

## Makunduchi OR19-8 Test Site – Atmospheric Corrosivity

### Site OR19-8

Installation: 20-12-2019



Makunduchi Test Site (Image by Geosun).

#### Background:

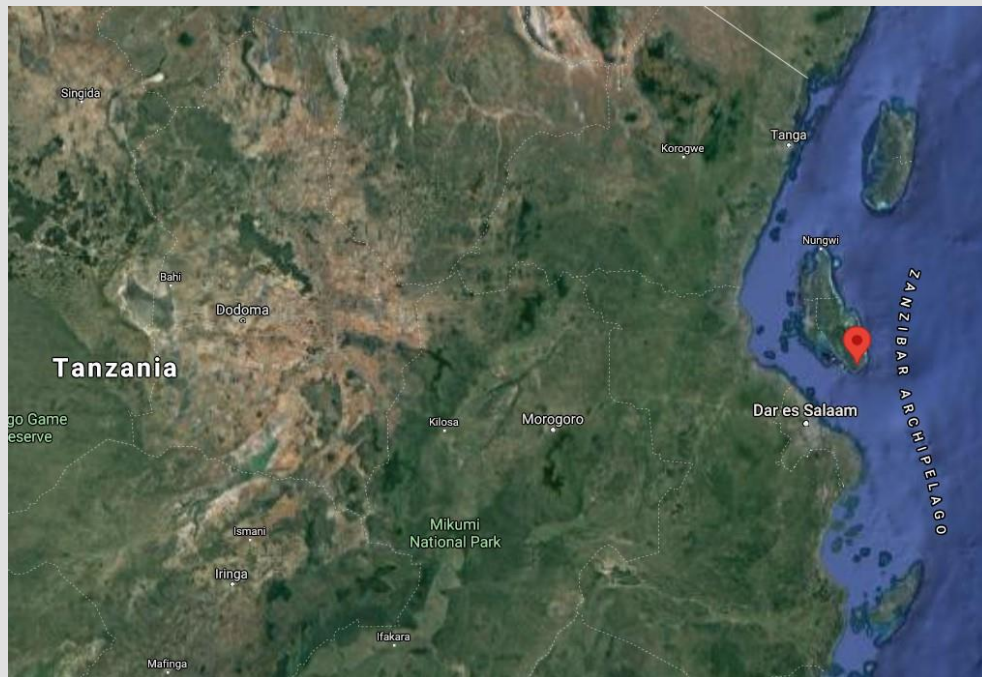
Makunduchi is located on the southern side of Unguja (also known as Zanzibar Island), about 50 km north of Dar es Salaam (Tanzania), in the Zanzibar Archipelago (situated in the Indian Ocean) [1]. The town of Makunduchi comprises two parts, i.e. an old former fishermen's village and a more modern urban establishment [2]. Unguja Island exhibits a mountainous terrain and is the most populace islet (896 721 per the 2012 census) in the Zanzibar Archipelago [3]. The island's length (north-south) measures about 85 km and its width 30 km (east-west), with the main economic activities involving tourism, fishing, and agriculture [3].

The test site is approximately 5.3 km from the ocean, between Mukunduchi and Kufile [1]. From a climatological perspective, the atmosphere is classified as tropical, with two rainy seasons, March to May and Middle-October to December [4]. The average yearly temperature at the site is  $26.7 \pm 1.2^{\circ}\text{C}$ , fluctuating between  $23.9^{\circ}\text{C}$  and  $29.4^{\circ}\text{C}$ , and the annual mean humidity level is  $82.4 \pm 23.7\%$ . Per the Köppen-Geiger system, the climate is classified as Am, Tropical Monsoon, with a yearly precipitation level of approximately 2 136 mm. The driest months are June to September, and the average wind speed at the site is  $2.0 \pm 0.9$  m/s, predominantly in a south-easterly direction. The seawater temperature ranges from  $25^{\circ}\text{C}$  to  $29^{\circ}\text{C}$  [4].

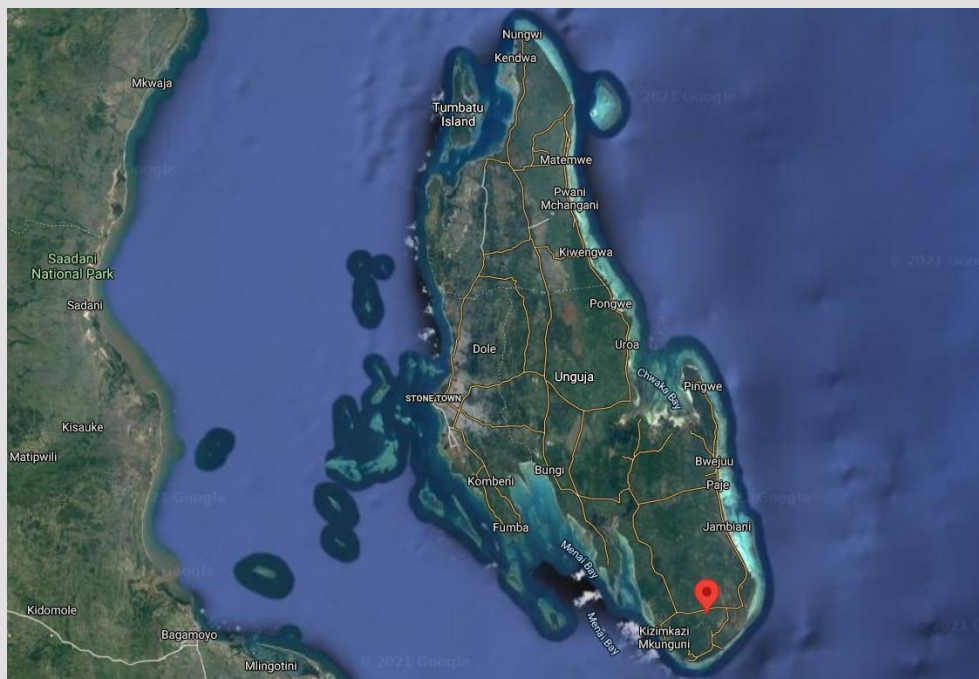
From an atmospheric corrosivity perspective, the site is classified as Moderate (C3) to High (low-C4-range), the latter rating applicable to copper, likely because of the tropical environment and the effects of chloride deposition.

Orytech (Pty) Ltd.

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Google Inc Map of Tanzania and the Zanzibar Archipelago [1].

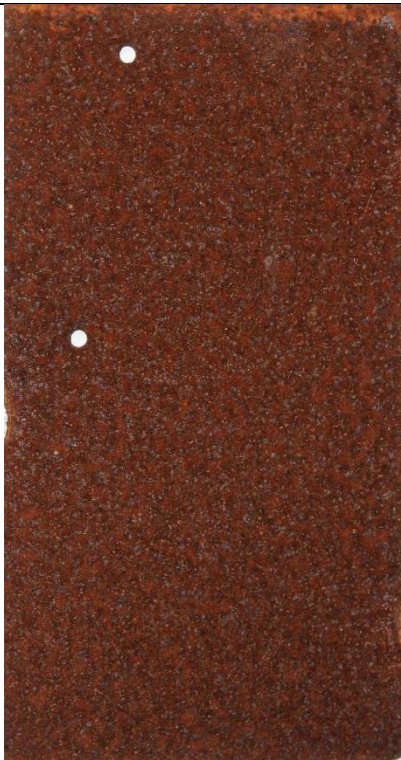


Google Inc Map of Unguja (Zanzibar Island) [1].

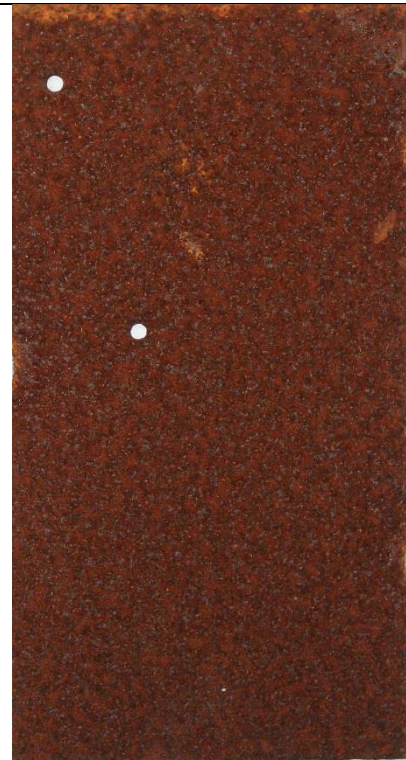
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<b>GPS Coordinates of Site:</b>	6°25'01.2"S 39°31'12.0"E	<b>Elevation above Sea Level (m):</b>	30 m	<b>Distance from Ocean (km):</b>	~5.3 km
<b>ISO 9226 Corrosion Rates and ISO 9223 Corrosivity Classification</b>					
<b>R<sub>CORR</sub> Mild steel (µm/yr)</b>	49.32 ± 2.88 µm/yr (1 <sup>st</sup> year) and 33.16 ± 0.57 µm/yr (2 <sup>nd</sup> year)				
<b>R<sub>CORR</sub> Aluminium (µm/yr)</b>	0.20 ± 0.01 µm/yr (1 <sup>st</sup> year) and <0.1 µm/yr (Negligible) (2 <sup>nd</sup> year)				
<b>R<sub>CORR</sub> Hot Dip Galvanised Steel (µm/yr)</b>	1.66 ± 0.05 µm/yr (1 <sup>st</sup> year) and 0.51 ± 0.01 µm/yr (2 <sup>nd</sup> year)				
<b>R<sub>CORR</sub> Copper (µm/yr)</b>	2.25 ± 0.01 µm/yr (1 <sup>st</sup> year) and 1.43 ± 0.08 µm/yr (2 <sup>nd</sup> year)				
<b>ISO 9223 Corrosivity Classification</b>	Medium (mid-C3) to High (low-C4)				
<b>Typical surface contaminants</b>	Pollution: mainly chlorides Specific contaminants include: Water-soluble salts – 10-26 mg/m <sup>2</sup> Chlorides – 15 ppm pH – Neutral (6.5-7.2)				

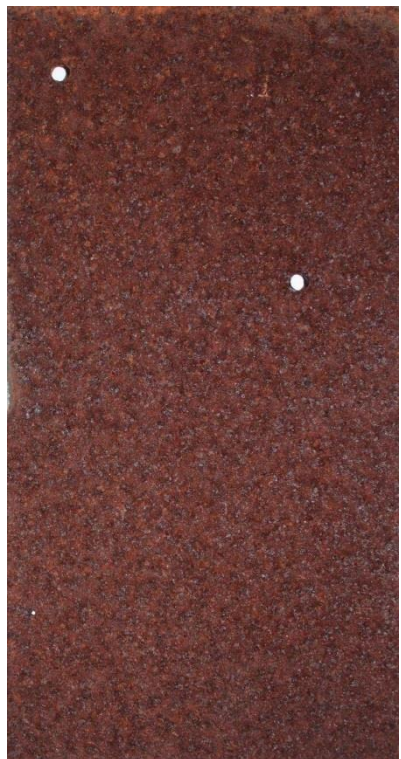




**Mild steel – 12 months**



**Mild steel – 12 months**



**Mild steel – 24 months**



**Mild steel – 24 months**





**Aluminium – 12 months**



**Aluminium – 12 months**



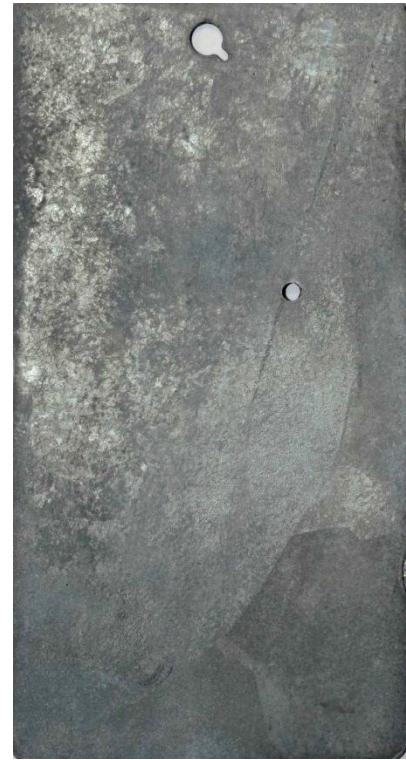
**Aluminium – 24 months**



**Aluminium – 24 months**



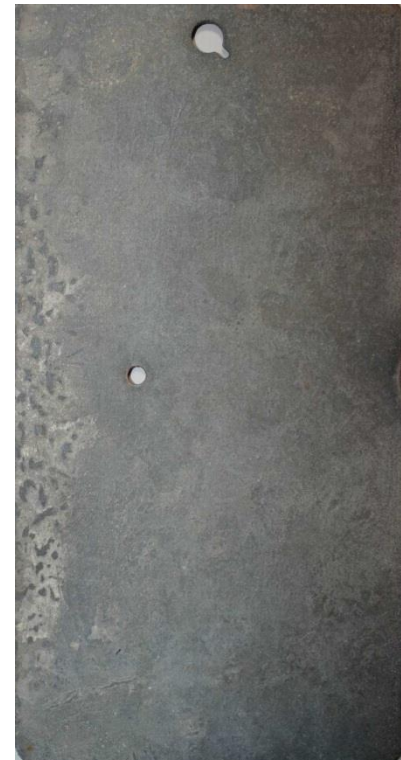
**HDG – 12 months**



**HDG – 12 months**



**HDG – 24 months**



**HDG – 24 months**

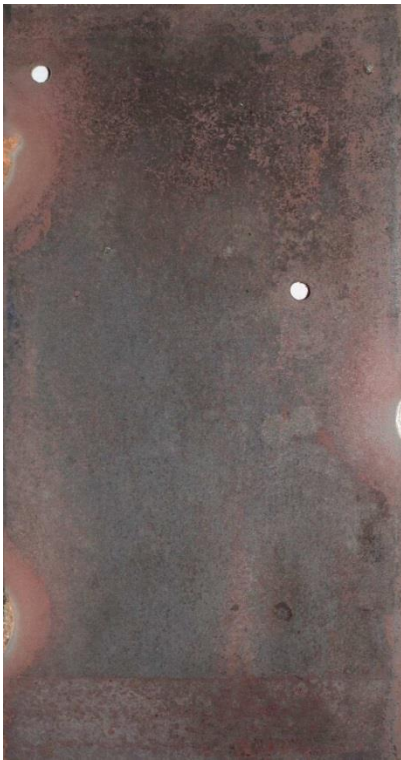




**Copper – 12 months**



**Copper – 12 months**



**Copper – 24 months**



**Copper – 24 months**

## Works Cited

- [1] Google Inc, "Google Maps," 28 April 2021. [Online]. Available: <https://www.google.com/maps/place/6%C2%B025'01.2%22S+39%C2%B031'12.0%22E/@-6.4594516,36.707704,635881m/data=!3m1!1e3!4m5!3m4!1s0x0:0x0!8m2!3d-6.417!4d39.52>. [Accessed 28 April 2021].
- [2] Wikipedia, "Makunduchi," 3 August 2020. [Online]. Available: <https://en.wikipedia.org/wiki/Makunduchi>. [Accessed 28 April 2021].
- [3] Wikipedia, "Unguja," 24 March 2021. [Online]. Available: <https://en.wikipedia.org/wiki/Unguja>. [Accessed 28 April 2021].
- [4] Climates to Travel, "Climate - Zanzibar," [Online]. Available: <https://www.climatestotravel.com/climate/zanzibar>. [Accessed 28 April 2021].