ASIA SUSTAINABILITY OVERVIEW 2025

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Introduction

At the High Security Printing conference Asia in Kuala Lumpur, December 2025, there was a sustainability workshop before the main conference started, and a sustainability session as part of the main agenda. This report summarises both sessions.

These sessions provide examples of what is being done across the whole cash cycle end-to-end. While they are only a snapshot of what is being done, they demonstrate opportunities to make changes from the small to the large.

They also show that none of this face sustainability challenges alone. There is considerable experience and expertise amongst all cash stakeholders that can be accessed to help.

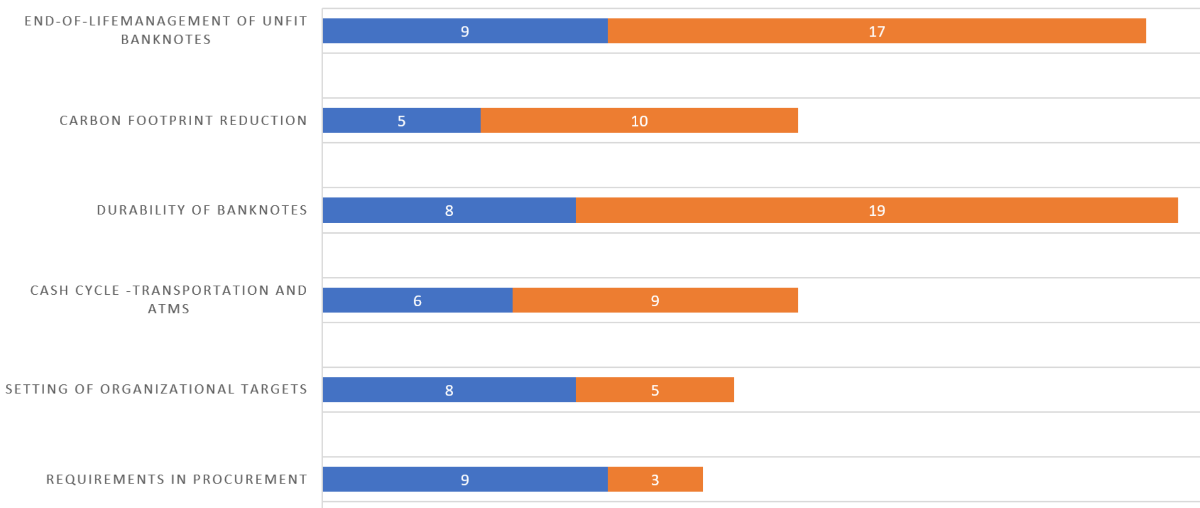
Workshop

Understanding priorities

The workshop started with the International Currency Association (ICA) running a session on the sustainability priorities of delegates. Everybody was asked to vote on six sustainability related topics. Each person had three votes which they cast for their most important topics. Central bankers had different tokens compared with other cash cycle stakeholders. There was then a group discussions about the topics:

- **Durability of banknotes**: the ability of banknote to withstand wear and tear over time. It refers to how long a banknote can last while maintaining its functionality and structural integrity under expected conditions of use.
- **End-of-life management of unfit banknotes**: the process of securely destroying or repurposing banknotes that are no longer fit for circulation.
- **Carbon footprint reduction**: efforts to minimise the total amount of greenhouse gases emitted directly or indirectly by activities, products, or services in relationship with the whole banknote lifecycle.
- **Cash Cycle – transportation and ATMS:** implementing eco-friendly practices in the transportation of cash and the operation of ATMS, such as using electric vehicles and renewable energy sources.
- **Setting of organisational targets:** establishing specific, measurable goals for an organisation's sustainability efforts, integrating them into organisational strategies and operations.
- **Requirements in procurement:** incorporating ESG criteria into procurement processes to ensure that purchased goods and services support sustainable development and the achievement of sustainability targets set by one organisation.

The results are shown below by the number of votes and by the percentage of votes cast by those who voted.



% of votes	Central Bank	Industry	Total
Durability of banknotes	30%	18%	25%
End-of-life management of unfit banknotes	27%	20%	24%
Carbon footprint reduction	16%	11%	14%
Cash cycle - transportation and ATMs	14%	13%	14%
Setting of organisational targets	8%	18%	12%
Requirements in procurement	5%	20%	11%

The results show a gap between central bankers and other cash stakeholders in that the industry places greater emphasis on procurement and setting organisational targets than central bankers.

From the flip charts, the following points were made (not a complete list),

- **Durability of banknotes**:
    - There was much discussion about options to increase the durability of banknotes, of which there are many
    - Understanding why notes become unfit, how to implement a clean note policy and how to manage the cash cycle were seen as challenges. Data is often lacking.
    - Public education is a challenge
    - What happens if a note lasts too long?
- **End-of-life management of unfit banknotes**:
    - Challenges discussed were when there are low and/or irregular quantities of notes for disposal and the lack of local infrastructure for recycling
    - Ideas discussed were composting and using briquettes to create cardboard
- **Carbon footprint reduction**:
    - While there are plenty of opportunities to reduce carbon (solar panels, energy saving, new technologies, increased note life, carbon offsetting, local recycling etc.), there are a lot of standards and enforcement of regulations is hard.
- **Cash Cycle – transportation and ATMS:**
    - Central banks often have only moral authority rather than direct control in the cash cycle. Nudging rather than telling.
    - Better data, standardised packaging, ATM consolidation, appropriate buffer stocks are all discussed.
    - Implementing a clean note policy was seen as a challenge, particularly beyond cash centres
- **Setting of organisational targets:**
    - Start with UN sustainable development goals as a base for target definitions
    - Don't overwhelm people with sustainability. Awareness training is needed. Explain the 'why'. Be willing to focus on little things rather than jumping to big targets. Evaluate what really matters.
    - Integrate environmental efficiency in all decisions – procurement, investment, products, processes etc.
    - Benchmark with more experienced organisations.
- **Requirements in procurement:**
    - Implement a standardised framework for the industry

- Recognise challenges such as some sustainability criteria can increase product costs, it can be difficult to verify supplier claims, data and submissions

The ICA will run a sustainability workshop at the Global Currency Forum in April.

Presentation and round table review of options for disposing of unfit shredded banknotes

Royal Dutch Kusters Engineering set the scene or a series of round-table discussions about options for disposing of unfit shredded banknotes. It started with the 'banknote shred waste pyramid'.

Landfill is the worst option because it adds no value and risks actually damaging the environment. Incineration may be quick, cheap and easy, requiring no infrastructure, but it immediately releases carbon, and other toxins, into the atmosphere.

Incineration with energy recovery, if done with proper flue gas treatment, starts to turn waste into a positive. Incineration with energy recovery could be at waste plants or furnaces or be used as an energy source substituting for other fuels at places such as cement plants. Temperatures of 900 degrees centigrade are needed and briquettes have excellent combustion properties.

Cotton banknotes can be **composted** sustainably. They turn cash into natural soil improvers, enhancing soil biodiversity and reducing waste volumes. Modern inks are mostly mineral oil-free oxidative inks. Security features can be metal free as well. Composting is a low technology solution, and almost all countries have agricultural sectors who need compost. A number of central banks compost, for example Pakistan, and there are a number of suppliers who can help with this, for example Biobanknote.

In recent years considerable work by a range of organisations, including Kusters, Oberthur, De La Rue, G+D and Blendpaper, has been put into finding new ways to use both polymer and cotton shreds, with the aim to recycle and even to create a true circular economy. These **'technical materials'** have been used to make recycled paper, to 3D print products and furniture and to create sustainable packaging and transportation solutions.

Recycling challenges

The challenges we all face when it comes to recycling include,

- The relatively low volumes of banknote waste compared to commercial waste
- That there is only one central bank in each country
- The maturity level of local recycling markets
- Waste follows the money. Does banknote waste have a market value?
- The product is not consistent; there are a wide variety of banknotes with a range of inks, security features and substrates

Recycling in Asia

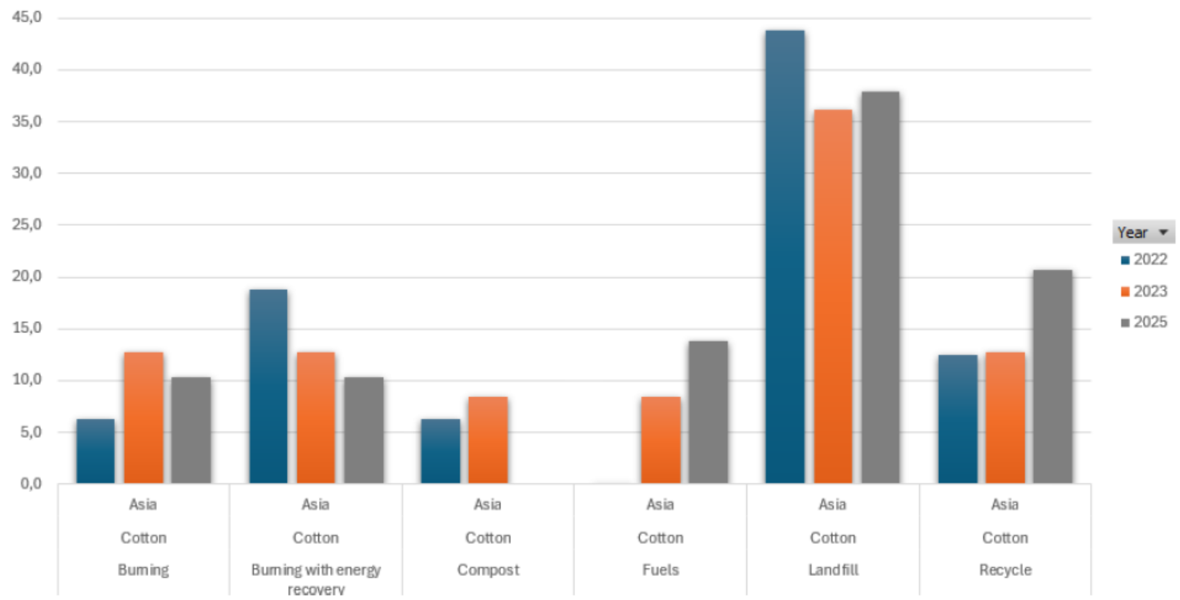
Kusters conducts a global study of who is doing what every other year. The results of the 2025 study will be published early next year, but Kusters reported the current Asia results. To date 17 countries have responded in Asia (82 in total around the world).

Of the 17 respondents, 32% had a mix of cotton and polymer notes, 13% a mix of cotton and composite notes and 3% a mix of all three. 52% were cotton only. 8% are considering a change to their substrate.

Kuster's survey has been run in 2022, 2023 and 2025. For cotton notes there has been a steady decline in burning with energy recovery but small increases in composting, using it for fuel and recycling. However, disposal using landfill remains the main method of disposal by a clear margin in Asia, but only 3.7 percentage points more than the global average.

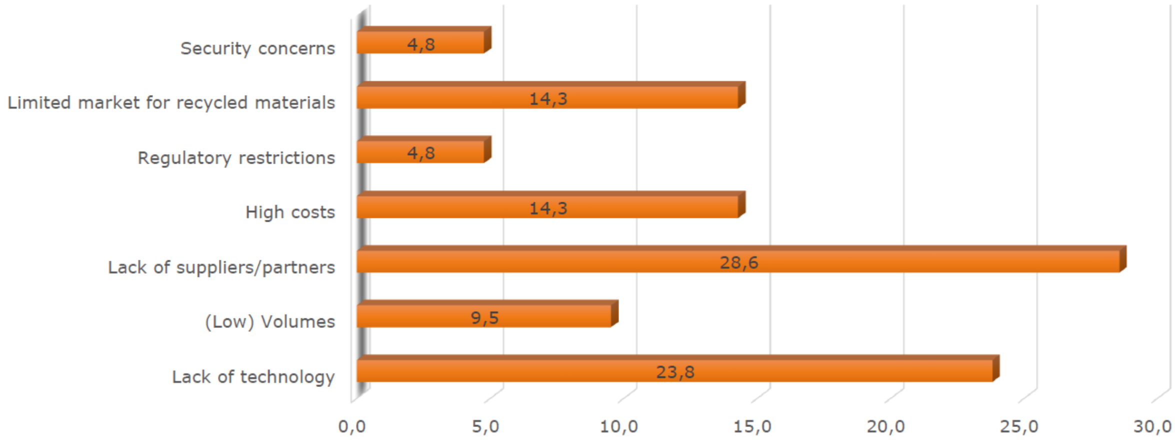
Asia uses burning with energy recovery considerably less than the global average (nearly 15 points less), it uses cotton as a fuel 8.4 points more and recycles nearly 10 points more.

9.5% of respondents are considering changing how they dispose of unfit notes. 57% are interested in exploring new approaches, although only 38% of all respondents are looking at changes in the next 2-5 years.



Barriers to recycling in Asia

The biggest issues are basically the same, a lack of ways to recycle unfit waste (lack of suppliers/partners, lack of technology and limited market for recycled materials).



Conclusion

While the theory of recycling unfit banknote shreds is increasingly well understood, the implementation requires local knowledge. With a third of shreds going to landfill though, there is an opportunity and need to find new routes for the waste to be used better.

At Welcome to the Cash Sustainability Forum - Reconnaissance there is a copy of the December 2022 'A Guide to Repurposing Unfit Shredded Paper Banknotes' which may act as a useful introduction to this topic.

Cash cycle – Thailand's Sustainability Initiatives

Given how much of the impact of the cash occurs once notes are issued, it was important that that the workshop heard what the Bank of Thailand (BOT) is doing. Pairote Balun, Director, Production Office at Note Printing Works, Bank of Thailand, delivered this presentation.

The BOT has set a target of reducing its Scope 1 and 2 greenhouse gas (GHG) emissions by 30% by 2030. This is being certified by the Thailand Greenhouse Gase Management Organisation. The BOT's work to achieve this is currently directed down three key avenues,

- Increasing the durability of key denominations by moving them to a polymer substrate (the 20 Baht in 2022 and the 50 Baht note in 2025)
- Introducing consolidated cash centres to reduce the distance banknotes travel (first opened in 2021, the eighth and nineth opened in 2025)
- Installing solar panels at regional cash centres (2025)

It carried out its first carbon footprint assessment of banknotes in 2022 and published its first climate related disclosure on its website in 2024. The climate disclosure is aligned with the Task Force on Climate-related Financial Disclosures (TCFD).

Targets and reduction sources

- **Decarbonisation**

Achieving a 30% reduction in GHG by 2030 is being achieved by fuel switching, using polymer banknotes and reducing electricity consumption in offices and banknote production.

- **Energy supply/efficiency**

A programme of introducing solar panels to maximise the use of renewable energy is in place through to 2027. Alongside this office space is being optimised, higher efficiency equipment is being introduced and LED lighting adopted.

- **Waste management**

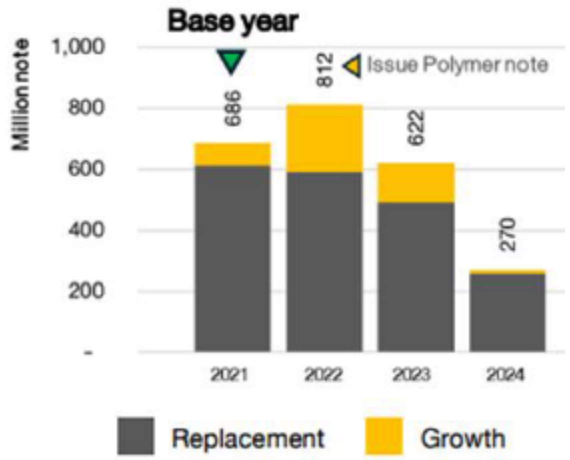
Waste separation is the starting point for waste management and so waste is not separated into office, industrial and shredded note waste. There is a focus on reducing both production materials and office supplies.

Decarbonisation framework by area

The BOT's direct span of control is over production, logistics (storage, issuance, redemption and processing) and disposal at the end of life.

- **Production**

BOT has moved to using sustainable cotton for its cotton banknotes and polymer notes for the 20 and 50 Baht. The impact of changing over to using polymer has been a dramatic decrease in notes required to replace worn out notes. At the same time the growth in the demand for banknotes has fallen.



The Polymer 20 Baht note now makes up over 50% of the currency in circulation three years after it was introduced. This is estimated to have reduced the number of notes needed by 400 million, saving 3,500 tonne of CO2e per year.

BOT generates 1MW from solar panels at its production facility and 760 kWh at regional locations.

- **Logistics**

Using polymer substrate has helped reduce the distribution of new notes by 200 million notes per year, saving 25 tonne CO2e per year.

Consolidated cash centres (CCC) are owned and equipped by the central bank but operated by private sector companies. About 30% of banknote sorting now happens at the nine CCC's. These are positioned close to the regions they serve, reducing the number of transportation trips by over 4,900. The result is that over 630 million notes have not had to be returned to the central sorting sites saving 634 tonne CO2e per year.

- **Other distribution changes**

Although white label smart machines use for cash issue and deposits are a private sector initiative, there introduction has led to the elimination of 1,348 duplicate machines. The removal of these machines has saved 1,008 tonne of CO2e.

Future opportunities for further reductions

The BOT has identified a number of opportunities to go further and do better. These include,

- Use more renewable energy to lower overall GHG emissions
- Take more supply chain GHG reduction initiatives
- Collaborate with stakeholders for best practices and improved reporting data
- Influencing sustainability practices with all partners

Presentations

SICPA – Sustainable solutions for the future of cash

SICPA presented on its sustainability agenda at the High Security Printing conference in Asia in December 2025. While it has a full Environment, Social and Governance (ESG) programme, here we cover SICPA's environmental focus.

SICPA focuses on four key areas,

- Climate action
- The environmental impact of its activities
- Creating environmentally friendly and safe products and technologies (and developing sustainable innovations and solutions)
- Managing a sustainable supply chain

All the while, of course, upholding the security, quality and reliability of its products, and, therefore, trust in SICPA.

Product sustainability

The company has defined four dimensions of product sustainability

- Safe products based on hazard-free inks
- Bio-renewable raw materials which are either fully renewable or recycled
- Materials that can be used efficiently in manufacturing processes, for example instant drying inks which have low consumption
- Products that optimise the banknote lifecycle, for example about helping lifecycle control

These dimensions have been explored at a number of customer workshops. When asked to rank them in terms of their importance, efficiency came first by a clear margin. Affordability and cost effectiveness were key. Product safety and bio-renewability came second and third but with only a small gap, and the banknote life cycle was fourth, although, again, quite close to bio-renewability.

Customers felt they needed more knowledge about options for disposing safely of unfit banknote at the end of their life.

Product initiatives

The 3VF ink series is a mineral oil-free oxidative offset ink which has 60% bio-renewable content. It is compatible with all offset presses and has excellent drying properties.

The 9SE (intaglio) ink series has now transitioned to both cobalt and octoate-free driers system. Both of these materials are potentially harmful and need careful handling and disposal. Their removal from the production processes is particularly helpful when considering end of life solutions, particularly composting.

Current intaglio inks have over 30% bio-renewable content. Newly developed inks have over 50% and the long-term ambition is to exceed 70%. By working with industry partners, such as G+D and Oberthur and others, SICPA is reducing the volatile organic compounds in the ink and reducing fossil fuel dependency by increasing the bio-renewable content.

In terms of protective varnishes, SICPA's varnishes can increase note lifetime by 30-60%. It offers a wide range of machine-readable IR-absorbing and magnetic features to enable banknote automation, decentralised cash cycles and transport reduction.

Oberthur Fiduciaire – can we make cash sustainable?

Oberthur has three areas of focus when it comes to sustainability,

- **Using renewable materials**

99% of a banknote is the substrate, 0.85% is intaglio ink and the rest is the thread, offset, silk screen and letterpress inks.

While all cotton fibres used in banknotes are fibres that have been recovered from waste processes of the textile industry, this is only the starting point. The key is to use the most 'bio-sourced' and durable substrate possible. Renewable components are also part of this story.

Oberthur uses a cotton paper with 'Highlink' and Sustainable' Highlink™. Highlink sustainable contains fibrous materials which come from local organic fibres, for example sisal. Sustainable Highlink contains natural latex that strengthen bonds between cotton fibres to create a more durable substrate.

	Banknote mass	Cotton & Highlink	Cotton & Highlink Sustainable
Substrate	99%	86.6%	90.25%
Features (eg. threads)	0.5%	-	-
Inks	0.95%	0.37%	0.37%
Total	100%	86.97%	90.62%

While Oberthur's sustainable banknote has been moved from 86.6% renewable materials to 91%, there is still 9% for R&D to aim for.

- **Minimising waste**

Environmentally friendly materials and comprehensive recycling processes go hand in hand with minimising waste.

In 2024 Oberthur recycled all of its shredded banknotes. It did this by testing its shredded banknotes and testing compatible applications for those shreds. It defined processes that created usable forms of waste and then connected organisations that could work with them.

Oberthur uses offset inks that do not contain mineral oils. It also uses alternative intaglio inks with a reduced mineral oils content and having some natural based raw components partly from waste recovery. Its security features have metal-free optical effects.

- **Adopting eco-friendly manufacturing processes**

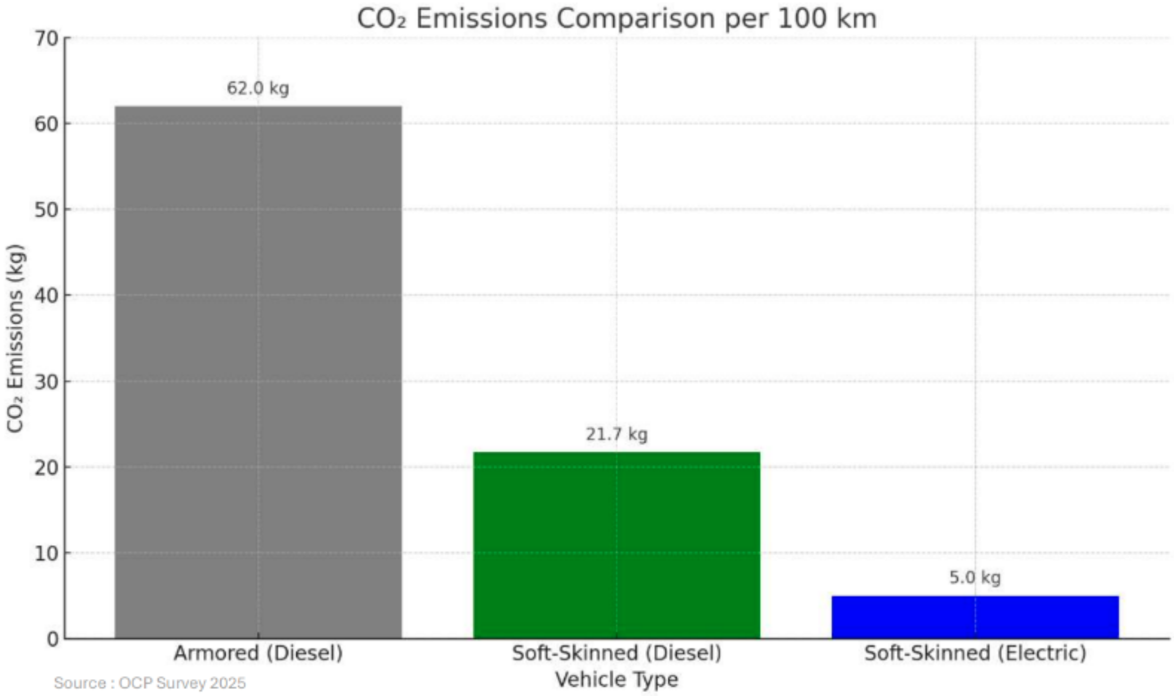
Sustainable manufacturing processes are a major area of focus. Four examples were given, Oberthur's use of green energy, its optimised consumption of power, use of cold roofs for its buildings and its use of electric trucks.

Oberthur Feerica – advancing a safer, more sustainable cash cycle

Oberthur Cash Protection has merged with Feerica to offer protection for ATMS, CIT operations and the entire cash cycle. While this presentation made the case for the implementation of

Intelligent Banknote Neutralisation Systems (IBNS), the environmental benefits come from the ability to use non-armoured CIT trucks.

The CO2 savings in terms of kilogrammes per 100 kilometre travelled are dramatic, 65% less moving from an armoured diesel truck to a soft skinned diesel truck, or 92% if moving directly to a soft-skinned electric vehicle.



OBERTHUR FEERICA

Security Fibres Limited

Regulations, such as the European Union's regulations on microplastics, defined as synthetic polymer particles smaller than 5mm, restrict their sale. Most standard, single colour fibres fall within this definition.

This is not the problem that it might have been, because security fibres in paper have moved from being either silk or polymer/synthetic to being made of paper. Extensive R&D means that all types of fibre, single colour, multi colour, UV etc. can now be on paper.

De La Rue – Decarbonising a banknote

Many countries have set a target date for getting to net zero carbon. 2050 is the most common target, although in Asia some are later, Thailand (2065), India (2070), China (2060), Indonesia (2060).

When you consider Life Cycle Analysis, circulation accounts for most of a banknote's emissions (50-60%). The substrate and banknote account for 10-20% each. The range depending on the choices made around substrate, production and circulation.

As always, Scope 3 emissions, those incurred indirectly in the purchasing and use of product, are 26 times greater than an organisations Scope 1 and 2 emissions (Boston Consulting Group and Climate Disclosure Project research). For De La Rue, their Scope 3 figure is 13 times more than its Scope 1 and 2.

For De La Rue's decarbonisation work on its polymer substrate, resource efficiency had a 2% impact. If polymer waste was sent for recycling, that had a further 2% impact.

Moving to using green energy (renewable energy such as solar or wind generated electricity) at the West Houghton production site reduced the carbon footprint by 4%.

Suppliers of raw material coming into polymer substrate switching to renewables and better waste practices had a 13% reduction.

De La Rue concluded that getting to a 90% reduction by 2050 in carbon emissions required better resource use, good supplier data and a change in energy use. It saw incremental changes as the key to decarbonisation.