



DEMONSTRATION REPORT -- SITE DEVELOPMENT

Red Sea coastal development - Jeddah area (demonstration)

Demonstration project (generated with WaiMAP engines)

Document no.	WMAP-DEMO-SITEDE-20261012
Revision	A
Status	Demonstration -- not for construction or investment decisions
Design status	Concept
Approval status	Pre-feasibility only
Report level	Demonstration -- sample report
Date of issue	2026-10-12
Project	Red Sea coastal development - Jeddah area (demonstration)
Location	North of Jeddah, Red Sea coastal plain, Saudi Arabia
Coordinates (WGS84)	22.0000, 39.1200
Scope	Large-scale site development screening
Prepared for	Public demonstration (no client)
Prepared by	WaiMAP - Spatial Intelligence
Data basis	Open atlas data (GSA, GWA, GHSL, JRC) · WaiMAP engines

Revision history

Rev	Date	Description	Prepared	Checked	Approved
A	2026-10-12	Demonstration issue	WaiMAP engines	--	--

Public demonstration · Demonstration -- not for construction or investment decisions

Demonstration project (generated with WaiMAP engines). Generated from open data with the WaiMAP engines to show the workflow and the method. It is not a study of a real project, makes no statement about any real project, and does not replace site surveys, detailed design, permits or independent review. WaiMAP does not guarantee lender or independent-engineer approval.



Red Sea coastal development - Jeddah area (demonstration)

Demonstration project (generated with WaiMAP engines)

1 Purpose and scope

Large-scale site development screening on the Red Sea coastal plain north of Jeddah: a 600 ha mixed-use district scenario, its utilities and cost, solar resource and rooftop PV, river-flood exposure, urban growth around the city and access distances. Demonstration project (generated with WaiMAP engines).

2 Site and scenario

Engine: WaiMasterplan (assets/js/wai-masterplan.js)

Method: Site boundary drawn (600 ha, 1.4 : 1 rectangle); target 45,000 residents, 5 per household, hot climate.

Programme from planning standards -> land budget -> block grid -> land use by rule -> GFA, dwellings, jobs.

- o Programme needs ~ 358 ha gross on a 600 ha site -- fits

- o 9,000 dwellings · 16,350 jobs · 1,985,250 m² GFA · 238.3 ha open space

- o Program fits the site: PASS -- needs ~ 358 ha gross (incl. 25 % roads) on a 600 ha site

- o School walking distance: PASS -- 100 % of residential blocks within 800 m of a school

- o Open space: PASS -- 53.0 m² per resident (target 12)

- o Density: PASS -- 75 people / gross ha · 9000 dwellings

- o Cooling: PASS -- 68,974 TR -- district cooling (3 plant(s) of ~30,000 TR) saves ~30-40 % of cooling power vs split units

3 Utilities and indicative cost

Engine: WaiMasterplan demand and cost model

Method: Unit demands per land use (W/m², TR of cooling per m² GFA, water, wastewater, waste, trips, parking) and typical building / infrastructure cost per m².

- o Peak power 64.2 MW · cooling 68,974 TR · water 19,805 m³/day · 3 substations of 60 MVA

- o Indicative development cost USD 2,188 million (buildings 1,816, infrastructure 300, landscape 71) -- typical unit rates, Class 5

- o Phasing: phase 1 -- 78 blocks, 132 ha; phase 2 -- 128 blocks, 216 ha; phase 3 -- 60 blocks, 101 ha

4 Solar resource and rooftop PV

Engine: Atlas (worker/atlas.py) + pvlib through the worker's /pv/yield

Method: pvlib 0.16.1 clear-sky (Ineichen-Perez, Linke turbidity climatology) scaled ×0.979 to the Global Solar Atlas annual GHI 2251 kWh/m² at the site; Erbs decomposition; air temperature 28.2 °C (GSA long-term mean, constant); wind 1 m/s. Rooftop arrays at 15° tilt, DC/AC 1.2, 10 % other losses.

- o GHI 2,251 kWh/m²/yr, PVOUT 1,840 kWh/kWp/yr, air temperature 28.2 °C (Global Solar Atlas at the site centre)

- o Rooftop PV 43.9 MWp -> 83.2 GWh/yr, specific yield 1,894 kWh/kWp, PR 0.8 (pvlib 0.16.1)

- o Independent atlas value: GSA PVOUT 1,840 kWh/kWp at optimum tilt vs pvlib 1,894 kWh/kWp at 15° with 10 % losses

5 Flood and site screening

Engine: Atlas statistics over the site polygon + WaiMAP Solar Suitability (worker/derived.py)

Method: JRC RP100 depth statistics inside the boundary (nodata inside the extent = not flooded); suitability score

- with re-normalised weights (no slope without a DEM).
- o RP100 flood: 11.4 % of the site flooded, maximum depth 0.32 m
 - o Solar Suitability at the centre: 97 / 100 (missing input: slope)
 - o Population 2025 around the site: mean 0 persons/km²

6 Urban growth

Engine: WaiMAP Urban Growth (worker/derived.py growth_area)
Method: Built-up m² per epoch from GHS-BUILT-S (share × cell area), inside the site and within 30 km of the city centre.

- o 30 km around the city: 47.1 km² built-up added 2000 -> 2025 (+30.9 %), 119.2 km² added 1975 -> 2025
- o Inside the site: 0 m² added 2000 -> 2025

7 Access and logistics

Engine: Straight-line distances (this demonstration); truck routing with Valhalla runs in the app
Method: Great-circle distance from the site centre to the main hubs. Road distance, vehicle limits and abnormal loads need the Logistics module with a routing service -- not available on the build machine.

- o Jeddah Islamic Port (approx. centre): 59.1 km straight line
- o King Abdulaziz International Airport (approx. centre): 35.8 km straight line
- o Jeddah city centre (Al Balad, approx.): 57.7 km straight line

8 Terrain, grading and earthworks

Engine: Terrain Design Studio / WaiEarthworks / WaiMassHaul (in the app)
Method: Needs elevation data (the global DEM or the member's survey). The build machine had no DEM, so no cut / fill numbers are published here -- none are invented.

- o In WaiMAP: draw the platform -> Terrain Design Studio -> balanced level / best-fit plane -> mass haul optimisation (exact SSP solver) -> quantities and haul cost.

9 Land budget by use (masterplan engine)

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Land use	Area (ha)
Parks / open space	211.9
Residential -- villas	55.1
Residential -- townhouses	50.0
Residential -- mid-rise	31.4
Schools	23.7
Retail / mixed use	6.3
Residential -- high-rise	5.8
Utilities	5.1
Worship	4.8
Offices / employment	4.1
Civic / community	1.7
Health	1.2

10 Site statistics from the atlas (inside the 600 ha boundary)

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Layer	Mean	Min	Max	Units	Source
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Specific PV power output (PVO _{UT})	1,840	1,839	1,840	kWh/kWp/yr	Global Solar Atlas 2.0 (Solargis)
Global horizontal irradiation (GHI)	2,252	2,251	2,252	kWh/m ² /yr	Global Solar Atlas 2.0 (Solargis)
Air temperature (TEMP)	28.2	28.2	28.2	°C	Global Solar Atlas 2.0 (Solargis)
Mean wind speed at 150 m	6.19	6.18	6.20	m/s	Global Wind Atlas 3 (DTU)
Population density 2025 (GHS-POP)	0	0	0	persons/km ²	GHS-POP R2023A, European Commission, Joint Research Centre (JRC)
River flood depth, 100-year return period	0.02	0.00	0.32	m	JRC / Copernicus Emergency Management Service (CEMS) - GloFAS flood hazard maps, 100-year return period
Built-up surface 2000 (GHS-BUILT-S)	0.00	0.00	0.00	% built-up	GHS-BUILT-S R2023A, European Commission, JRC
Built-up surface 2025 (GHS-BUILT-S) -- projection	0.00	0.00	0.00	% built-up	GHS-BUILT-S R2023A, European Commission, JRC

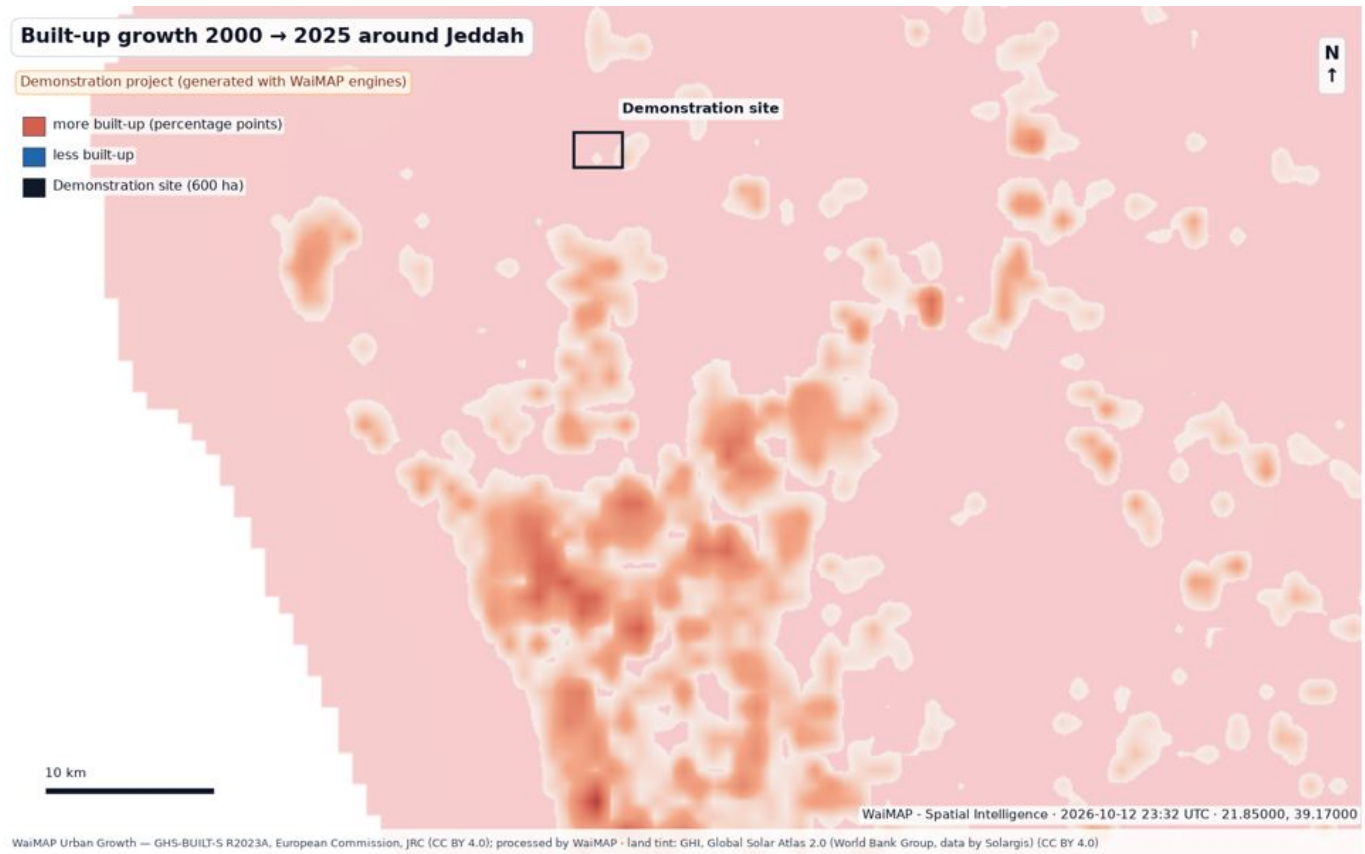
11 Rooftop PV monthly energy (pvlib)

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Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
MWh	6,247	6,193	7,334	7,398	7,592	7,303	7,526	7,524	7,142	6,934	6,068	5,906

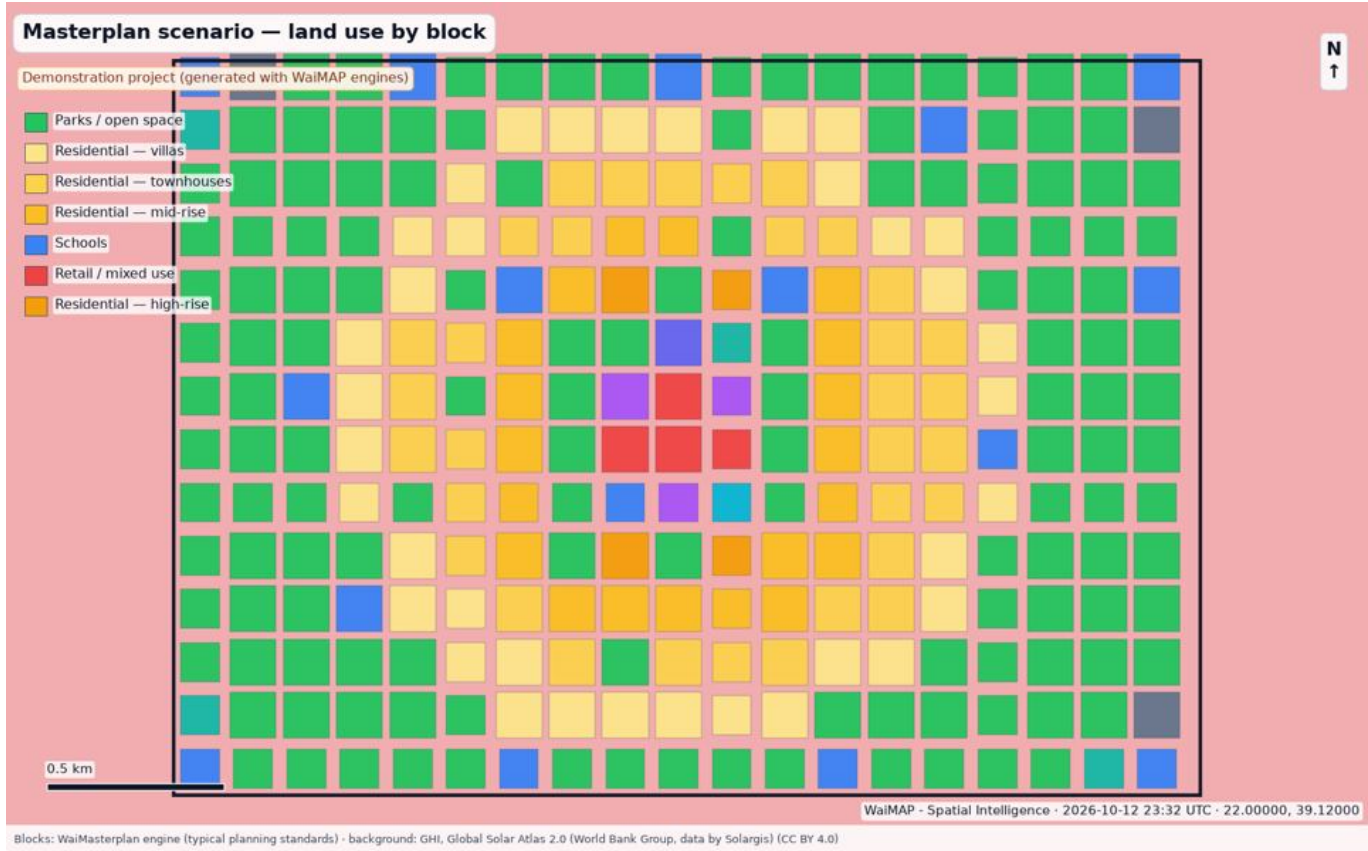
12 Figures

WaiMAP Urban Growth layer: change of the GHS-BUILT-S built-up share 2000 -> 2025 (percentage points) with the 600 ha demonstration site.



13 Masterplan scenario

Masterplan engine: 45,000 residents on 600 ha -- land use per block, phases and utilities from typical planning standards.



14 Warnings and limitations

- o No elevation data on the build machine: terrain, grading and earthworks are not quantified in this demonstration (they run in the app on the DEM).
- o Flood screening uses the JRC river flood map (RP100, ~250 m); coastal storm surge and wadi flash floods are not in this layer -- a site-specific hydrology study is needed.
- o Masterplan costs use typical unit rates (Class 5, -50 % / +100 %); land, permits and off-site infrastructure are excluded.
- o Rooftop PV assumes the masterplan's usable roof area; structural capacity, shading and grid export rules are not checked.

15 How this demonstration was made

Generated on 2026-10-12 23:32 UTC by tools/demos/build_demos.py with the WaiMAP engines on Intel(R) Xeon(R) Processor @ 2.80GHz (2 cores). Engine computation time for the whole story: 0.7 s. Real project material -- added after client approval: this slot stays empty until approved real material exists.