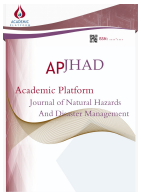

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Urban Mobility in Covid-19: How We Adapted to Change and How Should We Respond

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Abstract

Starting with late 2019, we have been struggling with the Covid-19 pandemic. An unprecedented change in our mobility needs and behaviour forced us to reshape our thinking of transportation networks and urban mobility. From a disaster management perspective, transportation networks are crucial for providing mobility in response, recovery, and preparedness. In such disasters, the monitoring and use of transportation networks become a very complex problem as the needs and priorities of individuals change dramatically. With the COVID-19 pandemic, difficult circumstances created a shift to personal vehicles including automobiles, motorcycles, bicycles, and scooters as well as increased walking. This study is carried out to understand the mobility changes and public behaviour during pandemic and normalization periods, and discussing strategic responses for policymakers and service providers. The focus of the study is four major cities in Turkey and nationwide trends. The data source includes walking and driving trends and accessibility of locations in certain categories. The mobility data shows that there is a significant increase in walking and driving personal vehicles as opposed to using public transportation. Additionally, a shift from shopping malls to open spaces and parks indicates that the public use precaution in response to pandemic conditions. Lastly, the flexible and remote working hours reduced the density of workplaces in urban centers. Considering the temporary demand increase in bicycles, scooters, and motorcycles, it is suggested that policymakers should focus on improving micromobility infrastructure in urban centers to make this temporary increase permanent. Additionally, planning and operational activities in public transportation should be managed accordingly to meet dynamically changing demand, and public needs and priorities including sanitary conditions and in-vehicle spacing to accommodate pandemic conditions.

Key words: Urban Mobility, Covid-19, Resiliency, Transportation Policy, Disaster Management

1. Introduction

Transportation has a critical role both in our daily life and in national and international integrations. Transport networks are cruical in our daily activities such as school, work, and leisure-related mobilities; in the delivery of our needs; in commercial and economic activities; in security and national defense requirements; and many more. In this context, the quality and efficiency of transportation networks ensure that all these mobility needs are met in an economical, safe, and efficient manner. On the other hand, the concept of mobility, which has been increasingly used in recent years, refers to 'accessibility' rather than meeting the need for

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transportation with 'vehicle ownership' [1]. Within vertical-growing urbanization, vehicle ownership is becoming an issue both economically and practically due to congestion and time loss, which promotes the shift to mobility. The efficiency of public transportation systems can be a good example for increased mobility as well as the use of shared vehicles (Mobility-as-a-Service) and micromobility vehicles (bicycle and scooters, etc.).

From a disaster management perspective, transportation networks play a critical role in natural and human-induced disasters, both for emergency response and disaster management and for the response and recovery of post-disaster effects in the medium- to long-term. In such disasters, the real-time monitoring and use of transportation networks become a very complex problem as the transportation needs and behaviors of individuals are very different from the normal. Disruption of transportation systems and infrastructure can be devastating as known from various historical events including earthquakes, hurricanes, and explosions [2].

In disasters we know it is coming like hurricanes, the transportation network has been extensively used for preparedness and evacuation before it hits and response and recovery after the damage. Understanding the real-time network behavior, as well as local and regional traffic and population dynamics, are critical for preparedness and first response. On the other hand, in disasters we face unexpectedly, like earthquakes or explosions, the immediate response becomes life-saving to alleviate the severity of the disaster. Transportation networks are used for emergency vehicles to reach affected areas for rescue operations; emergency relief bodies to distribute urgent needs like foods, water, hygiene products, medicine, etc.; and responsible agencies to work on removing debris, fixing broken water lines, electric outages, road infrastructure damages [3, 4]. Of course, the extensiveness of the damage and recovery time is directly related to the severity of the disaster and resiliency of the transportation network. If the transportation network is not resilient, providing much-needed goods and services will be interrupted, and the recovery time will be much longer [5]. Therefore, we can define the resiliency of transportation network as: maintaining the current level of service and restore quickly after disaster events; ensuring that the system performs well without significant failure under unexpected circumstances; ability to absorb the disruption to reduce the possible impact and maintain the mobility [2, 6].

In cases where we are in as of 2020, with the COVID-19 pandemic, an unprecedented change in our mobility needs and behavior forced us to reshape our thinking of transportation networks and urban mobility. Compared to the aforementioned disasters, the long-term and global impact of pandemic situations has changed the needs and priorities of people, the continuity of industrial activities, the working hours of private and public sector, and the ways in which authorities operate and manage the transport infrastructure [7, 8]. Therefore, understanding the change in mobility trends and behaviors during the restricted mobility and lockdown, and in normalization period, will enable decision-makers and transportation service providers to further evaluate and adjust the transportation network to meet the needs of the public in pandemic-like situations.

From a behavioral perspective, human mobility and behaviour under the influence of disasters is limited perhaps owing to the inherent unpredictability of disasters and resulting lack of data [9]. Most studies investigated the mobility behavior of people either just after the occurrence of severe and sudden disasters such as earthquakes and explosions to understand the first reaction (fear, confusion, anger, etc.) or expected natural disasters such as hurricanes to understand the evacuation behavior [9-11]. However, the COVID-19 case is different due to its spatial and temporal distribution, where the situation scattered across the world for months and

continue to do so. According to Drury and Guven [12], there is a chain reaction in public behaviour in this pandemic that the mortal threat causing fear, and it causes excessive behaviour in public. It is stated that this behaviour can be in the forms or over-reaction or under-reaction, but can highly be manipulated by news, rumors, and uncertanties. Within the concept our study, this can be in the form of over-reaction (rushing the supermarkets before lockdowns, avoiding shopping malls, preferring open spaces and parks, etc.) or under-reaction (not applying the flexible working hours and increasing the traffic in usual rush hours).

In this study, our aim is first to understand the mobility behavior of people in pandemic situations, second to evaluate the possible shifts in demand, and third to propose the most appropriate planning and operational policy suggestions in the short term for our new way of living. Our focus will be on monitoring the density of certain location categories in major cities in Turkey during the temporary lockdowns in the early phases of the pandemic and throughout the normalization process. Modeling the public mobility behavior is not considered within the scope of this study due to 1) we don't know what is normal or so-called "new normal" yet, and 2) the last year or historical mobility data is not available at this moment.

2. Methodology

The study is carried out by using the mobility data provided by Apple Inc. [13] and Google Inc. [14], in four major cities (Istanbul, Ankara, İzmir and Bursa) and national trends in Turkey. The data source provided by Apple includes daily driving and walking trends starting from January 13th, 2020. On the other hand, data from Google provides daily location access trends in six categories: retails & recreation, public transit, workplace, residential, grocery & pharmacy, and parks, starting from February 15th, 2020. Both data sources include daily trends in all categories listed until late August, and some categories continuously until mid-October, giving us the opportunity to evaluate the mobility trends before and during the mobility restrictions and lockdowns, and in the normalization phase.

Mobility and location services data was evaluated in three periods: before the first case and lockdowns (Period 1), during temporary lockdowns (Period 2), and normalization (Period 3). Period 1 covers from the first availability of data to March 8th for Apple Inc. data and March 2nd for Google Inc. data. In this period, the virus was affecting China and started to be seen in some European countries, not In Turkey [15]. The schools were open, work schedules were as usual, etc. After the first Covid-19 case was reported on March 11, the government decided to give a temporary break (turned into cancellation of all face-to-face education later for the semester) in all educational institutions, including K-12 and universities starting from March 16th.

Starting from breaks and later temporary and location-based lockdowns in April and May is considered as Period 2. In this period, schools, shopping malls, parks and recreational locations, restaurants, movie theaters, and locations that usually have high human interactions and less personal space were temporarily closed. Public transportation services were available with limited services and reduced in-vehicle capacity, and intercity transportation was restricted in all major cities, excluding key personnel. Public and private institutions and businesses were encouraged to have flexible working hours and remote working options. On public holidays and weekends, full lockdowns were applied, excluding the necessary personnel. Starting from June 1st, a gradual normalization process has been put in place by the government, enabling the opening of restaurants, shopping malls, hair salons, etc. with limited visitors and working hours. In this study, after June 1 was accepted as Period 3, where normalization has started (Figure 1).

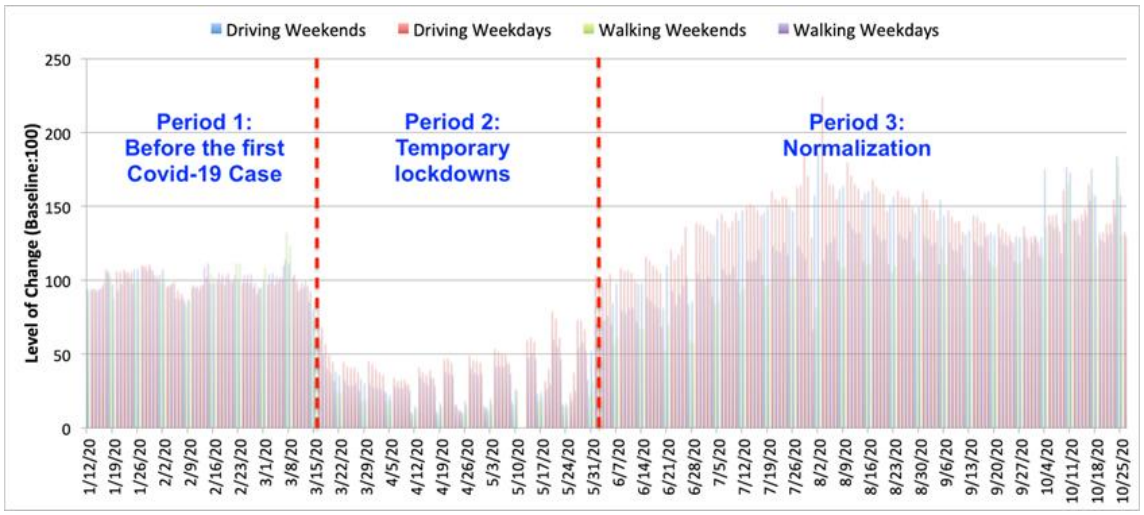

Figure 1: Normalized driving and walking trends in weekdays and weekends from mid-January to October.

Data includes driving and walking trends starting from mid-January and was received from mobile devices that enable the location services. Although, the data might seem biased to a certain brand of mobile device users, considering the population of the cities investigated in the study and the categorization in driving and walking only make the data reliable. On the other hand, Google provides location service data in six categories: retails & recreation, public transit, workplace, residential, grocery and pharmacy, parks. Again, considering the population of the cities and coverage of the Google-based location services in mobile phones ensures that the data is able to represent the population trends. Besides, both data sources include notifications if the amount of data does not meet the threshold criteria, and there are no notifications encountered in regions subject to this study [13, 14].

In period 1, a data normalization has been applied to the data sets since Apple data compare each day's mobility data with the first day in the dataset. Although this approach is not inaccurate, a normalization is expected to have a more meaningful comparison with period 2 and 3. In order to compare the mobility and location accessibility, it is expected that the mobility trends in the pandemic period will be compared with the same period in the previous year or with historical data. However, both are not available. Therefore, it is decided to calculate the day-of-week (DOW) averages in period 1 and compare the mobility trends in periods 2 and 3 with these averages. The following formula is used in normalizing the data in period 1:

$$DOW_i = \sum_{k=1}^{n} DOW_{ik} \,/n$$

DOW_i: i'th Day-of-week (i → 1 to 7)
k: k'th week in period 1
n: total weeks in period 1

After this normalization, an adjustment factor was used to set the DOW averages to the value of 100 to make the comparison easy to understand. Following formula is used in adjusting the data in Period 2 and 3 based on the adjustment factors:

$$M_j = M_{j0} * 100/DOW_i$$

M_j: j'th day mobility data (adjusted)
M_{j0}: j'th day mobility data (raw)
DOW_i: i'th Day-of-week (i → 1 to 7)

After this normalization, for instance, a Saturday mobility trend in Period 2 or 3 will be compared with averages of all Saturdays in Period 1 instead of just comparing the mobility value of January 13th, the first day of the data set, which is a Monday. It is expected that this approach will increase the interpretation of data considering the lack of historical data.

3. Evaluation of Mobility Trends

The pandemic mobility trends were evaluated based on the current categories of the data, presented in Table 1. The focus of the study was to evaluate and quantify 1) collapsing demand in public transportation and rise in personal vehicle use, 2) the effect of remote working in public and private institutions, and 3) shift from indoor activity centers (shopping malls) to open spaces.

Table 1. Location attractiveness categories and their coverage

Categories	Definitions
Driving[1]	Driving personal vehicles
Walking[1]	Walking in metropolitan area
Transit Stations[2]	Restaurant, cafe, shopping mall, amusement park, museum, library and mobility about places like cinema trends.
Workplaces[2]	Mobility trends in workplaces
Residentials[2]	Mobility trends in residential
Grocery an Pharmacy[2]	Grocery store, food store, market, specialty food shop where products are sold and mobility trends places like pharmacy.
Parks[2]	National parks, public beaches, marinas, dog parks, plazas and public mobility trends for places like parks.
Retail and Recreation[2]	Restaurant, cafe, shopping mall, amusement park, museum, library and mobility trends about places like cinema.

[1]Apple data categorization [2]Google data categorization

Evaluating the driving and walking behavior, a dramatic dropdown is visible in Period 2 with a %63.4 decrease in driving and %71.1 decrease in walking since most affected countries take serious precautions and lockdowns. As mentioned earlier, Turkey has enforced mandatory lockdown in all major cities on most weekends and public holidays. If lockdown days are removed from data, is it seen that driving and walking decreased by %57.2 and %64.5 respectively compared to baseline (Figure 2 and Figure 3). This is understandable since most people were afraid of exposing the virus, researchers were still trying to understand how it spreads and how can we protect ourselves, and officials were trying to adapt to the unsteadiness.

On the other hand, when evaluating the normalization period (Period 3), we are still towards using personal vehicles more nearly %39.1 compared to Period 1 (January and February 2020 –two weeks before the first case). This is the result of people still feel that traveling with public transport is less safe compared to car/motorcycle and micromobility vehicles [16]. Additionally, walking rates are still higher by %19.8, %19.3, and %34.1 for July, September, and October (first half) compared to Period 1 (Figure 2 and Figure 3).

Investigating at the density of transit stations, the change in mobility behavior of individuals has decreased considerably, as can be seen in period 2 due to lockdown. In this period, public transportation was generally used only by those who had to work, such as healthcare personnel and factory workers. However, in period 3, although the normalization has started, public transportation is still far from being ‘back to normal’. The average density of transit stations in Period 3 is %26 less in Istanbul (Figure 4) and Izmir, %16 less in Bursa, and %21 less in Ankara (Figure 5). The national average in this regard is %17 compared to Period 1. Considering the

large share of public transportation in pre-pandemic times in Turkey, it is safe to say that Turkey is among the countries quickly recovering the transit ridership. In fact, based on survey results, almost %90 think that transit ridership will recover at most %65-80 within a year [17]. Thus, volatility in demand is expected to push policymakers and service providers worry about the increasing cost of operations [16, 18-19].

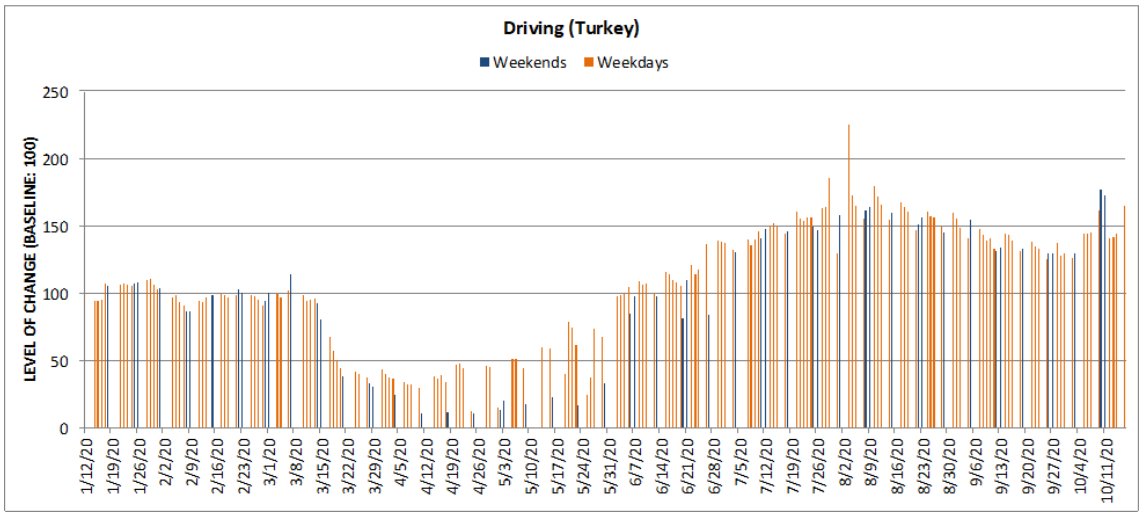

Figure 2. Driving trends in weekdays and weekends from mid-January to October 2020

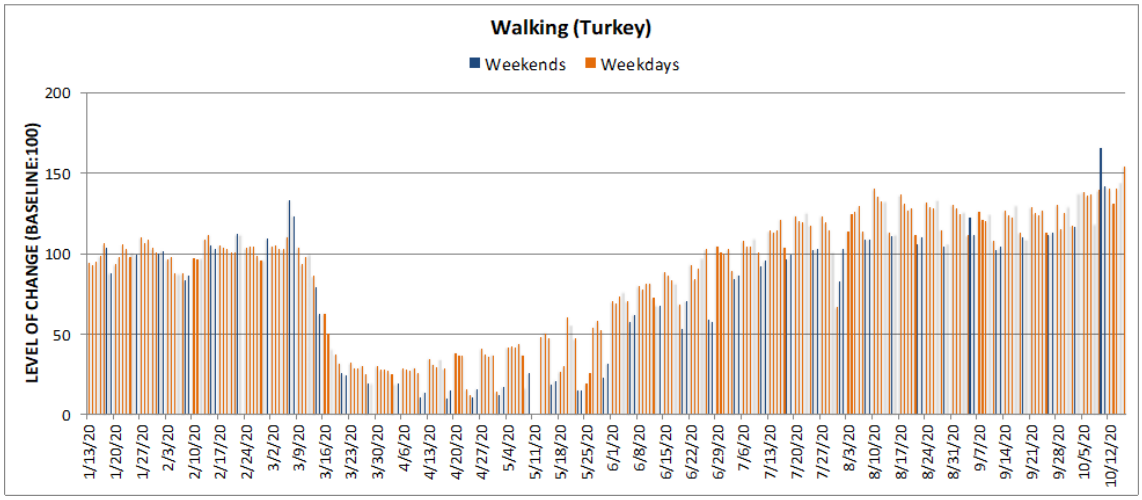

Figure 3. Walking trends in weekdays and weekends from mid-January to October 2020

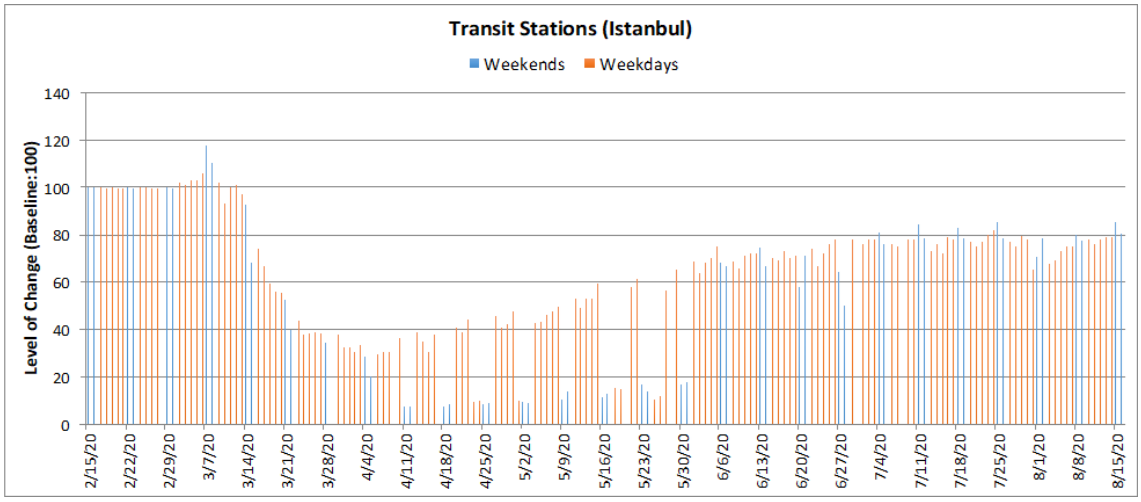

Figure 4. Demand in 'Transit Stations' from mid-Fabruary to August in Istanbul

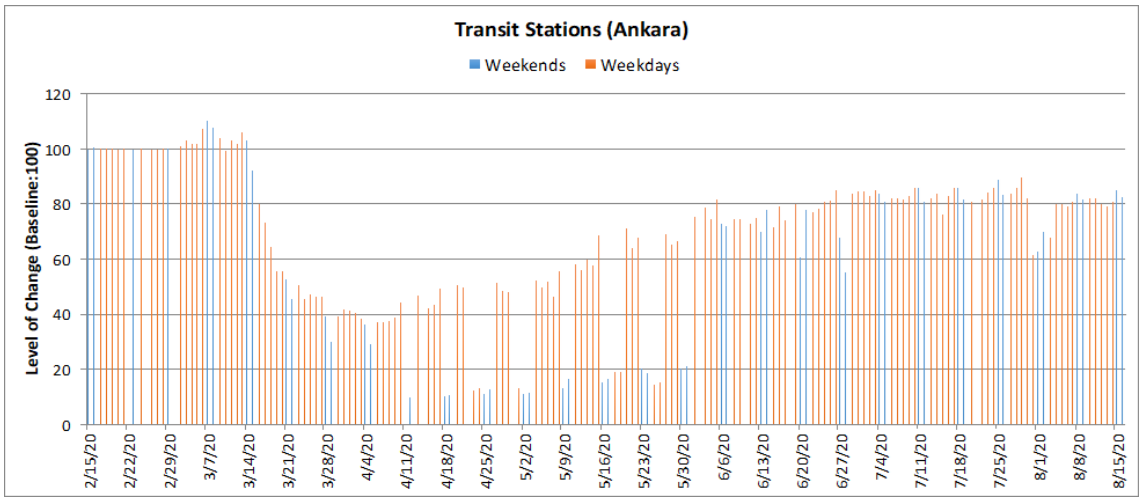

Figure 5. Demand in 'Transit Stations' from mid-February to August in Ankara

The trend in the workplace and residential categories show a rather expected trend. A sharp dropdown (almost %49) in demand density of workplaces in Period 2 resulted in an almost %19 increase in residential places (Figures 6 and 7). Travel restrictions and lockdowns boosted "staying home" by approximately %40 on weekends in Period 2 (Figure 6). On the other hand, evaluating the trends in Period 3 reveals that demand in workplaces decreased with an average of %24 in weekdays compared to the pre-pandemic time. This value is calculated as %24 in Bursa and Izmir, %29 in Istanbul, and %27 in Ankara. This can be explained by remote and/or flexible working hours both in public and private institutions. The weekday and weekend difference stood out in Figure 6 – Period 3 is expected to demonstrate the perception of remote working and flexible working hours between the public and private sectors.

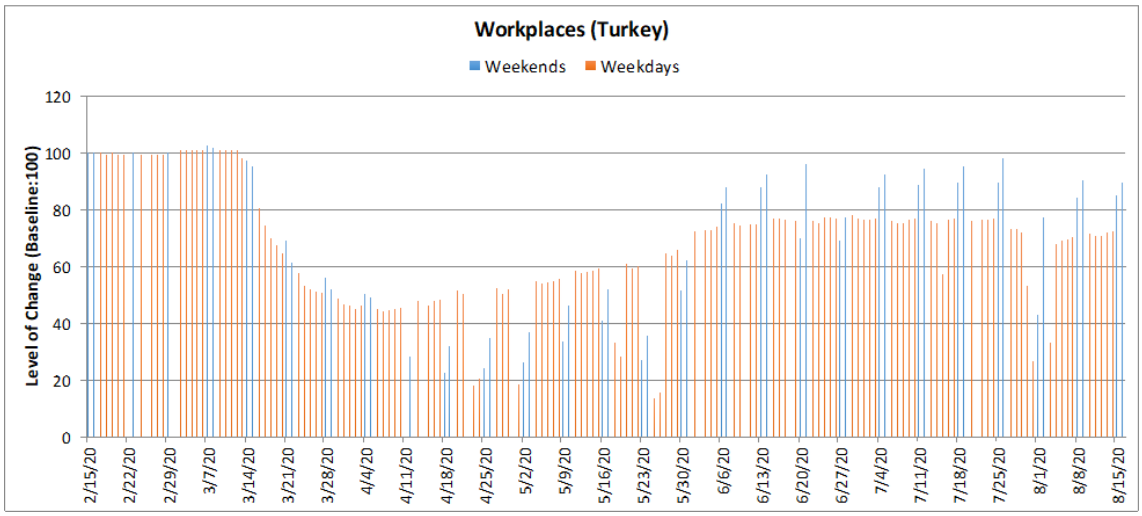

Figure 6. Demand in 'Workplaces' from mid-February to August, national average

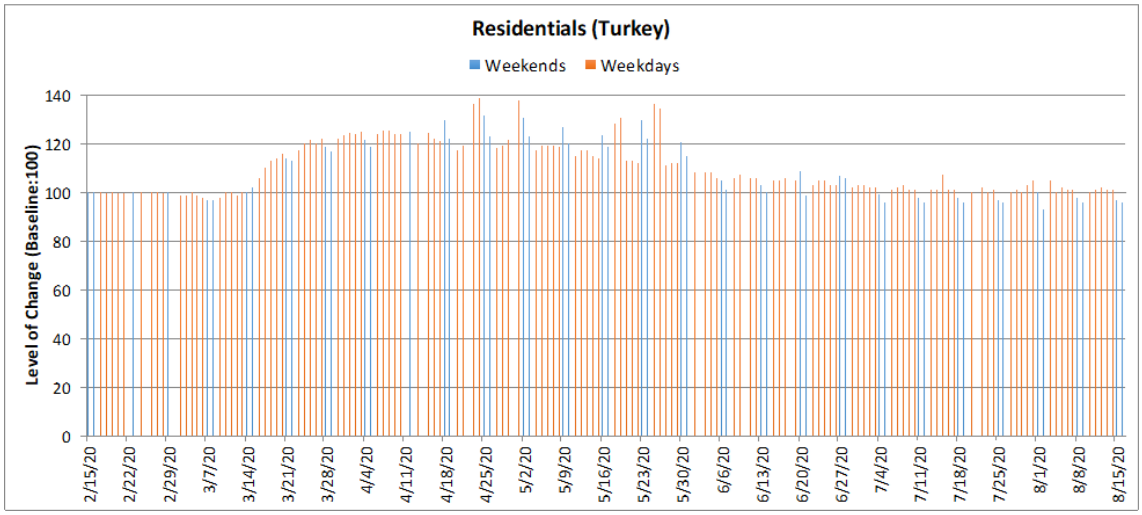

Figure 7. Demand in 'Residential' areas from mid-February to August, national average

In the grocery and pharmacy category, the focus will be directed to Period 2. As revealed in Figure 8, specifically in April and May where travel restrictions and temporary lockdowns are in place, weekday demand in grocery and pharmacy was observed as high as %62. Trends are very similar in other major cities and on the national average. Besides, it is critical to note that the demand peaks just before and after the lockdown days, where people shop for food. At this point, from a disaster management perspective, real-time management of the transportation network is critical for directing the volatility in traffic. Excessive demand will cause congestion, parking problems, and as well as a reduction in sanitary and spacing, which are extremely critical in a pandemic.

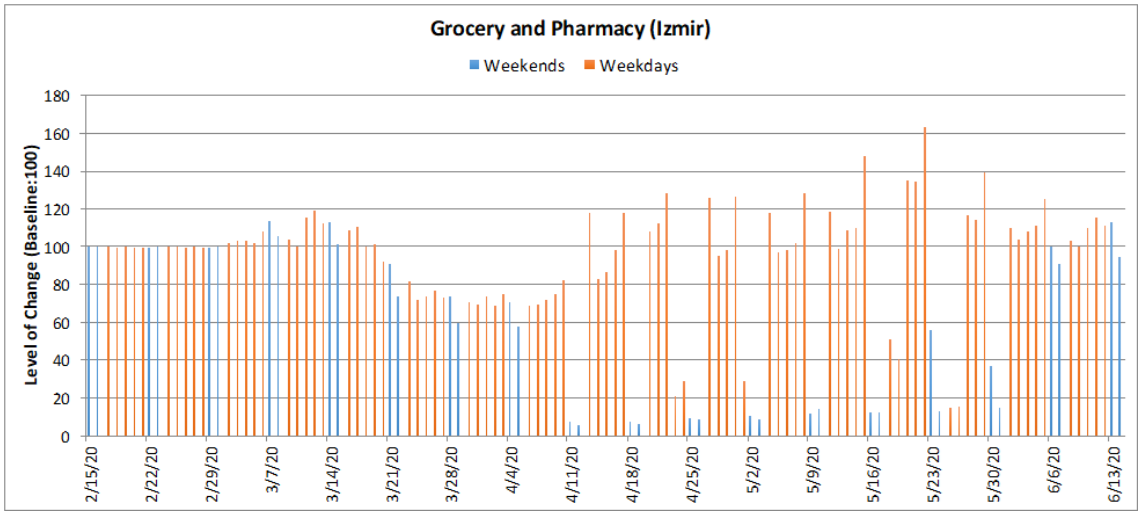

Figure 8. Demand in 'Grocery and Pharmacy' in Period 2 (mid-March to June), Izmir

In the category where the density in national parks and large green areas is evaluated, the increase in demand especially in the 3rd period draws attention (Figure 9). People prefer parks and recreational areas almost %41 more compared to baseline in the national average, where this value is %14 in Ankara, %32 in Izmir, and %26 in Istanbul. At this point, it is also important to note that the 'Parks' caegory does not include small green spaces and playgrounds we usually have in urban residential districts. In Figure 10, considering the loss of demand in closed spaces (shopping malls, etc.), it is observed that people shifted from closed spaces to open areas during the pandemic time where distance and hygiene caution rise. Although this situation is also related to the high temperatures in the summer months, it is expected that the preferences that

allow open space activities will continue in the near future. The demand for parks and open spaces is still approximately 26% above the average in the last month (September to mid-October) even with the off-holiday season and start of the schools with distance education [20].

4. Discussions: Strategic Response to Covid-19 and Policy Suggestions to Post-Pandemic

Both from disaster management and sustainable mobility perspectives, the current pandemic mobility shift brings new opportunities to transportation planners and decision-makers. Besides reduced demand for public transportation and increased automobile use, public attitude to micromobility vehicles and walking has changed significantly. Of course, from a sustainability perspective, we have been actively promoting the use of public transportation, walking, bicycles, scooters -and new forms of micromobility vehicles, in the last decade for reducing the congestion and adverse environmental effects in urban centers. This compulsory social distancing that came with the pandemic has directed people to individual means of transportation and walking, and has created a serious impact in the context of sustainability.

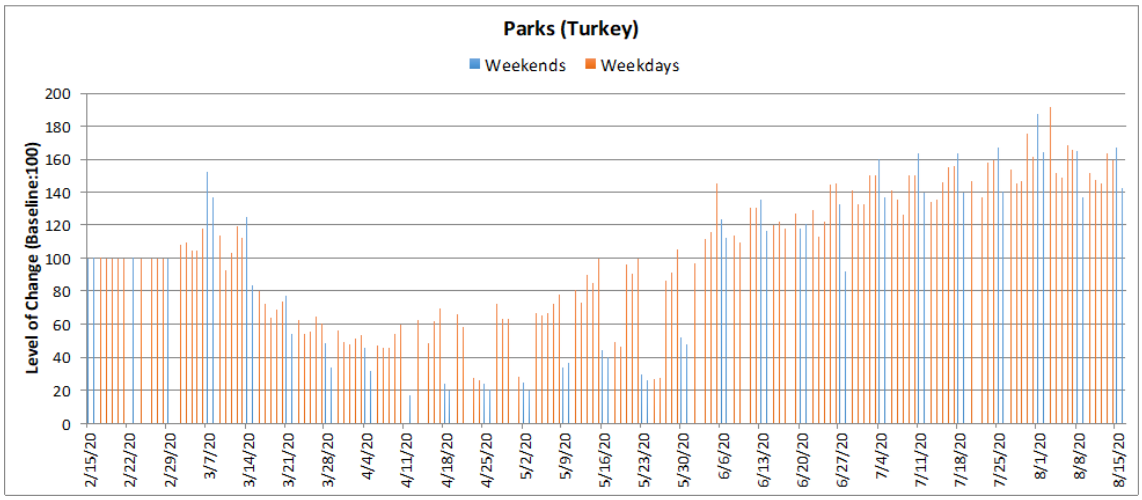

Figure 9. Demand in 'Parks' from mid-Fabruary to August, national average

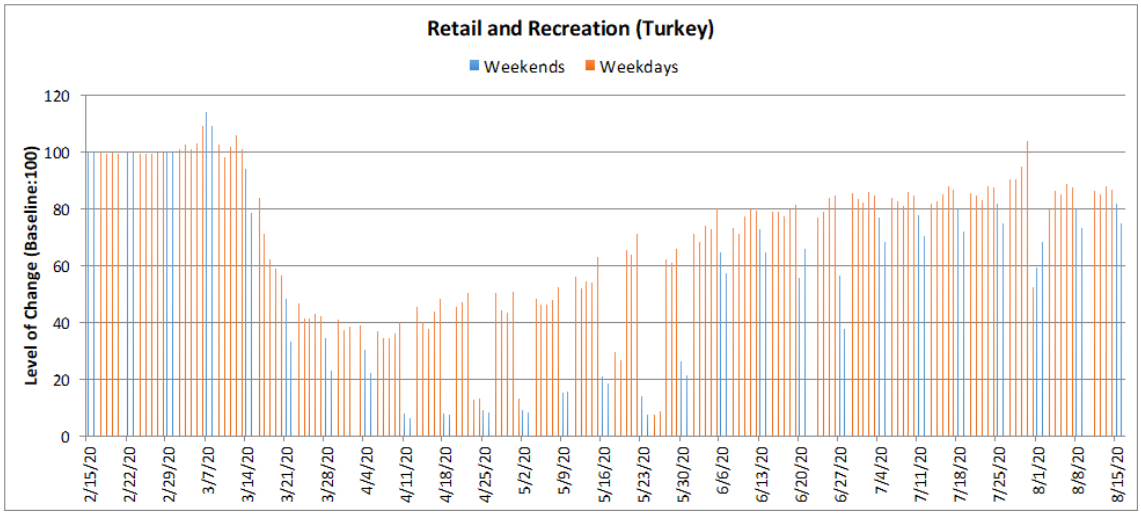

Figure 10. Demand in 'Retail and Recreation' from mid-Fabruary to August, national average

Although we stay away from public transportation due to social distance and sanitary complaints, it is expected that the collapsing transit demand will at least regain some of the loss in time [17]. The important thing here is to develop the necessary policies and to carry out

infrastructure studies in order for the traffic shifting to 'safe and sanitary' public transportation and micromobility to be permanent. Therefore adapting necessary changes and improving public transportation and micromobility infrastructure can *"turn the crisis into an opportunity to accelerate towards more sustainable, resilient and humancentric urban mobility systems"* [21]. In this regard, this study was prepared to point out strategic policy and planning needs to support decision-makers in terms of transportation infrastructure and urban mobility.

Regardless of whether the schools are open or closed, the public transportation system is always used extensively in Turkey due to the high cost of vehicle ownership and gasoline prices, especially in large urban centers subject to this study. Trying to stay away from busy and crowded environments in pandemic time has created a situation such as avoiding public transport [17-19]. The fact that we still haven't reached the rates in February and March levels as of October shows that these systems are still be perceived as risky in terms of health and sanitary conditions [17]. This picture forces policymakers and service providers to start re-evaluating:

- current dynamic public transportation demand in urban districts
- the ability to collect real-time information regarding the passenger loads and empty spaces to dynamically adapt the demand
- in-vehicle air conditioning systems, the possibility of using disinfectants while the vehicles are in operations to regain passenger trust
- spacing in vehicles, both seating and standing capacity

On the other hand, the accessibility of transit stations is becoming more critical in large cities. Walking paths, bike-scooter paths, bike racks, and car parking stations near or close to transit stations increase the accessibility of stations while reducing the dependency on another transit mode. Additionally, spacing and sanitary conditions including air conditioning, regular disinfection, and contactless payment methods, etc. are should be necessary operational and infrastructure changes.

Furthermore, the integration of micromobility vehicles with public transportation is expected to have a positive impact on the accessibility of urban transportation systems. As seen in some cities, bike racks in buses, foldable bike and scooter acceptance in certain trams, buses, intercity trains, etc. should be extended to cover all major cities and public transportation networks.

Connectivity and spatial distribution of the bike paths play a critical role in urban sustainability [22]. It is expected that the share of micromobility vehicles and walking will increase specifically in short and mid-range distances in urban districts even after full recovery from the pandemic. This was in fact the desired situation that decision-makers wanted to have for a long time, especially in urban centers, and they tried to develop policies in this direction. However, in order to make walking, biking and riding continue in the long term, the existing physical infrastructure must be at a level that allows these journeys to be carried out in a safe and secure manner. Therefore, increasing the quality of biking and walking paths by ensuring completeness, connectivity, and safety is expected to have a positive effect on the continuity of these habits after the pandemic [23, 24]. Especially in the period of avoiding public transportation, it is one of the rare times when the demand for micromobility vehicles will show to people, as the mobility preferences of individuals will be directed to personal vehicles.

In connection with micromobility infrastructure, Turkey has park-and-ride facilities in some major cities, which has not been effectively used and mostly idle. It is not the aim of this paper

to discuss the reasons for the inefficiency; however, where applicable, increasing the urban connectivity of park-and-ride facilities with micromobility paths are expected to have a positive impact. Travelers may use biking or scootering to reach the inner part of the city after parking in a park-and-ride facility [25]. Thus, transportation agencies should facilitate this connectivity by enabling rentals (bikes and/or scooters, etc.), safe and secure travel paths, and dedicated or shared travel lanes.

Furthermore, Turkey has been working on a quite difficult project over a long time to provide all public transportation systems in the country and even some intercity transportation systems to be made on a single passenger card. It will be a significant success for passenger transport, although it poses serious difficulties in itself, given the existing differences in the technological infrastructure of cities and ongoing institutional agreements. In relation to this, a social media conversation between the Minister of Health and the Ankara Metropolitan Mayor triggered the idea of preventing the Covid-19 positive passengers to use public transportation vehicles. With the early phases of the pandemic, Turkey has created a HES code system to track the Covid-19 patients and contacts, as well as monitoring the intercity mobility. If the HES code system can be integrated with public transit database for preventing infected people from using public vehicles and spaces, this mode will be much safer to regain the trust of the public. Thus, it can be ensured that passengers that should be in quarantine, will be restricted in public transportation, and if necessary, essential mobility requests can be met with different methods. In this regard, a nationwide passenger information system, either a single card campaign or integration of databases, may have a critical role in the prevention of misuse and ensuring public safety.

From a different perspective, we have seen a dramatic shift from shopping malls and closed spaces to parks and recreational areas during the normalization process (See Figures 9 and 10) [26]. Before the Covid-19 pandemic, the high demand in shopping malls required the design of closed/open parking spaces and accessibility of buildings accordingly. However, we did not have a high demand in open spaces (parks and recreational areas) as we have during the summer and fall of 2020 due to the pandemic. Therefore, the current transportation infrastructure was insufficient to handle the excessive demand causing high access time for parks, long tailbacks, inadequate parking spaces, etc. In light of this information, it is recommended to re-evaluate for the physical infrastructure and transportation convenience in the existing park and recreational areas, and enhancements in management and control mechanisms for possible high demands.

Based on the reports [27], the use of motorcycles has increased noticeably as well as applications to obtain a driver's license for these personal vehicles during the Covid-19 pandemic. On the other side, the safety of motorcycles and micromobility vehicles (including electric scooters and mopeds) on roadways has always been a question in developing countries. These vehicles, which are smaller in size, do not usually receive the respect they deserve and have the right to share the road, and often experience serious traffic safety problems and accidents. This situation arises from not only the problem of the automobile and large vehicle drivers' point of view of motorcycles and small vehicles but also the fact that policymakers and decision-making mechanisms do not give necessary importance to the issue. It is predicted that motorcycles and micromobility vehicles that increase even more during the pandemic, may cause serious traffic safety problems in the short- and medium-term. In order to overcome this problem, the relevant institutions should provide the necessary infrastructure arrangements (warning signs, training and information methods, deterrent warnings and fines, etc.). Additionally, especially in urban transportation, an increase in traffic control mechanism is

necassary to ensure both motorcycle and micromobility users, as well as automobiles and large vehicle drivers, and they should comply with traffic regulations regarding the sharing of the roads with other vehicles.

Lastly, the flexible working hours adopted by many public and private institutions should be further evaluated both for reducing the mobility in peak hours and profitability of the institutions. If possible, this temporary change will further be used in the long term, specifically in densely populated urban districts to reduce the congestions and environmental effects.

5. Conclusions

The need for mobility of individuals and communities is crucial for cities and humanity. Especially urban mobility has an important place in this regard with increasing urban density. On the other hand, disasters have always affected the way we plan and operate based on our needs and priorities. Similarly, the Covid-19 pandemic forced us to re-shape our thinking of transportation networks and brought an opportunity *"to accelerate towards more sustainable, resilient, and humancentric urban mobility systems."*

After examining the trends starting from mid-January to October, a few situations come to the fore. People have started to tend towards open spaces rather than closed areas in the normalization period, a shift from shopping malls to parks. The use of public transport and demand density of transit stations is far from being "back-to-normal" at this point and is expected to stay in low-demand for a while. Additionally, the use of personal vehicles and walking increased notably as well as the tendency to micromobility vehicles during Covid-19. Last, the data demonstrates the use of remote working and flexible working hours contribute to the density of workplaces.

Considering the mobility trends and behavioral changes, strategic suggestions are made to keep the temporary demand in micromobility permanent for urban sustainability. The sanitary of public transport services and transit stations are critical for regaining the trust of the public. At the same time, improving the real-time monitoring and management of transit services enables us to respond to the demand volatility. Rapid improvements on current urban mobility infrastructure and their spatial coverage, specifically for pedestrian walkways and bicycle paths, have the potential to keep the current temporary demand after the recovery from the pandemic. Increasing the connectivity of transit stations and park-and-ride facilities also contributes to the resiliency and sustainability of urban mobility.

It is critical to note that the aforementioned highlights are given with a focus on the sustainability of the current mobility shift, considering the increased demand for micromobility vehicles (bicycles and scooters), motorbikes, and walking. With the rapid implementation of strategic decisions and practices, policymakers have a chance to turn this crisis into an opportunity.

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