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**Contemporary legal and political implications of PFAS pollution**

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## 1. Introduction

This paper intends to provide political actors with an overview of the current implications of the upcoming PFAS pollution, in particular the legal avenues which are potentially available to supress the advance of PFAS, but also to determine the boundaries of liabilities of governments and corporations which are responsible for the fabrication and distribution of products containing PFAS. For this purpose, the Dutch and French national law systems have been studied and compared with the current European and American liability frameworks. This paper will conclude with a recommendation for a more far reaching liability for producers of PFAS, which could be beneficial for the upcoming European legislation in this area.

## 2. What are PFAS?

Per- and polyfluoroalkyl substances, abbreviated as PFAS, is a group of thousands of different chemical compounds that have multiple fluorine atoms attached to an alkyl chain.[1] According to the OECD, there are at least 4,730 PFAS known, according to the United States Environmental Protection Agency, at least 14,735 unique PFAS are known, and PubChem lists roughly six million different PFAS. Commonly known PFAS are PFOA, PFOS and GenX.

## 3. Uses of PFAS

PFAS were once considered 'a miracle substance', due to their resistance to heat, water and stains. As such, they have been used in a wide variety of manufactured products for the last sixty years.[2] Since

[1] Toward a New Comprehensive Global Database of Per- and Polyfluoroalkyl Substances (PFASs): Summary Report on Updating the OECD 2007 List of Per- and Polyfluoroalkyl Substances (PFASs) (Report). Series on Risk Management No. 39. OECD. Archived from the original on January 17, 2020. Retrieved December 9, 2019.
[2] L. M. Diaz and M. R. Stewart, ""Forever Chemicals": Forever Altering the Legal Landscape". *Belmont Law Review* 7(4): 308-342, p. 311;

their invention in the 1930s and their proliferation in the decades afterwards, PFAS have been used in a wide variety of applications, including but not limited to firefighting foam, the aerospace industry and a broad number of consumer products.[3] Over the years, PFAS have been increasingly used in items that come into contact with food, such as Examples of PFAS-laden food contact materials include non-stick and glazed pans, griddles, waffle makers, storage containers, gaskets, burger and sandwich wrap paper, bakery contact paper, muffin cups liners, take-out containers, pizza boxes, chocolate and candy wrappers, food bags, disposable dishes, butter wrappers, microwavable popcorn bags, pet food bags, infant formula boxes, take out cups, ice cream tubs, and numerous other paper and plastic food storage containers. PFAS chemical compounds have been and are used in a wide variety of applications, see Table I.

As such, it is difficult for consumers to avoid exposure to PFAS. One study found that 95% of Americans have some detectable level of PFAS in their bloodstream. In more industrial settings, PFAS have also seen widespread usage in aerospace, construction, and the electronics industries.[4]

**Table I: uses of PFAS[5]**

| Category | Use | Examples |
|---|---|---|
| **Food packaging** | Used to keep oil and moisture oozing from foods | - Fast food containers<br>- Wrappers<br>- Microwave popcorn bags<br>- Pizza boxes |
| **Non-stick cookware** | Used for its non-stick features | - Frying pans<br>- Spatulas<br>- Spoons |



[3] N.M. Brennan, A.T. Evans, M.K. Fritz, S.A. Peak and H.E. von Holst, "Trends in the Regulation of Per- and Polyfluoroalkyl Substances (PFAS): A Scoping Review" *International Journal of Environmental Research and Public Health* 18: 1-28, p. 1;

[4] N.M. Brennan, A.T. Evans, M.K. Fritz, S.A. Peak and H.E. von Holst (2021). "Trends in the Regulation of Per- and Polyfluoralkyl Substances (PFAS): A Scoping Review. *International Journal of Environmental Research and Public Health* 18: 1-28, p. 1

[5] List sourced from: C. Mo. "PFAS Regulations in the European Union: An Essential Guide". Compliancegate.com, <https://www.compliancegate.com/pfas-regulations-european-union/>, viewed 31 March 2023.

| | | |
|---|---|---|
| | | - Egg beaters |
| **Furniture and carpets** | Used to increase stain and water resistance | - Waterproof-upholstered furniture<br>- Car seats<br>- Booster seats<br>- Waterproof carpets or rugs |
| **Water-Resistant Clothing** | Used to increase stain and water resistance | - Gore-Tex outdoor clothing<br>- Raincoat<br>- Period underwear<br>- Hiking boots<br>- Tents |
| **Cosmetics** | Used to increase long-term wearability, water, and sweat resistance. May also make skin appear smoother | - Dental floss<br>- Shampoo<br>- Nail polish<br>- Eye makeup<br>- Sunscreen |
| **Building materials** | Used to improve glossiness of materials and decrease bubbling and peeling. Also used to make paint stain and water resistant | - Metal/asphalt roofing<br>- Waterproofing membranes<br>- Tensile roofing<br>- Paints<br>- Metal coatings<br>- Wood lacquers<br>- Plastic coatings<br>- Resilient and hard flooring<br>- Windows<br>- Artificial turf |

**4. What are the risks/hazards/dangers of PFAS?**

The qualities of PFAS are also precisely what makes them a hazard to human health and the environment. PFAS have been proven to cause cancer, endocrine disruptions, liver and kidney failure, infertility, developmental difficulties and learning disorders, as well as immunodeficiencies.[6]
With regard to PFOS and PFOA, it is known these have certain harmful properties/qualities to health. Other PFASs have not been proven to have similar health effects, but the attention of the scientific community towards and available information on the potential hazards of these substances is increasing.[7]

PFAS are commonly considered to be persistent organic pollutants (POPs) as they break down poorly in the environment, easily spread and accumulate in plants, animals and humans (bioaccumulation).

Due to the widespread use and the long half-life of PFAS compounds, over 98% of the U.S. population has some detectable level of PFAS in their bloodstream.[8] The most commonly used PFAS compounds have been found in water, soil and wildlife and human blood globally[9].

The persons at risk can generally be grouped into three types of categories:

- **Workers**: workers who inhale, swallow, or have physical contact with PFAS are at the highest risk of exposure. Within the category workers, those at the highest risk



[6] K.S. Cronin. (2022). "FDA-Approved: How PFAS-laden Food Contact Materials are Poisoning Consumers and What to do About it", *The Business, Enterpreneurship & Tax Law Review* 6(1): 1-36.
[7] European Chemicals Agency (ECHA). *Annex XV Restriction Report. Proposal for a restriction on Per- and polyfluoroalkyl substances (PFASs)*. 2023 p. 48. Helsinki, Finland: ECHA
[8] L. M. Diaz and M. R. Stewart (2020), ""Forever Chemicals": Forever Altering the Legal Landscape". *Belmont Law Review* 7(4): 308-342, p. 311; Ryan C. Lewis et al., Serum Biomarkers of Exposure to Perfluoroalkyl Substances in Relation to Serum Testosterone and Measures of Thyroid Function Among Adults and Adolescents from National Health and Nutrition Examination Survey (NHANES) 2011-2012, 12 International Journal of Environmental Research and Public Health 6098, 6103-06 (2015); See generally Centers for Disease Control and Prevention, Fourth National Report on Human Exposure to Environmental chemicals (Feb. 2015). Antonia M. Calafat, et al, 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, 115 Environmental Health Perspective 1596, 1596 (2007).
[9] Environmental Protection Agency (2022), "PFAS Explained", <https://www.epa.gov/pfas/pfas-explained>, viewed 31 March 2023.

- **Bystanders**: those living or working near manufacturing/processing plants, landfills, wastewater treatment plants, firefighter training facilities, military bases and/or airports may be exposed through contaminated water.
- **Consumers**: the average consumer who uses/consumes one or more of the aforementioned consumer products that have been named in Table I are at risk of exposure, as well as people who eat fish from PFAS-contaminated water.[10]

As the dangers and health risks of PFAS become more apparent, it is tenable that this produces not only a legal but also a moral responsibility on the producers of such substances to prevent damage done to the environment and individuals. In so far as such damage has already been inflicted, this moral and legal responsibility implies at the same time an obligation for the producers (in addition to the governments) for indemnification of the victims of such damage. Article 2 of the European Convention on Human Rights (ECHR) which obliges states parties to protect the lives of their inhabitants, might serve as a legal basis for governments to ensure that producers of PFAS can be kept liable on the basis of the principles set out on this paper, in particular on the basis of the Lohrmann-doctrine, elaborated on below.

**5. What has currently been done and what can be done?**

Globally, the most important international instrument governing the use of PFAS is the Stockholm Convention on Persistent Organic Pollutants of May 22, 2001. It includes a list of measures that states must take to restrict and/or prohibit the use of certain persistent organic pollutants (POPs). The Convention covers certain PFAS, notably PFOS since 2009 and PFOA since 2019, but also other POPs. The Convention however does not include any concrete non-compliance mechanisms, so that most signatories can disregard their commitments – with little to no repercussions. The Stockholm Convention has been implemented in the EU through the REACH-regulation – which does include non-compliance mechanisms for businesses.

[10] Categorization taken from C.T. Liljestrand (2022), "PFAS Exposure: A Comprehensive Look at Emerging Facts and Studies, Risk and Liability Assessment, Litigation History, Evolving Regulations and Future Predictions." *Defense Counsel Journal* 89(2): pp. 1D+

The Biden administration is planning on designating certain PFAS, more specifically PFOS and PFOA as hazardous substances under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA).[11]

Whereas PFAS regulations in the US up until now has mainly been left to the local levels over government (cities and states), the EU is eyeing a much more comprehensive regulation of PFAS for the bloc. Several EU member states (notably Denmark, Sweden, Norway, Germany and the Netherlands) have currently proposed plans to enact far-reaching phased restrictions on 10,000 known PFAS to the European Chemicals Agency (ECHA). Two types of PFAS have already been banned by the EU, under its persistent organic pollutants (POPs) regulation (Regulation (EU) 2019/1021). The banned PFAS in question are the same the US is currently planning on designating a hazardous substance: PFOS and PFOA.

The new proposal takes PFAS and prohibits their use as a class instead of prohibiting the use of individual PFASs. Up until now, PFAS restrictions and bans have mainly centered on specific types of PFAS: earlier legislation only banned or restricted, for example, PFOA or PFOS. This has led to a substitution problem of sorts: simply alter the molecular structure of a certain PFAS just slightly, and from a technical standpoint, one now has a new substance which does not fall under the ban, whereas for all other intents and purposes, the new substance is still largely the same as the earlier substance and can be used for the same applications – and has the same negative effects. It is thus beneficial to handle PFAS not as several thousands of separate substances, but rather as a group or class – based on relevant intrinsic properties (the aforementioned proposal suggests property-based grouping based on persistence, bioaccumulation, potential, toxicity, mobility and molecular size – and even argues that a grouping on persistence alone could be justified).[12]



[11] White House Press Statement October 18, 2021: "Fact Sheet: Biden-Harris Administration Launches Plan to Combat PFAS Pollution. <https://www.whitehouse.gov/briefing-room/statements-releases/2021/10/18/fact-sheet-biden-harris-administration-launches-plan-to-combat-pfas-pollution/#:~:text=Consistent%20with%20President%20Biden's%20commitment,from%20discharging%20PFAS%20into%20America's>, viewed March 31, 2023.

[12] European Chemicals Agency (ECHA). *Annex XV Restriction Report. Proposal for a restriction on Per- and polyfluoroalkyl substances (PFASs)* Helsinki, Finland 2023: ECHA p. 20-21.

Important to consider is that a total ban on any and all uses of PFAS seems unrealistic: there are numerous vital applications of PFAS, for which there (at least at the time) simply is not a realistic or viable alternative. These vital applications of PFAS are either excluded from the proposal, or, depending on the existence of alternatives, are granted a longer phaseout time (up to twelve years).[13] In so far as the activity and/or resource for which a PFAS is used is necessary and in so far as there is no realistically viable alternative, an exemption hardly seems unjustified.

One of the key issues with regulating PFAS has been that it is not a single product or a single substance but rather a class of substances: as noted earlier, there are several thousands of known PFAS. While the scientific consensus is that PFOS, PFOA and GenX are carcinogens, such has not been conclusively proven the same level as regards to other PFAS-substances. Nonetheless, treating PFAS as a class and prohibiting their use as a class, using a proactively careful approach seems prudent given the fact that they are such persistent substances.

### 5.1 International Developments: CERCLA and the EU Environmental Liability Directive

Both the United States and the European Union have a comprehensive approach to liability arising from hazardous waste: imagine the situation of a company in which a hazardous substance accidentally leaks from their production facilities and ends up in the groundwater. This is the type of situation the US Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA) and the EU's Environmental Liability Directive aim to cover and provide liability schemes for.

CERCLA, also known as the Superfund Law, is the statute that governs hazardous waste liability in the US. It also includes the authority for the US federal government to levy the excise tax through CERCLA expired in 1995, but has been reinstated since July 1st, 2022,[14] The Environmental Protection Agency (EPA) has plans to designate PFOA and PFOS as hazardous substances under CERCLA, which would create i) reporting requirements and perhaps more notably ii) allow the government to tax

[13] European Chemicals Agency (ECHA). *Annex XV Restriction Report. Proposal for a restriction on Per- and polyfluoroalkyl substances (PFASs)*. Helsinki, Finland 2023: ECHA, p. 69

[14] T. Shaw. "Return of Superfund Excise Taxes Will Burden US Companies, Experts Say". *Thomson Reuters* June 14, 2022, <https://tax.thomsonreuters.com/news/return-of-superfund-excise-taxes-will-burden-us-companies-experts-say/>, viewed March 31, 2023.

manufacturers of these substances in order to fund efforts to remove these substances. What CERCLA however is most known for is the so called 'Superfund Liability': Under CERCLA, liability is imposed on parties responsible for the presence of hazardous substances at a site (the so called Superfund[15] liability)[16]. Notably, the liability is retroactive – potentially responsible parties (PRPs) can be held liable for acts that caused the presence of hazardous substances at a site before the enactment of CERCLA in 1980. The liability is triggered if hazardous wastes are present at a facility, there is a (possibility of a) release of these hazardous substances, response costs have been or will be incurred and the defendant is a liable party. These criteria are cumulative. The liability covers government clean-up costs, damages to natural resources and costs of certain health assessments. Liable parties are current owners and operators of a facility, past owners and operators at the time hazardous wastes were disposed, generators and parties that arranged for disposal and/or transport of hazardous substances and transports of hazardous waste that selected the site where the hazardous substances were brought.[17] Said liability is also a joint liability, meaning any single party that had liability for some part of the damage can be held responsible for the entire amount of the damages.

CERCLA thus creates a fairly far-reaching liability, the reason for which is that it is considered unfair that taxpayers would have to bear the burden of the clean-up costs while they were in full compliance with the law. CERCLA's far reaching liability is considered to be somewhat controversial, and as such no other nation has adopted a similar liability standard.

The EU's equivalent, the Environmental Liability Directive, on the control of major-accident hazards is noticeable more 'sober'. It too imposes a 'polluter pays'-principle with strict liability, but said liability is less broad in its applicability than Superfund liability: companies carrying out inherently dangerous activities are strictly liable for ensuing environmental damage – which encompasses damage to natural resources, protected species, habitats, water, and soil.



[15] CERCLA is known under the name 'Superfund' because the concept of CERCLA was originally the creation of a multibillion-federal trust fund funded through additional taxation of certain hazardous industries. The authority to collect those taxes expired in 1995 and since then CERCLA is mainly 'used' through the civil liability mechanisms it created.

[16] L. S. Kirsch & J. C. Raffetto (2021). "Federal Environmental Liability under CERCLA and RCRA" In: K. R. Murray (ed.). *Environmental Aspects of Real Estate and Commercial Transactions: Acquisition, Development, and Liability Management, Fifth Edition*. Chicago: *American Bar Association Publishing*, p. 4-6.

[17] 42 U.S.C. §9607 et seq. (1980).

**Table II: Liability under CERCLA and the Environmental Liability Directive compared**[18]

| **Aspect** | **CERCLA (US)** | **Environmental Liability Directive (EU)** |
|---|---|---|
| Retroactively applicable | Yes | No |
| Potentially responsible parties | - Past operators<br>- Present operators<br>- Past owners of property<br>- Present owners of property<br>- Party arranging for disposal of wastes<br>- Transporters of waste | - Operator who was primary source of contamination |
| Potential plaintiffs | - Government suits<br>- Citizen suits against government for failure to act<br>- Citizen suits against responsible party | - Government suits<br>- Citizen suits against government for failure to act<br>- No citizen suits against responsible party |
| Liability apportionment | Joint and several liability | At discretion of member states: either proportionate liability or joint and several liability. Most member states have opted for latter. |
| Financial maximisation of liability | None, potentially limitless | None, potentially limitless |

[18] Table taken from M. Tabatabai (2012). 'Comparing US and EU hazardous waste liability frameworks: how the EU liability directive competes with CERCLA'. *Houston Journal of International Law* 34(3): p. 654-685. Table is found on p. 662-664.

| | | |
|---|---|---|
| Damage covered | Limited to clean-up and removal of contaminated matter, hazardous substances and potentially harmful remnants | Both clean-up and removal and rehabilitation of natural resources and biodiversity. |

Applying the rules of the Environmental Liability Directive to PFAS substances could – because of the risk liability it creates – provide a solution to hazardous waste liability pertaining to PFAS pollution in the environment.

The Environmental Liability Directive provides a ready-made solution that is already 'in the books' (in the sense that it doesn't require any new law to be created), in so far as the liability concerns hazardous waste liability. A clear limit of it however, is that it requires governments to act: there exists no action for individuals to receive compensation. They are left with only the 'basic' options that national laws provide them with. One should however consider that many national law systems within the EU do include grounds for such a civil suit in their civil codes.[19]
In order to have the Environmental Liability Directive be effective for individuals as well (in situations in which their national law does not allow for such an individual action), one could consider to create a legal avenue that this Directive can also be used as a legal basis for individual persons to bring a claim.

Additionally, one could consider to extend this liability not just to cases of hazardous waste but take it further and apply it to situations in which personal damage has been incurred, for example a person living in close proximity to a PFAS production plant, who, as a result, has developed cancer. Paragraph 4.2 under 1) considers the introduction of a risk liability system for such cases.

One could also consider applying the further reaching CERCLA rules in the EU – applying the more far-reaching liability grounds of CERCLA instead of the current ones – but the question is whether this is

[19] In the Dutch Civil Code, risk liability in the civil sense for hazardous waste is established in artt. 6:175 (hazardous materials), 6:176 (waste disposal), 6:177 (mining). Further rules on this liability are laid down in artt. 6:178 through 6:184.

politically feasible: such a far-reaching system as CERCLA liability was apparently not politically feasible enough in the EU at the time the Environmental Liability Directive was signed into law. However, with public opinion having become more and more aware of the problems of environmental damage, the time may now be ripe to introduce such more extensive liability.

A less often proposed solution would be creating an excise tax on products that include PFAS. The gains from such a tax could be put towards the creation of a fund used to pay for clean-up costs of hazardous PFAS waste or for compensation of PFAS victims should the liable party provide no option of recourse (for example due to bankruptcy). In essence, this is applying the 'polluter pays-principle' to the PFAS industry as a whole. A concern is that this (indirectly) puts the burden on the consumer. Taxes are eventually always factored into the price of the product a company sells. This may nonetheless have a behavioural effect (in the sense that products containing PFAS become more expensive and as such are bought less by consumers – essentially using the market to get rid of PFAS) – but this is purely theoretical and there does not seem to be conclusive evidence that a behavioural effect does indeed exist in regards to excise taxes (especially in the situation in which the excise tax does not raise the price of a product to prohibitive levels).

**5.2 Potential legal remedies to reinforce the current liability framework**

The remedies mentioned in the previous paragraph are far from the only ones available to combat the PFAS problem. The following paragraph focuses mainly on the question whether private law offers sufficient pathways to those who have been exposed to PFAS and have suffered health consequences due to such exposure. Said question is highly relevant and important as 95% of the public has PFAS in their blood.

Comparable to the large number of lawsuits for damages against former employers after persons in the construction sector were diagnosed with mesothelioma and other types of cancer, one could reasonably expect that persons exposed to greater levels of PFAS will file comparable lawsuits, either against (former) employers, or for example situations in which a person who has used Teflon cookware for years.

### 5.2.1 Causality is the problematic factor

A fundamental principle of tort law is that the 'tort' should have actually caused (or at the very least have very likely caused) the damage that the plaintiff is claiming compensation for: the principle of causality. In most law systems, it is the responsibility of the plaintiff to make plausible up to the standard of preponderance of evidence that the damage was caused by the act or omission in question. The burden of proof of the causal relationship lies with the plaintiff.[20]

The 'causality advantage' plaintiffs had in many of these cases, was that mesothelioma is scientifically known to be caused almost solely by asbestos.[21] This makes it considerably easier to 'pass the hurdle' of proving causation: if someone has worked their entire life in an asbestos-using industry and later develops a type of cancer only caused by asbestos, then causation is essentially a given.

The difficulty, however, is that, as opposed to asbestos exposure, PFAS exposure is not associated with a 'signature illness': exposure to PFAS has been linked to health problems such as decreased fertility, increased high blood pressure in pregnant women, developmental effects or delays in children, increased risk of cancers (including prostate, kidney and testicular cancers), immunodeficiencies, increased cholesterol levels and a higher risk of obesity[22] – all diseases, illnesses, conditions and deficiencies that are generally known to have a variety of potential causes. As such, causality is much harder to reliably establish.

'Solutions' to this legal obstacle of causality could exist in several forms,

- 1) Introduction of risk liability
- 2) Application of proportional liability
- 3) Imposing a (partial) reversal of the burden of proof (reverse onus)



[20] In Dutch law, this principle is laid down in art. 150 of the Code of Civil Procedure.
[21] "EBSCO database". Archived from the original on 2012-05-12. verified by URAC; accessed from Mount Sinai Hospital, New York; Richard L. Attanoos, MBBS, FRCPath; Andrew Churg, MD; Francoise Galateau-Salle, MD; Allen R. Gibbs, MBChB, FRCPath; Victor L. Roggli, MD
Arch Pathol Lab Med (2018) 142 (6): 753–760.;
[22] Environmental Protection Agency (2023). "Our Current Understanding of the Human Health and Environmental Risks of PFAS", <https://www.epa.gov/pfas/our-current-understanding-human-health-and-environmental-risks-pfas>, viewed March 31, 2023.

### 5.2.2 Risk liability

CERCLA introduces a fairly far-reaching form of risk liability. Liable parties are not the parties that would be liable under regular tort law (generally 'the negligent party') but rather so called potentially responsible parties (PRPs). These PRPs include current owners and operators of a facility, past owners and operators at the time hazardous wastes were disposed, generators and parties that arranged for disposal and/or transport of hazardous substances and transports of hazardous waste that selected the site where the hazardous substances were brought.[23]

On an EU-level, *EU Council Directive 85/374/EEC on the approximation of the laws, regulations and administrative provisions of the Member States concerning liability for defective products* (hereafter: the Directive) has created a so called 'risk liability' for defective products.

In the Netherlands, this Directive has been implemented in articles 6:185 through 6:193 of the Dutch Civil Code (BW). The Directive has been similarly implemented within the French legal system in articles 1245 through 1245-17 of the French Civil Code.

Here, the word 'defective' should be considered in a 'broad' fashion, namely a product is considered 'defective' when 'it does not provide the safety which a person is entitled to expect, taking all circumstances into account, including (a) the presentation of the product; (b) the use to which it could reasonably be expected that the product would be put; (c) the time when the product was put into circulation.'[24]

While this research has not been able to discover any court cases thus far in which liability on the basis of this Directive was accepted in a PFAS-related case, the wording of aforementioned provision makes it clear that PFAS-related damage claims, under circumstances, could very well be awarded by the courts on the basis of this Directive.

[23] 42 U.S.C. §9607 et seq. (1980).
[24] Article 6 Council Directive 85/374/EEC

The liability created by art. 6:185 BW/art. 1 Directive constitutes a risk-liability, meaning the persons that are liable under this provision (the producer) cannot shield themselves from liability by claiming ignorance or absence of blame/guilt. The producer can only absolve himself from liability if he can prove:

- (a) that he did not put the product into circulation; or
- (b) that, having regard to the circumstances, it is probable that the defect which caused the damage did not exist at the time when the product was put into circulation by him or that this defect came into being afterwards; or
- (c) that the product was neither manufactured by him for sale or any form of distribution for economic purpose nor manufactured or distributed by him in the course of his business; or
- (d) that the defect is due to compliance of the product with mandatory regulations issued by the public authorities; or
- (e) that the state of scientific and technical knowledge at the time when he put the product into circulation was not such as to enable the existence of the defect to be discovered; or
- (f) in the case of a manufacturer of a component, that the defect is attributable to the design of the product in which the component has been fitted or to the instructions given by the manufacturer of the product.

Particularly important is article 8(1) of the Directive, which states that the liability of the producer shall not be reduced when the damage is caused both by a defect in a product and by the act or omission of a third party. This provision aims to better protect consumers and prevents them from having to 'gather' their damages from several different producers. The producers among each other do have recourse against other producers if national law allows for it. How this exactly protects consumers is best explained with an example:

Say that a consumer uses a Teflon pan for cooking on a regular basis and as a result, suffers health damage. This person can then bring a claim against the producer of said Teflon pan. However, the producer of the Teflon pan has however fabricated said pan not knowing (and not being able to know) that it included Teflon (which is made from the toxic PFOA). The producer of the Teflon pan, who is now confronted with said claim, is still liable in relation to the consumer. However, the producer now

also has a claim against their supplier (who sold the producer of the pan the Teflon). This system of recourse between parties in the production chain saves the consumer the time and money involved in finding out exactly what company in the production chain is responsible for the 'defect' in the product.

The Directive additionally creates a statute of limitations for liability claims arising from it, with a limitation period of three years applied to such claims, starting from the day on which the plaintiff became aware, or should reasonably have become aware of the damage, the defect, and the identity of the producer. Suspension and interruption of aforementioned period are left to national law.[25] Because the 'timer' only starts 'ticking' when the potential plaintiff has become aware of the damage, the defect *and* the identity of the producer, this statute of limitations does not create any cause for concern over the effectiveness of the Product Liability Directive in PFAS cases.

For the purposes of the Directive, the burden of proof, however, still lies with the plaintiff: the plaintiff is to prove the damages, the defect, and the causal relation between defect and damages. The causal relationship is perhaps most difficult to prove in a court. The proposal Ad 3 below might countervail this causality issue.

In cases in which the product liability directive does not apply, one could consider creating a separate risk liability specifically for PFAS-cases. An example of such a case would be the earlier mentioned case of a person living in close proximity to a PFAS production plant, who, as a result, has developed cancer. The Product Liability Directive does not apply in their case, as the 'product' in question will likely not have been put into circulation yet (thus precluding the Product Liability Directive from taking effect). For them, the issue will likely be not causality, as their cancer will more likely than not have been caused by PFAS (and this will likely be easy to prove to the standard of preponderance of evidence – but rather the problem of establishing that the producer was 'at fault'. A risk liability effectively solves this, as the producer does not need to be 'at fault' in the legal sense. Their liability exists because their conduct (the production of PFAS) is deemed inherently hazardous enough to justify such a risk liability.

Another option could be to seek liability through the principle of ecological prejudice. The principle of ecological prejudice was introduced in the French Civil Code in articles 1246 through 1252 on 8 August

[25] Article 10 Council Directive 85/374/EEC

2016.[26] While in principle the damage must affect the environment, the doctrine distinguishes two types of prejudice: "pur" and "derived". "Pur" means that the prejudice can be recognised in the case of a non-negligeable harm to the natural environment and without any consideration of the repercussions on individuals or their property. For example, on 22 June 2022, the French company SOBEGI was held liable for ecological prejudice caused by their emissions of dust. While the Tribunal noted that the investigations did not establish the causality between the damage caused and SOBEGI's dust emissions, the company was held liable for not complying with the dust emission threshold established by prefectural decree to protect the environment and the human well-being. In this case the judge applied the precautionary principle.[27] Should similar thresholds exist in relation to PFAS, a similar approach by the French Tribunals could be envisaged. The "derived" damage touches upon the consequences of ecological damages caused to individuals and their property. In this second hypothesis, the plaintiff must prove that the prejudice is direct (the causal link), personal, and certain (future damage and the risk of damage can be taken into account by a French court) and can claim compensation for property damage, extra-patrimonial damage, and personal injury.[28] Should the prejudice be recognised, article 1247 prioritises a compensation in nature i.e. the restoration of the damaged environment and only secondarily the payment of damages. While no case-law exists until today on the application of the ecological prejudice in PFAS cases, such principles should in theory be applicable.

#### 5.2.3 Proportional liability

A second solution might relate to the principle of 'proportional liability'. An example could be the Dutch Supreme Court case of *Nefalit v. Karamus*, also an asbestos exposure-case, albeit that this case did not concern mesothelioma but rather a type of lung cancer that could be caused by either asbestos exposure or smoking. Because Karamus had a smoking habit, his former employer Nefalit defended

[26] Biodiversity Law n°2016-1087 of August 8, 2016.
[27] Tribunal Judiciaire de Pau, June 22, 2020, n°9999 (SOBEGI c/ SEPANSO).
[28] Julie Lecoq, "*Le préjudice écologique, une action en responsabilité reconnue explicitement dans le Code civil*", 24 October 2016, <https://www.lepetitjuriste.fr/prejudice-ecologique-action-responsabilite-reconnue-explicitement-code-civil/#:~:text=D'autre%20part%2C%20le%20pr%C3%A9judice,Erika%20en%202012%2C%20%C3%A9voqu%C3%A9e%20pr%C3%A9c%C3%A9demment.> (Viewed 30 March 2023).

itself against Karamus' claim by arguing that Karamus' smoking habit was the thing that caused his lung cancer, and that he himself was thus responsible for him developing lung cancer.

Expert witnesses in the case estimated a 55 percent chance that Karamus' lung cancer was caused by asbestos exposure, and a 45 percent chance Karamus' smoking habit caused it. While a 55% chance is not enough to rise to the level of 'preponderance of evidence'[29] (the standard of evidence generally required in civil cases), the Court of Appeal considered it unfair in this situation to let the burden of proof rest solely with Karamus. While not explicitly stated by the Court, what may have also played a role is the fact that cancers caused by asbestos exposure have a long incubation period which can range up to 35 years.

The Court of Appeal thus resolved this causality problem through the concept of proportional liability: Nefalit was liable for 55% of the damages. The Supreme Court upheld the verdict including this line of reasoning.[30]

Important to note is that the proportional causality-rule does not apply if the probability that action X caused result Y is very low.[31] While the Supreme Court did not provide any indication as to when such a probability is considered to be 'very low', one could likely make the argument that a 10% probability qualifies as 'very low'. The 'proportional causality'-rule will thus likely only be effective in situations of PFAS exposure due to living in close proximity to or working in a PFAS manufacturing location – because these cases are generally cases where a causal link can be established more easily.
The obvious downside of applying the 'proportional causality'-rule to tort cases regarding PFAS exposure is that a person will only receive partial indemnification.



[29] Also known as 'balance of probabilities' in British English.
[30] Hoge Raad March 31, 2006. ECLI:NL:HR:2006:AU6092, *NJ* 2011/250 (Nefalit/Karamus)
[31] In the reversed situation, if the probability is very high, the Nefalit/Karamus-rule cannot be applied either, because the plaintiff will then have presumably proved the causal relation up to the standard of the preponderance of evidence. Full damages will then likely be awarded, ceteris paribus.

### 5.2.4 Reverse onus

In civil cases, the burden of proof traditionally lies with the plaintiff: the plaintiff is to prove the damages, the defect, and the causal relation between defect and damages. The causal relationship is perhaps the most difficult element to prove in a court. As such, certain exceptions have been either created in legislation or in jurisprudence of the courts, in which the burden of proof is transferred to the defendant.

In the academic literature on causality in the legal arena, a distinction is generally made between specific causal uncertainty and general causal uncertainty. In a so called toxic tort case, the plaintiff must prove that 'the substance in question is *capable* of causing the injury in question. This is known as general causation.' Furthermore, the plaintiff should prove 'that this substance caused *his* injury. This is known as specific causation.'[32]

The difference is made clearer by Steel in his dissertation 'Proof of Causation' of 2015: 'in essence there is a broad distinction between cases where our uncertainty extends to ignorance of whether *c* can ever cause *e* and cases where our uncertainty is simply over whether *c* caused *e* on a specific occasion.'[33]

Asbestos plaintiffs, as explained earlier, often have difficulty gathering concrete evidence of the causal link between their exposure and diseases and health issues they have contracted. This is mainly due to the long incubation period of asbestos-related diseases and the fact that the cause is, more often than not, not a single exposure but a series of exposures. Proving how much asbestos exposure they received, is thus a difficult endeavour. Reversing the onus and thereby 'lessening the burden' for PFAS plaintiffs, could therefore perhaps be an option.
An example of a reverse onus of proof in Dutch Law is art. 6:177a(1) of the Civil Code, entered into force in 2020 stating:

[32] D. Bernstein. 'Getting to Causation in Toxic Tort Cases'. *Brooklyn Law Review* 74(1). 2008: p.51-74 (p. 52);
[33] S. Steel, Proof of Causation (diss. Cambridge), Cambridge University Press: 2015, p. 6;

> 'For physical damage to buildings and works, which by its nature could reasonably be damage caused by movement of the soil due to the construction or operation of a mining work for the purpose of extracting gas from the Groningen field or gas storage at Norg, it shall be presumed that such damage was caused by the construction or operation of that mining work.'

The reason for the existence of this provision however lies in the fact that there is not any real general causation uncertainty at play in such cases. Therefore, this evidentiary presumption was deemed justified. The Supreme Court explained the legislator's reasoning for this provision in the *Aardbevingsschade Groningen I*-case:

> 'Coming to the aid of the injured parties in their proof was deemed justified because the physical damage to buildings and works reported in Groningen is, in the majority of cases, actually the result of soil movement caused by gas production'[34]

The provision is thus to be considered as one of procedural-economic nature and its justification is to be found in cost-efficiency. Once again, the Supreme Court emphasizes in its ruling of 19 July 2019 that evidence in civil cases does not mean that the facts are irreversibly established, but only that the facts are made sufficiently probable. Yet, a (near) full reversal of the burden of proof such as the one employed by art. 6:177a(1) of the Civil Code however seems contrary to the fundamental principles of law, namely that the person invoking a certain right has the burden of proof for his claim. Concerns about creating such a legal situation, as jurisdictions with low requirements regarding evidence to be produced experienced something of a litigation explosion in regard to asbestos cases with hundreds of thousands of claims filed by claimants in such jurisdictions even when they had little to no physical impairment. The United States Supreme Court even noted in 1997 that the United States was confronted with a type of 'asbestos-litigation crisis'.[35] A (near) full reversal of the burden of proof may thus perhaps be 'too much of a good thing'. One could also ask the question whether a reverse onus in situations where there exists a general causality uncertainty is justified – because the reverse onus

[34] Supreme Court of the Netherlands, July 19, 2019, ECLI:NL:HR:2019:1278, *NJ* 2020/391, ann. J. Spier, (*Aardbevingsschade Groningen I*) par. 2.9.3;
[35] D. Bernstein. In 'Getting to Causation in Toxic Tort Cases'. *Brooklyn Law Review* 74(1). 2008: p.51-74. (p. 57-58)

of art. 6:177a(1) of the Dutch Civil Code was not created in order to alleviate the problems caused by a general causality uncertainty, but because there existed a high degree of causality certainty – it was a mere procedural-economic consideration.[36]

In the United States, the Fourth Circuit Court of Appeals, in *Lohrmann v. Pittsburgh Corning Corp.*, an asbestos case against a former employer brought by a former employee that had contracted lung cancer (not mesothelioma), created the *frequency, regularity, proximity-test* (alternatively also referred to as the Lohrmann-test). This test has since been copied and applied by a large number of other courts in the United States and has even been incorporated into law by statute in several states.[3738] The Lohrmann-test is used as a measuring tool for whether a plaintiff has provided enough evidence for his claim for damages arising from purported exposure to asbestos. In order to provide 'enough evidence', the plaintiff must present evidence of 1) an exposure to a specific product attributable to the defendant, 2) on a regular basis over some extended period of time, 3) in proximity



[36] E.R. De Jong, "Generieke causaliteitsonzekerheid bij het bewijzen van een oorzakelijk verband'. *Nederlands Tijdschrift voor Burgerlijk Recht (NTBR)* 2021/6, afl. 2, p.41-53 (p. 48).

[3737] A non-exhaustive list of cases in which the *frequency, regularity, proximity-test* has been applied by the Fourth Circuit courts has been compiled by D. Bernstein. In 'Getting to Causation in Toxic Tort Cases'. *Brooklyn Law Review* 74(1). 2008: p.51-74. He names: Chism v. W.R. Grace & Co., 158 F.3d 988, 992 (8th Cir. 1998) (applying Missouri law); Jones v. Owens-Corning Fiberglas Corp., 69 F.3d 712, 716 (4th Cir. 1995) (applying North Carolina law); Jackson v. Anchor Packing Co., 994 F.2d 1295, 1303 (8th Cir. 1993) (applying Arkansas law); Dillon v. Fibreboard Corp., 919 F.2d 1488, 1491 (10th Cir. 1990) (applying Oklahoma law); Robertson v. Allied Signal, Inc., 914 F.2d 360, 380 (3d Cir. 1990) (applying Pennsylvania law); Lyons v. Garlock, Inc., 12 F. Supp. 2d 1226, 1229 (D. Kan. 1998) (applying Kansas law); Kraus v. Celotex Corp., 925 F. Supp. 646, 652 (E.D. Mo. 1996) (applying Missouri law); Chavers v. General Motors Corp., 79 S.W.3d 361, 369 (Ark. 2002); Thacker v. UNR Indus., Inc., 603 N.E.2d 449, 457 (Ill. 1992); Spaur v. Owens-Corning Fiberglas Corp., 510 N.W.2d 854, 859 (Iowa 1994); Eagle-Picher Indus., Inc. v. Balbos, 604 A.2d 445, 460 (Md. 1992); Monsanto Co. v. Hall, 912 So. 2d 134, 137 (Miss. 2005); Gorman-Rupp Co. v. Hall, 908 So. 2d 749, 757 (Miss. 2005); James v. Bessemer Processing Co., Inc., 714 A.2d 898, 911 (N.J. 1998); Sholtis v. American Cyanamid Co., 568 A.2d 1196, 1207 (N.J. Super. Ct. App. Div. 1989); Gregg v. V-J Auto Parts, Co.,943 A.2d 216, 227 (Pa. 2007); Eckenrod v. GAF Corp., 544 A.2d 50, 53 (Pa. Super. Ct. 1988); Henderson v. Allied Signal, Inc., 644 S.E.2d 724, 727 (S.C. 2007); Borg-Warner Corp. v. Flores, 232 S.W.3d 765, 770 (Tex. 2007); Vaughn v. Ford Motor Co., 91 S.W.3d 387, 393 (Tex. App. 2002) (applying Illinois law). But see Ingram v. ACandS, Inc., 977 F.2d 1332, 1343-44 (9th Cir. 1992) (applying Oregon law); Blackston v. Shook & Fletcher Insulation Co., 764 F.2d 1480, 1486 (11th Cir. 1985) (applying Georgia law); Bailey v. N. Am. Refractories Co., 95 S.W.3d 868, 872 (Ky. Ct. App. 2001); Purcell v. Asbestos Corp., Ltd., 959 P.2d 89, 94 (Or. App. 1998), modified on reconsideration, 963 P.2d 729 (Or. App. 1998) (applying Oregon law). The Lohrmann causation standard has been adopted by statute in a number of states.

[38] Florida, Georgia and Ohio have incorporated the test into law, see Florida Stat. Ann. § 774.203(30)-204 (2008) (applying to certain claims); Georgia. Code Ann. § 51-14-3(23) (2008); Ohio Rev. Code Ann. § 2307.96(B) (2008). (As described by D. Bernstein. Ibid.)

to where he claims to have been exposed to asbestos (this will generally be the workplace or the home), 4) such that it is probably that the exposure to the defendant's product caused the plaintiff's injuries.[39]

The Lohrmann-test seems to provide a reasonable solution in toxic tort cases regarding PFAS as well, at least insofar as that these cases concern persons who are exposed to PFAS at work and persons who are exposed to PFAS due to living close to a PFAS production installation: the Lohrmann-test lessens the evidentiary burden resting upon the plaintiff but does not fully absolve the plaintiff from providing evidence for their claim. Application of the Lohrmann-test in civil suits would likely aid persons who are exposed to PFAS in their line of work and those who live in close proximity to PFAS-producing plants. The general populace would likely benefit less from a Lohrmann-approach: a plaintiff in this category would still have to prove a certain frequency and regularity of exposure and/or proximity. If we take for example pizza boxes, which sometimes include PFAS, a plaintiff will have to gather a large number of receipts from pizza deliveries to prove such a frequency and regularity – besides also proving that the boxes used each time included a PFAS. On the other hand, a person who works or lives in close proximity to PFAS, will likely have much higher exposure and as such will have a higher likelihood of experiencing negative health effects.

**6. Conclusion**

The regulation of PFAS relates to a broad field with many different aspects to take into account. In order to regulate this phenomenon, one can consider both public law remedies and private law remedies. Public law remedies exist generally in prohibitions on the use of PFASs, while private law remedies are generally 'after the fact'-solutions: providing relief for those who have incurred damages due to PFAS exposure. In both situations, the existing regulatory framework may provide solutions for limiting the damage of PFAS or for holding producers of PFAS accountable for the damage – but as the existing regulatory framework so far has not been applied to PFASs – the key is thus to amend the existing regulation to apply to PFAS as well. In essence: the solution is 'getting PFAS on the list'. If this is legal-politically achieved, one should focus on more effective and precise legislation, including the

[39] Ibid.; Lohrmann, 782 F.2d at 1162-63.

question whether the Lohrmann-test should be adopted regarding liability for PFAS contamination, both for governmental-industrial activities and the private industry. It is advised that the EU is more aware of the three options as proposed in this White Paper.

**Knoops' International Law**

**12 April 2023**