of the important factors to ensure road safety of the delivery cyclists during their trips are the

Fortaleza (CE) - Disk Água FP

In order to save time, the company defines the set of deliveries that will be made in one trip by proximity of the destinations to the location of the bike courier, and the route to be covered is decided by the delivery worker. Although the company does not give route directions, an important factor for the road safety of the delivery cyclists are the bike lanes, according to the person interviewed. He believes there should be more of them in the city so that cyclists could ride in a safer way.

The interviewee could not distinguish which are the least safe areas, because for him, the places that his bike coureirs ride through are afluent and safer areas. For him, what the company can do to increase the delivery workers' sense of security as cyclists is to perform maintenance on the bicycles frequently, so that they are always in good working conditions, thus avoiding claims. The company listens to the bike couriers reports, but this does not affect the decision of the routes, which is made by the cyclists themselves.

Fortaleza (CE) - Tele Entrega

The interviewee said he was quite satisfied with the availability of bicycle paths in the city of Fortaleza (CE) and said that during the pandemic he sought to analyze the location of cycling infrastructure on the perspective of cyclelogistics, identifying areas with volume of deliveries and direct purchases of products. According to him, the Aldeota region is the area of greatest demand for fast deliveries and that is why the company operates in this region. The Montese neighborhood has with fewer bike lanes, but that the company was successful

São Paulo (SP) - Señoritas Courier

In general, the orientation is for bike couriers to operate in urban areas close to where they live as a way to increase their safety, since they already know the local urban dynamics. When this is not possible, the management of the collective indicates a safer route and places to avoid.

Although the bike couriers have the autonomy to make their own routes, the use of bicycle lanes and quieter streets is recommended, and routes that go through highways are not indicated under any circumstances by the collective's operations management. Highways and high-speed roads were indicated as more dangerous.

The time limit for deliveries use slower travel times as a parameter, so as not to pressure female workers who feel safer cycling more slowly to speed up their pace. The company representative believes that an important factor that has influence on traffic claims involving bike couriers is precisely the demand for urgency and "haste" for the completion of bicycle routes.

The representative of the collective highlighted the importance of training these workers so that they understand their responsibility in traffic, for their own safety as well as that of the safety of others such as pedestrians, who often share spaces with the bicycle - *"A city with more women and children cycling is a city with safer traffic"*.

The interviewee also reinforced the vulnerability of women to different types of violence. Besides traffic and social violence, gender violence influences the choices and behavior of women and the LGBTQIA+ community in public spaces.

Curitiba (PR) continuation

maintenance condition of the bicycles, such as brakes, tires, and gear ratio, the use of cell phone support so that the cyclist does not lose attention when he needs to consult the device, and the use of safety accessories such as helmet, lights, bell, and rearview mirror. In addition, he believes that delivery cyclists should eat and drink well, have a work plan with a forecast of hours worked and a daily goal, and also know the guidelines of the apps for which they work.

Regarding changes in urban space so that cyclists can ride more safely, the company representative believes in a vision zero concept in which the blame for traffic claims is divided between: infrastructure, psychological aspects and lack of inspection. He believes that road safety can be achieved and all deaths can be fully avoided through enforcement, speed reduction, and geometric adjustments in the roads that are able to "absorb" the human errors of drivers and cyclists. He states that through narrower streets and more intelligent intersections, it is possible to predict these errors. For the representative, places where collisions have already occurred must be studied in order to help prevent others.

About what the company believes can be done to make cyclists ride more safely, the interviewee reported that they provide assistance, through guidance, to cyclists involved in traffic claims who seek out Bicicletaria Cultura.

The interviewee and his partner are part of the NGO Associação de Ciclistas do Alto Iguaçu (Cyclists Association of Nova Iguaçu), the CicloIguaçu. Bicicletaria Cultural refers the cases they receive from cyclists involved in collisions to the NGO, which has a legal team that can offer counseling. Before

Fortaleza (CE) continuation

attending this region with deliveries by bicycle of auto parts.

Training is also considered a key point for road safety, which takes into account reports from the bike couriers themselves. From the company's perspective, the fact that employees are residents of regions close to the location of their deliveries has a positive influence on their road safety, since they already know the dynamics of these urban areas.

São Paulo (SP) - Carbono Zero Courier

Regarding the definition of the routes, the interviewee stated that the presence of cycling infrastructure is not considered, because it is possible that such roads do not exist on most of the paths that the cyclists serve.

As a way to increase the safety of its workers, they usually cycle on familiar routes, and if they are newcomers to the company, they are usually directed to routes close to the bases or close to where they live. If the cyclists do not feel comfortable cycling in a certain region, the company does not force them and looks for routes suitable for that delivery worker.

For the interviewee, the important factors for cyclists' road safety during their routes are not to take risks in traffic, to respect pedestrians and other vehicles, not to get into conflicts, and to always wear a helmet. In addition, part of the delivery workers' training includes guidance on how to ride the bicycle.

From the representative's perception and the reports from his delivery workers, the treatment from drivers towards cyclists is different according to the region of the city of São Paulo (SP). The peripheral regions tend to be less safe for cyclists in terms of road safety, while the central region is safer due to drivers' greater respect for bicycles.

The company usually collects reports from the delivery workers through some members of the team who have a lot of interaction with the cyclists and also through WhatsApp groups. These reports serve to enrich and improve the training courses, the company's routine and operational issues.

Curitiba (PR) continuation

forwarding the cases to Ciclolguaçu, the company instructs the cyclist to register the occurrence on the website BATEU (Bulletin of Unified Electronic Traffic Accident), an online platform created by the government of the state of Paraná for registering traffic claims. According to the representative, the possibility of registering occurrences with bicycles is a popular achievement. The BATEU website, created 9 years ago, was suited only to drivers until about 3 years ago, when cyclists started to be able to register their occurrences.

The representative believes that the creation of a database with the information from these minor collisions, which do not always enter the statistics, would help in road safety issues.

Figure 27 - Road signs in Fortaleza (CE)

Source: Adriana Marmo, 2021.

TRAFFIC CLAIMS

Curitiba (PR) - Sem CO2 Entregas Ecológicas

The representative was unable to indicate how often his employees were involved in traffic claims. One episode mentioned was a claim in which a former employee, who was no longer working for the company at the time of the interview, fractured a bone. The episode occurred in the afternoon, in the city center, and involved a cyclist and another motor vehicle. According to the interviewee, hearing about these episodes helps to prevent future situations.

Curitiba (PR) - Bicicletaria Cultural

According to the company representative, there have never been any claims with the delivery cyclists while making deliveries for the company.

The interviewee commented on the claims that are reported to the company by other cyclists. According to him, for being more exposed and vulnerable to traffic, bike couriers are the ones who most report collisions and conflict situations without collisions. The reports indicate that claims usually happen more frequently in the central region of the city, at no particular time of the day or night, and range from minor claims with lighter damage to the bicycle to major collisions, with injured cyclists or total bicycle loss.

As a form of assistance to cyclists who seek out the company on these occasions, they provide first aid and, if necessary, they suggest that the cyclist registers the event on the BATEU webpage. DPVAT insurance is the mandatory insurance for personal injury caused by land-based motor vehicles, or by their cargo, to people being transported

Fortaleza (CE) - Disk Água FP

The interviewee said that accidents are very rare, but that there has already been one incident involving one of his bike couriers, but it was not serious. On this occasion, the cyclist had been rear-ended by a motorist. No further details were reported.

Regarding the assistance provided, the company representative did not report specific measures for cases of claims, but reported as an example, an episode in which he took the delivery cyclist involved to the hospital and covered the costs of medication.

Fortaleza (CE) - Tele Entrega

The company representative, who had been making bicycle deliveries for about a year and three months at the time of the interview, said that so far there had been no traffic claims involving his delivery cyclists and that the CIPA (Internal Commission for Accident Prevention) training course seeks to prevent these claims.

São Paulo (SP) - *Señoritas* Courier

Three episodes of traffic claims were indicated: in one of them, the delivery woman was serving another collective; in the other, the person was commuting from home to pick up a product; in the third, the delivery woman was making a delivery when a group of pedestrians stepped in front of her on a bicycle path. In neither case were the cyclists seriously injured or hospitalized. After verifying that the person is well, conscious, and in need of urgent medical attention, the collective seeks to ensure that there is someone who was not involved in the claim to support the delivery worker and take her by Uber, if necessary, to her home or another location of her choice at the time.

São Paulo (SP) - Carbono Zero Courier

It was indicated that there have been claims with bike couriers of the company's fleet, but they are usually falls, without involving pedestrians or vehicles. According to the interviewee, in general, claims involving pedestrians are rare, and claims with other vehicles do occur, but not often. These reported traffic claims are not serious and occur because of potholes in the pavement, wet roads due to rain, and in some cases, app cyclists in the opposite direction of bicycle paths or lanes.

The company's main method for preventing claims, besides the mandatory use of helmets, is offering training courses in which cyclists' safety issues are always reinforced.

Curitiba (PR) continuation

or not, which entitles the victims of traffic claims with these types of vehicles to receive compensation.

For the interviewee, some experienced cyclists are able to claim bike maintenance payments from drivers, use car insurance, give 3 quotes and get drivers to pay for a new bike, but the question of how people should proceed in cases of traffic claims is still a bit unclear. He believes that all traffic collisions and deaths have legislation that partially relieves the responsibility of the driver, and that in traffic, drivers should have a greater fear that they might injure someone.

Figure 28 - Delivery-biker in Curitiba (PR)
Source: Doug Oliveira/ Cicloiguaçu, 2021.

EDUCATION AND TRAINING

Curitiba (PR) - Sem C02 Entregas Ecológicas

The company does not have a specific training, capacity building, or traffic education program for its employees, nor does it offer training on repair and mechanical maintenance of the bicycles.

The guidelines are passed on to the delivery cyclists informally. Good practices are suggested to the workers, such as avoiding riding on the wrong side of the road, which according to the interviewee avoids a lot of claims; prioritizing bike lanes and cycle tracks; prioritizing slower traffic lanes; signalizing when making turns. Another guideline is to avoid cycling on the sidewalk, to be aware of traffic turns, and to use bicycle uniforms and signs. The "bag" for deliveries, which has the company's logo, was indicated as an accessory that helps improve safety, since it makes the bike courier more visible.

Curitiba (PR) - Bicicletaria Cultural

Bicicletaria Cultural does not have specific training programs on traffic education, road safety, or mechanics for the bike couriers. Every two weeks, the company offers a paid course on mechanics, aimed at anyone interested. The course includes road safety topics.

Fortaleza (CE) - Disk Água FP

According to the company representative, no training is done with the bike couriers.

Fortaleza (CE) - Tele Entrega

In relation to the training and education of its employees, the company conducts continuous training on information, good practices, and labor rights, and has a CIPA (Internal Commission for Accident Prevention), focused on safety training at work.

São Paulo (SP) - Señoritas Courier

The collective's orientation is for delivery women to use safety equipment, avoid violence in traffic, and protect themselves. At the time of the interview, the collective was implementing a training campaign for the delivery women. There are five traning classes from Selim Cultural, where cultural guides present issues of history, culture and diversity related to the city and the bicycle, instructions on traffic and legislation, and notions of mechanics. The routes taken during the training are selected collectively.

São Paulo (SP) - Carbono Zero Courier

The training of the cyclists is part of the company's procedure. All contracted bike couriers go through an initial training, where they are instructed about road safety issues, traffic laws, cycling guidelines, bike repairs, etc. A variety of lectures and refresher courses are also offered, when necessary. According to the representative, *"training is the mainspring for any operation"*.

IMPROVEMENTS, BEST PRACTICES AND CHALLENGES

Curitiba (PR) - Sem C02 Entregas Ecológicas

The implementation of more bike lanes, cycle tracks, and the maintenance of the existing ones in bad state were two measures indicated to improve the safety of the work routes of the delivery cyclists. The representative also indicated that he would like to be able to provide health insurance for his employees.

Regarding challenges to carry out the cycling activity, the competition with apps that provide low prices for deliveries was indicated. The representative believes that incentives and outreach through public policies could strengthen his activity. An example of improvement that could come through political support mentioned was the implementation of more bikestands in the city, to assist in deliveries. The company representative believes that there is little visibility of the companies that specialize in bicycle deliveries in society and also prejudice towards cyclists.

Curitiba (PR) - Bicicletaria Cultural

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Fortaleza (CE) - Disk Água FP

Regarding improvements that he would like to implement, the interviewee said that he would like to develop an app for the company, and that tricycles with a front-mounted transport box seem to be safer models with a greater load capacity.

For the representative, the biggest challenge is the lack of cycling infrastructure, and he believes that increasing the number of exclusive cycling lanes would be one of the fundamental solutions to promote cycling.

Fortaleza (CE) - Tele Entrega

The continuous increase of bike lanes and improvement of road signs were pointed out as one of the main points for improvement in the city of Fortaleza (CE). The interviewee highlighted that he positively evaluates the work done by the City Hall in recent years, including the creation of areas to improve the comfort of pedestrians and cyclists. Regarding public safety, the increase in police patrol was indicated as an important measure.

The company representative sees communication, clarity, honesty, and transparency as key values in the relationship between the company and delivery workers. The company advises employees not to expose themselves to risks by communicating with the company about any issue that may influence their safety at work. According to the interviewee, another factor is the data provided by the app that allow users to analyze the performance of the deliveries in different urban areas. No challenges were indicated.

São Paulo (SP) - Señoritas Courier

Increasing the number of bicycle paths was mentioned as the main factor to improve road safety for delivery cyclists, especially women. Reducing speed limit on the roads, increasing traffic education and awareness in driving schools and as part of the school curriculum were other measures suggested for improvement.

Regarding the operation of bicycle deliveries and working conditions, different practices were indicated for improvement: control of the weight of the products transported, control of mileage and distance traveled during trips, control of working hours, nutritional monitoring and avoidance of target practices based on the speed of deliveries. According to the interviewee, these practices could and should be regulated by the government to ensure the rights of female delivery workers.

One of the challenges indicated, besides the economic crisis, was the view of cycling as a cheap option, due to the low value of the vehicle compared to motorized vehicles, which influences the poor remuneration and working conditions of the delivery cyclists. According to the interviewee, cycling should be seen as an economically viable option, an economic activity that generates income and maintains a fair remuneration and working conditions for the worker performing the service – which takes into account the risk involved in the occupation.

One element indicated as a possibility to improve the efficiency of cycling is the use of distribution hubs for deliveries. The representative indicated that partnerships with larger companies that provide storage points for

Curitiba (PR) continuation

that could come through political support mentioned was the implementation of more bikestands in the city, to assist in deliveries. The company representative believes that there is little visibility of the companies that specialize in bicycle deliveries in society and also prejudice towards cyclists.

São Paulo (SP) continuation

products on the peripheral areas of the city would make it possible to carry out a greater number of deliveries. From these hubs, cargo bikes would be able to transport products from more distant regions to more central urban areas. However, the interviewee recognizes that the investments required for the maintenance of these locations, the purchase of specialized bicycles, and the training of delivery cyclists may represent a bottleneck to the viability of this model. The interviewee believes that a possible solution would be the encouragement and incentive for cycling through public policies. According to her, in some places in Europe, for example, governments facilitate the purchase and leasing of cargo bicycles.

The interviewee indicated the project "Mapeamento Ciclo-Amigável" (Cycle-Friendly Mapping) as a reference for the systematization of information about places that can serve as support points (with restrooms, microwaves, cheap meals, charging cell phones stations) for delivery cyclists in the city of São Paulo (SP) . According to her, the public authorities should also be responsible for providing public restrooms and other support spaces in the city's public spaces.

Finally, partnerships with academia and volunteers are fundamental for the growth of the collective and for improving the conditions of the delivery cyclists. They help by providing services, developing technological solutions, improving administrative management and logistics, and supporting fundraisings.

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São Paulo (SP) continuation

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Figure 29 - Adequacy of equipment for deliveries.
Source: Adriana Marmo, 2021.

São Paulo (SP) - Carbono Zero Courier

Regarding improvements in the urban space, the interviewee believes that the care with the paving of the roads where cyclists circulate and their maintenance, such as cleaning and pruning of low trees, are changes that reduce the risk of claims and can help cyclists cycle in a safer way. The representative believes that one of the things the company can do to make its delivery workers feel safer as cyclists is to participate in public policies, in partnership with other actors, trying to make themselves heard to benefit cycling and cyclists.

The company representative mentioned some good practices such as the exclusive use of vehicles with zero carbon emission and the mandatory use of uniforms and helmets. Another good practice of the company are the training sessions, in which the company's philosophy is passed on to the delivery workers. They approach concepts of social sustainability,

São Paulo (SP) continuation

which ensures that the delivery cyclists are not exploited, that they receive benefits and are treated with dignity: *"It's not about price, the business is different, and it's not that "it's urgent". It's not because it's a bicycle and I'm paying more that I have to give up zero. I'm not going to kill a cyclist to deliver something faster."*

For the interviewee, one of the main challenges to be faced to make bicycle deliveries more efficient and attractive is to make companies see initiatives like Carbono Zero as lively and fast alternatives to replace pollution with something positive, by ceasing to emit CO2 and employing a cyclist with labor rights. Another challenge, according to him, is to convince companies that they need to change their internal processes to hire companies like Carbono Zero, they need to adopt less rigid processes and better payment conditions.

Finally, the fundamental solutions for the promotion of cycling, in the perception of the representative, could come from the public authorities, through tax incentives and the need to change the way people look at the bicycle and start seeing it as a tool.

Figure 30 - Support infrastructure for delivery workers, São Paulo (PB)
Source: Douglas Farias, 2021.

4.3.3 DIMENSION SYNTHESIS

In this dimension the study sought to collect data related to the management and operation of delivery companies, collectives, and app, and their relationships with the bike couriers.

The case studies in Curitiba (PR), Fortaleza (CE), and São Paulo (SP) involve companies and collectives of different characteristics and scales – specialized delivery companies, retail companies, cycling support collectives, with 03 to 200 delivery cyclists who deliver documents, food, and various products.

Three of the six companies have been working with cycling for at least ten years and entered the business motivated by advantages such as efficiency, sustainability, low cost of this type of delivery and also by a personal interest in working with bicycles;

The risk of theft, the low security of delivery cyclists, and the high price of specialized cargo bicycle models are some of the disadvantages of cyclelogistics;

Regarding the impact of the Covid-19 pandemic, it was possible to observe in most cases an important increase in demand during the phases of greatest restriction of operation of urban activities.

However, with the return of these activities it has already been possible to notice a drop in demand, especially for smaller and less structured companies and collectives.

Despite the great variety in the scale of the services provided – where the delivery cyclists make from 03 to 60 deliveries per day – it was possible to observe some common points;

Most deliveries are made on demand, with the help of some app to map the places of origin and destination and to set the route;

The distribution of deliveries and route choice takes into account the experience and capacity of the cyclist;

Great variety of models (Mountain Bike (MTB), fixed gear, electric, cargo, speed) and of accessories used to support the transport of cargo (backpacks, bags, boxes attached to the bicycle, trunk, luggage carriers);

In general, the maintenance of the bicycle and equipment is carried out or facilitated by the company;

Two companies indicated that the use or provision of helmets and accessories is mandatory, the others only suggest the use and offer a guideline;

Formal and informal links were identified between the companies and collectives and the delivery cyclists in their network;

In four of the five companies/collectives no health, dental or life insurance is provided for the workers;

In general, the headquarters and company bases are the only support points, providing a place for bicycle maintenance and storage, food, use of restrooms, cell phone recharging, and social interaction among employees;

Company representatives agree that the preference for routes with bicycle infrastructure contributes to the road safety of the delivery cyclists;

Another relevant factor mentioned was the fact that cycling near familiar places contributes positively to the feeling of road safety of these workers;

The maintenance of the bicycle, training and qualification of the delivery cyclists are also important to avoid falls or claims;

Delivery time pressure can negatively influence road safety;

Some companies let the workers have the autonomy to run the routes according to their individual capacity;

The companies and collectives reported low claims ratios ;

Training and collection of reports on claims were indicated as forms of prevention;

Three of the six companies/collectives had a training or capacity building program for their bike courier network;

It is a common agreement that the implementation and maintenance of bicycle and bike lanes suitable for cycling activities are fundamental for road safety;

Improved road signs, more bicycle stops near buildings in cities, and more support points available in public areas for delivery cyclists are also needed;

The market availability of specialized bicycle models with greater load capacity, supported by public policies that facilitate the purchase of these models could help expand cyclelogistics;

Public campaigns to encourage and publicize cyclelogistics were mentioned as a sustainable and efficient alternative.

4.4 URBAN INFRASTRUCTURE

The analyses of the urban infrastructure dimension were developed from the triangulation of primary and secondary data collected through three collection instruments. The objective was to investigate the perspectives of these workers about the feeling of safety linked to urban road infrastructure in different scenarios.

The first instrument applied was a quali-quantitative structured survey with app delivery cyclists in the city of São Paulo (SP). The results of the survey and the research in each city are described in the following sections.

The second instrument was the application of a script of in-depth interviews with delivery cyclists in the three cities selected for the case studies: Curitiba (PR), Fortaleza (CE) and São Paulo (SP). Additionally, ethnographic follow-ups were conducted with six delivery cyclists during their workday in these cities.

Finally, the third instrument was a case study with companies and collectives in the delivery business. The following participated: in Curitiba (PR), Bicicletaria Cultural and Sem CO2 Entregas; in Fortaleza (CE), Disk Água FP and Tele-Entrega; and in São Paulo (SP) , Carbono Zero Courier and Señoritas Courier. In this dimension, the following indicators were considered for data collection:

1. Existence of cycling structure;
2. Preference for cycling infrastructure;
3. Width of lanes and comfort for cycling;
4. Lighting;
5. Speed of cars;
6. Orientation signs;
7. Quality of pavement;
8. Direction of the road;
9. Visibility at intersections;
10. Obstacles on the road;
11. Volume of vehicle flow;
12. On-street parking;
13. Perception of safety by areas of the city;
14. Previous involvement in traffic claims.

Figure 31 - Delivery cyclist in São Paulo (SP)

Source: Douglas Farias, 2021.

4.4.1 Survey São Paulo (SP)

The survey applied in the city of São Paulo (SP) to delivery cyclists who use the iFood Pedal electric bicycles sought to investigate the opinion of these workers regarding some factors related to urban infrastructure that impact their perception of road safety.

From the analysis of the results presented below, it can be stated that poorly lit and poorly signposted streets, heavy traffic and high speed, street parking spaces next to cyclists, narrow shared lanes and intersections are aspects that generate a feeling of insecurity for a large part of the bike couriers. The vast majority (70%) of these workers indicated that the provision of more bicycle lanes or bike paths is one of the main points they would like to see changed in relation to the city of São Paulo (SP), along with other aspects related to improving urban infrastructure such as lighting, signage, paving, and improved connections of the existing network of bike lanes.

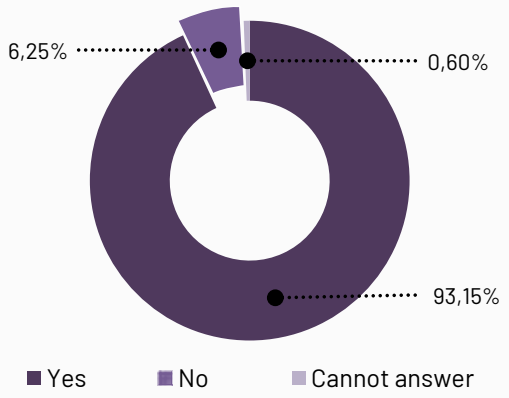
Types of lanes - Bicycle lanes, bicycle tracks and shared lanes

The results show that according to the perception of delivery cyclists, bike lanes and cycle tracks are fundamental to their road safety. We note that 93% of respondents agreed with the statement that they prefer to ride on bike lanes or bike paths when possible. For those who do not agree with this statement, a variety of reasons were given: the presence of pedestrians and many cyclists in bike lanes and paths, the existence of faster or better alternative routes, and reasons related to the quality of bike lanes – whether paving, width, or lighting.

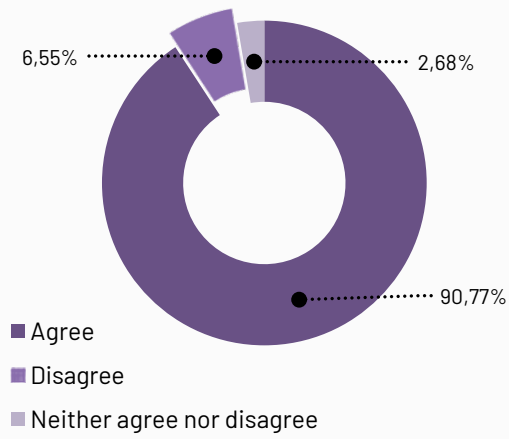
Regarding their perception of safety on shared lanes, 90% of the delivery cyclists agree that wider shared lanes make it safer for them to get around.

Street spaces and intersections are also factors that influence the safety and behavior of delivery cyclists. Among the respondents, almost three-quarters (73%) agree that roads with parking spaces for cars make it unsafe for them to cycle, and the vast majority (94%) agree that they are more careful at intersections for fear of being in traffic claims. It is important to mention that these statements did not relate these factors to a specific road type, and may refer to shared or unshared roads.

Graph 32- If possible, would you prefer to ride on a bike lane/cycle path?



Graph 33- On a street shared with other vehicles, the wider the lane, the safer I feel. (n=336)



About 70% of delivery cyclists indicated that, when reflecting on their safety when traveling with an electric bicycle during their work, the provision of more bicycle lanes or bike paths is the main point that they would like to see changed in the city of São Paulo (SP). Looking at Graph 17, it is possible to verify that this factor had a considerable relevance compared to the other factors indicated, which were shown in 35% or less answers. Still regarding bike lanes, respondents also indicated that they would like them to be wider and better connected to each other. Some respondents also suggested that they be included even on roads with lower speed limit.

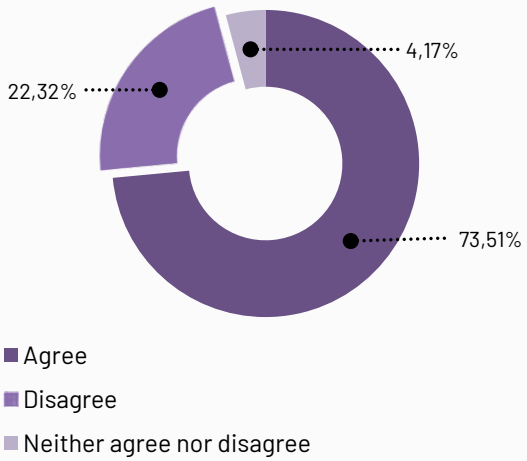
The survey also investigated how many of these delivery cyclists have been involved in falls or traffic claims. The detailed analysis of these questions can be found in item 4.1. It is worth noting that among the 64% of bike couriers who have had a claim while commuting with an electric bicycle, 63% of the traffic claims mentioned occurred on shared roads while only 12% occurred on bike lanes and bike paths - which reinforces the relevance of adequate cycling infrastructure for the safety of delivery cyclists. In addition, many respondents highlighted potholes on the roads as factors influencing the crash or traffic claim.

Lighting, visibility and horizontal and vertical signs

The delivery cyclists of apps that use the iFood Pedal also indicated that lighting and visibility in the traffic are relevant factors for their road safety. Graph 36, presented above, shows that for 34% and 26% of survey respondents, respectively, improvements in street and bike lane lighting and clear traffic signs are aspects that they would like to see improved in the city of São Paulo (SP) to make them feel safer.

Charts 36 and 37 below show that almost all respondents (97%) agree that a well-lit street and being visible to other vehicles is important for their safety.

Graph 34- Cars parked on the street cause me insecurity. (n=336)



Graph 36- A well-lit street gives me a feeling of safety. (n=336)

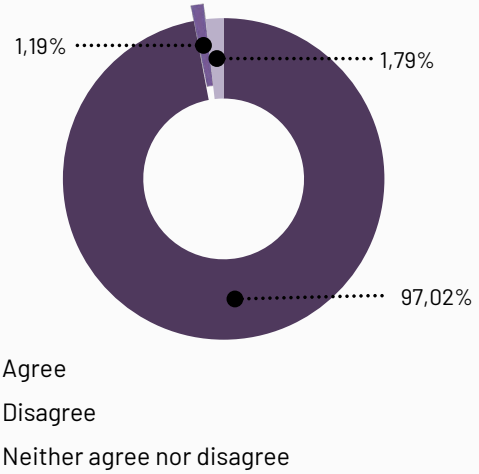
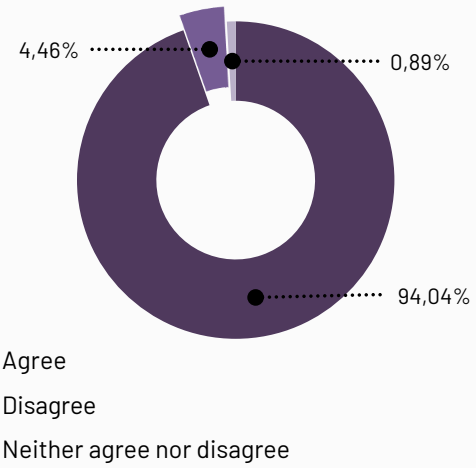
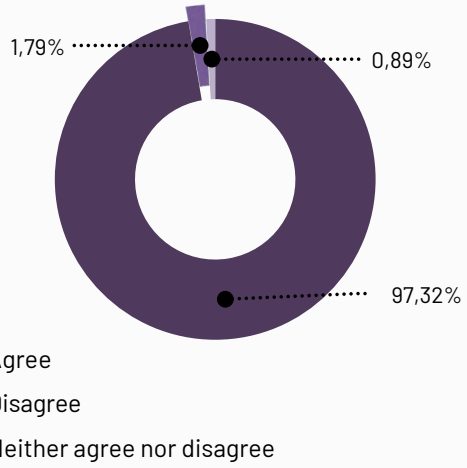


Chart 35-I am more careful at intersections for fear of being in a traffic claim. (n=336)



Graph 37- Being visible to other vehicles is an important factor for my safety as a cyclist. (n=336)

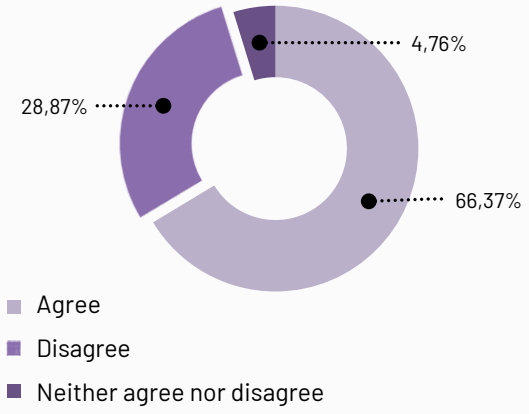


It is interesting to note that just over a quarter of the respondents (28%) do not agree that they feel unsafe riding on the wrong side of the road. One hypothesis is that these delivery cyclists believe that by riding on the counterflow, they will be more visible to drivers and will also see cars better. Therefore, they will not feel unsafe riding this way. Riding on the opposite direction was indicated by the delivery cyclists, in interviews and follow-ups, as a strategy to be "seen".

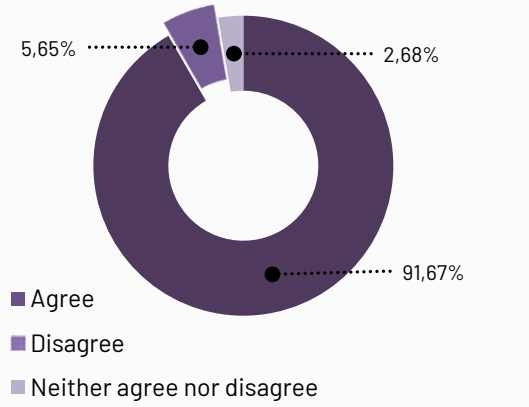
Signage, both horizontal and vertical, is also an integral part of the urban and road infrastructure of cities. For 91% of delivery cyclists, horizontal stripes painted on the road surface are important for their cycling safety.

Horizontal markings are fundamental, since they limit the space for each lane and organize traffic by signaling various situations for drivers, cyclists and pedestrians, such as bidirectional or unidirectional lanes, passable areas and narrowings in the roadway[40].

Graph 38- I feel unsafe riding on the wrong side of the road. (n=336)



Graph 39- The strips painted on the street are important for my cycling safety. (n=336)

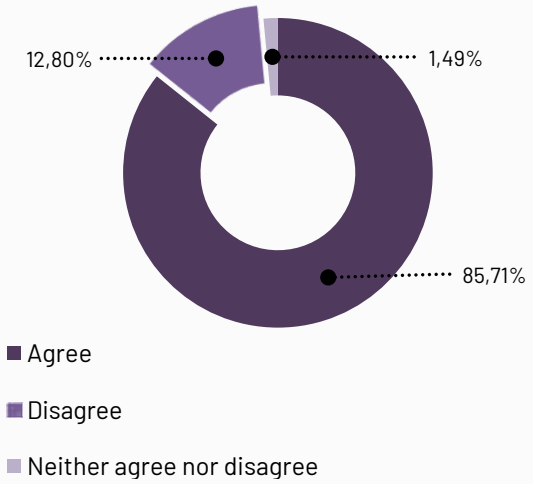


40 *SOUZA, L. E. G.; OLIVEIRA, G. F. S. Importância da sinalização horizontal viária. Revista Científica Multidisciplinar Núcleo do Conhecimento. Ano 05, Ed. 12, Vol. 04, pp. 24-41. Dezembro de 2020. ISSN: 2448-095. Link de acesso: https://www.nucleodoconhecimento.com.br/engenharia-civil/sinalizacao-horizonta*

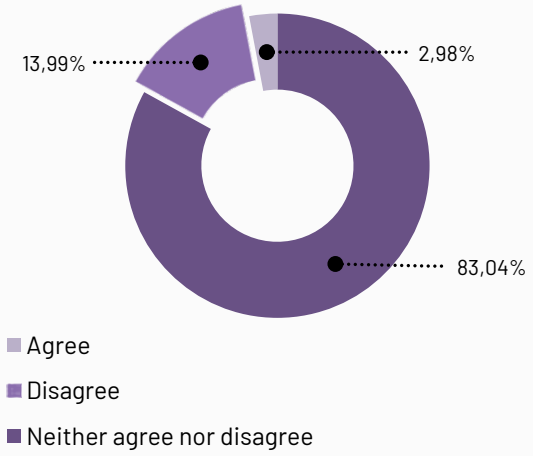
SPEED

Speed is known to be one of the main reasons for traffic claims in the world. About 85% of the respondents agree that the higher the speed of the cars next to them, the less safe they feel when cycling. In addition, 83% of them also agreed that they feel unsafe at times when there are too many vehicles driving by them.

Graph 40- The faster the car(s) move next to me the less safe I feel. (n=336)



Graph 41- Roads with many vehicles passing by me make me more insecure. (n=336)



4.4.2 Case studies

CURITIBA (PR)

In both Curitiba (PR) case studies presented in this section, in-depth interviews were conducted with 2 delivery cyclists and 1 representative from the bike courier company Sem CO2 Entregas and Bicicletaria Cultural. The findings from the interviews are organized in the sub-themes: safety perception and the urban road infrastructure, Curitiba (PR) for cyclists, traffic claim involvement, and the local context. In addition, ethnographic follow-ups, road characterizations, and counts were conducted to learn the perspective of delivery cyclists directly from their experience.

SAFETY PERCEPTION AND URBAN ROAD INFRASTRUCTURE

The delivery cyclists were questioned about their relationship with the urban road infrastructure through questions in which the interviewee should indicate on a scale of 1 to 5 how much he/she agrees with some statements, being 1 totally disagree and 5 totally agree.

All respondents totally agree that painted lanes are important for their cycling safety because *"the signaling of the road is of prime importance. A road that doesn't have a lane, for example, on the street that has just been paved and they haven't painted any lane, there's room for three lanes there. If there is no (painted) lane, you will see, there will be four cars passing together there. People often lose that spatial notion."* (Miguel).

They also agree that a well-lit street gives a feeling of safety, for example, to be able to see the condition of the sidewalk, especially at night. But the lighting factor is not enough, it is also necessary to consider the time of day and the region.

Of the 4 delivery cyclists interviewed, 3 totally agree that being visible is an important factor for their safety. In the case of disagreement, it was understood that the issue of visibility was considered negative when thought from the perspective of safety related to violence and crime rather than from traffic.

Regarding being more careful at intersections for fear of being involved in claims, 3 respondents

totally agree and the other also agrees, but with the caveat that more than just being careful, it is important to respect who has preference at the intersection. Along the same lines, 3 delivery cyclists feel totally unsafe riding on the wrong way, while 1 cyclist was did not have an oppinion on the matter.

Most respondents were also in agreement on 3 more statements. First, the idea that *"The faster cars travel by my side, the less safe I feel."* is justified by the reduced reaction time if something unexpected happens. Second, the sentence *"When I cycle down a street with potholes or bad pavement, I slow down because I need to pay more attention"* was ratified by the majority, however, for Davi the presence of cars is a much more relevant reason to double the attention. And third, *"Cars parked on the street make me feel less safe"*, since the imminence of being surprised by a car door opening generates the feeling of insecurity, just like what happens when passing by vehicle exits from buildings, as commented the interviewee Pedro. On the other hand, cyclist Davi does not agree so much with this statement because he usually rides in the middle of the lane and not in the corner, where there is a bigger chance of being hit by a door.

Figure 32 - Bike path at Avenida 7 de Setembro, in Curitiba.

Source: Doug Oliveira/CicloIguaçu, 2021.

The statement *"On streets shared with vehicles, the wider the lane, the safer I feel"* generated a discussion because it was considered relative to the feeling of safety in this context. *"Regardless of the width of the lane, it is shared, so we never know the reaction of the other human being. But of course the wider the better"* (Samuel). For Pedro, it is relative because, *"by law, you can use the whole lane. Many times you stay there on the side for everyone to go past you. So, you have to try to stay in the middle and whether they can pass or not (...) What really makes a difference is your behavior in the lane."* He also indicated that a narrower lane will not have overtaking, which can be safer, and cites as an example the República Argentina Avenue and more dangerous cases, as in the downhill of the Erasto Gaertner, in Bacacheri, where *"there are two lanes and they are narrow. That is, there, a car is driving by you in the left lane, you are in the right lane, a car can try to go in the middle (...) it is a narrow lane but dangerous because there is space for the car to try to pass where it can't"* (Pedro).

Two statements had more divided answers: the first was related to the increased insecurity associated with heavy vehicle traffic and the other linked the presence of bike lanes to a greater perception of safety for cycling. As for heavy traffic, for Samuel it represents a risk of being involved in a claim, while for Miguel it means that cars are stopped in traffic and that he will be able to ride his bike between cars. For David, people's behaviour is more important than the intensity of traffic. He believes that the cyclist's behavior conditions the driver's behavior: *"If (you) occupy your space and impose yourself, cars don't want to get close. If you stand in the middle of the lane, the guys don't get close, they don't drive past you (...) If you go in that corner, then you'll suffer."* (Davi). And about bike lanes and tracks, half of the delivery cyclists consulted totally agree that the presence of this infrastructure increases the perception of safety. However, Miguel realizes that the creation of bike lanes is used more as political currency in elections rather than to actually provide a structure for cycling as a means of

transportation, *"Although Curitiba (PR) is well planned in this sense, it has a good planning of bike lanes; as I said, they are made for leisure. They are not planned for daily use"*. Davi, on the other hand, considers that there is a lack of planning and that based on the state of the existing bike lanes, it doesn't matter whether they exist or not.

In the context of the research, it is relevant to understand the risk perception of traffic claims at urban intersections from existing urban scenarios. Based on the research developed by Diniz (2019), in the interviews conducted, five scenarios of occurrence of conflicts between motor vehicles and cyclists at urban intersections were considered (Figures 34.1, 34.2, 34.3, 34.4, and 34.5) and respondents were asked to indicate the level of safety in the scenario pointed out, on a scale from 1 to 5, where 1 meant very unsafe and 5 very safe).

There was no unanimity in any of the scenarios, mainly because, on the one hand, Davi, 35, felt safe in all the scenarios while Peter, 40, felt unsafe in 4 of the 5 scenarios presented. The scenario of intersection C in figure 34.3 was the only one where the answers were between numbers 3 and 5 on the scale, and therefore everyone feels safe to a greater or lesser extent because there is a better reaction time, there is a place to swerve, and there is good visibility. In contrast, intersection D in Figure 34.4 was considered a little more unsafe, according to Pedro, because of the reduced visibility. For half of the respondents, intersections B and E, corresponding to Figures 34.2 and 34.5, generate a feeling of safety. The answer was opposite for the other half, who therefore feel unsafe in these scenarios mainly due to a lack of visibility – they may be in the blind spot; the lack of visual contact between driver and cyclist in Figure 34. As for Figure 34.5, David argues

Figure 33 - Delivery cyclist Pedro on a street with parallel parking spaces in Curitiba (PR).

Source: Doug Oliveira / Ciclolguaçu, 2021

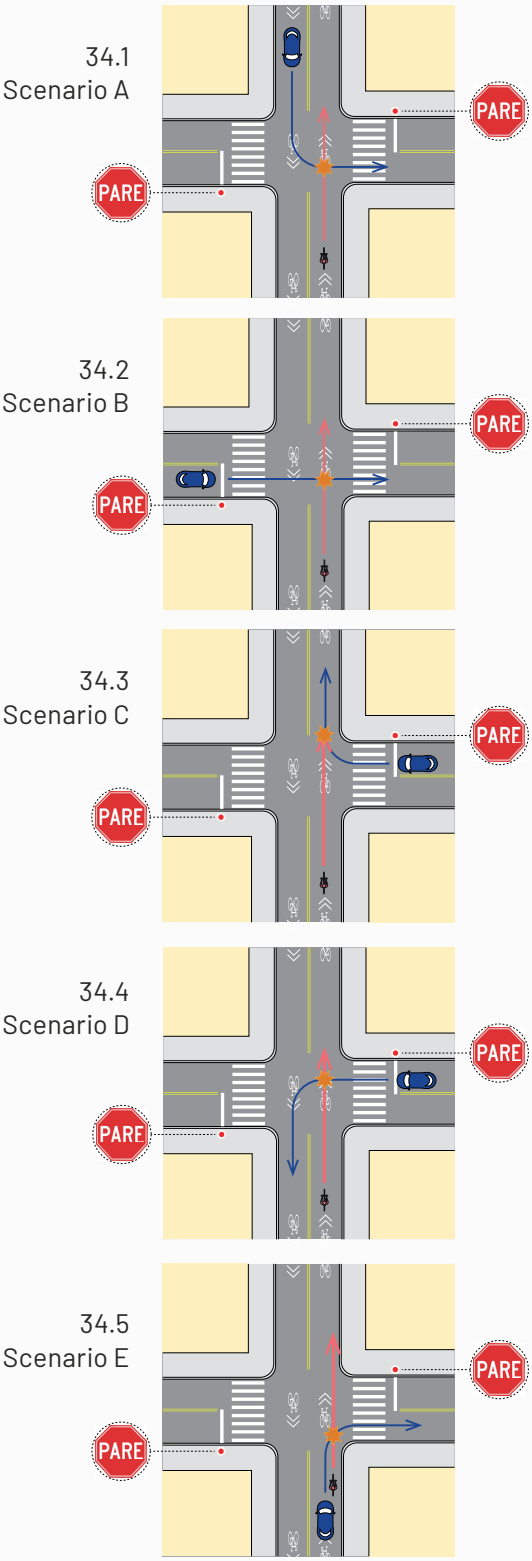
again that having a cyclist in the middle of the lane decreases the danger in these situations compared to cyclists riding on the corner of the road, and Samuel warns that this is a recurring scenario that deserves attention: *"This one is really complicated. I go through this every day, without exception. It's very common on the quiet lane, on João Gualberto, on Sete de Setembro"*.

And finally, in Scenario A in Figure 34.1, only Davi reported feeling safe while Samuel and Miguel worry about the possibility of not being seen by the driver because of lack of attention or blind spot: *"I always try to come a little bit more to the middle of the lane or even close to the yellow lane in the center of the road here. I try to have direct visual contact with the driver, to be sure that he sees me. But it is a very complicated case because there is the risk of getting in the blind spot"*(interviewee Miguel).

After getting to know the perspective of delivery cyclists on some scenarios, the respondents were asked what they believe the city can improve so that they feel safer while cycling, especially considering their commute. For 3 of the 4 interviewees, education and awareness about traffic safety and about mobility in general are fundamental and should be taught from childhood, in schools, until adulthood – for drivers, motorcyclists, cyclists and everyone who moves around the city, regardless of the means of transport. For Miguel, *"Campaigns cost much less for the government and are much more efficient,"* and for Pedro, the City Council is the one that should take responsibility for these awareness campaigns.

Other improvements also mentioned by 3 out of 4 respondents, were related to investment in urban infrastructure. For example, better planning of the cycling network, implementation and maintenance of visual communication equipment such as signs, and the creation of more bike lanes. *"If there were more bike lanes, it would result in more traffic flow, more people would adopt the bicycle. The bike lane brings this benefit"* (Davi). Despite this report, Davi mentioned that he does not intend to use the bike lane in respect to those who will actually cycle, because he uses a heavy electric bike, which makes him afraid of colliding and hurting other cyclists. This shows that people's needs for urban infrastructure are increasingly dynamic, and nowadays it is also necessary to consider that besides cyclists for work, for leisure or for transportation, there are also different categories of cyclists according to the type of bicycle they use.

Figure 34 - Conflict scenarios at intersections.



CURITIBA (PR) FOR CYCLISTS

Still bringing the discussion into the interviewees' reality, they were asked in which neighborhoods or regions of Curitiba (PR) they feel more or less safe on their daily routes and why. All of them directed their answers to the reasons why they feel safe or unsafe, and not to the places in the city. Therefore, no neighborhoods were mentioned, but the answers related to the central region raised interesting ideas about the experience of delivery cyclists.

On the one hand, Samuel, 43, feels safer when there are bike lanes and quiet roads or in extremely residential neighborhoods; while his insecurity is greater in heavy traffic areas, expressways, highways, and therefore in the Central Region.

Figure 35 - Bike courier using the bicycle path Rio Belém, in Curitiba (PR).

Source: Doug Oliveira / Ciclolguaçu, 2021

Miguel, 28, has the opposite opinion. He feels safer downtown because there is more traffic and he sees that people pay less attention to traffic in less busy areas of the city: *"When there is more traffic, for example, people won't cross an intersection without looking, they won't go straight through, they won't cross main streets. But in a neighborhood intersection this is more likely to happen. So, I mean, the issue of requiring more attention. The central region requires more attention from the driver in general. So I would say that there is a safer situation."* (Miguel).

Pedro agrees that the city center is safer. Whenever possible, he prefers to use the bike path and thinks it is unsafe to ride in the bus lane because drivers go too fast. And when there is no bike lane, he takes the sidewalk which he also finds dangerous *"because the yellow lane is very close to the curb, I think it is badly done, I don't know if there is an official traffic measure for that... it would be a safety lane actually, right?"*

Davi perceives insecurity in the neighborhoods from a socioeconomic point of view. On the one hand, in less affluent neighborhoods, he feels insecure about robberies and assault, in addition to infrastructure problems such as potholes. On the other hand, in the more luxurious neighborhoods, he feels that people act as if they always have priority in traffic *"There is something in the Brazilian culture that I think is very wrong, but it's the culture, which is to think that a bicycle is for poor people. And the guy who has money thinks he's the boss in Brazil."*

All the interviewees' arguments are valid and therefore it is difficult to classify one or another area of the city of Curitiba (PR) as safer or less safe, since similar contexts generate opposite sensations. What is possible to consider and apply in urban infrastructure improvements are mechanisms that allow cyclists of opposite opinions to feel equally safe, mainly devices that increase drivers' attention to their surroundings and provide enough space for bicycles to circulate safely.

CLAIMS

The continuation of the interview was related to the occurrence of traffic claims, conflicts, or violent situations in traffic that had happened with respondents while they were cycling, or that they witnessed happening to other people. Details were asked such as the time, place, and conditions of the claim, if there were injuries and how serious, if it was related to some other means of transportation. All respondents had already suffered some kind of claim, and almost all of them answered that they had also witnessed other people's claims.

Among the claims mentioned are crashes due to weather conditions combined with speeding and lack of maintenance of urban infrastructure; accidental collisions between bicycles due to one of them being in the contraflow; collisions between bicycle and car due to lack of attention; collisions between cyclist and motorcyclist due to the latter's negligence when running a red light; collisions in situations like the one in Figure 34.5 (scenario E) in which the cyclist was in the blind spot. and intentional collisions due to malicious intent and driver stress.

Samuel attributes this to the current lifestyle: *"I think our society is sick with this life rhythm. The economic situation we live in is making people more nervous, more insecure. We live in a cycle of despair for the need to survive"*. Samuel himself has been through two traffic claims where the drivers were malicious and knocked him off his bike. In one of the cases, which occurred on Rua 24 de Maio in the city center, he was severely injured, had to stay away from work for 45 days, broke his elbow and two fingers, and is now undergoing physical therapy. In addition, he has already broken both arms in bicycle claims in 2021.

Miguel reported that he has observed collisions on Av. Sete de Setembro and that worker himself has collided with other cyclists more than once, in a scenario where one of them is in the contraflow, one of the two is distracted and the collision happens. In no case was there a serious injury, but the fact that cyclists seem to use bike lanes in both directions even when the bike lane is only one-way indicates the so-called "path of desire" for cyclists; after all, if the most convenient path includes riding along part of a road in the contraflow, the cyclist will choose to take this path despite the risk. Therefore, the provision of road infrastructure should be thought with this premise in mind.

In Davi's case, he experienced a few falls on rainy days when he was riding at high speed (60km/h), one of the occasions was near the Tingui neighborhood in the late afternoon. He was not injured, but his bicycle was scratched.

Additionally, he was rear-ended by a car that was about to enter a gas station on Av. Sete de Setembro, a road mentioned earlier also in relation to collisions.

Finally, Pedro recounted two experiences. The first happened during the day on Brigadeiro Franco in the direction of Parolin, where a car closed in on him while he was cycling down the street. He fell and bent the wheel of his bicycle. He didn't get hurt because he was able to foresee the collision, but he warns that *"It could have been worse if I had had no brakes, or wasn't paying much attention"*. The driver of the car did not render assistance or pay for the repair of the bicycle. The other collision was also during the day, on Av. Sete de Setembro with Westphalen Street. *"I got on the bike path, I know it was wrong because I was going in the opposite direction of the bike path, right? The bike path goes down on one side and up on the other side. But I was going in the opposite direction because I was going to go very quickly there, it was just there. Then a car came and drove over the bike lane, I tried to get out and dodge it, and a lady came walking, she didn't see that I was there... She didn't pay attention to me or to the car, she stepped on the bike lane and kept walking in front of me, so I dodged this car that invaded the bike lane and was going to run me over, so I ended up hitting her"*. Pedro was injured because he hit his chest on the handlebars and the lady hurt her hand, she cursed him out and he preferred to go on and complete the job. Neither of them received medical attention. This case reinforces the need to rethink the logic of bicycle lanes and tracks, the speed limits for both cars and cyclists, the access of cars to the space within the bike lanes, and the culture of immediacy where meeting a short delivery time is more important than the life of the delivery worker.

Regardless of age or personal background, all of the delivery cyclists have had their riding styles impacted after being in these situations or witnessing one, always with the intention of avoiding going through the same or similar situations again. *"The next time I see a similar situation, I'll be a little more cautious. So I'm always accumulating experience to avoid getting into a risky situation. The issue of defensive driving, I can predict very well what is going to happen and I avoid it"* (Miguel).

For Davi, the cyclist is the bumper itself, while in the case of drivers, they can be protected by the bumper of the car. He also reminded that the bike path has a speed limit and that this limit must be respected just like every other traffic law.

In Pedro's case, besides the adversities faced by all cyclists, he also has to deal with panic episodes. He became very frustrated when he noticed the lack of action by traffic authorities and companies, added to the lack of awareness of drivers. Therefore, he found his own means to feel safer when cycling: *"Using the bike lane and the sidewalk are the ways I found to feel safer and less vulnerable, right?"* (Pedro)

One of the cyclists commented on his motivations for being more cautious when cycling: *"One rides with fear, even more so when you get older, when fatherhood comes too"* (Samuel). Therefore, experience, age, and the risk of losing what is important to them are fundamental factors for a more defensive behavior from cyclists.

TRAVEL BEHAVIOR AND ROAD CHARACTERIZATION

In addition to interviews, ethnographic follow-ups were conducted with a delivery cyclist from each company or collective to observe and identify characteristics such as the desired route and route actually taken; their behavior from the built environment, i.e., preference of place to ride on the road, detours according to obstacles, etc; conflicts with other vehicles, other cyclists and pedestrians along the road and at intersections; and perceptions of cycling comfort, road safety (visibility, width of lanes, speed of other vehicles, quality of pavement, direction of the road, on-street parking, etc), safety in neighborhoods, safety in intersections (various types).

After the end of the follow-up, each delivery person was asked to indicate 1 section of the route where he/she felt the safest and 1 section where he/she felt the least safe. The excerpts will be divided in the order of the interviewees.

BIKE COURIER PEDRO

The delivery worker Pedro, from Bicicletaria Cultural, was accompanied by a member of the research team during a route of several app deliveries, in a total route of about 11km between the central region and the neighborhoods of Rebouças and Cristo Rei, as shown in Figure 36. The route lasted about 1 hour in the morning, approximately between 11:45 am and 12:45 pm, on a sunny day.

From the field diary of the researcher who followed Pedro's route, it was possible to understand a little about the choices of the delivery cyclist in relation to the route; how he behaves with the built environment, i.e., the prefered places to ride on the road, deviations according to obstacles, etc; conflicts with other vehicles, other cyclists and pedestrians along the road and at intersections; in addition to perceptions of cycling comfort, road safety through visibility, width of lanes, speed of other vehicles, quality of pavement, direction of the road, parking on the road, etc; safety in neighborhoods; and safety at intersections.

Figure 36 - Follow-up route of delivery cyclist Pedro, in Curitiba (PR).

Source: Own elaboration.

The cyclist tried to keep the shopping mall 'Estação' as his base. He cycled on bike lane, sidewalk, roadway, and exclusive bus lane, depending on the quality of the sidewalk, the flow of cars and presence of pedestrians (and even the presence of a dog). Overall, he appeared to be a defensive cyclist, maintaining an average speed and avoiding possible collisions with pedestrians and inattentive drivers by being able to anticipate conflict situations, for example, when exiting a building or at a crosswalk. In some cases he ran the red light or cycled a short stretch in the counterflow carefully and attentively.

As for the physical quality of the path, some stretches were more cyclist-friendly than others. In some places, the trees reduced the heat of a sunny day while in other areas, besides having no trees, the pavement made the heat worse. He also cycled by some points where the presence of poles greatly limited the space on the sidewalks, which were very narrow. In addition, in another specific part, an electricity wire was hanging close to the cyclist's head. Therefore, any infrastructure serving the citizens has to take into account all the aspects that make up the city so as not to generate a benefit on the one hand and create an issue on the other.

It is also interesting to note that in two points there were sanitation workers cleaning the sidewalk and the roadway, but not the bike path, an indispensable aspect for cyclists' safety, as commented by one of the interviewees. In addition, the cyclist cycled through bike lanes that were sometimes well maintained with smooth pavement, and other sections it had holes, patches and stones. This is true for the roadbed and the sidewalk. But drivers, being protected by cars, are less impacted by sidewalk inconsistencies than cyclists and pedestrians have more time to react to an instability in the road surface than a cyclist, due to their reduced mobility speed.

The last relevant aspect of the follow-up was the flow through the train track. In this stretch, when noticing an unexpected situation, the cyclist gets off the bike and analyzes how he will make the cross and decides to keep walking with the bike in hand across this area with a lot of thick stones, tall grass and the rail.

The monitoring allowed the direct observation of aspects indicated in the interview, especially the issue of riding on the counterflow and on the sidewalk. The cyclist justifies that car and bus drivers have little respect and awareness, so this is the way he feels less unsafe.

At various times, he would stop to check notifications on his mobile phone. They would be demands for deliveries sent by the app. It was also necessary to stop to check the map and the delivery route. When the cyclist didn't stop for these checks, he reduced paced down. As he receives calls for races while cycling, he makes decisions on whether or not to accept them according to the distance to the final destination. On two occasions he refused the calls because he thought the destination was too far away, in this case equivalent to 5 kilometers. In the interview he had already indicated that he preferred trips of up to 3 kilometers.

Even though he indicated that he was afraid of armed robbery, Pedro left his bicycle untied in front of the store to pick up the orders at one point. Another time, to finish the delivery, Pedro again leaves the bicycle on the sidewalk without securing it.

After the end of the escorting, each delivery cyclist was asked to indicate 1 stretch of the accompanied route where he felt the safest and 1 stretch where he felt the least safe. The stretches indicated by Pedro were Sete de Setembro Avenue (near the Shopping Estação Mall as the safest and São José Avenue, corner with Affonso Camargo Avenue as the least safe. We identified some particular characteristics of the road conditions and urban road infrastructure in the 2 stretches mentioned, which are characterized and compared in Tables 05, 06, and 07 below.

About Table 05: In summary, the safer section has more physical permeability, lower speed limit for motorized vehicles, less greenery, and is less flat than the unsafe section. This comparison leads to inconclusive results about the influence of these characteristics on cyclists' perceived safety, and therefore it is necessary to consider the information in the next tables for a more complete analysis.

Finally, regarding the perception of risk and points of conflict, both sections present similar characteristics except for the flow of motorized vehicles that is higher in the unsafe section.

Table 05. Comparative characterization 01 between the safest and the most unsafe stretch indicated by the delivery cyclist Samuel.

BUILT ENVIRONMENT AND ROAD CHARACTERISTICS	SAFEST STRETCH SETE DE SETEMBRO AVENUE	UNSAFE STRETCH AFFONSO CAMARGO AVENUE
Physical Permeability	Medium	Low
Land use	Eixo Estrutural (EE)	Between Eixo Estrutural (EE) and Residential Zone 4 (ZR 4)
Road direction	Unidirectional	Unidirectional
Regulatory road speed (for motor vehicles)	30km/h	50km/h
Type and condition of pavement	Good condition but with signs of overuse	Flexible pavement in good condition
Presence of physical obstacles on the road	Temporary structure from a renovation being done on a shopping mall	None
Street lighting	Good, except at Eufrásio Corrêa square	Excelllent, along the entire avenue
Horizontal Signaling	Signalling to mark the space of bike lanes and at intersections.	Good signalling, clearly visible lanes for vehicles and pedestrians
Vertical signalling specific for cyclists	There are no signs informing that there is a bike lane at the location/priority of the cyclist, only signs for car use.	Good signalling, stop signs, no parking, speed signs, among others.
Road width / number of lanes	One-way road with one lane.	São José avenue has one lane and it is bidirectional. Affonso Camargo avenue has two unidrectional lanes.
Parking spaces along the streets	There is parking for motorcycles and cabs. However, it is a point of attention especially in this case because it is a narrow road, and it is common for drivers not to notice the presence of the cyclist when parking the car.	Present in both.
Road topography	Slight hills and slopes.	Mainly flat.
Shading and greenery on the roadway	There are few trees, and there is almost no shade on the road, except near the avenue squares.	Presence of medium-sized trees, but there is no shading.

Own elaboration with data from the road characterization activity, 2021.

Regarding the perception of risk and conflict, the section considered unsafe does not present any of the facilities analyzed. The safest section does not meet all aspects considered, but at least offers bike lanes connected to bicycle networks.

Bicycle counts for 30 minutes and motorized vehicle counts for 5 minutes were also conducted to verify the use, primarily by cyclists and delivery cyclists, of the routes noted as most and least safe. The counts were conducted around lunchtime and are detailed in Table 08.

On the safest stretch (Sete de Setembro avenue) despite the heavy flow of vehicles – 72 between cars (67) and motorcycles (5) – there is a double lane with an exclusive bus lane and usually no trucks. The street where cars flow through is very narrow in this area, and the bike lane is merged with the road in this sector. Because it has a narrow space for cars and a large flow of bicycles and pedestrians, cars naturally ride slowly and carefully, making it a safe place for cyclists, as mentioned by Pedro. 79 cyclists were counted, all riding on the bike path. However, the researcher members mentioned in the field diaries that cyclists also often ride on the sidewalk to attend to deliveries at the mall.

Affonso Camargo avenue and São José street were considered less safe because of a dangerous diagonal intersection where the

Figure 37: Stretch of Sete de Setembro Avenue, Curitiba (PR): indicated by Pedro as the safest stretch on his route.

Source: Doug Oliveira, 2021.

Figure 38: Stretch of Affonso Camargo Avenue, Curitiba (PR): indicated by Pedro as the least safe stretch on his route.

Source: Doug Oliveira, 2021.

Table 06. Comparative characterization 02 between the safest and the most unsafe stretch indicated by cyclist Pedro.

RISK PERCEPTION AND CONFLICT POINTS	SAFEST STRETCH SETE DE SETEMBRO AVENUE	USAFE STRETCH AFFONSO CAMARGO AVENUE
Traffic volume of motorized vehicles	high	very high
Visibility at intersections	good	good
Conflicts at intersections	The intersection of Av. Sete de Setembro with Av. Marechal Floriano is dangerous for cyclists, since it is the meeting point of two gutters where several buses travel through (not only the bi-articulated).	The intersection is the meeting of several streets and because it has several directions, it generates conflict despite the presence of traffic lights. There is also a significant circulation of buses.
Conflicts with other vehicles/ cyclists/ pedestrians	There is conflict because of the taxi/bike parking on the street and also because of the entrance to the shopping mall parking lot.	There is conflict due to the high volume of motorized vehicles. The presence of traffic lights assists only cars and buses, there is no preference for cyclists and pedestrians.
Number of entrances for motorized vehicles	There is an entrance to the shopping mall and also in residential buildings along Sete de Setembro avenue.	None.

Own elaboration with data from the road characterization activity, 2021.

Table 07. Comparative characterization 03 between the safest stretch and the most unsafe stretch indicated by cyclist-driver Pedro.

RISK PERCEPTION AND POINTS OF CONFLICT	SAFEST STRETCH SETE DE SETEMBRO AVENUE	UNSAFE STRETCH AFFONSO CAMARGO AVENUE
Cycling space preference	There is cyclist preference, especially at points where there is "narrowing" of pedestrian-friendly streets due to tube stations.	There is none, with no space provided for bicycle use.
Bicycle parking availability	None	None
Availability of support points for cyclists	None	None
Presence of bike lanes/ cycle tracks	Present all along Sete de Setembro avenue	None
Connections to bicycle networks	Connection to the bike lane at Av. Mariano Torres next to Mercado Municipal	None
Protection of bike lanes/ tracks	None	None

Own elaboration with data from the road characterization activity, 2021.

Table 08 - Counts on Sete de Setembro Avenue, indicated as the safest stretch, and Affonso Camargo Avenue, indicated by Pedro as the least safe stretch.

SAFEST STRETCH	Sete de Setembro Avenue and Eufrasio Correia Square			
Cyclists - 30min				
Counting location:	Sete de Setembro Avenue, corner of the Eufrasio Correia Square			
Time of counting:	13h07 to 13h37			
Cyclist characterization	Regular cyclist		Delivery cyclist	
Gender	Male	Female	Male	Female
Bicycle lane	40	9	27	
Cycling track				
Carriageway				
Sidewalk				
Vehicles - 5 min				
Local:	Sete de Setembro Avenue, corner of the Eufrasio Correia Square			
Time of counting:	13:39 a 13:44			
Types of vehicles	Cars	Motorcycles	Trucks	Buses
	67	5	0	0 (only on exclusive lane)

LEAST SAFE STRETCH	Affonso Camargo Avenue, corner of the São José Street			
Cyclists - 30min				
Counting location:	Av Affonso Camargo esquina Rua São José.			
Time of counting:	12:55 a 13:25			
Cyclist characterization	Regular cyclist		Delivery cyclist	
Gender	Male	Female	Male	Female
Bicycle lane				
Cycling track	12	4	1	
Carriageway	14	1	5	
Sidewalk	1	1		
Vehicles - 5 min				
Local:	Affonso Camargo Avenue, corner of the São José Street			
Time of counting:	12:48 a 12:53			
Types of vehicles:	Cars	Motorcycles	Trucks	Buses (only on exclusive lane)
Heading towards the neighborhood	45	5	5	8 (only on exclusive lane)
Heading downtown	127	16	2	8

Own elaboration with data from the road characterization activity, 2021.

cyclist must be very attentive in all directions since there is no proper moment for having priority to cross. The intersection has a high flow of vehicles, 202 in total at the count, mostly cars heading downtown. Buses are algo present, but only on their exclusive lane. Regarding cyclists, the proportion between bicycles and motorized vehicles is lower than on the safe stretch, but even so, and even though it is an unsafe stretch, a considerable number of cyclists were observed. 39 cyclists were counted, mostly regular (33) and most were also distributed between the roadbed (20) and the bike lane (17), while only 2 cycled on the sidewalks, which have no bicycle ramp.

Figure 39 - Follow-up of cyclist Pedro, Curitiba (PR).

Source: Doug Oliveira / CicloIguaçu, 2021.

DELIVERY CYCLIST SAMUEL

The delivery worker Samuel, from Sem CO2 Entregas, was accompanied during a route of several deliveries, as shown in Figure 39. During the route, Samuel used the bike lane or cycle track whenever available, reinforcing his statement about the use of cycling infrastructure. Samuel had indicated that he felt neither too unsafe nor too safe riding on the wrong side of the raod, and this scene was seen a few times throughout the follow-up.

Like Pedro, he had to anticipate situations to avoid conflicts with other modes of transportation, but also with cyclists. He went through an area with a high flow of pedestrians, mainly due to the end of day of a school on the way, where he even shouted to ask the students to make way and give him permission to cycle through. Unlike the other delivery cyclist accompanied in Curitiba (PR), he showed haste and reached high speeds in some stretches. He also went through some red lights, however the perception of the researcher escorting the cyclist regarding the degree of care and attention when performing this type of action was not mentioned.

Samuel also cycled over the curb to go from the sidewalk to the roadbed, confirming a riskier and perhaps more irresponsible way of cycling than Pedro. At some points, Samuel alternated between cycling in the counterflow and on the sidewalk, as he tried to take the shortest possible route. In front of the restaurant for which he makes deliveries, he rides on the sidewalk and goes on the counterflow, as someone who knows the area and is already used to the traffic there, where he feels safe.

He was cautious in areas with poor visibility.

At a certain corner he indicated low visibility on a street and he waited for the traffic light to open, to avoid any problems. His behavior at intersections varied. At signalized intersections, Samuel tried to optimize his time and accompany the pedestrians while the vehicles waited for the green light. In the interview regarding intersections, Samuel had said "Besides taking care of ourselves, we have to take care of what others are doing too". This caution was noticeable throughout his journey.

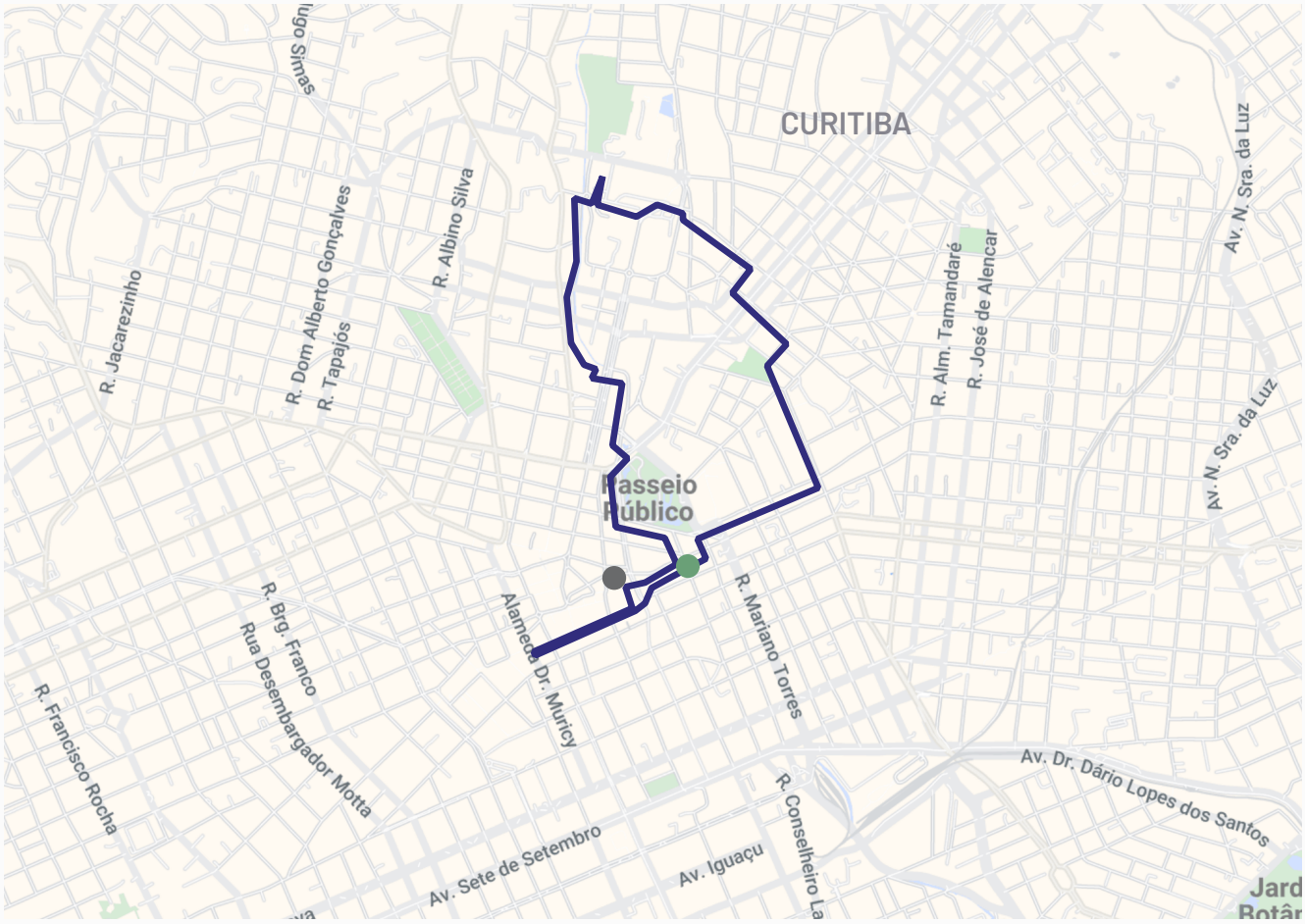
As for the urban physical aspects, he cycled through areas with better or worse sidewalk maintenance, had the opportunity to park in a bike rack, and rode through wooded areas. However, he also crossed areas with some obstacles on the way, such as fallen palm leaves, and areas with a leaking culvert with sewage odor.

Samuel took advantage of parking spaces on the empty street and rode through them, whenever empty. When cars were parked, he swerved by taking a minimum safe distance and then returned to the parking space.

Samuel has the habit of locking his bike in the bike rack while he leaves the bike to hand a delivery. Since it is not possible to enter the delivery locations with the bike, he always tries to lock the bike in a place near the entrance of the location.

After the end of the accompanied route, each delivery cyclist was asked to indicate 1 stretch of the route where he felt safest and 1 stretch where he felt least safe. For Samuel, the safest stretch was on the Civic Center bicycle path after the bridge, and the least safe was on the corner between Campos Salles Avenue and Mauá Street. Both will be characterized and compared in Tables 09, 10 and 11 below.

Figure 40 - Follow-up route of the delivery cyclist Samuel, in Curitiba (PR).



Source: own elaboration.

Table 09. Comparative characterization 01 between the safest and the most unsafe stretch indicated by cyclist-turner Samuel.

BUILT ENVIRONMENT AND ROAD CHARACTERISTICS	SAFEST STRETCH BIDIRECTIONAL BIKE LANE RIO BELÉM	UNSAFE STRETCH MAUÁ STREET
Physical Permeability	High	Medium
Land use	Centro Cívico Zone (ZCC)	Between Residential Zone 4 (ZR 4) and Eixo Estrutural (EE)
Road direction	bidirectional, both exclusive for bikes	unidirectional, exclusive for cars
Regulatory road speed (for motor vehicles)	Does not apply	40km/h, with electronic monitoring a few meters after the intersection that was being investigated.
Type and condition of pavement	40km/h, with electronic monitoring a few meters after the intersection that was being investigated.	Flexible sidewalk in good condition, with some "patches" along its length.
Presence of physical obstacles on the road	None	None
Street lighting	Good	Good, especially on Via Campos Salles
Horizontal Signaling	The bike path is entirely painted red with white stripes, signaling the direction of the road.	Despite the worn paint, it has good signage. It has lanes, signs for the direction of motor vehicle entrances, speed of the road, pedestrian crosswalk, among others. There are no signs for bicycle use on either street.
Vertical signalling specific for cyclists	There are signs indicating exclusive bicycle use on the road and motorized vehicles for residents only.	There is no cycling signage.
Road width / number of lanes	The road consists of two lanes, going opposite directions and exclusive for cycling.	Mauá street has two and Campos Salles street has three.
Parking spaces along the streets	There is no parking for motorized vehicles.	There is parking only on Mauá Street.
Road topography	Flat.	Mauá Street is mostly flat, while Campos Salles Street is a slope.
Shading and greenery on the roadway	The road is tree-lined along its entire length and on both sides, creating significant shade.	Both have few trees and lack shade.

Own elaboration with data from the road characterization activity, 2021.

The first table summarizes the main differences regarding the built environment and road characteristics related to the fact that the safer road is exclusive for bicycles, while the unsafe road serves primarily motorized vehicles. Therefore, in the unsafe section, there is no infrastructure to promote cycling safety, it does not have enough trees and lacks shade, unlike the tree-lined bike lane. In addition, physical permeability is higher in the safer section than in the unsafe section.

Related to risk perception and conflict points, on the safer section the motorized vehicle flow is very low and visibility is good, while on the unsafe section, there is high motorized vehicle flow and a wall that hinders visibility. On the one hand, in the Civic Center bike path, there is conflict in 2 intersections with streets with a high volume of motorized vehicles, both cars and pedestrians. On the other hand, in the unsafe section, the presence of traffic lights reduces the conflict with other means of transportation. Therefore, the feeling of safety is not exactly linked to the absence of conflicts, but to the possibility of dealing with these conflicts, especially by giving preference to the most vulnerable individuals in traffic.

Figure 41: Stretch of the Rio Belém bidirectional cycling lane, Curitiba (PR): indicated by Samuel as the safest section on his route.

Source: Doug Oliveira, 2021.

Figure 42: Stretch of Mauá Street, Curitiba (PR): indicated by Samuel as the least safe section on his route.

Source: Doug Oliveira, 2021.

Finally, regarding risk perception and conflict points, the main differences are that on the safe section the bicycle is the exclusive vehicle on the roadway and on the unsafe section, there is no preference for cyclists; and that the safe section is directly connected to the bicycle network while the unsafe section is only close to a connection, but does not connect. These factors highlight the importance of preference for cyclists in front of other larger vehicles and exclusive bicycle lanes to improve road safety for bike couriers.

Table 10. Comparative characterization 02 between the safest and the most unsafe stretch indicated by cyclist-turner Samuel.

RISK PERCEPTION AND POINTS OF CONFLICT	SAFER STRETCH BIDIRECTIONAL BIKE LANE RIO BELÉM	UNSAFE STRETCH MAUÁ STREET
Traffic volume of motorized vehicles	Very low, the volume of motorized vehicles refers only to residents/for access to the residences of that street.	High on both.
Visibility at intersections	Good	There is visibility reduction due to a robust wall on the corner being studied.
Conflicts at intersections	Yes, at the intersection of with a high volume of motorized vehicles, without a traffic light for crossing cyclists and pedestrians.	These are busy roads but there is a traffic light, which facilitates the crossings.
Conflicts with other vehicles/ cyclists/ pedestrians	There is a high volume of pedestrians on the road, which can cause conflict between cyclists and pedestrians.	Little conflict because there is a traffic light.
Number of entrances for motorized vehicles	Exclusive to residents.	Not many, there are few buildings at this intersection.

Own elaboration with data from the road characterization activity, 2021.

Table 11. Comparative characterization 03 between the safest stretch and the most unsafe stretch indicated by cyclist-rider Samuel.

RISK PERCEPTION AND POINTS OF CONFLICT	SAFER STRETCH BIDIRECTIONAL BIKE LANE RIO BELÉM	UNSAFE STRETCH MAUÁ STREET
Cycling space preference	Exclusive cycling lane.	There is no preference for bicycle use on any of the streets. These are streets intended for motorized vehicle use.
Bicycle parking availability	None	None
Availability of support points for cyclists	None	None
Presence of bike lanes/ cycle tracks	It is a bike path	None
Connections to bicycle networks	Connected to the bike lane on João Gualberto Avenue.	Connection to the bike lane on João Gualberto Avenue one block away from the analyzed intersection.
Protection of bike lanes/ tracks	None	None

Own elaboration with data from the road characterization activity, 2021.

Table 12 - Countings on the Rio Belém bidirectional bikeway, indicated as the safest stretch, and Mauá street, indicated by Samuel as the least safe stretch.

SAFEST STRETCH	Rio Belém bidirectional bikeway - between Cândido de Abreu Avenue and Roberto Barrozo Street			
CYCLISTS - 30 min				
Counting location:	Rio Belém bidirectional bikeway - City center direction			
Time of counting:	12:25 até 12:55			
Cyclist characterization	Regular cyclist		Delivery cyclist	
Gender	Male	Female	Male	Female
Bicycle lane				
Cycling track	11	1	10	
Carriageway				
Sidewalk				
VEHICLES - 5 min				
Local:	Ciclovia Bidirecional Rio Belém - City center direction			
Time of counting:	12:55 a 13:00			
Types of vehicles	Cars	Motorcycles	Trucks	Buses
	0	0	0	0

LEAST SAFE STRETCH	Affonso Camargo avenue on the corner with São José street			
CYCLISTS - 30min				
Counting location:	Mauá Street - between João Gualberto Avenue and Campos Salles Avenue			
Time of counting:	13:30 até 14:00			
Cyclist characterization	Regular cyclist		Delivery cyclist	
Gender	Male	Female	Male	Female
Bicycle lane				
Cycling track				
Carriageway			1	
Sidewalk			1	
VEHICLES - 5 min				
Local:	Ciclovia Bidirecional Rio Belém - City center direction			
Time of counting:	12:55 a 13:00			
Types of vehicles	Cars	Motorcycles	Trucks	Buses
	71	11	0	0

Source: Own elaboration with data from the road characterization activity, 2021.

In addition to the road characterization, on the stretches considered the safest and the least safe, counts of bicycles and motorized vehicles were conducted to check the cycling use of the roads indicated as safer and less safe. The counts were conducted around lunchtime and are detailed in Table 12.

In the safer section, towards the neighborhood of the bidirectional bike lane Belém River, there were 21 cyclists, 11 of them were regular cyclists and 10 were delivery cyclists. On the less safe section, on Mauá Street, only 2 cyclists went by, both delivery cyclists, one in the counterflow on the sidewalk and the other on the roadway. The amount of cyclists on the safer route, therefore, was significantly higher than on the less safe route. However, there were still too few cyclists for the 30 minute time lapse. And as for motorized vehicles, none were counted on the safer section and 82 were counted on the least safe section, including cars (71) and motorcycles (11).

The stretch assessed by Samuel as safe does indeed provide road safety by having a bike lane completely segregated from the flow of motor vehicles, with no interruptions or garage entrances. However, it is worth noting that the location is between a river canal and by blind facades, a characteristic that often discourages the use by women cyclists, even in broad daylight. Therefore, despite being a great cycling path, it may generate fear in some more vulnerable groups due to the risk of harassment, which may explain the low frequency of women cyclists during the counting period. Regarding the least safe stretch, the researchers noted that despite crossing a main bicycle path in the city – bordering the BRT freeway – Mauá Street is uninviting for cyclists, and they believe the few ones counted were experienced cyclists.

Figure 43 - Follow-up of cyclist Samuel, in Curitiba (PR).

Source: Doug Oliveira / CicloIguaçu, 2021.

Figure 44 - Counting on Presidente Affonso Camargo Avenue, in Curitiba (PR).

Source: Doug Oliveira / CicloIguaçu, 2021.

FORTALEZA (CE)

In the case studies in Fortaleza (CE), in-depth interviews were conducted with 2 delivery cyclists and 1 representative from Tele-Entrega and Disk Água FP. The findings of the interviews are organized in the sub-themes: safety perception and the urban road infrastructure, traffic claim involvements and the local context. In addition, ethnographic follow-ups, road characterizations, and counts were conducted to learn about the perspective of delivery cyclists directly from their experience.

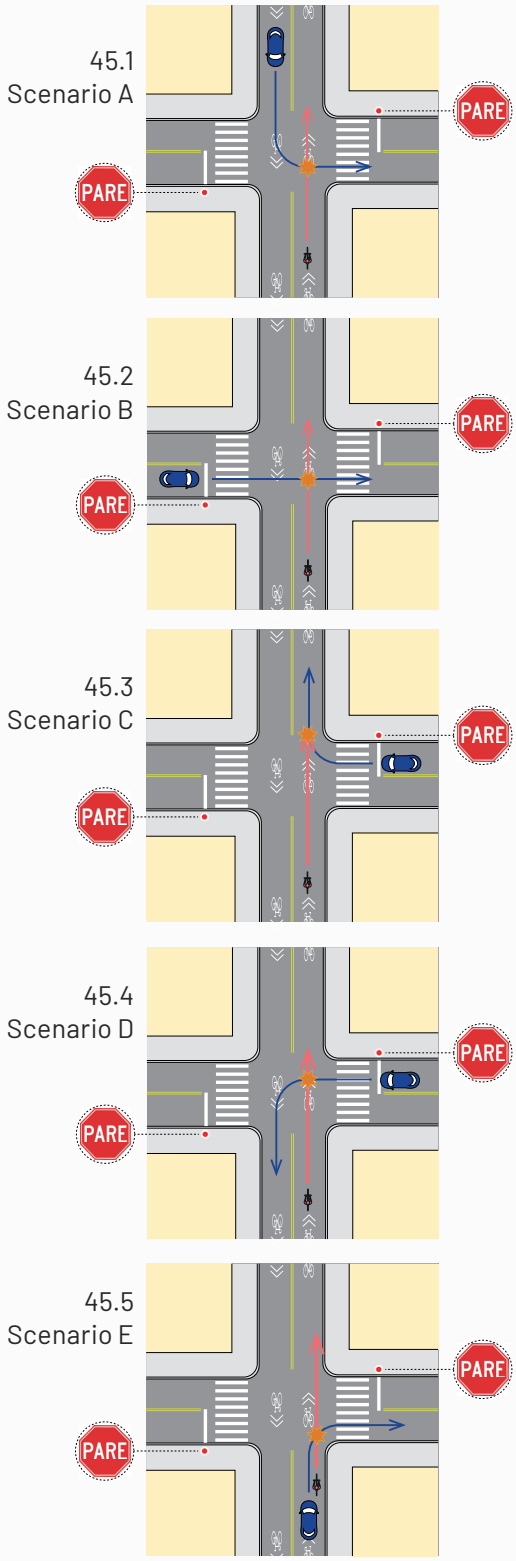
SAFETY PERCEPTION AND URBAN ROAD INFRASTRUCTURE

The delivery cyclists had to answer how much they identify with some statements, and the answers obtained were fairly homogeneous. Of the 11 statements, respondents unanimously agreed with 7 of them. Of these, 4 are directly associated with the presence of motorized vehicles on the streets: *"On the street shared with vehicles, the wider the lane, the safer I feel."*; *"The faster cars travel on my side, the less safe I feel."*; *"Cars parked on the street make me less safe."*; *"Motor vehicle traffic makes me more unsafe."* and 3 are related to urban design, road maintenance, and cycling infrastructure: *"At an intersection, I am more careful for fear of accidents."*; *"When I ride through a street with potholes or bad pavement, I slow down because I need to be more attentive."*; *"The presence of bike lane and cycle track makes me safer to ride."* In addition, most respondents feel safer riding when there is good visibility and when there are painted stripes on the pavement, while only 2 of the statements received negative responses, i.e., from cyclists who do not agree with them. One of the 4 respondents does not agree that lighting creates a feeling of safety and half of the respondents do not feel unsafe riding on the wrong side of the road.

Then, the bike couriers commented on how safe they feel in some scenarios presented on maps (Figures 45.1, 45.2, 45.3, 45.4 and 45.5), on a scale from 1 to 5, where 1 is very unsafe and 5 is very safe. Unlike the previous moment, at this stage of the interview there was not as much consensus among the interviewees. On the one hand, scenario B in figure 45.2 is the only one in which all interviewees feel very safe – for Fabio, this is because of the good visibility: *"here I can stop and look"* (delivery cyclist Fabio from TeleEntrega). Additionally, most respondents also feel safe in scenario C in figure 45.3. On the other hand, all bike couriers feel unsafe in scenario D in figure 45.4 and most feel unsafe in the situation in figure 45.5. Figure 45.1 was in the middle ground, where half of the respondents feel safe and half responded indifferently.

When asked about the neighborhoods and regions in Fortaleza (CE) where they feel safer while cycling, the cyclists from Tele-Entrega emphasized that they feel safe regarding the road infrastructure but are afraid of assaults and robberies. In turn, Gabriel from Disk Água FP mentioned the following, *"The area where I cycle is generally safe, but it has many narrow streets that drivers speed, such as Tenente Benévolo."* On the other hand, Fábio from Tele-Entrega, despite not having mentioned it before, believes that several streets need bike lanes, including Silvia Jatahy Street. The implementation of bike lanes is the urban intervention that all interviewees agree is necessary to contribute to road safety for cycling. In addition, respect for cyclists, pavement improvement, and implementing more crosswalks and traffic lights were mentioned.

Figure 45- Conflict scenarios at intersections.



INVOLVEMENT IN TRAFFIC CLAIMS

In another block of the interview, questions were answered about involvement in traffic claims and the local context. Most of the interviewees had witnessed claims involving other people, and fortunately 3 of the 4 cyclists had never been involved in a traffic claim while cycling.

The only one who had been in a traffic claim was Gil from Tele-Entrega.

Whether as a participant or an observer, cyclists have changed the way they ride after these experiences with claims, having become more cautious and alert, paying more attention, looking both ways, riding on the sidewalk, and avoiding places where they feel unsafe.

ETHNOGRAPHIC MONITORING AND ROAD CHARACTERIZATION

In addition to interviews, ethnographic follow-ups were conducted with a delivery cyclist from each company to observe and identify characteristics such as: the desired and performed route; their behavior from the built environment, i.e., place preference for cycling on the road; detours according to obstacles, etc.; conflicts with other vehicles, other cyclists and pedestrians along the road and at intersections; perceptions of ride comfort; road safety (visibility, width of lanes, speed of other vehicles, quality of road pavement, direction of the road, on-street parking, etc.); neighborhood safety; and safety in intersections(various types).

After the end of the observed route, each bike courier was asked to indicate 1 stretch of the route where they felt safest and 1 stretch where they felt least safe. The presentation of stretches will be divided in order of respondents. First, the answers of the delivery cyclist Cícero from Disk Água FP and then the delivery cyclist Gil from Tele-Entrega will be analyzed.

BIKE COURIER CÍCERO

The follow-up performed with the bike courier from Disk Água FP was conducted around 4pm during a 2.6 km route as per Figure 46, during short deliveries of up to 2 gallons of water.

Every day Cícero cycles a cargo bike with capacity for four gallons of water (20 liters), which can add up to a load of up to 80 kilos. He reported that he makes many trips throughout the day, carrying two gallons most of the time, for short distances.

At the very beginning of the follow-up it was possible to observe that the cyclist takes a preventive behavior according to the location and stretch of the street where he is. When cycling on a street with a slope, he preferred to ride on the shared lane to avoid the damaged sidewalk of the bike lane. According to him, it is difficult to control a cargo bike on a downhill slope. His concern reinforces what he pointed out about the need for frequent maintenance in the braking system of the bicycle. According to Cícero, the Historiador Guarino street is the one that makes him feel the most unsafe of all the routes he usually takes. The existing intersection requires a lot of time for him to cross and there is conflict with cars.

Another obstacle perceived was the presence of vehicles parked on the bike lane around a school. As he already knew this place and was aware of the drivers' practice, Cícero rode outside the bike lane, sharing the lane with other vehicles.

According to Cícero's report and observation, it was noticed that the most complex moment and the one that required more caution was at the intersection. Cícero always prefers to wait until the two-way street is clear. The cyclist reported a similar situation to scenario E (Figure 45.5) pointed out in the interview and indicated *"here I have to wait for the street to be clear"* to complete the crossing safely.

Figure 46 - Route of the follow-up of the delivery cyclist Cícero, in Fortaleza (CE).

Source: Own elaboration.

Figure 47 -Follow-up of the cyclist Cícero, in Fortaleza (CE).

Source: Adriana Marmo, 2021.

Figure 48 - Follow-up of the cyclist Cícero, in Fortaleza (CE).

Source: Adriana Marmo, 2021.

On another street with intense flow (Monsenhor Tabosa Avenue) which he often takes, Cícero cycled on the sidewalk and reported doing so because *"the road here is very narrow and the cars come right up at you"*. In the questions about safety perception, Cícero had indicated that he felt unsafe riding in the counterflow, and during the follow-up he justifies his statement by showing that the space his bicycle occupies is too big to compete with other cars in the opposite direction. In a situation like this, he doesn't feel safe.

When stopping to make the deliveries, Cícero did not lock his bicycle because he said that it is not common for this type of bicycle to be stolen (Figure 47). This argument is aligned with his statement of not having any fears related to the occupation.

Table 13 - Road characteristics on the safest and unsafe sections indicated by Cícero.

ASPECT	SAFEST STRETCH NOGUEIRA ACIOLI STREET	UNSAFE STRETCH HISTORIADOR GUARINO STREET
Physical Permeability*	160 buildings on the block, 46 entrances for cars	11 buildings on the block, 5 entrances for cars
Land use*	160 divided into 8 varieties 114 Residential (houses or townhouses) 4 Businesses (offices, commercial rooms, companies, etc) 10 Retail 8 Services (bank, beauty salon, gym,...) 10 Bar, restaurant, bakery, snack bar 6 supermarket, grocery store 2 Parking lots 4 Empty	11 divided into 5 varieties 1 Residential (houses or gated) 1 Hotel 1 Educational 5 Empty 3 Parking lots
Road direction	one way	one way
Regulatory road speed (for motor vehicles)	None	None
Type and condition of pavement	Asphalt with little signs of use	Asphalt with little signs of use
Presence of physical obstacles on the road	No	No. Some days there is a popcorn cart over the bike path on the way out of school
Street lighting*	16 poles on the sidewalk	10 poles on the sidewalk
Horizontal Signaling	Yes (two pedestrian lanes)	1 pedestrian lane in front of the school
Vertical signaling specific for cyclists	Yes, 1	Yes, 4
Road width / number of lanes	14m of carriageway 3 lanes (1 traffic lane, 1 parking lane, 1 cycling lane)	18m of carriageway 4 (2 traffic lane, 1 parking lane, 1 bidirectional bicycle lane)
Shading and greenery on the roadway*	8	8

**In some aspects, the value was adjusted to obtain data referring to road sections of the same length. Since the safe stretch is 200m long and the unsafe stretch is 400m long, the data for the first stretch was multiplied by 2.*
Study's own elaboration with data from the road characterization activity, 2021.

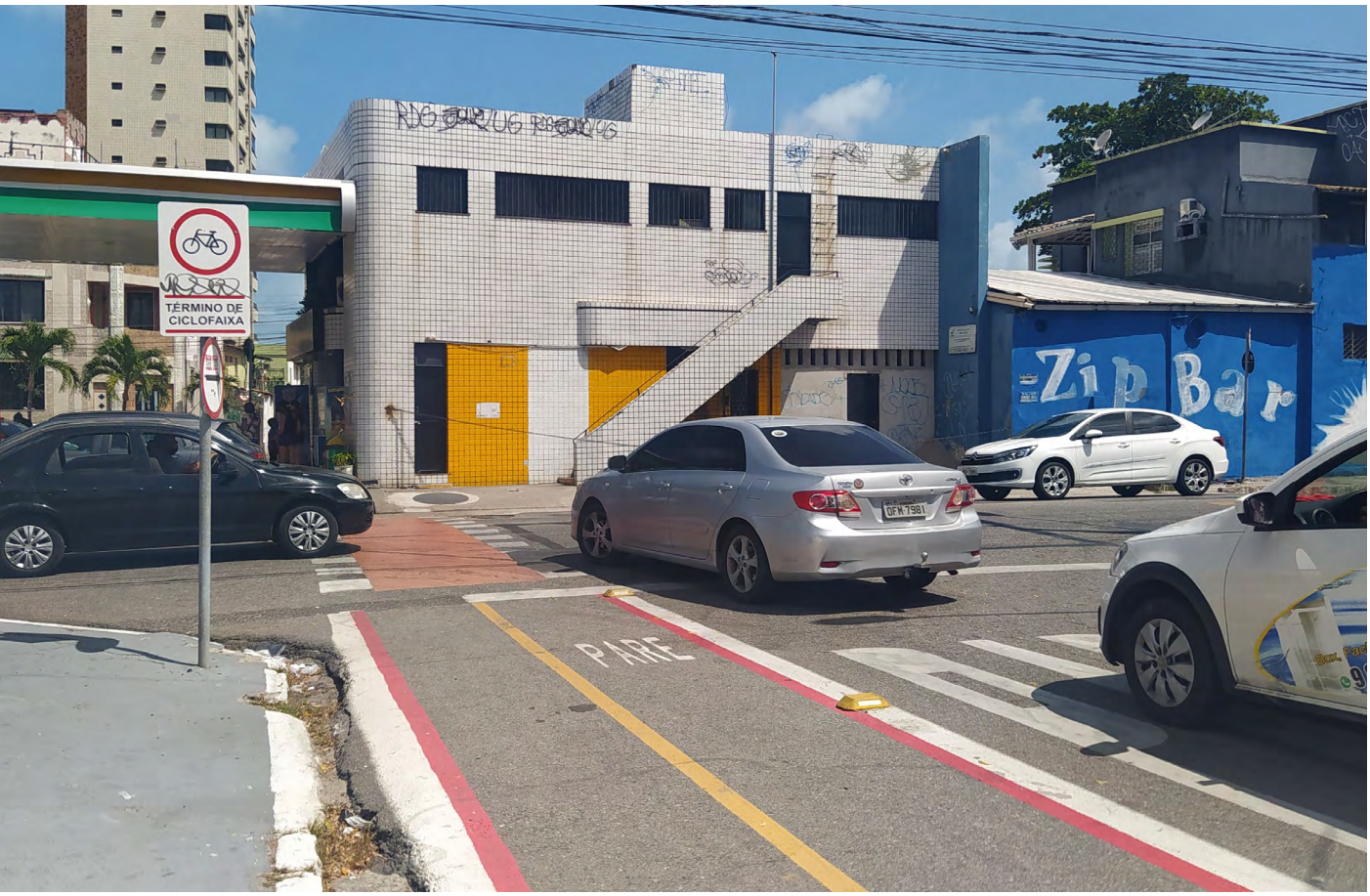
After the end of the route, the delivery cyclist was asked to indicate 1 stretch of the route escorted where he felt the safest and 1 stretch where he felt the least safe. The stretches indicated were: Nogueira Acioli Street as the safest, and Historiador Guarino Street as the least safe. We identified some particular characteristics of the road conditions and urban road infrastructure of the two stretches mentioned. As the stretches have different lengths, some data were standardized in order to compare the two cases in an equivalent way, as shown in Table 13 below.

It can be concluded from the table that the safer section has more concentration and diversity of types of land use, more physical permeability and more street lighting, and even though it is the safer section, it has more intense vehicle traffic and less bicycle-specific vertical signage than the unsafe section. Both streets have bicycle lanes with no physical protection from the roadway and no support points for cyclists or bicycle racks, but they are connected to bicycle infrastructure. At intersections on the safe section, when there is no visibility, the presence of the traffic light compensates the feeling of insecurity, and a point of conflict was observed in a slight curve where cars invade the bike lane. And in the unsafe section, although the T intersections have good visibility, there is conflict due to lack of traffic lights for cyclists (there are traffic lights only for vehicles) and also in front of a school.

Figure 49: A stretch of Nogueira Acioli street, Fortaleza (CE): indicated by Cícero as the safest stretch on his route.

Source: Adriana Marmo, 2021

Figure 50: Stretch of Historiador Guarino Street, Fortaleza (CE): indicated by Cícero as the least safe stretch on his route.



Source: Adriana Marmo, 2021

Table 14 - Counts on Nogueira Acioli Street, indicated as the safest stretch, and Historiador Guarino Street, indicated by Cícero as the least safe stretch.

SAFEST STRETCH	Nogueira Acioli Street - between Tenente Benévolo street and Monsenhor Tabosa Avenue			
CYCLISTS - 30 min				
Counting location:	Nogueira Acioli Street - between Tenente Benévolo street and Monsenhor Tabosa Avenue			
Time of counting:	18h10 to 18h40			
Cyclist characterization	Regular cyclist		Delivery cyclist	
Gender	Male	Female	Male	Female
Bicycle lane	12	5	21	
Cycling track				
Carriageway				
Sidewalk				
VEHICLES - 5 min				
Local:	Nogueira Acioli Street - between Tenente Benévolo street and Monsenhor Tabosa Avenue			
Time of counting:	18h00 to 18h05			
Types of vehicles	Cars	Motorcycles	Trucks	Buses
	35	13	3	2

LEAST SAFE STRETCH	Historiador Guarino Alves Street - between Monsenhor Tabosa Avenue and Historiador Raimundo Girão street			
CYCLISTS - 30 min				
Counting location:	Historiador Guarino Alves Street - between Monsenhor Tabosa Avenue and Historiador Raimundo Girão street			
Time of counting:	17h10 to 17h40			
Cyclist characterization	Regular cyclist		Delivery cyclist	
Gender	Male	Female	Male	Female
Bicycle lane				
Cycling track				
Carriageway			1	
Sidewalk			1	
VEHICLES - 5 min				
Local:	Historiador Guarino Alves Street - between Monsenhor Tabosa Avenue and Historiador Raimundo Girão street			
Time of counting:	17:00 a 17:05			
Types of vehicles	Cars	Motorcycles	Trucks	Buses
	89	10	1	0

Own elaboration with data from the road characterization activity, 2021.

Next, counts of bicycles and motor vehicles were performed on the mentioned sections to check cyclist use of sections on the roads identified as safer and least safe: respectively, Nogueira Acioli Street and Historiador Guarino Street (Figures 49 and 50). The counts were taken on a Monday, between 5 PM and 6:40 PM, which coincides with the time that students are leaving the school; it's also the peak time identified by the delivery cyclists, and counts were taken under good weather. On the safer stretch, most of the 41 cyclists were men (36) and delivery workers (24). In addition, 53 motor vehicles drove by, mostly cars (35) and motorcycles (13). The ratio between bicycles and motor vehicles was balanced, especially when compared to the counts in Curitiba (PR) and São Paulo (SP). On the unsafe stretch, of the 31 cyclists, most were also male (25) but were not delivery workers (17) and the proportion of motor vehicles was higher, with a total of 100 units, mostly cars (89) and no buses.

On Historiador Guarino, the most unsafe place, you can see that most of the cars were leaving from the school. The delivery cyclists going towards the city center and would have to face the climb in its entirety, were not carrying cargo. This leads us to believe that most of them come down heavy and go up light. We noticed a few women cycling and all who rode were on their way to the beach, based on the way they were dressed. Among the bike couriers, eight of them were carrying water. On Nogueira Acioli street, the safer stretch, a large flow of bike couriers were noticed, mainly delivering water and some grocery items. Two of the women who passed by had children on their backs.

BIKE COURIER GIL

The follow-up with the Tele-Entrega delivery cyclist was performed around 6 pm during a 2km route, as shown in Figure 51.

As observed in the follow-up, since he is an experienced motorcyclist Gil is also a very skilled cyclist. The deliveries were made in places close to the pharmacy, which is his workstation and the main place to pick up products. The cyclists at this station usually make deliveries within a radius of up to 3 kilometers. So their work ends up being several short trips that arise throughout the day. There is also a small volume of scheduled deliveries.

For most of the route, Gil rode on the counterflow. According to him, this way he feels safe *"because I have total control of the situation. I see who's coming and I can save myself. I don't trust drivers, they don't see the cyclists"*. This behavior is followed by riding on the sidewalk right after leaving the pickup point. Also during a short ride of about 2 km, Gil executed a risky maneuver cycling between a bus and the curb, still in the counterflow. In another part of the path, even where there were bicycle lanes, he kept riding on the counterflow. This behavior seems to be related to the lack of fear of being involved in traffic claims and the search for the fastest way, always. Even if this pace includes risks for riding in the opposite direction.

Figure 51 - Follow-up route of the delivery cyclist Gil, in Fortaleza (CE).

Source: Own elaboration.

According to Gil, residential buildings in general don't allow delivery workers to enter with their bicycles to finish the deliveries, so they always need to lock the bicycle and park it near the destination, trying to optimize the delivery dynamics as much as possible. About half of the follow-up time was spent parking the bicycle and waiting to finish the delivery with the receiver (Figure 54). Knowing the time needed to finish the delivery, Gil tries to reduce the time spent on the commute even if this decision includes risks, as stated above.

After the end of the follow-up, each delivery cyclist was asked to indicate 1 stretch of the monitored route where they felt the safest and 1 stretch where he felt the least safe. The indicated stretches were: Desembargador Moreira Avenue and Canuto de Aguiar street, which were characterized based on the conditions of the road and urban road infrastructure, according to Table 15 below.

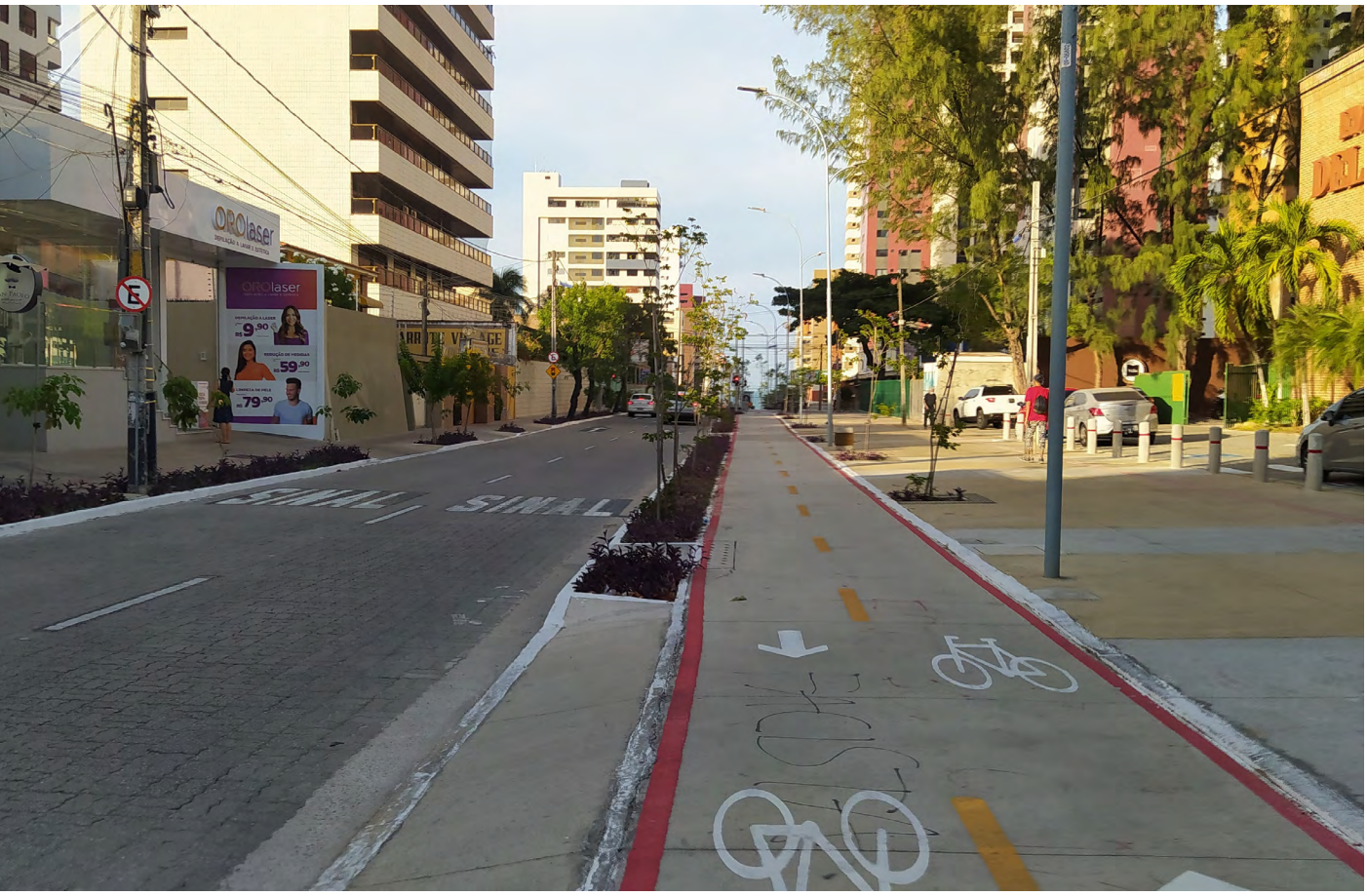
Unlike the comparisons between other stretches of Fortaleza (CE) and other cities, the table shows more similarities than differences between the safe and unsafe stretches. And even the existing differences are not drastic. The safer section has slightly more diversity of land use, more physical permeability, more street lighting and better sidewalk maintenance than the unsafe section, besides being better served by bicycle-specific signage, both vertical and horizontal. Both sections have cross-intersections with good visibility, so without conflicts with other modes of transportation. They also have bike lanes connected to cycling infrastructure. The safer section stands out for having two bicycle racks and there are raised kerbs between the bike lane and the car lanes to protect the cyclist.

Table 15 - Road characteristics on the safest and unsafe sections, as indicated by Gil.

ASPECT	SAFEST STRETCH DESEMBARGADOR MOREIRA AVENUE	LEAST SAFE STRETCH CANUTO AGUIAR STREET
Land use	8 divided into 6 varieties 2 Residential (houses or entrance halls) 1 Business (offices, commercial rooms, companies, etc) 2 Services (bank, beauty salon, gym,...) 1 Bar, restaurant, bakery, snack bar 1 Supermarket, grocery store 1 Parking lots	8 divided into 6 varieties 2 Residential (houses or entrance halls) 1 Business (offices, commercial rooms, companies, etc) 2 Services (bank, beauty salon, gym,...) 1 Bar, restaurant, bakery, snack bar 1 Supermarket, grocery store 1 Parking lots
Physical Permeability	8 buildings on the block, 3 car entrances	6 buildings on the block, 2 car entrances
Direction of the road	one way	one way
Regulatory speed of the road (for motor vehicles)	40 km/h	None
Type and condition of pavement	Interlock flooring with no signs of overuse	Asphalt with little signs of overuse
Presence of physical obstacles on the road	No	No
Street lighting	4	2
Horizontal Signaling	Yes	No
Vertical signaling specific for cyclists	3	1
Road width / number of lanes	2	1
Shading and greenery on the roadway	12	13

Own elaboration with data from the road characterization activity, 2021.

Figure 52: Stretch of Desembargador Moreira Avenue, Fortaleza (CE): indicated by Gil as the safest stretch on his route.



Source: Adriana Marmo, 2021.

Figure 53: Stretch of Canuto Aguiar Street, Fortaleza (CE): indicated by Gil as the least safe stretch on his route.

Source: Adriana Marmo, 2021.

Table 16 - Counts on Desembargador Moreira Avenue, indicated as the safest stretch, and Canuto de Aguiar street, indicated by Gil as the least safe stretch.

SAFEST STRETCH	Desembargador Moreira Avenue - between Canuto de Aguiar Street and República do Líbano Street			
CYCLISTS - 30 min				
Counting location:	Desembargador Moreira Avenue - between Canuto de Aguiar Street and República do Líbano Street			
Time of counting:	17h10 to 17h40			
Cyclist characterization	Regular cyclist		Delivery cyclist	
Gender	Male	Female	Male	Female
Bicycle lane				
Cycling track	34	5	8	
Carriageway			2	
Sidewalk				
VEHICLES - 5 min				
Local:	Desembargador Moreira Avenue - between Canuto de Aguiar Street and República do Líbano Street			
Time of counting:	17h50 to 17h55			
Types of vehicles	Cars	Motorcycles	Trucks	Buses
	84	18	0	0

LEAST SAFE STRETCH	Canuto de Aguiar Street - between Osvaldo Cruz Street and Visconde de Mauá Street			
CYCLISTS - 30 min				
Counting location:	Canuto de Aguiar Street - between Osvaldo Cruz Street and Visconde de Mauá Street			
Time of counting:	18h25 to 18h55			
Cyclist characterization	Regular cyclist		Delivery cyclist	
Gender	Male	Female	Male	Female
Bicycle lane				
Cycling track	23	2	3	
Carriageway			1	
Sidewalk			1	
VEHICLES - 5 min				
Local:	Canuto de Aguiar Street - between Osvaldo Cruz Street and Visconde de Mauá Street			
Time of counting:	18:15 a 18:45			
Types of vehicles	Cars	Motorcycles	Trucks	Buses
	44	13	2	0

Own elaboration with data from the road characterization activity, 2021.

Next, counts of bicycles and motorized vehicles were performed on the mentioned stretches to check the use, by cyclists and delivery cyclists, on the streets indicated as the most and least safe: respectively, Desembargador Moreira street and Canuto de Aguiar street (Figures 52 and 53). The counting was done on a Friday between 5:10 pm and 7 pm, which coincides with the peak time mentioned by the bike couriers, and in good weather. On the safest stretch, 49 cyclists were counted, from which only 5 were women and only 10 were delivery workers. And for motor vehicles only cars (84) and motorcycles (18) were counted. On the least safe stretch there were fewer bicycles (28) but again, the majority were not delivery workers (25) and there were also fewer motorized vehicles (59), 2 trucks included.

On Desembargador Moreira Avenue, the bike path is one of the ways to get to the beach. A curious fact is that in the direction of Beira Mar, we noticed a large number of men practicing sports, with expensive bikes, while in the opposite direction, most were workers going home, with popular bikes and carrying backpacks. Another curious observation was that one of the delivery cyclists who entered the count was Gil, the same worker we accompanied.

As for the cars, the intensity of traffic comes in waves that coincide with the opening of the traffic light, resulting in several moments of a practically empty roadway. Of the 18 motorcycles counted, 12 were delivery workers. It is curious to note that the safe stretch is a region full of conflicts with cars maneuvering and invading the sidewalk, but the interviewee explains that *"I feel safe here because it is lit, it is separated from the street, and the bike lane is wide"*. No particular features of the unsafe stretch were identified that could contribute to its understanding as such. Perhaps the cyclist indicated the section motivated to answer the question raised during the follow-up more than because he felt unsafe. Or, there was just a lack of data and reports to identify the feeling of insecurity on this stretch.

Figure 54 - Bike courier Gil, in Fortaleza (CE).

Source: Adriana Marmo, 2021.

Figure 55 - Counting on Canuto de Aguiar Street, in Fortaleza (CE).

Source: Adriana Marmo, 2021.

SÃO PAULO (SP)

In the case studies in São Paulo (SP), in-depth interviews were conducted with 2 delivery cyclists and 1 representative of the company Carbono Zero Courier and the collective of female delivery workers and LGBTQIA people + Señoritas Courier. As in the analyses of Curitiba (PR) and Fortaleza (CE), the results of the interviews conducted in São Paulo (SP) are organized by sub-themes: relationship of delivery cyclists with the infrastructure, São Paulo (SP) for cyclists, involvements in claims and the local context. Additionally, the characterization of the ethnographic follow-up contributes to deepening the study.

SAFETY PERCEPTION AND URBAN ROAD INFRASTRUCTURE

The relationship of delivery cyclists with the urban road infrastructure was analyzed based on questions in which the interviewee should indicate how much he/she agrees with some statements, on a scale of 1 to 5, where 1 means strongly disagree and 5 means strongly agree. All respondents totally agree that on streets shared with other vehicles, the wider the lane, the greater the feeling of safety; and that they are more careful when crossing intersections, for fear of being involved in a traffic claim.

Figure 56 - Bicycle path on Vergueiro Street, in São Paulo (SP).

Source: Douglas Farias, 2021.

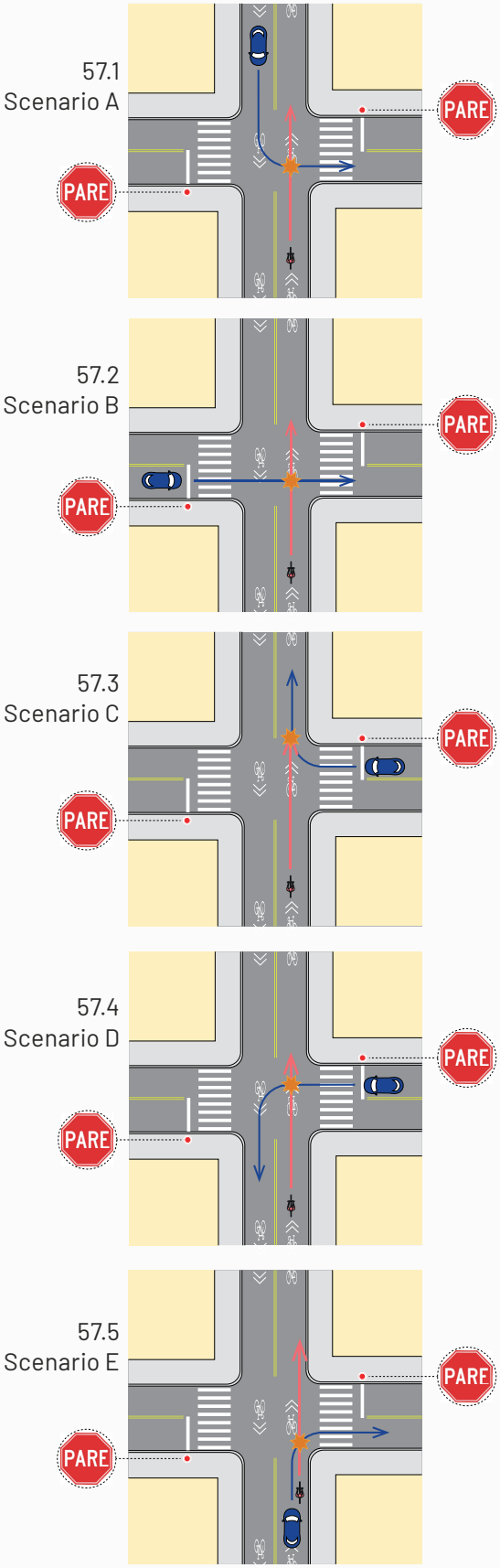
Respondents partially or completely agree that being visible is an important factor for their safety; that they slow down when riding on a street with potholes or bad paving because they need to pay more attention; that their feeling of safety decreases the faster the car(s) are driving next to them; that they feel unsafe when riding on the wrong side of the road; and that a well-lit street gives them a feeling of safety. For Júlia, just the fact that a street is lit does not bring a feeling of safety, but it is better than riding on a dark street.

For 3 of the 4 delivery cyclists, the painted stripes on the streets are totally important for cycling safety, while 1 was indifferent. Half of the delivery workers totally agree that the presence of bike lanes would make it safer to ride, while the others commented that they even consider bike lanes dangerous and do not feel so safe when using them, for example, in Rebouças Avenue, where one interviewee has already suffered a fall for colliding with a pedestrian who was crossing in an inappropriate place.

Nor were there unanimous opinions among respondents regarding the statements about parked cars on the street causing insecurity (50% totally agree and 50% were indifferent) and that heavy motor vehicle traffic increases the feeling of insecurity (2 totally agree, 1 is indifferent and 1 does not agree). In the case of parked cars, the agreement is justified by the fact that many cars stop on top of the bike lane, and algo because of the risk of someone opening the car door on the cyclist.

To better visualize the perspective of the delivery cyclists, they were asked to indicate their level of perceived safety in different scenarios presented on the maps below (Figures 57.1, 57.2, 57.3, 57.4 and 57.5), on a scale of 1 to 5, 1 being very unsafe and 5 being very safe. None of the scenarios had unanimous answers. However, the last case, scenario E (Figure 57.5), was considered very unsafe by 3 of the 4 interviewees – and the interviewee who voted 3 on a scale from 1 to 5 commented that the situation is the most complicated of all, because of the disrespect of some drivers who

Figure 57 - Conflict scenarios at intersections.



drive over to the front of the bicycle in order to make a turn despite the bicycle's preference, according to the CTB. Therefore, this scenario was considered the most dangerous among the interviewees and it was also highlighted that the car is not respecting the mandatory 1.5m distance. Scenario B was also considered very dangerous by most cyclists, except for 1 cyclist who considered it safe.

On the other hand, scenario C was considered the safest in all interviews, since the cyclist preference could be proven by the stop sign directed to the cars, and also considering the scenario of having a cohesive driver, as mentioned by some interviewees. Scenarios A and D had quite different answers among the participants. Scenario D was considered safe by half of the respondents and unsafe by the other half.

It is important to mention that most of the respondents asked or requested more information than just the image of the scenario to be able to evaluate the degree of safety in each case. For example, they asked to know if the road is busy, if the driver gave an arrow to turn, if there is a traffic light or only a stop sign, they asked about the behavior of the driver and to consider traffic laws. Therefore, it is assumed that they considered these criteria for their answers to complement what the observed from the image

This reflection on criteria for evaluating a scenario leads to the next question in the interviews, which asked what could be improved in the city so that delivery cyclists felt safer. The most recurrent suggestions were related to traffic education through awareness campaigns, both for drivers and cyclists and even in schools, so that they have more knowledge and are more educated about the CBT, about rights and duties. In addition, campaigns to encourage cycling were suggested, including campaigns for health promotion.

The only female delivery worker said it is important to improve the implementation and maintenance of bike lanes, traffic monitoring and enforcement, urban mobility education since childhood and infrastructure to support cyclists, such as bike racks, public drinking fountains and accessible toilets. Ariel focused

his answer on awareness because traffic rules must be followed and penalties for those who don't respect them should be stricter. Roberto from Carbono Zero agrees with him about awareness while Mário believes that the most important contribution is the creation of more bike lanes and tracks.

In general, regarding road infrastructure, the ideas for improvement from the respondents are as follows:

- creation of new bike lanes and cycle tracks so that people are encouraged to get around by bicycle, especially in the peripheral areas.
- maintenance of bike lanes
- Cyclist-friendly places that offer support for delivery workers, such as a bike garage with public drinking fountains, accessible toilets both in public spaces and in train and subway stations. .

Interviewee Julia commented on her own experience regarding infrastructure:

"I don't leave my bike in any bike rack and not all public places also have that space to park the bike. So I think that this support not only in public spaces, but also in subway and train stations. There are some bike racks, but not everywhere, for example in Barra Funda. Barra Funda is a bus station, it has trains, subway, municipal and intercity bus terminals and does not have a bicycle garage."

Finally, the respondents mentioned issues related to enforcement of compliance with traffic laws and stricter control directed to drivers. It was argued that it is necessary to increase enforcement *"because it's no use having several articles in the traffic code and none being respected, nobody enforcing them."* (Júlia). She believes that the enforcement itself should be done by CET employees, on bicycles.

SÃO PAULO (SP) FOR CYCLISTS

Following the interviews, the bike couriers indicated in which regions or neighborhoods of the city of São Paulo (SP) they feel more or less safe regarding road safety, considering their usual routes. As in the previous answers, the interviewees' references go beyond the theme of urban infrastructure, which confirms the research's systemic approach that road safety is composed of the integration between different variables, indicators and perspectives.

In summary, central areas were considered safer while areas further away from the city center were mentioned as less safe. Related to urban road infrastructure, these responses were justified by the presence or absence of bike lanes, the flow of cars, the presence of other cyclists, and how topography and road design induce driver's behavior.

The North and East zones were mentioned among the least safe areas, as well as the neighborhoods of Pirituba, Osasco, Morumbi, Vila Andrade, Vila Gustavo, Mooca, Ipiranga and Munhoz because of the lack of cycling infrastructure, lack of attention to cyclists and disrespect of drivers towards cyclists and pedestrians. One interviewee attributed this disrespectful behavior to the fact that some drivers are older and/or less educated on how to behave in traffic. However, Roberto mentioned that some people, both drivers and cyclists, do have this knowledge but do not apply it: *"Many times, the driver who comes from the outskirts and rides downtown, he respects cyclists in the center, but when he goes back to the neighborhood he doesn't respect them"*. Additionally, there were comments about the arrogance of some drivers from higher social classes who see themselves as the priority in any situation.

Therefore, the cultural issue is confirmed as a theme linked to urban infrastructure in the perception of safety. The same happens to justify the choice of the safest areas: the city center and the neighborhoods of Brooklin, Vila Mariana, Bela Vista, Consolação, Santa Cecília, Barra Funda, Pinheiros and Itaim Bibi. These areas were considered safer because they have bicycle infrastructure, people are more educated on how to prioritize different modes of transportation, there is a higher flow of cyclists – therefore, people are more used to the presence of the bicycle and are more respectful towards them. Respondents also said that they feel safer in areas that they know better themselves.

Despite the dichotomy between center and periphery to indicate a greater or lesser sense

of safety, the comments of some interviewees showed that it is important to consider details on the street scale within the same neighborhood, regardless of its position in relation to the city center.

TRAFFIC CLAIMS

The experience of delivery cyclists in relation to urban road safety can be evaluated according to the occurrence of traffic claims in which respondents were involved. This was another theme addressed by the study and all respondents have already experienced some claim, conflict or violence in traffic, with different levels of severity. Half of the occurrences were in the morning, between 10 and 11 am, and one in the afternoon, around 2 pm. Besides reporting their own experiences, 3 out of the 4 interviewees had already witnessed claims involving third parties.

Among the interviewees' experiences, they described some occurrences similar to Figure 57.5 (SCENARIO E) from the question about safety perception, where the driver closes in on the cyclist when turning right with the car. It was explained that this situation can lead to claims with different levels of severity. The milder cases were attributed to caution and defensive conduct on the part of the cyclists. A not so mild case was described when a driver rear-ended interviewee Júlia by turning right as she was going straight ahead on the Avenue, as shown on scenario E. She was knocked off her bicycle, suffered scratches on some parts of her body, and injured her wrist. The rear wheel of the bicycle was compromised. There was an argument between the cyclist and the driver, the police were called and both filed a police report against each other. In the end, the cyclist was left alone with the driver, which left her in shock, but another delivery woman arrived to help her.

The most serious of the mentioned cases occurred around 10am on an avenue with a bike lane very close to where the delivery worker was going to pick up a delivery. He was verbally and physically assaulted, his nose was broken, his head was cut, and his eye was injured to the point that he was hospitalized for a day. And the last traffic claim experienced among the interviewees was also in the morning, on Rua dos Pinheiros, and occurred due to disrespect, distraction and lack of care by car users towards cyclists and cycling infrastructure. An app driver stopped on the bike lane, the passenger opened the door without looking at the surroundings so the cyclist had to react quickly not to run her over stepping out of the bike lane, which made him fall off his bike. He was not injured, but he could have been.

Mário characterized in a few words the vulnerability of the cyclist, the importance of visibility and of foreseeing situations, as well as the struggle for space in the road infrastructure: *"Right away I say: in cycling, you are the bumper. You have to look 100 meters in front of you to see what is happening, I learned that. Before, I was a little careless, I thought that the bike lane was only for cyclists. And after that day, I realized that it is shared and we have to be very careful".*

Regarding the claims observed, the interviewees commented that they had witnessed several cases of harassment and chases between men on motorcycles and women on bicycles, of hit and run over situations due to distracted car and bus drivers, as well as claims that did not involve bicycles but pedestrians, buses, cars and especially motorcycles. In the case of bicycles, it was mainly the car drivers who were to blame for the claims, either for distraction, disregard, or bad intention. However, it was also exposed that there is lack of responsibility and negligence on the part of some cyclists; for example, by not reducing speed on rainy days.

The claims experienced and witnessed by the bike couriers happened in the following areas of the city of São Paulo: Av. Marquês de São Vicente, between the neighborhoods of Água Branca and Barra Funda; Av. Vital Brasil and Av. Eliseu de Almeida, between the neighborhoods of Butantã and Vila Sônia; Rua dos Pinheiros, in the neighborhood of Pinheiros; Av. Francisco Morato, in the neighborhood of Morumbi, and in the Lapa neighborhood.

It is worth noting that the areas where these claims occurred are located in neighborhoods considered both unsafe and safe to ride by the cyclists themselves, which confirms the relativity between neighborhood and perceived safety. Consequently, it takes this discussion to a smaller scale and to a greater diversity of factors integrated into urban infrastructure.

Additionally, the intersection in Figure 57.5 of the question about perceived safety was the most related to the cases of claims experienced and observed.

It was evident that all the interviewees changed their way of acting and reacting after the claims they experienced. That is, they became more alert, more cautious, more suspicious. It can be said that these are traumatic experiences that change the relationship of cyclists with the road infrastructure. *"So we start mapping these places in the city. And no matter how much time goes by, we always have a memory of 'ah, let me be careful here', 'ah, let me be careful here', 'it's not nice to cycle at this time'. The more we cycle, the more we are afraid of cycling.* (Júlia).

Figure 58 - Delivery cyclist Mário uses the bicycle lane on Brigadeiro Faria Lima avenue, in São Paulo (SP).

Source: Douglas Farias, 2021.

ETHNOGRAPHIC FOLLOW-UP AND ROAD CHARACTERIZATION

To complement the interviews, ethnographic follow-ups were conducted with a bike courier from each company, seeking to observe and identify characteristics such as: the desired and performed route; their behavior from the built environment; preference of place for cycling on the road; detours according to obstacles, etc; conflicts with other vehicles, other cyclists and pedestrians along the road and at intersections; and perceptions of cycling comfort; road safety (visibility, width of lanes, speed of other vehicles, quality of the paving, direction of the road, parking on the road, etc); safety in neighborhoods; safety in intersections (various types). After the end of the route taken with the research team member, each delivery person was asked to indicate 1 part of the route where he/she felt safer and 1 part where he/she felt unsafe. The excerpts will be divided in the order of the interviewees.

BIKE COURIER JÚLIA

The delivery cyclist Júlia, from the collective Señoritas Courier, was accompanied during a route of 2 pickups and 7 deliveries, on a route of about 25 km, from 11:35 am until 2:35 pm. The route was taken on a sunny and cloudless day. At the starting point, in the Vila Buarque neighborhood, the courier picked up 7 orders from the same client of natural cosmetic products. The deliveries were made in the neighborhoods of Cambuci, Vila Mariana, Pinheiros, Perdizes and Pompéia. The observed route ended at the location of the second pickup, in the Perdizes neighborhood, and no follow-up was done on this second route.

The route taken was indicated by the Google Maps app. In this route, the preference of the delivery woman was the use of bike lanes or cycle tracks. She used the road when there were no such options, when the conditions of the existing ones were not so good, or when there was a very long detour. To take shortcuts or avoid stretches without bike lanes, the cyclist took some wide sidewalks shared with pedestrians in three stretches: Praça da República and the sidewalks of Barão de Itapetininga and Direta streets. Only

Figure 59 - Route to follow the delivery cyclist Júlia, in São Paulo (SP).

Elaboration over Google Maps, 2021.

on the stretch down Rebouças Avenue (towards marginal) there was a bike lane, but the cyclist preferred to ride on the carriageway, because she considers that specific bike lane too narrow and with bad paving, besides her fear of claims with pedestrians and vehicles making right turns at intersections. In the interview she mentioned that she had already been involved in claims with pedestrians in this same bicycle lane. When she used the carriageway she would take the right lane and try to ride near the center of the lane. At times, when the flow of vehicles paused because of traffic lights, the delivery woman would take the "corridor" formed between them.

Throughout the route the cyclist signaled her turns with her hands, as well as lane changes, when going straight at intersections that could generate some conflict with vehicles making the turn, etc. Besides visual signaling, she also used sound signaling through a whistle to warn others about her presence in some situations with vehicles and pedestrians. In the interview, she said that on certain occasions, when she knows the route and does not need the guidance of the GPS, she plays music on her speaker to alert others about her presence.

Figure 60 - Delivery cyclist Júlia shares a stretch of street with pedestrians, in São Paulo (SP).

Source: Douglas Farias, 2021.

The conflicts observed on the way involved vehicles that were on the bike lane in some way. One of them was parked to unload a passenger, and forced her to swerve by the carriageway, which was not difficult to do because the street was not busy, but still exposed the delivery cyclist to risk. The others were near the intersection of Rebouças avenue and Henrique Schaumann avenue: one car was leaving an establishment and stopped on the sidewalk and bike lane, and another when trying to enter the establishment. On all occasions the delivery woman warned the drivers about their mistakes.

The greatest perception of comfort was in relation to the shading of the roads. Since the route observation was done on a sunny day with high temperatures, the tree-lined stretches were the most pleasant to ride on. The perception of road safety reported by the delivery woman along the route came from a sum of factors on each of them. For her, the least safe section was Tabatinguera street because it was a long slope with 2 curves, 3 narrow lanes, moderate to high traffic flow, 3 T-junctions, vehicles stopping on the right, and several driveways. The intersections at the beginning and end of the block are also uninviting to cyclists, who are barely visible on the road due to the many lanes and to the absence of cycling infrastructure.

Although the route went through Av. do Estado, the delivery woman did not point out the stretch as unsafe. The distance traveled was short (800m), but the wide lanes allowed a safe distance from passing vehicles.

For the cyclist, the safest stretch was at the beginning/end of the bike lane on Vergueiro Street, near the bicycle counter, between Dr. Nicolau de Souza Queirós Street and Estela Street. In this stretch, the bike track is in a central kerb with two wide strips of grass around it, a metal protection grid, safe crossings, and good visibility for pedestrians. The delivery woman feels safe all along the cycle track on Vergueiro Street and Paulista Avenue.

Júlia did not say anything about the stretch of Teodoro Sampaio Street, but during the observed route the street had a moderate flow of vehicles and some did not give way, drove by close to the cyclists and cut the bicycles. There

were also some parked vehicles on the left that increased the feeling of insecurity.

As for the Perdizes neighborhood, the last of the route, the perceptions of road safety of the delivery woman were about the road paving and intersections associated with the topography of the neighborhood, which is quite accentuated, with several hills and steep streets. Regarding the paving, the cyclist pointed out that some of them have cobblestone stretches, which cause trepidation and discomfort when using bicycles without shock absorbers, and they also make the road smoother thus more slippery than those with asphalt. For Júlia, another point of road insecurity in the neighborhood are the intersections of very steep streets, because she feels that the behavior of drivers on those intersections becomes unpredictable, she can't tell if they will cross with greater speed in order to avoid stopping on a steep street.

Regarding safety in the neighborhoods along the route, she pointed to the Glicério region as the one with the greatest feeling of insecurity. She says that streets with women and children are an indication of safety and cites this region as a counter example of this. The large male presence in the area causes her a lot of discomfort and insecurity, so she tends to avoid it.

After the end of the escorting moment, the delivery cyclist was asked to indicate 1 stretch of the route where she felt the safest and 1 stretch where she felt the least safe. For Júlia, the safe stretch was on Vergueiro Street, in Vila Mariana, on the block opposite Dr. Afonso Afrodísio Vidigal Square. And the unsafe section was on Tabatinguera Street, in the Sé neighborhood. The characterization was done between 12:30 and 3:30 pm on a cloudy day with drizzle at times, and the main observations are as follows.

First, regarding Tabatinguera street, the least safe: this street is composed of a single block on its even side and 4 blocks on the odd side, creating T intersections. During the observed route, the delivery woman rode in the lane closest to the single block (right side), so this was the block to be characterized. This is a long block, with several entrances/exits for vehicles. Together with the steep slope of the street, two curves that make it difficult to see the entire path, and the 3 T-intersections, these elements made the cyclist feel the least safe of all the sections. The delivery cyclist highlighted as even more unsafe the stretch of the last curve of the street, near the intersection with Carmelitas Street, which is not signalized.

Another point of insecurity caused by the characteristics of the road, especially when approaching curves, is the unpredictability of the presence of parked vehicles near the block, because although there are no parking spaces on this side of the street, vehicles are not prohibited from parking there. Additionally, the intersections at the beginning and end of the street are composed of several lanes and there is no dedicated lane for cyclists, leaving them barely visible.

As for Vergueiro Street, the section considered the safest for the delivery woman was the stretch where the bike lane on Vergueiro Street (towards Consolação) becomes a cycle track located in the median strip along the entire extension of Paulista Avenue. Close to this point, Vergueiro Street intersects with the beginning of Bernardino de Campos Avenue and makes the road network complex, so the length of the central median is different from the adjacent blocks that were characterized. The block west of the bike path (Dr. Afrodísio Vidigal Square) is the smallest, the bike path is the intermediate and the block east, between Dr. Nicolau de Sousa Queirós and Correia Dias streets, is the most extensive. For this reason, and because they do not share the same corner in the north direction, the intersections characterized were the extremes of the bike path.

The square is the least complex and was not in use on the day of the road characterization survey. There is no sidewalk paving, just a grass lining. The bike path is surrounded by curbs and has metal railings at the southern intersection. The east block has bike stands in front of one of the stores. Due to the distance of the blocks to the central median, the existing trees and the lamppost in the square do not affect the bike path, which has 3 lampposts, but no trees for shade. There is a pedestrian crossing at the north intersection of the bike path, but its design and visibility between pedestrians and cyclists seems to contribute to a peaceful interaction between the two parties, with no conflict. Due

Table 17 - Road characteristics on the safest and most unsafe sections.

ASPECT	SAFEST STRETCH VERGUEIRO STREET	UNSAFE STRETCH TABATINGUERA STREET
Land use*	49 divided into 9 varieties 3.5 residential (houses or entrance halls) 3.5 Hotel 7 Business (offices, commercial rooms, companies, etc) 3.5 Store 7 Services (bank, beauty salon, gym,...) 10,5 Bar, restaurant, bakery, snack bar 3,5 Not defined 7 Parking lots 3,5 Square/green spaces	56 divided into 12 varieties 12 Residential (houses or entrance halls) 1 Educational 1 Religious 2 Institutional 5 Retail 13 Services (bank, beauty salon, gym,...) 4 Bar, restaurant, bakery, snack bar 2 Empty 11 Indefinite 1 Under construction 3 Parking lots 1 Shopping malls/galleries
Physical Permeability*	42 establishments are estimated on to be on the block	56 establishments are estimated on to be on the block
Road direction	bidirectional	unidirectional
Regulatory road speed (for motor vehicles)	50km/h	40km/h
Type and condition of pavement	Asphalt with little signs of use	Asfalto with no signs of use
Presence of physical obstacles on the road	No	No
Street lighting*	14 lampposts on sidewalks, 10.5 of them on the bike path	9 lampposts
Horizontal Signaling	traffic lanes, exclusive bus lane	traffic lanes
Vertical signaling specific for cyclists	Yes	No
Road width and number of lanes	11.5m of carriageway 6 lanes 2 exclusive bus lanes 1 two-way bike lane	10m of carriageway 3 travel lanes 1 parking lot No bike lane
Shading and greenery on the roadway*	45,5	29

**In some aspects, the value has been adjusted to obtain data referring to road sections of the same length. Since the safe section is 155m long and the unsafe section is 540m long, the data for the first section were multiplied by 3.5, and therefore some numbers appear broken. Prepared by the author with data from the road characterization activity, 2021.*

to the timing and flow organization of the traffic lights and the visibility of cyclists, there are no apparent conflicts at either intersection with vehicles.

The road characterization of both roads continues with the data shown below in Table 19. Some particularities of the road conditions and urban road infrastructure were identified in the two sections mentioned by the cyclist. Since the stretches are of different lengths, some data have been adjusted in order to make an equivalent comparison between the two cases.

The comparison of the elements shown in the table indicates that the two sections are similar in terms of variety and quantity of land use, as well as physical permeability and some other aspects. However, unlike the unsafe stretch, the safer section of the route has a bicycle lane, more trees and more lighting, more traffic lanes and exclusive bus lanes, specific cycling signaling, besides being a two-way street and having a higher speed limit for motor vehicles.

Therefore, in this comparison, it is understood that the plentiful presence of

road infrastructure, especially the two-way bicycle lane connected to cycling networks is a determining factor for the delivery cyclist to feel safe. In the unsafe case, where there was no bike lane, Júlia prefers to ride on the sidewalk.

In addition, the bike lane of Vergueiro street is protected by raised curbs and metal barriers in part of the stretch and has 6 bicycle racks. There is good visibility for cyclists and no conflicts with other means of transportation at intersections, despite the busy flow of motor vehicles. On Tabatinguera Street there are no bicycle racks, there is moderate motor vehicle traffic but cyclist visibility is low due to the lack of an exclusive lane. There are conflicts between cyclists and pedestrians on the sidewalk and between cyclists and vehicles on intersections with several lanes and no exclusive lane for bicycles. And both roads coincide in the high number of motor vehicle entrances, approximately 25.

Finally, bicycle and motor vehicle counts were performed on the 2 stretches of roads indicated by Júlia as the safest and least safe, to check the use by regular cyclists and delivery cyclists of Rua Tabatinguera, in the Sé neighborhood, on the stretch considered the least safe, and Rua Vergueiro, in Vila Mariana, on the stretch indicated as safest. The activity took place between 12:30pm and 2:30pm on a cloudy day with occasional drizzle, which may have affected the number of cyclists on the roads.

One thing to be considered regarding Tabatinguera Street was that due to the lack of an exclusive lane and the moderate-high volume of vehicles, the was a low number of cyclists. Some of the delivery workers counted were apparently from local businesses and carried gallons of water or market bags, using cargo tricycles, and like most of the cyclists counted, preferred to use the sidewalk for circulation.

Figure 61 - Route observation with cyclist Júlia, in São Paulo (SP).

Source: Douglas Farias, 2021.

Figure 62: Stretch of Vergueiro Street, São Paulo (SP): indicated by Júlia as the safest stretch on her route.

Source: Douglas Farias, 2021.

Figure 63: Stretch of Tabatinguera street, São Paulo (SP): indicated by Júlia as the least safe stretch on her route.

Source: Douglas Farias, 2021.

Table 18 - Counts of the safest (Vergueiro Street) and least safe (Tabatinguera Street) stretches indicated by Júlia.

SAFEST STRETCH	Vergueiro Street			
CYCLISTS - 30 min				
Counting location:	Vergueiro Street and Dr. Afonso Afrodísio Vidigal Square			
Time of counting:	14h00 to 14h30			
Cyclist characterization	Regular cyclist		Delivery cyclist	
Gender	Male	Female	Male	Female
Bicycle lane				
Cycling track	14	5	10	1
Carriageway	3		4	
Sidewalk	3		2	
VEHICLES - 5 min				
Local:	Vergueiro Street and Dr. Afonso Afrodísio Vidigal Square			
Time of counting:	14:30 a 14:35			
Types of vehicles	Cars	Motorcycles	Trucks	Buses
	337	70	8	12

LEAST SAFE STRETCH	Tabatinguera Street			
CYCLISTS - 30 min				
Counting location:	Tabatinguera Street			
Time of counting:	12h30 to 13h00			
Cyclist characterization	Regular cyclist		Delivery cyclist	
Gender	Male	Female	Male	Female
Bicycle lane				
Cycling track				
Carriageway			1	
Sidewalk	1	1	2	
VEHICLES - 5 min				
Counting location:	Tabatinguera Street			
Time of counting:	12h30 to 12h35			
Types of vehicles	Cars	Motorcycles	Trucks	Buses
	85	28	4	0

Source: Own elaboration with data from the road characterization activity, 2021.

Vergueiro Street is an important street for vehicle flow in the city, therefore it is quite busy. However, due to the location and condition of the bike lane, the high density flow of vehicles does not affect the use of the bike lane. On the day of the count, the few cyclists using the roadway or sidewalk went in different directions than the bike path.

Vehicles from both directions of the street were counted separately and added together.

The number of cyclists and motor vehicles on the safer section, 42 and 427 respectively, is much higher than on the unsafe stretch, where only 5 bicycles and 117 vehicles were counted, no buses included. Proportionally, on Vergueiro Avenue, cyclists are 9% of the total modes of transportation counted while on Tabatinguera Street, they account for 4%. It makes sense that a higher proportion of cyclists was found on the safer route, but still the proportional amount of bicycles in relation to motorized vehicles is quite low in both cases. Furthermore, in the 2 sections bike couriers represent 40% of the total count of cyclists, and considering the amount of cyclists riding through Vergueiro Street, it can be concluded that this is a relevant road for bicycle commuting in general.

BIKE COURIER MÁRIO

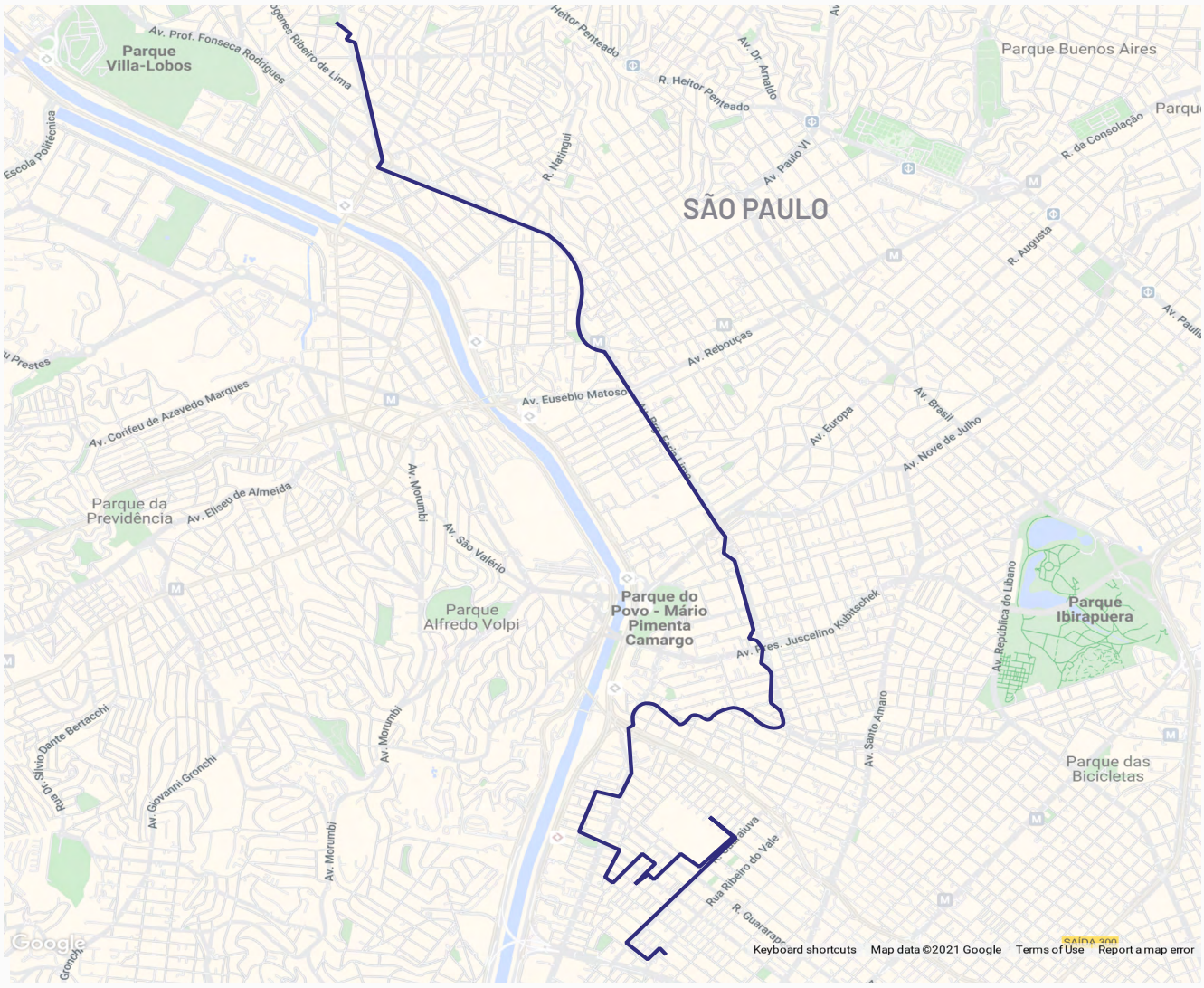
The delivery cyclist Mário, from Carbono Zero Courier, was observed during a route of several deliveries in the same neighborhood, a total journey of about 16km between the neighborhoods of Alto de Pinheiros, Cidade Monções and Brooklin, as shown in Figure 64. The route lasted approximately 2 hours in the morning, between 9:30 and 11:30 am, on a cloudy day.

EOn the route, the delivery cyclist used the bike lane or cycle track whenever possible, and the shared road when there was no other infrastructure dedicated to cyclists. The volume of vehicles on the carriageway of the route was light to moderate, so on some occasions to avoid longer paths, he took the counterflow. The cyclist, whenever necessary, gave preference to pedestrians and other people on bicycles.

There was no type of conflict situation during the observed route, but the delivery cyclist pointed out some points on the route that he considers unsafe and susceptible to conflict with vehicles. Besides these, it was also possible to notice some locations of potential conflict with pedestrians.

All these locations were intersections in the bike lane or track such as on Brigadeiro Faria Lima Avenue where there are some unsignalized intersections between the bike lane and vehicle turn lanes. In addition, the delivery cyclist pointed out other points of intersections between bike lane and exclusive bus lane, one of them on Funchal Street, near Av. dos

Figure 64 - Observed route of delivery cyclist Mário, in São Paulo (SP).



Source: Own elaboration.

Bandeirantes, and another on Eng. Luís Carlos Berrini avenue, in Brooklin. The intersection of Funchal Street is not signalized and the bike lane crosses the path of buses at 90 degrees, while the Berrini Avenue intersection is signalized, but according to the delivery man it still offers risk to cyclists who are cycling inattentively on the bike lane.

As for urban infrastructure, the delivery cyclist commented on some aspects that contribute to drivers paying even less attention to cyclists, such as the lack of visibility between driver and cyclist due to the presence of vegetation and a shared bike station. On the same avenue, the accompanying researcher noticed some pedestrian crossings that go over the bike lane and offer risk to cyclists and pedestrians who are innatentive.

Regarding the perceptions of comfort on the path, bike lanes and tracks were shaded most of the time, while the part of the path taken on the shared road had no shade. In some sections of the route, the pavement of the carriageway was overused with exposed cobblestone in some parts. On the stretches of the observed route where the cyclist took the the counterflow, the bike courier cycled at low speed, on the right side of the road and backed into the parking lane when he needed to give way to vehicles coming his way.

Figure 65 - Stretch of the bicycle path on Michel Milan Street, in São Paulo (SP).

Source: Douglas Farias, 2021.

The next step of the activity was the road characterization of the sections pointed out by the interviewee. Mário indicated a stretch of Brigadeiro Faria Lima Avenue (Jardim Paulistano neighborhood) as the most unsafe, and a stretch of Michel Milan Street (Vila Olímpia), as the safest. The bike courier felt less safe on a stretch of the bike lane on Faria Lima Avenue located between two unsignalized intersections with turning lanes towards Vila Olímpia, in front of the block between Manduri and Cel. Irlandino Sandoval streets, which, in the Pinheiros direction, are now called Sampaio Vidal and Benedito Chaves streets. This section of the bike path is located in the central lane of the avenue, between return lanes in both directions of the avenue. Because these lanes are not signalized and vehicles have poor visibility of cyclists, getting on and off the bike lane in this section is unsafe at these two intersections. There are "Stop" signs for cyclists, but still, there are conflict situations. Another point of conflict highlighted was the crossing of pedestrians on this stretch of the bike path, because the crossing is signalized with traffic lights for vehicle flow, but not for bicycle flow. During the field trip, we witnessed one or two near-misses between cyclists and pedestrians. As additional data, in the same central lane of the bicycle path there is a set of equipment for physical activity where there are bike racks, and it is used as a resting point by some delivery workers. It does not affect the bicycle path, the built surroundings, vehicle accesses, or vegetation.

In turn, Michel Milan Street (where the bike courier Mário feels safer) has a bike path that comes from Brigadeiro Faria Lima Avenue and becomes a bike lane on the sidewalk until the connection with Fiandeiras Street. It is a calm street, with light to moderate vehicle flow and few pedestrians. All the lots in this block have their back walls to this sidewalk and all the façade is made up of blind walls. Only two of them have some kind of access, one for pedestrians and the other for vehicles, and neither seem to be used often.

The sidewalk is very shaded by trees present along the the sidewalk and inside the lots. The

Table 19 - Road characteristics of the safest and least safe sections indicated by Mário.

ASPECT	SAFEST STRETCH MICHEL MILAN STREET	LEAST SAFE STRETCH BRIGADEIRO FARIA LIMA AVENUE
Land use*	10 divided into 3 varieties 4 Residential (houses or townhouses) 2 Business (offices, commercial rooms, companies, etc) 4 Undefined	45 divided into 7 varieties 18 Business (offices, commercial rooms, companies, etc) 3 Educational 6 Retail 9 Services (bank, beauty salon, gym,...) 3 Bar, restaurant, bakery, snack bar 3 Supermarket, grocery store 3 Undefined
Physical Permeability*	10 buildings on the block, but only 1 access for cars and 1 access for pedestrians.	45 buildings on the block, on both sides of the street
Road Direction	unidirectional	bidirectional
Regulatory road speed (for motor vehicles)	40km/h	50km/h
Type and condition of pavement	Asphalt in good condition	Asphalt in good condition
Presence of physical obstacles on the road	No	No
Street lighting*	9 lampposts on the sidewalks	24 farolas de luz, 3 en la ciclovía
Horizontal Signaling	parking lane	traffic lanes, exclusive bus lane
Vertical signaling specific for cyclists	Yes	Yes
Road width / number of lanes	9m of carriageway 2 shared traffic lanes 1 parking lot 1 one-way bike path on the sidewalk	14m of carriageway 6 shared traffic lanes 2 exclusive bus lanes 1 two-way bike lane
Shading and greenery on the roadway*	55	48

**In some aspects, the value was adjusted to obtain data referring to road sections of the same length. Since the safe section is 300m long and the unsafe section is 100m long, the data for the second section were multiplied by 3.*
Prepared by the research team with data from the road characterization activity, 2021.

path of the bike lane and the pedestrian lane alternates along the block, creating a zigzag path, where sometimes the pedestrian path is closer to the carriageway, and at other times the bike lane is closed to the carriageway. In some points the cycling lane has its paint worn away and in others, the paving has been redone but has also been repainted. In some parts of the sidewalk, it is possible to see the old track of the erased bike lane, which came in a straight line, near the carriageway. The lane occupies approximately half the width of the sidewalk.

To continue with the road characterization, some particular features of the road conditions and urban road infrastructure were identified in the two mentioned sections. Since the stretches are of different lengths, some data were standardized in order to make an equivalent comparison between the two cases, as shown in Table 17 below.

On the one hand, the characterization shows that the two stretches have quite similar characteristics regarding aspects such as greenery and the presence of specific vertical signs for bicycles. On the other hand, the less safe section has greater diversity and concentration of types of land use, has more physical permeability and better public lighting. In addition, it is a two-way avenue with 6 lanes, 2 exclusive bus lanes and a two-way bicycle lane within the median. Meanwhile, the safer section is on a one-way street, 2 traffic lanes, 1 parking lane, and the bike lane is on the sidewalk. It is worth noting that the safer section has fewer

Figure 66: Stretch of Michel Milan Street, São Paulo (SP): indicated by Mário as the safest stretch on his route.

Source: Douglas Farias, 2021.

Figure 67: Stretch of Brigadeiro Faria Lima Avenue, São Paulo (SP): indicated by Mário as the least safe stretch on his route.

Source: Douglas Farias, 2021.

Table 20 - Counts on Michel Milan Street, indicated as the safest stretch, and Brigadeiro Faria Lima Avenue, indicated as the least safe stretch.

SAFEST STRETCH	Michel Milan street (even side)			
CYCLISTS - 30 min				
Counting location:	Michel Milan Street			
Time of counting:	13h30 to 14h00			
Cyclist characterization	Regular cyclist		Delivery cyclist	
Gender	Male	Female	Male	Female
Bicycle lane	3	1	2	
Cycling track				
Carriageway			1	
Sidewalk	13		9	1
VEHICLES - 5 min				
Counting location:	Michel Milan Street			
Time of counting:	14h00 to 14h05			
Types of vehicles	Cars	Motorcycles	Trucks	Buses
	34	11	4	2

LEAST SAFE STRETCH	Brigadeiro Faria Lima Avenue - cyclepath between Manduri Street and Cel. Irlandino Sandoval Street			
CYCLISTS - 30 min				
Counting location:	Brigadeiro Faria Lima Avenue - cyclepath between Manduri Street and Cel. Irlandino Sandoval Street			
Time of counting:	12h30 to 13h00			
Cyclist characterization	Regular cyclist		Delivery cyclist	
Gender	Male	Female	Male	Female
Bicycle lane				
Cycling track	49	14	30	1
Carriageway	3		12	
Sidewalk	1		4	1
VEHICLES - 5 min				
Counting location:	Brigadeiro Faria Lima Avenue - cyclepath between Manduri Street and Cel. Irlandino Sandoval Street			
Time of counting:	13h00 to 13h05			
Types of vehicles	Cars	Motorcycles	Trucks	Buses
	189	68	4	20

Own elaboration with data from the road characterization activity, 2021.

intersections and no "U" turns, while the unsafe section has 2 "U" turns with no traffic lights for cyclists, only a "stop" sign, as will be explained in the following block of observations.

The following aspects observed were related to risk perception and conflict points. On one hand, the safest section has moderate motor vehicle traffic volume, 2 signalized intersections in a "+" format where cyclists are visible to drivers, thus there are no conflicts related to intersections or to the only motor vehicle entryway on this stretch. The only perceived conflict happened between cyclists and pedestrians who have to share the same space since the bike lane is on the sidewalk and has confusing painting and layout.

On the other hand, the Faria Lima Avenue section has a high volume of motor vehicle traffic and 24 entry lanes for motor vehicles, which requires more caution and attention from cyclists riding on sidewalks or on the carriageway. On this stretch, there are 2 "+" intersections between the two-way cycle track and the return of the avenue (the "U" turn) where there are no traffic lights for cars or cyclists. For the latter, there is a "Stop" sign. On the return from Vila Olímpia to Pinheiros, the cyclist going in the direction of Vila Olímpia is barely visible to the driver. And at the intersection in the opposite direction, the cyclist going towards Pinheiros is barely visible.

In a complementary way, the suitability of the built environment for cycling contributes to reducing conflicts and dangerous situations that bike couriers go through. In both cases, the interviewee Mário prefers to ride in the space designated for cycling, the bike lanes in section 1 and section 2. And since both are connected to bicycle networks and are biderectional, they can be used for different routes. Exclusively in the case of Av. Faria Lima, the cycling infrastructure is protected by raised curbs and there is a set of exercise equipment with a bike rack, where many delivery workers stop to rest.

Counts of regular cyclists, delivery cyclists and other vehicles were conducted on the same stretches in order to check cyclist use of the roads identified as safer and less safe. On Faria Lima Avenue, the most unsafe stretch, in a 30-minute period at 12:30 pm, 48 delivery cyclists were counted, most of them (31) on

the bike lane, 12 on the shared lane, and 5 on sidewalks. Of the total 67 non-delivery cyclists, the majority were observed on bike lanes (63) and fewer on the shared lane (3) and sidewalks (1). As for other modes of transportation, in a 5-minute timeframe at 1 pm, 189 cars, 68 motorcycles, 20 buses, and 4 trucks were counted. In turn, Michel Milan street, indicated as the safe stretch, received a significantly lower amount of both bicycles and other vehicles in the same time period and at a similar time of day. It was a total of 13 delivery cyclists, mostly on the sidewalk (10), and 17 non-delivery cyclists, mostly also on the sidewalk (13). Regarding other means of transportation, 34 cars, 11 motorcycles, 4 trucks, and 2 buses were counted. In both cases, there was more flow of non-delivery cyclists than delivery cyclists, and on Faria Lima Avenue many more bicycles and other vehicles were counted than on Michel Milan street, with the exception of trucks, which were the same amount on both stretches. In overall numbers, 3.8 times more bicycles and 5.5 times more motor vehicles on the less safe stretch than on the safer stretch. Table 18 indicates more details of the count.

To conclude, it is worth mentioning once again the difference in perspectives regarding the stretches considered safe or unsafe. The environment that Mário considered unsafe is similar to the one that Júlia considered the opposite, safe. These are streets with bike lanes connected to a cycling network, with street lighting and other aspects of road infrastructure that contribute to safety. However, in the case of Mário's route, the fact of having 2 turns for cars without traffic lights and without visibility was already enough to generate the feeling of insecurity. Therefore, even if a road is very well served by urban infrastructure that promotes road safety, some details cannot be ignored because they will have a greater impact on the feeling of (in)security despite all the existing structure.

Figure 68 - Delivery cyclist Mário, in São Paulo (SP).

Source: Douglas Farias, 2021.

4.4.3 DIMENSION SYNTHESIS

This dimension sought to investigate the perspectives of these workers on the feeling of safety linked to the urban road infrastructure in different scenarios.

Data from the survey conducted in São Paulo (SP) with delivery cyclists using electric bicycles indicate that:

- Poorly lit streets with bad signage, high traffic and high speeds, street spaces next to cyclists, narrow shared lanes and intersections are all aspects that create a feeling of insecurity for a large part of the delivery cyclists;
- 70% indicated that the provision of more bicycle lanes or tracks is one of the main things they would like to see changed in the city of São Paulo (SP) ;
- Some suggested that bike lanes and tracks should be included even on low-speed roads;
- For 34% and 26% of the respondents, improvements in road and bike lane lighting and clear traffic signs, respecitvely, are aspects they would like to see improved in the city to make them feel safer;
- Almost all (97%) agree that a well-lit street and being visible to other vehicles is important for their safety.
- Other aspects most often cited were related to improving urban infrastructure such as paving and improving connections to the existing cycling network;
- 93% agreed with the statement that they prefer to ride in bike lanes or cycle tracks;
- Of those who disagree, the justifications are: the presence of pedestrians and many cyclists in the bike lanes, the existence of faster or better alternative routes, the quality of the bike lanes - whether its paving, width, or lighting;
- 90% of delivery cyclists agree that wider shared lanes make it safer for them to commute;
- 73% agree that cars parked in the streets make it unsafe for them to cycle;
- 94% agree that they are more careful at intersections for fear of being involved in a traffic claim;
- A little more than a quarter of the respondents (28%) do not agree that they feel unsafe riding on the wrong side of the road;
- For 91% of delivery cyclists, horizontal striping, painted on the carriageway, is important;
- Some 85% of respondents agree that the higher the speed of cars next to them, the less safe they feel;
- 83% agreed that they feel unsafe at times when there are too many vehicles driving beside them;

Of the 64% who have been involved in a claim while riding an electric bicycle, 63% of the claims or collisions occurred on shared roads, while only 12% occurred on bicycle lanes.

After aggregating the data obtained in the six case studies carried out in Brazilian cities, we arrived at different results from those found in the survey. Considering the 12 people interviewed, we have a group where:

83% agree that on a street shared with other vehicles, the wider the lane, the safer they feel;

83% agree that being visible is an important factor for safety as a cyclist;

91% agree that a well-lit street gives them a feeling of safety;

Being visible and having visibility of the location are highlighted in the interviews and follow-up;

91% agree that the faster cars travel by them, the less safe they feel;

91% agree that horizontal street signs are important for their cycling safety;

75% agree that cars parked on the street make them unsafe;

Only 41% agree that heavy motor vehicle traffic makes them feel unsafe;

For 33% of those interviewed, the presence of a bike lane/ cycling path makes it safer for them to ride;

Only 25% indicate feeling unsafe riding on the wrong side of the road;

91% indicate being more careful at crossings for fear of claims;

There was no common agreement among the delivery cyclists regarding safety perception in the intersection scenarios presented;

If the most convenient route includes riding through a stretch in the counterflow, some cyclists will do so despite the risk;

Respondents also said that they feel safer in areas that they know better themselves;

When asked about changes in cities, the suggestions most commonly mentioned were related to traffic education through awareness campaigns, both for drivers and cyclists and even in schools;

Regardless of age or personal context, all of the delivery cyclists had their cycling style affected after experiencing or witnessing claims, always with the intention of avoiding going through the same or similar situations again.

In general, regarding road infrastructure, the ideas for improvement from the respondents are as follows:

- Creation of new bike lanes and tracks so that people have the courage to get around by bicycle, especially in the peripheral areas.
- Maintenance of cycle tracks and lanes;
- Cyclist-friendly places thatoffer support to delivery people: support locations.

4.5 LEGISLATION AND PUBLIC POLICY

The considerations of the dimension Legislation and Public Policy were developed from secondary data collected through documentary research, considering bibliographic and statistical elements. The objective was to find out about the instruments through which the State can impact the working conditions of delivery cyclists and road safety through legislation, regulations, tax incentives, and campaigns.

The dimension sought to understand the context of public policies aimed at this category of delivery workers. Information was gathered about the regulation of the activity, benefits and legal support for the occupational group, road safety policies and current legislation or projects in progress. Furthermore, this dimension sought to understand how the legislation deals with the health security of this group based on the contractor's obligations. Actions and educational campaigns are essential for road safety and for a harmonious coexistence among the different players in the road network, and they act preventively, in a stage prior to any event.

In this dimension the following indicators were considered for data collection in all instruments:

- Regulation of cyclelogistic activity;
- Public policies to encourage cyclelogistcs;
- Public policies for road safety;
- Educational actions.

4.5.1 Survey São Paulo (SP)

The survey targeted delivery workers who use electric bicycles. This section addresses the regulations corresponding to the circulation of these vehicles in Brazil and São Paulo (SP).

Resolution 465 of 2013 of the National Traffic Council (Contran) defines an electric bicycle as a bicycle equipped with an auxiliary electric motor, maximum rated power of 350 Watts, maximum speed of 25 km/h, which does not have an accelerator or any other manual device to switch power and is equipped with a system that ensures that the motor runs only when the rider os pedalling. If the two- or three-wheeled vehicle with an electric motor does not meet these requirements and has a power of more than 350 Watts, it is no longer treated as a bicycle and is equated to a moped.

The same resolution also defines that these bicycles must be equipped with speedometer, bell, front, rear and side night signs, rearview mirrors on both sides, tire in minimum safety conditions. In addition, it establishes the mandatory use of helmet to the cyclist. The circulation of this equipment is allowed in pedestrian areas at a maximum speed of 6 km / h on bike lanes and cycle tracks at a maximum speed of 20 km / h.

The regulation of electric vehicles, not only bicycles, occurs as a rule in the municipal or state legislative or administrative spheres. In the city of São Paulo (SP) was approved the Law no. 17,322/2020, not yet enacted, that creates the Municipal Policy of Cycling (Appendix I), which aims to regulate, promote, encorage and monitor sustainable logistics in the city.

Among the requirements established by the law, some refer to delivery companies by bicycle and tricycle and delivery apps that make use of cyclelogistics. These companies and apps are required to provide a minimum structure for cyclists, facilitate access to data for the municipal government and offer free training courses for their cyclists, whose content must be approved in advance by the adequate technical agencies. iFood, through the iFood Pedal program, meets these requirements with the support points and the Pedal Responsa.

Regarding electric personal mobility vehicles, in the case of São Paulo (SP) , the municipal legislation regulates about electric scooters without addressing specific issues about electric bicycles, except for Article 18, item III of law No16.885/2018 that deals with the circulation of such electric vehicles and authorizes them to use bike lanes and cycle tracks, provided that they ride at a speed compatible with the safety of the cyclist and pedestrian.

4.5.2 Case studies

CURITIBA (PR)

PUBLIC POLICY

In Curitiba (PR), there is no law regulating cyclelogistic activity. However, being one of the pioneer cities in the creation of bicycle paths in Brazil, it has a Bicycle Path Plan seeking to integrate this transport to bus networks and thus improve the effectiveness of this mode of transportation and provide safety for cyclists.

DELIVERY CYCLISTS AND WORK

Currently, in Curitiba (PR), there is no specific regulation that obliges contractors to provide some type of health, life, or dental insurance to delivery cyclists, leaving these benefits subject to the type of contract and agreement between the parties.

However, a bill began to be processed in 2020 in the Legislative Assembly of Paraná by state deputy Goura with the aim of regulating the occupation in the state and thus ensure better working conditions for this class.

Figure 69 - Distribution of signs during action by the City Hall of Fortaleza (CE).

Source: Rodrigo Carvalho, 2021

FORTALEZA (CE)

DIAGNOSIS AND ACTION

The Municipality of Fortaleza (CE) produces the Annual Road Safety Report in order to monitor the trends of traffic morbidity and mortality[41], allowing it to guide public policies for road safety in order to prevent traffic claims. Through several actions and partnerships with institutions focused on road safety, the capital of Ceará has managed to reduce traffic fatalities. In the 2016 ranking of the main causes of deaths, traffic claims were the sixth leading cause of death in the city in 2016, dropping to the sixteenth position in 2019.

The Municipality of Fortaleza (CE) produces the Annual Road Safety Report in order to monitor the trends of traffic morbidity and mortality, allowing it to guide public policies for road safety in order to prevent traffic accidents. Through several actions and partnerships with institutions focused on road safety, the capital of Ceará has managed to reduce traffic fatalities. In the 2016 ranking of the main causes of deaths, traffic claims were the sixth leading cause of death in the city in 2016, dropping to the sixteenth position in 2019.

The City Hall also acts specifically from the data survey of critical points in relation to aspects of road safety. With the identification of the most critical intersections for the occurrence of claims, in the last year, the City can make interventions in all the points that were raised.

EDUCATION AND MONITORING

Since 2013, in the months of September the Municipality of Fortaleza (CE) annually performs actions focused on Mobility Week, in partnership with the Association of Urban Cyclists of Fortaleza (CE) (Ciclovida) and the support of the Academic Center of Civil Engineering UFC (CAEC).

41 *Morbidity and mortality is the union of two concepts: morbidity, which is the presence of a certain cause or disease that causes death in the population; and mortality, which, in turn, is the statistics of deaths in a population. Thus, morbidity-mortality is understood as the statistics of those deaths caused by a certain cause or disease.*

In addition, in 2021, the city government carried out a massive campaign to increase respect for cyclists in traffic. The campaigns carried out in the city contribute to the public acceptance of the implementation of the cycling infrastructure that has been expanded over the years.

In parallel, focused on monitoring and enforcement, an electronic monitoring equipment was deployed in 2016 in the city bike lanes[42] aiming to curb violations and irregularities committed by motor vehicles in the bike lane of Beira-Mar Avenue. The adoption of this type of instrument was only allowed after the publication of Ordinance No. 100/2015 of the National Traffic Department (Denatran).

PUBLIC POLICY

Fortaleza (CE) has been building a history of policies aimed at encouraging the use of bicycles in the city since 2011. Law No. 10.303, of December 23, 2014, created the Bicycle Transportation Policy, approved the integrated Bicycle Master Plan of the municipality and made other provisions. However, the policies serve cyclists as a whole, that is, without much support for the activities and specificities of cyclelogistcs.

BIKE COURIERS AND THEIR WORK

There is no specific regulation or project to oblige contractors to provide health insurance for delivery workers in Ceará or Fortaleza. Therefore, the guarantee of benefits and assistance varies according to the type of contract between the parties.

SÃO PAULO (SP)

DIAGNOSIS AND ACTION

Studies conducted by Ciclocidade and Cidadeapé point out the places in the city of São Paulo (SP) most vulnerable to the safety of cyclists and pedestrians. The interactive map is the result of a survey based on traffic claims with victims from 2016 to 2020[43]. This instrument serves to support the actions developed based on the concepts of Vision Zero and Safe Systems, through the Road Safety Plan. The strategy of the São Paulo (SP) City Hall, called Vida Segura (Safe Life), encompasses short, medium and long term actions focused on halving the number of traffic deaths in the city by 2028.

With the Road Safety Plan[44], the city of São Paulo is pioneering the country's position on shared responsibility for traffic claims, as well as offering to invest in the Vision Zero and Safe Systems approach.

Another highlight of the plan's axes is in relation to the revision of the road classification and speed management following the Safe System precepts. The fluidity of the vehicles is in second place and the safety of all users gains relevance. In this change, the arterial roads will have a maximum speed limit of up to 50 km/h, the collector roads up to 40 km/h and the local roads 30 km/h, in addition to the reclassification of roads that do not have an infrastructure consistent with their current classification.

Still within this axis, in June 2020 the City Hall opened the public consultation of 22 road safety projects[45] conducted by the SMT (Municipal Mobility and Transportation Secretary) and by the CET (Traffic Engineering Company), which are part of the plan to implement Quiet Areas in places of high pedestrian circulation, limiting speed and intervening in the infrastructure.

42 *https://www.mobilize.org.br/noticias/9464/prefeitura-de-fortaleza-implanta-primeiro-equipamento-de-fiscalizacao-eletronica-em-ciclovia.html*

43 *https://vadebike.org/2021/10/mapa-ruas-avenidas-perigosas-para-ciclistas-sao-paulo/*

44 *https://www.prefeitura.sp.gov.br/cidade/secretarias/mobilidade/plano_seguranca_viaria/?p=262886*

45 *https://www.prefeitura.sp.gov.br/cidade/secretarias/subprefeituras/noticias/?p=298785*

EDUCATION AND MONITORING

Within the Road Safety Plan, continuous campaigns for education, training and transparency of this process are also foreseen. Thus, meeting the requirements of Article 75 of the CTB (Brazilian Traffic Code) in which educational and awareness campaigns must be permanent.

Bicibot is an initiative created with artificial intelligence in order to register the complaints of invasion of bike lanes and cycle tracks by other means of transportation, in addition to the demand for maintenance in these infrastructures of active mobility, as the focus on bicycles. The purpose of the action is to monitor, record, and quantify in order to diagnose, with data, the reality of road safety from the perspective of cyclists – and thus give voice to this group.

The Road Safety Plan for São Paulo (SP) has an axis entirely dedicated to legislation and enforcement for road safety, aiming to expand and/or qualify the different forms of traffic regulation in order to reduce unsafe behavior. To this end, the proposed actions range from the expansion of the electronic surveillance equipment network to different types of regulations and incentive programs within the scope of the City Hall's attributions.

PUBLIC POLICY

The public mobility policies of São Paulo (SP) address guidelines in favor of providing the necessary infrastructure for the safe circulation of delivery cyclists and actions to encourage bicycle use.

São Paulo (SP) was a pioneer in creating the Municipal Policy for Cycling, Law No. 17,322, mentioned above. In this law, it was proposed that establishments use curbside parking for bicycles and tricycles; however, the law was vetoed. On the other hand, they approved guaranteed parking in existing spaces on public roads and in buildings with bicycle racks. It also requires logistics and delivery companies and apps based in São Paulo (SP) (and that make use of cyclelogistics) to provide data to the government to assist in cycling policies; free training courses; and minimum structure for delivery cyclists (such as drinking fountains, toilets, cell phone charging stations and lockers). This is an extremely important point, because during peak deliveries, cyclists are on the streets all of the time. However, this law has not yet been regulated, only approved.

The public mobility policies of São Paulo (SP) contemplate guidelines in favor of providing the necessary infrastructure for the safe circulation of bike couriers and actions to encourage bicycle use.

BIKE COURIERS AND THEIR WORK

The state of the current legislation regarding labor rights of the category shows a situation of helplessness. Regarding workers' insurance, there is no regulation that requires it. Therefore, this coverage depends on the type of contract and agreement between the parties.

The class union, SindimotoSP along with Detran SP, has been working on a series of actions that aim to give more security to professionals through the Safe Motofretista, whose focus is on regularization of documents and offering credit for the acquisition of new equipment, however, there is no obligation to offer security.

In parallel, Bill 358/2021 seeks to make it mandatory for companies that provide delivery services via app to provide collective life insurance for delivery drivers and cyclists while on duty.

4.5.5 DIMENSION SYNTHESIS

This dimension sought to investigate instruments through which the public authorities can impact the working conditions of delivery cyclists and their road safety through legislation, regulation, tax incentives, and campaigns.

Secondary data collected through documentary research considered information regarding the regulation of the cyclelogistics activity, public policies to encourage cyclelogistics, public policies for road safety, diagnosis and prevention of claims, diagnosis of the problem of delivery cyclists, and educational and enforcement actions. Data were collected in the three cities of case stud: Curitiba (PR), Fortaleza (CE) and São Paulo (SP) :

Curitiba's (PR) Bicycle Paths Plan already uses data from the diagnosis to define investments in areas where there is greater demand for bicycle paths;

The diagnosis also found that the bicycle would be more used in the city if the infrastructure offered higher quality and greater safety in the cycling system;

The Annual Road Safety Report of Fortaleza (CE) in its diagnoses considers official data from the Traffic Accident Information Systems (SIAT) and monitors risk factors in traffic;

The City Hall of Fortaleza (CE) developed the Plataforma Vida, a digital tool for the management of traffic safety in the city;

The Road Safety Plan of São Paulo (SP) takes a pioneering position on the national scene regarding shared responsibility for traffic claims;

The diagnostic structure of the Traffic Safety Plan of São Paulo (SP) is based on understanding the big picture of traffic claims, analysis of the culture and behavior of the agents;

The Curitiba (PR) City Hall constantly carries out educational actions focused on cyclists;

Enforcement actions that directly benefit cyclists are still not a challenge in Curitiba (PR);

The City Hall of Fortaleza (CE) has been dedicated to the agenda of urban bicycle transportation since 2011;

Through continuous actions that reinforce the importance of cycling, there was no social resistance to the implementation of new cycling infrastructure;

In Fortaleza (CE), electronic monitoring equipment was installed in bike lanes as a protective measure against invading bike lanes and tracks;

In São Paulo (SP) City Hall Road Safety Plan there is an axis totally dedicated to bicycle lane legislation and inspection;

In Fortaleza (CE), Law no. 10.303/2014, created the Cycling Transportation Policy and approved the integrated Cycling Master Plan of the municipality that recognizes cyclelogistic activities;

None of the three cities (Curitiba (PR), Fortaleza (CE) or São Paulo (SP)) has a regulated Cyclelogistics Law;

The Municipal Policy of Cyclelogistics in São Paulo (SP) was approved but is not yet in effect;

The law of São Paulo requires logistics and delivery companies and apps based in the city to provide data to assist in cyclelogistics policies, in addition to offering free training courses and minimum structure for delivery cyclists;

There is no specific regulation or project in any of the three cities (Curitiba (PR), Fortaleza (CE) or São Paulo (SP)) or in the country to oblige contractors to provide insurance to delivery cyclists;

In Paraná, Deputy Goura's bill aims to regulate the occupation of delivery cyclist.

Source: Douglas Farias, 2021.

5 BEST PRACTICES AND RECOMMENDATIONS

Based on the information collected and the analysis carried out, this chapter will present recommendations aimed at improving road safety conditions for delivery drivers and cyclists. We highlight some good practices from national and international contexts. These recommendations and best practices are advised in an attempt to implement improvements and stimulate road safety for these workers, considering that this is a growing group of workers in an emerging market.

WORK CONDITIONS

The vulnerability to which delivery cyclists are exposed daily is related to the precariousness of their work and the absence of minimum labor rights, besides the lack of assistance such as insurance. These deficiencies occur due to the lack of regularization of the delivery workers and the inaction of the public power in guaranteeing assistance to the category.

- Recommendations: Regulate the occupation and establish labor guarantees for delivery cyclistss.
- Good practice: Carbono Zero Courier guarantees all delivery cyclists hired via MEI an insurance policy with coverage in case of claims, disability and death.
- Good practice: The European Union wants to oblige app companies to regularize employment relationships of couriers, drivers and other digital platform workers[46].

The absence of support points for these workers, who spend hours cycling in traffic without the opportunity to return home due to the long distances between their place of residence and "work places", was an issue heavily commented on in the interviews and questionnaires.

- Recommendation: Creation and provision of free (or low-cost) support points for the routine of the delivery cyclists. Availability

46 *https://brasil.elpais.com/economia/2021-12-09/uniao-europeia-obrigara-empresas-de-aplicativos-a-regularizar-4-milhoes-de-falsos-autonomos.html*

of drinking fountains, rest areas, restrooms, cell phone chargers, etc.

- Good practice: The iFood Pedal support points are available to all users of the exclusive delivery plan. In these spaces, the delivery people find the necessary structure for their daily break moments, including drinking fountains, restrooms, microwaves, tables, alcohol gel, and power outlets.
- Good practice: The Delivery Point is an initiative of the Fortaleza (Ceará) City Hall that aims to offer facilities for delivery workers, cyclists or motorcyclists. The project ensures action on road safety through educational actions and the completion of a safe driving course, with theoretical and practical classes at the AMC Training Center (Autarquia Municipal de Trânsito e Cidadania). The first point was installed in August 2021 and, by the end of the year, the City Hall intends to inaugurate two more points, in partnership with the company iFood[47].

The need for meals such as lunch and dinner was identified as a sensitive point in the routine of the delivery workers. Many have no fixed routine and eat when possible to avoid disrupting delivery routes, according to them. Also according to their' reports, finding affordable food for their budget is challenging.

- Good practice: Friendly Cycle Mapping - Señoritas Courier develops mapping of public and private spaces that help in the routine of the couriers. Restaurants with affordable meal prices were included in the data survey.

Figure 70 - iFood Pedal support point in Pinheiros, São Paulo (SP).

Photo: Publicity / Midori de Lucca.

Figure 71 - Delivery point inaugurated in Fortaleza (Ceará).

Photo: Publicity / Fortaleza City Hall

47 *https://www.fortaleza.ce.gov.br/noticias/prefeitura-de-fortaleza-fecha-parceria-com-o-ifood-para-expansao-do-projeto-piloto-do-ponto-do-entregador*

BICYCLE AND EQUIPMENT

The high cost of buying electric bicycles and the limited supply of suitable cargo bicycle models make it difficult to expand cyclelogistics activities. The Brazilian market offers few options and charges high import taxes, making cargo bikes unaffordable.

Electric bicycles are also not affordable for the majority of the delivery-cycling public.

- Recommendations: Tax and financial incentives, such as reducing taxes in the production chain of bicycles and tricycles, and making it easier for bicycle delivery companies to purchase and finance the vehicles;
- Recommendations: The expansion of electric bicycle sharing systems, such as those available at iFood Pedal, allows access to equipment that facilitates the work routine and enables greater performance.

Figure 72 - Cargoroo, electric cargo bike sharing system in Amsterdam, the Netherlands.

Photo: Publicity / Cargoroo.

- Good practice: In December 2021, iFood Pedal expanded its coverage area and allows, besides São Paulo (SP) and Rio de Janeiro (RJ), exclusive plans for bike couriers in Brasília (DF), Porto Alegre (RS), Recife (PE) and Salvador (BA).
- Good practice: Sharing system for electric cargo bikes in the Netherlands - Cargoroo. The startup creator of the project received a grant from the European Union as part of a pilot program to introduce electric bikes for sharing in seven cities in Europe.
- Good practice: The Community of Madrid (Spain) subsidizes the purchase of up to 5 electric bicycles by self-employed professionals and microenterprises[48].

The bag is the accessory most used by delivery cyclists. In the interviews, some comments highlighted the lack of comfort and practicality of use that the product design provides.

- Recommendation: Development of user-friendly design pieces, considering aspects such as the cyclist's center of gravity and the movements made while pedaling.

For the bike couriers, being visible and being noticed proved to be an important aspect for their sense of security. For this, they adopt various strategies, such as the basic use of front and rear lights, use of reflective clothing or clothing with bright colors, and use of sound accessories to warn about their presence on the road.

- Good practice: In November 2021, the City Hall of Fortaleza (CE) carried out educational actions and distributed LED flashlights to cyclists in the city[49]. The action aimed to encourage the use of safety accessories, especially flashlights and helmets.

48 *https://www.comunidad.madrid/servicios/urbanismo-medio-ambiente/ayudas-fomento-movilidad-cero-emisiones-comunidad-madrid*

49 *https://www.fortaleza.ce.gov.br/noticias/amc-realiza-nova-distribuicao-de-lanternas-led-para-ciclistas*

ADEQUATE INFRASTRUCTURE

Issues related to urban road infrastructure were highlighted in the analyses carried out. When asked about the perception of safety related to the infrastructure that cities provide, the delivery cyclists pointed out desires for changes and necessary improvements according to their experiences. Intersections appear as the main problem in their feeling of insecurity. Many delivery cyclists say they adopt prevention strategies and defensive behavior as a way to avoid involvement in claims.

- Recommendations: Adoption of road design based on Vision Zero premises combined with effective traffic calming measures, including speed reduction, adequate roadway signage, and intersection redesign.
- Recommendations: Expansion of bicycle infrastructure in Brazilian cities (bike lanes, bike racks, bike garages, parking lots, quick stop pockets, signage), taking into account the use of different bicycle models, such as cargo bikes and tricycles, for deliveries.
- Recommendation: Transform temporary cycling infrastructure (pop-up bike lanes) deployed during the Covid-19 pandemic into permanent routes through safety upgrades[50].
- Recommendations: Implementation of cyclist-friendly infrastructure from the adoption of street furniture that provides convenience and safety on the roads.
- Good practice: Fortaleza (CE) City Hall installs foot stands for cyclists in 8 city streets[51]. Food stands are items that serve as foot and hand supports for the cyclist to stand on when stopped at a traffic light.

EDUCATION AND TRAINING

Many bike couriers indicated education and awareness campaigns as a strategy to increase the perception of road safety. According to reports, many drivers are careless, unaware that they can seriously injure a pedestrian or cyclist. Suggestions for educational campaigns with the whole society, from early childhood on, appear in the answers. One of the delivery cyclists also said that there is no point in having a minimally adequate structure if there is no respect from drivers, who sometimes invade and block bicycle lanes and cycle tracks. According to the Brazilian Traffic Code, educational campaigns must be constantly developed by the competent bodies.

- Recommendations: Conduct educational campaigns with the whole society, especially drivers of automotive vehicles.
- Best practices: The adoption of traffic education in the curricular matrix of São Paulo state schools[52].
- Best practices: Interactive actions show how cyclists feel in traffic to encourage respect for vulnerable users[53].

Figure 73 - Cabin for interactive action part of the campaign for fostering respect toward cyclists.

Source: Publicity / National Road Safety Observatory

50 https://wribrasil.org.br/pt/blog/cidades/do-emergencial-ao-permanente-infraestrutura-cicloviaria-para-alem-da-pandemia

51 https://g1.globo.com/ce/ceara/noticia/2021/09/02/fortaleza-implanta-20-parapes-para-ciclistas-em-oito-vias.ghtml

52 https://www.jornalosemanario.com.br/governo-vai-incluir-educacao-para-o-transito-na-grade-curricular-das-escolas-estaduais/

53 https://www.onsv.org.br/experiencia-interativa-mostra-como-ciclistas-e-motociclistas-se-sentem-no-transito/

- Recommendations: Training of bike couriers regarding their duties and rights as active agents of the traffic system. The creation of training programs for bike couriers increases the supply of qualified labor.
- Best practices: Live by Bike (VdB)[54] project, developed by the Aro Meia Zero Institute provides training for those who want to use the bicycle to generate income. Courses are offered and actions are developed to address four main contents: basic bike mechanics, riding in the city, entrepreneurship, and financial management.
- Good practices: The Recife City Hall (PE) promotes an event on road safety for delivery cyclists. In the "Bora de bike, Recife?"[55], bike couriers received guidance on road safety and safety items such as helmet, jacket, first aid kit, flares and maintenance tools, as well as masks, alcohol gel and bicycle maintenance manuals.

Figure 74 - Delivery cyclist participating in the event "Bora de bicicleta, Recife?
Photo: City Hall of Recife / Daniel Tavares

54 *https://www.aromeiazero.org.br/viverdebike*

55 *https://www.diariodepernambuco.com.br/noticia/vidaurbana/2021/08/prefeitura-do-recife-realiza-evento-sobre-seguranca-viaria-para-entreg.html*

Source: Douglas Farias, 2021.

6 CONCLUSION

Since 2019, the volume of bike couriers circulating on the streets has accompanied the intensification of the delivery industry and the expansion of the number of people working with delivery. Therefore, considerations about the road safety of these delivery workers, who spend much of their day in traffic, are essential for the improvement of their living and working conditions, as well as for the growth of cyclelogistics, an essential activity in the energy transition and decarbonization of transport in cities.

This study sought to explore relevant aspects of road safety for bike couriers in Brazilian cities. Through a systemic approach, it was possible to understand issues that question the road safety of these workers.

The study was based on five dimensions that composed the cyclelogistics ecosystem from the lens of road safety, considering the delivery cyclists, the bicycles and equipment used, the cyclelogistics companies, the urban space (workplace), and the laws and public policy that affect the activities. These dimensions are considered fundamental to the cyclelogistics ecosystem and were the basis for the analyses developed throughout the study.

The study reaffirms some issues already seen in previous research (ALLIANCE BIKE, 2019; LABMOB, ALLIANCE BIKE, 2020), but is unprecedented in approaching them from the lens of road safety and from the "voice" of the bike couriers. The study sought to understand their perceptions in the face of such issues and factors. Despite the low presence of women in the universe of delivery cyclists, we prioritized their approach in order to raise aspects related to gender perspectives in the work routine.

The data survey was carried out through the application of several methodological instruments. The analyses were carried out through the triangulation of qualitative and

quantitative data. The survey research carried out with delivery cyclists users of electric bicycles in São Paulo (SP) was done with the application of questionnaires in four points of the city where the bicycles were picked up. The survey method was adopted due to the possibility of collecting information from a large group of people. With the application of the questionnaire, 336 answers were collected, a highly significant number, considering the universe of bike couriers. The main questions addressed were related to the profile of these workers linked to apps and the main aspects and issues concerning working conditions and road safety.

The case studies conducted in Curitiba (PR), Fortaleza (CE), and São Paulo (SP) included in-depth interviews with bike couriers and representatives of companies and collectives, ethnographic follow-ups with the bike couriers, road characterization, and counts of cyclists. The cities were selected with the intention of giving the study a comprehensive understanding that takes into account specific Brazilian geographies. The number of case studies and participants allows for a qualitative understanding of the issues raised, similar to those considered in the survey.

Considering the important role of road infrastructure in traffic claim risk reduction, especially for the most vulnerable users (pedestrians and cyclists) (DINIZ, 2019), this study investigated the conditions offered to cyclists regarding bicycle infrastructure, from quantitative variables in road characterization, perceptions and behavioral aspects in ethnographic monitoring and in-depth interviews.

Comparisons between the results of case studies and survey are possible given the differences in context of each instrument and especially their target audiences.

The evaluations about the profile of the participants show that it is a public made up mostly of black, young men - 26 is the average age of the respondents of the survey, while 31 is the average age of those interviewed in the case studies -, who work about seven hours a day. Only a low percentage of this group has some type of insurance, whether health, life or dental, revealing the lack of assistance and vulnerability of bike couriers, who work for hours in the violent traffic of Brazilian cities.

The possession of insurance is related to the existing labor ties. In the group of participants, different forms of hiring were identified, where few are insured. In more fragile structures, such as in the groups of app deliverers, a support network was identified among the workers. These solidarity networks, which provide assistance in cases of need, reveal themselves as important supports to unassisted workers.

Even though some of these Brazilian cities, including Fortaleza (CE) and São Paulo (SP), have already been applying measures aimed at reducing traffic incidents over the last decade, the answers found in this study indicate the need for continuity and intensification of the measures adopted. It was observed that all participants had been involved in traffic claims or had witnessed some occurrence.

It was also found that previous experience with claims impacted the behaviors and perceptions of these workers. Fear is present in the daily lives of delivery cyclists, and the perception of an unfriendly city to their work dynamics is also common among the group surveyed. Issues such as lack of respect and inattention to cyclists were strongly repeated as causes of traffic claims.

The interviewees were asked about changes in relation to the cities so that they felt safer when commuting: a large portion of answers were related to educating drivers, as they do not feel considered and respected by them during their work (cycling). Another highlight is related to the urban road infrastructure of the cities: there is a desire for the adequacy of the infrastructure to cyclelogistic activities, especially the provision of support points that contribute to the intense routine on the street and in traffic.

Road safety appears as something desired by bike couriers, but it is secondary to economic needs and the search for efficiency and productivity in order to meet daily goals linked to financial income from work. In short, delivery workers tolerate many risks.

The perceived feeling of insecurity about the job, combined with the risks of the occupation

and the lack of assistance found, have a direct impact on the decision to keep this occupation. It was pointed out that few intend to continue working as bike couriers.

The survey carried out on existing public policies in Brazil, at federal and municipal levels, shows that despite the potential for inclusion in mobility plans, the cyclelogistics activity is still little addressed in Brazilian urban and transportation planning. The production of studies that present reliable data on bicycle deliveries and road safety is a key issue to expand the knowledge of the actors and support the creation of public policies.

This study sought to identify and analyze, from a systemic approach, the main factors related to daily safety in the cyclelogistics ecosystem, considering the agents, equipment, urban space and laws involved. Far from exhausting the discussion about road safety, it highlighted aspects that are sometimes secondary, besides connecting issues that are part of different dimensions.

Despite the recognition of cyclelogistics as a considerable opportunity in the energy transition and for the improvement of the transportation agenda in favor of active mobility in Brazilian cities, if one considers the number of cyclists killed in Brazilian traffic in the last decade and the reports presented here, it is agreed that the road safety of delivery cyclists should be closely monitored.

The research on road safety within cyclelogistics is still scarce. This study presents a contribution in the construction and sharing of information and experiences, favoring the identification of the main challenges of the sector and assisting in the development and application of efficient solutions to the issues identified. In addition, it is necessary to highlight the importance of the systemic approach and the collaborative process in the promotion of cyclelogistics and road safety from the participation of urban logistics players, public authorities, associations, academia and the third sector.

Finally, we draw attention to some limitations regarding the methodology, especially the definition of the number of app workers, as there is no clearly defined and surveyed universe in Brazilian cities. Another issue was the low participation of women, which may not be representative of the population as a whole, making generalizations impossible. Therefore, it is acknowledged that many of the results show patterns and perceptions referring to a mostly male audience.

Therefore, it is recommended that future research seek to examine a universe through the filter of gender, presenting patterns and perceptions that are representative of the universe and reality of female delivery cyclists.

Figure 76 - Delivery cyclist in Rio de Janeiro.

Source: Jéssica Lucena, 2021.

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8
APPENDIX

A - Sample of questionnaire used in Survey São Paulo

B - Interview script applied to delivery cyclist

C - Interview script applied to company/collective representative

D - Intersection scenarios (A,B, C, D and E) presented in the interviews with delivery cyclists

E - Road characterization data entry model

QUESTIONNAIRE SAMPLE USED IN SÃO PAULO

BLOCK 01 - PERCEPTIONS OF ROAD SAFETY

Q01 If possible, would you prefer to ride on a bike lane/cycle track?

( ) Yes ( ) No ( ) Cannot answer

RAMIFICATION Q01.01 For what reasons would you not prefer to cycle on a path with a bike lane / cycle track, if you have the option?

a. Width of bike lanes
b. Speed of other cyclists
c. Many cyclists on the bike lane
d. Quality of pavement of the bike lane
e. Means taking a longer path
f. Path with more uphill/downhill stretches
g. I know better paths
h. Not well lit / visible
i. Other (Specify)
j. Cannot answer

Q02 Being visible to other vehicles is an important factor for my safety as a cyclist.

a. I agree
b. Disagree
c. Neither agree nor disagree
d. Cannot answer

Q03 On a street shared with other vehicles, the wider the lane, the safer I feel.

a. I agree
b. Disagree
c. Neither agree nor disagree
d. Cannot answer

Q04 The faster the car(s) move next to me the less safe I feel.

a. I agree
b. Disagree
c. Neither agree nor disagree
d. Cannot answer

Q05 Streets with many vehicles driving by me make me more insecure.

a. I agree
b. Disagree
c. Neither agree nor disagree
d. Cannot answer

Q06 A well-lit street gives me a sense of safety.

a. I agree
b. Disagree
c. Neither agree nor disagree
d. Cannot answer

Q07 The stripes painted on the street are important for my cycling safety.

a. I agree
b. Disagree
c. Neither agree nor disagree
d. Cannot answer

Q08 Cars parked on the street make me feel unsafe.

a. I agree
b. Disagree
c. Neither agree nor disagree
d. Cannot answer

Q09 I feel unsafe cycling on the wrong side of the road.

a. I agree
b. Disagree
c. Neither agree nor disagree
d. Cannot answer

Q10 I am more careful at intersections for fear of traffic claims.

a. I agree
b. Disagree
c. Neither agree nor disagree
d. Cannot answer

BLOCK 02 – INVOLVEMENT IN TRAFFIC CLAIMS

Q11 Have you ever been involved in a traffic claim while making deliveries using one of the electric bicycles?

( ) Yes ( ) No ( ) Cannot answer

RAMIFICATION Q11.01 If yes, considering your last claim, how serious was it?

( ) No injury ( ) Slightly injured
( ) Seriously injured ( ) Cannot answer

RAMIFICATION Q11.02 Did this claim involve another vehicle(s) or pedestrian(s)?

( ) No, I crashed alone
( ) Yes, another bicycle
( ) Yes, a car
( ) Yes, a motorcycle
( ) Yes, a bus
( ) Yes, a pedestrian
( ) Yes, but another vehicle. Which one? _____
( ) Cannot asnswer

RAMIFICATION Q11.03 Do you remember the location of the claim?

( ) Address. Please specify street and neighborhood: _____
( ) Shared lane
( ) Bike lane
( ) Sidewalk
( ) Cannot answer

RAMIFICATION Q11.04 At what time did the claim happen?

( ) _____ (number field)
( ) Morning
( ) Afternoon
( ) Night
( ) Cannot answer

BLOCK 03 – CHANGES IN THE CITY

Q12 Thinking about your safety when commuting with an electric bicycle during work, which points would you like to see changed in relation to the city of São Paulo? Indicate up to 03 points that you consider important.

a. More cycling lanes/ tracks
b. Better connection between cycling lanes / paths
c. Quality of sidewalk in bike lanes
d. Widening of bike lanes
e. Bike lanes on low speed roads
f. Clear signs about traffic preferences
g. Reduced vehicle speed on curves
h. Reduced speed on shared lanes
i. Widening lanes on shared streets
j. Improve public lighting on street and bike lanes
k. Having support points for cyclists
l. Feeling of safety (harassment, theft, robbery, etc)
m. Other (please specify)
n. Cannot answer

BLOCK 04 – FEAR

Q13 What do you fear in your day-to-day work? Please indicate up to 03 points that you consider the main ones.

a. Vulnerability in relation to motor vehicles.
b. Fear of having a crash (traffic claim)
c. Fear of harassment
d. Fear of verbal violence
e. Fear of physical violence
f. Fear of robbery / theft / assault
g. Fear of having my bicycle stolen
h. Other (please specify)
i. None
j. Cannot answer

BLOCK 05 – ACCESSORIES

Q14 What accessories do you use during work?

a. Delivery bag
b. Reflective clothing
c. Helmet
d. Helmet Light
e. Gloves
f. Goggles
g. First Aid Kit
h. Others (specify)
i. None
j. Cannot answer

Q15 Do you use any kind of audio accessory connected to your cell phone?

a. Yes, earphones
b. Yes, speaker
c. Yes, speaker and earphones
d. I do not use any
e. Cannot answer

BLOCK 06 – WORK ASPECTS

Q16 What is your main type of transportation to the bicycle pickup point?

a. Bus / Minibus
b. Subway / Train
c. Car
d. Motorcycle
e. Bicycle
f. Walking
g. Other (specify)
h. Cannor answer

Q17 In which neighborhood is the majority of your deliveries (destination) ?

a. ___
b. Cannot answer

Q18 What days and times do you usually work?

Matrix: 7x4 - Weekdays x morning (06h-12h), afternoon (12h-18h), evening (18h-00h), early hours (00h-06h)

Q19 Using the electric bicycle how many deliveries per day do you make on average?

a. _____ (number)
b. Cannot answer

Q20 Do you have any kind of personal insurance?

a. Health care plan
b. Dental plan
c. Life insurance
d. I do not have any
e. Others (specify)
f. Cannot answer

Q21 How long have you been riding electric bicycles?

a. _____
b. Cannot answer

BLOCK 07 – SOCIODEMOGRAPHIC PROFILE

Q22 What is your age? _____

Q23 What gender do you identify with?

a. Female
b. Male
c. Other
d. Prefer not to answer

Q24 What race/ color/ ethnicity do you identify with?

a. White.
b. Asian.
c. Black.
d. Brown.
e. Indigenous.
f. Prefer not to answer

Q25 What is your education level

a. No education.
b. Incomplete basic education (primary and junior high school, up to 9th grade)
c. Complete elementary school (elementary and secondary school, up to 9th grade)
d. Incomplete High School (secondary school)
e. Complete High School (high school)
f. Incomplete higher education (university)
g. Complete higher education (university)
h. Incomplete postgraduate degree
i. Completed postgraduate degree
j. Prefer not to answer

Q26 In what city/ neighborhood do you live?
_____

SCRIPT FOR THE INTERVIEW WITH DELIVERY CYCLISTS

BLOCK 01 - PRESENTATION OF THE DELIVERY CYCLIST

1. First of all, what may I call you? What is your social name?

2. To understand a little about your routine, generally, what days of the week do you work?

BLOCK 02 - RELATIONSHIP WITH BICYCLE AND OCCUPATION

3. How did your relationship with the bicycle begin? For how long have you been riding bicycles? (Whether as a hobby, leisure, means of transportation and/or work)

4. Is this your first experience as a bike courier? How long have you worked as a bike courier?

5. What was your motivation for working in bicycle delivery?

6. What was your previous occupation?

BLOCK 03 - WORK ROUTINE

7. What is your work routine like?

BLOCK 04 - RELATIONSHIP WITH WORK AND PERCEPTION OF THE OCCUPATION

8. What means of transportation do you use to get to work?

9. If you don't ride a bike or the bike you use is not shared, where do you leave it outside of your work hours?

10. In your routine, on average, how many hours per day do you work making deliveries? And is this average set by you?

11. Regarding your occupation, what do you fear? Considering physical integrity, various types of violence, lack of assistance, vulnerability, fear of traffic claims, etc.

12. Do you have any kind of health, dental and/or life insurance?

13. Do you intend to continue working in bicycle delivery? For what reasons?

BLOCK 05 - BICYCLE AND EQUIPMENT

14. What type of bicycle do you use?

15. Do you own the bicycle? If not, who owns it?

16. Are you satisfied with the bicycle you use for deliveries?

17. Do you think there would be a better option? Why do you think so?

18. How often does the bicycle have technical problems and maintenance needs?

19. What accessories do you use to transport the deliveries?

20. Do you make use of earphones or speakers while cycling? Which ones? Do you believe that the use of this equipment hinders your perception?

BLOCK 06 - PERCEPTION OF SAFETY

21. During your work routine, how are the routes defined? Is the definition of routes based on shorter delivery time, shorter distance, safer routes, routes with bike lanes / cycle tracks? In what sense does each of these aspects influence your route definition?

22. Being visible is an important factor for my safety as a cyclist.

[Strongly disagree 1 2 3 4 5 Strongly agree]

23. On the street shared with other vehicles, the wider the lane, the safer I feel.

[I totally disagree 1 2 3 4 5 I totally agree]

24.A well-lit street gives me a feeling of safety.

[Strongly disagree 1 2 3 4 5 Strongly agree]

25. The faster the cars ride next to me the less safe I feel.

[Strongly Disagree 1 2 3 4 5 Strongly Agree]

26. The stripes painted on the street pavement are important for my safety when cycling.

[Strongly disagree 1 2 3 4 5 Strongly agree]

27. When I ride on a street with potholes or bad pavement I slow down because I need to pay more attention.

[Strongly disagree 1 2 3 4 5 Strongly agree]

28. Cars parked on the road make me feel unsafe.

[Strongly disagree 1 2 3 4 5 Strongly agree]

29. Heavy motor vehicle traffic makes me feel more unsafe.

[Strongly disagree 1 2 3 4 5 Strongly agree]

30. The presence of a bike lane / cycle track would make me safer to ride.

[Strongly disagree 1 2 3 4 5 Strongly agree]

31. I feel unsafe riding on the wrong side of the road.

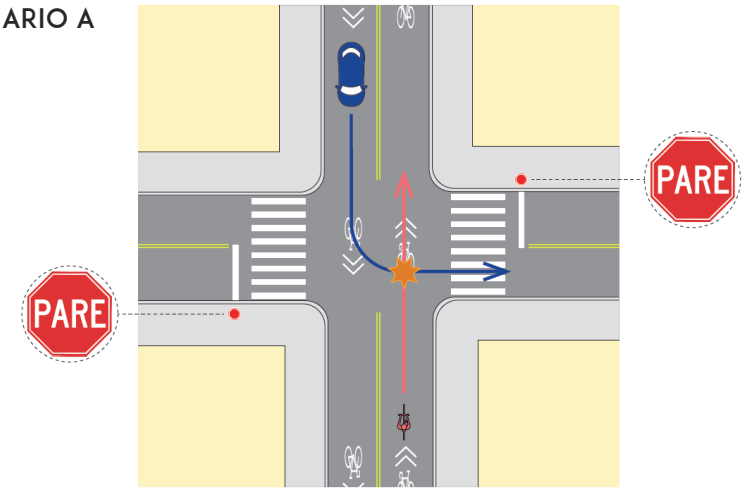
[Strongly disagree 1 2 3 4 5 Strongly agree]

32. I am more careful at crossroads for fear of claims.

[Totally disagree 1 2 3 4 5 Totally agree] 31.

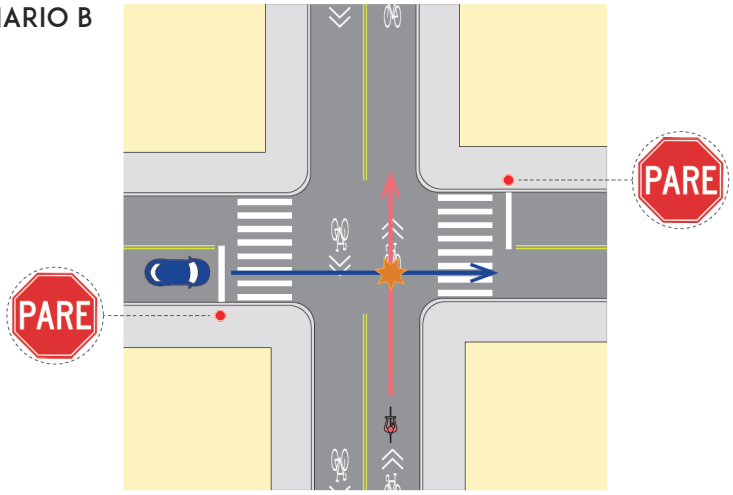
33. Next, I will show you hypothetical map images and would like to understand your perception of safety in street intersection scenarios:

SCENARIO A



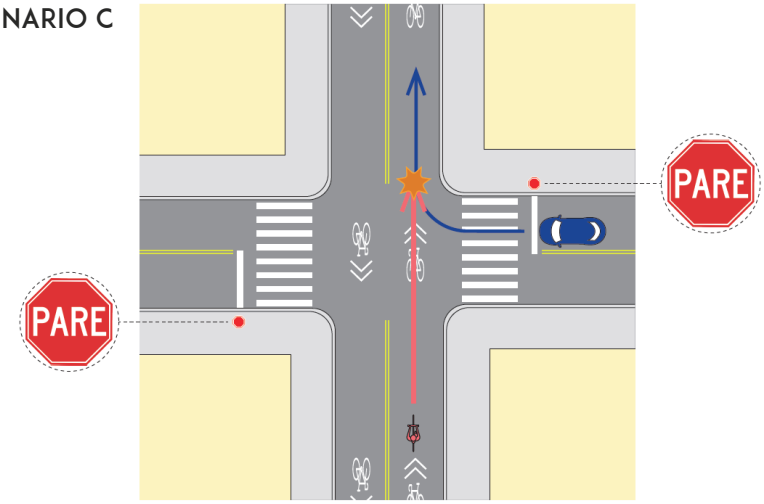
On a scale of 1 to 5 (where 1 means very unsafe and 5 means very safe), how safe are you in this scenario?

SCENARIO B



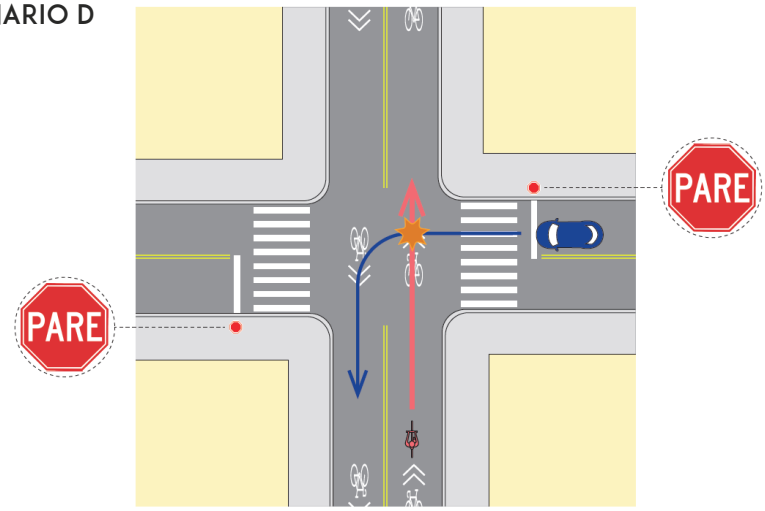
On a scale of 1 to 5 (where 1 means very unsafe and 5 means very safe), how safe are you in this scenario?

SCENARIO C



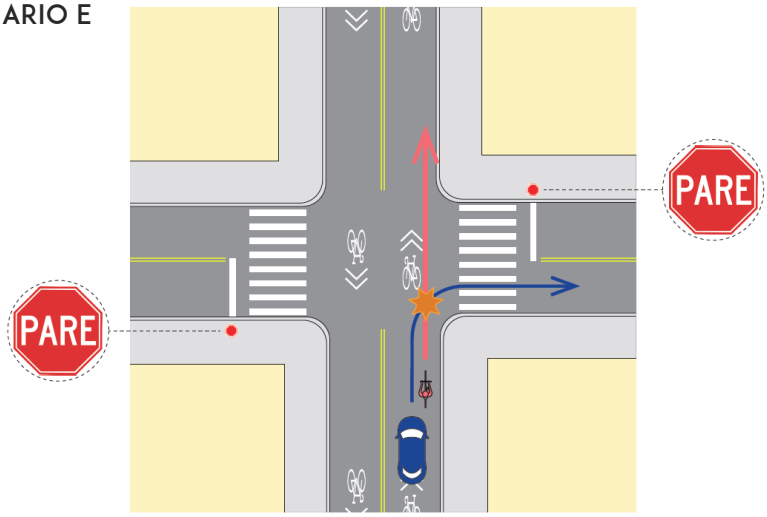
On a scale of 1 to 5 (where 1 means very unsafe and 5 means very safe), how safe are you in this scenario?

SCENARIO D



On a scale of 1 to 5 where 1 means very unsafe and 5 means very safe), how safe are you in this scenario?

SCENARIO E



On a scale of 1 to 5 where 1 means very unsafe and 5 means very safe), how safe are you in this scenario?

34. Regarding road safety and considering your usual routes, can you distinguish neighborhoods or regions where you feel more or less safe? For what reasons?

35. What do you think the city could improve to make you feel safer while cycling? (Thinking of the bicycle commuting you do during work, which points would you like to see changed in the city)

36. What do you think the company/collective could do to make you feel safer as a worker and as a cyclist?

37. What do you fear regarding your work / occupation?

BLOCK 07 - INVOLVEMENT IN CLAIMS

Regarding traffic claims...

38. Have you ever been involved in a traffic claim while cycling? If more than one, please tell us about the most recent one. Please describe the place and conditions of the claim. Were you injured? How serious was it? Did this claim involve any other vehicles and/or pedestrians? And where did this claim occur? At what time?

39. Have you ever witnessed other claims, conflicts or violent situations in traffic?

40. Having witnessed or being involved in traffic claims affected your way of cycling? Have you changed any behavior after this episode?

BLOCK 08 - PROFILE AND CLOSING

41. How old are you?

42. With what gender do you identify with?

43. With which race/color/ethnicity do you identify yourself?

44. What is your level of education?

45. In which neighborhood and city do you live?

46. We have come to the end of the interview. I will leave a few minutes for you to comment on something that we did not address in the previous questions but that you consider relevant to the context of the research.

SCRIPT FOR INTERVIEW WITH COMPANY/COLLECTIVE REPRESENTATIVE

BLOCK 01 - THE COMPANY / THE COLLECTIVE

1. What is the name of your company / collective?

2. What position do you hold in the company / collective?

3. What is the nature of the company?

4. What types of deliveries do you usually perform?

5. How long has the company been making deliveries by bicycle?

6. What are the motivations to make deliveries by bicycle?

7. What was the determining factor for choosing bicycle as a delivery method?

8. What are the operational and economic advantages/disadvantages of bicycles?

9. With respect to cyclelogistics, what is the size of your fleet of delivery cyclists?

10. How is this team hired?

11. Does the company guarantee any labor rights or benefits to these employees? What benefits do they receive? (Health insurance, life insurance, dental care, meal allowance, ipe's.)

12. Has your volume of deliveries by bicycle changed in the context of the COVID-19 pandemic? What impacts have these changes had on your activities and fleets?

BLOCK 02 - BENEFITS

13. Do you offer a support area for the bike couriers? If yes, what is the structure of this place? If not, where are the bicycles and/or accessories stored?

14. Does the company offer delivery cyclists any kind of dental, health and/or life insurance? If yes, what is it?

15. If the bicycle belongs to the delivery worker, does the company offer any kind of insurance for the equipment?

BLOCK 03 - BICYCLE AND EQUIPMENT

16. Which bike models are used in the fleet? What are the advantages and disadvantages of these models?

17. Does the company make bicycles available to delivery cyclists? If yes, what type? Conventional or electric?

18. Does the company supply accessories to the delivery cyclists? Which ones?

19. E.g.: bicycle protection elements (lock, chain, etc.), light signaling (retroreflectors and lights), sound devices (horn, bell, etc.), rear view mirror), body signaling (reflective clothing), protection elements (helmet, gloves, glasses, etc.).

20. Does the company provide transport accessories for the delivery cyclists? Which ones? E.g.: front crate or trunk, back crate or trunk, saddlebags, backpack, basket, etc. If yes, what is their load capacity?

21. Do you believe that the quality of the equipment is adequate for the services performed? Does the company adjust the deliveries to the quality of the equipment used by the delivery workers who will make them?

22. How often do you perform preventive maintenance on the bicycles? Is maintenance offered to the delivery worker's own bicycles?

23. How often do bicycles have technical problems and need repairs? Are repairs offered to the workers' own bicycles?

BLOCK 04 - DELIVERY LOGISTICS

24. How many daily deliveries are made, in total? And by each delivery cyclist?

25. Where are the products stored and collected by the delivery cyclists?

26. How are the routes adopted for the deliveries defined? What criteria are used to define these routes? (time, distance, safety)

27. Are indications given regarding the routes? (with respect to optimizing time or distance, safety of the delivery worker, etc.)

28. How is the distribution of deliveries done among the delivery cyclists? What criteria are used?

BLOCK 05 - SAFETY

29. Does the company define the routes of the delivery drivers? If yes, what are the defining aspects? Attemping to get shorter delivery times, shorter distance, safer routes, routes with bike lanes? In which sense each aspect influences the route definition?

30. From your perception, which factors are important for the road safety of bike couriers during the routes they take?

31. With respect to road safety and considering the routes your delivery cyclists usually take and what they report, can you distinguish between safer or less safe neighborhoods or regions? For what reasons?

32. Thinking about the commuting trips your bike couriers make during their work, what does the company believe that can be improved or changed in the city / urban space can so that these cyclists can ride in a safer way?

33. What does the company believe it can do to make the bike couriers feel safer as cyclists?

34. Does the company collect reports from the delivery workers? If yes, in what way do these reported experiences contribute to you? Do traffic claim reports, for example, help prevent other claims?

BLOCK 06 - ACCIDENTS / CLAIMS

35. Have there ever been accidents with deliverers of your fleet?

36. How often do accidents occur? In general, how serious are they?

37. Do these accidents usually involve other vehicles and/or pedestrians?

38. Do they usually happen more frequently in any neighborhood/region of the city? Which one?

39. Do they usually happen more frequently on a certain day and period? Which one?

40. What assistance is given to the deliverers in case of accidents?

41. What are the actions and methods used for accident prevention?

BLOCK 07 – EDUCATION

• Are there training sessions with the bike couriers? What kind of training? Do you organize partnerships for educational campaigns / professional training?

• Are they trained in traffic law?

• Any specific content about road safety?

• Are guidelines about traffic circulation provided?

• Are educational and training courses on notions of mechanics provided to the bike couriers?

BLOCK 08 -BEST PRACTICES, CHALLENGES AND PERSPECTIVES

42. What actions, activities or techniques in your company do you consider as good practices? (in general, regarding cyclelogistics and road safety)

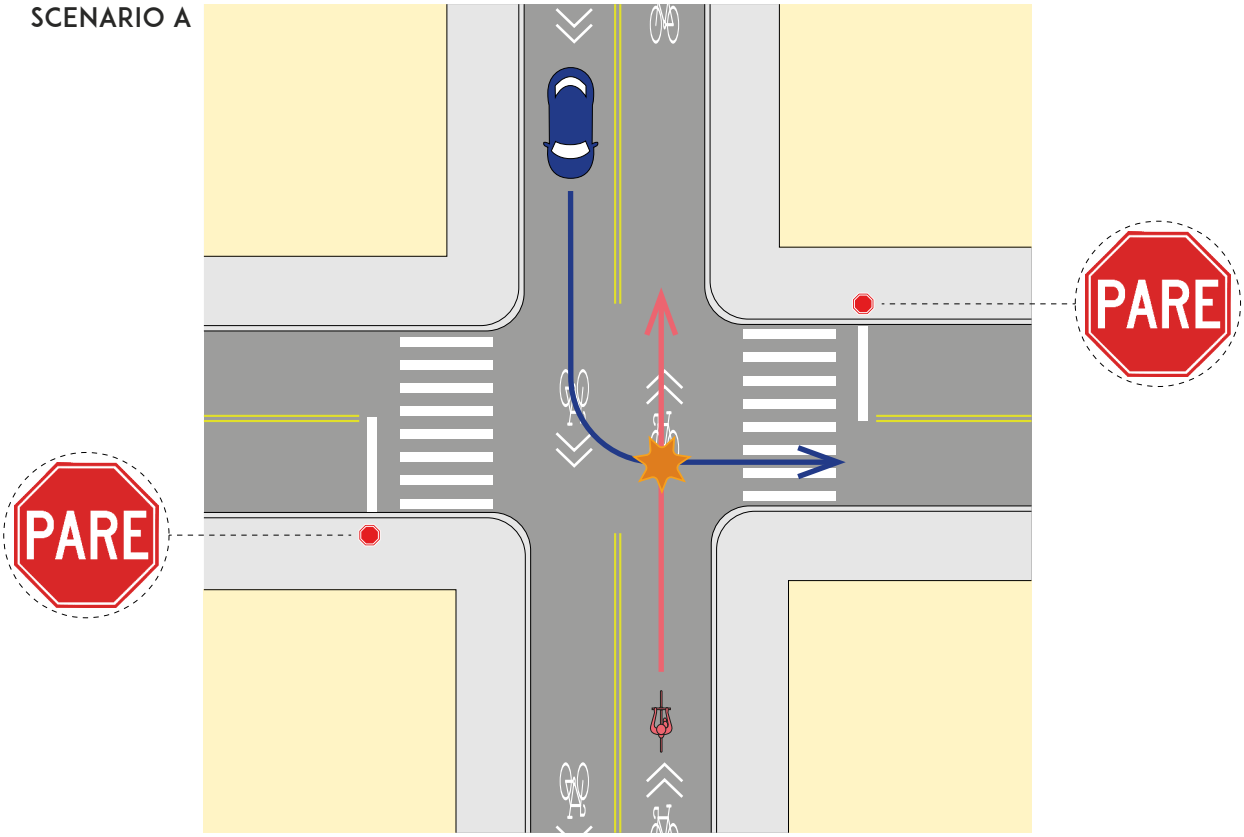
43. Is there something you would like to implement but haven't been able to yet?

44. What is the main challenge to make bicycle deliveries more efficient and attractive? Examples: Lack of cycling infrastructure, lack of bike couriers, limitations of load capacity and distance traveled, bureaucracy - licenses and permits.

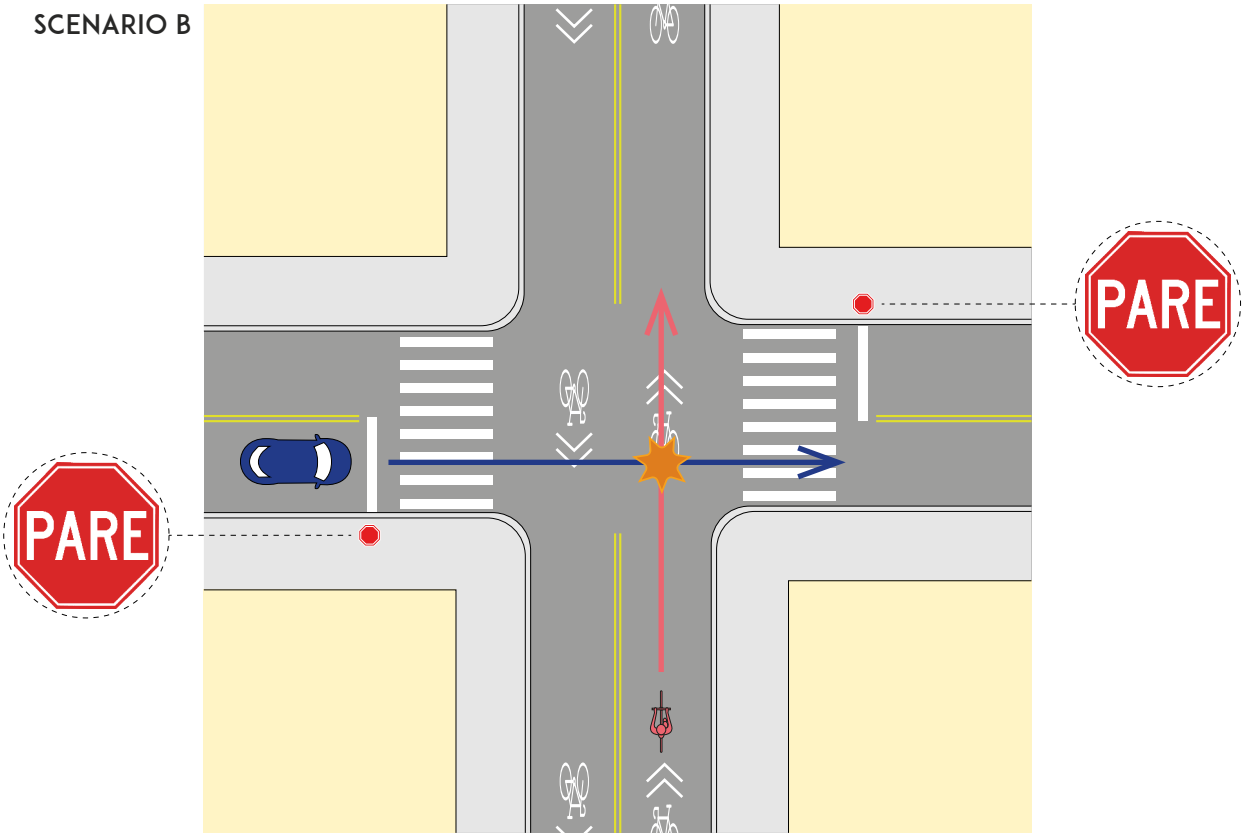
45. Do you suggest any improvements or incentives to facilitate the operation of bicycle deliveries? In your perception, which of these solutions would be fundamental to promote cyclelogistics?

INTERSECTION SCENARIOS (A,B, C, D AND E) PRESENTED IN THE INTERVIEWS WITH BIKE COURIERS

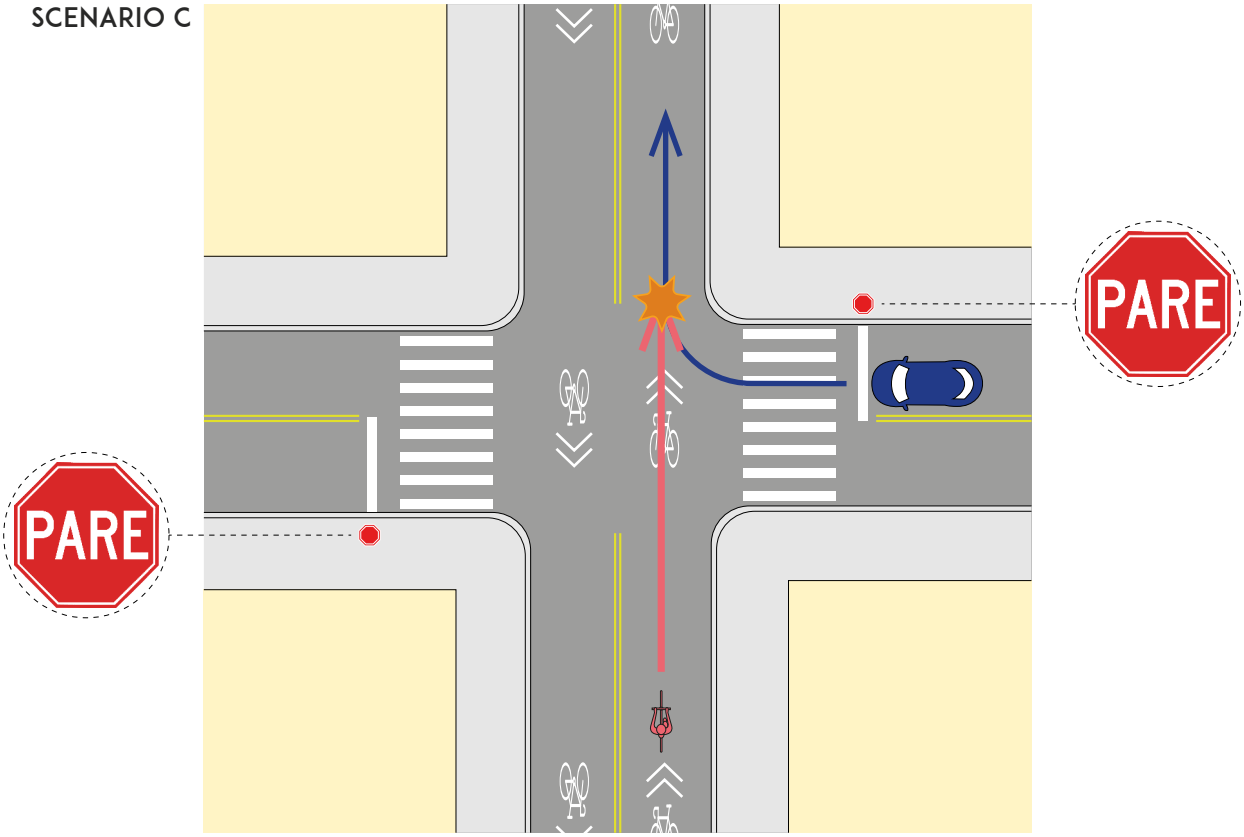
SCENARIO A



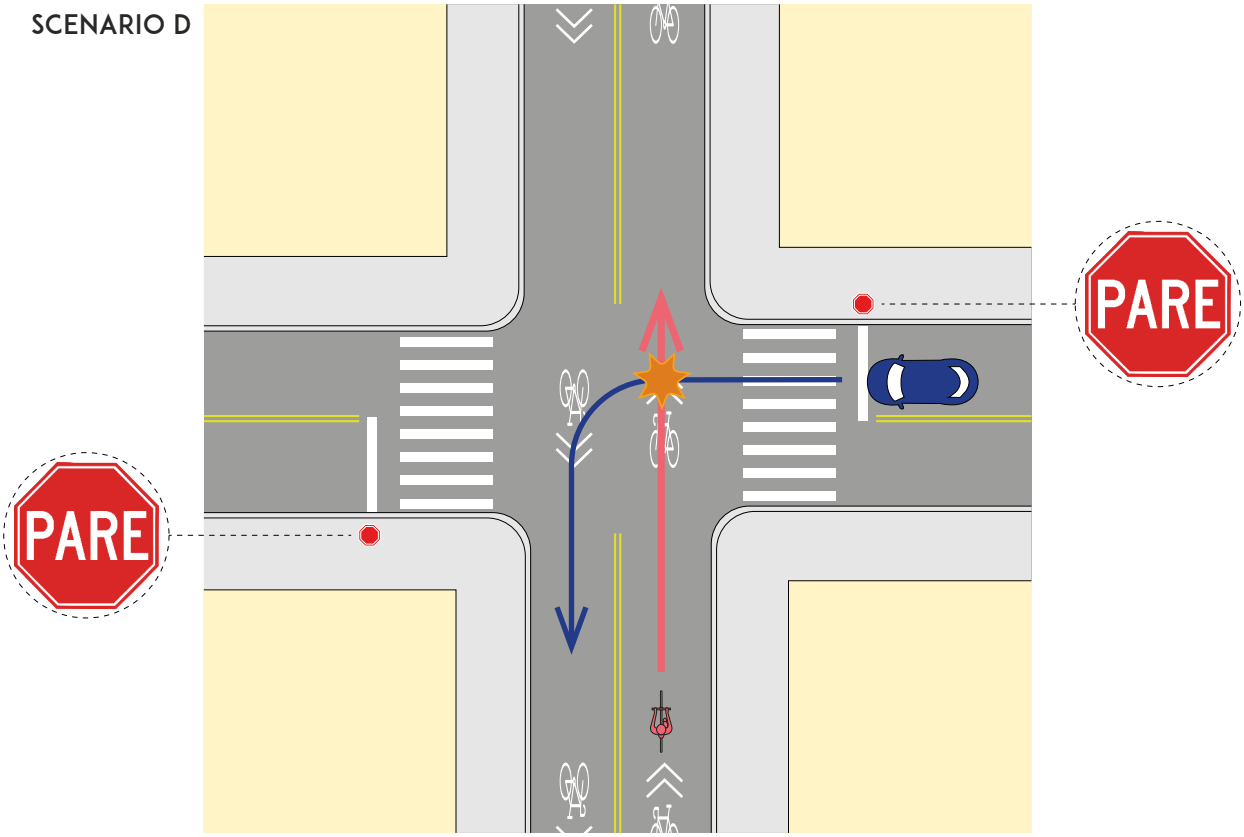
SCENARIO B



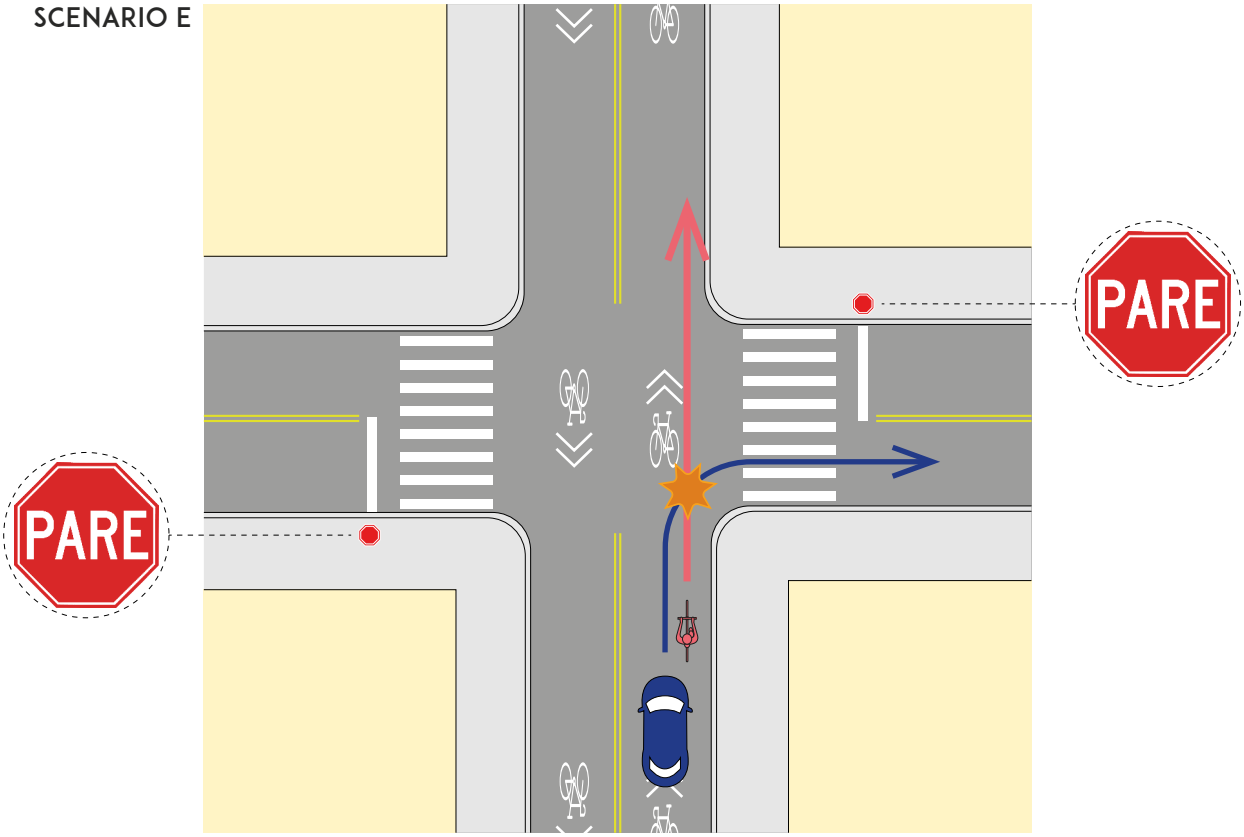
SCENARIO C



SCENARIO D



SCENARIO E



ROAD CHARACTERIZATION DATA TABULATION MODEL

Basic instructions:	1. The survey can be done during the week; 2. Enter data; 3. Label as Q.01 the block indicated as safest/ least safe; 4. Label as R.01 the street of the safest location; 5. Label as R.02 the street of the least safe location; 6. Start the survey from the beginning of the street; 7. Research members responsible for the field survey will also be responsible for data entry; 8. Complete the data sheet 02 with noted from the field and observations; 9. Enter the fieldwork report.

Research member:	**Douglas Farias**
Date:	**18.11.2021**

	Indicator	Indicator	Description of collected data	Unit	Street 01: Rua Vergueiro (block next to the opposite lane to Dr. Afonso Afrodísio Vidigal)		Street 02: Rua Tabatinguera (even side)	
					Block code			
					Q.01.R.01	observation Q.01. R.01	Q.01.R.02	observation Q.01. R.02
Measured with Google Maps.		EXTENSÃO DA QUADRA	Extension of the block in meters	Meters	odd: 155 even: 52 cycle: 84		540	
Measured in steps or tape measure.		SIDEWALK	Predominant width in meters of the public sidewalk	Meters	odd: 4,5 even: 0		3,3	
Counting done by local observation.		CARRIAGEWAY	Predominant width in meters of the carriageway	Meters	odd: 11,5 even: 11,5		10	
Counting done by local observation.		PHYSICAL PERMEABILITY	Estimation of the number of establish-ments on the block	Number of establishments	odd: 12 even: 0		56	
Counting done by local observation.	Built environment	LAND USE	Residential (houses of lobbys)	Number of establishments	odd: 1 even: 0		12	
			Hotel	Number of establishments	odd: 1 even: 0		0	
			Cultural (culture centers, theater, cinema,...)	Number of establishments	odd: 0 even: 0		0	
			Educational	Number of establishments	odd: 0 even: 0		1	
			Religious	Number of establishments	odd: 0 even: 0		1	
			Institutional	Number of establishments	odd: 0 even: 0		2	
			Business (offices, commercial rooms, companies, etc)	Number of establishments	odd: 2 even: 0		0	
			Stores	Number of establishments	odd: 1 even: 0		5	
			Services (bank, beauty salon, gym,...)	Number of establishments	odd: 2 even: 0		13	
			Bar, restaurant, bakery, snack bar	Number of establishments	odd: 3 even: 0		4	
			Supermarket, grocery store	Number of establishments	odd: 0 even: 0		0	
			Empty	Number of establishments	odd: 0 even: 0		2	
			Undefined	Number of establishments	odd: 1 even: 0		11	
			Under construction/ renovation	Number of establishments	odd: 0 even: 0		1	
			Parking lot	Number of establishments	odd: 2 even: 0		3	
			Gas staion	Number of establishments	odd: 0 even: 0		0	
			Square/green spaces	Number of establishments	odd: 0 even: 1		0	
			Shopping malls/galleries	Number of establishments	odd: 0 even: 0		1	
			Nightclub	Number of establishments	odd: 0 even: 0		0	

			Sport related	Number of establishments	odd: 0 par: 0		0	
		Road direction	Directions of the tracks: one-way (unidirectional), two-way (biderectional).	Written indications	double		single	
		Regulatory road speed (for motor vehicles)	Track speed limit. Check for signage	Speed	50		40	
Local observation.		Type of pavement	Asphalt, cobblestone, dirt, etc.	Written indications	Asphalt		Asphalt	
		Condition of the pavement	Good conditions, light signs of use, signs of overuse, etc	Written indications	Slight overuse		No overuse	
		Presence of physical obstacles on the road	Presence of physical obstacles on the road	Indications in text and number	None		None	
Counting done by local observation.		Street lighting	Street lighting	Number of poles on the sidewalk	odd: 0 even: 1 cycle: 3		9	
		Horizontal Signaling	Horizontal signaling on the road	Written indications	Traffic lanes; Exclusive bus lanes		Traffic lanes	
Local observation.		Vertical signaling specific for cyclists	Vertical signalling specific for cyclists	Written indications	Yes		No	
Counting done by local observation.		Number of lanes	Specify flow and parking lanes, and uses: vehicles, bus-only, cycling lane	Number of lanes specified by type	6 traffic lanes; 2 exclusive bus lanes		3 traffic lanes; 1 parking lane	
Counting done by local observation.		On-street parking	If available, indicate type (parallel, 30º, 45º, 60º, 90º) and number of spaces along the court	Indications in text and number	None		None	The existing spaces are only on the odd side of the street
Local observation.		Road topography	Topographical characterization (flat, slight or steep slopes)	Written indications	Slight slopes		Steep terrain	
Counting done by local observation.		Shading and greenery on the roadway*	Trees	Number of trees	odd: 9 even: 4 cycle: 0		29	
	Risk perception and points of conflict	Motor vehicle traffic volume	Indication: light, moderate, high	Written indications	high		moderate	
		Visibility at the intersection - corner 1	Type of intersection: signalized or not, T, +, Y. Indicate visibility of cyclists to cross.	Written indications	"Traffic light; +; visible cyclist"		traffic light; +; low visibility of cyclist	Due to the absence of an exclusive lane
		Visibility at the intersection - corner 2	Type of intersection: signalized or not, T, +, Y. Indicate visibility of cyclists to cross.	Written indications	"Traffic light; +; visible cyclist"		traffic light; T; low visibility of cyclist	Due to the absence of an exclusive lane
Local observation.		Visibility at the intersection - corner 1	Indicate in case of conflicts between cyclists and other users (other cyclists, pedestrians, vehicles, etc)	Written indications	None		Cyclists and vehicles; cyclist and pedestrian (if using the sidewalk)	Intersection with several lanes and no dedicated bike lane.
		Visibility at the intersection - corner 2	Indicate in case of conflicts between cyclists and other users (other cyclists, pedestrians, vehicles, etc)	Written indications	None		Cyclists and vehicles; cyclist and pedestrian (if using the sidewalk)	Intersection with several lanes and no dedicated bike lane.
		Conflicts at roundabouts	Concrete case. Overlapping flows between vehicles, bicycles, etc.	Written indications	No roundabout		No roundabout	
Counting done by local observation.		Number of Motor Vehicle Entrances	Number of incoming/ outgoing vehicles at neighboring establishments	Number of accesses (garages, parking spaces)	odd: 7 even: 0		26	
Local observation.		Lane preference for cycling	Position on the track where most cyclists ride	Written indications	Bike lane		Sidewalk	
Counting done by local observation.		Bicycle parking infrastructure and availability	Number of bike racks	Number of bicycle racks	odd: 6 even: 0		0	

Local observation.	Cycling suitability of the built environment	Support points for cyclists	Support points for cyclists, furniture that can be used by cyclists	Indications in text and number	None	Only bike racks	None	
		Presence of bicycle lanes/ tracks	Existence of cycling infrastructure, by type	Indications in text and number	1 Two-way cycle track		None	
		Connection to cycling network	Whether the structure is isolated or connected to other cycling infrastructure	Indications in text and number	Connected		No cycling infrastructure	
		Protection of the cycling lane/ track	If the structure has any protection. E.g.: parking blocks, medians, etc.	Written indications	Median strip; metal barrier in part of the stretch		No cycling infrastructure	

9
ATTACHMENTS

ATTACHMENT A

LAW Nº 17.322, 18 OF MARCH OF2020 - CYCLELOGISTICS LAW OF SÃO PAULO

LAW Nº 17.322, 18 OF MARCH OF2020 - CYCLELOGISTICS LAW OF SÃO PAULO

Diário Oficial

Cidade de São Paulo

Bruno Covas - Prefeito

Ano 65 | São Paulo, quinta-feira, 19 de março de 2020 | Número 53

GABINETE DO PREFEITO

BRUNO COVAS

LEIS

LEI Nº 17.319, DE 18 DE MARÇO DE 2020

(PROJETO DE LEI Nº 862/17, DO VEREADOR TONINHO PAIVA - PL)

Altera a denominação do Centro Esportivo Tietê para Centro Esportivo Tietê – Jornalista Hélio Ribeiro, e dá outras providências.

BRUNO COVAS, Prefeito do Município de São Paulo, no uso das atribuições que lhe são conferidas por lei, faz saber que a Câmara Municipal, em sessão de 12 de fevereiro de 2020, decretou e eu promulgo a seguinte lei:

Art. 1º Fica alterada a denominação do Centro Esportivo Tietê, situado na Avenida Santos Dumont nº 843, Distrito do Bom Retiro, Subprefeitura Sé, para Centro Esportivo Tietê – Jornalista Hélio Ribeiro.

Art. 2º As despesas decorrentes da execução desta Lei correrão por conta das dotações orçamentárias próprias, suplementadas se necessário.

Art. 3º Esta Lei entra em vigor na data de sua publicação, revogadas as disposições em contrário.

PREFEITURA DO MUNICÍPIO DE SÃO PAULO, aos 18 de março de 2020, 467º da fundação de São Paulo.

BRUNO COVAS, PREFEITO

ORLANDO LINDÓRIO DE FARIA, Secretário Municipal da Casa Civil

RUBENS NAMAN RIZEK JUNIOR, Secretário Municipal de Justiça

Publicada na Casa Civil, em 18 de março de 2020.

LEI Nº 17.320, DE 18 DE MARÇO DE 2020

(PROJETO DE LEI Nº 658/18, DOS VEREADORES ISAC FÉLIX – PL, ADRIANA RAMALHO – PSDB, EDUARDO TUMA – PSDB, NOEMI NONATO – PL E PATRÍCIA BEZERRA – PSDB)

Dispõe sobre concessão de auxílio-aluguel às mulheres vítimas de violência doméstica, no Município de São Paulo, e dá outras providências.

BRUNO COVAS, Prefeito do Município de São Paulo, no uso das atribuições que lhe são conferidas por lei, faz saber que a Câmara Municipal, em sessão de 12 de fevereiro de 2020, decretou e eu promulgo a seguinte lei:

Art. 1º O auxílio-aluguel previsto na legislação municipal será concedido, sem prejuízo dos beneficiários constantes nas normas regulamentadoras, às mulheres vítimas de violência doméstica, em extrema situação de vulnerabilidade.

Art. 2º O auxílio de que trata o art. 1º será concedido às mulheres que se enquadrem nos seguintes critérios:

I - mulher atendida por medida protetiva prevista na Lei Federal nº 11.340, de 7 de agosto de 2006 – Lei Maria da Penha;

II - (VETADO)

Art. 3º (VETADO)

Parágrafo único. (VETADO)

Art. 4º O benefício é temporário, e será concedido pelo prazo de 12 (doze) meses e poderá ser prorrogável apenas uma vez por igual período, mediante justificativa técnica.

Art. 5º (VETADO)

Art. 6º O Poder Executivo regulamentará esta Lei no prazo de 120 (cento e vinte) dias contados da data de sua publicação.

Art. 7º As despesas com a execução da presente Lei correrão por conta das dotações orçamentárias próprias, suplementadas se necessário.

Art. 8º Esta Lei entra em vigor na data de sua publicação, revogadas as disposições em contrário.

PREFEITURA DO MUNICÍPIO DE SÃO PAULO, aos 18 de março de 2020, 467º da fundação de São Paulo.

BRUNO COVAS, PREFEITO

ORLANDO LINDÓRIO DE FARIA, Secretário Municipal da Casa Civil

RUBENS NAMAN RIZEK JUNIOR, Secretário Municipal de Justiça

Publicada na Casa Civil, em 18 de março de 2020.

LEI Nº 17.321, DE 18 DE MARÇO DE 2020

(PROJETO DE LEI Nº 30/19, DO VEREADOR XEXÉU TRIPOLI – PV)

Dispõe sobre normas de funcionamento dos zoológicos e similares situados no âmbito do Município de São Paulo e dá outras providências.

BRUNO COVAS, Prefeito do Município de São Paulo, no uso das atribuições que lhe são conferidas por lei, faz saber que a Câmara Municipal, em sessão de 12 de fevereiro de 2020, decretou e eu promulgo a seguinte lei:

Art. 1º Esta Lei tem o intuito de dispor sobre normas de funcionamento dos zoológicos e similares situados no âmbito do Município de São Paulo, para fins de cumprimento das funções de educação, pesquisa e conservação das espécies nativas ameaçadas.

§ 1º Para efeitos desta Lei, considera-se zoológico qualquer coleção de animais silvestres nativos e exóticos mantidos vivos em cativeiro ou em semiliberdade e expostos à visitação pública.

§ 2º Aplica-se o disposto nesta Lei também aos aquários e congêneres.

DAS DIRETRIZES

Art. 2º Os zoológicos de que trata o art. 1º deverão observar as seguintes diretrizes:

I – (VETADO)

II - (VETADO)

III - (VETADO)

IV - (VETADO)

V - priorizar a adoção de medidas de reabilitação e restituição dos animais à natureza, quando esta for possível.

Parágrafo único. (VETADO)

Art. 3º Os zoológicos ou similares abrangidos por esta Lei, com vistas à diminuição paulatina da exposição de animais, deverão realizar estudos para o desenvolvimento de técnicas de realidade virtual.

DAS VISITAS

Art. 4º (VETADO)

Art. 5º Os estabelecimentos de que trata esta Lei deverão adotar providências no sentido de colocar avisos alertando aos frequentadores de que os animais são seres capazes de sentir e vivenciar emoções e que não devem ser expostos a ruídos excessivos e agressões de qualquer tipo.

Art. 6º (VETADO)

DOS CONVÊNIOS E PATROCÍNIOS

Art. 7º Os zoológicos poderão celebrar convênios com organizações não governamentais para fins educativos, com instruções sobre a vida animal e formas de preservação de seu bem-estar, entre outros.

Art. 8º Os zoológicos poderão buscar patrocinadores para aumentar suas fontes de custeio.

DAS DISPOSIÇÕES FINAIS

Art. 9º Fica proibida a instalação de novos zoológicos no âmbito do Município de São Paulo.

Art. 10. A fiscalização da presente Lei será realizada pelo órgão competente, nos termos da regulamentação.

Art. 11. Esta Lei entra em vigor na data de sua publicação, revogadas as disposições em contrário.

PREFEITURA DO MUNICÍPIO DE SÃO PAULO, aos 18 de março de 2020, 467º da fundação de São Paulo.

BRUNO COVAS, PREFEITO

ORLANDO LINDÓRIO DE FARIA, Secretário Municipal da Casa Civil

RUBENS NAMAN RIZEK JUNIOR, Secretário Municipal de Justiça

Publicada na Casa Civil, em 18 de março de 2020.

LEI Nº 17.322, DE 18 DE MARÇO DE 2020

(PROJETO DE LEI Nº 31/19, DO VEREADOR CAIO MIRANDA CARNEIRO - PSB)

Cria a Política Municipal de Ciclologística, que visa regulamentar, promover, estimular e monitorar a logística sustentável na cidade de São Paulo, e dá outras providências.

BRUNO COVAS, Prefeito do Município de São Paulo, no uso das atribuições que lhe são conferidas por lei, faz saber que a Câmara Municipal, em sessão de 12 de fevereiro de 2020, decretou e eu promulgo a seguinte lei:

Art. 1º Fica criada a Política Municipal de Ciclologística, que visa regulamentar, promover, estimular e monitorar a logística sustentável na cidade de São Paulo.

Parágrafo único. Entende-se por ciclologística o transporte de bens e serviços feitos por bicicletas e triciclos à propulsão humana ou eletricamente assistidos.

Art. 2º (VETADO)

Art. 3º (VETADO)

§ 1º (VETADO)

§ 2º (VETADO)

Art. 4º (VETADO)

Art. 5º Não poderão os bicicletários públicos ou privados proibir o estacionamento de bicicletas ou triciclos de carga.

§ 1º (VETADO)

§ 2º (VETADO)

Art. 6º Edifícios privados comerciais e edifícios públicos que possuirem bicicletários deverão permitir seu uso para parada rápida, durante horário comercial, por entregadores enquanto realizarem entrega no estabelecimento.

Parágrafo único. (VETADO)

Art. 7º Fica permitido o estacionamento de bicicletas e triciclos cargueiros nas vagas existentes em vias públicas.

Parágrafo único. Em áreas de intensa atividade comercial poderão ser delimitadas vagas específicas para esse fim ou criados bolsões de parada rápida com paraciclos.

Art. 8º As empresas de entrega por bicicletas e triciclos que tenham sede e atuação na cidade de São Paulo, bem como os aplicativos de entregas que fazem uso da ciclologística, deverão disponibilizar gratuitamente aos seus ciclistas estrutura mínima que envolva bebedouros, banheiros, área para carregadores de celular e armários.

Art. 9º (VETADO)

Parágrafo único. (VETADO)

Art. 10. As empresas de logística e entregas por bicicletas e triciclos que tenham sede e atuação na cidade de São Paulo, bem como os aplicativos de entrega que fazem uso da ciclologística, deverão disponibilizar dados ao Poder Público Municipal que o auxilie na elaboração da política de Ciclologística, conforme definido em regulamentação.

Art. 11. As empresas de entrega por bicicletas e triciclos com sede e atuação na cidade de São Paulo, bem como os aplicativos de entregas que fazem uso da ciclologística, deverão disponibilizar cursos gratuitos de formação e capacitação para seus ciclistas, cujo conteúdo deverá ser aprovado previamente pelos órgãos técnicos competentes.

Art. 12. Programas de formação e capacitação para o setor de ciclologística, realizados pelo Poder Público Municipal, serão instituídos por decreto regulamentador e deverão priorizar jovens em primeiro emprego, pessoas em situação de vulnerabilidade social e pessoas com deficiência.

Art. 13. A Administração Pública Municipal poderá permitir sistema de compartilhamento de bicicletas e triciclos de carga, incentivando a economia colaborativa e a logística sustentável na cidade.

Art. 14. A adoção e promoção da ciclologística por estabelecimentos terá sua importância reconhecida pela Administração Pública Municipal através da concessão do selo municipal "Logística Sustentável", visando estimular a adoção da ciclologística na cidade de São Paulo.

Parágrafo único. Os requisitos para concessão do selo serão definidos por norma regulamentadora, que poderá prever incentivos fiscais e gradações de selos, conforme o incentivo concedido pela empresa.

Art. 15. As despesas decorrentes desta Lei correrão por conta de dotações orçamentárias próprias, suplementadas se necessário.

Art. 16. As disposições desta Lei serão regulamentadas por decreto do Poder Executivo Municipal em 90 (noventa) dias.

Art. 17. Esta Lei entra em vigor na data de sua publicação, revogadas as disposições em contrário.

PREFEITURA DO MUNICÍPIO DE SÃO PAULO, aos 18 de março de 2020, 467º da fundação de São Paulo.

BRUNO COVAS, PREFEITO

ORLANDO LINDÓRIO DE FARIA, Secretário Municipal da Casa Civil

RUBENS NAMAN RIZEK JUNIOR, Secretário Municipal de Justiça

Publicada na Casa Civil, em 18 de março de 2020.

LEI Nº 17.323, DE 18 DE MARÇO DE 2020

(PROJETO DE LEI Nº 103/19, DOS VEREADORES FÁBIO RIVA – PSDB E ADRIANA RAMALHO – PSDB)

Altera a Lei nº 16.518, de 22 de julho de 2016, para dispor sobre o ingresso de pessoas com deficiência visual, acompanhadas de cão-guia, em veículos que atuam em atividade econômica privada de transporte individual remunerado de passageiros por meio de Operadoras de Tecnologia de Transporte Credenciadas – OTTCs.

BRUNO COVAS, Prefeito do Município de São Paulo, no uso das atribuições que lhe são conferidas por lei, faz saber que a Câmara Municipal, em sessão de 12 de fevereiro de 2020, decretou e eu promulgo a seguinte lei:

Art. 1º A Lei nº 16.518, de 22 de julho de 2016, passa a vigorar com as seguintes alterações:

"Art. 1º Esta Lei regulamenta, na cidade de São Paulo, o direito de pessoas com deficiência visual ingressarem com cão-guia nos veículos providos de taxímetros (táxis) e veículos que prestem serviços em atividade econômica privada de transporte individual remunerado de passageiros por meio das Operadoras de Tecnologia de Transporte Credenciadas – OTTCs no âmbito do Município." (NR)

"Art. 2º É vedada a exigência do uso de focinheira nos cães-guia para o ingresso nos táxis e nos veículos que prestem serviços em atividade econômica privada de transporte individual remunerado de passageiros por meio das Operadoras de Tecnologia de Transporte Credenciadas – OTTCs." (NR)

"Art. 3º É vedada a cobrança de valores, tarifas ou acréscimos vinculados, direta ou indiretamente, ao ingresso ou à presença de cão-guia nos táxis e nos veículos que prestem serviços em atividade econômica privada de transporte individual remunerado de passageiros por meio das Operadoras de Tecnologia de Transporte Credenciadas – OTTCs de que trata esta Lei." (NR)

"Art. 7º .....

Parágrafo único. Nos casos de descumprimento desta Lei por condutores de veículos que prestam atividade econômica privada de transporte individual remunerado de passageiros, será considerada infratora nos termos deste artigo e ficará sujeita ao pagamento de multa a Operadora de Tecnologia de Transporte Credenciada – OTTC responsável pela intermediação entre o motorista que descumpriu a presente Lei e a pessoa com deficiência visual que teve o seu direito ofendido, garantido o contraditório e a ampla defesa." (NR)

Art. 2º Esta Lei entra em vigor na data de sua publicação.

PREFEITURA DO MUNICÍPIO DE SÃO PAULO, aos 18 de março de 2020, 467º da fundação de São Paulo.

BRUNO COVAS, PREFEITO

ORLANDO LINDÓRIO DE FARIA, Secretário Municipal da Casa Civil

RUBENS NAMAN RIZEK JUNIOR, Secretário Municipal de Justiça

Publicada na Casa Civil, em 18 de março de 2020.

LEI Nº 17.324, DE 18 DE MARÇO DE 2020

(PROJETO DE LEI Nº 502/19, DOS VEREADORES EDUARDO TUMA – PSDB E JANAÍNA LIMA - NOVO)

Institui a Política de Desjudicialização no âmbito da Administração Pública Municipal Direta e Indireta.

BRUNO COVAS, Prefeito do Município de São Paulo, no uso das atribuições que lhe são conferidas por lei, faz saber que a Câmara Municipal, em sessão de 12 de fevereiro de 2020, decretou e eu promulgo a seguinte lei:

CAPÍTULO I

DAS DISPOSIÇÕES GERAIS

Art. 1º Esta Lei institui a Política de Desjudicialização no âmbito da Administração Pública Municipal Direta e Indireta, com os seguintes objetivos:

I - reduzir a litigiosidade;

II - estimular a solução adequada de controvérsias;

III - promover, sempre que possível, a solução consensual dos conflitos;

IV - aprimorar o gerenciamento do volume de demandas administrativas e judiciais.

Parágrafo único. A política de que trata esta Lei visa atender às disposições das Leis Federais nº 10.259, de 12 de julho de 2001, nº 12.153, de 22 de dezembro de 2009, nº 13.105, de 16 de março de 2015, e nº 13.140, de 26 de junho de 2015, bem como das leis que vierem a substituí-las.

Art. 2º A Política de Desjudicialização será coordenada pela Procuradoria Geral do Município, cabendo-lhe, dentre outras ações:

I - dirimir, por meios autocompositivos, os conflitos entre órgãos e entidades da Administração Pública Municipal Direta e Indireta;

II - avaliar a admissibilidade de pedidos de resolução de conflitos, por meio de composição, no caso de controvérsia entre particular e a Administração Pública Municipal Direta e Indireta;

III - requisitar, aos órgãos e entidades da Administração Pública Municipal, informações para subsidiar sua atuação;

IV - promover o arbitramento das controvérsias não solucionadas por meios autocompositivos, na hipótese do inciso I;

V - promover, no âmbito de sua competência e quando couber, a celebração de termo de ajustamento de conduta nos casos submetidos a meios autocompositivos;

VI - fomentar a solução adequada de conflitos, no âmbito de seus órgãos de execução;

VII - propor, em regulamento, a organização e a uniformização dos procedimentos e parâmetros para a celebração de acordos envolvendo a Administração Direta, bem como as autarquias e fundações representadas judicialmente pela Procuradoria Geral do Município, nos termos desta Lei;

VIII - disseminar a prática da negociação;

IX - coordenar as negociações realizadas por seus órgãos de execução;

X - identificar e fomentar práticas que auxiliem na prevenção da litigiosidade;

XI - identificar matérias elegíveis à solução consensual de controvérsias.

Parágrafo único. (VETADO)

CAPÍTULO II

DOS INSTRUMENTOS PARA A SOLUÇÃO ADEQUADA DE CONTROVÉRSIAS

Seção I

Dos acordos

Art. 3º A celebração de acordos para a solução consensual de controvérsias dependerá da prévia análise de sua vantajosidade e viabilidade jurídica em processo administrativo, observados os seguintes critérios:

I - o conflito deve versar sobre direitos disponíveis ou sobre direitos indisponíveis que admitam transação;

II - antiguidade do débito;

III - garantia da isonomia para qualquer interessado em situação similar que pretenda solucionar o conflito consensualmente;

IV - edição de ato regulamentar das condições e parâmetros objetivos para celebração de acordos a respeito de determinada controvérsia quando for o caso;

V - capacidade contributiva;

VI - qualidade da garantia.

§ 1º O consenso das partes envolvendo direitos indisponíveis que admitam transação deve ser homologado em juízo, exigida a oitiva do Ministério Público, nos termos das Leis Federais nº 13.105, de 2015, e nº 13.140, de 2015.

§ 2º O disposto no § 1º deste artigo não se aplica ao termo de compromisso de ajustamento de conduta e outras hipóteses em que a lei dispense a oitiva do Ministério Público e a homologação judicial.

§ 3º A autocomposição poderá versar sobre todo o conflito ou parte dele.

§ 4º Nos conflitos judiciais, a autocomposição poderá abranger o reconhecimento da procedência do pedido formulado na ação ou na reconvenção, a transação ou a renúncia à pretensão formulada na ação ou na reconvenção.

§ 5º (VETADO)

Art. 4º Os acordos de que trata esta Lei poderão consistir no pagamento de débitos limitados até o valor de R$ 510.000,00 (quinhentos e dez mil reais) para as dívidas tributárias e não tributárias, em parcelas mensais e sucessivas, não se aplicando aos acordos firmados em Programas de Parcelamento Incentivado – PPI anteriores à publicação desta Lei, regidos por legislação própria.

§ 1º A efetivação do parcelamento, por qualquer forma, implica confissão irretratável do débito e renúncia ao direito sobre o qual se funda a defesa ou recurso interposto no âmbito administrativo ou judicial, observando-se o regramento próprio dos créditos municipais, inclusive em relação aos acréscimos legais.

§ 2º Independentemente da origem ou natureza do débito, se inadimplida qualquer parcela, após 60 (sessenta) dias, instaurar-se-á o processo de execução ou nele prosseguir-se-á pelo saldo consolidado originalmente, devidamente corrigido, subtraindo-se os valores já pagos.

§ 3º (VETADO)

§ 4º (VETADO)

§ 5º (VETADO)

Art. 5º A autorização para a realização dos acordos previstos nesta Lei, inclusive os judiciais, será conferida:

I - pelo Procurador Geral do Município, diretamente ou mediante delegação, quando a controvérsia envolver a Administração Direta, bem como as autarquias e fundações representadas judicialmente pela Procuradoria Geral do Município;

II - pelo dirigente máximo das entidades de direito público, diretamente ou mediante delegação, quando a controvérsia envolver as autarquias e fundações não representadas judicialmente pela Procuradoria Geral do Município;

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PROGRAMA DE PÓS-GRADUAÇÃO EM URBANISMO

LABMOB Laboratório de Mobilidade Sustentável

Source: Adriana Marmo, 2021.