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Embracing the Metaverse: Towards the Construction of a Sustainable Future

Terry Trickett*

Trickett Associates, London EC2Y 8BP, United Kingdom.

*Corresponding Author: Terry Trickett, Trickett Associates, 605 Mountjoy House, Barbican, London EC2Y 8BP, United Kingdom; Email: terrytrick@mac.com

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Abstract: A proposed development by the City of London, at London Wall West, illustrates the intractable problems that can occur for a city seeking post-pandemic renewal whilst, at the same time, aiming to lead the way towards constructing a sustainable future. Current forecasts by the UN paint a gloomy picture of progress so far in meeting defined targets for combating climate change, with particular stress laid on the failure of cities to address their huge toll in generating CO₂ and GHG emissions. The way city policy makers of East Asia already have engaged with virtual reality (VR), as an ‘all or nothing’ approach to digital transformation, offers a glimpse of how to proceed elsewhere - although, a similar policy, if applied in the West, will require that we adopt a 50/50 approach, partially physical, partly virtual, where people have choice on how much time they spend as an avatar in a metaverse. Success in developing an ecosystem of metaverses will depend on designers adopting a behavioral approach to constructing the virtual world; lessons from the past teach us that, as in the physical world, people’s well-being in the metaverse will demand that we pay close attention to their environmental and psychological needs to ensure that a virtual life can be as fulfilling as life outside in the physical world. If all this can be achieved technologically, the resulting lifestyle changes, together with a requirement for less physical construction, give promise that we can get back on track in meeting the Paris Agreement target. By encompassing a radical policy of ‘Building Less is More’, cities, worldwide, will find a new route to zero carbon.

Keywords: Sustainability; Metaverse; Virtual Reality; Conjecture; Artificial Intelligence



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1. PART ONE: A Tale of Two Realities

1.1 The City of London's plans for post-pandemic recovery

Known as the 'Square Mile' and located at the heart of Greater London, the City of London's reputation for commercial and financial expertise remains undented by Covid-19 but the outward signs of activity have changed, probably forever. No longer are the pavements thronged and

the restaurants and pubs full to bursting. The memory of a deathly quiet Covid-struck urban desert may now be banished, hopefully forever, but in its place there remains a City still recovering from an event that has impacted on its future to the extent of the Second World War and, even, the Great Fire. (Figure 1) Always the City has bounced back and, this time, in facing up to a post-pandemic future, the task of overcoming misfortune and turning it to advantage is no less challenging.



Figure 1. London 1666, 350th anniversary of the Great Fire of London, burning model by David Best in collaboration with Artichoke, 2016. (Image courtesy of Artichoke.)

Early in 2021, the City's Culture and Commerce Taskforce (C&CT) dedicated to Fuelling the City's Creative Renewal declared its intention to:

"....reanimate the City of London's spaces in unique ways that attract people back.....and build the connections required internationally for the City to remain a global hub of commerce and become a center for culture."^[1]

In arriving at its conclusions, the Taskforce recognized that the Cultural Sector potentially can play a crucial role in the City's recovery – a city, where, as in many other metropolises round the world, it can be anticipated that in a post-pandemic world up to two fifths of current office space will become surplus to requirements and, thus, become available for repurposing. Of course, changes to physical space as now demanded by a depleted city cannot, in themselves, generate new types of collaboration between people from different spheres of activity. It will take the 'software' of digital transformation working in close harmony with

reconfigured working environments, both physical and virtual, to ensure the success of the City's bold plan for renewal.

The City is fortunate in having, in the North West corner of the Square Mile, a place already established as a center for culture, which can be expected to play an increasingly important role in furthering the City's long-term cultural ambitions. Already, it embraces world class institutions such as the Barbican Centre's performance and exhibition spaces, the Guildhall School of Music and Drama, the Museum of London and the London Symphony Orchestra (Figure 2). Now, at a time when the City is entering new and relatively unexplored territory, with its intention to join commerce, culture and the arts together in a spirit of partnership and sociability, I'm giving focus to one particular site in the City's cultural center, London Wall West, because it typifies the intractable problems currently faced by cities, worldwide, on how to re-invent themselves in a post-pandemic world.



Figure 2. The City of London's cultural center with London Wall West located at a midpoint.

1.2 London Wall West: a Microcosm of Conflict

In briefing architects Diller Scofidio + Renfro (DS+R) to prepare a scheme for London Wall West, the City was aiming 'to develop the City of London's bold new cultural district stretching from Farringdon to Moorgate, the vision for which seeks to amplify the creativity embedded in the area and use it to create lasting change long into the future'. At a first glance, the resulting scheme reveals two massive office buildings which have done little to endear the scheme to

local communities, who remain largely opposed to the development^[2]. But, on closer inspection, it becomes evident that both buildings contain floorplates of sufficient depth and flexibility to accommodate cultural and commercial organizations working alongside one another. They should be regarded, therefore, as mixed use buildings where many and various members of the Cultural Sector can be expected to come together with their counterparts in the Commercial Sector in a spirit of sociability and partnership (**Figure 3**).



Figure 3. The main feature of the proposed development at London Wall West by Diller Scofidio & Renfro is a pair of deep-space office towers surrounding a public suspended 'meadow' with public meeting space under. The construction of the scheme necessitates the demolition of the now vacated Museum of London and Bastion House built in air space above the museum.

DS+R's proposals are exemplary in providing spaces both within and outside buildings, which will encourage cross-sector interactivity and, further, the wealth and quality of new landscaped, open and accessible spaces to be provided will ensure that London Wall West becomes a magnet for visitors. The comprehensive greening of the proposed buildings will serve to markedly improve the environment not only for visitors but also for workers and residents.

Once implemented as a prototype for the future, London Wall West gives every indication that its

influence will spread to every corner of the Square Mile. In my opinion, once built, it will be seen as a model of thoughtful development which looks beyond the environmental dimension by addressing how people from different backgrounds both mix and connect. And quite apart from meeting these functional requirements, the architects have given close and expert attention to the importance that 'feel' and atmosphere can play in generating a sense of place. Existing green spaces will become part of a connected oasis of glades, which give promise of making the area a sought-after destination

as well as a microcosm of biodiversity (Figure 4).



Figure 4. A suspended meadow is the center piece of Diller Scofidio & Renfro's scheme.

It's true, of course, that the proposed built environment at London Wall West is carbon hungry but so is every other development, new build or conversion of existing, that involves major demolition and construction processes. In a world where construction and the wider built environment currently account for over a third of the planet's global carbon (CO₂) and greenhouse gas emissions (GHG), we need to find some way of reducing, radically, the amount of carbon embedded in construction processes. For this reason, the City's aim at London Wall West must be to ensure that the development plays some small part in preventing global heating rising above 1.5C by the year 2050.

The omens appear to be good because Chris Hayward, Policy Chairman of the City of London's Corporation, returned from his attendance at COP 27 to declare:

"Although each annual climate summit is tasked with the gravest challenge - protecting the only home we have ever known - we should feel confident that the City can continue to be leaders in creating a more sustainable future."

But, to date, the only concession made by the City towards a more sustainable future at London Wall West is a decision to "reduce the width of the building proposed to replace the Museum of London by three meters, while the building proposed to replace Bastion House will be reduced by two meters". These reductions won't go far in reducing the amount of greenhouse gases emitted by either building. In fact, by reducing the size of available floorplates, they will

serve only to make the buildings less able to perform their function to accommodate a multiplicity of cultural and commercial organizations working together.

To cut a long story short, the London Wall West scheme has now become becalmed in a sea of conflict. This is partly of the City's own making but, also, caused by the vehement opposition of a group who acknowledge none of the scheme's potential benefits but, instead, lay stress on its apparent failure to meet the City's own sustainability targets (ie. because DS+R's proposals require the demolition of existing buildings). Such conflicts of interest impede progress not only in the City of London; they are symptomatic of expressions of doubt and confusion that surround the development of cities worldwide. One key passage in the UN's 'First Global Stocktake' (published 8 September 2023), which lays stress on the significant part that cities play in generating CO₂ and GHG emissions, places emphasis on the importance of policy makers (ie. those responsible for construction in cities) finding a way of resolving current misunderstandings and conflicts generated by the exigencies of climate change:

"The share of emissions from cities is estimated to be 67 to 72% of global emissions when using consumption-based accounting that includes indirect emissions outside urban areas."^[3]

The City of London is not alone in acknowledging responsibility for the huge toll of cities in generating CO₂ and GHG emissions but, as with all cities worldwide, the City's policy makers have difficulty in defining appropriate action. It's with this problem in

mind that I'm turning first towards the megacities of East Asia.

1.3 Embracing a Virtual World

In South Korea and China, to alleviate the difficulties of physical communication in ever-growing urban centers, local governments have been motivated to embrace Virtual Reality (**Figure 5**). The result is an 'all or nothing' approach to digital transformation which demands that South Korean workers spend all their working time in a virtual world. For instance, employees of Zingbag, a financial company, no longer need to travel to the center of Seoul. They work

virtually in a 30 storey building, Metropolis, that can accommodate up to 300 people, at any one time, on each floor. Employees working in the same virtual space can immediately communicate with colleagues whenever they want by moving their avatars. They have no need to use phones or e-mail. Instead they communicate by word of mouth. We're told that Zingbag's virtual environment has generated a more motivated workforce with a lower cost of living and a better quality of life. Certainly, in East Asia generally, the idea has caught on^[4].

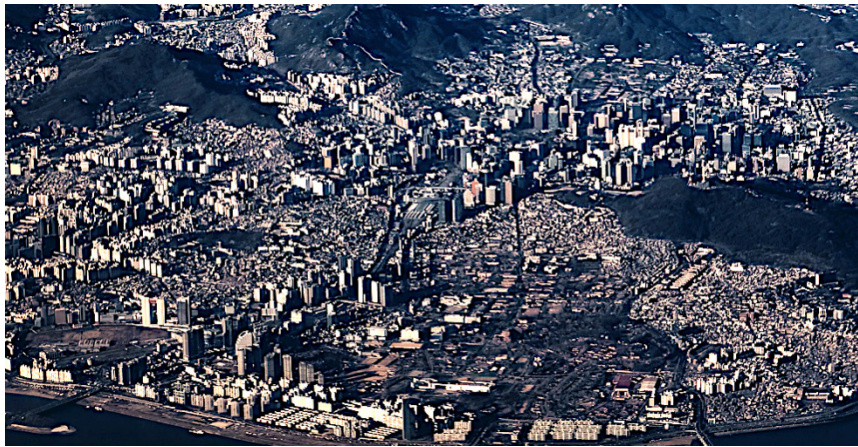


Figure 5. View of Seoul, South Korea, where the ever increasing difficulties of physical communication in a congested city have led to workers spending time in a virtual world.

By contrast, In the West, I can foresee that individual choice will remain a matter of paramount importance. Here, our adoption of a new post-pandemic work/life balance requires that we are given the option of deciding, for ourselves, how much time we want to spend in a virtual world. I'll call this the '50/50' approach to digital transformation. It heralds the 'Dawn of a New Everything'. In this new dawn, which is already with us in a nascent form, we can anticipate metaverse curators, new media artists and digital architects taking delight in creating '*a different place, perhaps fantastical, perhaps where we assume bodies that are far from human*'^[5]. David Hockney gives us a foretaste of just such a world. In a recent London exhibition he has provided scenes of work and play projected in three dimensions. Although not yet fully

immersive, they give some indication of a future virtual world taking shape alongside our normal physical world (**Figure 6**).

For the future, we will see this type of virtual world replacing, at least in part, our constructed physical world where architects and builders are responsible for more and more buildings producing bigger and bigger cities. I think you'll see where this is leading; the construction industry can play a significant part in averting a climate crisis only by building less - a paradox, if ever there was one. By encompassing a radical policy of 'Building Less is More', as I'm advocating in this article, cities will find a 'new route to zero carbon'¹, which gives promise of setting the world back on track in meeting required targets by 2050. Time, then, to look at the full implications of taking such a fundamental step towards tackling climate change.

¹Net zero means no longer adding to the total amount of greenhouse gases in the atmosphere. Greenhouse gases include carbon dioxide (CO₂) and methane. Under the 2015 Paris climate agreement, 197 countries agreed to try to limit global temperature rises to 1.5C by 2100. To achieve this, scientists said that net zero CO₂ emissions should be reached by 2050.



Figure 6. In Lightroom's 'Bigger and Closer (not smaller and further away)' exhibition, London, 2023, David Hockney provides first signs of a world where you're in a different place, perhaps fantastical, perhaps with a body that is far from human.

1.4 A Symbiosis of Virtual and Physical Space

The making of the virtual world (or, metaverse as I'll now call it) is dependent on the development of Virtual Reality (VR) as a tool for social interaction. As with most technologies, whether VR is good or bad depends entirely on how it's used. In full-dive VR, users should be able to build their own lives as they choose, genuinely interacting with others around them and leading a meaningful and valuable life. This is a future that David Chalmers foresees when in his book 'Reality+, Virtual Worlds and Problems of Philosophy' he suggests that in the not-too-distant future, as our planet becomes increasingly ravaged and overcrowded, people will migrate more and more towards the virtual realm where we will find that:

- *Virtual worlds are not illusions or fictions or, at least, they need not be. What happens in VR really happens. The objects we interact with in VR are real.*

- *Life in virtual worlds can be as good, in principle, as life outside virtual worlds. You can lead a fully meaningful life in a virtual world.*

- *The world we're living in could be a virtual world. (Chalmers doesn't say it is, but it's a possibility he doesn't rule out.)*^[6]

So, from this we can infer that VR can be much more than escapism; it can be a full blooded environment for living a genuine life in a first class virtual reality. The metaverse can be envisaged as a virtual world where no one spends an entire lifetime; people will be able to enter or exit as they choose. It gives promise of a world that users will apprehend with all their senses, as if they are physically inhabiting the environment and

where no trace of the ordinary physical environment remains. To sum up, the metaverse can be described as a virtual world (or system of virtual worlds) in which everyone can spend time living day-to-day lives with many forms of social interaction.

In its current primitive form the signs of an ecosystem of metaverses is beginning to take shape although, as yet, it doesn't come close to realizing Chalmers' forecast of virtual worlds becoming first class realities. However, by 2026, it can be anticipated that 25% of people will spend a few hours every day in the metaverse. Whether for work, shopping, education or entertainment, a nascent metaverse is set to take our experiences online to the next level. Capgemini, one of a number of multinational firms advising companies on digital transformation, forecasts the metaverse giving rise to a new era of collaboration where:

"by replicating an office environment, people can come together in a shared virtual space that can be both informal and formal. Whether to relax in a breakout space or to present at meetings, employees can use their digital avatar to immerse themselves in a new virtual environment with colleagues."^[7]

In the City of London, for instance, where the pandemic has reshaped the working world, employers are beginning to think about the metaverse's capability to promote not only collaboration but, also, creativity and increased productivity. Often, advised by experts in the field of digital transformation, managements are investigating the benefits of 'digital twins' as a means of transforming ways of working^[8]. A digital twin is a virtual copy of a company's operations enabling it to

insert any potential changes into a virtual version of the business, which then helps the company to identify more efficient ways of working. Approaching a digital twin in this way is valuable as a means of finding out what works and what does not without putting the business at risk. The point I’m making here is that the metaverse should not be viewed as something unknown, happening sometime in the future. The beginnings of a symbiosis of virtual and physical space already has become a reality – a new way of everything that will enable cities to grasp the future now and commence the long haul to achieving net zero.

1.5 The Impact of the Built Environment on Climate Change

Released at the latest round of climate talks in Egypt, COP 27, the ‘2022 Global Status Report for Buildings and Construction’ found that the sector accounted for around 37% of energy and process related CO₂ emissions in 2021. It advised that:

“To reduce overall energy, the sector must improve building energy performance, decrease building materials’ carbon footprint, multiply policy commitments alongside action and increase investment in energy efficiency.”^[9,9a]

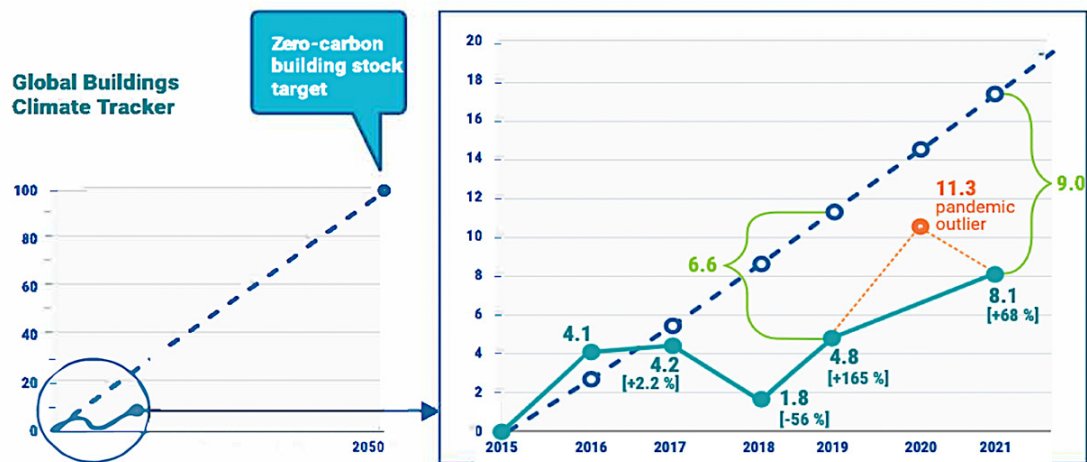


Figure 7. Global Buildings Climate Tracker extracted from ‘United Nations Environment Programme, 2022, Global Status Report for Buildings’ reproduced with permission. Path to a zero-carbon building stock target in 2050 (left). Detail of the period between 2015 and 2021 (right).

The report also included a ‘Global Buildings Climate Tracker’ which showed graphically why the sector’s performance was so poor (Figure 7). There’s a big discrepancy between required progress to achieve zero

carbon emissions by 2050 (the blue dotted line) and actual progress (the solid blue line) which indicates the likelihood of an ever widening gap occurring by 2050.



Figure 8. Bio-based structure (timber) is proposed for a social housing project in Milan. (architects Diller Scofidio + Renfro and Stefano Boeri Architetti)

Exhortations for the sector to improve its performance don't fall on deaf ears but there is a limit to what the construction industry can realistically achieve – and that limit is fast approaching. Building designers are well aware that the selection of building materials plays a critical part in creating a high-performance building with low operation carbon over time. For example, when designing materials for both new and retrofit construction sites, swapping a concrete based exterior wall system for a bio-based structure (eg. timber or bamboo) can greatly reduce the amount of up-front embodied carbon (as well as the ongoing emission caused by maintaining cooling systems in hot countries). Many ingenious examples of this approach can be found, worldwide, but a change of materials, in itself, will never make up for the overall poor performance of the construction industry in reaching Paris Agreement targets (**Figure 8**).

1.6 Building Less is More

I've indicated in my Korean example (1.3) that migration towards a virtual life is already underway to the extent that it now offers a fast emerging but

viable investment opportunity. To make this happen, digital architects are engaged in designing an entire parallel universe that seamlessly connects with our existing one^[10] (**Figure 9**). It's a new world that enables investors and owners to create interactive spaces that facilitate virtual contact between users anywhere. Such virtual real estate investments take place primarily on established metaverse platforms eg. [Sandbox] and [Decentraland]², where the skills required to make these early forays into the metaverse involve virtual real estate management, digital architects, metaverse curators, technologists (ie, specialists in virtualization) and, significantly, new media artists to create the look and feel of customized virtual space. All involved bring a cluster of new technologies, including Artificial Intelligence (AI), to bear on the creation and management of metaverse platforms. It's an area where invention constantly sparks invention with the skills and imaginations of all exponents stretched to the limit in giving expression to a virtual life which aims to be as good as life outside in the physical world.

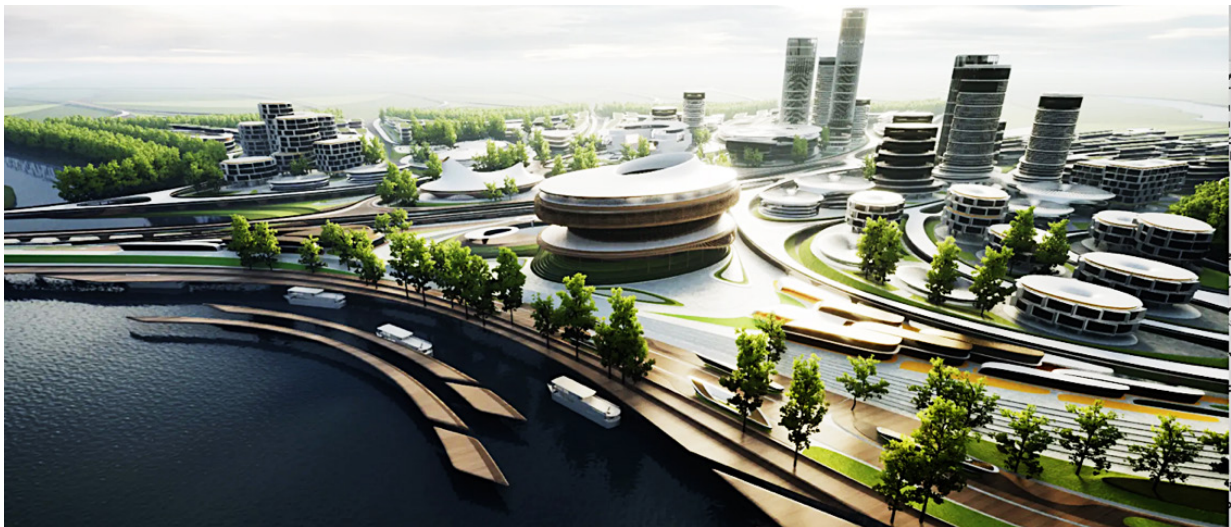


Figure 9. A virtual self-governed City in the Free Republic of Liberland, a ‘micro-nation’ squeezed between Serbia and Croatia. No one lives there but according to Patrik Schumacher of Zaha Hadid Architects, “*The time is ripe, technologically, economically and socially, for shifting more and more of our productive lives into the metaverse*”.

There appears to be much to gain by making an early investment in the metaverse; cities taking the plunge, while having to navigate a number associated risks, could well find themselves in a position to reap

substantial financial rewards as the metaverse gains mainstream adoption in the next five years or so. Moreover, the adoption of a Building Less is More policy, if applied worldwide, could bring us back on

²Whenever reference is made to a virtual platform, eg. Decentraland, the name is placed inside square brackets: [Decentraland]

track in reaching net zero CO₂ and GHG emissions by 2050. By referring again to the UN's Global Status Report for Buildings, 2022, and the Global Buildings Climate Tracker included in that report (9,9a), it is possible to estimate the extent of the anticipated shortfall in reaching zero carbon building stock by 2050. This is shown below (Figure 10).

The lower blue line shows how a 'Continuation of current methods for decarbonizing the building sector' ends up at a point in 2050 where only two fifths of the

required CO₂ and GHG emission reductions is achieved. The dotted blue line shows what has to be achieved by 2050. By adopting a 'Building Less is More' policy, as shown in red, it becomes possible to make up for lost ground. This new and potentially successful 'route to zero carbon' is achieved not only by constructing fewer buildings but, also, to a greater extent, by reduced emissions generated by a replacement virtual world – building **less** means gaining **more** from a fulfilling lifestyle in the metaverse.

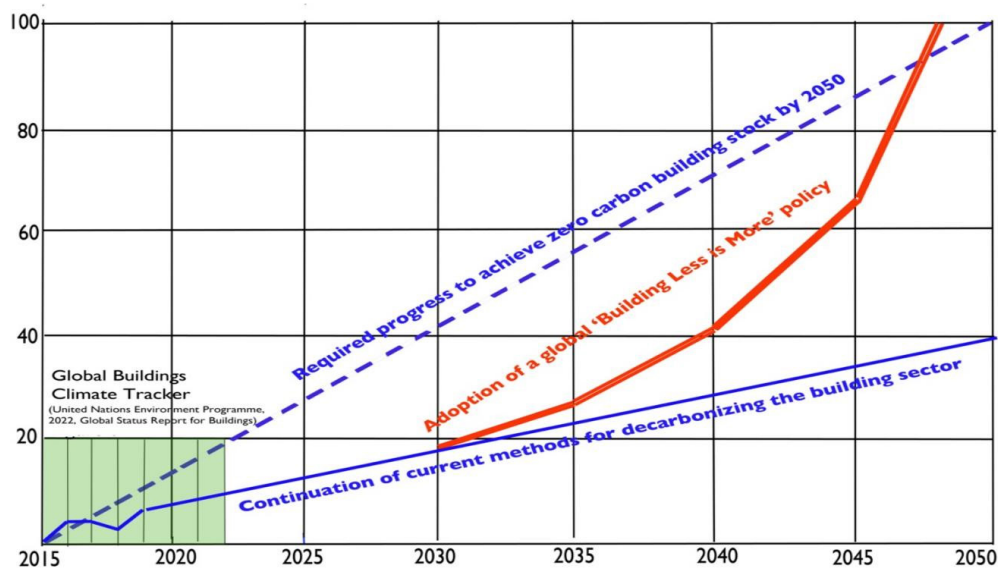


Figure 10. Route to zero-carbon. Taking the UN's Global Building Climate Tracker (Figure 7) as a start point, this revised tracker shows the path to a zero-carbon building stock target extended to 2050 (see lower blue line). As expected, it fails to achieve the required zero-carbon target. By adopting a 'Building Less is More' policy (see red line) the required target can be reached.

Currently, the UN's exhortations 'to do better' in *raising ambitions and implementing existing commitments* offer little incentive for people to abandon an existing carbon-heavy lifestyle^[3]. A future that demands restrictions on travel and, maybe, a curtailed urban existence seems too dull to contemplate. For many, reluctant to take on the exigencies of climate change, there has to be light at the end of a very dark tunnel – a reason to welcome inevitable and radical change, which I'm suggesting can be provided by a 'new way of everything', a metaverse that gives promise of exciting other-worldly experiences for all, at work and play.

1.7 Seizing the Opportunity at London Wall West

Time is on the City of London's side because by the time London Wall West has become a physical reality

(in, say, 5-10 years) the market in virtual real estate will have become fully established. For the City, facing an uncertain future, I believe it's a hybrid form of development (part virtual and part physical) that may offer the best of both worlds; it will enable the City to demolish existing buildings at London Wall West without compromising the construction of a fully sustainable development. The vacated London Museum structure is overtly idiosyncratic, fit only for the purpose for which it was designed and Bastion House, to achieve status as a Grade A office, will require the replacement of every element of its fabric and services. A myopic stance towards climate change should never become a reason to retain existing buildings that are no longer fit for purpose. At London Wall West, demolition, not retention, is the way forward with

a watchful eye kept on the City's declared role as a champion of sustainability.

Fortunately, the DS+R scheme already contains the seeds of its own transformation into a 50/50 world. A glance at the proposed office buildings (**Figure 3**) reveals that each is almost a mirror image of the other - a somewhat exceptional circumstance that enables them to be reconfigured as digital twins - one physical, the other virtual - as we've seen happening in companies undergoing digital transformation. At London Wall West, the virtual twin can be expected to contain vital information on the structure, context and behaviors of the physical twin. It will be dynamically updated with data from its physical counterpart throughout the lifetime of the project. Further, the virtual twin will enable owners, designers, contractors and trades to speak the same language and share a common

understanding of the project's requirements, constructs and needs. For the City, a virtual twin's potential to provide 'what if' analysis and simulations of the future will be of particular value - a key management tool for assessing risks and assessing outcomes.

To illustrate the environmental impact of this transformation, I've adjusted one of DS+R's presentation drawings to show how the physical 'removal' of one of the twin towers opens up vistas from a substantially enlarged meadow (**Figure 11**). The potential gains are significant; more open green space is acquired and the considerably reduced carbon footprint of a partially virtualized scheme, achieved by building less, will set new standards of sustainability. Moreover, the fact that the physical presence of buildings at London Wall West will be dramatically reduced should do much to staunch objections to the proposed scheme.



Figure 11. Left: view looking South showing current proposals for London Wall West with the replaced Bastion House and new Rotunda building. Right: the replaced Bastion House retained as a physical building. Rotunda becomes a digital twin (shown in yellow outline). As a result, the extent of the suspended meadow is increased and views South are opened up. With acknowledgement to Diller Scofidio + Renfro, New York.

As with all property development, the location of non-real estate reigns supreme and there is no better location than in the heart of the City of London. Companies and institutions, worldwide, will be encouraged to establish a City outpost which provides both virtual and physical access to a global hub of commerce and emerging center for culture. Either way, the opportunities for attracting people back and appealing to new users are almost endless. This is why I'm urging the City to take a long hard look at a way ahead that appears, at first glance, to be 'blue sky' but, on closer examination, offers a creative resolution to a seemingly intractable problem.

Of course, before plunging into a virtual world the City will need to be confident that the carbon footprint of constructing non-real estate will represent a significant improvement over the carbon cost of physical construction. It's a subject surrounded by confusion, which is not helped by the arcane language used to describe the processes involved.

1.8 The Carbon Footprint of Virtualization

The high quantities of energy involved in 'minting' NFTs (Non Fungible Tokens) has sent up alarm signals regarding the unsustainability of virtualization. Only a few years ago NFTs were notoriously expensive to

produce in terms of energy because the mechanisms used to create them relied on a computationally costly system called ‘minting’, where blockchain technology, essential to the creation of metaverses, produce unique pieces of data associated with photos, videos, audio and other types of media. NFTs come in the form of avatars, artwork, music, digital creatures and HTML code, as well as plots of land in virtual worlds like [Decentraland]. Further, most NFT minters opt for the Ethereum blockchain, which requires computers – ‘miners’ - to take turns guessing answers to increasingly challenging mathematical problems. The key point here is that the Ethereum blockchain, representing an industry worth \$195 billion, recently has made a 99.95% cut in its absolute energy use. Overnight, the sustainability movement, which previously had ignored or deplored the virtual world, recognized that it now represents a *‘pixelated escape route from fragile earthly reality’*. More than that, it might offer the only feasible escape route to a future sustainable planet^[11].

The metaverse will continue to need very high resolution pictures, which will boost energy use even further. But, now, these increases can be achieved without compromising sustainability targets. Ethereum has led the way and other data centers are planning improvements in energy use that will enable them to become more environmentally friendly. Meta has committed to achieving net zero emissions by 2030. Microsoft has pledged to run its Azure cloud platform entirely on renewable energy by 2025. For the future [Decentraland], a virtual platform based on Ethereum, will be able to rely on green, clean and renewable energy. Such radical, immediate impacts on energy use can be made in the virtual world because the data on which these reductions depend are concentrated in a relatively few centers; their carbon footprints are readily identifiable. Whereas, in the construction industry, the opposite applies; sources of high carbon emissions are located in millions of separate sites, worldwide, which explains, in part, the construction industry’s dismal record in meeting sustainability targets.

2. PART TWO: Constructing a Virtual World

2.1 Defining the Quality of a Metaverse

Many people are making predictions about what the metaverse will be and what it should be. For my money, the thoughts of Nick Clegg (Vice President of Global Affairs and Communications at Meta) on *‘Making the metaverse: What is it, how it will be built, and why it matters’* possess a clarity of purpose, which is lacking in most published information on the subject^[12]. Moreover, ‘Building Less is More’ is an idea that he finds intriguing, as do others who have described it, variously, as revolutionary, compelling and not least, totally convincing.³ It’s an idea that depends on first, defining what we should expect from the metaverse and then, pursuing the difficult path of making it happen. That’s what I’m aiming to do in this article.

Nick Clegg suggests that the quality of a metaverse will be the feeling of presence; you will be right there with another person or in another place. He knows, too, that our interactions in the metaverse must replicate those we experience in our daily lives:

- Currently our communication with one another involves emails, text messages and written posts on social media. Face-to-face conversations and speech based communication continue to happen but less frequently as a result of the enforced periods of isolation we’ve all experienced during the pandemic - a pattern of communication that has remained persistent, even now, as the pandemic recedes. The metaverse will constitute a shift back towards **ephemerality** making speech in a shared virtual environment the first option for communication.

- In our familiar physical world, we have the ability to pick up on emotional cues or influence audiences by modulating our voice, moving around and using body language. To create this level of **embodiment** in the virtual world, avatars will reflect our bodily movements just as they might occur in physical reality. They will enable us to communicate expressively, to use our hands to create and manipulate digital objects and to interact within a virtual 3D environment (**Figure 12**).

- In the not-too-distant future, we will be able to communicate virtually in ways that make us feel as if

³Commentators include Dominik Lenguel, Architect and Professor of Visualization, Brandenburg University of Technology, Cottbus, Germany and Dr. Susan Hazan, CEO Digital Heritage, Israel, and Chair, Europeana Network Association

we are actually in a specific space with other people – an outcome that can be regarded as the next generation of the Internet, a 3D experience which prioritises a sense of **immersion** encompassing not only VR but, also, augmented reality (AR) and a mix between these and other forms of reality (XR).

The technological challenges of meeting the attributes of ephemerality, embodiment and immersion are formidable but, once overcome, they will ensure that people can experience the metaverse in a way that is as good as life outside in the physical world.



Figure 12. Users can already gain a strong sense of embodiment in a virtual world when they control ‘humanoid’ avatars with their hands. (Tsinghua and Carnegie Mellon Universities).

2.2 Processes of Re-worlding

It’s not a one-size-fits-all metaverse that lies ahead, as I think Mark Zuckerberg might have anticipated when he launched his concept of Meta but, instead, a series of many separate virtual worlds all dedicated to meeting individual aspirations *where you can be in a different place, perhaps fantastical, perhaps where you can assume a body that is far from human*. There’s nothing mundane about such an environment where the relationship between mass and gravity (flying), the principle of locality (teleportation), entropy (making the arrow of time go backwards) and causality (there is no physical damage despite the intensity of the blow) all turn our expectations of normal human behavior upside down. All these experiences lie in wait for users who, accessing or interacting with a virtual world for the first time, will begin a process of ‘re-worlding’.

“Re-worlding in VR depends on the possibilities that the virtual world allows you to experience, both a feeling of social presence (the sensation of interacting and sharing the same experiences with another avatar) as well as a perception of control (degree

of synchronization between user – avatar - virtual environment), both conditions mediated by the code and computing capability of the VR device with which you are accessing the virtual environment.”^[13]

It is through the re-worlding process that the user interprets and finds meaning in the virtual world, whose consequences can extend to real life.

The term ‘user’ can be defined as being the actual person immersed subjectively in a virtual world. As I mentioned in 1.3, I’m anticipating that, in the West, a 50/50 ratio is likely to be adopted by users who, potentially, might spend half their time in a virtual world and half in the physical world. It’s a ratio that should be regarded as being variable depending on users’ own inclinations and the extent to which their working life demands contact with others who may be remote physically but easily accessible virtually. Always, organizations undertaking processes of digital transformation should ensure that a seamless transition can be made between both worlds – a transition that can be made by each and every person in the organization via their VR device.



Figure 13. Fantasy Avatars: Universal Everything explore digital life in motion with ‘Lifeforms’ at 180 Strand, London, 2022.

Users will be personified in the virtual world through their own avatars, which can be defined as the digital interfaces that allow users to interact intentionally and purposefully in a metaverse. The design of a personal avatar can have implications for other users; avatars with human characteristics tend to create more positive social interactions than fantasy avatars (**Figure 13**). Further, people’s emotional states can influence how their avatars behave in the virtual world thus indicating

that there is a fine line between the real and the virtual experience; in VR, it is impossible to completely detach ourselves from what we’re feeling in real life.

In the not-too-distant-future, when organizations, both large and small, can be expected to create their own metaverses, the behavior of users will be influenced by the same factors that have served to generate an organization’s unique ‘pattern of activity’ in the physical world.

2.3 Defining People’s Needs in a Metaverse

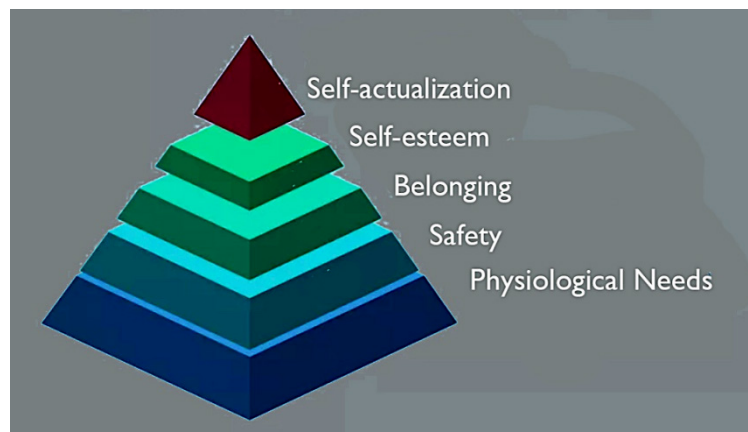


Figure 14. Maslow’s hierarchy of needs.

Not all will be new and unfamiliar in a metaverse created as a virtual expression of a presence in the physical world. As techniques are developed which are capable of extending processes of digital transformation into a virtual world, success will depend, as it does in the physical world, on paying close attention to the well-being of people, at all levels

within an organization, whose needs are ever changing rather than a fixed set of requirements. Maslow, in his ‘Hierarchy of Needs’ includes, at the lower level, physiological needs (to sustain life and health), safety (the avoidance of physical danger and need for protection) and belonging (social needs involving the desire for affection and friendship). Higher level

needs include self-esteem (a desire to be treated with deference and respect) and self-actualization (the need of a person to strive for his or her fullest potential as a human being). People do not move from one level to another in any precise fashion but it is safe to assume that, unless lower order needs are satisfied, the others will not come into play in any major way (**Figure 14**).

In creating a metaverse, it can be anticipated that people's needs, both lower level and higher level, must be kept firmly in mind by the metaverse curators and new media artists involved. Indeed, they can play at being gods but only as long as a tendency for capriciousness (a common trait of deities) is replaced by respect - respect for people's freedom of action and ability to carry out their tasks effectively. Further, they must remain constantly aware of people's differences and the multiplicity of their needs to ensure that:

- The adoption of a 50/50 approach to digital transformation enables people to feel as **comfortable** in the virtual world as in their more familiar physical environment. (It's through giving close attention to ergonomic factors that life in a virtual world can become as fulfilling as the physical world.)

- A sense of order emerges from the expression of **diversity** in the virtual world, where many new opportunities for the expression of differences will exist (ie. in the choice of avatars and metaverse settings).

- A freedom of expression is available in the virtual world, which **compensates** for time spent away from a more familiar physical world. (Experiences of flying, teleportation, entropy and causality can add excitement and a sense of everyday adventure, which far exceeds anything available in the physical world.)

- **Communication** via speech is the first option in the virtual world with less reliance on emails, text messages and written posts on social media as in the physical world.

- A seamless transition between the virtual and physical worlds enables effective **collaboration** with colleagues not only locally but, also, throughout the world. (Control of entering and exiting the virtual world is in the hands of all personnel via a range of VR devices.)

- An organization's extension into the virtual world

is seen as a way of contributing to people's **self-esteem** as they make their own way into a new virtual world, which offers extraordinary opportunities for self-actualization and advancement.

Attention to all these issues, social, behavioral, technological and psychological, will enable people's fear of the unknown to be tempered by the 'intrinsic rewards' they gain from experiences in the virtual world. No two metaverses will ever be the same. Metaverse curators responsible for processes of digital transformation will find that they have to probe well below the surface of organizational life to obtain a clear set of objectives - ie. those which underlie an organization's unique pattern of activity - before translating them into a metaverse.

2.4 New Problems, New Skills

The emerging skills of new media artists and digital architects will need to be brought to bear on the construction⁴ of the 'extremely complex system' of a metaverse. The nature of artistic practice has changed radically over the last 50 - 60 years to the extent that new media artists can apply to their work an ability to use computation as a blank canvas for exploring art as a process and to use the remarkable attributes of artificial intelligence (AI) to produce options that learn from experience. As an aide to creativity, there's now a Pandora's box of opportunities available for producing and presenting ideas for the virtual world (**Figure 15**). But, as I've already indicated, to prevent capriciousness, all of these must be rigorously controlled to ensure that users' multifaceted and changeable needs are given proper consideration. For this purpose, the new and relatively untried role of 'metaverse curator' will come into its own - a role that will extend the word curating to cover not only the content of a virtual world but, also, its impact on people from a behavioral and psychological point of view (**2.3**). Only then can life in a virtual world become as fulfilling as life outside in the physical world.

Already, just a few new media artists and digital architects, who are fluent technologically, have demonstrated their ability to explore the virtual world to find forms which astound in their scope and imagination. But, within the next few years, the

⁴Throughout this article, the meaning of the word 'construct' is: to erect a building (physical reality): to form an idea bringing together various conceptual elements (virtual reality).

oncoming metaverse will require that many more become similarly equipped. Fortunately, it's a need that already has been recognized in the realm of art education. In the UK, to name just one, at the University of the Arts London (UAL), the Creative Computing Institute (CCI) offers training and diplomas in creative technology to students, across UAL, providing opportunities for textile, illustration and film students alike to gain fluency in emerging technologies^[14]. Stress is laid on the way AI generative platforms enable the production of high definition

virtual environments. At an equivalent institute in New York, the School of Visual Arts (SVA), students gain experience in the programming of special effects for the film industry as well as the skills needed to step inside and explore virtual spaces. These centers of 'arts technologies' are continuing a tradition developed over many centuries (since the Renaissance, in fact) for artists to bring disruptive mechanical and electronic tools to bear on radical and revolutionary artforms. It's in the metaverse that new media artists will find their métier.



Figure 15. A Pandora's box of opportunities is available for producing ideas in the virtual world. Here, a metaverse hub inspired by the Silk Road is proposed by Grimshaw, WKN, Farshad Moussavi.

To make the future, advanced technology, in itself, will never be enough. It will require art and technology to be woven seamlessly together to make the virtual world a place where we want to be^[15]. Then, we can anticipate that all our lives will be altered forever by a mix of electromyographic sensors, volumetric holographic displays, immersive headsets, and projection and tracking cameras that collectively will provide support, stimulation, and simulations never before possible^[16].

2.5 The Crucial Role of Cities

Cities have an increasingly important role to play in reducing CO₂ and GHG emissions because, as the UN has recognized, they are mainly responsible for producing these excess gases in the first place. There's every reason for cities worldwide to acknowledge their responsibility by leading the way forward towards a

solution.

The UN's assessment of cities' overall toll in generating emissions (67 - 72%) can be accounted for, in part, by the toll of the Buildings and Construction sector – see Global Status Report 2022^[9,9a]. At 37%, this accounts for approximately half of cities' emissions. It comes as no surprise, therefore, that other multiple causes of emissions generated by industry (from energy use and fugitive sources), on-road transportation, railways, aviation, waterways and waste disposal, bring the total toll to around 70%. Stationary energy⁵, as used by all these separate sectors, is one of the largest contributors to GHG emissions which, if controlled, can achieve significant emission reductions. In China, for instance, where stationary energy predominates in cities with a large industrial base, Shanghai, Suzhou, Dalian, Handan and Tianjin have all succeeded in

⁵A stationary energy storage system can store energy and release it in the form of electricity when it is needed.

making significant progress in mitigating GHG emissions. Although such opportunities cannot be replicated to the same extent in the West, where cities have a less significant industrial base, this doesn't alter the fact that cities worldwide, by reducing emissions, can be expected to exert a fundamental impact on driving forward long-term sustainability.

The virtual world, apart from replacing, in part, the need for physical building, will have a knock-on impact on other sources of emissions. We can anticipate that lifestyle changes, occurring as a result of adopting a Building Less is More future, will be reflected gradually in the physical makeup of cities. It will take time but we can expect to see, by say 2030, clear signs of reduced emissions from institutional and commercial buildings, on-road transportation, railways, aviation and waterways. Additionally, some people who fled to the countryside during the pandemic have not returned. Is it too much to be expected, therefore, that the anticipated exponential growth of cities might be halted? Current predictions indicate that, driven by rural migration and overall population growth, 68% of the world's population will live in urban areas by 2050, compared to 55% today. Such an increase, if it occurs, will negate any profound effort aimed at reducing the share of emissions from cities. Local governments and national governments can do much to encourage a return to pre-industrial rural living to produce fewer CO₂ and GHG emissions; for many people, this migration away from urban settings would signal an improved lifestyle.

2.6 Taking a Leap into the Future by Looking Back at the Past

The metaverse is a subject that arouses considerable controversy. I'm acutely aware of the high level of scepticism aroused by any mention of 'the metaverse'. It's a subject that borders on sociology and ethics and is central to issues associated with digital health, big data and AI. In my research, I've sought out the views of Dr. Gabrielle Samuel, lecturer in environmental justice and health at King's College, London. She is concerned, in particular, with the unintended consequences of the metaverse when she opines:

“Rushing into technology without considering consequences is never a good thing; it can affect mental health and physical well-being, especially when

driven by capitalist markets that strive for profit above all else.”

Such scepticism is well founded which is why, in this article, I lay stress not on technology but on defining the quality of the metaverse as it will respond to people's environmental and psychological needs. These considerations have to come first in any serious attempt to construct a metaverse. My own conviction is that we can both anticipate unintended consequences and, through a process of determined research at the outset, plan to mitigate their potential impact by adopting a behavioral approach towards design:

“Designers need concepts that are relevant to physical (and virtual) forms of human behavior - an approach which presupposes that it is possible to define and understand the determinants of people's behavior in some depth. Behavior which results from formal organizational demands, informal activities and individual needs for self-fulfilment must all be taken into consideration to successfully uncover the 'unique pattern of activity' by which an organization generates its own success”^[17].

Robert Sommer wrote these words over 50 years ago; I have needed only to add 'and virtual' to make them relevant to our current and future needs. But before considering the future, let's take a glimpse into the past.

In the early 1970s, computer hardware was making the transition from centralized processing frameworks, located in air conditioned isolation, to heavy cumbersome machines placed on individual desks – ie. the beginnings of personalized computing. As an architect specializing in interior space and the way organizations occupied buildings, I have vivid memories of investigating the environmental, social, technological and logistical aspects of 'organizational tangles' where, at every turn, expressions of considerable doubt were voiced by all those whose lives would be radically changed, for better or worse, by an unknown technological future. One example will illustrate what I mean:

The FT (Financial Times), a long-ago client, was a company that had suffered over a long period from ongoing changes based on intuition, anecdote and casual observation rather than a close study of requirements through consultation. (At the time, in the UK, this was a common trait in company life.) So,

when the FT's board announced, in 1978, its intention to lead the way in Fleet Street by installing new electronic methods for both editing and printing the paper, emulating procedures already adopted by the Washington Post and Baltimore Sun, they set in motion a hornets' nest of agitated concern. Given the radical nature of the FT's ambitions, my role was to investigate the full impact of change on communications between people and the nature of their interface with new and unfamiliar working tools. I've described the process in 'A Cybernetic Clarion Call to the Arts' Community'^[18]. Enough to say here that, in carrying the project through

to a successful conclusion, I applied, to the letter, a behavioral basis of design and have continued to do so ever since (**Figure 16**). It's by adopting this behavioral approach that people's fear of an unknown metaverse can be tempered by the 'intrinsic rewards' they gain from experiences in the virtual world. No two metaverses will ever be the same. Metaverse curators, responsible for processes of digital transformation, will find they have to delve well below the surface of their client organizations (cities, companies or institutions) to obtain a clear set of objectives, before translating these into a metaverse.



Figure 16. The Financial Times newsroom as redesigned by Trickett Associates, in 1979, to accommodate new electronic methods for both editing and printing the paper. It was acclaimed by the UK Press Gazette as *'the most comfortable newsroom in London – a model of thoughtful design'*.

2.7 Commerce and Culture Stronger Together

Intractable problems surrounding the City of London's 'London Wall West' project may or may not be resolved but, whatever happens, they have served as a catalyst in my defining a 'Building Less is More' policy, which is applicable to all cities worldwide. It's by adopting a 50/50 approach to digital transformation that cities can realise their ambitions for the future whilst, at the same time, demonstrating their determination to reduce their heavy toll in generating CO₂ and GHG emissions. But the benefits of embracing the metaverse don't stop there. For the City of London, it's glimpse of a future, where commerce and culture become stronger together, can be made a reality through the same process of virtualization.

Owners of virtual land can transact, develop, lease or otherwise use their entitlement to virtual construction, in any manner they see fit. As yet, there are very

few restrictions in place affecting virtual space. For instance:

- Everyrealm (formerly Republic Realm) purchased a plot of land in [Decentraland] and converted this into a shopping district called Metajuka (inspired by Tokyo's Harajuka shopping district).
- Sotheby's has created a digital replica of its London headquarters, in [Decentraland], to showcase digital art for sale.
- Samsung has launched virtual retail space, again in [Decentraland], for engaging customers in its own products.

If City policy makers decide to construct a [Square Mile] platform, as a complement to the existing physical Square Mile, the City will be able to provide opportunities for real estate managements to gain valuable experience in letting a portfolio of virtual space. We can anticipate that the aim, in offering

preferential rates to those tenants who also have a physical presence at London Wall West, will be to encourage a pattern of dual tenancy that can be extended, over time, to other City owned metaverses in the Square Mile. Although, in theory, such a plethora of metaverses will enable people, activities and businesses to disperse geographically, the City will remain crucial – perhaps even more than today – in serving as a person-to-person hub of collaboration and innovation. In the City of London, organizations will continue to gain access to a deep talent pool because people want to be there (eg, those who have moved, within the last 10 years or so, to Canary Wharf, a docklands outpost of the City, are now returning). For the future, we can expect to see this trend continuing as leading ‘superstar’ cities become more and more important as places for workforces to come together and interact in the

physical world.

Am I taking my conjecture too far by suggesting that the City should consider constructing a [Square Mile] platform (the City’s own [Decentraland])? To some, the idea will appear as a ‘fantasy beyond belief’ although, in fact, the construction of a virtual [Square Mile] represents the only feasible way for the City to not only *build the connections required internationally for the City to remain a global hub of commerce* but, also, *to become a center for culture*. It heralds a future rich in possibility. The infrastructure of a virtual [Square Mile], created and managed by the City, would generate a platform where new media art’s engagement with technology can be expected to act as a magnet for visitors and create a fulfilling wonderland for the City’s inhabitants and workers.



Figure 17. A [Square Mile] platform for virtualization (ie. the City’s own Decentraland) will enable the City, and many commercial and financial organizations already located in the physical Square Mile, to become ‘hosts to culture’. Sketch by the author shows the hub of the City’s [Square Mile] platform from where visitors gain entry to cultural presentations from every part of the world.

With the long term aim of giving commerce and culture equal status within the City of London, the many commercial and financial organizations already gathered together in the City from all corners of the earth can be encouraged to become hosts of culture (**Figure 17**). To take one hypothetical example, I can imagine, for instance, that Deutsche Bank, with a large physical presence in the City and potentially

an equivalent virtual presence in the [Square Mile] platform, inviting *Staatliche Museen zu Berlin* to curate an out-reach virtual presentation, where a City-based international audience can engage with German art and artefacts. *Staatliche Museen*, as one of the most digitally advanced museums in Europe, will be well equipped to take on this challenge.⁶

This type of cultural brokerage, applied many times

⁶Many other museums, including the Imperial War Museum and Science Museum Group in London, are now transgressing their physical boundaries by engaging with emerging technologies (eg. volumetric displays, ray tracing, holograms and Desktop AR) as a way of sharing 3D exhibits in remote locations. Such lessons, learned during the pandemic, are proving to be vital in establishing new audiences for arts and culture.

over, will quickly establish the City as a global center for culture. Moreover, as has proved to be the case in [Decentraland] and other platforms, real estate prices in the metaverse are rising exponentially; Bloomberg estimates that the metaverse market could reach US\$800 billion by 2024, up from about US\$500 billion in 2020. The creation of a [Square Mile] virtual platform gives promise of becoming a winning venture for the City, firmly establishing its reputation as a global hub of innovation and sustainability.

2.8. Conclusion: The Value of Conjecture

My suggestion that the metaverse offers a way of stemming our seemingly unstoppable drive towards climate disaster must be regarded as a conjecture - a conjecture which, in highlighting the salient factors that are set to impact on the construction of an ecosystem of metaverses, provides a gleam of hope that we can counteract the UN's gloomy predictions. The current dire performance of the global construction industry in reducing CO₂ and GHG emissions pinpoints the need for action – action as proposed in this paper for cities, worldwide, to adopt policies of ‘Building Less is More’ where building **less** means gaining **more** from a fulfilling life in the metaverse. Apart from performing a crucial role in averting a climate crisis, cities can reap rich rewards, both commercially and culturally, by making an early leap into the future.

When Bill Gates, in his book ‘How to Avoid a Climate Disaster’^[19] tells us that to find a solution *we’ll need biology, chemistry, physics, political science, economics, engineering and other sciences*, he’s missing out the other 50% - the arts and humanities. Maybe, this explains our current poor performance. Science, of course, is playing a crucial part in researching and achieving new forms of generating renewable electricity and, further, work on finding ways of decarbonizing the production of carbon-heavy materials (eg. cement and steel) is proceeding apace. But science alone cannot solve all the problems posed in confronting climate change. What is now required is a way forward where the two great ways of knowing, understanding and discovery - art and science - become harnessed together as never before. A blurring of the boundaries between art, the humanities and science has been happening for the last 50 years or so to the extent that, now, a ‘code of the collective’, as George Steiner

calls it, is poised to create a ‘new way of everything’^[20].

If my conjecture has validity, the spark for collective action will be ignited by cities. As prime generators of CO₂ and GHG emissions, some cities already have recognized their responsibility for leading the way forward, but it won't be easy. Far from it; as Jeremy Green, a developmental biologist explains:

“It is precisely the limitations of what a model or conjecture can do that gives it value. If you cannot make your model match the data, one of them must be wrong and you have something to learn. The process of bridging that gap provides the value and excitement of new discovery.”^[21]

I can anticipate that, initially, a collective approach might not be completely successful in tackling each and every aspect of a process which, inevitably, must change our lives forever. However, with adjustments to the conjecture as work proceeds, it holds promise that, **in a world that is not on track to meet the goals of the Paris Agreement, it’s the impetus for change provided by cities’ early embrace of the metaverse that can save the planet.**

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4. Author Biography

For over 30 years, Terry Trickett's own firm, Trickett Associates (architects and designers), helped organizations, large and small, to know themselves before they initiated changes to existing buildings or commissioned new ones. From 1974 onwards, his specialized professional skills were called on to solve seemingly intractable problems experienced by organizations attempting to harness new technology in buildings that showed little promise of adaptation. Many of these were located in the City of London

and, more often than not, Trickett recommended re-purposing as the preferred option. Additionally, with the partnership of Trickett & Webb (graphic designers), Terry Trickett developed an approach to exhibition and display design where clarity of communication predominated in events that travelled the world.

Now, Terry Trickett acts as International Liaison for EVA (Electronic Visualisation and the Arts), a venture which started in London, in 1990, with the aim of providing opportunities for artists, researchers, scientists, technologists, and educationalists to explore

the potential offered by new technologies. EVA's conferences take place worldwide and provide a setting where creativity, critical thinking and free expression are coalesced to promote action. The EVA International Sessions that Trickett organizes go one step further by providing a platform for generating discussion on specific subjects of concern across the worldwide EVA network (eg. EVA and the metaverse, 2022, Music and Artificial Intelligence, 2023).

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