

## Maritime Summary Note n°257 – January 2024

### « Canals and corridors in Central America »

*Central American canal infrastructure projects are embedded within a global context of maritime transportation growth and modernization, powerfully driven by transpacific cargo flows between Asia and the Americas with a dominant East-West orientation. They generate high expectations in terms of economic spin-offs, all the more so in a world region characterized by slow-progressing development indicators, alongside widespread poverty and deep inequalities. The political will of Central American States is fierce to transform the isthmus into the strategic multimodal platform within the global trading network. The objective targets launching a virtuous circle of economic and social growth by rendering their territories highly attractive to international investors and industrial conglomerates, notably through the engineering of robust transport infrastructures. What are the major interoceanic corridors constructed or under development across the Central American Isthmus?*

#### **The Panama Canal: a strategic crossroads**

The geopolitical idea of cutting through the Isthmus of Panama dates back to the 15th century, when the Spanish first discovered the territory. At the time, the sole maritime route to the Pacific coast of South America was the Cape Horn route—prolonged, arduous, and highly dangerous. The infrastructure project for a canal would officially commence four hundred years later, in 1881, under the aegis of Ferdinand de Lesseps within the Colombian province of Panama. His primary ambition was to construct a sea-level canal without locks, drawing inspiration from the successful architecture of the Suez Canal completed in 1869.

However, due to extreme topographical hurdles (highly clayey soil, a mountain ridge rising over 100 meters high), coupled with grueling and even lethal working conditions, Lesseps recanted. Following the advice of his engineers, he adopted a revised project in 1887 featuring ten locks designed by Gustave Eiffel. The initial budget exploded, triggering the bankruptcy of the *Compagnie Universelle du Canal Interocéanique de Panama* in 1889, which precipitated the largest financial scandal in 19th-century France. Lesseps abandoned his project.

Against the strategic backdrop of the Spanish-American War, the United States identified a critical military interest in the Panama Canal and pursued the work already undertaken. They sought to transit their warships rapidly and safely from one ocean to the other. Construction work officially resumed in 1904. Concomitantly, the department of Panama—backed by the military intervention of American troops—seceded from Colombia in 1903. The United States committed to internationalizing the waterway, guaranteeing total freedom of navigation. In exchange, Panama granted the United States perpetual rights over the Panama Canal Zone: encompassing the administration of the waterway, the right of occupation over a 16-kilometer-wide corridor along the route, the right to militarily defend the canal, and a guarantee of Panamanian independence in return for a recurring annual annuity. Decades later, legal renegotiations would thoroughly reshape the canal's statutory status.

This transoceanic axis, opened to navigation on August 15, 1914, interconnected two worlds through a central, high-speed maritime highway. Stretching over 80 kilometers, it links the Atlantic Ocean to the Pacific Ocean via a system of locks utilizing the artificial Gatun Lake, which was engineered to raise the water level rather than continuously excavate the bedrock. This lake is partly supplied with fresh water by the *Río Chagres*. As early as 1930, the question of the canal's capacity materialized, driving a determination to expand the tidal basins on one hand, and to construct a third set of locks on the other. The core objective for the Americans focused on enabling their largest naval warships to transit without hindrance. These modernization works were officially launched during the Second World War.

Since January 1, 2000, the Canal Zone has been permanently dissolved, and the canal territory stands as strictly neutral. Protection is exercised jointly, and transit freedoms and neutrality principles are firmly

re-affirmed. Management is entirely assured by the Panama Canal Authority (ACP — *Autorité du Canal de Panama*), an autonomous Panamanian government entity commanding its own public assets. It remains solely responsible for the administration, operation, and maintenance of the canal, with all transit tolls and revenues directly filling the Panamanian treasury.

Transpacific maritime traffic between Asia and the Americas continues to expand aggressively. The United States East Coast marketplace stands as the predominant driver within these exchanges. At the dawn of the 2000s, the Panama Canal absorbed approximately 5% of global maritime trade, concentrated essentially on North America–Asia trade lanes, representing roughly 12,000 vessel transits per calendar year. At that time, only so-called Panamax vessels, structurally dimensioned according to the physical limitations of the legacy locks (294 meters long, 32.3 meters wide, with an operational draft of 12 meters), could navigate the waterway—restricting container shipping to vessels of 5,000 to 6,000 TEUs and dry bulk carriers to a maximum of 85,000 deadweight tonnes (dwt).

Since 2004, the canal has faced structural saturation. Face to the global trend of vessel size expansion (*gigantisme des navires*), engineering an overhaul expansion emerged as a vital necessity. The highly publicized rival project of an interoceanic canal in Nicaragua concurrently accelerated the domestic legislative vote in favor of the expansion works. The Panama Canal expansion master project was officially launched in 2007. It engineered a brand-new transit lane along the waterway fitted with an advanced system of water-saving locks. Its official inauguration was celebrated in 2016, representing a cumulative capital expenditure estimated near \$5.2 billion. These newly engineered Neopanamax locks henceforth enable larger-tonnage vessels and container ships commanding a capacity of up to 15,000 TEUs to transit the isthmus.

### Traffic patterns and commodity flows

In terms of cargo volume, Neopanamax vessel transits account for 50% of the canal's throughput. According to ACP corporate datasets, the three primary vessel typologies utilizing the waterway are tankers (29%), container ships (27%), and dry bulk carriers (26%). The total volume of vessel transits stood at 12,449, a metric that has remained relatively stable since the 1980s; however, the evolution of cargo volumes demonstrates a steady, structural expansion in average vessel tonnage.

These maritime transits are significantly heavier along the Atlantic-to-Pacific axis, representing nearly 180 million tonnes, whereas the Pacific-to-Atlantic direction accounts for a mere 92 million tonnes, of which 41% consists of containerized freight. This container traffic transits predominantly between East Asia and the United States East Coast, aggregating 40 million tonnes. This specific maritime trade lane is heavily sustained by the Chinese export-driven economy and its industrial capacity to supply low-cost consumer commodities (textiles, toys, smartphones, electronics).

The two alternative trade corridors of the Pacific-to-Atlantic axis originate in equivalent proportions from the West Coast of South America (exporting raw mineral ores, agricultural products, and fisheries), bound respectively toward Europe and the United States East Coast. Crucially, the Panama Canal supplies a relatively minor share of the European marketplace, as the Old Continent remains structurally interconnected to Asian industrial centers via the Suez Canal, most notably regarding the premium container shipping lines.

Regarding the Atlantic-to-Pacific axis, trade flows are heavily dominated by the corridor connecting the United States East Coast to East Asia, which commands 80 million tonnes. This massive export flow is essentially composed of refined petroleum products, liquefied gases, and agricultural grains (wheat, corn, soybeans). Following in the second and third positions rank the maritime exchanges connecting the US East Coast to the West Coast of South America and the West Coast of Central America, respectively. Evaluated in terms of total transported volumes, the Panama Canal henceforth handles 2.4% of global seaborne trade.

### **Strategic hurdles and the climate crisis**

The interoceanic canal generates approximately 10% of the State of Panama's total public revenues through direct maritime taxation and associated logistical cluster activities. The industrial zone flanking the waterway operates as a highly dynamic free trade zone, facilitating the clustering of multinational corporations and private container terminals.

The baseline transit toll varies from \$10,000 for small vessels up to \$300,000 for a 15,000 TEU Neopanamax giant. In periods of extreme traffic congestion, the right of passage becomes subject to a

highly speculative special auction system (*ventes aux enchères*), offering supplementary transit slots for the legacy Panamax locks and unreserved vessels. While the opening baseline bid is fixed at \$55,000, the severe rarefaction of available transit slots has caused pricing to skyrocket. A specialized liquefied natural gas (LNG) carrier recently deallocated a monumental \$2.85 million just to secure a single transit slot through the canal. The average premium paid within this competitive auction framework hovers around \$1 million per transit (in addition to standard baseline toll tariffs).

Global climate change, coupled with an acute hydrological deficit, directly jeopardizes the long-term sustainability of this primary maritime arterial highway. Today, the most severe operational challenge confronting the ACP is a chronic freshwater shortage. Approximately 200,000 to 250,000 cubic meters of fresh water are discharged into the oceans during each individual vessel transit. The expanded capacity of the Neopanamax locks has mechanically accelerated this hydrological drainage.

Consequently, the water reserves of the artificial Gatun and Alajuela lakes are contracting severely, particularly during protracted drought seasons. This landscape becomes exceptionally critical during El Niño calendar years—a global climate phenomenon characterized by abnormally elevated sea surface temperatures across the South Pacific Ocean, triggering intense heatwaves and severe droughts worldwide.

Faced with this environmental crisis, the ACP aggressively reduced daily vessel transits alongside maximum authorized drafts (throttling capacity down to 24 slots per day in January 2024, and plunging to 18 slots in February). These binding operational restrictions target more specifically high-capacity container ships, LNG carriers, and large crude tankers. The maximum permissible draft was slashed, and vessel waiting times at anchorage plummeted from a normal baseline of 4 days to an extreme 20 days, with the outer queue peaking at 163 vessels.

To offset the loss of fresh water during transits, a special freshwater surcharge scaling from 1% to 10% of the baseline toll cost is applied to vessels. Global shipping lines like CMA CGM and MSC have already responded by deploying targeted peak season surcharges, such as CMA CGM's "Panama Adjustment Factor", fixed at \$150 per TEU.

To safeguard the infrastructure, the ACP is evaluating heavy engineering adjustments, notably constructing an underground aqueduct network to resupply Gatun Lake. However, the long-term viability and ecological reasonableness of these multi-billion dollar interventions remain highly debated. The societal allocation of water has sparked intense public controversy: while fresh water is mandatory to secure the municipal drinking supply of expanding urban populations across Panama City, San Miguelito, Arraiján, La Chorrera, and Colón, it is concurrently required for national hydroelectric power generation and the country's macro-economic activities.

Condemned to adapt to a climate disruption over which they command zero leverage, selected ocean carriers are actively evaluating alternative maritime routes. These options encompass bypassing the Americas entirely by navigating around South America, either transiting through the Strait of Magellan or braving the extreme weather of Cape Horn—an operational detour that demands up to 32 additional navigation days at sea .instead of the standard 23 days, adding some 10,000 supplementary kilometers (equivalent to 18,520 kilometers). A structural reconfiguration of maritime trade flows is already highly visible. Bypassing the isthmus via these alternative routes will considerably elongate transit times and negatively impact the carbon footprint of global shipping. In a more or less distant future, the Northwest Passage, if it becomes reliably accessible during the summer seasons, could emerge to actively compete against the Panama Canal, yielding a net gain of 4,000 kilometers on the strategic New York–Shanghai trade lane. What remains certain is that while Panama genuinely requires economic globalization, the inverse is not true. Concurrently, the alternative mega-project that has triggered intense debate, yet remains for the time being a mere chimera, is the Nicaragua Canal.

### **The deadlock of the Nicaragua Canal project**

The geopolitical idea of cutting through the Central American Isthmus via Lake Nicaragua was originally formalized and presented to the King of Spain as early as 1780. Throughout the Spanish colonial administration of the region, multiple route concepts for an interoceanic canal had regularly surfaced. During the 1800s, the Federal Republic of Central America and the United States jointly audited a project blueprint routing a canal through Lake Nicaragua. Following the successful opening of the Panama Canal in 1914, the project lost its commercial relevance, yet the concept was never entirely abandoned. A century later, in 2013, a high-level public-private partnership materialized: the HK Nicaragua Canal Development Investment Co. Ltd. (HKND)—a Chinese consortium controlled by the telecommunications

billionaire Wang Jing (who commanded zero corporate experience in civil engineering and heavy infrastructure works)—successfully secured a 50-year concession. In exchange for a recurring annual annuity of \$10 million, the contract granted HKND a 51% controlling stake in the canal assets upon the concession's expiration. For the Chinese investor, the Nicaragua Canal was framed as highly complementary to Panama, designed to alleviate the capacity bottlenecks of its neighbor. HKND was mandated to execute the construction, development, and operational management phases of the waterway, alongside building two deepwater ports, free trade zones, an international airport, a pipeline network, an interoceanic railway, and all secondary infrastructure assets required to complete the canal grid.

The cumulative capital expenditure of the works was estimated at a monumental \$50 billion—more than three times the total GDP of Nicaragua. The political promise of generating thousands of domestic jobs fueled intense hope within a nation where over 45% of the population subsists below the poverty line. The canal project simultaneously allowed Nicaragua to strategically reposition itself on the international diplomatic stage. Construction work commenced timidly in 2014, with a scheduled completion date initially targeted for 2020.

The engineered waterway was designed to stretch over 278 kilometers—more than three times the length of the Panama Canal—with a width of 230 meters and a depth of 30 meters. This massive length significantly elongated transit durations, shifting from a normal average of 9 hours through the Panama Canal to an estimated 30-hour transit across the Nicaraguan project. Consequently, the commercial relevance and return on investment (ROI) of the infrastructure were heavily questioned by experts. The canal was tailored to accommodate Super Post-Panamax vessels commanding a deadweight capacity of up to 250,000 tonnes and a length of 450 meters, alongside container ships of 14,000 TEUs—a layout even more ambitious than Panama's expanded locks. Geographically, the route was engineered to interconnect Brito on the Pacific coast to Punta Águila on the Caribbean Sea, transiting directly through Lake Nicaragua.

Paralleling the engineering of this pharaonic macro-project, HKND was granted a sweeping territorial concession of 5,600 square kilometers—representing 5% of Nicaragua's sovereign land area. Within this perimeter, the Chinese consortium planned to develop intensive agribusiness operations on highly fertile soils irrigated directly by Lake Cocibolca (Lake Nicaragua), the primary drinking freshwater reserve of Central America.

The infrastructure project remains deeply controversial. It was launched without any meaningful democratic consultation with local populations, leaving thousands of rural communities exposed to high risks of forced expropriation. The environmental protection component triggered widespread international anxiety, centering on the catastrophic contamination risks facing Lake Nicaragua, the irreversible disruption of the lake's lacustrine ecosystem, and severe impacts on the primary tropical rainforest.

The engineered network of dams and locks would have severely altered the salinity of the water—fresh water that is strictly potable and serves to supply multiple central cities across Nicaragua and Central America while irrigating agricultural lands. Furthermore, the selected route crossed multiple active volcanic and seismic hazard zones. Finally, Nicaragua must regularly cope with catastrophic Category 4 or higher hurricanes, a meteorological hazard highly liable to severely damage canal infrastructure assets, further amplifying the project's financial risk profile.

A few months after the official launch of the works, Wang Jing lost the absolute bulk of his personal fortune following the Chinese stock market crash of the summer of 2015, and the entrepreneur subsequently vanished from the public sphere. Confronted by compounding political, financial, and technical hurdles, Nicaragua was unable to pursue the construction works alone; the project was permanently halted.

Through this infrastructure project and its complex legal assembly, numerous geostrategic observers identified a clear determination by Beijing to expand its global projection of influence, contesting American hegemony directly within its Central American historical sphere. Within a contemporary context of escalating Sino-American trade and geopolitical tensions, the canal would have indeed delivered a first-rate strategic asset for China. It would have enabled Beijing to avoid being entirely dependent on a primary maritime arterial highway controlled by a close ally of the United States.

The canal will highly likely never see the light of day, to the immense relief of a large section of public opinion. Today, the most severe peril does not reside in the uncompleted state of the waterway, but

rather in the persistent legal land-grabbing and freshwater resource capture threatening the sovereignty of Nicaragua.

Numerous large-scale public demonstrations took place across the country to contest the Chinese presence and demand the absolute repeal of the legal frameworks granting the sweeping territorial concession to HKND. Yet, this domestic unrest triggered only minimal echoes on the international diplomatic stage. Concurrently, Costa Rica, heavily dependent on its national "green tourism" model, continuously demanded rigorous impact and feasibility studies, highly alarmed by the projected negative repercussions on the regional environment. Symptomatic of a broader Chinese disinterest in the Nicaragua Canal, Beijing ultimately preferred to invest heavily in the economy of its neighbor, Panama, culminating in the formal signature of multiple bilateral commercial agreements in 2018.

### **Central American "dry canals" and landbridge networks**

The alternative operational pathway poised to compete against the Panama Canal relies on the development of "landbridges" (*ponts terrestres*). This paradigm manifests as an integrated multimodal corridor interconnecting two deepwater ports between the Pacific Ocean and the Caribbean Sea, capable of combining rail networks, highways, and energy pipelines. Mexico, Guatemala, Honduras, Costa Rica, and Nicaragua have all conceptually designed their own proprietary "dry canal" (*canal sec*). The core strategic objective focuses on repositioning these nations within the international diplomatic sphere while expanding their gross domestic product (GDP).

Californian gateways—spearheaded by the world-class port hub of Los Angeles/Long Beach—already constitute highly competitive entry points for Asian cargo bound for the United States interior. Conversely to the Panama Canal, which operates as a seamless "all-water" route, terrestrial landbridge corridors structurally necessitate intermodal breaks-of-bulk (*ruptures de charges*) and intensive transshipment operations. Consequently, their commercial utilization requires a flawless synchronization between port authorities, terminal operators, railway corporations, customs administrations, and state services.

In Mexico, a historic railway line crosses the Isthmus of Tehuantepec, directly linking the port of Puerto México in Coatzacoalcas on the Gulf of Mexico (Veracruz State) to the port of Salina Cruz (Oaxaca State) on the Pacific Ocean coastline. This interoceanic corridor, originally completed in 1907 and stretching over 214 kilometers, holds a powerful economic interest for major United States manufacturing centers. This Mexican Landbridge attempts to actively rival the Panama Canal, offering a transoceanic transit time of 6 hours by road or 12 hours via rail logistics.

However, historically, commercial success failed to materialize face to the crushing competition of the water route. In 1985, its annual traffic amounted to a mere 1,766 containers. To reverse this trend, the Mexican presidency announced in 2020 a master plan to thoroughly modernize this infrastructure, notably accelerating freight train speeds from a slow 20 km/h baseline up to 70 km/h.

Currently, a strategic Mexico–United States partnership aims to inject heavy capital into this interoceanic corridor. Under this modernization blueprint, the port of Salina Cruz is being engineered to ultimately accommodate ultra-large container ships of 22,000 TEUs. The integrated corridor will encompass a high-capacity highway system alongside a crude oil pipeline, a fiber-optic telecommunications grid, and the creation of targeted industrial manufacturing parks designed to attract foreign direct investment (FDI), for a cumulative cost estimated at a minimum of \$1 billion.

Nevertheless, this macro-project faces fierce opposition from local indigenous communities, who fear severe environmental damage and face the immediate risk of forced expropriation from their ancestral lands.

According to the Central American Commission for Maritime Transport (COCATRAM)—whose sovereign member States encompass Guatemala, El Salvador, Honduras, Nicaragua, Costa Rica, and Panama—a "dry canal" multimodal project is commercially relevant only if transit can be executed in under 10 hours by road between the Atlantic and Pacific coastlines. The low operational cost and transit simplicity remain, for the time being, unassailable competitive advantages held by the Panama Canal. As early as the 1960s, a unifying and strategic vision between Central American States regarding intra-regional freight transport corridors was progressively implemented, though meeting with mixed success due to the chronic political instability of selected nations (most notably Guatemala and El Salvador). The Central American Integration System (SICA — *Système d'Intégration Centraméricain*), a regional political, economic, and cultural organization operating in close alignment with COCATRAM, targets as a primary goal the engineering of integrated logistical corridors to transform Central America into a highly competitive region fully integrated into global maritime trade. One of its landmark successes materialized

as the 1997 finalization of the Pan-American Highway, threading the American continent from North to South through an interconnected grid of expressways and freeways.

The Pacific Corridor stands as the most vital terrestrial trade route in Central America, handling 95% of all land-based freight exchanged across the region. It stretches over more than 3,000 kilometers through Mexico, Guatemala, El Salvador, Honduras, Nicaragua, Costa Rica, and Panama, operating as the shortest overland highway route connecting Mexico to the Panamanian hub.

Concurrently, developing short-sea shipping lines (*transport maritime de courte distance*) between the regional ports of the Central American isthmus is under intense evaluation, specifically engineered to alleviate heavy highway truck congestion while maximizing regional transit safety. Within this framework, 49 strategic ports scattered across both the Pacific and Atlantic façades are receiving targeted public and investment attention.

In conclusion, selected regional infrastructure mega-projects raise critical questions regarding the dominant regional development model and the acute socio-environmental conflicts they systematically trigger, alongside the friction of geostrategic rivalries between foreign superpowers acting through proxies. The facilitation of supply chain flows, economic competitiveness, and logistics productivity must imperatively embed environmental and social factors into their core development matrices. The "*Proyecto Integración y Desarrollo Mesoamérica*" (Mesoamerica Project) operates precisely within this logic of strategic, inter-state cooperation, whose ultimate goal focuses on reinforcing structural connectivity, economic integration, and sustainable development across the region. Let us hope it bears fruit.

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