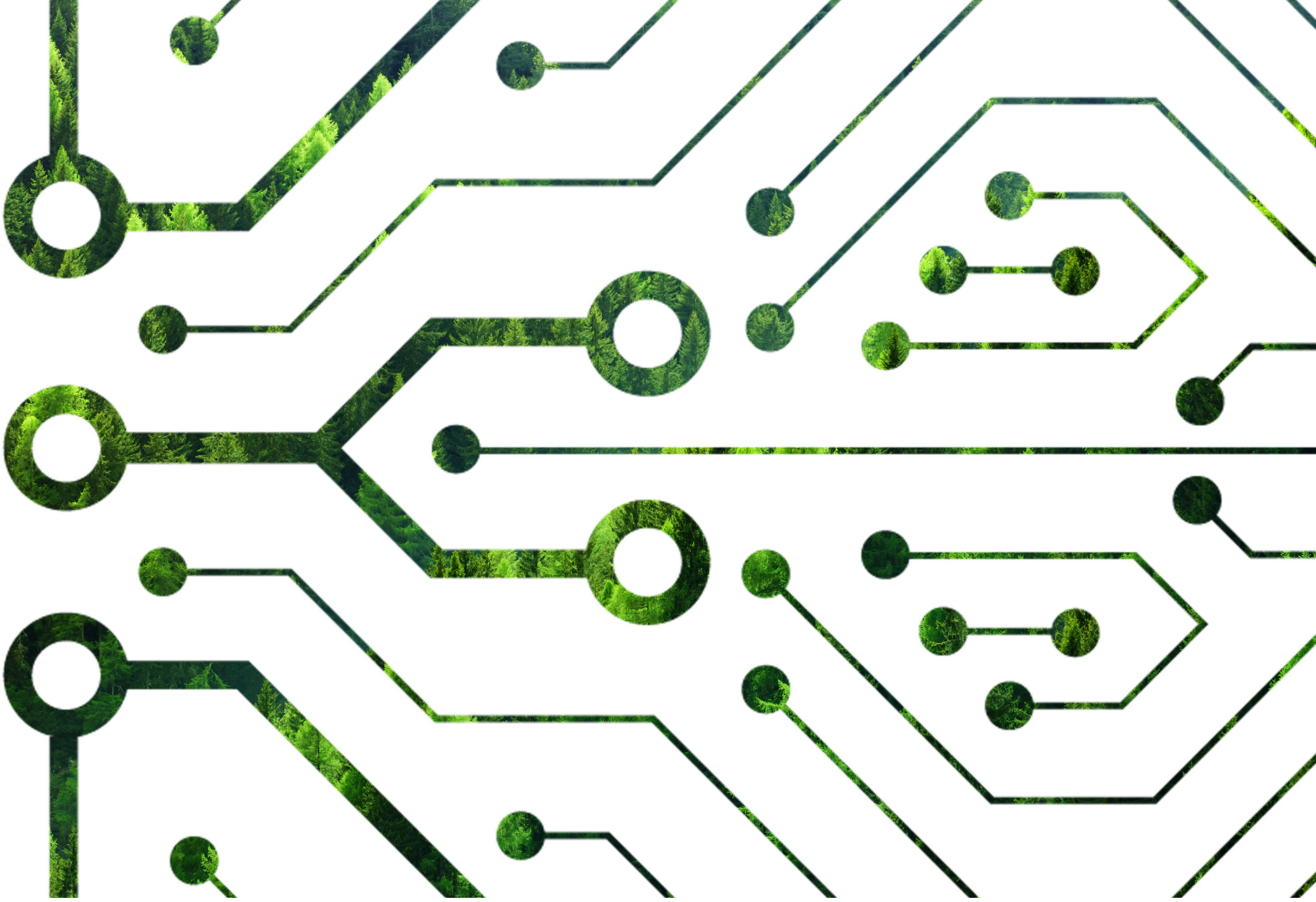

waste manifesto

LEADING ELECTRONIC MANUFACTURERS TOWARDS ZERO WASTE

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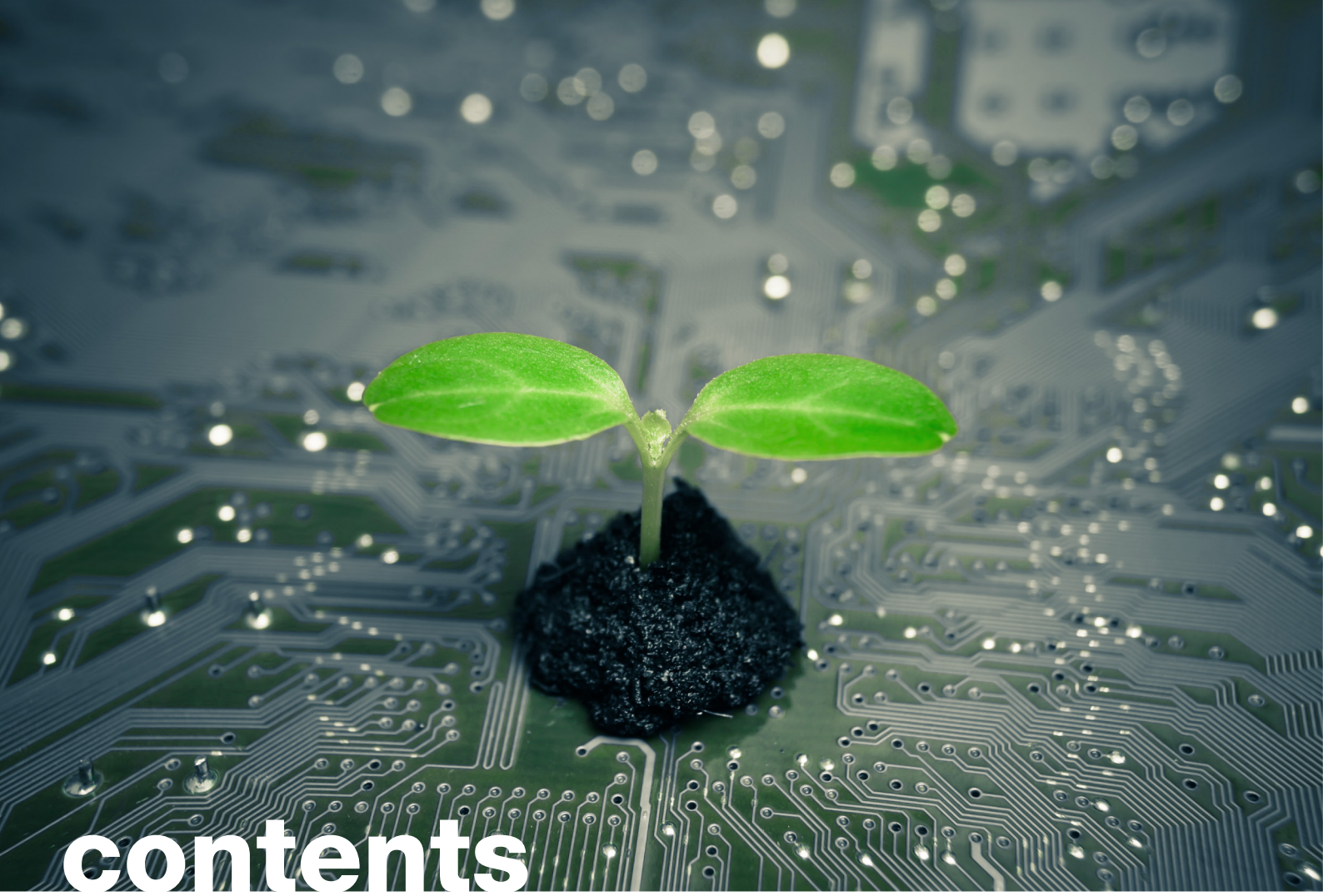


contents

introduction

A foreword from the CEO

Welcome to our first Waste Manifesto, in which we set out our intention to lead electronic manufacturers towards zero electronic component waste.

Visiting electronics factories around the world, it is clear that a high volume of excess and obsolete (E&O) waste is being generated. With the focus on production, high value waste components are often discarded. Factory waste often ends up feeding the counterfeit supply chain, or is dumped in wastelands all over the world. Not only is this costly to businesses, but it is also having a negative impact on our planet.

Experts in sustainability and the circular economy often talk about the 3Rs; *Reduce*, *Reuse* and *Recycle*. We want to share our vision for how this applies to electronic component waste.

Kenny McGee
CEO, Component Sense

visiting factories around the world, it is clear that a high volume of E&O waste is being generated

the need for change

The need for change in the electronic industry

e-waste remains one of the planet's fastest growing streams of waste

Electronic waste, also known as 'e-waste', is a global pandemic, encompassing all items of discarded electrical and electronic equipment, that have been discarded without the intention of further use.[1]

Despite rising global pressures to address the harmful impact of e-waste, and years of education and media attention highlighting its damage, it remains one of the planet's fastest growing streams of waste.[2] In 2016, it was recorded that the world generated e-waste equal in weight to almost 4,500 Eiffel Towers.[3]

Although the e-waste recycling industry is growing, studies have shown that a sobering volume of e-waste delivered to recycling companies still goes on to be shipped wholesale to landfills in Hong Kong, China, and developing nations in Africa and Asia.[4] This signals that we either need to be more stringent in our approach to recycling e-waste, or double down on our recycling efforts. However, we cannot rely on recycling alone.

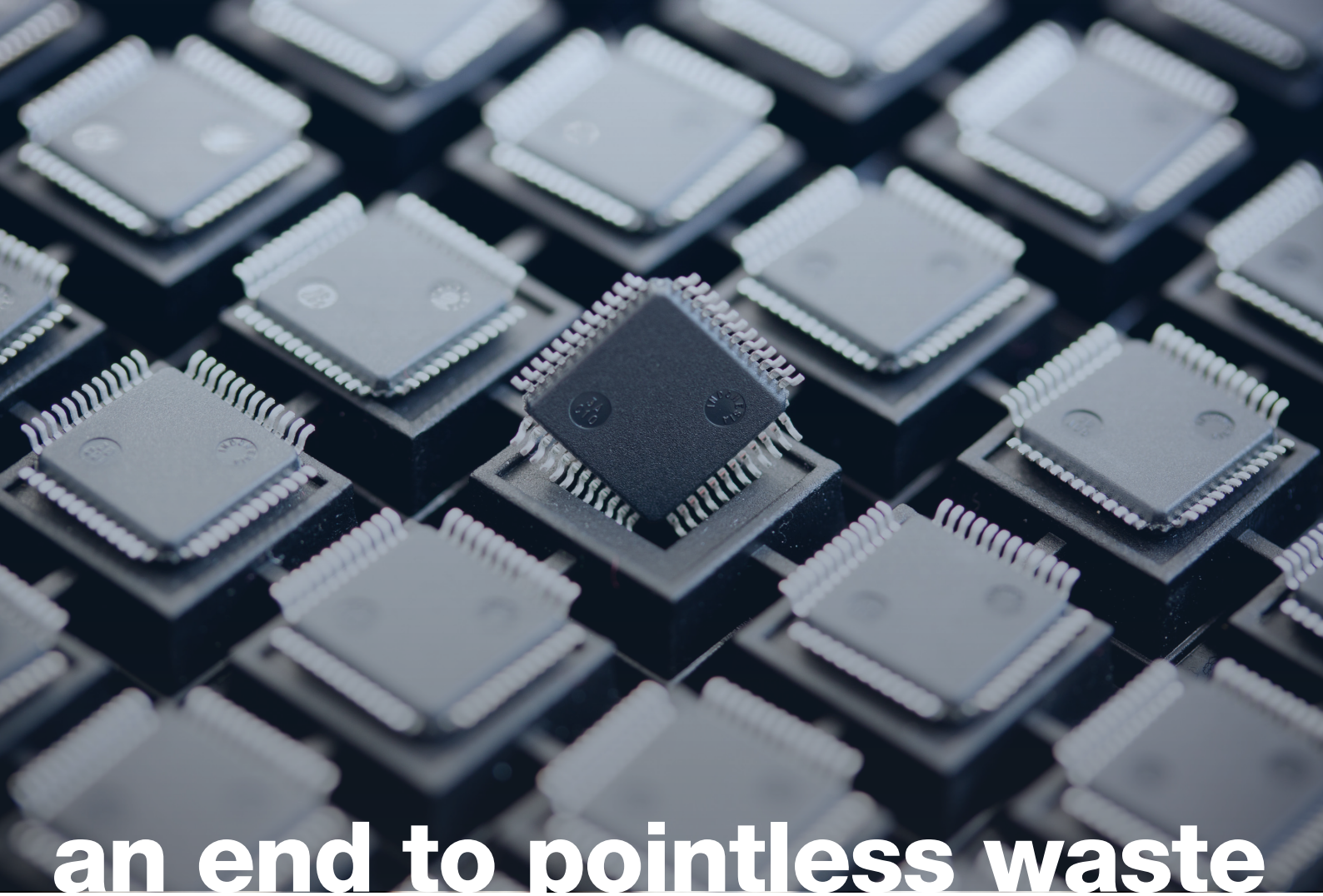
At the heart of the problem is an electronics industry driven by planned obsolescence.[5] Our current economy incentivises the generation of waste, and encourages manufacturers to manipulate their products to be used and

then discarded for something new in increasingly shorter cycles. Although it is difficult to guage how many electronic devices are produced annually, it is estimated that 40 billion devices will be connected to the internet by next year.[6] The by-product of this is a ballooning volume of e-waste.

At Component Sense, we recognise that electronic component waste is a widely overlooked but significant part of the e-waste problem, and we acknowledge that a substantial number of electronic components are discarded each year, many of which are scrapped, and either incinerated or disposed of in landfills. This is causing harm to local communities, the environment, and is contributing to human-made global warming. We believe that only the life extension of electronic components currently in circulation can make a meaningful difference to their environmental impact.

While we accept that electronics are an inevitable and important part of our future, it is vital that we work together to minimise the electronic industry's damage to the environment as far as we possibly can. To achieve a truly sustainable impact on the e-waste problem, we need to act proactively and collectively. Together we can leave a functioning planet for our children, and can reduce costs in the process.

electronic component waste is a widely-overlooked but significant part of the e-waste problem



an end to pointless waste

REDUCE: An end to pointless electronic waste

When it comes to the problem of electronic component waste, the most sustainable solution is to reduce the amount of waste that is produced in the first place. The root cause of this waste can be traced to the high volume of excess and obsolete (E&O) component stock generated by electronics manufacturers. In helping manufacturers to take positive action on their E&O stock, we believe that together we can build a more sustainable future for both the electronics industry and for our planet.

the most sustainable solution is to reduce the amount of waste produced in the first place

What is E&O stock and how does it arise?

First, it is important to recognise that E&O component stock is a normal part of the manufacturing process, albeit a costly burden to both businesses and the environment. The definition of 'excess' may vary from business to business, however, excess inventory typically covers components that are still included in a live Bill of Materials (BoM), and falls into two categories:

1. **Excess inventory without demand** (in other words, the component is in a live BoM, but the forecast demand is less than the stock on hand); or

it is important to recognise that E&O stock is a normal part of the manufacturing process

2. **Excess inventory with demand**, also known as ‘slow moving’, which is forecast to be consumed in more than a set time (e.g. 12 months) or where stock turns are below an acceptable minimum (e.g. <1x).

Obsolete stock, also known as ‘dead stock’, may be characterised as components that are no longer part of a live BoM (e.g. the product line is being replaced, or an engineering change has eliminated the component requirement), or components where stock is on hand for which there is no demand (e.g. stock turns are at zero).

In this section, we will look at the key ways in which E&O stock can be managed and limited in the future.

Communication

Recently, we reached out to 400 senior figures in the electronics industry and asked them what they believed were the key obstacles to taking action on E&O stock. Almost 40 percent of these leaders cited poor communications between Supply Chain, Operations and Finance as the biggest issue. So how do we resolve this and enable departments to work better together?

Departmental silos are common and present a huge challenge to businesses of all sizes. Problems arise when departments have conflicting key performance indicators (KPIs) or goals, and become focused on their own targets, at the expense of the company's overall goals. In their eyes, they are just doing their job. However, without a unified stock management vision and a common E&O goal, departments end up with conflicting priorities, which can be detrimental to the health of a business.

Ways to help build a unified front

- Set more holistic targets across departments
- Allow flexibility with departmental targets, where a concession against a target is in the overall interest of the company
- Provide senior-level oversight to address circumstances where targets conflict
- Create cross-functional teams, with team targets rather than individual function targets
- Implement regular multi-disciplinary team meetings and communications
- Build an understanding of other teams' processes and priorities (e.g. 'shadowing' each other)

Demand forecasting

Demand forecasting allows an electronic manufacturer to anticipate future demand for components, predicting the quantities that will be needed to satisfy production requirements.

The gap between forecasts and actual sales is a root cause of increased E&O inventory. However, this is not about blame, as forecasts are inherently inaccurate. What businesses need are mechanisms for rapid reaction. Forecast reviews, trend analysis, and planning, help towards lowering the stock on hand, and when variances arise it is important to react quickly without finger-pointing.

Stocking policies

Typically, a manufacturer's inventory will include a variety of stock types; for example, fast-moving and slow-moving stock, or high value and low value stock. Applying a broad-brush stocking policy to all stock can be a recipe for disaster.

Although this might seem obvious, it is surprising how many businesses apply the same stocking policy to all stock, often because of a gap in the knowledge, skills, systems or processes needed to deal with a high volume of data and products. Ideally, businesses should aim to create different categories for different types of E&O stock, and apply custom strategies to each.

Buying and negotiation

Buyers, and the systems they use, must consider the wider impact of their decisions, on areas such as demand rates, investment, warehouse space, and obsolescence. It might be tempting to bulk buy components to get a lower unit price instead of what is actually needed, however this can actually be counter-productive and costly. Sometimes this is a perfectly reasonable reaction to a bonus-based measure such as purchase price variance (PPV); this behaviour might also be encouraged by finance, where the focus is on profit and loss for the current quarter, but not the impact on the balance sheet and profit when stock is written off further down the line. Ultimately, it is a trade-off between the unit price and minimum order quantities, which a buyer should negotiate assertively.

Lead times

Accurate lead times are key to maintaining an optimal inventory, however, in reality most businesses lack a means of measuring these precisely. Instead, lead times are based on rules of thumb and assumptions across the board. For example, a standard 14 days might be assumed for all products even though many are normally delivered in two or three days.

Questions to consider

- Do your suppliers add days or even weeks to their lead times, with the intention of under-promising and over-delivering, only to miss them anyway?
- Do you penalise your suppliers if they deliver too early?
- Do you negotiate lead times with your suppliers and measure their performance against these?
- When was the last time you reviewed your lead times?

Late deliveries

This seems counter-intuitive, as late supplier deliveries result in stock shortages rather than over-stocking. However, if the organisation compensates by increasing its buffer stock, then the danger of stock becoming E&O increases.

The key way to overcome this problem is to manage your suppliers more assertively, build closer relationships with them to increase visibility and understand where improvements can be made, and to use penalties for planned delivery dates that have been missed.

Component proliferation

For many electronic manufacturers, the increase in component proliferation is the bane of lean supply chain operations. Yet to an extent it is unavoidable, thanks to factors such as increased product variety, globalisation, the internet of things, and a general increase in the electronic component content of products.

Component proliferation causes long-term growth in the number of components on live BoMs, or an increase in the number of components that only appear on one BoM, both of which can lead to E&O.

Engineering changes

Relentless innovation and competition for market share can lead to endless product improvements. However, a downside is complexity of forecasting and an increase in the total component count. A key question in an Engineering Change Meeting needs to be the impact on E&O. If you don't consider

this then the knock-on effect can be increased costs which can impact profits or, if prices rise, lower sales. Generally, engineering change requires careful planning between all departments, with strong channels of communication between supply chain, production and design. It is also important to accept that many engineering changes are forced by obsolescence coming from component manufacturers, so they are inevitable - they just need careful planning.

KPIs

KPIs are vital for measuring a business against its goals, but the wrong KPIs can drive the wrong behaviour. Equally, the right KPIs that are not shared with the right teams can mean that the need for urgent action gets overlooked.

A perfect example of an inappropriate KPI would be one which exclusively measures PPV without also measuring the total value of stock on hand and stock turns, preferably at component level.

So what should you do? Some ways to help you tackle E&O

Review your stock management and supply chain processes to stop the problem ever arising. Do you need to update supplier leadtimes? Do individual objectives need to be reviewed because they incentivise the purchase of higher quantities to achieve a lower price? Do your stock forecast algorithms work from historical sales (which might be too low if there has been a shortage), or from more accurate historical demand?

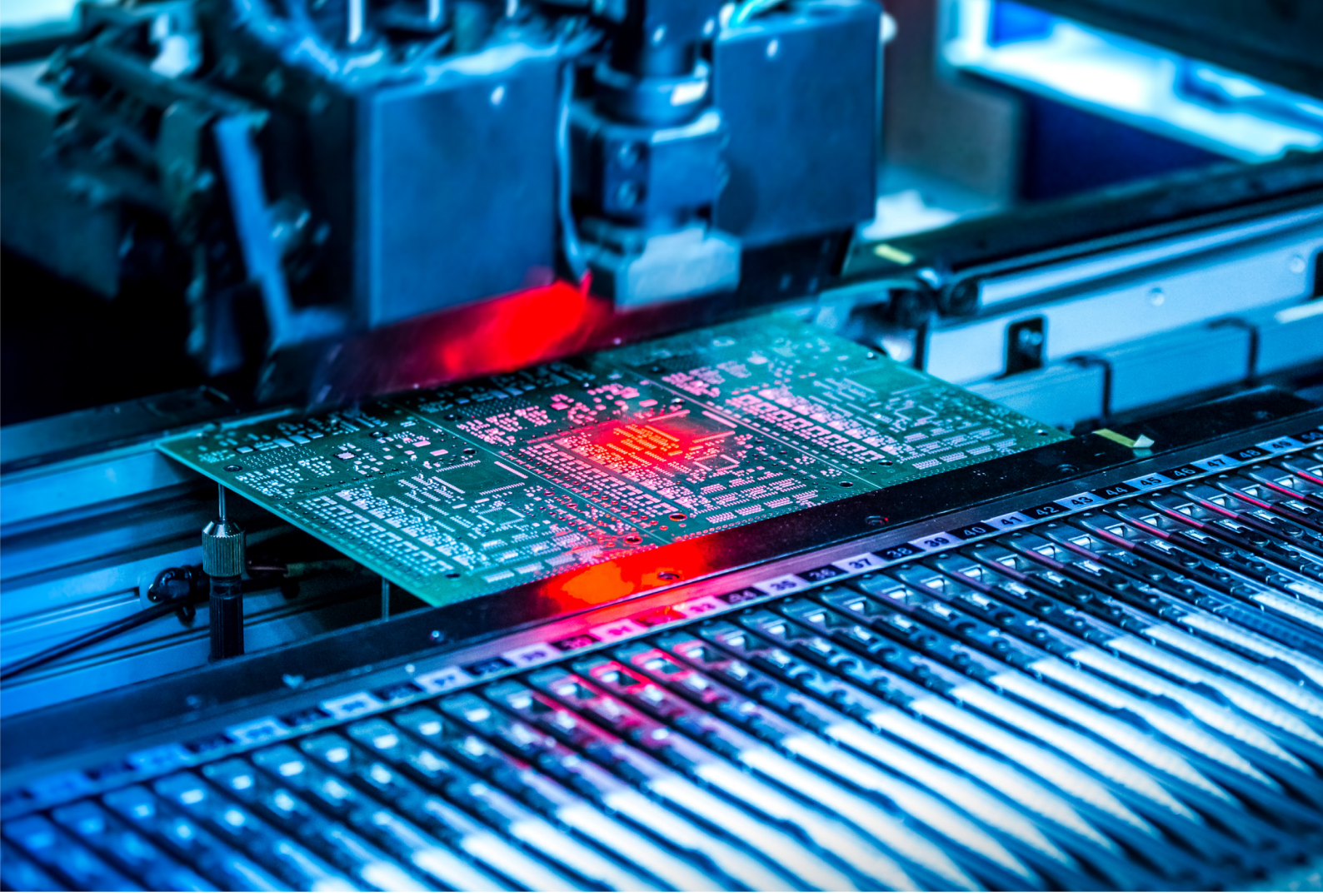
Once stock is accurately known, clear and relevant KPIs are vital. These could include current and forecast stock turns per component, value of stock over a threshold usage level (i.e. value of your E&O stock), value of E&O liquidated in the past month, number of single source components, or number of components on only one BoM - whatever gives you the tools to know what is happening to E&O stock. Once you have clear KPIs, these should be shared internally with all relevant teams.

Have a dedicated cross-functional team that continuously reviews the E&O position, with clear and sensible E&O KPIs/objectives, and authority to act when a component is becoming a problem. To be really effective, the cross-functional team should have a senior management respresentative, to influence on their behalf at executive level.

Whatever you do, E&O is likely to happen. When it does, there should be a mechanism to review how it arose (without blame) and a way to change or update processes to eliminate or minimise the root cause.

Once E&O is identified, you need processes to quickly liquidate the stock. The longer it is left, the less desirable it becomes in the market, and the harder it is to sell. Wait too long and it will simply become scrap.

Implement appropriate processes and resources, such as a Perpetual Inventory Team, to continuously audit stock levels.



The next steps

Learning from each other and sharing best practice is the key to driving change in our industry. We encourage you to do the following:

1. Join our LinkedIn group **Zero Component Waste** and share your expertise, your war stories, your learnings, or ask questions to get help and advice from other members.

2. Send your stories and experience to us. We will blog about them (anonymously if preferred), share them in our weekly emails and with the wider world. Blog about your experiences in your own blog, and if you let us know we will link to it.

learning from each other and sharing best practice is the key way to drive change in our industry

maximising reuse

REUSE: Maximising reuse opportunities

At Component Sense, we enable manufacturers to redistribute E&O components, reducing the waste of components that are already in existence, and contributing towards a more circular economy (See Figure 1, p.12). In doing so, electronic components that would otherwise be scrapped are used for their original intended purpose, keeping them out of landfills, and maintaining maximum value.

electronic components that would otherwise be scrapped are used for their original intended purpose

How do we do this?

We take E&O stock from large original equipment manufacturer (OEMs) and electronics manufacturing services (EMS) companies, which comes with full traceability and guaranteed quality.

Typically, these companies have excellent buying power, and buy at prices smaller companies can only dream of. Consequently, we can buy their stock for 100% of cost plus +PPV (profit), and still sell to our customers at better-than-market prices. This also presents an excellent opportunity to cross-sell stock between companies. This is trusted, guaranteed, fully traceable stock.

We then market the stock to smaller OEM and EMS clients, who use our BoM matching service. These smaller businesses benefit from cost reductions resulting from tier one buying power.

Finally, we market the stock to 4,500 brokers worldwide. These brokers are typically connected to a vast network of companies, giving us exposure to over 80% of the global marketplace. Approximately 40 of the largest component brokers have direct access to our live stock list, and the rest access our stock via component forums in North America, Europe and Asia.

We provide three key solutions to facilitate the redistribution of E&O component stock:

1. InPlant ™

This is our premium solution. With this model, the manufacturer shares their stock data allowing us to market it for them. Early identification means that this stock is brand new and we can generally return up to 100% of cost plus PPV.

2. Consignment

This fully managed solution offers the convenience of having your E&O stock uplifted at our cost, stored and insured in an appropriate environment, whilst still providing a good return.

3. Outright sale

This is simply a lot buy. We uplift the stock, pay you a cash sum for it, and you don't need to worry about it again. You will have the reassurance that we will do everything possible to redistribute it, and where this is not possible we will recycle it responsibly.

Figure 1: Our place in the circular economy

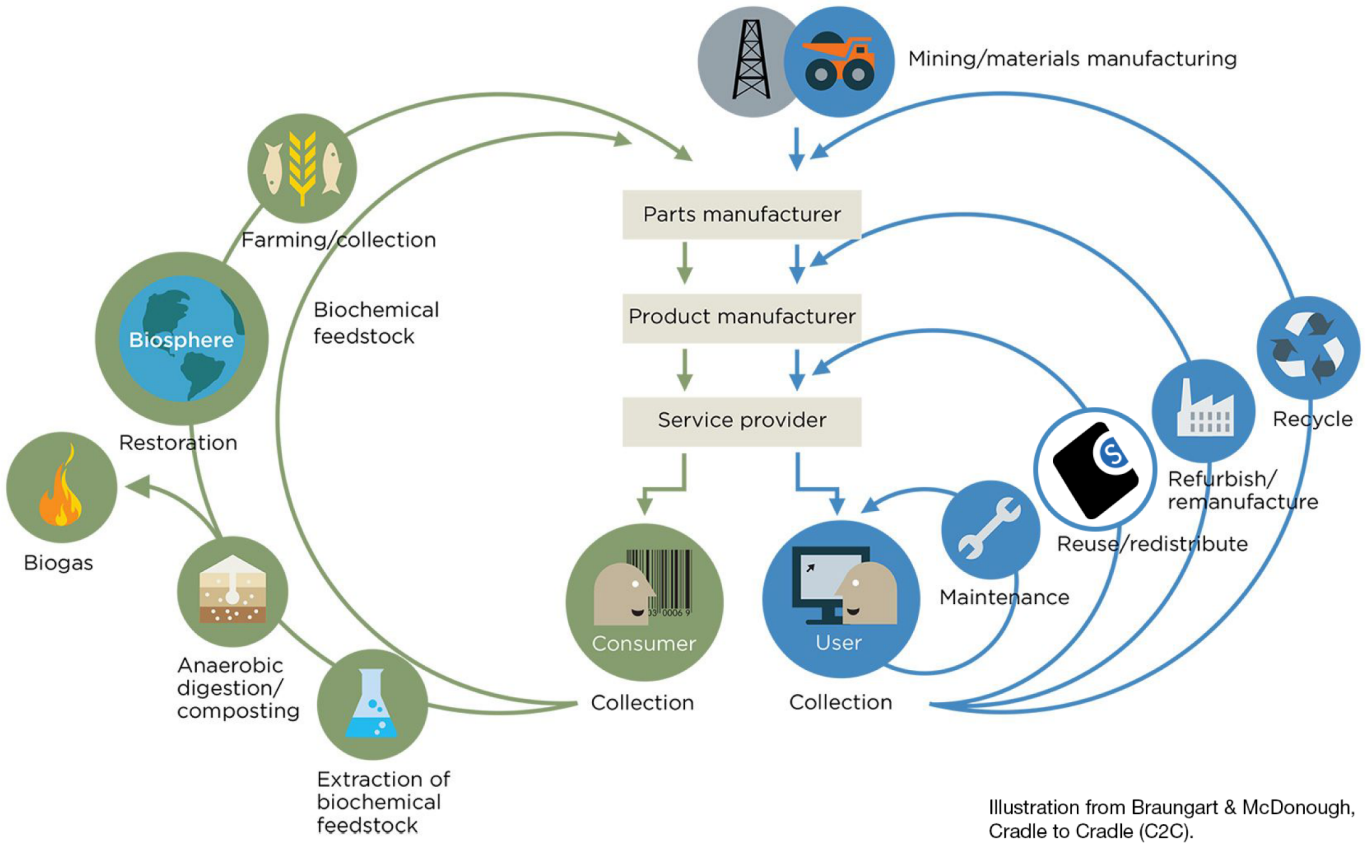
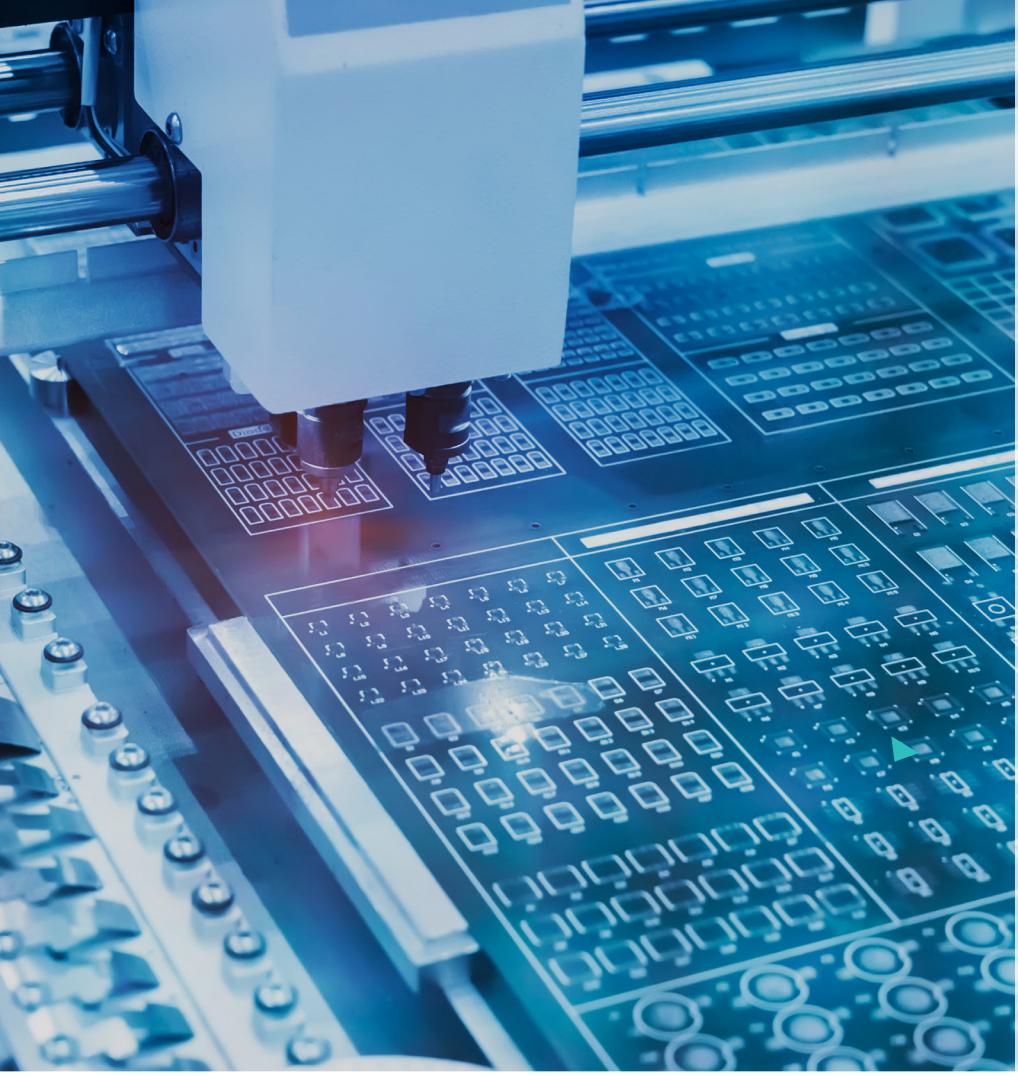


Illustration from Braungart & McDonough, Cradle to Cradle (C2C).



REDISTRIBUTION

Component Sense enables electronic manufacturers to redistribute excess and obsolete electronic components, addressing waste before it becomes an environmental hazard. We redistribute surplus components while they are still in new and re-useable condition, extending their life cycle without the need for additional processing or chemical treatment which may harm the envioronment.

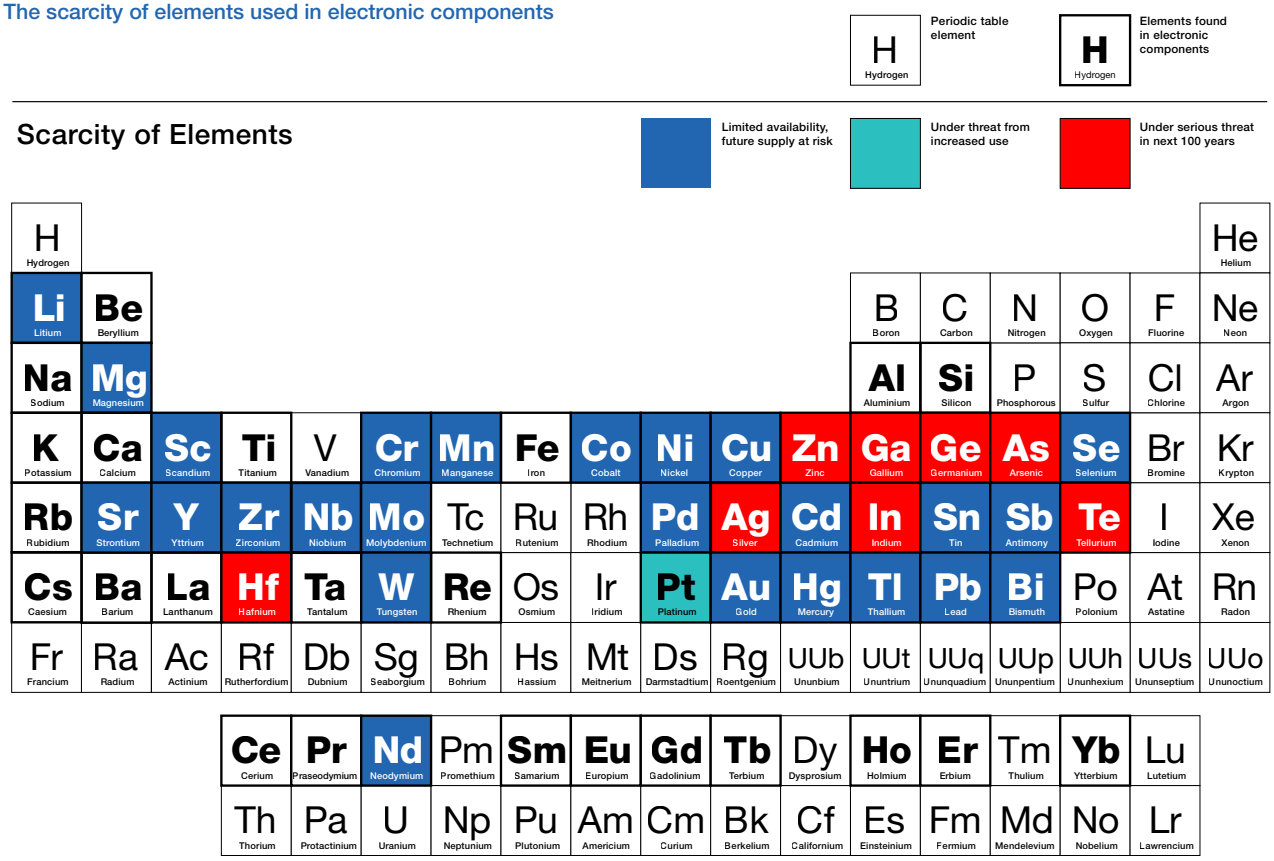
The next steps

The very best solution is *Reduce*, to prevent E&O from ever becoming a problem. If that can't be achieved, the next best thing is *Reuse*, preventing the stock from being crushed or ending up in landfill, and ensuring that it is used for its original intended purpose.

Do not wait until the stock is too old to be resold. Talk to a business like Component Sense, who will help you address your E&O and convert it into cash.

the best solution is to reduce, and prevent E&O from ever becoming a problem

Figure 2: The scarcity of elements used in electronic components



Items in bold are used in electronic components. Items with a blue background future supply is at risk. Platinum is under threat from increased use, marked in green and the items with a red background are under serious threat of running out. A smartphone, for example, uses more than half the elements in the periodic table, some of which are very rare, and in the longer run will be exhausted without recycling.

Source: Adapted from UNU, 2015; UNI, 2014

RECYCLE: Converting scrap into raw materials

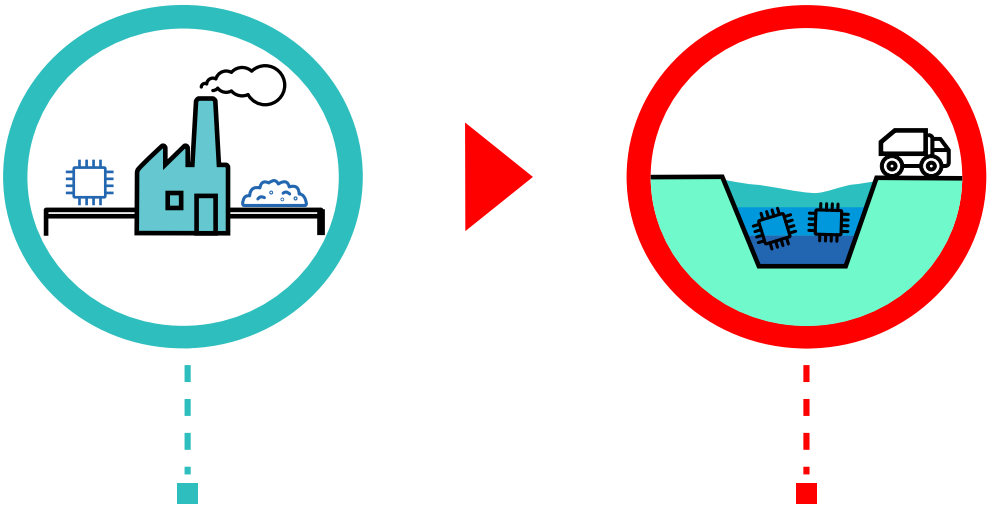
Our thirst for modern technology and the latest electronic devices relies heavily on the planet's finite resources of elements.[7] Although we have a duty of care over these resources, we have been squandering them over decades of unchecked use. There are major concerns that in the next 100 years we may run out of some elements which are heavily used in electronics, including lithium, platinum, nickel and indium (see Figure 2).[8] This does not bode well for the electronics industry, nor for humankind as a whole.

there are major concerns that in the next 100 years we may run out of some elements which are heavily used in electronics

Using alternative but abundant elements may be one answer to this issue.[9] For instance, scientists have designed a rechargeable battery based on aluminium, the third most abundant element in the Earth's crust, which one day has the potential to outperform lithium batteries.[10]Other reports indicate that magnesium could replace lithium.[11] This is not, however, a long-term solution. Although there is greater abundance of aluminium and magnesium, there is not an endless supply, and these can still be considered as finite resources.[12]

This means that one key part of a long-term solution must be recycling.

Figure 3: Components that are not recycled end up in landfill



RECYCLING

By crushing and grinding discarded electronic components, metal ores and minerals can be extracted and re-used. Although the life cycle of materials is extended, this option still generates soil, water and air pollution, affecting local communities. For example, extraction of gold requires mercury, which can be released into the soil and water, and is highly toxic to humans and animals.

LANDFILL

Discarded electronic components are scrapped and incinerated or disposed of in landfills, causing considerable harm to the environment and contributing to human-made global warming. Electronic components contain hazardous substances such as cadmium, mercury and lead, which can pollute the air if incinerated, or leech into the soil and water if dumped in landfill.

Buried in the world's electronic waste mountain is approximately $55 billion worth of precious metals per year.[13] A smartphone alone includes about 40 critical raw materials, with a gold concentration 25 to 30 times higher than that of the richest primary gold ores.[14]

Once manufactured, it is extremely difficult to recover raw materials from electronic components.[15] However, new research indicates that it is far less costly to extract metals from discarded electronics, a process known as urban mining, in comparison to traditionally mining them.[16] Additionally, urban mining is estimated to have an 80 percent lower carbon footprint than primary mining operations.[17]

So what can we all do? The best solution is to *Reduce*, don't get to the stage where E&O is created. The second best is to *Reuse*, if you have E&O then sell it and turn it into good stock for someone else. If neither of those work, rather than scrap the components they should be *Recycled* (see Figure 3). Recycling e-waste is currently a challenge, but that's where we can work together.

buried in the world's electronic waste mountain is approximately $55 billion worth of precious metals per year.

The next steps

We need to create a more sustainable industry, and electronic manufacturers play a key part in achieving this.

Visit **www.componentsense.com/WasteManifesto** where you can access a list of live e-waste projects and initiatives, led by universities and global organisations. We encourage businesses to consider how they can participate in these and make an impact.

If you decide to get involved, we would love to know how you get on, so please email **WasteManifesto@componentsense.com** and we will include your story in our blog.

we need to create a more sustainable industry, and electronic manufacturers have a central role in achieving this

Conclusion

There are many clichés about the challenges the planet faces. ‘There is no Planet B’. ‘We’re in this together’. ‘Time is running out’. ‘The greatest threat to our planet is the belief someone else will save it’.

They are clichés because they are true.

We need to do something about it, and we have chosen to focus on electronic component waste. The good news is that if you agree with us, if you work with us and follow the ideas in our Waste Manifesto, you’ll not only help the planet but will save money - less cash tied up in stock, less E&O, and better ways to turn E&O into cash when things do go wrong.

Let’s work together and make a difference.

let’s work together and make a difference

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