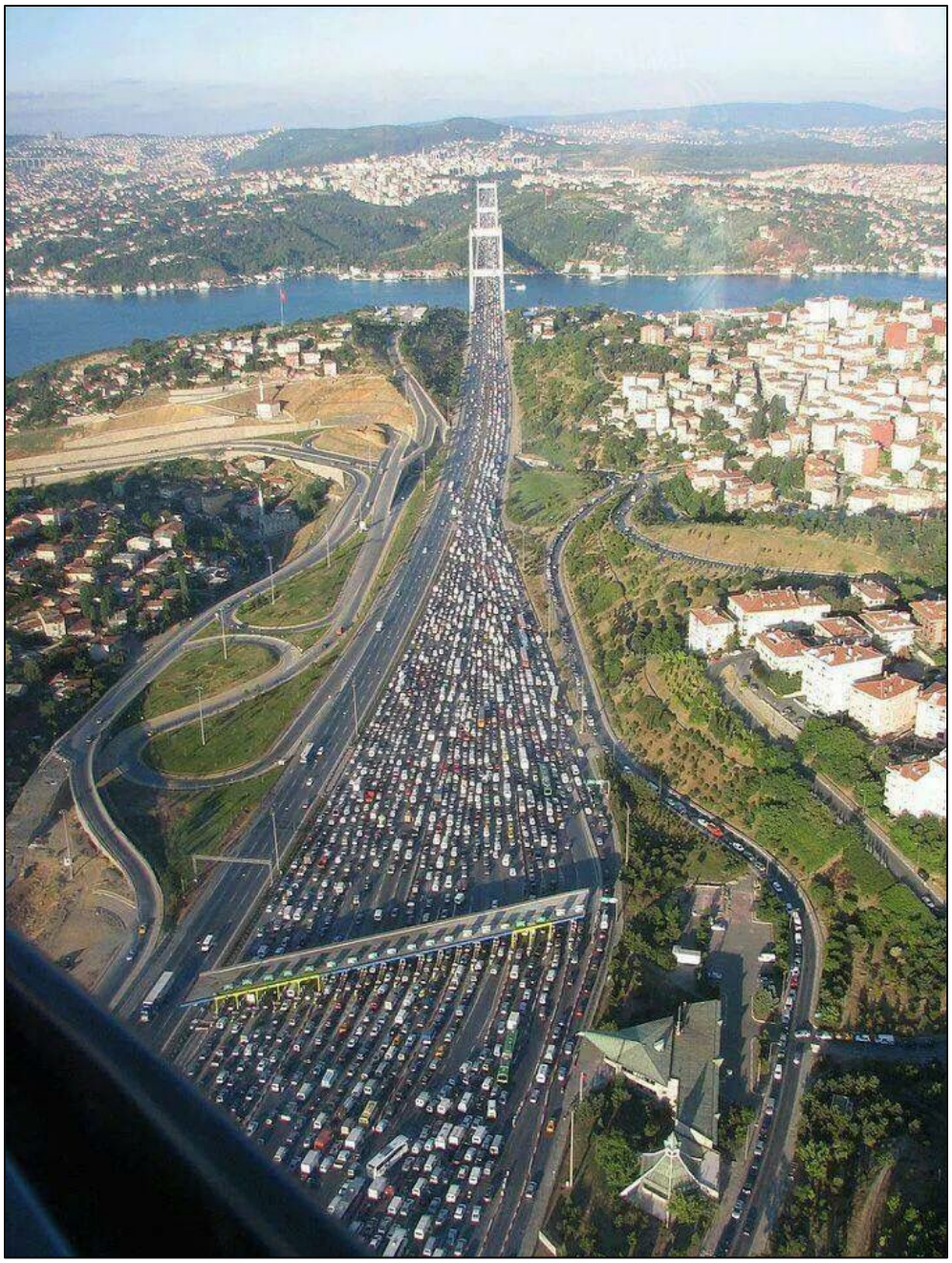
Netherlands Enterprise Agency



who needs cars anyway?

green and smart mobility in turkey

a study on the situation on and possibilities for green and smart mobility in turkey

I – MANAGEMENT SUMMARY

With the world urbanizing in a rapid tempo, new issues challenging cities globally are lurking around. Istanbul is Europe's biggest city and deals with many challenges concerning urban life, also mobility. Besides being Europe's biggest city, it is also the city in Turkey with the busiest roads. Istanbul was ranked number one in 2015 when it comes to most congested cities in the world. The world of mobility is undergoing a vast transition where innovative technologies are being implemented to solve various mobility challenges and the swift from owning a mode of transportation to sharing a mode of transportation is distinctive for this transition. The implementation of innovative technologies within the world of mobility all fall under the umbrella of green and smart mobility. This report handles the various relevant developments and organizations in Turkey in the field of green and smart mobility.

There are various developments taking place in the field of green and smart mobility in Turkey, mainly Istanbul. The projects primarily take place in the construction and improvement of the public transport infrastructure and better management of traffic flows. Besides, other projects such as the launch of an electric bus fleet in Izmir are also on the radar. Shared services are not as popular yet as they are in other countries, this can be explained to the idea that the shift from owning to sharing a mobility mode is not so popular yet in Turkey. The developments are linked to Dutch stakeholders and situations to properly connect them.

The organizations that are linked to green and smart mobility range from governmental organs to educational institutions or stakeholders from the industry. It is recommended that organizations from different field that are connected to the subject should collaborate to find fitting solutions for Turkey's mobility challenges. By bringing Dutch know-how and experience to Turkey, Turkish and Dutch stakeholders can collaborate and learn from each other because of Dutch expertise at the hand of early urbanization in the Netherlands.

This report provides an overview of the situation regarding green and smart mobility in Turkey. It shows the developments taking place and maps the organizations responsible for these developments. Furthermore, it demonstrates the possibilities for Dutch parties interested in collaborating with Turkish partners on working on the green and smart mobility situation in Turkey.

index

I - WHY THIS REPORT

The core theme and goal of the Consulate General of the Kingdom of the Netherlands is the concept of 'livable cities': a programme that focuses on creating a city with a higher quality of life based on assessments of cities' stability. Because of early urbanization, the Netherlands has good experience on this subject and has found innovative ways to deal with complex societal situations in various fields. A product and know-how exchange between the Netherlands and Turkey can be established because of the Netherlands' experience in the field on urbanisation.

The approach to transportation of humans and goods is undergoing a vast change, a change that has an impact on the daily lives of almost every human being on earth. Urbanized areas are becoming more popular by the day and cities are growing so rapidly that, at the current growth, 66 per cent of the world's population will reside in urban areas in 2050 (as opposed to 'just' 54 per cent in 2014)[1]. By 2045, the world's urban population will count more than six billion inhabitants while the global rural population will decline from 3,4 to 3,1 billion[2]. Many cities already deal with various societal challenges today and with the forecast of a rapidly increasing number of inhabitants those challenges will, unfortunately, most probably not decrease nor solve themselves.

In Turkey, 72,1% of the inhabitants is located in urban areas[3], with Istanbul as Turkey's biggest city. The population of Istanbul consisted of 4,7 million inhabitants in 1980 and this number has been growing ever since[4]. Today, Istanbul officially counts as many as 14,741,000 settlers[5], while it is being said that this number is even higher. Besides the fact that Istanbul accommodates so many citizens, the major part of these inhabitants lives in the European side of the city, namely 65%[6]. This leads to a city that is becoming more

[1] http://www.un.org/en/development/desa/news/population/world-urbanization-prospects-2014.html
[2] Idem
[3] http://www.worldometers.info/world-population/turkey-population/
[4] Kaya, S., & Morgan, P. J. (2006). Monitoring urban growth on the European side of the Istanbul metropolitan area: A case study. International Journal of Applied Earth Observation and Geoinformation, 8(1), 18-25.
[5] http://worldpopulationreview.com/world-cities/istanbul-population/
[6] Kaya, S., & Morgan, P. J. (2006). Monitoring urban growth on the European side of the Istanbul metropolitan area: A case study. International Journal of Applied Earth Observation and Geoinformation, 8(1), 18-25.

densely populated by the day. And next to being a very large city, Istanbul is also known for its very large amount of cars and the accompanying traffic jams these cars go hand in hand with. Furthermore, round and about 50% of new cars in Turkey are registered in the Istanbul area. Because the number of cars in Istanbul will keep increasing in the coming years, it is important that the city understands and emphasizes the importance of innovative technologies within mobility. This way, the situation can be monitored and controlled and, in the future, hopefully solved[7].

This report will provide an overview of the current situation regarding green and smart mobility in Turkey and ultimately serve as an advisory report how Dutch knowledge and know-how can be implemented in Turkey.

[7] Idem

II – DEFINITION GREEN AND SMART MOBILITY

A. WHAT IS GREEN AND SMART MOBILITY

According to the Cambridge Dictionary, mobility can be defined as the ability to move freely or be easily moved[8]. Transportation, of humans and goods, is what connects people, culture, information, countries and much more. Transportation and mobility are two inseparable factors as mobility handles everything that falls under the movement of people to secure basic human needs[9]. Besides, green and smart mobility can benefit to a more livable and cleaner world thanks to the implementation of new technologies.

When one thinks of green and smart mobility, one often thinks of electric vehicles or car sharing services. While these two examples definitely count as parts of green and smart mobility, the subject covers a much bigger range of results and consequences. Green and smart mobility can be translated into the use of innovative and technical solutions in the whole spectrum that handles mobility. The implementation of innovations and technical and creative solutions in, for example, parking spaces, transportation, logistics or public transport can and will lead towards more livable cities. This will happen because green and smart mobility solves various societal challenges such as air pollution, noise reduction or road safety.

The world is rapidly changing and various systems and their accompanying models are going through a major reshape. All over the world a shift from goods to services can be witnessed and where this shift started in the computer industry, it is now also affecting other sectors, such as the mobility industry. A car is, for example, no longer seen as an item of status or as a mandatory object one needs in his or her household[10]. One of the most interesting changes that is going on in the mobility industry is the change from owning a method of transportation to sharing a method of transportation, be it through public transport, a self-driving car, city bicycles or a shared car service. This shift is not yet as recognized in Turkey as it is in other parts of the world, but that is where Dutch knowledge can help.

[8] https://dictionary.cambridge.org/dictionary/english/mobility
[9] http://www.low-carbonbritain.co.uk/smart-future-mobility/
[10] http://www.the-future-of-commerce.com/2015/04/10/commerce-trends-moving-from-things-you-sell-to-services-you-provide/

The implementation of technical solutions and innovations in the world of mobility has an enormous impact on human life. A lot of aspects that are now considered as obvious will (partly) disappear or be replaced and obtain a new purpose. Think of all the parking spaces that will be left empty as soon as car owning will be greatly replaced by car sharing or the change in healthcare or insurance packages when accidents will become seldom because of self-driving cars that are connected through the Internet of Things (IoT). These are just two of the many examples of the consequences of the results that green and smart mobility can have on modern society.

Green and smart mobility has an interesting link with the topic of circularity and the sharing economy. By sharing mobility services and creating efficiency in logistics, products of mobility can be re-used with lower congestion as a result. By implementing circularity in transportation, mobility options can be used much more efficiently, a good case if for example fully packed buses and trains that travel to their destination and subsequently return empty to their home base. Various services that tackle these kinds of challenges do already exist but not yet in a global, centralized setting that communicates with all involved stakeholders.

Another aspect that is tensely linked with mobility is Industry 4.0 (or Smart Industry, as it is being called in the Netherlands). Industry 4.0 consists of nine digital industrial technologies:

1 – Autonomous robots
2 – Simulation
3 – System Integration
4 – Internet of Things
5 – Cybersecurity
6 – Cloud Computing
7 – Additive Manufacturing
8 – Augmented Reality
9 – Big Data

The future of mobility is strongly affiliated with these steps, as they are all an integrated part of green and smart mobility. Because of the abovementioned steps mobility will change into a service that can be seen as one whole, a service that is safer, more secure, more personalized and more up to date with current day standards of living.

The future of mobility will be shaped through the pattern of behaviour of mobility users. The shift from owned mobility possibilities to shared mobility services goes hand in hand with this principle, the user's needs and demands will namely determine how mobility services will look like. When viewed from the point of view of Industry 4.0, green and smart mobility is most tensely affiliated with the points of autonomous robots, system integration, the internet of things, cybersecurity, cloud computing and big data. Mobility as a service will continuously communicate within the various offered services to offer the user the best possible option. This all happens through the gathering and exchange of data. All the data that is collected through mobility and also all the data that is affiliated with mobility (such as air quality, minimal physical activity per day etcetera) is registered and used. This data will then be used to find the perfect route for the user through multimodality within mobility. The whole process behind Industry 4.0 can also be translated into green and smart mobility: state of the art technologies driven by IoT, automation and autonomy will define the world's new industry. These innovations also found their way into the field of mobility, namely through new services and optimizations in the mobility world, as mentioned above.

B. VARIOUS TYPES OF MOBILITY

The way people move from point A to point B has been changing enormously due to the impact of the sharing economy. One of the most interesting shifts that is happening right now in the field of mobility is the alteration from 'owning' a mode of transportation to 'sharing' a mode of transportation. Because of many densely populated cities, more and more people choose for the option to use various types of transportation to get to their destination instead of just one transportation form.

Connectivity and convenience are important factors in choosing how one will travel together with the overall cost and customer experience[11]. Thanks to innovative technologies and their services it is no longer necessary for daily travellers to own a car to be able to use a car.

Fortunately, cars are not the only mode of transportation in our world. The iconic red tram riding through the Istiklal street in Istanbul has been around since the 1990's and transports more than 2500 people on a daily basis[12]. And besides trams Istanbul counts a number of bus-, ferry- and metro lines that help getting people to their destination every day. In today's society, more and more possibilities of transportation and mobility are arising by the day. Services like car2go, MaaS, Uber or Velib are significantly improving the quality and possibly of mobility and are becoming more adapted to the demands of the users by the day, resulting in an on-demand mobility system for customers[13].

As previously mentioned, humans are not the only ones that profit from the rise of new mobility services. Logistics, the transportation of goods and products, is an important part of mobility as well. Two very important aspects of green and smart logistics are the collaboration between chains and the prediction of travel time[14]. Logistics and mobility are two very connected factors, though at this time there are still seen as two separate entities. Mobility and logistics need to be seen as a whole, there are already many systems that can be implemented in the world of logistics and besides there is very much data available about drivers and travel routes for example, these need to be combined and occupied in the field. A good example of how the implementation of data could have high value in the world of logistics is through the prediction of travel time[15].

[11]http://publications.deloitte.nl/mobility?mkt_tok=eyJpIjoiTkdFM01UVXhNR1EyWldRNSIsInQiOiJmY3B6d05NK3ZiNWdRN2FsYktlTkp3akNZVXVcL3cwVk9Fek9RNkFsK2xxM3JjcHNzeStrWVdZWUwwZ1pRVWxJNkRhUWtObnlBY3lSeUc1K3lGdHkxOVpXSWxYemwwSlliUzlYNG9Kenk3VHk4cjFaQUdWc0hSekVBcG5WbkhpXC9BIn0%3D#!/does-gen-y-want-the-keys-to-the-car

[12] http://www.istanbulguide.com/71/info/nostalgic-trams-of-istanbul.htm

[13] https://www2.deloitte.com/content/dam/insights/us/articles/smart-mobility-trends/DUP_1027_Smart-Mobility_MASTER1.pdf

[14] http://www.lean-green.nl/2017/01/26/smart-mobility-meets-smart-logistics-ketensamenwerking-en-reistijdvoorspelbaarheid/

[15] Idem

Another important aspect that needs to be taken into consideration regarding logistics, is the collaboration between chains, it is even being said that this is the inevitable step that needs to be taken to improve logistics. By collaboration organizations, the occupancy of logistic vehicles can be raised and the amount of empty driven kilometres can be reduced, the improvement of collaboration between logistics stakeholders has clear benefits by reducing the distances that are drives by logistics vehicles, save on empty driven kilometres and reducing CO2 emissions[16].

ICT plays an important role in this plan as an all-encompassing service has to ensure the abovementioned plans. A strong link with the IoT can be seen here as the vehicles, but also the systems managing these vehicles, need to be in continual contact with one another in order to make sure the abovementioned benefits can be reached to their full effects.

Mobility handles a wide spectrum of possibilities and opportunities, the main aspect this report will focus on is the transportation of humans and goods through innovative ways of 'moving'.

C. FROM OWNING TO SHARING / FROM MEANS TO POSSIBILITIES

As mentioned above, an interesting shift is happening from a goods focused economy to a service focused economy and this shift is having an interesting impact on mobility as well. Various industries have seen an interesting shift in the last few years regarding their business model with Netflix as one of the prime examples. Netflix changed the way media can be exploited and it goes even further than just the purchasing of media. The entire way media can be sought and payed for has also changed intensively with the introduction of Netflix[17]. Not just the media industry is affected by this vast change, a rise in mobility as a service is becoming more and more palpable with various services emerging all over the world. Urban areas are becoming more popular and this means congestion, mobility services

[16] Idem
[17] https://www2.deloitte.com/content/dam/Deloitte/nl/Documents/consumer-business/deloitte-nl-cb-ths-rise-of-mobility-as-a-service.pdf

thus need to meet the user's transportation demands while cities have to become less occupied by cars. Smart innovations implemented in mobility systems can calculate how to do so.

Another important aspect is the idea of multi-mobility: the possibility and accessibility to various types of mobility, such as car or bike sharing services, public transportation, (self-driving) taxis or even a walking route. Offering multiple modes of mobility to get from point A to B can have a positive impact on the congestion in urban areas as well as on public health as more people will have the opportunity to use physical movement as a way of getting somewhere.

Public health is a very important issue of green and smart mobility, that is why new green and smart mobility services also take into consideration what is the healthiest route one can take, for example by providing a suggestion for part of the route by bike or by walking. Besides, the air quality of an area is also being measured and this plays an important role in which route the service will propose (for more information on the air quality in Istanbul, please request the report by Orkide Kara on this subject through the innovation or economic department of the Consulate General). By implementing multiple ways of transportation into a mobility system, users should eventually decide to exchange their personal transportation methods for ways of commuting. Personal choice and (cost) efficiency are important aspects in this shift.

Because of continuous data collection and machine learning that is happening all over the world in this time, more efficient and custom-fit ways of transportation can be presented to the user centred in this society and her new services. The digital revolution impacts mobility on a big scale, the IoT for example opens the possibility of a service that provides tailored advice on which way to travel. Amsterdam is a living lab concerning this subject. Amsterdam counts over 350 cars from car sharing services, 400 electric cars and more than 30,000 unique users of other mobility sharing services. Besides, many other learning and testing activities are happening in the city concerning innovative mobility. Therefore, a knowledge and best practice exchange between Turkey and the Netherlands, or Amsterdam and for example Istanbul, could be very fruitful.

D. SUMMARY

The way people and goods move around is undergoing a vast change. Goods are being replaced with services in the mobility sector which results in the rise of mobility as a service. Cars, scooters, motorcycles or other forms of transportation are no longer seen as items that need to be owned, in the next generation transport opportunities can and will be shared. Furthermore, multimodality within mobility can lead to less congestion in urban areas because it offers the centred user the possibility of choosing between multiple options of transportation with more green alternatives such as public transport or city bicycles.

The main goal of the Consulate General in Istanbul is to find out what the potential for Dutch organizations is regarding collaborations with Turkish parties on green and smart mobility. Also, to set up a knowledge and goods exchange between the Netherlands and Turkey and to teach Turkey about Dutch knowledge concerning green and smart mobility. Green and smart mobility also has a strong link with circularity as innovative implementations in mobility strive to have the users make use of existing ways of mobility and especially share these possibilities instead of creating more and more goods that will only cause more congestion and have a negative influence on busy urban areas.

Another important aspect of green and smart mobility is the idea that existing infrastructure should be optimally employed. More is not always better, many urban areas already have great infrastructural possibilities and plans and it is worth looking into how their potential can be maximized.

III – CURRENT SITUATION

A. WHAT IS HAPPENING

Turkey is not (yet) known as a country for its advanced developments in the field of green and smart mobility, but this might be about to change. Developments are taking place in the field of new mobility advancements such as electric buses or the improvement of the existing public transport infrastructure. Besides, many events handling the topic are taking place in different cities over the country. Izmir, for example, hosts the Turkish edition of the global public transport event 'Busworld'. Izmir is also the city in Turkey with most installations of intelligent transportation systems, followed by Istanbul and Ankara[18]. Examples of developments are the public transport card in Istanbul that can be used for all forms of public transport, bicycle share stations in Izmir and smart bus stops in Ankara.

Various developments are taking place in Turkey in the field of new mobility and the four main trends that are emerging are shared mobility, product innovation, commuter experience and data driven decision making[19].

Shared mobility

Services that allow urban inhabitants to share modes of transportation are emerging all around the world. Services like car2go are operative in many countries worldwide and gives members the opportunity to access modes of transportation such as cars or (electric) bicycles. Istanbul counted a few car-sharing services (YoYo and Algita among others, with approximately a maximum of five vehicles per fleet,[20]) but these have unfortunately ceased to exist due to a lack in interest. Car ownership is 133 per 1000 inhabitants (96 per 1000 in Turkey)[21], and this number is still increasing. In the Netherlands, car ownership is much

[18] https://build.export.gov/build/groups/public/@eg_tr/documents/webcontent/eg_tr_092324.pdf
[19] Sonmez, H., Aki, M., Donmez, I., & Ozturk, M. (2018). *A market scan of how new mobility trends are evolving in Turkey*. Retrieved from http://wrisehirler.org/sites/default/files/TurkeyMarketScanforNewMobility_web_0.pdf
[20] https://www.smartcitiesdive.com/ex/sustainablecitiescollective/car-sharing-picking-speed-developing-world/152996/
[21] Dilek, E., Kizilok, U., Den Ouden, E., & Valkenburg, R. (2015). *Ambitions of Istanbul. Appendix C to D1.1 Report - Specific ambitions of the R4E partner cities*. Retrieved from http://www.tue-lighthouse.nl/Images/R4E/20151215%20D1-1%20Appendix%20C%20-%20Ambitions%20of%20Istanbul.pdf

higher, namely 432 cars per 1000 inhabitants[22] (against 247 per 1000 inhabitants in Amsterdam[23]). Shared mobility is not as popular yet in Turkey as it is in the Netherlands; this can be explained because of a cultural difference between the two countries. Cars are no longer seen as a necessary object in a household nor as a status symbol, in Turkey both are still the case.

Product innovation

One of the best examples of product innovation that took place in the mobility world of Turkey, was the introduction of the IstanbulCard in 2009. The IstanbulCard is a good example where mobility is seen as a whole and not as different islands in one bigger field. The IstanbulCard can be used in all forms of public transport in Istanbul (except for the Dolmuş buses) and in taxi's that make use of the iTaksi system. The iTaksi system is a service that allows you to book taxi's through a mobile application on your phone and thus offers the possibility to pay with your Istanbulcard (next to paying in cash or by credit or debit card). This system is a good example of innovation in the mobility service in Istanbul. In 2015 the usage quota of the IstanbulCard was 92%[24]. Because of the need of satisfying Istanbul's inhabitants mobility needs, the Istanbul Metropolitan Municipality (IMM) makes almost half of its resources available for solving transportation related issues[25].

Commuter experience

It is of utmost importance that the desires of the end users that are central in the design of new mobility services are met, that is why the commuter experience is one of the four main trends. Data needs to be collected from daily commuters on how their experiences can be improved, albeit through new products or renewing existing services. Having access to accurate date and being able to use this data can result in finding fixes for various

[22] http://statline.cbs.nl/StatWeb/publication/?DM=SLNL&PA=7374hvv&D1=2-11&D2=0&D3=a&HDR=T&STB=G2,G1&VW=T

[23] https://www.binnenlandsbestuur.nl/ruimte-en-milieu/nieuws/blaricum-heeft-meest-amsterdam-heeft-minste-auto.9441968.lynkx

[24] [24] Dilek, E., Kizilok, U., Den Ouden, E., & Valkenburg, R. (2015). *Ambitions of Istanbul. Appendix C to D1.1 Report - Specific ambitions of the R4E partner cities*. Retrieved from http://www.tue-lighthouse.nl/Images/R4E/20151215%20D1-1%20Appendix%20C%20-%20Ambitions%20of%20Istanbul.pdf

[25] Idem

challenges concerning mobility issues. An application developed by the IMM gives real time overview of traffic status, traffic conditions, weather conditions that affect traffic and other forms of data to present the best possible traffic information to the users[26]. Real time data from sensors and moving vehicles is being used in the application.

Data driven decision making

Big data and the IoT is all around us, also in the world of (new) mobility. Data is being gathered from many different angles and used to design the perfect route for the user. The implementation of data in mobility applies to, for example, route optimization, health, safety, fuel efficiency or multi mobility. This also concerns the aspect of seeing mobility as one whole, multiple forms of transportation are for example presented in a route suggestion. The implementation of real time date gathered by users of multiple modes of transportation can result in more accurate and smarter solutions for transportation.

Data driven decision-making can have a big impact on decreasing congestion in big Turkish cities as different routes and travel options can be presented as a better option for Turkish daily commuters and other travellers.

Public transport

The focus of Istanbul Metropolitan Municipality within smart mobility currently lies on smart public transport and smart traffic management. Congestion is a very serious issue in Istanbul, so Istanbul is dedicated to optimizing the existing transportation infrastructure and expanding the infrastructure with new projects and constructions. Istanbul is one of the cities that competes in the Roadmaps for Energy (R4E) project funded by the European Union under the Hiorizon2020 project[27]. The two projects focus on the regulation and improvement of mobility in Europe's biggest city with a focus on creating a more livable environment.

[26] https://ieeexplore.ieee.org/document/7503002/

[27] http://roadmapsforenergy.eu/#theproject

Public transport via bus in Istanbul is regulated through Istanbul Elektric Tramvay ve Tunel (IETT). IETT has operational buses, Metrobus (buses with private lanes) and Tunnel Operation[28]. As mentioned before, all Istanbul's public transport (except for the Dolmus) is equipped with a smart payment system, the IstanbulCard. Besides, the IETT fleet is environment-friendly because of a recent update and now operates with lower gas emissions[29].

Several ambitions have been set up for Istanbul with a fully integration, accessible and sustainable mobility in Istanbul in 2050[30]. Istanbul's citizen will have a variety of choices when it comes down to forms of transport, the use of cars has declined and commuters prefer forms of public transport, cycling or sharing mobility. Furthermore, the accessibility of all forms of transport has improved. Every part of Istanbul will be reachable with public transport while the historic structure of the city maintains respected. And last but not least, the implementation of (big) data will ensure up to date and accurate travel information. This way travellers can choose between various forms of transportation which suits them best. Mobility is seen as a one service and all options are being taken into account. The satisfaction and comfort of the users of all forms of mobility are constantly measured and consulted. The experience of traveling improves because of green and smart mobility options.

An important shift in the implementation of data driven decision making is that new mobility services focus on the demand of the people, not on the usable systems. One of the key factors in the improvement of Istanbul's mobility is the comfort and pleasure public transport carries. Relocation between modes of mobility is becoming more easily and the establishment of a personal travel assistant gives, thanks to real time data, live information about the situation regarding transportation.

[28] Kilicaslan, O., Karakaslioglu, C., Den Ouden, E., & Valkenburg, R. (2017). *Ambition, vision and roadmap. Smart public transportation Istanbul.*. Retrieved from http://roadmapsforenergy.eu/wp-content/uploads/2017/final_city_reports/20170912_D6.4_Final_City_Report_Smart_Mobility_Public_Transport_Istanbul.pdf
[29] Idem
[30] Idem

Smart traffic management

The second focus lies on smart traffic management. As mentioned before, Istanbul has to deal with congestion on a daily basis. 80,2% of transportation happens on the road in vehicles while, currently, only 14,6% of transportation happens via Istanbul's rail system[31]. Istanbul is a good example of a city that is designed for cars and not for people, this could raise some questions as transportation on foot and on motorized vehicles happens almost equally, namely 50,72% on motorized vehicles and a vast 49,28% on foot[32]. To make transportation on foot or by bicycle more attractive, IMM has designed a plan for the construction of pedestrian and bicycle roads of 1004 kilometres in total. The building of the first roads will take place between Bakırköy and Alibeyköy, Eminönü and Besiktas and from Üsküdar to Kartal[33], the rest of the lanes have a lower priority and will be built at a later point in time. Istanbul has 88,3 kilometres of bicycle roads and plan on extending this up to 1050 kilometres to make cycling a more attractive mode of transportation in Istanbul Metropolitan.

A Traffic Control Centre (TCC) is operative in Istanbul since 2003 and provides drivers with real time traffic information to make sure buses, for example, do not get stuck and waste energy and fuel. Besides, IMM developed an application that provides real time traffic information taking all factors into account that influence traffic in Istanbul. Foresights for Istanbul's traffic management in 2050 are personalised travel advice, fast and smooth traffic flows and traffic safety[34]. This should lead to less congestion in Istanbul because of multiple new ways of transportation, less accidents as autonomous vehicles are equipped with safety systems and personalized and efficient travel advice because of communicating vehicles.

[31] Dilek, E., Den Ouden, E., & Valkenburg, R. (2017). *Ambition, vision & roadmap. Smart traffic management Istanbul.*. Retrieved from http://roadmapsforenergy.eu/wp-content/uploads/2017/final_city_reports/20170912_D6.4_Final_City_Report_Smart_Mobility_Traffic_Management_Istanbul.pdf
[32] Idem
[33] Idem
[34] Idem

Another interesting project that is taking place in Turkey in the field of green and smart mobility is the electric bus project from Izmir. There are currently 20 electric buses operational in Izmir, with plans from ESHOT (the public bus operator in Izmir) to expand this amount to 400 electric buses in 2019. Besides, ESHOT is establishing a grand solar panel field in order to generate electricity for the Izmir buses[35]. Izmir plays a leading role in Turkey in the field of electric fleets in public transportation. Since the introduction of the buses, CO2 emissions have been reduced by 1384 tons in Izmir with an extra 420 tons because of the use of renewable energy from solar panels[36]. ESHOT is also sharing all the data from the electric buses online to explain and emphasize the importance of air quality. The project is currently in the growing phase and is undergoing development. Izmir is leading in the developments of the usage of electric buses in public transportation and is open for collaboration with interested parties. B. WHAT IS MISSING

The two biggest challenges Istanbul faces in the field of mobility are the amount of cars the city hosts and the lack of an efficiently enough working public transport system to get every inhabitant from A to B.

Public transport

In 2016, Istanbul scored sixth on the world's list of most congested cities with a congestion level of 49%, which equals to 46 minutes per day (175 hours per year) stuck in traffic per car[37]. There are 133 cars per 1000 inhabitants in Istanbul and this number keeps growing and with the introduction of the electric vehicle this number might climb even higher. Building more roads has proven not to solve traffic problems worldwide, so IMM focuses on other infrastructural projects. The Municipality's focus lies on building a new network on rails that guarantees Istanbul's inhabitants efficient transportation possibilities all through the city. An efficient and adequately working framework that can its users around is missing in the big city and the construction of new projects progresses slowly.

[35] Imamoglu, C. T. (2017). *E-BUS CASE STUDY IN IZMIR. Transforming mass transit to clean*. Istanbul, Turkey: WRI Turkey.
[36] Idem
[37] https://www.tomtom.com/en_gb/trafficindex/city/istanbul

84% of transportation in Istanbul happens via roads (including every driving vehicle from private cars to bus services) while railway transportation accounts for just 13% (the last 3% happens via boats crossing the Bosporus). Therefore, IMM set up a plan back in 2007 to shift the balance towards more use of public transport systems to, at least, 50%. There are many plans for the improvement of the public transport system but these need to be executed at a higher pace as the city is getting more and more crowded every day. There is room and need for improvements in Istanbul for public transport, especially and urge for innovative systems or improving the existing systems.

The three ambitions set up by IMM discussed earlier in this report (clean, green and healthy mobility, fully accessible, seamless transport and well-informed travellers) have clear aspirations, but it is unclear how these ambitions will be met. It is most important that Istanbul's public transportation system gets adapted to modern standards and provides the service its commuters need. This can be realised by collaborating with other municipalities, like Amsterdam, on how to improve the city-wide infrastructure.

Another big issue regarding public transportation in Istanbul is the lack of connections between various platforms. There are very few (comfortable) links between forms of mobility; commuters have to walk long distances to get from, for example, the metrobus to the metro. Time and comfort seem to be the biggest values when it comes to transportation, therefore most commuters choose travelling by car over travelling by public transport. Even though public transport is much cheaper than commuting by car, people tend to choose time and comfort over money in this case. By taking comfort and time into consideration in the design process of (new) public transport possibilities the experience of the user could be improved significantly which could result in a higher percentage of (daily) use of public transport by Istanbul's inhabitants. That being said, the user of Istanbul's public transport should be consulted in the design process. By doing research into the needs and demands of the users public transport can be designed in a much more user-friendly way, public transport could than outweigh cars in time and comfort.
In summary, it can be concluded that there are too few options when it comes to public transport, meaning that it is too difficult to commute on a daily basis with public transport. Second, better connections between public transport possibilities need to be established to

improve commutes and as a third point the design of public transport should be improved from the user's point of view. Travelling by public transport can be made more appealing this way.

Too many cars

As mentioned before, car ownership is 133 per 1000 inhabitants in Istanbul[38]. Congestion is a recognized and known problem in Istanbul and therefor various regulations and plans are being established. This congestion is due to the high amount of cars and the inefficient public transport system.

The focus therefore lies on building a bigger transportation infrastructure that encourages Istanbul's inhabitants to move themselves forward through different types of mobility, other than personally owned vehicles[39]. Bicycle roads and pedestrian areas are scarce in Istanbul which leads to less people travelling by bicycle or foot. People need to be encouraged to choose for another form of transportation then going by car and therefore the establishment of other modes of transportation is essential. Another important issue that needs to be taken into consideration is that making electric vehicles more appealing is also not the solution to the problem. Electric vehicles do have a better impact on air quality but because of lower prices and better regulations, only more cars would enter the city which would again lead to more congestion. Therefore, Istanbul's inhabitants need to be coaxed to make use of mobility as a whole to get from point A to B, for example by using bicycles, public transport or sharing services.

When it comes to parking, Istanbul has another big challenge to face. When one wanders through the city, parked cars are found everywhere, even in places where they are not meant to be parked. Especially in older and more densely built areas the parked cars cause

[38] Dilek, E., Kizilok, U., Den Ouden, E., & Valkenburg, R. (2015). *Ambitions of Istanbul. Appendix C to D1.1 Report - Specific ambitions of the R4E partner cities*. Retrieved from http://www.tue-lighthouse.nl/Images/R4E/20151215%20D1-1%20Appendix%20C%20-%20Ambitions%20of%20Istanbul.pdf

[39] Kilicaslan, O., Karakaslioglu, C., Den Ouden, E., & Valkenburg, R. (2017). *Ambition, vision and roadmap. Smart public transportation Istanbul.*. Retrieved from http://roadmapsforenergy.eu/wp-content/uploads/2017/final_city_reports/20170912_D6.4_Final_City_Report_Smart_Mobility_Public_Transport_Istanbul.pdf

congestion as they take in a lot of space in the streets. This could be solved by raising parking fees in various parts of the city or by building large parking places close to metro stations where people can park their car for free or for a low fare and take the metro into the city. Another example could be closing down certain parts of the city for cars, or only allow cars to enter for a short period of time during the day.

Cars are no longer seen as status symbols in many countries around the globe, but they still are in Turkey. Therefore, car sharing services are not popular (yet) among Turkish citizens. To facilitate a change in this mind-set, the new generation needs to be brought up with new ideas and principles. By emphasizing the importance of a shift in car usage at a young age, a new generation will develop another attitude towards car ownership. Multiple tests for car sharing services in Istanbul have been aborted because of a lack of interest in them. This process needs time and has to start at the root: by bringing up a new generation with a new mind-set towards mobility.

C. HIGHER GOALS

It is not just about the improvement of traffic flows or creating a bigger transportation infrastructure, the bigger picture behind these challenges also needs to be seen. The world is urbanizing in a rapid tempo which leads to various new challenges all cities around the globe have to face. Changes need to be made to make sure urban life stays habitable, and improving mobility in big cities is one of those challenges. Istanbul has a growth rate of 3,45% and is expected to surpass 15 million inhabitants in 2020[40], which will also mean more cars and more congestion if nothing changes. According to published plans by the IMM, the aim is to make Istanbul a more livable and reachable city through smart traffic management and improvement and expansion of the public transport infrastructure. These plans are carried out to keep Istanbul accessible and a safe and endurable place to live.
Thanks to the construction of new public transport possibilities, mobility in Istanbul will improve in the next ten to 15 years. The construction of vast underground metro projects especially has a significant impact on the transportation situation as it offers many new routes and improves currently existing routes.

[40] http://worldpopulationreview.com/world-cities/istanbul-population/

All these plans are carried out to make the city more livable, which is also the core theme of the public diplomacy of the Consulate-General of the Netherlands: livable cities.

D. ACTION POINTS

Turkish and Dutch parties need to connect to underline the importance of multimodality within mobility. But beforehand, the concept of multimodality needs to be introduced in Turkey; this is a point where the Netherlands and Turkey can collaborate on. Studying, testing and prototyping with best practices from the Netherlands in Turkey can lead to a new understanding of, and concept for, multimodality.

First off all Turkish and Dutch stakeholders need to come together and determine specific fields and points of action, for example the construction of bicycle lanes or the introduction of shared vehicle possibilities. The various action points then need to be prioritized and planned. By determining specific priorities and plans a realistic action list can be designed from where stakeholders can work.

Specific action points thus lay at creating awareness around the subjects of the importance of green and smart mobility, multimodality within mobility, the improvement of public transport and the challenge regarding the amount of cars. The first step would be creating knowledge and awareness around the situation regarding mobility before any other concrete action plans can be set up. Afterwards, it is of importance that research into the solutions for certain challenges is done from the point of view of the users of that specific challenge.

E. SUMMARY

Istanbul faces two major challenges when it comes to green and smart mobility: the vast amount of cars and the inefficient public transportation infrastructure. IMM is currently developing many plans to improve the situation regarding mobility and is mainly focusing on smart traffic management and improving the public transportation infrastructure. When it comes to the issue regarding congestion because of the amount of cars in the city, it is very important that it is taken into consideration that electric vehicles are a step in the right direction but might lead to only more congestion. This is due to the fact that electric vehicles are more affordable in the long term and could thus result in only more cars. Also, the

amount of parked cars in the city needs to be reduced through, for example, higher parking fees and by towing stalled cars in crowded areas. Improvement of public transport seems to be the biggest priority, followed by the construction of bicycle and pedestrian areas. The design of comfort and time-efficiency in public transport is a very important aspect that should not be neglected in (future) projects.

The biggest change that is inevitably necessary is a shift in the mind-set of people. Mobility needs to be seen as a whole with different modes of transportation at its disposal. To facilitate this, government regulations need to be established and pushed. A good example of this is the proposition of Dutch political party D66 to reward commuters that choose other modes of transportation over their car with tax benefits[41]. At this point the solution is sought for in improving the existing public transportation infrastructure and smarter management of traffic, and this is a step in the right direction but not yet the right answer. As mentioned before, the biggest change lies in a change of attitude towards mobility within Turkish inhabitants, and this takes time. Then, the awareness of multimodality within mobility needs to be spread among Turkeys inhabitants. Stimulus of the use of multimodality within mobility needs to be regulated from the government or municipality in a widespread campaign that creates awareness of the (negative) influences the current mobility situation has. As mentioned above, time and comfort are the most important values when it comes to commuting, therefore it is important to bargain with time. Improve the link between different forms of transportation, the base already exists (multiple metros, buses and boats for example) but the connection between these transportation modes needs to be improved. Thus, public transport can be made more appealing by improving the links and connections between mobility modes; it has to become easier to switch between various modes of transportation. Next, the comfort has to be improved through design, which makes travelling with public transport more interesting for Istanbul's inhabitants.

[41] https://www.nu.nl/politiek/5320364/d66-denkt-belastingkorting-automobilist-voertuig-laat-staan.html

NAME	FIELD	DESCRIPTION

IV – STAKEHOLDERS

TURKISH STAKEHOLDERS

The table presented on the next pages consists of affiliated stakeholders from Turkey in the field of green and smart mobility. The stakeholders represent different fields and departments, from governmental to educational organizations. In order to find a sustainable and fitting solution to the challenge around mobility in Turkey, collaboration between these stakeholders would be necessary.

TUBITAK - The scientific and technological Research Council of Turkey	Research and development	The scientific and technological Research Council of Turkey
Marmara Research Center	Research and development	The research centre aims at becoming a world leader in science and technology production with its research, development and innovation capabilities widely shared by its Environment and Cleaner Production Institute and Energy Institute among other things.
ISBAK	Research and development	ISBAK Istanbul Transportation Communication and Security Technologies Inc. was established by Istanbul Metropolitan Municipality in 1986 with the aim of performing traffic and system engineering, projecting and implementation services and removing dependency on foreign technology by making domestic production
ISPARK	Logistics	Istanbul's largest parking operator

Istanbul Metropolitan Municipality (IMM)	Governmental organization	Especially the traffic management department of the IMM is concerned with green and smart mobility
WRI Turkey	Research and development: specialised in the subject of livable cities	World Resource Institute Turkey: focuses on creating more livable cities through smart innovations in different fields
TÜSİAD – Turkish Industry and Business Association	Economic organization	TÜSİAD's activities are aimed at creating a social order based on the competitive market economy and sustainable development. Environment and Climate change is one of their focus areas
TEHAD – Turkish Electric & Hybrid Vehicles Association	Research and development	TEHAD is working on electric and hybrid vehicles such as cars, motorcycles and buses.

		TEHAD also generates projects for having market in Turkey for transportation vehicles with low CO2 emissions
DMA – Derindere Motor Vehicles	Research and development	DMA seeks, through the use of the advanced technology that he developed, to contribute to the emergence and growth of the electric vehicles in Turkey
CEE – Chamber of Environmental Engineers	Research	CEE gives advices and does research on environmental issues in Turkey. CEE also follows the process of industrialization, urbanization and protection of the environment and is interested in their reporting
Center for Urban Studies – Istanbul Şehir University	Education	To examine the social, economic, cultural and political structures, practices and processes with their

		various features and to shed light on the aspects of community and urban life which have not been discovered or which have been subject to partial research and, thus, to contribute to the planning, implementation, academic research process
Mimar Sinan University - Faculty of architecture / industrial design / urban and regional planning	Education	Various departments of the Mimar Sinan Fine Arts University deal with the topic of design in urban space or other disciplines
Istanbul Technical University	Education	A university of engineering and architecture with many studies in science, technology, research and development. İTÜ works closely in collaboration with enterprises and other economic and social partners
Smart Mobility Cluster	Research and development	The cluster has a focus on Smart Vehicles, Internet of Things and Continuous Data Collection in order to solve

		mobility problems in congested urban areas (especially in Istanbul)
Ministry of Environment and Urbanization	Urbanization	The ministry focuses on the environment and urbanization of Turkey with topics such as air quality and urban growth
Ministry of Transport, Maritime Affairs and Communications	Transportation	The ministry has comprehensive studies on improvement and arrangement of road sector and on the establishment of R&D department for road and maritime sector. The ministry is also supporting the information and communication sector
Ministry of Energy and Natural Resources	Renewable energy	The ministry is currently working on the launch of the smart coal strategy. Furthermore, many projects are ongoing to increase the energy efficiency in Turkey
Ministry of Science, Industry and Technology	Environment and climate change	The ministry's activities include leading the export of technological products by taking part in international

		markets and commercializing new products or products emerging as a consequence of R&D and innovation activities, in priority technology fields, to create added value to the country's economy

B. WHERE TO CONNECT

The particular point where Turkish and Dutch stakeholders could strongly connect on is the point of multimodality in mobility. Multimodality within mobility is a big focus point in the Netherlands at the moment. This is why Dutch organizations could explain how multimodality within mobility could result in a better mobility situation, using best practices from for example Amsterdam as an example. Mobility needs to be seen as a service instead of as a product, transportation should concern the trip itself and not the vehicle the trip is made with.

Another important connection is the shift from car city to bicycle city. When one thinks of Amsterdam, one often also thinks of bikes. The bicycle is one of the most used ways to move around in Amsterdam, where it is not in Istanbul. But Amsterdam was not always a bicycle friendly city, in the 1950's cars were causing many problems regarding congestion. By re-designing the city for its inhabitants instead of for cars, congestion decreased and

Amsterdam got more approachable. By bringing experts from the Municipality of Amsterdam to Istanbul a knowledge and experience exchange can be established. Based on this exchange, new plans for the city of Istanbul can be designed to create a more accessible city for bicycles or pedestrians. This is accompanied with the need of more links between modes of transportation within Istanbul, as mentioned above. By creating more pedestrian or bicycle areas between, let's say, metro- or bus stations and make them more reachable, a shift towards more usage of public transport could be possible.

When it comes to smart innovations in mobility, there are many stakeholders in the Netherlands active such as the Helmond Smart Mobility Living Lab. It would be very fruitful to set up a co-creation project between Turkish and Dutch partners to find out how various Dutch initiatives can improve mobility challenges.

A helpful step would be setting up a delegation of Dutch experts from the field of green and smart mobility and to plan a visit to Turkey. During this visit, cities have to be visited and challenges need to be mapped, in collaboration with Turkish stakeholders. Then, these challenges need to be redefined according to the point of view from the daily user of the cities' transportation methods. This way, sustainable and innovative solutions can be found for multiple challenges regarding mobility. It is also important that it is kept in mind that this exchange does not concern a sale of Dutch knowledge and experience; it concerns a project of collaborative creation in which Dutch and Turkish have to find the perfect solution to particular challenges. A situation sketch per challenge needs to be sketched and defined and based on this overview, plans can be developed which can then be tested. The base has already been constructed, the time to move forward and bring constructive plans into action is now.

V – IDEAL SITUATION

A. HOW TO FILL THE GAPS

When it comes to green and smart mobility, Turkey seems to be behind a couple of years compared to other countries. This can be explained due to various factors and other priorities Turkey has to deal with. But with cities in Turkey urbanizing in rapid tempo, green and smart mobility is becoming more and more important. Luckily Turkey is not alone in the battle against congestion and many other mobility challenges and can collaborate with other countries that deal (and have dealt) with the same issues. The Netherlands is one the

countries that urbanized in an early stage and therefor has experience in the field of green and smart mobility. A knowledge and experience exchange thus can (and more importantly, needs to) be set up between the two countries to establish a strong collaboration project to improve Turkey's mobility situation.

A network between the two countries could be established to work on various mobility challenges. Dutch experts from the field visit Turkey to analyse the various issues and brainstorm on solutions, all in collaboration with Turkish stakeholders. Based on the analyses of the current situation, an ideal situation will be sketched. Next, realistic plans are made that will lead to concretion. To design fitting and specific solutions for Turkey's problems it is of utmost importance that the research and development process behind these challenges is done in from the point of view from the (daily) user of public transport.

Per specific challenge a team has to be set up consisting of Turkish and Dutch experts from the field. The team will be responsible for their point of interest but will also work together on a more global scale with the whole network. This way, all the team's needs and demands can be ensured while everyone is simultaneously collaboratively working on the overall improvement of the situation around mobility in Turkey.

Prototyping and testing is a very important in the aspect of the design process to make sure the situation that will be created stays up to date with challenges. By continuously improving the situation around mobility with small steps challenges can be solved with less effort and more efficiently. To ensure the process of prototyping and testing happens efficiently, the mobility situation should be monitored closely.
This can be done through continuous data collection through the users of mobility services. By collecting this data and closely observe changing patterns, new challenges can quickly be identified and handled.

B. SUPPLY AND DEMAND

According to various experts from the field in Turkey, the focus currently lies on the expansions of the public transportation infrastructure and the introduction of electric vehicles, as well as improving the current situation regarding electric vehicles within public

transport. Car sharing and multimodality are, at this moment, not yet a focus point, these will follow when the first steps into the right direction are made. Dutch parties could help by providing knowledge about these two fields, especially about introducing electric vehicles in public transport. Furthermore, the situation on public transport in Turkey (mainly Istanbul) can be sketched together with, among others, experts from the municipality of Amsterdam.

The biggest need can be found in sustainable solutions that outweigh the current possibilities that are around. First off all the on-going projects within the world of public transport need to be finished where after better connections between these platforms have to be constructed. Another need is the creation of loops within public transport, instead of straight lines running back and forth. By creating loops, more locations can be reached more effectively which results in more efficiently working public transport. A second step is the introduction of new forms of mobility, such as bicycles (shared or privately owned), pedestrian areas or for example car sharing services. These steps are taken to decrease congestion but when it comes to cars it is also important that the current fleet will (slowly) be replaced by electric vehicles instead of regular emission vehicles. People will keep cars, no matter what, so it is better to have people drive around in electric vehicles than non-electric vehicles. With electric vehicles come charging stations and better regulations, these are also mandatory when it comes to the introduction of electric vehicles. For more information about electric vehicles in Turkey, please read the full report on the emerging market of electric vehicles in Turkey and its opportunities by Rory Nuijens and Müge Yazgan Van Herk on the website of the Netherlands Enterprise Agency.

In general, there is a special need for knowledge and experience in the field of green and smart mobility. The Netherlands can help in this process by bringing experts from the field over to Turkey and collaborate on the improvement of green and smart mobility in Turkey.

B. SUMMARY

There is a comprehensive need for knowledge and experience when it comes to innovation in green and smart mobility. Best practices from the Netherland could serve as learning materials for this need. The importance of efficiently operating mobility services has to be highlighted with time efficiency and comfort as its most important values. The general

situation and importance around mobility first needs to be understood whereafter specific situations in Turkey can be picked. Then, sketches of an ideal situation with accompanying solutions can be designed and plans determined. To make sure this process happens as efficiently and productively as possible, a network of Turkish and Dutch experts from various disciplines within the field of mobility could be established. This network has the aim to design solutions for Turkey's mobility challenges. In collaboration with other local stakeholders fitting and situational solutions can be found that will have sustainable meaning for the users of the mobility services.

VI – CONCLUSION

There are two major challenges when it comes to Turkey's, and more specifically Istanbul's, challenges concerning mobility, namely congestion because of the vast amount of vehicles on the road and the not efficiently working public transport infrastructure. Istanbul is the biggest city in Europe and counts many roads but also many vehicles. What is exceptional about the situation regarding the amount of cars in Turkey is that gas prices in Turkey are relatively high. One litre of gas costs as much as €1,15[42], in the Netherlands one litre costs €1,94[43] on average. The price per litre of gas is higher in the Netherlands, but so is the monthly average gross wage. While the monthly average gross wage is €2850 per month[44], which is ₺15,247,50 (with the current rate of the Turkish Lira), Turkish average gross wage is ₺2207[45]. This shows that time and comfort are more important values when it comes to commuting than financial values.

By improving mobility services in Turkey through the improvement of public transportation and other forms of transportation (especially multimodality), individual traveling in private owned cars can be outweighed. Multimodality within mobility can reduce the use of private owned cars by the daily commuter and can contribute to an increased use of other forms of transportation such as shared mobility and public transportation (to name a few of the possibilities the future of mobility has to offer). Another important focus point of new

[42] https://www.globalpetrolprices.com/Turkey/gasoline_prices/
[43] https://www.globalpetrolprices.com/gasoline_prices/
[44] https://www.gemiddeld-inkomen.nl/modaal-inkomen-huishouden/
[45] https://tradingeconomics.com/turkey/wages

mobility is the introduction and expansion of human transportation: by bicycle and by foot. Improving the links between forms of mobility through the construction of bicycle- or pedestrian paths can result in more usage of others forms of transportation than individually driven cars.

The second biggest challenge is the completion and improvement of the many public transport projects. Especially in Istanbul there is a need for better connections between and better design of public transport. There currently are too little adequate links between modes of transportation, meaning that it takes too much time or effort to switch between transportation modes. By doing research into the needs and demands of public transport systems' daily users the experience of these commuters could be improved time and comfort wise.

The challenges concerning mobility are known in Turkey, but because of other priorities they are not the most important focus at the moment. This can be explained through a gap in knowledge and know-how. The seriousness of the issue is not yet as broadly known as it is, it seems. By highlighting the problems the challenge brings along through know-how and experience from the Dutch side, Turkey can accelerate the approach of the challenge and deal with its various controversies before the situation deteriorates. Turkey is an interesting country for Dutch stakeholders from the field of green and smart mobility as there a vast need for a knowledge, experience and product exchange.

The transition that shows mobility as a service and not a product has spread it wings globally and also reached Turkey. Various trends are recognisable in Istanbul, mainly due to the issues caused by congestion. Back in 2015 Istanbul ranked number one as most congested city in the world[46], now, three years later, they rank sixth most congested city in the world[47]. This reduction in congestion might be due to the large construction projects in public transport that have taken place in the past few years. While swapping from first to sixth

[46] https://www.independent.co.uk/news/world/americas/istanbul-revealed-as-the-most-congested-city-in-the-world-10149543.html
[47] https://www.tomtom.com/en_gb/trafficindex/city/IST

place in three years is decent, Istanbul however still deals with many challenges on a daily basis. Dutch experts from the field can help resolve the challenges concerning mobility in the field of urban design, public transport design, and connection between mobility systems and establish an international collaboration in Istanbul as a mobility living lab. Another important issue where the Netherlands can supply help is the governance side of the challenge. The Netherlands can explain how they have dealt with similar challenges as facilitate the process behind the change in the mind-set of Turkish commuters.

Do's and don'ts from the field will be explained which can lead to the creation of a test- and experimentation site in Istanbul. Health is another valuable aspect of green and smart mobility and therefore the quality of the air is taken into consideration in the process of ideating solutions. Experts from the Netherlands can help in this process by bringing over know-how and experience to Turkey, which could lead to a green and smart relationship.

VII – HOW CAN THE HOLLAND INNOVATION NETWORK HELP

The Holland Innovation Network is represented in 22 countries worldwide. The Turkey office is represented by Rory Nuijens, the advisor for innovation, technology and science and Yavuz Selim Yasar, the assistant advisor for innovation, technology and science. The network aims to improve collaboration in the field of research & development (R&D) as well as innovation between Dutch knowledge institutions and knowledge intensive companies and their Turkish counterparts. The Holland Innovation Network functions as:

- A liaison for international R&D cooperation, including multilateral cooperation in European framework programs such as Horizon 2020 and the EUREKA program;
- Trend watcher and -scout regarding future technologies;
- Informant regarding trends and developments by means of publications and seminars;
- Advisor for Turkish organizations that wish to engage in R&D collaborations with parties from the Netherlands.

The Holland Innovation Network is familiar with both the Turkish and Dutch parties in the fields of innovation, technology and science. Therefore it is the ideal contact point when matching Turkey and the Netherlands in the field of green and smart mobility.

For more information, please do not hesitate to contact Rory Nuijens via:

Holland Innovation Network Turkey
Consulate General of the Kingdom of the Netherlands
Istiklal Caddesi 197, 34433 Beyoglu, Istanbul
+90 530 844 2810
rory.nuijens@minbuza.nl

VIII – THANKS

This report has been made possible with the help of many, I would especially like to express my gratitude to the following persons:

Rory Nuijens
Yavuz Selim Yasar
Bart van Bolhuis
Hande Dolmez
Ceren Erten
Tolga Imamoglu
Eda Yucesoy