AUTOMOTIVE
TECHNOLOGY
PLATFORM

Automotive Technology Platform

VISION DOCUMENT

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PREFACE

Automotive Technology Platform (OTEP[1]), is a non-profit organization which was established on October 1, 2008 as a TUBİTAK supported project having 17 members including OEMs, automotive suppliers, engineering companies and energy supply companies

In line with the Automotive Sector Technology Vision determined in the first workshop of the Automotive Technology Platform, separate working groups have been established to carry out various tasks. As a consequence of the efforts spent in the workshops and the resulting evaluations, these working groups have underlined the vision and the main components comprising all the elements of the automotive supply chain. This vision, which has been considered within a wide socio-economic perspective and specified for a long-term period such as 20-25 years, will constitute a sound basis for the Strategic Research Plan.

This vision document is published with the date and the version stated on its cover page. Updated vision documents will continue to be published with new dates and version numbers.

[1] abbreviation for **O**tomotiv **TE**knoloji **P**latformu, namely, Automotive Technology Platform.

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AUTOMOTIVE TECHNLOGY PLATFORM

The efforts to establish **"Automotive Technology Platform"** (OTEP) were initiated in the workshops carried out in the halls of TÜBİTAK-TÜSSİDE[2] on March 9-10, 2007 and completed on 1.10.2008 with the adoption of İŞBAP project submitted to TÜBİTAK. So, OTEP was established to unite the institutions which are directly or indirectly related with the Automotive Industry and manufacturing technology, conducting or supporting R&D activities around a common platform, to increase the R&D capacity of the Automotive Industry by creating synergy, and to take the necessary steps for maintaining the long-term competitiveness of Turkey in automotive industry in the light of a common wisdom.

Currently, the platform has 28 members comprising the OEMs and the suppliers of the Automotive Industry, Engineering Companies, Associations, Universities and Research Centers.

13 Large Scale Institutions

ANADOLU ISUZU Automotive Industry and Trade Corp.
BAYRAKTARLAR Design Research Development Services and Trade Corp.
COŞKUNÖZ Metalform Machinery Industry and Trade Corp.
FORD Automotive Industry Corp.
HASSAN Textile Industry and Trade Corp.
MARTUR Corp.
OPET Petroleum Corp.
OTOKAR Corp.
OYAK RENAULT Automotive Company Corp.
TEMSA Research, Development and Technology Corp.
TOFAŞ Automotive Company Corp.
TÜPRAŞ
İNCİ AKÜ Trade and Industry Corp.

[2] (abbreviation for **TÜ**rkiye **S**anayi **S**evk ve **İD**are **E**nstitüsü, namely, Turkish Institute of Industry Management.

5 Engineering Companies

AVL
BİAS Engineering
FİGES Computer Simulation Services for Physics and Geometry Trade Corp.
HEXAGON STUDIO
TEKNO TASARIM

3 Associations / Foundations

OSD - Automotive Industry Association
TAYSAD - Association of Automotive Parts & Components Manufacturers
TTGV - Technology Development Foundation of Turkey

5 Universities

ISTANBUL TECHNICAL UNIVERSITY
KOCAELI UNIVERSITY
MIDDLE EAST TECHNICAL UNIVERSITY – BİLTİR Center
SABANCI UNIVERSITY
ULUDAG UNIVERSITY

2 Centers

OTAM R&D Center for Automotive Technology
TÜBİTAK-Marmara Research Center

The Vision of the Platform:

“To make Turkish Automotive Industry R&D and Innovation infrastructure competitive in the international arena”;

Mission:

“To make policies and build cooperation for the development of R&D and Innovation capabilities”,

Aim:

“To create added value by coordinating the regional, national and European scale activities in order to stimulate investment incentives for research and innovation and create an innovative economy in terms of technology”;

Objectives:

To determine the necessary technology strategies and road maps for the development of the National R&D and Innovation competence; to specify the automotive technology policies and common R&D cooperation fields; to develop regional, national and international R&D projects *and ensure coordination within the academic, scientific and industrial institutions and organizations operating in this field".*

Before the date of its official foundation stated above, OTEP has realized the following activities:

- *Became a member and participated the meetings of the European Road Transport Advisory Council, ERTRAC on behalf of the Platform.*
- *Started the membership of the European Automotive Research Partners Association, EARPA, in 2008 with OTAM as being the executive institution.*
- *Participated several conferences organized by EARPA and ERTRAC and the sub-working group meetings of EARPA on "Safety" on behalf of OTEP.*

On 06/03/2009, First, Workshop was held with a high level of participation to carry out the R&D SWOT Analysis in the Automotive Industry in Turkey and to determine the "Vision of the Automotive Technology and the Priorities". The evaluation of this workshop was completed by a board established for this purpose.

In this workshop, discussion of common mind was made on the strong and weak aspects of the Turkish Automotive Industry comprising the whole automotive supply chain, and on the issues such as infrastructure and main technology. At the end of the workshop, the Vision of Automotive Technology was stated as follows:

"To authentically develop and implement technologies of high added value for meeting the global transportation requirements and expectations in order to obtain a globally sustainable and competitive Automotive Industry which provides innovative, environmentalist, efficient and contemporary transportation systems and platform solutions."

At the first stage, preparation of the documents for the "Turkish Automotive Industry Vision and Strategic Research Program for 2023" was initiated by the working groups created within the platform.

Four working groups were established in order to determine the Vision and build the Strategic Research Plan. These are:

- **Mobility, Transportation and Infrastructure**
- **Environment, Energy and Resources**
- **Safety**
- **Design and Production Systems**

In addition to these four working groups, "**Special Electrical Vehicles Research**" working group was established. This group has been working in the following fields for generating new ideas: Projects regarding electrical vehicles; collecting information about the products on the market; the market estimates stated in various resources on electrical vehicles; electrical vehicle technologies, the present state-of-the-art and foresights regarding the field; power supply technology, engine technology and the outstanding companies/research centers in these fields; making analysis on the state of the electrical vehicles in terms of performance and environmental pollution, and the state of affairs in Turkey regarding the above mentioned issues together with the possible suggestions. **Vision and Strategic Research Plan Working Groups** under OTEP wrote up their vision texts and documents as a result of efforts lasting 8 months. The first version of these vision documents is presented below. The working groups have been continuing their efforts in order to write up the "Strategic Research Plan". In the upcoming years, this Vision Document will be renewed periodically and announced as different versions.

The list of the working groups is given in the Annex.

1. THE VISION ON DESIGN AND PRODUCTION SYSTEMS AND ITS MAIN COMPONENTS

1.1 The Vision on Design and Production Systems:

It is usually stated that, in Turkey, automotive industry[3] has attained such a satisfactory level of competence in terms of production capacity, product diversity and standards that it can cover almost all the parts required for the transportation vehicles manufactured in Turkey. This competence is generally concerned with production. However, there is a lack of competence in the fields of design and design verification; in the development and implementation of high level, new design and production systems. The achievement in the field of production should be supported by the local competence to develop high technology design and design verification systems. Therefore, the vision on design and production systems can be stated as follows:

"To develop and implement new design and production systems in order to obtain a sustainable, competitive automotive industry producing innovative, environment friendly vehicles with high level of added value in global terms."

1.2 The Main Components of the Vision on Design and Production Systems

It is necessary to spend effort for ensuring the deployment of mission and strategies in order to gain competence to develop and implement new, high technology design and production systems, and for building industrial enterprises having their own know-how.

Here, the important points are to ensure the realization of the action plans specified for the mission and strategies and of the policies to be implemented collectively by the relevant institutions, to evaluate the implementation results of the strategies and policies, and finally, to make the necessary arrangements. Below, the mission, strategies and the policies to be implemented for the realization of the vision stated above is given as a draft:

1) *To initiate and maintain activities on design and production systems, in the fields which are determined based on technological foresights and which can bring high added value; to*

[3] The term "automotive industry" comprises the whole automotive supply chain.

gain competence in systems which pave the way for the design of innovative and competitive products using technology,

2) *To use jointly the parts that do not provide competitive advantage in the main industry for saving resources in design and production; to attach significance to the activities on designing (the whole) systems in addition to the parts,*
3) *To use computer aided design and simulation systems for the development of new design and production systems; to attach importance to the development of digital prototypes, virtual reality and testing; and to strengthen such efforts with fast, cheap, innovative and reliable real prototypes,*
4) *To encourage specialization in design, testing, production, development and implementation of technology; to start undergraduate and graduate degree programs at universities in the field of automotive for training well-educated researchers and qualified work force,*
5) *In addition to enhancing the relationship among the enterprises, to enhance the relationship between universities and the industry for promoting activities regarding the design and production systems intended for achieving innovation and benefiting from the R&D centers,*
6) *To ensure share and transfer of knowledge among the enterprises of the main and supplier industries for production design and technology development; to establish centers that can be used jointly by those enterprises for carrying out design verification tests,*
7) *To facilitate the activities in information, communication, information security, patent and innovation; to overcome infrastructural inadequacies,*
8) *To gain competence in the fields of energy and environment in designing and producing innovative, environment friendly products with the purpose of ensuring sustainable transportation (efficient, economic, fast, environment friendly transportation of people and goods); to enhance and implement recycling and reusing techniques,*
9) *To gain competence in using light materials, electronic systems, information and communication systems and nano technology in designing and manufacturing the products,*
10) *To develop and implement high technology design and production systems for obtaining innovative and competitive products within the specified vehicle segments,*
11) *To establish information centers intended for the supplier industry enterprises to consult before they apply to the centers of excellence in order meet their information requirements concerning the development of new technologies; to establish information, R&D and*

technology centers which will serve in the fields of design, design verification and the development of advanced technology,

12) *To ensure the interaction between the infrastructure and the vehicle through design and optimization of the transportation infrastructures with innovative technology,*
13) *To ensure maintaining and enhancing the characteristics of the production centers such as good job opportunities, social coherence, competitiveness, dynamism and knowledge orientedness for attaining the goal of sustainable growth,*
14) *To develop software and simulation systems to meet the requirements of special design.*

2. THE VISION ON ENVIRONMENT, ENERGY AND RESOURCES AND ITS MAIN COMPONENTS

2.1. The Vision on Environment, Energy and Resources:

The concentration of CO_2 in the atmosphere, the main reason of global warming, was measured as 387 ppm in 2009. This has now reached critical values. A binding decision could not be taken at the intensive meetings of the UN Climate Change Conference held in Copenhagen in 2009 for determining and ensuring the global methods to be implemented in the process of climate change that is envisaged to occur after 2012. However, at the end of this conference, a compromise text titled "Copenhagen Accord" was announced by China, India, Brazil and South Africa within the leadership of the USA.

According to the above mentioned text, global warming is aimed to be limited below 2 degrees Celsius and the developed countries stated in the Annex 1 of the UN Climate Change Contract are required to explain their emission targets for the year of 2020 along with the base year. Finally, developing countries which are excluded from the Annex 1 are expected to announce their national efforts with regard to the decrease of emission levels planned for 2020.

The activities intended for meeting these targets might lead to very important changes in the automotive industry in terms of energy, environment and the utilization of resources.

Automotive industry has very comprehensive relationships with environment. It is possible to consider this relationship in three headings as follows:

I. Environmental Impacts During the Production Processes: *Atmospheric Emissions, Waste, Waste Water*

II. Impacts of the Motor Vehicles During Their Life Cycles: *Atmospheric Emissions, Solid and Liquid Waste*

III. Impacts of End-of-Life Vehicles: *End-of-Life Vehicles, Solid and Liquid Waste of Them.*

As for the first impact, it is necessary to ensure energy savings in heating, power generation, illuminating and production processes through improving energy efficiency. In order to accomplish this, greenhouse gases and especially CO_2 emissions should be diminished with the framework of a specified program.

The second environmental impact is caused by the greenhouse gases emitted from the motor vehicles during their life cycles while they are used on the roads. In addition to being related with the use of vehicles for transportation of people and goods, this impact is also directly related with the personal use of vehicles. Therefore, it requires a comprehensive and “Holistic Approach”. In basic terms, this “Holistic Approach” requires to employ measures taken by the industry to decrease the greenhouse gases along with other measures that are necessary for attaining successful outcomes. 20-25 % of the total energy consumption in the world (this ratio has been 18 % in Turkey as of 2007) and the 50 % of the total petroleum consumption is caused by the use of energy for marine, air and land transportation. The share of the land vehicles in the consumption of the petroleum derivative fuel is around 50 % in the developed countries. This ratio is around 84 % in Turkey. Noise and toxic compounds in the exhaust gas (especially CO, HC, NO_x and particles) which are produced by the vehicles and cause environmental pollution constitute the 60 % of the total pollution in the urban areas. In Turkey, 15 % of carbon dioxide is generated by the land vehicles.

In this context, the following can be listed among those topics which need further consideration: balancing the modes used in transportation, development of clean and new vehicle technologies, spreading environment friendly utilization techniques of vehicles, limiting the excessive loading, conducting regular maintenance and repair of vehicles, using fuel of appropriate quality and increasing the average flowing speed of the inner-city traffic. Moreover, since they consume excessive amount of fuel and release excessive amount of emission, vehicles over a certain age should be removed from use within the framework of a national program.

It becomes increasingly important to design, produce and put into market vehicles having high level of energy efficiency and releasing low level of greenhouse gas emission. With the EU Directive numbered 443/2009, for vehicles to be put into market in 2012, the limit of 120 g CO_2/km is introduced as the average amount of CO_2 emissions per shipment of a brand to be sold per year. Further, the target for the year of 2020 is stated as being 95 g CO_2/km. With the production of new vehicles, it is aimed to replace the vehicles that have currently been in use with those vehicles having low levels of CO_2 emission.

In this context, efforts to develop and improve hybrid electrical and electrical vehicles which have very low levels of CO_2 emissions have gained speed especially in the USA, Japan and EU. Attempts to initiate mass production of such vehicles have also been in progress. To this end, support of public authorities - which can be provided through incentives such as proper funding and tax decrease – directed towards the activities intended for the production of energy friendly vehicles to increase the use of low or zero emission technologies is extremely important.

The third environmental impact area is concerned with ensuring the disposal, recycle and reuse of end-of-life vehicles without causing any environmental impact. Removal of vehicles older than a specified age from use and sending them for scrap within a specific program should be regarded as an important project for decreasing CO_2 at the national level. In addition, removal of the old vehicles from use should be integrated with ways of motivating the purchase of new vehicles.

60 % of CO_2 released to the atmosphere comes from electricity generation and land transportation. EU has taken urgent measures for this situation. In its "Strategic Energy Technologies" document published in October 2009, EU outlined its plan and targets for the transition to the technologies releasing low level of carbon in electricity generation by 2020. All these developments indicate that the production methods and the resulting products will have to comply with the limitations with regard to the carbon release.

It is evident that Turkey - by being a country having 1.5 % of annual population growth and 4 % of economic growth - has to adopt effective strategies for decreasing its CO_2 release. Turkey has been continuing its efforts to become a full member of the EU, and EU member states constitute the leading customers of automotive and supplier industry goods produced in Turkey. Therefore, Turkey has to reach the standards of low carbon emission levels set by EU member states.

Turkey imports petroleum and natural gas which are among the primary energy resources. According to the figures in 2008, 50 % of the petroleum imported is used for transportation purposes, and 60 % of the natural gas imported is used for electricity generation. 50 % of the total electricity generation in 2008 (198 500 GWh) derived from the conversion stations operating with natural gas, 15 % from the hydroelectric power stations, 20 % from lignite and 10 % from thermal power stations operating with mineral coal.

Due to the unforeseeable price changes in petroleum and natural gas and the increasing amounts of consumption, by 2030, the amount to be paid for these two energy resources is estimated to be around 400-600 billion USD per year. Turkey has to increase the rate of its economic growth to provide welfare of its growing population. Therefore, it obviously has to start using stable and sustainable energy resources. In today's world where almost all economies are converted into low carbon economies due to the global warming, it is logical and meaningful to seize this objective by employing technologies that lead to low levels of carbon emissions.

Turkey has steadily become urbanized with internal migrations. These migrations caused by economic reasons are limited to several cities where job opportunities are relatively high. For example, Istanbul accommodates nearly 20 % of Turkey's population. Inner city roads, in the heavily populated cities, cannot be enough for the demand and the resulting traffic jams lead to energy loss per vehicle as well as to the environmental pollution of various kinds. The share of the top 20 cities in Turkey (in terms of population density) in the release of CO_2 resulting from transportation within the country amounts to 60 %. In these cities where there is a potential of population growth, transportation should be rearranged by taking energy, environment and resources into consideration.

When we look at the foreseen distribution of energy resources in the year of 2050, we can say that there will be a tendency towards using mineral coal rather than petroleum and natural gas for energy generation purposes. The reason behind this foresight is that the remaining lifespan of the mineral coal reserves on earth is limited to approximately 160 years. This possible change in the energy resources will bring together the requirement to develop CCS-carbon capture and storage technologies in order to cope with the resulting carbon emissions.

Presently, when we consider the use of nuclear energy for energy generation in the world, we can find out the percentages of 76 % in France, 42 % in Sweden, 25 % in Japan, 28 % in Germany, 20 % in the USA. Approximately 15 % of the electricity in the world is produced by using nuclear energy.

It is inevitable for any country in the world to shift to low carbon economy by the year of 2050 so as to keep the level of CO_2 at the desired level by maintaining the maximum increase in the temperature as 2 degrees Celsius. Increasing the use of nuclear and renewable energies, enhancing

energy efficiency and the use of biofuels, establishing carbon capture and storage technologies are among the significant steps to be taken in fulfilling the targets for 2050.
Unlike the year of 1990, some countries announced their emission decrease targets for 2050 by 50 % or above due to the climate change. For example, Japan explains its emission decrease target for 2050 as 70 %, EU 95 % and Mexico 50 %. Costa Rica aims to be a carbon neutral country by 2021.

In the light of the above mentioned information, our vision concerning energy, environment and resources is as follows;

"To develop energy efficient automotive technologies that can decrease environmental damage and global warming"

2.2. The Main Components of the Vision on Environment, Energy and Resources:

1. *To develop engine and transmission organs with increased thermal and mechanic efficiency*
2. *To develop fuel and vehicle technologies leading to low levels of emission*
3. *To develop and use hybrid, electrical vehicles or vehicles operating with alternative energies*
4. *To develop light materials and widely use them in the vehicles*
5. *To develop vehicles by employing recycled or reused materials and the suitable designs on them*
6. *To spread technologies increasing energy efficiency during the energy supply process*
7. *To spread applications increasing energy efficiency during the vehicle production process*
8. *To establish smart systems for optimally managing the network loading of the rechargeable hybrid and electrical vehicles in charge mode*
9. *To let the CO_2 release in electrical energy generation direct and shape the energy policies as a determinant variable*
10. *To encourage the use of renewable energy (wind + sun) in the facilities*
11. *To ensure the use of tires with lower rolling resistance*

3. THE VISION ON MOBILITY, TRANSPORTATION AND INFRASTRUCTURE AND ITS MAIN COMPONENTS

3.1. The Vision on Mobility, Transportation and Infrastructure:

In 2023, at the end of the enlargement process of the European Union with the participation of the central and eastern European countries including Turkey, the EU economy is expected to become the biggest economy in the world with its total population of 550 million. In this foreseen profile, 70 % of the EU citizens will reside in the city centers or nearby areas, and 25 % of the total population will be over 60 years of age.

In Turkey, demand for circulation of people and the transportation of goods are expected to grow by the year of 2023. When we consider the road construction presently underway and the developments in the inner city transportation systems, we foresee that this increasing demand will lead to a significant increase in the mileage accumulation per passenger, per vehicle and per good to be transported. Therefore, increasing the mobility efficiency is very important due to its positive contribution to decreasing carbon dioxide release.

In Turkey, population is increasingly getting younger and those young people prefer living in the urban areas rather than the rural parts of the country. The changing demographic profile brings together the need for new forms of mobility, and this leads to a huge demand for uninterrupted, flexible, more attractive and user friendly mobility systems.

The above mentioned demand can be covered by ensuring a better information flow and integration in mass and individual transportation together with a concurrent improvement in land planning.

"In the transportation of people and goods; to develop accessible, safe, optimized, effective, uninterrupted and economical transportation systems that can cover the changing mobility/transportation demands."

3.2. The Main Components of the Vision on Mobility, Transportation and Infrastructure:

1. *Better integration of mass transportation and private vehicles will be ensured. A transportation system that can be accessed easily by people of any age, income and physical state and that can cover their needs will be developed.*
2. *The network of infrastructure will be optimized with continuous investments and monitored regularly. It will also be developed constantly, therefore, maintained in high standards.*
3. *Road networks will be turned into an efficient and a common system which can be connected with all the other transportation systems smartly, fluently and uninterruptedly.*
4. *Freedom of uninterrupted transfer of the passengers among various means of transportation will be respected. Meanwhile, the use of minimum number of vehicles will be the main target.*
5. *In transportation of goods and in the field of logistic, roads and other infrastructure systems will be utilized efficiently for delivery within the city and for long-distance shipment purposes. The main criteria will be ensuring delivery and distribution on time, decreasing travel costs, minimizing the total cycle fuel economy and the amount of the pollutant emissions.*
6. *It will be ensured that the planning of land use within the city will be made together with the transportation planning.*
7. *Proper technical values and instructions will be determined for managing the travel demand. In this way, optimization regarding the capacity utilization of the road network will be completed. Thus, the quality of life will be increased.*
8. *Real time information on the state of the traffic and roads will be made available in more common and efficient ways in order to optimize the coordination of traffic, the management of road network, and to help people take conscious decisions for minimizing the time spent in traffic and for making the transition between the transportation systems more efficient.*

4. THE VISION ON SAFETY AND ITS MAIN COMPONENTS

4.1 Safety Vision:

Road safety is very important for maintaining sustainability of circulation and transportation. In order to make progress in road safety, an integrated approach is necessary involving all the related actors (rule makers, infrastructure designers and engineers, road users, R&D centers, vehicle manufacturers, etc.)

Everyday, over 500 million people in the world get in the roads; on foot, by bicycle, bus, truck or automobile. In such an environment, the main focus should be to avoid accidents in the lives of those people who are in traffic as drivers, passengers or pedestrians by providing vehicles equipped with features that increase safe driving. In cases where accidents cannot be avoided, the focus must be preventing death or injuries.

This extreme target might be exciting for the period later than 2030-2040. However, the situation we are faced with today is a bit different.

According to the World Health Organization, each year, 1.2 million people die in the traffic accidents worldwide, 50 million people are injured at various severity levels and almost half of the injured become permanently disabled. In order to prevent accidents, the resulting injuries and death cases, it is necessary to determine the contribution of each component constituting the traffic to the occurrence of the accidents and find solutions accordingly.

Within the last thirty years, the traffic on the European roads has been tripled; however, the number of accidents has been reduced by half. (Source: European Commission, European Road Safety Action Program, 2003). By providing continuous improvements in the active and passive safety systems, European Automotive Industry has been contributing to a great extent to the use of motorways in a safer way and to the production of safer vehicles.

In terms of crash safety, it is possible to consider the state of the traffic at four levels:

1. Normal riding/driving
2. Danger case : Possibility of an accident

3. Accident unavoidable and in crash
4. Post crash : Rescue actions

Traffic safety can only be possible when all the Columns of the traffic are able to benefit from the available opportunities at the maximum level. Technologies: Roads and the vehicles are equipped with the latest technological means; drivers fulfill the eligibility criteria for driving; traffic is continuously monitored and controlled; the contact between the pedestrians and the roads are predefined and controlled; finally, in case of an accident, qualified and fast rescue teams intervene.

If we suppose that the infrastructure (the spatial adequacy of the road, independent double direction, traffic signs, traffic lights, road illumination, road lines, means for providing information on road conditions, communication facilities, service areas, etc.) is sufficient, we can foresee that the normal driving can be disrupted by diminishing control of the driver over the vehicle, occurrence of technical problems on the vehicle and the emergence of sudden problems on the road. Active safety components which can enhance the quality of the driver's control over the motor vehicle and eliminate or decrease the possible insufficiencies that may be caused by the driver and/or road conditions are very important for traffic safety. With the prevailing technological resources, it is possible to develop tools that can be used for continuously controlling the problems to be caused by the vehicle or the driver. When there is a problem disrupting the "normal driving" in the traffic, such tools can intervene and solve these problems.

Despite all the measures taken, when the accident is inevitable, the passive safety features such as energy absorbing BIW structure, steering column & wheel, seat & restraint components are crucial for protecting the occupant survival space.

The vehicles should be designed in a way that the repairing cost will be low in case of accidents occurring at low speed. In such accidents, damage in the vehicle usually occurs at the front and back parts of the vehicle. Repairing cost of these accidents can be decreased by designing energy absorbing features in front and rear (front and rear bumper and crush cans) and by moving the high cost parts (such as hood, headlamps, fender and rear door, etc) out of the crush zone. Thus, insurance costs are decreased, customer satisfaction is ensured and national wealth is protected.

In Europe, with the tests developed by Thatcham and GDV, standards are established for determining the repair cost of passenger cars and commercial vehicles up to 15 kph.

Customers in developed countries make market investigate on safety of the vehicle which they intend to purchase. In other words, they deal with the active and passive safety features of the vehicle and checks full vehicle crash tests and their performance in these tests performed by public domain organizations. In addition to the legal requirements in this regard, several public organizations (EuroNCAP, USNCAP, IIHS, Thatcham, ADAC, etc.) carry out more challenging tests that go beyond the legally binding rules. Low speed damageability performance of the vehicles has been determined in the tests performed in low speeds and structural performance and occupant injury levels have been measured in high speed crash tests. The latest EuroNCAP protocol also monitors pedestrian injury ratings, whiplash performance of the front seats, child performance and safety assist features. The results of the tests are shared with public through websites. Receiving high scores from these crash tests run by independent organizations is very important for the automotive companies in order to maintain "safe vehicle" image in the market.

The crash tests determined by the public organizations are designed in a way that they involve real accident scenarios, legal tests and more challenging conditions. Therefore, data on driving culture, the vehicle types in the traffic and details about the traffic conditions and accident reports constitute important information for specifying more realistic tests. For example, since there are some states in the United States of America where using seat belts is not a legal obligation, legal authorities design unbelted crash tests.

In Turkey, the rapidly growing automotive industry and the resulting intensified product development activities have led to the requirement of conducting academic studies and activities on safe driving and crash safety.

In our country, mobility of people and goods are often carried out through highways. Motor vehicles used for this service, the environment where these vehicles are used or the people using them might cause accidents.

In Turkey, transportation of goods is usually conducted by trucks. In addition, it is observed that the number of SUVs (Sport Utility Vehicles) in the traffic has been increased recently. The size and weight of the trucks are bigger than other vehicles. Since trucks are higher, heavier and stronger than the vehicles in M1 class, passenger cars are in a disadvantageous position in those incompatible crashes between passenger cars and SUVs. Therefore, the possibility of the accidents between passenger cars and trucks must be decreased and the people in the passenger cars must be well protected against the risk on compatible crashes.

Buses, minibuses and automobiles are used intensively in inner and inter city transportation. Transportation of the students and staff on short and medium term distances is performed by service buses. Since these service buses have to be in the traffic at the rush hours, they have a higher risk of having an accident. The user profile should be taken into consideration while designing the service vehicles which are intensively used for the transportation of students.

Compressed Natural Gas (CNG), Liquefied Petroleum Gas (LPG), fuel batteries, electrical batteries, hydrogen and helium are regarded as alternative sources of energy. Technical inadequacies might occur in the LPG applications which are adapted after vehicle purchase. In such applications, crash engineering contribution is necessary. Obviously, different fuel systems are adapted to the vehicles as a result of the diversification of the energy resources. However, safety standards should not be ignored while making such adaptations.

It may be possible to produce lighter vehicles by using alternative materials and manufacturing techniques. In this way, it will be easier to meet the emission and crash safety targets.
By making investments on People – Vehicle and Vehicle – Road interfaces, it may also be possible to diminish driver mistakes that may occur while the driver is in the traffic.

The design of the roads where the vehicles are used may have an impact on the accidents. The infrastructure (including highways, signage, and traffic control devices), must be designed in a way that the drivers can use them easily and infrastructure, vehicles, occupants and pedestrians must be controlled and monitored continuously. It must be ensured that the drivers using the motor vehicles possess the necessary competences, and these competences should be monitored periodically.

Data on the traffic accidents in our country (detailed reports on the conditions of the accident, vehicles and the survivors involved) should be kept systematically and become accessible by the relevant authorities.

Being able to receive detailed news from the accident location is important for providing fast and adequate first aid service.

The contribution of our country to the constitution, elaboration and diversification of international directives on active and passive safety must be increased in terms of quality and quantity. Availability of the data on the accidents occurring in Turkey will increase the involment of our country's specific conditions in such directives.

As for vehicle safety and security, it is necessary to conduct activities by considering all the markets in the world. To this end, vehicle testing areas bearing international accreditation and equipped with the adequate facilities to test all the active and passive safety components of a vehicle should be established in our country. These laboratories should have the competence to carry out tests at all levels ranging from parts to the whole vehicle and they should be as flexible as private companies.

A platform with academic affiliations that is designed in line with the relevant laboratories and can work for vehicle safety is necessary. This platform should comprise all the disciplines which intersect all the elements involved in traffic. In this context, a local institution that can investigate specific characteristics of Turkey, increase the quality of its integration with the rest of the world and overtake the functions of the institutions such as EuroNCAP, Thatcham, ADAC, NHTSA is required.

Our vision is; to contribute to the creation of a "Safe Highway Transportation System" in harmony with the developing world, taking into consideration all the components involved in the traffic.

4.2 Main Component of the Vision on Safety:

1. *In addition to the studies on the vehicle and user profiles, studies on the impacts of the components in the traffic to the traffic itself should be conducted.*
2. *The user profile must be more carefully considered in designing vehicles such as school buses which are intensively used by the students. All the phases of the student transportation service should be examined within the framework of "safe transportation" requirements and the resulting knowledge should be used for describing the proper vehicle for this service.*
3. *The vehicles used for the transportation of people and goods must bear active and passive safety components. Importance should be attached for increasing awareness regarding these active and passive safety components.*

4. *The possibility of accidents between trucks and passenger cars should be decreased. Protection of the passenger cars should be ensured in case of accidents between trucks and automobiles.*
5. *It should be possible to apply alternative energies to the vehicles. In addition, support should be provided for eliminating inadequacies in adapting alternative energy technologies to the vehicles that are presently in use. Safety issues that may arise from CNG, hybrid and electrical vehicles coming into traffic should be considered.*
6. *By Using alternative materials and production methods, safer vehicle bodies less damaging vehicles should be designed.*
7. *People – Vehicle and Vehicle – Road interfaces should be used* actively in order to eliminate accident possibility.
8. *Highway infrastructures should be designed in a way that they can be comprehended easily by the drivers and minimize driver mistakes. Thus, the accidents caused by driver mistakes can be limited.*
9. *Continuous and attractive trainings on safety awareness should be provided for all road users, especially during the early school education period.*
10. *Standards of trainings provided before and after receiving the driving license should be increased and the drivers' competence should be regularly checked.*
11. *Effective and active methods should be used to* monitor traffic conditions and driver *so as to accomplish advanced road safety. Means should be developed to control if the people in the traffic comply with the rules (i.e. speed limits, use of safety belts, driving with alcohol, drug use, etc. should be controlled).*
12. *Methods should be developed for improving the quality of the first aid to be provided after the accidents. In this context, action scenarios should be developed for emergency rescue situations and post-accident treatment. These scenarios should be implemented by distributing the tasks to the responsible bodies.*
13. *Accident report should be prepared in the proper format and it must be made available to the relevant persons, authorities.*
14. *The vehicles should be equipped with good monitoring technologies to ensure security and prevent theft and robbery. Monitoring technologies must respect personal privacy rules defined with laws.*

ANNEX:

WORKING GROUPS FOR VISION AND STRATEGIC RESEARCH PLAN

Design and Production Systems

	Member	Institution
1	**Ömer Altun** *(Chair)*	(MARTUR)
2	Ahmet Şişman	(HASSAN)
3	Bülent Haraçcı	(TOFAS)
4	Efe Karaismailoğlu	(MARTUR)
5	Ferruh Öztürk	(ULUDAG UNIVERSITY)
6	Hakan Özenç	(ANADOLU ISUZU)
7	Mehmet Toker	(FORD OTOSAN)
8	Mehmet Demirci	(TEKNO DESIGN)
9	Murat Yıldırım	(TUPRAS)
10	Mustafa Uysal	(TEKNO DESIGN)
11	Özlem Gülşen	(TAYSAD)
12	Recep Kurt	(MARTUR)
13	Sancar Yörükoğlu	(COSKUNOZ)
14	Tarık Öğüt	(FIGES)
15	Tolga Kaan Doğancıoğlu	(HEXAGON STUDIO)
16	Volkan Bayraktar	(OTAM, OTEP Secretary General)
17	Zafer Dülger	(KOCAELİ UNIVERSITY)
18	Aydın Kuntay	(BIAS Engineering)
19	Ahmet Hacıyunus	(OTOKAR)

Environment, Energy and Resources

	Member	Institution
1	**Vedat Akgün** (*Chair*)	(OPET)
2	Ali Şengür	(TOFAS)
3	Hakan Tandoğdu	(OYAK RENAULT)
4	Hülya Özbudun	(OSD)
5	Hamdi Uçarol	(MAM Energy Institute)
6	Metin Ergeneman	(ISTANBUL TECHNICAL UNIVERSITY)
7	Mehmet Toker	(FORD OTOSAN)
8	Murat Yıldırım	(TUPRAS)
9	Özlem GülŞen	(TAYSAD)
10	Sertaç Yavuz	(ANADOLU ISUZU)
11	Tolga Kaan Doğancıoğlu	(HEXAGON STUDIO)
12	Volkan Bayraktar	(OTAM, OTEP Secretary General)
13	Zafer Dülger	(KOCAELI UNIVERSITY)
14	Ferda Ertekin	(OTOKAR)

Mobility, Transportation and Infrastructure

	Member	Institution
1	**Tolga Kaan Doğancıoğlu** (*Chair*)	(HEXAGON STUDIO)
2	Ahmet Bayraktar	(BAYRAKTARLAR)
3	Ali Şengür	(TOFAS)
4	Aytül Erçil	(SABANCI UNIVERSITY)
5	Erhan Ünsal	(OSD)
6	Fatih Bayraktar	(BAYRAKTARLAR)
7	Ferruh Öztürk	(ULUDAG UNIVERSITY)
8	Hakan Tandoğdu	(OYAK RENAULT)
9	Hamdi Uçarol	(MAM Energy Institute)
10	Mehmet Bilir	(ANADOLU ISUZU)
11	Mehmet Toker	(FORD OTOSAN)
12	Murat Yıldırım	(TUPRAŞ)
13	Mustafa Uysal	(TEKNO DESIGN)
14	Tarık Öğüt	(FIGES)
15	Volkan Bayraktar	(OTAM, OTEP Secretary General)
16	Aydın Kuntay	(BIAS Engineering)
17	Ahmet Hacıyunus	(OTOKAR)

Safety

	Member	Institution
1	**Mustafa Erdener** (*Chair*)	(FORD OTOSAN)
2	Aytül Erçil	(SABANCI UNIVERSITY)
3	Canan Ergün Tavukçu	(FORD OTOSAN)
4	Cenk Gebeceli	(TOFAS)
5	Mehmet Bilir	(ANADOLU ISUZU)
6	Mustafa Gökler	(MIDDLE EAST TECHNICAL UNIVERSITY)
7	Server Ersolmaz	(TEMSA)
8	Tarık Öğüt	(FIGES)
9	Tolga Kaan Doğancıoğlu	(HEXAGON STUDIO)
10	Volkan Bayraktar	(OTAM, OTEP Secretary General)
11	Selahattin Ender Koç	(BIAS Engineering)
12	Namık Kılıç	(OTOKAR)