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Mirror Macro-Imagineering Water Supply Megaprojects: Pipedream Chile-California Complementarity?

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Abstract: Two tractable New World west-coast Mediterranean climate zones, burdened with increasing urbanized populations, must each be transformed by humans because of inherent North-South variances of natural precipitation. In other words, each politically-defined landscapes must technically devise its own anthropogenic dimension for future prosperity induced by the prospect of a plentiful freshwater supply. Both the nation of Chile, as well as the State of California (USA), have investigated the hypothetical use of gigantic offshore buoyant freshwater pipelines to serve their coastal and inland population's needs. This report is meant to inspire and engage the next generation of Macro-Imagineering experts.

Key words: Submarine pipeline, freshwater transport, Chile, State of California, geographical similarities.

Resumo: Duas zonas de clima Mediterrâneo na costa oeste do Novo Mundo, sobrecarregadas com o aumento das populações urbanizadas, devem ser transformadas por seres humanos devido às variações inerentes de precipitação natural entre o Norte e o Sul. Em outras palavras, cada cenário politicamente definido deve tecnicamente conceber sua própria dimensão antropogênica para a prosperidade futura, induzida pela perspectiva de um suprimento abundante de água doce. Tanto o Chile como o Estado da Califórnia (EUA) investigaram o uso hipotético de dutos de água doce flutuantes (*offshore*) gigantescos para atender às necessidades de suas populações costeiras e interiores. Este relatório tem como objetivo inspirar e engajar a próxima geração de especialistas em *Macro-Imagineering*.

Palavras-chave: Aqueduto submarino, transporte de água doce, Chile, Estado da Califórnia, semelhanças geográficas.

1. Introduction

Earth's principal watershed separates the drainage regions of the Atlantic, Pacific and Indian oceans; in the New World the watershed follows the Cordilleran Belt, which includes the Southern Hemisphere's Andes Mountains, as mapped by the indefatigable Russian geographer A.A. Tillo (1839-1899) by 1887 AD. Numerical model experiments show that both coastal Chile, extending latitudinally 4,200 km between latitudes 170 30' South and 560 00' South, and the USA's State of California located in the Northern Hemisphere would become more arid climatically if our Earth actually spun in a retrograde rotation [1]; in other words, even with an Earth spinning backwards, their thirst-beset, needful populaces would still have to technically overcome significant urban and agricultural freshwater supply macro-problems for all human

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inhabitants! Ultimately, the definition of "fresh-water" is a function of the actual end-use of water — human consumption, river release and industrial applications/municipal uses [2-3]. Homo sapiens' working real-world collaboration with our Earth-biosphere's total water mass means that, from our multiple regionalized human outlooks, major parts of our world's natural hydrologic cycle is rapidly becoming properly named the "hydro-social cycle" [4]. Well before the World Wide Web's advent, agriculture, mining and cities are humankind's longest-running examples of "open-source" megaprojects.

The northernmost part of Chile is likely our planet's driest region while the southernmost part of Chile is probably the wettest extra-Tropical Zone region of our Earth-biosphere. Chile's physiography stimulates the divergence of expert opinions about the comprehensive management of its natural freshwater resources — ~928 km^3, 7.9% of all South America runoff [5]. The UNO, as well as other concerned organizations, hold the threshold value internationally considered minimum for sustainable development is ~2,000 m^3/person/year; from Chile's capital, Santiago, to the far-north desert, the average freshwater availability is only ~800 m^3/person/year whilst, by marked hydro-social contrast, from Santiago to the far-south freshwater availability exceeds 10,000 m^3person/year! The rain-shadow effect of the Andes Mountains maintains the hyper-arid conditions of the Atacama Desert in northern Chile and the South Pacific Ocean's cold northward flowing Humboldt Current paralleling Chile's shoreline further contributes to the south-north latitudinal desiccation landscape geography. A Mediterranean-type climate occupies a narrow ocean-adjacent landscape zone from 300-360 South latitude. However, all 21st Century climate regimes are changing and this evident and appreciable alteration has come just as freshwater availability is increasingly vital to intensifying industrialization and mining of Chile's northernmost landscape. The aquifers (groundwater) of Chile's northern and central landscapes suffer overexploitation as well as natural and anthropogenic pollution! Freshwater pollution in northern Chile is mainly the naturally mineral-rich soils formed by ancient and modern-day erosion of rock formations bearing contaminants such as copper, molybdenum, boron, aluminum and arsenic whereas in Chile's central Mediterranean climate zone most of the apprehensive freshwater pollution seems to originate from cities and modern agriculture's use of artificial chemicals. In the past, anthropogenic freshwater supply management systems were typically designed and operated under the assumption of stationarity; this normal operational assumption is nowadays invalid under increasingly sophisticated and perfected global and regional climate change modelling scenarios [6-7]. Coordinated management of the total natural flowing freshwater resources of Chile's northern, central and southern regions, perhaps to most embellish its coastal Mediterranean climate zone where most of the nation's human population dwells and works, is of paramount national importance to forestall or prevent freshwater insecurity (stimulated by meteorological droughts, desperate user competition, over-allocation of available freshwater and freshwater supply infrastructure damaged or destroyed by commonly world-renowned earthquakes accompanied sometimes by major tsunamis) [8].

2. Submarine Pipeline, Chile

Long-distance freshwater transport by can be accomplished by the emplacement of a system of pipes forming a continuous pipeline carrying that chemically stable substance, so vital to human prosperity and comfort, to wherever it has been deemed to be needed. Team Geographos visualizes submarine pipelines as reserve supply tanks, a kind of elongated storage "bottle" which ought to be complemented by carefully built back-ups on land since freshwater dependency is

not desirable. Chiles' Minister of Public Works first sent a letter of interest to Via-Marina, focused on its Subma-River (submarine river) concept, during June 2009; Via-Marina's freshwater-carrying flexible undersea pipeline — dubbed Subma-Flex — is secured by the European Patent Office publication EP 2,788,643 B1 as a proprietary protected technology. Via-Marina emphasizes the pipeline's structural flexibility because the well-known natural occurrence of major seismic events in Chile arouses skepticism amongst a few potential design and construction partners and ordinary financial investors. The quite recent Maule region earthquake, with its epicenter near Chile's second largest city, Concepcion, stalled temporarily governmental consideration of this proposed 2,500 km-long megaproject transporting freshwater abstracted from the Bio-Bio River and then inexpensively pumped to northward to Arica situated near the Chile-Peru border. The most recent news-media provided status report of related organizational activity dates from late-2017 AD. Patent holder Mr. Felix Bogliolo, presently listed as a Founding Partner and the acting Chief Executive Officer of Via-Marina, when contacted on 11 October 2018 through the business entity's Via-Marina website (http://www.via-marina.com), declined to provide any "sensitive", generally enlightening or substantial information whatsoever. However, according to data provided in various documents derived from a thorough search of the Internet, in the Chile setting and instance, Via-Marina offered to convey 2.6 million m3/day of freshwater moving at 30 m^3/second, shifted geographically at a basic energy cost of ~0.9 kWh/m^3 from the Bio-Bio River, situated adjacent to but south of earthquake devastated Maule, to the Arica coastal segment of northern Chile. The Mean Annual Runoff difference between these two places could not be more startling: a ~335 m^3/second flow for the Bio-Bio River versus ~0.3 m^3/second outflow at Arica — that is, ~1116 times more freshwater river runoff per second! A submarine pipeline would be a difficult target for petty or major freshwater thefts, nuisance vandalism, industrial sabotage and even some inadequately strategized terrorist-schemed onslaughts on Chileans. Figure 1, prominent base image of South America, illustrates the maximum possible extended length of a national Subma-Flex pipeline that is geopolitically conceivable as of late-2018 AD. (As mentioned earlier in this Section 2, Mr. Felix Bogliolo declined to offer publicly a location-precise map of Via-Marina's proposed offshore undersea route.)

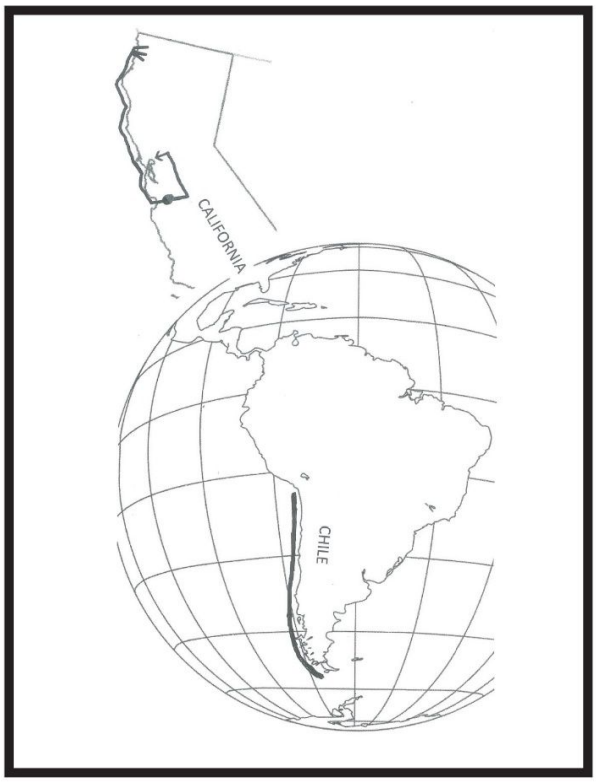

Figure 1. The maximum possible extended length of a national Subma-Flex pipeline in Chile.

As is the case of Subma-River, publicly available information on any macroproject is usually imperfect, rarely complete, and often lacking in absolute revealed clarity. Team Geographos, surely characterizable as upstarts in the offshore infrastructure business, here boldly suggests several possible improvements for the Subma-River concept as it is here applied to Chile's coastline. First noticed elsewhere during the mid-1960s

[9], beach-sited groundwater springs supported pre-historic human populations living on the distant island of Rapa Nui, Chile [10]. Though known coastal aquifers are present in the northernmost region of Chile, most known to exist in the Atacama are located in fluvial valleys on land, none yet known to be offshore. Yet, at Surquillo, Peru, freshwater is currently pumped from beach-located wells which is subsequently distributed by ordinary commercial tanker-trucks [11] and meteoric-origin freshwater exists in quantity within the marine sediments near Callao, Peru's biggest international seaport [12]. In the context of northern Chile, tanker-trucks might in future be assisted in especially hilly landscapes by dedicated funicular railways using freshwater-transporting pods than can be rolled horizontally from trucks to railway flatbed wagons where they would be latched to assure immobility during transit. Perhaps intensive 21st Century exploration of Chile's offshore continental shelf ought to be done to develop supplemental or emergency resources for the Subma-River mega-project? Furthermore, a reflective Team Geographos recommends Beryle D. Brister's US Patent 4,220,012, "Apparatus for freezing a slug of liquid in a section of large diameter fluid transmission line", awarded on 2 September 1980, as a potentially worthwhile and economical means for controlling the Subma-Flex freshwater inflows and outflows at important places along the submarine route. Since the undersea pipeline is necessarily affixed to the seafloor with numerous anchor moorings, why not utilize its obligatory structural fixity for useful and profitable macro-planned structural add-ons, such as associated aquaculture installations (fish-farming, seaweed farming)? Even when moored, inhabited artificial islands afloat on the ocean's surface above the invisible South-North flowing freshwater pipeline does not seem too ridiculous as a viable Macro-Imagineering proposition! Such installations are possible as the submarine pipe, filled with freshwater, naturally floats because of a density difference with seawater; consequently, the submarine freshwater pipeline will bend upward slightly between its vertical anchors, some of which could be perhaps intentionally spaced more widely at desirable geographical ocean-surface sites. Under the influence of seawater currents, the flexing submarine pipeline can be monitored by attached remote-reporting devices powered by piezoelectric patches attached to the constantly vibrating pipeline. Nothing ambiguous is deemed impossible, just so long as Macro-Engineering can make it happen eventually whenever afterwards the real-world economic cost appears to be reasonable; a corollary rule of commerce is that every situationally non-recurrent — that is truly unique — macroproject must also be constructed by closely associated and cooperative public event-managers, news-media consultants, website-masters, region marketers, brand-name formulators and politicians. In its present-day formulation, Chile's serious and sober-minded announced investigations of a seemingly feasible real-world civilian submarine freshwater pipeline megaproject cannot be compared to any distasteful, illegal drug-induced human pipedream!

3. Submarine freshwater pipeline, State of California (USA)

In the USA, the State of California's coastline extends from 32^0 30' to 42^0 North latitude, a shoreline of ~1,350 km. Like Chile, the disparity of coastal zone river runoff regimes is remarkable: the State's North Coast has an annual runoff of ~35.6 km^3 while the Sacramento River (27.6 km^3) and San Joaquin River (9.7 km^3) finally debauch into the Delta Region and thence into San Francisco Bay. In contrast, the South Coast has a runoff of merely ~1.5 km^3 yearly — in other words, ~48 times less than the North Coast alone! "California's [fresh-] water landscape has been reengineered so that roughly 75 percent of the *demand* for water originates south of Sacramento, although 75 percent of the water *supply* in the state comes from

north of the capital city" [13]. The key fact relevant to *Team Geographos*' proposal in Section 3 is that, because of persistent long-term farming and some established industrial use, the only freshwater entering the Delta Region since World War II issues from the Friant Dam Reservoir with some enhancement by selenium-infused farm return drainage and urban sewage! In other words, like today's repugnant Salton Sea located in Imperial County in Southern California, the lower reaches of the San Joaquin River is a perennially polluted human-designated "sump sacrifice region" that contributes to the further degradation of beloved San Francisco Bay ecosystems. Since the San Joaquin River deposits little or no sediment into the Delta Region, the puny marshlands partly surrounding San Francisco Bay are dwindling spatially through normal erosion event-processes. Supercomputer climate modelling implies a future Pacific Ocean sea-level rise that, inevitably, will push tidal seawater into the already ecologically-distressed Delta Region [14]. Realizing the societal gravity of this worrisome mismatch of regionalized river freshwater runoff data and the macro-problems nowadays endemic to environmentally beleaguered San Francisco Bay, *Team Geographos* will here offer a new Macro-Imagineering solution for a very difficult hydro-social cycle intellectual "knot" of ecologic and general political discord amongst extant Californians. **Figure 1**, upper incomplete image of the State of California, with small dot that indicate site of San Luis Reservoir mentioned in the text.

It is immensely instructive that a 107 km-long, 1.6 m-diameter freshwater pipeline already horizontally extends 80.15 km beneath the Mediterranean Sea's surface linking the reservoir of Alakopru Dam on Turkey's Anamur River (draining the Taurus Mountains) to the reservoir backed by the Gecitkoy Dam on north Cypress. The satisfactorily serving submarine pipeline, operational since 29 October 2015 AD, is immersed ~250 m below the seawater's surface — deep enough to avoid ships from striking and sundering the underwater high-density polyethylene tube — and is held in place by 132 plastic buoys. Therefrom, 0.075 km^3 of freshwater can be distributed annually to northern Cypress farms and homes as well as other connected and served establishments. The concept of buoyant, anchored structures is proposed by *Team Geographos* as having many unique advantages over existing conventional seafloor-resting, load-bearing marine structures usually emplaced in the ocean. The particular case of a submerged, buoyant pipeline, anchored safely below the tumultuous Pacific Ocean's notable surface energy effects for the purpose of transporting freshwater by gravity flow from California's North Coast to near Moss Landing on the shore of Monterey Bay, thence ~40 km inland to the San Luis Reservoir and beyond, ultimately to merge with the San Joaquin River south of the seaport City of Stockton is rudimentarily technically and economically evaluated. (Electric power for pumping delivered fluid from Moss Landing uphill to San Luis Reservoir may most easily be provided were Vistra Energy's natural gas-fired Moss Landing Power Plant, now idled, were brought on-line again.) We have dubbed this proposed infrastructure the "*California Umbilical Cord*". In effect, it continues an 11-page preliminary technology assessment effort instigated 14 August 1991; by January 1992 the Congress of the United States, Office of Technology Assessment, issued its summarizing report ***Alaska Water for California? The Subsea Pipeline Option — Background Paper, OTA-BP-O-92***. Freshwater was to be subtracted from rivers in Alaska at a withdrawal site upstream of the river mouth and then entering an intake sited somewhere near Prince Rupert Sound, conveyed by submarine pipeline to a landfall place east of the Pacific Ocean, but exactly west of Shasta Lake, a reservoir impounded by Shasta Dam, which usually contributes to the overall seasonal regulated flow of

northern California's Sacramento River. From the near-seashore outfall, the freshwater was intended to be pumped, at considerable energy and monetary cost, to far-distant Shasta Lake. Such a scheme is hereby determined to be economically infeasible as well as unsightly infrastructure if carelessly emplaced in that mostly wild, pastoral and rural landscape! Like Chile, the State of California cannot ever actually be under-resourced in terms of its freshwater so long as much of its freshwater runs off into the Pacific Ocean; conversely, like Chile the State will have a naturally-limited freshwater resource so long as its coastal rivers continue to flow unimpeded into the Pacific Ocean, without anthropogenic infrastructure intervention whatsoever.

The "*California Umbilical Cord*" megaproject fostered by *Team Geographos* contains some very attractive elements in its operation if it is realized and materialized! Like Chile's potential undersea aqueduct, these systems operate gravitationally and energy is needed chiefly to pump the delivered freshwater into established major canal distribution systems on land; this feature allows a speculation—that a volumetrically enlarged San Luis Reservoir, today used jointly by the State Water Project and the Central Valley Project could, in an emergency (such as cave-in or blockage of the twin tunnels bored under the Delta Region west of Stockton connecting from south of Sacramento to Clifton Court Forebay), serve as a substitute freshwater deliver mechanism. As of 2018 AD, barely 2% of all State of California energy consumption is applied to pumping freshwater — extraction, conveyance, potability treatment and waste disposal. Massive freshwater redistribution within the State of California using relatively short ocean routes is desirable from a hydro-social cycle managerial viewpoint. However, we cannot honestly claim origination of the basic hydro-social cycle idea because the outlining vision was originally proposed by partners of the (now corporately defunct) National Engineering Science Company of Pasadena, California [15-17]. During the late-1960s and early-1970s, legislators at the capital in Sacramento helped to shift profoundly California's general outlook on supply management of freshwater to greater consideration of managing demands by improving efficiency to cause freshwater cost reductions, or at least to retard the increase in freshwater supply costs paid by the public. The proposed Macro-Engineering-styled megaprojects, such as vastly increasing the lake area of San Luis Reservoir could act to create anomalous regional moisture and/or heat sources (or sinks) the effects of which may, in theory, propagate eastwards via atmospheric dynamics [18]. *The main goal for our* "*California Umbilical Cord*" *must be the essential restoration of the San Joaquin River's pre-World War II volume of freshwater flow into the overstressed Delta Region and San Francisco Bay by using its watery augmentation through North Coast freshwater importation via submarine pipeline and connected overland pipeline to San Luis Reservoir.* Coincident with this singular environmental maintenance goal must be the reformation or reorganization of the Eel River [19-21], Russian River and Rogue River; the documented response of North Coast residents and their representatives, in the past, has been hostile to development plans affecting these California rivers. On 18 July 2018, California's Supreme Court removed Proposition 9 from the General [State-wide] Election Ballot slated for 6 November 2018. Proposition 9, sometimes referred to as the "Three State Initiative", would have sought the citizenry's voted advice on a proposal to divide the State's existing counties into three new USA states. Monterey County, Santa Clara County and San Benito County were suggestively mapped as included in one of the three new USA states, "Coastal California". Were this political separation to occur it would be fortunate that these strategically nodal counties be joined in

freshwater supply management since the rock-mass volume beneath the 417 m-high Pacheco Pass (37^0 3' 59" North latitude by 121^0 13' 7" West longitude) and surrounding the extant San Luis Reservoir currently is being excavated in places and reshaped for enlarged reservoir capacity by massive earthmoving megaprojects: the California High-Speed Rail System tunnels penetrating the difficult Franciscan mélange formation of the Coast Range into the Central Valley and the rebuilding of the B.F. Fisk Dam (first closed 1963) prior to some unpredictable future seismic dam-failure event initiated by the dangerously nearby 66 km-long north-northwest-striking, right-lateral strike-slip Ortigalita Fault [22]. Shortly after the sudden release of 2.518 km^3 of that mass of deliberately stored off-stream freshwater, the B.F. Fisk Dam's failure could cause flooding of the western outskirts of the City of Stockton and certainly disrupt ocean-going shipping schedules at its port! Still uncertain, is whether the Delta Region's yet-t-be-dug twin tunnels under the Sacramento-San Joaquin rivers could be damaged by strong temblors. (By comparison, California's famed Lake Tahoe contains only 0.903 km^3 of freshwater.) Both intrusive megaprojects are multi-billion USA dollar governmental investments, funding for which remains open, uncertain and legally disputable (see Figure 2).

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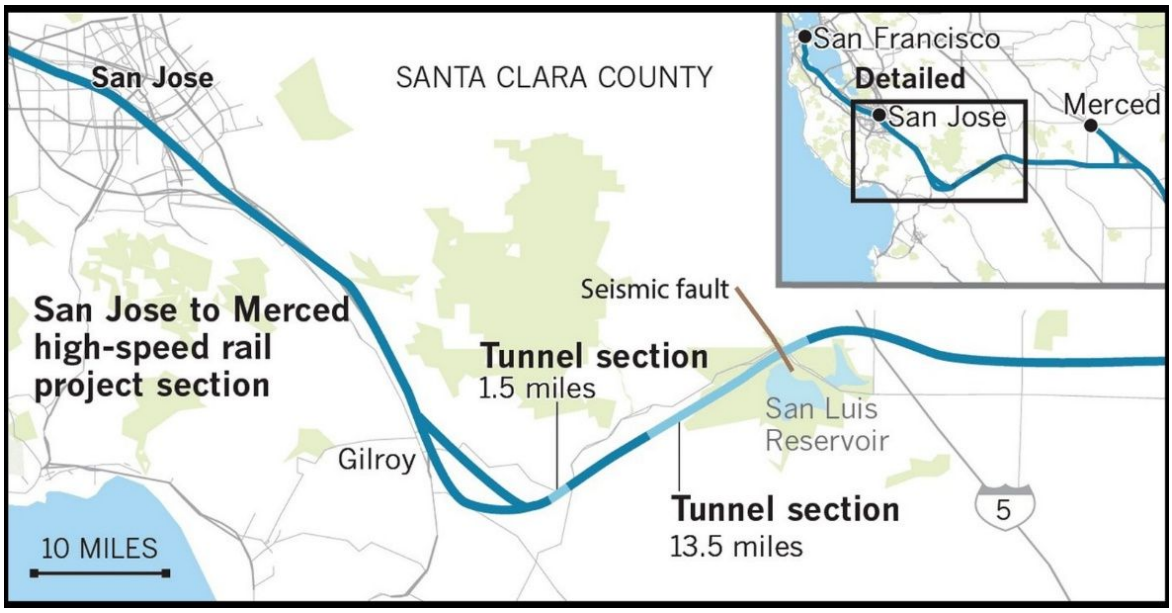

Figure 2. All Californians' standard of living depends on access to abundant and low-cost freshwater. Might a "*California Umbilical Cord"* imitate Chile's potential ***Subma-River*** before 2030 AD?

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Solar Thermo-Powered Desalination Fountain-Barge: A Macro-Imagineering NA Venezuela's Golfo de Cariaco

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Abstract: Based mainly on the Fourier Law valid for parallel material layer temperature gradients, a massive floating seawater desalination macro-project almost entirely covering the Golfo de Cariaco, NE Venezuela, is proposed. The purpose of the geographically-scalable unsinkable *Fountain-Barge Desalination Factory* (FBDF) formed chiefly of composite metal foam is bulk freshwater production then to be utilized domestically for commercial crop irrigation and urban population maintenance and increase. Brine reject from the huge FBDF could allow 21st Century development of a commercial aquaculture industry during a potential local encompassing region BS_w Koppen Climatic Classification change as well as adjacent southern Caribbean Sea changes [1].

Key words: Freshwater production, aquaculture industry, solar thermal-powered desalination fountain-barge.

Resumo: Com fundamento na Lei de Fourier, válida para gradientes de temperatura em camadas paralelas de material, propõe-se um macroprojeto flutuante de dessalinização da água do mar cobrindo quase inteiramente o Golfo de Cariaco, NE Venezuela. O objetivo da *Fountain-Barge Desalination Factory* (FBDF), geograficamente escalável e formada principalmente de espuma de metal compósito, é a produção de água doce para ser utilizada em residências, em irrigação comercial e demais aplicações da população urbana. A rejeição de salmoura da grande FBDF poderia permitir o desenvolvimento, no século XXI, de uma indústria de aquacultura coetânea à potencial transformação da região de BSw Koppen, assim como às mudanças adjacentes no sul do Caribe [1].

Palavras-chave: Dessalinização da água do mar, indústria de aquacultura, barcaça-fonte termosolar.

1. Introduction

The relative scarcity of freshwater compared to the Earth's super-abundance of seawater has fostered the investigation of many abstruse technologies for removing salt from seawater as a centuries-old human quest via Macro-Imagineering to amplify reliable and well-regulated regional freshwater supplies. Fountains are a source of both refreshment and joyous renewal [3]. Greenhouses afford constant shelter from all kinds of weathers for commercially valuable plants, decorative or edible; at one locale in the Old World's southern Spain landscape ~270 km^2 are presently enclosed contiguously by sealed glass-houses growing tomatoes and other commercial crops controllably; the effect of the sunshine-reflecting landscape-cover of glazing is to cool the local climate whilst protecting all plants grown within from radical short-term air

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temperature excursions [4]. A floating solar thermal-powered desalination fountain-barge (FBDF) built atop an open 640 km^2 body of seawater, Venezuela's Golfo de Cariaco, Figure 1, might be composed of a plurality of prefabricated, standardized rectangular, composite metal foam modules rigidly locked together in a continuous side-by-side relation and anchored so as to rest on a very large area of swell-quelled gulf seawater. These modules will not require Cathartic Protection. GEOGRAPHOS supposes a maximal freshwater FBDF product annually to be ~0.57 km^3 predictably derived from a FBDF solar distiller empowered by a ~640 km^2 solar energy VANTA-black receiving surface which ultimately causes 2.5 liters/m^2 of freshwater to be made during near-Equator sunny days. The multi-level moored FBDF, unencumbered by shading obstacles above, can be expected to revolutionize freshwater supply (quantity and quality) and use within the Koppen Classification BSw Tropical Semi-desert that completely surrounds Golfo de Cariaco. The contiguous hill and mountain reliefs restrict the gulf's precipitation catchment but might serve as lookouts for enthralling vistas appreciated by national and international tourists appreciating the gulf's monumental anthropogenic facility scenery. Modern solar thermal-powered desalination first commenced at the Las Salinas factory (1872-1912), which generated 4.0 liters/m^2, in desert-coast Chile and various brine and seawater evaporator devices with significant-sized distilled freshwater outputs have operated in Venezuela since circa AD 1930 [5].

2. "Drinking Watershed": Un Unexamined Mega-Infrastructure

A statement of opportunities for enhancement of freshwater supply infrastructure in Latin America ignored recently-developed desalination technology [6]. During the 21st Century, NE Venezuela can become the essential national region contributing vital drinking freshwater withdrawn from Golfo de Cariaco seawater using a gigantic industrialized thermal energy-powered mechanism, the FBDF which abides by the Fourier Law, for the region's agriculturalists and potable water guzzling urbanists . More than a century old [7], pressure-driven membrane desalination is, currently, the most preferred means of manufacturing freshwater from a seawater "Drinking Watershed" resource [8]. Mega-scale floating desalination plants for Spaceship Earth have been proposed previously, although never before on the spatial scale as the macro-imagined FBDF! Admittedly and unavoidably, the FBDF concept has a starkly characteristic aura of a young child's paracosm — a self-created imaginary parallel world — as, for example, the puzzling but stimulating observed fact that crewmembers aboard the interstellar space-travel vehicles associated with Star Trek television episodes and films never, ever worried about their personal freshwater source; no actor/actress is ever seen repairing a freshwater-fountain [9]! GEOGRAPHOS apprehends its FBDF proposal as a "Grand Design" [10] which, if constructed and successful, would correlate its operational product, artificial freshwater, and its encompassing Venezuelan arid landscape. The Koppen BSw Tropical Semidesert Climate of the entire ~400 m-high Araya Peninsula and the heights of the ~800 m-high topography Eastern Interior Range bordering the latitudinally-elongated Golfo de Cariaco requires irrigation all year for commercial crop farming.

On gulf's southern flank, the Pan American Highway [11] parallels the Golfo de Cariaco, following a route traversing its southern shoreline north of the Eastern Interior Range's foreland, potentially allowing the FBDF, with or without a remarkable viewable urban skyline, or even be entirely invisible from both shorelines due to Earth's curvature, to become an infrastructure signed by place-marketers, transnational aquaculture boosterism, waterfront development and de-development, perhaps even a unique tourism floating attraction named after some

globally-recognized Latin American celebrity (of course, toponyms can always be altered to adhere to evolving popular sentiment about faddish and eventually outdated identifiers) ! With its modularized, linked foamed-metal base, the buoyant FBDF might attractive to persons nowadays exclusively dwelling ashore to its offered futuristic living and working accommodations as well as themed entertainment features primarily because it will be isolated from any major future effects of too-familiarly destructive regional earthquakes (think rentable apartments, leasable condominiums, owned single-family residences stacked decorously atop a vibration-free, noiseless movable desalination barge-fountain floating man-made island [2]). Because of its components and sturdy naval construction, the FBDF is earthquake-proof and unsinkable — that is, there can never be an installation failure (the unacceptable difference between expected and observed buoyant platform's module performance)! It is safely foreseeable that only very small, technically-isolatable and extinguishable fires could pose a life-threatening menace to people, pets and personal property.

3. Un Uncertain Future

Chapter 14 of H. Michael Tarver's The History of Venezuela (2nd Edition, Greenwood, Santa Barbara CA, 2018, 248 pages) carries the same title as this Section. But, the brief statement is generally true of all human-manipulated things, alive and/or organizational and seems inapplicable, or at least inartful, when taken as a prospectus conclusion relating to ever-changing Venezuela. Macro-Imagineering ought to play an increasingly useful role in helping Venezuela's 21st Century citizenry (32+ million persons, 89% of whom are currently urbanized) to progress technologically and economically. Many bays of Venezuela's coastline seem adaptable for additional non-electricity consuming FBDF-type installations, so it is surely the case here that GEOGRAPHOS randomly selected Golfo de Cariaco, situated in NE Venezuela abutting the Caribbean Sea, as a suitable demonstration of the unusual "Drinking Watershed" macro-project concept that is quite independent of present-day landscape topography, including past planned or unplanned terrain changes thereof [12]. (Envision 11,800 km^2 blank-slate State of Sucre available for remodeling by its 900,000 + human population, nearly 300,000 of whom live in the State's seaport-capital Cumana City, established under another toponym in AD 1515. It is the oldest Spanish settlement on the New World mainland).

The truly singular composite metal foam FBDF installation bearing a glassed-in distiller, atop ~4,347 km3 of Golfo de Cariaco seawater separated from the Caribbean Sea by a 55 m-deep seafloor sill officially-dubbed the "Salazar Sill", Figure 2, located northwest of Cumana which could be geometrically modified to reduce or increase the present-day Golfo de Cariaco tidal range of 10-20 cm, could cover ~2.13% of Venezuela's declared 30,000 km^2 national water territory, enduring future higher mean air temperature than 26-27^oC and mean wind-speed of >4.0 m/s. Cumana receives ~250 mm of rainfall annually. Therefore, the prevalent BSw climate encourages the anticipation of some wind-power and solar-thermal power enterprises focused on, and in the vicinity of, the State of Sucre's central geographical feature, the Golfo de Cariaco! Within a Nation hampered by an ongoing electricity shortage mega-problem, NE Venezuela has difficult-to-master landforms as well as an aridic regional climate affected by pronounced latitudinal fluctuations of the Earth-atmosphere's Intertropical Convergence Zone that, so far, still restrictively inhibits, or even retards, developmental pace of the region's early-21st Century vigorous socioeconomic development.

Major earthquakes and subsequent tsunamis have had a profound impact on the Golfo de Cariaco for

many thousand years. The earliest Spanish-reported tsunami in Venezuela, in AD 1498, occurred at Boca de la Sierpe, Pedrenales. Some geoscientists strongly support the geohistorical opinion the 1498 AD temblor first opened the Gulf of Cariaco to massive seawater intrusion [20] and the opening event-process was furthered later by the seismic catastrophes of AD 1530 and 1543 AD and, perhaps, then completed by a large-scale seafloor displacement on the sill's western face at the gulf's entrance. Little of the available and thoroughly examined published geological evidence is actually conclusive on this specific sediment slump timing subject [21-22].

4. Geographical Summary of the Present

The Golfo de Cariaco east of Cumana City is a semi-enclosed ocean sub-basin hydrographically affected mainly by the present-day wind regime affecting northeastern Venezuela [13]. Unintentionally Cumana City was sited and continues to be maintained on the dangerously active 800 km-long right-lateral strike-slip El Pilar Fault which formed the whole gulf in its existence as a visible geomorphic surface trace for accommodative relative motion along the Caribbean-South American tectonic plate boundary. During the most recent Ice Age low-stands, the Golfo de Cariaco was disconnected from the world-ocean and sometimes functioned as a freshwater and/or saline lake basin. West of the gulf, the Cariaco Basin is the largest anoxic basin of Venezuela's submarine continental borderland, in our world second in volume only to the notorious Black Sea [14-15]. Venezuelans have promoted the inundation of some segments of the Nation's 2,800 km coastline — that is, ~0.4% of the Earth's — by their petroleum mining: since AD 1929, the 12,000 km^2 Maracaibo Lake located in northwestern Venezuela evidenced induced lakebed subsidence of >5.5 m caused by that extraction of valuable liquid and gaseous materials. Dredger deepening of an oil-tanker shipping lane by AD 1956 increased ocean seawater flow into Maracaibo Lake [16]. Future sea-level rise must, therefore, subject both Maracaibo Lake and the Golfo de Cariaco to greatly increased openness to non-placid marine influence [17]. Indeed, the Nation's Caribbean coast is constantly subject to Trade Winds and, episodically, to hurricane storm surges and tsunami-generated waves. Since circa AD 1950, agricultural landscapes of the Caribbean Sea Basin have suffered a drying trend as well as a few multi-year droughts — for instance the 2013-2016 AD drought was universally judged as very severe, putting at risk ~2.0 million people because of food production insecurity and slackening tourism [18]. Even the diminishing fishery annual take has apparently been affected by commonly observed climate change [19].

5. Solar-thermal Fountain-Barge Desalination Factory (FBDF) Particulars

Established incrementally — modules added to the "initiating rectangular barge kernel" as propitious financing permits — the composite metal foam FBDF has the potential to become a picturesque tourist industrial desalination factory venue additional to many other already extant famous attractions of the State of Sucre, Venezuela. For example, tri-cable detachable gondolas, each carrying ~35 passengers, moving at 30 km/h, passing support towers spaced 3,000 m apart, could afford visitors fine, inspiring elevated and long-distance views of the stationary FBDF from the Araya Peninsula and the Eastern Interior Range hillsides. Possibly the cable-supporting towers — executed in some recognizably Venezuelan architectural style — could be designed also to remind people that Cumana City is/was an industrial seaport containing ships and waterfront cranes. Of course, such a cableway would have to be constructed so as to endure expectable major earthquakes and remain always in a safe condition of workability! The use of super-cables formed of graphene might be advisable too. In the event of necessity — such as a reasonable

tsunami warning — the cableway might be beneficial to the citizenry and tourists as a method for rapid evacuation of low-elevation high-risk wave run-up danger zone landscapes. Serious strong temblor disasters seem to be repeated sporadically on, approximately, 130 year cycles meaning that long time-periods elapse before similar recurrences. All structures intended for disaster mitigation and post-disaster recovery inevitably are subject to expensive maintenance costs and, therefore, ought best to be used daily. The specific weight of seawater may be taken to be 10.09 kN/m^3 or 1.03 t/m^3; a general operational rule is that it is necessary to have a breakwater if the significant wave-height is >4 m. As a result of the major temblor of AD 1530, Cumana City was totally swamped, and all its infrastructure converted into worthless rubble by serial 7 m-high tsunamis! Ideally, this fact indicates that resettlement of the human population currently at considerable risk ought to be accomplished; however, practicality and finances surely intervene in this instance, necessitating instead other pragmatic real-world actions. Abandonment of some unprotectable at-risk strand properties should be considered carefully by responsible local authorities and concerned citizens. Would thousands of willing former Cumana residents, assured of their safety during future tsunami event-processes, live permanently aboard the solar-thermal composite metal foam FBDF? (YES!) Kiyonori Kikutake (1928-2011), the Japanese proponent of marine metropoles — that is, self-sustaining, flexible, clean, safe communities — under the rubric of Metabolist Architecture was only able during his lifetime to complete one tiny example, the Okinawa Ocean Expo in 1975 AD as the only Metabolist Architecture floating macro-project: as a social group, until circa AD 1970, Metabolist architects planned to transform Tokyo Bay into a body of seawater supporting a floating metropolis extension of old Tokyo.

But, what is the alluded GEOGRAPHOS macro-imagined FBDF?

Floating all solar-thermal FBDF components on a spatially-vast captive composite metal foam barge infrastructure decouples the installation from seismic disturbance because the linked rectangular modules floating base-isolation structure prevents relative shifts of all FBDF components aboard [22]. Any damaged edge-modules can be removed for timely repair or if the sea-surface space is needed for other “Grand Design” purposes in future. The FBDF’s constant position in all circumstances with respect to the seawater surface, whatever its position at any specific time or sea-state condition, facilitates boats and ships to come along-side in the same manner as usually done with fixed piers and berths. From AD 1995 until 2001 AD, macro-engineers tested technologies inherent in a Mega-Float airport (with a 1 km-long runway) in Tokyo Bay, Japan, which is subject to tsunamis of remarkable size [23]. “Closed cell metal foam was first announced in 1926 by M.A. DeMeller in his French Patent 615,147” [24].Composite metal foams are lightweight, reduce collision penetration and can cope with fire temperatures twice that of the metals of which they are comprised [25]. Robust metal-ceramic foam forms a part of the hulls and superstructures of many boats and ships already afloat upon the world’s mutable ocean as well as our planet’s navigable lakes and rivers [26]. Since such foams are cellularized (enclosing empty voids or trapped gas bubbles by >50%), the Fourier Law of thermal transmission by conduction between various materials or layers of material, and convection, according to the values of heat resistance or surface thermal resistance owing to the convection currents generated applies rigorously. The surrounding Golfo de Cariaco dryland is an appropriate region for the confident operation of the effectively high-performance and low-cost desalination factory entailed by the composite-metal foam FBDF. Industrially simple, the interfacial one-Sun (1000

W/m^2) solar contactless steam/vapor generation by photon management and heat localization FBDF, operating at 100°C and ambient air pressure, raises the possibility of stable and ultra-efficient daytime-only solar-thermal Golfo de Cariaco seawater desalination [27-28] (see Figure 3).

The pervasive fabric photon-absorber, normally situated beneath the overhead slanted glass-house as a VANTA-black flat defect-free carpet affixed to the deck of each FBDF module, is the key technology for the proposed FBDF freshwater factory. The dark-colored fabric reflects ~0.035% visible spectrum sunlight [29]. The Serpentine Gallery Pavilion in London, England, designed by Peter Zumthor as a uniformly black-box artwork situated in a vast expanse of naturally green grass owned by London Kensington Gardens, existed for three months during AD 2011 [30]. VANTA-black is almost impossible for the human eye to perceive the shape of any object and structure coated by the light-absorbing pigmented spray-painted carrier solution: Asif Khan unveiled a pavilion at the Pyeongchang Winter Olympics Games held in South Korea during AD 2018 as his version of our world's darkest 35 m by 35 m building. (Pyeongchang, South Korea is typed as a Koppen Climate Classification Dwb, a humid continental climate). Anish Kapoor's Descent into Limbo (1992) was displayed until 6 January 2019 at the Fundação de Serralves, Museum of Contemporary Art in Porto, Portugal. Suggesting a cube-shaped building inside of which is a lit, circular 2.5 m-deep real hole coated in black-pigmented paint, thus presenting an illusion to its parade of temporary viewers of a depthless ground cavity. Sadly, during August 2018 a 60 years-old Italian man fell into it and was injured! From a close or distant vantage place, the FBDF might appear to be a sparkling crystalline structure, but its interior would have an entirely different impressive visual effect: maintenance personnel must be wary as they carry out their duties inside the Fountain-Barge Desalination Factory! GEOGRAPHOS supposes some infrastructure add-ons might be required if the FBDF installed at the Golfo de Cariaco. Reject brine produced by seawater flushing of the accumulated particles of salt resulting from the FBDF's operation as a distiller may need to be managed using a method quite different from those usually employed [31]. From a trough-like collector along the keel of the FBDF, a slightly self-buoyant plastic hose may be used to convey the brine wastewater westwards toward the lip of the "Salazar Sill". Released through a pendulous hose's directive nozzle, the dense brine fluid would naturally flow by gravity down the western slope of the sill and, thusly, be transported for ultimate disposal into the anoxic Cariaco Basin. Humbly, GEOGRAPHOS recommends that Venezuelan regional planners please consider the FBDF as a potentially viable 21st Century infrastructural option for their Golfo de Cariaco segment of the New World's "little Venice" [32].

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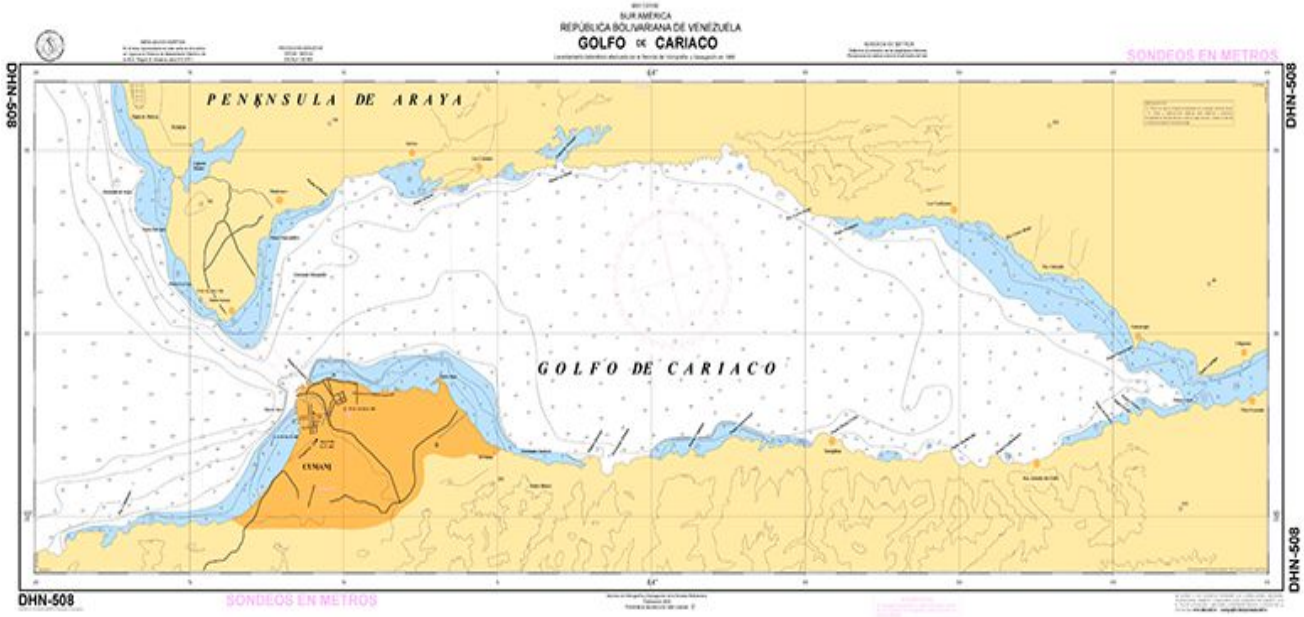

Figure 1. Authoritative Venezuelan armed forces navigation chart of the Golfo de Cariaco.

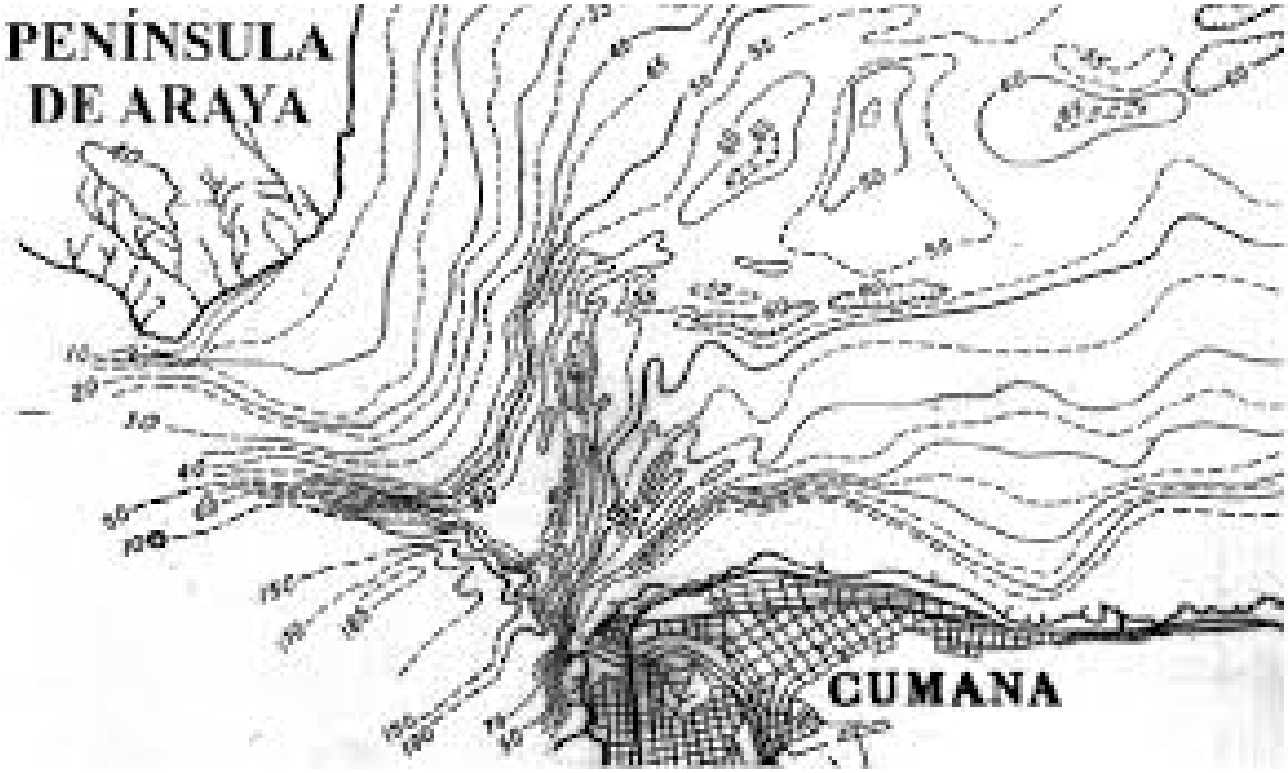

Figure 2. Entrance/exit of Golfo de Cariaco illustrating the "Salazar Sill". Source of data and author(s) unknown. Notice the unfortunate tsunami-vulnerable geographical siting of present-day Cumana City.

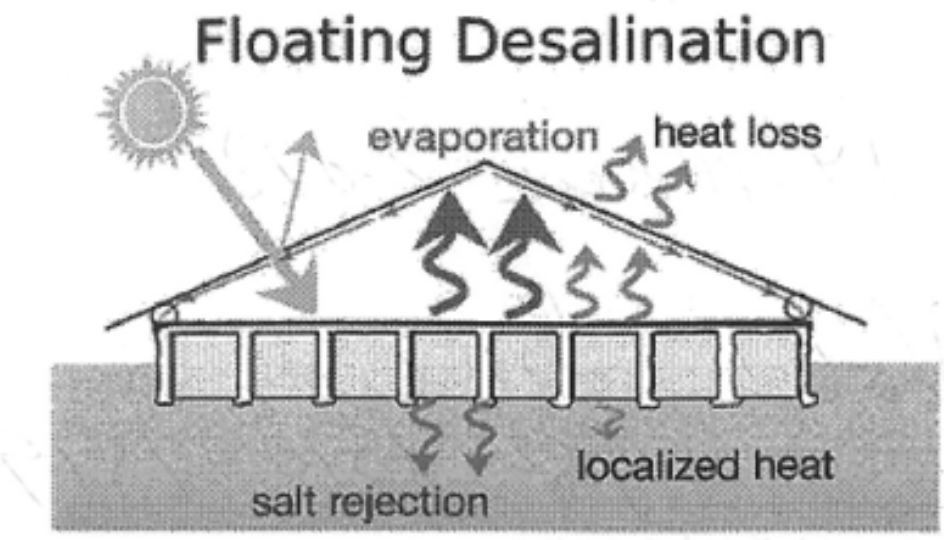

Figure 3. Schematic diagram of the FBDF module.

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Meteorological Macro-Imagineering:

A Re-plumbed Freshwater Supply System for the USA's Southwest?

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Abstract: The macroproject proposed, encompassing the arid Southwest of the USA and northern Mexico, has the potential to more than pay for itself. If a radical volumetric enlargement were competently completed by correctly educated advocates of Macro-Imagineering, supplemented by geothermal power-plants, it could make benign an over-polluted aquatic "monster" — the present-day stagnant and putrid Salton Sea — through induced importation of diluting Gulf of California saltwater resulting in rapid areal increase of the inanimate "creature", converting it from its presently degraded smelly status to an amply beneficial condition as an anthropogenic extension of Mexico's Gulf of California! Formation by Macro-Engineering means of a sustainable human development around and thereon can result in profitable voluminous desalinated seawater exportation from the State of California to adjacent Arizona, Nevada and nearby Utah as well as Mexico bordering the USA's Southwest. The key infrastructure permitting these developments is a centralized multi-segment photovoltaic-powered desalination factory resting atop named floating artificial islands covering most of a deliberately enlarged and robotized Salton Sea. A particular macroproject proposed, the Southwest Water Alliance Project (SWAP), is fashioned somewhat after NEOM, an announced ecopolis, but still structurally unspecified robot megacity, scheduled to be built in northern Saudi Arabia connected by a yet-to-be-constructed fixed sea-strait crossing linking Tabuk, Saudi Arabia to Sharm el-Sheikh on the Sinai Peninsula of bordering Egypt.

Key words: Seawater desalination, floating photovoltaic platforms, arid Southwest USA and Mexico development, Macro-Imagineering, Macro-Engineering.

Resumo: O macroprojeto proposto, abrangendo o árido sudoeste dos EUA e norte do México, tem potencial para mais do que pagar por si mesmo. Se um aumento volumétrico radical fosse conduzido por defensores competentes da Macro-Imagineering, suplementado por usinas de energia geotérmica, seria possível tornar benigno um "monstro" aquático extremamente poluído — o atual e estagnado Mar de Salton — por meio de importações induzidas de água salgada diluente do Golfo da Califórnia, resultando em um rápido aumento de área da "criatura" inanimada, resgatando-a de seu estado atual degradado como uma extensão antropogênica do Golfo da Califórnia! Por meio da Macroengenharia é possível conduzir um desenvolvimento humano sustentável e lucrativo capaz de garantir uma expressiva exportação de água do mar dessalinizada do estado da Califórnia para os adjacentes Arizona, Nevada e Utah, além do México na fronteira com o sudoeste dos EUA. A principal infraestrutura que permite esse desenvolvimento é uma fábrica centralizada para dessalinização multissegmento baseada em energia fotovoltaica, formada por ilhas artificiais flutuantes que cobririam a maior parte do Mar de Salton em um sistema ampliado e robotizado. Em

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particular, um macroprojeto semelhante proposto é o *Southwest Water Alliance Project* (SWAP) — criado um pouco depois do NEOM —, uma ecópolis anunciada, megacidade robótica estruturalmente ainda não especificada, programada para ser construída no norte da Arábia Saudita, conectada por uma passagem estreita ligando Tabuk, na Arábia Saudita, a Sharm el-Sheikh, na Península do Sinai (fronteira com o Egito).

Palavras-chave: Dessalinização da água do mar, plataformas fotovoltaicas flutuantes, desenvolvimento do sudoeste dos EUA e do México, Macroengenharia.

1. Introduction

The trash-cluttered, chemically contaminated and ugly defective "monster" of 20th Century Technology that is today's infective Salton Sea puree is not an apprehension prevalence-induced concept [1] but rather a widely-recognized, real-world degraded environmental quality macro-problem actually adversely affecting directly the citizens of northern Mexico and the USA simultaneously [2]. What air pollution was to the State of California's infamous smog-town, the City of Los Angeles during the 1950s, toxic lakebed dust emissions is to today's inland Imperial Valley. This article is not just another spoofy Salton Sea redevelopment manifesto; instead, it will merely outline in sufficient geographical detail several new macro-planning means to indisputably suplant all of the past disastrous so-called State of California "desert development" schemes, possibly to achieve an attractive and lasting 21st Century Salton Trough infrastructural development status realized via SWAP, the Southwest Water Alliance Project. In other words, to close-out Southern California's never-ending costly-to-taxpayers cascades of unsafe curative Macro-Imagineering fantasies with conversion of the Salton Trough into a real-world public-appreciated asset, the region's ultimate landscape perfection done with proper Macro-Imagineering! In this report, Team Geographos excludes discussion of all navigational aspects of a previously proposed twin canal and megaports macroproject plan — the Salton Sea PLUS — other than to present an exemplary ultra-case of photovoltaic-desalination SWAP trades! In other words, here we do not account for the requirements of multiple seaports and their marked navigational channels for very large ships.

An English-language antonymic neologism for a newly-described aspirational social group, or recognizable community, avivocracy's fans oppose blind ideology and any demonstrably wasteful implementation of unadulterated Technocracy, which is both an identifier as well as a popular social movement first fostered during AD 1919 by Californian engineer William Henry Smyth (1855-1940). First imagined as new terminology by Marc Hudson working at the Sustainable Consumption Institute, University of Manchester in the UK, carefully he sought to impose the term avivocracy on all Region-reforming macro-planners as a cautionary bridle because, Hudson says, "It means those tasked with imagining how we will cope, as a species, cannot hide [anymore] behind soothing stories of technological (and technocratic) salvation" [3]. Obviously, the newly-minted term well applies to this outrageous everyday technological-geographical State of California tainted desert "monster", today's occasionally putrid non-cyborg Salton Sea! Advocates and silent followers of avivocracy prudently attempt to train and constrain the most outrageously hubristic proponents of Macro-Imagineering to be humbler and more forthright about the data and informational limits to what they know for certain as accepted truth (sometimes referred to as "prediction"), what is indisputably uncertain, as well as what they may personally deliver to the world-public in the form of totalizing regional and global macro-plans and megaprojects [4]. It is possible, in other words, for cosmopolitan Macro-Imagineering persons, studied

intentional special-interest groups to create desirable 21st Century eucatastrophes, a word coined in 1944 by famed story-teller J.R.R Tolkien (1892-1973) [5]! Viva Happy Endings!

Today's Salton Sea is an artificial, increasingly salty terminal lake sitting in a 6.3-million-year-old rift-valley, a sometimes-deadly feature of a trough-shaped Earth-crust rip still being torn asunder by Nature. A maximum area 1,100 km^2 Salton Sea was emplaced during 1904-1907 AD in the dryland Trough at minus ~60 m below global sea-level as a result of an extra-ordinary sequence of environmental event-processes involving the intentional commercial diversion of Colorado River freshwater for irrigation farming. Unlike its many historical natural predecessors, the existing unnatural Salton Sea has been sustained since those early days mainly by contaminated drainage from its surrounding intensively irrigated fertile landscape. Nowadays, it is basically a briny sump presently subject to total evaporation under some often vaguely futuristic climate regime change scenarios that usually entail postulated presence, in future, of a much drier climate regime affecting the USA's Southwest and northern Mexico desert. One of the initial founders of the University of Southern California, Joseph Pomeroy Widney (1841-1938), as early as AD 1873, wastefully proposed to deliberately divert the Colorado River into the USA's below-sea level rift-valley territory with the goal of creating a big "…freshwater lake and to ameliorate the region's hot and dry climate" [6]; a year after the Colorado River ceased to flow naturally into Mexico because of the closure of several massive upstream dams constructed in the USA, maverick atmospheric scientist James Edward McDonald (1920-1971) had correctly pooh-poohed — proven fallacious as well as ridiculed — J.P. Widney's and others' regional air-modification concept, evaporational rain-making downwind from artificially pooled freshwater [7]. However, the overrated idea is still grudgingly promoted, often by densely jargonized, obfuscating, circumscription-style pseudo-scientific reports authored by innumerable researchers with various educational and employment qualifications — many are mere Californian politicians first trained as lawyers and realtors [8-10]. And, it is generally alleged that extensive solar-power panel arrays sited above simultaneously cultivated fertile soils underneath (so-called agri-voltaism) may have an as yet unknown effect on post-installation precipitation distribution; two Salton Sea PLUS-proposed canals from the Gulf of California conveying seawater north to enlarge and maintain the Salton Sea by water-mass compensation could reduce slightly the Region's surrounding adjacent landscape air temperature, increasing annual precipitation as well as the year-round vegetation density because of moisture-laden winds arriving from the Gulf of California following the canal routes as happened in the Middle East after the Suez Canal had been dug by AD 1869. (To access the "California Climate Tracker tool, please visit: https://wrcc.dri.edu/Climate/Tracker/CA/). Hurricane Odile interrupted the energy and freshwater supply systems for several days during September 2014 in the State of Baja California Sur, Mexico; assuming future climate regime change, hurricanes could move still farther north, making landfall so as to affect the Colorado Delta and commercial shipping within the sheltering Gulf of California with slightly increased storminess).

Following the accidental emplacement of the Salton Sea, by AD 1909 all commercial cargo shipping ceased using the lower Colorado River as an arterial freshwater rivercraft traffic route after completion-by-closure of the Laguna Diversion Dam situated between the State of California and the State of Arizona. The troubled binational territorial influence of today's wretched Salton Sea exists because of the past absence of international cooperation between Mexico and the USA: the American developer-builder of the unsound irrigation canal head-gate at a locality within

the jurisdiction of Mexico which failed structurally under Spring floodwater impact, allowing the full flow of the Colorado River for several years to enter the Salton Trough, sought exemption by geopolitical evasion tactics from the few then existing legal regulations imposable by the State of California as well as the USA's national government, by only obtaining building permits from Mexico's national government. Today's Salton Sea is a disappearing monument to past disharmony amongst two ecosystem-nations; nowadays their respective citizenry require "togetherness"!

2. Abandoning all previous generations' infrastructure development hallucinations [9-10]!

By dictionary definition, "the geographical future" is a place, landscape or Region without objects. During AD 2012, the USA and Mexico concluded a bilateral agreement to restore the Colorado River Delta [11-12]. This enshrined international concord typifies the stale-minded thinking ever-present in the two-international border-separated political and academic conversational circles, unfortunately hosted by somewhat confused and ill-informed Californians and Mexicans, focused upon the extant disgusting, horrendously low-environmental sustainability status so-called Salton Sea. Professional landscape Architects are promoting the idea that Americans must retreat in another compass direction because of the Southwest's supposed ultimate natural freshwater supply limitations [13], one of the sub-themes of the 1994 Hollywood movie Wagon's East! starring comedian John Candy (1950-1994)! Alternatively, Team Geographos determinedly recommends a singular massive macro-planned enlargement of the Salton Sea — to nearly seven times its present-day area — finally to attain a constant artificial seawater area of ~7,722 km2 using seawater imported from the Gulf of California, via cost-free gravitational flow through one or more canals excavated by floating dredgers, and passing through cooperating Mexico and Imperial County, State of California, into a new internationalized and robotic landscape feature, the Salton Sea PLUS [14] — that is, a permanent anthropogenic seawater-flooding of the entire below-sea level part of the Salton Trough north of the Gulf of California, including Mexico's below-sea-level Laguna Salada. (Daring Geoscience literature speculates that between 1000-1600 AD, when the world-ocean is known to have been >1 m higher than its measured average global 21st Century elevation, the Salton Trough may have become inundated by seawater owing to the arid Colorado River Delta's high-tides and associated large tidal-bore; it is possible that Gulf of California seawater may have reached, impactfully eroded and finally penetrated a former river delta crest located at Volcano Lake near Cerro Prieto, Mexico, subsequently wholly flooding Mexico and the USA's shared Salton Trough geographic feature.) Whether or not Nature ever seawater-submerged the Salton Trough in the USA, today's landscape ought to become, by binationally-deliberated agreed design a seascape at the hands of positivist Geoscience human beings! If undertaken, such a Macro-engineering project must, of necessity, surpass all currently contemplated linear "restoration", "reclamation" or "stop further deterioration" misaligned mega-schemes — all of which are fabulously hyper-costly to taxpayers as well as so poorly conceived structurally as to be obviously inappropriate financial and mega-engineering binational reactions when considered in the full 21st Century world civilization context — in short, too many proposed schemes are simply the effusions of resigned and uncaring politicians and the faithful news-media's hallucinations ceremoniously dumped onto the otherwise uninformed publics, some of whom are irked knowledgeable voters! Could it be that the commonly employed deterministic "landscape developmental" scenarios, in fact the equivalent to virtual resignations to existential risks [15], used until

ow for evaluating environmental outcomes should be substituted by stochastic scenarios after AD 2018?

The Colorado River, which supplies freshwater to ~ 40 million dependent persons in the Southwest and northern Mexico, including corporatized commercial farmers in the Imperial Valley, endured the worst mega-drought of recorded history during 2000-2014 AD. The 2015 "Salton Sea Restoration and Renewable Energy Initiative" framed California's stinking and eye-irritating brine pool's geographical recession (because of desert climate regime conditions and a reduction in anthropogenic effluents) as an inevitable and lucrative economic desert landscape windfall since profitable geothermal wells could be drilled and serviced based on dry-land worksites rather than operated through a impeding brine layer; briefly, for commercial renewable energy facility operators a semi-disgusting anthropogenic desert playa is preferable to any remaining area of the State's repulsive anthropogenic Salton Sea! The Salton Sea's 2018 AD exposed lakebed constitutes a medically-recognized, spatially-widespread public health risk since the persisting poisonous odiferous dust is already wind-shifted in every direction; before AD 2028, will these industrial macro-planners, real-estate developers and their lax State and Federal governmental regulators suppose its aerosolized topping toxicant-impregnated grainy salt residue will not become equally harmful to adjacent Imperial Valley residents, workers and other important persons and organizations, whenever blown by rainless windstorms off the even vaster dry lakebed resulting from the Salton Sea's total evaporation? This vivid prospective Region doomsday scenario is daunting; eucatastrophe for the Salton Sea Region can most certainly never actualize during our 21st Century without the genuine teamwork and camaraderie of its majority contributors and specialist consultants seeking concerted infrastructural improvements for the Region [16]!

3. Optimizing northern Mexico-southern California's Freshwater Supply Systems

Obviously Whilst taxpaying residents, businesses and governmental entities unintentionally unsafely sited on the Nature-provided eastern Pacific Ocean coasts of western Mexico and southern California must fitfully mull physical retreat from an impending, or at least popularly forecast, global sea-level rise [17-18], those presently located next to the evaporating Salton Sea — trending physically to become a kidney bean-shaped tainted hot desert-dunal landscape—must consider ways to avoid its harmful wind-lofted toxic dust emissions and stinky brine water chemistry-induced clouds which do not yet, but should perhaps, contain injected pleasantly odorized disinfectants! Could a conjunction of humans and their managed computation-mechanical agencies (robots) revolutionize this unmistakably blighted binational New World Region? For Saudi Arabians, the toponym "NEOM" was constructed from two words: Greek "neo" (new) and the Arabic word "*Mostaqbal*" (future) [19-20]; NEOM identifies an abuilding new Middle East city (280 17' 17" North latitude by 340 50' 42" East longitude) where robots function to produce desalinated water, provide adequate installation security and efficient time-tabled industrial and civic logistics, all powered by reliable renewable energy resources and backed-up by out-of-Region high-voltage direct current (HVDC) transmission line sources of electricity input. If the USA possessed a practically functional nationwide electrical grid, then solar power emanating from the desert Southwest could meet peak electricity demand in the early-evening Northeast and then support a similar demand peak in the West a few hours later; new HVDC transmissions lines could follow existing Federal Government-granted trans-continental railroad rights-of-way with very little political or commercial contestation. In the instance of a technically futurized Salton Sea, such resources shall include major photovoltaic, geothermal facilities and a few powerful

"wind farms". Team Geographos admires the inspiring AD 1975 geographical thoughts of Allen Kellogg Philbrick (1914-2007) regarding desalination infrastructure strategic modality [21].

Figure 1 illustrates proposed desalination Plants that are herein indicated by ovoid-shaped dot symbols, located at appropriate landscapes on crucial coastlines, causing manufactured freshwater, put into connected pipelines (narrow dark arrow-tipped lines) thence transporting the made potable freshwater inland to virgin agricultural landscapes and old or new burgeoning cities. Top-left: photovoltaic installation actually should be illustrated as sited on the areally-enlarged Salton Sea resting atop special floating islands (uniquely big unsinkable foamed metal barges [22])! See Figures 2-3 for a clearer photomontage image of the macroproject suggested elsewhere by the supporting and referenced texts for this article [6]. Imagine the Pacific Ocean-volumized Salton Sea being entirely covered by industrial buoyant structures, possibly including within its multi-level "skyscraper" overall form of farms, residences and supporting businesses! According to the USA's 2018 National Ocean Recreation Expenditure Survey, the Pacific Coast is 48% of the USA's coastline which garnered the largest number of beachgoers, the most beach-days accumulated and the greatest ocean-related consumer spending; some ~9,848 km of skirting beaches will become available following full emplacement of the envisioned single articulated artificial island of securely interlinked modularized flat-boats or immobile non-keeled Megafloat-like installation; imagine finalization of the Italy-based architectural firm *Superstudio's Il Monumenteo Continuo* inhabited monolith as being afloat in desertic southern California! Such structural envelopment would, of course, halt almost all direct evaporation from the Salton Sea PLUS. At the very least, such a gigantic aquatic installation would allow decoupling of Mexico and the USA from any future freshwater flow Colorado River variability. In fact, the human populations of the USA's Southwest and northern Mexico might find themselves in a truly revolutionary early-21st Century situation whereby independence from all freshwater extraction macro-problems related to the Colorado River is achievable under neart-term future meteorological circumstances [23]. Surely, governmental budgeteers will be pleased, as will taxpayers, and commercial circles will certainly take notice of persuasively influential new economic facts [24-27].

The southern shoreline of today's Salton Sea is subsiding by ~52 mm/annually, "…greater than the far-field background rate" [28]. The State of California, therefore, ought to become a major for-profit desalinated water exporter to the customer States of Nevada, Arizona and Mexico. Through two dredged canals, unlined like those of the Middle East's Suez Canal, commencing at the Colorado River Delta, seawater originating in the Gulf of California would move northwards (down gradient) into the USA's Salton Trough property: ~400 km^3 of seawater inflow should fill the below sea-level Earth-crust hollow to present-day eastern Pacific Ocean sea-level [29]; however, although capped or lidded by a sunshine intercepting photovoltaic barge of immense area, the two canals will exhibit permanent strong north-flowing non-tidal seawater currents due to the extraction from a closed basin at a single enormous electricity-powered distillery of a huge volume of freshwater! Indeed, removed solid salt particles must then be exported to somewhere that is receptive to massive imports of that sunlight-reflective granular waste product—elsewhere Team Geographos will suggest filling 1,300 km^2 of the below sea-level Death Valley, State of California via a heavy brine-slurry pipeline to prevailing world-ocean sea-level. In a typical sunlight-aided seawater reverse osmosis desalination factory, the factory consumes 3-6 kWh (electric) per m^3 of freshwater produced; therefore, harnessing 1.69884 million GW generated

by a single Salton Sea PLUS-covering 7,722 km^2 floating array of photovoltaics operating with a standard commercial solar cell efficiency of 23%, ~339 km^3 of freshwater will be abstracted. (By circa 2014 AD, more than 17,000 individual desalination factories worldwide existed, some of which drew only seawater; those that did so had a freshwater output of ~30 km^3 yearly!). Let us take some numbers:

7722 km^2 = 7722 x 10^6 m^2;

The PV operate 8 h/day x 365 days:

8 x 3600 x 365 = 10512000 s / year;

Solar average irradiance: per year 400 W/m^2 (this might be too large);

Energy per year, for a PV efficiency of 0.23:

7722 x 10^6 x 1.05 x 10^7 x 4 x 10^2 x 0.23 = 7459 x 10^{15} J;

1 m^3 of fresh water requires 5 kWh = 5000 x 3600 J = 18 x 10^6 J;

Number of m^3 of fresh water = 7459 x 10^{15} / 18 x 10^6 = 1801 x 10^9 m^3 = 414 km^3 / year.

4. *Team Geographos'* Action Proposal: A Southwest Water Alliance Project (SWAP)

Geoscientist now casually assert "…that the annual direct anthropogenic contribution to the global production of sediment in 2015 was conservatively some…150 km3, a figure more than 24 times greater than the sediment supplied annually by the world's major rivers to the ocean" [30]. Speaking in the fashion of pro-desalination Ecopolis-Macro-Imagineering extremists, the yearly replenishment of an enlarged Salton Sea might eclipse that impressive ocean-sedimentation deposition bulk! A photovoltaic platform lidding all of the enlarged Salton Sea will perform structurally as equivalent to an ordinary land-based building's floating foundation in terms of response to seismic-induced vibrations — in other words, otherwise powerful earthquakes can, in future, be treated as urban nuisances through diminishment by structural intervention! The transform San Andreas Fault trends from Mexico, chiefly at the head of the Gulf of California, to San Francisco, State of California; the majority of the State of California's population lives in the vicinity of the San Andreas Fault. The anticipated next major projected temblor epicenter is assumed to be near Brawley, California [31]. The landscape and cities finally inundated forever by the Salton Sea PLUS-SWAP megaproject, perhaps partially rebuilt under the shading photovoltaic paneling of the artificial island covering the bigger Salton Sea artificial water-body, will never again suffer damage, property destruction or human and animal lives lost inflicted by the San Andreas Fault's notorious strike-slip movements! A future slippage of tectonic plates edges seems to be a real potential based on 2018 AD Imperial County news reports of increased horizontally shifting boiling mud-pot activity which threaten to sever Union Pacific's freight railroad tracks from Yuma, Arizona to the City of Los Angeles and beyond, a Kinder Morgan petroleum pipeline, a Verizon fiber-optic telecommunications cable [32] and a heavily-traveled section of Interstate Highway 10 in the Coachella Valley connecting to the USA-Mexico international boundary. During 1540 AD, Spanish explorer Melchor Diaz encountered "fields of boiling mud" at several places on his march northwards from the Colorado River Delta and, before their anthropogenic submergence centuries later, live steam fumaroles, mud volcanos and boiling mud-pots were encountered by local inhabitants. The first effort to exploit the evident geotherm resources of the Salton Sea Trough took place during 1927-1928 AD [33]. Moderate future release of geothermal heat by Nature into the seawater beneath the enlarged Salton Sea's artificial island can be considered quite beneficial since

by raising the seawater temperature for the distillery, the distillation process is made quicker and thus more efficient [34] and some have already sought successfully means to tap this manifestation of Earth-crust energy resource via underwater submarine geothermal facilities [35]. Photovoltaic farming upon the turbulent high-seas is a staple of futurist dogma [36] and even a floating university was tried on a placid artificial lake in Berlin, Germany during AD 2018. What was not outstanding in either of these proposals and attempts is any recognition of the future importance of aquaculture [37]. Expected Salton Trough Region climate regime change [38], as well as the large alluvial landscapes in Mexico such as the Vizcaino Plain and Magdalena Plain which can be more vigorously cultivated whenever low-cost desalinated water becomes available, makes it imperative that farmers and others working outdoors wear sun-protective clothing, possibly including air-cooling properties. As the climate regime changes, heatwaves intensify, and humidity increases, working many hours outside in farm fields as well as inside buildings without or equipped with inadequate air-conditioning systems will become unhealthier, and in some instances dangerously life-threatening, for active humans of both the State of California and northern Mexico. Thus, robotic agents may have to replace humans in some especially health-compromising industrial production situations [39]. On 13 March 2004 until 2007, in the rough desert between Barstow, State of California and Primm, State of Nevada three DARPA Grand Challenge tournaments were held as tests of robotic wheeled cross-country vehicles; since then driverless automobiles and trucks have transited highways as almost everyday car/truck technology worldwide. "While humankind faces unprecedented challenges, technology still represents the best shot to overcome them….[It] is timely to dissect in depth those grand challenges and the respective technologies that could address them, covering research, design, development, practice, maintenance, and even the social-related elements" [40].

In the State of California, the City of Los Angeles' Department of Water and Power (LADWP) is seriously examining the 2018 USD $3 billion Macro-Engineering concept to place near Hoover Dam a huge photovoltaic array on the Colorado River which will generate enough electricity for a battery of fluid pumps below Hoover Dam to collect spilled Lake Mead freshwater — that is freshwater that has already fallen through Hoover Dam's powerhouse — and push it uphill to refill the reservoir (Lake Mead) impounded by Hoover Dam and recirculated through the powerhouse again and again! Such a scheme is highly notional — it keeps the LADWP in business providing customers with electricity but provides no additional freshwater and, worse, may well reduce freshwater flows to places downstream of Hoover Dam! Depending on the pump intake site and the intake size, this question is pertinent: how many times can outdoor freshwater be recycled for power generation, especially as evaporation is unhindered in any fashion whatsoever by the LADWP's "loon-shot"? It is Team Geographos' assessment of the current State of California-northern Mexico freshwater macro-problem that these adjoining territorial Regions have chiefly two megaproject options: (I) keep and mend their current water supply systems or (II) conduct an exchange via the Salton Sea PLUS-Southwest Water Alliance Project, SWAP. The State of Nevada, in particular the City of Las Vegas, and the State of Arizona have been adapting to a forecasted 21st Century future of freshwater shortage induced by climate regime change but that policy is very stressful and, sometimes, disliked by their voting publics. It is possible that even some of the macro-planning techniques utilized by Walt Disney Imagineering for, say, its unbuilt Western River Expedition, could be helpful in the proper creation of SWAP-Salton Sea PLUS [41]. A chemical engineer, Mr. Sidney Loeb, who died in 2004, invented the

reverse osmosis membrane, perfecting it after AD 1965 with filtering tests done in the San Joaquin Valley for the City of Coalinga, State of California. During AD 2014, an Israel-California water cooperation agreement was concluded which is premised on the fact that Israel has constructed coast-sited desalination factories and now exports freshwater from its national territory [42]. Ponder Figures 3-4.

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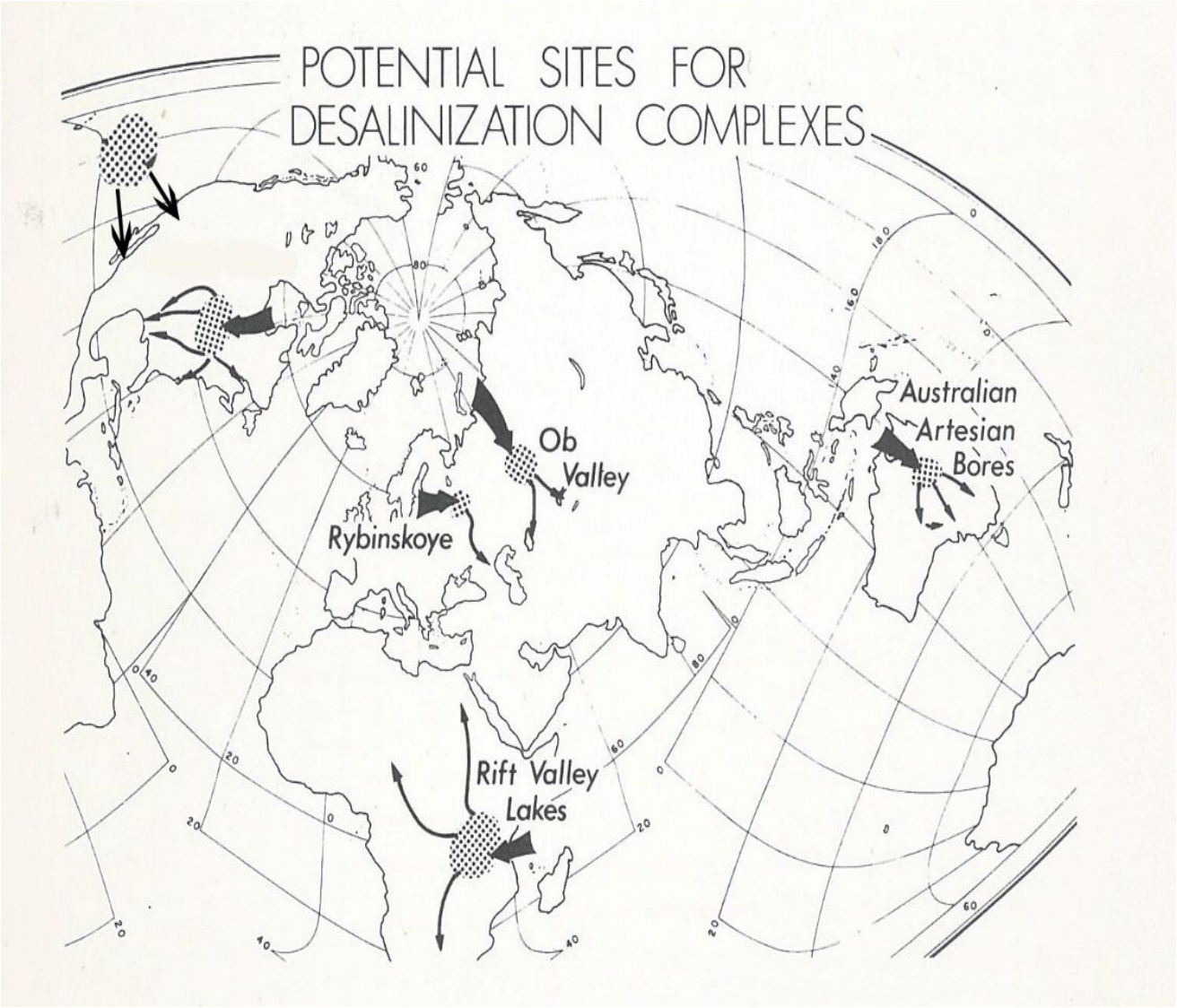

Figure 1: Proposed desalination Plants indicated by ovoid-shaped dot symbols.

Figure 2: One-half of the Salton Sea PLUS-SWAP idea — that is, the two canals and the amplified area of the transmogrified Salton Sea which could add another international marine seaport to the USA's extant infrastructure of ~150 such installations. After the imposition of such a shipping center, the State of California's Inland Empire will spread geographically eastwards and probably become far more prosperous than it was during AD 2018 [44].

Figure 3: Tiny photovoltaic "island" as a polka-dot sample-kernel for the larger Salton Sea PLUS version proposed in our text. After all, if we had covered the entire enlarged Salton Sea, then it would have become uninstructive by geographical invisibility! The tipped arrows indicate freshwater product being transported to northern Mexico only.

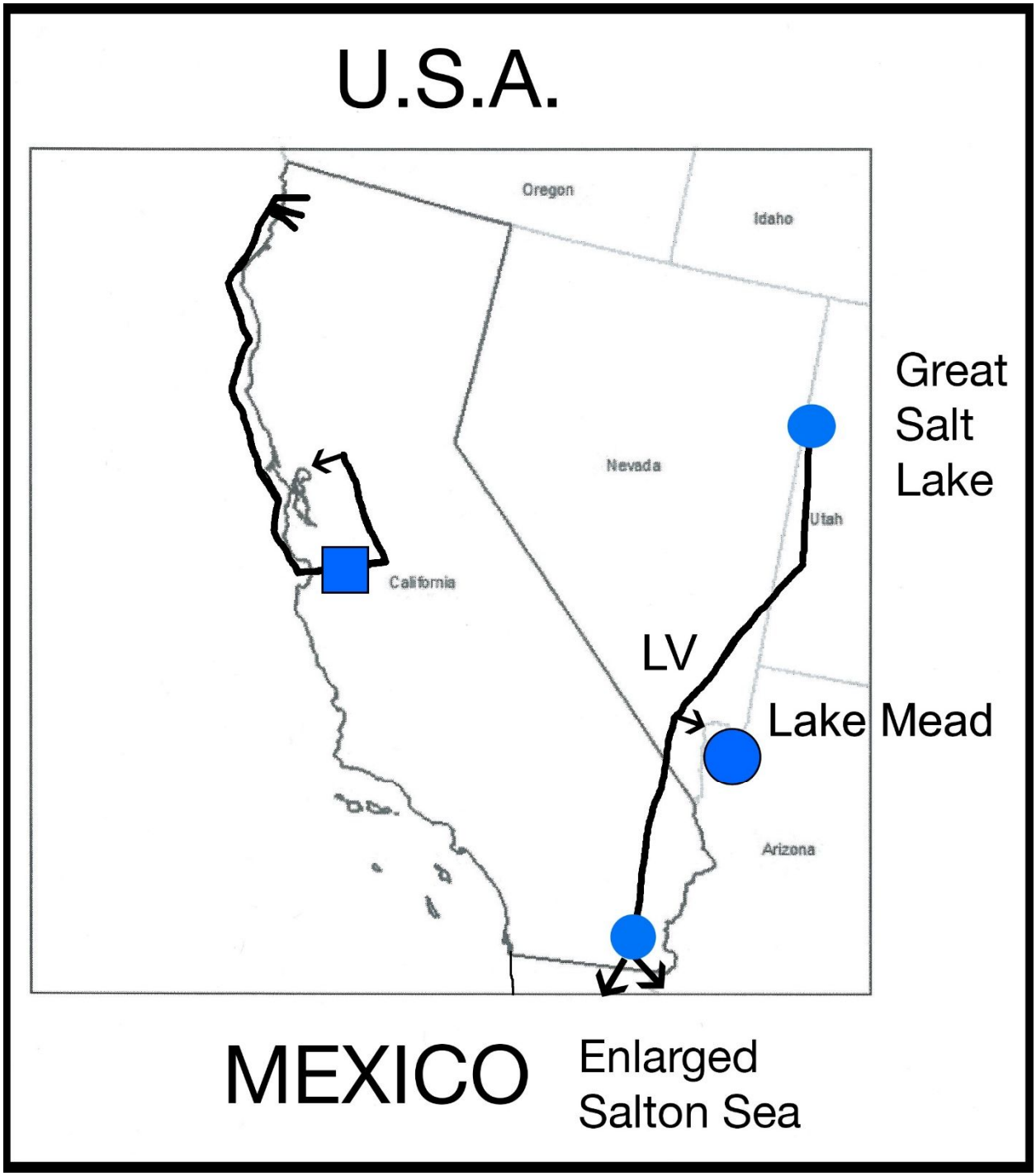

Figure 4: The SWAP pipeline system (the Northern California system, with the box-shaped cartographic symbol representing a man-made freshwater reservoir, the bigger-than-Lake Tahoe San Luis Reservoir, was explained in detail in a previous paper published in this journal [43] so that further explanation herein is repetitive). This figure indicates *Team Geographos'* hope that the State of Utah's Great Salt Lake may someday become a paying Salton Sea PLUS-SWAP customer [45]!