**WG2 conclusions/recommendations on road safety:**

**1) The 1968 Vienna Convention in its latest amendment seems sufficient to account for upcoming automated systems that still require a driver (e. g. Level 3 systems).. Contracting Parties should clarify in UNECE fora that the provisions set forth in the Vienna Convention cover levels 3 and/or 4 automated systems as defined by the SAE provided there is a still driver available who is ready, able and willing to take the control upon vehicle's request.**

**2) Tasks of the vehicle and the driver shall be clarified and regulations amended where necessary in the relevant fora of the UNECE (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 automated systemshall be designed to ensure that the driver remains active/aware if needed, depending on the level of automation. The "intended use" of automated system shall be clearly outlined as to instruct drivers on how to apply and understand the automated system and its limitations. Human Machine Interface (HMI) is very important for automated vehicles, particularly in relation to the level of attention required for a safe operation of an automated function and for the safe transition 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 systems at SAE Levels 3 and higher 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 (SAE Levels 4 and 5) (vehicle as the "driver", human being inside the vehicle becomes passenger)), vehicles shall obey all relevant regulations(eg.g. road traffic rules, safety-related rules etc.). . 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. In contrast to Level 4-5 systems, at Level 3, the system shall issue a transition demand to the driver when the functional boundaries of the system are about to be reached. The driver shall thus have a lead time for a safe manual takeover.

c) The vehicle shall be designed so that it is clear to the driver what the operational capability of the automated mode is 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 for Level 3 and above . 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. In addition, communication by

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

**Comment [SSD(1]:** According to the current draft recommendations of the Commission the Vienna Convention is not considered a hurdle for Level 3 systems. For this reason, we do not support statements that Level 3 poses a special challenge. Please delete!

**Comment [SSD(2]:** This means that the driver shall not be sleeping, rather he has to retain a degree of vigilance as to acknowledge the transition demand and any technical warning that the vehicle is issuing (e.g. empty fuel tank, faulty headlamp, etc.)

**Comment [SSD(3]:**

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**Deleted:** 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.

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**Comment [SSD(4]:** Partially = level 2, highly = level 4. So what about „conditional automation" = level 3.

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**Comment [SSD(5]:** This is the official term discussed in UN-fora.

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**Comment [SSD(6]:** This is a research task for urban traffic and a common definition of the „indicator" should be standardized. It should not required for a high way automation.

light signalling seems a promising future field of activity as to facilitate communication with other road users including pedestrians for urban use-cases of automated driving.

e) Automation shall not be enabled on roads, in situations or in circumstances that it is not capable of handling, that is outside of the use-case domain., Traffic rules may need to be adapted for that. The automated system 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 - – in general recognizing its functional boundaries for Levels 3 and above.. On encountering situations that it cannot handle, it shall hand over driving to the human in case of a Level 3 system..

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 . for Level 3 systems. The vehicle shall ascertain driver availability, e.g. not being asleep. For Level 2 systems the system, 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 at Level 3 automation, then the vehicle shall take appropriate action by initiating a minimal risk maneuver.. 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.

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