

IMAGINARY GARDENS: SOLARPUNK ILLUSIONS AND REALITIES IN THE "GARDEN CITY" OF SIN- GAPORE

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* ABSTRACT

By extending its vision in 2014 of building a sustainable state through the framework of a "Garden City", Singapore has set itself up to become the world's first "Smart Nation". With a focus on energy and resource solutions, the city-state has heavily relied on state-driven technocratic interventions to create what Prime Minister Lee Hsien Long calls "meaningful and fulfilled lives" for all. This technocratic, human-centered development draws a parallel to "Solarpunk", a model of environmental utopia. The Solarpunk genre gathers speculative fiction works which imagines post-transitional climatic utopias. This model draws ties to the concepts of circular economies, degrowth economies, and decolonization of energy. Inspired by energy and environmental humanities scholar Rhys Williams, it can be understood that the Solarpunk environmental model offers the elements necessary for ongoing global energy transition. It is important to note that Singapore's current energy transition solutions, embedded in its Smart Nation vision, inform some Solarpunk imaginaries. Specifically, it utilizes an interdisciplinary method by conducting a close reading of both designer and governmental reports on two smart projects in Singapore: Gardens by the Bay and Jewel Changi Airport. It compares the aesthetic, design, purpose, and meaning of these structures to existing conceptions of Solarpunk. These projects embody Solarpunk in their aesthetic and ethos, but they are appropriated for uses and meanings that undermine this embodiment. While

Singapore's ecologically reflective solutions offer some climatic hope, they reaffirm the need to rethink the energy transition in the name of climatic justice, freedom, and environmental harmony.

1 INTRODUCTION

Choosing a certain image of the Earth's ecological future makes that image a reality. An optimistic vision can inspire people to act, leading to change and ingenuity. A pessimistic image can promote inaction and apathy. Driving the way we think and act, the environmental imaginary thus becomes our reality. Along this line of thinking, a movement known as "Solarpunk" has sprung out of the literary genre of speculative fiction as an explicit rejection of dystopic imageries, gathering disparate voices to paint a detailed portrait of ecological utopia. Recently, Singapore has gained recognition as a real-life embodiment of Solarpunk. Positioning itself as a leader in environmental consciousness and futuristic architecture, the nation has enacted policies and concrete architectural projects, attempting to actualize a utopian environmental vision. Singapore's green image is so recognizable that one of its projects has even become the community banner on Reddit (Reference source not found), though Reddit users have challenged its visibility, calling Singapore's lived experience "actually Cyber punk instead," referencing the genre's dystopic predecessor ([deleted] comment on CaptainSponge 2020).



Figure 1: Singapore, as shown in the r/solarpunk community banner. Source: www.reddit.com/r/solarpunk/

Emerging out of this online discourse is a productive question: is Singapore Solarpunk? More specifically, to what extent does Singapore embody the ideals of Solarpunk? The "green" image Singapore presents to the world can have significant ramifications as an environmental imaginary, validating its model of eco-conscious development. This image may bring a sustainable model to global prominence. Conversely, it may obscure lingering challenges that the country fails to address. Moreover, Singapore reveals under close

analysis the values and challenges of taking Solarpunk as a model of development. Within Singapore's current vision of a "Smart Nation", major government projects provide the main insight into the country's Solarpunk excursions. Specifically, Singapore's Gardens by the Bay and the Jewel Changi Airport have garnered international attention for setting "new green energy standards" (Kolesnikov-Jessop 2011), while also projecting a utopian aesthetic. In examining these projects, this paper argues that they partially embody the Solarpunk aesthetic and ethos, but that their geopolitical and economic meanings prove challenging to a Solarpunk reality. Despite these challenges, both projects advance technology that may support a Solarpunk future, allowing them to become aspirational examples that demand further creativity to overcome the challenges of actualizing a Solarpunk reality.

2 WHAT IS "SOLARPUNK"?

"Solarpunk" refers to a collection of imaginary utopian futures. This definition draws on the work of environmental humanities scholar Rhys Williams, laid out in "'This Shining Confluence of Magic and Technology': Solarpunk, Energy Imaginaries, and the Infrastructures of Solarity". In his essay, Williams synthesizes a number of anthologies into a cohesive framework of three pillars: light, abundance, and transparency (Williams 2019). Evident in the vibrant, futuristic aesthetics of the genre, these pillars run much deeper, as his analysis suggests that they form the core values of a Solarpunk society. For instance, sunlight becomes "entangle[d]... with community", being a shared public resource and even at times, an object of communal religious feeling (Williams 2019). In stark contrast with the supply-and-demand dialectic of modern capitalist society, Solarpunk celebrates an abundance of natural resources. The first and foremost is light, around which transparent and harmonious societies flourish. At times, Williams acknowledges the transparency of such societies as a totalitarian streak, which underscores the fact that Solarpunk explores an unfamiliar set of relationships between people and the environment (Williams 2019). This dissonance posi-

tions Solarpunk as a cautionary exploration of the fine line between eco-consciousness and authoritarian environmentalism. Nevertheless, Solarpunk's target remains a harmonious imagined society built on the values of light, abundance, and transparency.

Another understanding of Solarpunk considers the examination of the supporting structures of the lifestyle it depicts. As per Rhys Williams, a Solarpunk society is built on "...an infrastructural base encoded with an ecologically sound sensibility, facilitating agency in a way that allows us to act without thinking in much the way we do now, but in full knowledge that our actions do not extract an ecological cost" (Williams 2019). In other words, Williams suggests that Solarpunk rethinks the ways in which people achieve a common and elevated standard of living. Part of the work of Solarpunk is redefining this elevated standard, prioritizing harmony with nature and freedom from environmental concern. Today's consumerist convenience may not be consistent with, or even desirable in, such a future. But his definition also highlights Solarpunk as a term with infrastructural meaning and as a means of producing and distributing the resources people need in which every step is in harmony with the environment.

It is tempting to conclude that the Solarpunk philosophy is an outright rejection of capitalism. Solarpunk as an idea should not outright embrace or reject any one economic system, for this unduly limits its speculative capacity. Nevertheless, in his essay "art, energy, and technology, the Solarpunk movement," engineering researcher Juan David Reina-Rozo rightly concludes that "the decolonization of energy is necessary to inhabit potential futures" (Reina-Rozo 2021). Reina-Rozo's analysis recalls the linguistic origins of Solarpunk with its emphasis on solar and other renewable energies, and highlights the genre's relevance to the ongoing energy transition. Moreover, Solarpunk draws a parallel to other concepts in the energy transition. "Degrowth economy", rejects limitless growth and demands reduced resource consumption. "Circular economies" are completely renewable, self-sustaining pathways of production (Lai 2022). Certainly, these sustainable economic models cannot be consistent with capitalism in its purest, most unrestrained form. In this way, a Solarpunk future necessarily demands a challenge to the status quo, collecting and implementing

values, infrastructures, and individual practices that contribute to a revolutionary and sustainable way of life.

3 IS SINGAPORE'S "SMART NATION" SOLARPUNK?

Like Solarpunk, the "Smart Nation" vision Singapore has embraced outlines an imaginary, idealized future. Key to understanding this self-imagination is understanding how Singapore imagines the roles of its government and businesses leading the way into the future. Singapore has long envisioned itself as a "garden city," a phrase which took root in 1967 when then-Prime Minister Lee Kuan Yew introduced a major beautification plan for the city ("S'pore to Become Beautiful, Clean City within Three Years" 1967). This vision, more recently referred to as a "city in a garden," operated through the creation and expansion of tree-planting and park development programs in the hopes of weaving a beautiful green environment throughout the city ("Garden City Vision Is Introduced" 2015). Among other goals, this beautification project sought to make the country more attractive globally, both for tourists and for investors ("Garden City Vision Is Introduced" 2015). Highly successful, the ongoing garden city vision has played an important role in Singapore's growing global status and rapid development. Since 2014, PM Lee Hsien Long's new "Smart Nation" vision has extended and expanded this trend, promising in his words for a nation "where people live meaningful and fulfilled lives, enabled seamlessly by technology, offering exciting opportunities for all" (Ho 2017). Nanyang Technological University researcher Ezra Ho elaborates that "the Smart Nation initiative is about coordinating and intensifying the effort to develop the institutions, regulations and talent for a hyper-connected, datafied urbanity" (Ho 2017). He illustrates this effort with three examples: high-tech living spaces which track energy and water usage for the reporting of data to citizens, digital monitoring and remote consultations in elder care, and promotion of active participation in what leaders call the "engineering ethos" (Ho 2017). These programs highlight the his-

torical continuity of Singapore's focus on centralized development which is conscious of the environment and of people's well-being, using technocratic interventions to develop the nation-state of the future. As a project, Solarpunk or otherwise, Singapore operates top-down.

From these brief descriptions, the overlaps and gaps between Singapore and Solarpunk begin to become clear. Singapore's focus on "meaningful and fulfilled lives" recalls the characterization of Solarpunk, in which an eco-friendly infrastructure supports a high standard of living. The practical approach of reporting energy and water usage exemplifies the transparency needed in a Solarpunk society, though effective implementation of this transparency might require a more complete infrastructural redesign. More broadly, the beautification goals of the garden city underscore its aesthetic considerations, emphasizing light and abundance. However, it is unclear what role such aesthetics play in shaping core values. On the other hand, Singapore does not seem to embrace Solarpunk in its cold, distant attitude towards the environment. As political science professor Heejin Han explains in her study of authoritarian environmentalism, the country embraces an "instrumental and utilitarian view toward nature" (Han 2017). Given that the "garden city" adopts such a cold view, its development is mismatched with the Solarpunk idea of environmental harmony.

Although its location on a small island in Southeast Asia demands creative and intensive development, it can allow for the implementation of Solarpunk aesthetics and infrastructures. Singapore's approach to the environment would be contradictory at best. Solarpunk and Singapore may share similar goals, but it does not necessarily have the same approach. The technocratic nature of the "smart nation" demands a closer look at major projects in these visions, namely the Gardens by the Bay and Jewel Changi Airport. These projects, as physical enactments of the "garden city" and "smart nation" visions, reveal not only the practices and technology that make up these self-imaginings, but also how everyday people interact with them. We will see that, just like the government visions behind them, both of these projects are limited and contradictory in their solarity.

4 THE JEWEL CHANGI AIRPORT AND THE GARDENS BY THE BAY: INHABITING SOLARPUNK SPACES?

Poet Joanne Leow once described Singapore's Gardens by the Bay as a place of "perpetual spring / in a land that has known only the sea and the monsoon" (Leow 2022). As noted, there is something poetic about the environment that is captured within the carefully controlled climates of conservatories and infrastructure projects: the contradiction between oppressive tropical heat and a temperate haven along with the impossibility of indoor mountains and waterfalls. Both incongruencies underscore the sense of artistry with which Singapore builds its vision of a garden city.

Boldly embracing this image, a set of parks called the Gardens by the Bay have garnered much international attention for their ecological design since before their opening in 2012 ("Gardens by the Bay"). Most recognizable in the Gardens are the memorable sights of Bay Gardens South: two arching glass conservatories and a "grove" of Supertrees, fusion structures of natural and man-made materials that reach up to 50 meters in height (Figure 2). Of the glass conservatories, the "Flower Dome" houses collections of flowers from around the world, and "Cloud Forest" (Figure 3) features "one of the world's tallest indoor waterfalls" and a lush simulation-mountaintop environment ("Gardens by the Bay"). As constructed environments, the domes are built with energetic and aesthetic considerations that aspire to fulfill a Solarpunk vision. For instance, Designer Meredith Davey explains that the conservatories use "highly selective double-glazed [windows]" to maximize daylight while minimizing heat from the sun, a careful and considered integration of light and transparency which harmonizes the needs of the plants with the comfort of human visitors (Davey 2011). On top of this, she states that energy production uses "biomass combined heat and power" sourced from "horticultural residue" (Davey 2011), upcycling natural waste from the Gardens and other parts of Singapore in one of many steps towards a self-sus-

taining Solarpunk infrastructure. Noting that this practice is not yet in use at the Gardens, one horticultural study investigated the uses of biochar, a byproduct of the Gardens' energy production demonstrating a promising potential for upcycling this waste in horticulture and agriculture (Arora et al. 2021). The fact that such further upcycling has yet to be implemented undermines the solarly of these domes. This "bubble" of Solarpunk demands for more improvement to meet this infrastructural standard.



Figure 2: Ariel view of Gardens by the Bay, Singapore, showing the conservatory domes (left) and Supertrees

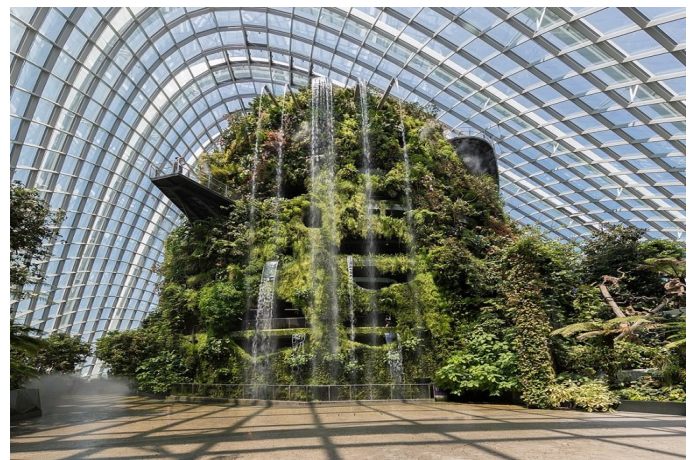


Figure 3: Cloud Mountain, inside Cloud Forest. Photograph by Basile Morin; Source: Wikimedia Commons

The exhibit-based nature of these parks marks the Gardens by the Bay as a structure with a message, not limited to being solely a development project. Critiquing the visitor experience, scholar Eng-Beng Lim approaches the Gardens as “both a performative space and a [transnational] performance,” further arguing their horticultural design inherits from British colonial imagery (Lim 2014). While Lim focuses on the Garden’s role in a “system of national feeling,” architectural professor Donald McNeill examines their technopolitics, arguing that the project perpetuates the “paternalistic” role of the Singaporean government. This fits neatly into its “Smart Nation” approach to governance (Lim 2014, McNeill 2022). Both analyses center the role of citizenship within the Gardens, re-emphasizing the role of centralization within the state-driven project. In this way, Gardens by the Bay presents contradictory messages ranging from environmental harmony and community to authority, dominance, and power, all contained within isolated projects of incomplete sustainability. Such contradictions stand in the way of any clear and concerted effort in the direction of Solarpunk.

On the eastern end of Singapore, the Jewel Changi Airport was built from a vision similar to that of the Gardens by the Bay. The project which opened in 2019, expanded the biophilic and commercial characteristics of Changi Airport. It now styles itself as a “multi-dimensional lifestyle destination” with its indoor park, a shopping mall, and a supporting infrastructure for the airport (CapitaLand 2019, Schröpfer 2015). Like in the Gardens, the structure’s extensive use of windows served multiple purposes. The glass was “fritted” (made finely porous) to “allow optimal ultraviolet penetration for the garden areas while also helping to control solar heat gain for occupant comfort” (Correa 2022). The developer CapitaLand adds the following notes regarding the panels:

“Each glass panel also has a 16 mm air gap to insulate against noise emitted from aircraft... Likewise, a series of tests and research were conducted to ensure that the glare emitted off

the glass surface will not interfere with the daily operations of air traffic controllers as well as aircraft that are approaching the two runways at Changi Airport” (CapitaLand 2019).

In this way, the project flaunts its attempt to integrate the pillar of light into its construction. To support its “more than 2,000 trees and palms and over 100,000 shrubs”, the structure also embraces natural rainwater, which is “funnelled into the waterfall and harvested for landscape irrigation systems”. The visual centerpiece of the Jewel is its memorable Rain Vortex (Figure 4), which is surrounded by the Shiseido Forest Valley and sponsored by a Japanese cosmetics brand (CapitaLand, 2019). Together, these spectacles provide the backbone of the inviting green atmosphere which greets visitors to the Jewel. Upon the opening of Jewel Changi Airport, the chairman of Singapore’s Government Parliamentary Committee for Transport, who initially had “doubts about the need” conceded that “a beautifully designed garden concept recreational centre which complements the existing airport and exemplifies [Singapore’s] position as a garden city” (Kaur 2019). Although Jewel Changi Airport differs from the Gardens by the Bay in that it de-centers the exhibition-like purpose, the Jewel has a similar potency as a national symbol. Even artists such as pop star JJ Lin have adopted the building as a symbol, featuring the Jewel in a music video to express “magical moments” in life (Fatt 2019). From the gleam of its countless windowpanes and the glitter of falling water, to its symbolic resonance, the imagery of the “Jewel” is apt.



Figure 4: The Rain Vortex in Jewel Chang Airport. Photograph by Mike Peel. Source: Wikimedia

5 DISCUSSION

Although the design of the Gardens by the Bay and Jewel Changi Airport embodies the aesthetic and ethos of Solarpunk, that embodiment is limited, if not entirely appropriated, by the structures' alternative motives and meanings. The aesthetic being a clear celebration of natural light during the daytime, also supported less-natural uses. This often-created nighttime spectacles, such as the one which greeted early-access visitors to Jewel Changi Airport in 2019 (Figure 5). Gardens by the Bay in particular, suffers an appropriation of meaning for the purposes of visual spectacle to the extent that Lim describes the exhibition as being "designed to awe, but the order of display can be somewhat categorical and even sterile" (Lim 2014). Above all, both structures suggest an underlying message of man's dominance over nature: the symbolism of capturing a mountain and taming it within a glass cage, the creation and preservation of bubbles of temperate climates within the tropical environment, and the visual spectacle of the Rain Vortex. This proud assertion of dominance strikes a dissonant note with notions of environmental harmony, though Solarpunk does not explicitly object to the use of such spectacle. Williams, for instance, highlighting the connection between light and community, explains how festivals in Solarpunk "connect the pragmatic use of solar power to a conscious celebration of it" (Williams 2019). Singapore's developments can support a Solarpunk community in at least two dimensions: spatial, maintaining celebrated parks and indoor spaces where people can gather, and visual, celebrating the solarly of Singapore's infrastructure through spectacles and festivals of lights. Though it contrasts the grassroots ethos of the literary genre, the centralization project in these developments could potentially support a Solarpunk society due to its ability to tie citizenship and community to solar architecture. Nevertheless, there is a lingering hollowness to these structures. A persistent reminder is made of the missing human-centered element that is critical to Solarpunk.

On a more practical note, the vision of an ecologically sound infrastructure is a possibility, but

a rather slim one in Singapore's current reality. Notable advancements in engineering, including the advanced glasswork and the reuse and upcycling of natural waste, have a real impact on the actual resource usage of these projects. For instance, Lim cites one study which claims that the Gardens design makes significant cuts to energy usage by up to thirty percent (Lim 2014). Though far from a completely self-sustaining model, such energy cuts make significant advancements towards a sustainable ideal and could provide some of the technological basis for a Solarpunk infrastructural redesign. On the other hand, both projects are implicated in a number of global energy and sustainability issues, such as the airline industry, consumerism and capitalism, post- or even neo-colonial power structures of investment from the Global North, and resource extraction of sand, from the rest of Southeast Asia (Mam 2018). Economically, their cost is staggering. "The Straits Times" reported in 2013 that Jewel Changi Airport project was estimated to cost 1.47 billion Singaporean dollars (Sim 2013). In 2013, this figure was roughly equivalent to \$1.17 billion USD, which in 2023 would be roughly \$1.54 billion. Moreover, both projects come at the cost of continued resource extraction and fast-paced, capital-intensive global development which is fundamentally incongruous with visions of circular economies, degrowth, and the decolonization of energy. This deep ideological conflict is perhaps the most existential question which Solarpunk faces in the ongoing energy transition.



Figure 5: Jewel Changi Airport at night. Source: CapitaLand News Releases.

6 CONCLUSION

Analysis of the “Smart Nation” in Singapore through the lens of Solarpunk reveals a complicated relationship between fantasy and reality. Solarpunk being a space in speculative fiction where light, abundance, and transparency are prioritized in an infrastructure free of ecological concerns shares some idealisms with the “Smart Nation” vision, though they differ in how they make use of nature. Two recent projects, Gardens by the Bay and Jewel Changi

Airport, exhibit a number of Solarpunk features, especially in their use of light intertwined with community and in infrastructures that enact a partially-circular ecosystem. With the weaving sunlight and greenery into their infrastructure as aesthetic celebrations, the structures make visible the pillars of light, abundance, and transparency on which Solarpunk rests. The extent to which these projects meet the genre’s self-renewing standard is limited, as their sustainability is better expressed in terms of impact mitigation rather than self-sustenance. However, novel technologies such as windows that maximize natural light while minimizing heat and renewable energy production using upcycle-able biowaste, suggest the value of pursuing these kinds of development further. The greatest challenge to the “Solarpunk-ness” of these projects is their relationship to existing social and economic structures, including capitalism, neoliberalism, and even neocolonialism, which concentrate power in a way that undermines the efficacy of a Solarpunk transition. Works of speculative fiction emphasize that Solarpunk features a “decolonization of energy” and promises “full knowledge” that the infrastructure does not harm the environment, neither of which is consistent with multi-billion-dollar technocratic development projects that support a capitalist reality. To the extent of which these top-down projects express a proud dominance over nature, they are better understood as neoliberal fantasies rather than Solarpunk realities. That is to say, Singapore’s well-publicized sustainable projects may nod to promising Solarpunk possibilities, but they raise challenging open questions about development and decolonization.

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