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To our readers

We welcome Dr. Charles W. Finkl to our Editorial Committee! Dr. Finkl is Professor Emeritus at Florida Atlantic University, Department of Geosciences, Boca Raton, USA. He was Adjutant Research Professor at Florida International University, International Hurricane Research Center, Miami, USA. Also, he was Director & Program Professor at Nova Southeastern University Institute of Coastal & Marine Studies, Port Everglades, USA. His vast curriculum includes numerous publications in Coastal Science and Environmental Studies. Dr. Finkl stands out for his extensive editorial experience and for his frequent participation in international events of great relevance. His presence among us as an author will certainly have great repercussions in the history of CALIBRE.

Nilo Serpa

Editor-in-Chief

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ARTIGOS ORIGINAIS

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Macro-Imagineering

Carpet Tidal Power-Plant Around the Peninsula Valdes in NE Chubut Province, Argentina

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Dedicated to a masterful "Vitruvian Man" [1], *the late Prof. ROGER HENRI CHARLIER* [2].

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Abstract: Tidal power is a renewable energy source that is environmentally friendly and has many advantages over traditional power supply that produces waste products. This macro-imagineering proposal is based on mesochronic tidal inequalities between *Golfo San José* and *Golfo Nuevo*, separated by the *Florentino Ameghino* Isthmus that connects the *Area Natural Protegida Península Valdés* with the mainland on the Argentine southeast coast in *Chubut* Province. Hypothetical construction of a canal or tunnel across the 6-8 km wide isthmus would allow a hydropower channeling turbine to take advantage of the M2 tidal amplitude differential between the two bays to produce electrical energy for the immediately adjacent region. Additional beneficiation of the site would accrue from eco-tourism associated with the commercial tidal-range electricity-generation macro-project that envisages terrestrial as well as submarine bio-site visitations by tourists. Properly conducted macro-imagineering projects such as this proposal offer multiple advantages to coastal sites such as this one near the famed *Peninsula Valdés* in Argentina. During 2021, the United Nations is embarking on a Decade of the Ocean.

Key-words: Tidal energy, hydropower, renewable energy, tidal turbine, hydro-electricity supply, tidal barrage energy, eco-tourism, submarine sea tents, marine park.

Resumo: As marés são fontes de energia renovável que não agridem o meio ambiente e apresentam muitas vantagens sobre as fontes tradicionais que geram resíduos. Esta proposta de macroimagenharia é baseada nas desigualdades mesocrônicas das marés entre o Golfo *San José* e o Golfo *Nuevo*, separadas pelo Istmo *Florentino Ameghino* que liga a Área Natural Protegida *Península Valdés* ao continente na costa sudeste da Argentina, província de *Chubut*. A construção hipotética de um canal ou túnel através do istmo de 6 a 8 km de largura permitiria que uma turbina de canalização hidrelétrica aproveitasse o diferencial de amplitude de maré M2 entre os dois golfos no intuito de produzir energia elétrica para a região imediatamente adjacente. Benefícios adicionais para o local seriam advindos do ecoturismo associado ao macroprojeto comercial de geração de eletricidade por faixa de maré, o qual prevê visitas a *bio-sites* terrestres e submarinos. Projetos de macroimagenharia adequadamente conduzidos, como a presente proposta, oferecem múltiplas vantagens para locais costeiros. Durante 2021, as Nações Unidas estão embarcando em uma Década do Oceano.

Palavras-chave: Energia das marés, energia hidrelétrica, energia renovável, turbina de maré, fornecimento de hidroeletricidade, energia das barragens de marés, ecoturismo, tendas submarinas, parque marinho.

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1. Introduction

Within the early-21st Century Macro-Imagineering community, the word cliché usually describes a thing, event, or process that repeatedly appears in Oceanography's dominant macro-project propositional literature, causing a degree of weariness. Unfortunately, because renewable energy output schemes are extra-ordinarily predictive over extended timescales, conceptions of "tidal-power" may appear redundant but in fact their applications are greatly underestimated. Although many hundreds of tidal-power macro-project proposals have been elucidated and promoted by macro-imagineers worldwide, it is perhaps surprising that only about five tidal power installations have been constructed and operated since 1966 [3]!

Figure 1. Conceptualization of shoreline positions associated with a hypo-theoretical sea-level rise of 100 m. The dotted lines show the highly generalized relative positions of the present-day coastline and the solid line shows the hypothesized location of the shoreline for this improbably hyper-elevation of sea-level that would produce additional possibilities for macro-imagineering projects that could produce tidal power [8].

The dynamic world-ocean covers about 72% of the Earth's surface with a volume of about 813,485 km3 and yet continental shelves have been subaerially exposed by lowered sea levels during much of Geologic Time [4-5]. Certainly, the Earth's under-seawater landscape does provide a rich source of data about the archaeology of past

human settlement and long-term changes in climate regimes and sea-levels. Some geographers speculate that the theoretical maximum fluctuating local relief along continental margins was on the order of ~100 m, although there are other estimates that show fluctuations ranging up to 200 m. Figure 1 shows that about 17% of South America's coastal belts could theoretically become inundated, that is with a marginal seascape [6], due to an hyper-hypothetical 100-m rise in sea level [7]. This magnitude of sea-level rise would drastically change shoreline positions and flood Amazonia, but at the same time produce new possibilities for macro-imagineering of tidal power plants [8].

Tidal power (electricity generation) devices effectively utilize tidal differentials by impounding seawater within a basin that is naturally occurring or artificially excavated or blockaded, prior to release through turbines which turn generators during ebb and/or flood tidal cycles. Because rhythmic tidal cycles respond to lunar stresses induced by interpositions of the Earth-Moon system, macro-imagineers envision ocean tides as massive moving liquid "plateaus" containing significant potential energy. Whether sea-level rises or falls during the 21st Century, regional tidal regimes will be altered everywhere within Earth's bioshell [9-10]. These potential changes in sea-level are minuscule compared to hyper-theoretical possibilities envisaged by macro-imagineers who look at the big picture over long-time scales.

2. Southern Argentina's potential tidal-power generation using two barely separated gulfs

Interpretation of archaeological data obtained from today's continental shelves has become increasingly useful in organizing assumptions about the "Aquaterra" past sea-level still-stands [11]. From these studies it is presumed that pre-literate humans moved landward and seaward with coastline changes that occurred in response to deglaciation, interstadial phases, and short duration Ice Ages. In accordance with Dr. Jerome Dobson's "Aquaterra" concept [8], much of human history is posited to have been intricately entangled with fluctuating coastal margins because of relative changes in global and regional sea-levels!

Drs. Roger Henri Charlier and Charles William Finkl, in *Ocean Energy: Tide and Tidal Power* (2009), at Section 6.3, pages 123-124 of their book's Chapter Six, offers readers a concise but nevertheless complete description of the multiple tidal-power opportunities afforded by the proposed variably-configured "San Jose Tidal Power Plant", an electricity-generation macro-project scheme to be situated both north, in the 17,000-km2 San Matias Gulf (the deepest sea-bed basin known to exist on Argentina's continental shelf) and south, in the 2,500-km2 Nuevo Gulf . This proposed macro-imagineering project is located on the Florentino Ameghino Isthmus that connects the Peninsula Valdes Natural Protected Area [12] because it could harness the large amplitude M2 tidal-wave which presents a phase shift of six hours on either side of the peninsula (Figure 2). Since 1923, in some mega-project configurations, namely the "San Jose Tidal Power Plant" concept, these two marine gulfs were to be connected by a 6-8 km-long canal dug across the narrow 35 km-long isthmus, a geologically complex gravely spit or tombolo that is part of the Peninsula Valdes linking, via unpaved National Highway #2, with the mainland; other

configurations involved the difficulty and costly emplacement of a control dam north of the isthmus to separate the Golfo San Jose from the Golfo San Matias [13] (Figure 3).

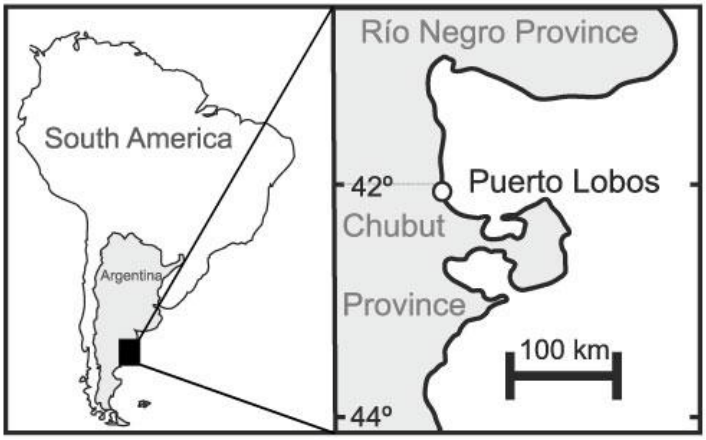

Figure 2. Satellite imagery illustrating the general geographical placement in South American and Argentina of this paper's subject.

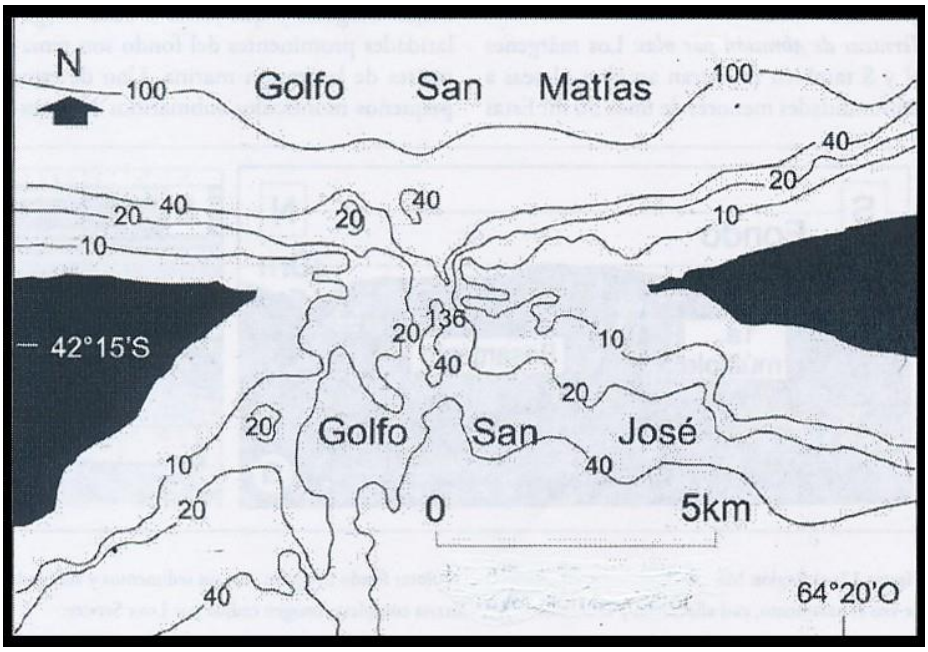

Figure 3. A not easily overcome by macro-engineering bathymetry typifies the gap between the gulfs, highlighting the preferability of the macro-imagineering concept proposed by this article. Depths are in meters below sea-level. (Image provided by JMH.)

3. Macro-Imagineering coastal NE Chubut Province, Argentina: a mimic littoral region?

Employment of "mimic" phraseology is intended to inform readers of a 21st Century national impetus in Argentina to minimally alter the present-day littoral zones of the two gulfs situated on each side of the narrow Peninsula Valdes. Such efforts mean to literally deconstruct, by applied macro-engineering techniques, the existing seascapes and landscapes that are normally geomorphologically modified by maximum flood- and ebb-tidal flows near their respective navigational entrances where there are ~2 m/s semidiurnal tidal currents. As a result, a thalassographic vision is invoked that optimistically surpasses the several potential tidal-range electricity-generation developmental scenarios already elucidated in **Section 2**, above. Nearby subaerial (dryland) land surface depressions are tectonic relatives to the strand-erosion sediment trap depressions on the Argentine continental shelf at the gulfs of San Matias and Nuevo [14]. The main effects of regional and global climate change on coastal regions are alterations in the hydrodynamics of sea-level rise or fall, change in seasonal impacting wave-heights, diminished or enhanced coastal erosion, and damage to coastal infrastructure. Great oceanic storms can cause ship groundings that desecrate the seascape by sunk wreckage. Sometimes, urban-sprawl becomes (as at Guanabara Bay at Rio de Janeiro, Brasil) submarine-sprawl [15]! Also, not to be overlooked are uncontrolled marine biotic invasions. In other words, the essential environmental baseline for any proposed tidal-range harnessing macro-project near or about the Peninsula Valdes is constantly transforming and transitioning due to natural and anthropogenic processes.

4. The Polemic of Seascape Ecological Art

From 1894 until 1907, William Dean Howells (1837-1920) penned three novels encompassing the futurity of Komatsu Sakyo's later science-fiction [16], in which he imagined the utopic ecosystem-nation of ***Altruria***, which occupied a whole Southern Hemisphere continent, but not necessarily Australia or South America. As Howells tells his tale, a large sea-strait had been 'artfully' excavated through a peninsula that had blocked a warm-seawater oceanic current from closely skirting his fabled continent's southeastern coastline. Successful completion of the massive earth-moving mega-project resulted in "…the climate of Italy" for happy *Altrurians* instead of its former harshly unpleasant, almost Siberia-like, climatic conditions [17]. Ecological Art is characterized by its absolute geographical location, sometimes intentional ephemerality, as well as its participatory and pedagogical deliberateness. Of course, wind and precipitation can modify the shapes of such fanciful artworks set in, on or beneath landscapes whilst Art placed (mostly) on the seascape is inevitably transformed by maritime climatic conditions and biota. More or less imitating the *negative art* produced by Michael Heizer [18]. Before 2017, Norway planned to finance ***The Memory Wound***, an artwork designed by Swedish artist Jonas Dahlberg to commemorate the 22 July 2011 deaths of 77 persons at the hands of terrorist Anders Breivik during his lone-gunman attack on the Utoya Island-situated Workers' Youth League summer-camp. Dahlberg's unique memorial proposal was for a clean-cut, vertical slit, made at sea-level and below, through Norway's rocky Sorbraten Peninsula (Figure 4), below.

Figure 4. An artistic conception of what the proposed Dahlberg memorial would possibly look like from a sea-level view. Note the clean face of the surficial and submarine trench cut through the Sorbraten Peninsula showing its relative size compared to humans and an observation platform that is cut out of solid rock.

Due to professional training and mutual cultural tastes, it is not possible to recommend fieldwork investigations in Argentina that would permit a similar Macro-Imagineering travesty by splitting the picturesque parkland Peninsula Valdes, to materialize the technically outdated 7,000 MW "San Jose Tidal Power Plant" mega-project scheme! Appreciating the tourist attraction it might become, like the French 240 MW La Rance Tidal Power

Plant completed in 1966, such a project could endanger many creatures such as right whales, seals, various sea-bird flocks, dusky dolphins and sealions that already attract Argentine vacationers and Nature-adoring foreign tourists! It thus seems far wiser to retain the region's present-day elemental composure rather than brutally eradicate it from the Earth's bioshell, perhaps substituting instead a blobby unnatural sculpture in the energized vacuity of outer-space called ***Ocean*** [19], perhaps to be seen only telescopically! In most circumstances Jonas Dahlberg's artwork is labeled "Land Art"; however, a better and significantly more comprehensive term is available in "Earthworks" which logically might someday even be extended to artistic "Marsworks". "Earthworks" has the advantage of encompassing terrestrial and seabed terrains. Some preservationists might delight in the artwork ***Ocean*** as a vivid visual reminder to the planet's far-future minded-creatures that Earth's first land, the supposed super-continent "Kenorland", emerged ~2.4 billion years ago [20] and the world-ocean will probably be reduced in total volume in the far-future. So, it appears that Earth's ocean is not sempiternal, of never-ending duration as a superficial liquid planetary geophysical presence. Eventually, it will surround a future super-continent [21] and then, ultimately, entirely disappear whenever the Sun enters its Red Giant phase of thermonuclear decline. Hence, it behooves observers to now cherish its beauty and useful presence, as our admired colleague Roger Henri Charlier did.

4. Mimicking Nature's seafloor for eco-friendly tidal-range electricity production

South America's seacoast contains many coastal marine locations that are well suited to the installation requirements of commercial tidal-range electricity-generation macro-projects [22]. Macro-imagineers have elucidated many different mechanical devices that contain electricity-generating turbines [23-24]. The professional terminology of Earth-ocean focused macro-imagineers is such that it attracts the lexicon of Mathematics, Physics and is, under normal circumstances, revealed through essays and mappings. Understanding these proposals is a "must happen event-process" or the entire effort to illuminate progressive Earthly oceanographic mega-project possibilities will be for naught, undeniable failures. Thus, here the authors try to impart sufficient basic information to entice persons attached to the region discussed, Argentines in northeastern Chubut Province, whilst at the same time giving ***CALIBRE*** readers exciting verbal content that will stimulate their own future strivings to acquire usefully accurate knowledge. For example, a new tourist attraction might be a variable depth, down to 150 m water depth, anchored field of spherical bubble-shaped 360^0 view live-feed television cameras that allow tourists to observe sea creatures that won't be disturbed by the presence of operational bubble "telescopes"! Super-computer algorithmic methods have been developed that permit color-correction of underwear images and other techniques ensure moderation of real-time image distortion caused by seawater's density and light-refraction effect (Figure 5).

Figure 5. Photographic conceptualization of submarine live-feed television cameras that could provide views and real-time views of ambient marine life in the project area.

Another tourism amplifier might be the installation of several Sea Tents, of the type designed by William D. Boyce, II, who was awarded US Patent 4,047,390 for same on 13 September 1977. His apparatus allows the isolation of parts of the seafloor via a funnel-shaped plastic material curtain that protects SCUBA divers from turbulent currents and aggressive sea-creatures by allowing aqualung-equipped tourists to view wrecks and marine seascapes.

The oceanic region surrounding the Peninsula Valdes is generally well-mapped and fairly up-to-date because nautical charts are used for surface and submarine navigation. However, new data must be acquired to produce an updated seascape map of the two hyper-tidal gulfs derived from multibeam sonar bathymetry and imagery that visually classify the floors of both gulfs in terms of morphology, texture and biotic zones. As automation advances, exploration and assessment of the seafloor by un-crewed submarine and aerial drone vehicles will intensify. Unquestionably, the manipulation of "Big Data" and Artificial Intelligence will also afford 21st Century macro-project researchers with investigative tools that enlarge the mapped thalassographic scale whilst affording fine-resolution charts! The "Neo-Aquaterra" of our common future Earth-bioshell's ocean, whatever its shape, will become fully knowable by the world-public!

Apparently, future physical integration of South America's eco-friendly electricity generation and transmission systems is an impending real-world possibility [25]. Additionally, and perhaps more importantly, a single intertied global electrical system of the global bioshell will be achieved sometime during the 21st Century. For instance, see US. Patent Application 2004/0199478 A1 issued on 7 October 2004 to Hiroshi Arita and his sixteen associates in Japan for "Energy and Power Interchange system and its Method". The region centered on rural "Cabo San Jose" will be reviewed finally during the 2018-2020 LafargeHolcim Awards Research in Practice Grant

"TERRITORIAL FIGURE IN ARGENTINA: Evolutionary process of infrastructures in new territories: The Patagonia Case" the goal of which is to (1) "Develop a territorial strategy of tidal energy in the Argentinian coast, (2) Localize opportunity areas, (3) "Identify links between possible tidal projects along the coast," and (4) "Study the economical, energetical and social benefits of tidal projects in cities, provinces and nation". Dr. Nilo Serpa and Cathcart [26] peripherally pointed out the serious commercial issue that has to be addressed also by these researchers: how and where to timely use the intermittent electric-power generated by tidal-range mega-projects. The maximum ebb and flow of South Atlantic Ocean tides, once thought to be utterly predictable, are actually quite variable over long periods of Geologic Time. For example, tides have changed markedly over thousands of years, and may change again in the near-term future at North America's famous Bay of Fundy. That bay's tidal-range, which is one of the most extreme in the world, perhaps 5,000 years ago may not have been hardly remarkable [27]! As pointed out previously, tides in the gulfs on the north and south sides of Peninsula Valdes will likely be lower than currently and will consequently necessitate some major mathematical and physics recalculation accommodations. In socio-ecological terms, the region may become more attractive to migrants, meaning an increase in human population from <1,000 full-time residents to some more numerous censused populace.

Dredge spoils and fill mounds dumped on the seafloor can be configured to alter the flow patterns and adjacent ecosystems. Indeed, Tatsuo Suzuki of the Hazama Corporation has already designed a "Super-Ridge" to be deployed over the deep seabed offshore Japan to create a nutrient-rich upwelling to form the substantial basis of a high-seas commercial aquaculture business. In the case of Hazama Corporation's block-mound, it was to be composed of cement-stabilized coal-ash derived from an extant, coast-sited electricity-generation facility in Japan. Interestingly, the Canadian Earthworks artist Betty Beaumont offers an existing example with her similar, but smaller, monumental mound, her ***Ocean Landmark*** (1980) [28]. This barely sketched macro-project for electricity production from the two gulfs bracketing the Peninsula Valdes is founded, basically, on the concept of a power-producing seabed "carpet" pioneered by Mohammad-Reza Alam [29]. Dr. Alam's synthetic seafloor "carpet", useful only in water depths of 20 m to the surf-zone, mimics the sea-wave damping effect of muddy seafloor sediments yet can be used to extract kinetic energy from incoming ocean waves passing above it. It might be most effective if deployed along coastlines with cliffs and other rocky shorelines of Golfo Nuevo and Golfo San Matias which currently have a maximum 5 m tidal-range potential. Dr. Alam's device is always completely underwater and hence imposes minimal danger to over-passing boats and mobile sea-life. Further, such an installation will likely not have any visible impact on the appearance of the natural strand.

Finally, it is suggested, that Argentinian regional planning authorities consider a new architecture for their Control Center needed to oversee such an interesting facility: possibly an official building resembling China's ***Chapel of Sound***, constructed by 2020 of massive concrete mixed with locally-supplied crushed stone to resemble a rugged country-rock outcrop, in a depopulating rural region north of Beijing near restored remnants of the Great Wall of China. With the semi-outdoor amphitheater, outdoor stage and viewing balconies is a ~790 m^2 concert-hall.

Visitors may hear and see Nature's wonders from the viewing platforms and somewhat idealistically (Figure 6), it is macro-imagined that audiences might listen to renditions of appropriate music in the concert-hall. Tunes such as "Higher Ground" (Red Hot Chili Peppers), "Radioactive" (Imagine Dragons), "Rock the Casbah" (The Clash), "Rock with You" (Michael Jackson) and "Under Pressure" (Queen and David Bowie)! But, maybe not, even though the magnificent sounds of "Golden Years" (M-Phazes, Ruel) might be appealing.

Figure 6. As the natural and gardened growth of the vegetation takes hold of the landscape, the ***Chapel of Sound*** in China will, more and more, come to blend with its surroundings. A similar building would fit pleasantly into the landscape of Argentina's Valdes Peninsula.

5. Conclusions

The scientific question is: What distinctive added value does our macro-imagineering approach hold? Local and global anthropogenic agency compels an urgent change of human behaviors that is only possible if each Argentinian understands the world-ocean's vital role in supporting human civilization. All macro-projects are complicated to undertake and to complete [30]. However, educational-recreational facilities built on the Vales Peninsula which are focused on both Golfo San Matias and Golfo Nuevo, along with the intermediary bay Golfo San Jose, cold accomplish that task without too-great expenditure of public funds. A tidal power mega-project of the kind we have proposed here can support the goal of increased coastal conservation.

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Revista Brasiliense de Engenharia e Física Aplicada

Hypo-Loop Container Freight Transport: PART I

Macro-Imagineering New World Macro-Projects

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Abstract: Consideration of operational New World passenger and freight transportation infrastructures from the point of view of impending Hypo-Loop technologies, suggests that American nation-ecosystems have become barely measurable politically-demarcated geomers. If a map of a province, state or region made sense during the past Age of Canals and Roads, it no longer did so with the advent of the Age of Railways. And, modern-day aviation — including the shortly anticipated 21st Century appearance of aero-space vehicles such as the UK's developing SKYLON — has similarly dispelled conceptions of common human passenger and freight conveyance. Many landscape planners, in their misplaced confidence, insist upon skyscrapers where cities must adopt a vertical disposition accommodating ever denser populations, requiring a complex system of vertical and horizontal elevators. Such buildings must be securely ground founded, based on thorough geotechnical studies! Attribution of skyscrapers in a transverse or lateral direction requires structural linkages via secure subterranean tunnels, also requiring a large automated internal transport system. The proposed 21st Century freight-only Hypo-Loop cargo-carrying installation, with significantly reduced aerodynamic resistance, should fundamentally improve the urban soundscape of the Los Angeles River Basin as well as California's Inland Empire.

Key-words: Hypo-Loop, Los Angeles River Basin, macro-projects, Inland Empire, Standard International Shipping Containers.

Resumo: A consideração das infraestruturas operacionais de transporte de passageiros e de carga do Novo Mundo, do ponto de vista das tecnologias *Hypo-Loop* iminentes, sugere que os ecossistemas das nações americanas se tornaram geômeros politicamente demarcados e pouco mensuráveis. Se o mapa de uma província, estado ou região fazia sentido durante a Era dos Canais e Estradas, não o fazia mais com o advento da Era das Ferrovias. Além disso, a aviação moderna — incluindo a aparição no século XXI de veículos aeroespaciais, como o SKYLON, em desenvolvimento no Reino Unido — também dispersou as concepções comuns de transporte de passageiros e cargas. Muitos urbanistas, em suas convicções mal orientadas, insistem em arranha-céus onde as cidades devem adotar uma disposição vertical que acomoda populações cada vez mais densas, exigindo um complexo sistema de elevadores verticais e horizontais. Tais edifícios devem ser implantados sobre fundações robustas, com base em estudos geotécnicos completos! A disposição de arranha-céus em direção transversal ou lateral requer ligações estruturais através de túneis subterrâneos totalmente seguros, também exigindo um grande sistema automatizado de transporte interno. A instauração de um sistema *Hypo-Loop* de transporte de carga para as mercadorias do século XXI, com resistência aerodinâmica significativamente reduzida, deve melhorar fundamentalmente a paisagem sonora urbana da bacia do rio Los Angeles, bem como do chamado "Império Interior" da Califórnia.

Palavras-chave: *Hypo-loop*, Bacia do Rio *Los Angeles*, macroprojetos, Império Interior, Padrão Internacional de Contêineres.

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1. Introduction

20th Century long-distance evacuated air-tube transportation technologies, designed for maximum value networking of cargoes and passengers, were first introduced to Californians in 1972 by RAND Corporation researcher Robert M. Salter (1920-2011). By 2013, a Swiss company, Loglay AG, proposed its *Cargo Sous Terrain* scheme that was based on specially designed movable capsules that would improve commercial efficiency in the rapid delivery of goods using predominantly subterranean tunnels. Because mobility and efficiency are operational hallmarks of international trade, work, tourism, and leisure activities, Macro-Imagineering's major challenge is providing cargo-haulers with safe, top-notch transport infrastructures. Development of new concepts that will successfully network complex cities and remote regions requires the integration of many technologies. Some visions such as those of Elon Musk (born 1971) and others feature operationally systematic hyperloops that are harmonized with existing infrastructures. Although the modern concept of a "Hyperloop" was coined in 2012 by Elon Musk, our 2020 infrastructure neologism is "Hypo-Loop", a hyperloop spin-off that is also a magnetically-levitated cargo delivery idea that foresees the utilization of linear electric motors to propel only Standard International Shipping Containers (SISC) long-distances through specially constructed pipelines generally emplaced underground or, when geophysical conditions require, atop aesthetically-acceptable visible over-ground pylons. The Hypo-Loop, as envisioned, will accommodate steep gradients ranging up to ~10-15%.

The Boring Company, which was founded during 2017 and currently headquartered in the Los Angeles River Basin City of Hawthorne (Figure 1), dug a short experimental or proof of concept tunnel there which was successfully completed during 2018. By 2019, the company had also demonstrated in the City of Las Vegas, Nevada, a rapidly-excavated tunnel to move tourists and conventioneers across town from one important convention venue to another. Because surface railways typically move little freight in urbanized regions, due to the associated high costs that involve time-consuming last-kilometer truck delivery, it becomes inefficient using congested roads and especially if constantly emitting noxious motor fumes. Evacuated tunnels exclusively conveying SISC will be tailored to avoid the train station-to-train station bottleneck; indeed, final container delivery will only be to automated warehouses that host fully automated last-kilometer delivery devices! Conventional rapid pace tunnel boring machines, especially those designed by Richard James Robbins (1933-2019), became more common after the mid-20th Century because of his pioneering patented tunnel boring machine (TBM) inventions. In 2020, the Boring Company announced its "Prufrock" TBM that operates ten times faster at heading excavation than any previous conventional Robbins-type tunnel boring machine! In other words, this technological advance results in cheaper tunneling. The acronym "Prufrock" suggests the first syllable of "prudence" and "frock" a woman's dress thereby indicating the absence of corporate exaggeration. The Boring Company intends to capitalize on new technological developments in electro-magnetic propulsion and totalizing computer controls that have the potential to revitalize geographically large-scale sub-surface tubular systems.

Figure 1. Base map illustrating the relative courses of the Los Angeles River and its main tributary such as the Rio Hondo.

Securing rights-of-way is the political and social macro-problem that will affect use of the Hypo-Loop in both urbanized (developed) and natural California landscapes. The advantage of an underground tunnel system is that there will be no need to review, assess or provide acceptable solutions to the surface (ground level) impacts of transportation on wildlife and superficial soundscapes because there will be none! The Hypo-Loop will be independent of weather conditions and advantageously offers zero biotic mortality, zero biological barrier effects, zero species invasions, zero imposition of operational noise or chemical pollution. After completion, the notable effect on the Los Angeles River Basin's ground-level soundscape ecology will be some insignificant anthrophony — the actual infra-hum of Southern California's existing industry [1-2]. Environmental Impact Assessments (EIS) were first instituted nationally five decades ago during 1970 when the U.S. National Environmental Policy Act became law. State of California laws have as well caused the EIS compilation and approval process to become remarkably expensive, involving multiple government agencies, the critical public, crucial special interest advocacy groups, and often the legal profession through intentional macro-project delay litigation that produces income for those other than technology developers. With underground transit tubes increasing in relevance, there will be little likelihood of continuous post-construction legal, economic, and political issues. Authorities representing the City of Los Angeles could try to exert that city's enormous bargaining power (rent squeezing, leasing contestations) owing to the value variability of the Los Angeles River Basin's Hypo-Loop hauled cargoes. However, the two initial Hypo-

Loop routes advocated will most benefit the extant Los Angeles International Airport (LAX), the Hollywood Burbank Airport (BUR), the Palmdale Regional Airport (PMD), and the Ontario International Airport (ONT) [3]. The Mojave Air & Space Port (MHV), the first ever certified Federally, could also benefit as an allied operational and connected transportation system.

2. Hypo-Loop and Los Angeles River Basin Landscape Planning

The City of Burbank-based famed film-studio Warner Brothers' most profitable moving picture during 1954 was ***Them!*** Science-fictional ants developed gigantism after being irradiated by the 1945 Trinity first nuclear-fission bomb at the State of New Mexico explosive test site. In that movie the giant ants migrated westward, unobserved, from New Mexico to downtown Los Angeles's reinforced concrete-lined river where they established a breeding colony [4]. After arriving, the colonizers next excavated a subterranean nest; nest-digging was made possible by the Los Angeles River Basin's vast networked concrete stormwater drainage channels. Unlike Niagara Falls' "disguised design" [5], the Los Angeles River's design is a "blanket design", a deliberated costume in the urban fabric clearly meant to conceal an unruly natural watercourse! Progressive architectural firms, stimulated by City of Los Angeles planners, Basin building contractors, unionized labor, and possibly the impressive overseas example of Seoul, South Korea's Cheonggyecheon Restoration Project (2003-2005) [6], are still, despite considerable cautions from others, foolishly dabbling with idealist natural channel design imagery when attempting to publicly promote re-naturalization of the Los Angeles River. Should they succeed in convincing a majority of Los Angeles County voters that such a de-construction mega-project plan is wise, then those working and living beside the unleashed river will become even more endangered, subject to Nature's unbridled freshwater flash-flood runoffs as in the officially recorded historic past [7].

Their hazy and simplistic architectural plans reek of geophysical Denialism as well as radical Green Utopianism: from a reasoned scientific point of view, re-naturalization of the Los Angeles River and its tributaries is dangerous. Total annual freshwater discharge of the Los Angeles River at its mouth has increased by several hundred percent due to inflows of treated water from tributaries, leaking public water supply pipes, the irrigation of public and private urban landscapes, and the impervious surfaces (roads, buildings, pavements) that increase surface runoff that contributes to the annual flood magnitudes [8]. In fact the bottom of the watershed is, practically speaking, not really fully known [9]. Any confirmed and taxpayer-funded channel de-construction plan that will affect the cultural future of the entire Los Angeles River Basin human populace, even those living and working river-side in the City of Burbank at, say, Warner Brothers, ultimately threatens to damage property and lives of an essential creative industry which, in part, symbolizes the Los Angeles River Basin. The world-famous signatory ***HOLLYWOOD*** sign emplaced on the front — south-facing slope — of Mount Lee, declared a historical landmark by the City of Los Angeles in 1973, has existed in its present-day abbreviated word formation since 1949 [10].

During July 2018 Warner Brothers announced its hope to build an aerial-cable tramway on the north slope of Mount Lee, its proposed "Hollywood Skyway" future tourist entertainment attraction, to originate from an automobile parking structure adjacent to its property on the left-bank of, and close to, the partly concrete-wall trained Los Angeles River. Extreme storm river runoffs could impair, damage or possibly destroy a realized "Hollywood Skyway" if down-river channel obstructions such as massive bridge piers and high-friction natural riverbed sections had the engineering effect of backing up 21st Century flash-flood freshwater flows! At last report, internationally famous progressive architect Frank Gehry, who once endorsed massive alterations to the blanket macro-engineered Los Angeles River, has shifted to cantilevered structures projected over selected sections of the undisturbed watercourse channel.

Then office-holder California State Assemblyman Richard Katz, recycling a macro-imagineering concept that was first bruited in the 24 March 1941 issue of *The Los Angeles Times*, offered during 1989 an add-on macro-project plan to utilize the existing paved Los Angeles River into a remarkable Los Angeles River Basin daily traffic-flow altering "bargain freeway" — in other words, already constructed and available for improvements to expedite automobile, truck and bus movement to and from the Basin's economically vitalizing Los Angeles-Long Beach harbors. Katz, born 1950, was then, as well as since, been publicly ridiculed, his rehashed update of a pre-World War II transportation macro-project plan junked by "outraged" — politically posturing — radical non-progressive Greens. Nevertheless, a 21st Century use for the geotechnically known ground underneath the reinforced-concrete Los Angeles River is here proposed as a primary route for Hypo-Loop tunnels linking containership port infrastructures with upgraded and fully operational aero-space departure and reception centers located within California as well as extending to the capacious warehouses, which are already built or could be built, in the State of Nevada accessed also by the Rio Hondo route (Figure 2).

The Los Angeles River and its main tributaries are not, as radical Green planners often proclaim, a "lost" river absent from appreciative citizenry gaze. Instead, the river is a known destructive flowing fluid landscape element, a sporadically rampaging watercourse that damages and disassembles vast swaths of costly-to-replace infrastructure while also endangering, sometime killing, the Basin's vulnerable humans. No rainstorm super-computer models or real-world pluvial flood-hazard mapping efforts can accurately predict real-world effects on future home and business flood-insurance premiums, as Frank Gehry found worrisome. In addition, potential Basin-specific sea-level rise of 0.3-2 m by 2100 will affect the mouth of the Los Angeles River and its adjacent yet separately administered seaports as well as its surrounding urban and industrial infrastructures [11-12]. The upper limit of tidal influence on the Los Angeles River is ~3.2 km inland and it is possible that tsunamis might extend the influx of seawater farther upriver [13]. Finished in 1920, the Devil's Gate Dam was the first flood-control structure constructed within the Los Angeles River Basin. A dam at the river's mouth may become its last since it may become vital to install a closure dam as well as watercourse paralleling flood and storm-surge walls [14]. A river mouth closure dam would be a spectacular hydraulic structure that requires complex macro-engineering to survive severe

loading from future ocean waves, tides and river flash-floods. However, as an ersatz architects mega-project, it seems possible that houses and offices could be situated atop such a blockading structure equipped with lift-gates to release Los Angeles River Basin's runoff whenever it is deemed necessary to do so by professional hydraulic macro-engineers.

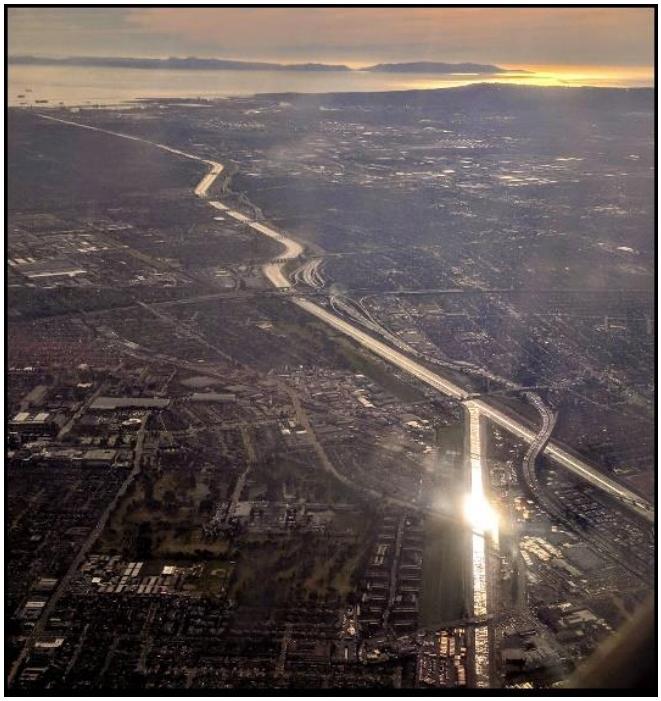

Figure 2, Aerial oblique photograph showing the lowermost course of the 26.4 km-long Rio Hondo, a tributary of the mainstem of the Los Angeles River (also pictured in the background distance), looking toward the horizon of the North Pacific Ocean.

Organization and establishment of cannular Hypo-Loop SISC conveyance corridors, possibly commenced near the City of Hawthorne where The Boring Company is situated, might easily become beloved by the public as a necessary, and long overdue, practical economic re-generation of the famed multi-county freight-hauling Pacific Electric Railway Company's pre-1969 surface track network of yesteryear! In jest, the collective description for the macro-project's bevvy of Hypo-Loop "Prufrock" TBMs could be dubbed ***THEM!***'s Big Bugs!

3. Future Hyperbola Hypo-Loop Macro-project

The defunct Pacific Electric Railway Company's extensive trackage and comprehensive services during the halcyon days of many coastal and Inland Empire counties and cities, 1901-1965, instigated the emergence of multiple civic-minded social movements that instituted a similarly comprehensive follow-on transportation

infrastructure construction (Southern California's globally famous post-World War II freeways). A new 21st Century social movement probably could emerge to encourage the development of a Hypo-Loop system serving the same region as well as reaching as far as the State of Nevada! Since the City of Los Angeles is already reasonably well served by its halo-like mass-transit facilities (subways, bus lines), it is logical to build an inter-linked subterranean freight transport network that relieves the tremendous current overload on the Basin's vehicle-crowded freeways and surface streets, some of which serve Southern Californians and other people faraway, even to the USA's East Coast. Because of the precipitation imperviousness of the Los Angeles River Basin due to urbanization, certainly there can be no return to a legendary, yet currently radical Green-prompted, geophysical past that was idyllically happy and peaceful. To limit any further sealing of the Basin's ground surface, why not construct a hyperbola-shaped Los Angeles River Basin Hypo-Loop?

A suggested freight-hauler Hypo-Loop might be inspired by the work of a genius Swiss mathematician, Daniel Bernoulli (1700-1782), a configuration called a hyperbola [ ) ( ]. Such a geographical configuration that features the absence of SISC loading and unloading facilities in the downtown of the City of Los Angeles ensures speedy throughput of cargoes to and from the seaports as well as the Inland Empire's burgeoning warehousing districts [15]. Two essential operational branches of this macro-imagineered multi-county and coastal cities-serving hyperbola Hypo-Loop, managed by a single governing authority composed of equal-vote delegates from all Los Angeles River Basin member cities as well as the Inland Empire, would extend between Long Beach and the improved and expanded Palmdale Regional Airport (PMD). This is achieved by mostly following the concreted Los Angeles River's macro-engineering controlled course while another branch spans the Long Beach-Pasadena-Inland Empire by utilizing the partly concreted Rio Hondo channel route. (Some parts of both rivers were not paved, either because the groundwater-table was too high to emplace stable poured concrete or because it was desirable to promote infiltration of freshwater into local aquifers.) Emplaced underneath the Los Angeles River and its tributary Rio Hondo, Hypo-Loop's SISC service cannot be interrupted by landslide as France's high-speed trains, the TGV, was 5 March 2020. Also, by not adding to the back-up of floodwaters caused by downtown City of Los Angeles' more than a dozen bridges supported on wide and obstructive piers, Hypo-Loop adds nothing to the flood risks faced by people and property holders in the cities of Glendale, Burbank and other San Fernando Valley locales.

4. Conclusion

Since Hollywood's post-1969 First Human Landing on the Moon, film-makers have envisioned the architectural future of the Los Angeles River Basin as ultra-rainy (***Blade Runner***) as well as the Los Angeles River itself as a Space Shuttle emergency landing strip (***The Core***). Some additional lateral macro-imagineering seems needed, not a lampoon, but which could help solve several of the Basin's most citizen-vexing mega-gripes—surface traffic congestion, smog, and much diminished presence of beautiful Nature!

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Hypo-Loop Container Freight Transport: PART II

Macro-Imagineering New World Macro-Projects

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Abstract: The proposed Hypo-Loop megaproject, which would tunnel under the Darién Gap, could provide a safe conduit for the transport of container freight and passengers between Panama and Colombia. The advantage of a tunnel linking Central America with South America is that transport would be via an underground low-pressure steel tube that alleviates terrestrial compromises of the environmentally sensitive Darién Gap ecosystem, which is recognized as an important natural environmental linkage between Panama and Colombia. This tunnel link is technically feasible using today's modern tunnel boring methods that are amenable to providing infrastructure for mixed modal train transport. The Darién Gap Hypo-Loop Macro-project has the potential to provide environmentally safe transport across sensitive ecosystems by tunneling beneath them and at the same time opening up expansive transfer of goods and materials in the New World. Initiation and completion of the Hypo-Loop under the Darién Gap landscape would bring this region into the 21st Century as a showcase for enhancing the quality of life and improving New World economic systems.
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Key-words: Panama, Columbia, Atrato River, Hypo-Loop, passenger pods, containerized freight shipment, Darién Gap, Panama Canal, tunneling technology.

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Resumo: O megaprojeto *Hypo-Loop* proposto, com tunelamento sob o *Darién Gap*, poderia fornecer um canal seguro para o transporte de contêineres e passageiros entre o Panamá e a Colômbia. A vantagem de um túnel que liga a América Central à América do Sul é que o transporte seria por meio de um tubo de aço subterrâneo de baixa pressão que evitaria o comprometimento do ecossistema *Darién Gap*, reconhecido como um importante vínculo ambiental natural entre o Panamá e a Colômbia. Esse túnel é tecnicamente viável pelos métodos modernos de perfuração, capazes de fornecer infraestrutura para um modal misto. O macroprojeto *Darién Gap Hypo-Loop* tem o potencial de fornecer transporte ambientalmente seguro através de ecossistemas sensíveis, encapsulando-o sob eles e, ao mesmo tempo, abrindo um amplo intercâmbio de bens e materiais no Novo Mundo. No cenário do *Darién Gap*, a realização do *Hypo-Loop* faria dessa região uma vitrine sobre a melhoria da qualidade de vida e dos sistemas econômicos do Novo Mundo no século XXI.

Palavras-chave: Panamá, Colômbia, Rio Atrato, *Hypo-Loop*, cápsulas de passageiros, remessa de carga em contêiner, *Darién Gap*, Canal do Panamá, tecnologia de tunelamento.

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1. Introduction

The excavation and stabilization of the Culebra Cut insured the Panama Canal's subsequent success. Hypo-Loop tunneling under the Darién Gap, shared by Panama and Columbia, will insure the future containment of menacing contagious diseases affecting valuable livestock. During 2019, UNICEF reported that >24,000 persons, 16% of whom were children, crossed the dangerous mature rainforest that is the Darién Gap's landscape; the illegal migrants first find shelter at La Penita in Panama's Darién Province before continuing their journey northwards, usually passing through Panama to adjacent ecosystem-states. It is likely that the population of migrants will increase markedly due to unsettling conditions in many societies, especially Venezuela and Columbia. Meantime, on 29 March 2020, the Panama Canal Authority, in a humanitarian gesture during the COVID-19 pandemic, allowed the cruise-ship ***Zaandam*** to transit the artificial waterway to return to the mainland USA.

A macro-project plan to link all the capitals of the New World through railways was first outlined at the Pan-American Conference meeting in Washington, D.C. of 1899-1890. Later, the macro-imagineering plan to connect the New World by unified highways was first revealed at the Pan-American Conference at Santiago, Chile, during 1923. To increase its international competitiveness [1], the Panama Canal, which operates continuously, has been macro-engineered for modernization, increased its freshwater-lock supply and performance capacity for more and larger ship passages. Its encompassing watershed is being better protected to afford reliable dry-season freshwater river flows needed for the Canal's consistent latitudinal operations [2] but there is, as yet, little adaptation to accommodate the near-term future presence of autonomous vessels [3]! The absence of both a longitudinal railway and a highway system traversing the biologically crucial Darién Gap, a vital biodiversity conservation zone directly affecting the livelihoods of >100,000 indigenous people there, prevents legal land-based international trade and travel and also forestalls efficient patrolling for illegal rainforest logging and gold mining offenders.

Formed by Nature ~2.8 million years ago [4] the isthmus of Panama is subject to earthquakes potentially affecting future modernized Panama Canal operations [5]. Shared territorially by Panama and Columbia, the Darién Gap (Figure 1), remains a natural landscape — Panama's 579,000 ha Darién National Park, created in 1980, and Columbia's 72,000 ha National Park of Los Katios, created in 1974 — as well as a modern transportation interval, a ~100 km-long missing land link. Columbia currently has no railway connections with any other New World country and Panama has no railway connecting that nation's two international border landscapes. Standard International Shipping Containers on loaded trucks, and passenger-carrying automobiles, have to be ferried between these adjacent ecosystem-nations by task-dedicated ships.

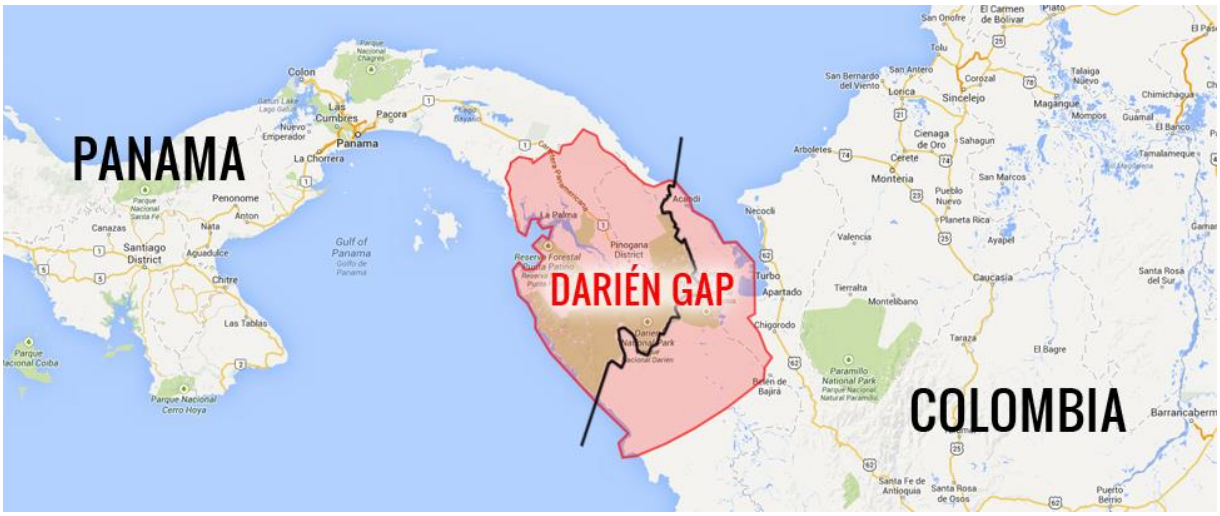

Figure 1. The Darién Gap's mature rainforest and swamps intervenes between Panama and Columbia.

Figure 2. Panama and Columbia electrical grids linked across Gulf of Darién by underwater power-cable.

2. The Darién Gap

The region's Hispanophones commonly refer to the Darién Gap as "el Tapon de Darién, "*tapon*", meaning "seal", "lid" or "stopper"; "*tapon*" is a statement recognizing the long-term need geopolitically for a permanent peaceful institutionalization of the existing Columbia-Panama boundary-line. A trans-Darién Gap Hypo-Loop installation could be made to function as a secure border control outpost for both ecosystem-states at their mutually-shared demarcated territorial separation [6]. But for objections from both nation's citizens, if in the past a strip of Darién Gap rainforest had been cleared for a railway and the Pan-American Highway, the whole of Darién Province would probably have been cleared, settled and farmed [7]. During 2019, a new macro-project attempting to complete a 20th Century governmental economic development goal — the electrical interconnection of Panama and Columbia — was again being considered: the latest plan foresees a 55 km-long submarine transmission cable installed in the Gulf of Darién to avoid intrusion into the Darién Gap landscape [8]. The ~614 km-long powerline is planned to connect the Panama II sub-station in Pedregal with the Cerromatoso sub-station in Columbia (Figure 2).

Contingencies enveloping a linear, direct origin-to-destination, Hypo-Loop design that has no interactions with other major transport modes or wildlife; thus, it need never produce for its innovators any truly significant environmental uncertainty: thorough geo-technical investigation could be performed to develop site-specific design criteria, selection of tunneling method. Entrance and exit shafts — the base stations in each ecosystem-country — shall not exceed one hectare in area. Hypo-Loop's developers are deliberate well-trained human technological engineers, not natural ecological engineers like dead cocaine kingpin Pablo Escobar's exotic 100 or more *Hippopotamus amphibus* which observing biologists now consider a Tropic Zone introduced re-wilding experiment [9]! The general Hypo-Loop macro-imagineering idea dates from 1909-1917 [10]. This singular Hypo-Loop concept for Central America anticipates 'Standard International Shipping Containers + Passenger Pods" riding in a wheel-less train levitated on a layer of pressurized air or magnetic force-field cushions used regularly within a fixed-guideway sealed within an underground low-pressure steel tube [11]. Subterranean facilities cannot be compromised by windstorms and are barely affected by earthquake vibration! All cargoes would be routed according to RFID bar-codes based on freight origin and destination. No passenger should ever have occasion to have an unpleasant or frightful experience; in other words, earthquake motions that cause lateral deformations of the tube could cause centripetal forces within the comfortable passenger pods that must be preemptively compensated by careful Hypo-Loop designers [12]. Scheduled mixed-modal trains equipped with electronically augmented pod windows — actually, television screens — could present simultaneously the Darién Gap landscape being under-passed [13].

3. Columbia's most relevant pre-Hypo-Loop macro-project history

The lowest elevation of the New World's mountainous Continental Divide (~100 m) which is also geographically the narrowest (~2 km) separates two major rivers in Columbia, the south-flowing Atrato and the north-flowing San Juan [14]. Circa 1788, Antonio Carezo completed a dug border-defining boat channel which, for a short time, artificially linked the two watersheds; one hundred eighty-eight years later Columbian authorities announced a macro-imagineering conceptual plan for a Pacific Ocean-Atlantic Ocean Canal to compete with the extant Panama Canal [15] (Figure 3). Their plan never became a project.

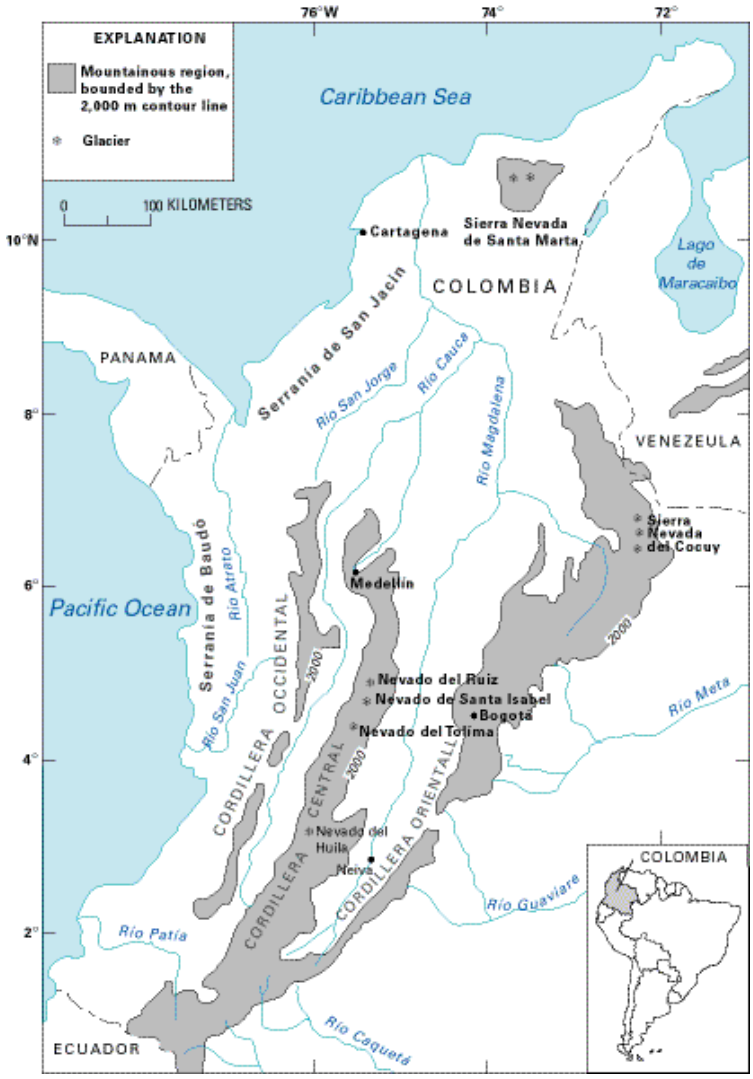

Figure 3. On the left-side of the map, paralleling Columbia's Pacific Ocean coastline, are illustrated the natural courses, anthropogenically linkable, of the San Juan and Atrato rivers.

4. Tunneling the Darién Gap

Installation of the Hypo-Loop under the Darién Gap landscape would seem to be a logical and appropriate outcome of the fiscally-conservative Initiative for the Integration of the Regional Infrastructure of South America [16]. Neither Elon Musk nor The Boring Company (in Hawthorne, California, USA) have provided technical specifications of the existing "Prufrock" TBM. Still, biological investigations indicate that burrowing underground is advantageous for many species of animals: indeed, "…the entire surface of our planet is built upon one big complex and constantly evolving burrow system, controlling the nature of our existence" [17]. Tunneling beneath the Dairen Gap will entail the confident handling of geotechnical information required for contractual reasons; a modest coping effort with the little-changed ground stress field during excavation; safety-tested steel pipeline installation; post-Hypo-Loop excavation design goals fulfilled satisfactorily; the intensive use of numerical super-computer modeling that is based on documented human experience. Rock formation mass conditions will, of necessity, influence cost factors most directly related to mechanical rock properties, discontinuities with the Darién Gap rock formation as well as the presence of groundwater. Year 2020 typical costs to remove one cubic meter of jointed, limestone dolomite and chalk using TBM equipment are about USD$73; $146 for weak marly rocks, weak sandstone above the water-table; $438 for weak marly rocks, weak sandstone below the water-table or sand, silt and clay above the water-table and, lastly, about $1,460 to remove sand, silt and clay that is below groundwater. As to The Boring Company's "Prufrock" TBM, it may be based on crack propagation of burrows accomplished simply in Nature by worms such as *Nereis virens* [18]; human tunneling efforts have been labeled by geoscientists as a form of past and present-day bioturbation [19].

5. Conclusion

The proposed Darién Gap Hypo-Loop Macro-project must be classed as a true infra-structure meant to make everyday life for the citizens of Panama and Columbia and others elsewhere easier. There is the possibility that Hypo-Loop may be cheap to build and operate as well as convenient and reliable to use! It might become the Darién Gap's largest technical system — that is, exceeding the Panama Canal in value — by delivering specialized services, materials, and assets to households, corporations and organizations, governmental and private-sector. Like marked and monitored for safe navigation natural channels and air-lanes, Hypo-Loop installations are always invisible. Construction requires socio-technical expertise and common-man confidence in the completed facility and its future increase in real-world value, stimulated peaceful geopolitical cooperation and strong boosting of future innovative thinking (Macro-Imagineering) [20]! Therefore, it is intuitive that the Darién Gap Hypo-Loop Macro-project ought to be considered at the outset as an all-services single sustainable utility corridor infrastructure connecting the entire New World [21].

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