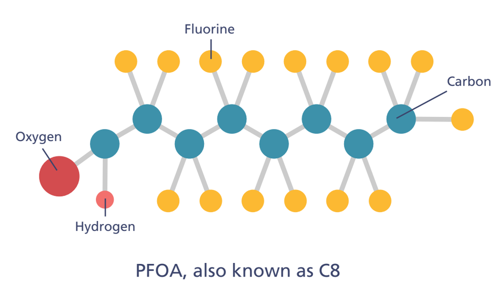
REVEALING THE INVISIBLE WEB

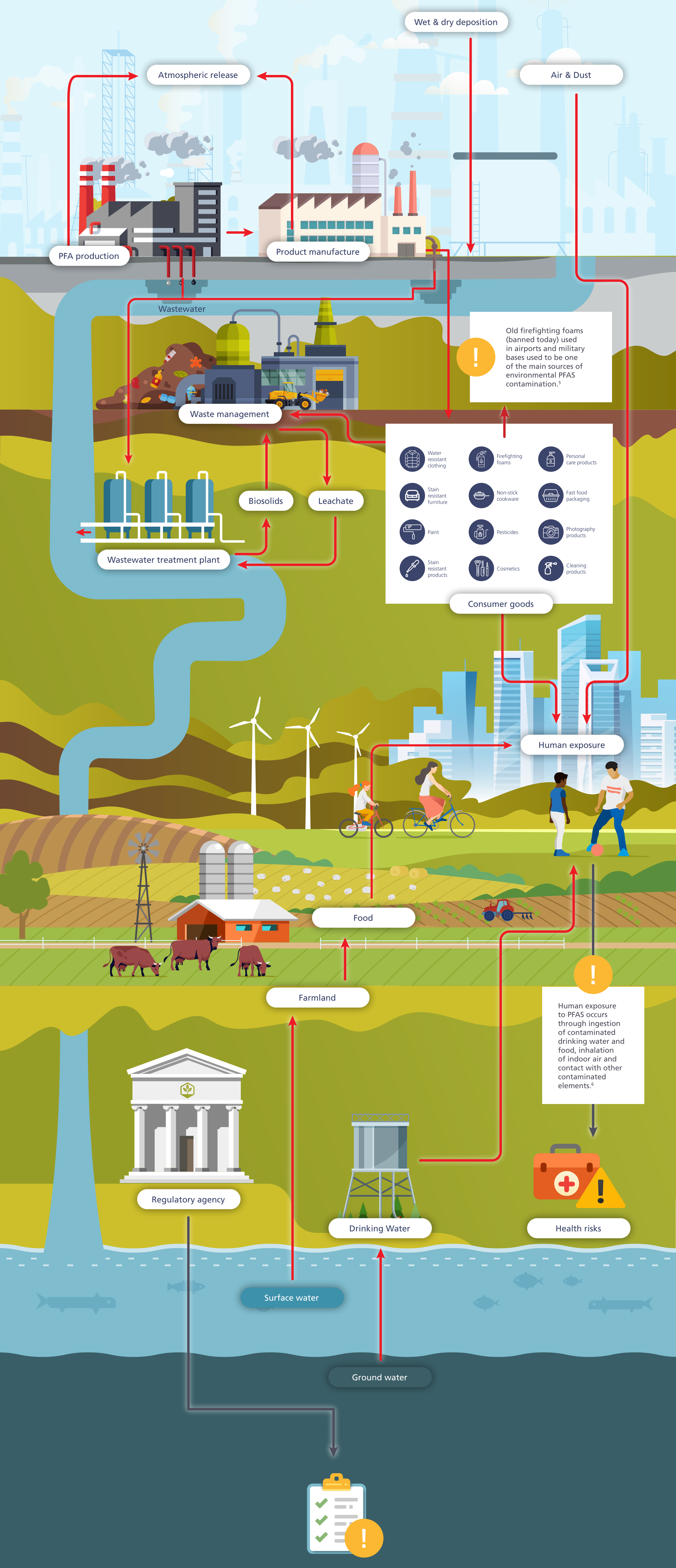
Solutions for an Efficient Analysis of PFAS

Per- and polyfluorinated alkyl substances (PFAS) are a family of more than 6000 synthetic chemicals with a fluorinated carbon chain connected to different functional groups.[1,2] These man-made substances – first produced in the 1940s – are released to the environment at various stages of manufacture, use and disposal of PFAS-containing products. Due to their extremely stable carbon–fluorine bonds, PFAS are resistant to degradation and accumulate in the environment and living organisms, earning them the name "forever chemicals".[3] Today, PFAS are present in the products we consume, the air we breath, the food we eat, the water we drink and inside our own bodies. However, new technologies are being developed to prevent them lingering in the environment indefinitely.[4] These technologies together with proper monitoring of PFAS are required to help mitigate the harmful effects these substances have on humans and ecosystems.

PFAS consist of an alkyl chain with multiple fluorine atoms attached (e.g., perfluorooctanesulfonic acid (PFOS), perfluorooctanoic acid (PFOA), GenX and many more). PFAS have many desirable properties, such as resistance to oil, grease, water and heat.



PFOA, also known as C8



GUIDELINES TO MEASURE PFAS

As PFAS pose risks to humans and ecosystems, governments have established standardized methods to monitor PFAS levels and help manage their risk.

EPA methods:

- 533, 537 and 537.1 for drinking water.
- 8327 for surface water, groundwater and wastewater matrices.
- 1633 for wastewater, surface water, groundwater, soil, biosolids, sediment, landfill leachate and fish tissue.

ASTM International methods:

- D7968-19 for soil.
- D8421-22 for aqueous matrices.

ISO standards

- ISO 25101 for water, sludge, soil and sediment.

PFAS ANALYSIS: CHALLENGES AND SOLUTIONS

Liquid chromatography-tandem mass spectrometry (LC-MS/MS) is one of the most frequently used techniques to detect PFAS in environmental samples. LC-MS/MS workflows offer excellent sensitivity and a low limit of detection. Yet, researchers often face significant bottlenecks in the analytical process that must be overcome in order to detect PFAS efficiently:

HOW TO AVOID SAMPLE CONTAMINATION & SAMPLE LOSS?

PROBLEMS	SOLUTIONS
Consumables contain materials derived from PFAS that can contaminate the sample.	Use PFAS-free containers (no Teflon or low-density polyethylene (LDPE) materials) to store stock solutions and samples.
Some PFAS may settle, precipitate or adsorb onto vials when left for extended periods of time.	Mix the extract/sample before (re)injection.
PFAS can adsorb to glass, especially when stored for long periods of time.	Do not store samples in glass containers.
Some methods require a step of solid phase extraction (SPE) to preconcentrate the samples.	Test all consumables and SPE cartridges for PFAS, prior to the first use.
Several components of LC-MS/MS instruments contain materials derived from PFAS that can contaminate the sample.	Install a delay column after the mixer and before the injection port to retain PFAS leaching from the instrument or present in the mobile phases.

WHAT'S THE BEST APPROACH TO ANALYZE PFAS?

Targeted analyses detection of specific known PFAS in a sample.

The small sample volumes required result in less sample loading and low downtime frequency by using **Shimadzu's sensitive LC-MS/MS instruments**.

Combine with vetted **LC/MS/MS Method Packages for PFAS analysis**

Non-targeted analyses detection of all (known and novel) PFAS in a sample.

Use **Shimadzu's high resolution quadruple time of flight (Q-TOF)** instruments.

HOW TO OPTIMIZE DATA PROCESSING?

PROBLEM	SOLUTION
Data processing and review are laborious and time consuming.	Use Shimadzu's LabSolutions Insight software: • Easy-to-use and customizable • Automated QA/QC flagging for vetted methods • Ensure data integrity

STREAMLINE PFAS ANALYSIS WITH SHIMADZU'S LC-MS/MS SOLUTIONS

EASY-TO-USE

VETTED METHODS

LOW COST

QUALITY RESULTS

ADVANCE PFAS ANALYSIS WITH SHIMADZU

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