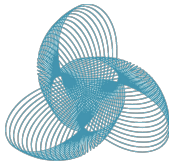

Deera Editorial

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Madinat al-Hareer: A Blueprint

A Working Plan for the Northern Economic Zone, From Material to Greenery

Twenty kilometres north of Kuwait City, across the bay and over the Sheikh Jaber Al-Ahmad Al-Sabah Causeway, sits a peninsula on which the next quarter-century of Kuwait's national development is meant to rest. Subiya is currently a power plant, a port under construction, and an inheritance of empty land. Madinat al-Hareer — the Silk City — has been the object of national planning since 2006 and a pillar of the New Kuwait Vision 2035 framework since 2017. The project is officially scoped at 250 square kilometres, $132 billion, and a 2024-2040 build horizon, with capacity for approximately 700,000 residents and 450,000 jobs (Black Ridge Research). It is, by any reasonable measure, the largest planned urbanisation event in modern Kuwaiti history.

This article is not a critique of past timelines. It is a working blueprint for what should be built, in what order, and against which performance standards, given the material, climatic, and institutional realities of the site. The argument has a single thesis: a city built in the Subiya desert can be both a credible regional financial hub and the most environmentally serious urbanisation project in the Gulf, but only if the engineering decisions are made in a particular order, and only if the governance layer that surrounds those decisions is built before the first major foundation is poured. The model that comes closest to demonstrating what is possible is not in the Gulf. It is Copenhagen, the European capital that reduced its carbon emissions by seventy-five percent between 2005 and 2025 while growing its population by twenty percent over the same period (Copenhagen Climate Plan). The Copenhagen instruments do not transfer to a fifty-degree desert unmodified. They translate. This blueprint shows how.

I. THE SITE AND THE INHERITANCE

The Subiya peninsula offers four assets a planner cannot manufacture. The first is geography: the site sits at the intersection of the Gulf shipping lane, the Iraqi border, and the historic land routes through Kuwait Bay. The Mubarak Al-Kabeer Port, partially operational on Bubiyan Island as of 2026, is twenty-four berths in its full design and links by rail to the planned Gulf Cooperation Council network. The second is energy: the Subiya power station, at five thousand megawatts, is the largest electrical generation facility in Kuwait and provides the load capacity any new city of this scale will require for its first phase, with substantial overhead for desalination and district cooling. The third is the causeway: at thirty-six kilometres, the Sheikh Jaber Al-Ahmad Al-Sabah Causeway is among the longest sea bridges ever built, and it has, since 2019, reduced the travel time between Kuwait City and Subiya from ninety minutes to fifteen. The fourth is the legal framework: the Northern Economic Zone designation, integrated into Vision 2035 in 2017, contemplates a Special Economic Zone status with regulatory autonomy distinct from the rest of Kuwait.

These four assets, taken together, mean that the question facing Silk City is not whether the foundational infrastructure exists. It does. The question is what shape the city built on top of that infrastructure should take. The published masterplan organises Madinat al-Hareer into four quarters: Finance City, Leisure City, Ecological City, and Residential City, each with its own urban centre, anchored by the Burj Mubarak Al-Kabir, the proposed 1,001-metre, 234-floor tower designed by the architect Santiago Calatrava (Tamdeen Group). The blueprint that follows accepts these four quarters as the planning convention but argues that a more important organising principle is the engineering one: every district, regardless of programmatic use, must be designed against the same five performance standards — embodied carbon, operational energy, water cycling, urban heat-island mitigation, and biodiversity recovery. These standards are what turn a real-estate development into a city.

II. COPENHAGEN, TRANSLATED FOR THE DESERT

Copenhagen reduced its emissions by seventy-five percent over twenty years not through a single technology but through three coordinated infrastructural decisions taken at the city scale.

The first was a district heating network — the largest in the world — that captures waste heat from power generation and delivers it to almost every building in the municipality through insulated water pipes. The second, opened in 2010 as the first of its kind in Denmark, was a district *cooling* network: the Adelgade plant draws cold seawater from the Nyhavn Canal and pipes it under the city to cool office buildings, hotels, department stores, and data centres without on-site compressors (Yale Environment 360). The third was the cycling network: two hundred and forty-nine miles of dedicated tracks carrying forty-nine percent of all commuting trips by 2025.

Each of these three instruments has a desert analog that is not only feasible at Subiya but that the site is unusually well-suited to deliver. **The district heating network becomes a district cooling network**, scaled to the inverse problem: instead of capturing waste heat to warm Danish winters, the Subiya system would draw cold water from the deeper layers of the Gulf — below the thermocline, where temperatures remain in the mid-teens Celsius year-round — and pipe it through the city to cool buildings without mechanical chillers. Sea-Water Air Conditioning is a proven technology already operational at scale in Stockholm, Toronto, and Honolulu; the engineering challenge at Subiya is not novelty but corrosion management, given the higher salinity of the northern Arabian Gulf. The capital cost is recovered in approximately seven to ten years against avoided electricity for compression cooling, which represents seventy percent of summer load in Kuwaiti residential buildings.

The cycling network becomes a shaded pedestrian network. The instrument is the same — dedicated, continuous, prioritised infrastructure for non-motorised movement — but the form is different. Copenhagen's tracks run in the open air. Subiya's must run beneath shade structures, integrated into the building envelope wherever possible: arcaded ground floors, mashrabiya-style lattices, photovoltaic canopies that double as power generation. The Masdar City experiment in Abu Dhabi demonstrated that narrow, shaded streets and traditional Arab urban forms reduce ambient cooling load by up to seventy percent against an open-grid baseline (Architecture Courses). The design move is not to build a Copenhagen-style cycling city in the

Gulf. It is to recognise that what Copenhagen achieved with bicycles — the elimination of the private car as the default movement mode — can be achieved at Subiya with shaded pedestrian networks linked to a high-capacity transit spine, provided the shading is engineered as primary infrastructure rather than decorative afterthought.

The third instrument is the integration itself. Copenhagen's achievement was not any single piece of technology but the systems engineering that bound them together: the energy grid, the heating grid, the cooling grid, the cycling grid, and the building stock all designed to work as one integrated urban metabolism. "The Danish energy system is very much a systems solution," Copenhagen's Executive Climate Project Director observed. "It's not power as one, and heat as one. It's integrated" (Alleguard Foam Solutions). This is the principle that the Masdar experience validates from the opposite direction. Masdar's technologies all worked: the wind towers worked, the solar arrays worked, the narrow shaded streets worked. What was missing was the institutional capacity to integrate them into a self-reinforcing system rather than a set of demonstration projects beside one another. Subiya has the chance to build that integration from the start.

III. MATERIAL FLOW AND EMBODIED CARBON

The largest single environmental decision in any new city is also the least visible: the embodied carbon of its construction materials. Roughly forty percent of the lifecycle emissions of a typical twenty-first-century building are locked in by the time the first occupant moves in, in the cement, the steel, the glass, the aluminium, and the transportation of those materials to the site. For a city of Madinat al-Hareer's ambition — 175,000 residential units, a 1,001-metre tower, multiple commercial cores — the embodied-carbon decision dwarfs the operational-carbon decision over a thirty-year horizon. Three commitments at the project-procurement layer would reduce that footprint by an estimated forty to sixty percent against a Gulf-baseline build.

The first is a low-carbon cement specification. Conventional Portland cement is responsible for approximately eight percent of global CO_2 emissions; the chemistry is unavoidable in ordinary cement production. But cement blends that substitute up to seventy

percent of the clinker with ground granulated blast-furnace slag, fly ash, or calcined clay are now in commercial use across Europe and parts of the United States. The procurement specification for Silk City should require a maximum embodied-carbon ceiling per cubic metre of concrete, set at the level achievable by these blends, with imports from regional suppliers in Saudi Arabia, the United Arab Emirates, and Oman where domestic capacity is insufficient. **The second is a structural-steel and aluminium standard tied to recycled content.** Aluminium produced from recycled feedstock requires approximately five percent of the energy of primary aluminium production; for a city that will use aluminium at the scale of a Calatrava-designed tower and several hundred curtain-walled commercial buildings, the difference is measured in millions of tonnes of CO_2-equivalent. **The third is a domestic recycled-aggregate stream.** Demolition waste from existing Kuwaiti building stock, currently landfilled in the Sulaibiya area, is a usable construction-grade aggregate after standard processing. Establishing a recycled-aggregate plant adjacent to the Mubarak Al-Kabeer Port, drawing on national demolition flows and on dredge spoil from the port itself, would supply roughly thirty percent of the aggregate requirement for the first phase of construction.

IV. WATER AND ENERGY

Water is the constraint that defines every desert city, and Kuwait is among the most water-stressed nations on earth. Total domestic water consumption per capita is among the highest globally, driven primarily by desalination dependency: more than ninety percent of municipal water in Kuwait is desalinated seawater, produced through energy-intensive multi-stage flash distillation. A city of 700,000 people built on the Subiya peninsula will require, at conventional Kuwaiti consumption rates, approximately three hundred and fifty thousand cubic metres of water per day. The blueprint case for Silk City rests on a different assumption: that demand can be reduced by fifty percent through closed-loop water cycling and that supply can be provided through reverse-osmosis desalination powered by dedicated solar generation. Both targets are achievable with technology that is currently in commercial deployment elsewhere in the Gulf.

The closed-loop principle is straightforward. Every drop of municipal water that enters a Silk City building is captured, treated, and reused for purposes that do not require potable quality: irrigation, cooling-tower makeup, toilet flushing, and industrial process water. Greywater from showers and sinks is the simplest case; blackwater from toilets, treated through membrane bioreactor systems, is technically more demanding but operationally proven at the district scale. Singapore's NEWater system, which supplies forty percent of the city-state's water demand from treated wastewater, is the working global benchmark. Silk City should set a target of seventy percent water reuse across the residential and commercial stock, with monitoring at the district level published in the same public-data format as Copenhagen's annual carbon accounting.

Energy follows the same logic. The city's baseline electricity demand can be cut by approximately forty percent against a Kuwait-typical building stock through a combination of better envelopes, district cooling, daylighting, and demand-side management. The remaining sixty percent can be supplied substantially through dedicated solar capacity, exploiting the most abundant resource the site possesses: roughly two thousand kilowatt-hours per square metre of solar irradiance per year, among the highest values measured globally. A solar generation footprint of approximately twenty-five square kilometres of photovoltaic capacity, sited on the western edge of the development zone where the land is least useful for residential or commercial purposes, would meet the city's daytime electricity demand in full. Storage, through a combination of lithium-iron-phosphate batteries and a thermal-energy-storage layer integrated with the district cooling network, addresses the night and shoulder-hour gap. The remainder, in the early phases, is supplied by the existing Subiya power station, which is itself convertible to natural gas combined-cycle and, eventually, to hydrogen-blend operation.

V. GREENERY IN A FIFTY-DEGREE SUMMER

The image of a green city in the Subiya desert is the single most rhetorically important promise the Silk City masterplan has made. It is also the most technically demanding. Conventional landscape architecture in the Gulf has relied on imported turfgrass, ornamental palms, and high-irrigation flowering plants that consume enormous quantities of desalinated

water and that fail catastrophically during summer heat events. The blueprint approach inverts this logic: rather than imposing an imported landscape on the desert, the project should rebuild a native one, scientifically informed and densely planted, across the non-built portions of the site.

Three planting strategies, in combination, would produce the green infrastructure the masterplan promises without the unsustainable water burden. **The first is xeriscape design with native and adapted species:** ghaf trees (*Prosopis cineraria*), sidr (*Ziziphus spina-christi*), Christ's thorn jujube, salt-tolerant acacias, and groundcover halophytes such as *Salicornia* that thrive on brackish or seawater irrigation. These species, planted at appropriate density, sequester carbon, anchor soil against the shamal winds, and require less than ten percent of the water consumed by ornamental landscaping. **The second is a soil-regeneration layer:** the desert floor at Subiya is largely impoverished sand, but it can be amended with biochar, mycorrhizal fungi, and treated organic waste from the city's residential stream to support a self-sustaining rhizosphere within five to seven years. **The third is a productive layer:** halophyte agriculture for halophyte fodder and biofuel-feedstock production, salt-tolerant date palms, and an urban food forest concept of the kind Singapore has pioneered. The Ecological Quarter as named in the masterplan should not be a decorative park. It should be the operational demonstration of a Gulf-native ecology that the rest of the GCC will eventually need to adopt as climate stress intensifies.

VI. GOVERNANCE AND THE DATA LAYER

The Masdar lesson, distilled, is that technology is not the constraint. Institutional integration is. Every individual subsystem in the Silk City blueprint — sea-water cooling, recycled aggregate, halophyte agriculture, distributed solar — is technically mature. What Subiya needs is a single governance vehicle empowered to procure across these subsystems on a single set of integrated performance standards, rather than as separate contracts let to separate primes with separate metrics.

The Special Economic Zone framework anticipated in the Vision 2035 documents should explicitly contain three governance instruments. **The first is a city data platform** — an

analogue, scoped to urban operations, of the sovereign defense-data architecture Deera has examined elsewhere in its work on the SIGHT project. The Silk City platform would ingest energy-grid telemetry, water-network data, transit usage, building-management-system outputs, environmental sensors, and occupancy data into a single ontology under full Kuwaiti data residency, with public dashboards for accountability and closed operational layers for utility management. **The second is a public carbon and water accounting framework** modelled on Copenhagen's annual climate accounting, audited and published every year against the original masterplan targets. A city that reports its performance in public is a city that improves; a city that does not, will not. **The third is a procurement authority empowered to specify integrated performance standards** rather than disaggregated technical specifications. The procurement officer who buys cement should be able to require an embodied-carbon ceiling, the procurement officer who buys cooling capacity should be able to require seasonal performance against a coefficient-of-performance threshold, and both should report into the same dashboard. The institutional vehicle for this is conventional in the Gulf experience — a project-specific authority with budgetary autonomy — but its remit must be engineered for integration rather than for compartmentalised functional efficiency.

VII. SEQUENCING

The order of construction matters as much as the content. The blueprint sequence is as follows. **Phase one (years 1-4):** complete the seawater-cooling intake and primary distribution loop from the Gulf to the inland edge of the Finance Quarter; complete the first solar generation field on the western boundary; complete the recycled-aggregate plant at the Port; complete the soil-regeneration and native-species planting program across the Ecological Quarter footprint, allowing five years of growth before the buildings around it begin construction. **Phase two (years 5-10):** the first residential and commercial cores are built, in compact form, around the Finance Quarter centre, served by the seawater-cooling network and the closed-loop water system from day one. The Burj Mubarak Al-Kabir begins construction at the end of this phase, when the surrounding city has the population to make it operationally viable. **Phase three (years**

10-20): the Residential and Leisure Quarters develop outward from the Finance core. The Mubarak Al-Kabeer Port reaches full twenty-four-berth operation, and the rail link to the Gulf Cooperation Council network is completed. **Phase four (years 20-25):** the Ecological Quarter, by now fifteen years into its planted ecosystem, is integrated with the surrounding city as a living biological infrastructure rather than a recreational amenity.

VIII. CONCLUSION

Silk City is, on the published numbers, the largest single bet on Kuwait's post-oil future that the country will make in the twenty-first century. It is also, given the climate trajectory of the northern Gulf, one of the most environmentally consequential urban developments in the world. The argument of this blueprint is that those two facts are not in tension. A city that integrates its energy, water, materials, and ecological subsystems from the first day of construction will outperform a city that bolts sustainability features onto a conventional development plan in every metric that matters: lifecycle cost, environmental performance, livability, and resilience against the climate stresses Kuwait will face over the next half-century. Copenhagen demonstrates the principle in a temperate climate; Masdar demonstrates the technical components in the Gulf; Singapore demonstrates the water and food layers; Stockholm demonstrates the seawater cooling. None of these cities is Madinat al-Hareer. But each of them has solved a piece of the problem Madinat al-Hareer must solve at full scale and at speed. The blueprint exists. The engineering exists. The question is whether the governance layer is built before the foundations are poured, or after. Deera holds that this is the single decision on which the project will succeed or fail.

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