INTERPRETATION OF PUBLIC SURFACE WATER MONITORING DATASETS: CHARACTERISING POLLUTANT SOURCES AND THEIR EXPOSURE PATHWAYS TO ASSESS THEIR RELATIVE IMPORTANCE

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Background Public surface water monitoring datasets are increasingly used within the regulatory process either directly (e.g. registration requirement under plant protection products [PPP] directive 1107/2009/EC) or indirectly (e.g. pharmacovigilance initiatives under the veterinary medicines [VM] directive 2001/82/EC). This public monitoring data provides valuable insight into the state of the environment, emerging issues and possible impacts. However, caution is required when collating, analysing and interpreting these datasets, especially where active substances are registered under multiple directives and used in a wide range of sectors by a range of professional and amateur users. Interpretation of the results, considering confounding factors and understanding what might be concluded from such datasets is key to ensuring that policy responses are targeted at the correct sector, source, exposure pathway and use-period.

Observations There are frequently data gaps that make the full characterisation of sectors, sources and exposure pathways for chemicals detected in the environment difficult (Table 1). Sales and usage data for Plant Protection Products (PPPs), often collected under the Sustainable Use Directive (2009/128/EC), are increasingly available. Sales data for veterinary medicines are rare. Key gaps relate to biocidal and general chemical uses, where sales data collected by data providers is not generally available at active substance level e.g. cockroach bait volumes are surveyed/calculated but the total volumes of individual active substances is not collated. This is particularly problematic for imported goods treated with substances e.g. food, timber, potted plants or textiles/clothing.

- **Textiles**
  - The presence of plant protection products (e.g. in cotton) and veterinary medicines (e.g. in wool) in raw fibres may be released during different stages of the production process (Figure 1). Additional dyes and chemicals may also be added during these production phases and may not be completely rinsed off as expected e.g. fabric not washed properly to remove excess dye. In some cases, insecticides are added to protect users (e.g. permethrin to outdoor clothing) or the products during shipping and usage (e.g. anti-microbial and anti-fungal treatments). While some information is available from Safety Gate, the EU rapid alert system for dangerous non-food products, established under the General Product Safety Directive (2001/95/EC) this only relates to a small subset of non-food products where an alert was issued and reported by a participating country.
- **Food Residues**
  - Imported foods contain residues of PPPs used during their production. Even when these are well below Maximum Residue Levels (MRLs), consumption of a variety of foodstuffs containing residues and their subsequent excretion can represent a significant urban source (Table 1) emitted via Waste Water Treatment Works (WWTWs) to surface water. Reporting of food residue data and integration of these data into percentage of the Acceptable Daily Intake (ADI) using likely diets is reported annually.

Use #	Sector and Use	PEC/PNEC Ratio
1	**Plant Protection Products**	
	Amateur usage	0.25
2	**Veterinary Medicines**	
	Realistic case	0.37
	Worst case	0.86
3	**Biocides**	
	Realistic case	0.30
	Worst case	1.49
4	**Other Sources**	
4A	Food Residues	
	Average % of ADI	0.21
	Maximum % of ADI	0.41
4B	Clothing Residues	
		?
	WWTW Effluent Monitoring	
	Mean	0.8
	Maximum	1.4

Table 1: Summary of urban sources of an example pollutant and the contribution these would make to the Predicted No Effect Concentration within the mixing zone of a Waste Water Treatment Works.

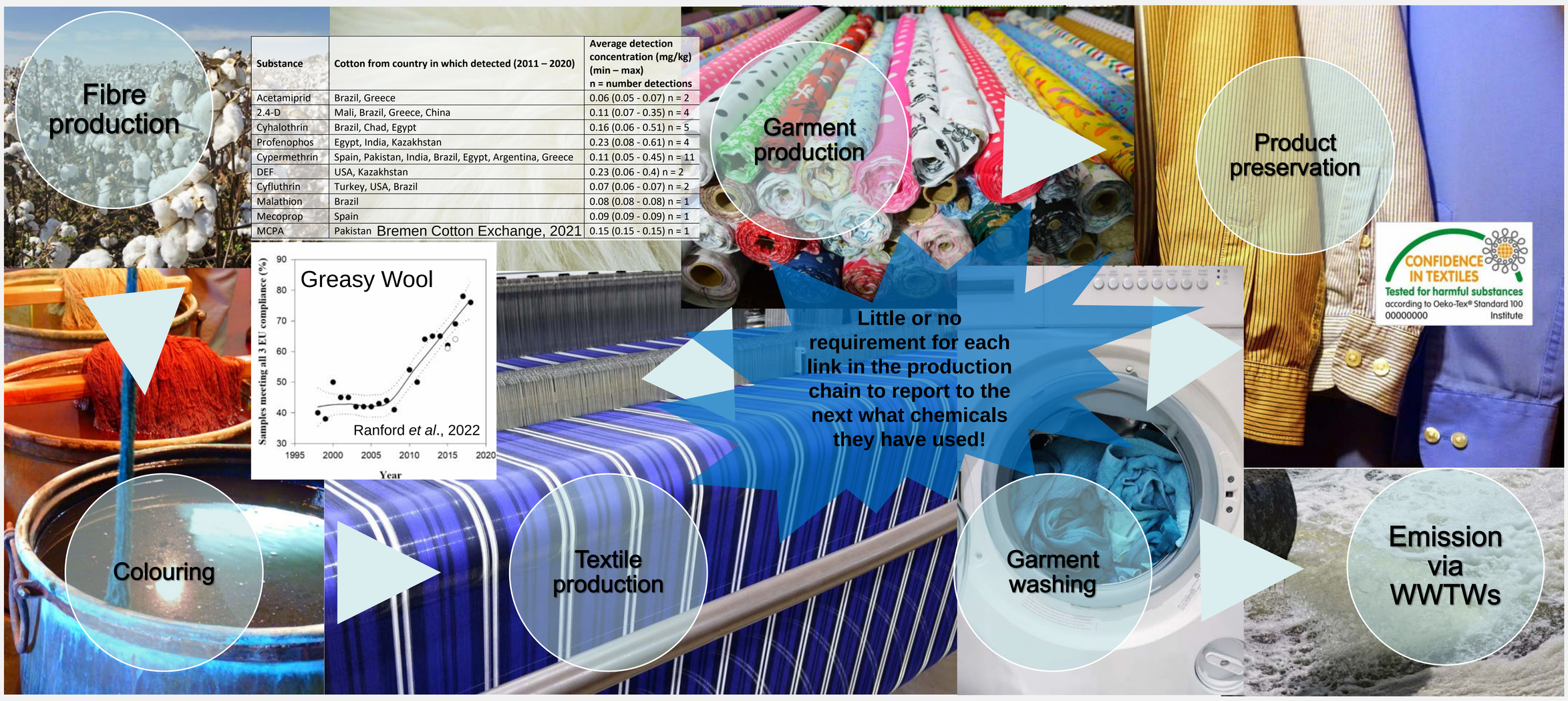

Figure 1: Working with garment and fashion industry specialists allows the development of a deeper understanding of sources of pollutants associated with the different production processes.

Summary, Conclusions & Recommendation

- Public monitoring data collected by regional/national environment agencies and water companies is a valuable source of information regarding the state of the environment, however, caution is required when using these data as they are collected and analysed for diverse purposes using an array of approaches.
- This is particularly the case for substances that are registered under various Directives and have a wide array of uses and usage patterns. While data collected under the Sustainable Use Directive has provided much needed information on agricultural sales/uses, key gaps in sales and usage data for veterinary medicine, biocidal and general chemical uses exist making it difficult to undertake informed source apportionment and exposure pathway assessments.
- Better information on the sales and usage of veterinary medicines, biocides and general chemicals is required. Likewise, the reporting of chemicals used in the production processes of non-food articles that are either in direct contact with water (e.g. treated timber) or where residues may connect with water (e.g. potted plants) need to be established.
- Improved sales/usage/inclusion data will promote a deeper understanding of detected environmental residues of chemicals and lead to better policy decisions ensuring that appropriate management and mitigation options are targeted at the right source, pathway and use-period.

References:
1 Bremen Cotton Exchange, 2021. Analysis of chemical residues in raw cotton. https://baumwollboerse.de/en/wp-content/uploads/sites/2/2021/02/Pesticides-1992-2020_by-countries.pdf
2 Ranford *et al.*, 2022. Chemical residue trends for Australian and New Zealand wool. Sci Rep 12, 768 (2022). https://doi.org/10.1038/s41598-022-04787-x