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Defensive, Preventive and Eco-driving of Road Vehicles: Concepts, Significances, Principles, Rules

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Abstract
Little known to Romanian drivers until recently, defensive, preventive and eco-driving are increasingly being chosen by road users and commercial fleet owners through their employees. At the same time, the number of drivers who realise the importance of more applied driving courses than driving school is also increasing. By applying specific techniques, drivers will have better control of their vehicles, prevent incidents that can lead to collisions and even reduce fuel consumption and vehicle running costs. This scientific paper presents a research on the three types of road vehicle driving: Defensive, preventive and eco-driving. Definitions, concepts, meanings, principles and rules are presented, analysing their similarities, objectives and common elements. At the end, a case study is presented in which the *"two-second rule"* in defensive/preventive traffic of motor vehicles is mathematically analysed. Final conclusions are drawn on the subject of this research.

Keywords: Road Vehicle, Defensive Driving, Eco-driving, Preventive Driving, Safety, Rules

1. Introduction

Fig 1: Defensive, preventive and eco-driving of road vehicles [1]

Road safety education can be a step forward in that it can help raise awareness of the danger of aggressive driving and - on the other hand - prepare drivers to drive defensively. Also, the ability to give correct first aid in the event of a car accident can save lives, which is why it has been proposed that a first aid course be made compulsory as a precondition for obtaining a driving licence. A predictable and consistent driving style saves on parts and components, leads to lower fuel consumption and less pollution. Preventive driving is a somewhat vague concept, which speaks broadly of adapting speed to road conditions or obeying traffic signs. Preventive driving is the practical tool that we can all use to ensure that we increase our chances of reaching our destination safely [1]. In order to drive economically - or for a car to meet the manufacturer's fuel economy standard, but also to reduce chemical and/or noise emissions - a number of defensive/ecological driving rules need to be

applied. This cannot be completely equated with preventive and eco-driving, but in the view of the author of this scientific paper, they share common features and meanings. Preventive driving is exclusively concerned with road safety, whereas defensive driving is concerned with the way the vehicle is driven and operated. However, defensive driving has elements in common with eco-driving. If the rules and principles of each are followed, road safety is increased, the number of road accidents is reduced, fuel consumption and levels of noise pollution are reduced, traffic noise is reduced (Fig 1). For this reason, it can be analysed from several perspectives: Fuel consumption, road safety [2, pp. 31-35], road events, risk prevention [3] traffic, road infrastructure, climatic factors, environmental conditions, emissions of chemical pollutants, noise, vibrations, etc. The overall objective of this research is to highlight the importance of defensive driving as a basic component of preventive driving in road traffic. Sustainable development is that concept that defines in a new way the way the world is understood, but also a method to clarify global issues [4, pp. 241-242]. In the report Our Common Future, also known as the Brundtland Report, which became a reference document as it was the first to use the term sustainable development, it was stated that sustainable development is the concept of meeting the needs of the present without compromising the ability of future generations to meet their own needs [5].

2. Review of existing legislation

Regarding defensive driving, in January 2022, the President of Romania promulgated the law on the completion of Government Emergency Ordinance No. 195/2002 on traffic on public roads, by introducing defensive driving and first-aid courses in driving schools, to obtain the license or to regain it after its suspension. Defensive driving of road vehicles is defined in the law as special training of drivers to prevent road accidents. According to the act, drivers can follow a training course for special training in defensive driving. Defensive driving is the practice of driving a car with the aim of reducing dangers. Preventive driving of road vehicles in Romania is regulated by the Romanian Government Emergency Ordinance (OUG) no. 195/2002 (Road Traffic Code), with subsequent amendments and additions, in accordance with European road traffic requirements and standards.

On eco-driving, the European Union developed the *European Green Deal* in December 2019, a package of policy initiatives that aims to put the European Union on the path to a green transition, with the ultimate goal of achieving climate neutrality by 2050. It supports the transformation of the EU into a fair and prosperous society with a modern and competitive economy. The pact highlights the need for a holistic and cross-sectoral approach, with all relevant policy areas contributing to the ultimate climate goal. The package contains initiatives covering climate, environment, energy, transport, industry, agriculture and sustainable finance, all of which are strongly interlinked. At the same time, the EU's *"Ready for 55"* package aims to translate the climate ambitions of the Green Pact into legislation. It is a set of proposals to revise climate, energy and transport legislation and implement new legislative initiatives to align EU legislation with EU climate objectives. The package of proposals aims to provide a coherent and balanced framework for achieving the EU's climate objectives, which:

- Ensures a fair and socially just transition;
- Maintains and strengthens the innovation and competitiveness of EU industry while ensuring a level playing field with third country economic operators;
- Supports the EU's leadership in the global fight against climate change.

3. Literature review

3.1 Defensive versus defensive driving of road vehicles

What many drivers lack is the ability to be aware of the risk and, above all, to recognise it in traffic. In general, this superficial approach stems from the damaging idea that "it can't happen to me... I have experience, I've been driving for years and I haven't had any problems..." [6]. In this context, ATA (Titi Aur Academy) representatives stress that, in order to be safe at the wheel, drivers must, at the same time, adopt a preventive conduct as well as a defensive driving style [7].

Specifically, ***preventive driving (conduct)*** refers to road behaviour that ensures the prevention of accidents by anticipating and avoiding the incorrect actions of road partners, as well as adapting the mode of travel to specific weather, road or traffic conditions.

The main elements of preventive behaviour are [6]:

- **Good theoretical and practical training.** Tthe driver must be up to date with changes in road legislation, regularly study road legislation;
- **Vigilance**, manifested by concentrating attention on the road, the traffic flow and the operation of one's own vehicle (in order to detect road signs, changing weather/road conditions and the intentions of traffic partners in good time). Vigilance has the following attributes of attention: *Volume* (the ability of the driver to select more than one piece of information simultaneously); *stability* (the ability to maintain attention on moving or stationary objects or activities, even in the presence of disturbing factors); *concentration* (the delimitation of the dominance of attention on a particular activity, in the presence of other disturbing factors acting simultaneously); *distributivity* (performing several activities automatically at the same time, one of which is basic and the others complementary); *mobility* or *flexibility of attention* (the driver's ability to follow various independent actions going on at the same time alternately, with vividness, detachment and naturalness). Factors influencing vigilance are: Fatigue, alcohol consumption, drug and medication use, mental state, constant noise, heavy traffic, high speed and night-time environment. Forms of alertness include: Talking to passengers, blocking visibility to the front, side or rear, petty preoccupations (lighting a cigarette, handling or pressing a phone, gadgets, etc.), focusing on the scenery, falling into deep thought or pondering. The simplest informational connection of man with reality is achieved through sensations that can be: Visual, auditory, tactile, olfactory, proprioceptive, kinaesthetic;
- **Foresight**, represented by the driver's ability to anticipate risky traffic situations in advance and to find solutions to avoid the occurrence or involvement in road events. She can be: *Remote* (preparing the vehicle for the road, preparing the driver for the road - being rested, calm, informed; choosing the basic and back-up route; phasing the journey); *close* (wearing a seatbelt;

reducing speed; turning on the dipped headlights when visibility is poor; preparing the foot for braking; when meeting another oncoming vehicle in rainy weather, operating windscreen wipers; increasing the distance when overtaking a cyclist in wet or slippery weather); or *immediate*;

- **Judgement** is the mental process of thinking and choosing a solution with the best outcome in a conflictual situation arising in traffic at a given time. Judgement must be: *Prompt* - requiring reaction without delay; rapid - allowing a shorter time between analysis of possible options and the best decision; *selective* - so that the best of the possible solutions or alternatives is chosen, with a backup. For example, to avoid a head-on collision with another vehicle travelling in the opposite direction, the initial choice is to reduce the speed of the vehicle in order to provide the necessary space to allow the other party to return to their direction of travel and, if necessary, to exit the road on the right-hand side of the carriageway or, if necessary, off the carriageway; *fair* - means that the solution chosen was in accordance with the provisions of the regulations and that the accident was avoided or had minimal consequences;
- **Dexterity,** which translates into the driver's ability to correctly and quickly execute driving manoeuvres;
- **Level of education,** manifested by the ability to be polite in traffic (attentive, respectful, benevolent, even generous attitude towards the road partners, regardless of their category);
- **Accident** is defined as an unforeseen event that disrupts the smooth flow of road traffic, resulting in damage to vehicles, personal injury or death of their users. The conduct by which a road traffic participant prevents or avoids a road traffic event, as a result of a breach of road traffic rules, caused by his own fault or that of other road traffic participants (pedestrians, cyclists, motorcyclists, vehicle drivers), constitutes the basis of preventive conduct. From the point of view of preventive behaviour, a road accident is defined as follows:

a) anticipating the situation created that generates the road accident;
b) avoiding road accidents and the ways in which they occur;
c) choosing the best way out of a road accident that can no longer be avoided with minimal consequences;

- **reaction time:** The interval measured in seconds from the moment a signal or event occurs until one or more vehicle controls required by the vehicle are actuated. The total reaction time is between 0.5-1.5 seconds and is influenced by: Age; physical and mental state; level of concentration of attention; fatigue; intake of alcohol, drugs, medication.

For this picture to be complete, however, it is necessary to adopt a defensive driving style, characterised by several additional elements [6]:

- **Risk assessment:** So that it can be easily identified in everyday traffic;
- **Knowledge of the behaviour of vehicles:** In critical situations and the correct way to react in order to get out of these situations. It is another unknown for many drivers. The reason for this is that, during driving school, instructors focus on acquiring the minimum skills needed to negotiate traffic and not necessarily on perfecting the art of driving, which should be achieved after at least six months to one year's experience in traffic, when a ”symbiotic” bond with the car is already established, enabling the driver to learn effective braking techniques, counteracting skidding or avoiding obstacles;

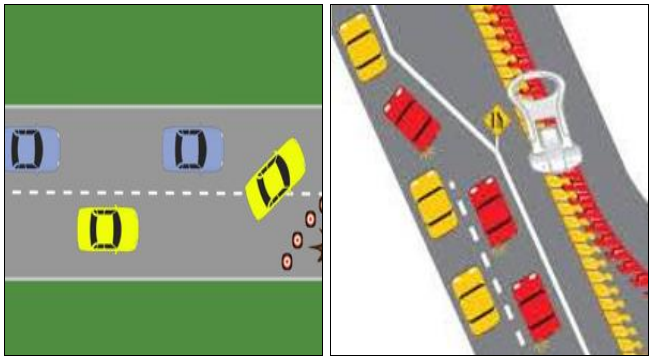

Fig 2: Zipper rule [10]

- **Adopting a defensive attitude:** Aimed at preventing conflicts or borderline situations from arising while driving on public roads. It involves learning specific driving techniques in circuit/polygon conditions and applying them in traffic, such as driving in low grip conditions, controlling speed and visibility (according to the "see and be seen" principle), maintaining a minimum safe driving distance ("two-second rule"), driving techniques in congested traffic (applying the "zipper rule") (Fig 2). To acquire a defensive attitude, specialised defensive driving courses can be taken. In other words, defensive driving involves the skill of "driving to save lives, time and money, despite traffic conditions and the actions of others", a concept first introduced in 1964 in the USA, representatives of the Titi Aur Academy (ATA) pointed out.
- **Position of the driver behind the wheel:** The driver's driving position is important and has three objectives: 1. Visibility; 2. Easy access to all vehicle controls; 3. Ensuring personal comfort.

This is how these three objectives can be achieved:

Fig 3: Adjustment of the driver's seat backrest by placing the palm of the hand with the forearm on the steering wheel [7]

a) **Seat adjustment:** The seat can be adjusted in height so that the field of vision outside the vehicle can be easily seen over the steering wheel and to the sides through the vehicle door windows. Seat adjustment can also be made by front-back logitudinal sliding, so that when the clutch pedal is depressed with the left foot, where the furthest position of the seat is located, the knee of the left foot is slightly flexed to avoid stretching the foot and changing the position of the body on the seat when the clutch is operated. In this case, if there is an impact between vehicles or between the vehicle and other obstacles on the road, we are instinctively forced to lean against the steering wheel and stand, and if the left leg is stretched, one of the wrists or the hip will give way (usually the hip gives way) and we are seriously injured. The backrest is adjusted in such a way that when we bring our right or left hand over the steering wheel, we have the steering wheel at the wrist of the palm with that of the forearm of the hand.

Fig 4: The correct rule of hand positioning while driving a road vehicle [7]

Fig 5: Correct steering wheel operation in turns [7]

Fig 6: Correct adjustment of car seat headrests [7]

b) **Easy access and hand position when operating the steering wheel:** The road traffic regulations of European countries do not stipulate the correct position of the hands on the steering wheel of road vehicles. Preventive driving lays down specific rules on the position of hands on the steering wheel, with the aim of ensuring driver comfort and facilitating driver intervention to avoid imminent danger, with the main objective of traffic safety. The rule of placing the wrist on the steering wheel (Fig 3), by correctly adjusting the seat backrest, must be observed so that, when the hands are placed horizontally on the steering wheel (the correct rule for positioning the hands when driving a motor vehicle), they form a 120-degree angle in the area of the elbow, at the wrist of the arm with that of the forearm (Fig 4). In this way we will have the best grip and the possibility to turn the steering wheel correctly, smoothly and comfortably (Fig 5), but especially in case of an impact, when the airbag in the steering wheel will explode, if we hold our hand incorrectly in the upper area of the steering wheel, the airbag will hit our hand hard (the airbag deploys at a speed of 300 km/h), which it will direct and hit us hard in the face (if it is the left hand, it can hit us hard with the watch over our face or forehead). In this case the hand may be broken and we may faint from the strong blow to the forehead or face. If the correct position is maintained, horizontal to the steering wheel, in the event of an impact when the airbag is triggered from the steering wheel, the hands will be removed from the steering wheel and we will be restrained in the seat by the seatbelt and the airbag will protect my head and hands;

c) **Adjustment (adjustment) of seat back headrests:** In order to avoid serious accidents to drivers and other road users (passengers in other seats), it is very important to adjust the position of the head restraints correctly before setting off. The correct rule for adjusting the seat head restraints is to adjust the height of the head restraints so that the maximum height of the head restraints does not exceed the height of the vehicle seat occupant's head (Fig 6). An incorrectly adjusted head restraint in an impact will allow the user's head to move backwards, which would overload the cervical spine, even leading to a broken spine in this area (Fig 7).

Fig 7: Inorrect adjustment of car seat headrests [7]

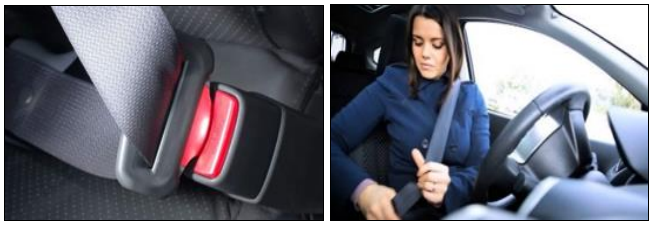

Fig 8: Fixing and adjusting seat belts correctly [7]

Fig 9: Correct positioning of children under 135 cm in child restraints [7]

Fig 10: Place and regular wearing by children under 12 years of age or under 150 cm in height [7]

d) **Adjustment of safety belts:** (Fig 8). Very often we see drivers on the road who are not wearing safety belts, thinking that nothing special can happen to them. We have no way of knowing what will happen to you in the event of a road accident. Safety belts are part of the passive safety of the vehicle, and protect the user in the event of an impact with the windscreen at the time of the accident, eliminate the possibility of being thrown out of the vehicle on impact, restrain the driver or passenger in their seats, reduce the effect of centrifugal force and the force of inertia acting on the driver, helps to maintain a correct driving position, which is important for safe driving, is a precautionary measure, encourages safe driving, reminds the driver of the danger of speeding, prevents injury to other passengers in collisions and considerably reduces the risk of spinal injury. It is usually fixed at three points to the vehicle body and should be adjusted to the body so that in the event of a vehicle impact, it locks instantly and does not allow the body or head to move towards the steering wheel, dashboard, windscreen or front/side airbags of the vehicle. There are safety belts that also attach to four points on the vehicle body. They are often used in sports cars and for securing children in child seats. No matter where we sit in the car, no matter how far we travel, we are morally and legally obliged to wear seat belts because they save our lives without any serious consequences. Moreover, drivers of motor vehicles are obliged to inform all passengers when they board the vehicle that they must wear safety belts. Failure to comply with the obligation of the driver and passengers to wear a seat belt or approved safety belt devices when driving on public roads is an offence and is punishable by a fine in class I of the sanctions. Children in the vehicle are also required to wear seat belts. According to Article 97 of the updated GEO 195/2002 (Highway Code), which stipulates in paragraph 1: Children up to 135 cm in height may be transported in motor vehicles equipped with safety systems for the driver and passengers, hereinafter referred to as safety systems, only if they are secured or restrained by means of a child restraint system installed in the vehicle, and in the same article, paragraph (1^2) stipulates: Children over 135 cm in height may only be transported in motor vehicles equipped with restraint systems if they are wearing adult safety belts, adjusted so that they do not pass over the neck or face area, or if they are secured or restrained by means of a child restraint system installed in the vehicle. Next, in the same article, paragraph (1^3, 1^4 și 1^5) stipulates what the child restraint means (Fig 9). Children under 12 years of age or under 150 cm tall must wear safety belts suitable for their weight and size (Fig 10). They cannot travel in the front passenger seat even if they are held by adults, and children under the age of three must be carried in approved devices. Animals may not be carried in the front seats, even if they are carried.

There is an exception to the requirement to wear safety belts:

- Drivers while reversing or parking;
- Women who are visibly pregnant;
- Drivers of vehicles performing public passenger transport services;
- Persons who have a medical certificate stating that they have a medical condition that makes it impossible to wear a safety belt;
- Driving instructors during the practical training of persons learning to drive a motor vehicle on public roads or the examiner during the practical tests of the driving licence examination.
- Medical conditions for which exemption from wearing a safety belt is granted.

3.2 Eco-driving of road vehicles

Eco-driving is the set of behavioural rules and vehicle inspection and control measures that can achieve fuel economy and/or environmental protection. In other words, eco-driving is defined as driving in such a way as to reduce wear and tear, fuel consumption and pollution levels. Any use of an engine-driven auxiliary system (air conditioning, servo device, power generator) will increase fuel consumption. Cars are made of materials which, once they become waste, can seriously pollute the environment, either through their toxicity (brake fluid, antifreeze, fuels, lubricants, etc) or through their long decomposition period (tyres, plastics, etc.). Changing the way a vehicle is driven can significantly reduce fuel consumption and reduce air pollution. The solution is to adopt a responsible driving style, maintain vehicles in accordance with the technical legislation in force and use them sensibly. When it comes to the actual fuel consumption of the vehicle, the general rule is that we cannot rely on the figures provided by the manufacturers when the vehicle is not equipped with equipment and means of determining and displaying fuel consumption. Therefore, if a driver wants to know how much fuel his vehicle consumes, he has to make his own determinations. Bad roads not only damage the vehicle's

equipment but also cause high fuel consumption.
Fuel consumption can be reduced in this way:

- Tyre balancing: If the tyre pressure is as prescribed and the tyres are well balanced, fuel consumption is reduced and an 8% reduction is achieved;
- Engine tuning and a technical condition check at least once a year will bring at least a 10% reduction;
- Reducing speed in urban areas and driving on roads outside cities at a constant speed as close as possible to the cruising (economical) speed of the vehicle recommended by the manufacturers can bring a reduction of almost 17%.
- Change the oil within the time limits prescribed by the manufacturer;
- Avoid engine overheating by using it at 1,500 rpm.;
- Shifting gears at low revs of 2,000 rpm instead of 3,000 rpm (sporty, aggressive driving style);
- Frequent use of higher gears (3,4,5);evitarea aglomeraţiilor şi fluidizarea traficului;
- Informing and establishing travel itineraries in advance to avoid unnecessary journeys;
- Using air conditioning as little as possible and recirculating it inside the vehicle;
- Avoid overloading the vehicle;
- Avoid driving at high speeds, above 110 km/h, as consumption increases greatly due to air friction (aerodynamic drag);
- Avoid fitting additional headlamps, spoilers and ornaments that increase drag;
- Driving at a constant speed, avoiding sudden acceleration or braking, gradually reducing speed and anticipating dangerous situations in advance.

3.3 Subjective causes of pollution defining environmental management

Driving style has a decisive influence on fuel consumption. An aggressive, sporty style means burning a lot of fuel, which is necessary for strong acceleration. A moderate style means running the engine at low to medium revs and fuel consumption will be lower.
Planning the route to be taken upfront, avoiding areas of heavy traffic or congestion also reduces fuel consumption. A number of practical measures need to be taken in order to reduce the level of pollution caused by vehicles in road traffic:

- Reducing fuel consumption by:

a) Building economical, small-displacement engines;
b) Lowering the aerodynamic coefficient (Cx) of bodies;
c) Adopting an economical driving style that avoids sudden acceleration;
d) Use of low rolling resistance tyres;
e) The development of road infrastructure to ease traffic congestion;utilizarea de carburanţi alternativi ecologici (biodiesel, etanol, GPL);

- Use of anti-pollution devices (catalytic converters, particulate filters, adblue, etc.);
- Encouraging public transport;
- Increasing recycling of materials used in car manufacturing.

3.4 Basic general rules and recommendations common to defensive, environmental and preventive driving

Viewed and analysed through the prism of fuel consumption, but also through the prism of eco-preventive driving, defensive driving is defined by the way, the style in which drivers intervene on controls and how they operate the means of transport. This depends basically on their knowledge, techniques and skills.
Table 1 shows the most important similarities between the objectives of preventive and defensive driving.

Table 1: Important similarities between the objectives of preventive and defensive driving

Preventive driving	Defensive driving
Checking the vehicle at the start of the race (on the road)	Checking the pressure in the wheels according to the technical note and the weight of the vehicle, cleaning the windows of the vehicle, the state of fixation of the bodywork elements, mirrors, headlights, signalling system, etc.
Maintaining an appropriate distance between vehicles according to the speed of traffic	Adapting speed to traffic
Viewing and using conventional traffic communication methods (headlights, turn signals, brake stop)	Observing and reacting correctly to non-conventional communication by drivers (sudden changes of speed, irregular and unsignalled manoeuvres, unexpected gestures)
Compliance with traffic rules to ensure traffic flow	Adopting appropriate behaviour to actively smooth the flow of vehicle traffic in extreme cases (road accidents, roadworks, blocked or closed lanes), or giving way according to the zipper rule when narrowing the road
Reducing speed, preparing the vehicle and paying more attention to decreasing road grip	Knowledge of specific manoeuvres in conventional and unconventional braking, control of the steering wheel in skids (oversteer or understeer)
Observing the rules of driving in adverse conditions and increasing alertness while driving	Proactive measures to check the conditions and how the vehicle reacts (regular check of safe road holding)

The main defensive driving rules that can result in reduced fuel consumption are:

- The optimum operating temperature (and not at idle);
- While stationary, the engine shall be stopped;
- An appropriate distance shall be maintained between the vehicles in motion, depending on the speed of the vehicle (observing the two-second rule), (Fig 13);
- An anticipatory attitude in traffic, using, as a rule, deceleration instead of braking;
- Avoiding “sporty”, aggressive driving;
- Avoiding sudden braking;
- Avoiding long, hard starts;
- Shift gears carefully, in good time, to ensure reserve engine power;
- Moving the car smoothly, gently along the road and avoiding sudden changes of control;

- Emptying the boot of cargo or unnecessary items;
- Checking the tyre pressure every 500-1,000 km driven, or once a month;
- Removal of the roof rack or bicycle rack, if not required for the journey;
- Avoiding the unjustified use of car-mounted equipment (air conditioning, headlights, various gadgets fitted in the car);
- Carrying out maintenance work on time (changing engine oil, transmission or steering, regular technical inspections, technical overhauls, replacing brake fluid, other maintenance work);
- The use of original spare parts and materials in the maintenance and repair process;
- Applying deceleration when going downhill (in this case the engine does not consume excess fuel);
- Recovering electrical energy when downhill or decelerating (for hybrid and electric cars);
- Advance planning of car trips or excursions, which allows cost-effective itineraries to be set;
- Making journeys more efficient (loading the vehicle to capacity and full/full journeys).

3.5 Rules and recommendations in defensive driving

In defensive driving courses, drivers who want to hone their skills come into contact with a whole range of new ways of approaching the car and the driving process. Some of the principles of defensive driving are not included in the rules of the road, but complement them. These include the recommendations (rules) that follow:

- **The two-second rule** (Fig 13): The rule requires you to be within two seconds (or more) of the vehicle in front when driving. This means that if the vehicle in front brakes suddenly, the driver of the following vehicle will have more time to react and can stop the vehicle safely to avoid an accident. Also, by following this rule he will have a wider field of vision on the road, having the necessary time and anticipating situations. The two-second rule applies under normal, optimal driving conditions. There are circumstances when it may need to be modified, for example in rain, snow or traffic jams;
- **The zipper rule:** In situations where two lanes merge into one, or where we have a busy intersection marked with a "Yield" sign, the solution is not always for only priority vehicles to continue moving. In order for the whole process to run smoothly, it is necessary that one car at a time enters from each side;
- **Avoiding the "group effect" on motorways:** As on any other road segment, the two-second rule needs to be applied on motorways, but there is a specific risk here. When driving in larger or smaller groups, or in parallel lanes with other vehicles whose speed equals that of the vehicle we are driving, we tend to speed up. This tendency, manifested by each traffic participant, causes the other traffic participants to "force" the one in front, who "rushes" by creating a state of stress, suddenly shortening the distance between vehicles or forcing him or her into the path of other vehicles driving regularly on the other lanes of the motorway, putting them in danger;
- **Controlling the vehicle in a skid (oversteer and understeer):** Understeer is when the front end slides, while oversteer involves the rear end skidding. In each of these situations, different actions are recommended. Understeer should be counteracted by gradually reducing speed carefully so that the wheels do not lock up and the front axle regains grip. Oversteer will require the opposite action: Accelerate and keep the wheels on the direction of travel;
- **Driving in snow or ice:** The front-back balance is the safest way to get out of a parking space when it's snowing. Revving the engine and spinning the wheels idling will only result in ice forming under the wheels. It's important not to reduce speed in the event of a skid, but to carefully dose the throttle and maintain the car's trajectory. The car should be thoroughly cleaned in terms of windows, headlights and taillights, and the fuel tank should always be full for scenarios involving snow blockages;
- **Attention on the road:** The Road Code penalizes cell phone use, but that doesn't mean hands-free systems can't distract you from the road. A hurried conversation can take your attention away from other traffic or traffic signs and markings. It is also very dangerous to eat or drink while driving.

3.6 Rules and recommendations in preventive driving of road vehicles

Preventive driving is a careful and responsible approach to driving that aims to minimise the risk of accidents and maximise safety on the road. It involves taking into account all the factors that can affect safety during the journey, such as weather conditions, road conditions, traffic, etc., and taking steps to manage them appropriately. One of the most important aspects of preventive driving is following traffic rules and road signs. This means observing legal speeds, obeying stop and yield signs, and making sure you are always in the correct position on the road. It's also important to pay attention to the traffic around you and expect the possibility of other drivers making mistakes or not following traffic rules.

Another important component of defensive driving is maintaining a safe distance from other vehicles. This means making sure there is always enough space between you and the vehicle in front of you to be able to brake in case of an emergency. It's also important to keep out of the danger zone when driving on motorways or multi-lane roads, especially when overtaking other vehicles.

Preventive driving also involves keeping your full attention on the road while driving. This means avoiding distractions, such as using your mobile phone or listening to loud music, and making sure you are rested and alert while driving. The 10 essential rules of safe driving are:

- Respect traffic signs and speed limits;
- Use the correct signalling when changing direction or making a maneuver;
- Always check if the road is clear when entering it or making a turn;
- Keep a safe distance from other vehicles;
- Adapt speed according to road and weather conditions;
- Make sure you have good visibility by frequently cleaning your windscreen and side mirrors;
- Keep your attention on the road at all times, avoiding using your phone or other distractions while driving;
- Watch out for pedestrians and other small vehicles that may suddenly appear on the road;

- Do not consume alcohol or drugs before or while driving;
- Check the condition of your car frequently, making sure your tyres, headlights and other essential components are in good working order.

As you can see, most of the rules of defensive driving have common features and meanings with the rules of defensive driving of road vehicles.

3.7 Eco-driving recommendations for road vehicles

Eco-friendly driving behaviour means adapting to a system that allows the driver to avoid overloading the car and at the same time save up to 20% in fuel consumption. In order to drive a car in an environmentally friendly way, it is necessary to take into account some practices that are quite important, such as:

- **Route planning:** Prepare your route in advance to optimise your journey and do your best to avoid areas with heavy traffic, roadworks or rough terrain to save time and fuel.
- **Optimisation by using the vehicle's gearbox at maximum efficiency when changing gears:** If you drive a car with a manual transmission, shift quickly but gradually up to higher gears because the engine will run more efficiently and use less fuel. If your vehicle does not have an automatic transmission, get used to using the overdrive gear, which makes the engine work more smoothly and therefore reduces engine wear, and will also save fuel.
- **Choosing a flexible style of driving the vehicle which consists of choosing a constant cruising speed and frequent use of the engine brake:** Applying the service brake should only be done if necessary. At the red light of an electric traffic light, from a distance of at least 100 metres before reaching the traffic light, the driver will not accelerate and will use the decelerator;
- **Acceleration management:** Don't accelerate hard, sporty;
- **Efficient use of the engine when climbing slopes and descending ramps:** The use of an appropriate gearbox ratio is important so as to ensure that there is enough power reserve to move the vehicle up the ramp without the engine being revved hard. When descending ramps, the service brake should be used without forcing (revving) the engine. The engine brake shall be used only when necessary;
- **Engine shutdown if stationary for more than five minutes:** Use the Start-stop system, if available. In winter, do not warm up the engine while stationary. Start at low speed, warming up the engine while running until it reaches optimum operating temperature and then rev it up. Avoid idling the engine (e.g. stopping at traffic lights or in heavy traffic). 60% of general environmental pollution with noxious emissions is created by exhaust gases from internal combustion engines in cars [8, p. 76];
- **Efficient use of the vehicle during journeys:** Checking tyre pressure every month is more than necessary. Planning trips or journeys, using GPS (Global Positioning System) for route guidance are also important. Do not carry unnecessary luggage, objects or cargo in/on the boot of the vehicle (remove the boot from the vehicle when no longer needed). Setting the eco driving style in the vehicle and the cruise control function at any speed (if fitted) is recommended. An overall score from 0 to 100 is displayed, allowing you to rate your eco-driving performance. The higher the overall score, the lower the fuel consumption. You are given eco-recommendations by the on-board computer to improve your performance;
- **Use the automatic speed control (speed limiter):** On the motorway. The speed limiter saves fuel by maintaining a constant speed.

3.8 Effect of oversteer and understeer (skidding) of the road vehicle

When a vehicle's trajectory does not follow the exact direction desired by the driver turning the steering wheel, approaching a left or right turn ends either in a skid or a wrong turn. Oversteering or understeering are road vehicle events that take the driver by surprise and can put other road users in a situation they cannot avoid. Understeer is a phenomenon specific to front wheel drive cars and oversteer is a phenomenon characteristic of rear wheel drive cars. Oversteer can be explained as the phenomenon where a car rotates around a vertical axis perpendicular to the road surface.

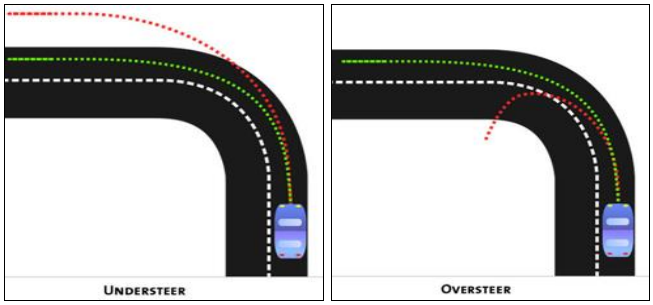

Fig 11: The phenomenon of understeer and oversteer of a motor vehicle [11]

Understeer (Fig 11) is the phenomenon of motor vehicles losing their correct dynamic trajectory and is closely related to their most frequent architecture in road traffic. Most of them are front wheel drive and their engine is also located at the front. Thus, the wheels that steer the vehicle are also the driving wheels. At each turn, they have to manage two demanding processes during acceleration, which can lead to a loss of adherence. The mass transfer between the axles, amplified by centrifugal force, will direct more mass to the front of the vehicle, making it more difficult to drive through the curve. This will put extra stress on the tyres, compromise the correct alignment of the vehicle on the optimum trajectory, and in extreme cases, the trajectory followed will be radically opposite to that intended by the driver. This is when the vehicle will go to the outside of the curve, instead of following the curve, and will enter the other direction or the roadside. It is not just acceleration that can predispose a traction car to understeer. It can also occur when braking hard and late, especially on wet asphalt. In such a scenario, the car simply goes forward, misses the turn and ends up in the scenery.

Oversteer (Fig 11) is the phenomenon that also occurs as a result of loss of grip on the road, but its most serious consequence is skidding. As scary as skidding is for the average driver, it is also very satisfying for drifting enthusiasts, and a specially prepared vehicle is chosen only from the rear-wheel drive range. Another difference

between oversteering and understeering is the direction the drifting vehicle can follow. While an understeered vehicle will have difficulty travelling along the curve or going in a straight line, an oversteered vehicle may end up in a position perpendicular to the axis of the curve and can exit either on the inside or the outside (Fig 11). When the front wheels have only steering effect and the drive is given to the rear wheels, the transfer of mass between the two axles is much faster. Thus, when a driver in a rear-wheel drive car enters a corner at speed and then brakes hard, the car will tend to spin around the vertical axis and ”pull” towards the inside of the curve.

Maneuvers that prevent understeer: If you feel that the steering wheel is rotating faster than the wheels in a curve, the following procedures will help you get your vehicle back on an optimal direction:

- Take your foot off the accelerator pedal and keep your eyes constantly on a point where the vehicle should arrive safely on the road;
- Do not press the brake pedal under any circumstances;
- Reduce speed gradually.

Maneuvers that prevent oversteer: When you feel you are losing adherence on the rear axle of your vehicle, don't panic and choose to take the following steps for optimal direction:

- Do not press the brake pedal;
- Reduce the steering angle to allow the vehicle to steer progressively;
- Perform a countersteering manoeuvre by by orientating the steering wheels in the opposite direction to that in which the vehicle is moving.

3.9 Vehicle speed in defensive and preventive driving

Travel speed is an essential parameter in public road traffic. As speed is one of the important factors contributing to accidents and other unpleasant traffic events, the rules of preventive/defensive driving should also be taken into account. From this point of view, the driver has a legal and moral obligation to adapt the speed at which he drives to the objective and subjective conditions, so that he can avoid any event, even unforeseen ones. In order to achieve this objective, it should be borne in mind that the maximum legal speed does not give a driver the right to ignore situations which require driving below that speed. If the braking space is not correctly estimated, impact with an obstacle or another vehicle is imminent. The driver should bear in mind that as speed increases, the field of vision reduces. The main cause of traffic accidents is driving at excessive or inappropriate speed. It is recommended to reduce speed as a preventive measure in all cases provided for by road traffic law and in all situations where a dangerous situation is foreseen which can be avoided by driving at a lower speed.

Driving defensively and/or pre-emptively in bad weather means slowing down to the limit where you have good visibility and full control of the controls. We are tempted to say many times that 50 km/h or 30 km/h are low speeds and road accidents cannot happen, and if they do happen the human body does not suffer serious lesions.

Fig 12: Injuries to the human body in road traffic accidents equivalent to falls from different floors of a nine-storey building [7]

Next we will look at lesions that the human body receives in collisions of motor vehicles with obstacles on the road or roadside, or in vehicle-vehicle and vehicle-pedestrian. The analysis will be carried out by comparing it to the free fall of a person from different floors of a building. From the analysis of the data shown in Fig 12, an impact at a speed of 30 km/h is equivalent to a human free fall from the first floor of a building. An impact at a speed of 50 km/h is equivalent to a free fall of the human body from the third floor of a building. An impact at a speed of 70 km/h is equivalent to a free fall of the human body from the sixth floor of a building. An impact at a speed of 90 km/h is equivalent to a free fall of the human body from the ninth floor of a building. Experts estimate that when a vehicle hits a fixed obstacle at over 64 km/h (40 mph), the chances of survival are extremely low [7]. The explanation is that although the bodies of today's cars are capable of absorbing and not deforming up to 100 km/h, the passenger compartment remains intact. Passengers remain in the vehicle on impact, protected by seat belts and airbags. At this speed, the deceleration force on the people in the vehicle peaks at 50-60 G, i.e. the weight of the human body multiplied by these values (peaks of G-force, measured for 1-2 milliseconds). The internal organs of the human body are not protected. On impact the human body is restrained in the belt but the internal organs move through the body with their weight multiplied by 50-60 which is the G-force value. During the movement, for 1-2 milliseconds they cause internal damage by rupturing major veins and arteries, resulting in internal bleeding which leads to death.

The impact at such speeds is devastating. That's why it's so important to wear a safe belt and to have the vehicle you're driving equipped with a safety package. All these elements will substantially reduce the impact.

4. Case study. The two second rule in road traffic

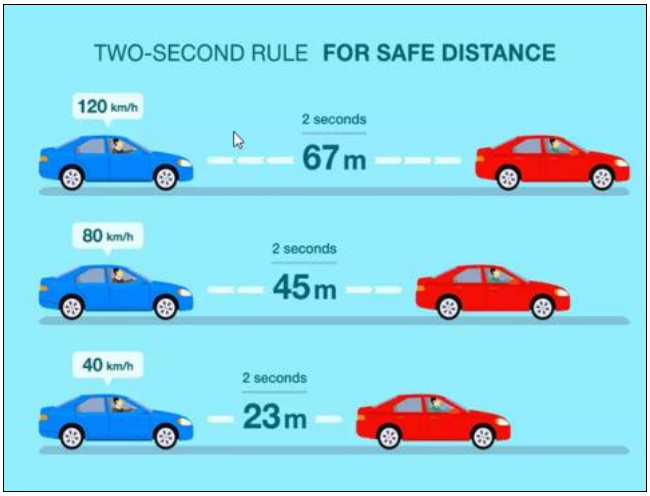

Fig 13: The two-second rule in preventive/defensive driving for safe distance [9]

Perception of danger, reaction time and fatigue of the driver, distance between vehicles, speed of travel and road conditions are the main determinants of a collision between two vehicles in traffic. This case study examines the distance to be maintained between vehicles at different speeds. The braking distance between two vehicles running at different speeds is always defined by mathematically determined rules. The braking distance is also found in the literature called the braking distance of the road vehicle, which is always defined by the *"two-second rule"* (Fig 13), which recommends taking a fixed target on the road as a reference and counting to two from the moment the rear of the vehicle in front has overtaken it. If you pass it before you finish counting, you need to move further away from the vehicle in front of you, or when you're behind the wheel and driving, look for a point, a landmark, that is ahead of the car in front of you.

For example, a tree or a power pole. As soon as the car in front is in front of the marker, say out loud (without rushing the words): *"this is the two second rule"*. Saying the sentence should take you about 2 seconds. When you have finished, your position should be to the right of the landmark. If you have already passed it, you have not kept the proper distance. So you have not followed the rule.

Table 2 shows the total stopping distance of a vehicle as a function of speed.

Table 2: Total stopping distance of a vehicle as a function of speed

Speed (km/h)	10	20	30	40	50	60	70	80	90	100	110	120	130
Distance travelled as a function of speed (m/s)	2.7	5.5	8.3	11.1	13.8	16.6	19.4	22.3	25	27.8	30.6	33.4	36.2
Distance travelled in reaction time (m/sec)	2.8	5.6	8.4	11.2	13.9	16.7	19.4	22.3	25	27.8	30.6	33.4	36.2
Distance travelled in (mechanical) braking time (m)	1.5	3	7	12	19	27	37	48	61	78	90	108	130
Total Stop Distance (m)	4.27	8.55	15.32	23.11	32.88	43.65	56.4	70.22	86	105.8	120.55	141.33	166.11

Consequently, the higher the initial speed, the longer the distance needed to stop the car, keeping the deceleration constant. However, with regard to the two-second rule in preventive/defensive driving shown in Fig 6, in the opinion of the author of this research, the representation is not quite correct. It is interpretative. For example, for v = 40 km/h, a distance of 2 x (40/3.6) = 22.2 m can indeed be covered in two-seconds. However, the distance between the rear of the pursuing vehicle and the front of the pursuing vehicle (as shown in the figure) will be less by the value of the vehicle length. Suppose the length of the vehicle is 5 m. In this case the distance between vehicles becomes 22.2 - 5 m = 17.5 m. For the other distances corresponding to speeds of 80 km/h and 120 km/h respectively, similar calculations can be made. This two-second idea actually means that the psychophysical delay time is increased from 1.1 to 1.2 seconds (as recommended in the literature, and also taken into account in car expert reports) to 2 seconds. Basically, in road traffic, too great a distance between vehicles occurs and those behind will overtake, blaming the driver of the vehicle in front for *"not keeping close"*. In my opinion, the rule as such is aimed more at novice drivers, for whom it is both useful and justified.

5. Conclusions and recommendations from the author on defensive, preventive and eco-driving of road vehicles

Both eco-driving and defensive driving have common identifying elements. In the author's view, their common elements define and determine certain elements of preventive driving, thus increasing the level of safety and avoiding undesirable events in road traffic.

The driver's manoeuvres during oversteering or understeering can make the difference between a borderline situation and a difficult moment, which is passed with success. Knowing as much as possible about the car's behaviour is important for learning not only preventive but also proactive driving.

Experts estimate that wearing a safety belt reduces the risk of death of drivers and front seat occupants by 50% in the event of an accident.

Safety belts are life safety. They make the difference between life and death, so we're obliged to wear them when we drive. They must be properly adjusted and fitted to the body so that the horizontal part of the belt lies on the pelvis and not on the belly, so as not to damage the wearer's internal organs in the event of a severe impact. At the same time, the correct fit on the body prevents submarining caused by the human body slipping underneath it on impact in a collision.

The chance of death in a pedestrian accident increases greatly with a speed increase of only 15 km/h. At 55 km/h, a pedestrian has a 45% chance of being killed. At 100 km/h, it is fairly certain that a pedestrian will not survive.

When driving at night on an open stretch of road and signs of fatigue are present, it is important to take a necessary rest break.

When driving on public roads, one must be rested and the vehicle must be ethnically appropriate. Tiredness and nervous tension can be reduced by driving at a safe, measured speed and keeping a steady pace.

Driving ability is reduced from a blood alcohol concentration starting at 0.1 grams/liter (0.1 ‰). Drinking alcohol, even in small quantities, can lead to a risky and excessively relaxed driving style.

Drivers who have been prescribed medication must ensure that taking it will not affect their ability to drive a motor

vehicle. Euphoriants belong to the category of substances that have a similar effect to alcohol and reduce a driver's ability to concentrate.

It has been scientifically demonstrated that within the first two minutes of starting an internal combustion engine, 80% of the pollutants released into the atmosphere are carbon monoxide (CO).

In the accident of a vehicle-pedestrian, vehicle-obstacle impact on the roadway, the forces are major. If the impact is frontal between vehicles the speeds sum up. The safer the vehicle and the better equipped it is in terms of active or passive safety, the more protected we will be during an impact. The most important thing is to drive carefully, defensively and not get into that impact.

When it starts raining after a long period without rain, be aware that dangerous slush can form on the road surface. The most dangerous road surface in rainy conditions is made of cubic stone. In these conditions, drivers must be very careful because of the increased danger of skidding. Aquaplaning occurs when the road is covered with water and can be avoided if tyres are not worn and speed is reduced. The road is slipperier at the start of rain showers.

To drive on a snowy road, it is recommended to equip your car with winter tyres and snow chains. The speed at which you have to drive on a wet or slushy, icy or snow covered public road should give you the confidence to stop and avoid any traffic event without skidding. On a stretch of road covered with ice, be aware of the inevitable impact with a dog. To avoid an accident, you must release the accelerator and keep the steering wheel firmly in the direction of travel, ready to stabilise the vehicle.

If you are driving past a group of school children travelling in the same direction as you, on the national road in a rural town, it is advisable, from a preventive driving point of view, to reduce speed and drive cautiously around the group. If you see children on a pedestrian crossing, it is worth remembering that they may run back across the crossing for no discernible reason. When approaching a school and you notice pupils leaving the building, be aware that pupils may be inattentive and suddenly appear in front of the car. Driving on a public road, you notice a group of children on the pavement who have dropped a ball on the road. In terms of preventive behaviour, you should be aware that in this situation one of them might turn to pick up the ball from the road. While driving on a public road, you notice a ball that has moved from the pavement onto the road. In this situation, you should immediately reduce speed and prepare for braking.

When you observe a ball rolling in front of you, it is recommended that you signal acoustically, reduce speed and drive with maximum caution, as it is very possible that a child may appear behind it. If an elderly person crosses the public road irregularly in front of you, it is recommended that you reduce your speed in good time and take all measures to avoid hitting the person crossing. When travelling on a public road behind a child on a bicycle, be aware that the cyclist may turn left without indicating a change of direction. When riding behind a cyclist and you notice that the cyclist wants to change direction, it is advisable to provide conditions for the cyclist to complete the manoeuvre. When stopping the car to allow an attendant to get out on the right-hand side where a cycle lane passes, you should first make sure that no cyclist passes, then the attendant can open the door. Before overtaking a cyclist, you are allowed to honk your horn if the distance to the cyclist is more than 25 m. When a school bus stops with its hazard warning lights on, you are advised to drive with extra caution.

If a negligent driver starts an overtaking manoeuvre and risks colliding with an oncoming driver, it is understandable that the latter will have to drastically reduce speed to avoid an accident. If the public road is covered with cobblestones, reduce speed and avoid sudden sudden changes of control. After a heavy downpour, you will reduce speed and increase the distance to the vehicle in front, as the splashing water reduces visibility. If you want to check whether the road surface has become covered with ice, reduce speed and brake carefully to test the vehicle's reaction. When driving at night and visibility is reduced due to fog, you should keep a balanced distance between the centre line of the road and the right-hand edge of the carriageway. You should also drive at a low speed to ensure that you stop in a space less than your visibility. If you are driving from a well-lit road into a poorly lit road or when entering a tunnel, you should bear in mind that your speed must be adapted to the new lighting conditions.

When driving on a wet road, it is necessary to increase the distance to the vehicle in front of you as tyre grip on the road surface decreases and braking distance increases. When driving in a convoy, it is advisable both to keep your distance from the vehicle in front and to stay within your own lane, driving slightly to one side, so that you can observe the behaviour of those in front and behind you. do not brake hard in bends; inertia will generate forces which will destabilise the car, causing it to skid. If the vehicle skids when braking, stop braking and turn the steering wheel in the opposite direction to the sliding direction. If you approach a curve at an inappropriate speed, the car will skid to the outside of the curve; if it is to the left, it will skid to the right; if it is to the right, it will skid to the left. Another special situation arises when the car is rear-wheel drive; if the acceleration is too high in the curve, the car will skid backwards to the outside of the curve. If, however, the vehicle skids backwards to the right, it is advisable to release the accelerator pedal and turn the steering wheel slightly to the right; you will do the same for the left side. If the vehicle you are driving has a trailer attached and you are approaching a sharp bend, you should reduce your speed early as the danger of the trailer skidding is very high.

Do not brake hard in curves; inertia will generate forces that will destabilise the car, causing it to skid. If the vehicle skids when braking, stop braking and turn the steering wheel in the opposite direction to the skid. If you approach a bend at an inappropriate speed, the car will skid to the outside of the bend. If it is to the left, the skid will skid to the right; if it is to the right, the skid will skid to the left. Another special situation arises when the car is rear-wheel drive. If you accelerate too hard in a bend, the car will skid backwards out of the bend. If, however, the vehicle skids backwards to the right, it is advisable to release the accelerator pedal and turn the steering wheel slightly to the right; you will do the same for the left side. If the vehicle you are driving has a trailer attached and you are approaching a sharp bend, you should reduce your speed early as the danger of the trailer skidding is very high.

If you are overtaken by a vehicle which has misjudged the distance and speed of an oncoming vehicle, you should proceed in such a way as to avoid a road traffic accident by

immediately reducing speed and driving as close as possible to the right-hand edge of the carriageway to allow the vehicle to overtake and return to the normal direction of travel. A reckless driver has overtaken you and a lorry is approaching from the opposite direction at a short distance, signalling him with its lights; in such situations, reduce your speed and increase the distance to the vehicle in front of you, thus creating the conditions for the overtaker to enter the column. When a driver, who is not travelling at a constant speed and has overtaken you several times, tries to overtake you again, it is advisable to create the conditions for him to overtake you by moving as close as possible to the right-hand side of the public road. When a passenger bus has stopped in front of you, you should bear in mind that some passengers may get off and cross in front of the bus without securing themselves properly. To safely overtake a tram stopped at a station with a refuge, it is recommended that you reduce your speed. If you are driving behind a lorry with a mark-out, intending to turn right into a narrow road, you should be aware that the lorry initially commits to the left before turning because of its gauge.

The places where high speed traffic most often leads to accidents are junctions; caution and moderate speed will save you from unpleasant events. If a vehicle is turning in front of you, stop and wait for traffic to clear. You are approaching an intersection without traffic signs.Visibility in both directions is impossible due to stationary vehicles; in such situations it is advisable to enter the intersection slowly and with increased caution. When you are driving behind an animal drawn vehicle and see that it wishes to change direction, you must allow the vehicle to do so safely. When approaching an industrial railway, drivers should exercise extra caution. You intend to start moving from a roadside car park and a car is parked behind you. In such situations you should bear in mind that, due to poor visibility to the rear, following vehicles may be late in noticing your vehicle's signal. If you are driving through a town behind a vehicle with a foreign or foreign number plate, be aware that the driver in front may brake and stop unexpectedly to ask for road information. When driving at night and visibility is reduced due to fog, from a preventive driving point of view you should keep a balanced distance between the centre line of the road and the right hand edge of the carriageway, driving at a speed that ensures stopping in a space less than that of visibility. The main risk factor to bear in mind when driving through road tunnels is the difficulty of adapting your vision when entering and exiting such passages. When driving on public roads, you can make your car more visible by keeping the outside of the bodywork, number plates and lighting systems clean. When a queue of cars has formed behind a lorry, it is advisable that the first car behind the lorry overtakes first. If you are exiting a yard and intend to turn into the roadway, you should be aware of pedestrians on the sidewalk first, as they will not expect you to be driving through this area. If you wish to use your mobile phone when you do not have a hands-free system, it is recommended that you stop your vehicle in the car park in the service complex area. Transporting luggage on the roof of the car may increase the instability of the vehicle in side winds.

Failure to wear a seat belt can result in an accident, even in a collision at speeds starting at around 20 km/h. When getting into a car, you should remember to open the door only if the traffic allows it. If you intend to consult a road map, it is advisable to stop the vehicle off the road. If your vehicle has made a mess on the road, it must be removed without delay, and until it is removed, the dangerous spot must be visibly marked. If you intend to tow a power-steered car that has broken down, you should bear in mind that steering the steering wheel requires more physical effort and therefore towing must be carried out with particular care. It is not advisable to keep or store certain objects on the floor of the vehicle, as there is a possibility of them rolling off and even the risk of getting under the pedals, thus creating dangerous situations. Your vehicle's lighting system should be set for night time driving so that you can see and be seen without causing discomfort to other road users. The role of head restraints, from the point of view of preventive driving, is to prevent, in the event of a rear-end collision, the possible fracture of the cervical spine of occupants of seats fitted with such devices. When you find that you have certain problems with your eyesight, you should avoid driving until you have been seen by your doctor and follow his advice. When driving, the driver should sit as comfortably as possible on the seat, with the head against the headrest and both hands on the steering wheel, positioned "between 10:00 and 14:00". When driving on motorways, it is recommended to increase the tyre pressure, but not to exceed the maximum permitted value. The main cause of tyre blowout while driving is under-inflation. If, while driving on a public road, there is a road accident ahead of you which is being investigated by the police, and traffic is moving slowly in one direction only, it is advisable to proceed carefully, following the instructions of the traffic police officer. In the event of an accident with a wild animal, you must stop, turn on your hazard warning lights and secure the scene of the accident. Road traffic laws must be respected by all road users. However, it cannot cover the multitude of real life situations. Preventive driving is a necessary and obligatory addition to make driving safe and comfortable.

An analysis of the three types of driving (defensive, preventive and eco-driving) shows that they all have a common goal, to bring environmental, economic, social, cultural and spiritual benefits to humanity.

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