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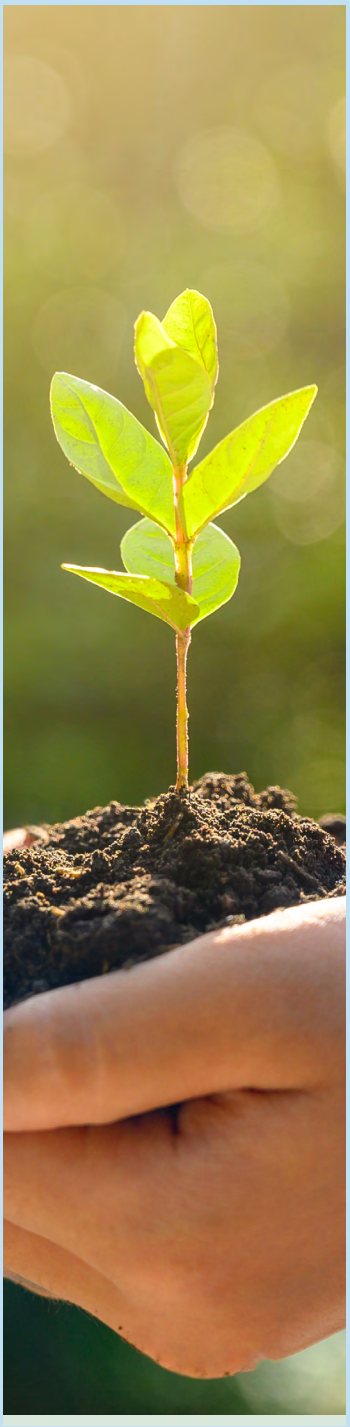

SUSTAINABILITY AND THE METAVERSE- HOW GREEN IS THE FUTURE?

Abstract

Sustainability, today, in its broadest sense has gained a lot of momentum and is most certainly a boardroom discussion. The time has come for organizations to look at sustainability as an opportunity, and not just as a marketing tool or a perceived risk. It is an imperative influencer in all aspects of decision making from product, to promotion, to pricing. Another topic of discussion, and possibly creating havoc hype in today's time, is undoubtedly the Metaverse. Most Big Tech is shifting to the metaverse or at least talking about it. Now what does this mean for us and the future? If the metaverse is unavoidable, then it is pertinent to know its impact on sustainability, how they work in tandem and if the metaverse has an impact on the environment. This paper discusses the possible impact of the metaverse on sustainability, what organizations need to watch out for as they embark on their metaverse journey in this context, and how sustainability has become a business priority and a fiscal responsibility in the meta world.

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Introduction

Sustainability is now at the forefront of any business strategy, across industries and governments alike. Issues related to climate change/ carbon emissions are weighing heavily on all organizations and with this, businesses are expected to redesign their business models, the products they use , how they use them, and what they sell. The technology choices, these businesses make, will also need to have a negligible impact on the environment.

Arguably the next big thing in tech, and probably the most spoken about tech change today is the "Metaverse". According to Statista, the global Metaverse market is worth $47billion in 2022 and is set to soar to $678 billion by 2030. It is also possibly one of the most confusing tech changes, and even today, there are multiple perspectives on what the metaverse really is? To quote Wikipedia, *"in futurism and science fiction, the metaverse is a hypothetical iteration of the Internet as a single, universal, and immersive virtual world that is facilitated using virtual reality (VR) and augmented reality (AR) headsets".* In colloquial use, a metaverse is a network of 3D virtual worlds focused on social connection. The novel 'Snow Crash', which gave birth to this term, essentially describes it as a VR based successor to the internet. Now, while I do not intend to get into the definitions, details, and future of the metaverse, (that's another paper in itself), what is important to understand here is, that sustainability must be a business priority in the metaverse.

Not to take a simplistic view, but the first thought that comes to mind when the metaverse is discussed, is that it is in fact a virtual world! In a virtual reality, seemingly the impact on the environment should be positive. It is in fact something that isn't physical in any way and accessed through a world connected by hardware and software. Peel the layers though, and it appears that it does in fact have an impact on the earth, some of it positive, but also negative. Let's examine this in detail.

The Physical is now Virtual

The metaverse is envisaged to be the next evolution of the connected world. It is defined as a "collective virtual open space, created by the convergence of virtually enhanced physical and digital reality".

Given that the metaverse is the next big thing, it is but natural to examine, if this opens new avenues for sustainability. In my view, sustainability should be a key consideration, when a new technology is introduced.

In a post pandemic world, workplaces have become hybrid, shopping experiences have become even more digital, and consumers expect everything from commerce to healthcare at home. There is an apprehension to step out of home unless it is very necessary. Factors like physical distance, traffic, possible exposure to illness etc., have made some groups of people think twice about stepping out into the real physical world. The metaverse, though not set up with this intention, is a fantastic world that people can explore, from anywhere, anytime, and certainly from the comfort of their couches. The physical world is well and truly digital and virtual.

As early as May 2021, Gucci built the Gucci Garden, a virtual art installation for Gen Z consumers, powered by Roblox's VR technology. Considered a marketing effort to dominate the metaverse, this campaign featured a French garden where players could walk through the French garden and try on and buy Gucci virtual fashion items to dress up their blank avatars. To be clear, the Gucci Garden, was more a virtual reality installation and gaming experience and not a full product of the metaverse, but this is what influenced them to then make investments in an Ethereum gaming platform, releasing virtual fashion.

Think about the time, effort, resources, travel, waste, water usage that goes into launching a physical French garden shopping experience instead. In this scenario, surely at the face of it, going virtual is a more sustainable choice.

Most workplaces today have meetings all day. Meetings can be held in realistic meeting rooms, with coffee table conversations or water cooler set ups in the metaverse. While it is nothing like the real thing, today even holidaying via the metaverse without the need to travel, is being discussed. The lines are in fact getting blurred and anything is possible. In these scenarios, the sheer energy and emission consumption in travel, traffic and transport is massively reduced. Does this mean there is no impact on sustainability though? Scratch the surface, and you see that the metaverse and its set up consumes many resources. Connected devices and people, need energy. Like the devil is in the details, here the **details are in the data centers**. While the lack of actual metaverse platforms in production today makes it hard to say exactly how much energy they might consume, an educated guess implies it is going to require magnitudes more electricity to run a metaverse than to host, say, a WordPress instance.

The 3D checklist for a sustainable metaverse - Data Centers, Devices & Decarbonization

A simple email accounts for 4 g of carbon emissions, which accounts for the power the data centers and computers spend sending, filtering, and reading messages. An email with a big attachment can go to a carbon footprint of 50g. A basic extrapolation of this, gives us a rough idea of the negative impact of sustainability from the metaverse! From 2010 to 2020, internet traffic increased 16.9x and data centers 9.4x, yet power consumption grew only 1.1x. Excluding crypto currency mining, data centers represent about 1% of global electricity demand. This is because organizations are working towards decoupling data center workloads from power consumption and using alternate sources of energy. Hyperscale data centers have become the need of the hour in this context.

"If you aggregated the electricity, use by data centers and the networks that connect to our devices, it would rank sixth among all countries, it's not necessarily bad, but it's significant, and it will grow."
— Gary Cook, international IT analyst of Greenpeace

According to Data Quest, analysts are worried that the metaverse could lead to an influx of greenhouse gas emissions. Needless to say, the technologies involved in the metaverse span across VR, AI, Cloud services, all operating from data centers.

"A recent study estimates that training just one AI model could generate 626,000 pounds of carbon dioxide, which is more than five times the amount of greenhouse gases emitted by a car during its lifetime. Cloud gaming, which is necessary for VR, could also raise carbon emissions by 2030. And it will increase the necessity for hi-res images, which only increases the need for more energy."

The pressures of sustainability today are real, and the large corporations are certainly expected to have a perspective on how they address this. The big players like Google have pledged to run data centers on completely carbon-free energy by 2030, and Microsoft is targeting to do so by 2025. Most large tech companies, as we all know, have a strong commitment to eliminating carbon emissions. Some already meet 100% of their electricity needs through renewable energy and are moving to "24x7 renewables", where data center energy demand is met by location-specific renewables at all times. It is a different matter, that these companies may achieve this with carbon offsets or other environmental investments.

So, the vision to decarbonize data centers is certainly present and keeping sustainability as a priority while planning these large scale metaverse innovations, is now commonplace at least for the big tech firms.

However, it is not easy to say the least. The whole point of a metaverse is the larger-than-life experience. Even consumers and developers who don't know about the metaverse, perceive it as something that is bright, shiny, attractive and with business potential. Creating these virtual worlds and engaging experiences would mean zero to low latency, faster data processing and of course keeping privacy in mind, local data centers and huge amount of back up generation, that is all too carbon intensive. So not all data centers can operate with the energy efficiency while doing what's needed for the metaverse! Essentially, this infrastructure planning and the moving parts of the metaverse, would have to be designed keeping in mind the environmental impacts, to be completely future proof.

Beyond the use of data centers, AI and VR, the metaverse also needs hardware/ devices. This could complicate impacts on sustainability. As pointed out earlier, the metaverse needs immersive, high quality 3D experiences. This technically would need high end GPUs, which not every phone or computer has

today. It is unknown today what exactly would be needed as a device to use the metaverse, but if gaming is anything to go by, it doesn't look good for sustainability. The accelerated development of AR and VR will encourage people to buy new technology, the need for new graphics hardware, will possibly result in enormous influx of e waste in the form of old phones, outdated computers/ laptops, which is polluting our soil, groundwater, and landfills, and more energy spent to make devices that now fit into the metaverse.

This experience in the meta world would also mean, a continuous spectrum of upgrades, possibly increasingly better experiences and therefore a fast fashion approach to the devices used. Arguably, this might be the path smartphones and devices are on already, and maybe irrespective of whether the metaverse makes it big or not, but this is certainly something for metaverse creators to consider, in their quest to launch bigger and better tech.
The metaverse is also expected to need semiconductor chips, a component that is already in shortage across the globe and has halted the push into EV. Now consider EV and the metaverse competing for these chips, and in some sense the metaverse is indirectly slowing down the push into the EV sector.

Is all Sustainability about environmental sustainability?

As with other aspects of sustainability and the core foundation of ESG, while the environmental impact is most significant, the social impact cannot be ignored. Tech firms and developers building the metaverse as well as organizations investing in this need to also focus on launching a metaverse that is accessible, inclusive, and safe.

Again, a first step here is to keep sustainability at the epicenter of these new worlds, rather than do what we are doing today with all other tech and businesses, which is to retrofit sustainability into everything we do, or at least try to. Since this is still in early stages, the metaverse technology companies need to collaborate, have focus group discussions and trials with the vast possibilities of potential consumers, to understand what they expect, need, how to make the metaverse affordable and enjoyable. The "Governance" aspect of ESG plays a pivotal role here because key decision makers in the metaverse creation, and the businesses exploiting its potential need to ensure the right compliance to sustainability and the right intent with this virtual world.

So, what might it take make a universe that is on the path to sustainability?

While talking about the metaverse, analysts and experts alike have one assessment in common. "We do not know enough". Is there a lot of expectation from this new technology, Yes! Are the use cases currently being looked at seemingly extensions of a gaming world- probably yes. It has not yet reached the stage of being an alternate channel for every experience, and while it is being touted as the next best thing to e-commerce, it isn't there yet. So how do you make a universe, that we know so little about, on the path to sustainability?

Here are some perspectives on areas being considered in the market and aspects to watch out for-

Virtual Retail

While the metaverse has a play in absolutely every industry, and the positive effects are envisaged to cut across Education, Healthcare and Services, Retail is probably an industry that has gone into the metaverse the fastest. This is of course excluding the corporations like Facebook or Microsoft (with its acquisition of Activision), who are more creators or propagators of the metaverse than actual consumers. From a retail business perspective, this creates a draw into a store, because the metaverse creates a store like experience with digital flagship channels, and maybe faster checkout. Secondly it allows interactions, and experiences in the metaverse which can then end with actual physical purchasing but based on the effort that has gone into it from the customer, will possibly reduce returns. Also, the belief is, consumers will shop virtually for all retail therapy, but buy physical only on a need basis, which in a fast fashion world, goes a long way toward sustainability.

The NFTs (non-fungible tokens, which are digital assets that someone can purchase) are a logical element in the metaverse world, and anything from digital real estate to shoes, use these. Like how concerts and holidays are now happening in the metaverse, purchasing is moving from physical or luxury goods to NFTs. Celebrities and influencers today are trying to set an example (and maybe getting paid to do it) by issuing digital collections, instead of using resources like paper, plastic chemicals and polluting the environment when the items are no longer viewed as valuable. There is a narrow view, that NFTs are also a bad thing for the environment. "Estimates by the Digiconomist suggested that **a single Ethereum transaction emits about 110 kg of CO2, equivalent to that of 42,734 VISA transactions or watching 18,253 hours of YouTube.** So, while it's not all greener on the NFT side, it still is more virtual than physical, with fewer real resources and that accounts for a lot of emission reduction.

Digital twins

A key pillar in the Metaverse building blocks is the usage of Digital twins. With Digital Twins and IoT technologies, the idea is to create digital representations of real-world things, places, people, and processes. Technology today, like Azure Digital Twins from Microsoft are focusing on gaining insights that can then influence building better tailored products, optimization of manufacturing and operations and eventually superior customer experiences.

In Supply chain and manufacturing the digital twins contribute to sustainability, because these virtual twins help to plan operations, resources, wastage better. Merging this with additive manufacturing and using this with an immersive metaverse experience to better plan wastage and reduce both energy and scrap, offer many possibilities for sustainable business processes. Smart Cities and Smart Spaces conversations today, use the digital twin idea, to forecast energy consumption, plan around its reduction, enable space utilization efficiencies, understand what people need and use and all in all enable sustainability gains. Usage of digital twins and the metaverse extensions in avenues like military or industrial trials could prove to be very interesting. These require the usage of carbon fuels to run, but a digital simulation, cuts down on the GHG emissions and influences in creating a final product that is eco-friendly.

Blockchain

The entire concept of NFTs rely heavily on the use of blockchain technologies. From a social sustainability perspective, this is a more transparent, decentralized approach and therefore an accepted one. Supply chain traceability and eventual enablement of a green supply chain to dive into track and trace for wastage using blockchain are common areas of discussion in the space of sustainability. There are multiple initiatives already in place for blockchain to be used for all parties to come together towards recycling, incentivizing participants with NFTs. It goes without saying that Ethereum is a huge consumer of electricity and computing power, so this is not a clean answer to a path to sustainability for the metaverse, but if in use, it would help to connect blockchain, NFTs and the metaverse for rewards in sustainability.

While these are some ways in which technology can be leveraged with the metaverse to have a lens of sustainability, as consumers we need to use the metaverse with sustainable intent, we can buy only if we need to, we can use NFTs with a sustainability mindset, go digital to save physical impacts, and fundamentally, use the metaverse or get it only if we need to. Sustainability wise, or otherwise, this is not a bandwagon to get on to, without a true business case!

Looking ahead

Anything new coming into the market always has mixed reviews, and more so in a social media world, where everything is met with conflicting views. The metaverse is no different! Today we cannot fully fathom the entire spectrum of benefits or pitfalls that may arise from this metaverse, but personally, I can say, that it seems fascinating that experiences are diving into completely new dimensions.

Like I said earlier, we do not know enough about the metaverse today, and it may be too soon to speak or speculate about it, and its impact on sustainability. But if we have learnt anything from the state of the planet today and the effects of climate change, it is not too early for the creators of the metaverse to start thinking and mulling over, what it takes to make the metaverse a boon rather than a bane. Enterprises are constantly contemplating how to do business in a world that is hinging on the usage of enormous amounts of data, reliance on data centers, costly devices and more consumption resulting in more waste. It helps that the physical is replaced significantly with a virtual in the metaverse, but ways to reduce the concurrent carbon footprint and eventual environmental impacts need to be in check, for the metaverse to be a sustainable success.

About the Author

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She is a Principal Consultant with Infosys and has over 16 years of experience in the Microsoft technology space, across Dynamics 365 and Power Platform, having worked on CX implementations, pre-sales and development and strategy for new Industry vertical solutions, Industry Consulting and Digital Experience Innovation. Her areas of interest span across thought leadership, consulting frameworks and strategies and building of new solutions enabling modernization to the existing enterprise ecosystem with focus on Next Generation technologies, Smart Spaces, Climate Action & Sustainability areas across AI, Experience solutions, Automation, Analytics, Mixed Reality, and related enrichments.

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