Developing urban transport in Turkey with greater consideration for sustainability

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Abstract: This paper sets out three visions for the year 2035 which bring about a radical change in the level of walking, cycling and public transport in Turkish urban areas. A participatory visioning technique was structured according to a three-stage technique: *(i) Extensive online comprehensive survey.* In which potential transport measures were researched for their relevance to promoting sustainable transport in future Turkish urban areas; *(ii) Semi-structured interviews.* Where transport strategy suggestions were developed in the context of the possible imaginary urban areas and their associated contextual description of the imaginary urban areas for each vision; *(iii) Participatory workshops.* Where an innovative method was developed to explore various creative future choices and alternatives. Overall, this paper indicates that the content of the visions was reasonable, but such visions need a considerable degree of consensus and radical approaches to tackling them.

Keywords: sustainable development, active transport, visioning, policy

1. Introduction

Sustainable transport modes (in most cases, identified as walking, cycling and public transport) are extensively endorsed as viable solutions to alleviating some of the well-documented issues associated with car-dependent urban societies. Such a transition could influence road traffic congestion and lead to increased economic competitiveness; reduce investment in new roads and increase investment in sustainable transport systems; reduced local noise and air pollution emissions; road traffic danger and deterioration of the public realm; increase opportunity for face-to-face interaction; reduce risk of a range of diseases linked to sedentary lifestyles and decrease levels of obesity [1,2].

Visioning approaches for sustainable mobility have been established to be useful techniques for motivating significant changes towards sustainable action. It is a great way to bring a variety of different disciplines together, develop a shared goal, and find mutually acceptable solutions to problems [3]. It is also valuable to design a number of archetypal examples that assist inspirational thinking about future urban areas in general and thus provide a means of engaging with the public and experts. Furthermore, this is critical for determining national actions & events and demonstrating the maximum potential for national policy guidance and strategies to support policymakers in achieving their local objectives [4]. Therefore, this paper explores the reliability of different proposed Turkish sustainable transport visions and constructs local policy pathways to demonstrate how the targets of one more desirable vision could be reached by 2035 in several selected Turkish cities.

Section 2 reviews the existing literature addressing previous visioning approaches. Section 3 details the theoretical framework for the research design, while Section 4 presents the main results are as follows: (a) public desires in scenario formation and (b) examples of changes to typical Turkish urban streets. Section 5 analyses the reliability of the visions. Section 6 discusses how the targets of

one desirable vision could be reached from the future to the present. Section 7 discusses and concludes the paper.

2. Literature Review

An integrated approach combining visioning and backcasting processes can be considered as being complementary to looking over the long term and the related techniques are useful when radical changes are essential to reach future transport objectives [5,6]. Visioning is an approach that requires looking at how different future urban areas appear and operate. Backcasting considers what policy pathways are required to move to the future from the present [7].

The role of visions has been recognised by Smith et al. [8], where a critical level of participants among its experts and community can approve of a desirable future place to make a joint and shared means of action. According to Watson and Noble [9], a wide variety of members from the public, practitioners, and scholars should be involved to draw an assessment of desirable future endpoints. Visions ought to not only act in compliance with sustainability principles but to represent the interconnected mechanism of a desirable future through systemic relationships. In other words, a systemic vision explicitly links the different pieces, i.e., how the actions relate to and affect other measures when the vision gets implemented. Furthermore, visions are composed of several vital drivers and not all the key drivers are of similar desirability [10] and reflecting nuances of value-laden perspectives by separating different clusters of desirability makes it more distinctive to comprehend complex visions [11].

Despite the emerging recognition that an organized involvement of stakeholders should become central to all the relevant features of the visioning studies [12], limited attention has been paid to encouraging different stakeholders in all critical stages of the visioning process [13]. Many sustainable transport visioning studies [14-16] have shown that sustainability visioning processes allude to deficits in a theoretical base and methodology. More international studies are needed to carry out better design principles for vision methodology studies, in terms of increasing public participation in vision development [13], developing systemic features of visions [17], establishing visions based on the concept of sustainability [18,19], as well as using 3D visualization techniques [20-21].

There is a relatively small body of published studies that are concerned to pay particular attention to the participatory-oriented scenarios and visioning development approaches in Turkey [22]. The first Turkish visioning project for walking and cycling focussed urban transport systems was described and explored within a publication entitled: *Megacities on the Move Project* by Gazibara et al. [22], as part of a practical plan for addressing the challenges of future mobility. However, it is still not known whether the aspirational thinking of achieving desirable transport environments in Turkish urban areas is workable. Therefore, this paper seeks to add to the body of knowledge on the development of sustainable urban transport visions, thereby contributing to understanding the requirements to propose a radical change in future urban sustainability in Turkey and imagination of archetypal areas inside a simulated Turkish transport environment.

3. Methodology

Consideration of previous research and practical constraints led to the development of a three-stage approach, with an engagement of public, experts and policy-makers a critical influence at all stages: (i) Extensive online comprehensive survey; (ii) semi-structured interviews; and (iii) participatory workshops. The first of these has been used to determine the variety of participant opinions from five Turkish cities (Ankara, Eskişehir, İzmir, İstanbul and Konya) for future typical transport measures in the whole country. The semi-structured interviews provide a much more open research process to receive feedback on the realism and plausibility of the visualisations and their background assumptions. Finally, participatory workshops were organised to bring a group of

professionals and local policymakers (and a small number of the public) together to construct policy clusters and pathways for achieving the target of one specific vision. The selection of participants was a crucial aspect in reducing the likelihood of the visioning being too focused on expert views.

To ensure that the above techniques could be carried out competently, the determination of stakeholders depended on the following criteria:

(i) "Public", including participants from different demographic and socio-economic groups and various mode choice transport users (pedestrians, cyclists, public transport users, and drivers). Recorded mailing lists from local associations were used to identify and select participants from this group in each case study city.

(ii) "Experts" with different experiences in the sustainable transport field, including urban planners, transport engineers, architects, civil engineering academics, and civil society organisations. Recorded mailing lists were used from several Turkish professional companies, associations and institutions to recognise participants.

(iii) "Policymakers", national and local transportation experts across five selected Turkish local municipalities (Ankara, Eskişehir, İzmir, İstanbul and Konya) to construct a timeline for the implementation of measures for their city.

3.1. An extensive online comprehensive survey

Setting up an efficient online email system for sourcing and recruiting research participants is the most appropriate way when the authors can quickly get access to lists of potential participants and the targeted participants in such lists already have an affiliation with an institution or sector [13]. E-mails were initially sent to only a portion of the people on the lists of potential participants. To get a higher participation response rate, the authors made several adjustments to the recruitment letters, then sent the revised letter to a different group of people on the long list of people to contact. The criteria for the urban location and stakeholder categories in which potential participants live were set out in the recruitment letter (see Section 3).

A comprehensive research survey was conducted from March to June 2014 by using an online survey programme. The online survey link was sent to approximately 75,000 participants from the e-mail lists obtained from several Turkish public and private sectors. A total of 1135 people agreed to participate (see Section 3.1), and they were given a choice to provide their contact information for a possible follow-up interview, and workshop (see .21% of these participants (238 people) provided their contact information for a follow-up interview, and workshop, of these 95 people subsequently responded positively (see Section 3.2).

The socio-economic features of the participants are demonstrated in Table 1. Females accounted for 28.9% of participants, and males 71.1%. The age breakdown was: 18-35 years old (68%); 36-55 years (27.6%); and 55+ (3.7%). Less than a third (32%) indicated that they earn less than €300 income per month, while 44% of the participants earn between €300 and €900. The remaining 24% earn over €1,200 per month.

The main questions being addressed here are how participants visualise their desirable futures. What are the expectations of participants regarding future sustainable transport visions? What are the key factors affecting the public choice of travel mode? What are the suitable policy measures to help achieve sustainable Turkish visions?

Table 1. Socio-economic characteristics of the participants.

Factor	Subgroups	Number of participants	Percentage
Gender	Female	328	28.9
	Male	807	71.1
Age	18-25	390	34.4
	26-35	390	34.4
	36-45	194	17.1
	46-55	119	10.5
	56-65	42	3.7
Income	No income	203	17.9
	Less than €300	160	14.1
	€300-€600	240	21.1
	€600-€900	260	22.9
	€900-€1200	143	12.6
	Over €1,200	129	11.4

The survey text results were analysed line by line and codes were assigned to the text (Available at http://www.bisikletizm.com/bisikletli-ulasim-nasil-gelisebilir/ by clicking Anket Sonuçları). Then, the search for relations between conceptual survey texts and categories were examined. The goal was to understand possible drivers for urban transport change in Turkey thoroughly. The critical changes in the vision development were categorised into four factors: (i) Environmental solutions; (ii) Technology; (iii) Urban structure; and (iv) Mode share. The scenario metaphors (see Section 4.1) and their visualisations (see Section 4.2) were mapped onto the possible Turkish urban areas designed, providing both a contextual description and associated generic representations of the vision storyline.

3.2. Semi-structured interviews

Semi-structured interviews offer a more open research process, where the interviewer has a series of general questions, as well as having some latitude to ask more detailed questions following up important issues. A total of 95 volunteer participants were asked to engage in the improvement and justification of the future visioning exercises through semi-structured interviews (Table 2).

Table 2. Description of participants in the follow-up works.

	Ankara	Eskişehir	İstanbul	İzmir	Konya
Public	Two pedestrians Two drivers Three public transport users	Three drivers One public transport user One cyclist	Seven drivers Five public transport users Four pedestrians Two cyclists	Three cyclists Two public transport user Two pedestrians	Four drivers Three pedestrian Two public transport users Two cyclists
Experts	Three from university Two civil engineers Two urban planners	Three from civil society organisations Two from university One civil engineer	Four from civil society organisation Three transportation engineers Two urban planners Two from university	Two urban planners. Two traffic engineers Two from the private sector	Three transport planners One from university
Policy-makers	Two from the national government Two from local government	Two from local government	Two from local government One from the regional government	Two from local government	One from local government One from district municipality

Ninety-five in-depth interviews were conducted within the sample urban areas, and each semi-structured interview, based on a predefined guide, was designed to take about 15-25 minutes. The sample had a higher number of public participants (48), and the remaining participants were professionals (34) and decision-makers (13) (Table 2). The interview work was completed in spring and summer of 2015.

Each interview consisted of seven open-ended questions for three sustainable visions in Turkey by 2035, according to the following structure: (i) What are the views of the participants about the visions? (ii) Are these visions desirable? (iii) Do participants think the visions are consistent with their internal expectations? (iv) What differences would participants like to see regarding these systems? (v) What should central and local governments do? (vi) What are the requirements for such future changes? Moreover, (vii) What are the uncertainties regarding the visions?

3.3. Workshop

The third stage of this study was operationalised through a series of five local policy construction workshops between January 2016 and April 2016. All policymakers involved in semi-structured interviews contributed to the local policy development workshop. The workshop size was between 25-30 people and this stage of the work mostly aimed to attract relatively senior participants from the local governments in each sample area and previous public and professional participants.

Each group were provided with samples of generic illustrations for specific visions in both a demonstration and in a hand-out. Further clarification was provided giving extended vision narratives for each vision (see Section 4.1). Questions to guide this clarification were asked as follows: What challenges exist for applying the strategies required for achieving the 2030 vision? For a specific vision, what policy measures will be implemented by 2020, 2025 and 2030? (for achieving the 2035 vision). The structuring of the qualitative data analysis process of the classification and the development of links between policy measures were simplified by using the NVivo (2.0) software programme.

4. Vision Development

Figure 1 shows the most popular suggestions arising from 208 different responses from 1135 participants on designing future Turkish sustainable transport visions over the next two decades (see Appendix A). The most common factor is segregated cycle paths (72 participants), while the second highest measure was car speed reduction (53 participants). More cycling paths, restrictions for cars within the city centre, decreasing vehicle reduction, and the provision of pedestrian crossings are some of the other frequently described measures for the desired future visions (Figure 1).
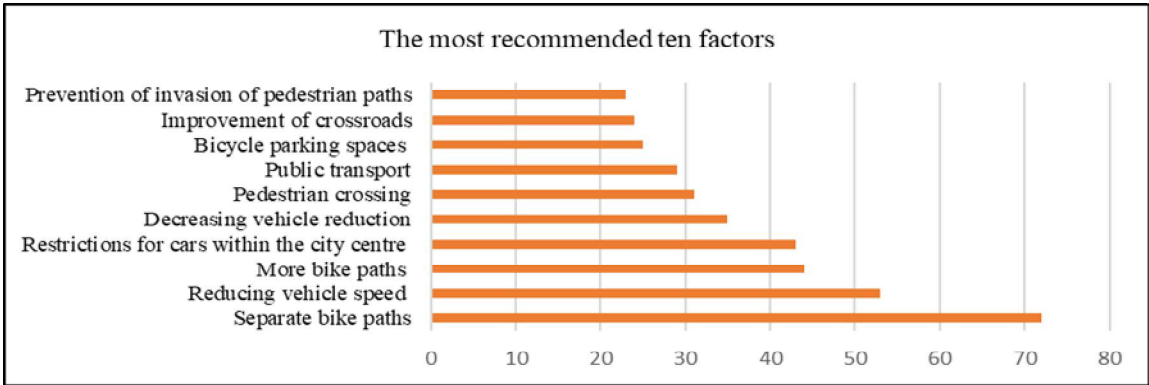

Figure 1. The most recommended ten factors for Turkish transport visions

These were initially analysed by text line, and relevant quotations assigned to nine different conceptual codes (special groups; public awareness; incentives; sustainable transport strategies; urban features; walking; cycling; public transport systems; and preventing car use) (see Appendix A).

Each of the visions presents futures for parts of an ideal Turkish urban area where dependence on sustainable transport systems has been increased and where provision for private cars has been substantially restricted. These visions are distinctly different from the main perspectives, such as the approach to environmental solutions, technological innovations, urban structure changes, and mode-sharing arrangements (see Table 3). The visions have been established based on participant recommendations from the comprehensive survey data, quotations of the volunteer participants from the open-ended questions in the survey work (see Section 3.1), and extensive discussion with the members of the İstanbul Metropolitan Urban Design and City Planning Office team through a series of committee meetings and presentations.

Table 3. Summary of 2035 Visions for Turkish urban Areas.

	Vision One	Vision Two	Vision Three
Environmental solutions	- Reducing the need for car travel in urban areas	- Closing central parts of urban areas to the car	- Extensively expanded public transport systems for all commuters
Technological innovations	- Improvements to prevent possible traffic accidents among different users	- Implementing applications to promote walking and cycling	- Less traffic and emission-friendly public transport vehicles in traffic
Change in land use and urban form	- House prices in the city centre going up would make it harder to form compact cities	- More compact, mixed-use urban form - The changes in urban form tend to happen slowly	- Rapid population growth is rapidly spreading to the outside of the urban area by forming new parks and forests.
Mode-sharing arrangements	- 40% walking; 5% cycling; 35% public transport; 20% car	- 45% walking; 10% cycling; 35% public transport; 10% car	- 40% walking; 5% cycling; 50% public transport; 5% car

The scenario development meetings were carried out in a fast-moving brainstorm form, and the outcomes do not provide a straightforward input to tools for transportation planning such as mathematical modelling, socio-cultural and travel behaviour changes and computational sciences. Integrated participant suggestions and participants quotations were elaborately structured by filling in the empty cell in the example table presented in Table 3. It was then thought most appropriate to shape the process of scenario development of the visions with the members of the urban design and planning office team who could be considered to be acquainted with some of the urban transport practices of the development proposed.

4.1. Scenario Narratives

4.1.1. Vision One

People are being encouraged to meet their basic needs online to decrease the length of automobile travel in urban areas. Various conveniences and promotional coupons are being provided for online shopping and bill payments. Widespread use of digital technology would cause a significant decrease in transport demand. High energy prices are not effective in decreasing automobile dependency because the price of public transportation would also go up. Dedicated

walking and cycling lanes would promote more children and young people to use non-motorized systems to go to school. In this vision, similar and moderate increases are foreseen in all three types of sustainable transport systems relative to the existing poor infrastructure systems.

Technological innovations would be most improved to decrease possible accidents and to develop a more environmentally friendly transportation system. Also, Intelligent Speed Adaptation (ISA) is installed in new vehicles. Digital technology is viewed as a meaningful solution to reduce road accidents. People would do major activities and pay their bills via state online programmes. Some meetings would be carried out from home by work platforms. Follow-up work systems are being monitored and reported more rigorously than before; however, there may be some implications of home working on active lifestyles.

There are no significant changes taking place in the physical structure of cities. House prices in the city centre going up would make it harder to form compact cities. Strategies to either provide good street lighting or physically separate cyclists from vehicle traffic would be expected to improve road safety significantly. Strengthening road infrastructure with a concern for safety and penalising drivers for not giving priority to pedestrians.

Traffic and driver education programs become an integral part of the National Curriculum, to encourage safe and responsible behaviour either as a driver, cyclist, or pedestrian. There would be more traffic signs visible around schools and shopping malls. Drivers will be prohibited from driving over 30 km/h on the busiest streets in the urban areas. Local administrations would receive funding for making cycling or walking transportation safer and more attractive by implementing calming traffic measures. The investments are highly associated with the automotive and technology sectors.

4.1.2. Vision Two

Local administrations would encourage the public to use non-motorised transport modes mainly due to air pollution problems. With the development of newly pedestrianised locations, a decrease is expected in car dependency, and so a decline in air pollution emissions is expected. New settlement areas close to the city centre decrease car dependency and make a broader range of people easily able to use non-motorised transport modes. Public buses are cheaper and more comfortable than the current situation and enable different income groups to access town centres easily. Walking and cycling have significantly increased, and car use has dramatically reduced.

Technological applications help make walking and cycling more convenient. Weather reports, events, health measurement equipment, public transportation stops, and route information are easily accessible. Most of the people consider that digital technology will obliterate social interaction and they do not want to move to home working or internet shopping entirely. City centres would be reachable through small cars that operate on renewable energy systems.

Growing petrol prices would increase employment densities and so lead to denser urban areas, although the effects of increasing petrol prices on some features of urban form are hard to forecast. However, the changes in urban form tend to happen very slowly because local land use strategies constrain increases in urban density. Municipalities warn residents to park their automobiles in a way that would not block pavements and cycle lanes. High parking prices and cycling awareness events encourage people to utilise cycling. More extensive areas are assigned to cyclists and pedestrians. Pedestrianisation projects and running parks are becoming more common to increase people's physical activity. Cycling and the integration of cycles with public transportation at transfer stations make cycling more appealing for different income groups.

Local administrations are encouraging cities to become more compact and multi-purpose. The pedestrianisation of some locations in town centres offers significant advantages for the safe transport

mode of cyclists and pedestrians. Denser urban areas would require automobiles to go slower, which in return helps to decrease possible accident risks in urban areas.

4.1.3. Vision Three

Local administrations are trying to find efficient solutions for traffic jams and air pollution through a substantial reduction in car usage. Car drivers are encouraged to use workplace service buses or public transportation for their commutes. Car dependency shows the sharpest decline in this vision. Offering incentives to encourage the use of public transport options decreases the individual cost for such transport, and so encourages behavioural change. High energy demands would impose enormous hardships on private and public agencies in Turkey. The scarcity of energy resources will cause the price of fossil fuels to go up. Therefore, the government accepts the need to overcome the difficulty of procuring energy by investing in public transportation systems and by increasing awareness about sustainable energy. Supporting infrastructure developments have enabled public transport to become more convenient and people less dependent on car use compared to other visions.

A significant proportion of technological development consists of innovations regarding the improvement of fuel performance and economy. The new vehicles would operate on renewable energy that produces fewer emissions, or on electrical power. Technological developments will be limited, but city centres would be reachable through small cars that operate on renewable energy systems and would be integrated with cycles. Free-of-charge Wi-Fi systems spearhead public transportation systems, which are becoming a more practical transportation mode.

Local administrations are creating greenbelt areas to prevent city sprawl. The development of public transport would make new social and business location on the outer parts of the city more appealing. The number of public transportation terminals would be increased in the outer parts of the city to increase accessibility. There would be a significant decrease in the number of severe accidents as drivers are encouraged to use public transportation services or non-motorised transport systems. Public transport drivers will be trained to be more aware of cyclists.

4.2. Visualisations

Three locations of the possible Turkish urban areas were designed and demonstrated as they were in 2015 in Figure 2. Specific archetypes used included a suburban area, an area close to a busy university campus, and part of the city centre. The residential area is a modern residential place to travel and live, but one where road parking is a crucial problem. The road is lacking the infrastructure to help pedestrians to cross the road safely and comfortably. There is a large taxi stand in the residential area, and unaffordable public transport links between the residential suburb and the outer locations of the city are the norm. The university campus is bound by a ring road, although beyond this there was recent development such as scientific research and development centres and shopping areas. Pedestrian and bicycle access on the ring road is weak. The current roads for pedestrians and cyclists are narrow and uncomfortable. Illegal car parking along the road is common. A typical busy traffic corridor in the city centre has not successfully adapted to changing traffic circumstances over the years. The location is cluttered, and traffic congestion, noise and local air pollution is the norm. The street lacks pedestrian infrastructure.
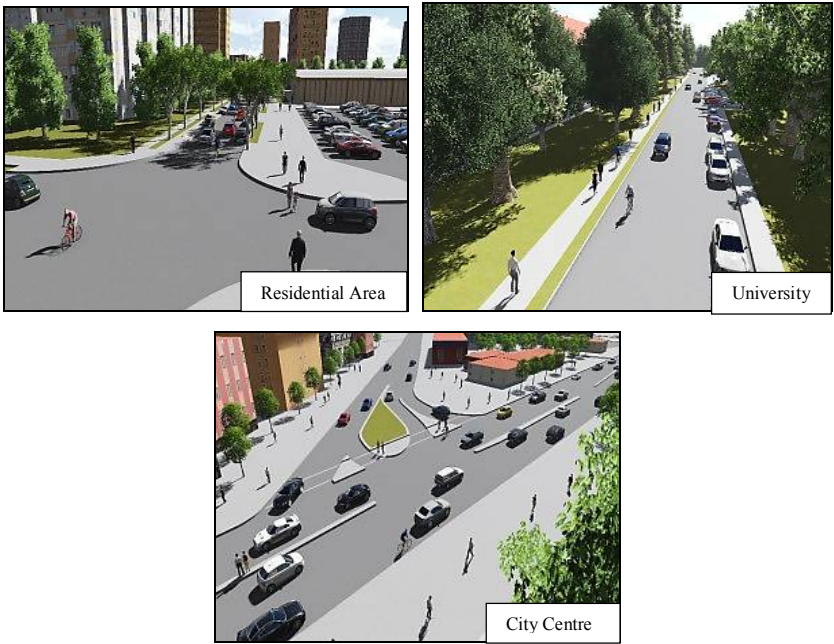
Figure 2. The current Turkish urban locations in 2015.

4.2.1. Vision One

Vision One decreases automobile dependency and proposes a more comfortable and safer active transportation system than the existing situation. Newly-arranged parking lanes prevent the pavement on the right side of the road being occupied by cars, enabling pedestrians to walk comfortably on the pavement.

Measures to ease pedestrian use of the road have been implemented (Figure 3). In the new settlement areas, to reduce accident risks, suitable lighting systems improve the visibility of vulnerable road users. Properly placed barriers ensure safer cycling by separating the road from the motor vehicle.
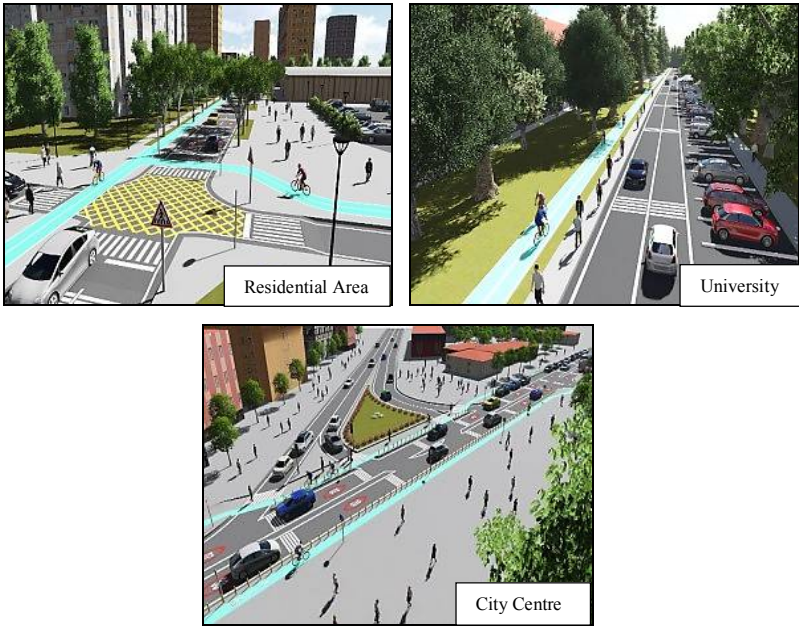
Figure 3. The Turkish locations as they might look in Vision One.

Cyclists can cross the road conveniently by using combined walking/cycling crossing places (see Figure 3). The fact that the cycle lane is to the left of the pedestrian walkway allows cyclists to travel faster. Some small-scale improvements have been made regarding the use of public transportation systems.

Passenger capacities in public transportation are increasing. Physical speed bumps and speed reduction practices are placed in the street to enable motorised vehicles to move at a slower speed. There are reductions in available space for motor vehicles. Vertical displacement is used to slow drivers on the approach to crossing facilities. Drivers are prohibited from driving over 30 km/h on the busiest streets, and greater enforcement is applied.

4.2.2. Vision Two

Figure 4 shows the same three locations as in Figure 3 and how they may look in 2035 under Vision Two. The prevention of new settlement areas at the edges of the city is approached in a planned manner. The changes in urban form tend to happen very slowly because local land use strategies constrain increases in urban density. People tend to move through certain parts of the urban centres closer to workplaces.

Vision Two presents a broader and more socialised location for the users of non-motorised vehicles. There are numerous social facilities, such as cafes and art galleries, which enable people to socialise. Pedestrianisation projects and open space are more familiar to encourage physical activity.

A separate road at the far end of the broad pedestrian area was designed for cyclists. The pedestrianisation of residential areas offers an opportunity for safe cycling. Public information spots are placed at the nearby university to raise awareness of cycling. The formation of cultural facilities and activities makes changing attitudes towards cyclists in new urban environments. Public buses are cheaper and more comfortable than the current situation and enable different income groups to access town centres more efficiently. Tax incentives encourage people to go less to city centres by car. Denser urban areas force slower driving, which in turn helps reduce accident risk and severity.
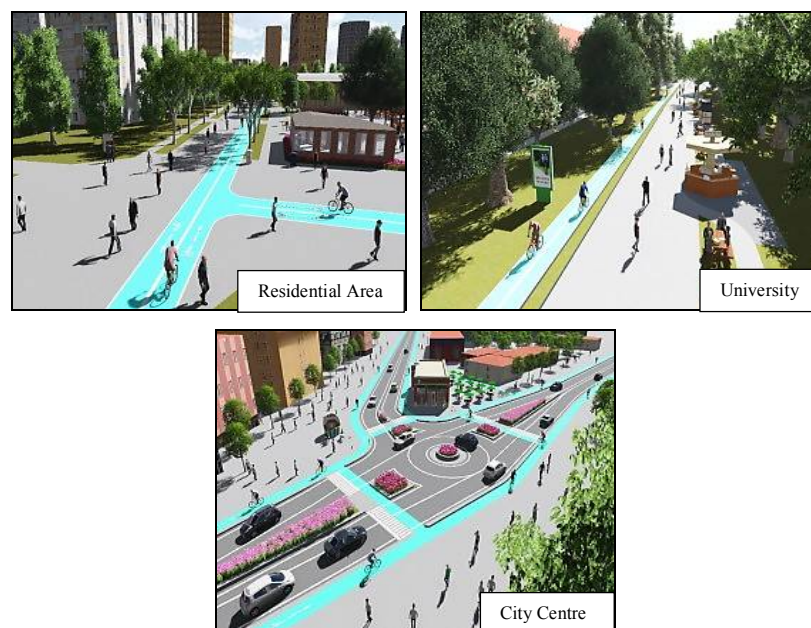
Figure 4. The possible Turkish locations in Vision Two.

4.2.3. Vision Three

Figure 5 shows the same three locations as in Figures 4 and Figures 3 and how they may look in 2035 under Vision Three. More affordable housing tends being encouraged in new developments with better transport connectivity and strong service provision, so it becomes increasingly possible for those on lower incomes and without an automobile to access jobs.

Systems with pedestrian priority are designed, and roads for motorised vehicles are restricted. Road space is allocated to vulnerable roads users.

There are more bicycle tracks for mainly recreational purposes in outer, natural areas of the city. Dedicated cycling lanes will pass behind bus stops, enabling cyclists to continue past a stationary bus, away from the traffic. Bicycle and public transport lanes are changing their places to prevent possible collisions between turning traffic.

Public transportation systems would become faster, more comfortable and will ensure that transportation to the city centre is less stressful. Public transport systems, school buses, and institutions' service buses will cover 50 per cent of the traffic in urban areas. Car dependency has the sharpest decline of the visions, and non-motorised transport increase by nearly 10 per cent.
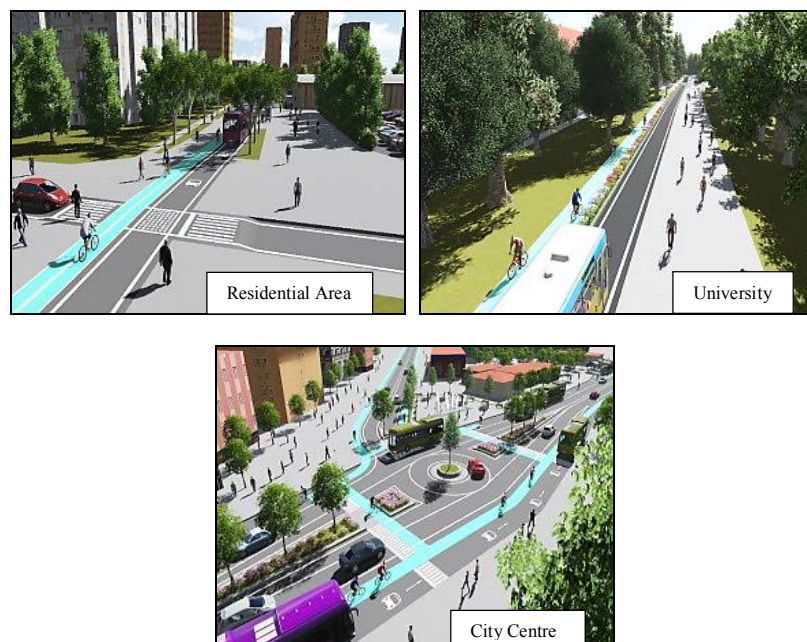
Figure 5. The possible Turkish locations in Vision Three.

5. The justification for the Visions

In general, participants stated that the core requirements for having active transport systems were explicitly considered in all three visions and all reduced the space available for cars to promote the development of sustainable transport.

As a public participant from İstanbul (Driver, male, aged 26-35) said "*we need to adopt these alternative transportation visions anyway. It looks more and more like we cannot live. If we do not emphasise walking, cycling and public transport more, İstanbul will become a giant car park. Small cities are experiencing similar concerns as well*".

Some expert participants felt the visions presented a balanced approach to increasing more sustainable transport. For them, the protection of the rights of non-motor vehicle users is vital for planning because they are claiming that the required spaces are only taken from pavements when building bicycle paths or new parking areas.

"The widths of the pavements in all visions are a point that I like especially. When we put a strip of parkland, we like to do this for pavements. Alternatively, while a bicycle path is made, the bicycle path is gotten from the pavements" (Expert, traffic engineer, male, aged 46-55, İstanbul).

"A plan not having been made only for cyclists or only on the bus transport system. All transportation modes have been considered in a way to be balanced in different visions at the same time. One of the most neglected issues in our country is this. For example, if bicycle path is made, the place from where vehicles can go is not considered, or if one lane is removed, the places where cars will be parked are not taken into consideration" (Expert, academician, female, aged 36-45, İstanbul).

Several participants, especially expert and policy-makers, mentioned the critical changes in each vision are dealt with in other visions in different ways and concluded that these visions could be combined in a solution-oriented manner to the existing challenges of urban transportation systems.

''Primarily, the topic should not be regarded as a 'vision' or 'utopia'. The information I read contains the systems which I applied directly to my career and are run smoothly in other countries. The first two visions are evaluated as part of transportation demand management (TDM). Society and Safety are two main titles, and we cannot claim that safety is not included in the community" (Expert, urban planner, male, aged 46-55, İstanbul).

''The specific criteria of the other vision found in the others — for example, safety measures included in both Vision Two and Vision Three" (Expert, civil engineer, male, aged 26-35, Eskişehir).

"The only problem is why you cannot fictionalise the condition after 20 years classified into three as a single 'climate-friendly scenario'. This is not compulsory, but these three visions can be combined. Naturally, a climate-friendly scenario is affordable and should not lead to other problems" (Policy-maker, district, male, aged 36-45, Konya).

5.1. Environmental Solutions

The environmental solution address issues such as air pollution, noise and congestion. Generally, public participants think that the most critical change is reducing traffic jams through the development of existing public transport systems. In addition, the expert participants think that ''motor vehicle lane does not need to be closed off too much because the roads closed off somewhere create more traffic congestion in other locations" and ''walking distances increase too much with the closing of the areas and will cause stressful situations rather than minimizing traffic jam".

''In Vision Two, instead of closing off the motor road and creating a social area, such areas could be formed in different areas where the road does not pass. There are adequate society areas at the university. Thus, I think if we narrow down the roads and close them to traffic this could then pose problems" (Driver, male, aged 18-25, Konya).

''Even three minutes is necessary for the condition of students being late for class in the morning. Vision Three can offer fast transportation, and everyone can drop off at his or her faculty" (Public transport user, female, aged 18-25, İstanbul).

Even though the participants thought that, especially in the early hours of the day, there is a need for more efficient and fast public transportation systems within the campus, and therefore, even though Vision Three would create a better campus atmosphere, the vision would create a much more stressful situation by increasing walking distances, particularly for the students. One expert (Urban planner, female, aged 36-45, İstanbul) thinks dedicated road space for public transportation systems will permit traffic to flow faster; otherwise, the effects of public transport vehicles stopping in narrow lanes will cause traffic stoppages.

5.2. Technology

Technology has advantages and disadvantages in reducing travel demand and is an essential factor for business and social life. In Turkish cities where home working may be appropriate, and to design smart technologies into working life, the spread of smart and digital innovations can lead to a decrease in daily travel trips. Several public and expert participants think that the introduction of digital technology into working life is awkward for the whole of Turkey; and said that it could cause declines in one-to-one people interactions.

"You mentioned especially a scenario in which office works will be performed remotely. Is this an assumption? Is this an estimate? I wondered because of the subject in Turkey. It is likely for our cities, such as İstanbul and Ankara. Is it possible for the whole of Turkey?" (Driver, male, aged 26-35, İstanbul).

"Life gets easier with increased information gathering opportunities by use of technology, online services cut down travels, but it would not be wrong to foresee a decrease in human and one-to-one interactions?" (Transport planner, male, aged 36-45, Konya).

One policy-maker considers the fact that the automotive sector does not need to make significant investments for safer urban transport environments in Vision One. The policy-maker (Local, female, aged 46-55, Ankara) stated *"If speeding limits are decreased, the number of accidents will decrease. Death tolls in collision accidents will also decrease — no speeding. When there is no speeding, the driver can manage his safety. There are comfortable cars too. There is a new technology too. There are human-less drivers, sensitive pedestrian systems, but it seems like the automotive sector will not have to make these investments in this scenario"*. An expert participant from İstanbul (Female, academician, aged 36-45) assumed that the designing of small cars with low carrying capacity in Vision Two would be technologically and environmentally disadvantageous.

"Popularity of smaller cars with lower carrying capacity is in contrast with the technological objectives. It is wrong. Big cars are more advantageous about fuel consumption, operating costs and conditions, traffic safety and traffic jam" (Policy-maker, local, male, aged 26-35, İzmir).

5.3. Urban Structure

Many of the experts interviewed in this study, tend to underestimate the importance of compact and high-density areas.

"Taking measures for traffic safety particularly in the cities and settlements, which are dominated by motorised transportation, will make them more attractive and useful. The escape to suburban areas with dense traffic will be stopped" (Expert, transportation planner, male, aged 26-35, Konya).

"The presence of dense areas is preferred. What we have is not compactness; it is an unplanned density. Bicycle transportation, to be improved has come down to such a compact area level that it is a problem in itself" (Expert, urban planner, female, aged 26-35, İzmir).

"Increasing the square metres of the pedestrian area does not enhance socialising. Vast, empty, and non-functional areas are not perfect" (Expert, transportation planner, male, aged 36-45, Konya).

They highlighted that the Turkish economic strategy had driven urbanisation for years and they said designing a compact urban area model is not possible with the current conditions unless the economic policies of the central government change.

"Creating a compact city is possible with these improvements only for a very extended period since the growth of Turkish cities is dependent on unearned income" (Expert, academician, female, aged 36-45, Ankara).

"Economy policies of the central government should be changed significantly. The economic strategy of Turkey has driven Urban development and construction for years" (Expert, civil society organisation, female, aged 26-35, Eskişehir).

Another public participant claimed that there is no need for vehicles inside the campus and therefore it should be a system that supports pedestrians and cyclists as in Vision Two. "*Universities need to be made into more social areas. It could be easier to convert these places into a human-oriented urban environment, compared to the city centres*" (Public, pedestrian, female, aged 18-25, İstanbul).

"*Some streets are too narrow. The vehicles can barely fit because it is not so possible for buildings built 40 years ago to be demolished to widen the streets. There needs to be more pedestrianisation in the centre*" (Expert, urban planner, female, aged 36-45, Ankara).

Besides, several public participants said road spaces for cars had been limited too much in Vision Two and that the need for cars is inevitable in some cases.

"*Sometimes there can be a situation of having to reach a place in the university; therefore, I may need the car. The bags I need to carry are heavy, and our campus is large, so carrying them can be tough for me. It would also not be possible for me to bring in from the university entrance; therefore, there should be lanes for the vehicles. If the drivers want to make an interim stop, a problem can arise. Still, it looks like having a two-lane road is essential. Otherwise, there would be transportation problems*" (Driver, female, aged 36-45, İstanbul).

"*In a city like İstanbul, where 15 million people live, I think it is tough to apply simple solutions. I believe Vision Two limits freedom of travel for motor vehicle users too much. The Vision Three, on the other hand, both provide a faster transportation system by allocating separate roads for buses and offers a better urban area for bicycle and pedestrian transportation users*" (Driver, male, aged 56-65, İstanbul).

"*When coming to the university, I continuously must bring in and take away things. There could be a one-way road as in Vision Three, and more attractive social areas could be created within the university. I believe Vision Two limits freedom of travel for motor vehicle users too much*" (Public transport user, male, aged 26-35, İzmir).

5.4. Mode Share

In general, participants think that Vision One looks like a transitional vision in the short term, although they think this vision seems more reasonable since motor vehicles do not decrease as much as the other visions.

"*In Vision One, automobile numbers do not decrease so much; this vision looks like a transition point. It can be a transition point for urban areas in Turkey as well*" (Expert, academician, female, aged 26-35, Eskişehir).

"*Vision One might be more realistic because it decreases automobile dependency less. There is a more consistent lane reduction in Vision One, and there isn't a far-reaching reduction in the decreasing of traffic. It seems more reasonable since there is not as much lane reduction as Vision Two and Vision Three*" (Expert, transportation engineer, male, aged 36-45, İstanbul).

The expert participants think that Vision Two is not an alternative future that can be applied everywhere in different parts of typical Turkish urban areas, whereas it can be successfully implemented in certain parts of urban areas where motor vehicles are rarely restricted from entering the streets such as; narrow roads, campus areas, and historical places.

"*Some areas might be said that vehicles should get out, and just pedestrians and cyclists should be allowed. It could especially be historic urban centres. So, all three visions may have different application areas. For example, Vision Two can be considered in some regions of the city where there are more bicycle and pedestrian transportation, and where some motor vehicles cannot enter some streets. It can be applied in city centres and university campuses, but it is not a vision that could be implemented to every location of Turkish urban areas*" (Expert, urban planner, female, aged 26-35, Ankara).

Vision Three prioritises public transportation more, and that is why it seems more logical for the existing urban transport problems.

"All three visions are meaningful but the vision that prioritises public transportation includes the other visions more, and that is why it seems more logical. Especially three types of sustainable transportation futures are brought together. It shows it includes public transportation" (Expert, civil society organisation, female, aged 36-45, Eskişehir).

"Vision Three seems an ideal vision since you suggest more complex transportation in the city centre as well. Vision Three can also promote people to mass transport and can decrease the problems they live in daily transport. Otherwise, if we do not give more importance to public and active transport systems, İstanbul will be transformed into a big car park area" (Expert, academician, male, aged 36-45, İstanbul).

The participants emphasised that the economic strategy of Turkey is mostly dependent on the income-oriented building industry, so it is not convenient to design a compact urban model, as proposed in Vision Two. Besides this, it was underlined that the spread of digital technology would lead to a decrease in communication between people in Vision One. Also, they specified under the title of technology that producing smaller cars and lowering their carrying capacity in Vision Two is in contrast with the environmental objectives and this approach can create disadvantages regarding fuel consumption, operating costs and conditions, traffic safety, and traffic jams.

The current opinion of the participants is that Vision One seems like a transitional approach, Vision Two can only be implemented in minimal locations, and Vision Three appears to be the most complicated approach and solution. Although three future urban transport systems in this paper were initially developed with much higher dependence on walking and cycling, the results show that the vision that most developed the public transport system was seen to be most realistic by the participants, although the visions were initially developed with much higher dependence on walking and cycling.

6. Policy Implications for Vision Three

This section serves as a useful tool for helping different Turkish cities and towns to understand how they might build their local policy pathways with sustainability in their mind. As stated in Section 3.3, policy-makers were supplied with related resources (generic visualisations and its scenario statements for Vision Three), in advance of each workshop, to discuss and create pathways with the context of their urban areas, as presented in Table 4. The workshops were carried out in the transportation planning division of the selected local governments over a day — we intended to identify distinctive policy measures that each sample needs to implement for achieving the target of one specific vision. Twenty-six participants were selected from across the five urban samples: five from Ankara, Eskişehir, İzmir, and Konya, and six from İstanbul.

It is interesting to mention that all selected urban areas in this study would have to apply different vital strategies to achieve their vision targets and that these local policy pathways could constitute exemplary approaches for many other Turkish cities. Meanwhile, it was noticed that the municipalities make their transport plans as part of their visions since the effect of the central authority on the local administrations is not strongly effective and satisfactory. It is somewhat surprising that the prominent sustainable transport practices of some Turkish urban areas are not applied, and the policy measures of each selected city can suggest important ideas for other cities.

The key strategy for Ankara is to integrate cycling with metro and public transport systems, particularly at university stations, and to develop new smart card systems for all public transportation systems, with new rights and benefits for minibus drivers (see Table 4). On the other hand, the integration between the public transport systems or any smart card system has not yet been established in Ankara, whereas, in the other sample areas, the smart card systems and the public transport integration applications were being used much earlier for promoting the use of affordable public transport systems. Eskişehir was a single sample urban area that collaborates with

Table 4. Local policy pathways for Vision Three applied in the selected Turkish urban areas.

	Ankara	Eskişehir	İstanbul	İzmir	Konya
2015-2020	❖ Improvement of metro and mass transportation systems. ❖ Increasing the tramway's capacity and some navigations in M2Çayyolu metro. ❖ Finding additional resources for new metro investments. ❖ Start-up of Kecioren and airport metro lines.	❖ Start the construction of the new light rail transit line. ❖ The extension of tram lines into three separate regions (Yıldıztepe-YenikentÇankaya, Çamlica - Batikent and Emek - 71 Evler) for increasing the capacity of tramway journeys. ❖ Activation of the ropeway transportation system.	❖ Improvement of underground and ground railway systems. ❖ Making private public transport lanes on some road corridors. ❖ To connect the new airport with the city centre by new rail systems. ❖ To create High Occupancy Vehicle (HOV) lanes on the two Bosporus bridges. ❖ To prevent the destruction of green areas because of the construction of the new airport and Bosporus bridge.	❖ Re-arrangement of recreational fields. Making bicycle roads in compliance with national standards. ❖ Enlargement of the bicycle sharing systems along the coast. ❖ Formation of vertical bicycle road connections from coastal areas to the city centre. ❖ The connection of the leading bike artery roads with each other.	❖ Providing the opening of new development in some areas (University and TOKI lines). ❖ To create better public transportation facilities between Meram Medical Faculty and the Bus Terminal.
2020-2025	❖ Free car parks at metro stations. ❖ The realisation of bicycle projects in universities. ❖ The presence of bike sharing systems on university campuses. ❖ Construction of bike parking in metro stations. ❖ Construction of new bicycle roads ❖ Integrating the metro with bicycles.	❖ Determination of car park violation points in the city centre. ❖ Integration of bicycles into mass transportation. ❖ Penalizing for car users occupying bicycle routes. ❖ Formation of bicycle road networks. ❖ Increase the accessibility of public transport buses where passengers cannot easily use tramway systems.	❖ Construction of bicycle roads near the seaside. ❖ Distribution of free bicycles to students Integration of coastal mass transportation system with bikes. ❖ The performance of bicycle events and activities. ❖ Strengthening pedestrian infrastructures near the coastal sites ❖ The performance of pedestrianisation works in historic areas.	❖ Integration of suburb and bus transportation with bicycles in all sub-provinces. ❖ Provide priority for bicycles in narrow streets. ❖ To apply high parking charges around the bus stops in the city centre.	❖ The implementation of the monorail project, which provides great convenience for public transportation systems. ❖ Development of light railway systems and increasing the network length to 180 km. ❖ After the conversion of minibuses to buses, an electronic fare system should start in the city.
2025-2030	❖ Increasing car park charges. ❖ Improvement of smart card systems. ❖ Formation of new rights for minibus drivers. ❖ Development of the integration of all masses transportation systems.	❖ A review of public transport routes and lines according to the density of motor vehicle traffic. ❖ The design of smart stations for all bus and tramway stations. ❖ To convert 15% of the municipal fleet to electric vehicles.	❖ The creation of low emission zones ❖ To divide the city into different zones (high-density housing, commercial density, forestland, etc.) and evaluate each zone depending on their characteristics.	❖ Movement of the city centre's density to the Bayraklı region. ❖ Pedestrianisation of Bayraklı, which would be the new town centre. ❖ Pedestrianisation of the old Kadife Castle.	❖ Improvement of social life and public culture around part of the city centre. ❖ The minibuses will be removed from the city centre. ❖ The completion of road construction works for bicycle transportation.
2030-2035	❖ Designing the main centres of the city (like Ataturk Avenue, Kavaklidere, Sihhiye and Ulus) to provide priority to pedestrians	❖ Activation of the pedestrianisation works in some regions of the city. ❖ Increase green fields per individual.	❖ Implementation of traffic congestion charges on the Historical Peninsula.	❖ Construction of metro lines from the city centre to North (Bergama) and to South (Ephesus) direction. ❖ Activation of the metro system towards the west (İzmir Institute of Technology) areas.	❖ Prohibition of car parking on certain roads to decrease vehicle use.

the general security of the town for preventing car parks in cycle lanes. The general security and transportation departments of Eskişehir collaborated to prevent car parking in cycle lanes; however, similar applications are not implemented in other cities. This collaboration is essential for many Turkish cities where cyclists cannot use their routes due to the occupation of cycle lanes by cars (even for Konya, which has 240 km of cycling paths). The policy agenda of İstanbul includes new underground and ground railway systems and to implement a traffic congestion charge. İstanbul provides an essential message to the other major car-dependent cities that it is crucial to develop initially public transport systems for changing public behaviour from car journeys into public transport systems and then to improve non-motorised transport systems (see Table 4). İzmir was the only city that does not allow minibuses to enter the city centre as a transport mode, but their commercial use between definite terminals in the suburban areas and the counties was allowed.

This practical application may offer an excellent point to other municipalities that have high traffic congestion due to the intense use of the urban minibuses in other urban areas. The topography and urban structure of Konya offers a better urban environment for cyclists and pedestrians. However, cars occupy many cycle lanes, and current pedestrian planning projects were terminated due to public pressure. Making the city centre more attractive for the public needs may promote car drivers to use more sustainable transport systems because people in Konya must use some central parts of the city for their long transit journeys (see Table 4).

7. Conclusion

This paper has outlined a participatory approach taken to designing future urban transport environments for the year 2035 which bring about a radical development in the level of sustainable transport through the hypothetical Turkish urban areas. The alternative futures are intended as a foundation for participant involvement and to assist inspirational thought about whether such futures are desirable and reliable. The paper has highlighted many novel features to the participatory approach, relating to the meaningful public involvement with a variety of participant groups throughout the construction of the associated policy-pathways.

The key message from our research is that switching much of the population to more sustainable forms of transport for many journeys is entirely feasible, if such forms of transport are made accessible, comfortable, and can easily be integrated into the user's daily routine. Most people recognise the visions are reliable and solutions to the existing challenges are clear but robust to implement because they require relatively radical development not only in the habits in which people travel but also in the structure and organisation of urban development. Although many Turkish urban areas already have levels of sustainable transport mode shares that are comparable to or higher than most other developed and developing countries, there is an obligation to increase this substantially and to validate how sustainable systems can be regularised within urban areas.

It is clear that in order to generate sustainable transport development a wide-ranging approach needs to be synchronised among a variety of different public and private sectors to create an urban environment in which choosing to use sustainable systems becomes noticeable. Such coordination may seem idealistic or utopian, but they are undoubtedly still some distance from present Turkish government action plan on sustainable transport development. Undoubtedly, such developments would involve a considerable degree of consensus that such a future is achievable, that the existing transportation problems are real, and that radical approaches to tackling them are essential. However, it is important to emphasise that if the reliability of such radically different futures (and the implication of the pathways for this vision) is not confirmed, then it is less likely that such changes will be achieved in Turkish urban areas.

Acknowledgements

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Appendix A

Table 1. Preventing Car Use.

Key factor	Response number
Reducing private car usage	5
- In city centre	2
Reducing vehicle speed	53
A limited parking ban in a city centre	3
Resolving parking problems	4
Increasing petrol prices	7
A reduction in the number of cars parked	2
Complicating car purchase	1
Making harder to get car license	1
Speed control	5
- In residential areas	4
- City center	1
Annual quota system for vehicle usage	1
Decreasing vehicle reduction	35
Restrictions for cars within the city centre	43
Designing small cars	3
Deceleration of private cars in the crosswalk	1

Table 2. Public Transport Systems.

Key factor	Response number
Public transport	25
Better planned public transport system	4
Modern public transport systems	2
Increasing the number of public transport buses	3
Improving the quality of public transport services	3
Increasing public transport comfort	1
Improving public transport facilities	1
Intelligent public transport systems	1
Renewal of public transport vehicles	2
Upgrading public transport vehicles	1
Safer transport systems	2
More quiet transport systems	2
More enjoyable transport systems	1
Traffic management centre implements	1
Alternative systems	2
Intelligent road design	3
Smart design	4
Integrating cycling and public transportation	9
Technology advancements in public transport	2
Public transport users should respect each other	1
Reduced fare program	2
Minibuses	1
Tramway	3
Metro	3
Accelerating tram	1
Systematic road transportation systems	1
Increasing the frequency of time	1
Increasing the frequency of times during business hours	2

Public transport management service	1
Dissemination about public transport services	2
More accessible public transport systems	1
Increasing the share of renewable energy in public transport services	1
Route improvement project	1

Table 3. Cycling.

Key factor	Response number
Lowering the price of bicycles	2
Dissemination on cycling awareness	13
Safe bike paths	19
Aesthetic bike paths	1
Bicycle lifts	1
Electric bikes	1
Bike hire	2
Separate bike paths	72
Expansion of bike paths	2
Safety strips	1
More bike paths	44
Comfortable bike lanes	3
Safe bicycle parks	1
Security cameras near bike parking space	3
Bicycle parking spaces	30
Warning signs at the junction	2
Do not allow pedestrians to walk on bike paths	4
Bicycle police	1
Signalized intersections	2
Traffic light priority for cyclists	1
Inserting helmet	3
Shower facilities	2
Improvement of bike paths	4
Creating complete bicycling networks	6
Better quality bike paths	2

Table 4. Walking.

Key factor	Response number
Increasing pedestrian paths	4
Safe pedestrian paths	2
Expansion of pedestrian paths	15
Giving priority to pedestrians	2
Seat benches	3
Reduction of the defect in the pedestrian path	2
Comfortable pedestrian paths	1
Better pedestrian paths	3
More comprehensive pedestrian paths	2
Regular pavement	1
Better pedestrian infrastructures in suburban areas	4
Less waiting times for pedestrians	1
Tree-lined pathways	1
Prevention of invasion of pedestrian paths	23
- *By motor vehicles*	19

- *By electric poles*	1
- *By cyclists*	4
Improvement of crossroads	25
- *Suburban areas*	3
More comfortable bike pathways for elderly	3
More comfortable bike pathways for disabled	2
Encouraging walking	1
Pedestrian crossing	31
Pedestrian signs	2
Designing more direct routes	6
Walking maps	4
Facilitating pedestrian access in hilly areas	2
Street lighting	8
Running parks	1
Editing underpasses and overpasses on the roads	3
- For pedestrians	1
- For cyclists	2

Table 5. Urban Features.

Key factor	Response number
Increasing aesthetic	16
Park areas	4
Green areas	5
New modern squares	4
Visual beauty	1
More social and business places in residential areas	3
Urban design for family securities	3
More compact cities	1
Decreasing the population of major cities	4
- By shifting into another city	3
Industries should be relocated outside of cities	3
Fixing distorted urban land	2
Improvement of urban environments	2
- *for better air quality*	1
- *for decreasing noise pollution*	1
City and regional planning for public	1
Ensuring security in the streets	2
Reduction of the population densities in major cities	2
Artistic places in major cities	3

Table 6. Sustainable Transport Strategies.

Key factor	Response number
Cyclists should have more rights	3
Protecting all rights of pedestrians	2
Preventing society from crazy young drivers	1
Penalty sanctions	4
Each transport mode users should comply with traffic rules	3
Improving the conditions of cyclists	2
Increasing the rules	1
Arrangements about passenger cars	3
Development of traffic laws	2
Development of local sustainable transport policies	4

Development of national sustainable transport policies	6
Ensure the observance of traffic signs	1
More comprehensive bicycle strategies	2
Developing bicycle culture in urban areas	1
Prevention of invasion of bike paths	6
- *By pedestrian*	1
- *By motor vehicles*	5
Tax incentives for cyclists	1
Cycling license law	2
The application of deterrent sanctions	1
Improvement of pedestrian rights	1
Making mandatory the use of pedestrian crossings	3
Penalising car drivers who do not respect cyclists	1
Penalising car drivers who do not give way to pedestrians	4
Campaigns and education	6
Different cultural campaigns based on sustainable transport	2
Giving bike education in kindergarten	1
Improving municipal management for cities to succeed	1
Shifting investments to small towns	1
People should live in or near areas where jobs are concentrated	1

Table 7. Incentives.

Key factor	Response number
- Economic	4
- For walking	2
- For public transport	4
- For decreasing passenger cars	2
- For cycling	1

Table 8. Public Awareness.

Key factor	Response number
Related to walking and cycling issues	3
Increasing the awareness of bicycle use	2
Awareness of pedestrians	1
Awareness of motor vehicles	4
- Towards using walking and cycling for short trips	3
- Towards sharing roads with cyclists	2
- Towards respecting pedestrians in the pedestrian crossing	1
Expert and public events towards dissemination of walking and cycling as transport modes	3
Public spots for increasing the awareness of pedestrians	2
Dissemination of cycling	4
Organised cultural events for cycling	6
Extraction of traffic laws that increase people's consciousness	1
Increasing respect towards pedestrians	2
Increasing respect towards cyclists	1
Cyclists should have more rights	6
Protecting all rights of pedestrians	1
Organised cultural events for cycling	5
Cultural changes	1
People respect each other	2
Conscious and trained drivers	1

Prevention of unnecessary horn-blowing	1
Cultural innovation for a sustainable future	3
Public awareness	1
Training of public transport drivers	4
Solving social dimension problems	6
Giving importance to education	2
Health campaign for people using private vehicles	1
Training of people	1
Regular trainings	1
Granting of traffic education in schools	1
Public spot that expresses walking is good for heart health	1
Raise awareness about sustainable energy trends	2
Public spotlight on carbon emissions	1
Public spotlight on obesity	1
Raise awareness about sustainable energy trends	1
Public spotlight on carbon emissions	1
Education	1
Preventing society from crazy young drivers	1
Improving people attitudes towards less polluting public vehicles	1

Table 9. Special Groups.

Key factor	Response number
- Convenience for families with babies	2
- Providing safety for child and young cyclists	3
- Encouraging low-income people to use cycle	1
- Electric bikes for adults	1
- Better systems for disabled people	2
- Build a shelter for stray dogs	1