Smart City Planning with Drone Data- A Case Study

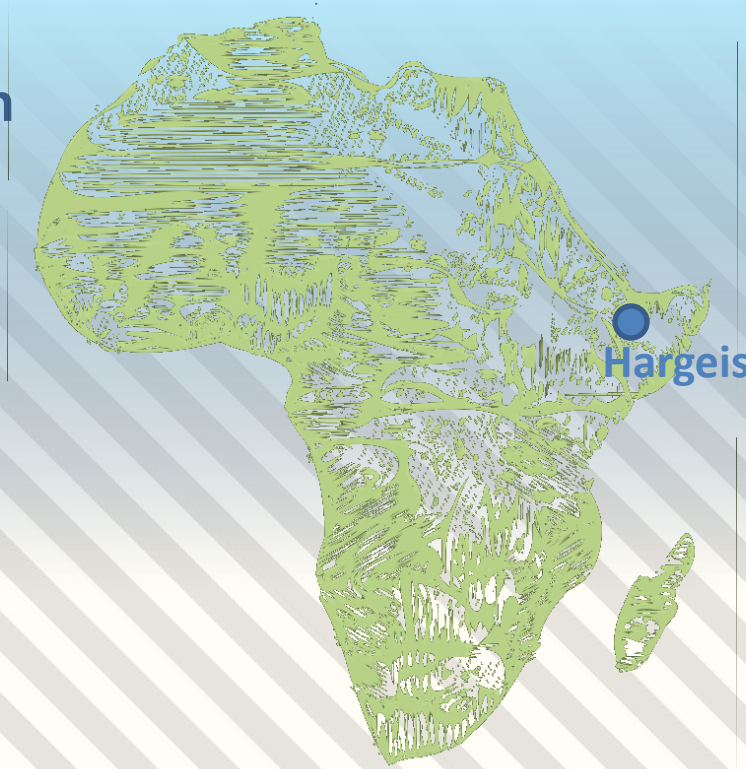
HUVIRIR

A BOEING HorizonX Company

HUVIAiR
A BOEING HorizonX Company

Drone generated geo-referenced high resolution 2D and 3D GIS maps are emerging as a must have tool to design, plan and execute smart city projects around the world.

HUVIAiR Technologies created such maps for Hargeisa, the capital of Somaliland, Africa.



Project Background

HUVIAIR A BOEING HorizonX Company

Hargeisa, the capital city of Somaliland covers almost 20,000 acres of urban built up area and
has a population of 1.6m.

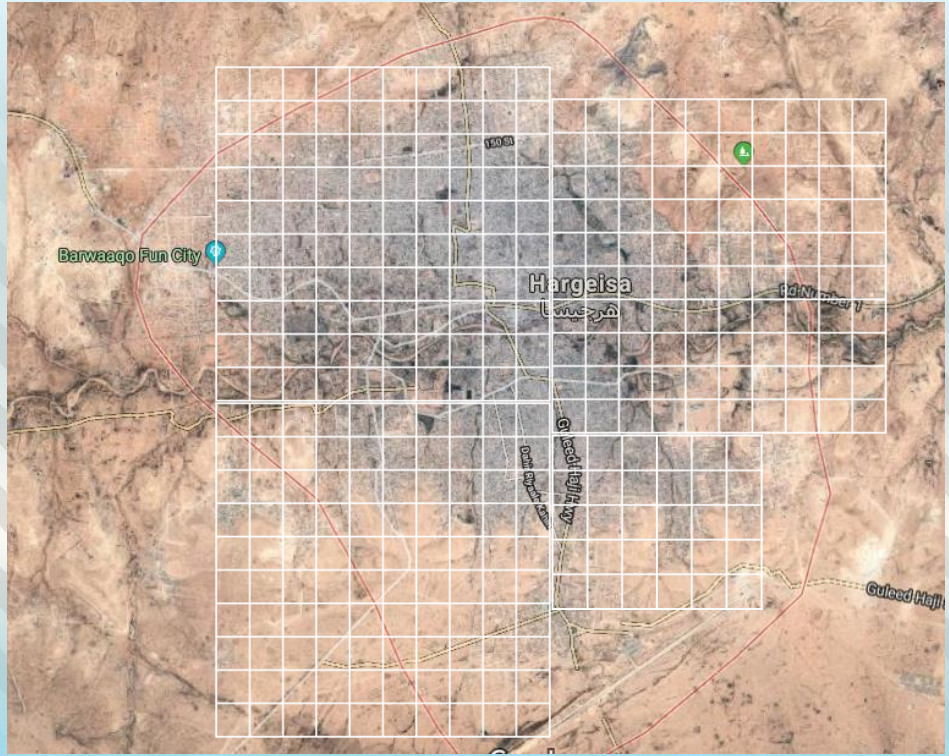
The Government of Somaliland is using cutting edge technology to enhance governance and to plan the complete development of the city. Using Drone Data technology, Huviair is helping the Government of Somaliland to achieve this.

Process

A BOEING HorizonX Company

Flight planning

The entire area was subdivided into multiple zones and flight plans were created for each zone.



Process

HUVIRIR A BOEING HorizonX Company

Drone platform selection

Two phantom 4 pro drones were used.

AIRCRAFT

Weight (Battery & Propellers Included)	1388 g
Diagonal Size (Propellers Excluded)	350 mm
Max Ascent Speed	S-mode: 6 m/s P-mode: 5 m/s
Max Descent Speed	S-mode: 4 m/s P-mode: 3 m/s
Max Speed	S-mode: 45 mph (72 kph) A-mode: 36 mph (58 kph) P-mode: 31 mph (50 kph)
Max Tilt Angle	S-mode: 42° A-mode: 35° P-mode: 25°
Max Angular Speed	S-mode: 250°/s A-mode: 150°/s
Max Service Ceiling Above Sea Level	19685 feet (6000 m)
Max Wind Speed Resistance	10 m/s
Max Flight Time	Approx. 30 minutes
Operating Temperature Range	32° to 104°F (0° to 40°C)
Satellite Positioning Systems	GPS/GLONASS
Hover Accuracy Range	Vertical: ±0.1 m (with Vision Positioning) ±0.5 m (with GPS Positioning)

VISION SYSTEM

	Forward Vision System Backward Vision System Downward Vision System
y Range	≤31 mph (50 kph) at 6.6 ft (2 m) above ground
itude Range	0 - 33 feet (0 - 10 m)
Operating Range	0 - 33 feet (0 - 10 m)
Obstacle Sensory Range	2 - 98 feet (0.7 - 30 m)
FOV	Forward: 60°(Horizontal), ±27°(Vertical) Backward: 60°(Horizontal), ±27°(Vertical) Downward: 70°(Front and Rear), 50°(Left and Right)
Measuring Frequency	Forward: 10 Hz Backward: 10 Hz Downward: 20 Hz

Sensor	1" CMOS Effective pixels: 20M
Lens	FOV 84° 8.8 mm/24 mm (35 mm format equivalent) f/2.8 - f/11 auto focus at 1 m - ∞
ISO Range	Video: 100 - 3200 (Auto) 100 - 6400 (Manual) Photo: 100 - 3200 (Auto) 100- 12800 (Manual)
Mechanical Shutter Speed	8 - 1/2000 s
Electronic Shutter Speed	8 - 1/8000 s

GIMBAL

Stabilization	3-axis (pitch, roll, yaw)
Controllable Range	Pitch: -90° to +30°
Max Controllable Angular Speed	Pitch: 90°/s
Angular Vibration Range	±0.02°

INFRARED SENSING SYSTEM

Obstacle Sensory Range	0.6 - 23 feet (0.2 - 7 m)
FOV	70° (Horizontal), ±10° (Vertical)
Measuring Frequency	10 Hz
Operating Environment	Surface with diffuse reflection material, and reflectivity > 8 (such as wall, trees, humans, etc.)

CAMERA

Sensor	1" CMOS Effective pixels: 20M
Lens	FOV 84° 8.8 mm/24 mm (35 mm format equivalent) f/2.8 - f/11 auto focus at 1 m - ∞
ISO Range	Video: 100 - 3200 (Auto) 100 - 6400 (Manual) Photo: 100 - 3200 (Auto) 100- 12800 (Manual)
Mechanical Shutter Speed	8 - 1/2000 s
Electronic Shutter Speed	8 - 1/8000 s
Image Size	3:2 Aspect Ratio: 5472 × 3648 4:3 Aspect Ratio: 4864 × 3648 16:9 Aspect Ratio: 5472 × 3078
PIV Image Size	4096×2160(4096×2160 24/25/30/48/50p) 3840×2160(3840×2160 24/25/30/48/50/60p)

INTELLIGENT FLIGHT BATTERY

Capacity	5870 mAh
Voltage	15.2 V
Battery Type	LiPo 4S
Energy	89.2 Wh
Net Weight	468 g
Charging Temperature Range	41° to 104°F (5° to 40°C)
Max Charging Power	160 W

Process

HUVIRIR
A BOEING HorizonX Company

Data capture process

A total of 12 ground control points were marked and established using the Trimble R8 in RTK mode.

Process

HUVIRIR
A BOEING HorizonX Company

Data capture process

After obtaining the required permissions from aviation and local authorities, the 2 drones were flown simultaneously and autonomously across the areas of interest.

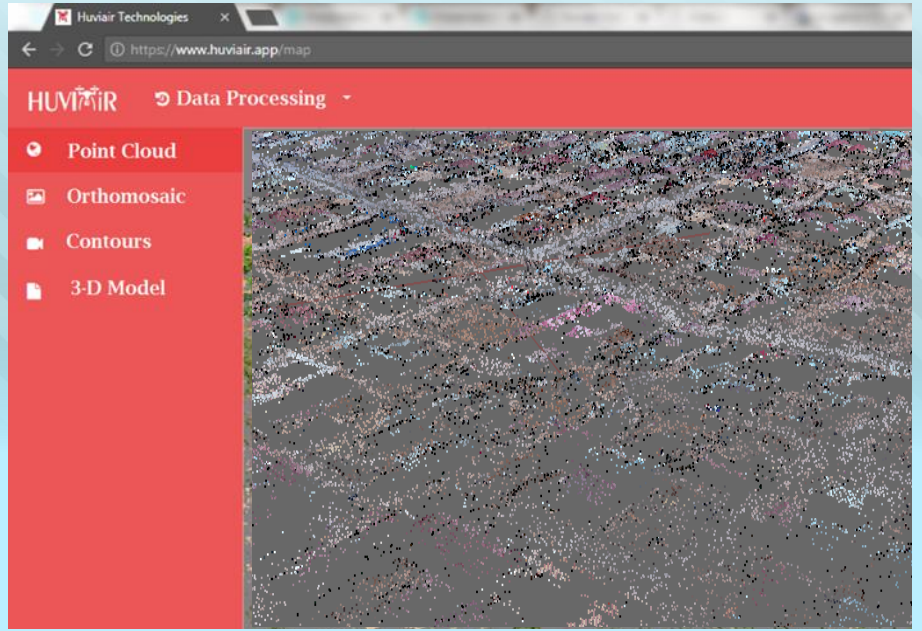
Two drone pilots flew the drones and completed the data capture process in 7 days.

Data Processing

HUVIAiR A BOEING HorizonX Company

Data processing:

The HUVIAiR app was used for processing all the data collected with drones.



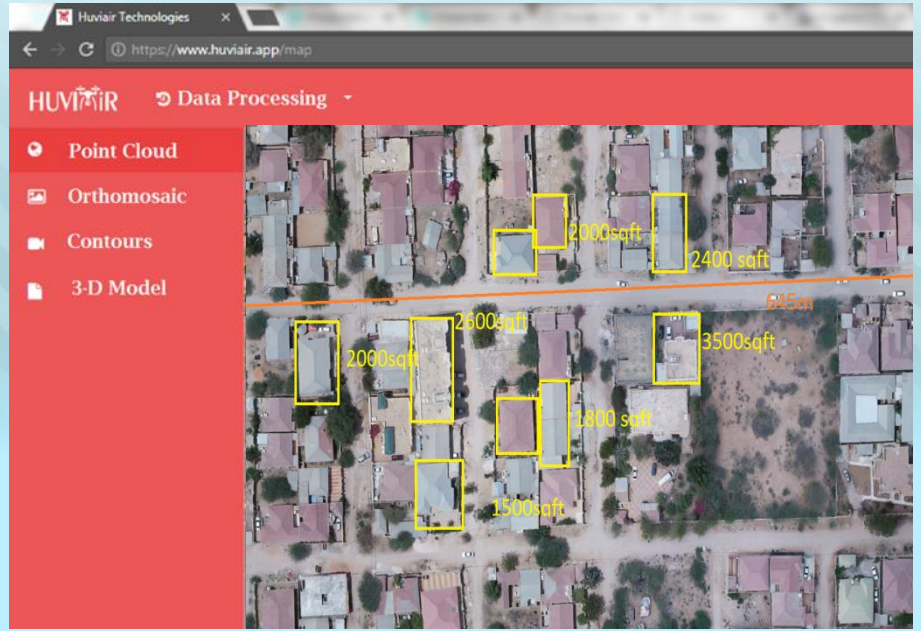
.

Outcomes

A BOEING HorizonX Company

Various images of the site were stitched together to form one single 2D top view ultra high resolution and accurate image of the city.

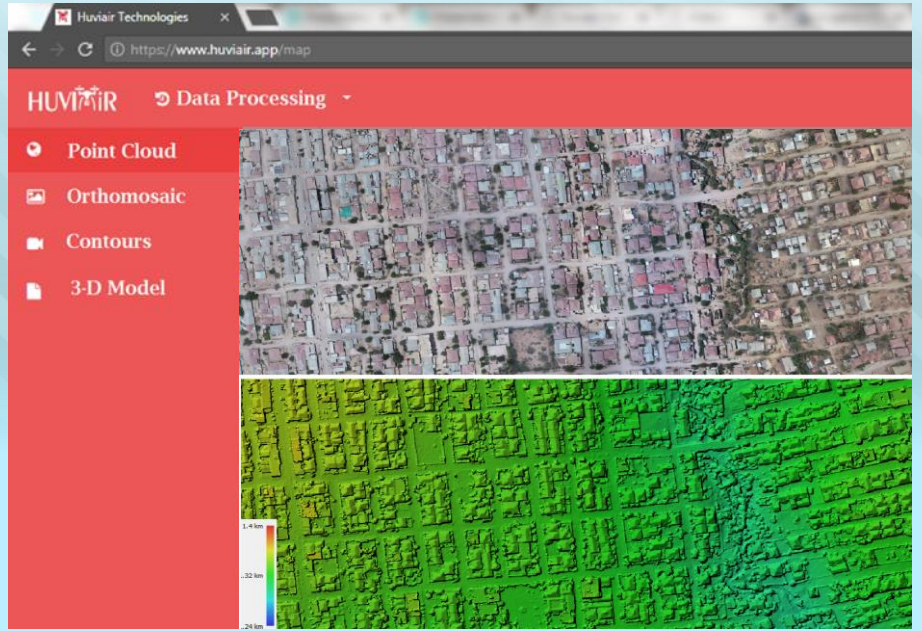
As the orthomosaic has the resolution of 5cm/ pixel, extremely accurate measurement of lengths and areas of property was done.



Outcomes

A BOEING HorizonX Company

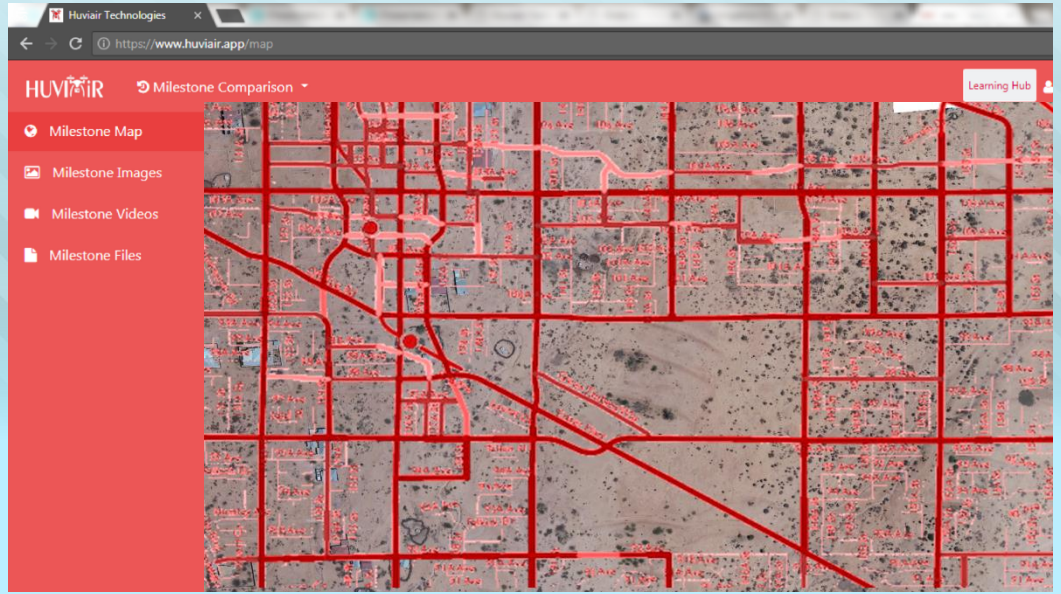
Urban surface water models for Drainage systems and Rainwater harvesting were created using the drone generated digital surface model.



Outcomes

A BOEING HorizonX Company

Road network plan, powerlines routing and water piping routing were created using the drone generated maps.



Outcomes

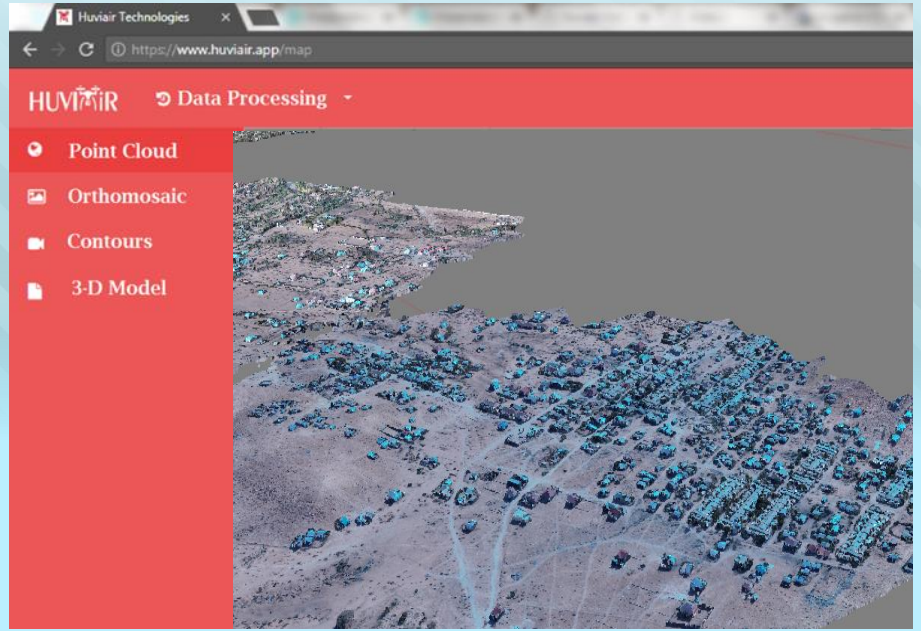
HUVIAIR A BOEING HorizonX Company

3-D Model

A 3D model of the city was generated.

This model was used to fly/orbit through the city to visualize the details in 3D and to plan the work at hand.

Example
http://huviair.com/3dmodel.html

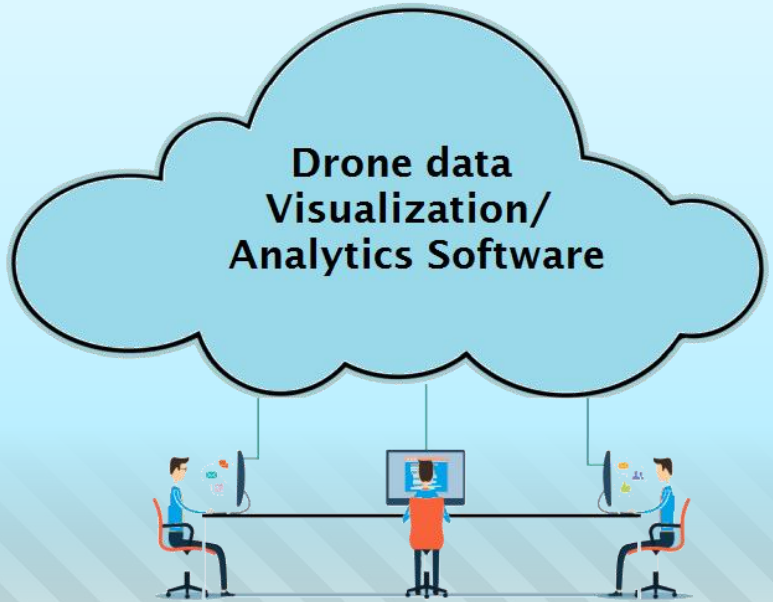


Software

HUVIAiR
A BOEING HorizonX Company

All the outputs were deployed in the HUVIAiR app – a browser based cloud software for all drone data visualization and analytics.

This enabled the Government officials to visualize, analyze and manage the outputs generated from any device and from any location.



Smart City Planning with Drone Data

HUVIAiR
A BOEING HorizonX Company

The HUVIAiR platform was used to label and measure each property.

With this data, a GIS based property tax information system was created and the property tax is fixed based on the property size and location. Each property was geo-referenced and the ownership was digitally established.

Further the following outputs were generated-

- Postal code zoning system
- Nomenclature of City roads
- Road network plan, powerlines routing , water piping routing
- Urban surface water models for Drainage systems and Rainwater harvesting

HUVIAiR continues to provide inputs and solutions to enable the city administration to execute all of the above plans.

Impact

HUVIRIR
A BOEING HorizonX Company

This project led to the following -

- The entire project was completed within 3 weeks, saving 6 months of on ground traditional survey work.
- Due to the extremely high accuracy of drone data outputs, all the infrastructure plans such as road network plan, powerlines routing and water piping routing were created and executed swiftly without any errors and deviations
- For the first time in history, complete survey maps of the city were available to decision makers in the Government.

About HUVIAiR

HUVIAiR Technologies is a Drone Data Solutions Company.

The HUVIAiR solution delivers drone data based insights for construction, infrastructure, smart cities, renewable energy and natural resource management sectors.

Contact us:

Email: info@huviair.com
Website: www.huviair.com
Facebook: https://www.facebook.com/HUVIAiR
Linkedin: https://www.linkedin.com/company/huviair-technologies-pvt.-ltd.
Ph no: +91-9945429131