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Forever Chemicals and Comparative Tort Law: Grounds for Liability

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Abstract: The present paper provides a comparative law analysis of liability for per- and polyfluoroalkyl substances (PFAS) pollution with a special focus on grounds for liability. The paper explores liability based on public and private law to reflect on the role of environmental litigation, its potential and its limitations. Further, with this scope and aim, the paper shall demonstrate the necessity of taking intra-, inter- and transdisciplinary approaches to tackle chemical environmental pollution. While the present paper focusses on forever chemicals, it furthermore emphasises the necessity to better understand the impacts of anthropogenic chemicals on the environment and human health.

I Introduction and scope

PFAS (commonly referred to as ‘forever chemicals’) are an integral part of our daily life as they are added to a variety of products and as they are being used in different industrial processes. PFAS resist degradation and, due to their ubiquity, pose severe risks to the environment and human health.

PFAS pose significant challenges to regulatory law. Against this backdrop, this contribution aims to evaluate the potential of liability law from a comparative perspective and includes both mechanisms of public and private law. It will analyse different grounds for liability, with a special focus on environmental liability by means of public law, product liability, liability due to breach of statutory duty and a breach of a duty of care. For an in-depth analysis of questions of harm, causation and prescription, the paper refers to the contributions in this issue by Albert Ruda, Maria Lee and Corinne Widmer Lüchinger.

First, the paper will define PFAS and summarise recent scientific findings on occurrence, exposure and potential risks associated with PFAS. Second, setting the scene for an evaluation of liability law, the paper will outline the regulatory frame-

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work governing PFAS and unpack the shortcomings of regulatory mechanisms and concepts. Next, the paper will reflect on environmental liability of a public law nature, vertical environmental litigation based on the European Environmental Liability Directive (ELD¹). Examining different grounds for liability of a private law nature, a special focus will be put on product liability, liability for breach of a statutory duty, and liability for breach of a duty of care. This examination will address the concept and assessment of defectiveness, the state of scientific and technical knowledge and the level of public awareness. Further, the paper will consider whether regulatory law can be operationalised under private law and thus will reflect on its protective scope. For an evaluation of a duty of care, the paper will include considerations on foreseeability of harm and reasonable care to avoid such harm.

This paper will not provide an all-encompassing examination of claims based on private law. Thus, it will not assess claims based on property law, contract law, or competition law but will concentrate on tort law.

II Tackling environmental challenges: the role of private law in general and tort law in particular; the necessity of a differentiated approach

This paper seeks to examine the function of tort law in addressing environmental challenges. It contextualises PFAS litigation in comparison with other types of horizontal environmental litigation, such as that involving microplastics pollution or climate change, highlighting both the similarities and distinctive characteristics.

¹ Directive 2004/35/EC of the European Parliament and of the Council of 21 April 2004 on environmental liability with regard to the prevention and remedying of environmental damage [2004] Official Journal of the European Union (OJ) L 143/56.

The operationalisation of private law to strengthen supra-individual interests, specifically environmental protection, can be observed in various domains, eg liability law,² contract law,³ residential and real estate law,⁴ competition law,⁵ corporate law,⁶ and labour law.⁷

In this context, one must emphasise that this utilisation of private law does not result in a transfer of responsibilities. Therefore, environmental protection is not exclusively the task of private law. Rather, the idea of operationalisation is based on the assumption of a complementary function of private law, which, in coordination with environmental protection by means of public regulatory law, aims to offer a comprehensive and harmonised approach. The present paper, therefore, is based on the understanding that private law mechanisms are apt to complement conventional mechanisms of regulatory public law and can enhance environmental protection by engaging numerous private actors.⁸

2 *J Setzer/N Silbert/L Vanhala*, The Effectiveness of Climate Change Litigation, in: F Sindico/K McKenzie/G Medici-Colombo/L Wegener (eds), Edward Elgar (2024); *M Sato/G Gostlow/C Higham et al*, Impacts of climate litigation on firm value, *Nature Sustainability* 2024 (7) 1461–1468, <<https://doi.org/10.1038/s41893-024-01455-y>>; *H Hayden*, Haftung für fremdes Verhalten am Beispiel der CSDDD, *Juristische Blätter (JBl)* 2024, 429; *S Nitsch*, Microplastics Litigation: eine rechtsvergleichende Orientierung, *Zeitschrift für Europäisches Privatrecht (ZEuP)* 2024, 316–345; *JE Schirmer*, Klimahaftung und Kausalität – und es geht doch! *Juristen Zeitung (JZ)* 2021, 1099–1106; *EM Kieninger*, Klimaklagen im internationalen und deutschen Privatrecht, *Zeitschrift für das Gesamte Handels- und Wirtschaftsrecht* 2023, 348–391; *W Kahl/MP Weller* (eds), *Climate Change Litigation – Liability and Damages from a Comparative Perspective* (2021).

3 See ie, Directive (EU) 2024/1799 of the European Parliament and of the Council of 13 June 2024 on common rules promoting the repair of goods and amending Regulation (EU) 2017/2394 and Directives (EU) 2019/771 and (EU) 2020/1828 [2024] OJ L, 2024/1799.

4 OGH 5 Ob 137/21i NR 2022, 471 (*P Felzmann*); *R Pittl/B Egger*, Errichtung und Betrieb einer Photovoltaik-Anlage im Wohnungseigentum, *Wohnrechtliche Blätter (wobl)* 2024, 181; *J Höllwerth*, Zum neuen Änderungsrecht des Wohnungseigentümers nach der WEG-Novelle 2022, *wobl* 2022, 115; *R Pittl/E Ponholzer*, Klimarevolution im Miet- und Wohnungseigentumsrecht? *Nachhaltigkeitsrecht (NR)* 2024, 39.

5 Directive (EU) 2024/825 of the European Parliament and of the Council of 28 February 2024 amending Directives 2005/29/EC and 2011/83/EU as regards empowering consumers for the green transition through better protection against unfair practices and through better information [2024] OJ L 2024/825.

6 *MP Weller*, Empfehlen sich im Kampf gegen den Klimawandel gesetzgeberische Maßnahmen auf dem Gebiet des Gesellschaftsrechts? *DJT-Gutachten* (2024); *JE Schirmer*, Nachhaltiges Privatrecht (2023); *AC Mittwoch*, Nachhaltigkeit und Unternehmensrecht (2022); *S Kalss/J Deutsch*, Nachhaltigkeit – Aufgaben und Chancen des Gesellschaftsrechts, *Zeitschrift für Recht & Rechnungswesen (RWZ)* 2022/61.

7 *E Brameshuber*, Arbeitsrecht und Nachhaltigkeit – Kollektive Rechtsgestaltung, *Deutsches Recht der Arbeit (DRdA)* 2024, 97.

8 *B Gsell/S Meyer*, How to Combat ‘Greenwashing’ (2025) *Journal of European Consumer and Market Law (EuCML)* 21.

The paper rests on the notion of *Hess*, who points out that it is ‘the genuine task of courts to decide on the compensation and assessment of damages. It is equally the task of courts to decide on the prevention of future losses’.⁹

Further, the paper builds on the belief that one should not take climate change litigation as an example or even as a representative for analysing the capacity of liability law to overcome the various forms of environmental pollution of regional or global extent. With this belief, the paper acknowledges the planetary triple crises,¹⁰ climate change being one environmental emergency aside from pollution and biodiversity loss. Certainly, these crises are interlinked. However, each of these emergencies has its own causes and effects.¹¹

Thus, the paper is intended to illustrate that environmental risks and catastrophes should be perceived in their full differentiation. This means that it must be recognised that environmental pollutants have very different origins, paths of distribution, different properties and behaviours and different levels of toxicity. This necessitates an interdisciplinary approach to ensure a translation of scientific research into the realm of liability law.

III Forever chemicals: definition, properties, occurrence, exposure and potential risks for the environment and human health

Forever chemicals are a large class of thousands of completely or partially fluorinated carbon chains of varied lengths, per- and polyfluoroalkyl substances (PFAS).¹²

Forever chemicals are synthetic chemicals. They were developed in the 1940s¹³ and to date are used in many consumer products and industrial applications because of their oil-, stain-, and water-repellent properties, eg, in plastics, food packaging, cookware, clothing, cosmetics, firefighting foam.¹⁴ Thus, forever chemicals are

⁹ *B Hess*, Strategic Litigation: A New Phenomenon in Dispute Resolution, MPILux Research Paper, 2022 (3) 32, <<http://dx.doi.org/10.2139/ssrn.4107384>>.

¹⁰ For the UN Global Foresight Report, visit: <<https://news.un.org/en/story/2024/07/1152136>>.

¹¹ For a definition of the triple crises, visit: <<https://unfccc.int/news/what-is-the-triple-planetary-crisis>>.

¹² <<https://echa.europa.eu/hot-topics/perfluoroalkyl-chemicals-pfas>>.

¹³ <<https://www.unep.org/topics/chemicals-and-pollution-action/pollution-and-health/persistent-organic-pollutants-pops/and>>.

¹⁴ <<https://www.nature.com/collections/heeicfdidfDefinition>>.

an integral, but also persistent, part of our daily life. As they are persistent, they even resist high temperatures: they are referred to as ‘forever chemicals’.

Although the author of the present paper is aware of the various forms of forever chemicals, and although it is important to recognise that the risks to the environment and human health associated with forever chemicals vary depending on the specific type, the paper uses the term PFAS.

Increasingly, PFAS are detected as environmental pollutants, some are linked to negative effects on human health.¹⁵ The website of the United Nations Environment Programme (UNEP) describes PFAS as: ‘toxic, man-made, hazardous chemicals that have dangerous effects on the environment and our health’.¹⁶ In 2020, the UNEP published an assessment report on issues of concern with a special focus on chemicals and waste issues posing risks to human health and the environment. This report identifies eight issues of concern under the Strategic Approach to International Chemicals Management (SAICM): ‘chemicals in products (CiP), endocrine disrupting chemicals (EDCs), environmentally persistent pharmaceutical pollutants (EPPPs), hazardous substances in the life cycle of electrical and electronic products (HSLEEP), highly hazardous pesticides (HHPs), lead in paint, nanotechnology and manufactured nanomaterials (Nanomaterials), and per- and polyfluoroalkyl substances (PFASs)’.¹⁷ Similarly, the European Chemical Agency (ECHA) associates PFAS to negative effects on human health.¹⁸

The presence of PFAS in many various plastic products necessitates a combined assessment of PFAS and microplastics pollution and their litigation.¹⁹ Microplastics are used as an additive to many consumer products, ie cosmetics. Aside from the deliberate use of microplastics as additives, microplastics can be released through a physical, biological, or chemical degradation of plastic products.²⁰ This includes their release in cases of intended use (eg, tyre and brake wear²¹ or washing syn-

¹⁵ <<https://echa.europa.eu/hot-topics/perfluoroalkyl-chemicals-pfas>>.

¹⁶ Per- and Polyfluoroalkyl Substances (PFASs) | UNEP – UN Environment Programme.

¹⁷ For the executive report, see: <<https://wedocs.unep.org/bitstream/handle/20.500.11822/33807/ARIC.pdf?sequence=1&isAllowed=y>>.

¹⁸ <<https://echa.europa.eu/hot-topics/perfluoroalkyl-chemicals-pfas>>.

¹⁹ For an in-depth analysis: Nitsch, ZEuP 2024, 316.

²⁰ D Miklos/N Obermaier/M Jekel, Mikroplastik: Entwicklung eines Umweltbewertungskonzepts (2016) 16.

²¹ D Jepsen/T Zimmermann/L Spengler/L Rödig/R Bliklen/J Wagner/K Struck/L Hiestermann/H Schulz, Kunststoffe in der Umwelt – Erarbeitung einer Systematik für erste Schätzungen zum Verbleib von Abfällen und anderen Produkten aus Kunststoffen in verschiedenen Umweltmedien, Abschlussbericht im Auftrag des deutschen Umweltbundesamts (2020) 102f, 123f.

thetic clothes²²). Further, a release of microplastics was detected in cases of inadequate storage,²³ use, or disposal.²⁴

PFAS (like microplastics²⁵) enter the global environmental cycle²⁶ through soil and wastewater. Thus, they enter surface waters, the ocean, air and even our food, eg fish and seafood.²⁷ PFAS are detected in flora,²⁸ fauna,²⁹ and even in the human body (eg, human blood).³⁰

The Forever Pollution Project, a cross-border and interdisciplinary journalism investigation launched in 2022 to track PFAS pollution across Europe, detected many PFAS pollution hotspots and there are hardly any countries where no PFAS pollution was detected.³¹

22 *F De Falco/E Di Pace/M Cocca/M Avella*, The contribution of washing processes of synthetic clothes to microplastic pollution, *Scientific Reports (Sci Rep)* 9, 6633 (2019), <<https://doi.org/10.1038/s41598-019-43023-x>>.

23 *E Huerta Lwanga/N Beriot/F Corradini/V Silva/X Yang/J Baartman/M Rezaei/L van Schaik/M Riksen/V Geissen*, Review of microplastic sources, transport pathways and correlations with other soil stressors: a journey from agricultural sites into the environment, *Chemical and Biological Technologies in Agriculture (Chem Biol Technol Agric)* 2022, <<https://doi.org/10.1186/s40538-021-00278-9>>.

24 *D Miklos/N Obermaier/M Jekel*, *Entwicklung eines Umweltbewertungskonzepts* (2016) 25.

25 *Nitsch*, *ZEUP* 2024, 320.

26 *D Ackerman/Grunfeld/D Gilbert/J Hou et al*, Underestimated burden of per- and polyfluoroalkyl substances in global surface waters and groundwaters. *Nature Geoscience (Nat Geosci)* 17, 340–346 (2024), <<https://doi.org/10.1038/s41561-024-01402-8>>.

27 *ME Dimitrakopoulou/M Karvounis/G Marinos et al*, Comprehensive analysis of PFAS presence from environment to plate, *npj / Science of Food* 8, 80 (2024), <<https://doi.org/10.1038/s41538-024-00319-1>>.

28 *Jiuyi Li/Jing Sun/Pengyang Li*, Exposure routes, bioaccumulation and toxic effects of per- and polyfluoroalkyl substances (PFASs) on plants: A critical review (2022) 158 *Environment International* 106891, <<https://doi.org/10.1016/j.envint.2021.106891>>.

29 For PFAS: *G Sigmund/M Ågerstrand/A Antonelli et al*, Addressing chemical pollution in biodiversity research. *Glob Chang Biology* 2023 29 (12) 3240–3255, <<https://doi.org/10.1111/gcb.16689>>; for microplastics: *LJ Zantis/EL Carroll/SE Nelms/T Bosker*, Marine mammals and microplastics: A systematic review and call for standardization, *Environmental Pollution* 269 (2021) 116142, <<https://doi.org/10.1016/j.envpol.2020.116142>>.

30 *EM Sunderland/XC Hu/ C Dassuncao et al*, A review of the pathways of human exposure to poly- and perfluoroalkyl substances (PFASs) and present understanding of health effects, *Journal of Exposure Science and Environmental Epidemiology (J Expo Sci Environ Epidemiol)* (2019), <<https://doi.org/10.1038/s41370-018-0094-1>>; *AM Calafat/LY Wong/Z Kuklennyik/JA Reidy/LL Needham*, Polyfluoroalkyl chemicals in the U.S. population: data from the National Health and Nutrition Examination Survey (NHANES) 2003–2004 and comparisons with NHANES 1999–2000, *Environmental Health Perspectives (Environ Health Perspect)* (2007), <<https://doi.org/10.1289/ehp.10598>>.

31 <<https://foreverpollution.eu/>>

PFAS can not only have toxic effects on the environment, flora and fauna, they are also suspected of harming human health,³² eg PFAS and OH-PCBs are associated with a risk of multiple sclerosis onset and disability worsening,³³ links were found between PFAS and county-level cancer incidence between 2016 and 2021 in the US.³⁴ Similarly, microplastics are considered to pose a potential hazard to human health.³⁵ Once again, a parallel can be observed between these two environmental burdens. For an in-depth assessment of harm caused by PFAS, see *Ruda's* paper in this issue (121 ff).

IV The regulatory framework governing PFAS: (inter-)national approaches, shortcomings and recent developments

A (Inter-)national approaches to regulation

Since PFAS are linked to ecotoxic risks and negative effects on human health, they have attracted the attention of lawmakers. The regulatory framework is constantly expanding. Increasingly, PFAS are subject to regulatory bans or restrictions. The following list of European³⁶ regulatory approaches is not exhaustive but serves as an overview to clarify the potential, but also the shortcomings, of past and ongoing legislation.

32 *EM Sunderland/XC Hu/C Dassuncao et al*, J Expo Sci Environ Epidemiol (2019), <<https://doi.org/10.1038/s41370-018-0094-1>>.

33 *A Vaivade/I Erngren/H Carlsson et al*, Associations of PFAS and OH-PCBs with risk of multiple sclerosis onset and disability worsening, Nature Communications (Nat Commun) 16, 2014 (2025), <<https://doi.org/10.1038/s41467-025-57172-3>>.

34 *S Li/P Oliva/L Zhang et al*, Associations between per- and polyfluoroalkyl substances (PFAS) and county-level cancer incidence between 2016 and 2021 and incident cancer burden attributable to PFAS in drinking water in the United States, J Expo Sci Environ Epidemiol (2025), <<https://doi.org/10.1038/s41370-024-00742-2>>; *AM Calafat/LY Wong/Z Kuklenyik/JA Reidy/LL Needham*, Polyfluoroalkyl chemicals in the U.S. population: data from the National Health and Nutrition Examination Survey (NHANES) 2003–2004 and comparisons with NHANES 1999–2000, Environ Health Perspect (2007), <<https://doi.org/10.1289/ehp.10598>>.

35 *ES Gruber/V Stadlbauer/V Pichler/K Resch-Fauster/A Todorovic/TC Meisel/S Trawoeger/O Hol-lóczki/SD Turner/W Wadsak/AD Vethaak/L Kenner*, To Waste or Not to Waste: Questioning Potential Health Risks of Micro- and Nanoplastics with a Focus on Their Ingestion and Potential Carcinogenicity, Expo Health 2023, 15, 33–51, <<https://doi.org/10.1007/s12403-022-00470-8>> (Exposure and Health); with further references *Nitsch*, ZEuP 2024, 321.

36 For the US, see <<https://governance.pfasproject.com/>>.

The Stockholm Convention on Persistent Organic Pollutants, the POP Convention (adopted in 2001, revised in 2023) bans or restricts the production and use of certain persistent organic pollutants. On the European level, Regulation (EU) 2019/1021 on persistent organic pollutants, the POP Regulation³⁷ (recast of Regulation (EC) No 850/2004) introduces bans and restrictions similar to the POP Convention.

Further, Regulation (EC) No 1272/2008 on classification, labelling and packaging of substances and mixtures, the CLP Regulation³⁸ addresses PFAS. Lastly and most prominently, several PFAS have been added to the list of substances of very high concern (SVHC) of Regulation (EC) No 1907/2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals, the REACH Regulation³⁹.

Typical for public law, these regulations list specific chemical substances. This approach certainly can be seen as a mechanism enhancing legal certainty, which is of central importance for industries, international trade and authorities enforcing these regulations.

B Shortcomings of regulatory law and recent developments

This regulatory approach has several limitations. On the one hand, the Stockholm Convention does not impose direct obligations on private actors, such as corporations of the chemical industry. Its obligations are addressed only to States.

Moreover, the regulations that are legally binding for private actors are often lagging behind the advancements of the chemical industry. Bans can be circumvented by making slight or even major modifications to the chemical structure of substances. In some cases, these newly developed substances are described as equally hazardous.⁴⁰ Thus, regulatory law can be described to be slow and vulnerable to circumventing.

37 Regulation (EU) 2019/1021 of the European Parliament and of the Council of 20 June 2019 on persistent organic pollutants (recast) OJ L 169/45.

38 Regulation (EC) No 1272/2008 of the European Parliament and of the Council of 16 December 2008 on classification, labelling and packaging of substances and mixtures, amending and repealing Directives 67/548/EEC and 1999/45/EC, and amending Regulation (EC) No 1907/2006, OJ L 353/1.

39 Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/45/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC, OJ L 396/1.

40 NU Mazumder/MT Hossain/FT Jahura et al, Firefighters' exposure to per- and polyfluoroalkyl substances (PFAS) as an occupational hazard: A review, *Front Mater*, 2023;10:10.3389/fmats.2023.1143411. doi:10.3389/fmats.2023.1143411.

Against this backdrop, Denmark, Germany, the Netherlands, Norway, and Sweden have proposed a comprehensive⁴¹ ban on the use of PFAS within the EU.⁴² The unique characteristic of this ban is the introduction of an abstract general clause that will also cover, and consequently ban, new PFAS that are developed in the future. This abstract ban would undoubtedly be a major step forward and would be an effective approach to reduce, and even prevent, future PFAS pollution. However, it remains unclear if this ban will be enacted, especially in light of the current considerations on competitiveness in Europe.⁴³

V PFAS pollution and public environmental liability law

A central mechanism of public environmental liability law is the European Environmental Liability Directive (ELD)⁴⁴.⁴⁵ The ELD's objective is to establish a framework of environmental liability and, by introducing the 'polluter-pays' principle, it is aimed at preventing and remedying environmental damage. With this intention and scope, it is a suitable mechanism to tackle environmental pollution and biodiversity loss⁴⁶ due to PFAS pollution.

The ELD is based on the principle that an operator whose activity has caused environmental damage or the imminent threat of such damage is to be held financially liable and introduces both strict liability (for activities listed in Annex III) and fault-based liability (for damage caused to protected species or natural habitats or

41 Eg, Derogations for PFAS used as active substances in plant protection products, biocidal products, and human and veterinary medicinal products, as these are addressed under their respective regulations.

42 For the proposal, see: <<https://echa.europa.eu/registry-of-restriction-intentions/-/dislist/details/0b0236e18663449b>>; for the scientific evaluation of the proposal see: <https://echa.europa.eu/documents/10162/67348133/upfas_evaluation_state_of_play_en.pdf/d1ad6892-e726-84a7-d2dd-74bbf8fa09af?t=1727262011016>.

43 For an evaluation of current European approaches regarding competitiveness, see *EM Kieninger*, *Der Green Deal und das Europäische Privatrecht*, ZEuP 2024 (4) 731–737.

44 Directive 2004/35/EC of the European Parliament and of the Council of 21 April 2004 on environmental liability with regard to the prevention and remedying of environmental damage [2004] OJ L 143/56.

45 For an overview, see *S Nitsch*, *Applying Analogous Strict Liability Based on Dangerousness to Harmonize Environmental Liability in Austria*, *Vienna Law Review* 2018, 36–68. For the Austrian transposition act, see: *M Hinteregger/F Kerschner* (eds), *Bundes-Umwelthaftungsgesetz* (2011).

46 Recital 1.

the immediate risk of such through a commercial activity that is not listed in Annex III).⁴⁷

According to art 3 (1), the ELD applies to environmental damage and any imminent threat of such damage caused by commercial activities. It provides for compensation of damage to protected species and natural habitats,⁴⁸ water damage,⁴⁹ and land damage, which is any land contamination that creates a significant risk to human health. However, this anthropogenic orientation does not result in compensation for personal injury, damage to private property (aside from compensation for land damage) or any economic loss and does not affect any rights regarding these types of damage. Therefore, compensation claims under general private law are not subject to the ELD.⁵⁰

VI Horizontal PFAS litigation: private law pathways

A Horizontal PFAS litigation: past and recent cases in the US and Europe

In light of the above-mentioned risks associated with PFAS, it was no surprise that PFAS also entered the realm of tort law. Similar to microplastics litigation, the initial cases of PFAS horizontal environmental litigation took place in the United States. In 2024, the NY Times reported that ‘astronomical’ lawsuits are to be expected.⁵¹

One of the early and most significant cases is the lawsuit against Dupont. The case gained media attention and raised public awareness through the movie, ‘Dark Waters’⁵² and the documentary, ‘How to Poison a Planet’.⁵³ The case against Dupont is representative of an increasing number of lawsuits in the US.

⁴⁷ Nitsch, Vienna Law Review 2018, 36, 38ff.

⁴⁸ Which is any damage that has significant adverse effects on reaching or maintaining the favourable conservation status of such habitats or species. The significance of such effects is to be assessed with reference to the baseline condition, taking account of the criteria set out in Annex I.

⁴⁹ Which is any damage that significantly adversely affects the ecological, chemical and/or quantitative status and/or ecological potential, as defined in Directive 2000/60/EC, of the waters concerned, with the exception of adverse effects where art 4(7) of that Directive applies.

⁵⁰ S Nitsch, Umwelthaftung (2019) 32.

⁵¹ <<https://www.nytimes.com/2024/05/28/climate/pfas-forever-chemicals-industry-lawsuits.html>>.

⁵² T Haynes (2019): Dark Waters. Participant, Killer Content & Willi Hill.

⁵³ K McGowan (2024): How to Poison a Planet. Stan Original.

However, compensatory lawsuits have also been filed at European courts. Of particular relevance is the Swedish Supreme Court's judgment on product liability for drinking water that was contaminated with PFAS.⁵⁴ The case was filed by more than 150 residents of Ronneby in Blekinge County, with high⁵⁵ levels of PFAS in their blood due to high levels of PFAS in drinking water. This high level of PFAS contamination was caused by fire drills at Blekinge Air Force Base using firefighting foam. However, the action was not filed against the manufacturer of the firefighting foam. Rather, the defendant was the municipal water company.

While the District Court upheld the claim, the Court of Appeal considered that the high levels of PFAS in the residents' blood represented a risk of future illness but did not constitute personal injury and dismissed the claim. In its ruling, the Swedish Supreme Court determined that, in principle, the risk of a future physical defect cannot be considered to constitute personal injury. However, the Swedish Supreme Court concluded that such a defect has already occurred in each of the plaintiffs in the form of elevated levels of PFAS in their blood and, therefore, the plaintiffs were considered to have suffered personal injury. Nevertheless, the assessment carried out by the Swedish Supreme Court included neither a determination of the extent to which these personal injuries have given rise to consequences of the injuries entitling the plaintiffs to compensation nor the amount of such compensation.

A comparable increase in litigation can be observed in the context of (micro) plastics pollution: as of May 2025, the Plastics Litigation Tracker (the State Energy & Environmental Impact Center; both NYU School of Law)⁵⁶ lists 41 cases against companies in the US.⁵⁷

54 Högsta domstolen (Supreme Court of Sweden) 5 December 2023, T 486–23.

55 '... the measured total PFAS concentration in the blood of the appellants, in 2014 and 2015, was on average around 600 ng/mL. The lowest measured value among the appellants was 91 ng/mL and the highest value was 1,800 ng/mL. These levels are among the highest measured in populations worldwide. Even the lowest measured levels among the appellants are significantly above normal. The normal blood level of PFAS in Sweden is no more than 10 ng/mL. The facts in the case show that the half-life period of PFAS in the body is so long that it will take many years for the PFAS levels of the appellants' blood to reach levels approaching normal.'

56 <<https://plasticslitigationtracker.org/>>.

57 For an in-depth analysis of these cases, see *Nitsch*, ZEuP 2024, 322.

B The aim of channelling liability

Compared to regulatory law, private law, and especially liability law, is considered to be more flexible, more responsive,⁵⁸ robust, and timely. Furthermore, and probably overlooking practical hurdles of enforcement, private law can be considered to be more effective.⁵⁹

The following considerations on private law pathways focus on the liability of manufacturers in their various capacities and markets. Their liability is addressed as manufacturers determine the chemical structure and use of substances and are best positioned to assess and mitigate potential risks.

However, channelling liability to product manufacturers necessitates a distinction between the chemical industry and subsequent manufacturers who use these materials in their products but have no influence on, or knowledge of, the chemical composition and the associated risks. Channelling liability toward the chemical industry would result in a reduced number of potential defendants as the number and diversity of global market players are not overwhelmingly large or diverse.

It is important to underline this distinction at the very outset, even though product liability law imposes obligations on both manufacturers of components (eg, chemical substances and material) and manufacturers of final products (eg climbing shoes⁶⁰) alike.

This distinction between potential defendants is particularly crucial when evaluating fault, a potential state-of-the-art defence, as well as when assessing the addressee of regulatory law, which is relevant within the scope of a breach of statutory duty. Furthermore, distinctions between the respective industries regarding liability for a breach of a duty of care also have to be considered.

58 For the concept of responsive law, see: *P Nonet/P Selznick*, Law and Society in Transition: Toward Responsive Law (1978) 73ff, 77.

59 For climate change litigation: *J Setzer/N Silbert/L Vanhala*, The Effectiveness of Climate Change Litigation, in: F Sindico/K McKenzie/G Medici-Colombo/L Wegener (eds), Research Handbook on Climate Change Litigation (2024); *M Sato/G Gostlow/C Higham et al*, Impacts of climate litigation on firm value, *Nat Sustain* 2024, 7, 1461–1468; *A-C Mittwoch*, Nachhaltigkeit und Unternehmensrecht (2022); *A-C Mittwoch/T Friedmann*, Nachhaltiges Geschäftsleiterhandeln nach der CSDDD – im Unternehmensinteresse, *Neue Zeitschrift für Gesellschaftsrecht* 2023, 31, 1439–1446; *J-E Schirmer*, Nachhaltiges Privatrecht, *Jus Privatum (JusPriv)* 2023, 270, 106ff; *L Hübner*, Unternehmenshaftung für Menschenrechtsverletzungen, *JusPriv* 2022, 259, 323ff, 372 with an in-depth analysis of limitations

60 For the risk caused by rubber additives, see: *A Sherman et al*, The Invisible Footprint of Climbing Shoes: High Exposure to Rubber Additives in Indoor Facilities, *ACS EST Air* 2025, 2, 5, 930–942.

C Product liability

1 The European Product Liability Directives; temporal scope of PLD 1985 and PLD 2024

Regarding PFAS litigation based on European product liability and especially regarding the new mechanisms introduced by PLD 2024 (arts 9 and 10 PLD 2024, see below), it is important to consider the temporal scope of the European Product Liability Directives.

The Product Liability Directive 2024 (hereinafter: PLD 2024)⁶¹ applies to products placed on the market or put into service after 9 December 2026 (art 2 PLD 2024); the Product Liability Directive 1985 (hereinafter: PLD 1985)⁶² does not apply to products put into circulation before the date on which the national transposition acts entered into force (art 17 PLD 1985).

Tracing back PFAS pollution to products placed on the market before or after these dates seems difficult and depends on the specific chemical. For some chemicals which were only developed later, this might be easier than earlier PFAS and such an assessment requires interdisciplinary understanding.

2 Product

According to art 4 para 1 PLD 2024, ‘product’ means 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.

Many of the products to which PFAS are added are products within the meaning of the PLD 1985 or 2024. For example, pans coated with PFAS are movable objects and therefore products within the meaning of European product liability. Also, products containing PFAS unintentionally, like the PFAS-contaminated water in the Swedish case, are products under the PLD.

Even if PFAS are only released during or after disposal, and the other conditions of liability are met, manufacturers remain liable, as product liability is not limited to the use cycle of a product, but also includes disposal, provided that no

61 Directive (EU) 2024/2853 of the European Parliament and of the Council of 23 October 2024 on liability for defective products and repealing Council Directive 85/374/EEC, PE/7/2024/REV/1 [2024] OJ L, 2024/2853.

62 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 [1985] OJ L 210/29.

treatment that changes the characteristics of the product takes place.⁶³ This could be considered in the case of recycling.

3 Defectiveness

In terms of assessing defectiveness, it is important to emphasise that this concept is subject to an autonomous determination in tort law.⁶⁴ This means that compliance with the provisions of (product) safety regulations or compliance with product safety standards does not exempt a party from liability; and vice versa, a violation of public law provisions does not automatically imply defectiveness. Rather, under product liability, the consumer expectation test regarding safety⁶⁵ applies.⁶⁶

A defect can arise from manufacturing but also from design or instructions or warnings.⁶⁷ The responsibility of manufacturers also includes the product's disposal, provided that the respective hazards could have been avoided with reasonable effort, eg warnings or disposal instructions.⁶⁸ Safety warnings or disposal instructions have to state the very particular threat or risk. It is the author's impression that to date, if there are safety warnings, these warnings do not warn of the risks for the environment or human health that are associated with PFAS. Whether and to what extent instructions for use, storage or disposal are required should be assessed taking into account the level of knowledge and awareness of the average consumer.⁶⁹ This will necessitate a differentiated assessment depending on the respective product. Regarding some products, the public awareness will be more advanced while, in the case of other products, consumers are ill-informed. This assessment should be performed in a transdisciplinary setting including social science perspectives.

As the author has already mentioned in relation to microplastics litigation, a differentiated approach should be taken.⁷⁰ For those products where, regardless of

⁶³ Nitsch, ZEuP 2024, 326 with further refs.

⁶⁴ G Wagner in: Münchener Kommentar zum Bürgerlichen Gesetzbuch (MüKoBGB) BGB § 823 no 958ff; D Gesmann-Nuissl/C Wenzel, Produzenten- und Produkthaftung infolge abfallrechtlicher Produktverantwortung, Neue Juristische Wochenschrift (NJW) 2004, 117 (119).

⁶⁵ For European product liability, see art 7 and recital 30 PLD 2024; for US concepts see Nitsch, ZEuP 2024, 326.

⁶⁶ For microplastics litigation, see S Nitsch, ZEuP 2024, 326ff.

⁶⁷ MüKoBGB/Wagner (fn 64) ProdHaftG § 3 nos 41–58; MJ Moore/V Kip Viscusi, Product Liability Entering the Twenty-First Century: The U.S. Perspective (2001) 9.

⁶⁸ MüKoBGB/Wagner (fn 64) BGB § 823 no 951; see also MüKoBGB/Wagner (fn 64) ProdHaftG § 2 no 32ff.

⁶⁹ MüKoBGB/Wagner (fn 64) BGB § 823 no 986; Gesmann-Nuissl/Wenzel, NJW 2004, 117 (117 f).

⁷⁰ Nitsch, ZEuP 2024, 326ff.

consumer behaviour and even in cases of adequate use, it is certain that PFAS will end up in the environment and have harmful effects, these products could be considered defective if they are sold without sufficient safety warnings. In the case at the Swedish Supreme Court, the parties were in agreement that the drinking water contained very high levels of PFAS. The Court concluded that the water was thus defective (sec 3 Swedish Product Liability Act).

4 The state of scientific and technical knowledge

A mechanism of limitation of liability that is often overlooked is the state of scientific and technical knowledge. Provided that scientific studies will present sufficient data that enables plaintiffs to establish causation (eg proof of signature diseases that possibly could be traced back to specific PFAS from specific chemical industries), determining when the risks of these PFAS were known and, therefore the state of the scientific and technical knowledge, will be challenging. Nevertheless, it will still be necessary.⁷¹

In this aspect, in particular, it is crucial to differentiate between the various actors involved. It is probable that the chemical industry has a more comprehensive understanding of chemical substances and their associated risks compared to other industries that simply use materials without knowledge of their chemical properties.

With these questions regarding the knowledge of the involved industries, PFAS litigation again shows similarities with microplastics litigation. Further, these considerations are reminiscent of asbestos litigation, tobacco litigation or lead paint litigation.⁷²

5 Innocent bystanders: a concept of ubiquitous reach?

It should be noted that in addition to product buyers, PFAS, due to their ubiquitous presence and mobility, can harm third parties. Generally, innocent bystanders are protected by product liability.⁷³ Further, if a product is defective due to a lack of adequate instructions, it is consistent that incorrect use/storage/disposal by product purchasers does not prevent the manufacturer from being held liable to third par-

⁷¹ Nitsch, ZEuP 2024, 345.

⁷² Nitsch, ZEuP 2024, 327.

⁷³ C Rahl, Kommentar zum PHG Vorbemerkung PHG no 67; MüKoBGB/Wagner (fn 64) ProdHaftG § 3 no 8.

ties.⁷⁴ Whether the concept of liability towards innocent bystanders is of ubiquitous reach is a pressing question. However, according to the PFAS pollution project, there are regional hotspots that allow the definition of a rather closed circle of potentially damaged parties. At any rate for such cases, the damaged parties should be considered as innocent bystanders protected under product liability law.

6 The new mechanisms of disclosure of evidence and presumptions introduced by the PLD 2024

Articles 9 and 10 PLD 2024 introduce a fundamental innovation in product liability: the mechanisms of disclosure of evidence and the presumptions regarding defectiveness and causation.

In line with the general principles of burden of proof, the Recitals of the PLD 2024 lay down that: ‘[i]n light of the imposition on economic operators of liability irrespective of fault, and with a view to achieving a fair apportionment of risk, a person that claims compensation for damage caused by a defective product should bear the burden of proving the damage, the defectiveness of a product and the causal link between the two, in accordance with the standard of proof applicable under national law.’⁷⁵

However, the PLD 2024 suspects an information asymmetry, in particular in cases involving technical or scientific complexity, as claimants are often ‘at a significant disadvantage compared to manufacturers in terms of access to, and understanding of, information on how a product was produced and how it operates.’⁷⁶

Thus, according to art 9 PLD 2024, Member States shall ensure that, at the request of claimants who have presented facts and evidence sufficient to support the plausibility of a claim for compensation, the defendant is required to disclose relevant evidence that is at the defendant’s disposal. Certainly, whether claimants can overcome the hurdle of presenting facts and evidence *sufficient* to support the plausibility of their claims remains a crucial question.

Vice versa, if defendants have presented facts and evidence sufficient to demonstrate the need for evidence for the purposes of countering a claim for compensation, the claimant is required to disclose relevant evidence that is at the claimant’s disposal.

⁷⁴ Nitsch, ZEuP 2024, 326 with ref to MüKoBGB/Wagner (fn 64) ProdHaftG § 3 no 12.

⁷⁵ Recital 42 PLD 2024.

⁷⁶ Recital 42 PLD 2024.

Article 9 para 3 PLD 2024 limits this disclosure of evidence to what is necessary and proportionate. This assessment takes into account the legitimate interests of all parties concerned, including third parties, in particular in relation to the protection of confidential information and trade secrets.⁷⁷ The disclosure of evidence includes documents that have to be created *ex novo* by the defendant by compiling or classifying the available evidence.⁷⁸

Where a party (the claimant or the defendant) is required to disclose evidence, national courts can require such evidence to 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.⁷⁹

Article 10 PLD 2024 introduces presumptions regarding defectiveness and causation. These presumptions can be rebutted by the defendant (art 10 para 5 PLD 2024).

According to art 10 para 2 PLD 2024, the defectiveness of a product shall be presumed where the defendant fails to disclose relevant evidence pursuant to art 9 para 1 PLD 2024 (lit a); the claimant demonstrates that the product does not comply with mandatory product safety requirements⁸⁰ that are intended to protect against the risk of the damage suffered (lit b); or the claimant demonstrates that the damage was caused by an obvious malfunction of the product during reasonably foreseeable use or under ordinary circumstances (lit c).

In art 10 para 3, the PLD 2024 introduces a presumption of causation in cases where the defectiveness of the product has been established and where it has been established that the damage caused is of a kind typically consistent with the defect in question. Courts presume the defectiveness of the product or causation, or both, where, despite the disclosure of evidence (art 9 PLD 2024) and taking into account all the relevant circumstances of the case, 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 (lit a); and 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 both (lit b).

The Recitals of the PLD 2024 highlight that: ‘imposing the usual standard of proof as required under national law, which often calls for a high degree of prob-

⁷⁷ Recital 42 states Directive (EU) 2016/943 of the European Parliament and of the Council of 8 June 2016 on the protection of undisclosed know-how and business information (trade secrets) against their unlawful acquisition, use and disclosure [2016] OJ L 157/1.

⁷⁸ Recital 42.

⁷⁹ Art 9 para 6 PLD 2024.

⁸⁰ Safety requirements laid down in Union or national law.

ability, would undermine the effectiveness of the right to compensation' and underline that manufacturers, as experts, have better understanding than the injured persons.⁸¹

It remains to be seen how the national transposition acts and court practice will refine the prerequisites of arts 9 and 10 PLD 2024. Certainly, the nuances of these mechanisms will be of crucial relevance for product liability in general, and for PFAS litigation in particular.

7 Breach of statutory duty

a Protective scope, limitations regarding potential plaintiffs

The regulatory framework has already been outlined above. Due to the increasingly dense regulatory framework explicitly aimed at regulating PFAS, liability based on breach of statutory duty can be assessed. As previously discussed in relation to microplastics,⁸² a breach of statutory duty serves as grounds for liability under many jurisdictions.⁸³

To operationalise these regulations in the context of liability law, the respective breached regulatory law must be examined with regard to its protective purpose and scope. The starting point is that not every regulatory or prohibitive provision under public law is intended to be enforced by means of private law in general or by liability in particular.⁸⁴ The protective purpose of the law serves as a central mechanism to limit liability and to prevent excessive liability.⁸⁵ The relevance of this liability-limiting effect must be emphasised, as otherwise, regulatory legislation would have to take liability of a private law nature into account and, against the background of an even automatic enforcement under liability law, could take on a restrained approach and consequently could no longer fully fulfil its essential task: regulation. This must be recognised and maintained as a basic premise, even against the background of the established ineffectiveness of regulatory law outlined above.

⁸¹ Recital 48 PLD 2024.

⁸² Nitsch, ZEuP 2024, 329.

⁸³ Under common law (eg *Couch v Steel* (1854) 3 Ellis & Blackburn's Queen's Bench Reports [E & B] 402; 118 English Reports [ER] 1193), under Austrian law according to § 1311 sent 2, 2nd case Austrian Civil Code ('ABGB'), under German law pursuant to § 823 para 2 German Civil Code ('BGB').

⁸⁴ Nitsch, ZEuP 2024, 333; N Foster, The Merits of the Civil Action for Breach of Statutory Duty, Sydney Law Review 2011, 67.

⁸⁵ For the common law: *Gorris v Scott* (1874) Law Reports (LR) 9 Exchequer Cases (Ex) 125; for German law: A Spickhoff, Gesetzesverstoß und Haftung (1998) 238ff; BGH 23.7.2019 – VI ZR 307/18, NJW 2019, 3003; for Austrian law: RIS Justiz RS0031143.

Thus, the respective regulation must be assessed in terms of its personal scope, identifying the group of persons which the law wishes to protect.⁸⁶ Further, one has to consider the material and modal protective dimension, therefore asking against which damage⁸⁷ and which forms of infringement⁸⁸ does the law protect? Lastly but not crucially, it must be assessed whether protection is intended solely for the general public or (at least also) for individuals and, if so, with the consequence of liability.⁸⁹

In the case of a violation of the REACH Regulation, academic literature⁹⁰ affirms liability. As previously discussed regarding liability for microplastics,⁹¹ this approach is persuasive because the Regulation is clearly aimed at protecting the environment but also human health, and the group of individuals protected (namely the consumers of the respective product) is clearly defined.

However, it is also worth exploring whether individuals who are neither purchasers nor users of the product, but third parties harmed by the ubiquitous spread of PFAS, can derive claims. If the fulfillment of a given duty affects such a large and undefined group of people that it equates them with the general public, liability for the violation of protective laws is often denied.⁹² Against this background, liability for breach of the REACH Regulation may require differentiation regarding the personal scope (including product buyers and users) and the modal protective dimension (ubiquitous impact on third parties that would not be included).

b Addressee of the statutory law, limitations regarding defendants

If liability for breach of statutory law can be successfully argued, one must strictly examine who the statutory law addresses. Consequently, it is relevant whether the infringed standard imposes an obligation on the chemical industry that produces

⁸⁶ For the common law: *Kelly v Henry Muhs Co* (1904) 71 New Jersey Law Reports (NJL) 358, 59 A. 23; for German law: BGH 25.5.2020 – VI ZR 252/19, NJW 2020, 1962; for Austrian law: RIS-Justiz RS0119571.

⁸⁷ For the common law: *Gorris v Scott* (1874) LR 9 Ex 125; for German law: BGH 25.5.2020 – VI ZR 252/19, NJW 2020, 1962; for Austrian law: RIS-Justiz RS0027553; RS0023015.

⁸⁸ For the common law: *Gorris v Scott* (1874) LR 9 Ex 125; for German law: MüKo/Wagner (fn 64) BGB § 823 no 590; BGH 26.2.2013 – VI ZR 116/12 NJW 2013, 1679; for Austrian law: RIS-Justiz RS0027576.

⁸⁹ For the common law: *N Foster*, The Merits of the Civil Action for Breach of Statutory Duty, Sydney Law Review 2011, 67 (73); for German law: *Spickhoff* (fn 85) 111ff; MüKoBGB/Wagner (fn 64) BGB § 823 no 564; for Austrian law: OGH 1 Ob 15/92 SZ 65/94 = JBl 1993, 399.

⁹⁰ MüKoBGB/Wagner (fn 64) BGB § 823 no 1067.

⁹¹ Nitsch, ZEuP 2024, 334.

⁹² For the common law: *N Foster*, The Merits of the Civil Action for Breach of Statutory Duty, Sydney Law Review 2011, 67 (90); for German law: MüKoBGB/Wagner (fn 64) BGB § 823 no 564; *Spickhoff* (fn 85) 111ff; for Austrian law: RIS-Justiz RS0049993.

environmental pollutants or whether it also imposes an obligation on the industries that use these substances and, if so, on which.

8 Breach of duty of care

Lastly, liability due to a breach of duty of care must be examined, which is governed by similar concepts in German law, Austrian law, and common law jurisdictions.⁹³ From a comparative law perspective, this ground of liability argues that the tortfeasor should be liable for creating or failing to remove a foreseeable source of danger and at the same time for failing to take reasonable measures to avert that danger.

Even though some legal systems provide a statutory basis for such liability, it is usually left to refinement by court practice. Similar to climate change litigation, in some jurisdictions, courts could deny judicial competence (eg, based on the political question doctrine⁹⁴). Such judicial self-restraint is especially subject to extensive scholarly debate within the framework of climate change litigation.⁹⁵

Despite the ubiquitous presence of PFAS, which suggests a universally diffuse global environmental impact, there are crucial differences compared to climate change. These distinctions argue against an identical argumentation or consideration under tort law. First, all PFAS present in the environment are artificially created; there are no naturally occurring PFAS. Furthermore, and as stated above, when liability is directed toward the chemical industry, the number and diversity of global market players involved are not overwhelmingly large or wide-ranging. Furthermore, this group of potential defendants will have a better understanding of risks and measures to prevent harm.⁹⁶

⁹³ *G Wagner*, *Rabels Zeitschrift für Ausländisches und Internationales Privatrecht* (RabelsZ) 80 (2016) 717 (752).

⁹⁴ *Massachusetts v EPA*, 549 United States Supreme Court Reports (US) 497 (2007); *American Electric Power Company v Connecticut*, 564 US 410 (2011); *Kivalina v ExxonMobil Corp*, No 4:08-cv-01138 (ND Cal).

⁹⁵ *Nitsch*, ZEuP 2024, 335ff with further refs.

⁹⁶ *N Gaber/L Bero/TJ Woodruff*, *The Devil they Knew: Chemical Documents Analysis of Industry Influence on PFAS Science*, *Annals of Global Health* 2023, 89(1), 37, <<https://doi.org/10.5334/aogh.4013>>.

VII Goals of litigation: from claims for compensation to claims for a reduction of future pollution, change in substance or material

Certainly, one can suspect that plaintiffs pursue interests beyond their individual interests ‘to promote legal, political or social change’.⁹⁷ With this aim, PFAS litigation would be a form of strategic litigation. However, PFAS litigation can be perceived as both, strategic or conventional litigation. If plaintiffs seek injunctive relief or compensation due to their own individual (!) harm or endangerment, PFAS litigation is conventional.

Further, the present paper emphasises that PFAS litigation is not only a matter of liability law in its capacity as a mechanism of compensation. In fact, hurdles exist, especially with regard to establishing causation (see *Lee* in this issue, 165) but also with regard to the statute of limitations (see *Widmer Lüchinger* in this issue, 187).

However, in addition to compensation, liability law also has the function of preventing future harm. Instead of seeking compensation, plaintiffs could seek a reduction of future PFAS pollution, and, therefore, seek a change in substance and material, eg low-pollutant formulation of chemical-based materials. With this approach, PFAS litigation could show a parallel development with climate change litigation: from compensation to mitigation or reduction.

VIII Conclusion

PFAS litigation is another form of litigation that attempts to operationalise private law to address global environmental crises. It can be perceived as strategic and conventional. Where claimants pursue interests beyond their individual interests, PFAS litigation is strategic. However, if actions address individual harm or endangerment, PFAS litigation is conventional.

The regulatory framework governing PFAS often lags behind chemical innovation as the industries involved continually develop new substances and put them on the market. This represents a weakness in regulatory law, if these newly developed

97 B Hess, Strategic Litigation: A New Phenomenon in Dispute Resolution. MPILux Research Paper, 2022 (3) <<http://dx.doi.org/10.2139/ssrn.4107384>>.

chemicals, not yet covered by prohibitive or restrictive regulations, are equally toxic.

As seen in liability for climate change and microplastics pollution, it is discussed that tort law can, and should, fill these regulatory gaps. The present paper extended beyond the scope of liability law as merely a compensation mechanism. Instead, liability law should also be viewed as a proactive mechanism with the aim of preventing future harm.

As an overarching consideration, the paper emphasised that climate change litigation should not be used for evaluating the effectiveness of liability law in addressing different forms of environmental pollution in their various complex and significant distinctions on a regional or global scale.

Rather environmental pollutants and their associated risks should be perceived in their full differentiation. While PFAS litigation differs from climate change litigation, it shares similarities with microplastics litigation.

Whether the prerequisites of liability are met should be assessed in close cooperation with natural sciences (eg environmental geosciences, environmental toxicology) and social sciences. The advancements of these disciplines should be considered closely and continually.