



BANK OF ENGLAND

Polymer banknotes

Environmental impact of paper and polymer banknotes

The Bank of England is responsible for maintaining confidence in the currency, by meeting demand with good quality, genuine banknotes that the public can use with confidence.

To support this objective, for the past three years the Bank has been conducting a research project assessing the substrates (materials) that banknotes are printed on with a view to further enhancing counterfeit resilience and increasing the quality of banknotes in circulation. In particular, the Bank has been reviewing the relative merits of printing banknotes on polymer compared with cotton paper.

Environmental Study

As part of this research, we commissioned an independent study from PE International to assess the environmental impact of the Bank's current paper banknotes and polymer banknotes.

The study followed a Life Cycle Assessment (LCA), which looked at all the stages that a banknote encounters through its life: from first production of raw materials, manufacturing of the banknote materials, printing, distribution into circulation, recirculation (dispensing by ATMs, sorting at regional cash centres) and final return to the Bank of England for destruction and treatment of the waste. The study considered the impact of each stage of the banknote life cycle on 7 environmental indicators, including global warming potential, water and energy usage, ozone creation and environmental toxicity.

Polymer showed benefits over cotton paper for all the main phases of the life cycle. For the majority (six from seven) of the indicators covered by the study it has been shown that polymer banknotes have a lower environmental impact than paper banknotes. Polymer banknotes last at least 2.5 times longer than paper banknotes and this is the main factor leading to their stronger environmental performance. This is mainly due to the reduced environmental burdens associated with raw material production and processing of new banknotes to replace unfit ones. The single area where paper notes have a lower environmental impact than polymer is ozone creation potential.⁽¹⁾ In addition to the seven indicators noted above, three toxicity-related impact categories were also assessed to identify

(1) Photochemical ozone can be created in atmospheres containing nitrogen oxides and volatile organic compounds (VOCs), in the presence of sunlight. Although ozone is critical in the high atmosphere to protect against ultraviolet (UV) light, low level ozone is implicated in impacts as diverse as crop damage and increased incidence of asthma and other respiratory complaints. It is commonly known as summer smog.



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potential substances of concern. However, they are not considered sufficiently robust for making comparative assumptions. Therefore, although the figures show polymer is better, we could not use this for comparison purposes.

PE International conducted the study, according to ISO 14040/44⁽²⁾ standards and it has undergone a critical review by a panel of industry experts.

Bank of Canada, which moved to polymer banknotes in 2011, also conducted an environmental impact study which produced results similar to those provided here: polymer banknotes show benefits over paper banknotes for all the main phases of the life cycle.

At the end of their life, current Bank of England banknotes are shredded, compacted and then used with other organic materials in the manufacture of agricultural compost. The Bank will recycle polymer banknotes. There are a number of viable options and we are considering these in more detail. For the purposes of the study we assumed that polymer banknotes would be recycled by creating energy directly from waste in a specially designed plant. There are a number of other available options such as pyrolysis (thermal decomposition in the absence of oxygen) to create a form of bio diesel or converting the polymer waste into other usable products such as building products, plant pots and garden furniture.

Further details

Scope of the study

The study considered the life cycle of all denominations of Bank of England banknotes using a standard 'functional unit' of £1,000 face value over a time span of ten years, taking into consideration average note life. A forecast for the lifetime of a UK-circulating polymer banknote was calculated using data from countries where this type of banknote is already in use. For the purposes of this study a conservative lifetime was considered to be 2.5 times that of currently circulating paper banknotes, (most countries report longer lifetimes than this). This assumption is in line with a recent LCA study conducted on behalf of the Bank of Canada in 2011.⁽³⁾

The study used information derived from the Bank of England, its suppliers, a major ATM manufacturer, major cash in transit and wholesale cash providers, and the Bank's contracted waste treatment provider.

Main assumptions and limitations

The assessment of paper banknotes is based on the technical specification and performance of current Bank of England banknotes. The assessment of polymer banknotes is based on an assumed technical specification using a polymer substrate. The study also assumes that future banknotes

(2) http://www.iso.org/iso/catalogue_detail.htm?csnumber=37456.

(3) <http://www.bankofcanada.ca/banknotes/bank-note-series/polymer/life-cycle-assessment-lca/>.



would be of the same dimensions as those currently circulating. Given the Bank would introduce smaller banknotes if the decision is taken to move to polymer, the benefits are likely to be more significant.

Data was collected using a mixture of primary data from those companies involved in the life cycle of a Bank of England banknote and secondary data from an industry standard database created and maintained by PE International (GaBi Database 6 2012).⁽⁴⁾

Waste treatment of unfit banknotes

Bank of England banknotes are currently composted at the end of their life cycle. For polymer banknotes, a variety of potential treatments are possible. In some countries, for example, Australia, polymer banknotes are recycled into other useful plastic items, such as plant pots. For the purpose of this study it was assumed that polymer banknotes would be sent to an energy recovery facility, although it is recognised that mechanical recycling of polymer banknotes into other useful objects may provide additional environmental benefits depending on the UK market for such materials.

Next steps

Following our research programme, the Bank is considering the introduction of polymer for the recently announced Sir Winston Churchill and Jane Austen notes. However, we recognise that the public takes great pride in their banknotes, and that changes to the design and format of notes are consequently of great interest. Because of this we have decided to consult with the public before making any final decisions.

Therefore the Bank will be running a consultation programme between 10 September and 15 November that will provide the public with a greater familiarity with polymer banknotes. The consultation will, in turn, provide us with a better understanding of the public's views on the proposed change and, whether such a change would meet with broad public acceptance. A final decision will be announced in December.

(4) <http://www.gabi-software.com/databases/>.

If you would like to provide feedback on polymer banknotes please complete the online comment form on our website by 15 November 2013:
www.bankofengland.co.uk/banknotes/polymer
For further information telephone 020 7601 4878

