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COMMENT ON "PFAS AND THE POLLUTION TRAP: CONTESTED KNOWLEDGE IN ENVIRONMENTAL JUSTICE STRUGGLE"

DI CLAUDIA MARCOLUNGO

ABSTRACT: PFAS contamination is creating *sacrifice zones* where affected populations live as in a "*pollution trap",* well decribed by authors, Layla Lomé van der Donk and Marcel Llavero-Pasquina in their interesting article. In Italy, a first-instance ruling has shed light on an extraordinarily serious case of PFAS pollution in three provinces in the North-east of the country. During the process, several issues emerged: from scientific uncertainty to data cover-up by chemical manufacturers; from the difficulty of quantifying the damage to the underestimated effects of the PFAS contamination in the future. The analysis of the Miteni case in Veneto could be considered a useful way to discuss some implications of what the authors commented in the article analysed, adding some further elements regarding *coerced ignorance* and the role of civil society.

ABSTRACT: La contaminazione da PFAS, composti chimici "eterni", sta creando *zone di sacrificio* dove le popolazioni colpite vivono come in una "trappola dell'inquinamento", così ben descritta dagli autori Layla Lomé van der Donk e Marcel Llavero-Pasquina nel loro interessante articolo. In Italia, una sentenza di primo grado della Corte d'Assise di Vicenza ha affrontato un caso straordinariamente grave di inquinamento da PFAS in tre province del nord-est del Paese. Durante il processo sono emerse diverse questioni: dall'incertezza scientifica e il suo peso processuale all'occultamento dei dati da parte dei produttori chimici; dalla difficoltà di quantificare il danno ambientale e sanitario agli effetti sottovalutati della contaminazione da PFAS. L'analisi del caso Miteni in Veneto è senza dubbio utile per discutere alcune riflessioni degli autori nell'articolo analizzato, andando ad aggiungere alcuni ulteriori elementi sull'ignoranza forzata ed il ruolo della società civile nel caso della contaminazione chimica del nostro ambiente di vita.

KEYWORDS: PFAS, exposure, uncertainty, precautionary principle, scientific knowledge, forever chemicals

1. *Introduction*

The article discussed here[i] has the indisputable merit of bringing to general attention some fundamental points of the PFAS[ii] problem. This group of chemicals[iii] is gradually gaining increasing attention and concern both for the negative effects on the environment and health, for which evidence is accumulating and becoming increasingly refined, and for the large number of contaminated sites, the extent of which is currently neither known nor exhaustive[iv].

The aim of this commentary is to I) supplement some information about the contamination in Veneto resulting from the Miteni factory in Trissino, in the province of Vicenza; II) stimulate debate on some existing critical issues connected to the *pollution trap*.

First of all, just a preliminary remark aimed at defining, at least in broad terms, the contours of the PFAS contamination case recently ruled on by the Court of Assizes of the Court of Vicenza[v]. Eleven of the fifteen defendants, all former company executives, were sentenced to terms ranging from 2 years and 8 months to 17 years and 6 months, for an overall total of 141 years of imprisonment. The remaining four were acquitted. The PFAS pollution from the Trissino plant has affected over 350,000 people, in an area of more than 100 square kilometres, and contaminating the second largest aquifer in Europe. This pollution not only compromised drinking water and the natural environment but also had profound health and social implications.

This case shows similarities and differences to the cases analysed by the authors, van der Donk and Llavero Pasquina, as we will highlight. The Miteni case recalls what happened in Dordrecht: the PFAS production started in the 1960s; executives and owners knew the contamination on going and the health risks associated with PFAS substances, in particular PFOA[vi]; the conditions of the workers involved in production were the same and were underestimated and even denied; the results of blood samples and pollution were shared among the toxicologists and the scientists of the companies keeping them secret; the gradual, albeit belated, emergence of the extent of the contamination is due to social and media pressure; the supervisory authorities did not always appear to be proactive.

One difference, however, from the Hoosick Falls case, is that Miteni did not have the power to transform the small town of Trissino, where the plant was located, into a *'company town*', unlike what is happening today in Spinetta Marengo (Alessandria), where PFAS producer Solvay/Syensqo has created a highly *persistent* socio-economic network*,* where the term *'pollution trap'* fits perfectly[vii].

The activation of local communities in Australia, on the other hand, echoes the experience in Veneto, where public action was also driven by the tenacity of local NGOs[viii], fighting to protect public health and the environment and asking for justice and remediation.

2. *The corrupted conversation and science*

Scientific literature has revealed industrial strategies and tactics that create an environment conducive to weak controls on industrial activities and the risks associated with industrial chemical production[ix], amplifying gaps in evidence and strategically using doubts[x].These attitudes strongly emerged during the Miteni trial in the Assize Court, leaving a *poisonous aftertaste* that has characterised – and continues to persist today – public and political-economic debate, as well as the 'hard sciences'. Causal link is not proven enough, PFAS studies are not so scientifically sound, these compounds present a huge amount of uncertainties about the properties, characteristics and fate. These are the main alibi used by PFAS companies in order to escape their liability for the damage that occured[xi]. PFAS are still considered “emerging contaminants”, perpetuating a dangerous and costly inaction[xii].

Vested interests find fertile ground in areas that are still relatively unexplored by scientific disciplines, such as epidemiological and toxicological studies on PFAS, which require adequate implementation times and sufficient investment to support them. Chemical methodologies need time to be developed, to collect and systematise data, such as the latency periods of diseases, and the very knowledge of the degradation dynamics of these compounds requires careful consideration and analysis[xiii].

In the meantime, while affected communities are forced to live in this *'limbo of science*', a fundamental role is played by local groups, which often pick up on critical signals and problems, focusing on revealing clues that do not carry the weight of robust evidence as traditionally understood. This heightened susceptibility allows them to anticipate events and leverage the precautionary principle, with a view to effectively protecting health and the environment without getting caught up in the slow response of official bureaucracy. Local communities act as sentinels with regard to the independence of science, putting the brake on the excesses of *vested interests*, which, for their part, tend to minimise, delay and influence the timing of 'official' research, postponing the emergence of the dangers of these contaminants. At the same time, citizens assume a proactive role or change their habits to deal with the contamination. Water sampling or serum analyses were carried out by private individuals, independently verified by NGOs, which in some cases have opened Pandora's box of

contamination. Losing faith in institutions, local groups have carried out awareness campaigns, developing skills.

Unfortunately, mobilisation often comes after the disaster, once the state of pollution and the damage have been discovered, as van der Donk and Llavero Pasquina clearly described. In other words, in contaminated areas the feeling that something strange was going on was often not confirmed by the public institutions, but was 'concretised' and conveyed privately.

All this emerged clearly in the Veneto case: committees, NGOs and informal groups took action to combat this form of corruption of knowledge in the public debate, revealing delays, collusion and failures on the part of public and private administrators. Attempts were made to counter the reassuring official versions. Uncertainty became, as the authors rightly point out in the article, *'coerced ignorance*': from an inherent characteristic of scientific knowledge, it was reduced to a perimeter and enclosure dictated by producers, reducing, conditioning and influencing public debate. While uncertainty is usually an unavoidable part of scientific research, in the case of PFAS – but there are many other examples in the history of environmental pollution - the manufacturing companies deliberately concealed the results of the research they had conducted over decades, their findings and the risks that emerged and gradually became substantial. In other words, this ignorance was not the 'natural essence of things' but an artificial construct dictated by the logic of profit[xiv]. Shunning the *private management of public risk*, the affected community claimed its right to be heard, thereby challenging the existing epistemic monopoly, so well described by Funtowitz and Ravetz[xv], which is unidirectional and monocular.

Similarly, civil society mobilised to demand justice and effective action, seeking to set the political agenda and to put collective priorities on the table of public decision-makers.

3. *Uncertainty and the epistemic monopoly.*

One of the peculiar aspects of the 'Miteni case' is the breakdown of the reassuring voice of industry and certain institutions. In Veneto, gradually and slowly, the way has been paved for the emergence of a plurality of voices and perspectives. Independent scientists and ordinary people, committees and trade unions, local media and freelance journalists are claiming their space, asking questions and evaluating the solutions adopted. It is undeniable that this transition has been neither easy nor straightforward. It has been met with a general attitude of fatalism and irresponsibility, and has been mitigated by a certain isolationism and rejection of the environmental disaster persists in various strata of society.

However, scientific uncertainty has not become a justification for public inaction in the absence of established scientific evidence, as often happened in similar situations. On the contrary, it has prompted the public authorities to take action and to take into account the concerns that were growing within the affected community. Mobilisation has replaced the 'truth' of scientific evidence with the requirement of *due diligence* and *duty of care*. At the same time, social groups created a *network* – made up of scientists, consultants and professionals – to develop research questions and collect data to support them. In other words, this bottom-up action represented a barrier – both inside and outside the process - to the *coerced ignorance*.

The reductionism of the linear burden of proof of a criminal nature and the absence of sound science do not legitimise *the probatio diabolica* of the established cause-and-effect relationship. There is much more to reality than meets the eye. In essence, we can witness the valorisation of the 'suspicion' of danger, activating independent research, seeking to react to the inevitability of a *pollution trap,* thus recovering the full significance of the precautionary principle and the constitutional obligations of environmental and health protection incumbent upon public authorities[xvi]. The absence of scientific certainty – induced by rigorous concealment operations and minimisation strategies on the part of manufacturing companies – could not translate into a lack of responsibility for all the actors involved or a justification for inaction.

This approach is bound to clash with the phenomenon of *colonisation* of agencies by mainstream science and *vested interests*, well studied in the literature, which finds its peak in the so-called *sliding doors* for public officials and industrial administrators. In other words, and in a nutshell, it is a potential breach in the monolithic top-down epistemic monopoly[xvii].

4. *PNS and extended peer community: victims and/or actors*

It should be noted first and foremost that the role of the judge in environmental trials cannot be limited to ascertaining the statistical frequency of adverse effects resulting from pollution and exposure, thus reducing it to a mere accounting exercise, like Bartleby the scrivener[xviii]. The tasks of the judge, as the Italian Court of Cassation itself has reiterated on several occasions, are aimed at ascertaining the facts and evaluating scientific evidence through logical reasoning based on reasonableness.

In the Miteni trial before the Court of Assizes of Vicenza, the civil parties who joined the proceedings played an extremely important role. From victims claiming compensation for damages resulting from exposure to these chemical compounds, they became actors, being a factor both inside and outside the courtroom.

On the one hand, they engaged scientists, produced scientific opinions and advice of the highest calibre, contributing substantially to the full discovery of the facts in the trial and participating in the scientific research itself according to the *CitizenScience* model, in the Biggeri[xix] and Zamperini-Menegatto[xx] studies. On the other hand, they have revived the public debate, both internally and internationally, by actively participating in the 'social' definition of the PFAS problem. In other words, civil parties and participatory research have contributed to increasing knowledge, thus reacting to their confinement to a marginal role, as was usually the case. It is too early to attribute this to a more general trend, but it is undoubtedly an aspect that deserves attention, also in light of the reflections of Post Normal Science. As the Miteni case has shown, the warning signs that were proliferating, the concerns of residents, and the 'premonitions' of some *non-mainstream* experts were not heeded, either deliberately or unknowingly. Scientific certainty was – and often continues to be – a barrier to entry, limiting precautionary action, postponing adequate preparedness for possible imminent or future events, and reducing and simplifying complex and varied realities.

5. *Civil parties and the Courts: expertise in increasing knowledge*

As mentioned, the civil parties actively participated in establishing the factual circumstances in which the contamination occurred, unexpectedly spread, and the consequences that ensued. For the purposes of this operation, it proved essential to overcome the barriers to information access that usually characterise the T*oxic litigation*. As legal doctrine and numerous investigative journalism reports have shown, the PFAS affair on a global scale has revealed the *secrets at work*[xxi] in the chemical manufacturing industry.

For the purposes of procedural truth, the first problem was to recover the state of knowledge of Miteni's executives (the task of investigators and the Public Prosecutor's Office) and the various actors, which had been stubbornly concealed from public decision-makers and controllers as well as from public opinion, to which was added the need to contextualise this knowledge (the task of the trial). In this, the decisive contribution of witnesses and consultants for the civil parties was central. The traditional defence strategies that characterise PFAS contamination trials around the world (*permit defence,* denial of the dangerousness of PFAS, historical pollution, lack of knowledge of potential adverse effects and the state of affairs) proved ineffective.

This is precisely the interesting thematic focus of the Miteni case. That '*beyond a reasonable doubt*' – an inevitable and intangible mantra in environmental criminal trials – has receded in the face of the powerful force of reality. The doubts that had been discussed privately for decades by PFAS manufacturers, deliberately kept hidden to avoid reputational repercussions and environmental costs, were nothing more than clear and unequivocal warning signs, deliberately minimised and ignored by Miteni's owners and management. The expertise produced during the trial has unquestionably raised the level of general knowledge and contributed to highlight the defendants' responsibility.

A fruitful network has been created between experts and collective bodies, evoking interesting reflections in the literature on *gentle science*[xxii]. The civil parties have proved to be not simply victims, pitied and often unheard, but strong actors, making a difference. In a sense, this contributed to overcoming the narrow confines of the Daubert criterion. The admission of evidence – and science – into the trial does not depend on the name of the researcher or mere academic consensus, but requires verification of scientific rigour and the methodology adopted.

6. *PFAS intangibility and invisibility: a critical overview to avoid alibi*

PFAS substances, a galaxy of heterogeneous chemical compounds of indefinite number, are characterised not only by their chemical-physical properties, which determine their substantial unbreakability, but also by their invisibility. They are odorless and tasteless, making it impossible to perceive them through the senses and requiring sophisticated means to detect their presence in various matrices. This is the basis of the 'perfect crime' of PFAS contamination: the extent of the problem is unknown. Much of the production is unknown, shielded by intellectual property rights, patents and corporate reluctance to disclose volumes and production. Except for dramatic or commendable exceptions, the presence of these compounds in soil, air, water or the population is unknown. It is not possible to detect their presence without adequate and very expensive equipment, as well as appropriate analytical methods and suitable analytical standards.

The authors, van der Donk and Llavero Pasquina, rightly refer to this as *a pollution trap*. The persistence of these molecules and their now ubiquitous presence has often caused irreversible damage to the environment, astronomical social and economic costs, and irreparable harm to the bodies of exposed individuals. The half-life of these compounds, which varies depending on the type of substance but whose excretion is very long and complex, constitutes an undesirable presence in the bodies of contaminated individuals.

The term '*embodied harm*' is useful and, at the same time, evocative. People with PFAS in their blood experience a state of conscious alteration of their psycho-physical sphere that goes beyond the violence of the event. PFAS become part of their daily experience of themselves, almost a burden they carry with them, an existential mortgage they did not take out but in which they find themselves. Furthermore, the presence of PFAS in the blood is not only undesirable but also obscure. Some speak of a clock whose ticking marks the looming danger that could manifest itself in unknown forms, in a wide range of possible/probable pathologies. A state of latency and uncertainty – psychological and clinical – that calls for some reflection on the presence of PFAS in the body.

The peculiarities mentioned above reasonably impose the need to raise the thresholds of attention/alert, as is the case with nuclear danger or previous exposure to asbestos. The practical impossibility of controlling this phenomenon, these substances and their pervasiveness should trigger swift and rigorous action in their use, both in products and in production methods, moving decisively towards so-called *essential use*[xxiii]. This would be a necessary and inevitable step backwards, evidence of the clear failure – both public and private – and the impossibility of predicting and controlling various technological innovations. Taking such factors into consideration, alternative regulatory framework are to be employed as highlighted by the ongoing review of the REACH Regulation[xxiv].

On the other hand, it is precisely the peculiarity of these chemicals that represents the industry's strong point: invisible = non-existent or not provable with certainty, effectively allowing the indiscriminate emission of these compounds until the evidence is robust and the damage, as history and literature teach us, becomes as irreparable as the culprits.

That said, talking about environmental justice and the protection of exposed populations and violated territories is an essential step to ensure that the inaction of public authorities does not persist – like these *forever chemicals* – damaging the *safe operating space*[xxv] of each and everyone of us, legitimising the alibi of chemical industries that continue to dump tonnes of compounds on the planet with impunity, invoking the so-called *permit defence*.

7. *The pollution trap, an interesting idea to be developed*

Some aspects worthy of further study are mentioned here, without reaching definitive conclusions, but with the aim of stimulating a structured debate on an important and pressing issue.

Firstly, the characteristics of these molecules must be carefully examined. They are an extremely diverse group of chemical compounds with different chemical and toxicological properties. Two approaches are necessary, but they are potentially conflicting in some respects: on the one hand, reductionism to the chemical properties of PFAS and oversimplification of the issue; on the other hand, the objective impossibility of taking into account this ever-expanding galaxy of substances of unknown quantitative and qualitative scope.

In the first one, pressure from manufacturing industries that want to avoid the long timeframes (and risks) of toxicological and epidemiological investigations before using these compounds plays an important role. Furthermore, a certain degree of oversimplification – for example, in terms of definition[xxvi] and *group strategy*[xxvii] – is inevitable to make regulation possible, but, at the same time, care must be taken to avoid the trap of the pro-market deregulation.

In the second one, the reflection shifts from a practical to a more theoretical level: it is a matter of becoming aware of the impossibility of managing these compounds, which are now ubiquitous, out of control, persistent and often bioaccumulative, a sort of 'toxic soup' in which we are irretrievably immersed. The reference to the myth of chained Prometheus does not seem out of place. It is vital at least to introduce the reverse burden of proof for PFAS, abandoning the traditional "*innocent until proven guilty*"approach in order to protect human health and the environment as public health and environmental protection is currently not guaranteed.

A second point that needs to be highlighted is the dangerous trend that is emerging with toxic litigation: the "*juridicializing*" of compensation and the economisation of existence. Resorting to the courts to obtain justice is undoubtedly a means of recognising the wrong suffered and the damage incurred, as well as a source of 'educational' pressure with regard to reprehensible conduct. However, this practice is effectively endorsing a reduction of contamination at its cost, eliminating any political aspect of the underlying issues and diverting attention from the social pact of citizen protection by public bodies and the related duty of care.

This brings us to the third point worthy of public debate: the irreversibility and inevitability of exposure, the issue of persistence and the protection of health. PFAS, at least some of them, do not produce acute effects, but they can cause carcinogenic effects and other health risks over a very long period of time; in fact, we are talking about long-term risks. However, this situation of prolonged uncertainty about how and whether adverse consequences will occur is not really a situation of latency, but rather a sort of sword of Damocles with which we must live *indefinitely.* Inevitable exposure to PFAS has a number of consequences, induced by the concentration and absorption patterns of these compounds, which are irreversible even if they cannot be dated.

This situation calls for a redefinition of clinical approaches, economic and industrial policy, and risk management. Mapping ex-post (as well done by EJAtlas, EWG, and Le Monde[xxviii]) is only part of the measures that can be taken. It is essential to prevent *ex ante* by banning the production, use, and marketing of these substances where they do not fall within a narrow definition of *essential use*.

The fourth point to consider is about the scientific method and the underestimation of risks in the case of PFAS. With regard to these substances, it is appropriate to reverse the traditional perspective on evidence and causality as objective and monolithic data and adopt a vision – drawing on the reflections of the PNS – that views uncertainty as a resource, governing in the dark and preparedness (safe until proven NOT dangerous) – changing the epistemic monopoly to the stand. Waiting for confirmed results of epidemiological studies and frantically searching for updated limits, is not an effective or protective way to manage the PFAS crisis, as past experience has taught us.

The PFAS *pollution trap* is a matter of human rights and democracy, and deserves to be studied in a deeper, more comprehensive, and accurate way, and, above all, without further bureaucratic and political hesitation and delays.

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* Claudia Marcolungo Adjunt Professor of Environmental Law, DAFNAE, University of Padova

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