



Sustainability, FinOps and the Cloud: How to reduce cost and emissions through Resource Optimisation

A BJSS eBook

Contents



Introduction:

Facilitating sustainability with the cloud

The climate crisis has become inescapable. As a result, sustainability has become one of the top priorities for enterprise-level businesses. Operating in a more environmentally friendly fashion and delivering goods and services with fewer carbon emissions are now key objectives for C-suite leaders across all sectors.

At the same time, organisations are looking to create efficiencies, drive innovation and reduce operational costs through digital transformation, particularly by migrating on-premises data centres to the cloud.

Fortunately, these two objectives can support and drive one another. One of the great benefits of leveraging cloud services is that it offers incredible potential to reduce the carbon footprint of your IT operations.



We have to make sustainable living convenient, sustainable business profitable, and sustainable change fashionable.

Wayne Visser

83% of C-suite leaders and investment professionals expect ESG programmes to contribute to more shareholder value in five years than today.

McKinsey



Moving enterprise workloads to the cloud from on-premises data centres can reduce energy consumption and associated carbon emissions by nearly 80%.

451 Research

The key thing to stress is this: **reducing emissions in the cloud is inextricably linked with increasing the energy efficiency of data operations, which in turn reduces cost.** We will return to this idea many times over the course of this eBook.

One aspect of this sits with the main Cloud Service Providers (CSPs) – **Amazon Web Services (AWS), Microsoft Azure, Google Cloud Platform** – all of which are investing heavily in increasing the energy efficiency of their data centres. By shifting your IT operations into the cloud, you are immediately benefitting from some of the innovative energy efficiency measures that CSPs are achieving at huge scale. Later in this eBook, we discuss in greater detail the ways in which CSPs are creating these energy efficiencies and how they result in cost reductions for your business.

Running your IT operations in the cloud also gives you access to a host of tools and capabilities to optimise your applications and workloads so they run more efficiently, consume fewer resources, and cost your business less.

In fact, many of the activities you can do to reduce the carbon footprint of your cloud operations double as cost reduction measures:

- **Switching instances to chipsets that offer the same processing power at lower levels of energy consumption.**
- **Optimising usage of cloud resources so they only run when needed.**
- **Choosing data centres in regions using renewable or low-carbon energy.**
- **Adopting energy efficient architectures such as containers or serverless.**

We discuss these approaches in more detail later in the eBook, including those which are quick, easy options, and those which require greater time and investment.



Finally, one of the main business reasons why cloud, sustainability, and cost reduction go together is they align with the principles of **FinOps – a cloud cost management model that seeks to foster communication and collaboration between business and engineering teams**. FinOps aims to give all stakeholders visibility and accountability for cloud spend so it can be more tightly and predictably aligned to the overall objectives of the business. FinOps prioritises the use of tooling to drive observability, democratise information, and therefore facilitate cloud cost and resource optimisation. Throughout this eBook, we will discuss how embedding FinOps practices in your organisation can drive more sustainable cloud operations that reduce costs.

There has never been a greater need to act in the face of climate change. The good news for businesses is that greater sustainability and reducing costs don't have to be competing objectives.

Why migrate to the cloud?

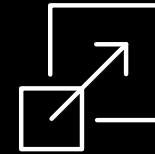
While sustainability will be the focus of this eBook, it's not the only benefit that the cloud represents. In fact, any business that wants to create organisational efficiencies, streamline processes, reduce costs, and deliver more innovative services to customers will be using the cloud as the enabler of that change.

Key Benefits:



Increased flexibility

Dynamically adjust your configuration as your needs change.



Scalability

Expand or contract compute environments through dynamic scaling.



Cost efficiency

Take advantage of flexible pricing models.



Business agility

Increase responsiveness to changing client and industry needs.



Enhanced performance

Have workloads sit in reliable, high-performing environments.



Innovation

Immediately access new features, capabilities, and services.

Understanding FinOps

One of the core benefits of cloud services compared to on-premises data centres is that cloud is charged on a consumption basis – you pay for what you use. But this shifts the spend from a fixed capital expenditure (CapEx) to more variable operational expenditure (OpEx). At the enterprise level, this requires a change in how IT projects are budgeted and costs are managed – which is where FinOps comes in.

80% of organisations will initially overshoot their IaaS budget, due to a lack of cloud optimisation governance and misguided upfront cloud spend commitments.

[The FinOps Foundation](#)



FinOps is an evolving cloud financial management discipline and cultural practice that enables organisations to get maximum business value by helping engineering, finance, technology, and business teams to collaborate on data-driven spending decisions.

[The FinOps Foundation](#)



Unfortunately, many businesses are not set up to deal with this shift, culturally or operationally. Finance departments are not normally used to dealing with OpEx at the scale cloud requires. Cloud bills can run to the hundreds of thousands every month for enterprise-size organisations. And the size and fluctuation of those monthly amounts (for example, doubling one month or halving the next) can cause bill shock, especially because the finance team might not be aware of exactly what the money is for.

And engineers, for their part, are not necessarily used to considering the cost implications of their work. They may not understand how the accounts, tools, and services they're using in the cloud impact the billable cost at the end of the month. When developing in the cloud, every line of code typed has a quantifiable cost, but engineers may not have access to that information.

FinOps aims to bring these sides of an organisation together and provide a framework to understand and manage cloud costs, including six key principles that all stakeholders must adopt, a project lifecycle structure, and three levels of organisational maturity in which to situate any FinOps efforts.

The Six FinOps Principles

1

Teams need to collaborate

4

Reports should be accessible and timely

2

Everyone takes ownership for their cloud usage

5

Decisions are driven by the business value of cloud

3

A centralised team drives FinOps

6

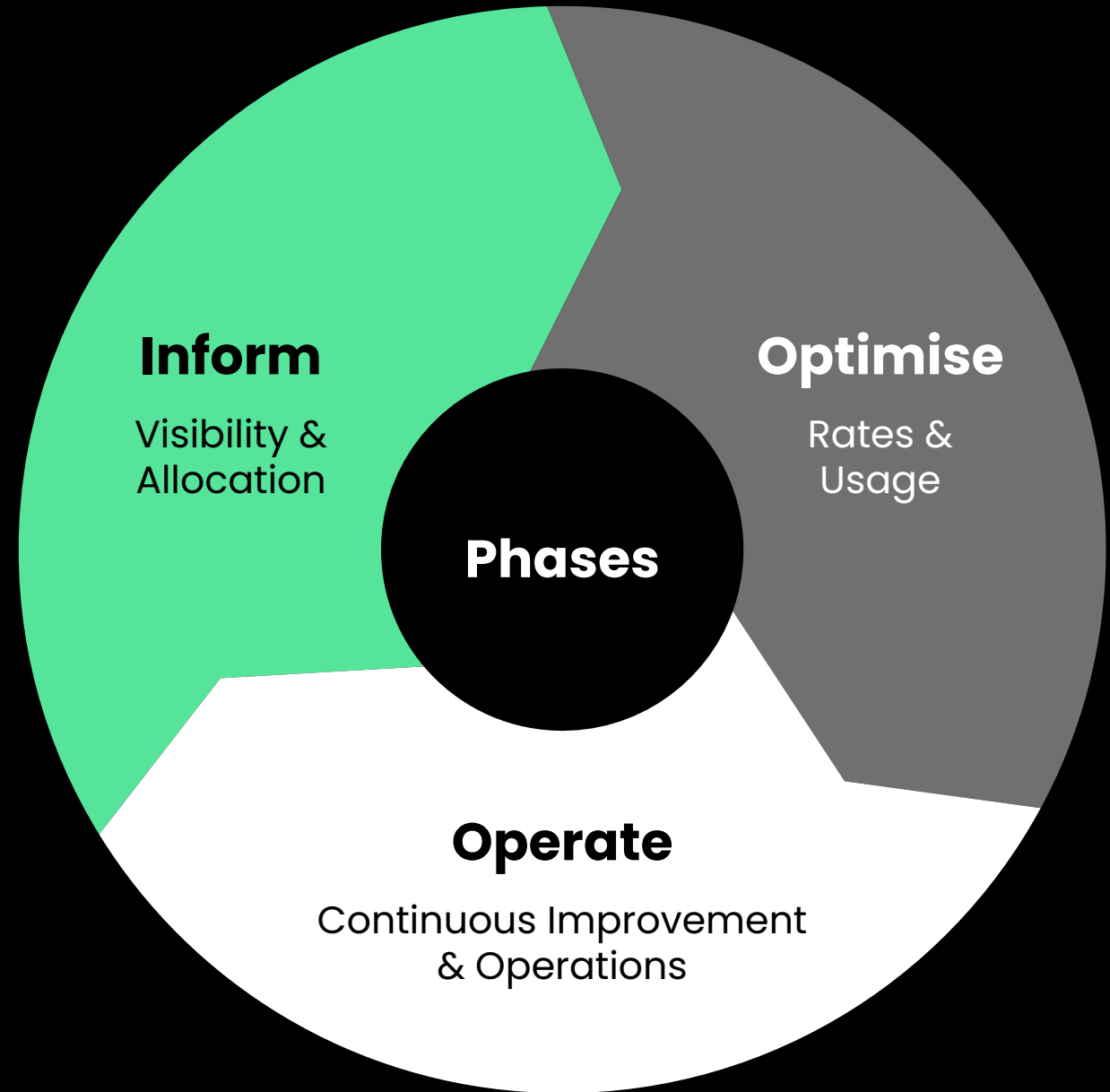
Take advantage of the variable cost model of the cloud

The FinOps lifecycle

FinOps is a discipline focusing on cloud cost and resource optimisation. Later in this eBook we'll discuss some of the tools that give teams visibility into resource utilisation to understand where their cloud costs come from – and, crucially, how to use them to reduce cost and carbon emissions.

However, it's important at the outset to stress the cultural aspect of FinOps. It's a model that requires people to change their usual behaviour, and the closer to the start of your cloud journey you start to embed it, the better. If you're yet to begin a cloud migration, get executive sponsorship from the beginning, bring in all the relevant stakeholders and explain to them the purpose of what you're doing and why it will benefit them. You should also get your cloud provider to come in and provide some context for it. As with any change management process, the sooner you get everyone bought into what you're trying to do, the easier the whole journey will be.

Source: [The FinOps Foundation](#)



How cloud service providers are creating energy efficiencies that reduce cost for your business

The growing scale and prevalence of cloud computing has prompted more intense scrutiny of the sector's energy consumption. There's growing pressure on the main CSPs to reduce their carbon emissions and they have made significant investments in this area.

The efforts made by CSPs to create greener, more energy efficient data centre operations can lead to cost reductions for business running in the cloud, especially compared to on-premises infrastructure. There are significant economies of scale at play here; very few companies can invest as heavily as Microsoft, Amazon, or Google into sustainability at the scale they are. By migrating from your own privately-run data centre to the cloud, your business can instantly realise many of the benefits discussed in this section.

By 2025, the technology sector could consume 20% of the world's total electricity, up from 7% currently.

Greenpeace

//

The carbon emissions from tech infrastructure and the data servers that enable cloud computing now exceed those of pre-Covid air travel, according to a report from The Shift Project.

[The Financial Times](#)



Higher utilisation rates

On-premises data centres must be set up to deliberately over-provision in the event of spikes in server usage. This results in a low utilisation rate as most of the time not all the hardware is being used. But those idle servers are still consuming power – an outsized cost for the business and a waste of energy from an environmental perspective.

However, due to the economies of scale CSPs operate at, they run their servers at much higher utilisation rates. And, for your business, running infrastructure in the cloud means you only pay for what you use – so you're not spending money on power for hardware that's sitting idle. In fact, AWS claims its **cloud customers consume 77% fewer servers compared to on-premises data centres.**

Greater hardware refresh rates

It's expensive and time-consuming to upgrade the hardware in on-premises data centres, meaning the refresh cycle is usually quite long. It also means that a typical corporate data centre will be running older, less energy-efficient hardware for longer. By comparison, the utilisation rate in CSP data centres is so high that they must refresh the hardware more regularly, which means they're often upgrading to newer servers that run more quickly and with greater energy efficiency. As a company consuming cloud services, you get immediate access to these benefits just by building on those platforms.

It's important to mention that there are, of course, carbon emissions associated with making and supplying this hardware, not to mention disposing of it and replacing it with new hardware. But it's also true that the majors CSPs can achieve economies of scale in terms of hardware choice and removal that facilitate greater sustainability in refresh cycles than your average on-premises IT estate.



Greater investment into renewables

While running all datacentre operations from fully carbon-free energy is still some way off for the main CSPs (**Google doesn't expect to reach this goal until 2030**), they are still making significant investments into greener energy in the meantime.

CSPs are reliant on the energy mix of the power grids their datacentres draw upon, which, depending on the region, could come predominantly from carbon-intensive sources. So CSPs often offset their consumption of fossil fuel energy through the purchase of Renewable Energy Certificates (RECs), which provide investment into producers of clean energy. CSPs also take advantage of Power Purchase Agreements (PPAs), which are long-term electricity supply agreements with green energy providers. For example, in 2021, a raft of new PPAs with clean energy providers made **Amazon the world's largest corporate buyer of renewable energy**.

The global scale of the main CSPs also allows them to invest heavily in effective renewable energy sources dependent on local climate, such as solar power in desert regions or wind power in Northern Europe. As a result, businesses region-shifting their cloud workloads can reduce their carbon emissions.

More innovation into cooling

Computer equipment generates a lot of heat and **cooling accounts for around 40% of the total energy consumption of data centres**. This is a significant cost for a business running its own data centre, but CSPs have the resources to invest in innovative cooling methods that reduce the energy consumption of data centres and thus the cost for customers.

For example, **Microsoft has submerged a data centre 117 feet deep to the seafloor off Scotland's Orkney Islands**, using the cold seawater as a natural coolant. This experiment has found that underwater data centres are reliable, practical and use energy sustainably. **Microsoft has similarly trialled two-phase liquid immersion**, in which servers are submerged in fluorocarbon-based liquid baths, to sustainably cool data centres in desert regions.



Optimisation in the cloud

Businesses running their IT operations in the cloud can take advantage of numerous capabilities to optimise applications and workloads so they run more efficiently, consume fewer resources, and cost your business less. This section of the eBook will outline some of the ways businesses can achieve this, from quick, flick-a-switch changes to more strategic approaches requiring greater investments of time and money. It's also worth mentioning that these are choices businesses need to actively consider and pursue beyond a decision to move to the cloud.

Minimum infrastructure changes

One of the easiest things you can do is move workloads to more energy efficient CPU platforms which provide the same level of performance but at a lower energy consumption – and therefore a lower cost.

Chip providers have been making huge leaps in this regard, and how this impacts you really depends on your appetite for change. **AMD chipsets available across all cloud providers** offer higher performance at lower levels of energy consumption compared to equivalent Intel processors. Little to no change to the application is required, meaning that moving to more AMD-based instances is a quick and easy way to reduce cost and energy consumption – the cloud providers have made it very easy for customers to make this switch.



Retrofitting applications for more sustainable consumption

Modernising your existing applications towards container-based or serverless architectures unlocks plenty of improvements in energy efficiency:

- **Container architecture breaks down your application into microservices. Out of these microservices, only the ones that need to be running constantly will be allocated compute power to do so, rather than running an entire application stack but only consuming part of it. This also allows you to increase the density of applications, which also increases efficiency.**
- **Serverless architecture goes a step further with an event-based setup, meaning compute power only becomes available to execute a function when a specific event triggers the request. This means you aren't running functions that are consuming power without being utilised.**

The caveat with container architecture and serverless architecture approaches is that they require investment to re-architect your applications, which in turn necessitates a deep dive into your requirements and reshaping your application to meet those needs. There are also attendant learning and training costs to develop your capabilities in these two architecture and development disciplines.



Designing from the ground up

There are several ways to design your applications for cloud by making software development and hardware choices at the outset that prioritise and support sustainability objectives.

You could, for example, redesign your application for ARM-based architectures offered by cloud providers. ARM architecture is based on Reduced Instruction Set Computer (RISCs) technology – processors designed to perform fewer types of compute instructions at higher speeds. From a processing perspective, ARM chipsets are much less energy intensive compared to a typical AMD or Intel processor.

While the underlying technology dates to the 1990s, the CSPs have been increasingly promoting it as part of their offerings: AWS, for example, is heavily pushing its **Graviton3 chipset**, which is based on ARM architecture and delivers up to 25% better compute performance to its predecessor while also using up to 60% less energy.

While ARM-based architecture offers higher processing speeds at lower levels of energy consumption – and therefore lower emissions and cost – it requires a significant amount of investment to design your applications from the ground-up to run on ARM-based hardware in the cloud. This may put it out of reach for many organisations, but any business with sustainability objectives should consider this approach.



Greener software development

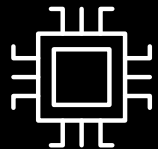
There are emerging schools of thought proposing that all aspects of IT be approached with a mindset that prioritises reducing environmental impact. Concepts of Green Software Development or Eco-First IT set out models for how to architect, design, and deliver software from the ground-up to reduce carbon emissions.

For example, the Green Software Foundation provides three categories into which actions to reduce the emissions of a piece of software could fall:



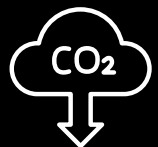
Energy efficiency

Actions taken to make software use less electricity to perform the same function.



Hardware efficiency

Actions taken to make software use fewer physical resources to perform the same function.



Carbon awareness

Actions taken to time or region-shift software computation to take advantage of clean, renewable, or low-carbon sources of electricity.

With the prevalence of the public cloud, so much of what we build is now hidden behind software – software is effectively the new hardware. This makes green software principles an important means through which businesses can manage the sustainability of their IT operations.

And while these new attitudes towards software development are in their early stages, we expect they will become more mature and in-demand in the coming years as more businesses embed sustainability objectives at all levels of their operations.

Read more

Blog: [Let's Talk About Green Software Development](#)

Blog: [How Eco-First IT Can Reduce the Environmental Impact of Software](#)

FinOps, sustainability and the democratisation of data

As mentioned before, the FinOps model of cloud cost management enables organisations to get maximum business value by helping engineering, finance, technology, and business teams collaborate on data-driven spending decisions. This is achieved in part through the democratisation of information – making sure that people understand and have sight of what they’re spending in the cloud and can report that back to financial decision makers in the business.

All the CSPs provide native tools to observe, monitor, and track the performance of applications and optimise resource utilisation, including [Azure Cost Management and Billing](#), [Amazon CloudWatch](#), and [AWS Cost Explorer](#). There are also third-party Software-as-a-Service (SaaS) tools that allow IT, finance, and DevOps teams to work together to optimise cloud resources for cost, including [CloudHealth by VMware](#) and [Apptio CloudAbility](#).

The purpose of these tools is not just to give visibility, but also to provide actionable insights into how certain changes can optimise use of resources, decrease energy consumption, and reduce emissions.

When used effectively, they can help teams understand where costs are coming from and where optimisations can be made.

The CSPs have also recently introduced similar tooling to give visibility into carbon emissions, including the [Microsoft Sustainability Calculator](#), [AWS Customer Carbon Footprint Tool](#), and [Google Cloud Platform Carbon Footprint](#) tool. These tools allow businesses to measure and report on carbon emissions from use of cloud services, understand carbon footprint drivers, forecast how changes in cloud usage could reduce emissions, and provide the foundation and benchmarks to drive further decarbonisation activities.

It’s also worth mentioning that these tools are relatively nascent and all three currently have gaps. They’re useful but should form part of a broader approach to cloud emissions, potentially including the use of third-party carbon emission measurements and analysis tools like [Cloud Carbon Footprint](#).

There is a distinction to be made between FinOps, which focuses on cloud optimisations that manage costs, and CarbonOps, which encompasses the use of cloud carbon tools to support incremental improvements that reduce emissions. The aims of these two approaches will often overlap, but not always, and not always in a directly proportional way.

Any business looking to fully leverage the cost and sustainability efficiencies that public cloud can offer will want to embrace a FinOps model, but it's not without its challenges. With all the tools previously mentioned, it can be challenging at first to know what the data is telling you and what action you should take as a result. And then there's the fact that FinOps is an organisational and operational model that diverges from how businesses have traditionally managed IT projects.

You will likely need seasoned cloud experts to help you understand what the tools are telling you and translate that information into practical, actionable steps that reduce cost and emissions. And before any of that can happen, a strategic approach to establishing a FinOps capability needs to be defined, including mapping the organisational structure, building the necessary skills within the business, and forging the link between business objectives and cloud spending.

Questions to ask:

- **What are your sustainability goals? How do they support or link to other business goals?**
- **What existing cost awareness processes do you have in your organisation? Where do they fall short?**
- **Are finance, technology, and business roles jointly involved in cost conversations across the organisation?**
- **What are the pain points around cloud costs in your business? Who in your organisation is affected by them?**
- **Are there stakeholders who could be early advocates of a FinOps operational model to the rest of the organisation?**

Case Study: Optimising Cost for NHS Test and Trace

The Department of Health and Social Care (DHSC) is the UK Government Department responsible for all policies on health and social care matters in England. Since the start of the Covid-19 pandemic, it has played a central role in the UK's fight against the virus by introducing the Test and Trace service.

Together with the Department of Health and Social Care (DHSC) team, BJSS rolled out its Enterprise Cloud to speed up the delivery of the Azure and AWS-based cloud platform that now underpins NHS Test and Trace.

Against the backdrop of the public health response to the coronavirus pandemic, this programme needed to be delivered securely and at great speed, all while meeting the anticipated demands on the service. And while the DHSC and BJSS were successful in achieving those goals, it meant a later programme was required to further manage and optimise the use of cloud resources on the platform.

BJSS' FinOps Advisory experts analysed the entire cloud platform, using the billing information to understand which accounts comprised the highest costs. From there, we understood where workloads were located, where there were underutilised resources, and where throughput was overprovisioned, among other things. We learned, for example, that **62% of costs were in six out of 70 accounts and over half of total cloud spend was on EC2.**

As a result of this analysis, BJSS was able to recommend a suitable savings plan and implement optimisations to the architecture, including right-sizing for better utilisation, adopting AMD-based instances, and moving to container or serverless architecture. As a result, **compute utilisation waste was reduced by 20%, resulting in around 30% in monthly savings.**



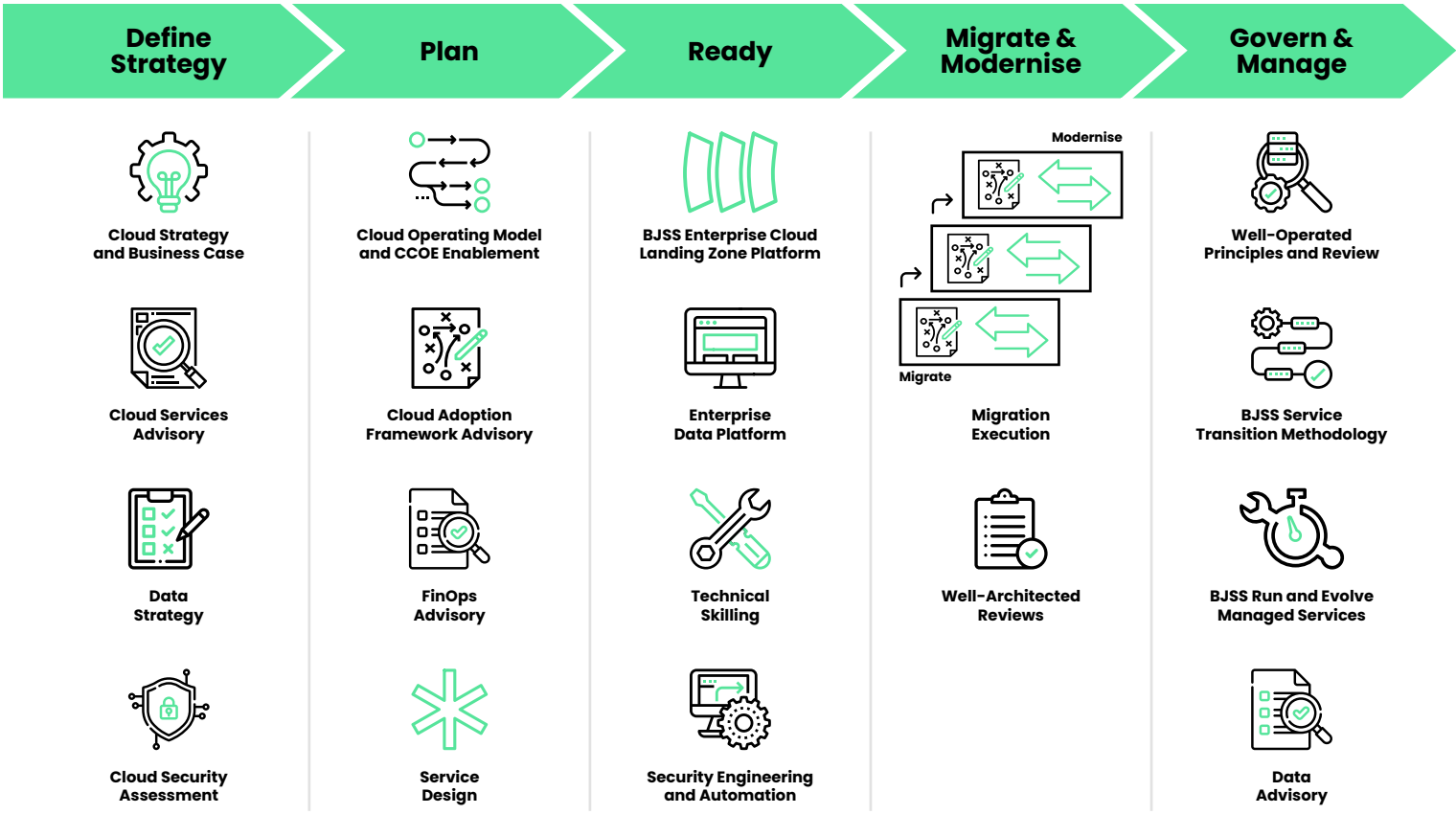
Become more sustainable through the cloud

BJSS provides cloud migration consulting and delivery expertise to some of the largest and most complex organisations in the world.

BJSS' five-step migration process can help you move your existing IT infrastructure to the cloud quickly, efficiently, and with minimal business interruption. The whole process is underpinned by BJSS' award-winning **Enterprise Agile methodology**.

For example, the second step, Plan, includes a FinOps Advisory service to help you establish a FinOps capability and maximise the value of the cloud while reducing cost and increasing sustainability.

Contact us today to find out how you can achieve your sustainability goals with the cloud.

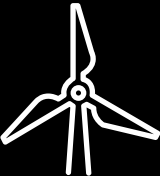


Our sustainability offering

Leveraging significant consulting and technical capabilities, BJSS' unique **Sustainability by Design** framework helps clients design, deliver, and embed sustainability across the end-to-end value chain.



Define and embed a sustainable, future-ready Operating Model.



Identify and realise opportunities to reduce emissions across the value chain.



Calculate and report your emissions to guide successful delivery.

Learn more >





Copyright © 2024 BJSS Limited. Enterprise Agile® and BJSS Enterprise Agile® are registered trade marks of BJSS Limited.