CARBON FOOTPRINT OF THE CARD INDUSTRY

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Introduction

This article is an attempt to estimate the overall carbon footprint of the plastic card industry. It therefore focuses more on global assumptions to gain an idea about the magnitude of the environmental impact of this part of the card industry. This article does not attempt to give exact numbers about market segments, etc.

Carbon Footprint of an Individual Card

Plastic

Most cards are made out of plastic materials. The most commonly used card material is PVC. Other commonly used card materials include ABS, PETG and PC. There is a huge volume of cardboard and paper-based cards. Paper and cardboard-based cards are usually for low usage/short life card applications such as prepaid phone cards or mobile phone recharge cards, though there have been solutions where cards made out of paper or cardboard were intended for a longer life.

The carbon footprint of the plastic material used to produce a single card varies with the material and the card characteristics. For a PVC-based credit card application, 20 g CO_2 equivalent is a realistic assumption.

IC

An increasing number of cards contain an IC (Integrated Circuit) to provide additional functionality, interfaces (e.g. contactless) and security. The size of the IC varies with the manufacturing technology and capabilities. ICs used in today's card applications range from 1 mm^2 to >25 mm^2 surface area. We assume that most of them are in the range of 4 mm^2 which is enough for a secure microcontroller for banking and mobile telecommunication applications.

The semiconductor industry is in many areas cost driven, with energy being a big contributor to the cost as well as to the carbon footprint. From a project conducted in the past, we determined a value of 5g CO_2 equivalent per mm^2 as a rough estimate for an IC. For a "common" IC, this results in an equivalent carbon footprint of 20 g/IC. Notably, this is about the same as the plastic for an entire ID-1 card.

Other 'stuff' on and in the card

Cards often are carriers of marketing messages and branding. Cards may contain special technologies like an antenna to communicate with a card reader without having to take the card out of the wallet. Increasingly, there are advanced card constructions on the market containing displays, batteries, pushbuttons, etc. ISO/IEC JTC1/SC17, the committee working on the standardization of cards, has just started work on standardizing such advanced card types.

All these additions to the card add to its carbon footprint. In the case of displays, batteries, etc., the carbon footprint could be substantially and possibly in the range of a multitude of what we assumed above for the plastic material of a card and the 'typical' IC.

Summary

For a typical ID-1 card 20 g to 50 g CO_2 equivalent is a realistic assumption.

For more complex cards with displays and other components, up to 100 g should be realistic, but currently these cards are rare. Thin, flexible cards such as paper tickets or voucher cards may have a much smaller footprint.

Market Segments

Mobile telecommunications

The mobile telecommunications market is a huge market segment with a strong level of harmonization thanks to the underlying standardization by ETSI.

The annual market volume, measured in mobile phones, is expected to be well in excess of 1.5 billion per year for 2012. Each of these phones contains a so-called SIM card to identify the mobile phone user to the telephone company. Also, there is a new SIM card every time a user registers with a new provider. There are pre-paid SIM cards that might get used only for a very limited time. An annual volume of 2 billion SIM cards is a very conservative estimate.

All SIM cards contain an IC. Most of them are made in ID-1 size and the much smaller 'plug-in' SIM card is broken out of the carrier and the rest is discarded.

We assume these to be simple plastic cards with a small IC, so an approximate carbon footprint should be 35 g CO_2 equivalent/card.

SIM cards thus contribute in the range of 2,000,000,000*35g CO_2 equivalent to the carbon footprint of the card industry or a total of 70,000 tons.

Banking

Banking cards are mostly ID-1 size cards. An increasing percentage of them these days contain an IC. With many of those countries who do not yet have an EMV-based infrastructure for rapidly implementing chip-based debit card systems (e.g. Indonesia), or are only now starting on the EMV path (e.g. the USA), it is reasonable to assume that the annual banking card market encompasses well in excess of 1 billion IC cards annually.

We assume these cards to be simple PVC with a 'typical' IC, hence having an approximate carbon footprint in the range of 40 g CO_2/card.

Banking cards thus contribute in the range of 1,000,000,000*40g CO_2 equivalent to the carbon footprint of the card industry, or a total of 40,000 tons.

ID

Over the past couple of years, many passports, identity cards, driver's licenses and other ID schemes have been migrated to an IC-based technology.

Many of these solutions require an ID-1 size card and to simplify the situation, this is what we will assume.

These cards are usually more complex, often with more energy-intensive card materials like PC, but also have a longer lifetime. While assuming an annual market of 1 billion ID cards is again probably too conservative, it should do for the purpose of this article.

Taking into account the more often sophisticated materials and electronics inside, an assumption of 50g CO_2 equivalent per ID card seems realistic.

ID cards thus contribute in the range of 1,000,000,000*50 CO_2 equivalent to the carbon footprint of the card industry, or a total of 50,000 tons.

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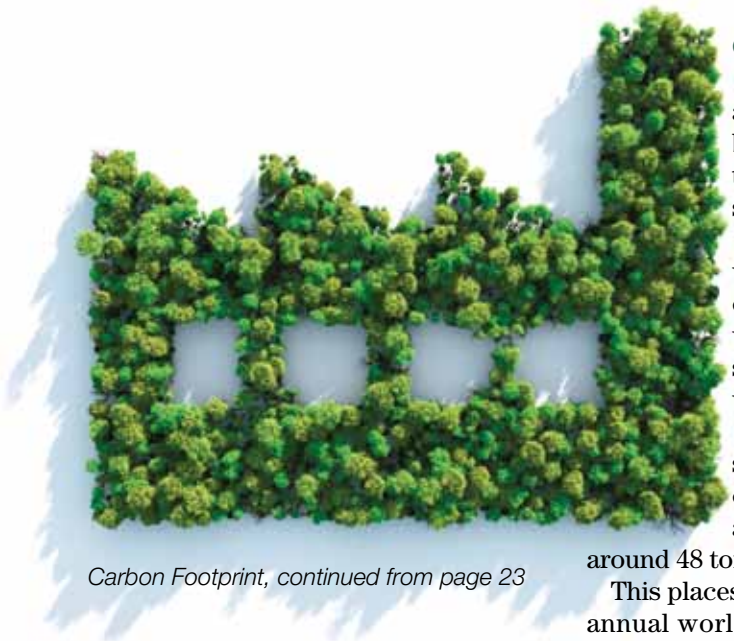

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Other markets

There are public transport and access control schemes and many other markets using cards in one form or another. Some of these use complex cards with a carbon footprint surely equivalent to that of an ID card, while others run with huge numbers but the cards have a relatively small carbon footprint.

To capture this additional market segment, we just assume the remainder of the card market to be in the range of 1 billion banking cards with a carbon footprint each of 40g. While many of these "other markets" cards do not have an IC or may be smaller in size, the market volume might be 10 times as much.

We estimate cards from other markets to contribute in the range of 1,000,000,000*40g CO_2 equivalent to the carbon footprint of the card industry or a total of 40,000 tons.

The total

The carbon footprint sum of all of these markets is 200,000 tons CO_2 equivalent. We are sure that each of the above numbers can be reasonably argued to either twice or maybe half their value. Anyhow, this admittedly crude way of determining a number to represent the carbon footprint of the card industry should be accurate enough and sufficient to put this into a global perspective.

Global impact

200,000 tons CO_2 equivalent as the estimated carbon footprint of the cards, the card industry makes it sound like a lot at first.

20,000 tons is the weight of a two Nimitz class aircraft carriers, which are the biggest warships currently sailing the waters of our planet.

Christopher M. Jones stated in 2011 that the carbon footprint of the average U.S. household is around 48 tons.

This places the carbon footprint of annual worldwide card production roughly equivalent to a village in the U.S. of approximately 5,000 households. The U.S. has about 117 million households.

Does it all not matter then?

To cite the slogan of a large UK supermarket chain: "Every little bit helps!" It is not appropriate to argue that just because something makes only a little contribution, it is not relevant.

While it is crucial to be aware that even turning all card products made on the planet into ones which are compostable, recyclable, carbon neutral and manufactured from renewable resources, is not going to substantially change the future of our precious planet. It is also crucial to keep in mind that a card is usually not a consumer product on its own. It is almost always part of a more complex service and, as such, in many ways is one of those parts that make or break that service—sometimes also from an environmental perspective.

How can the environmental impact be improved?

Cards are often sent on paper carriers, in paper envelopes, accompanied by paper brochures. The carbon footprint of four pages of A4/letter format paper can have an equivalent carbon footprint in the range of the individual card's plastic material.

Plastic wrappers, boxes and other packaging of single cards can also have a contribution to the overall carbon footprint dwarfing that of the card itself.

Transportation, especially when cards are transported half way around the planet by air, can have a substantial contribution too, for example flying a card over 10,000 km as part of an air freight shipment adds more than 25 g CO_2 equivalent to the card's carbon footprint.

However, environmental impact is more than just the carbon footprint. Materials used, water used and the impact of the card's construction on disposal are just a few aspects to consider.

The card has a function and an expected lifetime. Replacing a well established card product with something that appears to be more environmentally friendly, but that halves its lifetime, might simply be the wrong thing to do.

The card is often a marketing tool, a carrier for a message. As such, proper selection of the card's characteristics might exactly do that, i.e. convey a message supporting what the issuer intends to say about their service.

Environmental characteristics of a card product need to match the client's needs, just as other characteristics of the card need to too.

Uwe Trüggelmann has been an industry consultant and independent auditor in the card industry through his company TruCert Ltd. since 2003. His work has included developing quality and security requirements for the inlay of the UK passport, certification and accreditation audits in the payment industry, analysis of the environmental impact of payment cards and editing the new release of the CQM Requirements for MasterCard. Uwe chairs ISO/IEC JTC1/SC17/WG1, the ISO committee developing and maintaining standards about physical characteristics and test methods for Identification Cards and is the editor of ISO/IEC 24789-1 about Card Service Life.