A MARKET SCAN OF HOW NEW MOBILITY TRENDS ARE EVOLVING IN TURKEY

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EXECUTIVE SUMMARY

New Mobility uses technology to deliver access, involving supply driven "trends" such as shared mobility, improved commuter experience, product innovation and data-driven decision making. These concepts enable more equitable mobility while reducing emissions, injuries&fatalities and congestion. WRI aims to bridge catalyzing new mobility solutions to improve quality of life and equal access to opportunities for all.

WRI Turkey Sustainable Cities recognizes the growth of new mobility models in Turkish cities. As the trends ride-sharing, transit apps etc. grow rapidly, there is a need to steer this industry towards sustainable models that have positive socio-economic and environmental impact. To do so, it is first necessary to understand what is happening in the marketplace – to track the industry. This scan will study how four "trends" are evolving by looking at the following factors for each: Business models, Key players, Investment, Impact, Opportunities, Barriers, Regulations.

Key findings from the scan are:

- Comparatively, commuter experience is receiving less variety of investors especially from the vendors and angels.
- Data driven decision making is lagging behind in terms of regulation absence.
- In the shared mobility area, bicycle operations are standing out at municipality level and also very dynamic in startup environment.
- In terms of product innovation, the market is immature and awaiting for international maturity to shift to mainstream understanding.

CONTENTS

Working Papers contain preliminary research, analysis, findings, and recommendations. They are circulated to stimulate timely discussion and critical feedback and to influence ongoing debate on emerging issues. Most working papers are eventually published in another form and their content may be revised.

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INTRODUCTION: MOBILITY IN TURKEY

Mobility has been connecting the destinations to move people in every day. It has three basic elements to evolve; topography, passenger demand (number of people, certain route) and technology available.

Based on these three aspects in Turkey, the mainstream public transportation vehicles are bus, minibus, taxi, dolmus (collective taxi) and metrobus (with a separate BRT line on highway) for road transportation, metro for railway systems; boats as seaway vehicles.

However, currently three elements are expanding towards new eras that can be named as connectivity, environmentalism and safety.

In this report, the aim is to analyze current mobility models in Turkey with examples and to assess position of mobility in Turkey among the world mobility pioneers. Based on this vast information gathered from current local market players, a future outlook on New Mobility will be framed by defining role of WRI to push innovation, point out gaps, connect dots between different stakeholders and concepts.[1]

METHODOLOGY

Research methodology of this report is based on a mix between primary (interviews) and secondary (desk) research conducted heavily in local geography as well as international through understanding and knowledge developed through the know-how of the expert analysts and WRI.

The secondary research includes the extraction of information from existing reports of WRI, various databases, official statistics, government publications, specialized magazines, seminars, internet research.

The primary research is mainly the interviews conducted both one to one and a comprehensive workshop that involves the most important stakeholders including NGOs, entrepreneurs, investors, public/ government bodies, academics and technology providers in the Turkish new mobility market.

This report is constituted by the analysis on the basis of the market experts and key opinion leader interviews, supported with the collected data and information from desk research.

GLOBAL TRENDS & NEW MOBILITY DEFINITION

Global Definition of New Mobility

The population of the world is hovering around 7.4 billion by 2016 and vehicle ownership is reached to over 1 billion passenger cars (World Bank, 2016). Increasing urbanization is catalyzing the need for transportation alternatives in cities that has reached at 4.0 millions of urban population which is expected to grow by 16% by 2025 (Worldometers, 2017).

Nevertheless, the augmentation of demand for transportation generates undesirable consequences such as congestion, safety issues, air pollution and excess spending.

Therefore, transformation in demography, social preferences and expectations tracked by business environment and supported by government policies evolves mobility into a multimodal network of various alternative solutions, which leaves private vehicles to be part of the alternative systems rather than being the only travel option.

New Mobility aims to:

- act as a single body
- operate in complexity
- integrate different bodies such as government, vehicle manufacturers, system providers, transportation authorities, telecom/satellite providers and research facilities, technology platforms.

Everyday a new business model of “New Mobility” emerges, still they can be categorized according to customer preferences and active number of suppliers as depicted in the table below.

Globally “New Mobility” is a trend defined as combining innovative solutions to reach from one point to another by ensuring safety, easy accessibility, multimodal flexibility with an efficient energy and budget.

Table 1 | **Global New Mobility Categories**

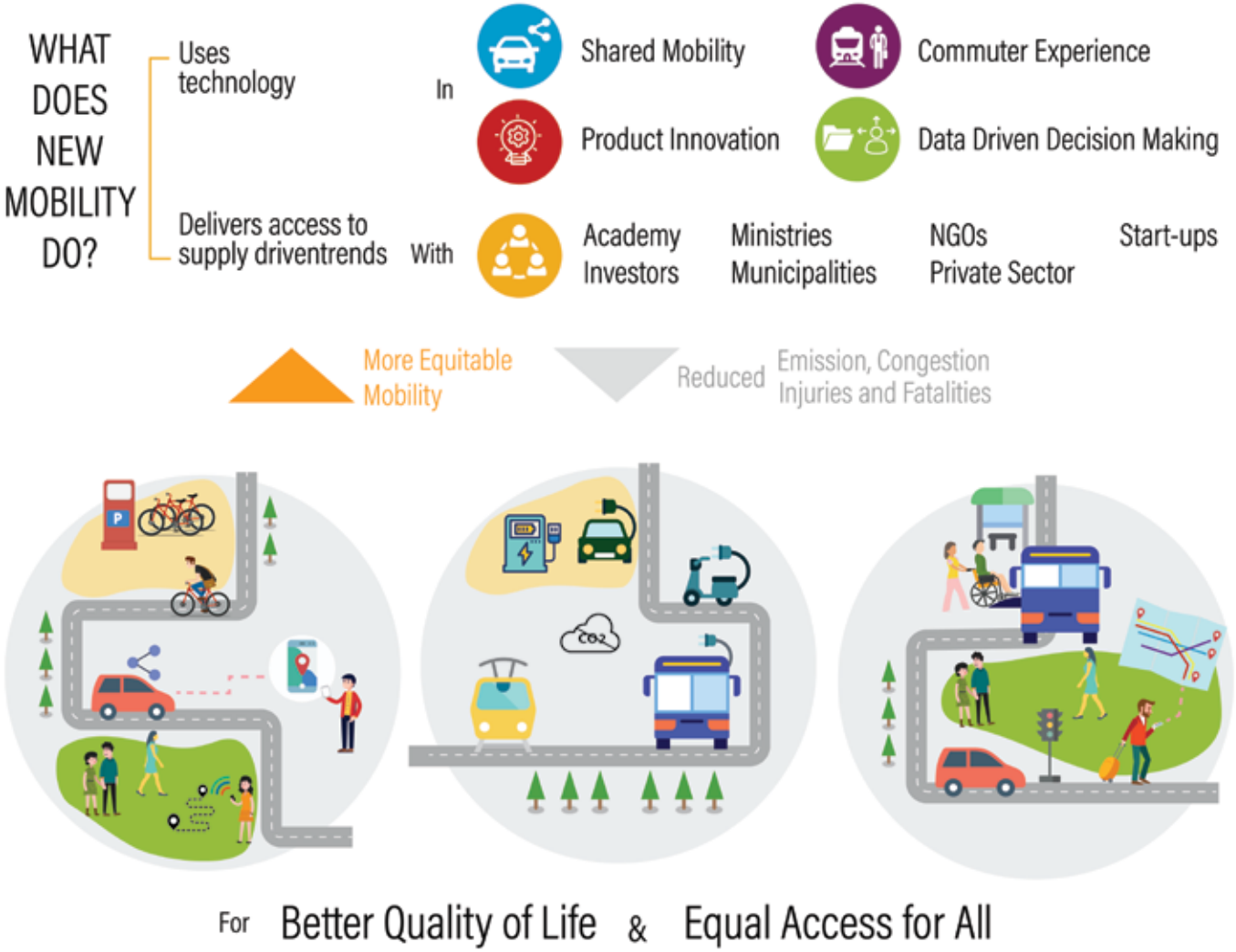
CATEGORY	BUSINESS MODELS	KEY PLAYERS
Traditional Car Sharing	· Traditional Fleet Based Car Sharing · Corporate Car Sharing	· Owned by vehicle manufacturers (e. g. car2go and DriveNow) · Car rental organizations (e.g., Enterprise Carshare, Zipcar by Avis BudgetGroup).
P2P Car Sharing	Private Car Sharing	· Drivy · Ford Credit Link · Easycarclub
Ride Sharing	Car Pooling	· BlablaCar · Faxi
Ride Hailing/eHailing	· Book a Taxi · Private Hire Vehicle · Microtransit Shuttles	· MyTaxi · Uber
Micro Mobility	· Bike Sharing · eBikes · Scooter	· Municipalities · ALD 6 or 7 Wheels Lease
Integrated Mobility and Reporting	· Multimodal Journey Planning · Aggregated Booking · Innovative Public Transit (BRT, High-Speed Rail, LRT) · Parking Solutions	· Moovel · Google Maps · Moovit · Citymapper · Siemens
Mobility & Financial Services	· Car Finance & Leasing · P2P Lending · Payment Services (fuel cards) · Service Packages	Insurance Companies (e. g. Mapfre)

WRI Definition of New Mobility

New Mobility is a trend that uses technology to deliver access, involving supply driven concepts such as shared mobility, improved commuter experience, product innovation and data-driven decision making that enable more equitable mobility, reduce emissions, reduce injuries and fatalities and reduce congestion.

WRI aims to bridge catalyzing new mobility solutions to improve quality of life and equal access to opportunities for all people in cities.

Figure 1 | **Definition of New Mobility**



What Are The Main New Mobility Trends?

Figure 2 | New Mobility Trends

Shared Mobility

The shared use of a vehicle, bicycle, or other low-speed mode - is an innovative transportation solution that enables users to have short-term access to transportation modes on an "as-needed" basis.

Product Innovation

Product innovation is a concept that focuses on environmental and sustainable solutions with the help of technology especially in alternate engines, autonomous vehicles and integrated infrastructure models.

Commuter Experience

Commuter experience is an optimizer that is data collected from addresses with technology-assisted tools and methods used to optimize the journey of commuters.

Data Driven Decision Making

Data driven decision making is a new mobility trend that use data to assist the user's decision making through the provision of routing and mapping services, as well as traffic information. In order to improve travel times, fuel efficiency, vehicle safety, etc. by using data at the consumer level and the systems level.

Global Trends?

- Urbanization & Congestion

Urbanization rate has increased by 4% during the last 5 years, leading congestion, pollution and safety concerns in city areas.

- Emission Regulations & Environment

Limitations regarding urban COx and NOx emission & congestion charging channels municipalities towards the usage of electric and hybrid vehicles.

- Gen Y and Millennials (Shifting Away from Driving)

Car ownership in young ages are decreasing compared to older generations, resulting in alternative.

- Sharing

Ownership and services are divided between companies, government and individual in transportation.

- Social Responsibility

Safety aiming 0 crash, accessibility for disabled and elderly people and aiming 0 emissions against pollutants are applicable and considered as important features while commuting.

- Connectivity & Technology

A quick and seamless access to a range of new products and services, through new technologies and particularly smartphones.

- Autonomous Technology

Vehicle embedded solutions are becoming standard. The protocol announced in USA enabled vehicle manufacturers to research and test autonomous vehicles legally.

- Population Growth

The rapid increase in the world population drives the need for mobility services.

- Changing Investment Environment

Traditional companies are threatened by innovative young companies that uses big data by closely tracking changing consumer behavior and trends.

Global Market Future Trends

The main future trend in global new mobility market is to achieve the most possible interaction and integration of the three main elements of sustainability, which are connectivity, environmentalism and safety.

In order to reach this aim, technologies creating efficient driving modes, optimized traffic flow and travel speed by lowering congestion and fuel consumption are in the focus of the global mobility leaders.

Table 2 | **Three Main Global Market Future Mobility Trends** [1]

AUTOMATION & SAFETY	NEW MODELS & CONNECTIVITY	ENVIRONMENTALLY CONCERNED
• Autonomous taxi • OLLI self-driving, electric shuttle bus that combines AI, AR and smartphone apps • Autonomous drones (especially in campuses and airports) • Uber ATG (Advanced Technologies Group) innovations on self-driving technologies, mapping, and vehicle safety (self-driving trucks for goods delivery and cars) • Smart boards giving signals to vehicles V2X systems • Adaptive Cruise Control • Blind Spot Recognition • Emergency Braking	• Ride hailing to be mainstream • Shared Mobility into Vertical Expansion: • Uber Eats, Uber Rush, Uber Freight, Uber Business • Navigation on next level links personal car usage to public transportation and shared mobility by assessing optimal routes against congestion.	• Electric Vehicles to be mainstream • Electric shuttle bus (Volkswagen microbus by 2022) • Electric Vehicles to increase their range of travel • Fuel efficiency technologies (conventional start stop systems) • Wireless charging systems

LOCAL TRENDS & NEW MOBILITY IN TURKISH MARKET

TRENDS	DESCRIPTION
ECONOMIC GROWTH	Turkey's economy has grown around 5% since last 3 years annually. Economy is expected to grow in the following years with similar trend with Syrians migrating to Turkey, consumption driven economy is getting stronger (IMF, 2017).
POPULATION GROWTH	Population in Turkey has grown by 8.7% since last 5 years and reached near to 80 million (IMF, 2017). Especially the working population that age between 15 to 64 penetrations has increased from 57.7% to 59.0% between 2016 and 2017, which is affecting consumer behavior to change drastically (TUIK, 2016). The population of Turkey and the percentage of urban population increase each year which are 79.8 million and 92.3% correspondingly by the end of 2016 (TUIK, 2016). Besides, the mega city Istanbul hosting 18.5% of the overall population has reached to 14.8 million people with a 1% increase (TUIK, 2016).
GROWTH IN VEHICLE OWNERSHIP	Between 2015 and 2016 the light vehicle ownership has increased at 6.5 % and reached 15.2 million vehicles (TUIK, 2017).
CONGESTION	Turkey has 6 cities that have congestion level higher than 25% as Istanbul being the first city with highest rank of 49% in Turkey and spotted as 6th most congested city around the world, followed by Ankara, Izmir, Bursa, Adana and Mersin (TomTom, 2016).
INVESTMENTS ON INFRASTRUCTURE	Major transportation construction projects that are completed and under construction help to decrease congestion in urban areas in overall Turkey. One of which are Eurasia Tunnel for vehicles to cross from submerged tunnel under Bosphorus, Marmaray which is also a submerged metro line under Bosphorus and 3rd Bridge in Istanbul that connects Bosphorus invested to reduce congestion and remove topography challenges in peak hours.
EMISSION REGULATIONS & ENVIRONMENT	Turkey is following the EU regulations closely in terms of CO2 and NOx emission rules for exhaust gases. As of 2017 January, all light vehicles produced should comply with Euro VI emissions.
CONNECTIVITY	Individual internet usage is 66.8% and households with access to the internet is 80.7%, which were 55.9% and 69.5% in 2015 correspondingly. The rate of growth in connectivity is very fast and accessibility to information is growing faster than availability of information (TUIK).
CHANGING CONSUMER PROFILE	Economy of Turkey is consumption driven, growing young age population shifts product consumption towards service consumption due to less time and resources against higher demand.
PRODUCTION HUB	Turkey is a production hub for light commercial vehicles and buses for global brands, this is raising the bar of technology usage in vehicle systems and creates simultaneous trend for autonomous vehicles, telematics and alternative powertrain solutions.
TRANSPORTATION STARTUPS	In the field of new mobility especially shared mobility, startups increase and vary day by day. Also, SME's that cover large portion of local economy, they are also now in startup area.

DRIVERS	DESCRIPTION
GROWTH IN NUMBERS	The growth of the parameters affecting everyday commute such as emission, population, pollution, urbanization, congestion, vehicle ownership results in finding out new sustainable and accessible solutions and drive the new mobility market.
MEGACITY	Istanbul as the Turkey's only megacity with 14.8 million people has been affecting the living conditions and pushing basic needs to become complex.
HIGH WHITE-COLLAR PENETRATION & LIMITED TIME	White collar penetration keeps its growth in the large 66% working population (2016), affecting heavily on the changing consumer demand and behavior.
CONNECTIVITY	Smartphone usage reached at 84% of the population in 2016, connectivity is integrating millions of touchpoints for many markets, one of which is mobility that drives real time solutions within the market (Ministry of Customs and Trade, 2017).
SYSTEM INTEGRATION	From the both transportation infrastructure system integration and technology adoption for single platform systems are considerably existent in complex megacity Istanbul and applicable also for other large cities. Monitoring systems in intersection points and highways operated from a single center are good examples of system integration.
POLICY AND REGULATION	Adopting EU emission norms to make it stricter to achieve the less hazardous gases polluting the environment results in faster enabling research and development of technologies. Strengthen governmental knowledge and purchasing power, enable market solutions, but make them work for the city, municipalities such as bike sharing, electric buses. Free Trade Agreement with 17 countries and EFTA, also has incentives in industry zones to push international know how to penetrate into country. Comprehensive incentives for technology zones and also supportive grants for startups increase the number of entrepreneurs and new mobility solutions in Turkey.

GOVERNMENT INVESTMENT BEYOND PASSENGER VEHICLES	Government infrastructure investments both to the new transportation modes such as Marmaray, 3rd Bridge, Eurasia and to the existing ones such as metro, metrobus enable continuous mobility with aiming less hour on travel and less emission by preferring public transportation more. Also, there are new infrastructure investments in solely targeting city centers. Tramway is introduced in the last 3 years to many cities such as Izmir, Bursa, Kocaeli, Antalya, Eskisehir, Gaziantep. Existing metro lines are extended in Istanbul, Ankara and Izmir.
HIGH SCT RATES	As of 1st January 2017, new Special Consumption Tax rates are applicable by a slight increment according to engine size and price ranges within these engine size categories. As a result, currently SCT is ranging between rate of 45%-160% which are topped on VAT (18%). This results in requirement of high purchasing power driving low and mid income consumers to prefer alternative mobility solutions.
PAYMENT OPTIONS	The smart transportation cards such as Istanbulkart provides the opportunity to be able to pay for iTaksi, parking and even public sanitary besides for all common public transportation modes. The other examples include AnkaraKart (for bus, metro, light rail system and telpherage), Izmirim Kart (for bus, metro, ferry, telpherage, parking, entrance to the nature park, public sanitary, municipality bike sharing, ice-skating rink and suburban train), Gaziantep Kart (offering internet load and payment option by smart phone or contactless debit/credit card during the transportation), and Kocaeli Kentkart (for all public transportation operated by the Municipality such as public buses, ferries, private bus systems, dolmus and bike sharing system. The citizens in Kocaeli can also use their mobile phones with NFC and credit cards to pay for the public transportation services [Seyahat Kartları Yönetmeliği, t.y.]). Kentkart is also responsible for 25 cities handling single card payment alternatives in city areas (KentKart, t.y.).
ENHANCEMENT IN MAPPING	Competitive environment and high usage of smartphones give thrive to detailed mapping solutions with a couple of providers such as Google, Yandex, Apple Maps supporting new startups to evolve more easily.

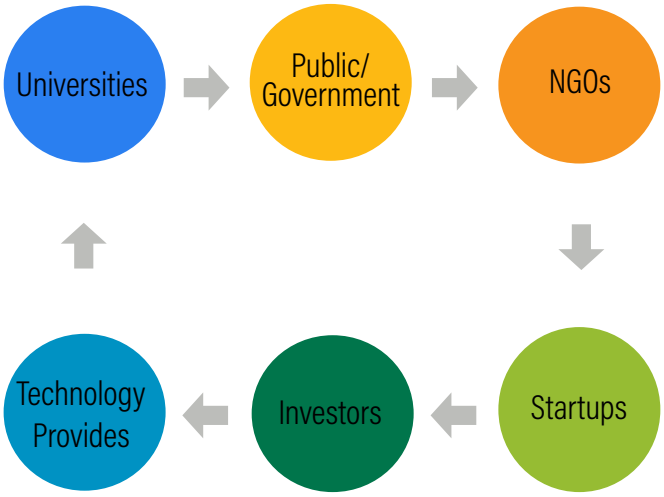
CHALLENGES	**DESCRIPTION**
SCALING	Istanbul is a tough market to serve due to the need for big data & its complex structure, the result creates an unscalable market for mobility. Therefore, challenges exist to mainstreaming.
SECURITY	The individual and industry level privacy concerns arise from the integration of different vehicles and infrastructure (V2X systems). Cybersecurity, big data analysis, and its correct interpretation should be balanced in terms of open data sharing because connectivity is also a threat against privacy.
FRAGMENTED DEVELOPMENT	Operation of continuity in transportation are happening in either specific transport mode or in specific area. Sprawl is a challenge that is affecting connectivity and creates gaps between where people live and work/go to school. Therefore, both travel time and congested hours to be increased in parallel. Besides, network and connectivity in transportation from private to public level are unplanned and has remedy solutions without considering the big picture.
PARKING	Istanbul hosting 14.8 million people with 3.4 million registered light vehicles is a real challenge for drivers due to limited area compared to large number of vehicles. Finding available parking locations require a considerable amount of time even if the driver is willing to pay an expensive amount. This situation bundles in increase in waiting time for congested hour, excessive time and spending on personal vehicle ownership.
TOPOGRAPHY	Istanbul as a city that is divided into two continents is a unique challenge to transit solutions. People commute at a frequency of approximately 480,000 vehicles daily crossing from the 3 bridges to go to work, home, school in 2016. Limited resources give cause for disruptions in traffic.
LOGISTICS	25% of the traffic of Istanbul stems from the logistics and goods transportation. Despite the existing regulation for the heavy commercial vehicles prohibiting them from in hours between 6-10 am and 16-22 pm, it does not relieve the traffic. Because delivery especially fresh food in the morning hours and shipping during the day are the vast markets.
THE LACK OF INTEGRATION BETWEEN SYSTEMS AND BUSINESS MODELS	There are many innovative business models already operating in the market. However, the payment systems offered by third parties are not aligned sufficiently. Also, the lack of infrastructure for electrical vehicles in terms of charging units is a restraint for electric vehicles to spread.
TRAFFIC	For electric vehicles, the biggest concern is the unpredictability of hours spent in traffic and low range of current electric cars creates hesitation against being mainstream. Traffic problem also impacting data driven technologies and commuter experience solutions such as simultaneous/trip planning, information systems and variable message board are not working due to heavy traffic conditions.
INAPPROPRIATE CONDITIONS FOR BICYCLE	Using bicycles are challenging in Istanbul due to lack of segregated bike lanes, mountainous topography and safety concerns in drop on and off points. Furthermore, the bike lanes are usually designed and implemented for recreational activity instead of an active transportation mode in many Turkish cities like Tekirdağ, İzmir and Kocaeli. Even if the bike line is built in the city center, it is usually implemented as a short route which is not connected with other transportation modes. Last but not least, in some cases bike lanes are implemented in the periphery of the urban areas with lack of network integration with the city center as in Eskişehir and Konya. Consequently, the citizens do not perceive cycling as a daily transportation alternative.

New Mobility Stakeholders in Turkish Market

Turkish new mobility market is composed of 6 main bodies that are interacting with each other. These bodies are:

- Public and Government is standing on top of the new mobility market as a regulator and implementer. They build the regulations, give incentives for startups, prepare vision plans for the future.
- NGO tracks changes in the world and is responsible for raising awareness, developing scenarios, directing public authorities for the necessary regulations for the sake of the improvement of the sector.
- Startups are the most reciprocal bodies in new mobility market, they interact with each stakeholder.
- Investors are mainly venture capitals, angel investors and supporting new technologies.
- Technology Providers are mainly established as companies that can afford their own R&D expenses, provides infrastructure for startups.
- Universities produce technology, they apply their deep thinking into the sector.

Figure 3 | New Mobility Stakeholders



Public/ Government

NGOs

Startups/ Entrepreneurs

Universities

Technology Providers

Investors

4 NEW MOBILITY TRENDS

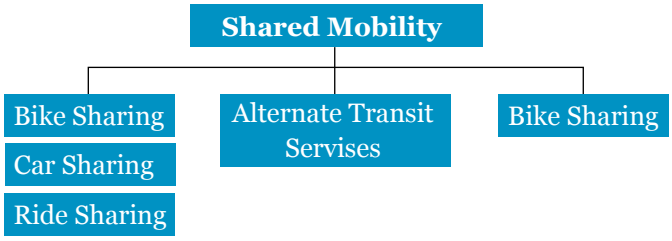
1. Shared Mobility

Shared mobility can be evaluated in 3 different categories mainly as bike sharing, scooter sharing, car sharing and ride sharing, alternate transit services, on demand services.

In Turkey, the person per car rate is 1.3, this number is an indicator of shared mobility variations to evolve. The efficiency and redundant use of personal cars can be increased up to 5 people ideally.

Bike Sharing, Car Sharing and Ride Sharing

In the segment of bike sharing, scooter sharing and car sharing, vehicles are typically left unattended, concentrated in a network of locations where the transaction of checking out of a vehicle is facilitated through information technology and other technological innovations. Users access bicycles on an as- needed basis, and they can use them for one-way transport, roundtrips and/or multimodal connectivity. ainly venture capitals, angel investors and supporting new technologies.



Alternate Transit Services

Corporate regional transit shuttles which are closed system with limited stops and funded by employer, student and local transit shuttles which are also closed systems working at agreement base and serving door-to-door could be evaluated in this segment.

On Demand Services

These are the models that connect vehicles to passengers enabling on-demand access to rides and convenient travel which are fundamentally changing the way commercial vehicles deliver rides to commuters by increasing accessibility and convenience. On-demand services have developed across several modes (such as taxis, buses and motorbikes) across the world.

Table 3 | **Shared Mobility Local Key Players** [2]

CATEGORIES	KEY PLAYERS	DESCRIPTION	FEATURES	IMPACT
BIKE SHARING	Municipalities Baksi Nextbike	Supply of smart bicycles, stations, bike roads	Payment systems, eco mobility	Ankara Istanbul Mersin Antalya Izmir Muğla Balikesir Kayseri Ordu Bursa Kocaeli Eskisehir Canakkale Konya Samsun Sakarya Malatya Tekirdağ Yalova
CAR SHARING	Garajyeri, Zipcar, YOYO	A fleet of cars available to be hired hourly or daily basis	Quick vehicle pick up based on membership	Varied
RIDE SHARING	BlaBlaCar, Yolyola, OrtakAraba	On a planned route, share of the personal ride	Efficient use of owned vehicles	Varied
ALTERNATE TRANSIT SERVISES	Voltlines	Ride Sharing for commercial services	Efficiency in daily mobility need such as going to school or work	N/A
ON DEMAND SERVICES	Bi Taksi	Taxi on demand	Charge per distance Payment with card or cash	>2 million users
	UBER	Taxi on demand Van on demand	Charge per distance, Payment estimation, Payment with card or cash	Istanbul, Bodrum, Cesme
	Careem, Yolo, Olev	Van on demand	Charge per hour for Careem, Prebooking	Yolo-14,000 users in Istanbul, Ankara, Izmir and Antalya
	Scotty	Motorcycle on demand	Rapid mobility in traffic	Reached 200,000 trip in 4 months

Shared Mobility – Bicycle Projects in Turkey

In Turkey, cycling has become a trend topic both at city level and ministry level. Although there is no certain regulation and standart regarding bike sharing systems in Turkey, many cities like Istanbul, Konya, İzmir and Kocaeli has made huge investment in bike sharing systems to promote cycling in urban areas. By 2016, 13 cities in Turkey has implemented bike sharing systems. While some of them are still active, some of the systems had to shut down.

Figure 4 | **Bicycle Mapping Among Cities in Turkey, 2016**

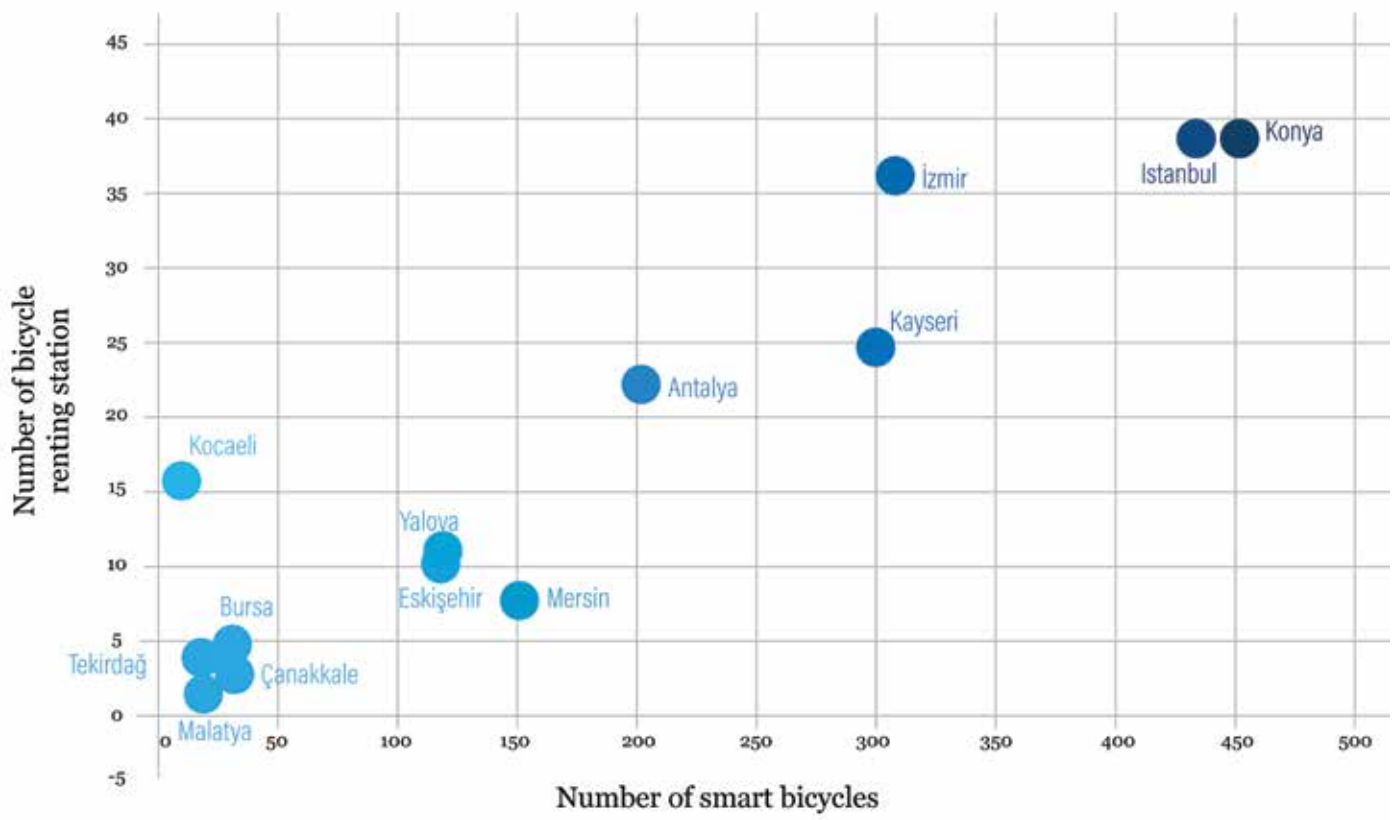


Table 4 | **Local Bicycle Projects** [4]

BICYCLE PROJECT OPERATOR	BAKSI	NEXTBIKE	CALL A BIKE	OTHERS
CITIES AND RELATED MUNICIPALITIES	Antalya, Bursa (Nilüfer), Çanakkale, Eskisehir (Esbis), Istanbul (Isbike), İzmir (Bisim), Kocaeli (Kobis), Tekirdag	Izmir (Karbis, Seferihisar), Konya, Ordu	Alanya	Kayseri, Malatya, Yalova

Table 5 | **Investment Snapshot**

VENTURE CAPITAL	ANGEL INVESTOR	PUBLIC BODIES
· Hummingbird to Garajyeri	· Emre Aydın	· Ministry of Environment and Urbanizaiton
· Vamda Capital – Abraaj Group to Volt	· Ali Cebi	· Undersecretaries for the Treasury
· Saned Partners to Volt	· Alp Saul	· The local administrations
· MEVP to Volt	· Hasan Aslanoba	
· Aslanoba to BiTaksi	· Nevzat Aydın	

Opportunities

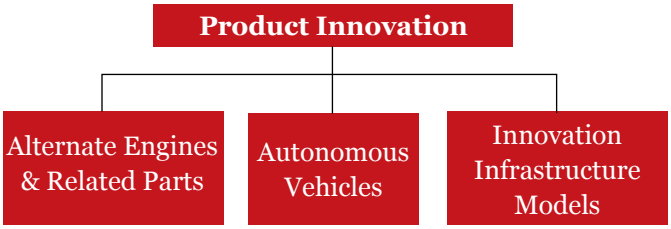
- Preference of shared mobility by young population, pushes municipalities and startups to offer new mobility solutions toward increasing demand.
- Price estimation before journey remove the risk of fraud create safer rides by monitoring the driver profile (photo, ratings, comments, etc.) in advance.
- Quick response time, geographical proximity assessment, easy reach out to vehicles obtains optimum supply and demand matches between users and a decrease in car ownership and congestion and increase in accessibility.
- Elasticity on product features towards local trends; cash payment option on trip, family & children and women passenger service trust on safety, guaranteed allowance of pets ensures a better commuter experience.
- Building up on collected data sets from shared mobility applications constructs the base of passenger trends that addresses daily life activities such as restaurant data, frequent pick up hours and groceries.

Barriers

- The penalty applied to companies who lease fleets are fined as a company in case of accident creates bottleneck toward company insurance history.
- Safety concerns of ride sharing /car sharing from both ends such as customers and also providers from cars to service is an obstacle for many potential consumers.
- Lack of regulations that allows money exchange between peers in car sharing or ride sharing limits the circulation.
- New mobility systems such as car sharing / rent a car has no specific regulation, there is only a tax regulation for renting cars for commercial usage which is just a tax payment and nonspecific for new business models.
- Absence of commercializing personal car usage restrain carpooling. This in particular, has a crucial drawback for transition towards ride sharing from personal usage. As a result, Turkey is still in car sharing period in general context.
- Traffic fines are issued to the owner of the car, not to the current driver. Lack of a tracking system is a barrier.
- Insurance distinction for B2B models in car rental. For example, no claim bonus for B2B effects and fines companies when a car in fleet makes a crash. Therefore, insurance system should be distinct for car rental business models that also supports rental companies by assessing driver record and fined accordingly.
- Lack of licenses in shared mobility category similar to tourism licenses to carry passengers limits the impact on operations, congestion decrease and profit from side income benefits of shared mobility.
- Lack of integration with public transportation, physical conditions of the cities are not allowing bicycles to be used as a last mile solution and to make room for separate bike lanes.
- Ambiguity of cyclist rights while travelling, traffic insurance considers bicycles as out of the scope.

2. Product Innovation

Product Innovation can be evaluated in 3 different categories mainly as Alternate Engines & Related Parts, Autonomous Vehicles, Innovative Infrastructure Models.



Alternate Engines & Related Parts

These are the innovations regarding the alternate engines (electric and hybrid) and their related parts such as charge units and batteries in order to reduce the usage of non-renewable forms of energy.

Autonomous Vehicles

These are the innovations regarding the autonomous car technology, covering applications from driving assistance to partial automation currently. Partial automation examples can be applications such as lane departure warning system and park assistance.

Innovative Infrastructure Models

Intelligent transportation systems involve many enhancements on existing infrastructure such as highways to have BRT lines, signalization integrated real time traffic management to new parking models by offering different payment solutions and charging stations for electric vehicles.

Table 6 | **Product Innovation Local Key Players** [3]

CATEGORIES	KEY PLAYERS	DESCRIPTION	FEATURES	IMPACT
ALTERNATE ENGINES & RELATED PARTS	Zebra Elektronic	Startup that has R&D, manufacturing, sales for EV charging infrastructure	Charging infrastructure – Voltrun brand, Voltrun charging stations offer card and smart phone payment options.	Ankara, Bursa, Istanbul, Konya (Izmir, Eskisehir planned)
	Esarj	Charging devices for EV	Respond to individual demands	106 Stations (Istanbul, Izmir, Ankara, Trabzon, Ordu, Mardin, Adana, Antalya etc.)
AUTONOMOUS VEHICLES	Connect-ION	Enhanced Driving Assistance	Smart phone connection	N/A
INNOVATIVE INFRASTRUCTURE MODELS	ISBAK	Highway and Tunnel Monitoring	Real-time congestion coordinator	Also Pioneer of many startups
	Proline	Safety Software for Surveillance cameras and sensors	Charge per distance, Payment estimation, Payment with card or cash	N/A
	North Anatolian Project	Ecologic bridges that allow animals trespassing	N/A	Kuzey Marmara Highway Line, Also in Mersin

Table 7 | **Investment Snapshot**

AUTOMOTIVE OEMS	TECHNOLOGY PROVIDERS	FUNDS AND VENTURE CAPITALS	INDUSTRIAL
· Renault · BMW · Subaru · Temsa · Toyota	· Companies in aerospace industry such as Aselsan, Aspilsan, STM for engines. · Bosch, Schaffler, Siemens, Yigit Aku, Mutlu Aku and Inci Aku for batteries	· Worldbank · EU Funds · Proline Ventures	· FARPLAS · DMA · GERSAN · METU Teknokent · Oyberpark

Opportunities

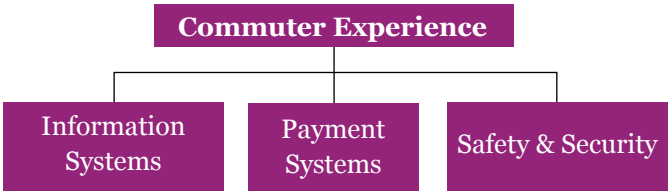
- Limitations in COx emissions, environmentalist feature, the noise pollution prevention and safety objectives are promoting autonomous and electric vehicles to be used in higher penetration in mobility.
- Incentive of SCT decrease for electric and hybrid vehicles is to drive the market when the technology becomes more accessible.
- Autonomous vehicles are expected to decrease the risk of traffic crashes, to save time and to have a positive impact on disabled individuals.

Barriers

- These fields currently require high amount of investment costs.
- Battery technologies allow in short travel distance with an average of 200 km. There are upper range batteries but efficiency is low in terms of cost structure.
- Due to immature market for electric vehicles, price levels are not positioned properly.
- Lack of incentives regarding EV components and infrastructure holds the market at a vicious cycle.
- Although there are some initiatives regarding EVs, the improvement cannot be observed without the necessary support from public bodies in terms of charging infrastructure. For instance, e-charging station request in 2013 for the Kadikoy-Uskudar e-minibus line was rejected by the municipality.

3. Commuter Experience

Commuter Experience can be evaluated in 3 different categories mainly as Information Systems, Ticketing, Safety & Security.



Information Systems

These are the type of information that includes models that give commuters scheduling, trip planning information and the information related to time efficiency such as traffic applications that gather real time traffic information, variable message boards in the bus stops that informs the bus arrival time or in the highways that gives information of traffic ahead.

Payment

The models that given commuters the ability to pay digitally for transport in one mode, or across a multi-modal trip e. g. ticketing. The smart transportation cards such as Kentkart that covers couple of cities, IstanbulKart which is now under development to pay not only different transport modes but also other applications such as taxi and parking.

Safety & Security

This segment includes models or technologies that make travel safer and more secure with the help of the commuter applications that track speed of the taxi driver and alert in case of an exceed or with the obligatory yellow taxi integrated application that protects both the passenger and the driver with the camera embedded system, panic button and online monitoring and tracking.

Table 8 | **Commuter Experience Local Key Players** [4]

CATEGORIES	KEY PLAYERS	DESCRIPTION	FEATURES	IMPACT
INFORMATION SYSTEMS	IETT (MobiETT)	Bus schedule & real time info	Both smart phone and on bus stop digital boards.	Istanbul
	MOOVIT Trafi	Journey planner in different modes, Bus schedule	Smart phone application	In 16 cities for MOOVIT
	Traffic Control Center (Directorate of Highways)	Variable highway message boards	Information on weather or congestion	N/A
PAYMENT SYSTEMS	Kent Kart	Electronic toll collection and offer other payments solutions such as smart phone usage, contactless debit/credit card usage	Many solution areas from main bus stations, parking to payment units	In 25 cities
	Istanbul Kart (BELBIM)	Electronic toll collection in metro, bus, minibus, seaway, tramway	Additionally, Parking and public sanitary payment	
	OGS-HGS (ASELSAN)	Bridge, tunnel automatic toll collection	Via vehicle Monitoring, plate/ vehicle recognition systems	N/A
SAFETY & SECURITY	EMUS AUSIS	Crash Prevention Allows buses, trucks to sense bicycles and pedestrians (Uses Mobileye Shield product)	Warning system for driver, aims to reach zero vision	Private Intercity Coach Company Kamil Koc with 900 vehicles (AUSIS)
	iTaksi (IBB & ISBAK)	Vehicle tracking, recording	Journey safety for both driver and passenger	Aimed to be mandatory for all taxis in Istanbul
	Comodif	Connected car platform	Analyzes driver behavior	N/A

Table 9 | **Investment Snapshot**

GOVERNMENT & RELATED BODIES
ISBAK (Istanbul IT and Smart City Technologies Inc.)

Opportunities

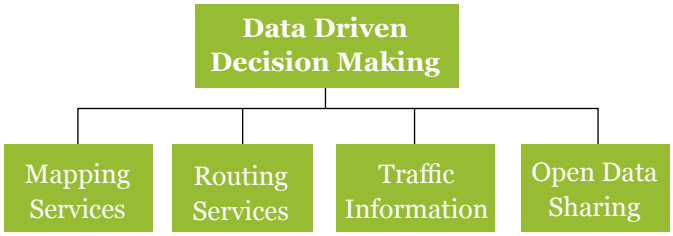
- Current solutions in the commuter experience creates valuable data sets in terms of passenger numbers, congestion, emission and even consumer behavior in real time.
- Security from both passenger and driver are becoming a product feature and mandatory.
- Awareness towards women passengers are recognized in public transportation rule of right to stop the bus in places besides bus stops after 10 pm.
- Toll collection and payment systems pushes integration of banking and deep learning in software area.
- Vehicle, infrastructure and driver are connected during journey fed by real time information. This creates opportunity towards flawless connectivity applications to evolve.

Barriers

- Lack of the pavements in terms of both in continuity and inefficiency due to infrastructure problems, frequent parking over pavements or inadequate lighting is a restraint for trip planning usage including walking.
- Due to security issues in mobility, government bodies and partners are tended to also operate commuter experience applications. This creates bottleneck towards independent startups to evolve since data is kept close.
- Lack of information in the waiting period due to high congestion, the applications in journey estimations cannot work properly.
- Municipality tenders are not open to new startups.

4. Data Driven Decision Making

Data Driven Decision Making can be evaluated by 4 different categories mainly as Mapping Services, Routing Services, Traffic Information, Open Data Sharing.



Mapping Services

Data as a base point for travelling starts from detailed mapping mostly being gathered by searching companies and being enhanced day by day. There are still parts of the world that are not scaled and addressed good enough.

Routing Services

After mapping services evolved, the need for calculating time, distance for travel between from point A to B, definition of different travel modes is built upon mapping services.

Traffic Information

Based upon routing services, a simultaneous travel planning is also now viable with the enhancements in mapping and routing services by adding a real-time data feature to calculate the most feasible route for travel by adding traffic information.

Open Data Sharing

Sharing real time data publicly is applicable in various countries and cities. The aim is to push new startups in mobility by making data more accessible. Open data sharing can support development for mobility in various ways by making it easier to build applications on data sets that are separately available on a single platform.

Table 10 | **Data Driven Decision Making Local Key Players** [5]

CATEGORIES	KEY PLAYERS	DESCRIPTION	FEATURES	IMPACT
MAPPING SERVICES	Yandex Google Maps Apple Maps IBB Navi	Geographic location maps for roads	Calculate distance Time estimation Alternative route according to simultaneous traffic information Now also offers different routes according to different transport modes	All are enhancing their accuracy day by day over all country IBB is solely for Istanbul Varied Varied
ROUTING SERVICES				
TRAFFIC INFORMATION				
OPEN DATA SHARING	Bi Taksi	Taxi on demand	Charge per distance Payment with card or cash	>2 million users
	UBER	Taxi on demand Van on demand	Charge per distance, Payment estimation, Payment with card or cash	Istanbul, Bodrum, Cesme

Table 11 | **Investment Snapshot**

GOVERNMENT & RELATED BODIES
▪ Sehir Haritasi API (IBB City Mapping API for Istanbul):Night Pharmacy, sport facilities, IBB social facilities, IBB Communication Desks, IBB Wi-fi points, Istanbul Stories data sets available currently. ▪ Istanbul Development Agency is funded blackbox implementation for public buses.

Opportunities

- Open data platform helps efficient and transparent data exchange between citizens and public bodies.
- Developers with the easy access to the available data, create better applications and services faster.
- Continuous expansion on new data sets and services obtains constant technological change.
- Scalability in business assesses health of new startups and creates an efficient development in mobility.

Barriers

- Fragmented available data limits the ability of existing sources of software, data and applications.
- Coordinated data is not enough to build up new data, the mainstream shared mobility companies gather important data, however government should provide a platform and incentive to transfer these to a trusted platform.
- Addresses in Turkey still very complicated and are not standardized, it slows down the enhancement of mapping.
- Rather than supporting and creating a base for incentive to data sharing, government bodies focus on data collection projects.

REGULATIONS

Shared Mobility Regulations in Turkey

- National Energy Efficiency Action Plan 2017-2023 by Ministry of Energy and Natural Resources, January 2018.
- Ministry of Environment and Urbanization: Guidelines on Urban Bicycle Roads, June 2017.
- Official Gazette: Implementing Regulation on the Design and Construction of Bicycle Roads, Stations and Parking Places in the City, November 2015.
- Union of Municipalities of Turkey: Guideline for Transportation Planning Studies and Transportation Master Plan Preparation, May 2014.Regulations are generally old or non-specific especially regarding main mobility bodies used heavily in Turkey such as bus, dolmus, yellow taxi. red mobility can be evaluated in 3 different categories mainly as bike sharing, scooter sharing, car.

Product Innovation Regulations in Turkey

- National Energy Efficiency Action Plan 2017-2023 by Ministry of Energy and Natural Resources, January 2018.
- Ministry of Science, Industry and Technology: Strategy Document for Turkey Automotive Sector 2016-2019, 2017 (Sanayi Genel Müdürlüğü, 2017).
- General Directorate of Renewable Energy: Energy Efficiency Action Plan, May 2016.
- Ministry of Environment and Urbanization: Regulation on Amendment to Zoning Regulation of Planned Areas, 2013 (Resmî Gazete, 2013).
- Official Gazette: Type approval incentive for vehicle conversions was placed as SCT deduction for electric vehicles, 2011.

Commuter Experience Regulations in Turkey

- Ministry of Interior Affairs is working on an E-Call system to be put into force in 2018.
- EU Regulation on deployment of the E-call in-vehicle system based on 112 service and amending Directive 2007/46/EC.

Data Driven Decision Making in Turkey

- Ministry of Transport: Regulation to Make Amendment in the Regulation for Procedures and Principles in Increasing the Energy Efficiency in the Transportation (Draft), (Republic of Turkey Ministry of Transport, Maritime and Communications, 2016).

RECOMMENDATIONS & CONCLUSIONS

This part is composed of recommendations for NGOs & government bodies to drive new mobility market.

Hydrogen and Electric Vehicles

Public transportation should be completely electrical and the automotive sector should be categorized as electrical and hydrogen in terms of the energy it consumes. Necessary regulations, incentives and investments should be carried out by the government with the know-how support of NGOs and the other stakeholders.

Creating Low Emission Zones

Non-monetary incentives should be put into account to encourage people to prefer electric cars and to raise popularity by making it mainstream.

Localization of Technology

Many multinational companies currently strong in its industry however technology development in local manufacturing sites will push their local suppliers to enhance their abilities in software and IT area. Government to constitute separate Innovation budget as in Europe.

Expansion of Car Sharing Companies to Ride Sharing Segment

New business models should be launched as “commute taxi” in the car pooling segment of on demand services to travel between specific A to B.

Promulgating Shared Mobility Regulation & Incentives

Regulations related with shared mobility that supports different models of vehicle sharing by adopting similar P2P regulations or licensing for individual vehicle usage for commercial purposes should be promulgated. Government should also support car sharing environment by incentives such as SCT reduction.

Innovative & Sustainable Infrastructure

Ecologic bridges that animals to be permitted to cross over highways.

Government as a role, rather than operating body, should take a lead on forming a plate to merge all different applications together.

Integrated Ticketing Systems Considering The Needs of The Disabled

Ticket compatibility is a must for a smooth travel for everyone. Smart ticketing systems and smart phone ‘apps’ can bring benefits to travelers with special needs by considering their needs in the software designs.

Box 1 | Rewarding Individuals for Their E-Car and Bike Sharing in Milan, Italy

Milan is struggling to reduce car traffic by enhancing the share of sustainable modes of travel and decreasing the car ownership ratio. Another challenge facing Milan is that the modal split for trips between Milan and its surrounding areas is very unbalanced, and car use still contributes significantly to causing traffic crashes and polluting emissions. Commuters coming into Milan via car tend to also use cars for short trips within the city.

Collaborating with EMPOWER (Horizon 2020 Research Project) as a Take-Up City, Milan intends to reduce the use of conventionally fueled vehicles (CFV) by using positive incentives to convince the people to shift their mobility behaviors, from CFV to the use of bikes for short trips, and to electric cars for longer trips.

Aims

Sharing mobility systems are already running throughout the whole of Milan's city area, and car sharing services have been extended to the first 33 municipalities around Milan. As an EMPOWER Take Up City, Milan plans to take this even further with their Positive Incentive Schemes (PIS). There are many occasional car/ bike sharing users in Milan, and the city will persuade occasional users to become systematic users by strengthening their motivations with incentives and challenges. The Bike challenges (Bike to Work and Bike to School) aim to encourage more people to commute by bikes. Similarly, the Car Sharing challenge encourages citizens to opt-in to car-sharing schemes instead of using their own private cars. The city will focus on recruiting new users to take part in the scheme 'Share&Win'. By the end of the EMPOWER project in April 2018, Milan intends to promote an increase the number of current e-car sharing users by 50%, and the number of current bike sharing members and daily bike sharing users by 12%.

Methods

Milan's "Share&Win" scheme comprises special incentives directed towards electric car sharing users and bike sharing users. Both schemes are based on the principle of "The more trips you switch to using a sustainable transport mode, the more you earn". For example, if individuals use the e-car sharing service off peak, they can receive huge discounts on the ride price. Both schemes have web-based tools and smart phone apps where users can measure their performance and verify their progress. The Bike challenges will recruit citizens in a friendly competition and reward them according to the km by bike they travel and the users they recruit. Work places and schools with the highest scores will be rewarded with incentives such as gifts/discounts on services and goods.

Progress

Milan has already achieved good progress with their 'Electric Car Sharing Challenge' with ShareNGo. This includes:
Free online / help desk services offered to people that are interested in shifting to e-car sharing services and to sell their own car.
Discounts on e-car sharing services and other facilitating action.
Discounts on parking fees in private parking slots if using e-car sharing vehicles.
Discounts on goods provided by commercial partners, offered to clients of e-car sharing services, and vice versa.

Source: EMPOWER, 2017.

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ENDNOTES

1. Sources: MIT Technology Review, 2017; Business Insider, 2017; UBER, 2017.
2. Sources: Dijitolog. 2016; Hurriyet. 2017; Hurriyet. 2017.
3. Above table depicts selected examples only.
4. Above table depicts selected examples only. Sources: authors, based on New Mobility Workshop, Istanbul, 2017.
5. Source: Birgun. 2016. "Black Box Period in IETT Buses" Accessed December 6,2016 at: https://www.birgun.net/haber-detay/iett-otobuslerinde-karakutu-donemi-138405.html. *CitySDK which is a linked data distribution platform covering mobility in Europe that involves Istanbul. The platform provides a linkage of data sets and city services. As an example, it connects a database with a dataset parking locations with only coordinates and with the help of shared platform it can be linked to addresses or streets.

ACRONYMS

AI : Artificial Intelligence
AR: Augmented Reality
B2B: Business to Business
BRT: Bus Rapid Transit
CO2: Carbon dioxide
EFTA: European Free Trade Area
EU: European Union
EV: Electric Vehicle
IBB: Istanbul Büyükşehir Belediyesi
IETT: Istanbul Elektrik Tramvay ve Tünel Isletmeleri
ISBAK: Istanbul Bilisim ve Akıllı Kent Teknolojileri
IT: Information Technology
N/A: Not Applicable
NGO: Non-Governmental Organizations
NOx: Nitrogen oxide
P2P: Peer to Peer
R&D: Research & Development
SCT: Special Consumption Tax
VAT: Value Added Tax
V2X: Vehicle to X (Vehicles and Infrastructures)
WRI: World Resources Institute

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OUR APPROACH

We measure our success through real change on the ground. Our approach involves three essential steps: Count It, Change It, and Scale It.

Count It

We start with data. We conduct independent research and draw on the latest technology to develop new insights and recommendations. Our rigorous analysis identifies risks, unveils opportunities, and informs smart strategies. We focus our efforts on influential and emerging economies where the future of sustainability will be determined.

Change It

We use our research to influence government policies, business strategies, and civil society action. We test projects with communities, companies, and government agencies to build a strong evidence base. Then, we work with partners to deliver change on the ground that alleviates poverty and strengthens society. We hold ourselves accountable to ensure our outcomes will be bold and enduring.

Scale It

We don't think small. Once tested, we work with partners to adopt and expand our efforts regionally and globally. We engage with decision-makers to carry out our ideas and elevate our impact. We measure success through government and business actions that improve people's lives and sustain a healthy environment.e.

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