PHW Microbiology Single-use Plastic Project – Annex L – Case Studies

As part of the final project report, Revolution-ZERO introduced four case studies on assessing and reducing single-use plastic. These have been sectioned into separate pages to be shared individually.

To support understanding of the impact of emissions and better communication, a table of CO_2e in real-life situations has been included.

Emissions Equivalents

Activity	CO_2e
Hour of using an average-efficient laptop	10 g[1]
Laundry load washed at 40C, tumble dried	2 kg[1]
Dry powder inhaler (estimated 200 doses)	4 kg[2]
5-watt low energy bulb for one year	15 kg[1]
London to Glasgow and back (train)	64 kg[1]
Using a smartphone (a year's typical usage of 195 minutes a day)	69 kg[1]
London to Glasgow and back (small efficient petrol car)	237 kg[1]
Metered dose inhaler (estimated 200 doses)	100 kg[2]
Insulating a loft (outlay for a detached house)	400 kg[1]
Hip replacement or knee surgery	1 tonne[1]
Heart bypass operation	2.3 tonnes[1]
A new build house (three-bedroom terrace, bricks and mortar)	32 tonnes[1]
Installation of a 100-kW wind turbine (saves 2619 tonnes after 20 years)	134 tonnes[1]

[1] Berners-Lee, M 2010, *How Bad Are Bananas?*
[2] https://www.nice.org.uk/news/article/nice-encourages-use-of-greener-asthma-inhalers

Case Study 1: Evaluate, Urinalysis

One of the key challenges we found during this programme was the disconnect between procurement data and actual quantity and type of waste as categorised by plastic type actually produced. It was suggested, during the group workshop, that we **take an approach by quantifying single-use items by costed intervention** such as urinalysis. As part of this case study the initial idea owner, Eleanor Cooper, performed a preliminary audit as a phase I start of a larger piece of work. In this case study, all items used in urinalysis were collected, logged and weighed with plastic type identified. While some of the item weights may be inaccurate, the emissions work below shows the potential for auditing different work streams.

Estimated emissions table for all annual urinalysis tests in PHW labs

Product	Material	Total Weight across all tests (kg)	CO_2e across all tests (kg)
Boric Acid Tube	Polypropylene/polystyrene	546	2,839
Specimen Bag	Polyethylene	234	1,193
Agar Plate (standard and antibiotic)	Polystyrene	2340	14,508
Blue Sterile Loop	Polystyrene	61	372
Orange/White Sterile Loop	Polystyrene	1950	11,895
Saline lid	Polypropylene	78	406
MALDI-TOF Pipette Tips	Polypropylene	21	109

It was estimated that the total number of tests carried out annually was 78,000, of which, 26,000 did not reach the inoculation stage.

In addition to the main plastic consumables, **future work should consider all single-use items which are used over multiple tests**. This would include separate weights and quantities for different materials and supporting items such as packaging and waste systems.

Other items supporting urinalysis

- Packaging, including a bag for the loops and wrapping for the agar plates
- Paper request forms
- Orange waste disposal bags with plastic zip ties
- Plastic disposable jars for used sterile loops
- Glass bottle for saline solutions
- Sometimes an additional test tube lid is used

When carrying out calculations, the project made some assumptions, which are listed below.

Urinalysis assumptions

- Where a range of quantities can be used, an average or usual number was taken
- The standard and antibiotic agar plates have been combined for this work. For each item, only the weight and material of the petri dish was taken into account
- It was estimated that the total number of tests carried out annually was 78,000. Of these, 26,000 do not reach the inoculation stage

As a next phase of this work, **we suggest quantifying these by what could be reduced, reused or recycled and also qualifying the overall waste by weight and carbon impact**. Moving forwards, **this type of approach should be carried out across all interventions which are costed and identifiable, not just across the laboratory**. Cost centres could be transformative in the obtainment of the real-world data relating to waste and relative real time. This work could start with the most frequently carried out tests and would allow labs to measure annual progress.

We strongly **recommend this approach is adopted as an initial pilot for urinalysis with a view to rolling out across NHS Wales healthcare settings**. As the project team struggled to find publications with accurate figures on laboratory emissions, this work could be useful for wider stakeholders.