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The transnational frontier of resort master plans: a gateway to borderless legacies for the environment and humanity

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The article departs from the evolving concept and practice of the tourism and hotel industry's environmental stewardship, with a special emphasis on the industry's initiatives inspired by the latest United Nations' agreements to tackle global warming and reverse biodiversity loss. It singles out the international resort enterprise for its unmatched yet dormant potential to deliver transformational insights into borders-blind linkages and relationships shaped by evolutionary and ecological forces and interwoven in the marvel and fragility of our living planet. This move is corroborated with analyses of the latent economic power of wonder embedded in the natural world's infinite connectivity and is emboldened in its promise via comparisons with the ever-grander ambition of science philanthropy and eco-philanthropy. The article makes the case and supplies a blueprint for a new generation of resort products and resort portfolios master-planned to shepherd and sustain through their business model transnational routes of awareness and guardianship of "one Earth" and to facilitate science-charted recalibration of global conservation strategies.

KEYWORDS

international resort industry, global conservation, science philanthropy, economic geography of wonder, transnational knowledge economy

1 Introduction

In an interview for the *Smithsonian Magazine*, Ellen Stofan, the John and Adrienne Mars Director of the Smithsonian's National Air and Space Museum, noted:

"When Apollo 8 astronauts Frank Borman, Jim Lovell, and Bill Anders orbited the Moon for the first time in December of 1968, they were awed by their first sighting of the beautiful blue marble of Earth rising above the gray lunar surface. Bill Anders' photo 'Earthrise,' taken at that moment, is said to have helped begin the environmental movement. The sight of our planet looking so small, so vulnerable in the blackness of space, with no country borders visible, drove home the fact that we live all together on spaceship Earth" (quoted in Kutz, 2020).

Borders vanish also in the Earthrise-inspired tribute to planetary unity by the poet Archibald MacLeish. Smee (2019) excerpts from MacLeish's essay published on the front page of *The New York Times* on Christmas Day 1968: "To see the earth as it truly is…small and blue and beautiful in that eternal silence where it floats, is to see ourselves as riders on the earth together…"

A life-changing exposure to our planet, devoid of the narrowness of national borders, is at the very heart of the ideal of space tourism as a force for environmental awakening—an ideal whose nascent implementation path is being mapped out by the suborbital flights of Blue Origin and Virgin Galactic and by the tourism mission even farther carrying SpaceX's orbital voyage (Sheetz, 2021; Wattles, 2021; Wilks, 2021). However, the need to engineer a paradigm shift, to achieve a globally unified understanding of the earth as a single environment, is highly time sensitive. It ought to include the mobilization of opportunities for genuine experiences of the borderless earth right here on earth. This position is at the core of the present article and its aspiration to unleash the untapped force of world travel to transform some of the most pressing transnational challenges into humankind's opportunities.

Panama, whose natural heritage bounty of globally important connectivity is a masterpiece of geological and evolutionary "engineering," offers a superb setting for effectively introducing the article's aims and scope and for contextualizing the discussion. The full emergence of the Isthmus of Panama, which completed the closure of the Central American isthmus roughly 3 million years ago, not only connected two continents, triggering the Great American Biotic Interchange, i.e., the mass migration of animals and plants through the tropics and into temperate latitudes from both north to south and from south to north (Wallace, 1997; Webb, 1997). It also divided the once continuous tropical American ocean into two, with the resulting divergence of organisms in the Pacific and the Caribbean (Jackson and D'Croz, 1997). Some 14 thousand years ago, when the sea level around the world started rising as the great glaciers began to melt, this extraordinarily dynamic and consequential story became even more complex. At that point, the Gulf of Panama and the Gulf of Chiriquí were created in Panama's Pacific, separated by the Azuero Peninsula. While the Gulf of Chiriquí maintained around 28°C throughout the year and an abundance of coral reefs, an upwelling, i.e., cold water rising from the bottom, significantly lowered the surface temperature of the Gulf of Panama, producing nutrients that support rich concentrations of fish, crustacean, seabird, and marine mammal species. Thus, two distinct oceanographic zones that, in terms of their ecology, represent two different "oceans" were created along Panama's Pacific side, complementing the Caribbean in a "Three Oceans" trilogy (Cooke and Jaén Suárez, 1999). It is only when valued collectively, through comparative studies, that the full conservation and scientific significance of these three oceans can be fully revealed. Would not this three-ocean platform also provide a priceless incentive for resort hotel investments that would be invited and entrusted to make the championship of an ongoing deciphering and protection of this natural trilogy's marvel the centerpiece of their master plans?

And there exists an even greater incentive for investments of even greater business and legacy ambitions—an incentive delivered by a monumental web of ecological and evolutionary linkages that embed Panama's three oceans within much larger ocean realms. The waters and archipelagoes of Panama's Pacific pertain to the Eastern Tropical Pacific marine region of astounding biological and ecological connectivity, of spectacular biodiversity, and of complex oceanographic characteristics, primarily due to the convergence of major marine currents. The Gulf of Panama and its natural wealth of enormous scientific importance are components of the Panama Bight ecoregion: a part of the Eastern Tropical Pacific that extends westward from the coasts of Panama, Colombia, and Ecuador, encompasses highly productive marine systems supported by rich nutrients that are brought to the ocean surface by tropical upwelling and currents, and is listed among priority ecoregions for global conservation (Olson and Dinerstein, 2002). On Panama's Caribbean side, previously unknown connectivity and genetic drift are being unmasked between the coral reef belt along the Caribbean coasts of Costa Rica and Panama and the Mesoamerican Reef ecoregion that harbors the largest barrier reef system in the Atlantic Ocean (Salas et al., 2010).

What an extraordinary new horizon this life-nurturing connectivity—and countless other connectivity lifelines that transcend this planet's natural heritage—opens for experiencing the one-Earth wonder and vulnerability from vantage points at the crossroads of this mind-boggling connectivity, for hugely augmenting the business premium as well as the responsibility that will come with the privilege of acquiring and transforming such vantage points into anchors of world travel. Can the existing resort models, the existing approaches to planning, design, and management of resort destinations, the existing economic, environmental, and social ambitions of the global resort hotel enterprise seize this premium and fulfill the responsibility that accompanies and reinforces it?

The article asks this question and channels the findings into a call for a profound rethinking of the existing resort models, of the strategic premises for building environmentally visionary resort portfolios, and of the legacy that the global resort industry could build on and for the borderless earth. And it progresses to create a roadmap for translating this call into an action plan.

This endeavor departs from an analysis of the travel industry's "environmental consciousness" journey. This introductory analysis pays particular attention to the tourism and hotel sector and to the progress that has occurred since the *Environmental Management for Hotels* (International Hotels Environment Initiative, 1993) emerged as a benchmark testimony to the importance that the industry had placed on upgrading its environmental standards. A broad sample of exemplary actions by hotel establishments and hotel companies, paired with references to scholarly publications on the subject, is complemented with an overview of actions undertaken sector-wide in connection with a recent series of United Nations Conferences that have delivered milestone agreements and initiatives to combat climate change and halt biodiversity loss.

While paying tribute to these laudable accomplishments, the article identifies a formidable omission in the context of pledges and goals for future actions, namely, the failure to recognize and prioritize the urgent need for environmental stewardship that would be structured to support and accelerate insights into the natural world's relationships and affinities that transcend political and geographic lines, the deciphering of which is critical to navigating the world's journey toward sustainability. This omission, and the enormous challenge involved in remedying it, provide a compelling reason to take a new look at the leisure segment of world travel and one of its principal facilitators, the global resort industry. Although scattered across iconic land and marine settings

and progressively embracing the noble role of a guardian of these settings' integrity and sustainability, the industry leaves unnoticed the front seat it provides for the appreciation of the wonder-packed evolutionary and ecological fiber of the natural world. It remains oblivious to its potential to value this fiber as a unique vehicle for mastering its most valuable product, i.e., a unique experience, across continents and oceans without any physical footprint.

Components of a master plan and business plan that would endow the resort product with the capacity to be nurtured by and, in return, to nurture this life-sustaining natural fiber of wonder already exist. They are envisioned by this article from new angles and are crafted into an assertion that interpretation aimed at harnessing scientific knowledge and wonder to redefine the resort product's boundaries while revolutionizing the dimension of attainable legacies ought to acquire the same stature as hospitality in the resort enterprise. A comparison of specific examples of resorts located in natural treasure troves of spectacular scientific value with prominent science and natural history museums that represent major tourist attractions in their urban settings serves to further illustrate the magnitude of the opportunity at hand. And so does a discussion of the unfolding and highly synergistic international megatrend of science philanthropy and eco-philanthropy.

The goal to create unprecedented opportunities for valuing scientific discoveries as fountains of wonder and for harnessing the enlightening and captivating power of wonder to keep advancing the frontiers of science frames the introduction of the transnational resort paradigm (Ayala, 2020) and its further refinement. Special mention is made of this paradigm's revelation of the dormant power of the resort enterprise to excel and benefit the world as a private sector player who would benefit by leaving intact the scientific value and intellectual property of the discoveries that it has a strong business incentive to underwrite and, thus, could exert enormous influence in favor of the treatment of basic scientific knowledge as public good.

The article's closing segment illustrates, and fortifies with references to scholarly publications, the deeply transformative and uniquely enduring contributions that this roadmap could provide for a science-charted recalibration of global conservation strategies; for mitigating and disproving faith-motivated objections to teaching and research in evolution that are undermining the power of science to enrich human welfare and human progress; for nurturing artistic creativity that can profoundly strengthen our bond with nature by illuminating the interlocking aspects of our planet; and for other causes of a collective capacity to harness the force of world travel to deliver and sustain the Earthrise awakening right here on Earth.

2 The evolving environmental dividend of the tourism and hotel business

Sustainability, ethical environmental practices, and responsible travel have now permanently entered the vocabulary of the hotel business and have increasingly spurred the formation of new brands and portfolios. For example, Jelski (2021) points out the launch, by Preferred Hotel Group, of Beyond Green, a global portfolio of sustainability-minded hotels, resorts, and other lodging concepts. The Small Luxury Hotels of the World (2022) give prominent exposure to their "actively sustainable" Considerate Collection hotels and resorts. There is a growing number of international awards that recognize visionary innovations in hotel corporations' and properties' efforts to inspire their patrons' appreciation of the importance of protecting nature. Prominent among the awardees, Six Senses Hotels Resorts Spas, have fortified their signature mix of sustainability, wellness, and meaningful experiences with "Earth Lab"—a hands-on vehicle for communicating and sharing the environmental work carried out on and off each property, "from marine conservation to forestry or farming initiatives, harnessing renewable energy from solar or biomass, and bottling drinking water" (International Luxury Hotel Association, 2021).

Another trend that is gaining momentum builds upon the legendary "green" foresight that Laurance S. Rockefeller demonstrated with the opening of the Caneel Bay island retreat, i.e., the desirability and feasibility of blending a top-quality vacation resort and environmental preserve. The luxury safari operator Singita, with a portfolio of 12 lodges that collectively protect over a million acres of land in Africa, now identifies itself as a "conservation company" rather than a travel company (Kellett, 2019). Responding to the damage that Australia's devastating bush fires of December 2019 inflicted on its 7,000-acre conservancy, the One & Only Wolgan Valley resort has employed the Emirates Hotels & Resorts' conservation-oriented resort model as an anchor of a regenerative travel destination (Sachdev, 2021). This move mirrors the emerging trend of "regenerative tourism" that has also become the subject of a growing number of scholarly publications. For example, Duxbury et al. (2021) and Martins and Santos (2022) demonstrate that the focus of regenerative tourism goes beyond traditional sustainable approaches aimed at minimizing the negative impact of human activity on the planet; rather, it positions tourism as a catalyst for environmental, social, cultural, and economic regeneration.

The tourism and hotel industry's very definition of sustainability is drawing scholarly research, as exemplified by publications centered on the global hotel industry. Jones et al. (2014) suggest that, in order to demonstrate a worthwhile and enduring commitment to sustainability, the industry ought to augment its sustainability definition by also addressing the issues of sustainable consumption and continuing economic growth. Based on their comparative analysis of the hotel industry's sustainability certification criteria—an analysis that features the World Sustainable Tourism Council as a key reference and embeds the paramountcy of the environmental dimension in a holistic sustainability perspective—Rodríguez-García et al. (2023) call for certifications that are not restricted to minimizing negative impacts on the environment but that stimulate sustainability strategies devised to maximize economic and social benefits for the local community as well as to respect and invigorate cultural heritage.

Travel philanthropy, purpose-driven travel, and transformative travel and tourism represent other evolving phenomena analyzed in academic literature. Examining the relationship between travel philanthropy and sustainable development, Novelli et al. (2015) observe that travel philanthropy has been accelerating as both a concept and a movement because of the democratization of charitable giving and the upsurge in international tourism to

less developed economies. Koot and Fletcher (2021) introduce the term "philanthrotourism" to describe the growing trend of non-governmental organizations—prominently environmental NGOs—inviting their major donors to accompany them on international trips to the sites of NGO-spearheaded projects, with the goal of securing future philanthropic support. Purpose-driven travel is also attracting growing attention in current academic discourse, as a potentially pivotal force in building an international momentum and disposition to tackle significant global issues. Galvani et al. (2020) note that "humanity has not evolved a global consciousness quickly enough to match the global advances in telecommunications and transportation technologies that have created a socially and economically ever-shrinking planet" (p. 567). Global consciousness, Lew (2020) argues, could be adopted as an 18th UN Sustainable Development Goal to give a holistic, spiritual, and personal vision to sustainable development, with travel and tourism becoming a major participant in achieving this goal given that tourism and travel experiences are a major contributor to expanding global awareness and consciousness. The concept and rapidly accelerating trend of transformative travel and tourism, which revolves around transformational experiences that encourage tourists "to self-reflect, question their assumptions, and develop a more tolerant worldview" (Soulard et al., 2021, p. 923) is most synergistic with this perspective.

Inkaterra's environmental record deserves a special mention for it commands a unique niche within the tourism and hotel industry. It delivers an internationally acclaimed synthesis of sustainability-championing approaches that inspired and/or emboldened existing practices. Inkaterra's journey, ignited and guided by the vision of its founder José Koechlin von Stein, began in Peru's biologically megadiverse Madre de Dios region with his acquisition of that country's first land concession for ecotourism and research purposes; that pilot investment yielded a private 24,710-acre ecological reserve and the opening of Inkaterra's flagship Reserva Amazónica lodge in 1976 (Rush, 2005). The foresight behind that investment is also strongly defined by Reserva Amazónica's emphasis on scientific research as the foundation for biodiversity conservation and the regeneration of Peruvian wildlife. This emphasis now spans Inkaterra's growing portfolio of hotels and lodges whose locations range from the Amazon rainforest of southern Peru to the Machu Picchu cloud forest, the Sacred Valley of the Incas, and the Cabo Blanco tropical ocean, desert, and dry forest and whose flora and fauna inventories continue to yield species new to science. The environmental awards that grace these achievements have recently been complemented with another accolade: Inkaterra has become the world's first "climate-positive" hotel brand and ecotourism company.

2.1 Environmental commitments spurred by the United Nations' agreements to tackle global warming and reverse biodiversity loss

Nandi (2021) notes that Inkaterra's climate-positive recognition coincided with the 26th United Nations Climate Change Conference of the Parties, COP26, held in Glasgow, October 31–November 12, 2021 (see, for example, Masood and Tollefson, 2021; Carver, 2022 for analyses of the COP26 outcomes). The 2021 Climate Change Conference—and its Glasgow Climate Pact deal—thrust the imperative of combatting climate change to the forefront of global attention. Developed through the collaboration of the United Nations World Tourism Organization (UNWTO), the United Nations Environment Program (UNEP), and others and launched at COP26, the "Glasgow Declaration for Climate Action in Tourism" articulated an urgent need for and commitment to a globally consistent, sector-wide approach to cutting emissions in half by 2030 and achieving net-zero status by 2050 at the latest (UNWTO, 2021). The Sustainable Hospitality Alliance is the engine behind the hotel industry's own initiative, the "Pathway to Net Positive Hospitality," devised as a coordinated and focused strategic plan to empower all hotels to take on urgently needed climate actions irrespective of their starting point on the sustainability journey (Fox, 2022). Conceived as a steppingstone to the Pathway's programs and unveiled by the World Travel & Tourism Council (WTTC) in April 2022, the "Hotel Sustainability Basics" initiative seeks to ensure that no hotel is left behind: it contributes a set of criteria that all hotels should implement as an absolute minimum in the pursuit of sustainability (Hillsdon, 2022). Thus, the Sustainability Basics initiative is also synergistic with the Sustainable Tourism Pledge (UNESCO, 2019), a global collaboration agreement ratified by the United Nations Educational, Scientific, and Cultural Organization (UNESCO) and Expedia Group in October 2019 and inviting the entire travel industry—from small, independent businesses to large-scale operators—to commit to goals that are within reach for everyone, namely, community engagement, energy and water conservation, waste reduction, and elimination of single-use plastics.

A sequel to COP26, the UN Framework Convention on Climate Change COP27 (Sharm El Sheik, Egypt, November 6–20, 2022) concluded with an unprecedented decision to create and operationalize a "loss and damages" fund intended to channel major resources from wealthy countries to the developing countries most impacted by climate change (United Nations, 2022). On the tourism front, COP27 illuminated the fact that more than 700 businesses, destinations, civil society groups, and even countries had signed the COP26 Glasgow Declaration on Climate Action in Tourism. Noting this accomplishment, UNWTO (2022a) also highlights the readiness voiced at COP27 by the United Nations Development Program, World Bank Group, and other prominent financial and UN institutions to support tourism destinations in their transformation toward more low-carbon, sustainable, and resilient tourism models.

While the subject of climate change has also drawn the rapidly growing interest of scholars in the tourism field, the fast-progressing biodiversity loss has spurred publications that identify an urgent need to commit much greater research attention to the tourism-biodiversity interface. The declaration of 2010 as the United Nations International Year of Biological Diversity provided the context for Hall (2010)'s assertion that "biodiversity is as significant an issue as climate change. The challenge for tourism researchers is to develop as substantial a research program on biodiversity as has begun to emerge on climate change, and effectively to convey research findings to policymakers, industry, and communities" (p. 264). Legrand et al. (2023) frame their call

for the transformation of the hospitality industry's relationship with the natural environment with a momentous reference to the United Nations' dedication of 2021–2030 as the decade of ecosystem restoration. They establish the desirability and urgency of incorporating the basic concepts of ecology, biodiversity, and environmental science, along with their application, into hospitality curricula and, thus, empowering education to demonstrate and justify the need for sustainability actions on a planetary scale.

The accelerating ascent of the biodiversity topic toward the level of attention commanded by climate change has not been confined to academia. "Landmark," "milestone," and "historic" are among the qualifiers that praise the 15th meeting of the Conference of the Parties to the UN Convention on Biological Diversity, COP15 (Montreal, Canada, December 7–19, 2022) for equating the threat posed by biodiversity loss with that posed by the climate crisis and for establishing that both ought to be tackled with the same urgency—and jointly. COP15's core outcome, the "Kunming-Montreal Global Biodiversity Framework," is a sweeping agreement of almost 200 countries to protect 30 percent of land and oceans by 2030 and to pursue this commitment along four overreaching global goals and 23 targets aimed at addressing biodiversity loss and restoring ecosystems while protecting indigenous rights (Convention on Biological Diversity, 2022; UNEP, 2022).

Released in September 2022, WTTC's "Nature Positive Travel & Tourism" report (WTTC, 2022) became a prelude to a new collaboration bonded to champion the travel and tourism sector's vision for halting and reversing biodiversity loss by 2030. As announced during the COP15 UN Biodiversity Conference, WTTC, UNWTO, and the Sustainable Hospitality Alliance will collaborate in supporting and inspiring governments, businesses, and society to implement the Global Biodiversity Framework. They pledge "to adopt a nature positive approach to tourism through integrating biodiversity safeguards by reducing carbon emissions, the impact of pollution, the unsustainable use of resources, as well as by protecting and restoring nature and its wildlife" (UNWTO, 2022b).

The proliferation of new "eco" standards and "eco" labels that has paralleled and challenged all these initiatives has prompted the goal to standardize hotel sustainability worldwide. As revealed in January 2024 (a month after the completion of the 2023 UN Climate Change Conference, COP 28), this goal brings together WTTC and the non-profit Biosphere Foundation as partners in an endeavor to create "the most comprehensive international framework for the sector, with a unified vision connected to the [UN] Sustainable Development Goals" (Taylor, 2024).

3 Destination earth: an uncharted "green" horizon of the resort industry

Collectively, these praiseworthy undertakings—and countless others carried out in the spirit of environmental stewardship—reflect the force and mindset that the tourism and hotel industry now commands to champion and facilitate humanity's efforts to mitigate climate change, to help guard the earth's finite resources, and, increasingly, to help build a sustainable future by involving travelers in their destinations' conservation efforts. However, in the specific context of this industry—and, most prominently, in the arena of resort hotel anchors of world travel—there exists another, vast and unharnessed opportunity for the earth's stewardship, entirely free from borders and other political and cultural subdivisions with which humankind has imprinted the earth. As disclosed and analyzed in this article, this opportunity is conditioned on addressing an omission by both the industry and the UN Conventions to recognize and operationalize in its primacy on a global scale a vital environmental dimension of vital significance and enormous promise for charting a globally momentous path toward sustainability.

An explanation of this omission is well introduced by the following excerpts from the Kunming-Montreal Global Biodiversity Framework. A key component of the Framework's Goal A is to maintain, enhance, or restore the "integrity, connectivity, and resilience of all ecosystems." The "well-connected and equitably governed systems of protected areas… integrated into wider landscapes, seascapes, and the ocean" is a centerpiece of Target 3.

The priorities assigned to connectivity, resilience, and integration into wider land and marine environmental context are also immense challenges. They present a most momentous and consequential opportunity for environmental stewardship that would be structured to support and accelerate critically needed insights into the natural world's relationships and affinities that go beyond physical connectivity, have been shaped by evolution, transcend political and geographic lines, and represent frontiers still largely unexplored by science. Beger et al. (2022) note: "Unlike other objectives or co-benefits—such as carbon or some ecosystem services—biodiversity benefits and flow processes do not accumulate linearly" (p. 1089). Moreover, "conceptual advancements and tools to quantitatively integrate connectivity for and across land, freshwater, and marine systems with area-based conservation are still being developed… and are only implemented in a fraction of existing conservation areas" (p. 1079). Examining coral reef networks in the Caribbean, the Southwest Pacific, and the Coral Triangle (a spectacularly biodiverse marine habitat that spans the waters of Indonesia, Malaysia, the Philippines, Papua New Guinea, Timor Leste, and the Solomon Islands in the Western Pacific Ocean), McManus et al. (2021) reveal that "locations of reefs that are likely to survive future warming… remain largely unknown, particularly within the context of both ecological and evolutionary processes across complex seascapes that differ in temperature range, strength of connectivity, network size, and other characteristics" (p. 4307). Additional regional comparison studies of multiple regional coral networks under an eco-evolutionary framework are imperative.

The present article draws attention to the priceless bonus of "wonder" that will accompany this urgently needed mobilization of the globe crisscrossing and connecting research. This bonus translates into a priceless opportunity to enrich the traveler's experience of the world's naturally affluent places with the understanding and appreciation of the history and interconnectedness of their ecosystems and, thus, also deepen the traveler's awareness of the fragility of these life-sustaining, wonder-packed connections, i.e., awareness of what we could lose. However, this opportunity currently eludes its prospective stakeholder with the greatest vested interest—the international resort industry.

A map of the industry's global presence and future growth projections, particularly in the luxury segment, could, to a great degree, be used to locate some of the planet's most biodiverse habitats and prominent crossroads of nature's ecological and evolutionary connectivity. Yet currently, the market value of these "hotspots" for resort investments is just that of a prime real estate. Utterly missed is the tremendous potential of many resort sites to serve as portals into interpretation-mediated, uniquely meaningful, and authentic experiences of science-mapped, wonder-packed webs of the natural world's connections on unbounded geographical and time scales. A correction of this omission would enable resorts to excel as "as gateways into journeys of wonder that string and guard heritage marvels along the frontiers of scientific exploration" (as quoted in Weinstein, 2006, p. 7). It would define this new-generation resorts as catalysts of "a global archipelago of interconnected 'wonder sites' where the scientific study and preservation of nature are the explicit and formal motivation for linking sustainable economics with science" (Avise, 2008, p. 11567). It would reward the resort enterprise with an unmatchable capacity to shepherd and sustain the globe-circling routes of awareness and guardianship of "one Earth" and to make this mission the centerpiece of the resort business model.

This corrective action ought to unfold on two levels. One pertains to re-thinking the resort master plan in recognition of the connectivity-based "fluidity" of many resorts' natural settings and, thus, of the opportunity to orchestrate planning, architecture, design, and management to extol this fluidity in shaping experiences and environmental pledges of boundless trajectories. The other is the level of multi-resort portfolios whose layout along the paths of multisite research endeavors of global significance for the advancement of science and conservation would offer to partner pro-actively and embolden the participating resort projects in their business and legacy ambitions. Building expertise to harness and maximize the confluence of science and wonder is a prerequisite that applies to both levels and has already been explored in its promise at both.

3.1 The geography of wonder as a blueprint for the resort master plan

First introduced in the *International Journal of Hospitality Management* (Ayala, 1995c), this re-scaled master plan integrates three core principles that, together, make it internationally applicable from the point of view of conceptual guidance yet guaranteed to deliver a unique resort product in each destination. These three principles are: *"resort plus" scope of master-planning*, *expanded capacity to assimilate*, and *layered approach to product development*. They minimize "physical access" and maximize "contextual access." Drawing inspiration from the concept of "shakkei" ("borrowed scenery," "landscape captured alive"), which has been developed into an art by Japanese landscape architecture, they shift the emphasis from viewing to experiencing. Panoramic views explored as interpretive channels and ever-changing exhibits that keep unmasking the resort setting's belonging link to variously distant ecosystem networks are in the arsenal of interpretation-mediated "borrowing" that goes far beyond directly observable land and marine environments. While fully subscribing to the importance of developing the resort operation as a self-contained or closed system, in which "closed" implies re-use and recycling as well as minimized demand on the destination's non-renewable or scarce resources, these three principles converge in engendering the greatest possible "openness" of intellectual delights and conservation pledges that bridge the resort's proximal ecosystems with those borrowed from a wealth of science-mapped affinities and connections.

Let's examine, from the angle of this re-scaled master plan and in terms of their existing and potential valuation by the resort industry, two natural settings—a hotspot of coral biodiversity in the Indian Ocean and a biologically affluent tropical rainforest ecosystem on the Isthmus of Panama. And let's premise this examination on a comparison with natural exhibits offered by two distinguished institutions and representing major tourist attractions in their respective urban settings.

The Miavana resort, on a private island within Levens Archipelago off Madagascar's northeastern coast, is surrounded by some of the planet's most pristine coral reefs. Banyan Tree Ilha Caldeira, a resort scheduled to open in late 2024, commands a no less privileged natural setting. The resort's private island is part of the Primeiras and Segundas Archipelago off the coast of Mozambique, a large marine reserve that is a trove of intact living coral. The coral reef heritage of both resorts' locations is of a major scientific and conservation importance, including as a crucial component of the connectivity of the biological wealth of the entire Indo-Pacific.

At the Smithsonian National Museum of Natural History in Washington, DC, a 1,500-gallon Indo-Pacific coral reef tank is a centerpiece of the Sant Ocean Hall and its mission to explore ocean ecosystems past and present and to inspire interest in the ocean. Visitors from all over the world are drawn to this exhibit located in the urban milieu of the U.S. capital.

In contrast, Miavana and Ilha Caldeira are in possession of the extraordinary luxury of being right in the middle of a living coral bounty. However, the delight of the visual splendor that awaits the guests on and off the resorts' premises and their enjoyment of the discovery of these coral treasure-troves during snorkeling and other excursions only scratch the surface of the potential worth of these resorts' locations. These locations are endowed with the originals of some of nature's greatest wonders and greatly benefit by their position right on the paths of connectivity among ocean ecosystems past and present. Interpretive exhibits anchored in these crossroads of wonder could vastly outperform, in their inspirational and perspective-altering impact, museum exhibits enveloped by contextually foreign environments. Such exhibits could bring to life scientific discoveries pertaining to cradles of coral reef diversity and of dispersal routes that draw affinities among various regions and archipelagos of the Indo-Pacific (Reaka and Lombardi, 2011). They would spotlight research findings that emphasize those historical processes and geological forces, such as plate tectonics, that significantly account for the present-day biogeographical patterns of Indo-Pacific corals (Keith et al., 2013). Studies are disclosing high coral reef connectivity across the Indian Ocean and are starting to unlock the still obscure geological and evolutionary history of the East African hotspot of coral biodiversity, tying this hotspot's origin (in the middle- to late-Miocene) to the Coral Triangle (Reuter et al.,

2019). Utterly missed, currently, is the priceless opportunity to translate the rarity and rewards of such genuine insights into the coral reef heritage of the entire Indo-Pacific into invitations for legacy investments in the continuation of the exhibited and other trail-blazing transnational research endeavors that are becoming ever more urgent as we strive to manage the effects of global environmental change on biodiversity.

The discussion of Miavana's and Ilha Caldeira's dormant potential can be enriched by the introduction of a hotel property that was conceived as a trailblazer of this potential's awakening: the Canopy Tower Ecolodge and Nature Observatory in the Republic of Panama. A comparison with a renowned indoor exhibit located in a different part of the world is, again, most relevant. The Osher Rainforest at the California Academy of Sciences in San Francisco is housed in a giant glass dome. With a carefully regulated temperature of 82–85 degrees Fahrenheit and humidity at 75 percent or above, this 4-story neotropical rainforest exhibit takes visitors on a spiral path through different tiers of the rainforest, from the flooded forest of the Amazon to the forest canopy of Costa Rica.

The Canopy Tower rises through and above the lowland tropical rainforest of the Soberanía National Park—a 55,000-acre cradle of biodiversity within the Panama Canal Watershed. It recycles a former U.S. Air Force radar tower into an exquisite blend of hospitality and breathtaking exposures to multiple layers of the rainforest, crowned by the roof terrace and its 360-degree panoramic immersion into the canopy—a rare treat given that the rainforest canopy is one of the least explored ecosystems on earth. Thus, the Canopy Tower also became the unique recipient of an international traveling exhibit on "Parting the Green Curtain: The Evolution of Tropical Biology in Panama," loaned to it by the Smithsonian Tropical Research Institute (STRI). Superbly complementing the authentic features of the Canopy Tower's enlightening and nurturing bond with nature, the exhibit's panels "describe a broad spectrum of topics that are related to the real experiences awaiting the Tower's guests—such as Evolution of Tropical Biology, Dynamics of Tropical Forests, Armies of the Forest Floor, and Caring for the Tropics" (Ayala, 2000a, p. 49).

The originality and value of the Canopy Tower's blend of hospitality and interpretation are inseparable from this project's formation within a novel approach to partnering tourism, conservation, and research that was premised on and catalyzed by a translation of frontier scientific research into "heritage themes" conceived on national and regional scales and redefining the appreciation potential of tourism and hotel investments.

3.2 Tourism-conservation-research planning modeled on the world's evolutionary and ecological connectivity

The Pacific Island Region provided the initial geographical context for the conceptual development of this approach. In the tourist trade, the region has become synonymous with an ever-expanding offer of resort destinations extoled as "tropical island paradises." Although many are at the vanguard of sustainable hospitality—mastering environmentally-friendly architecture and operation and embracing conservation of the surrounding ecosystems—their business models and identities do not do justice to the extraordinary, wonder-drenched connectivity and relationships that knit together the entire region's natural bounty, radiate into other parts of the world and, importantly, frame the unique quality and identity of each resort setting based on its belonging to a much larger natural milieu.

The research that revealed the enormity of the economic and environmental losses caused by this omission began in the island nation of Fiji, backed by analyses of the Fijian archipelago's unique quality as a microcosm of the geological, climatic, ecological, and biological diversity of the South Pacific's natural heritage (Ayala, 1995a,b). An invitation from the UNESCO Office for the Pacific States permitted the expansion of this research across the collective natural heritage bounty of the Pacific Island nations, drawing attention to the webs of evolutionary and ecological linkages that permeate this bounty, are of major conservation and research importance, and would superbly translate into heritage themes of incalculable interpretive value (Ayala, 2000b). Each existing or planned island resort stood to gain the capacity to become a portal into mesmerizing insights into borderless natural labyrinths of wonder—insights not conditioned on physical access yet highly impactful by being consumed "live," from a location on the path of these labyrinths. A platform for bringing Tourism, Conservation, and Research (TCR) planning into a mutually reinforcing relationship on a scale whose dimensions are set by natural pathways began to take shape.

Scientific research, the "R," has a fundamental role in defining the "architecture" of the TCR alliance, grounding the alliance in a dynamic network of heritage themes brimming with wonder that is fluid in the spatial sense and expansive as it keeps absorbing new discoveries. The pivotal emphasis of the involved research on unmasking linkages, affinities, and relationships shapes the "C" component as a proactive *conservation* strategy receptive to acquiring a daring scale and endowed with guarantees that each of its future expansions will boost the scientific, conservation, and economic importance of the entire pool of the natural heritage assets it spans. For the resort enterprise—the ideal *tourism* business partner under the "T" umbrella—the prospect of acquiring the capacity continuously to enrich its core product, i.e., the tourists' experience, and to enhance it with input of wonder from places demanding protection while returning the favor by sponsoring their conservation is priceless.

A publication that introduced the TCR alliance model (Ayala, 1997) also drew a parallel between Fiji as a microcosm of the natural wealth of a much larger geographical setting and the exceptional value and significance of Panama's natural heritage bounty as a catalyst and chronicle of regionally and globally significant connectivity. The formation of the Isthmus of Panama, which completed the closure of the Central American isthmus while splitting apart the Pacific and the Atlantic Oceans, had enormous impact on the global climate and environment, and represents "the most important natural event to affect the surface of the earth in the past 60 million years" (Coates, 1997, p. 1).

At the invitation of the Panamanian government, a nationally scaled TCR blueprint harnessed the formidable asset that Panama possesses in hosting the science "powerhouse" STRI to extol the country's natural symphony of evolutionary and ecological

dynamics and connectivity as a mega- labyrinth of wonder that delivers an economic platform for bonding conservation and scientific exploration with tourism and hotel planning and investments (Ayala, 2000c). The crafting of this science-wonder portrayal of Panama's singular heritage identity—which involved several STRI experts joined by Omar Jaén Suárez, Panamanian geographer and historian—delivered an original network of *Thematic Routes*, *Chronological Routes*, and *Spatial Routes* branching into *Trans-isthmian crossings* and *Isthmian corridors* (For a comprehensive presentation of this pioneer heritage matrix, see Cooke and Jaén Suárez, 1999). Set in this dynamic network of heritage themes, a pilot portfolio of TCR Hotel Partners—the Canopy Tower prominent among them—acquired the capacity to become "staging areas" for actual and virtual journeys of discovery unique to each partner's location but converging in far-reaching stewardship of conservation, knowledge, and sustainability (Ayala, 2000a).

One characteristic of this pilot project merits a special emphasis. The TCR heritage themes are not travel itineraries, albeit suitable for and inviting tourist excursions along their carefully designated segments accessible from staging areas. These rigorously researched linkages, packed with knowledge and wonder and highly susceptible to combining or branching into new heritage pathways as they absorb new discoveries, possess the power actually to grow and continue enriching the nation's heritage wealth. At the same time, they guard the nation's endangered natural areas by ensuring their strict conservation and placing them off limits to tourist visitation. As Miller (1999) observed, the TCR action plan laid the groundwork for a "heritage-driven economy."

Panama has also provided a superb model for establishing the idea that the paths of the awakening of the natural world's knowledge and wonder reserves must not be restrained by national or regional borders, neither geographical nor political (Ayala, 2021). As described in the introductory part of this article, the waters and islands within Panama's exclusive economic zone on the Pacific side are an integral part of the vast Eastern Tropical Pacific biogeographic region endowed with an exceptional biodiversity and a great marine biological and ecological connectivity due to the convergence of major marine currents. And as increasingly uncovered by science, this vast system of natural infrastructure of connectivity is part of an even vaster system. Recent studies focused on reef-building coral species are disclosing another realm of connectivity that links the Eastern and Central Tropical Pacific across the two separating Eastern Pacific Barrier of deep water that has been considered impassable for most species. Romero-Torres et al. (2018) use the discovered evidence of connectivity—and dispersal in both directions—across the Eastern Pacific Barrier to map out a conservation strategy aimed at preserving this connectivity of profound implications for the health of the economies, many of them tourism economies, of the Pacific Island nations and the Pacific-bordering nations.

Using the widest angle of "a global web of connected systems," Scheffer and van Nes (2018) stress the importance of "unraveling hidden connections in the web of ecological and social systems on which we depend."

An international symposium hosted by the Arnold and Mabel Beckman Center of the U.S. National Academies of Sciences, Engineering, and Medicine in February 2014—and conceived as a sequel to a United Nations invited event on luxury tourism, science, and the knowledge economy (United Nations, 2010)—addressed the formidable task of deciphering nature's connectivity web via the introduction of a model set of science themes that can only be pursued via studies at multiple sites around the world and that could pave the way for the design of multi-resort portfolios. The University of California, Irvine (2014) noted, in the press release covering the event, that these themes included "reconstructing the genealogical histories of marine species across the world's oceans to pinpoint areas of historical biological significance, determining how the birth and death of species mold the patterns of life across the globe, and enabling a comprehensive study of relationships between prokaryotic organisms, such as bacteria, and species in coral reefs, which could lead to a better understanding of how human immune systems function in various conditions."

The symposium served as a vetting ground for the effort to align transnational research and the resort industry with the progressing transformation of the global economy into a knowledge-based economy. As detailed in a separate publication (Ayala, 2017), this effort has been premised on an appraisal of our planet's natural heritage as a source of natural knowledge capital, i.e., latent scientific knowledge that can be fully unlocked only through research that is carried out on a multiplicity of spatial scales. Additionally, it has placed a premium value on the earth's evolutionary and ecological connectivity as a transnational reservoir of this raw knowledge material that could transform the global economy as profoundly as oil defined the industrial economy, elevating conservation into an economic imperative. "The knowledge resource embedded in the Earth's evolutionary and ecological fabric could outperform metal ores and fossil fuels in endurance and lasting benefit to humanity, foster a culture of peace, and bolster conservation measures to mitigate rising temperatures around the world" (University of California, Irvine, 2014). This perspective also provided a framework for expanding the resort masterplan's business-cum-legacy radius to the most challenging scale across and beyond national jurisdictions. The *Journal of the Knowledge Economy* became the venue for a publication that inaugurated the *transnational resort* concept (Ayala, 2020) and defined it as a "transformative investment in the global knowledge economy."

An analysis of the growing global trend of eco-philanthropy and science philanthropy of daunting volumes and scales is pertinent to establishing the timeliness and capacity of the transnational resort paradigm as a *business* opportunity for "legacy investments" empowered to revolutionize the ambition of travel philanthropy and fortify it with potent economic incentives.

4 Eco-philanthropy meets science philanthropy: a momentous context for redefining the economic and humanitarian potentials of the global resort enterprise

Coinciding with the United Nations General Assembly meeting in New York in September 2021, the launch of the Protecting

Our Planet Challenge entailed a pledge of $5 billion over 10 years made collectively by nine philanthropic organizations in support of the "30 × 30" goal of protecting 30 percent of the planet by 2030 (Philanthropy News Digest, 2021). A $1 billion pledge to conservation, made by Jeff Bezos as part of a three-part "nature strategy" within his $10 billion Earth Fund destined to fight climate change, exemplifies this rising wave of philanthropic mega-investments in support of conservation efforts. Central Africa's Congo Basin, the tropical Andes region and Western Amazon, and the Eastern Tropical Pacific are among the beneficiaries of the Earth Fund's investments in support of the creation, expansion, and management of protected and conserved areas and of securing the territorial rights of indigenous people and communities (Alexander, 2021; Greenfield, 2021; Bezos Earth Fund, 2022).

Philanthropic pledges that benefit conservation are ever more explicit about basing the implementation strategies on input and guidance from science. Rockefeller Philanthropy Advisors acts as the fiscal sponsor and neutral home for Oceans 5 (oceans5.org), an international funders' collaborative comprised of philanthropists devoted to protecting the world's five oceans and prioritizing philanthropic opportunities that coincide with the highest priorities of marine scientists. Thus, guided by science, Oceans 5 has helped establish and sustain large marine reserves in different parts of the world, including the Seychelles, Cook Islands, Kiribati, and in the Arctic regions of Russia and Canada.

A strong synergy is coming from a bold new breed of science philanthropy that strives to advance the frontiers of knowledge while shepherding large-scale conservation. The philanthropic non-profit Schmidt Ocean Institute, established by Eric and Wendy Schmidt to improve the understanding and health of the ocean by advancing pioneering ocean science and technology, is now also a force that will help drive the United Nations Decade of Ocean Science for Sustainable Development (2021–2030). Partnered with the Intergovernmental Oceanographic Commission of UNESCO, the Institute will employ its research vessel *Falkor* to conduct deep sea mapping expeditions and collect ocean data that will generate new knowledge throughout the Ocean Decade and toward the Decade's goal of supporting resilient and sustainable oceans (UNESCO, 2023).

As reported by Verdon et al. (2021), the Schmidts belong to the Philanthropic Ocean Research Vessel Operators, "a daring crop of wealthy activists [who] are pouring their own money and energy into saving our endangered seas" (p. 117). Their article also profiles some other members of this coalition. Among them, Victor Vescovo, whose science-philanthropy mission involving research vessels, including a submersible, focusses on the exploration of the deepest trench in every one of the world's oceans. Founded by French fashion designer Agnes Troublé and prioritizing long-term studies that span years, the Tara Ocean Foundation and its schooner *Tara* have conducted research expeditions in all of the planet's oceans: on each expedition, the participating scientists from a number of countries are accompanied by artists invited to paint, draw, and photograph. Kjell Inge Røkke's REV Ocean foundation and its 600-foot research and expedition vessel equipped with laboratories and accommodations for scientists factor a tourism element into the goal of promoting the health of the ocean. The REV Ocean yacht doubles in function as a charter yacht, with guests funding the research initiatives through charter fees. REV Ocean also belongs to the group of philanthropic foundations that have committed to support the UN Ocean Decade by investing in transformative ocean science.

These philanthropic and philanthropic-cum-tourist projects are visionary and revolutionary. They are at the vanguard of environmental and social responsibility. They introduce, in various parts of the world, a new depth and means for scientific exploration, contributing unprecedented resources for conservation.

Paralleling philanthropic endeavors, tourism-tailored voyages are adopting research missions that, in the luxury segment of the tourism market, exhibit formidable scientific and environmental ambition backed by state-of-the-art technological and design innovation. *Le Commandant Charcot*, luxury cruise operator Ponant's new hybrid-electric vessel powered by liquified natural gas, made its maiden voyage to the geographic North Pole in 2021, showcasing the potential of this laudable trend. It intertwines ultra-luxury hotel experience with scientific exploration of the polar regions as it charts a course for eco-friendly navigation that preserves the pristine state of its destinations (see, for example, King, 2021). Equipped with science laboratories and with a mission to facilitate the exploration and preservation of the poles and oceans, this exploration cruise ship offers scientists from around the world the chance to collect data and set up research stations in difficult-to-access areas. The opportunity to witness the groundbreaking efforts to better understand the effects of climate change in the polar regions, and to attend lectures by onboard experts, further enriches the perspective-altering experience that awaits the passengers.

The pan-Earth—and proliferating—global crop of existing and planned resorts, and the permanent anchorage of resort infrastructures in a multitude of naturally privileged sites across the world, offer the resorts—both individually and collectively—an opportunity that resonates with and complements the unfolding ever bolder megatrend of eco-philanthropy and science philanthropy. This opportunity is premised on the distinctive potential of a resort master plan to employ a range of tools (interpretive and others) in conceptualizing and shaping resort design and operation as catalysts of philanthropy-spirited pledges whose business dividend—i.e., sustained appreciation of the resort product's value and stature—will drive these pledges' ever deeper fusion with the resort's identity, competitive strength, and legacy ambition. A principal focus of these pledges on research that unmasks the vital role of the borderless evolutionary and ecological linkages and affinities that are vital to humanity's progression into a sustainable future would open an entirely new horizon for experiencing the natural world and inspiring advocacy of planetary unity. It is this very perspective that the transnational resort model seeks to awaken and prove tangible.

5 Ecological economics: a bold paradigm for the transnational resort enterprise

Introducing the Elsevier Science Publishers' new journal of *Ecological Economics*, Costanza (1989) wrote: "We have chosen the

name *Ecological Economics*. . . because it implies a broad, *ecological*, interdisciplinary, and holistic view of the problem of studying and managing our world. The 'earth from space' cover of the journal reflects this global, holistic perspective" (p. 1).

The transnational resort master plan is not conditioned on combining hospitality with research laboratories on the resort project's property. A resort project's convergence with science is premised on the assertion that the currently dormant potential of many resort sites to serve as windows into science-revealed, wonder-packed connections among variously distant ecosystems, geological formations, and other pillars of the earth's architecture is of an even greater value for the sites' business and legacy capitalization than the natural assets of the sites themselves. The guests' experience of and enrichment by science's conquest of the unknown layers of the natural world will be profound at a resort that values its natural setting as an "infinity pool" that flows over the horizon on the revelations of the setting's larger geological, evolutionary, or ecological identity.

The idea of engaging the views' information content as a proprietary entry-point into land and marine habitats along borderless paths charted by scientific discoveries of affinity or connectivity among sets of these habitats is also most susceptible to harnessing the wonder mobilized by large-scale international scientific collaborations that drive technological innovations. For example, powerful images generated by satellites and other remote sensing tools could serve to fortify the resorts' capacity to act as anchors and benefactors of big-picture insights into Earth's ecosystems.

Comparisons have recently been drawn between the effects of remote sensing and the "Overview Effect" of viewing the planet from the space—an effect that has changed many spacefarers' perspective on the planet itself, inducing a feeling of deep connectivity to the planet. A bold title that extends the "Overview Effect" qualifier to remote sensing dominates the cover page of the September/October 2021 issue of *American Scientist*. In their article, Madin and Foley (2021) note that the broad perspective of satellite imagery permits scientists to observe changes on a global scale and compare ecosystems over time and across space. Reflecting on the new ways that satellites and other remote sensing tools offer to study ecosystems and to help save them, Pennisi (2021) writes in the journal *Science*: "With the loss of plant and animal species accelerating, some researchers say conservation efforts should turn to remote sensing to monitor biodiversity in near-real time across wide swaths of the globe—and help policymakers prioritize the most critical areas" (pp. 926–927). *Science* is also the venue of Voosen (2020)'s report on the revolutionary use of NASA ICESat-2 satellite's green laser to map the shallow sea floors <5 meters deep that surround world's coastlines and are largely unexplored because they are off limits to ships and their sonar beams. The images are spectacular, and the rewards will be immeasurable, hugely advancing our knowledge of the geography of coral reefs and our ability to monitor their health.

Looking at the luxury hotel sector in general, Shankman (2020) concludes that "these days, luxury hospitality would be wise to realize that their businesses extend beyond their physical property— and that land conservation adds value to the brand financially, aesthetically, and ethically." The growing number of globally reaching science projects that are inspiring discoveries otherwise impossible and reshaping our understanding of the world around us offers an entirely new ambition and scale for the beyond-property extension of the resort business.

In the context of new resort projects, the appreciation of a resort site's permanent anchorage in a natural milieu that is a living part of the continents- and oceans- bridging paths of connectivity that underpin the glory and fragility of the planet's biodiversity ought to be at the heart of the project's master plan and business plan from their earliest conceptual stages. The rewards will consist not only of the resort's acquisition of a limitless performance reserve from beyond property line. The rewards will also take the form of robust incentives for investments—not donations—into research, training, and conservation jobs tailored to enhance employment across vast land and marine habitats that are currently marginalized economically but possess untapped economic worth in the knowledge and wonder they contain.

Developing expertise for the design of a transnational "supra-structure" of natural heritage themes ought to rise to a top priority in building a mutually beneficial encounter of the hotel and science sectors backed by research endeavors projected to yield knowledge of groundbreaking implications for global conservation and the advancement of science while releasing bounties of wonder. The proactive, scientifically-rigorous, and business-savvy quality of such supra-structure will ensure that each allied resort will acquire an additional dimension of prestige and competitive strength in the convergence of its Earth-stewardship deeds with those of the others—both within and among the resort portfolios knitted together by the routes of knowledge and wonder. And, along those routes, unprecedented expanse and distance will redefine the horizons of conservation patronage as well as the reach of the growing trend of pairing hotels with private reserves that are currently largely confined to land and marine ecosystems adjacent to the hotels. This will reinforce the call that Bingham et al. (2021) make for fully integrating privately protected areas into the global conservation efforts and for including this integration in the post-2020 global biodiversity framework.

An examination of the subject of "governance"—specifically, of the new forms of governance that the philanthropic investments in mega-conservation initiatives are introducing across countries, regions, and the world—delivers an additional affirmation of the resort industry's singular position and motivation to spearhead the stewardship of "one Earth."

The concept of "frontier" is of utmost relevance to this examination. Steinberg (2018) looks at the world's oceans through the lens of this concept. Given that oceans cannot be enclosed by existing political institutions, he explains, they represent a frontier for science, conservation, development, and governance, opening new spaces for regulatory and ethical innovations. And this is where, as Gruby et al. (2021) reveal, private foundations are becoming ever more influential actors as they seek to shape the future of frontier spaces across both oceans and lands, such as by supporting the global movement to establish large-scale marine protected areas. But it is "the shift from government to governance in the environmental sector, whereby non-state actors are playing increasingly important roles in governance processes, structures, and institutions" that, according to Gruby et al., characterizes

the unprecedented political influence that foundations now exert. Using Chile as a case study, Beer (2022) details how a transnational network of "philanthro-environmentalists" (in this case led by Tompkins Conservation and The Pew Charitable Trusts) provides substantive philanthropic support for a mega-conservation initiative in Chilean Patagonia in exchange for substantial political and fiscal commitments from the state, thus acquiring significant control over state conservation governance. Now known as the Route of Parks, this initiative encompasses and protects more than 28 million acres in 18 national parks and includes Tompkins Conservation's private land donation of more than a million acres. As Beer points out, this "private-public" partnership was conceived and designed—including its components of Chile's public lands and the marketing strategy to be carried out by the Chilean government—by Tompkins Conservation, not the state. "By temporarily subsidizing national parklands in Chilean Patagonia, the Route of Parks Fund leverages philanthropic capital to very specific effect: incentivizing the state to improve its political and fiscal commitments to conservation through a 'dollars for policy' approach."

As a transnational network, the international resort industry is in a position to exert an equally consequential role in mega-conservation initiatives, not via a "dollar-for-policy" approach that leverages philanthropic capital to influence conservation governance but by leveraging wonder capital to become the principal business partner for scientific exploration carried out across and beyond national jurisdictions and vital for the rigor and vigor of global conservation strategies. Earth's diversity and unity, which are mutually reinforcing, endow the hospitality-science interface with a business model that thrives on transnational scales, for it is on those scales where this model's highest economic appreciation and greatest legacy dividends can be achieved.

The transnational resort awakens the self-interest of the international resort industry, exclusive to this industry, to align private enterprise system with investments in geographically unrestrained basic research endeavors. This self-interest defies the commonly held notion that the private sector cannot be expected to support basic science because of the business value of monopoly over the funded research finding—a premise defined by the influential work by Nelson (1959) and Arrow (1962) and ever since reaffirmed by countless academic gatherings and publications. For example, Dalrymple (2003) concludes that where the research process is sponsored by the private sector, proprietary rights are involved; where it is publicly financed, the products have traditionally been public goods. Myhrvold (2016) asserts that most basic scientific research will never happen without government support, particularly the kind of pure research that has delivered enormous prestige and great intellectual benefits but no profits. The utmost compatibility of the resort industry's self-interest with the non-profit, public-good spirit of basic research is premised on the idea that a zero value to the resort of seeking monopoly over the funded research, as opposed to the utmost value of monopolizing the resort-anchored interpretive treatment of that research to dazzle and stimulate the mind, leaves intact the scientific value and intellectual property of the discoveries that the resort has a strong business incentive to underwrite. This incentive extends to encouraging unrestricted use by science of the underwritten research findings as input into new research endeavors and as a foundation for conservation and sustainable-development initiatives of transnational scales, since such a use delivers guarantees of continued appreciation of the investment in both business and legacy dimensions. The collateral benefit of enhanced visibility and economic and political influence that science and conservation would stand to gain on multi-country scales would be unprecedented. And it would distinguish the resort industry as the sole private sector player that has a business reason to guard what Radder (2017) defines as the key qualifier of an item of scientific knowledge as a public good, namely, this item's potential to be useful in an indefinite number of new situations and not be subject to privatization, independently of whether it can or cannot be privatized for economic reasons.

6 Shaping the resort industry's path into the future by the grand evolutionary legacy of planet Earth: concluding perspectives

"The evolutionary origin of organisms is today a scientific conclusion established with the kind of certainty attributable to such concepts as the roundness of the earth, the motions of the planets, and the molecular composition of matter…The study of biological evolution has transformed our understanding of life on this planet" (Ayala, 2016, p. 24–25).

Evolution continues to be the subject of active scientific investigation that bears ever more profoundly on responses to the environmental challenges of our time. In the preface to the *In the Light of Evolution* series published by the National Academies Press, Avise and Ayala (2017) write: "Two urgent challenges, and opportunities, for the 21st-century science are to gain deeper insights into the evolutionary processes that foster biotic diversity, and to translate that understanding into workable solutions for the regional and global crises that biodiversity currently faces" (p. xiii).

The global resort industry is uniquely positioned to help address the enormity and time-sensitivity of these challenges and opportunities all across the monumental evolutionary theater of the natural world. It could now seize—and capitalize on, in both business and legacy dimensions—a novel opportunity to ally with transnational science endeavors that are unmasking evolutionary pathways into a sustainable future. Here belongs an increasingly prominent field of research that places a strong emphasis on phylogenetic analyses, i.e., analyses that use genetic data to identify unique evolutionary lineages, to determine whether a species is a relict or recently derived species, and to gain other knowledge that could provide a broad evolutionary context for conservation. The goal of this frontier scientific research is to complement the current emphasis on the protection of species with emphasis on the protection of evolutionary potential.

6.1 The momentum for aligning resort investments and multi-resort portfolios with science-charted recalibration of global conservation strategies

The traditional approach to designating areas of conservation priority is based on the identification of biodiversity hotspots, i.e., geographical clusters or concentrations of biodiversity. However, the use of taxonomic metrics such as species richness has missed out on a major component of the full richness of biodiversity that only phylogenetic information can reveal. The magnitude and significance of this omission are increasingly coming to light, revealing the need to develop strategies for minimizing the loss of evolutionary diversity as an integral part of conservation strategies that span both the aquatic and terrestrial realms of planet Earth, as illustrated by the following examples of relevant studies.

Huang and Roy (2015) used phylogenetic metrics in conjunction with geographical distributions of living reef coral species to model how extinctions are likely to affect evolutionary diversity across different ecoregions throughout the world. Their discovery is most consequential in the species-rich areas such as the Coral Triangle where the projected loss of evolutionary diversity is low compared to many species-poor regions that stand to lose much larger shares of their diversity. It points to the importance of integrating evolutionary history into conservation planning to safeguard the future diversity of coral reefs. Equally consequential findings by McManus et al. (2021) reaffirm that evolutionary potential is critical in preventing extinction and facilitating the long-term recovery of coral communities.

Daru and le Roux (2015) turned their attention to marine plants, pioneering the employment of spatial analyses in combination with taxonomic and phylogenetic techniques to identify global diversity hotspots for seagrasses and mangroves—two plant groups that play critical roles in carbon sequestration and nutrient cycling, that act as a nursery for many fish and invertebrates, and that perform other invaluable ecosystem services. Their disclosure of these plant groups' poor representation in the current network of marine protected areas, and of the spatial mismatch of different measures of diversity, frame their call for an integrative approach to conserve both the species diversity and phylogenetic diversity of marine plants.

Daru et al. (2019) carried out the first global evaluation of the spatial distribution of phylogenetic diversity of terrestrial birds, mammals, amphibians, and angiosperms. Their objective was to identify hotspots of phylogenetic diversity and compare these with hotspots based on species-level metrics and with the current protected areas network. The comparison revealed that the existing network of protected areas—as well as species-level hotspots—largely fail to overlap with areas of high phylodiversity. Brum et al. (2017) combined their disclosure of a strong spatial mismatch of priority areas for taxonomic, phylogenetic, and functional dimensions of the diversity of terrestrial mammals with the identification of a set of areas that are high conservation priorities across all three dimensions, thus charting a direction for expanding the current network of protected areas in a fashion that takes into account the evolutionary potential for species to evolve and adapt.

Protecting connectivity across regions, which is vital for maintaining biodiversity and ecosystem services, is another priority direction for global conservation strategies as well as for research that would better our understanding of connectivity's paths and patterns. Coral reefs would be prime beneficiaries, given that dispersal networks of coral and fish larvae are essential for supporting biodiversity persistence and promoting gene flow. Looking at reefs' dynamics globally, Fontoura et al. (2022) found that the majority—up to 70 percent—of important "source reefs" (i.e., reefs acting as sources of larval export) and dispersal corridors that connect populations between sources and larval "sinks" remain unprotected. Thus, the need to ensure increased protection of networks of well-connected reefs via strategic placement of marine protected areas is another critical impetus for re-thinking conservation strategies on transnational scales.

The above examples testify to the ever more consequential knowledge that is emerging from leading-edge, geographically unbounded research that calls for science-guided recalibration of global conservation strategies. This research represents an invaluable complement to the COP15 milestone agreement to protect at least 30 per cent of terrestrial, inland water, and coastal and marine areas by 2030. It builds an ever-stronger case for integrating entirely new dimensions into the selection, consolidation, and valuation of conservation areas across the world, and for this colossal undertaking's inseparability from mobilizing further insights into the relationships and connections that bond the earth's evolutionary and ecological fabric. It also engenders a singular opportunity for the resort industry to arise as the principal champion of this new, science-mapped direction for global conservation. It does so through a business model driven by traditionally non-profit priorities and by demonstrating that transnational research of natural legacies conducted under the umbrella of investments in world travel uniquely invites the treatment of the knowledge yields of this research as a global asset destined to benefit all of humanity.

6.2 The transnational frontier of resort master plans: a bold new frontier for fusing science with the broader human experience

There are other, highly consequential leadership roles that the transnational resort paradigm invites the global resort industry to play in this time of rapid, and escalating, challenges that societies face worldwide. As Shashidhara and Joshi (2023) point out, evolution is widely recognized as important not only to academic biology, but also to understanding, managing, and solving many of these challenges including "multidrug resistance in microbes, aging, increasing incidence of cancers, zoonotic pandemics, and ecological problems stemming from a warming world and anthropogenic environmental degradation" (p. 1303). Yet, as they demonstrate in the current context of India—while underscoring the relevance of their article to many other parts of the world—the unfortunate clash of evolution and religion, and the related faith-motivated objections to teaching and research in

evolution, are undermining the power of science to drive human welfare and human progress.

This clash is not only unfortunate and harmful; it is utterly unnecessary. Scientific teaching and writings of the evolutionary biologist and philosopher Francisco J. Ayala were broadly influential in establishing the falsity of a science-religion contradiction on the premise that they concern different matters and that each is essential to human understanding. Science and religion are like two different windows for looking at the world. The two windows look at the same world, but they show different aspects of that world: the movement of planets, the composition of matter and the atmosphere, and the origin and adaptations of organisms are among the foci of science; the meaning and purpose of the world and of human life are components of the view afforded through the window of religion (Ayala, 2007, 2014). It is in the context of the human interface with natural wonders where the horizons seen through these two windows uniquely converge. "Science may inspire religious beliefs and religious behavior, as we respond with awe to the immensity of the universe, the glorious diversity and wondrous adaptations of organisms…Religion often is, for scientists and others, a motivating force and source of inspiration for investigating the marvelous world and solving the puzzles with which it confronts us" (Ayala, 2016, p. 297). The transnational resort model's design as a catalyst of an unbounded interplay of science and wonder, which also opens vast new frontiers for the confluence and harmony of science-based and faith-based appreciation and guardianship of nature (Ayala, in press),[1] could yield a formidable, globally impactful contribution toward proving that embracing science need not lessen or compromise faith.

As Steven Jay Gould famously stated, "wonder and knowledge are both to be cherished" (Gould, 1992, p. 27). Wonder is an extraordinary asset that has profoundly shaped humanity. Schinkel (2019) points to the time-honored wisdom that wonder is "the inspiration for and the beginning of philosophy, art, and science" (p. 294).

The transnational resort paradigm places wonder at the heart of the sustainability journey it advocates and aspires to facilitate for the global resort industry. An emphasis on the power of art to illuminate knowledge through the experience of wonder and on the potential of art to translate research-based revelations concerning the natural world's transnational unity into awe, fascination, and delight accessible to the public outside the science world is integral to this effort. The bond that intertwines the timeless legacies of the great German explorer-scientist and humanist Alexander von Humboldt and the renowned American landscape painter Frederic Edwin Church offers a powerful corroboration of the merit of this emphasis.

South America—the Andes, in particular—shaped in a fundamental way Humboldt's legacy to modern mountain science, described by Körner and Spehn (2019) as "the unifying concept of climate belts, with their specific flora and fauna and conditions for sustaining human life, across the globe" (p. 1061). As a masterful interpreter of Humboldt's visionary idea that the natural world is a web of life—a unified whole wherein everything was connected and correlated, Church opened the world's eyes to the magnificence of the connections and unity of South America's wilderness. He translated Humboldt's breakthrough scientific concept of a climate-based delineation of life zones—and this concept's cradle, the Andes mountain chain—into an emotional journey of discovery. *The Heart of the Andes*, Church's large oil-on-canvas landscape painting, is iconic of this achievement. Winthrop (1859) observes: "By and by came Humboldt and lifted the Andes again. He proclaimed anew their marvelous wealth of vegetation, and how they carry on their shoulders the forests and gardens of all climes. He told, also, of their grandeur, and invited mankind to recognize it. But their transcendent glory, as the triumph of Nature working splendid harmony out of brilliant contrast, remained only a doubt and a dream, until Mr. Church became its interpreter to the northern world" (p. 4).

The immense added value, relevance, and impact that Church bestowed on breakthrough scientific concepts and discoveries by their genial processing into the senses-captivating, perspective-altering experiences are most inspiring and momentous in the face of emerging trends in geographically unbounded science. They reveal the power of the science-art "teamwork" to convey the sense of wonder in the interlocking aspects of our planet and to strengthen our bonds with nature. And they magnificently resonate with Humboldt's fusion of science and humanism, with his "applying the tools of science to understand nature, while simultaneously applying the practices of the humanities—art, poetry, literature, music—to appreciate nature and to deepen our understanding of it" (Jackson, 2019, p. 1075).

Resorts conceived, designed, and operated as experiential gateways into geographically unconstrained paths of scientific breakthroughs will have the singular opportunity of enhancing their legacies—and prestige—by becoming cradles of artistic inspiration whose fruits will become the property of all of humanity. They will be in a singular position to host painters, composers, and other artists, thus serving as nurturing grounds for artistic creativity that will advocate and share with the world the universal value of discoveries effected by borders-blind, free-flowing linkages and relationships that are central to the functioning of the earth's life-support systems.

The transnational resort paradigm makes implementable perspectives shaped by the passionate work of scientists who dedicated their professional lives to deciphering this planet's evolutionary legacy and who ventured to discuss travel-related implications of the unearthed knowledge based on the might of this knowledge to allow us to see the world immensely richer while strengthening our respect for nature and humanity. In his account of the rewards of being the *Darwinian tourist*, Wills (2010) writes: "As we look at the world through evolutionary eyes, we come away with a renewed sense of wonder about life's astounding present-day diversity, along with a new appreciation of that diversity's fourth dimension—its long evolutionary history" (p. 1). This sentiment is echoed in *Evolutionary Pathways in Nature*, a book conceived by Avise (2006) as a "biological expedition into the remarkable world of nature, as viewed through the evolutionary prism of molecular phylogeny" that permits "a deeper appreciation of the many intellectual and aesthetic treasures of the biological world" (p. x). Avise's pioneer work in phylogeography, which helped ignite one of the major scientific revolutions in the late 20th century, also substantiates his assertion that "by comprehending

1 Ayala, H. (in press). Harnessing evolution's gift of borderless wonder to open new economic frontiers for global sustainability. *Razón y Fe* 288.

and savoring the remarkable diversity yet unity of life, we gain a wiser understanding not only of nature's operations but of ourselves" (Avise, 2002, p. 204). Being lucky enough to become a "time traveler," i.e., to see extraordinary places and to gain a reasonable sense of the evolutionary legacy of the biological world, carries a special responsibility to help guard this legacy, concludes paleontologist Novacek (2002) whose discoveries of important fossils span all continents.

6.3 Epilog

As defined and substantiated in this article, the transnational frontier of resort master plans appreciates and celebrates naturally exquisite places through the lens of their belonging to much larger pools of the planet's natural heritage. It is a frontier that blends knowledge and wonder in the offer of genuine encounters with the complexity and fragility of one Earth, a frontier receptive to pledges that will deliver borderless gifts to the environment and humanity. It is a frontier of economic discovery and economic empowerment of large realms of natural riches welded by relationships of great conservation importance and research value and harboring a major potential to serve as incubators of dynamic knowledge economies that foster better management and conservation of global natural capital.

Destinations that pioneer this frontier will redefine the horizons of tourist experiences and set new standards of sophistication and purpose in world travel. They will align and enrich their experiential odysseys with the triumphs of international science. They will collectively anchor a self-sustaining system through which research funding and expertise flow into the most precious reservoirs of this planet's heritage, injecting economic justification into their protection. They could play a historic role as hosts of science diplomacy that would fortify their contribution toward building economic foundations of peace. As laid out in this article, this prospect is both tangible and non-deferrable.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Author contributions

HA conceived the paper, designed the featured hypotheses, theories, concepts, and analyses, wrote the manuscript, and approved the submitted version.

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