Towards Better Management of PFAS in Victoria

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A transdisciplinary RMIT research team has developed this policy brief to inform policy stakeholders on PFAS contamination in Victoria and discuss approaches to improve PFAS management across the State.

The Impact of PFAS

Poly and Per-FluoroAlkyl Substances (PFAS) are a family of synthetic chemicals based on carbon-fluorine bonds, which are highly stable. PFAS have been used in various industrial and commercial products, including non-stick cookware, fabric protection products, upholstery and carpets, waterproof clothing, cosmetics, food packaging and firefighting foams. Some PFAS are listed in the Stockholm Convention on Persistent Organic Pollutants, and their use is being restricted or phased out in signatory countries, including Australia. However, their persistence means that even no longer-used compounds are still found in the environment. Restrictions on such 'legacy PFAS' have led to increased use of replacements such as perfluoroalkyl carboxylic acids (PFCAs), perfluoroalkyl sulfonic acids (PFSAs), and fluorotelomer alcohols (FTOHs), the effects of which are not as well understood.

The exact number of PFAS varies depending on the definition used. Estimates of between 8,000 and 7 million chemicals are commonly given, and the US EPA toxicity database lists 14,735 unique PFAS. Those that are of environmental concern are resistant to degradation and highly persistent in the environment. These properties have led PFAS to be dubbed "forever chemicals" (although this term is a misnomer[1]). PFAS have been found in the environment, including in drinking water supplies, globally. They are of substantial public concern due to their reported links with various health effects, including immune system suppression, endocrine disruption, metabolic disorders, and cancer. Much public concern about PFAS comes from films like 'Dark Waters' and documentaries like 'How to Poison a Planet'. This has led some communities exposed to PFAS to launch class actions against chemical companies. PFAS have featured in the Australian media due to reports of their presence (albeit at very low, ng/L, concentrations) in drinking water catchments in New South Wales reported by the Age and Sydney Morning Herald newspapers, and the recent (October 2024) release of draft National Health and Medical Research Council (NHMRC) guidelines for PFAS in drinking water. However, public perception of the risk associated with PFAS does not always align with our evolving scientific understanding and data on the subject. Discussion about toxicity is futile without considering dose and context; this is often missing from public debate on PFAS, as is the fact that we could never be sure that the concentration of any chemical was zero, just that it was lower than the minimum amount we could measure. Context, in other words, is essential.

Sources of PFAS Contamination

Although not produced in Australia, PFAS have been widely used here. This country's primary source of PFAS was Aqueous Film-Forming Foams (AFFFs), used to suppress flammable liquid fires, particularly those from jet fuel. While the use of these products has ceased, there has been substantial contamination of both land and water where these products were used in large amounts, including defence land/sites, airports, and firefighting training sites. Contamination of these areas has led to concerns about the potential health impacts on local communities, particularly those using groundwater as a drinking water source if the pollution moves offsite. While they have been reported in some drinking water catchments, there is a lack of widespread monitoring of PFAS in drinking water. However, the recent reports of PFAS in drinking water catchments and the release of the aforementioned draft NHRMC guidelines for PFAS in drinking water have focused the issue in the public consciousness. The proposed NHRMC guidelines are more conservative than current Australian guidelines and those of most other jurisdictions.

[1] *The name is also a play on words; the F in forever and the C in chemicals can also stand for Fluorine and Carbon, respectively*.

The exception is the Biden Administration in the US, which recently issued the first national, legally enforceable drinking water standards on PFAS as part of the US EPA's PFAS Strategic Roadmap. Those guidelines are effectively the limit of detection for (4 ng/L) for most PFAS but are only due to come into effect in 2029. The concentrations of PFAS reported in drinking water are generally below the proposed NHRMC guidelines, so the risk here is low, especially because drinking water is not considered the major route for PFAS exposure for most people.

PFAS continue to be used in other processes and products, culminating in PFAS contamination at waste disposal sites such as landfills and wastewater treatment plants. More information is needed on the historical and ongoing use of PFAS and which PFAS have been used in which locations. This information is required to build reliable PFAS records, assess environmental risk, and reassure the public that concentrations of PFAS are not high enough, in most cases, to be a significant health risk.

We recommend the creation of a detailed registry of PFAS use in Victoria, with industry users mandated to report what PFAS products they are using, in what amounts, and how they are stored.

Current PFAS Contamination in Victoria

Little is known about the distribution and behaviour of PFAS in the Victorian environment outside the major Melbourne metropolitan area. Here in Australia, 'Hotspots' have been identified around defence sites (especially RAAF Base East Sale), fire-fighting training facilities (e.g. Fiskville) and heavily industrialised areas in Western Melbourne (see map of Victorian PFAS concentrations in Figure 1). Generally, however, data on the concentration of PFAS in the environment – including in soil, water, plants and animals – is lacking across the state. Even where data exist, they are often inconsistent and not readily comparable due to the different analytical methods, type of measurement(s) used, and quality control measures reported in various studies. This contrasts with other countries, such as the United Kingdom, which have extensive, publicly available mapping data of PFAS. Better information is essential to understand the fate and behaviour of PFAS in the environment and assess potential exposures and health risks to Victoria's environment and human population. This is particularly relevant due to Victoria's General Environmental duty regulations, which require all Victorians to identify and manage environmental risk proactively.

It is recommended that a more detailed assessment of PFAS location and concentrations be undertaken and made publicly available so we can better understand the volumes of PFAS in Victoria. We recommend that this includes testing of tap water at selected locations.

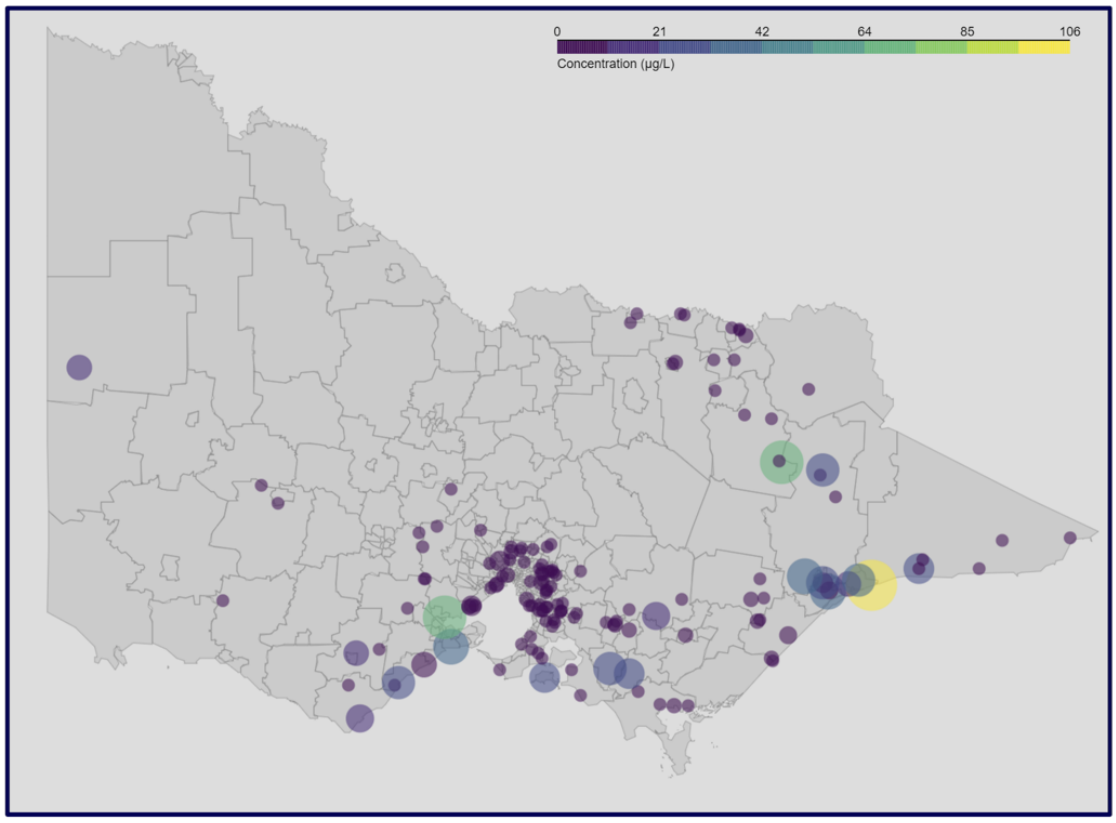

Figure 1: Bubble map of PFAS concentrations around Victoria using data from the scientific literature. The RAAF base in East Sale is responsible for the highest levels (yellow circle on the right-hand side of the image)

Understanding the effects of PFAS

Although PFAS have been associated with a range of health effects in humans, the concentrations of PFAS needed to cause such effects are much higher than those found in the environment (except for highly contaminated sites). There is a lot of misinformation and misunderstanding of the toxicology and pharmacology of PFAS, which, in some cases, has led to undue public concern. This could be alleviated with greater public education. We often overlook the fact that the mere presence of something does not mean it will automatically cause harm. For example, we know we can get skin cancer from UV light, but that does not mean we will get cancer as soon as we go outside. Levels of PFAS in drinking water are generally in the nanogram per litre (ng/L) range. One nanogram per litre is 1 part per trillion. This is equivalent to 1 second in 31.7 thousand years. There is a difference between someone drinking one ng/L of PFAS in their drinking water for life and someone who is exposed to much higher levels through working with firefighting foams. This is further complicated by the fact that the literature on PFAS (eco)toxicity is inconsistent for several reasons, including the concentrations and types of PFAS studied and the variety of tests used to assess the effects. The NHMRC relied on laboratory toxicology data when setting recent draft water quality guidelines, considering the existing human evidence insufficiently robust for the task. That said, some PFAS do bioaccumulate, meaning concentrations within an organism's body can be much higher than in the surrounding environment and, thus, potentially high enough to cause an effect. Dolphins in Victorian waters, for example, have been found to have the highest concentrations of PFAS in dolphins reported anywhere in the world.

It is recommended that a detailed review of the literature on the impact of PFAS be undertaken, with a focus on environmentally relevant concentrations and acceptable daily intakes for lifelong exposure. The recent NHRMC report from SLR Consulting could be used as a basis to avoid data duplication.

Improving Victoria's Management of PFAS Contamination

A consistent national approach to managing PFAS contamination has been promoted since 2020 by the PFAS National Environmental Plan, which provides guidance and supports collaborative action across all layers of government. Effective management of PFAS contamination in the environment requires a robust regulatory approach. Management of PFAS contamination is, however, complex. This is because it spans jurisdictions (the most affected areas are defence sites and airports located on Commonwealth land, which are outside the control of state government) and because it can be unclear who holds ultimate responsibility for PFAS pollution. Water utilities are responsible for wastewater discharge to the environment, for example, but PFAS in wastewater generally comes from industries within their catchment, not the water utility itself. Resolution of 'legacy' pollution issues can also be complicated, e.g. if the original polluter is no longer present. In the case of drinking water, the issue of how any necessary treatment upgrades are funded must also be addressed. If more advanced water treatment processes are needed, the cost of these will likely be borne by consumers (this will hit smaller and regional communities hardest). This is the opposite of the 'polluter pays' principle, in which the polluter bears the clean-up cost.

It is suggested that a Victorian PFAS action group be formed involving government, academia, and relevant industry and community stakeholders. The group should focus on improving PFAS monitoring, advising on new policies, and contributing to developing and implementing a Victoria state action plan to reduce and manage the risks of PFAS to the Victorian population and environment.

We also recommend the government invite traditional owners of Victoria's lands and waters to discuss how they would like to be involved with this issue.

Contact: To discuss any of the issues raised, please contact Professor Oliver Jones (oliver.jones@rmit.edu.au).

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