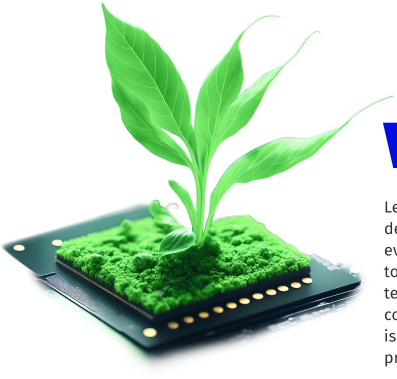
JASPER COLIN
DATA TO DECISION

The Illusion of 100%

Uncovering the Reality of Sustainable Computing

In today's digital world, the concept of sustainable computing has gained significant attention. As businesses and individuals strive to minimize their environmental footprint, achieving sustainability in computing seems like an admirable goal.

However, beneath the surface lies the illusion of 100% sustainability. In this thought-provoking article, we will delve into the complexities of sustainable computing and uncover the reality behind this illusion.

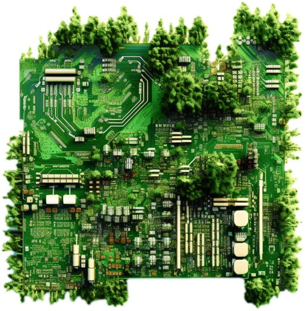


What

Let’s start with, what is sustainable computing? The definition of "sustainability" is indeed dynamic, continuously evolving over time. What may be considered sustainable today may no longer hold true in the future. Likewise, the technologies and practices used to promote sustainable computing are in a state of constant evolution. As a result, it is crucial for us to remain receptive to novel ideas and be prepared to adapt our practices as new technologies emerge.

Even if we have to define sustainable computing in current times, we can say it encompasses the conscientious management of computing resources to achieve a net-zero impact on the environment.

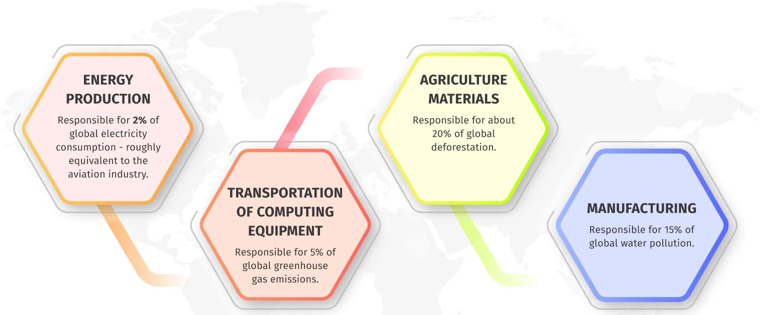
It extends beyond energy considerations to encompass ecosystems, pollution, and the conservation of natural resources.



Recognizing that individual behavioral change may be limited, sustainable computing emphasizes systemic transformations in energy production, transportation, manufacturing, and agriculture. These changes are necessary on a large scale to ensure that individuals benefit from sustainable practices by default.

A study by the University of Cambridge found that even if everyone in the United States made the most environmentally friendly choices possible, it would only reduce greenhouse gas emissions by about 10%.

In the realm of computing, achieving sustainability requires the involvement of organizations responsible for various aspects such as manufacturing components, building equipment, writing software, operating data centers, and running networks.



ENERGY PRODUCTION

Responsible for **2%** of global electricity consumption - roughly equivalent to the aviation industry.

TRANSPORTATION OF COMPUTING EQUIPMENT

Responsible for 5% of global greenhouse gas emissions.

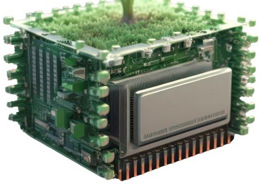
AGRICULTURE MATERIALS

Responsible for about 20% of global deforestation.

MANUFACTURING

Responsible for 15% of global water pollution.

While energy and the transition to clean energy play a significant role in sustainability strategies within computing, they are not the sole focus. Sustainable computing also involves addressing water stress, implementing policies related to the right to repair and material recycling through a circular economy approach, improving the energy efficiency of hardware and software, promoting responsible resource governance, fostering transparency, and establishing consistent reporting mechanisms.



By incorporating these multifaceted elements, sustainable computing strives to mitigate environmental impact and promote holistic, long-term solutions in the field of computing.

Did you know

The US data center market is predicted to be valued at $99.97 billion in 2023.

The Misconception

> The cleanest data center is not powered by solar, wind or hydro-electricity, it is one that you do NOT need to build.
>
> ***-Susanna Kass, Data Center Advisor, UN SDG Program***

Achieving 100% sustainability in computing is a common misconception that needs to be addressed, and it is important to uncover the reality behind this notion. While the ultimate goal is to strive for maximum sustainability, it is crucial to recognize that absolute sustainability may not be feasible or attainable in practice.

This is because the electricity grid mix varies throughout the day, and most organizations claiming to use only renewable energy are doing so only on an accounting basis.

For example, they may purchase Renewable Energy Certificates (RECs) or Renewable Energy Guarantees of Origin (REGOs), which represent the environmental attributes of a unit of renewable energy, but these certificates do not guarantee that the electricity they are using is actually generated from renewable sources.

Even if an organization does purchase direct renewable energy, such as through a Power Purchase Agreement (PPA), there will still be times when the grid is not producing enough renewable energy to meet their demand. This is why there is a push for what's known as 24/7 carbon free energy. The goal is that every unit of consumption is generated by carbon free sources of electricity, which can include wind, solar, nuclear, hydro, long-duration storage, and bio-gas.

There are a number of companies that are leading the way in the pursuit of 24/7 carbon free energy.

01 **Google** has committed to running on **100% carbon free energy** by 2030.

02 **Apple** has committed to become carbon neutral by 2030.

03 **Amazon** has committed to achieve net-zero carbon emissions by 2040.

04 **Walmart** has committed to reduce its emissions by 18% by 2025.

05 **Coca-Cola** has committed to reduce its emissions by 30% by 2030.

06 **Microsoft** has also committed to becoming carbon negative by 2030 and offsetting all greenhouse gas emissions produced since its founding by 2050.

07 **Intel** has set a goal of achieving net-zero greenhouse gas emissions by 2040. Intel has a goal of sourcing 100% renewable electricity for its global operations by 2030.

Other companies that are making significant progress in the area of sustainable computing include SAP, Samsung, Facebook, and Salesforce.

These companies are using a variety of strategies to achieve their goals, including investing in renewable energy projects, purchasing RECs and REGOs, and using demand-side management to reduce their peak electricity demand.

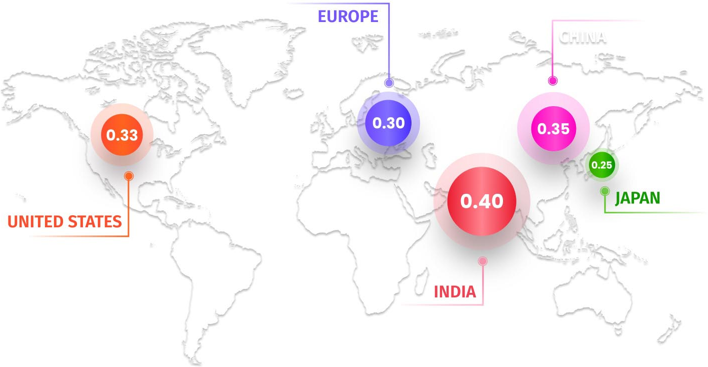
The Reality

Sustainability is a continuous journey of improvement rather than a destination. Computing technologies and practices evolve rapidly, and the pursuit of sustainability requires constant adaptation and innovation. It involves finding a balance between environmental, social, and economic considerations while minimizing negative impacts.

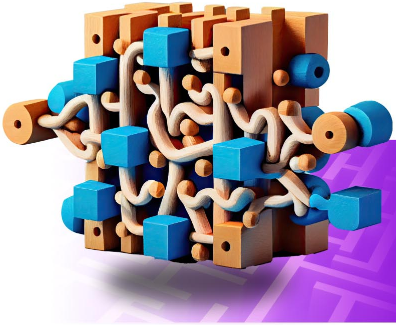
Additionally, the complexity and interconnectedness of global systems make it challenging to achieve complete sustainability. Factors such as global supply chains, varying regulations, and societal behaviors contribute to the complexity of the sustainability landscape.

> **it is more realistic and productive to focus on making meaningful progress.**

The misconception that computing can be 100% sustainable is a barrier to progress. By acknowledging the reality of sustainability, we can set realistic goals, drive innovation, and make tangible advancements towards a more sustainable computing ecosystem.



Carbon emission rate of data centers in some of the world's major countries



The Complexity

Sustainable computing is a multifaceted endeavor that extends beyond mere energy efficiency. While energy consumption is a crucial aspect, responsible material sourcing, waste management, and other factors also play pivotal roles. To achieve true sustainability, we must adopt a holistic approach that considers the entire lifecycle of our technology products.

ENERGY EFFICIENCY

This is one of the most important aspects of sustainable computing, as it can help to reduce the amount of energy that is consumed by computers and other electronic devices. There are a number of ways to improve the energy efficiency of computing, such as using more efficient hardware and software, and using virtualization to consolidate workloads.

RESPONSIBLE SOURCING OF MATERIALS

The manufacturing of computer hardware and software requires a significant amount of resources, including metals, minerals, and water. It is important to ensure that these resources are sourced responsibly, so that they do not contribute to environmental degradation or human rights abuses.

WASTE MANAGEMENT

When computers and other electronic devices reach the end of their lifespan, they often end up in landfills. This can have a number of negative environmental impacts, as electronic waste can contain harmful chemicals and metals. It is important to find ways to recycle or reuse electronic waste, so that it does not end up in landfills.

There are **8000** data centers in the world. Among them, **33%** of the data centers are located in the United States.

In addition to these specific aspects, sustainable computing also encompasses a number of other factors, such as:

- **The design of computing systems:**
  The design of computing systems can have a significant impact on their sustainability. For example, systems that are designed to be energy-efficient and to use fewer resources will be more sustainable than systems that are not.
- **The use of computing systems:**
  The way that we use computing systems can also have a significant impact on their sustainability. For example, if we turn off our computers when we are not using them, we can reduce their energy consumption.
- **The disposal of computing systems:**
  When computing systems reach the end of their lifespan, it is important to dispose of them in a sustainable way. This means recycling or reusing them, rather than sending them to landfills.

Achieving sustainability in computing involves a holistic approach that considers the entire lifecycle of technology products. This means considering the environmental impact of all aspects of computing, from the manufacturing of hardware and software to the disposal of electronic waste.

By taking a holistic approach, we can make computing more sustainable for the environment and for future generations.

The Challenge

Energy consumption stands as a significant challenge in sustainable computing. As our digital infrastructure expands, data centers and electronic devices consume vast amounts of energy.

> **According to a recent study by the International Energy Agency (IEA), the global energy consumption of data centers alone reached an astounding 1.8% of global electricity consumption in 2022. This energy consumption not only contributes to carbon emissions but also places strain on our energy grids.**
>
> **The IEA study also found that the energy consumption of data centers is expected to grow by 6% annually over the next decade. This growth is being driven by the increasing demand for cloud computing, artificial intelligence, and other data-intensive applications.**

To combat this challenge, the industry must focus on developing energy-efficient computing solutions. Manufacturers can design hardware that minimizes power consumption without compromising performance. Additionally, data centers can optimize their operations through advanced cooling techniques, virtualization, and workload management strategies. By reducing energy consumption in computing infrastructure, we can significantly reduce our carbon footprint.

1	UNITED STATES	2701
2	GERMANY	487
3	UNITED KINGDOM	456
4	CHINA	443
5	CANADA	443
6	AUSTRALIA	287
7	NETHERLANDS	281
8	FRANCE	264
9	JAPAN	
10	RUSSIA	

The Cost

Recently, a study funded by Google found that reaching 90-95% carbon free energy can be achieved with only a small cost premium compared to 100% annual matching. However, pushing closer to 100% significantly increases the cost to more than double.

BUT WHY?

There are a few reasons for this cost difference. First, 90-95% carbon-free energy can be achieved by **using a mix of renewable energy sources, including solar, wind, and hydro.** However, 100% carbon-free energy requires the use of additional renewable energy sources, such as nuclear power and geothermal energy. These sources are more expensive than solar and wind, which drives up the cost of achieving 100% carbon-free energy.

Do you know **global IT data center spending is expected to reach $222 billion in 2023.**

Second, 90-95% carbon-free energy can be achieved by **using existing renewable energy projects and technologies**. However, 100% carbon-free energy requires the development of new renewable energy projects and technologies. This is more expensive, and can also take longer to implement.

The study's findings suggest that it is more cost-effective to target 90-95% carbon-free energy than 100% carbon-free energy. However, achieving 100% carbon-free energy is still important, and it is something that we should strive for in the future.

The Solution

There are a number of innovations that are helping to make net-zero-energy data centers a reality.

HEAT MANAGEMENT

There are a number of innovative heat management techniques that can help to reduce the environmental impact of data centers. These include:

- Using liquid cooling systems, which can more efficiently remove heat from data center equipment.
- Employing free cooling techniques, such as using outside air to cool data centers during cold weather.
- Using thermal energy storage systems, which can store heat during times of low demand and release it when demand is high.

ENERGY OPTIMIZATION

There are a number of innovative ways to optimize the energy efficiency of data centers. These include:

- Using more efficient hardware, such as servers that use less power.
- Implementing energy-saving software, such as virtualization and workload management tools.
- Using demand-response programs, which allow data centers to reduce their energy consumption during peak demand periods.

MODULAR AND DEMAND-BASED INFRASTRUCTURE

The technological infrastructure supporting net-zero-energy data centers is becoming more modular and demand-based. This means that data centers can be scaled up or down as needed, and that they can be more easily integrated with renewable energy sources.

NOVEL COMPUTING ARCHITECTURES

There are a number of novel computing architectures that have the potential to improve the energy efficiency of data centers. These include:

- Systems on a chip (SoCs), which integrate multiple computing components into a single chip.
- Energy-proportional computing, which allows computers to use energy proportional to the amount of work being performed.

These are just a few of the innovations that are helping to make net-zero-energy data centers a reality. Achieving data centers that operate on net-zero energy will require the adoption of creative methods that combine the aforementioned approaches with emerging technologies for electricity generation, storage, and management. Considering the current surge in innovation and investment in this field, there are grounds for optimism regarding the future years.

The How

Let us harness the power of green computing initiatives, empower consumers through awareness, and foster collaboration for a sustainable world. Together, we can transcend the illusion and uncover the true path to sustainable computing.

At Jasper Colin, we understand the critical role that data centers play in the pursuit of sustainable computing. Our expertise lies in helping data center companies navigate the complexities of achieving sustainability and making a positive environmental impact.

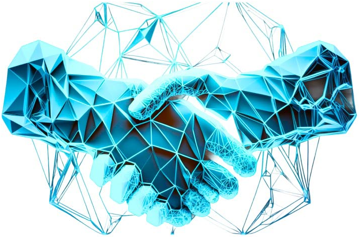
One of the key areas we focus on is energy consumption. We offer comprehensive energy audits and efficiency assessments to identify areas of improvement and implement energy-saving measures.

Responsible material sourcing is another aspect we prioritize. We collaborate with data center companies to develop sustainable procurement strategies, ensuring the use of eco-friendly materials and promoting circular economy principles. By engaging in environmentally conscious practices, we can minimize the environmental impact associated with the sourcing and utilization of materials in data centers.

E-waste management is a critical component of sustainable computing. At Jasper Colin, we provide guidance and solutions for proper e-waste disposal, recycling, and responsible end-of-life management for data center equipment. By implementing effective e-waste management strategies, we contribute to reducing the environmental footprint and supporting the circularity of resources.

Furthermore, our commitment to empowering consumers through awareness is paramount. We offer educational resources and workshops to raise awareness about sustainable computing practices among data center operators and end-users. By fostering a culture of sustainability and promoting responsible data center operations, we can collectively drive positive change in the industry.

Collaboration is at the heart of our approach. We believe that achieving sustainable computing requires collective efforts and collaboration across the industry. Jasper Colin serves as a catalyst for collaboration, facilitating partnerships and knowledge sharing among data center companies, technology providers, and sustainability experts. Together, we can leverage our combined expertise to overcome challenges and pave the way for a greener and more sustainable future.



Jasper Colin is dedicated to supporting data center companies in their journey towards sustainable computing. Through our comprehensive solutions in energy efficiency, responsible material sourcing, e-waste management, consumer awareness, and industry collaboration, we aim to empower data centers to make meaningful strides in achieving their sustainability goals.

Let us join forces and transcend the illusion of sustainability, working together to unlock the true path to sustainable computing and a better world for future generations.

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