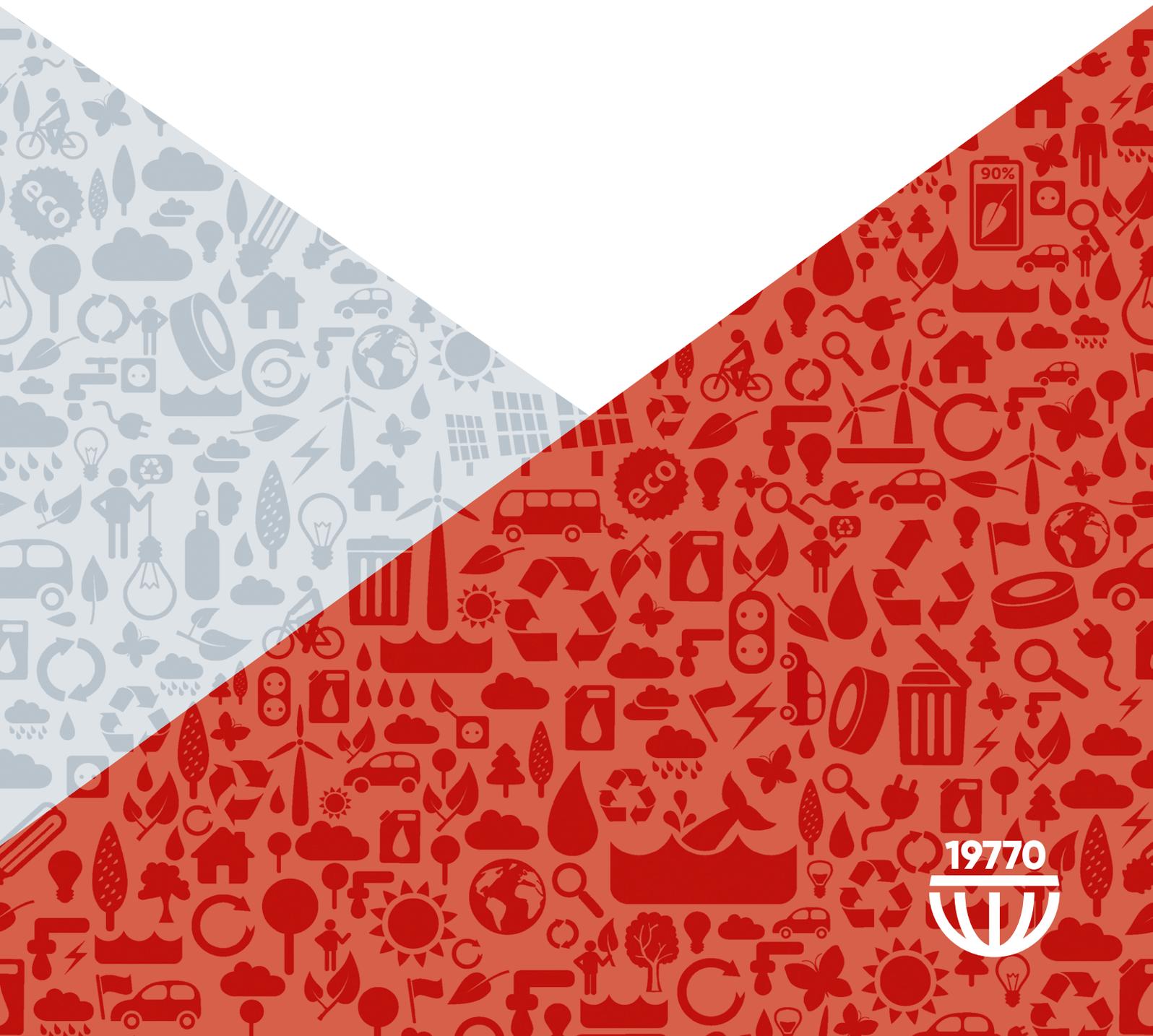


# How IT Asset Management can contribute towards sustainability

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# I Executive summary

The objective of the paper is to inspire IT Asset Management and the broader IT Management profession to embrace sustainability into their IT practices.

This paper focuses not on purely energy consumption but on the whole lifecycle impact of IT services, including the raw materials that go into building software, hardware and cloud services.

We believe IT Asset Management professionals can have a dramatic impact on the management of Information Communications Technology (ICT), resulting in a more sustainable approach to IT asset use.

- **Part one** of this paper covers how IT Asset Managers can help with sustainability, the business case for sustainable IT and how sustainable IT services begin with planning and procurement.
- **Part two** covers the circular economy. We explore why organizations should embrace suppliers that offer circular business models, that is, with a focus on the reuse of finite resources.
- Finally, in **Part three**, we look at prolonging the useful life of IT assets, the pros and cons of reuse and the disposition options available to organizations.

This paper has been compiled by a Working Group 21 (WG21) study group. WG21 is the international voluntary group that builds ITAM standards, including ISO/IEC 19770.

# I Authors, editors and contributors

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# I Introduction

The world economy is facing up to the reality of climate change. Slowly but surely, via collective agreements, economies are moving towards taking action to prevent permanent damage to the planet.

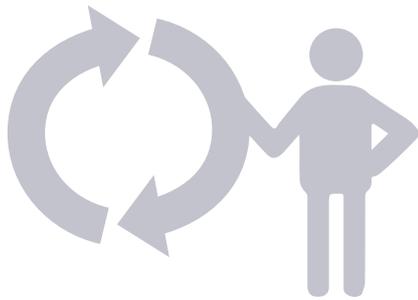
The world's leading brands are also embracing sustainability across their offerings and supply chains. They are recognizing there is not only a moral imperative to act but that a sustainable strategy can bring a competitive advantage. Employees don't want to work for, or buy from, organizations that don't grasp their impact on the planet.

**“In 5 years’ time the leading brand in any category will be the most sustainable.”**  
**James Watt, Brewdog<sup>1</sup>**

In our experience compiling this paper, whilst sustainability has reached the board room for many forward-thinking organizations, it has yet to reach the confines of many IT Management departments as a major priority. This paper outlines some initiatives and ideas for IT Asset Managers to embrace to make their contribution towards sustainability.

Focus is often placed on reducing energy consumption, and that's an important goal. But, for the purpose of this paper, we have decided to focus on an even more compelling priority—the environmental impact of creating IT services in the first place.

The consumption of IT services, including software and cloud services, are all underpinned by hardware, either on premises or in data centers. And whilst energy consumption is important, the precious minerals and finite resources used to create this hardware has a disproportionately large impact on the planet.



Therefore, this paper argues for a holistic approach to IT sustainability and that IT Management professionals can have an impact on sustainability throughout the whole lifecycle of IT services. It's not just a case of energy consumption and making sure assets are disposed of securely and ethically. It's also about managing the consumption of assets throughout their entire lifecycle.

We all have a role to play in the climate challenge, and we hope this paper will inspire IT Asset Managers and IT Management professionals to take action and make a contribution towards this global effort.

<sup>1</sup> <https://twitter.com/BrewDogJames/status/1379385983251193859>

# Part 1 – How IT Asset Management can help with sustainability

In this section, we will look at why sustainability in IT is important, the headwinds that are driving interest in IT sustainability and how IT Asset Management can contribute.

## IT is an extractive industry

Delivering IT services sustainability means to deliver them in such a way as to not deplete natural resources or disturb ecological balance in the process. IT Asset Management, the governance process of managing an organization's investment in IT, with its knowledge of the IT estate, usage, configurations and business value, has a pivotal role in delivering sustainable IT.

Data centers consume 1% of the world's global electricity demand<sup>2</sup>, and ICT as a whole, including some personal devices, totals 2%, putting it on a par with aviation.

However, the more alarming concern is that IT is an extractive industry. In order to build equipment to satisfy the growth in demand for all things digital, from mobile phones and IoT sensors through to laptops and cloud data centers, a vast array of precious metals is required, such as silver, gold, copper and platinum. Despite these precious metals being finite, less than 20% are being recycled.

Dumping e-waste has a toxic impact on society and the environment as the precious metals are released back into the air, soil and water. The minerals also have considerable commercial value if managed properly. There is more gold to be found in a tonne of e-waste than a tonne of gold-ore.

**“An end-of-life printed circuit board (PCB) may contain up to 60 different chemical elements, and have a metal content as high as 40% by weight, so should be viewed as a valuable secondary source of precious and base metals. The metal content of a PCB is typically ten to a hundred times higher than that of conventionally mined ores.”**  
Royal Society of Chemistry<sup>4</sup>

**“Only 17.4% of 2019's e-waste was collected and recycled. This means that gold, silver, copper, platinum and other high-value, recoverable materials conservatively valued at US \$57 billion – a sum greater than the Gross Domestic Product of most countries – were mostly dumped or burned rather than being collected for treatment and reuse.”**  
E-waste monitor<sup>3</sup>

<sup>2</sup> <https://www.nature.com/articles/d41586-018-06610-y>

<sup>3</sup> <http://ewastemonitor.info/>

<sup>4</sup> <https://pubs.rsc.org/en/content/articlelanding/2020/ra/c9ra07607g#!divAbstract>

# Make smarter decisions

Analyst firm IDC predicts that, **“By 2025, 90% of G2000 companies will mandate reusable materials in IT hardware supply chains, carbon neutrality targets for providers’ facilities, and lower energy use as prerequisites for doing business.”**

Not only should IT Managers have a moral imperative to address climate change, their markets will insist on it as a pincer movement of both consumer demand and government legislation to meet climate target goals.

The unequivocal evidence of climate change is forcing the world to look at the damage being done, and take action. ITAM should and can play an important role in helping businesses be more environmentally aware and better global citizens.

Fundamentally, ITAM is about understanding what you have, how it is used, how it is configured, where each asset is in its lifecycle, and, what’s needed. ITAM professionals also have access to an abundance of key data that can be leveraged to make decisions and assist with purchasing. With this information, ITAM professionals can help businesses to:

- 1.** Make smarter decisions around choosing sustainable partners and sustainable suppliers
  - a.** Buy from companies with sustainable practices and don’t harm the environment
  - b.** Choose reusable products and reduce plastic waste
  - c.** Buy second hand whenever you can
  - d.** Buy (user-)repairable devices that come with long warranties and support after the last sale
  - e.** Dispose of assets with help from a specialist – Independent parties tend to score highly for reuse or avoiding landfill.
  - f.** Seek support from third-party maintainers if support is not available from the original manufacturer
  
- 2.** Be smarter around usage of assets throughout their lifecycle
  - a.** Recycle paper, plastic and old hardware
  - b.** Reduce your use of paper – avoid printing, and substitute it with electronic devices
  - c.** Offset your carbon emissions
  - d.** Buy low-power devices and support proactive power management for all IT assets
  
- 3.** Make smarter choices when it comes to an asset’s end of life
  - a.** Re-use existing, fit-for-purpose assets rather than purchasing new

We urge IT Asset Managers to help make IT more sustainable through the everyday choices and decisions made about IT assets and throughout an asset’s lifecycle.

## Part 2 – IT Asset Management and the circular economy

The circular economy is often described as a system that is regenerative by design, where natural resources are optimized, waste designed out and emissions kept to a minimum. The concept brings together a number of sharing, product-life extension and reuse models that incorporate the entire value chain from design to end-of-life.

One of the main authorities in the field is the Ellen MacArthur Foundation<sup>5</sup>, a think-tank that exists to work with, and inspire, business, academia, policymakers and institutions to mobilise systems solutions at scale, globally.

It's [Circular Economy Diagram](#) describes the circular economy business model. The right-hand side of the diagram is most applicable to ICT. It shows various models – sharing, product-life extension, reuse, remanufacture and recycling. The loops on the inside are more effective in materials reclamation and energy saving than those on the outside.

### Circular economy in the context of enterprise ICT

ICT is extremely energy intensive to manufacture and transport to first use. Industry figures estimate the pre-use phase of a server to result in almost a metric ton of CO<sub>2</sub> emissions and around 450kg CO<sub>2</sub>e for a laptop. In addition, ICT contains a large number of rare earths that are in low or politically unstable supply. These are defined as Critical Raw Materials (CRM) by the EU and known as Critical Minerals in the USA. Whilst the lists in each region do not directly correlate, there is huge overlap.

Some of these materials are predicted to run out within decades unless an alternative source is found. The seabed has been suggested as an alternative source for some materials; however, this comes with obvious environmental risk. “Urban mining”, the recovery of materials from existing hardware, is another alternative; however, this is technically difficult and not possible in many cases with current widespread technologies.

Rare earth recovery is extremely limited at the moment for a number of reasons. Mainstream recycling looks at high-value materials (like precious metals) and chooses the melting temperature that recovers the most high-value items. Many rare materials such as cobalt, tungsten and neodymium exist in trace amounts in ICT and are destroyed by industry practices that shred and burn. There are alternative technologies in development that target the rare materials; however, they are in their nascent stages and a few years off from being economically viable to roll out at scale.

Therefore, reuse and remanufacture, which enable 100% material usage with no toxic byproducts and a far lower CO<sub>2</sub> output, are seen as the best options in the short and medium term.



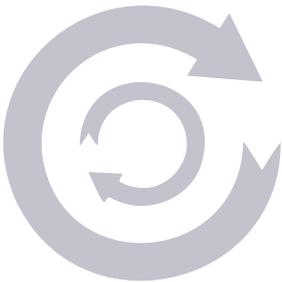
<sup>5</sup> <https://www.ellenmacarthurfoundation.org/>

# Reverse logistics and alternative ecosystems

The standard model in the circular economy for refurbishment is to return products to the manufacturer through reverse logistics. This is problematic in enterprise IT for a number of reasons:

1. Reverse logistics is a huge challenge given the two-to-three tier supply chains and the questions regarding the responsibility for shipment.
2. Local offices to cope with demand may be limited, which increases transport costs.
3. OEMs are likely to use service providers to manage the process, especially as some offer takeback practices for all models. This will add an extra layer of cost.
4. IT estate managers cannot “mix the streams” (PCs, laptops, servers, printers); however, if you use a specialized IT Asset Disposition (ITAD) company, you can.
5. OEMs bundle support and product meaning in-house refurbishment, repair, etc., will be more difficult.

Many IT Asset Management professionals are instead looking to third-party suppliers of ITAD services and refurbished hardware supply and services options as an alternative. This has the added bonus of enabling organizations to effect their own circular economy initiatives. For example, the sale to the secondary market enables an additional revenue stream. The purchase of bulk parts for spares and upgrades facilitates in-house reuse and refurbishment programs that can be managed by staff in-house and thereby reduce costs.



## Balancing energy efficiency with “asset sweating”

The importance of so called “embodied energy” or “Scope 3” emissions varies from product to product. According to in-house carbon footprint calculations from Dell, the average split between Scope 2 (use phase energy related emissions) and Scope 3 (supply chain and destruction related emissions) is around 20/80 for laptops but 80/20 for servers. This variance is explained by the fact that servers are “always on” and extremely high-energy users.

In the past, the high proportion of use-phase energy was used as an argument against reuse, refurbishment and remanufacture. With the historic doubling of energy efficiency roughly every two years (known as Moore’s Law), prolonging the life of IT assets was traditionally assumed to result in decreased efficiency at use phase and therefore negate the carbon benefits of reuse; however, recent changes in CPU trends demonstrate that efficiency gains are flattening at maximum usage and decreasing in low-power mode for servers.

A paper published in the IEEE Transactions on Sustainable Computing<sup>6</sup> reports that the economic and energy case is stronger for the immediate past generation than the latest generation of servers. Peer-reviewed research has proved that refurbished equipment is identical to new with respect to performance and energy draw in like-for-like comparison. Furthermore, researchers demonstrated that an immediate, past generation can outperform the latest with correct configuration and upgrades of storage and memory. This has wide-reaching implications not just for the server industry but also end-touch devices since it relates to CPUs, memory and storage.

<sup>6</sup> <https://www.computer.org/csdl/journal/su/5555/01/09246737/1oqGe9mvgcg>

# Establish a circular chain

Here are some key take-aways for ITAM professionals wanting to establish a circular chain.

1. Procure new equipment from suppliers that can demonstrate a commitment to:
  - a. Modular systems where components can be interchanged between manufacturers and generations
  - b. Design for disassembly (e.g. use screws, not glue)
  - c. Good material design. Currently, many materials are amalgams with specific purposes in mind...they are fit for purpose but a nightmare to recycle
  - d. Leveraging openly-available firmware updates to facilitate second use
  - e. Using reclaimed components in initial manufacture
  - f. Using recycled materials in initial manufacture
  - g. Decoupling product and support functions
2. Choose to share devices between staff and between purposes – pooled laptops, work SIM cards (as opposed to work phones)
3. Use cloud assets where appropriate
4. Commit to in-house redeployment of existing assets
5. Commit to in-house refurbishment with sources of new and harvested components (warranties and third-party maintenance contracts available)
6. Purchase refurbished equipment rather than new when use case allows
7. Purchase equipment made from recycled materials when use case allows
8. Sell to the local, secondary market via secure channels providing certified data sanitization
  - a. This cuts down the carbon costs associated with reverse logistics
  - b. This allows for entire estates to be repurposed rather than separated by type and manufacturer
9. Establish a zero-landfill policy
10. Award recycling contracts to new technologies like pyrolysis and bio-leaching rather than traditional technologies. This helps develop more effective recovery in the following way:
  - a. Critical mass – components made available on the secondary market rather than sent to landfill

## Part 3 – Prolonging the useful life of IT Assets

Globally, we generate some 53 million tons of electronic waste (e-waste) every year, an amount that is projected to more than double by 2050 according to the United Nations<sup>7</sup>. That makes e-waste the fastest growing waste stream in the world. IT — not just the energy consumption but the hardware itself — is now a major part of our environmental footprint and a toxic one at that. Heavy metals (mercury, lead, cadmium and more) can leach out of these devices and into the ecosystem causing a wide range of issues. It's no surprise that more countries are refusing to accept any more electronic waste. Thailand is the latest as of September 2020.

E-waste also poses immediate security and legal issues, and there are many data privacy and protection laws and regulations that have wide-reaching effects on ITAD, including international law.

“Reduce, reuse and recycle” is known as the waste hierarchy. The terms designate three essential components of environmentally-responsible behavior and are listed in the order of preferred action from least harmful to most harmful for the environment.<sup>10</sup>

**Within the U.S.A., some 25 states plus the District of Columbia have adopted laws requiring some level of electronics recycling and have established penalties for when the process is mismanaged.<sup>8</sup>**

**Ontario, Canada has started enforcing new e-waste regulations with a goal to achieve a 70% recycling rate.<sup>9</sup> And there are many data privacy and protection laws and regulations that have wide-reaching effects on ITAD — including international law.**

**Companies within the scope of the General Data Protection Regulation (GDPR) face severe fines for noncompliance, potentially up to €20 million or 4% of annual global revenue, depending on the severity and circumstances of the violation.**

7 <https://unu.edu/media-relations/releases/global-e-waste-surg-ing-up-21-in-5-years.html>

8 <https://www.ncsl.org/research/environment-and-natural-resources/e-waste-recycling-legislation.aspx>

9 <https://www.ept.ca/2020/11/new-e-waste-regulation-reduces-electronic-waste/>

10 <https://www.conserve-energy-future.com/reduce-reuse-recycle.php>

# The Pros and cons of reuse

**A major global bank was recently fined \$60 million dollars for a data breach that resulted from the improper disposal of their IT assets<sup>11</sup>.**

Reusing electronics is better for the environment than recycling because the reuse process consumes fewer natural resources and is substantially less energy intensive. The one caveat with reuse is the risk of a potential data breach if there is sensitive data left on the device when it's sold or donated to a third party.

Data security is important because hard drives that are not properly erased before an asset is disposed can contain sensitive information such as credit card numbers, financial data, account information and transaction records. Stolen data can harm both the person whose data was compromised and the reputation of the organization that failed to ensure the data was securely wiped before the asset was disposed.

In addition, the financial costs associated with such an incident can be substantial. A major global bank was recently fined \$60 million dollars for a data breach that resulted from the improper disposal of their IT assets<sup>11</sup>. These risks can be mitigated through adherence to proper data destruction procedures. Data-bearing assets designated for reuse should be sanitized using overwriting software that adheres to NIST SP 800-88 (LINK) guidelines for media sanitization.<sup>12</sup>

<sup>11</sup> <https://www.bloomberg.com/news/articles/2020-10-08/morgan-stanley-fined-60-million-over-failed-hardware-oversight>

<sup>12</sup> <https://nvlpubs.nist.gov/nistpubs/SpecialPublications/NIST.SP.800-88r1.pdf>

# Disposition options

There are a number of alternatives when disposing of end-of-life IT assets. These include:

- **Redeployment:** When employees leave the organization or require new IT equipment, their old IT assets can be reimaged and redeployed to other personnel. This extends the life of the equipment and reduces investment in new assets.
- **Remarketing:** Many end-of-life IT assets still have remaining life and economic value. Remarketing these assets enables organizations to lower their Total Cost of Ownership (TCO) while furthering their sustainability goals.
- **Donation:** Donating used IT assets to charitable organizations and/or schools extends the useful life of the equipment and may generate a tax deduction.
- **Employee Purchase:** These programs allow employees to purchase IT equipment once it reaches the end of its useful life with the organization. These programs are often viewed as a benefit by employees and can help to lower the organization's TCO.
- **Parts Harvesting:** Individual components can be harvested from end-of-life equipment for reuse in other products.
- **Recycling:** Recycling is the least attractive option for disposing of end-of-life IT assets as it can be up to twenty times more energy intensive than the other alternatives listed above. The equipment must be de-manufactured into its commodity components, and these components must be smelted in order to be incorporated into new assets. From a sustainability perspective, recycling is still preferable to disposing equipment into landfill.

## Selecting an ITAD partner

The best way to mitigate the risks inherent in the reuse or recycling process is to select a reputable ITAD partner that is certified to either the e-Stewards or R2 standards. These standards were specifically developed to address the ITAD industry and govern a variety of operational areas, including environmental compliance, data security and occupational health and safety.

While third-party certifications can provide additional assurance of an ITAD provider's compliance with applicable regulations and industry best practices, it's important for ITAM professionals to also undertake their own, independent due diligence. After all, it's your organization's reputation and resources that are on the line.

- Understand how the provider ensures secure chain-of-custody of the assets.
- Investigate the ITAD partner's ability to provide detailed and automated reporting.
- Ask to receive audit reports that list the individual weights, makes, models and serial numbers of each asset processed.
- Visit the company's facility, and interview their existing clients. Choosing the right ITAD partner is too important to rely solely on third-party certifications.

# I Conclusion

This paper builds a case for IT Asset Managers to make a real impact in making IT services within their organizations sustainable.

Rather than purely focusing on energy consumption, we have focused on the raw materials that make up ICT infrastructure, including software, hardware and cloud. We argue that these have a more lasting impact on the planet and should be a focus for IT Management professionals.

We covered how IT Asset Managers can get started with sustainability, the business case for sustainable IT, how organizations can make smarter decisions and that sustainability in IT begins with planning and procurement.

We discussed the circular economy and how organizations should embrace suppliers that adopt circular methods and therefore, more sustainable business models.

Finally, we looked at prolonging the useful life of IT assets. We talked about the considerable resources that go into creating ICT infrastructure and that prolonging the useful life of IT assets (either within our own environment or within another organization) is one of the most useful things we can do as IT Asset Managers.

We hope this paper inspires ITAM professionals to embrace sustainability and helps organizations to develop a strategic plan for building more sustainable IT services.

# | Further reading

## Paris Agreement:

- [https://en.wikipedia.org/wiki/Paris\\_Agreement](https://en.wikipedia.org/wiki/Paris_Agreement)
- <https://unfccc.int/process-and-meetings/the-paris-agreement/what-is-the-paris-agreement>

## UN International Resource Panel

- <https://www.resourcepanel.org/reports/re-defining-value-manufacturing-revolution>

## Green Deal:

- [https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal\\_en](https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en)
- [https://ec.europa.eu/commission/presscorner/detail/en/qanda\\_20\\_419](https://ec.europa.eu/commission/presscorner/detail/en/qanda_20_419)

## Bodies / Initiatives

- [ADISA](#)
- [CEDaCI](#)
- [Datacentre Alliance](#)
- [Estewards](#)
- [Institute of Scrap Industry Recycling](#)
- [ISO 14000](#)
- [FreeICTEurope](#)
- [NAID](#)
- [SERI R2](#)
- [Remanufacturing Industries Council](#)
- [Repair.org](#)
- [SNIA](#)
- [WEEE](#)

# | ITAM Standards Committee

**ISO/IEC 19770 DAY-TO-DAY MANAGEMENT COMES UNDER ISO/IEC JTC1/SC7/WG21, ALSO KNOWN AS WORKING GROUP 21 (WG21).**

Chaired by Ron Brill as convenor and Trent Allgood as secretary, WG21 is responsible for developing, improving and ensuring market needs are met when developing these standards.

Established in 2004, WG21 initially focused on Software Asset Management (SAM). Later, the scope was changed to include all IT assets. Currently, the committee is comprised of more than 130 volunteer experts who work for software companies, SAM tool vendors, consulting firms, end-users, media, analysts and more. For more information, please visit [www.itamstandards.org](http://www.itamstandards.org).