

AUTONOMOUS VEHICLES AND THE DUTY OF DAMAGE COMPENSATION: HOW LIABILITY REGULATIONS MAY INFLUENCE SELF-DRIVING CARS DEVELOPMENT

| 615

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SUMMARY: *1. Introduction: Searching for the Legal Regime of Autonomous Vehicles. – 2. The Indissoluble Relationship between Liability Rules and Technology Development. – 2.1. Focus on Self-Driving Vehicles: How the Regulation of Liability May Affect Their Deployment. – 2.2. The Need for an Update: Why Will the Current Liability Rules Not Be Adequate for Accidents Caused by Autonomous Vehicles? – 3. The Content and Structure of Directive (EU) 2024/2853 Liability for Defective Products. – 3.1. The Relationship between Directive (EU) 2024/2853 and the Artificial Intelligence Act. – 4. The Content and Structure of the Directive proposal on AI Liability. – 5. Autonomous Vehicles in the current EU Liability Framework: Immediate Effects and Future Developments. – 6. An Effectiveness Simulation: Analysis of a Possible Application of Directive (EU) 2024/2853 to Actual Accidents Involving Self-Driving Vehicles. – 6.1. The Collision between a Car Operating with Automated Vehicle Control Systems and a Tractor-Semitrailer Truck of 7th May 2016. – 6.1.1. Accident Reconstruction. – 6.1.2. The Causes of the Crash. – 6.1.3. Application Simulation of Directive 2024/2853 to This Incident. – 6.2. The Collision between a Vehicle Controlled by a Developmental Automated Driving System and a Pedestrian of 18th March 2018. – 6.2.1. Accident Reconstruction. – 6.2.2. The Causes of the Crash. – 6.2.3. Application Simulation of Directive 2024/2853 to This Incident. – 6.3. The Collision between a Sport Utility Vehicle Operating with Partial Driving Automation and a Crash Attenuator of 23rd March 2018. – 6.3.1. Accident Reconstruction. – 6.3.2. The Causes of the Crash. – 6.3.3. Application Simulation of Directive 2024/2853 to This Incident. – 6.4. More Recent Cases: Brief Simulations of Directive 2024/2853 Application to Two Accidents That Took Place in 2023. – 6.4.1. The Robotaxi Crash with a Fire Truck in San Francisco of 17th August 2023. – 6.4.2. The Accident between a Robotaxi and a Woman in San Francisco of 2nd October 2023. – 7. Final Remarks.*

ABSTRACT. Il 28 settembre 2022 la Commissione europea ha pubblicato due proposte di direttiva potenzialmente destinate ad incidere sulla disciplina dei veicoli a guida autonoma. La prima, relativa alla responsabilità per danno da prodotti difettosi, è stata definitivamente approvata e adottata nell'ottobre 2024 quale Direttiva (UE) 2024/2853. La seconda mirava invece ad armonizzare e adattare le norme sulla responsabilità extracontrattuale alle caratteristiche peculiari delle tecnologie di intelligenza artificiale, ma è stata ritirata dalla Commissione europea all'inizio del 2025. Entrambe le iniziative legislative avrebbero pertanto potuto avere un impatto significativo sui veicoli a guida autonoma, soprattutto se si considera che la ripartizione della responsabilità tra i soggetti coinvolti nella progettazione, produzione, commercializzazione, utilizzo e supervisione di tali veicoli rappresenta ancora oggi una delle principali criticità connesse a queste tecnologie. Si tratta di una questione che deve essere affrontata in modo efficace e in tempi relativamente brevi, affinché venga evitato il rischio di compromettere la futura



diffusione dei veicoli autonomi. Ciò è ancor più vero se si considera che una disciplina della responsabilità civile chiara ed efficace può contribuire ad accrescere la fiducia degli utenti nella tecnologia interessata e, più in generale, nel relativo mercato. Per tali ragioni, l'esame sia della Direttiva (UE) 2024/2853, sia della proposta di direttiva, successivamente ritirata, in materia di responsabilità extracontrattuale appare particolarmente attuale e rilevante nell'ambito degli approfondimenti giuridici concernenti le driverless cars, specie in considerazione della circostanza che – con riferimento a tale seconda iniziativa legislativa – interventi legislativi aventi natura analoga sono estremamente rari e che è ragionevole ritenere che eventuali future iniziative dell'Unione Europea volte a disciplinare la responsabilità civile nel settore dell'intelligenza artificiale saranno verosimilmente ispirate, almeno in parte, ai medesimi principi e alla medesima struttura normativa. Nella seconda parte del presente contributo si tenterà di simulare l'applicazione della Direttiva (UE) 2024/2853 ad incidenti che coinvolgono veicoli parzialmente o totalmente autonomi.

On 28th September 2022 the European Commission published two new Directive proposals potentially impacting autonomous vehicles. The first one, concerning the liability for defective products, was formally approved and adopted in October 2024 as Directive (EU) 2024/2853. The second one had the goal to harmonize and adapt non-contractual civil liability rules to the specific features of such technologies, but was withdrawn at the beginning of 2025 by the European Commission. Both proposed sources of law could therefore have had a great impact on driverless cars, especially if we consider how the division of liability among the subjects involved in driverless car production, trade, use and supervision is, as of today, one of the biggest issues related to such technologies. This is a problem that must be solved in an efficient manner and in a relatively short period of time lest the future deployment of autonomous vehicles be jeopardized. This is particularly true if we duly take into account how a proper liability regulation of a particular technology increases users' trust in the latter as well as in the relevant market. For these reasons, an examination of both Directive 2024/2853 and of withdrawn Directive proposal on non-contractual civil liability in relation to driverless vehicle technologies seems to be especially timely and important for legal analyses of autonomous cars, also considering, with specific regard to the latter, that comparable legislative initiatives are rare and that it is reasonable to assume that any future European initiatives aimed at regulating civil liability in the field of artificial intelligence will likely be based, at least in part, on similar principles and structures. In the second part of this article an attempt is made to simulate the application of Directive 2024/2853 to accidents involving partially or fully automated vehicles.

1. Introduction: Searching for the Legal Regime of Autonomous Vehicles.

A future full of driverless cars is much closer than one might think. In fact, technology and scientific research are advancing expeditiously, supported also by a great deal of interest from industry, which sees this new form of transport as a revolutionary business opportunity¹.

As the legal literature has been highlighting for some years now, the legal issues related to autonomous vehicles are many and varied, not least in relation to liability for damage caused by such technologies.

Consequently, it is necessary to (quickly) provide a clear legal scenario that foresees who is liable for damage caused by an autonomous vehicle².

On 28th September 2022, the European Commission published the following two Directive proposals: the Directive on liability for defective products³ and the Directive on adapting non-contractual civil liability rules to artificial intelligence (so called AI Liability Directive)⁴.

¹ Several studies have attempted to forecast the timeframe for the introduction and widespread diffusion of fully autonomous vehicles (*i.e.*, vehicles capable of operating without any need for human intervention), however, as of today, no definitive dates can be established. This uncertainty is mainly due to a number of different factors that must be carefully considered: outstanding scientific and technological challenges, the necessity to ensure coexistence with conventional vehicles, still unresolved legal, regulatory, but also ethical issues, cultural peculiarities, as well as the still ongoing definition of universally accepted safety standards. Particularly, these latter two aspects may lead to considerable disparities in the timing and modalities of the introduction of driverless vehicles across different jurisdictions. For instance, in the United States – as will also be observed later in this article – autonomous taxis operating without a human driver are already in use, whereas their commercial deployment is currently not permitted within the European Union.

Research in this field is vast and growing, and the forecasts on the timeline for mass adoption of autonomous vehicles often vary considerably from one study to another. Some examples of such analyses are, *e.g.*, reported below: according to D. MILAKIS/M. SNELDER/B. VAN AREM/B. VAN WEE/G. HOMEM DE ALMEIDA CORREIA, *Development and transport implications of automated vehicles in the Netherlands: Scenarios for 2030 and 2050*, in *European Journal of Transport and Infrastructure Research*, 2017, vol. 17, no. 1, 63-85, fully automated vehicles should be commercially available between 2025 and 2045, instead according to C.-Y. CHAN., *Advancements, prospects, and impacts of automated driving systems*, in *International Journal of Transportation Science and Technology*, 2017, vol. 6, 208-216, the current decade shall be characterized by very meaningful developments in automated driving system technology. Interesting is also the analysis on the perspectives of the future development of SAE Level 4 automation public on the SAE International website: B. VISNIC, *Hopeful but closer scrutiny for SAE Level 4 automation*, 25.10.2022, < <https://www.sae.org/news/2022/10/the-autonomous-level-4-horizon> > (27.11.2024). See also K. WEIGL/D. EISELE/ A. RIENER, *Estimated years until the acceptance and adoption of automated vehicles and the willingness to pay for them in Germany: Focus on age and gender*, in *International Journal of Transportation Science and Technology*, 2022, vol. 11, no. 2, 216-228.

² Correctly, S. BORGES, *Liability for Autonomous Systems*, in G. BORGES/ C. SORGE (eds.), *Law and Technology in a Global Digital Society*, Cham-Switzerland, 2022, 52, points out that this subject is “due to its immense practical relevance, justifiably at the centre of current legal discussion.”.

³ COM (2022) 495.

⁴ COM (2022) 496.



As this brief article will show in more detail, these two Directive proposals reflected the desire of the European legislator to support the spread of new technologies equipped with artificial intelligence systems (AI systems) through the enactment of rules aimed at regulating the various aspects of their use, related liability, and other legal aspects linked to these new tools.

Nevertheless, since the time of their issuing, the two Directive proposals have experienced different fates: the Directive proposal concerning the liability for defective products has been formally approved and adopted in October 2024 as Directive (EU) 2024/2853⁵, whereas the Directive proposal on adapting non-contractual civil liability rules to artificial intelligence was withdrawn by the European Commission at the beginning of 2025.

By means of Directive (EU) 2024/2853, Directive 85/374/EEC⁶ has been repealed⁷. Such replacement is made necessary by the fact that, since the adoption of the 1985 Directive, there have been significant changes in the way products are produced, distributed and operated.

Particularly, the 1985 Directive was inspired and related to products and technologies of the 1970s and 1980s. Moreover, when the 1985 Directive was adopted, the manufacturer-product relationship was significantly different than that between the producer of an autonomous vehicle – and of any product equipped with an AI system – and this technology⁸.

With the spread of AI systems, the type of control that the manufacturer can have over the use of the “smart” product has changed, there is new potential for external elements to influence it and, in addition, new parties are involved, such as software developers and operators⁹.

Manufacturers may probably have the control on the products not only when they put them on the market, but also later when they have already been used by the customers, thus creating a new user-product-producer relationship¹⁰. On the other hand, the product may now “behave” in a way that the manufacturer could not foresee.

Furthermore, subjects involved are not only the manufacturer and the user anymore, but also operators who shall control the general vehicle use¹¹. Moreover, there may also be public authorities and private bodies who manage the infrastructure and the data exchange between the latter and the sin-

⁵ dir. 2024/2853/EU of the European Parliament and of the Council of 23 October 2024 on liability for defective products and repealing Council Directive 85/374/EEC, published on 18th November 2024 (OJ L, 2024/2853, 18.11.2024) and that according to its art. 22 shall transposed by the Member States within 9th December 2026.

⁶ Council Directive 85/374/EEC of 25 July 1985 on the approximation of the laws, regulations and administrative provisions of the Member States concerning liability for defective products, OJ L 210, 7.8.1985, 29-33. In some documents also referred to as “PLD”.

⁷ art. 21, dir. 2024/2853/EU.

⁸ See more in detail in the following sections.

⁹ S. LI/M. FAURE/K. HAVU, *Liability Rules for AI-Related Harm: Law and Economics Lessons for a European Approach*, in *European Journal of Risk Regulation*, 2022, vol. 13, no. 4, 618.

¹⁰ L. MACHNIKOWSKI, *Producers’ Liability in the EC Expert Group Repot on Liability for AI*, in *Journal of European Tort Law*, 2020, vol. 11, no. 2, 139-140.

¹¹ S. BORGES, *op. cit.*, 54.

gle car¹². This leads to the emergence of more complex and intersecting relationships. Distributing proportionate liability between the different parties involved in designing and manufacturing driverless cars' physical and digital elements as well as in controlling the relevant services and infrastructures will be a particularly hard task¹³. Therefore, there is the need to modernise the rules concerning the manufacturers' liability for defective products.

The Artificial Intelligence (AI) Liability Directive proposal was instead based on the assumption that products and technologies need to be provided with a specific discipline on liability and that it is necessary to harmonise as quickly and comprehensively as possible national AI liability norms.

By means of these two Directives the European Commission aimed to: (i) modernise liability rules for circular economy business models by creating clear and fair liability rules; (ii) modernise liability rules for products in the digital age; (iii) create a more level playing field between EU and non-EU manufacturers and (iv) grant that consumers stay on an equal footing with manufacturers¹⁴.

More in general, the Commission adopted the abovementioned proposals aiming to adapt liability rules to the digital age, circular economy and the impact of global value chains. At the same time, it is clear that in order to reach those goals and to support the spread of AI technologies it is necessary to grant to those who were damaged by the same technologies an easy and sure access to redress¹⁵.

This article will be structured as follows. After this introduction, section 2 will have as its object an analysis of the relationship between technology development – and particularly automotive development – and liability regulations, aiming at understanding how the latter may influence scientific progress and if a certain product will or will not succeed on the market and in society. After that, an investigation on the *status quo* takes place. The purpose is to understand if current norms are already suitable for autonomous vehicles and to examine the reasons why a regulatory update may or may not be necessary.

Sections 3 and 4 represent this article's heart and focus on the analysis of the content, respectively of the Directive (EU) 2024/2853 on liability for defective products and of the withdrawn Directive proposal on AI liability.

Subsequently there will be a description of the possible influence of the two regulations (the adopted one and the withdrawn one) on autonomous

¹² A. F. SCALES, *Not So Fast: A Brief Plea for Muddling Through the Problems of Autonomous Vehicle Liability*, in *J. Tort Law*, 2020, vol. 13, no. 2, 192. See also J.-A. PATTINSON/H. CHEN/S. BASU, *Legal issues in automated vehicles: critically considering the potential role of consent and interactive digital interfaces*, in *Humanit. Soc. Sci. Commun.*, 2020, vol. 7., no. 153, 2.

¹³ K. NOUSSIA, *Autonomous Vehicles: Legal Considerations and Dilemmas*, in P. MARANO e K. NOUSSIA (eds.), *InsurTech: A Legal and Regulatory View*, Cham-Switzerland, 2020, 256.

¹⁴ European Commission press release “New liability rules on products and AI to protect consumers and foster innovation”, 28th September 2022, available at the following link: <https://ec.europa.eu/commission/presscorner/detail/en/ip_22_5807> (20.01.2023).

¹⁵ See the European Commission press release, *op. ult. cit.*



vehicles deployment as well as a consideration of the other possible legal developments in this field (section 5).

As will be stated more specifically later, the decision to offer an analysis also of the withdrawn Directive proposal on non-contractual civil liability is due to the following consideration: first of all it seems that legislative initiatives are rare and therefore in any case the Directive proposal represents an important source for legal reflection; secondly, it is reasonable to assume that any future European initiatives aimed at regulating civil liability in the field of artificial intelligence will likely be based, at least in part, on similar principles and structures.

In section 6, the application of Directive (EU) 2024/2853 will be hypothesised in relation to accidents involving partially autonomous vehicles that actually occurred in the United States. Section 7 proposes some final remarks.

The central thesis of this article is that the legal regulation of civil liability is not merely a mechanism for allocating the economic consequences of accidents, but one of the decisive factors influencing the development, public acceptance and market deployment of autonomous vehicles. In other words, liability rules should not be regarded solely as *ex post* instruments of compensation, but also as *ex ante* regulatory tools capable of shaping technological innovation, consumer confidence and industrial investment. From this perspective, Directive (EU) 2024/2853 should represent an important step towards the modernization of European product liability law and contribute to creating a more favorable legal environment also for autonomous driving technologies. Nevertheless, this article argues that the Directive alone cannot provide a complete and coherent legal framework for autonomous vehicles. The withdrawal of the proposed AI Liability Directive, together with the risk of divergent national implementations and the emergence of fragmented domestic regulations, leaves significant legal uncertainty. For these reasons, it is submitted that, once autonomous vehicles reach sufficient technological maturity, the European Union should move beyond the current legislative framework and adopt a dedicated and directly applicable regulation specifically governing autonomous driving technologies. Such an instrument would not only enhance legal certainty and ensure a more consistent allocation of liability across Member States, but would also strengthen public trust, stimulate investment and research, and ultimately facilitate the safe and effective deployment of autonomous vehicles throughout the European Union.

What this article will not cover, instead, is the possible division of liability between manufacturer and user (or owner) of an autonomous vehicle in case of damage to third parties, *i.e.* what the consequences in terms of damage compensation for an accident involving a driverless car are. In this case specifically the question is how the current discipline, that provides for a strict liability of the owner and will regulate the user's responsibility, will be applied.

The widespread inquiry among legal scholars is in particular whether a liability of the user of the vehicle will still remain in the case he or she did

not regain control of the vehicle or in any case could have avoided a specific accident.

This legal problem is certainly one of the greatest challenges for the legislator, but it is a topic that will be only partially examined in this article with reference to those aspects that are relevant to the main issue under investigation here.

2. The Indissoluble Relationship between Liability Rules and Technology Development.

The two Directive proposals and their explanatory memorandums proved that the Commission is perfectly aware of the central importance of a clear and specific liability regulation for the AI technologies, and therefore also for autonomous vehicles, to be successful.

More in detail, users need to be previously informed about their possibilities to be compensated if they suffer certain damage because of a product, otherwise such a product will have very poor possibilities to succeed on the market.

This is particularly true for AI technologies and driverless cars in light of the fact that the machine-human relationship is drastically changing and the decision-making power of the user is exponentially reduced. For AI technologies to be successful, people have to trust them¹⁶.

By way of example, we can find a confirmation of this idea in a survey conducted by the European Commission in 2020 and according to which liability for damage is one of the most relevant obstacles for companies interested in AI technologies that have not adopted them yet¹⁷.

The process to achieve this trust is much more complex than it may seem, but the European legislator has certainly taken some steps in the right direction with the regulatory measures under comment here.

Studying the various normative and analytical texts proposed by the European institutions, one perceives the existence of a chain of logically connected and mutually dependent concepts: to make a certain technology or

¹⁶ This idea has been expressly confirmed also by the European Commission in the person of Vice-President for Values and Transparency, Mrs. Věra Jourová, according to which: “We want the AI technologies to thrive in the EU. For this to happen, people need to trust digital innovations. With today’s proposal on AI civil liability we give customers tools for remedies in case of damage caused by AI so that they have the same level of protection as with traditional technologies and we ensure legal certainty for our internal market.” European Commission press release, *op. cit.*

See also J. STILGOE, *Can driverless vehicles prove themselves safe?*, in *Issues in Science and Technology*, 2020, vol. 37, no. 1, 12-14. The same Author, together with D.H. GUSTON, carries out a valuable exploration of the relationship between public engagement, scientific innovation and regulation in Responsible Research and Innovation, in U. FELT/ R. FOUCHÉ/ C.A. MILLER/ L. SMITH-DOERR (eds.), *The Handbook of Science and Technology Studies*, IV ed., The MIT Press, Cambridge-USA, 2016, 868-896.

¹⁷ European Commission, Directorate-General for Communications Networks, Content and Technology, *European enterprise survey on the use of technologies based on artificial intelligence: final report*, Publications Office, 2020, <<https://data.europa.eu/doi/10.2759/759368>> (23.01.2023), 58-60.

product successful, it is essential to ensure its potential users have confidence in it; to ensure that they have confidence in it, it is essential to give them the guarantee of the existence of clear rules on its manufacturing and use, and reliable means of compensation in the event of damage. No one will use a self-driving car if he or she believes they may not be compensated in the event of an accident due to a technological malfunctioning.

The importance of a European regulation with a clear and comprehensive structure in this field has also important economic and competitive implications. In fact, it is crucial to create a functioning legal ecosystem so as to incentivise the deployment of self-driving vehicles in Europe and thus the related scientific research and European companies active in this field.

This is even more true at a time like the present when a key competitor such as the United States does not have a definitive and unified legal framework; on the contrary, in the U.S. there is currently an overlapping system of state and federal regulations¹⁸ which may stand in the way of the evolution of these technologies.

Another aspect that needs to be taken into consideration when analysing civil liability lies in the question of the actual applicability to AI systems of the current liability rules.

Simplifying the principles behind the current legislation as much as possible, if a machine, due to malfunctioning, injures the user or a third party, liability falls on the person who manufactured it, unless specific exceptions apply¹⁹.

Such principles cannot be simply applied to artificial intelligence systems as well. On the contrary, it should be considered how such principles should be adapted to the characteristics of the abovementioned systems that can “behave” also independently and differently from the instructions initially provided²⁰.

In fact, AI algorithms may have a certain degree of autonomy from their initial programming and can improve or in any case change their functioning through the data they collect and process²¹. In this way AI systems,

¹⁸ M.L. KUBICA, *Autonomous Vehicles and Liability Law*, in *Am. J. Comp. Law*, 2022, vol. 70, no. supplement 1, 43-47; BURD J.T.J., *Regulatory Sandboxes for Safety Assurance of Autonomous Vehicles*, in *U. Pa. J. L. & Pub. Affairs*, 2021, vol. 7, no. 1, 196.

¹⁹ See also A. BERTOLINI e M. RICCABONI, *Grounding the case for a European approach to the regulation of automated driving: the technology-selection effect of liability rules*, in *European Journal of Law and Economics*, 2021, vol. 51, 249-250.

²⁰ E. MARCHISIO, *In support of “no-fault” civil liability rules for artificial intelligence*, in *SN Soc Sci*, 2021, vol. 1, no. 54, 2.

²¹ See, among others, the *Artificial Intelligence definition provided by the Independent High-Level Expert Group on Artificial Intelligence set up by the European Commission*, in *A Definition of AI: Main Capabilities and Disciplines*, 8 April 2019, 6: “Artificial intelligence (AI) systems are software (and possibly also hardware) systems designed by humans that, given a complex goal, act in the physical or digital dimension by perceiving their environment through data acquisition, interpreting the collected structured or unstructured data, reasoning on the knowledge, or processing the information, derived from this data and deciding the best action(s) to take to achieve the given goal. AI systems can either use symbolic rules or learn a numeric model, and they can also adapt their behaviour by analysing how the environment is affected by their previous actions. As a scientific discipline, AI includes several approaches and techniques, such as machine learning (of which deep learning and reinforcement learning are specific examples), machine reasoning (which includes

thanks to their high degree of autonomy, may also learn, adjust and take decisions they were initially not expressly programmed for²². This can result in constant improvement of the technology itself, but also – at least potentially – in errors that can cause material and non-material harm²³ and that could not have been foreseen when the product was placed on the market.

Based on the above, it should be assessed whether an increase of producer responsibility also increases investments in safer products and services that use AI systems²⁴.

Such question has no easy answers. In fact, this may not be the case since it is possible that the use of the traditional civil liability paradigm may not cause safety and quality improvements, but only less tendency to invest and develop these technologies²⁵.

Current civil liability rules assume that the producer can or could have used normal diligence foreseeing the harmful event. Such prediction by the producer may instead not be possible with AI systems which may develop unpredictable and different actions from the initial settings.

Consequently, the risk is that the application of the abovementioned rules to this kind of new technologies may “expose producers and programmers to unpredictable and potentially unlimited claims for civil liability, with no possibility of reducing the risks by increasing investments in safety”²⁶, resulting in a disincentive to investment and thus to research and development in this field and consequently the loss of all its benefits for the community.

At the same time, there are practical difficulties in identifying a responsible subject with respect to certain damage due to the simultaneous presence of numerous (and autonomous) parties in the procedures that bring an AI system to the market. Moreover, there is the circumstance – as mentioned above – that the process that brings an AI system to make a certain decision may be (at least partially) unpredictable at the time of its initial settings and opaque at the time of an *ex-post* control.

Based on the above, we can agree that risk allocation for autonomous vehicles and other AI systems represents a particularly difficult challenge²⁷.

Another possible problem is represented by the current absence of a uniform definition of Artificial Intelligence²⁸, which at the moment can take a

planning, scheduling, knowledge representation and reasoning, search, and optimization), and robotics (which includes control, perception, sensors and actuators, as well as the integration of all other techniques into cyber-physical systems).”

See also J. BURRELL, *How the machine “thinks”: Understanding opacity in machine learning algorithms*, in *Big Data & Society*, 2016, vol. 3, no. 1, 5.

²² E. MARCHISIO, *op. cit.*, 6-8; S. LI/M. FAURE/K. HAVU, *op. cit.*, 619; NOUSSIA K., *op. cit.*, 256.

²³ S. LI/M. FAURE/K. HAVU, *op. cit.*, 619.

²⁴ See, e.g., M. WANSLEY, *The End of Accidents*, in *UC Davis Law Review*, 2021, vol. 55, issue 1, 272, according to which “liability rules will influence how much AV companies invest in developing safer technology”.

²⁵ E. MARCHISIO, *op. cit.*, 5-8.

²⁶ E. MARCHISIO *op. cit.*, 9.

²⁷ S. LI/M. FAURE/K. HAVU, *op. cit.*, 620.

²⁸ A first attempt at this was made by the European Union by means of the Reg. EU 2024/1689 of the European Parliament and of the Council of 13th June 2024 laying down harmonised rules on artificial intelligence and amending Regulations EC 300/2008, EU

growing variety of forms²⁹, thus makes it even harder to create an adequate legal framework. Liability regulation has indeed to take into account such variety and the legislator has the difficult task of providing regulations both generally applicable in a uniform way and simultaneously able to provide for different applications on a case-by-case approach.

Finally, I agree with that scholarship³⁰ that has correctly observed how the definition – already very complex – according to which rules that balance the different interests at stake (such as consumer safety on the one hand, avoiding investment disincentivizing on the other) have to also consider elements outside the strictly legal world.

In determining the actual effectiveness of certain legal provisions, it is necessary to consider, much more today than in the past, the competitive relationship that may exist with other markets and legal orders.

Consequently, while no economic choice can justify compromising the safety of users, legislators cannot disregard the need to protect businesses and the relevant market under their jurisdiction.

Accordingly, the rules governing the liability of AI system manufacturers and programmers will also have to take into account the need to prevent the creation of a competitive disadvantage in favour of other jurisdictions more responsive to companies' and developers' needs.

2.1. Focus on Self-Driving Vehicles: How the Regulation of Liability May Affect Their Deployment.

The obstacles to the deployment of self-driving vehicles can be far more numerous on the legal, social and ethical levels³¹ than on the scientific and technical ones.

Such difficulties have already been studied by several scholars from various points of view³². The result is that, as of today, an important part of the population unwilling to use an autonomous vehicle, essentially due to fear³³.

167/2013, EU 168/2013, EU 2018/858, EU 2018/1139 and EU 2019/2144 and Directives 2014/90/EU, 2016/797/EU and 2020/1828/EU (Artificial Intelligence Act), of 12th July 2024 (OJ L, 2024/1689, 12.7.2024) and that shall apply from 2nd August 2026. In this Regulation is it foreseen at art. 3, nr. 1, that an "AI system" "means a machine-based system that is designed to operate with varying levels of autonomy and that may exhibit adaptive-ness after deployment, and that, for explicit or implicit objectives, infers from the input it receives, how to generate outputs such as predictions, content, recommendations, or decisions that can influence physical or virtual environments".

²⁹ J. LEE, *Artificial Intelligence and International Law*, Singapore, 2022, 7.

³⁰ E. MARCHISIO, *op. cit.*, 9.

³¹ See, e.g., the analysis carried out by B. LUNDGREN, in *Safety requirements vs. crashing ethically: what matters most for policies on autonomous vehicles*, in *AI & Society*, 2021, vol. 36, 405-415, and by J. LEE, *op. cit.*, 63-72. See also K. NOUSSIA, *op. cit.*, 260; S. LANDINI, *Ethical Issues, Cybersecurity and Automated Vehicles*, in P. MARANO/K. NOUSSIA (eds.), *InsurTech: A Legal and Regulatory View*, Cham-Switzerland, 2020, 301-305.

³² T. GILL, *Blame It on the Self-Driving Car: How Autonomous Vehicles Can Alter Consumer Morality*, in *Journal of Consumer Research*, 2020, vol. 47, issue 2, 272 and 286; A. SHARIFF/ J.-F. BONNEFON/I. RAHWAN, *Psychological roadblocks to the adoption of self-driving vehicles*, in *Nature Human Behaviour*, 2017, vol. 1, 694.

From a first, cursory reading this reluctance to adopt the abovementioned technologies may sound inconsistent. In fact, from a statistical point of view the number of accidents caused by a malfunction of artificial intelligence systems will probably be very low and for sure much lower than those caused by human mistakes³⁴.

However, we have to observe this phenomenon considering not only the scientific and statistical data, but also emotional and psychological issues, which have a great influence on customers' decisions.

This is especially true if we consider the risks naturally connected with driving and the fact that with autonomous cars the user accepts to grant – at least theoretically – a “heavy robot travelling at speed in an uncertain, uncontrolled environment”³⁵ the power to decide on his or her life or his or her loved ones’.

A preliminary clarification is warranted in this context: the concerns addressed in these pages do not primarily pertain to partially autonomous vehicles³⁶ – which are already in operation and can, at any moment, be brought back under human control – but rather to fully autonomous vehicles. It is with respect to the latter that the “reluctance to use” discussed herein is expected to be markedly more pronounced.

Driverless vehicles probably represent the first case of a mass-distributed technology that will require a transfer of decisional power from a human driver to an autonomous agent and this causes anxiety and fear³⁷ that need to be overcome in order to support the deployment of the technology itself. As pointed out, “autonomous vehicles are a disruptive technology that have the potential to change what is now our conventional understandings of a product, mobility, ownership and security. In other words, rollout and mass

³³ A. SHARIFF/ J.-F. BONNEFON /I. RAHWAN, *op. cit.*, 694, point out that “the biggest road-blocks standing in the path of mass adoption may be psychological not technological”.

³⁴ See *infra*. M. WANSLEY, *op. cit.*, 271-272 and 279; K. NOUSSIA, *op. cit.*, 253; S. LANDINI, *op. cit.*, 300-301.

³⁵ J. STILGOE, *How can we know a self-driving car is safe?*, in *Ethics and Information Technology*, 2021, vol. 23, 640; ID., *Can driverless vehicles prove themselves safe?*, *op. cit.*, 12.

³⁶ It is recalled that partially autonomous vehicles have already been on the market for a number of years and that they assist the driver (not substitute him or her) allowing longitudinal and lateral control. With regard to partially autonomous vehicles spread, users' attitude towards them and their influence on human behaviour there have already been multiple studies, see, among them, R. LIN/L. MA/W. ZHANG, *An interview study exploring Tesla drivers' behavioural adaptation*, in *Applied Ergonomics*, 2018, vol. 72, 37-47; T. VOGELPOHL/M. KÜHN/T. HUMMEL/M. VOLLRATH, *Asleep at the automated wheel – Sleepiness and fatigue during highly automated driving*, in *Accident Analysis & Prevention*, 2019, vol. 126, 70-84; N. DU/X.J. YANG /F. ZHOU, *Psychophysiological responses to takeover requests in conditionally automated driving*, in *Accident Analysis & Prevention*, 2020, vol. 148; S. YANG/J. KUO/M.G. LENNÉ, *Effects of Distraction in On-Road Level 2 Automated Driving: Impacts on Glance Behavior and Takeover Performance*, in *Human Factors*, 2021, vol. 63, no. 8, 1485-1497; S. NORDHOFF/J.D. LEE/C.C. CALVERT/ S. BERGE/M. HAGENZIEKER/R. HAPPEE, *(Mis-)use of standard Autopilot and Full Self-Driving (FSD) Beta: Results from interviews with users of Tesla's FSD Beta*, in *Frontiers in Psychology*, 2023, vol. 14, and J. STILGOE, *Self-driving cars will take a while to get right*, in *Nature Machine Intelligence*, 2019, vol. 1, no. 5, 202-203.

³⁷ T. GILL, *op. cit.*, 286.



adoption of autonomous vehicles are not another upgrade or improvement of the traditional product of the automotive industry, a vehicle, but rather a qualitatively new product”³⁸.

For this reason, it is necessary people trust vehicles equipped with AI systems and therefore capable of taking decision on their own, being trust crucial for the adoption of automated driving technologies. In other words: “[a]chieving the bright future promised by autonomous vehicles will require overcoming the psychological barriers to trust”³⁹.

Building trust in new technologies is not an easy and quick task: it is first of all necessary to understand which are the requirements to reassure people on the technology’s safety and how it can be granted, proved and improved, considering also that sooner or later autonomous vehicles will have to be brought to the market, and the more they spread, the more data will be available making it possible to detect the vehicles’ defects so that they can be solved to increase vehicle safety.

In fact, even if rigorous pre-market testing rules certainly have to be issued⁴⁰, with the initiation of driverless cars’ use not all road risks will be immediately eliminated⁴¹, Companies and vehicle developers have and will have to select a hierarchical scale of risks that they want to avoid or at least reduce⁴² but safety in the use of autonomous vehicles will only increase as their use grows.

Consequently, while it cannot be assumed that a riskless technology will be offered on the market, at the same time for said technology (and its benefits) to be successful it is necessary both that these risks be minimized and that the relevant users be induced to trust it. This second element represents a particularly insidious obstacle if we take into account that in the first phase of driverless car use it will be hard to know how safe autonomous vehicles will effectively be because of the fact that people usually are less willing to accept risks from modes of transport they cannot control⁴³. Consider for ex-

³⁸ K. NOUSSIA, *op. cit.*, 258.

³⁹ A. SHARIFF/J.-F. BONNEFON/I. RAHWAN, *op. cit.*, 694. This “passage” is by no means simple; the survey and analysis conducted by K. WEIGL/D. EISELE /A. RIENER, *op. cit.*, 216-228, are interesting in this regard. In such article the authors observed that their “first statistical analyses revealed that Avs at SAE level L3 (conditional automation) are estimated to be accepted and adopted by people in Germany in about 10 years and Avs at SAE level L5 (full automation) in about 20 years”.

See also K. WEIGL/C. SCHARTMÜLLER/A. RIENER/M. STEINHAUSER, *Development of the Questionnaire on the Acceptance of Automated Driving (QAAD): Data-driven models for Level 3 and Level 5 automated driving*, in *Transportation Research Part F: Traffic Psychology and Behaviour*, 2021, vol. 83, 42-59; P. PENMETS/A. KOFI ADANU/D. WOOD/T. WANG/L.J. STEVEN, *Perceptions and expectations of autonomous vehicles – A snapshot of vulnerable road user opinion*, in *Technological Forecasting and Social Change*, 2019, vol. 143, 9-13, and P. PENMETS/A. SHEINIDASHTEGOL/A. MUSAEV/E. KOFI ADANU/M. HUDNALL, *Effects of the autonomous vehicle crashes on public perception of the technology*, in *IATSS Research*, 2021, vol. 45, no. 4, 485-492.

⁴⁰ J.T.J. BURD, *op. cit.*, 205.

⁴¹ K. NOUSSIA, *op. cit.*, 253.

⁴² J.T.J. BURD, *op. cit.*, 198.

⁴³ J. STILGOE, *op. cit.*, 636. This is a problem felt by scholars of all different legal systems, as also proved, *ex multis*, by S. PETTIGREW, in *Why public health should embrace the autonomous car*, in *Australian and New Zealand Journal of Public Health*, 2017, vol. 41, no.

ample – *mutatis mutandis* – the fear of flying: it is common in a significant proportion of the population even though statistics show that air travel is significantly less dangerous than car travel.

Moreover, trust should not only be referred to driverless cars, but to the whole system that governs them, being it necessary that users' trust "go beyond" the simple mechanic and electronic performance of the vehicle⁴⁴. Otherwise, the rollout and success of autonomous vehicles (and of their unquestionable benefits for safety, traffic management, facilitating mobility for individuals otherwise deprived of transportation means and the environment)⁴⁵ will be endangered, regardless of the AI system's quality and efficiency.

Only after gaining the public's trust in autonomous vehicles, will it be possible for the companies active in the field to optimize their features⁴⁶ and thus also make vehicles more affordable for consumers.

One of the key elements necessary to build trust is a clear liability regulation, the sole instrument, that, if well-structured, is able to ensure compensation⁴⁷. And if a subject knows that one will be compensated if one suffers harm because of a certain product, one will be more likely to feel comfortable using it (*e.g.*, the knowledge that there are solvent entities such as insurance companies that will indemnify the victims of vehicle damage fosters citizens to use them despite a statistically well-founded fear of a possible accident).

Moreover, driverless cars will not eliminate traffic accidents and the resulting personal injuries and property damage. Errors by such technologies have to be taken into account, considering that a technology as complex as driverless vehicles in all likelihood will never be zero-risk⁴⁸.

1, 5-7. In this article, at p. 5, the author states that: "The disruptive technological advances associated with the advent of Avs vehicles may be overshadowed by the enormous social changes that will accompany a transition to a world in which humans relinquish control of their vehicles to artificial intelligence."

⁴⁴ J. STILGOE, *op. cit.*, 645. With regard to the crucial importance of establishing trust see also N. ADNAN, *Exploring the future: A meta-analysis of autonomous vehicle adoption and its impact on urban life and the healthcare sector*, in *Transportation Research Interdisciplinary Perspectives*, 2024, vol. 26.

⁴⁵ N. ADNAN, *op. cit.*, 16, observes that: "Autonomous vehicles (Avs) represent a seismic shift in transportation that promises to reshape urban life, revolutionize mobility, and set new safety standards. Beyond mere transportation, their transformative potential extends to industries as diverse as healthcare and shipping services. These vehicles operate autonomously, free from direct human control, marking a pivotal milestone in the evolution of transportation." See also S. PETTIGREW, *op. cit.*, 5-7 and C.-Y. CHAN, *op. cit.*, 208-216.

⁴⁶ J.T.J. BURD, *op. cit.*, 225.

⁴⁷ A. BERTOLINI/M. RICCABONI, *op. cit.*, 244 and 280.

⁴⁸ J.T.J. BURD, *op. cit.*, 199; J. LEE, *op. cit.*, 39; W. BIEVER/L. ANGELL/S. SEAMAN, *Automated Driving System Collisions: Early Lessons*, in *Human Factors*, 2020, vol. 62, no. 2, 249-259.

Accidents involving partially or fully autonomous vehicles have indeed occurred, particularly in areas where such technologies are more widely deployed, such as the United States of America. A short selection of these incidents will be examined in greater detail in the final section of this article.



This is particularly true if we observe that autonomous driving systems will physiologically need some years to be improved, during which some accidents due to the systems' failures will take place.

Furthermore, the higher the level of technology (and thus when autonomous driving systems are left more room and human intervention less), the greater the consequences of any errors by the driving system itself. Therefore, the need for safety will increase as the automation level of driverless vehicles grows⁴⁹.

Autonomous vehicles' failures can theoretically affect many aspects of AI driving systems: there could, for instance, be perception and communication errors, as well as AI system decision and action errors which could cause damage to the vehicle's user or to other people⁵⁰.

Considering that it is practically impossible to introduce a perfect driving technology (neither the "classic" vehicles currently in use are so) to the market, it is important to guarantee people's safety and when this is not possible, to ensure their right to be compensated, by identifying the liable subjects and proving clear norms to claim the damage compensation.

As seen above, safety is a central element in contemporary society, especially in the context of using a tool that by its nature is at least potentially dangerous⁵¹. Guaranteeing safety is one of the key factors for autonomous vehicles development⁵² and in cases where safety cannot be ensured there must be certainty that there is liability of the subject who caused the damage.

If the goal of building users' confidence in autonomous driving technologies will not be achieved, it will be much more difficult to disseminate them and for community members to then enjoy all of their benefits in terms of first and foremost safety, but also, *inter alia*, pollution, better traffic management, spread of transport options for those unable to drive.

In light of the above, it is in fact undeniable that the possibility that the abovementioned driverless cars benefits and advantages be effective is "in-

⁴⁹ J. WANG/L. ZHANG/ Y. HUANG/J. ZHAO, *Safety of Autonomous Vehicles*, in *Journal of Advanced Transportation*, 2020, 3-4.

⁵⁰ J. WANG/ L. ZHANG/ Y. HUANG/ J. ZHAO *op. ult. cit.*, 4-6.

⁵¹ G. CALABRESI/E. AL MUREDEN, *Driverless cars*, Bologna, 2021, 29-31 and 56-74.

⁵² J. LEE/D. LEE/Y. PARK/ S. LEE/T. HA, *Autonomous vehicles can be shared, but a feeling of ownership is important: Examination of the influential factors for intention to use autonomous vehicles*, in *Transportation Research Part C: Emerging Technologies*, Vol. 107, 2019, 414, 419-420. See also S. SOHRABI/A. KHODADADI/S.M. MOUSAVI/B. DADASHOVA/D. LORD, *Quantifying the automated vehicle safety performance: A scoping review of the literature, evaluation of methods, and directions for future research*, in *Accident Analysis & Prevention*, 2021, Vol. 152.

Furthermore, see, *inter alia* also, the research conducted by M. KÖNIG/L. NEUMAYR, *Users' resistance towards radical innovations: The case of the self-driving car*, *Transportation Research Part F: Traffic Psychology and Behaviour*, Vol. 44, 2017, 42-52, where, at p. 51, they point out that: "First evidence derived from obtained results points to the conclusion that the hypothesized psychological barrier of car drivers towards self-driving cars does indeed exist. People were found to be reluctant to hand over control over their cars to technology, the most distinct objections stemming from safety concerns caused by the fear of potential attacks by hackers and system malfunction."

fluenced by the speed and efficiency of regulatory action to aid the technology adoption process”⁵³.

2.2. The Need for an Update: Why Will the Current Liability Rules Not Be Adequate for Accidents Caused by Autonomous Vehicles?

| 629

Notwithstanding the above, arguably both national and European legislations regulating liability for damage and in detail for those caused by products already exists. The European legislator could therefore be presented with the argument that both self-driving vehicles and other AI systems do not entail the need for new *ad hoc* rules, but merely the interpretation of existing rules.

However, such an approach would not give due consideration to the inherent characteristics of AI systems, which instead require a rethinking of liability for damage and related compensation procedures.

Such need has been clearly explained and motivated, *inter alia*, by the European Parliament in its Resolution of 3rd May 2022⁵⁴. Particularly, point 143 clearly states that the European Parliament recognises “the legal challenges caused by AI systems, and that there is a need to consider a revision of specific parts of the existing liability rules; looks forward, in this regard, to the presentation of the Commission’s legislative proposal on AI liability; stresses that the Product Liability Directive and the national fault-based liability regimes can, in principle, remain the centrepiece legislation for countering most harm caused by AI; underlines that in some cases there could be inappropriate outcomes, but warns that any revision should take the existing product safety legislation into account and should be based on clearly identified gaps, while being future-proof and capable of being effectively implemented and of ensuring the protection of individuals in the EU”⁵⁵.

Similarly, point 146 highlights that “due to the characteristics of AI systems, such as their complexity, connectivity, opacity, vulnerability, capacity of being modified through updates, capacity for self-learning and potential autonomy, as well as the multitude of actors involved in their development, deployment and use, there are significant challenges to the effectiveness of Union and national liability framework provisions” and therefore the Parliament considers that “although there is no need for a complete revision of well-functioning liability regimes, specific and coordinated adjustments to European and national liability regimes are necessary to avoid a situation in which persons who suffer harm or whose property is damaged end up without compensation”. Consequently, on that occasion, the European Parliament had already proposed that “while high-risk AI systems should fall under strict liability laws, combined with mandatory insurance cover, any other activities, devices or processes driven by AI systems that cause harm or damage should remain subject to fault-based liability” and that “the affected

⁵³ J.T.J. BURD, *op. cit.*, 225.

⁵⁴ European Parliament Resolution of 3 May 2022 on artificial intelligence in a digital age - 2020/2266 (INI).

⁵⁵ European Parliament Resolution of 3 May 2022, *op. ult. cit.*, point 143.



person should nevertheless benefit from a presumption of fault on the part of the operator, unless the latter is able to prove that it has abided by its duty of care”⁵⁶.

Regulating compensation for damages stemming from the use of autonomous vehicles is probably the most complex and disputable legal problem currently in need of a solution. Either way, a decision must be made, and this, unfortunately, at a stage when technological development has not yet been completed and not all the characteristics of driverless cars can be contemplated.

The limits of the responsibility of the parties involved must be immediately clarified: users, manufacturers and the other abovementioned subjects. Otherwise, as has been noted, there remains a degree of “[u]ncertainty on the apportionment of liability among such parties would provide negative incentives to the adoption of CADs⁵⁷ with increasing levels of automation, delaying their diffusion, and further extending the time technology needs to penetrate the market, ultimately leading to a vicious cycle that could radically prevent the substitution of traditional vehicles”⁵⁸.

The specific characteristics of technologies equipped with artificial intelligence, and in particular their capacity for autonomous adaptation and modification of their own programming, suggest the need for a new approach to the law of damage compensation. Traditional liability frameworks – which were developed in contexts where the typical case involved two human beings, namely the injurer and the victim – appear increasingly possibly inadequate when applied to scenarios involving driverless vehicles or other AI technologies. In such cases, the causal chain leading to harm may not directly involve the deliberate actions or negligence of a human actor but rather the autonomous decision-making processes of an artificial system. This evolution challenges the anthropocentric assumptions underlying classical tort law and calls for a reconceptualization of liability principles to accommodate also self-learning and self-modifying technologies⁵⁹.

3. The Content and Structure of Directive (EU) 2024/2853 on Liability for Defective Products.

As previously mentioned, Directive (EU) no. 2024/2853 on liability for defective products and repealing Council Directive 85/374/ECC was drafted based on the consideration that since the adoption of the Product Liability

⁵⁶ European Parliament Resolution of 3 May 2022, *op. cit.*, point 146. See also L. MACHNIKOWSKI, *Producers’ Liability in the EC Expert Group Report on Liability for AI*, *op. cit.*, 138. The author also points out the significant role of the detachment of the AI system from the tangible medium, which may cause further difficulties in ascertaining the cause of a product defect.

⁵⁷ Connected and automated driving solutions.

⁵⁸ A. BERTOLINI/M. RICCABONI, *op. cit.*, 251.

⁵⁹ See the detailed analysis offered in this regard by A. GUERRA/F. PARISI/D. PI, in *Liability for robots I: legal challenges*, in *Journal of Institutional Economics*, 2022, vol. 18 no. 3, 331-343, and ID., *Liability for robots II: an economic analysis*, in *Journal of Institutional Economics*, 2022, vol. 18 no. 4, 553-568.

Directive of 1985, “there have been significant changes in the way products are produced, distributed and operated, including the modernisation of product safety and market surveillance rules. The green and digital transitions are underway and bring enormous benefits for Europe’s society and economy, be it by extending the life of materials and products, *e.g.* through remanufacturing, or by increasing productivity and convenience thanks to smart products and artificial intelligence”⁶⁰.

Particularly, the shortcomings of this law source, which by its very nature must necessarily reflect technological processes, are significant. Specifically, on the basis of the findings of the evaluation of the Product Liability Directive carried out in 2018 and mentioned in the explanatory memorandum of the Directive proposal⁶¹, these are the main weaknesses of the 1985 Directive: (a) some concepts and definitions are outdated, (b) the risk of an excessively heavy burden of proof for persons who believe they have been harmed by a product and (c) the excessive limitation of the possibility of making compensation claims⁶².

Consequently, with this new Directive the European legislator has deemed it appropriate to repeal the 1985 Directive and replace it with a new source of law that accounts for the enormous technological progress that has been made over the last – almost – forty years.

One of the main reasons for this change is for sure the emergence and expected spread of artificial intelligence, thanks to which products (including self-driving vehicles) with completely new characteristics will be placed on the market.

The Directive, since its proposal, assumes that “AI systems and AI-enabled goods are ‘products’ and therefore fall within the PLD’s scope, meaning that compensation is available when defective AI causes damage, without the injured person having to prove the manufacturer’s fault, just like for any other product”⁶³.

This is a fundamental aspect as, on the one hand, it determines with certainty the legal “status” of self-driving vehicles as products and, on the other hand, defines what we might call an objective liability for the manufacturer.

The other central points of the Directive, clearly stated in the explanatory memorandum of its proposal, are the following: (a) the possibility that also software providers and providers of digital services can be held liable; (b) possible manufacturers’ liability for changes they make to products they have already placed on the market, including when these changes are triggered by software updates or machine learning; (c) a significant alleviation of the burden of proof in complex cases for the damaged party.

⁶⁰ Explanatory memorandum’s first chapter “Context of the Proposal – Reasons for and objectives of the proposal” of the Directive on liability for defective Products, COM (2022) 495, 1.

⁶¹ Commission Staff Working Document, Evaluation of Council Directive 85/374/EEC of 25 July 1985 on the approximation of the laws, regulations and administrative provisions of the Member States concerning liability for defective products, SWD (2018) 157.

⁶² Explanatory memorandum, *op. cit.*, 1.

⁶³ Explanatory memorandum, *op. cit.*, 5.



In this way, the right to an effective remedy in accordance with art. 47 (“Right to an effective remedy and to a fair trial”)⁶⁴ of the Charter of Fundamental Rights of the European Union should be strengthened⁶⁵.

The Directive on liability for defective products is divided in four chapters: general provisions, specific provisions on liability for defective products, general provisions on liability and final provisions.

After the first five articles, which are respectively devoted to the object and purpose of the Directive (Article 1), its scope of application (Article 2), the indication of the level of harmonization (Article 3), the definitions of the key terminology used within the Directive (Article 4) and the establishment of the right to compensation for the injured party or his or her successors (Article 5), it contains a provision initially absent from the text of the Directive Proposal: Article 6, which defines the concept of compensable damage.

In the proposal, the notion of “damage” was included only within the definitions section (Article 4, no. 6 of the proposal). The final text of the Directive adopts a much broader and more structured approach, as an entire separate article is dedicated to regulating and significantly expanding the scope of compensable damage.

In particular, Article 6 expressly lists death or personal injury – including clinically recognized psychological harm – as compensable damage, thus expanding (or specifying) the traditional concept of injury under product liability law. Furthermore, it also covers material damage or destruction of any property (except the defective product itself, a product damaged by a defective component and property used exclusively for professional purposes), and introduces an important innovation by recognizing the loss or corruption of non-professional digital data as a compensable harm⁶⁶.

Through these additions, the Directive not only adapts the scope of recoverable damage to the realities of digital society and to the challenges posed by the increasing use of products equipped with AI systems, but, more in general, modernizes it.

Particularly interesting is, in the second chapter, Article 7, that determines when a product (as defined by the previous art. 4, No. 1)⁶⁷ shall be considered defective. More in detail, according to such norm, a product is defective when “it does not provide the safety that a person is entitled to expect or that is required under Union or national law”⁶⁸.

⁶⁴ Particularly the first Paragraph of Article 47 of the abovementioned Charter clearly states that: “Everyone whose rights and freedoms guaranteed by the law of the Union are violated has the right to an effective remedy before a tribunal in compliance with the conditions laid down in this Article.”

⁶⁵ Explanatory memorandum, *op. cit.*, 11.

⁶⁶ art. 6.

⁶⁷ *I.e.*: “all movables, even if integrated into, or inter-connected with, another movable or an immovable; it includes electricity, digital manufacturing files, raw materials and software”.

⁶⁸ The definition of “defectiveness” represents one of the (many) differences between the Directive proposal and its final text. In fact, art. 6 of the proposal foresaw a significantly different definition, which was also structured in a different way. Such law provision stated that a product shall be considered defective when it “does not provide the safety which the public at large is entitled to expect, taking all circumstances into account”, followed by a list of those circumstances, that is deemed to be illustrative rather than exhaustive.

The second paragraph states that “in assessing the defectiveness of a product, all circumstances shall be taken into account” and is then followed by a list of examples of the most relevant ones.

Some of those circumstance seem to be particularly significant with regard to driverless cars and particularly: the instructions for the product’s use⁶⁹, its reasonably foreseeable use⁷⁰ and its relevant safety requirements, including safety-relevant cybersecurity requirements⁷¹.

It will be interesting, for example, to understand how the concept of driverless car “reasonably foreseeable use” will be defined in practice. Several factors will in fact play a role in determining it.

First of all, the type of road on which the vehicle may or may not be used should be taken into consideration. *E.g.*, in an initial phase it could be that driverless vehicles will only be used on motorways. These seem to be the most easily adaptable infrastructures to the technologies that will eventually be required by self-driving cars, and moreover, they could be those with the least risk of “unforeseeable events” such as interference from the simultaneous presence of pedestrians and cyclists.

Consequently, if the “reasonably foreseeable use” of a driverless car will be only on highways and such instruction has been clearly explained to the user, the latter will not be entitled to claim for damage compensation if she or he uses the vehicle on another kind of road.

Another factor that could affect the use (or misuse) of an autonomous car could be given by the possible chance for the user to set different driving modes (*e.g.*, sporty driving) and to use them in a way which is not allowed.

It is true that at this stage it is difficult to clarify how in reality these standards will be applied since it is not yet clear from a technological point of view what degree of autonomy driverless vehicles that will be placed on the market will have and what power users will correspondingly have to influence their use.

It should be remembered, for instance, that in Level 5, the most advanced one among vehicles equipped with autonomous driving technology according to the categorization made by SAE International⁷², the user has no power to influence the use of the car, having only to indicate the desired destination⁷³. Consequently, what will a “reasonably foreseeable use” that the subject may make while “driving” a Level 5 autonomous car be?

⁶⁹ art. 7, par. 2, Lett. a).

⁷⁰ art. 7, par. 2, Lett. b). art. 6, par. 1, Lett. b) of the proposal mentioned also the foreseeable misuse.

⁷¹ art. 7, par. 2, Lett. f).

⁷² See the definitions of the different levels of driving automation on the SAE International website at the following link: < https://www.sae.org/standards/content/j3016_202104> (24.11.2024).

⁷³ G. CALABRESI/E. AL MUREDEN, *op. cit.*, 98; V. MARDIROSSIAN, *Will Autonomous Cars Put an End to the Traditional Third Party Liability Insurance Coverage?*, in P. MARANO/K. NOUSSIA (eds.), *InsurTech: A Legal and Regulatory View*, Cham-Switzerland, 2020, 274 and 276.

See also the effective description made by M.L. KUBICA, *op. cit.*, 58, of “non-discretionary vehicles”, that are those which “impede their users’ selection of route, determination of driving style, or ability to switch the self-driving function off and take control of the vehicle”.



Continuing with the analysis of the text of the Directive it is possible to observe that the following Article 8 clearly indicates Member States' duty to ensure the liability of specific subjects ("economic operators") related to the product's "creation" in case of damage, in accordance with the same Directive. Such subjects are: (a) the manufacturer; (b) without prejudice to its liability, the manufacturer of a defective component, where that component was integrated into, or inter-connected with, a product within the manufacturer's control and caused that product to be defective; (c) without prejudice to its liability, where the manufacturer of the defective product or component is established outside the European Union, the importer of the defective and the authorised representative of the manufacturer and, if such subjects do not exist, the fulfilment service provider can be held liable for damage caused by that product. The liability of the manufacturer referred above shall also cover any damage caused by a defective component where it was integrated into, or inter-connected with, a product within that manufacturer's control⁷⁴. The scope of application of such norm is further extended by the following paragraph, according to which "any natural or legal person that substantially modifies a product outside the manufacturer's control and thereafter makes it available on the market or puts it into service shall be considered to be a manufacturer of that product" in the sense of paragraph 1⁷⁵.

Moreover, according to Paragraph 3 the distributor of the product can be held liable in case the latter fails to identify the economic operator or its own distributor within one month of receiving the request from the claimant⁷⁶. This ensures that there will always be an economic operator in the European Union against whom the damaged person could make a compensation claim⁷⁷. This provision may have an important application with regard to autonomous vehicles in view of the fact that cars of non-EU manufacture are already widespread within the states of the European Union.

The subsequent Articles 9 and 10 are more strictly civil-procedural in nature, since they regulate respectively the disclosure of evidence and the burden of proof.

Particularly, Article 9 regulates a disclosure mechanism similar to that in Article 3 of the AI Liability Directive proposal⁷⁸ and states that Member States shall ensure that – if the claimant has previously filed facts and evidence sufficient to support the plausibility of the claim for compensation of

⁷⁴ art. 8, par. 1.

⁷⁵ art. 8, par. 2.

⁷⁶ art. 7, par. 3. Continuing the comparison with the text of the original proposal, it is worth noting that Article 7 of the Directive introduces other changes compared to Article 6 of the initial proposal. In particular, the definitive version expressly provides the possibility for the Member States to establish compensation schemes intended to cover cases in which the liable party cannot be identified or is insolvent, thereby strengthening the protection afforded to injured parties. These innovations mark an important broadening of the liability framework, aligning it more closely with the realities of contemporary digital commerce and the complexities of global supply chains.

⁷⁷ Explanatory memorandum, *op. cit.*, 12.

⁷⁸ See the following section.

damage caused by a product – the defendant will be required to disclose relevant evidence that he has at its disposal⁷⁹.

This provision has to be read combined with Article 10 according to which the claimant bears the burden of proof with regard to the defectiveness of the product, the damage suffered and the causal link between the defectiveness and the damage⁸⁰. As a first approximation, it can be stated that the claimant's right to obtain the disclosure by the defendant represents a counterbalance to his duty to prove the damage suffered and its cause.

Moreover, in this way, the claimant should also be able to better face the difficulties related to the burden of proof and related to AI systems complexity, interactivity and responsiveness to ambient data, as well as to the possible opacity of the algorithm and its capacity to make autonomous decisions⁸¹.

As will be better seen in the context of the analysis of the abovementioned Article 3 of the AI Liability Directive, the possibility the defendant be ordered to produce those documents and information at her or his disposal capable of supporting the claimant's request is characterised by “counter-limits” intended to protect the defendant's rights as well.

First of all, as seen, the claimant should have already filed evidence sufficient to support the plausibility of the claim for compensation. Moreover, the courts should limit the disclosure of evidence to what is necessary and proportionate to support the claim⁸², taking into account all concerned parties' interests, including third parties⁸³, especially with regard to the protection of confidential information and trade secrets⁸⁴. Finally, if it is deemed necessary to disclose a piece of information that is a trade secret or an alleged trade secret, the judge is empowered, upon a duly reasoned request of a party or on their own initiative, to take the specific measures necessary to preserve the confidentiality of that information when it is used or referred to in the course of or after legal proceedings⁸⁵.

Article 9 concludes with two paragraphs of particular significance – especially paragraph 6 – which were not included in the original proposal.

⁷⁹ art. 9, par. 1. The first paragraph of Article 8 of the Directive proposal was partially different considering that it foresaw Member States' duty to ensure that national courts were empowered to order the defendant to disclose relevant evidence. In the final version there here is no specific reference to national courts. Moreover Article 9 of the Directive foresees a (new) symmetrical duty at the following paragraph: “Member States shall ensure that, at the request of a defendant that has presented facts and evidence sufficient to demonstrate the defendant's need for evidence for the purposes of countering a claim for compensation, the claimant is required, in accordance with national law, to disclose relevant evidence that is at the claimant's disposal.”.

⁸⁰ art. 10, par. 1.

⁸¹ L. MACHNIKOWSKI, *op. cit.*, 147.

⁸² art. 9, par. 3.

⁸³ art. 9, par. 4.

⁸⁴ Differently from the proposal, in the Directive's final text the expressed reference to art. 2, point 1, of dir. 2016/943/EU, *i.e.* the Directive of 8th June 2016 on the protection of undisclosed know-how and business information (trade secrets) against their unlawful acquisition, use and disclosure, OJ L 157, 15.6.2016, 1-18 has been erased.

⁸⁵ art. 8.



Paragraph 6 introduces important innovations within the framework of the Directive, as it foresees the Member States' duty to ensure that, where a party is required to disclose evidence, national courts are empowered, upon a duly reasoned request of the opposing party or where the national court concerned deems it appropriate and in accordance with national law, to require such evidence be presented in an easily accessible and easily understandable manner, if such presentation is deemed proportionate by the national court in terms of costs and effort for the required party. Such norm reflects the European legislator's intent to consider the specific nature of AI technologies and to provide greater flexibility and protection for injured parties. In particular, it addresses specific situations where the burden of proof and access to redress could otherwise be compromised, thereby reinforcing the overall effectiveness of the liability system established by the Directive. According to the last paragraph of Article 9 existing national rules relating to the pre-trial disclosure of evidence are not affected by it.

Article 10, paragraphs from 2 to 5, lays down some procedural institutions that – similarly to the disclosure regulated by Article 9 – alleviate the burden of proof borne by the claimant pursuant to the first paragraph of the same norm. This “alleviation” takes place thanks to different kinds of presumption, which, however, is always rebuttable by the defendant pursuant to the last paragraph of Article 10.

Specifically, paragraph 2 entails some cases where the defectiveness of a product shall be presumed: (a) the defendant has failed to disclose relevant evidence pursuant to the above-summarized paragraph 1 of Article 9; (b) the claimant demonstrates that the product does not comply with mandatory safety requirements laid down by European Union law or national law that are intended to protect against the risk of the damage that has occurred; (c) the claimant demonstrates that the damage was caused by an obvious malfunction of the product during normal use or under ordinary circumstances⁸⁶.

Paragraph 3 rules, instead, the presumption of the causal link existence between the product's defectiveness and the damage. This occurs when the defectiveness has been proved and the damage caused is of a kind typically consistent with the defect in question⁸⁷.

The last kind of presumption ruled by Article 9, paragraph 4, which is very broad and of which it is difficult to find precedents, is particularly interesting. In fact, its content is very peculiar as it is based on the assumption that the national court shall presume the existence of the defectiveness of the product or causal link between its defectiveness and the damage, or both, where, despite the disclosure of evidence in accordance with Article 9 and taking into account all the relevant circumstances of the case, (a) the claimant faces excessive difficulties, in particular due to technical or scientific complexity, in proving the defectiveness of the product or the causal link between its defectiveness and the damage, or both; and (b) the claimant demonstrates that it is likely that the product is defective or that there is a causal link between the defectiveness of the product and the damage, or

⁸⁶ art. 10, par. 2.

⁸⁷ art. 10, par. 3.

both⁸⁸. It is not clear how such difficulties will be determined. Most likely it will be left to the discretion of the judge. Furthermore, there might be differences in the different States given the “space” Member States have within the enactment of the conversion law. The defendant shall have the right to contest the existence of all abovementioned presumptions⁸⁹.

Concluding with the last provision of the second Chapter, Article 11 rules those cases where there is an exemption from liability and therefore the economic operator shall not be considered liable for damage caused by a defective product. Such exceptions are referred to the cases in which the operator did not place or make available the product on the market⁹⁰ or when a defect did not initially exist or was due to compliance with legal requirements or it was not possible to discover it⁹¹.

The third Chapter consists of six articles (from 12 to 17)⁹² and has as its object some general provisions on liability.

Article 12 states – without prejudice to national law concerning rights of contribution or recourse – a joint liability in case there are two or more economic operators and both (or all) of them are liable for the same damage.

In this way the damaged user will have a larger chance to effectively enforce the judgment in case her or his right to compensation has been stated. This kind of provision reflects an already widespread juridical tradition in EU Member States such as, for instance, Italy⁹³ and Germany,⁹⁴ aiming to grant the damaged party the broadest possible guarantee of compensation.

Similarly, the following Article 13, Paragraph 2, foresees that the economic operator’s liability “may be reduced or disallowed when the damage is caused both by the defectiveness of the product and by the fault of the injured person or any person for whom the injured person is responsible”⁹⁵. Also this rule reflects a provision which is already present in many continental civil codes⁹⁶.

On the contrary, the circumstance that the damage is caused both by the defectiveness of a product and by an act or omission of a third party has no impact on the economic operator’s liability⁹⁷.

Compared to the original proposal, the final text of the Directive introduces in Article 14 the provision for a right of recourse. In particular, it establishes that where “more than one economic operator is liable for the same damage, an economic operator that has compensated the injured person shall

⁸⁸ art. 9, par. 4.

⁸⁹ art. 9, par. 5.

⁹⁰ art. 11, par. 1, lett. a) and b).

⁹¹ art. 11, par. 1, lett. c), d) and e). Other exemptions are foreseen by lett. f) and g) of the same norm.

Please note that Paragraph two foresees four derogations to lett. c) in which the economic operator shall be not be exempted from liability.

⁹² Two more than in the proposal where the right of recourse and the expiry period were not ruled.

⁹³ See, with regard to contractual liability, art. 1282 of the Italian Civil Code and, with regard to non-contractual liability, art. 2055 of the Italian Civil Code.

⁹⁴ See § 421 of the German Civil Code (“BGB”).

⁹⁵ art. 13, par. 2.

⁹⁶ *E.g.* in Italy see art. 1227 of the Italian Civil Code.

⁹⁷ art. 13, par. 1.



be entitled to pursue remedies against other economic operators liable pursuant to Article 8 in accordance with national law”⁹⁸.

The subsequent norm forbids that the economic operator’s liability, in relation to the injured person, be limited or excluded by a contractual provision or by national law.⁹⁹ This is a clear indication also in relation to the transposition law. With regard, instead, to the limit on the contractual autonomy, it can be observed that also such limitation is similar to others already existing in the Member States’ legal orders, especially in the field of consumer law¹⁰⁰.

The provisions of third chapter’s second to last article are particularly interesting. In fact, Article 16 rigorously regulates the limitation periods for claiming compensations for damage caused by defective products. In detail, it provides for a limitation period of three years to the initiating of proceedings for claiming compensation that run from the day on which the injured person became aware, or should reasonably have become aware of (a) the damage, (b) the defectiveness and (c) the identity of the relevant economic operator that can be held liable pursuant the same Directive¹⁰¹.

This norm will therefore affect Member States’ provisions on limitation periods, changing them. Instead, the national laws regulating suspension or interruption of the limitation periods shall not be affected¹⁰².

This provision could, in practice, lead to different periods depending on the regulations in the various States, with a risk of different treatment for damaged users depending on the competent court.

The last norm of the third chapter (“Expiry period”) incorporates (and modifies) a provision that was originally foreseen within the preceding article, but which has now been separated and systematically regulated under Article 17. More in detail it states that “an injured person is no longer entitled to compensation unless that injured person has, in the meantime, initiated proceedings against an economic operator that can be held liable pursuant to Article 8. That period shall run from: (a) the date on which the defective product which caused the damage was placed on the market or put into service; or (b) in the case of a substantially modified product, the date on which that product was made available on the market or put into service following its substantial modification”¹⁰³. Such provision has to be derogated if “an injured person has not been able to initiate proceedings within 10 years of the dates referred to in paragraph 1 due to the latency of a personal injury”, in this case “the injured person shall no longer be entitled to compensation pursuant to this Directive upon the expiry of a period of 25 years,¹⁰⁴ unless that injured person has, in the meantime, initiated proceedings against an economic operator that can be held liable pursuant to Article 8”¹⁰⁵.

⁹⁸ art. 14.

⁹⁹ art. 15.

¹⁰⁰ See, e.g., artt. 33 and 34, d.lg. 6.9.2005, n. 206, Codice del Consumo.

¹⁰¹ art. 16, par. 1.

¹⁰² art. 16, par. 2.

¹⁰³ art. 17, par. 1.

¹⁰⁴ In the proposal (art. 14, par. 3) a significantly shorter limit of 15 year was foreseen.

¹⁰⁵ art. 17, par. 2.

The 10 years limitation period running from the moment when the product was placed on the market may have significant effects on the deployment of autonomous vehicles. In fact, as of today, cars have been a kind of product which has been characterised by the particular duration in its use, in some cases even several decades.

At this stage it is not yet possible to establish how long self-driving cars will last and how quickly they will become obsolete. But nevertheless, this already defined limitation period in which it is possible to start a claim in order to obtain compensation for damage caused by the vehicle itself could be a deterrent (albeit not a major one) to companies to invest in this field and, consequently, to the spread of relevant technology.

In any event, the European legislator's choice is believed to be due to its desire to balance users' right to be compensated in case of damage with manufacturers' interests to not be liable for an indefinite period of time, or in any case one so long as to discourage their economic initiative.

At the same time, it could be more appropriate to concretely experiment the duration of use of autonomous cars and other AI systems and the average time it takes for any possible defects to manifest themselves, before laying down by law the maximum period in which it is possible to take legal action to obtain compensation for damage resulting from a defect in the relevant product.

The first article of the last chapter introduces a provision that was completely absent from the original proposal: the derogation from development risk defence.

This new Article 18 is particularly noteworthy, as it the "development risks" defence in product liability cases: it permits Member States to maintain or introduce national provisions holding economic operators liable for product defects (by way of derogation of art. 11, par. 1, of the same Directive), even if such defects were undiscoverable at the time of market placement or during the period the product was under the manufacturer's control, based on the objective state of scientific and technical knowledge. These national measures must be limited to specific product categories, justified by public interest objectives, and proportionate to those objectives. Member States intending to apply such provisions are required to notify the European Commission by 9th December 2026, detailing the measures and their compatibility with Article 18.

Such provision shall be considered as an improvement over the proposal and in any case as particularly relevant in enhancing consumer protection considering that it allows Member States to maintain or introduce provisions that impose liability on economic operators even for defects that were undiscoverable according to the most advanced scientific and technical knowledge. By permitting such national measures, the Directive ensures that the burden of innovation-related risks does not fall on consumers, but rather on those who are in the best position to prevent and insure against such risks. This approach seems to uphold a high standard of consumer safety and foster public trust in technological innovation, as well as to align European legal systems with the broader objective of ensuring fair access to compensation for harm caused by defective products.



The Directive concludes with the other final provisions having respectively as their object the transparency duties by the Member States (art. 19), the evaluation of the Directive application (art. 20), the repeal of Directive 85/374/EEC (with effect from 9th December 2026) and the transitional provision (art. 21), the transposition to be concluded within 9th December 2026 by the Member States (art. 22), the Directive's entry into force (art. 23) and its addressees (art. 24).

3.1.The Relationship between Directive (EU) 2024/2853 and the Artificial Intelligence Act

Directive (EU) 2024/2853 forms part of a broader European regulatory framework governing artificial intelligence and should therefore not be analysed in isolation. In particular, its relationship with Regulation (EU) 2024/1689 (Artificial Intelligence Act) is essential to understanding the liability regime applicable to AI-enabled products, including autonomous vehicles.

As a matter of fact, rather than regulating artificial intelligence through a single comprehensive legislative instrument, the European Union is progressively developing a multi-layered regulatory architecture in which different legal acts pursue distinct yet complementary objectives. Within this framework, the AI Act establishes the regulatory conditions governing the design, development and placing on the market of AI systems, whereas Directive (EU) 2024/2853 determines the civil liability consequences arising where those systems cause damage. The interaction between these two instruments is particularly significant in the context of autonomous vehicles, which simultaneously fall within the scope of both legislative measures.

The AI Act primarily adopts an *ex ante* regulatory approach. Its objective is to reduce the probability that AI systems will cause harm by imposing extensive obligations before such systems are placed on the market and throughout their lifecycle. To this end, the Regulation establishes requirements concerning risk management, data governance, technical documentation, human oversight, transparency, cybersecurity, post-market monitoring and corrective measures. In other words, the AI Act seeks to prevent accidents by ensuring that AI systems satisfy predefined safety standards before and after their deployment.

Directive (EU) 2024/2853, on the other hand, operates *ex post*. It does not primarily regulate how AI systems must be designed or operated but rather determines the legal consequences once damage has occurred. As described above, its purpose is to ensure that injured subjects are effectively compensated while simultaneously providing manufacturers and the other economic operators involved in the supply chain with a predictable liability framework.

The complementarity between these two instruments becomes particularly evident in relation to autonomous vehicles. Driverless cars constitute one of the clearest examples of high-risk AI systems under the AI Act, while simultaneously representing highly sophisticated products falling within the

scope of Directive (EU) 2024/2853. Consequently, the same autonomous vehicle will generally be subject to both legal instruments throughout its lifecycle.

This interaction is reflected in several provisions of the Product Liability Directive itself. Article 7 expressly requires courts to take into account compliance with mandatory safety requirements laid down by Union law when assessing whether a product is defective. Such mandatory requirements necessarily include those established by the AI Act whenever the product incorporates an AI system falling within its scope. Compliance with the AI Act therefore becomes an important factual element in evaluating product defectiveness, although it does not automatically exclude liability where the product nevertheless fails to provide the level of safety that the public is entitled to expect.

Conversely, failure to comply with the AI Act may significantly facilitate the injured party's burden of proof. Non-compliance with mandatory safety obligations may support the presumption of defectiveness under Article 10 of Directive (EU) 2024/2853 and may therefore strengthen the claimant's position in subsequent liability proceedings. In this respect, the AI Act and the Product Liability Directive establish a coherent interaction between preventive regulation and civil liability.

This relationship also confirms a broader regulatory choice made by the European legislator. Rather than relying exclusively on compensation mechanisms or exclusively on preventive regulation, the European Union has opted for a dual system combining both approaches. The AI Act attempts to minimise the occurrence of accidents through compliance obligations, whereas the Product Liability Directive guarantees effective redress whenever preventive measures prove insufficient.

From the perspective of autonomous vehicles, such coordination is particularly significant. The complexity of AI-driven driving systems, their continuous software updates, machine-learning capabilities and interaction with digital infrastructures make it impossible to rely solely on either preventive regulation or traditional liability rules. Instead, the effectiveness of the European legal framework depends on the interaction between the two instruments.

Nevertheless, despite this evident complementarity, the coexistence of the AI Act and Directive (EU) 2024/2853 still does not amount to a comprehensive legal framework specifically designed for autonomous vehicles. Both instruments regulate AI systems in general and only indirectly address the peculiar characteristics of driverless cars. As argued throughout this article, once autonomous driving technologies reach sufficient technological maturity and become widespread within the internal market, the European Union may likely need a dedicated and specific legislative instrument capable of integrating product safety requirements, operational rules and liability provisions into a coherent regulatory framework specifically tailored to autonomous vehicles.

4. The Content and Structure of the Directive proposal on AI Liability.



As mentioned above, the Directive proposal on adapting non-contractual civil liability rules to artificial intelligence was withdrawn. Specifically as can be read in Annex IV of the Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Region of 11.2.2025 “Commission work programme 2025” the Commission decided to withdrawal the proposal in its 2025 work programme because there was no foreseeable agreement but that, in any case, the Commission “will assess whether another proposal should be tabled or another type of approach should be chosen”¹⁰⁶. Certainly this news represents a step backward from the goals also discussed in this article, nevertheless it was deemed appropriate to keep the analysis conducted of the Directive proposal, also with a view to future comparison with any upcoming legislative proposals in this area.

The Directive proposal on adapting non-contractual civil liability rules to artificial intelligence had a structure that could be described as “agile” when compared to the Directive on liability for defective products analysed in the previous chapter.

It was divided into six articles, in addition to Articles 7, 8 and 9, dealing respectively with the Directive transposition, its entry into force and its addressees.

Article 1 set out the Directive subject matter and scope: this Directive should have been applied to non-contractual fault-based civil law claims for damages, in cases where it is caused by an AI system¹⁰⁷. More in detail the Directive’s goal was to set common rules on: (a) the disclosure of evidence on high-risk artificial intelligence systems to enable a claimant to substantiate a non-contractual fault-based civil law claim for damages; (b) the burden of proof in the case of non-contractual fault-based civil law claims brought before national courts for damage caused by an AI system¹⁰⁸.

Article 1 also then clearly stated what the Directive was not about: criminal liability¹⁰⁹. After that, it ruled what shall not be affected by the same law provision and specifically: (a) rules of Union law regulating conditions of liability in the field of transport; (b) any rights which an injured person may have under national rules implementing Directive 85/374/EEC; (c) the exemptions from liability and the due diligence obligations as laid out in other law provisions and (d) national rules determining which party has the burden of proof, which degree of certainty is required as regards the standard of proof, or how fault is defined, other than in respect of what is provided for in Articles 3 and 4 of the Directive proposal¹¹⁰.

In the same way – as happens very often – the Directive gave the Member States the possibility to adopt or maintain compatible national rules that

¹⁰⁶ COM (2025) 45 final, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Region of 11.2.2025 “Commission work programme 2025 - Moving forward together: A Bolder, Simpler, Faster Union”.

¹⁰⁷ art. 1, par. 2.

¹⁰⁸ art. 1, par. 1.

¹⁰⁹ art. 1, par. 2.

¹¹⁰ art. 1, par. 3.

are more favourable for claimants to substantiate a non-contractual civil law claim for damage caused by an AI system¹¹¹.

Based on the above, not only the applicability of this Directive and of its national implementing laws on self-driving vehicles would have been clear, but also that its content may have had an important effect on the development of such technologies. In fact, the liability regulation of AI systems is (and remains) undoubtedly an integral part of the driverless cars legislation.

Article 2 contained definitions of the most relevant concepts of this law provisions, by making also several references to the so-called AI Act¹¹². This also proves the European legislator's will to build a structured regulatory framework on AI systems, so as to avoid the risk of having non-harmonised and coordinated norms.

Particularly interesting was the "claim for damages" definition, which was "tailor-made" on artificial intelligence systems, distinguishing it and specifying it from the relevant general concept.

According to art. 2, No. 5, a "claim for damages" was "a non-contractual fault-based civil law claim for compensation of the damage caused by an output of an AI system or the failure of such a system to produce an output where such an output should have been produced".

This particular form of "specification" of the concept of claim for damages thus reflects the European legislator's awareness that AI systems necessarily entail an evolution of the concept of liability. The autonomy and decision-making discretion of such systems in fact modify, or at least develop, the concepts of liability for damage and chargeability. The output (or lack thereof) of an AI system is therefore introduced as a logical antecedent for the existence of liability.

This is particularly important with regard to self-driving vehicles.

It will certainly be a task of the legislator to clearly define the concept of "output of an AI system" and of "failure of such a system to produce an output", providing a description which should be as complete as possible also from a technological perspective. In fact, it is true that the definition of these elements is essential to establish when, following a road accident involving one or more self-driving vehicles, the user is entitled to claim for damages.

When considering the inherent dangerousness of vehicular travel, the exact definition of these elements is essential. For, although the risks associated with road traffic will decrease dramatically thanks to autonomous driving technologies¹¹³, we have seen in the previous chapters and we will see in the

¹¹¹ art. 1, par. 4.

¹¹² Proposal for a regulation of the European Parliament and of the Council laying down harmonised rules on artificial intelligence (Artificial Intelligence Act) and amending certain union legislative acts, 21.04.2021, COM (2021) 206.

¹¹³ See, e.g., M. BRENNER, *Verfassungsrechtliche Vorgaben für die rechtliche Ausgestaltung des autonomen Fahrens*, in M. HERMANN/M. KNAUFF (eds.), *Autonomes Fahren*, 2021, Baden-Baden, 47-48. The author – see note 10 – also points out that according to the *Staatliches Bundesamt* the 88% of accidents in 2017 were caused by a human error and only the 1% by a technical defect of the vehicle. See also T. GILL, *op. cit.*, 272; J. WANG/L. ZHANG/Y. HUANG/J. ZHAO, *op. cit.*, 1-2; P. RINGLAGE., *Haftungskonzepte für autonomes Fahren – „ePerson“ und „RmbH“?*, 2021, Baden-Baden, 53-54; JOURDAN/MATSCHI, *Au-*



rest of this article that it cannot be assumed that they will be completely eliminated.

As mentioned above, the certainty of being able to claim, if the conditions are met, fair compensation in the event of damage, is essential to the success of a given technology.

Then, at Article 3, the Directive focused on some procedural aspects and more in detail on the right and duties connected with the disclosure of evidence and the rebuttable presumption of non-compliance.

The European legislator seemed aware of the fact that in a possible trial for compensation of damage caused by an AI technology a user will probably face many difficulties with regard to the evidence to take in order to prove that said technology is liable for the damage.

Moreover, the complexity of AI technology and programming should also be considered: it may cause more difficulties in ascertaining the exact cause of an accident¹¹⁴ than in a case where a “classic” product is involved.

Therefore, the Directive proposal aimed at harmonizing some evidence norms of the Member States concerning non-contractual fault-based liability related to AI systems with the goal of ensuring “that persons claiming compensation for damage caused to them by an AI system enjoy a level of protection equivalent to that enjoyed by persons claiming compensation for damage caused without the involvement of an AI system”¹¹⁵.

Consequently Article 3 ruled the duty for Member States to ensure that national courts are empowered to order the disclosure of evidence about a specific high-risk AI system¹¹⁶ that is suspected of having caused damage, if the relevant request was previously refused and the potential claimant¹¹⁷ has presented facts and pieces of evidence sufficient to support the plausibility of a claim for damages.

Such right of the possible claimant to obtain an order against the counterparty¹¹⁸ which forces the latter to produce those pieces of evidence con-

tomatisiertes Fahren – Wie weit kann die Technik den Fahrer ersetzen? Entwickler oder Gesetzgeber, wer gibt die Richtung vor?, in *NZV*, 2015, vol. 1, 26-27, and H. EIDENMÜLLER, *The Rise of Robots and the Law of Humans*, in *ZEUP*, 2017, vol. 4, 770. Such circumstance is also confirmed in the German Bill for amendment of the Road Traffic Act and the Compulsory Insurance Act – Act on Autonomous Driving, available at the following link <https://www.bmvi.de/SharedDocs/DE/Anlage/Gesetze/Gesetze-19/gesetz-aenderung-strassenverkehrsgesetz-pflichtversicherungsgesetz-autonomes-fahren.pdf?__blob=publicationFile> (06.02.2023), 18.

¹¹⁴ M.L. KUBICA, in *Autonomous Vehicles and Liability Law*, *op. cit.*, 61 and specifically note 132.

¹¹⁵ Recital Nr. 7 of the Directive proposal. See T. DE MARI CASARETO DAL VERME, *Verso la AI Liability Directive: la proposta della Commissione europea del 28 settembre 2022 per una direttiva sull'adattamento delle regole di responsabilità civile all'Intelligenza Artificiale*, in *Persona e Mercato*, 2022, vol. 2, 500.

¹¹⁶ According to art. 2, No. 2, of the Directive Proposal, an “high-risk AI system” is an AI system with the characteristics foreseen by art. 6 of the so-called Artificial Intelligence Act (Proposal for a Regulation of the European Parliament and of the Council Laying Down Harmonised Rules on Artificial Intelligence) - COM (2021) 206.

¹¹⁷ See the definition of “claimant” and “potential claimant” set forth by art. 2, No. 6 and 7.

¹¹⁸ According to art. 1, par. 1, the counterparty may be a provider or a person subject to the obligations of a provider pursuant to art. 24 or art. 28, par. 1, of the AI Act or a user.

sidered necessary or at least useful by the competent judge is extremely significant.

In fact, on one side this was a tangible demonstration of the legislator's will to protect the "weak" party, *i.e.* the damaged user. This was already evident from the Directive proposal's explanatory memorandum¹¹⁹, but even previously, in the European Parliament's Resolution of 3rd May 2022¹²⁰ and, even earlier, in the European Commission's White Paper on Artificial Intelligence of 19th February 2020¹²¹.

Particularly, the White Paper notes that "persons having suffered harm may not have effective access to the evidence that is necessary to build a case in court, for instance, and may have less effective redress possibilities compared to situations where the damage is caused by traditional technologies. These risks will increase as the use of AI becomes more widespread"¹²².

On the other side, the civil procedural law tradition of many European countries, where this obligation to disclose documentation "against oneself" is absolutely not the norm, should not be forgotten¹²³. On the contrary, in legal systems based on civil law, the legal maxim "*nemo tenetur se detegere*" applies and, with some exceptions, a party does not have to produce those documents that could go against one's own interests and whose exact content the opponent may be unaware of¹²⁴.

Consider, by way of example, the German legislation in which an institution such as discovery is in no way provided for¹²⁵. Or also the Italian civil procedural law, where Article 112 of the Code of Civil Procedure expressly states that the judge must decide on the entire claim and not beyond the lim-

¹¹⁹ See the explanatory memorandum's first chapter "Context of the Proposal – Reasons for and objectives of the proposal" of the AI Liability Directive, COM (2022) 496, 1 and 2 of the same document.

¹²⁰ European Parliament Resolution of 3 May 2022, *op. cit.*, see point No. 146. Points 143 and 146 of the Resolution are cited above at chapter 2.b.

¹²¹ White Paper on Artificial Intelligence - A European approach to excellence and trust - COM (2020) 65.

¹²² White Paper on Artificial Intelligence, *supra* note 121, p. 13. See also J. LEE, *op. cit.*, 23-25.

¹²³ As explained by W.L. CRAIG, in *Common Law Principles on the Taking of Evidence*, in K.-H. BÖCKSTIEGEL (eds.), *Beweiserhebung in internationalen Schiedsverfahren*, Vol. 14, 2001, Cologne, 15-16. The different understanding of an institution such as discovery between civil law countries and common law countries – where it is much more widespread – is also explained by the different concept of justice existing in the different legal systems: whereas in common law the trial must tend to seek an absolute and abstract truth on the facts in dispute and therefore justifies such an "invasive" instrument, in civil law courts have only to decide on what is requested by the parties in their acts, basing their decisions solely on what emerges in the course of the trial.

¹²⁴ R.A. SCHÜTZE, *Beweisaufnahme nach Civil Law*, in K.-H. BÖCKSTIEGEL (eds.), *Beweiserhebung in internationalen Schiedsverfahren*, Vol. 14, 2001, Cologne, 32.

¹²⁵ R. TRITTMANN, *Basics and Differences of the Continental and Common Law System and State Court Proceedings*, in K.-H. BÖCKSTIEGEL/K.-P. BERGER (eds.), *The taking of Evidence in International Commercial Arbitration*, Vol. 26, 2010, Cologne, 18.



its thereof¹²⁶ and Article 115 foresees that he has to decide on the basis of the evidence offered by the parties¹²⁷.

There are for sure some exceptions, which are also provided by the Italian Civil Procedure Code itself. One of the most important ones is the so called “*ordine di esibizione*” (order of presentation) ruled by art. 210 of the Italian Civil Procedure Code, but the obligation to disclose imposed by Article 3 of the Directive seems to have a much deeper capacity for investigation. Similarly, §§ 421 ff. of the German *Zivilprozessordnung* (Civil Procedure Code) rule the “*Vorlegung durch den Gegner*” (production by the opponent).

With the exception of special cases like those mentioned above, a request for the production of documents or information could therefore appear in the eyes of civil law parties as an unjustified violation of their confidentiality and the protection of their secret information.

Probably for this very reason Article 3 indicated a number of requirements and limited to the disclosure ordered by the national courts in a damage compensation procedure in accordance with the claimant’s requests.

In addition to the already mentioned duty of the claimant to file facts and evidence proving the plausibility of a claim for damages¹²⁸, the claimant also has to previously undertake all proportionate attempts at gathering the relevant evidence from the defendant, otherwise the courts will not order the disclosure¹²⁹.

Also, the importance of keeping confidential certain information, the disclosure of which would cause commercial damage to the manufacturer regardless of whether the AI system is responsible for causing the non-subject claim or not, has been recognized.

This is especially true for autonomous vehicles: certainly, especially in the first decades of their deployment, there will be a high level of technological and commercial competition among the different manufacturers. In fact, the different autonomous driving systems will have a very advanced level of technology in relation to which an elevated degree of confidentiality will necessarily have to be maintained to ensure fair competition.

Consequently, it is necessary to balance two different needs: on the one hand, that of the injured subject to have access to that information necessary to prove the malfunction of the AI system and the causal link between that

¹²⁶ Article 112 “Corrispondenza tra il chiesto e il pronunciato” (Correspondence between the request and the judgment) of the Italian Civil Procedure Code precisely states that “*Il giudice deve pronunciare su tutta la domanda e non oltre i limiti di essa; e non può pronunciare d’ufficio su eccezioni, che possono essere proposte soltanto dalle parti.*” (The judge must rule on the entire claim and not beyond its limits; and may not rule ex officio on objections that may be raised only by the parties.).

¹²⁷ Article 115 “Disponibilità delle prove” (Evidence Availability) of the Italian Civil Procedure Code foresees at Paragraph 1 that “*Salvi i casi previsti dalla legge, il giudice deve porre a fondamento della decisione le prove proposte dalle parti o dal pubblico ministero nonché i fatti non specificatamente contestati dalla parte costituita.*” (Subject to cases provided for by law, the judge shall base the decision on the evidence submitted by the parties or by the public prosecutor, as well as on facts not specifically disputed by the constituted party.).

¹²⁸ art. 3, par. 1, last sentence.

¹²⁹ art. 3, par. 2.

malfunction and the damaging event that occurred, and, on the other side, the manufacturer's necessity to keep certain information confidential, considering that its disclosure could be damaging with respect to competitors and the market.

In light of the above, Article 3 foresaw at Paragraph 4 a necessity and proportionality requirement with regard to the information disclosure: “[n]ational courts shall limit the disclosure of evidence to that which is necessary and proportionate to support a potential claim or a claim for damages and the preservation to that which is necessary and proportionate to support such a claim for damages.”¹³⁰ The following sentence of the same paragraph specified this provision, expressly setting out that the “proportionality” of a disclosure order has to be determined on the basis of “the legitimate interests of all parties, including third parties concerned, in particular in relation to the protection of trade secrets within the meaning of Article 2 (1) of Directive (EU) 2016/943 and of confidential information, such as information related to public or national security”¹³¹.

The awareness of not having to risk the disclosure of information that must remain confidential was further evidenced by the next sentence of Article 3, Paragraph 4. In fact, this norm obliged Member States to “ensure that, where the disclosure of a trade secret or alleged trade secret which the court has identified as confidential within the meaning of Article 9 (1) of Directive (EU) 2016/943 is ordered, national courts are empowered, upon a duly reasoned request of a party or on their own initiative, to take specific measures necessary to preserve confidentiality when that evidence is used or referred to in legal proceedings”¹³².

With reference to the specific subject matter of this brief paper, it can therefore be considered that the provisions summarized above were to be viewed favorably with respect to the deployment of driverless cars. Indeed, it has been noted that they impose an obligation on defendants to file those documents and provide that information that the claimant needs to protect his or her right to compensation and to which he or she would otherwise not have access. At the same time, the requirements for the protection of trade secrets and confidential information of other parties involved are not overlooked.

Article 3 concluded with a further provision of significant relevance for the protection of the claimant's rights and of great impact from a procedural point of view and on the burden of proof sharing. In fact, Paragraph 5 established what the consequences of an unjustified refusal by the defendant to produce the evidence requested by the court are.

These consequences were particularly “impactful” – especially when one considers the procedural tradition of the civil law countries mentioned earlier – being provided that “where a defendant fails to comply with an order by a national court in a claim for damages to disclose or to preserve evidence at its disposal” the judge “shall presume the defendant's non-compliance with a relevant duty of care, in particular in the circumstances referred to in Arti-

¹³⁰ art. 3, par. 4, first sentence.

¹³¹ art. 3, par. 4, second sentence.

¹³² art. 3, par. 4, second sentence.

cle 4 (2) or (3), that the evidence requested was intended to prove for the purposes of the relevant claim for damages”¹³³.

In this way the defendant was actually forced to cooperate by providing the required evidence.

On the other hand, this presumption of non-compliance, ruled by Article 3, Paragraph 5, was rebuttable (so called “*praesumptio iuris tantum*”)¹³⁴, since the defendant is able to rebut it¹³⁵.

Also, the presumption regulated by the following Article 4 (“Rebuttable presumption of a causal link in the case of fault”) was rebuttable¹³⁶.

This was probably the most important norm of the Directive proposal, as it ruled the causal link between the AI system malfunction and the damage suffered by the claimant.

More in detail the first paragraph foresaw that the judge shall presume the existence of the causal link between the fault of the defendant and the output produced by the AI system or the failure of the AI system to produce an output (and consequently the defendant’s liability), if all the three requirements ruled by the same paragraph are met.

Specifically, the presumption of existence of the causal link shall take place if: “(a) the claimant has demonstrated or the court has presumed pursuant to Article 3 (5), the fault of the defendant, or of a person for whose behavior the defendant is responsible, consisting in the non-compliance with a duty of care laid down in Union or national law directly intended to protect against the damage that occurred; (b) it can be considered reasonably likely, based on the circumstances of the case, that the fault has influenced the output produced by the AI system or the failure of the AI system to produce an output; (c) the claimant has demonstrated that the output produced by the AI system or the failure of the AI system to produce an output gave rise to the damage”¹³⁷.

At least at this early stage when there is currently no widespread supporting commentary and analysis from doctrine and case law and when we can only comment a withdrawn regulation proposal on this subject, this provision of the law seemed to contain some critical issues due to the lack of the specific definition of certain concepts.

Particularly the ones of “non-compliance with a duty of care” (art. 3, par. 1, Lett. a)) and of “influence” of defendant’s fault (art. 3, par. 1, Lett. b)) come to the fore. These concepts should have been further specified to enable uniform application of the Directive’s provisions by all Member State courts.

It is unclear, for example, whether this influence by the defendant’s fault on the output or on failure thereof should be the sole causal element or whether it is sufficient that it contributed in conjunction with other factors to the occurrence of the output or its failure.

¹³³ art. 3, par. 5, first sentence.

¹³⁴ *I.e.* a rebuttable presumption.

¹³⁵ art. 3, par. 5, last sentence.

¹³⁶ This is expressly stated by art. 4, par. 7: “The defendant shall have the right to rebut the presumption laid down in paragraph 1.”

¹³⁷ art. 4, par. 1.

Similarly, it was not clear in what exactly the “non-compliance with a duty of care” can practically consist.

Paragraphs 2 and 3 of Article 4 set out the additional elements that the claimant is required to prove in order to meet the requirements of paragraph 1, Lett. a) in the event that the damage was caused by a high-risk AI system. More specifically Paragraph 2 had as its object claims against a provider or a person subject to the provider’s obligations pursuant to the applicable provisions of the AI act. Paragraph 3, instead, rules the different cases in which the claim was carried out against a user. In this case, the claimant had to prove that the user did not respect the accompanying instructions or did not suspend or interrupt the AI system’s use when he or she should have, or that she or he exposed the AI system to input data under his or her control which was not relevant in view of the system’s intended purpose.

These pieces of evidence were listed very specifically and related to several possible deficiencies or defects in the AI system. Reference is made by Paragraph 2 to the use of training of models’ data¹³⁸, transparency requirements¹³⁹, the possibility of oversight by natural persons¹⁴⁰, the level of accuracy, robustness and cybersecurity¹⁴¹, the duty to carry out corrective actions¹⁴². Paragraph 3 referenced to the obligations of users of high-risk AI systems¹⁴³.

The provisions set forth by Paragraphs 2 and 3 make numerous references to the AI Act and the definitions and norms contained therein. This again confirms the point made above, namely, the close interdependence among the various sources of European law on artificial intelligence and the desire of the European legislator to provide for a regulatory framework as harmonized and comprehensive as possible in this field.

The following Paragraphs 4, 5 and 6, set out provisions that were aimed – at least partially – to counterbalance the burden placed on the defendant by the presumption ruled by the first paragraph, regulating these paragraphs limits to the presumption of the existence of a causal link.

Paragraphs 4 and 5 had a more “processual” nature and specifically referred to the claimant’s possibility to access evidence. In fact, with an approach similar to that of Article 3, they foresaw – respectively with regard to claim for damages concerning a high-risk AI system (par. 4) and a not high-risk system (par. 5) – when the presumption laid down by Paragraph 1 shall be applied. Particularly, Paragraph 4 ruled that the presumption should not be applied if the defendant demonstrates that sufficient evidence and expertise is reasonably accessible for the claimant to prove the causal link, Paragraph 5 that the judge shall apply the presumption only if he or she considers it excessively difficult for the claimant to prove the causal link.

Finally, paragraph 6 made a distinction between use of the AI system for personal and professional activities and with regard to the first case limits

¹³⁸ art. 4, par. 2, Lett. a).

¹³⁹ art. 4, par. 2, Lett. b).

¹⁴⁰ art. 4, par. 2, Lett. c).

¹⁴¹ art. 4, par. 2, Lett. d).

¹⁴² art. 4, par. 2, Lett. e).

¹⁴³ art. 4, par. 3, Lett. a) and b).



the presumption stating that “the presumption laid down in paragraph 1 shall apply only where the defendant materially interfered with the conditions of the operation of the AI system or if the defendant was required and able to determine the conditions of operation of the AI system and failed to do so”¹⁴⁴.

In light of the above, the Directive proposal’s purpose seemed to be clear: to create simplification mechanisms with regard to the evidence to be filed by the claimant in order to counterbalance the specific procedural difficulties that may characterize a claim on AI systems¹⁴⁵ and therefore capable of discouraging the user to pretend the protection of his or her rights (and consequently the use itself of the products equipped with an AI system).

Correctly, the European Commission had taken note of how the regulation of AI liability is and will be in the next years constantly evolving and how it is therefore possible that the relevant regulation will be adapted or corrected in the future, also on the basis of data that will result from practical experience and case law.

It is believed that for this reason Article 5 (“Evaluation and targeted review”) foresaw that within five years after the end of the transposition period of the Directive, the Commission shall review its application and present a report to the European Parliament, to the Council and to the European Economic and Social Committee, accompanied, where appropriate, by a (new) legislative proposal.¹⁴⁶ Such report should analyze the effects of Articles 3 and 4 on achieving the objectives pursued by the Directive, especially with regard to “the appropriateness of no-fault liability rules for claims against the operators of certain AI systems, as long as not already covered by other Union liability rules, and the need for insurance coverage, while taking into account the effect and impact on the roll-out and uptake of AI systems, especially for SMEs”¹⁴⁷. Moreover, a data collection, analysis and exchange between the Commission and the Member States shall take place.

As much as the desire contained in the Directive proposal to improve its norms based on market and societal feedback was positive, this expressed possibility of regulatory change seems to generate some uncertainty resulting in difficulty for the various market and infrastructure players involved to understand *ex ante* what possible risks and costs they will be called upon to bear.

Such uncertainty – as seen above – is never helpful, as it risks discouraging investment in AI and driverless cars sector and in their technological development.

¹⁴⁴ art. 4, par. 6.

¹⁴⁵ See T. DE MARI CASARETO DAL VERME, *op. cit.*, 500.

¹⁴⁶ Such provision proposal was similar to the one contained in the Directive 2024/2853/EU at art. 20 (“Evaluation”): “The Commission shall by 9th December 2030, and every five years thereafter, evaluate the application of this Directive and submit a report to the European Parliament, to the Council and to the European Economic and Social Committee. Those reports shall include information about the cost and benefits of the transposition of this Directive, a comparison with OECD countries and the availability of product liability insurance.”.

¹⁴⁷ art. 5, par. 2.

A final critical remark emerges from a comparison with the European Parliament Resolution of 20th October 2020 with recommendations to the Commission on a civil liability regime for artificial intelligence¹⁴⁸.

The regulations foreseen by the Parliament and the one subject of commentary in this chapter differ in a number of respects¹⁴⁹. Particularly interesting is the fact that – unlike the Directive proposal – the Resolution of 2020 suggested a strict liability for high-risk AI-systems¹⁵⁰ and foresaw a mandatory insurance regulation¹⁵¹.

The withdrawal of the Directive proposal on adapting non-contractual civil liability rules to artificial intelligence represents, in many respects, a regrettable step backward in the process of establishing a coherent, harmonised and future-oriented regulatory framework for AI technologies. Although the proposal was still subject to refinement, it introduced essential principles aimed at addressing the distinctive challenges posed by autonomous and self-learning systems, included the difficulty in identifying a liable human actor in complex causal chains. Its withdrawal leaves a normative gap which is especially significant in the context of autonomous vehicles, where the interplay between human input, machine learning algorithms, and evolving data environments may make traditional liability models increasingly inadequate.

A harmonized European regime specifically tailored to AI-related harm would have had the potential to ensure greater legal certainty, to promote consumer trust in autonomous technologies, and to stimulate innovation by offering clearer rules of accountability. The absence of such a framework risks to increase (at least potentially) fragmentation at the national level and may hinder the safe and equitable deployment of high-risk AI systems, including (and especially) self-driving vehicles. For these reasons, the original proposal should not be viewed as a failed legislative experiment, but rather as an important reference for future initiatives that will inevitably have to revisit the question of AI-specific liability.

Establishing a legal framework concerning AI-related non-contractual liability is particularly critical for the future of driverless vehicles, which – as has been proved – represent one of the most advanced and socially impactful applications of artificial intelligence. As argued throughout this article, uncertainty surrounding the attribution of legal responsibility in case of damage caused by autonomous systems constitutes a major barrier to their large-scale deployment. Without clear rules identifying when and how compensation can be obtained, and from whom, both consumers and manufacturers are left in a state of legal limbo that inhibits trust, investment, and adoption. A legislative instrument such as the withdrawn Directive proposal – even if strongly improvable – would have provided a shared basis for as-

¹⁴⁸ 2020/2014 (INL).

¹⁴⁹ See T. DE MARI CASARETO DAL VERME, *op. cit.*, 500.

¹⁵⁰ See art. 4 (“Strict liability for high-risk AI-systems”), par. 1 of the European Parliament Resolution of 20th October 2020 with recommendations to the Commission on a civil liability regime for artificial intelligence: “The operator of a high-risk AI-system shall be strictly liable for any harm or damage that was caused by a physical or virtual activity, device or process driven by that AI-system.”

¹⁵¹ art. 4, par. 4 of the European Parliament Resolution of 20th October 2020, *op. ult. cit.*



signing liability in complex, human-machine interactions, while preserving fairness and proportionality and this is a necessary precondition for the safe, responsible, and socially accepted integration of driverless technologies into the mobility systems.

652

5. Autonomous Vehicles in the current EU Liability Framework: Immediate Effects and Future Developments.

The two Directive proposals (one approved and already in force and the other withdrawn), schematically summarised and analysed in the previous two chapters, aimed to deal with issues, which are complementary to each other.

Both Directives were intended to function in a complementary manner, each addressing distinct yet interrelated aspects of liability: the AI Liability Directive dealt with non-contractual fault-based liability regimes and thus with the risks associated with the requirements previously set by safety regulations, the Directive on liability for defective products, instead, focuses on AI systems use and production and is independent of the manufacturer's fault and it makes it possible for even a product that complies with safety standards to be considered defective¹⁵².

In the course of this brief analysis, an attempt has also been made to express what is believed to be the clear purpose of, more in general, this new kind of AI regulation: that of reassuring users and members of the community in general that they will be protected in the event of damage caused by AI systems.

This seems to respond to a principle correctly expounded by the scholarship, that “social welfare increases if the risk is allocated to a risk-neutral (or less risk-averse) party (if such a party exists) or to a party that is easily able to spread losses”¹⁵³.

Assuming that producers tend to be more able and willing to bear the risk of harm than users and other members of the community, however, the question of how responsibility will be allocated among the actors (*e.g.*, car manufacturer, supplier, software provider and its operator) who coexist within the planning and production of a certain AI system remains (at least partially) unresolved by the current legislation in force.

This problem will be even more significant in the case of autonomous vehicles, the complexity of which will certainly require collaboration among numerous subjects. In fact, there will be issues to be worked out and resolved that necessarily cannot be the responsibility of a single party. Consider, *e.g.*, driving software programming, the realization of the electronic and mechanical components of the vehicle and the management of communications between the vehicle, other vehicles, and road infrastructure.

¹⁵² T. DE MARI CASARETO DAL VERME, *Verso la nuova Product Liability Directive: la proposta della Commissione europea del 28 settembre 2022 per una nuova direttiva sulla responsabilità da prodotto difettoso che abroga la Direttiva 85/374/CEE*, in *Persona e Mercato*, 2022, vol. 2, 502-503.

¹⁵³ S. LI/M. FAURE/K. HAVU, *op. cit.*, 624.

In the event that an accident takes place it will be necessary to figure out which of these parties (or which other) is responsible for the event, and given the complexity of the technologies involved this task can also be very complex.

Directive 2024/2853 has only partially sought to address these kinds of issues, but two reasons for this decision can be found. First, there is currently a dearth of technical and empirical data on which a regulation must be based in order not to risk inconsistencies or future “short circuits”. Secondly, it could also be that the European legislator has chosen to make a choice of priorities: first of all, users must be protected, both because they are the weaker parties and their trust must be ensured; later (once AI technologies have begun to spread) a specific discipline will be proposed for the division of responsibility between various developers and programmers. In the meantime, the already existing civil law supplemented by the applicable rules of the abovementioned Directive can be used.

Instead, dwelling briefly on what may be critical aspects of Directive 2024/2853 and of the withdrawn AI liability Directive proposal, the following should be noted.

First of all, the choice of regulatory instrument (directive instead of regulation) has pros and cons. It certainly provides Member States with more room for discretion and respect for different legal traditions, but at the same time it opens the way for possible different interpretations and transposition laws resulting in a variety of norms and difficulty for users, companies and other investors to know the exact discipline in other States of the European Union.

This would happen in a technological and economic field where, on the contrary, the best possible harmonization and uniformity of law would be needed, since it is precisely on these conditions that the deployment of self-driving car technologies largely depends.

In fact, it is clear that autonomous vehicles diffusion would certainly be facilitated if their use and the regulation of liability related to them were the same throughout the entire territory of the European Union.

In this regard, it should also be remembered that according to Article 4 of the Treaty on the Functioning of the European Union, “transport” is one of the areas where there is a shared competence between the European Union and the Member States (art. 4, par. 2, Lett. g), TFUE).

Articles 90 and following of the same Treaty are specifically referred to the regulation of the transport sector. Based on such norms, the European legislator has already approved many regulations and directives in this sector, with the aim of creating increasingly harmonised legislation and ensuring as much safety as possible on European Union roads¹⁵⁴.

¹⁵⁴ See, e.g., the Reg. EC 661/2009 of the European Parliament and of the Council of 13 July 2009 concerning type-approval requirements for the general safety of motor vehicles, their trailers and systems, components and separate technical units intended therefor, OJ L 200, 31.7.2009, 1-24, and the dir. 2010/40/EU of the European Parliament and of the Council of 7 July 2010 on the framework for the deployment of Intelligent Transport Systems (ITS) in the field of road transport and for interfaces with other modes of transport, OJ L 207, 6.8.2010, 1-13.



For sure the above analysed Directive (as well as the AI liability Directive proposal) do not have autonomous vehicles as their sole object and consequently the decision on the most appropriate legal tool has to take further elements into account. Nevertheless, if we have to consider the possible impact of such law provisions on this particular technology, the abovementioned strong need for harmonization has to be highlighted and the difficulties related to the directives' characteristics taken into account.

Also, a possible alternative solution could have been to set forth specific norms having as their object only autonomous vehicles and more in detail accidents where they are involved and the consequent liability regulation with regard to damage compensation.

This would not impose a unified set of regulations covering the entire world of artificial intelligence technologies on Member States and would thus safeguard the needs of States to preserve some of their characteristic regulatory features. At the same time, however, it would ensure an efficient response to the demand for regulatory uniformity that characterizes the transportation sector and in particular driverless cars.

In any case, the European Union's legislative intervention must be as rapid and comprehensive as possible. In fact, I agree with the scholarship pointing out that "[f]or this very reason, thence to avoid market fragmentation, as well as to ensure a level-playing field and increased certainty at European level, the EU should intervene to regulate liability for accidents involving – partially – autonomous vehicles. Absent European intervention MS will regulate, adopting solutions that might prove divergent even with respect to the incentives they provide towards one form or the other of automation"¹⁵⁵.

The urgency that is pointed out above and in the preceding chapters, however, should not be interpreted as an oversight or underestimation of the difficulties that the legislator has to face, particularly that of having to create extremely innovative legislation (both on AI systems in general and autonomous vehicles in particular) without having comprehensive technical data on the technologies available themselves.

At the same time, as observed, one cannot have much empirical data without legislation governing the use of the aforementioned technologies.

Thus, we can say that a paradox is created: to be developed, legal norms require technical data and technical data legal norms. The European legislator has to navigate in this particularly treacherous and murky sea. The rocks are represented by the risk of writing a regulation that is partial and not all-encompassing – think, for example, of the difficulty of regulating the ability of the user to limit the damage of a product equipped with an AI system such as an autonomous vehicle – and that will therefore need to be improved over time. But it is essential to take the first steps.

In conclusion of this section, this article offers some final thoughts with specific reference to driverless cars' possible future legal discipline.

As discussed in previous sections, the transition to autonomous vehicles, despite their innumerable advantages, is very complex, and technological

¹⁵⁵ A. BERTOLINI/M. RICCABONI, *op. cit.*, 281.

progress is likely to come up against the fear of users to adopt this new technology.

For this reason, the discipline concerning liability will play a key role. Indeed, the guarantee of being compensated for possible damage will be much more relevant than statistical data on the safety of driverless cars in convincing users to use them.

Clear regulations ruling both autonomous car accidents and liability for defective products as well as an effective system of compensation will therefore be indispensable and should aim to make sure that a person has the certainty of being compensated in a way that is not more complex but rather more agile than now.

Furthermore, it should be noted in this regard that it will not be possible to shift liability to individual owners or users by means of informed consent alone because this would expose the weak subject to too great a risk (and thus disincentivize use). Moreover, there would be litigation related to whether a subject really understood the risk he or she was taking¹⁵⁶.

Secondly, on the other hand, it was also noted that such norms should at the same time not discourage companies from investing in the AI systems which autonomous vehicles will be equipped with. Indeed, the possibility that risks and costs will be too high for companies compared to the revenues given by the sale and use of driverless cars would be a dangerous disincentive to investments that at this stage are indispensable, both for the development of this technology in general and specifically for its success of the European market.

Thus, it is clear that “[i]n any event, we must reckon with the reality that any change in the liability system will be disruptive to someone, who may safely be expected to resist”¹⁵⁷.

It is patent that the interests of the companies producing self-driving vehicles or their intelligence software or the entities that will operate the related infrastructure must also be given due consideration.

A suggestion for a possible solution is given by the future role that insurance companies will have. Insurers, being the entity that by its own nature is best suited to manage risk, could in fact support on the one hand users and on the other producers in splitting liability for damage resulting from the circulation of autonomous vehicles or their interaction with other parties involved in road traffic: both “classic” human-driven cars as well as pedestrians and cyclists.

The importance of the role that insurance of autonomous vehicles will play will be indeed absolutely significant for the deployment of these technologies. In fact, along with the cost of using self-driving cars, the price and breadth of coverage of insurance policies will be critical in enabling their success or failure¹⁵⁸.

Likewise, manufacturers will also need to take out suitable insurances to protect themselves from the risks to which the product liability regulations analyzed above will expose them.

¹⁵⁶ J.-A. PATTINSON/H. CHEN/S. BASU, *op. cit.*, 4 and 7.

¹⁵⁷ A. F. SCALES, *op. cit.*, 194.

¹⁵⁸ K. NOUSSIA, *op. cit.*, 256.



For sure, insurance companies will have to consider how road traffic (and consequently) accidents will drastically change with driverless cars deployment. Insurance's object and characteristics will necessarily be different than current ones¹⁵⁹.

Certainly, in the changing world of vehicle circulation also the role of the relevant insurance companies will have to change, but this does not vary the fact that the latter, if they can evolve efficiently and there is the support of a suitable regulatory framework, can be decisive in the development of driverless cars.

In first approximation one can think that insurers will probably prefer that the legal system keep liability centered on owners (like the Italian Civil Code currently does) rather than on producers, also because owners are parties with whom insurers have much more negotiating power¹⁶⁰.

Nevertheless, at this still embryonic stage of the development of liability legislation related to the use of self-driving vehicles, a different or at least more nuanced development of such legislation certainly should not be ruled out.

More generally, the regulatory framework on autonomous vehicles that will be equipped with AI systems has been seen to be now at a central stage of its development, and it is therefore imperative the legislator succeed in making the best decisions for their deployment. Certainly, it will be preferable this be done uniformly at the European Union level instead of individual Member States.

6. An Effectiveness Simulation: Analysis of a Possible Application of Directive (EU) 2024/2853 to Actual Accidents Involving Self-Driving Vehicles.

The following section aims at examining the practical implications of the Directive (EU) 2024/2853.

Therefore, the conclusion of this brief study will be an attempt to carry out an "empirical" simulation of the possible application of Directive (EU) 2024/2853 on liability for defective products. In particular, the possible impact of the Directive application will be assessed with regard to some accidents involving autonomous or partially autonomous vehicles that actually took place in the last years.

All the cases under analysis occurred in the United States of America and therefore the application of the Directive is clearly only hypothetical on a type of accident corresponding to those that occurred. However, these cases were chosen because, (i) with respect to the first three, the National Transportation Safety Board provides very detailed reports on the characteristics of the accident that were useful in this analysis; (ii) those subject of the last section (which occurred in 2023) because they involved autonomous vehi-

¹⁵⁹ See the analyses carried out by V. MARDIROSSIAN, *op. cit.*, 285-289 and by S. LANDINI, *op. cit.*, 296-297.

¹⁶⁰ A. F. SCALES, *op. cit.*, 194.

cles which are currently not allowed to be used on “normal” public roads within the European Union.

The purpose of this analysis is to assess the effectiveness of Directive 2024/2853 and whether it would be able to clearly and fairly indicate who is responsible for each accident and who is entitled to compensation and how this compensation could be determined.

6.1.The Collision between a Car Operating with Automated Vehicle Control Systems and a Tractor-Semitrailer Truck of 7th May 2016.

6.1.1. Accident reconstruction.

According of the accident report issued by the National Transportation Safety Board (NTSB)¹⁶¹: on “May 7, 2016, a 2015 Tesla Model S 70D car, traveling eastbound on US Highway 27A (US-27A), west of Williston, Florida, struck a refrigerated semitrailer powered by a 2014 Freightliner Cascadia truck-tractor. At the time of the collision, the truck was making a left turn from westbound US-27A across the two eastbound travel lanes onto NE 140th Court, a local paved road. The car struck the right side of the semitrailer, crossed underneath it, and then went off the right roadside at a shallow angle. The impact with the underside of the semitrailer sheared off the roof of the car”¹⁶². While the truck driver was not injured, the driver of the car died in the crash.

The report points out also that “System performance data downloaded from the Tesla indicated that the driver was operating the car using features of its Autopilot suite: Traffic-Aware Cruise Control (TACC)¹⁶³ and the Autosteer lane-keeping system¹⁶⁴. ‘Autopilot’ is a proprietary name used by Tesla for a combination of vehicle automation systems that provide driver assistance. The car was also equipped with a forward collision warning (FCW) system and automatic emergency braking (AEB), but those systems did not activate. System performance data indicated that the vehicle speed just before impact with the semitrailer was 74 mph. The highway has a posted speed limit of 65 mph”¹⁶⁵.

¹⁶¹ The Accident Report, NTSB/HAR-17/02 PB2017-102600, is available at the following link: < <https://www.nts.gov/investigations/accidentreports/reports/har1702.pdf> > (4.01.2024). All the information referred to this accident is drawn from the same report. The accident is mentioned also by J. STILGOE in *op. cit.*, 635, and, more in detail, in *Machine learning, social learning and the governance of self-driving cars*, in *Social Studies of Science*, vol. 48, no. 1, 2018, 25-56.

¹⁶² Accident Report, NTSB/HAR-17/02 PB2017-102600, *op. ult. cit.*, vi.

¹⁶³ In the Accident Report, *op. cit.*, the “TACC” is described at p. 9 as “an adaptive cruise control system that maintains the set cruise speed, applies brakes to preserve a predetermined following distance when approaching a slower-moving vehicle ahead of the Tesla, and accelerates to the set cruising speed when the area in front of the Tesla is no longer obstructed.”.

¹⁶⁴ The “Autosteer”, instead, according to the Accident Report at p. 9 “automatically steers the car to keep it within its lane of travel.”.

¹⁶⁵ Accident Report, NTSB/HAR-17/02 PB2017-102600, *op. cit.*, 1.



Consequently, the car's level of automation was 2 of the SAE taxonomy of driving automation systems. For the purposes of this analysis (as well as of that of the NTSB report) it should be remembered that "[w]hen operating a Level 2 vehicle, the driver is responsible for monitoring the driving environment"¹⁶⁶. The tasks performed by this level of automation are steering and acceleration/deceleration, but with only a partial degree of automation and therefore the "driver engagement remains integral to the automated driving system"¹⁶⁷.

6.1.2. The causes of the crash.

In light of the detailed analysis carried out in its report, the NTSB states in its conclusions that "[n]o investigative evidence indicates that either driver was fatigued, that cell phone use distracted the truck driver, that the car driver was impaired by alcohol or other drugs, that any mechanical system on either vehicle failed, or that the highway design was inappropriate; consequently, these were not factors in the crash." (point 1); "There was sufficient sight distance to afford time for either the truck driver or the car driver to have acted to prevent the crash." (point 2); "The Tesla's automated vehicle control system was not designed to, and did not, identify the truck crossing the car's path or recognize the impending crash; consequently, the Autopilot system did not reduce the car's velocity, the forward collision warning system did not provide an alert, and the automatic emergency braking did not activate." (point 3)¹⁶⁸.

Consequently, according to the same NTSB, the probable cause of the accident was "the truck driver's failure to yield the right of way to the car, combined with the car driver's inattention due to overreliance on vehicle automation, which resulted in the car driver's lack of reaction to the presence of the truck"¹⁶⁹.

At the same time, however, it should be noted that the NTSB considers that there are liability profiles also with respect to the autonomous driving system. In fact, the report points out that "driver's pattern of use of the Autopilot system indicates an overreliance on the automation and a lack of understanding of system limitations" (point 7) and that how the automated driving system "monitored and responded to the driver's interaction with the steering wheel was not an effective method of ensuring driver engagement" (point 9).¹⁷⁰

Therefore, the operational design of the vehicle automation was considered a contributing factor to the driver's overreliance and to his prolonged disengagement from the driving tasks with a consequent "use of the automa-

¹⁶⁶ Accident Report, NTSB/HAR-17/02 PB2017-102600, *op. cit.*, 24.

¹⁶⁷ Accident Report, NTSB/HAR-17/02 PB2017-102600, *op. cit.*, 27.

¹⁶⁸ Accident Report, NTSB/HAR-17/02 PB2017-102600, *op. cit.*, 41.

¹⁶⁹ Accident Report, NTSB/HAR-17/02 PB2017-102600, *op. cit.*, 42.

¹⁷⁰ Accident Report, NTSB/HAR-17/02 PB2017-102600, *op. cit.*, 41.

tion in ways inconsistent with guidance and warnings from the manufacturer”¹⁷¹.

6.1.3. Application simulation of Directive 2024/2853 to this incident.

| 659

According to the NTSB report the crash between the Tesla and the truck was caused by three factors: (a) the truck driver’s conduct (failure to yield the right of way to the car); (b) the car driver’s conduct (lack of the necessary concentration and focus when driving); (c) the automated driving systems characteristics (operational design that did not prevent a prolonged disengagement of the driver from the driving tasks).

Consequently, it is not possible to identify a single subject liable for the crash but the relevant responsibility has to be divided between the two drivers and the car manufacturer.

In the same way indicating the three subjects as sharing equal responsibility does not seem correct. The main responsible party appears to be the truck driver, who did not comply with a legal driving regulation. The car driver inattention is the secondary crash contributing factor, while the shortcomings of the autonomous driving system appear to play only a marginal role.

In order to attempt to simulate the application of Directive 2024/2853 (and thus to identify the liability profiles of the manufacturer of the product equipped with AI) to the 7th May 2016 fatal crash involving a vehicle operating with partially automated driving systems we should consider exclusively the relationship between the injured party (or his successors) and the economic operator (the car manufacturer). As this chapter focuses on product liability under the new Directive 2024/2853, the causal contribution of the truck driver, although clearly the primary factor according to the NTSB report, must be set aside for analytical purposes. Consequently, the legal assessment under the Directive must consider whether, and to what extent, the vehicle driver could have sought compensation from the manufacturer on the basis of a product defect within the meaning of Articles 5 and following of the Directive.

According to the NTSB findings, the partially automated car driver was inattentive and failed to intervene despite having had sufficient time to do so: a conduct that significantly contributed to the fatal outcome. This circumstance would likely limit the driver’s entitlement to full compensation under Directive 2024/2853, as their contributory negligence constitutes a significant causal factor in the occurrence of the crash.

Nonetheless, the Directive does not exclude compensation where the product is defective and has contributed to the damage. Under Article 7 of the Directive, the assessment of defectiveness must also take into account the instructions for use provided by the manufacturer (art. 7, par. 2, Lett. a)). In this case, a reasonable argument could be made that the vehicle lacked

¹⁷¹ Accident Report, NTSB/HAR-17/02 PB2017-102600, *op. cit.*, 42.



sufficiently explicit and effective instructions regarding the need for continuous driver supervision and the timely resumption of control.

Additionally, the absence of a robust driver monitoring system – capable of detecting and reacting to prolonged driver disengagement – may further support the finding of a defect. These factors, taken together, could justify a partial attribution of liability to the manufacturer under the Directive.

In addition to Articles 5 (“Right of compensation”)¹⁷² 6 (“Damage”)¹⁷³ and 7 (“Defectiveness”), other provisions of Directive (EU) 2024/2853 may be relevant within the framework of a legal analysis of this case. For instance, Article 10, Paragraph 4, (under certain requirements that the claimant should meet) provides for a presumption of defectiveness of the product and of causality when it is excessively difficult for the injured person, in particular due to technical or scientific complexity, to prove the defectiveness of the product or the causal link between its defectiveness and the damage, or both. This provision could potentially assist in cases involving complex autonomous systems where the causal chain cannot be easily reconstructed by anyone other than the manufacturer.

Moreover, Article 7, Paragraph 2, Letter b), specifies that in assessing the defectiveness of a product the reasonably foreseeable use of the product must be also taken into account. Such “foreseeable use” might include excessive reliance on the system by users despite clear warnings, raising the question of whether such reliance was, in fact, reasonably foreseeable in light of the system’s design and communication.

All these elements together suggest that, even in the absence of a dominant causal role, the manufacturer might still bear a measurable share of responsibility under the Directive’s framework.

The simulated application of Directive (EU) 2024/2853 to the aforementioned crash illustrates the Directive’s capacity to modernize the notion of product defect, enabling courts to consider software failures, inadequate safety instructions, and even design omissions – such as insufficient driver monitoring mechanisms – as potential grounds for liability. This evolution is crucial in adapting legal standards to increasingly intelligent and complex products.

At the end of this simulation the Directive appears to provide a valuable legal toolkit for assigning liability to manufacturers in complex cases such as the one examined; nevertheless, it may fall short in fully capturing scenarios characterised by overlapping human error and system malfunction, where responsibility is inherently distributed.

¹⁷² “It should be recalled that this provision establishes the right to compensation not only for the injured party, but also, under par. 2, Lett. a), for “a person that succeeded, or was subrogated, to the right of the injured person by virtue of Union or national law or contract”.

¹⁷³ According to which “The right to compensation pursuant to Article 5 shall apply in respect of only the following types of damage: (a) death or personal injury, including medically recognised damage to psychological health; [...]”.

6.2. The Collision between a Vehicle Controlled by a Developmental Automated Driving System and a Pedestrian of 18th March 2018.

6.2.1. Accident reconstruction.

The following accident took place on 18th March 2018, at 9:58 p.m., when “an automated test vehicle, based on a modified 2017 Volvo XC90 sport utility vehicle (SUV), struck a female pedestrian walking across the northbound lanes of N. Mill Avenue in Tempe, Arizona. The SUV was operated by the Advanced Technologies Group of Uber Technologies, Inc., which had modified the vehicle with a proprietary developmental automated driving system (ADS). A female operator occupied the driver’s seat of the SUV, which was being controlled by the ADS. The road was dry and was illuminated by street lighting”¹⁷⁴. After the crash the pedestrian died on scene from multiple blunt force injuries while the car driver (*rectius* the vehicle operator) was not injured¹⁷⁵.

The pedestrian was pushing a bicycle at her left side and the location had no crosswalk¹⁷⁶ and the landscape median that separated the northbound and southbound travel lanes on N. Mill Avenue contained four signs prohibiting pedestrian crossing. Based on the available information it was not possible to determine “how the pedestrian arrived at the median, or whether she reached it by crossing N. Mill Avenue midblock, outside a crosswalk”¹⁷⁷.

6.2.2. The causes of the crash.

¹⁷⁴ The Accident Report, NTSB/HAR-19/03 PB2019-101402, is available at the following link: < <https://www.nts.gov/investigations/accidentreports/reports/har1903.pdf> > (10.02.2024). All the information referred to this accident is drawn from the same report. This quote is from p. v. The accident is mentioned also by J. STILGOE, in *Self-driving cars will take a while to get right*, *op. cit.*, 203, and in *How can we know a self-driving car is safe?*, *op. cit.*, 635-636. The Author particularly emphasized that this accident, as well as the one that took place in Florida described in the previous pages “and the investigations that have followed, have revealed not just a carelessness among some developers, but also a lack of consensus about how to assess risk, and an absence of clear regulation or standards to govern the testing or approval of new self-driving technologies. These incidents remind us not just of a technology’s limits, but also of the flaws of a mode of governance that leaves technology developers to their own devices.”.

The same Author analyses the Arizona crash also in *Who’s Driving Innovation? New Technologies and the Collaborative State*, Cham-Switzerland, 2020, 1-6 and offers a critique of the relevant driverless car testing rules and methods.

The accident involving the modified Volvo XC90 and the pedestrian has been analysed and commented by several other scholars. See, e.g., H. STAMP, *The Reckless Tolerance of Unsafe Autonomous Vehicle Testing: Uber’s Culpability for the Criminal Offense of Negligent Homicide*, in *Journal of Law, Technology, & the Internet*, 2019, 2024, vol. 15, no. 1, 37-75, and M.C. ELISH, *Moral Crumple Zones: Cautionary Tales in Human-Robot Interaction*, in *Engaging Science, Technology, and Society*, 2019, vol. 5, 40-60.

¹⁷⁵ Accident Report, NTSB/HAR-19/03 PB2019-101402, *op. ult. cit.*, 5.

¹⁷⁶ Accident Report, NTSB/HAR-19/03 PB2019-101402, *op. cit.*, 1.

¹⁷⁷ Accident Report, NTSB/HAR-19/03 PB2019-101402, *op. cit.*, 4-5.



The NTSB, in reconstructing the incident, notes a fundamental element for the purposes of the identification of the crash liability when it describes the functioning of the automated driving technology immediately before the accident: “[a]ccording to ADS data, the system first detected the pedestrian 5.6 seconds before the crash. It initially classified the pedestrian as a vehicle, and subsequently also as an unknown object and a bicyclist. Although the ADS continued tracking the pedestrian until the crash, it did not correctly predict her path or reduce the SUV’s speed in response to the detected pedestrian. By the time the system determined that a collision was imminent and the situation exceeded the response specifications of the ADS braking system to avoid the collision – 1.2 seconds before impact – the design of the system relied on the vehicle operator to take control of the vehicle. In such situations, the design of the ATG ADS precluded emergency braking for crash mitigation alone”¹⁷⁸.

With reference to the vehicle mechanical condition, no damage or defects in any major mechanical system that could have affected the car’s performance was found¹⁷⁹.

With regard to the behaviour of the parties involved (the car driver and the pedestrian) the report describes that the vehicle operator – a 44-year-old female with no health issues – had been working as an automated vehicle operator for ATG (Advance Technologies Group – Uber) since June 2017, was familiar with the place and before the day of the crash had already completed a 3-week training program as well as subsequent recurrent training classes and had completed the designated route 73 times in autonomous mode since completing her training. It was probable that at the time of the crash she was using (or watching) her phone¹⁸⁰.

The pedestrian was instead a 49-year-old woman. Her toxicological tests identified drugs in her system, including methamphetamine and an inactive marijuana metabolite that could have affect the woman’s perception and judgement¹⁸¹.

Consequently, also the pedestrian behaviour was one of the causes of the tragic accident.

Nevertheless, a more relevant cause was the abovementioned vehicle operator’ actions: particularly the operator was often distracted while in the car to look at her phone. Also, immediately before the impact, six seconds, the

¹⁷⁸ Accident Report, NTSB/HAR-19/03 PB2019-101402, *op. cit.*, 1. See also 36.

¹⁷⁹ Accident Report, NTSB/HAR-19/03 PB2019-101402 *op. cit.*, 6 and 36.

¹⁸⁰ According to the Report, NTSB/HAR-19/03 PB2019-101402, *op. cit.*, 1: “[v]ideo from an ATG-installed inward-facing camera shows that the operator was glancing away from the roadway for extended periods throughout the trip. Specifically, she was looking down toward the bottom of the center console where she had placed her cell phone at the start of the trip. According to her phone records, the operator was streaming a television show using an application on her phone. About 6 seconds before the crash, she redirected her gaze downward, where it remained until about 1 second before the crash.” The same report, at page 24, observes that “NTSB investigators examined the records that the TPD obtained from the content providers. The records showed that the account belonging to the vehicle operator was continually streaming a television show between 9:16 p.m. and 9:59 p.m. on March 18. That period covered the entire crash trip, which included 39 minutes on a public road.” See. Also pages 42-43.

¹⁸¹ Accident Report, NTSB/HAR-19/03 PB2019-101402, *op. cit.*, 22 and 36-37.

operator looked for five seconds at the bottom of the centre console (where the phone was located) and only about one second before the impact she returned her gaze to the road, not in time to steer away¹⁸². According to the NTSB report an attentive driver would have been able to detect the pedestrian and stop the vehicle before the impact or in any case to avoid (or at least mitigate) the crash¹⁸³.

Therefore, according to the NTSB's report, the operator's failure to monitor the driving environment because of her visual distraction was the main cause of the accident. Contributing factors were Uber Advanced Technologies Group's inadequate safety risk assessment procedures, an ineffective oversight of vehicle operators and a lack of adequate mechanisms for addressing operators' automation complacency¹⁸⁴.

With regard to the most relevant aspects in this article, the NTSB points specifically out in its report conclusions that "[t]he Uber Advanced Technologies Group did not adequately manage the anticipated safety risk of its automated driving system's functional limitations, including the system's inability in this crash to correctly classify and predict the path of the pedestrian crossing the road midblock." (point 3); "[t]he aspect of the automated driving system's design that precluded braking in emergency situations only when a crash was unavoidable increased the safety risks associated with testing automated driving systems on public roads." (point 4); "[t]he aspect of the automated driving system's design that precluded braking in emergency situations only when a crash was unavoidable increased the safety risks associated with testing automated driving systems on public roads." (point 5); "[t]he Uber Advanced Technologies Group's deactivation of the Volvo forward collision warning and automatic emergency braking systems without replacing their full capabilities removed a layer of safety redundancy and increased the risks associated with testing automated driving systems on public roads." (point 7); "[h]ad the vehicle operator been attentive, she would likely have had sufficient time to detect and react to the crossing pedestrian to avoid the crash or mitigate the impact." (point 9); "[t]he Uber Advanced Technologies Group did not adequately recognize the risk of automation complacency and develop effective countermeasures to control the risk of vehicle operator disengagement, which contributed to the crash." (point 11); "[a]lthough the Uber Advanced Technologies Group had the means to retroactively monitor the behavior of vehicle operators and their adherence to operational procedures, it rarely did so; and the detrimental effect of the company's ineffective oversight was exacerbated by its decision to remove the second vehicle operator during testing of the automated driving system." (point 13); "[t]he Uber Advanced Technologies Group's inadequate safety culture created conditions – including inadequate oversight of vehicle operators –that contributed to the circumstances of the crash and specifically to the vehicle operator's extended distraction during the crash trip." (point 15)¹⁸⁵.

¹⁸² Accident Report, NTSB/HAR-19/03 PB2019-101402, *op. cit.*, 42.

¹⁸³ Accident Report, NTSB/HAR-19/03 PB2019-101402, *op. cit.*, 44.

¹⁸⁴ Accident Report, NTSB/HAR-19/03 PB2019-101402, *op. cit.*, v and 59.

¹⁸⁵ Accident Report, NTSB/HAR-19/03 PB2019-101402, *op. cit.*, 57-58.



6.2.3. Application simulation of Directive 2024/2853 to this incident.

In order to simulate the application of Directive (EU) 2024/2853 to the incident of 18th March 2018 we will first assume that the successors of the victim initiate a civil action for damages against the driver and/or the owner of the vehicle involved in the accident. As in the previous case, for the purposes of this specific legal analysis, the contributory conduct of the pedestrian – although relevant in reality – will be set aside.

Within this simulation, the defendant (the driver and/or owner of the vehicle) is expected to involve the manufacturer in the proceedings, claiming that the latter should bear liability for the damage caused by the vehicle equipped with driverless technology. Conversely, the manufacturer will seek to demonstrate that the sole proximate cause of the crash was the inattention of the vehicle operator, who failed to intervene in time to prevent the collision because she was distracted.

According to the findings of the National Transportation Safety Board, multiple factors contributed to the incident (beyond the pedestrian’s own behaviour). These include the distracted conduct of the on-board operator and the malfunction of the autonomous driving technology and the absence of adequate oversight mechanisms. In particular, the system failed to correctly classify the pedestrian as a human being in a timely manner, did not adequately predict her path and initiated emergency too late.

These failures raise significant concerns under Directive 2024/2853, as they reflect both a potential defect in the product itself and a lack of adequate safeguards to prevent foreseeable harm. On the other hand, supervisory failures attributable to the operator (if acting on behalf of the vehicle’s owner) may further compound the responsibility of non-manufacturer parties.

As in the previous case, these facts suggest a partial liability of the manufacturer.

Under Article 5 of the Directive, the victim’s family members would be entitled to compensation for personal injury resulting in death (Article 5, Paragraph 2, Letter a)), should a product defect be established.

However, it should also be noted, although as a surely secondary fact, that according to the following Article 6, even in the hypothetical case where full responsibility were attributed to the manufacturer, no compensation would be due for the loss suffered by the vehicle owner for the damages at the autonomous car itself, because this is the “defective product” for which Article 6, Paragraph 2, Letter b) explicitly excludes recovery for damage.

This appears to be a relevant structural limitation of the Directive with regard to accidents involving driverless vehicles, considering that crashes, but also post-incident analysis and technical inspections often require substantial repair or destruction of the system. The inability to claim for such loss may act as a disincentive to pursuing fault-based litigation, especially

when the defective product is of high economic value and integrally involved in the production of harm.

In conclusion, the simulated application of Directive 2024/2853 to the 18th March 2018 crash illustrates both some of the strengths of the Directive, but also how it may still require refinement in its treatment of damages involving the defective product itself, particularly in light of the economic and evidentiary realities of high-tech and autonomous systems such those that will be use by driverless vehicles.

6.3.The Collision between a Sport Utility Vehicle Operating with Partial Driving Automation and a Crash Attenuator of March 23, 2018.

6.3.1. Accident reconstruction.

This third accident took place in Mountain View, California only a few days after the one in Arizona described above: “[o]n Friday, March 23, 2018 at 9:27 a.m., a 2017 Tesla Model X P100D electric-powered sport utility vehicle (SUV), operated by a 38-year-old driver, was traveling south on US Highway 101 (US-101) in Mountain View, Santa Clara County, California.” ... “A 630-foot-long paved gore with an unmarked neutral (inside) area separated the left-exit HOV lane for SR-85 from the US-101 HOV lane. The gore widened to about 17.5 feet at the point where a previously damaged and nonoperational crash attenuator was in place ahead of a 3-foot-high concrete barrier” [...] “As the SUV approached the US-101–SR-85 interchange, it was traveling in the second lane from the left with the Tesla’s Autopilot system activated (for more detail on the operational performance data, see section 1.2). When the SUV reached the gore dividing the main travel lanes of US-101 from the left exit ramp to SR-85, the vehicle moved to the left. It entered the gore, through which it continued traveling until the front left of the SUV struck the crash attenuator at a speed of 70.8 mph. The impact rotated the SUV counterclockwise and caused the front body structure to separate from the rear of the vehicle. The SUV was subsequently struck by two other vehicles, a 2010 Mazda 3 and a 2017 Audi A4, when it rotated into the lane to the right of the gore” [...] “The 51-year-old female driver of the Audi was uninjured, and the 25-year-old male driver of the Mazda sustained minor injuries. The Tesla driver died at Stanford Health Care Hospital at 1:02 p.m., 4 hours 35 minutes after the crash. The cause of death was multiple blunt-force injuries that included a fractured pelvis and significant internal injuries”¹⁸⁶.

The technology of this auto was similar to the one of the cars involved in the accident of 7th May 2016 in Florida: the car was equipped with an autopilot whose major subsystems are the Traffic-Aware Cruise Control (providing longitudinal control, *i.e.* acceleration and deceleration) and the Auto-

¹⁸⁶ The Accident Report, NTSB/HAR-20/01 PB2020-100112, is available at the following link: < <https://www.nts.gov/investigations/AccidentReports/Reports/HAR2001.pdf>> (19.02.2024). All the information referred to this accident is drawn from the same report. This quote is from pages 1-3.



steer (providing lateral control of the vehicle inside the lane, *i.e.* steering). According to the information collected by the NTSB the autopilot was active before the crash.

With specific reference to the manoeuvre that caused the accident, this was reconstructed as follows: “[w]hen the Tesla was about 5.9 seconds and about 560 feet from the crash attenuator, Autosteer initiated a left steering input (5.6 degrees at the steering wheel) toward the neutral area of the gore. At the time of the steering movement, no driver-applied steering wheel torque was detected by Autosteer. It is possible that hands can be resting on the steering wheel and no torque is registered. However, a lack of steering wheel torque indicates to the vehicle system that the driver’s hands are not on the steering wheel. This hands-off steering indication continued up to the point of impact with the crash attenuator. When the SUV was about 3.9 seconds and 375 feet from the crash attenuator and fully inside the neutral area of the gore, the TACC no longer detected a lead vehicle ahead and the SUV began accelerating from a speed of 61.9 mph to the preset cruise speed of 75 mph. The forward collision warning (FCW) system did not provide an alert and the automatic emergency braking (AEB) did not activate as the Tesla approached the crash attenuator. The data indicated that the SUV driver did not apply the brakes and did not initiate any steering movement to avoid the crash”¹⁸⁷.

6.3.2. The causes of the crash.

The car driver was a 38-year-old male with a good physical condition and the postmortem toxicology test did not detect alcohol or other tested-for drugs in his system¹⁸⁸. According to the data collected by the NTSB on the driver’s phones it was possible to note that a game application was active during the trip and was the frontmost application when the accident took place¹⁸⁹. In any case the report states that the driver’s inaction was so significant that, “given the numerous visual cues of a hazard ahead and unobstructed view, indicates that the driver was inattentive to his forward view and was not appropriately supervising the Autopilot vehicle control system”¹⁹⁰.

With regard to the car, the report points out that a full examination of its mechanical components was not possible due to the damage caused by the accident (and the subsequent fire)¹⁹¹.

With specific reference to the driving technology, the NTSB tried to determine why the autosteer directed the car into an area (the neutral one of the gore) which was not intended for vehicles. According to Tesla engineers “the Autosteer system likely momentarily lost its lane line prediction and/or identified a stronger lane line on the left side of the gore. Also, at the time of

¹⁸⁷ Accident Report, NTSB/HAR-20/01 PB2020-100112, *op. ult. cit.*, 6.

¹⁸⁸ Accident Report, NTSB/HAR-20/01 PB2020-100112, *op. cit.*, 17.

¹⁸⁹ Accident Report, NTSB/HAR-20/01 PB2020-100112, *op. cit.*, 19 and 33.

¹⁹⁰ Accident Report, NTSB/HAR-20/01 PB2020-100112, *op. cit.*, 33.

¹⁹¹ Accident Report, NTSB/HAR-20/01 PB2020-100112, *op. cit.*, 10.

the crash, bright sunlight was shining toward the Tesla's forward-facing camera at an angle of 6 degrees to the left of the vehicle's center and 26 degrees above the horizon. Although the effect of the bright light on the Tesla vision system cannot be determined with certainty, investigators determined that the sunlight presented no more than discomfort glare to the human eye and the lines delineating the gore were readily visible. Although an exact reason is not known, a steering movement into the gore was associated with the vision system's processing software not accurately predicting the path of the current lane of travel. Therefore, the NTSB concludes that the Tesla's Autopilot lane-keeping assist system steered the SUV to the left into the neutral area of the gore, without providing an alert to the driver, due to limitations of the Tesla Autopilot vision system's processing software to accurately maintain the appropriate lane of travel"¹⁹².

But there was also a malfunction with the collision avoidance system, which should have prevented the collision with the crash attenuator.

Such a system is "designed to recognize and detect slow, stopped, and decelerating vehicles when they are traveling ahead of the Tesla in the same lane", but was "not designed to, and did not, detect the crash attenuator at the end of the gore"¹⁹³.

Finally, it should be also observed that on the day of the crash "the crash attenuator was in a nonoperational, damaged state due to a previous crash that occurred on March 12, 2018"¹⁹⁴.

In light of the above, the NTSB stated that "that the probable cause of the Mountain View, California, crash was the Tesla Autopilot system steering the sport utility vehicle into a highway gore area due to system limitations, and the driver's lack of response due to distraction likely from a cell phone game application and overreliance on the Autopilot partial driving automation system. Contributing to the crash was the Tesla vehicle's ineffective monitoring of driver engagement, which facilitated the driver's complacency and inattentiveness. Contributing to the severity of the driver's injuries was the vehicle's impact with a crash attenuator barrier that was damaged and nonoperational at the time of the collision"¹⁹⁵.

6.3.3. Application simulation of the Directive 2024/2853 to this incident.

Among the three case studies examined in this article, the incident that occurred in Mountain View on 23rd March 2018 arguably provides the most interesting factual scenario where simulate the application of the law provisions foreseen by Directive (EU) 2024/2853.

In this case, a partially driverless vehicle, *i.e.* a product incorporating artificial intelligence, presented multiple identifiable defects. These defects, as documented by the NTSB, were directly linked to the fatal injuries sustained

¹⁹² Accident Report, NTSB/HAR-20/01 PB2020-100112, *op. cit.*, 32.

¹⁹³ Accident Report, NTSB/HAR-20/01 PB2020-100112, *op. cit.*, 32.

¹⁹⁴ Accident Report, NTSB/HAR-20/01 PB2020-100112, *op. cit.*, 23.

¹⁹⁵ Accident Report, NTSB/HAR-20/01 PB2020-100112, *op. cit.*, 58.



by the driver. The scenario thus aligns closely with the sequence of legal relevance established in the Directive: the presence of a defective product, the occurrence of compensable damage, and the emergence of a right to compensation on the part of the injured party or his or her successors.

According to the findings of the NTSB, the product defects in question were multiple. First, the lane-keeping assist system (Autosteer) steered the vehicle into a gore area not intended for vehicular traffic, without issuing any warning to the driver. This behaviour was attributed to a deficiency in the vision processing software, which failed to correctly interpret lane markings in the presence of conflicting or ambiguous visual cues. Second, the vehicle's collision avoidance system failed to detect the crash attenuator – a stationary object directly in the vehicle's path – and did not activate either a forward collision warning or the emergency braking system. This limitation of the detection algorithm constitutes a further functional shortcoming in the autonomous driving technology. Third, the driver monitoring system was ineffective: although the driver did not provide any corrective input during the final seconds before the crash, the system failed to alert or disengage, and therefore did not mitigate the impact of the human operator's distraction.

Under the legal framework provided by Directive 2024/2853, these characteristics would have strongly supported a finding of product defectiveness pursuant to Article 7.

In particular, under Article 7, Paragraph 2, Letter a), the defectiveness of a product must be assessed by considering also the instructions, warnings, and information provided by the manufacturer. In this case, the absence of clear guidance on the limitations of the vision system and on the system's incapacity to respond autonomously to stationary objects could be interpreted as a failure to properly instruct users. This is in addition to the technical defects and malfunctions described above. Furthermore, under Article 7, Paragraph 2, Letter b), the assessment must consider the reasonably foreseeable use of the product: drivers of partially autonomous vehicles frequently rely heavily on autopilot functionality, even in complex driving scenarios, raises a legitimate question as to whether the manufacturer should have foreseen such overreliance, and thus designed more robust safeguards against driver disengagement.

Moreover, Article 10, Paragraph 2, Letter c), foresees a presumption of defectiveness when the damage was caused by an obvious malfunction of the product during reasonably foreseeable use or under ordinary circumstances. In this case, both the nature of the incident and the documented technological failures support the application of this presumption. Additionally, as seen in the first case analysis, Article 10, Paragraph 4, provides a presumption of causal link between the defect and the damage in cases where the injured party would face excessive difficulty in proving such a link due to technical or scientific complexity. Given that the manufacturer is in exclusive possession of key data concerning the internal functioning of the vision and braking systems, this provision would likely strengthen the claimant's position in a litigation scenario.

As regards the damage, Article 6, Paragraph 2, Letter a), confirms that the death of the driver qualifies as compensable personal injury. However, in accordance with Article 6, Paragraph 2, Letter b), no compensation would be due for damage to the defective product itself – i.e., the destroyed vehicle – which – as we have already discussed – represents a structural limitation of the Directive, especially problematic when the defective product constitutes a high-value item that is itself destroyed in the process of causing harm.

Despite the above, the manufacturer would not necessarily be required to cover the full amount of the compensation. As stated in the NTSB report, the driver's own distraction – likely due to active engagement with a mobile game application – played a critical role in the failure to correct the vehicle's course. Therefore, the manufacturer could invoke the contributory conduct of the injured party to reduce its liability. While the Directive does not itself regulate apportionment, such determination would be made under national law, and most legal systems would foresee a reduction in damages proportional to the degree of the victim's fault.

Additionally, a second exogenous factor contributes to the overall outcome: the nonoperational state of the crash attenuator, which had been previously damaged and not repaired. Although this falls outside the scope of product liability under the Directive, it may have had a significant impact on the severity of the injuries sustained, thus indirectly affecting the quantification of compensable damages to be paid by the manufacturer.

In conclusion, the application of Directive 2024/2853 to this incident strongly suggests that the vehicle manufacturer could be held substantially liable for the death of the driver, based on the presence of multiple system-level defects and the foreseeable use of the product. At the same time, the contributory fault of the victim and external infrastructural deficiencies would result in a reduction of the recoverable compensation, to be assessed under the applicable national tort regime. This case thus represents an exemplary scenario for testing the effectiveness of the Directive in balancing technological accountability with user responsibility in the context of semi-autonomous driving systems.

6.4. More Recent Cases: Brief Simulations of Directive 2024/2853 Application to Two Accidents that Took Place in 2023.

In conclusion of these simulation attempts, the application of Directive 2024/2853 will be tried against some accidents where self-driving vehicles were involved that took place in 2023.

Considering that during the drafting of this article finding detailed reports on these accidents was not possible, the only available sources were online information outlets. The analyses that follow are therefore only based on partial information.

On the other hand, these cases are particularly interesting because they involve fully autonomous vehicles (which are not marketable in Europe yet)



and are therefore particularly useful in the context of this simulation of the application of the Directive 2024/2853.

6.4.1. The Robotaxi Crash with a Fire Truck in San Francisco of 17th August 2023 and the Application Simulation of Directive 2024/2853.

On 17th August 2023 a “driverless robotaxi [...] was involved in a collision with a fire truck in San Francisco Thursday evening, injuring the vehicle’s passenger”. According to the available information the driverless vehicle entered the intersection on a green light but “did not yield to the fire truck that was responding to a call nearby”¹⁹⁶.

In simulating the applicability of Directive (EU) 2024/2853 to the collision between a driverless robotaxi and a fire truck, the focus will be placed on the rights of the passenger inside the autonomous vehicle, who sustained injuries as a result of the crash. Under the Directive, the injured passenger – as a natural person using the defective product – clearly qualifies as a potential claimant under Article 6, Paragraph 1, Letter a), which grants a right to compensation for personal injury caused by a defective product.

Although no official investigative report is currently available, the facts as reported suggest a possible failure of the vehicle’s environment recognition or prioritization logic; specifically, the inability of the vehicle’s AI system to correctly interpret or respond to the approach of an emergency vehicle. In other words, the incident may reflect a failure of the autonomous system to correctly interpret or respond to emergency traffic scenarios, either due to limitations in object recognition, priority rules integration, or decision-making logic under unusual traffic conditions.

If such failure were confirmed, it would likely qualify as a product defect under Article 7 of Directive 2024/2853, particularly in light of Article 7, Paragraph 2, Letter b), which requires manufacturers to account for the reasonably foreseeable use of the product. The integration of autonomous vehicles into mixed traffic environments necessarily entails encounters with emergency responders, and it is therefore foreseeable that a self-driving system should recognize and appropriately react to vehicles with emergency right-of-way.

Moreover, Article 10, Paragraph 2, Letter b), could support a presumption of defectiveness, insofar as a vehicle that fails to yield to an emergency vehicle and causes injury may be understood as not complying with mandatory product safety requirements. Should the injured passenger pursue compensation under Article 6, Paragraph 1, Letter a), the Directive would sup-

¹⁹⁶ Driverless robotaxi crashes with fire truck in San Francisco; Passenger injured, CBS News, published on August 18, 2023, available at the following link: <<https://www.cbsnews.com/sanfrancisco/news/cruise-driverless-car-crash-san-francisco-fire-truck/>> (19.02.2024).

See also: Cruise robotaxi crashes into fire truck in San Francisco, FOX Business, Published August 22, 2023, available at the following link: <<https://www.foxbusiness.com/technology/cruise-robotaxi-crashes-fire-truck-san-francisco>> (19.02.2024).



port recovery for personal injury, provided the causal link with the system's failure can be reasonably established (such aspect, in the absence of technical data, remains speculative).

In this case, no contributory negligence on the part of the passenger is alleged, and no third-party driver (other than the fire truck vehicle operator) appears to have contributed to the crash. The allocation of liability would therefore centre on the manufacturer's responsibility for the decision-making logic and sensor performance of the automated driving system. If confirmed, the incident would provide an interesting case for the simulation of how product liability as regulated by the Directive 2024/2853 within the use of a car used in the absence of a human driver and based solely on the autonomous behaviour of the vehicle itself.

| 671

6.4.2. The Accident between a Robotaxi and a Woman in San Francisco of 2nd October 2023 and the Application Simulation of Directive 2024/2853.

Again in San Francisco, on 2nd October 2023 a driverless robotaxi hit a woman who was crossing the street against a red light. The woman was pinned under the car and was seriously injured.¹⁹⁷

According to some newspapers the woman was first hit by a regular vehicle which hurled her into the path of a driverless taxi that then ran her over¹⁹⁸.

Moreover, one newspaper also states that “after sitting still for an unspecified period of time, the robotaxi began moving forward at about 7 mph, dragging the woman with it for 20 feet”¹⁹⁹.

The incident that occurred in San Francisco on 2nd October 2023, involving a driverless vehicle operated by Cruise, raises complex issues of causation and system design, and is particularly relevant for testing the practical applicability of Directive (EU) 2024/2853 to real-world scenarios involving multiple actors and sequential events. According to the cited journalistic sources, a pedestrian crossing the street against a red light was first struck by a human-driven vehicle, which projected her into the path of a driverless robotaxi. The autonomous vehicle then ran over the woman and, after a

¹⁹⁷ R. MITCHELL, A Cruise car hit a pedestrian. The company's response could set back California's new robotaxi industry, Los Angeles Times, published on October 26, 2023, available at the following link: < <https://www.latimes.com/business/story/2023-10-26/cruise-robotaxi-dragged-injured-woman-misled-reporters>> (19.02.2024).

¹⁹⁸ J. PARKER/N. MISHANEC, Driver hits woman in S.F., then Cruise driverless car runs her over; photo shows victim trapped, San Francisco Chronicle, published on October 2, 2023 and updated October 3, 2023, available at the following link: < <https://www.sfchronicle.com/bayarea/article/woman-run-autonomous-vehicle-san-francisco-18403044.php>> (19.02.2024).

See also: Update: Hit-and-run driver strikes pedestrian, who is then run over by robotaxi in San Francisco, CBS News, published on October 3, 2023, available at the following link: < <https://www.cbsnews.com/sanfrancisco/news/robotaxi-san-francisco-woman-hit-pinned-fifth-street-market/>> (19.02.2024).

¹⁹⁹ R. MITCHELL, *op. cit.*



brief stationary phase, began moving forward at low speed, dragging her for approximately 20 feet. The woman sustained serious injuries.

Although the initial collision appears to be attributable to the first driver, and not to the robotaxi, the conduct of the autonomous vehicle in the second phase (failing to recognize a human being pinned beneath it and proceeding to drag the body) raises serious concerns regarding its perception and decision-making systems. In terms of the Directive's framework, liability for the injuries sustained in this second impact could potentially be attributed to a defect in the autonomous vehicle under Article 7, as the vehicle failed to detect and appropriately respond to a critical hazard that was directly within its operating environment.

Under Article 7, Paragraph 2, Letter b), the foreseeable use of the product – including emergency situations or atypical events in urban contexts – must be taken into account in the assessment of safety expectations. The vehicle's failure to recognize an immobile human presence under itself or to activate a safety protocol (such as halting movement) may suggest that the product did not meet the level of safety that the public is entitled to expect. Additionally, Article 10 could support a presumption of defectiveness, as dragging an injured person over a significant distance constitutes a form of damage that would typically be associated with product failure.

If the injured pedestrian or their successors were to pursue compensation under Article 6, Paragraph 2, Letter a), the Directive would allow recovery for personal injury, provided that a causal link could be established between the vehicle's behaviour and the aggravation of injuries. Although part of the harm may have already occurred in the first impact (for which the robotaxi is not responsible), the autonomous vehicle's conduct clearly appears to have exacerbated the situation, potentially causing additional or more severe harm.

However, the presence of multiple contributing causes complicates the attribution of liability. The Directive does not require exclusivity of causation, and the fact that the pedestrian crossed against the red light – and had already been struck by another vehicle – does not preclude a finding of liability for subsequent damage. Nonetheless, these factors would likely influence the extent of recoverable compensation to be paid by the taxi manufacturer, especially under national law principles of contributory negligence or apportionment of harm.

In summary, this incident exemplifies a situation in which shared responsibility between multiple actors and technologies may arise, but where the behaviour of the autonomous system during a critical phase of the event could lead to a finding of substantial product defectiveness. The case illustrates the Directive's potential to capture complex causal chains, while also revealing the challenges involved in quantifying liability where damage unfolds across multiple, interrelated events.

7. Final remarks.

This article has examined how recent and proposed developments in European liability law – particularly Directive (EU) 2024/2853 and the withdrawn Directive proposal on AI Liability – may influence the technological, economic and legal environment in which autonomous vehicles are developed and deployed and consequently their possible success among users.

It was observed that neither of the two pieces of legislation analysed in this article makes explicit reference to autonomous vehicles. Rather, they both apply broadly to products and technologies incorporating artificial intelligence systems. As a result, the legal instruments are naturally structured in general terms, yet their normative content necessarily extends also to self-driving vehicles, which represent one of the most advanced and socially impactful applications of AI.

The analysis has therefore focused on the importance of establishing a regulatory system capable of clearly allocating legal responsibilities among users, manufacturers, and other relevant stakeholders. In the context of disruptively innovative technologies such as autonomous driving, public acceptance is inseparable from legal certainty.

The successful integration and development of such technologies depends not only on their practical utility or performance, but also on the existence of robust legal guarantees that ensure the protection of individual rights in the event of malfunction or harm. Since technological perfection in dynamic, real-world environments is unattainable, the confidence that injured parties will be entitled to fair compensation becomes a critical factor in enabling trust and widespread deployment.

One dimension that is often underestimated in the debate on autonomous vehicles is their acceptance by the public. This is, in fact, a crucial issue, influenced by a range of psychological, ethical, cultural and practical factors. Trust in a technology capable of taking full control of a moving vehicle – and therefore potentially endangering both the user and other passengers – cannot be taken for granted. Moreover, driving is not merely a functional necessity for many people, but a source of personal satisfaction, identity, and autonomy. Individuals may also be reluctant to surrender full control to an algorithm, particularly when it implies the strict enforcement of traffic rules and eliminates the human discretion to, for instance, exceed the speed limit in urgent situations.

Nevertheless, once scientific and technological development reaches a reliable level of maturity, it may become legislator's responsibility to challenge such reluctance in order to actively support autonomous vehicles deployment.

Such deployment may, in fact, give concrete manifestation to several fundamental obligations that modern legal systems must pursue: the reduction of traffic accidents, injuries and fatalities, the mitigation of environmental pollution and urban congestion, and the expansion of transport accessibility for individuals who would otherwise be excluded from independent mobility constitute not only policy objectives of general interest, but also tangible expressions of fundamental rights. These goals reflect core values enshrined in both national constitutions, the Charter of Fundamental Rights of the European Union and the Treaty on European Union, including

the rights to life, health, equality, and social inclusion. As such, they form part of a normative horizon that both the European Union and national legislators are not only entitled but are required to pursue.

In this sense, the promotion of autonomous driving technologies – when done within a sound and transparent legal framework – can be viewed as part of the broader institutional duty to uphold fundamental rights.

From this perspective, the creation of a supportive legal context is not merely a matter of technical regulation but an expression of constitutional responsibility. The recent adoption of Directive (EU) 2024/2853 may therefore be seen as an important step in that direction, signalling the European legislator's willingness to modernise liability systems in order to facilitate the responsible integration of emerging technologies into society.

Directive 2024/2853 represents a significant step forward in adapting product liability rules to the digital age. By expanding the notion of defectiveness to include also issues related to software, updates, and data-driven behaviour, it allows for more realistic legal scrutiny of AI-based technologies. Nonetheless, due to its general scope, certain challenges specific to autonomous systems – such as distributed causality, permitted activities while driving and shared control – remain only partially addressed.

On the other hand, several limitations of Directive 2024/2853 must be acknowledged. While the Directive constitutes an important modernisation of the EU product liability regime, it does not comprehensively address all specific challenges posed by autonomous technologies.

In this context, the discontinuation of the legislative process for the adoption of the directive on non-contractual civil liability for artificial intelligence must be viewed negatively. Despite its limitations and room for improvement, that proposal represented a valuable effort to clarify liability rules in relation to AI systems and pointed in the right direction.

Its withdrawal has left a regulatory gap with respect to damages caused by autonomous systems. Although the text retains conceptual value, the absence of a dedicated legal instrument specifically addressing AI-generated harm limits the ability of the current European regulation to adequately respond to new and complex patterns of risk. Future legislative efforts will likely have to build upon that original foundation.

In parallel, doubts remain about the appropriateness of the legal instrument chosen. The adoption of a directive – rather than a regulation – may lead to significant disparities in the implementation and interpretation of liability rules across Member States. This possibility risks undermining the effectiveness of the reform, particularly in relation to technologies, such as autonomous vehicles, which are inherently transnational and operate across physical and legal borders.

These systems – in addition to naturally giving rise to international geographic shifts – depend on constant data flows, algorithmic updates, and cloud-based infrastructure and these elements require uniform legal treatment. In this respect, fragmented national implementations could weaken legal certainty and hamper both consumer trust and industry deployment.

Summing up and moving to the conclusion, Directive (EU) 2024/2853 must be positively evaluated, not only for its specific content, but also as a

signal of the European legislator's growing awareness of the legal implications of artificial intelligence. It is reasonable to conclude that this Directive will have a favourable influence on the legal environment surrounding the future deployment of driverless vehicles. However, it is equally clear that the Directive alone is insufficient to provide a complete regulatory framework for their safe and coherent integration into the internal market and the current legal and social environment.

If driverless vehicles were to be introduced onto European roads tomorrow – a scenario that is far from hypothetical, given ongoing experimentation and operational deployment in countries such as the United States of America – the current European legal framework would not be adequately prepared to govern their use.

In particular, significant uncertainties remain regarding how Directive 2024/2853 will be implemented in practice, especially due to the potential divergences in national transposition.

These risks are compounded by the fact that some Member States, such as Germany, have already adopted or are in the process of adopting national legislation regulating the use and circulation of driverless vehicles as well as assigning liability in cases of harm. As a result, a regulatory fragmentation is emerging and must instead be proactively countered.

A “multi-speed” Europe in the domain of autonomous mobility would not only undermine the autonomous vehicle sector, but also erode legal certainty for manufacturers, users, insurers and the public.

To avoid this outcome, the adoption of a dedicated European regulation focused specifically on autonomous vehicles could represent the most coherent and effective legal solution. A directly applicable regulation would offer a harmonised legal framework, reduce interpretive fragmentation, and help ensure the consistent allocation of responsibilities across Member States.

Admittedly, such a path would require careful consideration of the division of competences between the Union and the Member States, particularly in light of Article 4, Paragraph 2, Letter g), TFEU, which establishes shared competence in the field of transport. Nevertheless, should the necessary legal basis and political consensus be found, a targeted regulation at the European level could produce a significant positive impact, not only in terms of legal coherence, but also in accelerating public trust, commercial investment, research and cross-border deployment of one of the most transformative technologies of our time.

