Revista Brasiliense de Engenharia e Física Aplicada

Vol. 9 No 2 – Outubro 2024

Mundos aquáticos: Um futuro possível ?

. Cidades e cenários antípodas

. Desenvolvimento e periferias: A Baía de Guanabara e seus desafios sociais

ISSN 2526-4192

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ARTIGOS ORIGINAIS

The Anthropic Odyssey

Macro-Imagineering Waterworlds

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Received: _08 Apr 2024_/ Accepted: _20 Apr 2024_ / Published: _12 Oct 2024_.

Abstract: This macro-imagineering essay discusses the concept of settling small productive colonies on oceanic planets like Earth in dimensions and relative positions with respect to their primary stars, and particularly endowed with hydrogen-rich atmospheres. The primary objective is to indicate that, under certain terrestrial and hydrologic circumstances, no terraforming would be necessary for the establishment of anthropic habitats, because the main resources necessary for survival can be obtained from the available liquid water. From a thermodynamic perspective, colonies could be maintained by deriving energy transferred from the oceans through the different transient processes highlighted in this study, combined with energy received directly from the primaries. The conjecture posited here presupposes an advanced stage of scientific and technological development capable of effective interstellar navigation in a solar neighborhood of at least 50/100 light years distant.

Key words: Macro-imagineering, Waterworlds, Transient technology, Liquid water.

Resumo: Este ensaio de macro-imagineering discute a ideia do assentamento de pequenas colônias produtivas em planetas oceânicos semelhantes à Terra em dimensões e posições relativas com respeito às estrelas primárias, e particularmente dotados de atmosferas ricas em hidrogênio. O principal objetivo é mostrar que, nestas circunstâncias, nenhuma terraformação é necessária para implantação dos habitats antrópicos, uma vez que a partir da água líquida disponível é possível obter os principais recursos necessários à sobrevivência. Numa visão termodinâmica, as colônias são mantidas com a energia transferida dos oceanos por meio dos diferentes processos transientes apontados no estudo, combinada à energia recebida diretamente das primárias. A conjectura pressupõe, evidentemente, um estágio de desenvolvimento científico e tecnológico capaz de navegação interestelar efetiva em uma vizinhança solar de pelo menos 50/100 anos-luz.

Palavras-chave: Macro-imagineering, Mundos oceânicos, Tecnologia transiente, Água líquida.

1. Introduction

Terraforming has been a theme much more akin of science fiction than of futuristic realism based on known science and limitations imposed by laws of nature [1]. Terraforming an alien world can be an aspiring action of macro-imagineering as part of humanity's dream of greatness. Such a noble notion conveys almost unlimited power of exploration and pioneering spirit when it is associated with a less dreamy technology of interstellar travel by allowing space journeys that are consumable in a few decades, or even in a few years. Browsing the web shows many articles that deal with near-light-speed travel theories. But, as the Nobel laureate physicist Kip Thorne has pointed out, “it will take many centuries for humans to make any of those ideas real” [2]. In actuality it is not credible that humans will achieve such feats in one or two centuries. The travel distances to be overcome are unimaginable and the challenges of biological adaptation are colossal, to say the least, and some appear to be insurmountable. However, it is human nature to want to go further. If the same "luck" persists that brought together all the fortuitous factors that culminated in the formation of the Earth and its singularly giant moon, and established the auspicious conditions for the emergence of life and, later, including the human species, one might logically conjecture a remote future where humans will tend to seek survival under the starlight of alien suns, after consuming all the resources available in this solar system. Everything seems to suggests that, if humans outlive their own vices, at some point in anthropogenic civilization may dominate a small portion of deep space with a few colonies spread across a 50/100 light year radius from our primary star. This perspective focuses on educated guesses while remembering Arthur Clarke’s visionary spirit and many speculations. What is interesting about these fun conjectures is the fact that, except for the exotic technology required for interstellar travel, the establishment of clean energy colonies in other star systems with ocean worlds is based on common, non-exotic technologies.

Because water is an essential ingredient for life as we know it, planets with large masses of liquid water are the central attention of astrobiology, although there is the caveat where an overabundance of water — whether fresh, brackish or salty — points in the opposite direction of life sustainability. This assumption is conditioned by water-rich planets with H_2-rich atmospheres that are referred to as Hycean worlds [3], which include large ocean worlds with habitable conditions underneath H_2-rich atmospheres. The presence of large water volumes is inferred from the combination of mass, density, and planet physical diameter. For instance, the low density of the twin planets **Kepler-138 c** and **Kepler-138 d** (both located in Lyra constellation at 218 light-years away, twice Earth's mass and about half of Earth's density) indicates that they must be composed mainly of water. It cannot be assumed that there oceans are similar to those on Earth because it is possible that they may be a water phase occurring at high pressures, the so-called supercritical fluid (Figure 1). Additionally, earth-sized planets orbiting the very cool red dwarf **TRAPPIST-1** (Figure 2), around 40 light-

years from Earth, could be watery [4]. But, our approach does not concern the plausibility of the existence of life, a subject that has already been widely discussed by Serpa [5], Serpa & Cathcart [6] and Serpa [7], but rather focuses on the plausibility of the establishment of specific colonies in aquatic worlds that one might term "aquawelts"[1].

This essay extends macro-imagineering beyond terrestrial borders and ventures into extra-solar domains in an effort to project an alternative remote future, should humanity survive itself. While we remain far from such achievements, it is hoped that this work will motivate more projects and investments in simple and clean energy transformation technologies, exploring the technical potential of the different ocean energy processes that shall vary accordingly to further developments.

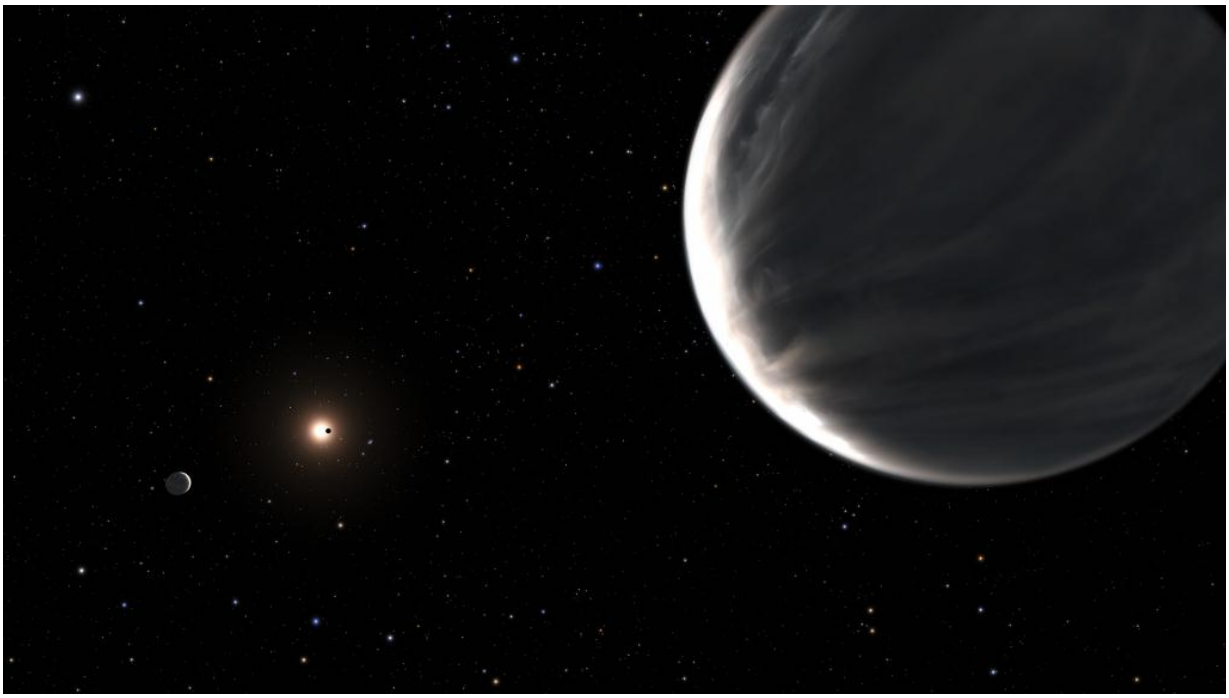

Fig 1. An artistic illustration of Kepler 138 d with Kepler-138 c at left, and Kepler 138 b transiting its parent star (credits to NASA, ESA, and Leah Hustak (STScI)).

[1] A combination of '*aqua*' for water and '*welt*' from the German for world.

Fig 2. An artistic vision of the TRAPPIST-1 system (credits to NASA, Jet Propulsion Laboratory).

2. The search for Waterworlds (Aquawelts)

The discovery of thousands of exoplanets has triggered all types of important researches and simulations to support the detection of atmospheres and the determination of the surface characteristics of the orbs. Overcoming uncertainties in this field, however, remains a challenging mission, despite the recognized progress of recent years.

Particularly, the detection of global liquid water surfaces, involving more than the combination of mass, density, and planet physical diameter, necessitates the establishment of other critical parameters in order to draw consistent and reliable conclusions because these observations involve some indirect assertive routes. An interesting and straightforward approach helping to identify exo-oceans was based on simulations of flux and/or polarization measurements of the light from the parent star reflected by exoplanet surfaces at wavelengths from 350 to 865 nm. This assumption supposes an ocean surface with waves composed of Fresnel reflecting wave facets and whitecaps [8]. Scattering within the water body is included. Their investigation started from a light column vector defined by

$$\mathbf{F} = \begin{bmatrix} F \\ Q \\ U \\ V \end{bmatrix}, \qquad (1)$$

where F is the total flux, Q and U are the linearly polarized fluxes, and V is the circularly polarized flux. The researchers assumed that incident starlight on the planets was unidirectional and unpolarized. The reflected starlight is polarized when scattered by gases, aerosol, or cloud particles through the planetary atmospheres and/or by reflection off the surfaces [8]. The degree of polarization of the reflected starlight was defined as

$$P = \frac{\sqrt{Q^2 + U^2}}{F}, \qquad (2)$$

where V is ignored because it is expected to be very small. The researchers performed the simulations covering the planetary disk by a grid of pixels, summing the fluxes reflected by each of the N pixels that are illuminated by the parent star. Influences of the ocean color, clouds and wind speed were considered. Detailed descriptions of the math are available and easily understandable in reference [8].

Those computer simulations provide an overview of what can be expected from the observations according to the theoretical background developed. Increasingly sophisticated orbital telescopes like the James Webb promise observations whose accuracy will take us closer to the reality of the neighboring worlds that intrigue us and instigate our macro-imagineering.

3. A realistic approach to exocolonies

Oceanic planets dimensionally similar to Earth and relative orbital position are particularly attractive for the settlement of small scientific colonies, strategic support star bases, and technological development centers. This type of situation is especially attractive if planets are comprised by an underlying rocky core. This kind of situation obtains precisely because the energetic foundation of anthropic activities in such worlds is easily discovered in observable hydro-dynamics of the ocean, this subject is well known in its connections with solar energy, which has provided a physical basis for the rise of clean technologies that are simple to implement. More than that, hydrogen processing and the direct use of thermal energy provided by the primary star are essential complements to battery charging system. Nothing exotic is required. It is not

necessary to terraform a waterworld (aquawelt) for such endeavors. All that is required in environmental terms is a suitable star, oxygen, and hydrogen, where daylight and whatever kind of water is present. These colonies could form networks of laboratories, accommodations, and various facilities, forming small floating cities, processing water desalination, hydrogen, and other atmospheric components for various purposes (Figure 3).

Fig 3. The network of a small floating power city (credits to https://www.freepik.com).

Fig 4. Power plant with mechanical arms to convert wave kinetic energy (credits to https://www.freepik.com).

Based on what is known from experience with Earth's Ocean, in a typical Earthly waterworld (aquawelt), without obstructing landmasses, there are five different main oceanic sources that can be used to implement transient technologies to perform useful work:

1) Waves on the upper surface of the oceans created by transfer of wind kinetic energy to water (Figures 4 and 5);
2) Ocean Thermal Energy Conversion (OTEC), which has been detailed by Serpa [9], based on temperature differences between stellar thermal energy stored in upper ocean layers and the coldest layers around 1,000 m below. In order to operate an OTEC power plant, a minimum temperature difference of 20°C (Figures 6 and 7) is needed;
3) Ocean currents driven by wind (Figure 6) and associated with inertial effects (Coriolis forces);
4) Tidal rise-and-fall derived from the gravitational interactions within the planet-star system, or, planet-moon(s)-star system if that is the case (also Figure 6).

Although there is substantial uncertainty in ocean energy's technical potential, to take an idea of the energetic power of the ocean motion, Krewitt *et al.* [10] reported (for 2050) a global technical potential of 331 EJ/yr that is predominantly derived from OTEC (300 EJ/yr) and wave energy (20 EJ/yr). This is questionable, of course, but based on literature searches, it appears to be the most realistic approach in the context of current technological development.

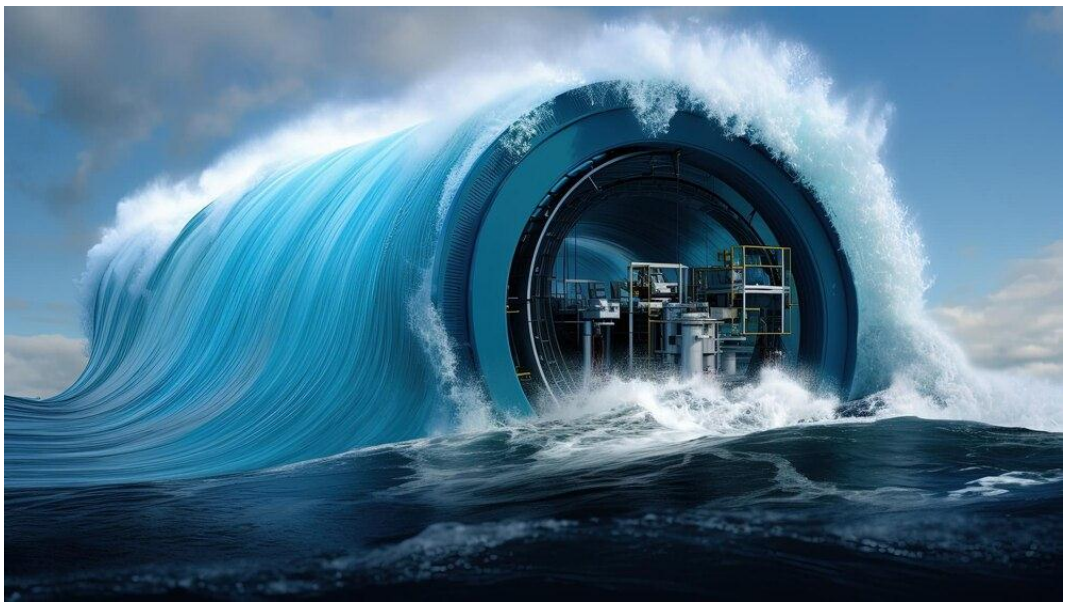

Fig 5. Ocean energy system for wave power generation (credits to https://www.freepik.com).

Fig 6. Transient towers to use both kinetic energy sea currents and OTEC operation (credits to https://www.freepik.com).

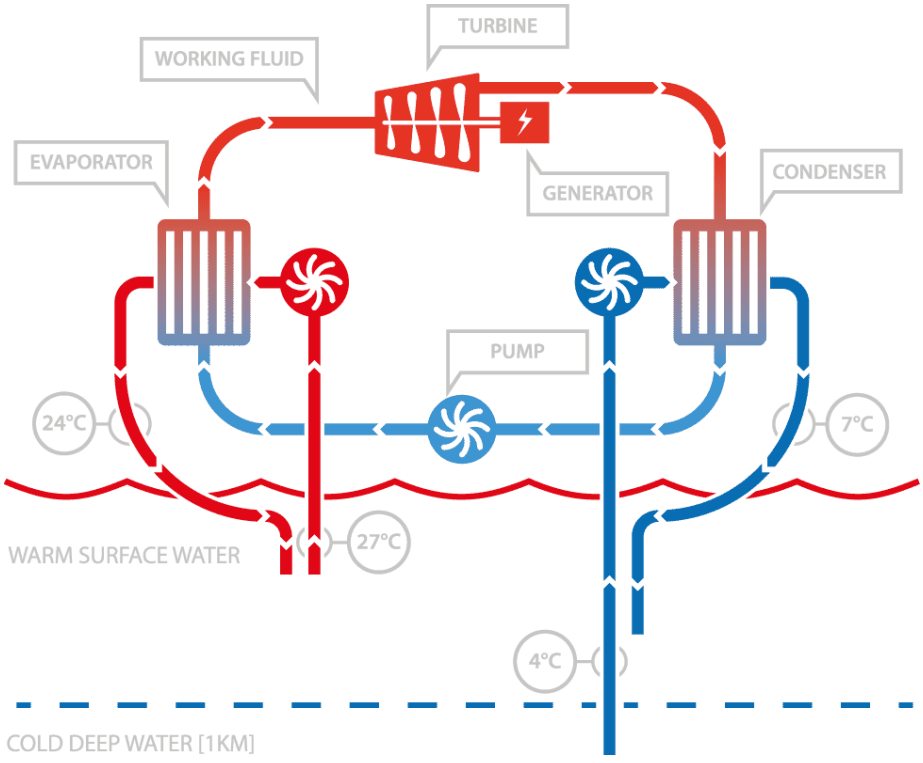

Fig 7. Basic scheme of an OTEC system (credits to https://globalotec.co/what-is-otec/).

Thermodynamics is the physical science of economy and efficiency par excellence. For this reason, the cost-effective supply of clean energy provided by OTEC systems is extremely attractive both for its obvious advantages in ecological and environmental savings and for its easy-to-apply operating principles based on the availability of energy originating from the primary star (most of the time a red dwarf is expected). Requiring less land than other renewable energy technologies, OTEC plants present immense potential for generating useful energy, perhaps even greater than that of other renewable sources. They can even be implemented on floating vessels or platforms (Figure 8).

Aswad *et al.* [16] summarized and applied the approach of Uehara and Ikegami [17] to simulate and calculate the power generated from the turbine in an OTEC system in Bali Sea accordingly two fundamental equations:

$$P_G = m_{WF}\eta_T\eta_G\left(h_1 - h_2\right), \qquad (3)$$

the turbine power equation, where P_G is the generator power (MW), m_{WF} is the mass flow rate of the working fluid (kg/s), η_T is the turbine efficiency = 0.85, η_G is the generator efficiency, and $h_1 - h_2$ is the decrease in adiabatic heat between the evaporator and the condenser shown in Figure 7;

$$P_N = P_G - \left(P_{WS} + P_{CS} + P_{WF}\right), \qquad (4)$$

the corresponding net electrical power equation, where P_N is the clean electric power (MW), P_{WS} is the warm sea flow pump power, P_{CS} is the cold sea water pump power, and P_{WF} is the working fluid pump power (see Figure 7).

Substantial attention is given in this essay to the OTEC system for obvious reasons of practicality and economy, not precluding the combined use of the other forms of clean energy production listed above. As can be concluded, using temperature gradients between the sea and the deep sea in the tropics of an earthly oceanic planet, the production of electrical energy on a large scale is perfectly plausible, as is furthermore proven by the simplicity of the principles involved and the extensive literature known on the subject.

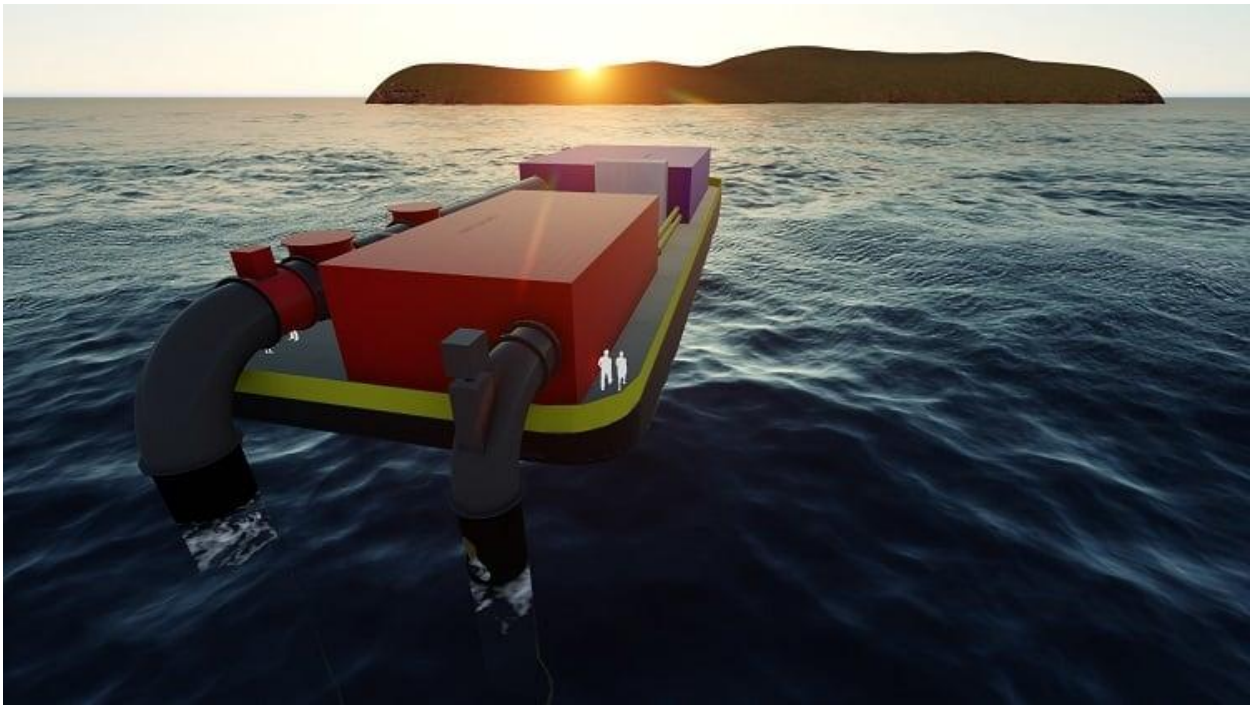

Fig 8. An OTEC system housed on a floating vessel (credits to https://maritime-executive.com/).

4. The Earth Example

Macro-imagineering's many published proposals for large-scale geographical technical interventions on the Earth have ignited modern-day considered thoughts about potential implications for global governance. However, it was the masterful geoscientist Rhodes W. Fairbridge (1914-2006) who vigorously promoted the concept that the solar system regulates Earth's basic climate regimes [11]. Governance, always an iffy and unceasing attempted effort, will soon be made more effective by the inauguration of a digital twin of planet Earth's Ocean [12]. Earth's tidal forces, an incessant flux of motionful seawater, are connected to solar and lunar rhythms that inexorably shift millions of metric tons of seawater and materials–at high speeds. Geoscience experiments led by Macro-imagineering may be the intellectual discipline that venerates real-world Earth and far-distant similar Earth observation most seriously [13].

While in limited circumstances technology's development can seemingly decouple society's economic growth from some oceanic impacts, but such is not usually the case. Since 2017, the SEABED 2030 mapping effort has been undertaken to chart the entirety of the world-ocean's floor. It has so far achieved about a ~25% mapping outcome. (Importantly, that is the equivalent of being fully aware of just ¼ of your home's multiple rooms!) Nevertheless, as Andrew Goudie indicated in his 2023 book *Landscapes of the Anthropocene with Google Earth*, the opaque and deep world-ocean is becoming more clearly defined and

intensely studied by experts desiring to learn its factual elements with increasing accuracy. So, it is obvious that some near-term future author will need to pen *Seascapes of the Anthropocene with Google Trappist-1*.

Earth-orbiting satellites, remote imagers, have already shown how geographically extensive is humankind's industrial actions on the world-ocean [14]. Extending that view, others have described the many potential intrusions on and in the world-ocean that are technically possible in the future near-term [15]. As arm-chair spectators and speculators, we cannot add much to these two documents except to say that caution must always be exercised to all interference with the circulation of the Earth's world-ocean, its living and inorganic contents, as well as its outstanding beauty!

5. Conclusions

This essay can be seen as a natural consequence of the macro-imagineering that has been widely discussed in several editions of *CALIBRE*, something that has already become a mark of boldness and modernity of the thinking minds dedicated to the topic. Despite the focus on a distant hypothetical future, the technologies discussed are classic expressions of anthropogenic activity upon the laws of Nature with practical purposes, configuring highly feasible technical suggestions for present-day energy conversion and cleaner production here on our suffering homeland planet, and, in prospective centuries, on the aquawelts that we colonize. In current global circumstances, it is unwise to make predictions for the next centuries, or even for the next fifty years. Devastation is accelerating and profit interests are rampant. In the escalation of environmental destruction, the voices of positive transformation are often drowned out by the fanfare of pathetic consumerist ideologies and technological futility. The future of humanity is unknown, but we can reduce the spectrum of possible negative outcomes if we focus our efforts on concrete objectives for the survival and good of the species *Homo sapiens sapiens*, not on futile and immediate lucrative goals that could result in planetary ecocide.

References

[1] Serpa, N., & Cathcart, R. (2021). Terraforming worlds: Humans playing games of Gods. *Terraforming Mars*, 23-36.

[2] Thorne, K. (2014). *The science of Interstellar*. WW Norton & Company.

[3] Madhusudhan, N., Piette, A. A., & Constantinou, S. (2021). Habitability and biosignatures of hycean worlds. *The Astrophysical Journal*, *918*(1), 1.

[4] Grimm, S. L., Demory, B. O., Gillon, M., Dorn, C., Agol, E., Burdanov, A., & Queloz, D. (2018). The nature of the TRAPPIST-1 exoplanets. *Astronomy & Astrophysics*, *613*, A68.

[5] Serpa, N. (2019). Fermi's Paradox and restraint orders: Why does no one respond? *CALIBRE-Revista Brasiliense de Engenharia e Física Aplicada*, *4*, 1-17.

[6] Serpa, N., & Cathcart, R. B. (2021-b). Magna Cosmogony. *CALIBRE-Revista Brasiliense de Engenharia e Física Aplicada*, *6*(3), 1-14.

[7] Serpa, N. (2022). The structure of space-time and the emergence of complex life. *CALIBRE-Revista Brasiliense de Engenharia e Física Aplicada*, *7*, 1-28.

[8] Trees, V. J., & Stam, D. M. (2019). Blue, white, and red ocean planets-simulations of orbital variations in flux and polarization colors. *Astronomy & Astrophysics*, *626*, A129.

[9] Serpa, N. (2017). Terraforming the Aral Sea Basin: Geomorphological and anthropogenic foundations (second part). *CALIBRE-Revista Brasiliense de Engenharia e Física Aplicada*, *2*(2), 28-38.

[10] Krewitt, Wolfram, Nienhaus, Kristina, Klessmann, Corinna, Capone, Carolin, Stricker, Eva, Graus, Wina, Hoogwijk, Monique, Supersberger, Nikolaus, Winterfeld, Uta von, & Samadi, Sascha. *Role and potential of renewable energy and energy efficiency for global energy supply*. Germany.

[11] Mackey, R. (2007). Rhodes Fairbridge and the idea that the solar system regulates the Earth's climate. *Journal of Coastal Research* 50: 955-968.

[12] Chen, G. et al. (2023). Toward digital twin of the ocean: from digitalization to cloning. *IMTS: Intelligent Marine Technology and Systems* 1: 3.

[13] Minunno, R. et al. (2023). A systematic literature review considering the implementation of planetary geoengineering techniques for the mitigation of sea-level rise. *Earth-Science Reviews* 241: 104431.

[14] Paolo, F. et al. (2024). Satellite mapping reveals extensive industrial activity at sea. *Nature* 625: 85.

[15] Mastrantonis, S. and Dubininkas, V. (2023). The next frontier: Human settlements in the marine environment. *Futures* 140: 102953.

[16] Aswad, I., Yusal, N., & Ridwan, A. (2021). Analysis of Ocean Thermal Energy Conversion (OTEC) potential using closed-cycle system simulation of 100 MW capacity in Bali Sea. In: *Proceedings of the 7th International Seminar on Ocean and Coastal Engineering, Environmental and Natural Disaster Management* (ISOCEEN 2019), pages 13-21.

[17] Uehara, H., & Ikegami, Y. (1990). Optimization of a closed-cycle OTEC system. *Journal of Solar Energy Engineering*, 112: 247-256.

The Sale of Two Cities

A Scalar Example of Antipodal Scenarios in California and Brazil

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Received: _18 Apr 2024_/ Accepted: _25 Apr 2024_ / Published: _12 Oct 2024_.

Abstract: In terms of antipodal city brandscaping, the Southern Hemisphere megapolis of Rio de Janeiro (population of ~14 million) markets itself globally as Brazil's "Tropical Silicon Valley" while the small Northern Hemisphere State of California City of Burbank (population ~100,000) brands itself worldwide as "The Media Capital of the World". Both large and small cities thus espouse false-front appellations where political camouflage for hyperbolic macro-imaginary symbolisms are unconvincing and destructive. Extant urban infrastructures, which in Social Physics [1] are termed "Mass", are perceived as physical asset banked accounts that are deemed inadequate to safely house everyday workers but are ironically lauded as sufficient for elitists who exclusively operate broadcast and Internet-based businesses. Here, fundamental factors affecting the success or failure of these two urban planning outlooks are based on comparison of a large Southern Hemisphere megapolis (Rio de Janeiro) and a small Northern Hemisphere urbanization (City of Burbank). These pending spatial adjustments demonstrate that, in practice, present-day goals of these two self-identified "Smarter Cities" of the Americas are plagued by yesterday's unintelligent *Homo sapiens urbanensis* choices for landscape and waterscape uses. It is thus posited that syncretic solutions are desirable where taxpayers and small businesses unite against duplicitous political forces in public media arenas that are based on strategic misrepresentations.

Key words: Guanabara Bay, Burbank (CA), Rio de Janeiro, Metabolism architecture, Los Angeles River.

Resumo: Em termos de paisagismo de marca urbana antípoda, a megalópole Rio de Janeiro (população de ~14 milhões) se comercializa globalmente como o "Vale do Silício Tropical" do Hemisfério Sul, enquanto a pequena cidade de Burbank, estado da Califórnia, no Hemisfério Norte (população de ~100.000), se comercializa mundialmente como "A Capital Mundial da Mídia". Tanto as cidades grandes quanto as pequenas, portanto, adotam denominações de fachada, onde a camuflagem política para simbolismos macroimaginários hiperbólicos é pouco convincente e destrutiva. As infraestruturas urbanas existentes, que na Física Social [1] são denominadas "Massas", são percebidas como contas bancárias de ativos físicos que são consideradas inadequadas para abrigar com segurança trabalhadores comuns, mas são ironicamente elogiadas como suficientes para elitistas que operam exclusivamente transações via Internet. Aqui, os fatores fundamentais que afetam o sucesso ou o fracasso dessas duas perspectivas de planejamento urbano são baseados na comparação de uma grande megalópole do Hemisfério Sul (Rio de Janeiro) e uma pequena urbe do Hemisfério Norte (Cidade de Burbank). Esses ajustes espaciais pendentes demonstram que, na prática, os objetivos atuais dessas duas autoidentificadas "Cidades Mais Inteligentes" das Américas são afetados pelas escolhas não inteligentes do *Homo sapiens urbanensis* de ontem para usos de paisagens e meios aquáticos. Portanto, é postulado que soluções sincréticas são desejáveis onde contribuintes e pequenas empresas se unem contra forças políticas enganosas em arenas de mídia pública que são baseadas em deturpações estratégicas.

Palavras-chave: Baía de Guanabara, Burbank (CA), Rio de Janeiro, Arquitetura do metabolismo, Rio Los Angeles.

1. Introduction

Geographical story-telling scenarios, effectively deployed, are an important conflict and confrontation element lodged between unjust present-day narratives and just narratives. When properly executed, geographical story-telling disables societal progress-crippling imaginaries while improving replacement imaginaries in real-world geophysical and social conditions. “Scenarios” — originally a term abstracted from Baroque theater by Hollywood screenwriters — is used by many 21st Century urban planners to retrofit, redesign, repair, and repurpose urban infrastructures at myriad geographical scales. However, in the City of Burbank (California) and Rio de Janeiro (Brazil), intransigent empowered politicians and citizen-paid participants in industrial class-centered transformational operations ignore their legal obligations. By disregarding obligative return value on extant public infrastructures, unethical politicians deploy ostentatious infrastructures that advertise their “branded” stylized politics! Concerned citizens thus struggle with calcification of corrupt civic governance regimes. Complex 21st Century urban identity politics is thus rife with unfair economies that are dominated by elite donors who (falsely) promise alleviation future poverty.

In 1964, geoscientist John Thomas McGill (1921-1987), referred to urban underpinnings as: “A major phase of master planning is the evaluation of the advantages and disadvantages of one use of land as compared to other use, […] to make planning and zoning possible for conservation and maximum beneficial use of land […]. Sooner or later we all pay, directly or indirectly, for unintelligent use of land” [2]. Construction of future Smart Cities requires an effective and optimized understanding of surface and subsurface conditions. Such aspirations are ideally achieved by holistic approaches that amass complete local authority networks, planners of variable persuasions, legal regulators, geographers, and private-sector macro-engineers. Feasibility is thus approached by linking providers of potable water, energy (e.g., natural gas, electricity) and public transport coupled with representation from historical and museum societies. For instance, citizens in a modern-day impressionistic depiction of the City of Burbank received impressive technical assistance from volunteer-staffer local history experts working at the apolitical Burbank Historical Society (founded 1973; http://burbankhistoricsoc.org). Its comprehensive museum buildings (existing from AD 1907) contain records of the first USA-patented monorail, designed and built in Burbank. Although not dramatically perched over its urbanized surroundings as the Niteroi Contemporary Art Museum, a saucer-shaped building that offers cliff-top viewers a spectacle of Rio de Janeiro’s magnificent and variably valuable beaches, it nevertheless is a conducive consultatory home for Burbank’s unpaid cadre of astute potential oracles [3].

Seventy-six years passed before the wired telephone was used by more than half the planet's populace yet the wireless Smart Phone was adopted in about a decade [4]. How might individual dedicated humans in Rio de Janeiro and the City of Burbank use private-sector aerial and submarine drones to update the various official maps of their respective urban areas? Such gathered data is openly available for multiple purposes related to conservation and development! In other words, future public-works planning can now be liberated from compromised (secretive) governmental approaches. Secret planning is accomplished by government staffers and corporate advisory committees that are sequestered from public perusal. Frequent immodest use of veiled electronic media unfortunately serves professionals in the Politics Industry for personal career progressivism. Although the Hollywood Burbank Airport (BUR) is separated from the Santos Dumont Airport (SDU) (serving Rio de Janeiro) by a flight-distance of about 10,225 km, there are profound similarities that are correctible and not assumed to be infrastructure inevitabilities!

2. Bad planning, Part I: Burbank is unnecessarily fractured geographically

Situated between the Verdugo Mountains and the Los Angeles River, the City of Burbank's century-old infrastructure is comprised by power plants and freshwater hydraulics (e.g., pipelines, canals, waterways) that represent an unbalanced "taxpayer's real-world savings account". Socially-imposed temporal shifts of infrastructure by natural decay or deliberate destruction of architectural and engineering works adversely impacts constructions that ought to be preserved because they serve useful purposes or are culturally beneficial. Planners often don't consider the durability of various types of infrastructure that are vulnerable to natural causes or damage because they are instigated by mendacious politicians seeking long-term careers. Examples of dubious plans for city 'improvements' are highlighted in Letters-to-the-Editor of the Burbank Leader (a local newspaper) that interestingly pose supposed low-cost development scenarios such as (1) "City's No. 1 Powerhouse Might Be Fossil Fuel-Free" (18 December 2023) and (2) "Burbank Bus Might Benefit From 'Hovercraft Route'" (26 February 2024). Use of dry geothermal heat to generate electricity locally might be less polluting than combustion of natural gas and a reconductoring of California's upgraded electricity transmission system would allow other renewable electricity sources, while hovercraft could theoretically ply an unimproved water-route bypassing the need to resurface roads with asphalt or concrete! In the big picture, these proposals do not meet practical needs and contribute to politically deceptive advertising that fractures pie in the sky ideas from common sense approaches.

Another common descriptive phrase for civilization's "savings account" is the totalizing "stock and flow" concept of urban Burbank's "city metabolism." A delightfully cherished city is more than a facet of economic geography because it contains loci that interlink image and style, placenames, and histories, with

inhabitant's daily vicissitudes and dreams. Like so many other cities, the periphery of Burbank is threatened by developers who are associated with aggressively competitive private and public institutions. The result of this potential engulfment is that Burbank's "city metabolism" is abused by persons who are not familiar with unique local societal preferences. The main drawback of the current so-called expert-favored circular use/cleansing of floodwaters and underground freshwater resources scheme is that it will eventually terminate Burbank's infrastructural expansion (horizontally and vertically). This scheme will thus present local taxpayers with the prospect of status quo "resilience" because infrastructure resilience is fundamentally at odds with infrastructure optimization. Many Letters-to-the-Editor printed by the Burbank Leader voice strong public desire for immediate landscape restoration via reforestation and re-suburbanization. These desires are commensurate with people everywhere in Earth's bioshell because they can only habituate to whatever is permanent (long enduring) in their life-style realm. In their collective official perceptions, politicians and support staff tend to view experts working on a problem and their composite solutions as a collective network of individuals (sometimes including volunteers) that are scattered about the City's discontinuous governing core offices. Career managers and administrators tend to primarily focus on detailed responsibilities, as defined by contrived Statement of Missions. Some of these mission statements are so narrow that they preclude broad overlook of citizen-beloved City of Burbank! The term "network" is a referential term that is used to communicate management's electrified (almost spirit-speak) promise to symbolize a town that is socially united. Contrarywise, networks are demonstrably the actual medium for controlling social conflict. By way of one example, although Burbank websites contain information dating back to the city's establishment in 1911, the jargonized geographical information masks what is really needed, wanted, or desired by taxpayers.

Imbued with stylistic innovation, private-sector developmental suggestions are indispensable to the flourishing of a cultural milieu. Organization of Burbank taxpayers can thus become a pervasive informally networked municipal adhocracy. Idiosyncratic reports by non-governmental planners are noteworthy because they can endow socially pre-eminent and technically-intercommunicated persons with a tactical edge. Yet, such endeavors may simultaneously expose purveyors of avant-garde ideas to potential public disapproval or even lifetime disgrace. (Never forget the post-1910-1912 AD undeserved mockery heaped on the bodacious noted Burbanker patentee, Mr. Joseph W. Fawkes after he audaciously proposed his 97 kilometers per hour Burbank-Los Angeles non-robotic connecting monorail rapid passenger/freight transit system.) This real-world dichotomy is paradoxical at both individual and stratified organizational scenes. Nevertheless, there may well be prevailing civic consenses on the importance of public input. At least that observation is repeated by public relations experts and lobbyist swarms! Taxpayers, however, usually never desire macro-

project proposals from irrational local provocateurs. This collective insight of citizens is based on previous experience revealing that insensate proposals generally result in undesired extreme future financial obligations. Inattention by the citizenry often results in prideful authorities who are made famous by elevation to semi-controlled stardom fostered by networked professional public relations mouthpieces. The ultimate result of a laissez-faire taxpayer attitude is that they can be lawfully led to monetary bondage by unwise City Councils, the member of which can confer secretly in exclusionary Chamber meetings.

Such was the monitored instance for a local major airport soundscape, a City of Burbank "atmospheric" if ever there was one! Facing Rio de Janeiro's scenic Guanabara Bay, the unextendible dredged landfill Santos Dumont Airport, like its counterpart of the Hollywood Burbank's airport, is a short distance (less than 5 kilometers) away from the Central Business District and central town government offices, but SDU is served by a light-rail system of transportation. That problem is one of "volume control" like the too-loud unmodulated sound system of a mismanaged Media Center movie theater. Nowadays to many common folks the obsolete downtown Media Center shopping mall, functionally an "off-ramp" for the #5 Freeway, is as unattractive as a neon-festooned low-rise Alcatraz Island in sewage polluted San Francisco Bay in northern California the situation strongly resembles Brazil's equally picturesque, but grotesquely abused Guanabara Bay. Not yet finished, USD $1.2 billion new Hollywood Burbank Airport Terminal will not raise its valid geographical description to that of an "aerotropolis"! No airport is a liberating palace-place but more like a place of incarceration. Burbank's air-travel-centric infrastructure is being created to by its political and bureaucratic elite. These ambitious persons sometimes wisely, and sometimes not so wisely, create a civic mythology that serves mainly their purposes, but which is mostly financed by monies coming from elsewhere. Such people have pledged their allegiance to the modern-day fiction of "inevitable Progress".

Because no infrastructure is ever completely stabilized, either politically or from the effects of ordinary physical decay, all infrastructure eventually succumbs to municipal despair. Burbankers everyday lives are framed by their ambient environment, such as the soundscape of the City's airport. If the State of California's High-Speed Railway intended to link San Francisco with Los Angeles, as planned by the approved 46 km-long segment known as SR14A, then several lengthy bored tunnels will pass beneath the City of Burbank, taking 7+ years to excavate and guesstimated to cost possibly USD $600 million per kilometer to dig. As officially mapped by mid-2024 AD, bored under Burbank's modernized airport, then paralleling the #5 Freeway southward to downtown CBD Los Angeles. Construction, when undertaken, would likely disrupt Burbank's underground water-supply pipes, its electricity distribution system, and its Internet cabling network besides causing surface roadway traffic disruptions. What is no longer a matter of public controversy is a singular fact: The High-Speed Railway project is the most egregious macro-engineering failure in the

history of the State of California. Burbank would do well to subvert and/or prevent this almost imaginary macro-project from crossing the City's boundary in any way or imaginable configuration.

Burbank abuts Los Angeles County's most insidious and gangrenous 21st Century urban infrastructure, the decayed City of Los Angeles. There, professional politicians have become societal morticians. The division occurs at the banks of the Los Angeles River. Experts warn the public of regional climate change and certainly any climatic variation will alter incur increased or diminished runoff to the Los Angeles River. Consequently, future need for hydraulic regulatory installations is likely. Like the State of California, Rio de Janeiro State, along with the former capital city's Guanabara Bay, have been adversely impacted by unprecedented regional drought conditions of the nearby Cerrado [5]. Burbank's section of the Los Angeles River, which is, in toto, 94% concrete banked and 75% hard bottomed — could theoretically be enhanced by emplacing an inflatable dam near its borderline with the City of Glendale. When enlarged, the dam could form a temporary shallow "Lake Burbank" after winter rain storms but before the heat-island forming days of summer. In other words, local urban heat mitigation caused by an artificial water body could absorb heat and cool adjacent neighborhoods through evaporation, a function much like that which Guanabara Bay naturally does for the international metropolises of Rio de Janeiro and Niteroi in Brazil. Supplemented by Burbank owned geothermal heat, possibly a spa-oasis commercial attraction might be developed.

Following the AD 2020-2022 drought years, the State of California endured nine consecutive major rainstorms over a three-week period during the winter of 2022-23. Note that Warner Bros., which had its sloped riverside parking lot eroded by the epic March 1938 flood, filmed its 1982 Blade Runner based on its scripted imagining of Burbank as a circa-2019 rainy dystopia. It would thus be prudent for concerned Burbank citizens and their leadership to think about a potentially wild Los Angeles River in a geographically comprehensive way. About 82% of the 62.4-kilometer-long river is lined with concrete and controlled like a hydraulic rapid-transit district disposal operation. That is, floods from normal and anthropogenic runoffs are allowed to descend gravitationally to the Pacific Ocean as fast as possible, resulting in a profitless river of zero return. About 11.4 kilometers of soft-bed pseudo-natural segments are currently uncovered because high groundwater tables do not allow permanent concrete emplacement. This means that there is a surfeit of subterranean freshwater that precludes some types of impermeable encasements. However, a 1979 Superior Court ruling awarded the City of Los Angeles all rights to groundwater under the City of Burbank. Meaning, that future geothermally heated freshwater use by Burbank will necessitate payments derived from taxes, either to Los Angeles or the Metropolitan Water District-California State Water Project.

For the year 2025 and beyond for the foreseeable future, the State of California will become more financially problematic, even significantly less superCALIFragilisticexpialidocious than in its more pleasantly memorable 20th Century past. During these harshening economic times, the 1957-1958-built Burbank section of the west coast-parallel I-5 interstate freeway (which stretches from San Diego, California, in the south to Vancouver, Washington, in the north), might slip from a lustrous state-of-mind descriptor to a toponym far less enjoyable, the Pyrite Freeway. The Metrorail tracks further decompose the community unity of Burbank. Sadly, an official symbol employed by the city government, a sloped-slashed B-letter, cartographically displays that rupture/scar (Figure 1), a geographical and architectural lobotomy. The symbol has a modern style, quite different from the classic "Great Seal of the State of California" (Figure 2). For this report, it might assume that "B" also signifies the ecosystem-nation of Brazil, particularly its famed Rio de Janeiro, which resembles the City of Burbank because of its tragic similarity, the existing rental and informal housing dysfunctionality and elite outsider property developer infestation.

Figure 1. City of Burbank logo in the form of a slashed letter B which could also stand for the ecosystem-nation of Brazil. Freeway #5, a geometrical construct, continues to shape local urban attitudes, beliefs, and life-styles, and yet are almost unappreciated by the citizens and government of Burbank. In other words, like internationally cherished Rio de Janeiro, the City of Burbank is formed by impractical adjacencies of buildings and structures, infrastructures and other urban components in mismatched configurations that are costly to maintain and use. Burbank's politicians and planners have permitted the penetration and perturbation of the City, "scarchitecture" is the term introduced by Roman Mars and Kurt Kholstedt in The 99% Invisible City: A Field Guide to the Hidden World of Everyday Design (2024).

Residents of Burbank are fortunate that a proposed "Riverside Freeway" planned to be gouged through the West Olive Avenue and Alameda intersection was canceled! Still, Burbank has been compromised because it is almost bisected by the I-5 Freeway and Metrorail-Southern Pacific Railway tracks. Even the SR 134 portion of the Ventura Freeway at the western edge of Burbank fosters a similar effect of Burbank isolation — and bus-based too-infrequently scheduled inter-urban transit on a restricted adjacent regional scale that is poorly developed. As of early-2024, human mobility — the movement of Burbankers at an individual or collective level from one place to another within an urban region manifests in its inherent

regularity and its anticipatory ballpark prediction underpins many important costly applications such as transport planning. Once a megaproject has emerged from the ordered atmospherics of a cleverly-contrived computer model, the sketchy drawings and three-dimension physical models, it necessarily must headbutt the facts of the real-world. In other words, sponsor expectations can be unfulfilled and designer dreams can be shattered into disarrayed components with vastly reduced economic efficacy.

During Spring 1952, Burbank's City Council members wisely refused Walt Disney's impassioned personal entreaties to construct "Disneyland" on the private Burbank property adjacent to the Los Angeles River. Pleas aside, it was rejected by the elected Council on good and sufficient grounds: noise, traffic congestion, vehicle collisions, and accidental pedestrian carnival-like atmospherics. During the summer of 1987, Disney announced intention to build on 40-acres (16 hectares) where the ABC Corporate headquarters, the Feature Animation Building and a multi-story car parking structure were eventually emplaced to become the "Disney-MGM Studio Backlot", a popular entertainment marketplace. A national economic recession, along with strategic inter-corporate economic competition signals and impending court actions by nearby Universal Studios, stifled management's enthusiasm at Disney Corp.

Social inequalities are made obvious by the distribution of Burbank's infrastructures and access to them. In order to maintain social coherence, there must always be co-production of infrastructure to promote sociality, functionally efficient spatiality, and pleasingly expressed materiality. Because of the Covid-19 plan-demic (sneaky pandemic social alterations), alarmed real-estate investors in Burbank sought protection of their wealth by introducing renters to predacious LLC "renovation evictions" schemes unrestricted by official, endemic urban plans! Those politically connected developer-instigated renovation evictions (sometimes called renovictions) all-too-often, as recorded in newspapers and on-line (https://burbankleader.outlooknewspapers.com) resulted in migrations of long-term, respectable citizens who were involuntarily compelled to vacate Burbank! Such departure of citizenry tends to weaken the social fabric and financial underpinnings of small businesses because the intertwining of businesses and customers is essential to tax-collectors. It is thus evident that by appropriate legislation and regulation Burbank's City Council needs to prevent depopulation of renters because they contribute to local businesses and thus enhance the city's tax-base.

By mid-1911, Burbank was legally incorporated and the Pacific Electric Railway tracks on Glenoaks Boulevard were opened to regular street-car use; by 1955, passenger service was permanently discontinued as was the hauling of freight. The overall effect of discontinued service was to pull Burbankers toward the adjacent City of Glendale and also toward downtown Los Angeles' Civic Center. Although today's poorly-

maintained freeways allow pass-through traffic, they do not bring new wealth to the City of Burbank. Further, it would not be financially responsible for Burbank to precede with completion of the projected Los Angeles County Metropolitan Transportation Authority's Sepulveda Transit Corridor Project (with its grotesque monorail placed above the #405 Freeway or an invisible tunnel dug below the #405 Freeway). Doing so would thus permit Burbank-bypassing traffic to enter the San Fernando Valley and usurp Burbank business opportunities. How might that worthy City of Burbank goal be achieved? With additional Los Angeles County freeways no longer contemplated publicly, vehicular traffic in Burbank appears to be one of less automotive travel. As an alternative, it is possible that a light-rail system would be less expensive than the absurd USD $1 billion estimated cost of the "K-Line" extension being built through Inglewood, California. This light-rail option might fulfill dreams of better-serving public transportation.

Burbank-based Warner Brothers' most profitable film of 1954 was THEM! In this memorable fantasy film, ants were made gigantic and voracious after being irradiated at the July 1945 Trinity Test Site nuclear-fission explosion. The ants had for decades migrated unobserved from New Mexico to the downtown concrete-lined river in Los Angeles. After arriving, the ants excavated an underground nest to serve the newly-arrived insect colonizers. Nest-excavation was made possible by the Los Angeles River's vast storm sewer tunnels. In terms of present reality, the City of Los Angeles as well as private-sector architectural firms and the US Army Corps of Engineers are dabbling with idealist natural river channel design imagery by trying to instigate re-naturalization (return to an unconcreted bed) of the lower Los Angeles River [6]. Should they succeed in convincing bond and infrastructure budget voters that such a de-constructive megaproject is wise, then those working and living beside the flash flood-prone watercourse could become endangered, subject to Nature's unbridled rapid freshwater outflows just as in the historic past! Their hazy and simplistic redevelopment concepts reek of geophysical denialism as well as utopianism: re-Naturalization is indeed rather iffy hydraulic engineering.

If implemented, the circa-2030 AD lower Los Angeles River channel de-construction will adversely affect higher elevated populations such as those working river-side in the City of Burbank at Warner Bros, for example. The flooding of cinematic facilities would clearly adversely impact the entertainment film-production industrial complex related to "Hollywood", which symbolizes the Los Angeles River Basin globally. Internationally famed architect Frank Gehry, apparently, was so worried about the prospect of costly negligence litigation that he nowadays suggests cantilevered offices, apartments, condominiums, and parklands that are projected on platforms over some carefully selected parts of the still-paved Los Angeles River's potential turmoiled future runoffs. Unlike bridge piers, cantilevered structures will not impede downstream freshwater flows to the Pacific Ocean and, thus, cannot be the unwanted cause of back-flooding

upstream near the cities of Glendale and Burbank. In 1992, there was widespread institutional mulling of a costly long tunnel dug under the adjacent City of Glendale. The “Whittier Narrows Pipeline” was supposed to siphon the upper-Los Angeles River’s flashy floodwaters to an existing unlined reservoir already created by Whittier Narrows Dam. However, the dam which impounds the reservoir has been deemed in dire need of expensive structural upgrades.

Realistically, a post-2023 Los Angeles River Basin, in the grandiose visions of too-Green progressives, is a mechanism for extracting perceived productivity by encouraging particular behavior from citizens of Burbank and their immediate citified geographical neighbors. The basin urban fabric, in geophysical and artificial structural senses, is but a frayed assemblage of place-named spaces, subservient towns and cities. These locals are slightly ordered by authoritative and empowered planners through diverse idea-muddying City and County-focused governmental and corporate bureaucracies and ego-centric celebrity personalities, all driven by fictitious taxpayer’s poll-revealed will. Interlocking and simultaneous crises are causing a rift in responsibility between polliwog politicians that toady to corporate interests and voters who are disappointed by Burbank’s gradual degradation. These socioeconomic machinations are attempted to appease oligarchs of real-estate development, mainly anonymously-managed limited liability corporations (LLCs). Burbank’s political polliwogs indulge in what is known as “local-washing”, the perceptual legitimization of top-down economic and political power structures by pitting civic bureaucracy against voter-elected public leadership. Nevertheless, the Los Angeles River Basin can never be more than a temporary instrument of constantly changing culture is Southern California. Downhill runoff flooding or permanent induced seawater inundations by sea-level rise does, however, require more protective infrastructure in the lowest segment of the Los Angeles River.

On 11 July 2008, the Burbank Leader’s frontpage headline read “Studio sets its sights on iconic site”. The article was refencing the century-old Warner Bros.’ desire to erect a USD $100 million “Hollywood Skyway” aerial tramway from its Burbank property to the now 100-year-old “Hollywood” sign emplaced on the City of Los Angeles-facing western slope of Mount Lee. Although it has not been installed yet, Warner Bros. desires another, perhaps more economically attractive prospect for an entertainment facility to be achieved by co-financing a public transit hub on its property next to the Los Angeles River. Reduction and possible removal of heavy-duty truck traffic on Burbank’s over-crowded local freeways could reduce smog (brown-colored air with a metallic taste) and congestion on roadways. Imagine a cannular conveyance corridor beneath, within at mid-river or above the Los Angeles River (Figures 3-5). This main corridor would theoretically provide a fixed economic linkage for the most prosperous San Fernando Valley communities to the City of Burbank. It is thus estimated that this transport facility will be an urban renewal-like catalyst in

the upper Los Angeles River Basin. That is, some kind of nostalgia-invoking light-rail system might eventually be seen as a long-overdue necessity that is a practical re-generation of the famed yesteryear Pacific Electric Railway system of Los Angeles County. Realization of this postulated ultimate "what-if" scenario could be thwarted by the multiplicity of municipal complications that are associated with the 'Politics Industry,' including the macro-problem of chronic mismanagement!

It does not seem beyond creative cogitation that a City of Burbank-encircling autonomous light-railway could ascend West Olive Avenue, pass over or beneath the 1954-built Olive Avenue road-bridge to somewhere near City Hall, then possibly loop around the CBD, returning to a Warner Bros. hub chamber. The possibly rubber-tired rolling stock might be painted in a livery reminiscent of the Pacific Electric Railway's former vehicular all steel-wheeled rolling stock. As a safety precaution, an electronically surveilled underpass would allow cyclists safe passage below the railway and the California segment of the I-5 Interstate Freeway. The word "chamber" is used in place of the traditional concept of a "station" because Warner Bros. would likely have indoor entertainment and shopping available to travelers; inside, one might foresee an Ant-shaped VR theatre that functions like Las Vegas's popular "Sphere"!

As a civic planning trial balloon, this electronic showcase, the proposed "Sphere", must surpass the educational and entertainment value of the famed but out-of-sight Griffith Park Observatory that was opened in 1935 [7]. This proposed facility might function as a redoubt of learning, as a place for sharing knowledge that includes rituals of communities for the performing arts in the vicinity of Hollywood but distinctively separate both geographically and in execution. The objective of these proposed infrastructures is straight-forward: bring more business to Burbank from distant parts of the Los Angeles River Basin and to curtail the inroads of metropolitan (City of Los Angeles) eco-political dominance. With numerous economically non-viable shopping malls closing throughout southern California, northern San Fernando Valley suburbanites could potentially enjoy family entertainment and comfortable shopping at family-owned businesses. Because Burbank's biggest attraction features its 1950s atmospherics, its citizens could potentially reinforce Los Angeles County-wide voter demands for speedier reforestation and re-suburbanization to accommodate natural and anthropogenic regional climate change.

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Figure 2. "The Great Seal of the State of California" was adopted in 1849 AD. Due to the State's dominant political party and its faltering economic status, some wits have jokingly suggested re-interpretation of Seal contents, viz.: (I) illustrate a wildfire scarred grizzly bear; (II) show a shriveled sheaf of wheat in the Central Valley that is deprived of irrigation water; (III) an unhappy miner brandishing his Insufficient Funds unemployment cheque issued by Sacramento's budget-busting bureaucrats; (IV) replace the majestic clipper sailing ships with container vessels; (V) makeover of Minerva — the Universidade Federal do Rio de Janeiro mascot — by substituting a Smart Phone for the spear and applying numerous $$$$-sign body tattoos; (VI) discolor what is known to be a waterborne pathogen contaminated San Francisco Bay; and (VII) artistically designate the background mountain that is shown on US Geological Survey Topographic Maps as "Mount Diablo." For polluted Guanabara Bay, Rio de Janeiro State, ~40% the area of San Francisco Bay, another important person's face might adorn one of the solid rock pinnacles other than that upon which stands the AD 1931 "Cristo Redentor" reinforced concrete statue [8].

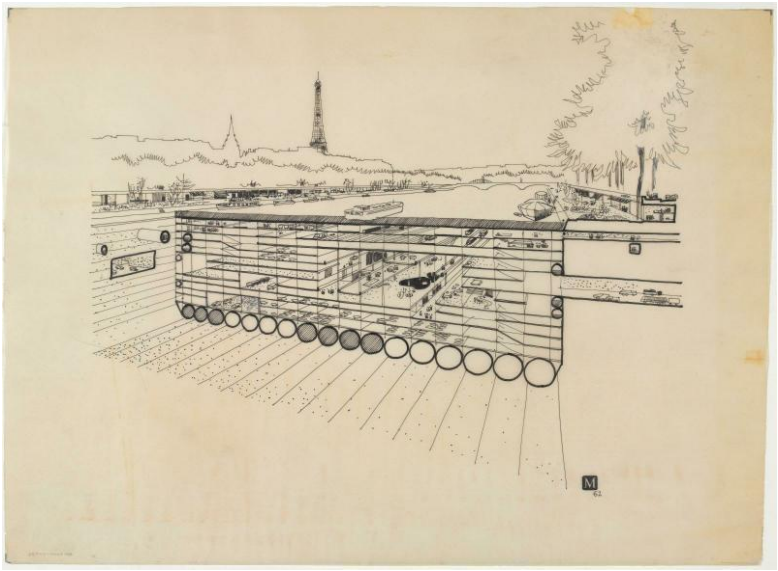

Figure 3. French architect Paul Maymont (1926-2007) foresaw transport and public utilities emplaced under the Seine River as it flowed through Paris, France. It is noteworthy, however, that subterranean utilities in the State of California can be disturbed by earthquakes, such as the seismic event of USA singer Taylor Swift's concert at SoFi Stadium, City of Inglewood on 5 August 2023. Because it is prone to flash-floods, it will not be built upon.

Figure 4. China's Hubei Province by 2015 built a 10.5 km-long road at the mid-line of its Xiangxi River to connect the town of Gufuzhen in Xingshan County to the main highway linking Shanghai to Chengdu in southwestern China. A similar highway over the Los Angeles River must be approved by the US Army Corps of Engineers and some other agencies as well.

Figure 5. Wuppertal, Germany's overhead monorail, extant for many decades, offers modern slung rail passenger service with on-board human drivers. Were this a photograph of the Los Angeles River, much plastic macro-litter would be visible to overlooking train commuters.

3. Bad planning, Part II: Rio de Janeiro is unnecessarily fractured geographically

While Burbank and Rio de Janeiro have never been, and are not now, officially-designated "Sister Cities" [9], they are by no means geographically estranged! Thus, our impressionistic report is based on representational mingling which bears unofficial information and data of a pragmatic nature. Surrounded by the mountains of the Rio de Janeiro metropolis [10], Guanabara Bay [11], one of Brazil's most important places, has comparable geomorphological and sociological features, and near-identical political creatures — not necessarily duplicating to the blood-sucking "Capelobo" that allegedly haunts Brazil's forests — to southern California's smaller population City of Burbank. For example, facing the semi-wild bank of the Los Angeles River, Burbank's current affordable housing shortage is being haphazardly addressed, so far, by legal constructions, Accessory Dwelling Units (a single ADU is an attached or detached structure that provides independent living for a person, or persons, and includes permanent provision for living, sleeping, eating, cooking and sanitation on the same land parcel as an existing single-family residence) which may portend the advent of an era of illegal State of California favelas! In both urban locales, public and private politics is masterminded by the financial and social whims of their pro-"smart city" elites, so much so that their affordable housing public need negligence appears sufficiently advanced as to be indistinguishable from obvious malice. Human mobility therein is structured by constrains of landscape geography, shaped by the geographical layout of Guanabara Bay and a mostly managed Los Angeles River.

Good geographic description requires not only respect for truth, but also inspiration and direction by a creative imagination. Urban infrastructure is often designed in isolation, yet it forms part of a geographically integrated network of real-world assets. Whilst Burbank may be media of entertainment's "unreeled' city, Rio de Janeiro is trending to become truly "real." The Instituto Brasileiro de Geografia e Estatística (established 1936) only recently accepted "Favelas and Urban Communities" as the operative enumerative category of Brazil's urban agglomerations of people living and working in, sometimes, illegal buildings on undefined property; under this definition such agglomerations are no longer officially assessed as territories that do no comply with laws and regulations but, rather, as territories having unmet rights enshrined in Article 6 of the 1988 Federal Constitution. Favela dwellers, sometimes in open defiance of Rio de Janeiro's officials, practice *gambiarra* (technical improvisation) to maintain the everyday functionality of their self-erected homes and small businesses. Globally, most young adults have chosen to live where their parents did while a smaller number moved away; that demographic fact is fundamental to having socially stable cities, the family ties, familiarity, risk-avoidance, rather than so-called economic optimization causation chains.

Could a useful definition for Rio de Janeiro and the City of Burbank [12] be that both are analogous to a sheltering building framed by laws and regulations, within which the individuals behave as inmates, an aggregation of spirited civilians performing collective action in restraint, liberation, and peaceful-lawful individual action? Jean-Jacque Rousseau (1712-1778 AD) attributed an ancient assertion to Marius Tullius Cicero (105-43 BC) to the effect that the world is a "hotel" — in our times possibly a "motel" too — in which each person stays for a few nights but that no human being ever has permanent residence here. Likewise, things built by people are not eternal or immortal. Waterfront redevelopment projects that are conceived, planned, macro-imagineered, financed and delivered locally can demonstrate urban planning and delivery practices influences, whether their outcomes are successful or unsuccessful. It is the authors' intention to offer a potential redevelopment strategy and installation specifically applicable to a shallow-draft watercraft navigable channel between greater Guanabara Bay and the post-1950 AD Ilha do Fundão on which is sited the venerable Universidade Federal do Rio de Janeiro. (Opened in 1965, Rio de Janeiro's 1.3 square kilometer Parque do Flamengo was formed by landfill; in 2012 it was heralded by UNESCO as a "World Heritage Site").

4. Guanabara Bay: archipelago assemblage ready for metabolism architecture?

Proposed infrastructures are always promoted as harbingers of modernization and further progress, while in fact the often-precarious state of existing infrastructure reflects pressing social macro-problems such as human poverty and social instability because of obvious social inequality. Burbank's citizens have mostly come to recognize the potential loss of real estate value for property adjacent to the flash-floodable Los Angeles River [13] while, at the same time, Rio de Janeiro's citizens living on steep hillsides, more and more, have come to assume future geomorphological risks owing to powerful intrusions by future South Atlantic tropical cyclones [14-15]. Indeed, in both locales, citizens suspect that truly non-representative government is closely associated with non-government organization's climate change-based coming disaster proclamations are intended by their elitist composers to rapidly alter social cohesion-context between moneyed elites and financially precarious active worker-retiree non-elites [16]. Some Burbank residents speculate that the barely regulated cluttering with ADUs of the community's riverside is a thoughtful act of subtle inducement (not a social shove, but a slight social nudge) being utilized by clever politicians and future-minded wealthy property developers, mostly outsiders, motivated by unannounced intentions for assured financial profit that will eventually generate an indisputable slum (aka, the City of Burbank's first favella created by deliberate "scarchitecture") for which costly, taxpayer-subsidized mandated "redevelopment" subsequently will become required, by mid-21st Century, or earlier. Major political

campaign donors will surely have unperceived influence on the appropriate redevelopment authorities elected or hired by taxpayers. It is possible to presume that all future real-estate redevelopments across from the abominable Guanabara Bay channel that isolates the Universidade Federal do Rio de Janeiro facility from Baixada Fluminense may also endure such schemed transformation.

The essential concept of post-WWII Metabolism Architecture is to conceive and materialize buildings and structures as safe and reasonably durable entities capable of constant change, a characteristic attributed to living humans (observed or assumed metamorphosis) with the minimalist outcome of survival. [17]. Metabolism thematized obsolescence as well as apocalypse (From AD 1942, Burbank allowed its most important aircraft production factory to be encased by a camouflagic net-megastructure — its only function then was to deceive flying enemy bombardiers by bestowing the Lockheed Corp. industrial property the appearance from above of a non-threatening wartime suburban neighborhood, a trompe l'oeil task unneeded in postwar times. The factory was replaced by a shopping mall, the Empire Center, which in 2024 assumed the odious reputation as Burbank's "Mecca of Crime". It is quickly becoming an inappropriately City-planning zone, a regrettable commercial ghost-town, almost of the kind graphically depicted in Graham Rawle's 2018 novel Overland.) The visions people have of their individual and collectivized neighborhood futures "…carry causative weight and ecological force in the real world" [18]. If life offered no scarcity of physical things and people were (by pervasive character) unselfish, possessing kind personalities of unlimited generosity, societies would not need the custom of property ownership; we know from experience that is not the case and so hierarchical bureaucracy has arisen to ensure regularity, stability, continuity, daily management-control, and citizen appeal mechanisms based on broadly interpretable rules. The central focus of governing bureaucracies is data control and knowledge manipulation — so much so, in fact, that almost any bureaucracy's modern-day electrized "smart city" administration techniques can erode real-world paid administrative duties of Mayors and City Councils. For example, the State of Rio de Janeiro's Centro de Operações da Prefeitura which monitors in real-time data from road traffic cameras, social media posts, weather stations and roving police patrol cars [19].

All the original proponents, working in Japan, of pragmatical Metabolism Architecture sought to 'futurize' reality; coiner of "megastructure", Fumihiko Maki (1928-2023) was the last member of that cadre of originators to pass from the realm of current events into human history [20]. According to academic Ricardo Rocha, the German-Brazilian architect Hartmut Freidrich Rodolf Thimel produced unique illustrated essays and maquettes that bridged Brazil's active building design professionals to Japan's innovative Metabolism Architecture philosophies [21]. However, not yet explained is the geographical scope of Thimel's interest; did his public-endorsement of Metabolism Architecture include a matching apprehension of Guanabara Bay

with, say, equivalent size macro-projects proposed for Tokyo Bay? (Guanabara Bay is ~25.6% as spacious as Tokyo Bay.) Ricardo de Souza. Rocha: "Urban density and compactness are desirable from the point of view of infrastructure and transport costs, but not very good for ecology and health" [22, page 1). Additionally, homes and apartments are boxes within a larger box, the named or nameless neighborhood, including the World Wide Web-caused virtual neighborhood taking geographical physical form today [23]. Announced during AD 2022, Japan's capital city government publicized an ambitious macro-project, the Tokyo Bay eSG Project (eSG: "e' for ecology, "SG" the last name initials of historical persons Elichi Shibusawa and Shinpei Goto), to construct a sea-level rise resistant and typhoon-survivable 1,000 ha landfill island in a mostly unpopulated part of Tokyo.

5. Rio de Janeiro's citizens, like Burbank's, can be channel changers!

Today's Guanabara Bay (GB) has the same incessant, unmanaged, and deleterious sewage-stormwater runoff seawater contamination macro-problem as Tokyo Bay had during the recent past [24]. For both territories, there is persistent macro-engineering uncertainty regarding the extent, severity, and magnitude of on-going local climate regime changes relative to the geoscientifically measured and historically documented past, including sea-level rise [25], and how plausible real-world changes will affect natural river and wastewater pipe outfall tailwater conditions at specific critical places within the respective bays, places where bay seawater circulation is weak or strong. The industrial sedimentation of GB, sourced from shipping, outfalls, smog fallout, and unclean rivers, poses a health risk because there is ineffective mitigation as well as governance corruption. Sometimes implementation strategies even exacerbate the eradicable macro-problem. The projected sea-level rise within GB by AD 2100 is not especially alarming, perhaps ~0.68 m at the shoreline of Fiscal Island [26]; that projection is, at best, an educated guesstimate because of the many contributing change factors that must necessarily be duly considered: (I) stronger intrusion of dense cold water into GB owing to seawater upwelling east of Cabo Frio [27]; (II) change in the wind-rose measure of wind direction and speed; (III) the number and density of harbor fogs [28] and (IV) changes in the coverage area of upper GB's conserved mangrove ecosystem [29]. Similarly, projections of the potential far-future floods of the Los Angeles River, as it passes at great speed through the territory of the City of Burbank, are iffy propositions, to say the least! In both instances, further anthropogenic modifications to the bay's shore and the river's embankments will likely be done at a pace that is commensurate with the taxpaying citizenry's inevitable change of environmental outlook over time.

Even though men insist on a chaotic mode of urban occupation, overloading the environment with the remains of their productive activities and the incalculable volume of waste they produce, looking now at GB, there is an optimistic expectation regarding Rio de Janeiro's citizens as channel changers. In recent months, cautiously encouraging news has been reported by environmental control bodies, such as the Secretariat of Environment and Sustainability of the state of Rio de Janeiro, referring to the recovery of the bathability of some GB beaches historically unsuitable for swimming. The bay shore at Flamengo, Botafogo and Paquetá Island are now considered examples of environmental regeneration provided by sewage treatment. Among the interventions implemented by the concessionaires — mainly the Águas do Rio, a Brazilian company that holds the concession for public water supply and basic sanitation services in the state of Rio de Janeiro —, the replacement of sewage collection trunks and other measures have caused positive impacts (82 million liters/day of water contaminated with sewage stopped falling into ocean beaches and GB) [30]. The constant environmental monitoring carried out serves to check the level of efficiency of the measures implemented by the concessionaires. Intervening, there are rumors that the literature provided by *CALIBRE* on environmental issues has been contributing, in its critical aspects, to encouraging citizens to call for the exercise of public urban sanitation policies (the high number of downloads of the articles seems to be a consistent indicator). In any case, GB, one of the largest on the Brazilian coast, with 412 square kilometers, where more than 35 rivers flow inside, has seen improvements in water quality, a fact that immediately reflects on the restoration of the local biota. In addition, thousands of migratory birds from Alaska to Patagonia pass through the region between November and March, with stops in the mangroves of GB and neighboring lagoons, particularly the Araruama Lagoon — which, despite its name, is not technically a lagoon, but a body of hypersaline water covering 160 kilometers of the coast of Rio de Janeiro State. Evidently, the number of birds has suffered a considerable reduction over the last three decades, but a significant restoration in numbers is already expected next summer. The gradual return of environmental standards from decades ago in all those areas boosted fishing activity and tourism. In addition to urban sewage sanitation, the Guardians of Mangroves Program was created in 2023 through the Municipal Secretariat for the Environment and Climate of the City of Rio de Janeiro, having the aim of recovering and taking care of the city's mangroves with the participation of residents of places directly benefited from the enterprise [30-a]. The program includes a green employability agenda, and foresees interventions in mangroves located near large favelas, such as Manguinhos, Fundão and Muzema. It is also an initiative that connects to the discussion of carbon neutralization and the retrieval of water resources in general, involving Barra da Tijuca lagoons and the iconic Rodrigo de Freitas Lagoon.

Briefly, we have now a promising start. The question is to ensure the continuity of the process — invulnerable to corruption and without the influence of personal or party interests — especially regarding complementary measures and environmental education, which is still deficient in Brazil. If *CALIBRE* literature really contributed in some way to stimulate citizens and the actions reported above, then perhaps we can hope that the technological suggestions previously presented will inspire the most daring and determined spirits to make the difference.

Because of climate change, or even the true or false speculation of it, and the increasing monetary costs of building materials and energy for earthmoving and other kinds of machines, home owners-renters and squatters will probably seek to fulfill their own human needs through self-constructions, self-repairs and social group-led communal housing plans: in other words, neglected by informationally-deficient and corrupt bureaucratized governments, people acting in their own best interests will work to foster the spread of favelas in Rio de Janeiro and the City of Burbank! The channel that moats the Universidade Federal do Rio de Janeiro is particularly pungent with pollution, both sedimentary and in seawater quality, but the macro-engineering to fix the macro-problem is complicated and expensive, and the municipal authorities can never be convinced to dedicate the money and other resources necessary to restore the channel to a markedly better condition. Dredgers would stir and resuspend the toxic channel bottom sediments, which would then need to be hauled to a waste remediation processing facility, followed by a channel bottom capping with some impermeable material to prevent unremoved pockets of sediment from depolluting the channel's slightly tidal seawater. Of course, such channels are not rare geomorphological features in Brazil [31]. In comparison, it is worth pondering what the state of the near-City of Burbank section of the Los Angeles River might become were there a Basin-wide massive management failure in the future because of, say, a major earthquake or a recurring 1930s Great (national and/or global economic) Depression!

If widespread tremie concreting were done that entombs the toxic channel sediment, it might stabilize the in-place sediment somewhat. Further contamination would be mitigated using devices manufactured to oxygenate channel bed seawater without disturbing post-tremie accumulated sediments [32]. Assembled floatable structures modeled after the concepts purveyed by Metabolism Architecture's endorsers, put together on land, and moved by tugboat to the Channel work-site [33-34], could partially cover the waterbody as a university Annex, thereby drastically reducing the deposition of any more natural and anthropic contaminations that deleteriously affect the quality of the incumbent seawater during the 21st Century. Possibly, and in part, the university Annex might resemble the Singapore Pavilion design ("The Dream Sphere") adopted for the Expo Osaka 2025 affair in Japan. An outstanding 17 m-diameter sphere, set upon a 900 square meter ground base on Yumeshima Island, from 25 April 2025 will contain a multi-story

perambulatory route for visitors featuring multi-sensorial exhibits that will, it is to be hoped, stimulate the imaginations of all those so fortunes to walk through and enjoy it.

6. Conclusion

AD 2025: it was the best of times, it was the worst of times, it was the Age of Wisdom, it was the Age of Foolishness, it was the Age of Hope, it was the Epoch of Incredulity. In brief, the pre-2025 AD period in the City of Burbank, geographically located in the Northern Hemisphere and the metropolis of Rio de Janeiro geographically located in the Southern Hemisphere was, so far, like the present-day, that some of its most verbal authorities insisted on its being received, for good or evil, in the superlative degree of comparison only. The previous is, of course, the famously epic Chapter One opening sentence of Charles Dickens' 1859 novel "A Tale of Two Cities", but here slightly emended to suit the occasion!

References

[1] Jusup, M. et al. (2022) "Social Physics" Physics Reports 948: 1-148.

[2] McGill, J.T. (1964) "Growing importance of urban geology" US Geological Survey Circular 487.

[3] Spence, R. (2024) Battle for the Museum: Cultural Institutions in Crisis (C. Hurst & Co Publishers Ltd, 288 pages).

[4] Schwab, A. and Stettner, P. (2017) "Megatrends of the future" Hydronews 30: 10-13.

[5] Strikis, N.M. et al. (2024) "Modern anthropogenic drought in Central Brazil unprecedented during the last 700 years" Nature Communications 15: 1728.

[6] Cathcart, R.B. and Finkl, C.W. (Maio 2020) "Hypo-Loop Container Freight Transport: Part I" CALIBRE: Revista Brasilience de Engenharia e Fisica Aplicada 5: 13-20.

[7] McConville, D. (2007) "Cosmological Cinema: Pedagogy, Propaganda, and Perturbation in Early Dome Theaters" Technoetic Arts 5: 69-85.

[8] Yadav, D. et al. (2010) "Earthquake Vulnerability of Free-Standing Monolithic Statues" European Journal of Scientific Research 44: 355-373.

[9] Howe, C. and Boyer, D. (2024) "Sister cities for the Anthropocene" Nature Cities 1: 330-331.

[10] Gomez, J.L.S. et al. (Eds) (2023) Rio de Janeiro (Built Environment City Studies) London: Routeledge, 182 pages.

[11] Silva, T.M. et al. (2015) "The Guanabara Bay, a Giant Body of Water Surrounded by Mountains in the Rio de Janeiro Metropolitan Area", Chapter 36 IN Viera, B. et al. Landscape and Landforms of Brazil (Springer). Pages 389-399.

[12] Crofts, P. (March 2024) “iZombie: Evil corporations, culpability and ir/responsibility” The Journal of Popular Television 12: 65-79.

[13] Orsi, J. (2004) Hazardous Metropolis: Flooding and Urban Ecology in Los Angeles. University of California Press, 316 pages.

[14] Garmany, J. and de Almeida, R.G. (2023) “Urban orientalism and the informal city in Rio de Janeiro, Brazil” EPD: Society and Space 41: 275-294.

[15] Luiz-Silva, W. and Oscar-Junior, A.C. (2022) “Climate extremes related with rainfall in the State of Rio de Janeiro, Brazil: a review of climatological characteristics and recorded trends” Natural Hazards 114: 713-732.

[16] Barbosa, L.M. and Coates, R. (2023) “Resisting disaster chronopolitics: Favelas and forced displacement in Rio de Janeiro, Brazil” International Journal of Disaster Risk Reduction 63: 102447.

[17] Bing, F.C. (1971) “History of the Word Metabolism” Journal of the History of Medicine and Allied Arts 26: 161.

[18] Rawson, M (2021) The Nature of Tomorrow: A History of the Environmental Future (Yale University Press, page 8.

[19] Kitchin, R. (2015) “Data-driven, networked urbanism (SSRN Scholarly Paper ID 2641802). Social Science Research Network, https://doi.org/10.2139/ssrn.2641802.

[20] Huebner, S. (2020) “Tackling Climate Change, Air Pollution, and Ecosystem Destruction: How US-Japanese Ocean Industrialization and the Metabolist Movement’s Global Legacy Shaped Environmental Thought (circa 1950s-Present)” Environmental History 25: 35-61.

[21] Hasegawa, J. (2023) “The plans for Tokyo Bay: the challenge of urban policy, 1950s-1990s” Urban History 1-21.

[22] Rocha, R. (2021) “The sustainable (compact) city: urban density and green space for a (post) pandemic urbanism” ACADEMIA/Letters, Article 1563. https://doi.org/10.20935/AL1563.

[23] Coutard, O. and Florentin, D. (2024) “Researching infrastructures and cities: origins, debates, openings”, Chapter 1, pages 1-49 IN Coutard, O. and Florentin, D. (Eds.) Handbook of Infrastructures and Cities (Edward Elgar: 482 pages).

[24] Nakamura, S. Oki, T. and Kanae, S. (2022) “Lost Rivers: Tokyo’s Sewage Problem in the High-Growth Perion, 1953-73” Technology and Culture 63: 427-449.

[25] Vasquez, W.F. et al. (2022) “Preferences for sea level rise adaptation: A contingent valuation study in Rio de Janeiro State. Brazil” Ocean & Coastal Management 218: 106020.

[26] Toste, R. et al. (2024) “Dynamically downscaled coastal flooding in Brazil’s Guanabara Bay under a future climate change scenario” Natural Hazards 120: 7846-7869.

[27] Fernandes, A.M. et al. (2023) “Temperature stratification in the Guanabara Bay and its relationship with wind-induced coastal upwell off Cabo Frio, Brazil: Estuarine, Coastal and Shelf Science 291: 108433.

[28] Rahim, A. et al. (2024) “Investigating the Impact of Climate and Land Use Changes on Mangrove Ecosystems: A Bibliometric Analysis from 2013 to 2023” Journal of Coastal Research 40: 768-778.

[29] Cotrim, C. et al. (2018) “Analise Observacional dos Eventos de Nevoeiros na Area de Porto do Rio de Janeiro, Brasil” Anuario do Instituto de Geosciencias 41: 123-132.

[30] Águas do Rio (2024) “Notícias”. Available in: https://aguasdorio.com.br/noticias/. Accessed on 07/10/2024.

[30-a] O Globo (2023) “O Rio lança programa de recuperação e cuidado com mangues; favelas também serão contempladas”. Available in: https://oglobo.globo.com/um-so-planeta/noticia/2023/06/rio-lanca-programa-de-recuperacao-e-cuidado-com-mangues-favelas-tambem-serao-contempladas.ghtml . Accessed on 07/10/2024.

[31] Monteiro, T.G. (2018) “Strategies and Difficulties in Living Alongside a Channel: From Spontaneous Strategies to Publicization”, Chapter 22, pages 373-386 IN Filho, W.L. and de Freitas, L>E. (Eds.) Climate Change Adaptation in Lain America (Springer).

[32] Perin, G. et al. (2020) “Preliminary Study on Mini-Modus Device Designed to Oxygenate Bottom Anoxic Waters without Perturbing Polluted Sediments” Environment 7: 23.

[33] Buraschi, G.V. and Gallo, M.N. (2023) “Hydro-morphodynamics of a dredged tidal canal, Fundao canal—RJ, Brazil” Journal of South American Earth Sciences 112: 103603.

[34] de Freitas, A. t al. (2023) “Chemical and Biological Indicators of Environmental Pollution in the Canal do Cunha (Guanabara Bay, Rio de Janeiro, Brazil): Analysis and Determination of Toxins” Journal of Coastal Research 39: 1146-1157.

The CORAL Project in Guanabara Bay

For an Almost Forgotten Peripheral Community

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Received: _08 Aug 2024_/ Accepted: _20 Aug 2024_ / Published: _12 Oct 2024_.

Abstract: This article discusses some socioeconomic advantages of an environmental development project that goes by the acronym CORAL (Brazilian abbreviation for "Lacustrine Complex for Observation, Recreation and Administration"). The CORAL project features the potential recovery of peripheral fishing communities in Guanabara Bay. Better biological and coastal management of Guanabara Bay is required because this ecosystem has been degraded by untreated sewage and oil industries installed along its shores. The purpose of the CORAL project is to link its conceptual and architectural design to public policy that targets artisanal fishermen, who fear that their means of survival is increasingly threatened in an irreversible manner. The CORAL proposal arose due to the fact that there has been almost complete abandonment of this important littoral periphery, which is rarely mentioned or seriously considered in Rio's debates on social development.

Key words: Periphery, artisanal fishing, biological and coastal management, public policy.

Resumo: Este artigo apresenta o projeto de desenvolvimento social CORAL (Complexo de Observação, Recreação e Administração Lacustre) voltado à recuperação das comunidades pesqueiras periféricas da Baía de Guanabara e, simultaneamente, ao manejo biológico e costeiro desse corpo d'água degradado pelo esgoto sem tratamento e pelas indústrias petroleiras instaladas em suas margens. A ideia é vincular o conceito e o próprio projeto arquitetônico a uma política pública voltada aos pescadores artesanais, que veem seus meios de sobrevivência cada vez mais ameaçados de forma irreversível. A proposta surgiu em razão do abandono quase total da referida periferia, pouco mencionada nos debates cariocas sobre desenvolvimento social.

Palavras-chave: Periferia, pesca artesanal, gestão biológica e costeira, política pública.

1. Introduction

Artisanal fisheries are the basis of survival for many families in the littoral zone of Guanabara Bay (GB for short). One of the peripheral areas most in need of public attention within the limits of Grande Rio (name given to the urban transshipment region of the city of Rio de Janeiro, in full process of conurbation) is the deep shore of GB, forming part of the marine border line of Baixada Fluminense between latitudes 22º40'00" and 23º05'00" S, and longitudes 43º00'00" and 43º20'00" W. Home to multiple colonies of artisanal fishermen, this peripheral area is rarely discussed by the government. This state of affairs probably exists because this littoral ecosystem suffers from daily environmental aggressions by causative actors who no one is willing to confront with severe measures that feature curtailment or remedial actions [1]. The petroleum industry is responsible for the largest discharges of non-degradable fluid pollutants that mix with sea water, compromising fish populations and the general health of the GB ecosystem [2]. Additionally, floating waste, notably various types of plastic, infiltrate mangrove stands along the north-northeastern shore. This plastic pollution adversely impacts the habitat of several species that are, as a result, gradually becoming scarcer.

The GB is an extremely resilient biome [3]. Its 412 square kilometers receive water from more than 35 rivers; its ecosystem, despite degradation, still displays native vegetation species from the Atlantic Forest, marshy forests, swamps, and mangroves, with 242 identified bird species, 167 fish species, 34 reptile species and 32 mammal species [8]. Highlights of aquatic biodiversity include dolphins and sea turtles. It is hard to believe that all this environmental wealth has been so degraded by the lack of education and ethics, which over time have transformed the GB into a spatially huge unregulated aquatic civic dump. Recent initiatives to stem degradation of this littoral zone showed social solidarity and cohesion. Although some proposals were very welcome and guided by a nostalgic romanticism, they unfortunately proved to be insufficient or ineffective given the proportions of the disaster.

Without adequate public policies for environmental protection, fishermen from Barão do Irirí, Suruí, Barão de Mauá (Guia de Pacobaíba) and Piedade are forced to travel further and further with their rudimentary boats to support their families. It should be noted that artisanal fisheries have the potential to go beyond the simple reason for survival because increasing gastronomic tourism can be guided by historical cultural aspects of the region that are undoubtedly rich in natural beauty. At the same time, the recovery of the biome would establish the necessary conditions for the proposal of a cultural center like the Museu do Amanhã, definitively changing the local panorama of abandonment and degradation. This paper discusses the social development project CORAL (Brazilian abbreviation for "Lacustrine Complex for Observation, Recreation and Administration") as an architectural complex that combines the functions of a marine biology observatory, cultural space, and center for public environmental management. Facilities could be built near various locations that promote coastal research and monitoring of water quality. Such efforts would clearly signal to the government the significance of salient transgressions by the pernicious oil industry. CORAL is thus not a mere hypothetical or theoretical academic exercise because it marks the presence of public governance as an oversight institution for the protection and control of animal and human health. Also included within the purview of CORAL is monitoring the dynamics of schools of fish, dolphin families, and crustacean colonies.

2. Good-bye GB, and thanks for all the fish

The literature on GB is extensive [6, 7, 9, 10, 11, 12], with varied approaches to its rampant degradation over the last six decades. This degradation has critically affected artisanal fishing and the suitability of its shores for bathing. Because of sea water pollution, sea bass (*Mycteroperca spp*) and hake (*Merluccius hubbsi*) have all but disappeared. Since 26 July 2024, artisanal fisher folk have used a specifically designed media app that documents and reports the exact geographical co-ordinates of GB oil films, illegal waste water purges as well as the location of noxious floating macro-plastics. Presently, there are no official reports of Rio de Janeiro State "cocaine shark" catches within GB [4]. It is thus essential that near-shore GB planning and development is fervently matched with consideration of the use of aquatic habitats and as well as with migration corridors of resident marine species [5]. By way of one example, the City of Linhares leads the way in Brazil by passing a municipal law (in August 2024) that legally bestows "life' to its world-famous surfing waves while recognizing their intrinsic right to exist, their natural generation and non-anthropogenic restoration, along with cleanliness of ocean water comprising the incoming waves!

3. Potential architectural defacement of coastal landscape

Another city, Balneário Camboriú in Santa Catarina State (Figure 1), is contemplating the erection of the world's tallest residential tower. The Senna Tower supposedly symbolizes the heroic overcoming of human limitations via metaphor and the manifestation of individual character by featuring luxury accommodations for international elites. Its proposed width-to-height ratio, as shown in flattering drawings (Figure 1-a), makes the tower appear as a building best named "The Fishing Rod & Reel Building." A tower exceeding 500m in height, directly facing a body of tidal sea water, will surely have very complicated foundational issues. Two recent structures serve as examples of what might occur if such issues are not properly addressed. In New York City there is the 161 Maiden Lane building (also known as One Seaport, 1 Seaport, or Seaport Residences) and in San Francisco, California, sits the Millennium Tower (301 Mission Street). In addition, due to future climate changes, fluctuating sea levels and non-stationarity of local wind regimes will have important impacts on the reliability of the Senna Tower.

Figure 1 – A view of Balneário Camboriú (credits to CNN Brasil).

Figure 1-a - Artistic conceptualization of the proposed Senna Tower, a 500-m high building with a very thin width-to-height ratio, shown on the foreshore of Balneário Camboriú (Santa Catarina State). The buildings proposed location close to the seashore and constructed on unconsolidated sediments poses potential engineering problems for stability of this skyscraper. This architectural projection of the Senna Tower would theoretically provide citizens of Balneário Camboriú with a metaphorical sundial "time-piece" (copyright free Google image).

In marked contrast, the CORAL Project on the other hand could become a low-rise, inexpensive GB development that is sited entirely on sand, silt and clay sediments. This alternative CORAL Project would barely protrude above the sea water surface in the form of an inverted "coral" formation! Indeed, were its exterior painted in "coral" tones of orange, red and pink known in English since 1513 AD, it would brand the facility as well as be easily visible during foggy weather within the upper GB! Sylvia Lavin, in her 2011 text ***Kissing Architecture (POINT: Essays on Architecture)***, defined it as "…architecture in contact with incommensurable forms of time, movement and immateriality that coalesce to produce enveloping and therefore political effects". In so doing, she attempted to describe what she perceived as the ever-growing intimacy between architecture and just-dawning types of Art—namely multimedia installation on the outside surfaces of buildings. The Salomon Eye seafood restaurant, established in the Norwegian Hardangerfjord in AD 2024, mostly derives its cuisine ingredients from adjacent aquaculture installations. This real-life example provides our readers with a realistic appreciation of the potential of the CORAL Project. Sitting well out in the fjord with approximately the same kind of wave regimes as the CORAL Project's GB location, the Salmon Eye restaurant can only be reached by boat.

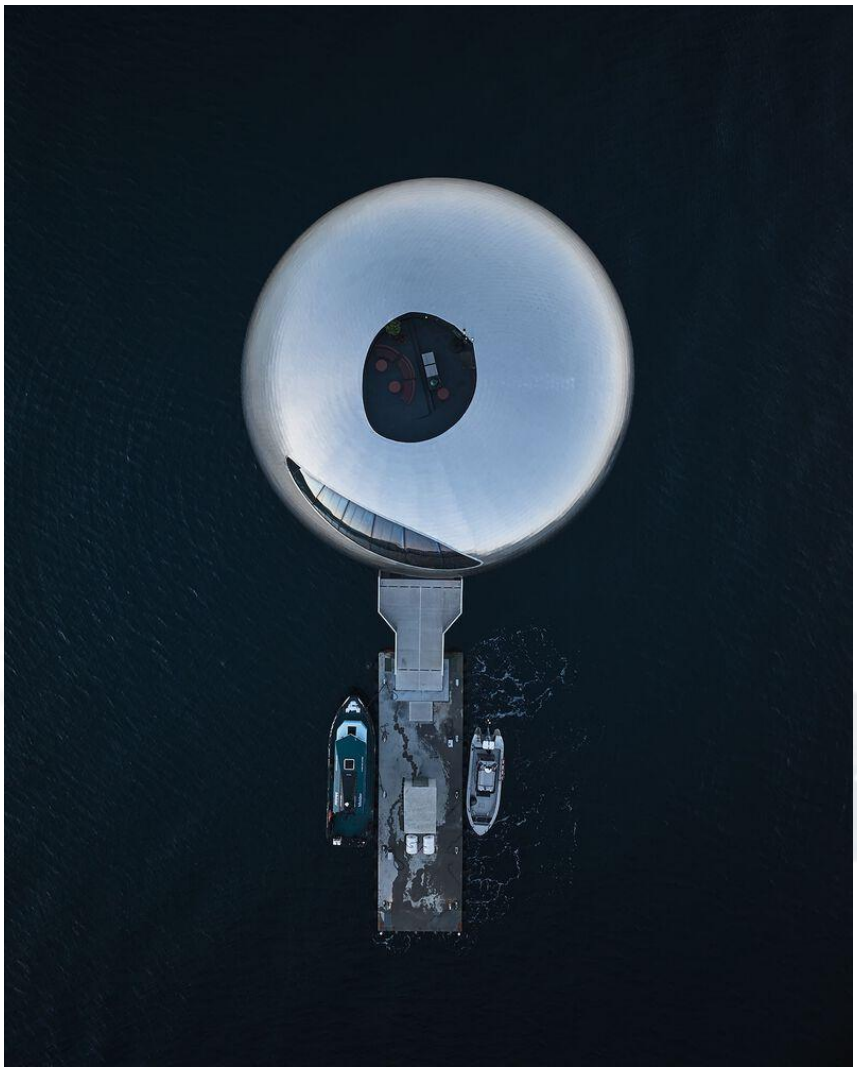


Figure 2. The Salomon Eye floating restaurant is located ‘at sea’ in a Norwegian fjord. The restaurant is symbolically housed inside an ellipsoid-shaped salmon eye structure. This floating art installation conceptualized by Eide Fjordbruk, is considered the world’s first CarbonNeutral-certified salmon producer. Note the floating dock that provides access to the restaurant. As seen from above in planform, the shape of this floating restaurant is remindful of a school fire-alarm bell (copyright free Google image).

4. The CORAL project

CORAL, designed by Santoro & Serpa, was developed by Santoro as a proposal for occupying water surfaces (applicable to lakes, lagoons and bays). The general concept includes suggestions from Cathcart and Finkl, rich in geographic and oceanographic content. The architectural conception is compartmentalized into three main platforms: 1) Observation Platform, 2) Administration Platform, and 3) Recreation Platform. An optional fourth logistics support platform can be implemented if required. This architectural concept was inspired by the morphology of marine animals (*e.g.*, jellyfish and Portuguese man-of-war) with volumes arranged to suggest the fluidity of water, whilst in the robust manner typical of contemporary architecture, forming an

architecturally attractive and simple structural ensemble. The Observation Platform is intended for biological and coastal research in general, in addition to offering short courses and educational events for fishermen. The Administrative Platform promotes socioeconomic support in collaboration with public backing for fishing communities. Such efforts could provide financial incentives in accordance with the solidarity organization of the communities. Lastly, the Recreation Platform is aimed at fishermen's families, providing entertainment and recreational activities for children and teenagers. The entire complex would be accessible to the mainland by interconnected bridges, which are for pedestrians and bicycles only. Alternatively, some sections of the interlinkage could be accomplished by installation of pontoon-supported connections which might be shifted horizontally by towboat to allow the unobstructed passage of small-draft masted boats.

Each platform has a suggestive name (Medusa, Ofelia and Hydra) and is supported by a structural "star" whose tips are mixed concrete/steel pillars (Figures 3, 4 and 5).

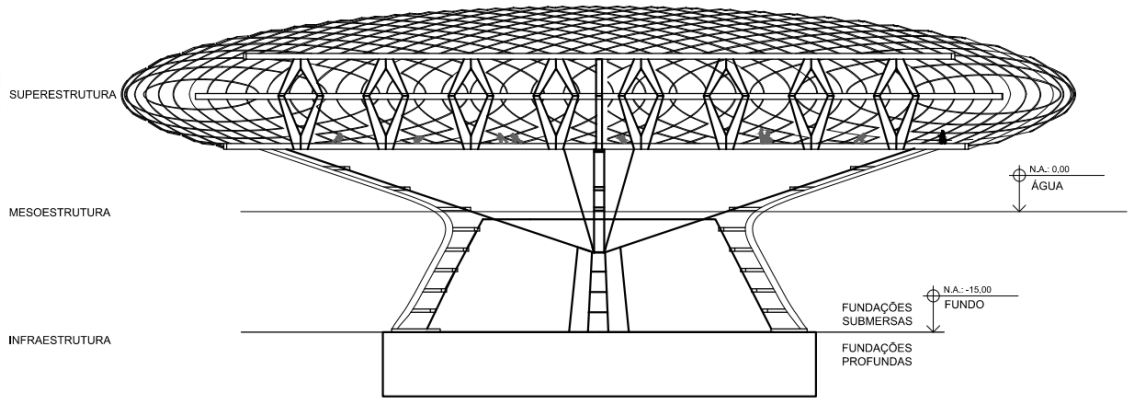


Figure 3 – The Hydra platform.

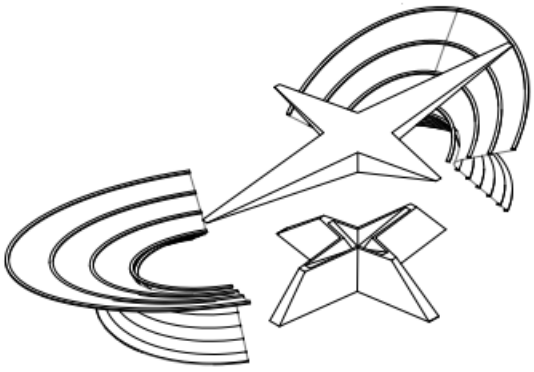


Figure 4 – The composed star-shaped pillar.

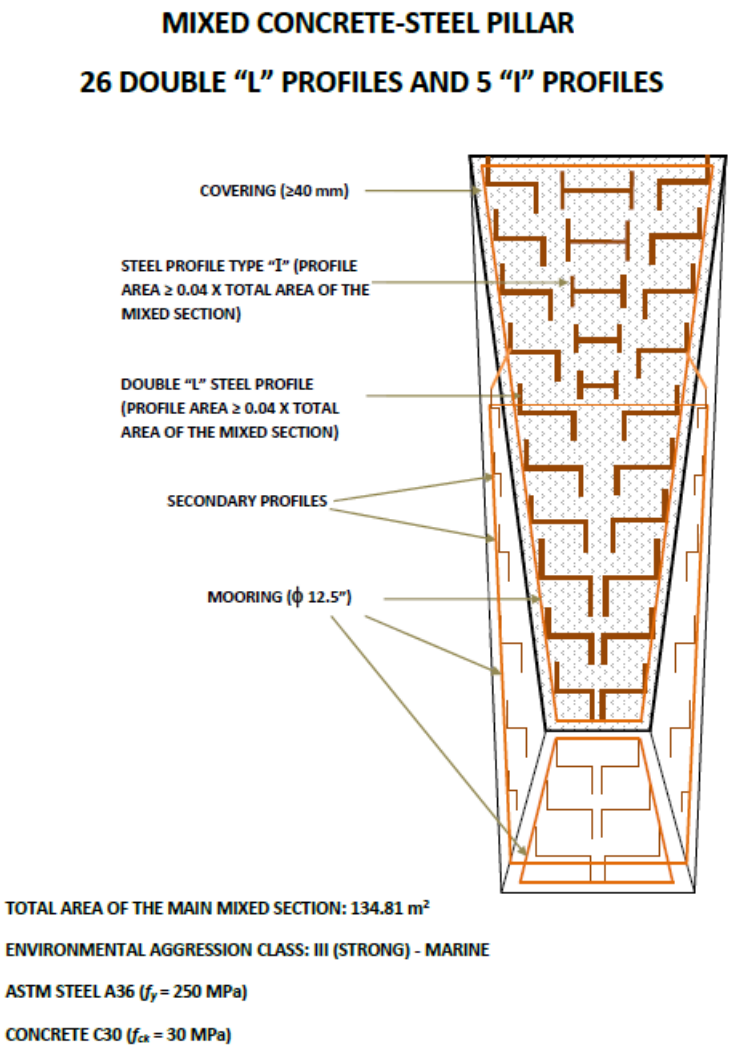


Figure 5 – The basic concrete-steel pillar designed by Serpa.

The platforms are placed over the water (Figures 6 and 7), with deep foundations topped by a large concrete block on which the star-shaped pillars are placed. The lattice structure of the platforms can be coated with Zeoform, a composite made from water and cellulose, suitable for many applications depending on the source material, being sustainable and compostable [15].

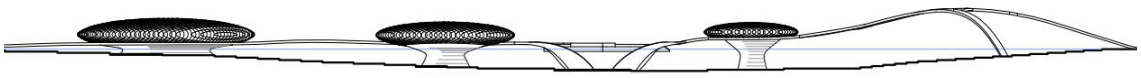
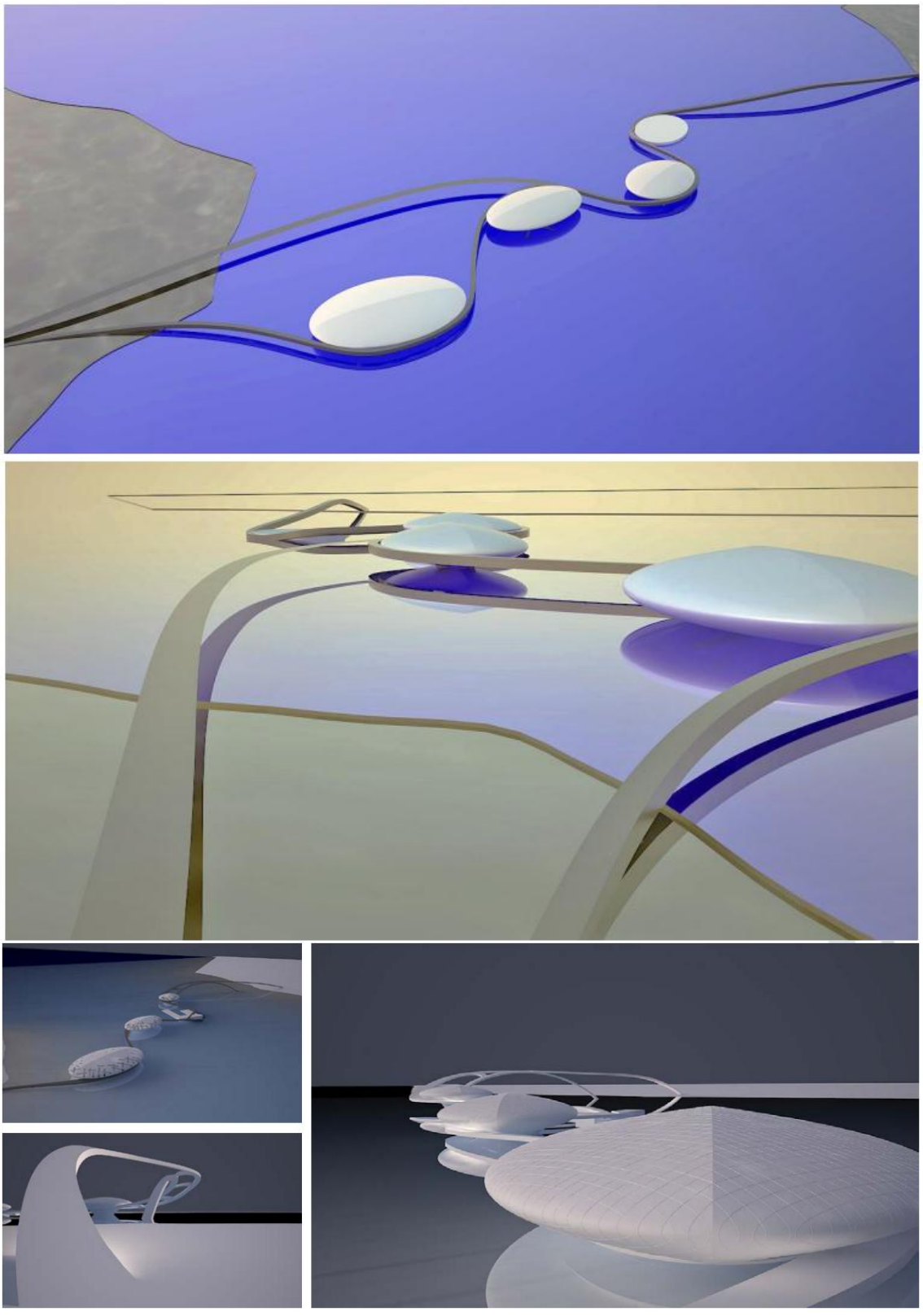


Figure 6 – A side view of the complex.



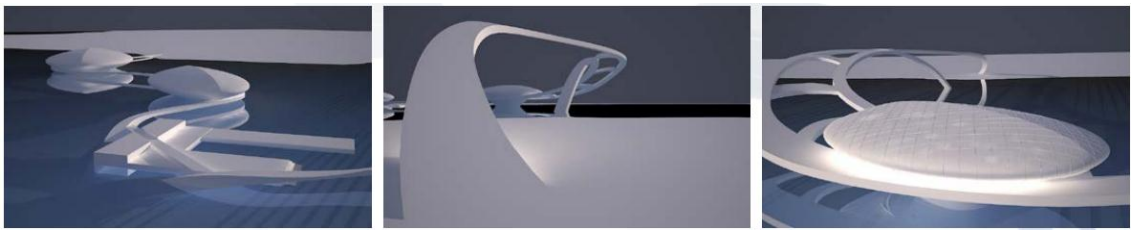


Figure 7 – Several perspectives of the complex. While dream-like visually, these could represent water-hugging fog.

The platforms were designed to withstand the aggressive environment, as well as the radical effects of climate changes [13]. The suggested locale for implementation of the complex includes the neighborhoods of Barão do Irirí, Suruí and Piedade (Figures 8 and 9). This location has the most beautiful landscapes in GB. Peak radiation fog occurrences are 5-7 A.M. local time. Afternoon foggy conditions almost never happen. In effect, a peekaboo architecture could exist.

Figure 8 – Ideal generalized shallow-water area for the CORAL project facilities, as marked by the red circle southwest of Paquetá Island (credits to http://www.rio-turismo.com/mapas/litoral.htm). As one of the most sequestered sub-bays of GB, this area is naturally sheltered from storm surge impacts.

Figure 9 – Possible sheltered vicinity (terrestrial and aquatic) for CORAL facilities demarcated in red. Potential locations of platforms (*cf*. Figures 3, 6, and 7) are shown white-colored formations.

5. The economics of CORAL

CORAL's social proposal in its broadest sense includes Gravatá's ideas about offering conceptual and material means to support improvements in the quality of housing at fishing communities. Such ideas result from discussions about the very fact that the eradication of poverty is the result of a long process of gradual improvement in people's living conditions, involving basic education, sanitation, correct disposal of waste, quality of built space and environmental conservation.

Poverty is a product of existing institutions and policies, not a creation of the poor. As self-evident as this observation may be, it was necessary to appear on the economics scene a man like Muhammad Yunus [14] to make it the basic premise of his own creation, the microcredit, which is now practiced everywhere. Microcredit, after the advent of Grameencredit (credit from the Grameen Bank), carries with it the principle that the poor have underutilized or even unknown skills. Keeping this basement in mind, the CORAL project, in its administrative and social functions, should promote credit as one of the fundamental human rights, helping fishing families to support themselves, and at the same time, increasing women's participation through special incentives for activities associated with fishing. This role should be exercised not through direct conventional banking, but by an official public representation designated to manage the municipality's resources allocated to microcredit exclusively via CORAL.

The microcredit provided by CORAL includes a commitment to invest the funds granted in fishing equipment, boat restoration, small home improvements, and culinary implements for the sale of typical dishes. Larger infrastructures such as piers and sheds for boat maintenance may be funded directly by CORAL outside of the microcredit lines, on account of investments in the operational sustainability of activities related to artisanal fishing. In particular, regarding amelioration of housing conditions as a fundamental topic, support for small repairs of fishermen's homes includes a

practical course with a manual on construction restoration and maintenance techniques, organized specifically for typical houses of peripheral communities.

6. Conclusions

The CORAL (Lacustrine Complex for Observation, Recreation and Administration) project is an environmental improvement proposal that focuses on potential recovery of artisanal fishing communities in GB that have been degraded by untreated sewage and oil industries extent in the littoral zone. It is proposed that better biological and coastal management of GB can be achieved through improved education and community involvement. Installation of these procedures is required because this coastal-marine ecosystem has been degraded to the point that part of GB have been turned into cesspools containing petrochemical waste products as well as plastic debris. The restoration of this habitat, which is an extremely resilient biome, is without precedent in Brazil but there are successful examples of supporting infrastructure commercialization as seen in some Norwegian fjords. The novel concept proposed here includes the construction of platforms that have pods placed on the water surface but which are stabilized with deep seabed foundations that are topped by large concrete blocks. Multiple platforms would be accessible to the mainland by interconnected bridges or pontoon-supported connections that could be shifted horizontally by towboat to allow the unobstructed passage of small-draft masted boats.

CORAL is, above all, a social inclusion project, bringing a new perspective on life to the artisanal fishery communities on the interior coast of GB. The soft and imposing architectural proposal symbolizes not only the appreciation of local culture, but also opens up the consolidation of the feeling of belonging and full citizenship, an essential factor for including the periphery in the agenda of public power. Avoiding real estate speculation and the consequent gentrification of the urban landscape, CORAL is a milestone in environmental surveillance, supporting and being supported by a serious protective public policy aimed at disseminating and establishing the understanding that preserving the environment also means combating poverty and ensuring people's dignity.

References

[1] Buchan, P.M. et al. (2024) “A Transdisciplinary co-conceptualisation of marine identity” *People and Nature*, 1-25. DOI: 10.1002/pan3.10715.

[2] Guerra, W. de S.D. (2019) “Petrochemical Complex of Rio de Janeiro/Brazil: a contemporary resistance in Guanabara Bay” *Sociedade & Natureza* 31: 1-18.

[3] Barreto, C.F. et al. (2024) “Transport and distribution of fluvial pollen in the northern portion of Guanabara Bay, southeastern Brazil: A paleoenvironmental tool” *Quaternary International* 693: 49-59.

[4] Araujo, G. de F. et al. (2024) “’Cocaine Shark”: First report on cocaine and benzoylecgonine detection in sharks” *Science of the Total Environment* 948: 174798.

[5] Lear, K.O. et al. (2023) “Effects of coastal development on sawfish movements and the need for marine animal crossing solutions” *Conservation Biology* 38: e14263.

[6] Serpa, N. and Cathcart, R.B. (March 2019) “Guanabara Bay: Proposals for a Territory of Exclusion Born from Paradise — Part I, The Present-Day Mess” Revista Brasiliense de Engenharia e Fisica Aplicada 4: 1-11. SEE: Serpa, N. and Cathcart, R.B. (December 2019) “Proposals for a Territory of Exclusion Born from Paradise — Part II, For a Macro-Engineering Covenant” Revista Brasiliense de Engenharia e Fisica Aplicada 4: 19-27.

[7] Serpa, N. and Cathcart, R.B. (March 2021) “The devil on a dying bay: Brazilian marine plasticarianism at Guanabara Bay” Revista Brasiliense de Engenharia e Fisica Aplicada, suplemento - fevereiro: 1-25.

[8] CEDAE Socioambiental (2024) “Baía de Guanabara”. Available at https://cedae.com.br/baiadeguanabara. Accessed Aug 16 2024.

[9] Fistarol, G.O. et al. (2015) “Environmental and sanitary conditions of Guanabara Bay, Rio de Janeiro”, Frontiers in Microbiology 6: 1-17.

[10] Soares-Gomes, A. et al. (2016) “An environmental overview of Guanabara Bay, Rio de Janeiro” Regional Studies in Marine Science 8: 319-330.

[11] Fries, A.S. et al. (2019) “Guanabara Bay ecosystem health report card: Science, management, and governance implications” Regional Studies in Marine Science 25: 1-17.

[12] Olivatto, G.P. et al. (February 2018) “Microplastic contamination in surface waters at Guanabara Bay, Rio de Janeiro, Brazil” Marine Pollution Bulletin 139: 157-162.

[13] Valdez, B. et al. (2010) “Effect of climate change on durability of engineering materials in hydraulic infrastructure: an overview” Corrosion Engineering Science and Technology 45: 34.6.

[14] Yunus, M. (2008). *Um mundo sem pobreza: A empresa social e o futuro do capitalismo*,1ª Edição. Ática.

[15] ZEOFORM (2024) “So strong, so light, so eco”. Available at https://zeoform.com/ . Accessed Aug 16 2024.