



# Social mapping of tribal communities using UAV technology in Suriname

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**GISsat - Suriname**



# Outline

- § **Suriname Facts**
- § **Technical Challenges**
- § **UAV Technology; a Breakthrough**
- § **Benefits for Suriname**
- § **Case: Social Mapping**



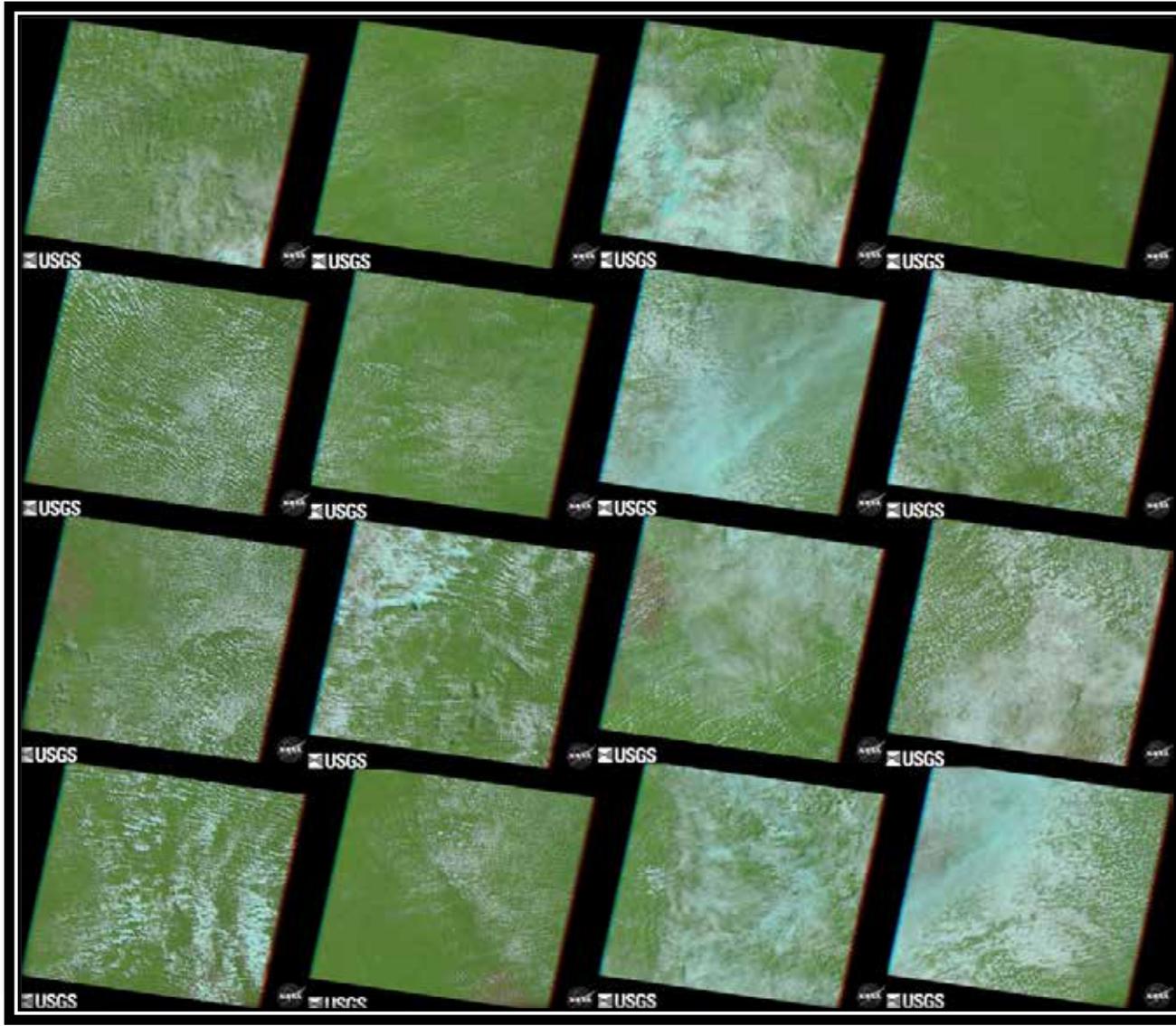
# Suriname is



- § 160.000 km<sup>2</sup>
- § Less than 500.000 inhabitants
- § 90% tropical rainforest
- § Avg. 185 mm rain / month



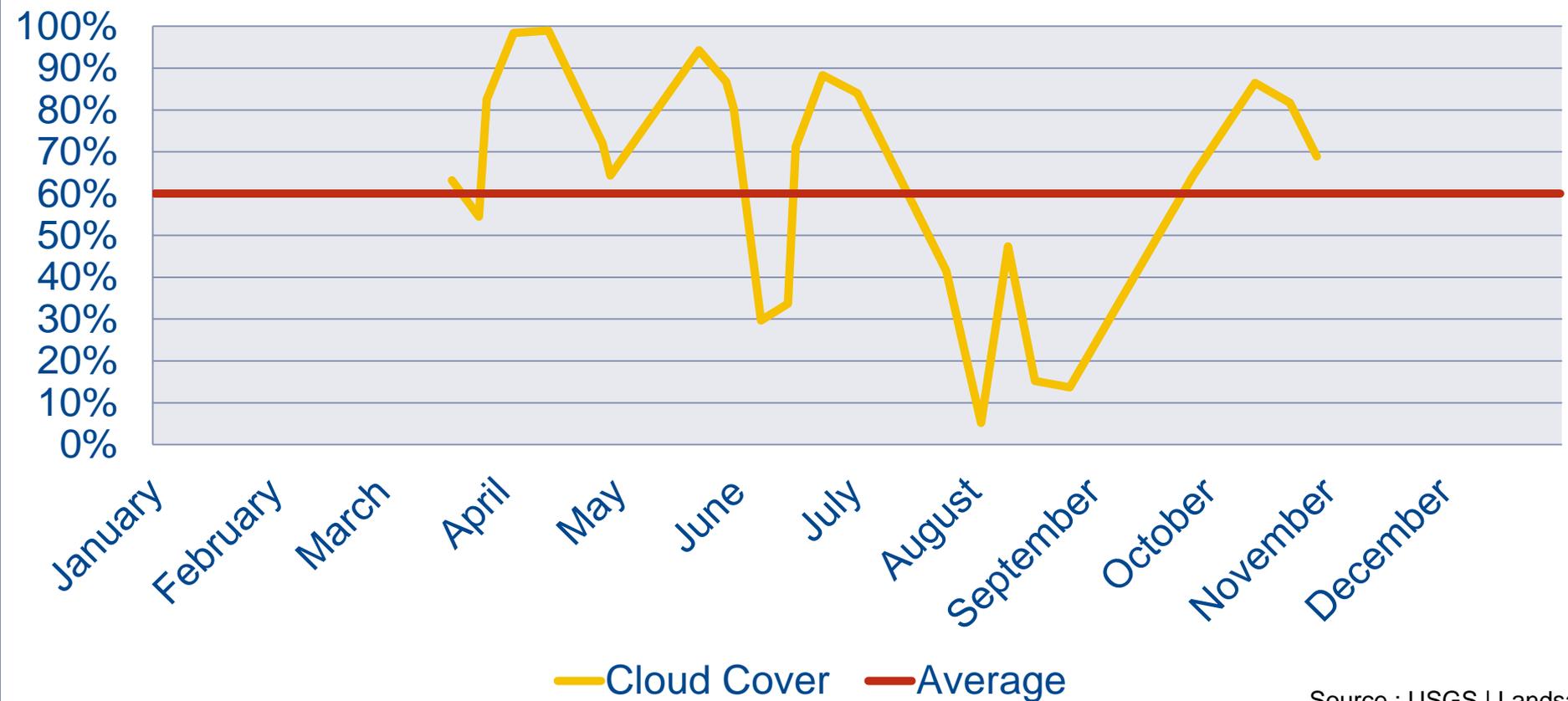
# Seen by Landsat



# Suriname is

§ Avg. Cloud cover ≈ 60%

## Cloud Cover Suriname 2011



# Suriname is

## § Tourism



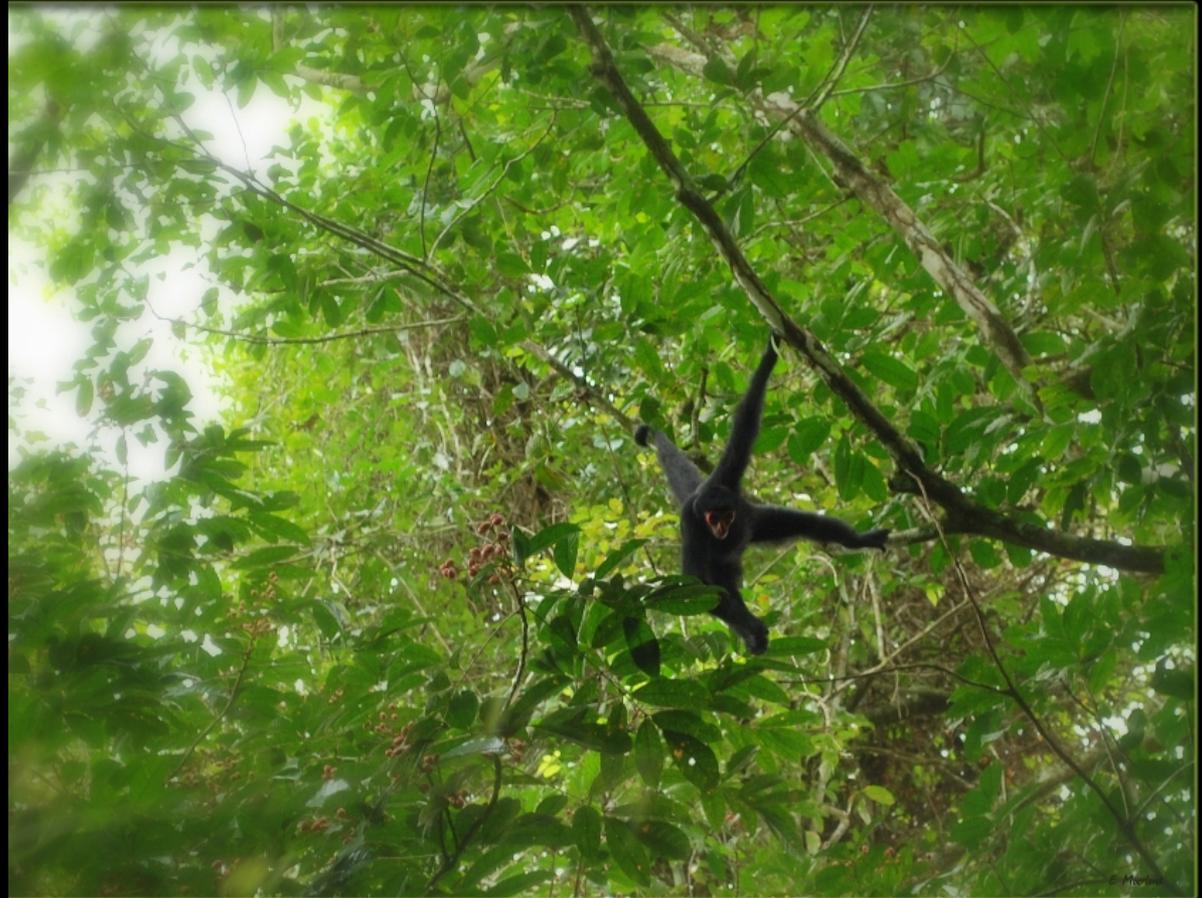
*Voltzberg*

# Suriname is

## § Flora & Fauna



*Dalulu*



*Kwatta Aap*

# Suriname is



§ Mining (mainly bauxite & gold)

§ Forestry

§ Agriculture (rice, fruit, ...)

§ Fishery

§ Petroleum



# Suriname is

## § Multicultural

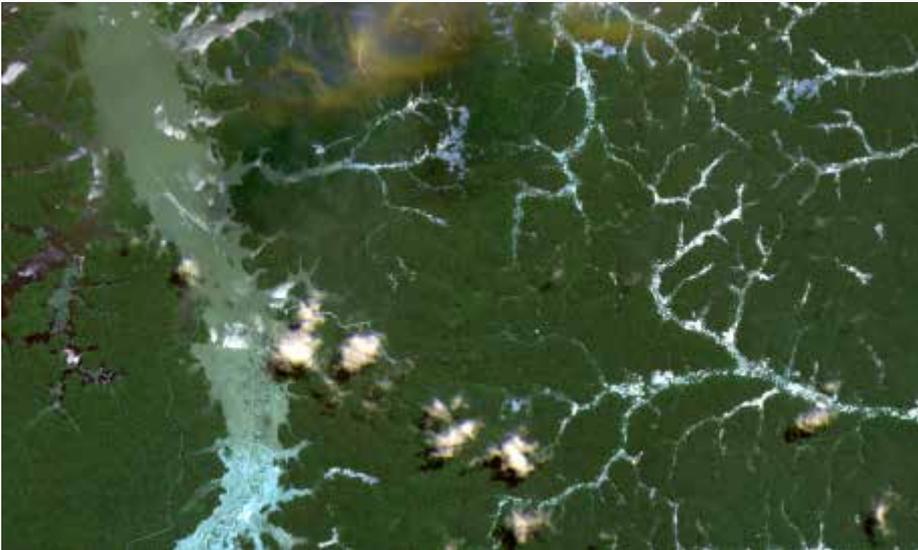
- Hindustani (37%)
- Creoles (31%)
- Javanese (15%)
- Maroons (10%)
- Indian, Chinese, Caucasian,... (7%)



# But Suriname is also



- § **Illegal Mining**
- § **Land degradation**
- § **Deforestation**
- § **Large environmental issues**



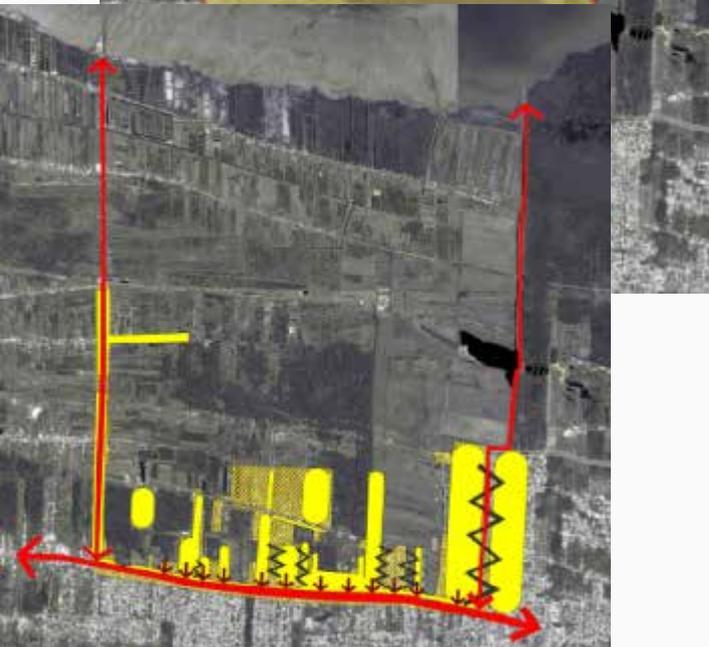
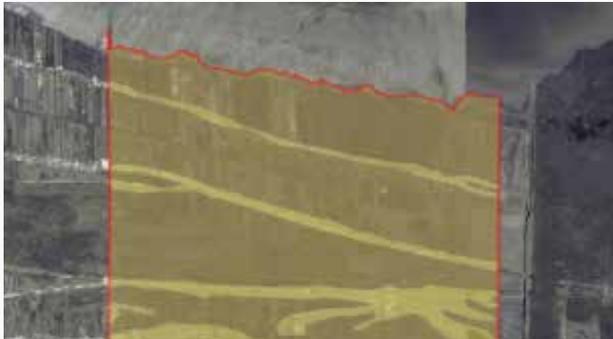
# But Suriname is also



**Economical  
development  
vs  
cultural & tribal  
heritage**



# Challenges for the government



- § Sustainable Land Management
- § Land use planning
- § Establishing a good land- & housing policy
- § Establishing a legal framework
- § Regulations



need for

- § Base line information
- § Accurate spatial data
- § Monitoring
- § Technical expertise

# Intl. Investment Projects



- § **GEF**
- § **Conservation International**
- § **WWF**
- § **EU**
- § **Worldbank**
- § **PAHO**
- 
**need for**
- § **Base line information**
- § **Accurate spatial data**

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- § UAV Technology; a Breakthrough
- § Benefits for Suriname
- § Case: Mapping Traditional Settlements

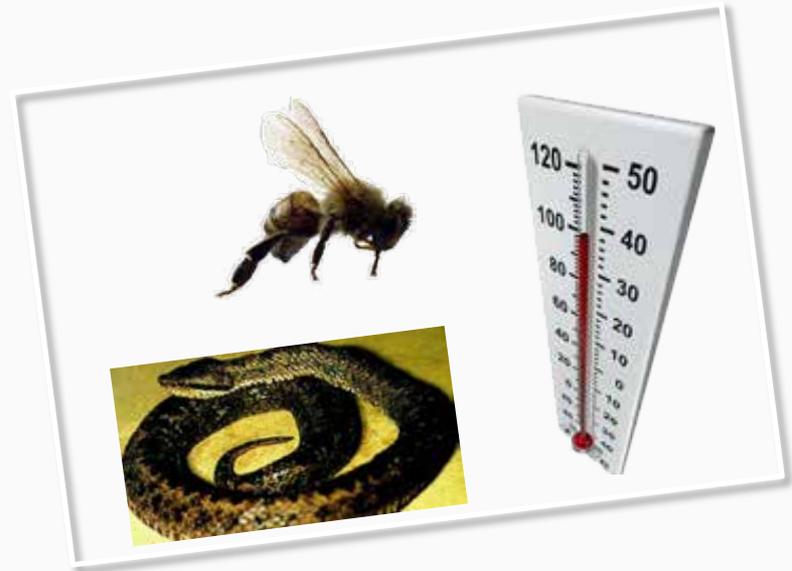


# Technical Challenges (1)



## § Terrestrial survey

- invasive in traditional communities
- Expensive due to difficult terrain
- Dangers and climate

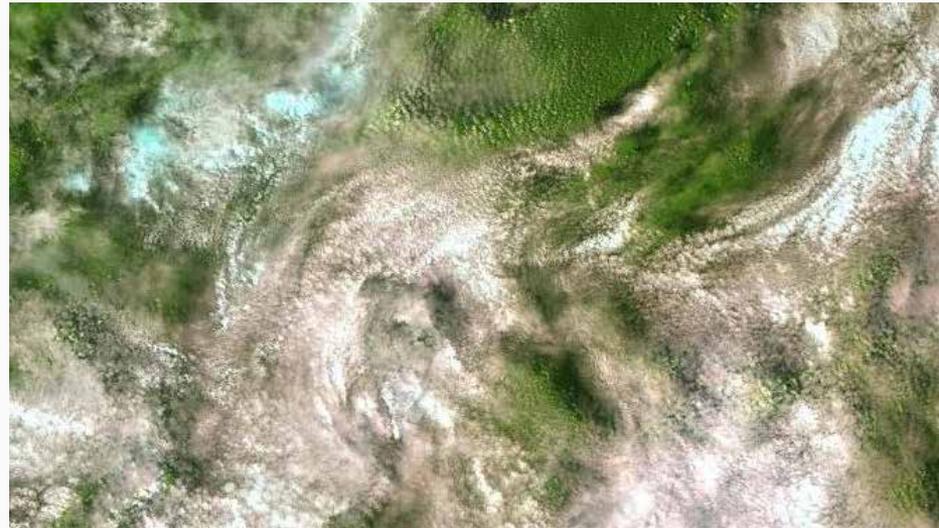


# Technical Challenges (2)



## § Traditional aerial photography

- High cloud cover
- Limited time window (aug - sep)
- Long (expensive) standby times
- No local service available



# Technical Challenges (3)



## Geo Spatial survey

- High cloud cover
- Limited time window (aug - sep)



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# UAV Technology: a breakthrough



## § Image acquisition

- Remotely
- 100-600m altitude
- NIR or optical camera

## § Image Processing

- Application or cloud based

## § Orthophoto production

- XY-Resolution: 5-20 cm
- XY-Error: 2-10 cm

## § DTM production

- § Z-accuracy : 3-30 cm

# UAV Technology: a breakthrough



# UAV Technology: a breakthrough

## Image Acquisition



## Raw Data



R0010891.JPG



R0010892.JPG



R0010893.JPG



R0010901.JPG



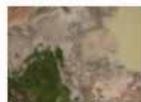
R0010902.JPG



R0010903.JPG



R0010911.JPG



R0010912.JPG



R0010913.JPG

## Rapid Processing



## Full Processing

ØDEM

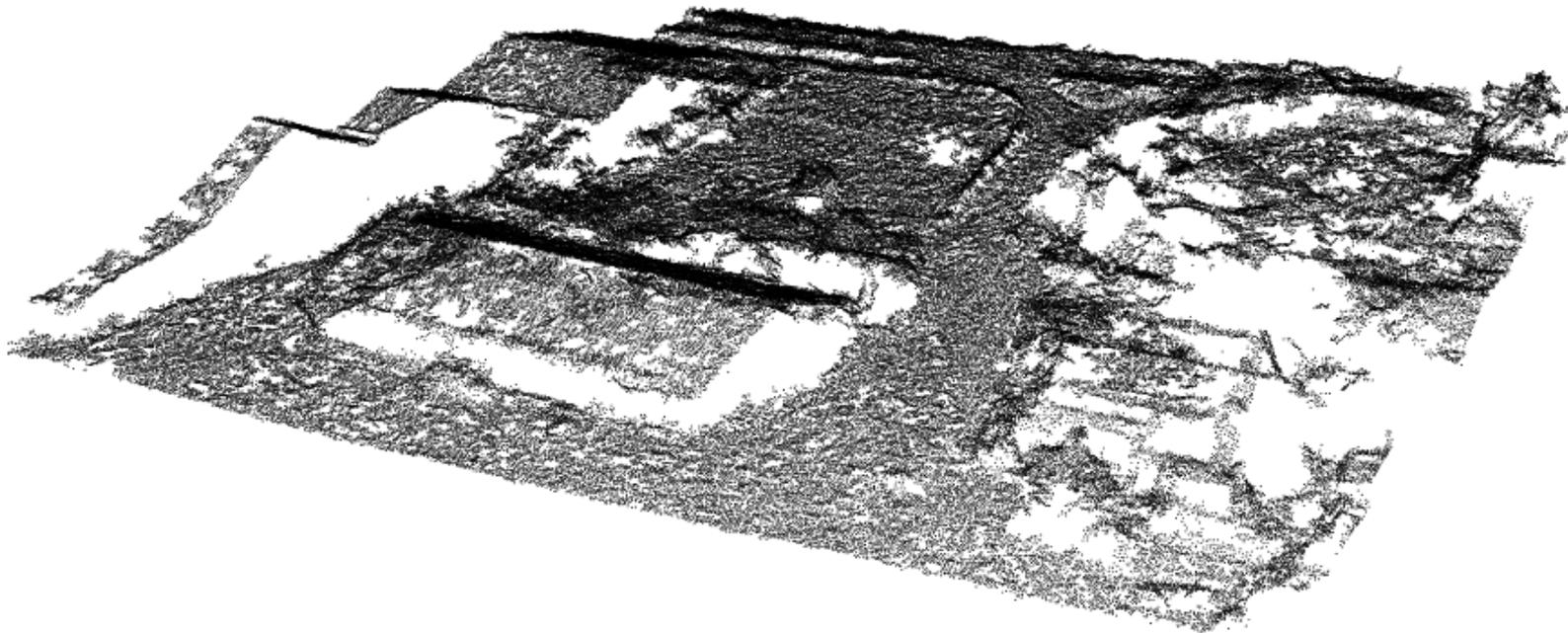
ØOrthophoto

ØXYZ Point  
Cloud

# UAV Technology: a breakthrough

The X100 vs. Traditional survey

1 flight à ≈ 30 minutes à > 1 Million XYZ points



# UAV Technology: a breakthrough

Bridging between survey and Mapping&GIS



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# Benefits for Suriname

## Non invasive survey

- § Ideal for rough & dangerous terrain
- § Avoiding social & cultural conflicts when mapping settlements



# Benefits for Suriname

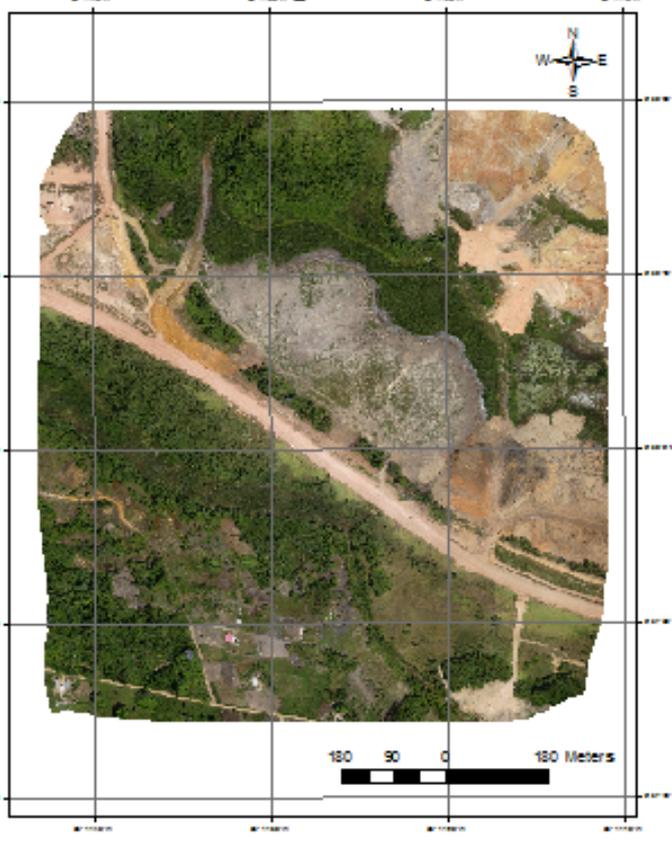
## Operational benefits

- § Operations all year round
- § Not impacted by clouds
- § Short deployment time
- § Highly cost effective for relatively small areas



# Benefits for Suriname

Ortho September '12



“Map products in a day”

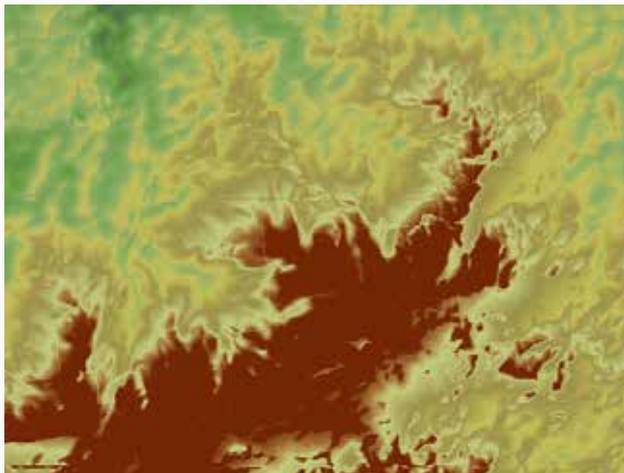
- § Highly accurate maps & terrain data when combined with GCP's
- § 600 m flight height for baseline data
- § 100 m flight height for calculation models

# Benefits for Suriname



## Mapping, Modeling & Monitoring

- § Using data products in change detection algorithms (GIS)
- § Using data products in land classification models (GIS)
- § Using data products to produce maps (policy)



# Benefits for Suriname



## Building a social (geo)database

- § Providing base line information for NGO's and governmental agencies
- § Establishing a regional fabric of settlement information
- § Bridging between survey and geo data management systems (GIS) by providing highly accurate data products



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# Case

## Settlement mapping

- § Mapping the settlement of an Indian community (savannah)
- § Monitoring illegal activities within concession boundaries
- § Inventory of households
- § Function classification
- § Supporting local NGO's



Client: Village Council

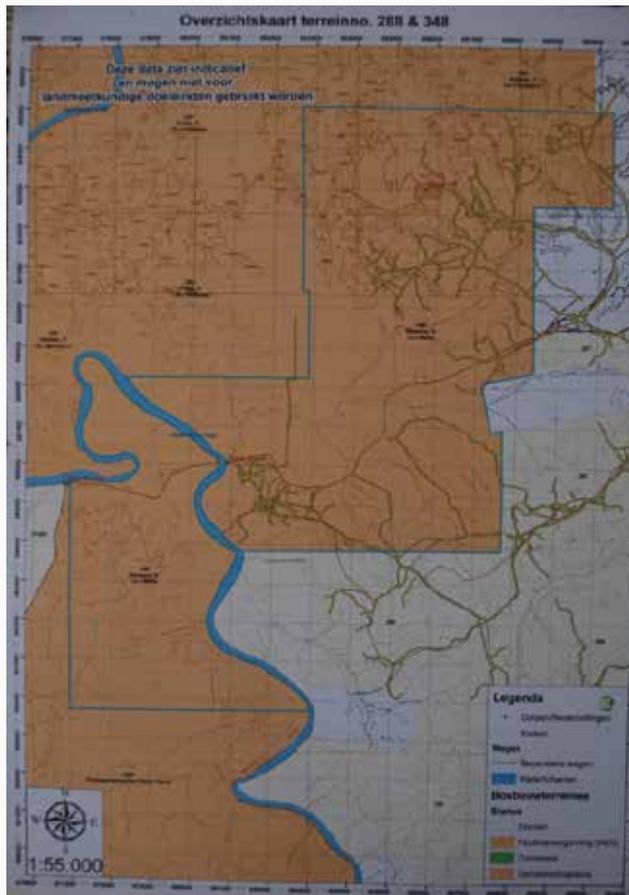
# Storybook



- § Case identification
- § Preparations
- § Operations
- § Data products
- § Impact



# Case Identification



- § Assessment of neighboring logging activities (border disputes) (PRIO1)
- § Compile an orthophoto map for the village board & NGO's (awareness)
- § Inventory of housing facilities for better village planning

# Preparations

- § **Defining AOI**
- § **GCP survey**
- § **Informing local (traditional) authorities**
- § **Informing aerial authority**

# Preparations

## § Defining AOI

- Focused on boundary issues – PRIO1
- Supporting local authority to build a legal case



# Preparations

## § GCP survey

- Site selection (regular grid)
- Visible (contrast)



# Preparations



## § Informing Traditional Authorities

- Get an “entrance pass” in the region
- Build awareness among the local community
- Supportive for ground control activities by involving local community
- Essential for “informal GO”
- Traditional authority supersedes certain legal regulations

# Preparations

## § Informing aerial authority

- Checking for final “go” from aviation authority



# Operations

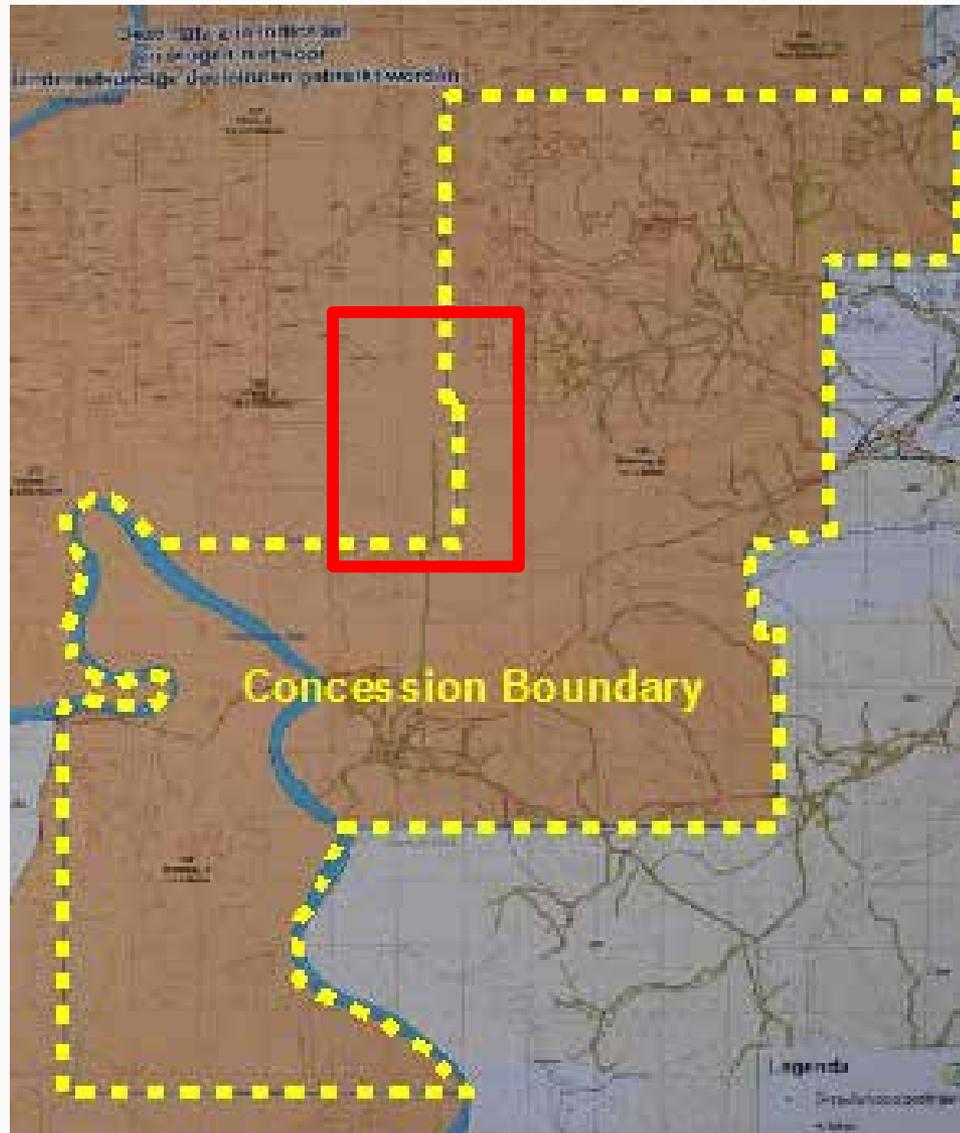


## Flight Facts

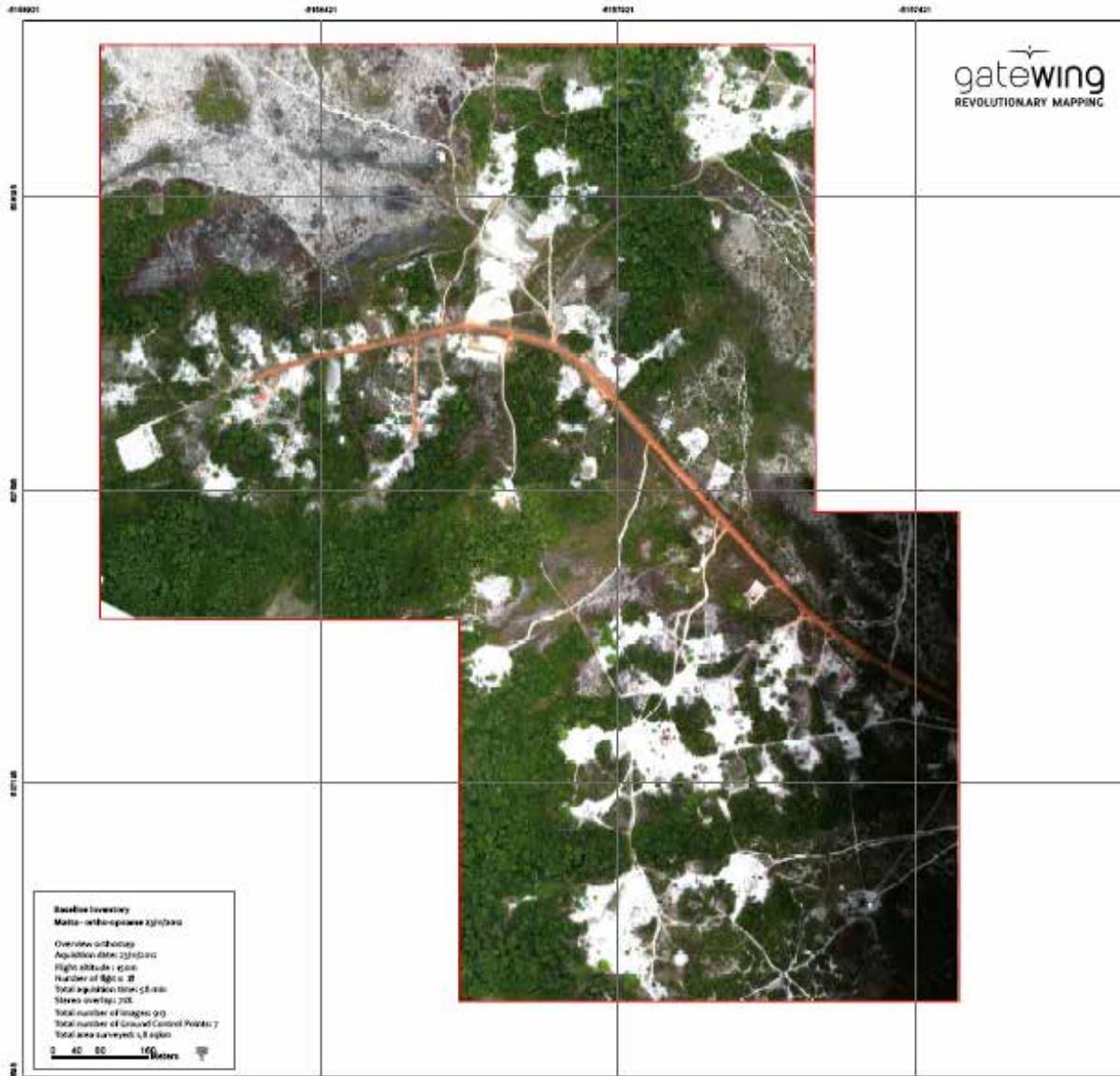
- Height: 150 m AGL
- Overlap: 75%
- Total area: 0.95 sq. km.
- Number of runs: 19
- Total flight time: 38 min.
- Landing ground: sand
- Incidents/Remarks: none



# Data Products



# Data Products



## Gatewing Aerial Survey

Orbitron/Orbita Matta.  
Data is available  
Resultant is still processing.  
Location/Orbita Gatewing: 100 MW ([www.gatewing.com](http://www.gatewing.com))  
Ground Control Point: 1000000 0000 ([www.orbita.com](http://www.orbita.com))  
Operator: R.V. GISat ([www.gisat.com](http://www.gisat.com))



The Xtoo  
Coordinate System: WGS 84 UTM zone 21M  
Projection: Transverse Mercator  
Datum: 1984 1984  
False easting: 500,000.0000  
False northing: 0.0000  
Central meridian: -57.0000  
Scale factor: 0.9996  
Latitude of origin: 0.0000  
Units: Meter

Baseline Inventory  
Matta - orbitron/orbita 2/10/09

Overview orbitron/orbita  
Acquisition date: 2/10/09  
Flight altitude: 14500  
Number of flight: 28  
Total acquisition time: 08 min  
Stores overtop: 200  
Total number of images: 910  
Total number of Ground Control Points: 7  
Total area surveyed: 1,8 sqkm

0 40 80 120 meters

# Conclusions, Remarks

## The results

- § **Powerful in envisioning a spatial “fabric”**
  - **An image says more than 1000 words**
  - **Building awareness, building a case, building proof...**
- § **Non invasive**
  - **Critical when working with traditional communities**
  - **Avoiding repetitive formal village hearings**
- § **Revolutionary compared to traditional survey in tropical countries (harsh environment)**
  - **Strong business case compared to traditional survey in tropical environments**
  - **Detailed and continuous**
  - **Quick deployment**

Questions ?

**Thank you !**