WG2 conclusions/recommendations on road safety:

1) The 1968 Vienna Convention as recently amended seems sufficient for upcoming systems but a way needs to be found to assess performance with the human driver in the loop. Level 3 Driving is a special challenge. Member States should confirm in UNECE if these provisions of the Vienna Convention include levels 3 or 4 as defined by the SAE as long as there is a driver able to take the control of the car.

2) Tasks of the vehicles and the driver shall be clarified/regulated in the relevant instruments (e.g. vehicle legislation, driving licence and traffic rules). This is to be discussed as soon as possible in the relevant groups in UNECE (WP1/WP29). The vehicle shall be designed to ensure that the driver is active/aware if needed. The driver shall be made aware of the limits of the system. Human Machine Interface (HMI) is very important for partially and highly automated vehicles, particularly in relation to the level of attention required for a safe operation of an automated function and for the safe transfer of control between vehicle and driver.

3) The rules for the tasks of the driver/vehicle could be drafted around the following main principles:

a) There will be an expectation by the public that automated vehicles at SAE Levels 2 and 3 will be safer than manually driven vehicles in line with the principle that robots shall not cause injury to humans.[1] At higher levels of automation (SAE Levels 4 and 5), there will be an expectation of far higher safety.

b) When operating under vehicle control (vehicle as the driver), vehicles shall obey all relevant safety-related regulations. This would include, for example, speed limits (fixed, variable and dynamic), access restrictions, lane restrictions, traffic signal instructions, road works regulations and restraint use. They would also, if operating in urban areas, have to comply with rules for zebra and other crossings.

c) The vehicle shall be designed so that it is clear to the person in the driving seat what is the operational capability (authority) of the automated mode or modes currently enabled. There needs to be an HMI able to indicate to the driver, for example, who is responsible for decisions about changing lanes (vehicle or human). There is a strong case for a level of standardisation of HMI indications, so as to reduce the possibility of misunderstanding and confusion.

d) The vehicle shall be capable of appropriate indication of its intentions in interactions with other road users. This would of course include using its indicators where a human driver should activate the indicators or sounding the horn to alert other road users, but may also involve other "gestures" or indications to replace those of the human if it is not expected that the driver is going to carry out this task.

e) Automation shall not be enabled on roads, in situations or in circumstances that it is not capable of handling. Traffic rules may need to be adapted for that. The vehicle shall therefore restrict the use of automation to road types, road layouts and road geometry that it can handle. It shall also recognise environmental degradations which prevent safe operation, such as reduced visibility. On encountering situations that it cannot handle, it shall attempt to hand over driving to the human.

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[1] This is the first of Isaac Asimov's Three Laws of Robotics.

f) The vehicle shall ascertain that the driver is ready to take over when a take over by the driver is required by the system. The vehicle shall ascertain driver availability, e.g. not being asleep, and shall ascertain that the driver is engaged, i.e. hands on the steering wheel, and has attention to the road and traffic situation.

g) If the vehicle determines that the human is not able or willing to resume control when required to do so, then the vehicle shall take appropriate action. Depending on the SAE level, the vehicle shall warn the driver and/or perform a minimum risk manoeuvre in which it secures as little danger as possible to the vehicle occupants and other road users.

h) There needs to be a means to verify compliance with rules derived from these principles.