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Up-the-Pipe Solutions: A Best Practice Framework to Engage Communities in Reducing Chemical Contamination in Waste

Louis A. Tremblay [1,2,*], James M. Ataria [1], Ian Challenger [3], Jacqui Horswell [4], Virginia Baker [4], E. R. Lisa Langer [5], Alan Leckie [5], Olivier Champeau [1], Alma Siggins [4,†] and Grant L. Northcott [6]

1 Cawthron Institute, Private Bag 2, Nelson 7042, New Zealand; jamie.ataria@gmail.com (J.M.A.); olivier.champeau@cawthron.org.nz (O.C.)
2 School of Biological Sciences, University of Auckland, Auckland 1142, New Zealand
3 Ekos Kāmahi Ltd., Nelson 7010, New Zealand; ian@ekos.co.nz
4 Institute of Environmental Science and Research Limited, Kenepuru Science Centre, 34 Kenepuru Drive, Porirua 5022, New Zealand; jacqui.horswell@mbie.govt.nz (J.H.); virginia.baker@esr.cri.nz (V.B.); alma.siggins@universityofgalway.ie (A.S.)
5 Scion, P.O. Box 29 237, Christchurch 8440, New Zealand; lisa.langer@scionresearch.com (E.R.L.L.); alnk@xtra.co.nz (A.L.)
6 Northcott Research Consultants Limited, Hamilton 3200, New Zealand; nrcltd@hotmail.com
* Correspondence: louis.tremblay@cawthron.org.nz
† Current address: School of Biological and Chemical Science, Ryan Institute, University of Galway, H91 TK33 Galway, Ireland.

Abstract: Anthropogenic chemicals are fundamental for maintaining our standard of living in modern society. Unfortunately, some chemicals are persistent and can enter waste streams and, ultimately, the environment. Commonly used household products, including pharmaceuticals and personal care products, are notable sources of contaminants. The aim of this study was to develop an 'Up-the-Pipe Solutions' framework to raise awareness within the wider community about the presence and potential risks of the chemicals found in household products. There is potential to reduce the levels of contaminants in waste streams or substitute them with less harmful alternatives by raising awareness. This framework is based on 'The Natural Step' and the concept of essentiality; it recognises the importance of engaging with communities to raise awareness of each individual's contribution to the problem. Our daily activities and behavioural patterns can have adverse consequences, including the release of persistent contaminants in main waste streams from our kitchens, bathrooms, and green wastes. The 'Up-the-Pipe Solutions' framework was successfully used in a small community to engage with school children, local authorities, and Māori leaders to raise awareness of chemical pollution.

Keywords: waste; chemical pollution; behavioural pattern; The Natural Step; survey; school; emerging contaminants; New Zealand; essentiality

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1. Introduction

Chemicals play a key role in maintaining our standard of living in modern society, including the use of pesticides to increase agricultural productivity [1] and pharmaceuticals and personal care products to protect and enhance human health [2]. However, the targeted benefits gained from the use of all chemicals are accompanied by trade-offs, or more specifically, the potential for some level of non-targeted adverse environmental effects [3]. There are notable examples of chemicals having adverse impacts on exposed wildlife populations [4]. With nearly two-thirds of the world's population living in urban areas, cities concentrate human impacts, and the generation of waste produces a significant repository and emitter of a myriad of anthropogenic chemicals and hazardous wastes [5–7].

Commonly used household products contain many organic compounds that through normal use, and/or end-of-life disposal, can end up in wastewater systems and pose a potential risk to the receiving environments and ecosystems [8–10]. One major source of chemical contaminants is from household products that are regularly used in daily domestic activities such as cooking, cleaning, personal grooming, medical care, and gardening [5]. A UK study that examined the contaminants contained in household solid wastes by direct sampling found that paint, pet products, pharmaceuticals, household cleaners, motor vehicle waste, and printer cartridges were major sources [11]. Among the chemicals contained in common household products, approximately 500 are considered to be high production volume chemicals (HPVCs); these are manufactured in or imported into the US in amounts equal to or greater than 450,000 kg per year [10]. Of the 26 HPVCs targeted, 20 compounds were consistently detected in the raw influents of full-scale wastewater treatment plants [10]. The long-term environmental impacts of these chemicals remain largely unknown, as the methods to establish cause and effect relationships between chemical pollution and the impacts on ecosystem health are lacking or poorly identified and described [12].

The key challenge is to achieve the right balance between obtaining the full benefits of using chemicals and minimising their unintended consequences on the environment and human health. Collins et al. proposed a new 'do no harm' approach for the use and disposal of chemicals that are considered in sustainable policy [13]. This approach builds on some fundamental principles of obligations and rights that constrain human action and provide a strong case for environmental protection as a matter of justice [13,14]. The path to the sustainable management of chemicals is not straightforward. O'Neill explained that non-utilitarian frameworks weighing up costs and benefits (even if all factors could be measured in a meaningful and equitable way) provide an insufficient guide to action, i.e., if harm to others breaches a fundamental obligation, it cannot simply be justified on the grounds that it maximises utility or the satisfaction of preferences [13,14]. The development of a better chemical strategy needs careful attention to duties and rights, which are familiar features of important ethical frameworks [13]. Many HPVCs have limited biological degradability and can only be partially eliminated by wastewater treatment; therefore, reducing the loads that enter raw sewage remains the most cost-effective solution [15].

The United Nations Environment Programme (UNEP) has declared chemical pollution a planetary crisis, and tackling this issue will require a transdisciplinary approach [16]. The environmental effects resulting from pollution are partly driven by household consumption and the resulting wastes from housing, transport, and food [17]. Overall, the success of a programme to reduce contaminant loads requires not only integrating disciplines of environmental chemistry, engineering, and ecotoxicology, but also incorporating research in economics, behavioural science, decision-making science, and public education [18]. The social sustainability field faces challenges regarding how to consider and debate different sets of values to derive acceptable solutions; this is in part due to the limitations of systems approaches. To be effective, frameworks such as The Natural Step (TNS) also require the effective incorporation of social dimensions and opportunities to share and discuss different points of view [19]. Education, participation, and legislative support have emerged as central leverage points for the transformation towards a sustainable circular economy [20].

The aim of this study was to develop a best practice framework that effectively incorporates social dimensions to address the gaps that currently limit the proactive management of pollution. The objective was to better inform communities about contaminants in household products that are often overlooked. It represents an initial step to building viable 'Up-the-Pipe Solutions' that increase awareness among individuals, whānau (families), communities, and local government of the chemical products that they routinely use; this approach provides a foundation to consider more sustainable options. The framework is based on TNS and the concept of essentiality, which can be applied to influence daily behavioural patterns to reduce our individual environmental footprints.

2. Materials and Methods

2.1. Community Engagement Context

The 'Up-the-Pipe Solutions' project team worked closely with the Kaikōura community (South Island of Aotearoa New Zealand), building on existing personal relationships and partnerships between the members of the team and the Kaikōura District Council, Te Rūnanga o Kaikōura (local Māori tribal council) and the wider Kaikōura community. The previous waste management research collaborations involving these groups were particularly helpful for this project [21].

2.2. The Natural Step Framework

The Framework for Strategic Sustainable Development (FSSD), commonly known as The Natural Step (TNS), was developed to ensure that current society can meet its needs without compromising the same ability for future generations by avoiding the degradation of ecological and social systems [22]. The Natural Step framework was developed by Swedish oncologist Dr Karl-Henrik Robért in response to the increasing seriousness of the environmental and social issues faced by society [23]. In the years since Robért began his work, the weight of scientific evidence has only increased [24,25]. Robért reasoned that the unsustainable behaviour of humans was due to a lack of a shared framework that defined what constituted sustainability [26,27].

The Natural Step framework aims to define sustainability and provide a mechanism for knowledge transfer to help society gain a shared understanding of the issues facing the planet and humanity [23]. The framework's primary goal is to inform communities and seek to change minds and perspectives [28]. However, the framework goes one step further by providing a process for identifying solutions through collective problem solving and strategy development for a sustainable society [27], which can be implemented based on the community's level of interest and their ability to respond. The Natural Step framework is based on four system conditions in a sustainable society [29]:

1. Concentrations of substances extracted from the Earth's crust;
2. Concentrations of substances produced by society;
3. Degradation by physical means;
4. Within society, there are no structural obstacles to people's health, influence, competence, impartiality, and meaning.

In essence, TNS FSSD is a hierarchy for planning in a complex social system [30]. A useful metaphor for understanding this is a tree. The tree is part of the system, and it depends on the surrounding environment for survival, i.e., water, soil, and sunlight. The tree acts as a hierarchy; ground-sourced water does not enter at the leaves but works its way up the tree through the hierarchy of the roots, trunk, and branches. Similarly, the FSSD starts by considering:

1. The system as a whole (the tree within its surrounding environment);
2. The principles of what it is to be sustainable (the tree's trunk);
3. The strategies that will enable society to return to sustainability once more (the branches);
4. The actions and tools that will enable the implementation of the strategy (the leaves) [23].

On occasion, people with a passionate desire to contribute will agree on a need to act and proactively respond. Equally, people who are antagonistic to the idea that action is required will attempt to divert attention from the big picture by debating its details. Robért [23] refers to these instances as hiding among the leaves and argues that they achieve nothing. Instead, if we can agree on the principles behind the actions and allow the actions to emerge naturally, then we are more likely to achieve results. The Natural Step framework consists of a series of steps that lead to a sustainable ranking of the options, as illustrated by the following example of four soap products for hand washing (Figure 1).

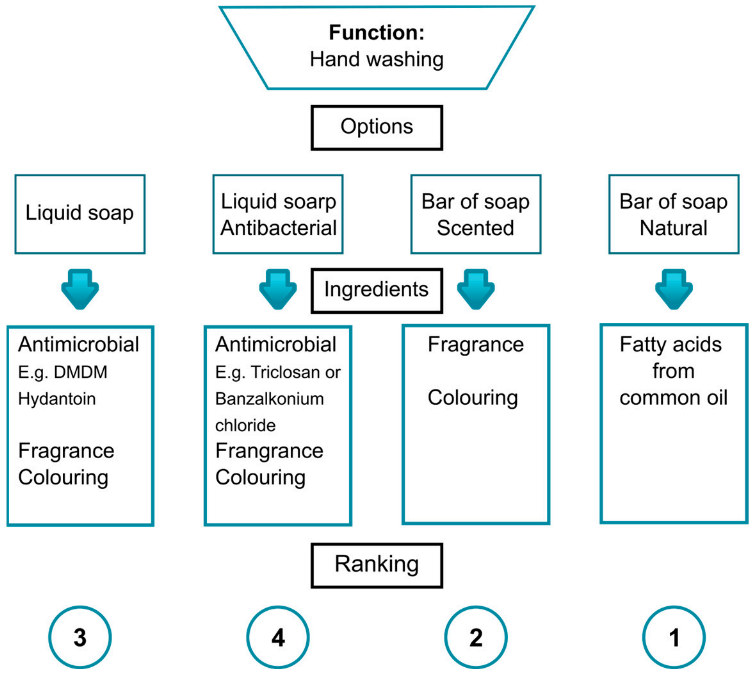

Figure 1. A schematic representation of how TNS framework can be used, along with a ranking to assist with the decision process. In this example, the function is hand washing, and four soap product options can be ranked based on the sustainability of their ingredients, with 1 being most sustainable and 4 being least sustainable.

2.3. Pilot Educational and Community Engagement Initiative

In March 2012, The Natural Step framework was applied in a community engagement process involving secondary school students from Kaikōura High School (KHS). The framework was used to characterise the behavioural patterns and motivations behind the use of common household products, including medication and cleaning products likely to contribute to persistent contamination in waste streams. Using household cleaning and personal care products as case studies, the approach aimed to raise awareness of chemicals, characterise household behaviours, and provide learning resources to support behavioural changes. A survey was designed to encourage Year 9 students (13–14 years old) to explore the waste management practices in their households (e.g., recycling and composting).

The approach used the following steps:

1. An introductory presentation with two school-based science classes to introduce the project and present the survey and web video;
2. A survey provided to the students by their teacher to collect data and raise household awareness—'What goes down the drain in your house?';
3. A web video to set the scene for the survey, which introduced the 'Up-the-Pipe Solutions' focus on emerging contaminants from household waste, the journey through a municipal sewage treatment system, and the potential impacts on waterways;
4. An independent classroom activity in which students were encouraged to research recipes for eco-friendly body care and cleaning products and produce posters to enter a competition;
5. An 'Up-the-Pipe Solutions' hui (a meeting often convened by Māori community leaders) at a marae (Māori communal facility that serves as a focus point for meetings and other cultural events).

2.4. Final Community Hui/Workshop

The final stage of the approach was a hui at the Takahanga Marae in Kaikōura in June 2012. The hui brought together students from KHS, teachers, parents, members of the Kaikōura District Council, Innovative Waste Kaikōura staff (a local waste management company), prominent local community business owners actively involved in waste reduction, two kuia (Māori female elders) who were stateswomen from the local rūnanga (tribal council), representatives from Enviroschools (https://enviroschools.org.nz/), and the New Zealand Council for Educational Research.

3. Results

3.1. Project Initiation

The 'Up-the-Pipe Solutions' community pilot initiative was officially launched at KHS and attended by two Year 9 science classes (approximately 60 students), several science teachers, the school principal, the Member of Parliament for Kaikōura, a media representative, and members of the multi-disciplinary research team The project team gave a presentation and presented a range of resources; these were aimed at raising awareness of the issue of household products that are put down the drain and the potential impacts of chemicals on the receiving environment. The primary goals were to demystify the wastewater treatment process, inspire young people to reflect on their own individual and household behaviours, and to provide steps for change. A short introduction to TNS was included in this session, and incentives to complete the survey were provided in product samples gifted by Ecostore, a New Zealand-based company producing eco-friendly cleaning and personal care products (https://ecostore.com/nz/).

3.2. The School Survey

The survey required students to identify products used in their laundry, kitchen, and bathroom that had ingredients they did not recognise or were concerned about. There was also scope to interview a parent or caregiver who was the primary household shopper about their motivations for purchasing household cleaning or personal care products. This involvement of parents and caregivers in the survey allowed the project team to engage with the wider community and gain further insights into relevant behaviours. The survey response rate of 40% was lower than expected but within the average return of 40 or 50% for mail surveys [31]. The results of the survey suggested that the Kaikōura community is more environmentally aware than the national average, with around 90% of surveyed households opting to recycle, buy refills, and reduce energy use. While environmentally friendly factors were identified as important considerations when purchasing products, cost and pricing were also significant.

3.3. The Video

A short film was produced to support the survey and help the students engage with the 'Up-the-Pipe Solutions' concept. The film was an excellent resource that helped introduce and explain the 'Up-the-Pipe' topic and its aims, as well as provide greater grounding and context for the survey exercise. The film involved college students, a kaumātua (Māori male elder) from the Ngāti Toa tribe in Porirua near Wellington, and a city council's wastewater management team. The video referenced a successful New Zealand drink driving campaign that had a high level of recognition and uptake among youth (https://www.nzonscreen.com/title/legend-ghost-chips, accessed on 20 April 2023). This approach provided a humorous but informative way of examining what goes down household drains, what happens in an urban wastewater treatment system, and how this can impact the quality of recreational and drinking water. The video proved highly engaging, relevant, and informative for our target audience, and it was a good standalone educational resource that reviewed emerging contaminants and the connections to household behaviours, as well as demystified a typical New Zealand urban wastewater treatment system. Several local and district councils have since used this resource to help explain their own wastewater treatment cycle in their work with schools and communities. The video is available online (https://www.youtube.com/watch?v=TNtgdJaeH3w, accessed on 6 November 2022).

3.4. The Hui/Workshop

The final stage of the project was an interactive hui/workshop that included hands-on activities such as pot scrubbing competitions and four parallel workshops, which took those in attendance on a "tour" through the local waste stream. The workshops highlighted areas where potential contamination can occur, why we purchase products that contain contaminants, and how we can reduce contamination by using alternative options. The two kuia provided anecdotal evidence of the cleaning products and cleaning methods used by their families and community when they were children.

Workstation 1: Alternatives for cleaning

In the first workstation session, the posters that were prepared by the students were displayed and discussed. Students had been challenged to undertake their own research and produce a poster about:

- The key message from the 'Up-the-Pipe' video;
- Their family's secret natural cleaning recipe;
- Their own natural cleaning recipe (based on library or web resources).

Community members then shared their approaches for natural cleaning from different perspectives. Conversations centred on topics such as how we now shower daily because we perceive ourselves as not clean, and how we use anti-bacterial hand washes and sprays. Questions that were raised included: Are we dirty or unclean? Are we dirty if we are not clean? What are the implications of using so many cleaning products? (e.g., linkages to increased allergies, environmental issues), and what did people do in the past? Through these exercises, the students learned about alternative ways to clean both themselves and the home, with a particular focus on the traditional knowledge gained from the involvement of community members and whānau. It also provided a 'meaningful' pathway to engage with the wider community, as suggested by the New Zealand's National Education Review Office: 'Research evidence shows that effective partnerships between schools and parents, whānau and communities can result in better outcomes for students. The better the relationship and engagement, the more positive the impact on students' learning' [32]. The exercises also used the following 'Best evidence synthesis iteration (BES)' recommendations [33]:

- That parents and teachers are involved together in children's learning;
- That family and community knowledge is incorporated into the curriculum and teaching practices.

Workstation 2: Becoming a critical consumer

The Workstation 2 session presented the students with feedback from their household survey results and then sought to provide tools and ways of thinking for students to become more critical consumers. The topics covered included how to identify 'need' as something deliberately created by advertising, how to be more resilient, and how to source natural products and avoid a consumer "fix". Supporting materials were developed to illustrate what models and celebrities looked like before and after airbrushing. These resources were used to emphasise the social and media pressures that drive large marketing campaigns that promote the consumption of "beauty" products; students were encouraged to be aware that looking perfect was simply an advertising myth.

A handout on advertising techniques was also prepared, and a video advert was shown to help students reflect on current sales techniques and apply critical thinking. Toxicologists outlined how these advertisements can potentially damage human and environmental health by promoting both 'germophobia' and the use of products containing more biologically active chemicals. The students were then asked whether they used liquid or solid hand soaps and why. The toxicologists explained why solid soaps were more environmentally friendly and shared tips on good hand washing techniques (https://www.health.govt.nz/your-health/healthy-living/good-hygiene/hand-washing, accessed on 4 March 2022). Through this activity, the students were encouraged to develop critical and ethical skills, or 'science literacy' [34].

Workstation 3: The Natural Step

Workstation 3 involved a reminder of the four 'Natural Step' conditions outlined above. These four system conditions in a sustainable society provided the foundation that underpinned the engagement with the students. The students were asked to do a back-casting activity and consider, 'What should we be doing with our sewage in 2030?' This session was followed by a history of waste activity, which involved a role play activity that highlighted Kaikōura's history from European settlement around 1860 to the current day. Students could choose to be the role of a scientist, town planner, or household carer. The use of role play and 'dress-ups' helped the students engage with the activity, and they could capture the historical events and implications by drawing on a giant roll of paper. A key learning outcome was that the management of human waste has been a longstanding issue that still requires more sustainable solutions.

Workstation 4: Make your own natural products

The activity in Workstation 4 gave students an opportunity to make their own low-cost natural personal care products. This activity provided the students with information on basic chemistry (i.e., the properties of acids and bases) and 'hands-on' learning. Some students also 'tested' their products by covering their hands in mud before cleaning them with the lemon hand scrub. This activity was enjoyed by the students as they expressed much enthusiasm.

The KHS students were asked to provide feedback on their participation in the project and the four workstations (Table 1). The 34 students that responded all agreed that they had learned something new; however, only seven responded that they had made changes following the activities. Some of the comments asked for more hands-on activities and less 'sitting down', and several students stated that there was too much talking.

Table 1. Summary of the results from the survey completed by Kaikōura High School. The students were asked to rank the activities of four 'Up-the-Pipe Solutions' workstations (WSs) according to the following scale: 1 = terrible; 2 = not fun; 3 = OK; 4 = fun; and 5 = awesome.

Activity	**Ranking**				
	1	**2**	**3**	**4**	**5**
Pot cleaning	1	7	17	6	3
WS1: What could we do differently?	0	1	30	3	
WS2: Why you buy?	9	7	18		
WS3: Have a go, make your own			1	3	30
WS4: What future do we want?	14	12	7	1	

4. Discussion

The 'Up-the-Pipe Solutions' framework was developed on the premise that increased community awareness of household contaminants and interactive shared learning experiences result in behavioural changes that reduce chemical loads in waste streams. Closing the waste loop through reduction, reuse, and recovery is complex. Our society requires socio-technical change that will lift performance in waste minimisation and promote the use of less harmful chemical alternatives. This change requires policy solutions that are driven by multiple actions from central and local agencies, industry, community, Māori tribes, local organisations (schools, clubs), households, and individuals. Waste can be defined as a problem of 'inconspicuous consumption', which occurs around the unseen and uncalculated products, services, and resources associated with daily living. From an industry perspective, there are few products that have not been 'enhanced' in some way by chemicals, e.g., increasing a product's appeal by adding specific colours and fragrances and increasing shelf life by adding antimicrobials. While environmental policies and science education initiatives aim to acknowledge the unseen resources and impacts of chemical use, there is a need to involve individuals and communities for continued multipronged pathways for future sustainability. Our approach involved multiple players in a community (central and local agencies, industry, community, Māori tribes, local organisations (schools), households, and individuals) by using a variety of engagement tools, including a survey, a video, and an interactive hui. The results of the hui suggest that although awareness of 'inconspicuous consumption' was raised, longer term impacts on behaviours may require continued messaging.

It has been concluded that humanity is currently operating outside the planetary boundary; this is likely altering the vital Earth system processes on which human life depends, and urgent actions are required to reduce the harm [35]. To address this challenge and achieve economic and sustainable development goals, human behaviour and actions in relationship to the environment must change [36]. The Natural Step provides a framework to define a sustainable vision to maintain environmental and human health. The model provides objective information to individuals so that they can better evaluate the options when purchasing products. At its core, The Natural Step framework emphasises the power of individuals to modify their behavioural patterns by making more informed decisions. Consumers have the ability to select products through group interactions that can affect choices and, ultimately, environmental outcomes [36]. For instance, in a different study that used the choice experiment technique, we asked consumers about their preferences when buying cleaning products, and all respondents stated they would pay more for liquid soap with natural ingredients that do not harm the environment [37]. Our hectic lifestyles, in combination with very powerful advertising campaigns by various industries, have created a culture of ready-to-use products. The harsh competitive environment for industry has encouraged the introduction of products that contain more active and persistent chemicals, which, when released, can contribute additional pressure on the environment. The attractiveness and perceived convenience of mainstream products make it difficult for individuals to impartially identify the options available and their sustainability.

A recent study linked the average lifetime citizen carbon emission to the future exposure of people to unprecedented heat [38]. Households are a major carbon emission source, and the varied origins of these emission are both obvious and hidden (Figure 2). Mitigation options in areas of consumption such as housing, mobility, and food can lead to major carbon emission reductions while reducing costs [39]. For instance, our diet and the pets we own can substantially increase household footprints, especially in terms of carbon emissions [40,41]. Urgent action is required to change behaviours and refocus on responsibilities so that communities can meet the social, economic, cultural, and environmental needs that will target global sustainability and reduce our 'footprint'. While improving hard infrastructure provides a foundation for a sustainable settlement, it will not by itself lead to sustainability. Instead, the required changes will be brought about by mobilising the energy of the communities living within each settlement.

When acknowledging the assumptions described above, it is also important to note that the agency of individuals and their actual power to make change is determined by a range of factors, which include socioeconomic statuses, cultural determinants, etc. Working with communities to build stronger pathways for collaborative collective action also underpinned the participatory methods used in this study's interventions. While there is merit and power in individual/community behavioural approaches, we note that transformative policy changes are also imperative to achieve sustainable change.

The 'Up-the-Pipe Solutions' framework aims to help communities take greater ownership and responsibility of their wastes by better characterising behavioural patterns, alternative products, and infrastructures. In this way, communities can reduce persistent and toxic contaminants in waste streams and ultimately create a healthier environment. It is difficult to engage with a community on issues that lack salience unless there is an obvious crisis, and arguably it is in the public interest for the costs of waste disposal to remain hidden [42]. Implementing The Natural Step framework is embedded in the concept of essentiality. Elements such as vitamins and minerals are required to maintain physiological health, and it is well established that deficiencies of essential elements can result in a range of clinical symptoms [43]. This fundamental concept has been well described for metals and the window of essentiality [44] (Figure 3).

Figure 2. An average family household with multiple sources of carbon emission.

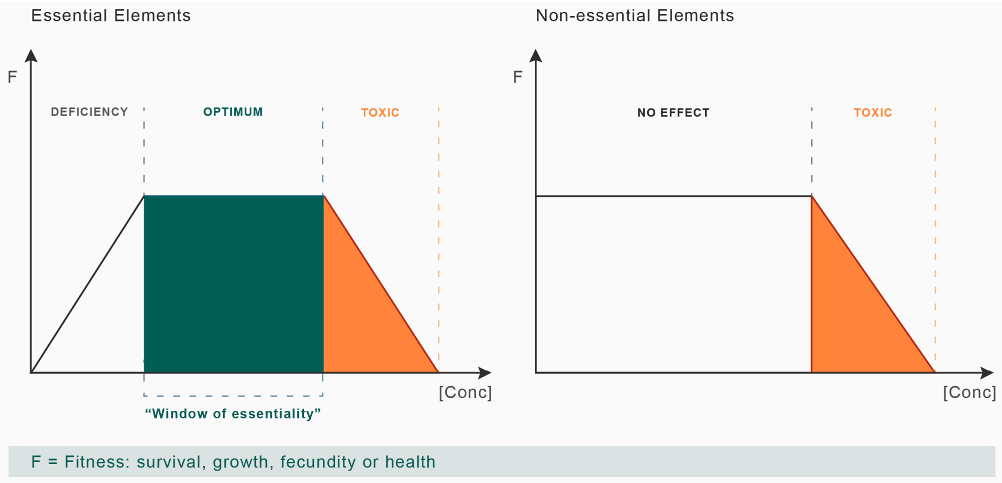

Figure 3. The concept of the window of essentiality for metals. The left panel describes the concentration range of essential metals, such as zinc and copper, required to maintaining the health of an organism, which is mainly based on its ability to reproduce. Concentrations outside this range are detrimental to the fitness of the organism. The right panel describes how organisms cope with non-essential elements and when they reach a level where the defence mechanisms are overwhelmed.

The 'Up-the-Pipe Solutions' framework was successfully used in November 2018 as part of the Galway Science and Technology Festival (https://galwayscience.ie/, accesses on 3 March 2019) in Ireland, where one-hour versions of Workstation 1 (the video and a discussion around alternative cleaning options) and Workstation 4 (Make your own natural products) were delivered. The festival involves 2 weeks of school-based workshops, culminating in a large 'Festival Day' (>20,000 attendees) at the University of Galway. Collectively, the festival reaches approximately 30,000 students per year. The "Up-the-Pipe Solutions" workshop was delivered to approximately 200 students between 10 and 12 years of age, including four school visits and four workshops that were part of the Festival Day.

The 'Up-the-Pipe Solutions' framework was also used for a younger age group at Tirohanga Primary School in the North Island of New Zealand. The curriculum work was oriented to explore the underpinning value of water as taonga (treasure), a precious resource vulnerable to pollution from household and farming waste. Some of the activities supported by the school included modules on understanding how a septic tank works and exploring the function of wetlands as ecosystems; there was also a visit to a local farm to look at effluent treatment. The students extended the 'Make Your Own Product' activities and developed a project of their own called 'Holiday Get Away'. They also looked at improving handmade personal care products (e.g., mouthwash and toothpaste) and investigated how to package and market their products to pay for a joint activity. These activities demonstrated that the framework's messages are relevant for all age groups and can strengthen relationships with local issues and concerns by empowering the community to develop their own solutions.

A key component of any waste management policy must include scope to reduce waste production at the source [45]. There is also a need to engage with communities on the responsibilities of care and guardianship for our shared environment [46]. An essential-use approach has been proposed for chemicals of concern based on whether the chemical is 'necessary for health, safety or is critical for the functioning of society' [47]. The essential-use concept has been used to investigate problematic chemicals such as poly- and perfluoroalkyl substances (PFASs) that are highly persistent or transformed into persistent compounds in the receiving environment [48,49]. An essential-use approach also aligns with the concept of Māori kaitiakitanga, a principle that expects a reciprocal and balanced relationship with the environment [46,50]. These concepts all contribute to the 'Up-the-Pipe Solutions' framework, a complementary tool used to engage with the community on sustainability issues and identify essentiality based on the key values defined in TNS. Alongside much needed global policy changes, such approaches can support individuals and communities to develop good habits when facing choices and thus minimise unintended consequences. The changes can be simple, e.g., switching from liquid pump to cake soaps, reducing the amount used, or reintroducing basic cleaning ingredients such as baking soda and white vinegar. These small transitional changes are cumulative and can lend momentum to the transformative global policy action needed to reverse the likely considerable, but as yet uncalculated, environmental costs of human activities and chemical use [40]. The 'Up-the-Pipe Solutions' framework provides an opportunity to incorporate social input in the community by empowering their ability to manage pollution on an individual scale.

Future work that could follow on from this research includes:

- Continue to characterise the risk of chemicals commonly found in household products;
- Maintain a close relationship with communities through programmes such as Para Kore (Marae Zero Waste) and building reference material that can be incorporated into the school curriculum;
- Seek out partnerships with key industries dedicated to creating healthier products for people and the environment;
- Assist organisations, such as The New Zealand Ecolabelling Trust, with the development of a labelling system for house products, similar to the Star rating for energy and water use, that can guide people towards more sustainable products;
- Facilitate community outreach through multiple media pathways, e.g., web-based sites, public libraries, and schools;
- Continue to work with school children, as they are more likely to adapt to sustainable habits and can influence their parents, who are the purchasers.

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