IMPROVING THE SUSTAINABILITY OF FORENSIC CONSUMABLES:

THE EASY WINS

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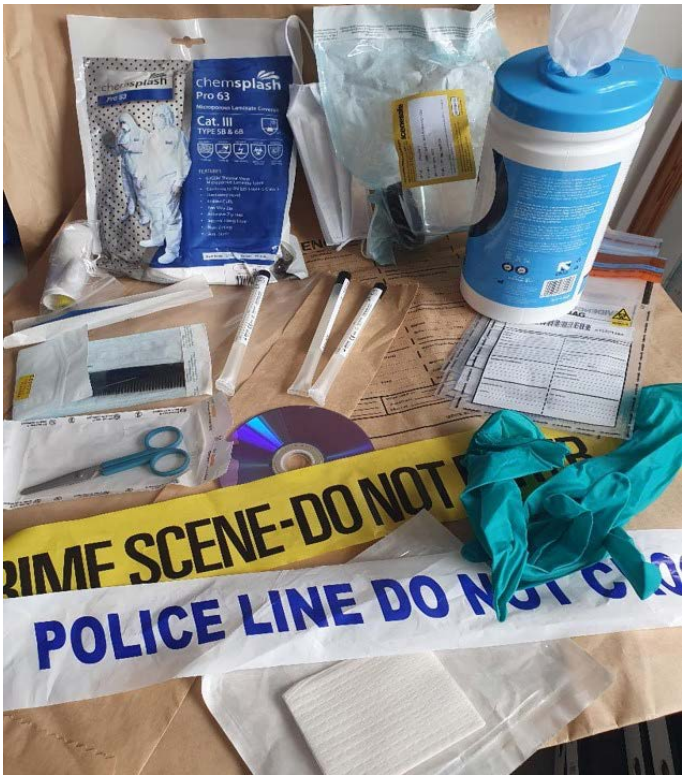
2024 Churchill Fellow



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BACKGROUND

Global plastic production now exceeds 400 million metric tonnes per year (Oberoi and Garg, 2021), consuming 6% of the world's fossil fuels and accounting for approximately 4.5% of global greenhouse gas emissions (Cabernard et al., 2021). But the problem doesn't stop there. Half of the world's annual production of plastic is single-use, referred to as consumables (Willskytt, 2021), often used for minutes before being discarded into the environment (Plastic Oceans, 2022). The consumption of finite carbon feedstocks, particularly oil and gas, and the greenhouse gases that are emitted during plastic production, coupled with mismanagement of their waste streams and persistence in the environment unequivocally contribute to climate change and loss of biodiversity (Walker and Fequet, 2023). Plastic litter degrades into micro-plastics (<5mm) and nano-plastics (<1000nm), which can also pass up the food chain, bioaccumulating in the human body (Revel et al., 2018). Plastic fibres can be absorbed through the skin, inhaled, and ingested and have been detected in drinking water (Gasperi et al., 2018), traced through contaminated hydroponic water into wheat and lettuce crops (Li et al., 2020), detected in lung tissue (Fend et al., 2023) and human placentas (Ragusa et al., 2021).

The Ellen MacArthur Foundation (2019) issued a stark warning that if we continue to consume and dispose of plastic in the manner that we are, it is estimated that by 2050 it will outweigh fish biomass in the marine environment. As the United Nation's Sustainable Development Goals (SDGs) gain traction, with 83% of global companies surveyed supporting the drive and all 191 UN member states agreeing to tackle, amongst other things, a reduction in plastic production and consumption (UN, 2019), efforts are being made to improve sustainability and reduce the environmental impact of single-use plastic (SUP) in the UK's private and public sectors, including medicine, dentistry and veterinarian settings (Rizan et al., 2021, Koytcheva et al., 2021, and Martin et al., 2022). Despite the regular consumption of SUPs in the field of forensics, particularly at Crime Scene Investigation (CSI) level, the generation of plastic waste, and the overall sustainability of consumables, has never been addressed.

As part of my Churchill Fellowship, I travelled to Australia, New Zealand, and Canada to identify plastic-free equipment, practices, and procedures that could help to reduce the amount used in the UK's crime scene sector, improve the circular economy by reusing more equipment, and discover solutions to improve recycling rates. I was also able to visit Dubai on a separate trip to see how their forensic practices and systems aligned with the UN's SDGs and global CSI practices.

The main part of my Fellowship report took the form of presentations and meetings delivered to the UK's Forensic Capability Network (FCN) sustainability group, my own force's competency and standards manager, the University of Portsmouth's Revolution Plastics Institute student conference, and the UK's leading supplier of forensic equipment, SceneSafe. However, I felt it was important to compile an anecdotal report comparing and contrasting some of the equipment and processes that international Crime Scene Investigators (CSIs) utilise when examining crime scenes, with my own experience of scene examination in the UK, to identify easily achievable sustainable options to reduce unnecessary plastic consumption and waste.

I have been a police Crime Scene Investigator (CSI) since 2000, attending over 5,500 individual cases to record and recover forensic and fingerprint evidence. While I have experienced a significant decline in the number of scenes I attend annually over the past 25 years, I have noticed an increase in our reliance on SUP equipment and the waste it generates. Single-use equipment is utilised in preference to reusable items primarily to reduce the risk of DNA contamination (FSR,

2023), although there is very little risk analysis data comparing sterilised reuseable item contamination rates with their sterilised, plastic wrapped, single-use disposable items.

Alongside my role as a CSI, I am undertaking a PhD researching the level of concern among my UK-based colleagues and examining the potential catalysts behind the increase in plastic waste. 97% of all CSIs surveyed (sample size of 365) reported being concerned about the amount of single-use plastic waste that they use and dispose of, with only 0.3% believing that the waste is always justified. Crime Scene Investigation is synonymous with officers clad in white personal protective equipment (PPE) conducting forensic examinations. The first 25 images that a 'Scenes of Crime Officer' (SOCO) Google image search produces depict masked and gloved officers in white coveralls in scenes cordoned off with plastic tape, and utilising plastic kit. Approximately half of all plastics produced globally are now thought to be single-use items, often used for seconds before being discarded, with 98% having been produced from fossil fuels, rather than being produced from recycled content (UNEP, 2019).

PPE-clad CSI

Virtually all of the single-use equipment, otherwise known as consumables, used by UK SOCOs/CSIs to recover forensic evidence is either made entirely of plastic, or contains plastic inserts or components that render them non-recyclable or non-compostable (see image below). My Fellowship took me to Australia, New Zealand, and Canada (plus a subsequent side-quest to Dubai), as these were identified as being countries that align with, or are working toward, the international standards that the UK has adopted (ISO 17020/ISO 17025). The main objectives were to:

- identify potential alternatives to the design and composition of single-use plastic equipment and consumables that are commonly used in the UK
- present my ideas to the UK's national crime scene manufacturer, the FCN, and my own force to reduce our consumption.

Commonly used plastic consumables and equipment

ON THE GROUND: FINDINGS FROM ABROAD

I visited 4 countries in total, spanning 9 different CSI bases across 7 states, provinces, and territories, plus 6 police forensic labs, each accommodating an array of disciplines (DNA, trace evidence, ballistics, toxicology etc).

Locations of the CSI bases and laboratories: New South Wales (NSW) Police, Victoria Police, Australian Federal Police (AFP), New Zealand Police (Christchurch and Auckland), New Zealand Environmental Science Research Institute (ESR), Vancouver Police Department, Toronto Police Department, and Dubai Police (stock image).

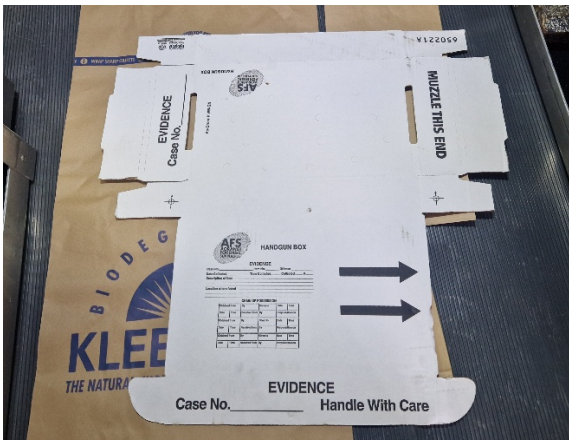
Every time I arrived at a crime scene unit or laboratory during my travels and introduced the aims and objectives of my Fellowship, it became apparent that the subject of single-use plastic waste in the forensic sector extended beyond the UK. The majority of staff from all areas of police-related forensic science acknowledged the problem and expressed concern, and virtually everyone, from the host CSIs and forensic scientists, through to senior managers, sucked through their teeth and said 'you're going to be appalled at the amount of single-use plastic waste we produce'. Surprisingly, they couldn't have been more wrong! The reliance on plastic is impossible to eradicate entirely from the CSI sector, due to it being cheap, versatile, lightweight, and easy to sterilise. Sometimes its use is necessary to protect and preserve the integrity of the evidence that is being recovered, or simply because an alternative has yet to be found, particularly with regard to PPE. However, many of the forces that I visited were clearly aware of the impact that plastic had on the environment, the waste stream issues it created, and were attempting to minimise their department's reliance on it. I was able to observe and identify some alternative consumables and procedures that relied less heavily on plastic and produced less waste, while improving staff efficiency and reducing procurement and waste stream costs.

PLASTIC-FREE EVIDENCE PACKAGING

All of the countries I visited stocked various sizes of plastic-free paper sacks and boxes, and the quality of the bag adhesive negated the need to reinforce the glued seams with additional plastic tape, a procedure commonly used in the UK. DNA items were always packaged in paper sacks or cardboard boxes after being air-dried in ISO accredited cabinets if required, to prevent the risk of the item 'perspiring' (Magalhãesi et al., 2015, Kaur et al., 2022) thus reducing the likelihood of fungal and bacterial growth which degrades DNA, particularly bloodstained clothing (Dash and Das, 2018). The Canadian evidence sacks also contained 40% recycled content and were clearly labelled as being recyclable. CSIs in Dubai only utilised window boxes when seizing firearms, so

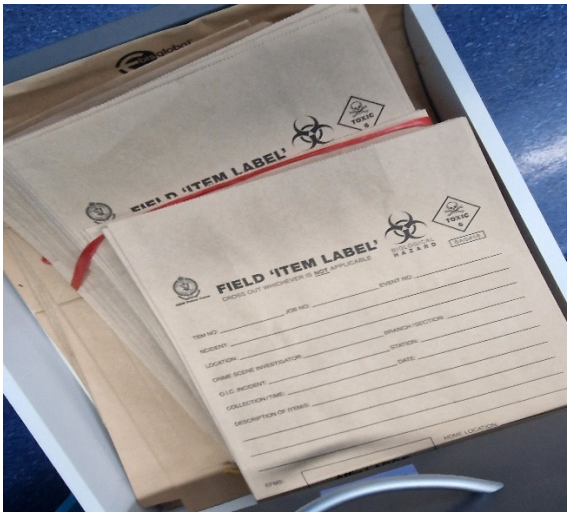
that officers could see the safety label indicating that the weapon had been made safe prior to opening it for further examination.

UK: boxes and bags have plastic strips.



New Zealand: plastic-free boxes and bags.

Canada: bags had minimum 40% recycled content.



Aus: printed various sized paper evidence sacks.

DNA ITEM RECOVERY AND STORAGE

The most striking difference, though, was that in Australia, New Zealand, and Canada, all DNA swabs and exhibits were air-dried, packaged into small paper envelopes or paper sacks and dry stored. This approach not only minimised SUP consumption and waste, but also reduced the burden of storage and the energy costs associated with freezing items (in the UK major crime samples are retained for up to 100 years). The increased choice in bag sizes in all of the countries visited also resulted in less waste as size appropriate packaging was used. Magalhães et al (2015) found that packaging exhibits in items that prevent movement significantly reduces DNA transference from the item on to the inside of the bag, better protecting and preserving the DNA, and improving the profiling outcomes.

PACKAGING ADHESIVES AND SEALS

As in the UK, most of the international departments that I visited used plastic tape to seal paper and card exhibit packaging. However, the Australian NSW police stocked two different paper-

based, tamper-evident, sealing tapes to securely package evidence. Paper warning stickers were also used in all forces, rather than the plastic variety used in the UK.

UK CSIs commonly use plastic tape and warning tape.

NSW CSIs use paper tamper-evident seals, warning labels, and heat sealing.

On the occasions where plastic exhibits bags were used to store evidence (often in the case of synthetic drug and cash seizures), some forces and labs used a heat-sealing machine to reseal once the item analysis had taken place, again negating the need to use plastic tape. The most important 'take-away' for me was to discover that plastic-free options are available for UK police forces to trial in place of plastic tapes, pending validation test results.

WEAPONS, SHARPS, AND TOOL PACKAGING

UK forces package items such as knives, firearms, tools, and sharps in heavy-duty plastic cylinders or window boxes and there is no plastic-free alternative. CSIs in Australia, Canada, Dubai, and New Zealand had a greater choice of packaging options, e.g. plastic-free boxes or thickened cardboard tubes with plastic reinforced ends.


UK: heavy duty PVC plastic tubes.

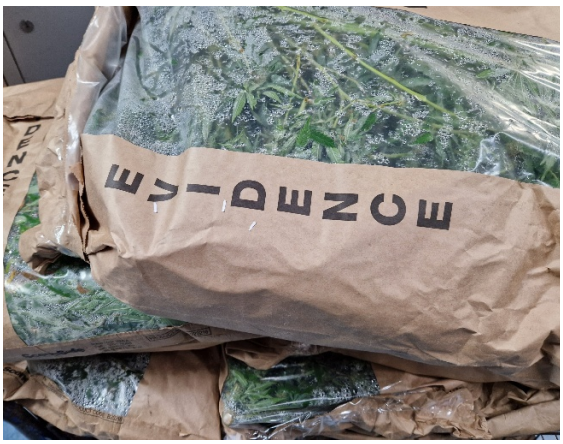
NZ: use of different sized card boxes (with UK tube for comparison).

Australia: the choice of different sized reinforced cardboard tubes and plastic-free boxes.

PLANT ORGANIC MATTER (INCLUDING CANNABIS SEIZURES)

In the UK, cannabis and forensic botany seizures are often placed in paper or 'breathable' sacks, both of which contain plastic inserts or backing. Dr Mark Spencer, one of the UK's leading forensic botanists, states that this practice causes microorganism proliferation as the plant continues to transpire, or 'sweat', which degrades the plant morphology rendering identification "much harder, if not impossible". Placing plants into plastic also prevents forces from composting organic matter seizures and recycling old packaging further down the evidence stream.

The New South Wales and Federal Police in Australia seize cannabis in reuseable hessian sacks, secured with tamper evident tags, before it is mulched and composted. The root balls and seeds are seized in paper, but are deep landfilled to ensure their destruction.



UK: plant seizures 'sweating' in paper/plastic sacks – condensation visible on plastic window.

Australia: plant matter is seized in reuseable sacks secured with security cable ties.

SWABS

There was no consistency in the size, weight, and shape of swabs, which are commonly used to recover crime scene stains, such as blood, saliva and latent cellular DNA deposits, in any of the countries I visited. The lightest was a plastic swab used in Australia, weighing 1g, compared to

the UK's black tip swab weighing 5g. The composite materials used also varied, with some having wooden, as opposed to plastic, shafts. Some of the swabs were designed with the medical industry in mind, as they had labelling related to patient details and bed numbers. NSW police CSIs recover cellular stain swab tips directly into robotic arm flip-top tubes (RAT) to limit human contact, and reduce further need for PPE and plastic usage and contamination risk during the laboratory analysis phase. All swabs were air-dried prior to packaging in paper to dehydrate the stain preventing DNA degradation during long-term dry storage (Bonnet et al., 2010, Lee et al., 2010 and Magalhães et al., 2015)

Swab designs from the different countries.

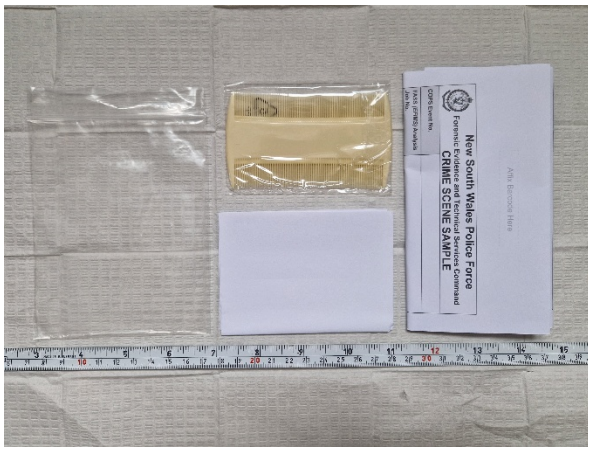
CSIs in the UK often use prepackaged, sterilised swab modules stamped with a short expiry date of approximately 2 years (even though the swab date inside is often 4 years in the future) containing distilled water, 10-20 swabs, and numerous exhibit bags. Once the module is open, any unused items have to be disposed of, creating a lot of unnecessary waste. Overseas forces created their own kits with the exact amount of swabs required, limiting the disposal of unused or unrequired consumables.

USE OF PRE-PACKAGED SAMPLING MODULES

The use of plastic pre-packaged modules, primarily utilised in the UK to retrieve samples from human subjects or to swab biological crime stains, were not widely used. The remoteness of Australia and New Zealand, in particular, often causes supply line insecurity, with standard delivery times of several weeks for less frequently used or ordered stock. This uncertainty has meant that both nations are often 'accidentally sustainable', with forces making use of or adapting the regularly stocked items, minimising their reliance on specific items and reducing wastage. All forces make up their own versions in DNA controlled areas using ubiquitously available sterile 'pick and mix' consumables, such as scissors and forceps. Some kits, such as gunshot residue (GSR), are also made in-house in Australia and Canada, and are sent back to be quality control checked, resterilised and repackaged when the 2-year expiry date is reached. The New Zealand ESR early evidence kits used during the investigation of rape and serious sexual

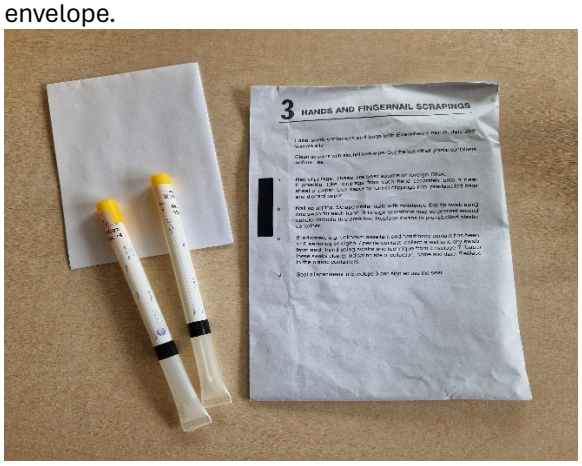
offences (RASSO) kit contains paper-packaged consumables in a carboard box resulting in little plastic waste.

The UK pre-packaged hair sampling module comes with 3 individually wrapped implements, 3 drop sheets, and 3 exhibit bags. Once broken down into component parts, the kit contains 17 pieces of plastic, 1 metal, and 4 paper items.



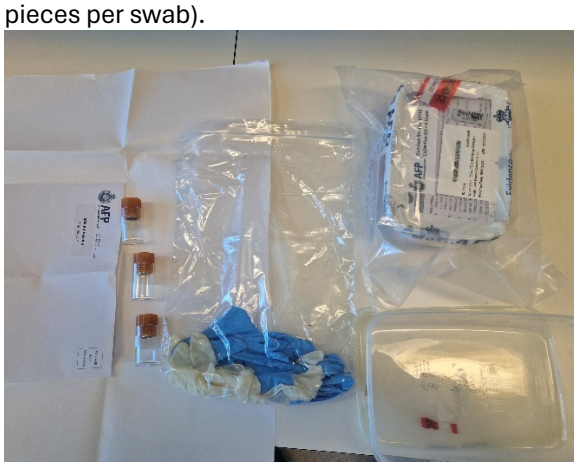
The Australian NSW kit consists of one plastic wrapped comb or scissors and paper drop sheet, in a plastic grip seal bag. Since my visit, the outer plastic bag has been replaced by a paper envelope.

UK: the fingernail collection module contains no less that 28 individual pieces of plastic.



NZ ESR: the New Zealand RASSO fingernail collection module contains 6 pieces of plastic (3 pieces per swab).

UK gunshot residue kits are bought as a ready to use, pre-packaged module. They are not sterilised, are expensive to purchase, and are overfilled, leading to considerable wastage (50 items of SUP).



AFP GSR kit: 3 plastic tubes, 2x gloves, paper evidence packaging, stored in a reusable plastic tub sealed in a tamper-evident plastic bag (14 items of SUP).

DISPOSAL OF UNUSED CONSUMABLES

The UK's Forensic Science Regulator's DNA contamination control document (FSR, 2023) dictates that all consumables, if taken into a scene and not used, are disposed of even if they are protected by layers of plastic packaging and could be decontaminated and put back into service. Non-disposable equipment, such as cameras, laptops and torches, which have a higher risk of introducing DNA contamination as they are taken into every scene, are not protected by plastic, and have difficult to clean, textured surfaces – yet they are not disposed of. None of the forces visited during my Fellowship disposed of their unused consumables, opting instead to decontaminate them and put them back into service, resulting in less waste.

STEPPING PLATES/MAJOR SCENE EQUIPMENT

The ESR and Australian crime scene departments put a lot of effort into reducing the risk of DNA contamination, primarily focusing on contamination mitigation in areas that they can control, i.e. the scene and the labs, rather than in areas that are constantly exposed to DNA contamination, such as vehicles and store rooms. Equipment was packed away in drawers or cases and the implementation of 'cold, warm, and hot zones' enabled officers to identify where they need to focus their efforts to ensure that DNA contamination measures are put in place in the most critical areas. Kit is decontaminated after use and repackaged in reusable, easy-clean, hard-shell cases, rather than being wrapped and stored in single-use poly bags.

UK: stepping plates wrapped in plastic.

Aus and NZ ESR (above and right image): stepping plates stored in sterilised, integrity-sealed, hard-shell cases

EXPIRY DATES

The justification in the UK for the short expiry dates of modules and consumables is that the packaging adhesive that contains the item comes with an 18-24 month warranty. It is ironic that the packaging is the very same type of exhibit bag that CSIs use to seize samples for forensic analysis. If the glue cannot be guaranteed for the consumable, then it poses the question as to whether this affects the integrity of the forensic evidence that is seized and potentially stored for decades. The short expiry dates lead to huge stock losses, which could be avoided if UK forces adopted the 'pick and mix' style of assembling modules in house used by their international counterparts.

‘Expired’ module packaging is the same as the type of bag used to collect evidence.

Thousands of pounds worth of expired crime scene stock from just two or four offices over a 3-month period for disposal.

In the UK, the Kastle Mayer and Acid Phosphatase presumptive bodily fluid testing reagent kits have an expiry date of just 9 months, whereas the Australian and NZ police departments mix their own reagents on a need-by-need basis from bulk purchases of component chemicals.

UK AND INTERNATIONAL CSI VAN CONFIGURATION

Vehicle configurations varied across all of the regions that I visited, though all of them had space for camera kit, fingerprint cases, light sourcing equipment, and tools. The use of fitted racking and pull-out drawers was common, though only the van in the UK used polybags to store evidence recovery consumables. All of the other forces used pre-packed, reusable hard-shell cases that were easier to decontaminate, reducing the reliance on single-use plastic.

Side compartment of UK CSI van with poly bag wrapped consumables.

In the UK, vans have rear pull out drawers (above image) for some DNA critical items, such as modules. However, PPE and packaging consumables are layered in plastic in the side compartment (top and left images). The Victoria and NSW CSIs have pull out drawers, but there is room for pre-packed hard-shell cases that contain packaging items, negating the need for the plastic wrapping.

Victoria Police CSI van layout

NSW CSI van layout

The NZ ESR trucks (above) are fitted with pull out drawers to house hard-shell major crime equipment, while the NZ Police CSI vans (right image) have open racking for their volume crime consumables and kit bags.

The Canadian Police have access to larger vans (left image) that are fitted with pull out drawers. Again, unlike the UK CSI vans, nothing is wrapped in layers of plastic. Pre-packed, easy-clean, hard-shell cases are also utilised, reducing the consumption of single-use polybags.

The Dubai forensic department has vehicles kitted out for the different departments, each with varying layouts. All have pull out drawers and space for prepacked hard-shell kits that can be wiped down prior to scene entry.

Top left: Dubai CSI Forensic engineering vehicle.
Top right: Dubai CSI Fingerprint vehicle.

REUSING AND RECYCLING

Although the aim of my Fellowship was primarily to seek solutions to reduce the amount of single-use plastic entering the sector, it also provided the opportunity to compare waste stream management initiatives.

The UK has varied waste stream options, which is reflected in some CSI departments, though staff may not always dispose of their scene examination waste appropriately. In a survey of 411 UK-based forensic staff, 42.6% never or rarely made an effort to recycle their work-related waste compared to 1.7% in their domestic lives, so a behavioural issue exists which needs to be addressed. In the UK, much of the municipal or offensive waste (black bag) is incinerated for energy production, though some may end up being landfilled. Clinical waste (yellow bag) is destroyed using High Temperature Incineration (HTI), though its use should be restricted to high-risk biohazard material and not general scene waste, due to its exorbitant cost. My own force provides mixed recycling waste disposal options for plastic, paper, card, glass, and metal, and specialist recycling for batteries and PPE (not a widespread option and is generated by staff effort rather than force led), but the streams can be haphazard and poorly labelled (see images below). Repurposing initiatives have been set up between some UK forces and universities but, again, they are generally staff member generated. Some of the more expensive non-single-use kit items e.g. cameras, tripods, forces, battery chargers etc are sold on eBay, or similar style selling pages, and the proceeds pumped back into force budgets.

Dubai, Australia and New Zealand all have clear, well-organised, colour coded recycling bins and staff appeared to be considerate when depositing their rubbish. New Zealand currently has no waste incinerators, so all of the waste is landfilled; however, they have an extremely proactive sustainability group who have initiated specialist recycling stations, e.g. bottle lids, batteries, fabrics, coffee cups, and second-hand uniform stores, to ensure that as little as possible reaches landfill. Australia, Dubai, and Canada are shifting from landfilling municipal rubbish to waste-to-energy incineration (Government of Canada, 2019, Zero Waste Australia, 2025, UAE Environment Agency, 2024). In all forces, ‘pop-up’ recycling and consumable repurposing stations had been established in many of the offices and labs, organised by environmentally conscious staff members, to ensure that unused consumables are used at least once prior to disposal, e.g.

unused drop sheets to wildlife rehabilitation centres. Again, in the case of New Zealand and Australia, expensive technology and equipment, such as cameras and light-sourcing kit, is often shipped to Pacific Island countries and territories.

UK: poorly labelled waste streams (above), though the PPE bin was well used.

Australia: had clear, colour-coded signage and a better choice of individual waste-streams.

NZ: great choice of colour-coded waste streams, including a coffee cup recycling station (below).

Canada: similar waste stream options to the UK but with separated paper and mixed material containers (above).

SUSTAINABLE PRACTICES IN THE FORCES AT A GLANCE

Location identities have been anonymised as the aim of my Fellowship was to discover solutions to reduce plastic consumption and waste in the UK CSI sector, and not criticise forces, products or processes in the host countries.

	UK FORCE	COUNTRY 1	COUNTRY 2	COUNTRY 3	COUNTRY 4
SCENE REPORTS	Printed paper sheets and laptop if possible	iPad – paperless	iPad at major scenes, paper at volume scenes	Notebook	iPad – paperless
FINGERPRINT RECOVERY	Photography and lifting	Photography and lifting	Photography and lifting	Lifting	Lifting
DNA CRIMESTAIN RECOVERY & STORAGE	Plastic swabs into plastic bags and frozen	Plastic swabs into paper sacks and dry stored	Plastic swabs into paper sacks and dry stored	Plastic swabs into paper sacks and dry stored	Plastic swabs into plastic bags and frozen
DNA ITEM RECOVERY AND STORAGE	Into paper sacks/boxes with plastic insert	Into plastic-free paper sacks/boxes	Into plastic-free paper sacks/boxes	Into plastic-free paper sacks/boxes	Into plastic-free paper sacks/boxes
IMAGES	Uploaded	Uploaded	Uploaded	Uploaded	Uploaded
MODULES	Yes – lots of waste	No – pick and mix	No – pick and mix	No – pick and mix	No – pick and mix
RASSO KIT	Yes, into plastic and frozen	No – pick and mix, dry stored	Yes, into paper and dry stored	No – pick and mix, dry stored	No – pick and mix, frozen
CRIME SCENE SWABBING & MODULES	Pre-packaged swab module, TEBs, and water.	Pick and mix – swabs, rat tubes, water	Pick and mix – swabs, water	Pick and mix – swabs, water	Pick and mix – swabs and water
WEAPON TUBES	Plastic tubes with reinforced ends	Cardboard tubes with reinforced ends	Cardboard boxes	Plastic tubes with reinforced ends	Plastic tubes with reinforced ends
FIREARMS BOXES	Cardboard box with plastic window	Cardboard box – no plastic	Cardboard box – no plastic	Cardboard box – no plastic	A mix of window and windowless boxes
PAPER SACKS	Paper with plastic window	Paper – no plastic insert	Paper – no plastic insert	Paper – no plastic insert	Paper – no plastic insert
RECYCLED CONTENT OF PAPER SACKS	No	No	No	Yes, 40% in paper sacks	No
PACKAGING SEAM REINFORCING	Yes. Windows sealed with tape	No	No	No	No
TRANSIT AND STORAGE OF EXHIBITS	Single-use plastic bags	Plastic bag only if large number of exhibits	Plastic bag only if large number of exhibits	Plastic bag only if large number of exhibits	Plastic bags only if large number of exhibits

CANNABIS SEIZURES	Paper bag with plastic insert	Reusable hessian sack	Paper sack – no plastic insert	Paper sack – no plastic insert	Paper sack – no plastic insert
KIT CLEANING AT SCENE	Wipes with polymer fibres	DNA degrading spray prepared at CSI base	DNA degrading spray prepared at CSI base	DNA degrading spray prepared at CSI base	Chemgene – single-use spray bottles
KIT DECONTAM AT BASE	Ready mixed cleaning agent	UV cupboard and self-mixed cleaning agent	UV cupboard and self-mixed cleaning agent	UV cupboard and self-mixed cleaning agent	Chemgene, but also have UV cupboard
BARRIER/DROP SHEETS	Paper and plastic	Paper and plastic	Paper	Paper	Paper
KIT PACKAGING	Plastic bags	Hard-shell cases	Hard-shell cases	Hard-shell cases	Hard-shell cases
ELECTRIC VEHICLES	No	No	Yes – trialling one EV	No	No

EASY WIN SOLUTIONS

I have selected a few easier to achieve solutions that will make an immediate impact on plastic consumption. It is worth noting that it is not only CSIs that use this kit. The UKs estimated 170,500 warranted police officers, 7,500 PCSOs, 90,000 designated police staff officers (Home Office, 2025, Allen and Wong, 2024, UK Parliament, 2025, PSNI, 2025, Police Scotland, 2025), forensic laboratory personnel, and other organisations involved in the forensic recovery of exhibits, such as the UK Border Force, who also regularly use the same packaging and personal protective equipment as determined by the Home Office (Home Office, 2023). One small change could make a significant difference and there needs to be a national force-led initiative to implement changes that cascade down to individual forces.

EVIDENCE PACKAGING – PLASTIC-FREE BOXES AND SACKS

The plastic windows in sacks and boxes were introduced initially to enable investigating officers to view the item, or show it to suspects or witnesses further down the investigation line, without the need to unpackage it. However, with the advent of digital photography and cloud storage, every crime scene and all evidential seizures are now routinely recorded by CSIs using digital photography. There is no longer a requirement for the plastic insert as images of the item, including with scale, are readily accessible to all investigating officers. Colour copies can be produced for interview and statement purposes. Once seized and packaged, exhibits are rarely removed from secure property storage areas to minimise the risk of item contamination or loss.

The use of plastic-free alternatives is actually beneficial for a number of scientific reasons, ensuring the integrity of the DNA evidence. The seizure of dry DNA items that are stored in contact with plastic, which are then stored at or above room temperature, can promote and accelerate microbial growth causing DNA degradation (Lee et al., 2010). Lee et al. (2010) and Magalhães et al. (2015) recommend that all DNA exhibits and biological samples, unless in liquid form, are air-dried prior to being packaged in paper or card, ensuring stability within the DNA sample (Bonnet et al., 2010). The plastic panels in both the box and the sack also increase the risk of adhesive, cohesive or bonding failure which can cause the window to separate from the substrate affecting the integrity of the item within (Dohr and Hirn, 2022). Furthermore, from a police budgetary perspective, the window boxes/sacks are more expensive to produce than their plastic-free counterparts, as they use more materials (adhesive, plant fibres, and plastic) and, in the case of boxes, the window has to be glued by hand during the manufacturing process.

Finally, from a GDPR and sensitivity point of view, members of the public and the press could potentially see, photograph, and publish evidence as it is removed from the scene if it is not obscured. Such photographs have appeared on media channels and it is not acceptable for victims or their family members to experience that breach of privacy or exposure. It could also prove prejudicial to a case.

Blood-stained knife visible through plastic insert of evidence box.

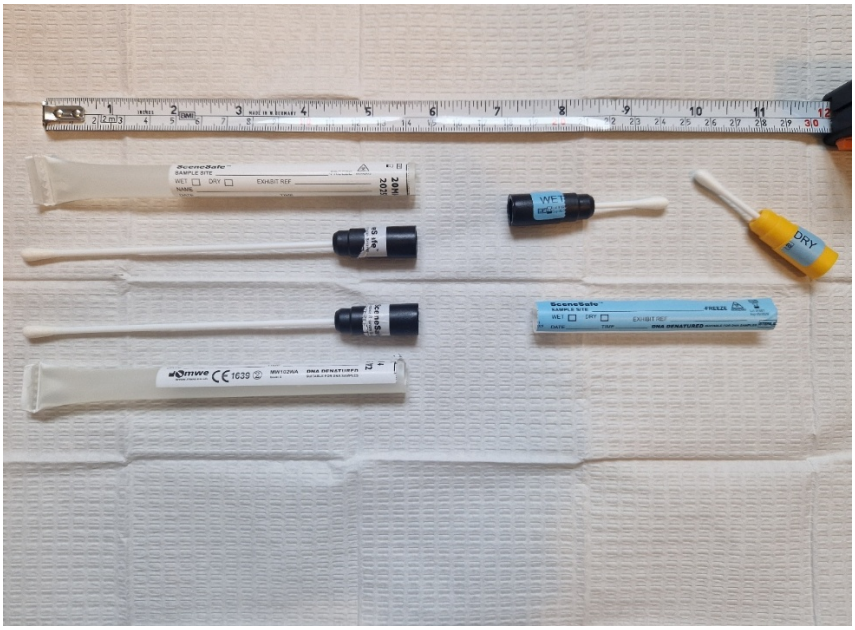
The UK manufacturer, SceneSafe, already stock plastic-free paper sacks and boxes, which are not only better for the environment, but are cheaper to produce and purchase, as the windows are glued manually. UK police forces could (and should) begin stocking windowless options allowing CSIs to select the window variety only when necessary. The use of plastic free options would also improve efficiency as CSIs in the UK have to use plastic tape to seal over seams of windows in case of bonding failure, which is time-consuming and uses yet more plastic.

CANNABIS AND BOTANICAL SEIZURES

Once the drug experts have taken their evidential samples from cannabis factories in the UK, the remainder of the plant matter is seized and packaged in window sacks for destruction. Following Australia's example, the introduction of reusable hessian sacks would reduce the cost burden on forces, reduce plastic use, and reduce waste stream costs. Plastic-free paper sacks should always be used for forensic botanical seizures to prevent the proliferation of microorganisms and protect and maintain the plant morphology.

SWABS

SceneSafe stock a double-ended swab tube, which consists of a 2-in1 short shaft wet and dry swab tip in a single cylinder (see below image). Weighing 6 grams, compared to the 10.5 grams of two individual standard swabs, it is smaller, resulting in reduced plastic generation, consumption, storage requirements and waste. Though the swab is more expensive to buy per unit, it is still cheaper than buying two standard swabs, is cheaper to transport, easier to store, improves work flow efficiency, and reduces the burden on the end-of-life waste stream. Research by Goray et al. (2012) found that DNA transfer occurred when the long swabs were placed into the tube. The smaller shafts of the double ended swabs would reduce that risk.



Size comparison between the current commonly used individual swabs and the double-ended swabs designed by SceneSafe.

Following NSW's example by placing latent or cellular DNA swab tips directly into RAT tubes could also be extremely beneficial. It would reduce the risk of human error and contamination further down the evidence stream, and increase throughput and cost efficiency while reducing single-use plastic PPE and lab consumable waste.

PRE-PACKAGED MODULES

Over-stocked UK pre-packaged modules contain numerous plastic components, many of which end up being disposed of without having ever been used, e.g. plastic forceps in the head hair collection module, unused plastic evidence bags, and unopened plastic packaging. Individually packaged items should be available, such as sterile scissors, paper collection sheets, clippers, and combs, for CSIs to select when required. My own force has recently cut back on module orders to limit unnecessary plastic waste. It is something all UK forces could do.

USE OF REUSEABLE HARD-SHELL KIT CASES

Many of the forces I visited kept major crime scene equipment, such as stepping plates, light sourcing equipment, PPE, and DNA-critical items, in easy to clean, integrity sealed, reusable hard-shell cases and crates, rather than storing them in single-use polybags. The kit boxes are more secure, can be integrity sealed, are easier to identify and access, and can be decontaminated after use at each base (using validated DNA degrading solutions) prior to being re-packed and stored. When the kit is called into use, the exterior can be wiped prior to entering the scene and placed onto barrier paper or plastic drop sheets (depending on whether the scene substrate is wet or dry, in the same way that laptops, cameras, and torches are cleaned and placed onto sterile drop sheets.

CONCLUSION

The issue of reducing single-use plastic waste and improving environmental sustainability in the UK forensic sector is slowly gaining momentum. Police sustainability groups, and collaborative work with other emergency service sustainability networks, are becoming established, and all are driven by passionate individuals who want to reduce the impact their working practices have on the environment. My Fellowship revealed many alternatives to the wasteful processes and products that are used in the UK, some of which are cheaper, and more practical, time and resource efficient, thus helping to reduce the burden on police budgetary expenditure by diverting funds away from the constant replacing plastic consumables and investing it in other much needed areas. More discussion needs to take place between senior leadership teams in the policing and forensic domain, with oversight from the Forensic Science Regulator, to ensure there is a balance between proportionate, evidence-based policy, to mitigate the risks of contamination, while reducing unnecessary plastic consumption and waste.

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