



DeLaRue



CURRENCY

Sustainable Confidence

2021

De La Rue

Currency

We provide banknotes that central banks and issuing authorities can be proud of.

More than half of central banks, banknote issuing authorities and state printing works around the world choose De La Rue. We provide market-leading security features, polymer substrate and fully finished banknotes.

De La Rue banknotes are more than just currency – they are secure, functional and inspiring products that countries can take pride in. They represent the very best of British design and innovation by capturing the richness of the cultures they represent with originality and creative flair.

Today, De La Rue is a progressive global company and international manufacturer, building on a heritage of customer focus, invention and expertise. We value our role as a trusted and long-term partner to banknote issuing authorities and respect this role by striving to offer the best products, support and services via a seamless experience from start to finish.

Sustainable Action

De La Rue is the only fully integrated provider of polymer banknote substrate, security features, designer and printer in the world.

Our goal is to be carbon net zero by 2030 across our operations. We are continually striving to reduce the environmental impact of our manufacturing and adopt effective, practical and measurable solutions which minimise the greenhouse gas emissions (GHGE) created throughout the lifecycle of a banknote.

De La Rue uses internationally recognised standards and accreditation to measure our performance in a meaningful and transparent way. The business has held ISO 14001 accreditation since 2006; is an active participant in the Global Carbon Disclosure project since 2011 and has been aligned to the UN global compact project since 2015.

De La Rue's activity in this area has led to it being ranked in the top 25 of the Financial Times listing of European Climate Leaders 2021. In August 2021 De La Rue committed to the Science-Based Targets Initiative as a route to reduce emissions in line with the Paris Agreement goals.

It is our intention to continue to reduce our emissions and achieve carbon neutrality as soon as practically possible. In parallel we want to reduce the lifetime GHGE of all banknotes. We see the recyclability and durability of polymer substrate as key to achieving this.



Assessing our environmental impact

De La Rue's goal is to reduce the overall environmental impact associated with the manufacturing and lifecycle of substrate, banknotes and banknote security features.

This goal is composed of two complementary streams. Internal improvement covers the ongoing activities related to the overall environmental impact of the business, reducing consumption of materials, energy, waste production and greenhouse gas emissions (GHGE). External impact reduction relates to the development and implementation of our banknote recycling service.

The ability to measure the consequences of one's action using a globally accepted methods is critical to producing valid and transparent assessments.

In order to track the effectiveness of our activities and to model the impact of proposed measures and recycling options for different issuing authorities, De La Rue uses Sphera. This is an internationally recognised provider of data and insight driven software for environmental analysis.

We use primary data from De La Rue's production processes and from suppliers of key materials such as substrates, inks and materials used in security features. Background data for electricity, materials and waste management processes have been sourced from the GaBi 2019 database. The model was built using the GaBi lifecycle assessment (LCA) software. Our LCA models are built in accordance with the Life Cycle Assessment standard ISO 14040:44.

De La Rue is able to incorporate specific environmental policy requirements from issuing authorities into our modelling. We are able to provide accurate individual environmental impact assessments which can be used to gain insights and support informed decision making to reduce the impact of what we do and meet specific issuing authority requirements.

By providing transparent and measurable methods of assessment we can demonstrate our commitment to improvement whilst providing new solutions to support issuing authority policies.

Reducing our environmental impact

Reducing energy requirements.

Energy monitoring is used to track the cost per tonne of good output and makes it easier to identify initiatives that will have an impact. The energy used per tonne of good output reduced from 3,633kWh in the financial year 2020 to 3,139kWh in the financial year 2021. This has been achieved by initiatives such as using sub-metering to monitor energy usage on large process equipment at Debden print works in the UK. This is now being rolled out to all print sites.

Smart building design to minimise energy

- A 'cool roof' is covered with a thermal waterproofing resin membrane to reduce heat intake by 90% and reduce internal temperatures by up to 2°C.
- De La Rue has recently announced a major expansion of its Malta site, and this will use materials and design to maximise heat storage benefits.
- The recent De La Rue investment into expanding its polymer and security feature manufacturing facility includes the re-commissioning of 569 solar panels.

Repair and upgrade programme

- Older equipment is routinely inspected and maintained to cumulatively minimise energy consumption.
- In Malta De La Rue saved approximately 2.5 million kWh per annum due to investment in new chilled water networks, a centralized compressed air system and replacement of old equipment. Energy efficient lighting in Malta reduced annual energy consumption by 630MWh, the equivalent of approximately 140 households.

100% renewable power

De La Rue's electrical power sourcing is based on 100% renewable power in the UK. This contributed to a 73% decrease in emissions from electricity consumption at their UK sites in the financial year 2021 from 1,210 tCO₂e to 328 tCO₂e.

Reducing waste

Better segregation of the waste types and improved recycling led to a 2% reduction in the amount of waste sent to landfill across all De La Rue sites.

Reducing the impact of Polymer Production

De La Rue produces its banknote polymer substrate,

known as SAFEGUARD®, at its Westhoughton production site in the UK.

Reduction in gas usage and energy-efficient heat recovery

Since 2001, gas has been replaced with waste solvent fumes, whilst neutralising exhaust fumes (known as Auto Thermal). Heat recovery coils are used to reclaim energy via heat exchangers used in the printing unit dryers, which further reduces gas usage. This approach has reduced gas usage by 50%. In 2021 De La Rue invested in a higher energy efficiency Regenerative Thermal Oxidiser, which will reduce gas usage by an additional 30%.

Process and efficiency improvements

On-site energy consumption per tonne of good produced has reduced by over 25% in the 12-month period up to June 2021. This was via a combination of product and production process improvements, for example improved polymer construction with lower waste and better energy utilisation through metering.

Investment in the latest equipment

De La Rue is investing £20 million in the latest polymer production equipment, with improved monitoring and inline feedback. The result will be a reduction in carbon emissions by 5% from more efficient equipment and lower waste levels.

Highest quality mono-recycling of polymer waste

100% of De La Rue's polymer substrate waste and UK banknote polymer waste is recycled via YES Recycling. See Appendix A.

Reduced waste during banknote printing

As a printer De La Rue monitors its polymer banknote production and has created experimental design trials to optimise its SAFEGUARD® substrate for banknote manufacture. Recent trials have significantly improved SAFEGUARD® so that one of the three main print processes now creates 2.3% less waste than before (and all other print processes are equivalent or show minor improvements). It also consistently prints 25% faster than before (now matching or surpassing the speeds of paper printing) thus reducing machine time.

Polymer substrate: benefits

The recyclability and durability of polymer make this substrate an environmentally viable long term solution for banknotes. De La Rue records many data points relating to the environmental impact of banknotes. Data points captured include manufacturing impacts, substrate production, finished note production, shipping and circulation estimates. Cross referencing this data with other publicly available studies has shown consistently that polymer banknotes have a lower environmental impact throughout their life cycle when compared to paper and hybrid substrate banknotes.

In addition to the environmental benefits, polymer banknotes remain cleaner, last longer, are more secure and the substrate is incredibly stable when printing allowing for high speed printing outputs to be achieved.

Reduced Environmental impact

The lower environmental impact that polymer banknotes impose is through a combination of factors; greater durability and longer note life, reduced transportation and circulation costs, plus the benefit of polymer banknotes being fully recyclable at the end of their useful life. Paper banknotes, made predominantly from cotton require a lot of water to produce and have a shorter life cycle, meaning more banknotes are needed to maintain a viable clean note and circulation policy. Paper banknotes are typically put to landfill or incinerated for energy rather than recycled.

This overall reduction in environmental impact has been stated by many issuing authorities that have made the move from paper to polymer.

Recyclable

A major benefit of polymer banknotes is that they are 100% recyclable at the end of their useful life. 100% of UK polymer waste from De La Rue is recycled into high quality pellets that become a variety of useful objects. The carbon footprint associated with shipping polymer waste back to the UK or other recycling locations is incredibly low, which means recycling options are already accessible to every central bank. Alternatively, De La Rue has a robust and proven qualification process that it can use to help qualify local recycling providers.

An analysis of the environmental impact of different end of life banknote destruction and recycling methods for paper and polymer can be found in Appendix C.

Highly durable

One of the most obvious benefits of polymer banknotes is their durability. Over 12,500 data points in DLR Analytics™ demonstrate that polymer banknotes last, on average, 2.5 times longer than unvarnished paper banknotes and twice as long as varnished paper notes.

When looking at specific examples of issuing authorities who have transitioned to polymer the actual improvement in note life can be as large as a factor of seven.

Cleaner banknotes

Banknotes are handled by numerous individuals in a wide variety of environments, the notes collect soil, grease and dirt which can cause issues for public acceptance. A heavily soiled and degraded banknote can undermine security features on the note. The porous nature of paper banknotes exacerbates soiling.

There are two solutions to keep circulating notes clean. The first is to remove notes from circulation after a short period of time before they become soiled. This requires a greater volume of new notes to be issued, an efficient cash cycle and has higher financial and environmental costs. Another solution is to keep the notes cleaner whilst circulating.

Polymer banknotes have a much greater resistance to soiling as they are non-porous and the dirt cannot penetrate the substrate.

More secure

Whilst no banknote is totally resistant to counterfeit attempts, research suggests that techniques required to produce a high-quality counterfeit polymer banknote are slow, expensive and require a high level of effort and technical expertise.

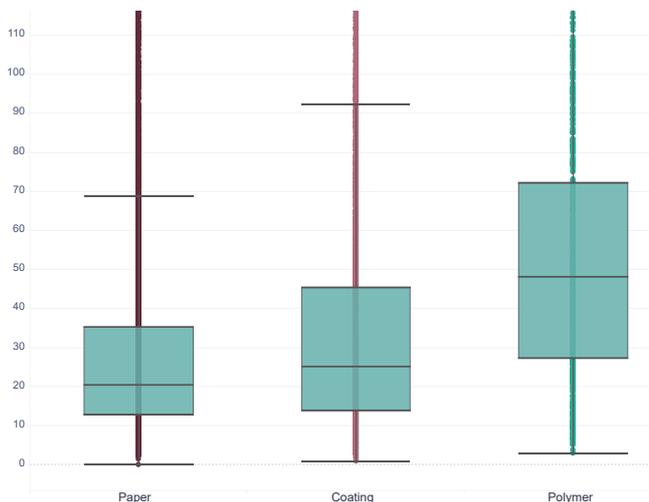
Polymer substrate is more difficult for counterfeiters to print on because digital inkjet and toner print does not adhere to it. Many countries have reported a drop in counterfeiting levels following the introduction of polymer banknotes.

SAFEGUARD® has a range of public and teller authentication features and machine readable features that can be incorporated as part of the substrate or printed on to secure the overall banknote.

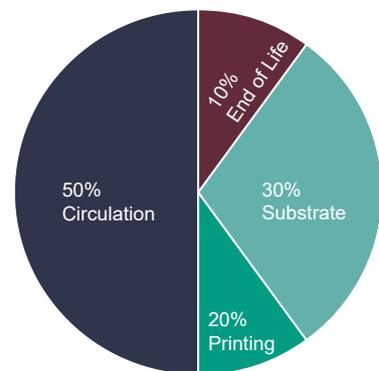
Better for printing

De La Rue has worked with polymer since 2012 across four print locations and with fifteen external partners, advancing our understanding of this substrate. We believe that the stability of polymer and the benefits mentioned make it a technically better substrate for the printing of modern, technologically advanced banknotes.

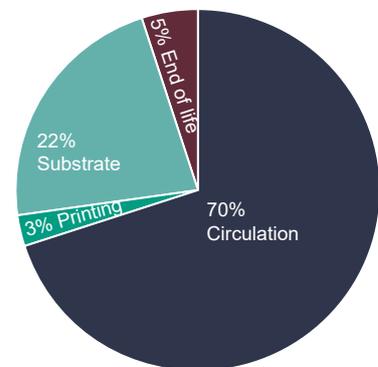
Note life comparison



Substrate lifecycle emissions



Paper banknotes: 160t / CO₂e per million notes



Polymer banknotes: 59t / CO₂e per million notes

Based on two banknote specifications in 2019

When switching from unvarnished paper substrate to polymer, two polymer notes will replace five paper notes

Polymer banknote recycling service

Polymer banknotes are not normal plastic waste. Clean and efficient recycling processes are available to turn used polymer banknotes into high quality pellets that can be used to manufacture a wide variety of goods. As banknotes are not thrown away and banknote issuing authorities have full control over the recycling or disposal of their banknotes, this makes it easier to collect and store end of life banknotes for recycling purposes.

De La Rue has developed a service to assist issuing authorities in finding the most environmentally sustainable and practical solution for disposing of their end of life banknote waste.

Mono-material recycling

Banknotes form part of a closed loop system, returning to the issuing authority for recycling or destruction at the end of their useful life. These authorities have full control over the recycling or disposal of their banknotes.

The homogenous polypropylene composition of polymer substrate means that it is well suited for recycling and polymer is now a widely recycled material worldwide. 100% of the polymer waste from De La Rue's polymer substrate manufacturing process is recycled into pellets which are then converted into new products. By the end of 2021, 80% of our customer polymer waste will be recycled.

In order to be able to recycle polymer waste effectively, it must be segregated from other forms of waste and grades of plastic. Due to the control an issuing authority has over end of life notes, this is an achievable requirement.

Relevant recycling solutions

The most appropriate recycling solution and provider for an issuing authority or print works is dependent on a number of factors; including volume of waste; local recycling infrastructure; the preferences for an in-territory solution and the proximity of the banknote issuing authority transportation hubs. Sea transport has a low GHGE per km compared to road or air transport. Consequently factors such as distance do not automatically mean an increased GHGE when shipping banknote waste.

De La Rue's Currency Services experts provide an assessment service to evaluate and qualify local and regional recycling requirements and solutions. We ensure that a print works or issuing authority can have direct access to their own end-of-life recycling solution.





“Polymer notes are destroyed by being shredded. The shredded notes can be recycled into other plastic products instead of being buried or burnt”

Reserve Bank of New Zealand, About Polymer



Carbon Neutral Banknote Service

Since 2019 De La Rue has helped central banks wanting to quantify the impact of their banknotes through every aspect of their lifecycle and offset that impact by investing in a project that meets the Quality Assurance Standard (QAS) for carbon offsetting.

De La Rue's Carbon Neutral Banknote service uses an internationally recognised Environmental Impact Assessment Tool, which aligns to PAS2050 and has been specially adapted to model De La Rue facilities and operations. This tool quantifies the impact of banknotes through every stage of their lifecycle (from raw materials and transport through to banknote circulation and end of life destruction). It enables customers to assess their choice of banknote substrates and security features and quantify the impact of the end-of-life options for their banknotes.

The Environmental Impact Assessment Tool uses Sphera, a provider of data and insight driven software for environmental analysis and gets background data from the GaBi 2019 database along with its own industry knowledge and experience. It then uses the GaBi life cycle assessment software in accordance with the Life Cycle Assessment standard ISO 14040:44. The assessment covers primary factors associated with the lifecycle of the banknotes, such as global warming potential and non-renewable primary energy demand, along with the secondary factors such as abiotic resource depletion potential, acidification potential, eutrophication potential and photochemical ozone creation potential.

This service is available for paper and polymer substrates.

Sustainable choices

Our goal is to be carbon net zero by 2030 and to reduce the environmental impact of banknote production and circulation, whilst supporting easy to access to cash for all. By offering a comprehensive and transparent means of assessment to our customers, we can enable informed decision making at every point throughout the process of banknote creation.

Whilst our evidence shows that polymer is a better long term solution, both environmentally and technically, we fully support our customers who choose to remain on paper. By providing a data driven service, we are able to recommend the most appropriate solutions that meet our customers needs and geography.

We support our analysis and assessments with practical solutions and partnerships which do not constrain us to a single supplier for recycling and instead can be used to identify local or regional providers to enable sustainable management of SAFEGUARD™ waste materials.

At De La Rue we are committed to reducing the environmental impact of what we do. We accept that whatever we do, all of us can always do more to increase sustainability and reduce our impact on the environment.

Greener

Cleaner

**More
durable**

**Cost
effective**

**More
secure**

Appendix A: Polymer banknote recycling case study

De La Rue recycles 100% of its UK produced polymer banknote waste. The ability to recycle all polymer waste is now available to all global customers. This includes low carbon recycling solutions for end-of-life polymer notes. Achieving this capability is the result of several years of work by the Bank of England, De La Rue and YES Recycling.

Requirement

This work began with the Bank of England setting a requirement for efficient polymer waste reduction and recycling prior to the introduction of sterling polymer notes in 2016. As the Managed Service Provider for the Bank of England's banknote printing facility and printer of the Sterling, De La Rue was responsible for identifying and delivering methods for reducing waste throughout the design and production stages.

The Bank of England identified YES Recycling as an appropriate mono-material recycler capable of processing polymer production waste and end of life banknotes. The materials to be supplied to YES Recycling fell within a narrow set of criteria, this was to ensure the quality of the recycled materials produced by YES Recycling. The supply of waste had to be free from contamination on collection.

The elimination of potential contaminants from the materials marked for recycling required the implementation of new Standard Operating Procedures from De La Rue to ensure better co-ordination across the different areas of the production site. Some changes

were as simple as segregating waste, changing the colour of the pink start up sheets, or switching from nylon to polypropylene cable ties. Other changes were more involved, requiring chemical analysis of materials and collaboration between all three parties to find an optimal solution. These changes were taking place against the Debden Transformation programme and in a live printing environment. The programme ran for six months from June 2017.

The ability to measure the carbon footprint of every stage and component of the banknote production cycle is a necessity when making accurate environmental impact assessments. As a producer of polymer substrate, security features, finished banknote and design services it is possible to combine the life cycle assessments of each stage into a holistic life cycle assessment.

Outcomes

As a result of the work by the Bank of England, De La Rue and YES Recycling, a unique system to process polymer banknote waste has been developed. This involved clear strategic goals, research, design consideration and changes to operational processes to align the materials supplied by the Bank and De La Rue with the capabilities and standards of the available technology. Since 2016 an estimated 1,150 tonnes of polymer waste has been taken for recycling.

After the implementation of the Bank of England's polymer waste recycling solution, a separate agreement was reached between De La Rue and YES Recycling to handle polymer waste from non-Bank of England sources. All De La Rue's polymer waste from the UK is now processed by YES Recycling.

In addition, YES Recycling will now process end of life polymer banknotes from non-UK issuing authorities, provided the waste material is within the requirements

1,150

**tonnes of polymer recycled
between 2016 and August 2021**



needed for processing. To facilitate this option, and ensure it is viable, De La Rue now provides an environmental impact assessment tool for polymer customers. Part of this will estimate the carbon footprint of returning polymer banknote waste to the UK versus identifying alternative, closer recycling options to the issuing authorities stored waste materials. Guidance on the optimal storage and segregation of end-of-life banknote materials is provided as part of this option.

Whilst it may seem counter-intuitive to ship end of life banknotes long distances by sea, the comparative carbon output is significantly lower per km than any other form of travel, meaning that closer, land-locked recycling alternatives may have a higher carbon footprint.

In 2015 De La Rue contracted with Sphera to build a carbon modelling tool which has enabled the measurement of the carbon impact of production methods and some design choices. This tool has evolved and is now able to help us identify and adjust the variables within the polymer substrate manufacture elements which have a significant element of the carbon impact. This enables us to further quantify the benefits of end-of-life polymer banknote recycling. As we continue to develop and update the model to identify further material carbon impacts of the various different security feature elements used within the design.

Summary

The thought leadership and polymer strategy of the Bank of England to reduce the environmental impact of their activities led De La Rue to develop new methods to measure, manage and control the physical waste deriving from the production and circulation of polymer banknotes. Working with YES Recycling and the Bank of England, De La Rue was able to establish working practices and parameters for the segregation and handling of polymer

waste, both during production and end-of-life. This knowledge forms part of our Technical Support team who can advise any polymer customer of the most appropriate solution to minimise the environmental impact of their banknotes.

By sharing this data, the insights it provides can be used by issuing authorities to drive informed decision making and make considered choices about their substrate selection and end of life processing which align with their internal environmental strategies.

Appendix B: Carbon Neutral Banknote Service case study

In 2019, the world's first carbon neutral banknote was issued. The pioneers of this project were the Central Bank of Samoa when they utilised De La Rue's Carbon Neutral Banknote Service.

The Carbon Neutral Banknote Service was created to enable all customers the opportunity to assess the carbon and environmental impact of their banknotes. Allowing the comparison of banknotes across a variety of scenarios, e.g. comparing current paper banknotes and a proposed new polymer banknote and creating opportunities to make early decisions that could result in an overall lower carbon impact from design to destruction.

Samoa 10 Tala

Samoa made history on two counts in 2019 – first by holding the first-ever 'green' Pacific Games, and second, by issuing the world's first carbon-neutral banknote. The latter being made achievable through the utilisation of De

La Rue's SAFEGUARD® polymer substrate and the Carbon Neutral Banknote service.

The Samoan Government had taken the decision to make the 19th Pacific Games 'green' by a variety of policies; including a clean-up of the islands beforehand; excluding single use plastics by athletes; excluding plastic plates and cutlery; issuing reusable water bottles to all athletes; providing free water stations with clean water at all venues and inviting the visiting athletes to plant 4,000 trees as part of the Ministry of the Environment and United Nations programme to plant 2 million new trees.

In support, De La Rue, as a participant of the United Nations Global Compact (UNGC) – a voluntary initiative





Wayang Windu Geothermal Power Plant

to align business strategies and operations with the UN's global principles – offered the Bank its carbon offsetting solution.

Following the design process of the new polymer commemorative banknote the environmental impact assessment tool was used. The assessment followed the entire banknote lifecycle and measured against the six criteria, while also comparing results from the same factors of the current 10 Tala paper design.

With the final carbon impact calculated, the Central Bank with support of De La Rue identified a project that would enable a verifiable carbon offset to be achieved. The Wayang Windu Phase 2 Geothermal Power Project is a 117MW geothermal power station in Indonesia. The project reduces greenhouse gas emissions through the displacement of fossil fuel electricity generation with a clean, renewable energy source whilst providing jobs for the local community.

This service enables customers to easily assess the environmental impact of their banknotes. This data enables the issuing authority to participate in a carbon offset programme of their choosing in order to accurately neutralise the environmental impact of their banknotes.

De La Rue can provide specific Environmental Impact Assessments detailing the impact of individual denominations or series at all stages in their lifecycle.

This service is available for paper and polymer substrates.



Appendix C: End of Life banknote disposal methods and comparative environmental impacts

Introduction

The comparative statistics used within these tables are based on paper and polymer banknotes only. Over 12,500 data points from DLR Analytics™ show that polymer banknotes last approximately 2.5 times longer on average than paper. This figure has been used to drive assumptions on replacement rates.

We have run this model at 100 million banknotes per denomination. The figures are approximately scalable although production efficiencies are improved on larger volume runs.

The carbon footprint modelling calculations used have been based on a full life-cycle carbon footprint and we have used some average assumptions associated with this for each banknote denomination:

- It is assumed that the paper substrate is manufactured in the UK at Overton Mill.
- The polymer is opacified and finished into substrate sheet form in the UK at Westhoughton.
- From the substrate sheet stage, the information used for the printing of the banknotes is based primarily on a KBBS line machinery assuming a litho print on both sides, a foil banknote thread on paper and a holographic overlay stripe on polymer and a single side intaglio print with standard letterpress. Varnish is included on both paper and polymer at end of the printing process.
- For final deliveries we have assumed a road distance of 100 kilometres at 100% lorry utilisation and a shipping distance of 5000 km.

For the circulation on CD1 we have assumed a note life of 1 year and a cycle/year of 1 for the polymer we have assumed a note life 2.5 years and 2 cycles.

For the model we have assumed that the region for circulation in South East Asia, that the cash cycle

environment is evolving and that the country size is small to medium.

Conclusions

The shows that the carbon impact of polymer is significantly lower than that of paper over a full life cycle.

Changing over to blended or ideally mono material recycling of polymer manufacturing waste and end-of-life polymer banknote waste demonstrates a significant improvement against waste going for landfill, which is often what happens in the banknote industry.

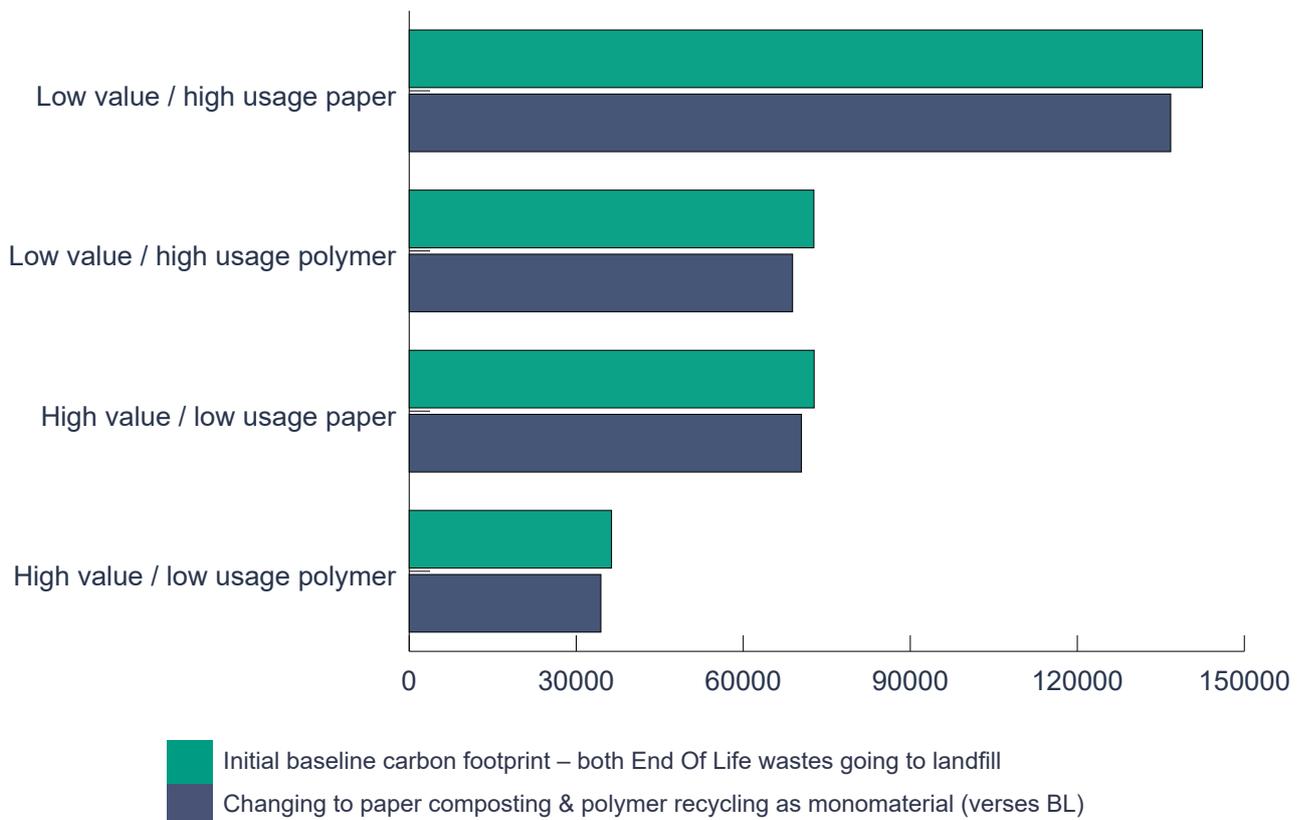
References

- Data relating to banknote life – supplied by DLR Analytics™ and comprised of data aggregated from issuing authorities.
- Data relating to banknote production – supplied by De La Rue Currency based on own manufacturing data.
- Cash cycle data – sourced from Sphera. Sphera is a business intelligence provider who aggregate submitted data from subscribers and provide a means of analysing said data for all subscribers.

kgCO₂e emissions by destruction / recycling method split by denomination and substrate.

	Initial baseline carbon footprint – both End Of Life wastes going to landfill	Changing to paper composting & polymer recycling as monomaterial (verses BL)
Low value / high usage paper	142483	136774 (-4%)
Low value / high usage polymer	72686	68859 (-5.2%)
High value / low usage paper	72736	70453 (-3.1%)
High value / low usage paper polymer	36343	34429 (-5.2%)

Note: All polymer BOPP substrate manufacturing waste is going to recycling for all CFP options above. Therefore the last column reduction percentage is comparing landfill to composting for paper showing a reduction or 4% and for polymer it is comparing landfill to mono-material plastic recycling showing a 5.2% reduction.



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