Image | Vector | Image - Geospatial SaaS

A California Social Purpose Corporation

Agenda

Eikonek

- Overview
- Technical Expertise
- Technical Outcomes
- Case Study – Mozambique
- Workflow
- Implications

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Eikonek Is…

Eikonek

Eikonek is a Social Purpose Corporation

We develop and direct geospatial feature data technologies to advance economic growth, environmental sustainability and the global health and welfare of society-at-large.

We pursue technology to make geospatial data a cost-effective global utility and to invest our resources into the countries and communities we serve.

FinitEdge™ Is…

Eikonek is the creator of FinitEdge™ Technologies

FinitEdge™ technologies are **Direct Vector-to-Image** and **Image-to-Image** geospatial feature detection and change analysis systems for geospatial data creation and updates.

- Object-based image classification
- Finite arc edge detection
- Proprietary crowd workforce of image analysts
- Semi-automated and AI-adaptive machine learning

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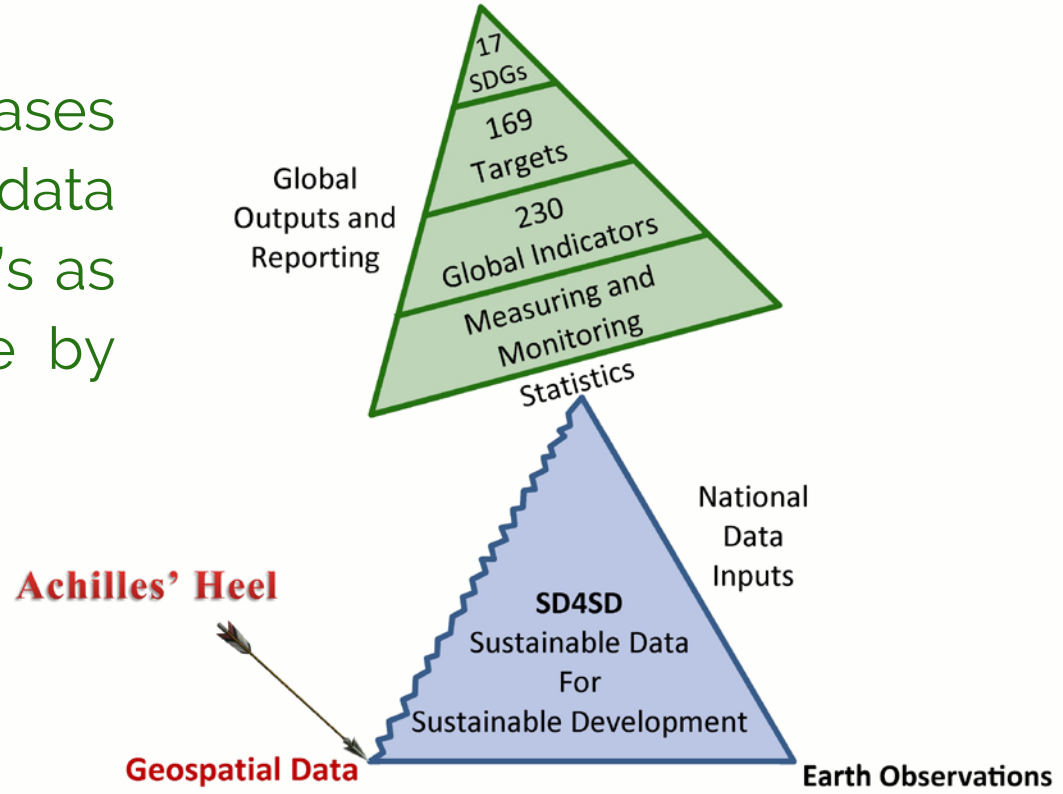
Precursor to FinitEdge™ Technologies

Eikonek

Much of the world is missing or has outdated geospatial data due to a lack of complete and affordable technology to create and maintain valuable geospatial data, limiting temporal databases to wealthy entities.

This lack was an Achilles' Heel to GIS databases worldwide, and also to the foundation geospatial data which is vital for measuring and monitoring SDG's as shown in this graphic adapted from the article by *Greg Scott & Abbas Rajabifard (2017).



Graphic adapted from Greg Scott & Abbas Rajabifard article (2017)

***Greg Scott & Abbas Rajabifard (2017) "Sustainable development and geospatial information: a strategic framework for integrating a global policy agenda into national geospatial capabilities" - Geo-spatial Information Science, 20:2, 59-76, DOI:10.1080/10095020.2017.1325594**
https://doi.org/10.1080/10095020.2017.1325594

FinitEdge™ Technologies

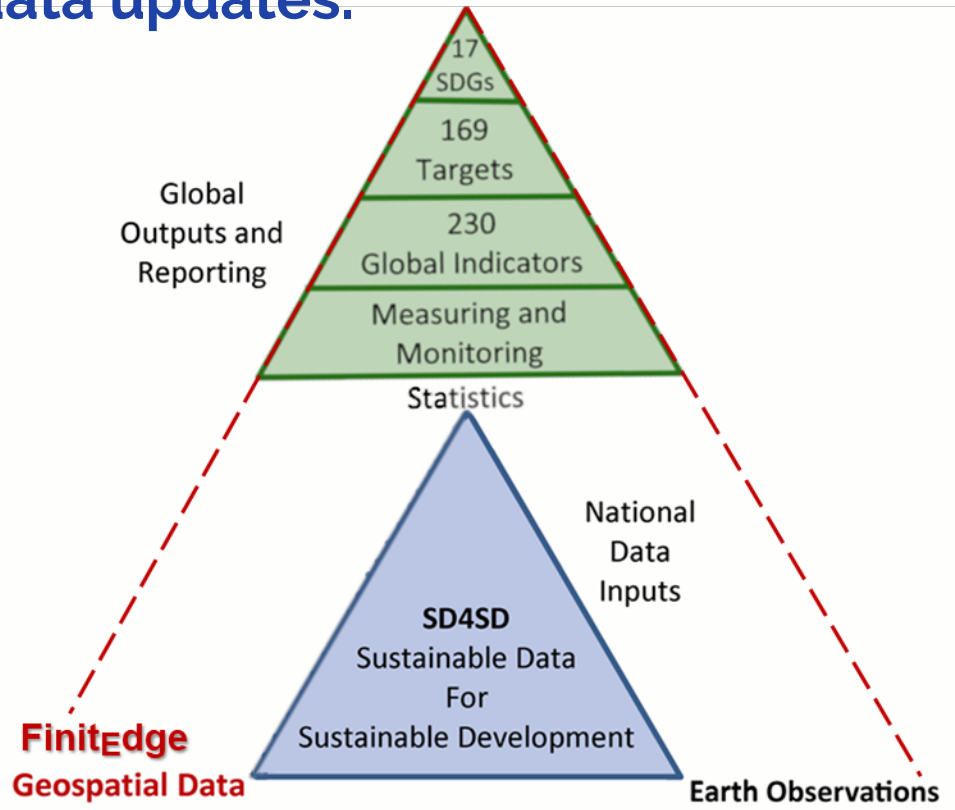
Eikonek

The success behind FinitEdge™ began with a passion to solve the Achilles' Heel of affordable geospatial data and a determination to develop Direct Vector-to-Image change detection systems—the key to GIS feature data updates.

FinitEdge™ succeeds in bridging the digital divide with technology to provide every country with geospatial data that is:

- ✓ Correct
- ✓ Complete
- ✓ Current
- ✓ Authoritative
- ✓ Repeatable
- ✓ Highly scalable
- ✓ Increasingly Fast
- ✓ Cost effective

High-resolution imagery and geospatial data provide the solid foundation to fully support measuring and monitoring the SDGs.



Graphic adapted from Greg Scott & Abbas Rajabifard article (2017)

Our vision

Eikonek

We see a world where affordable precision geospatial data becomes the catalyst, transforming communities and countries from poverty to sustainability and from sustainability to thrivability.

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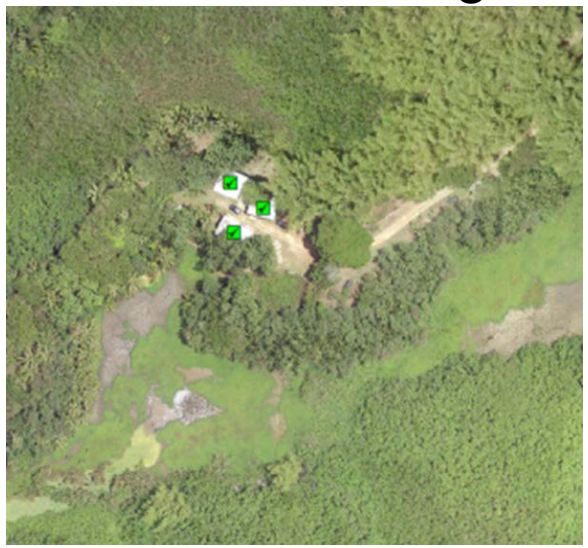
FinitEdge™ = Addresses

Eikonek

FinitEdge™ Technologies by Eikonek

- Detects Building Structures from High-resolution Orthorectified Imagery and Creates and Updates **Pintroids**™ (Rooftop Address Points)

Pacific Island Jungle



South African Slum

Urban Area

Suburban Area (Wooded)

FinitEdge™ = Centerlines

FinitEdge™ Technologies by Eikonek

- Detects Transportation Features from High-resolution Orthorectified Imagery and Creates and Updates Centerlines

Paved Roads

Unpaved Roads

“Wagon Tracks”

Railroads

FinitEdge™ "Wagon Tracks" Centerlines

"Wagon tracks" are a unique FinitEdge™ capability—they play a crucial role in mapping the most evident vehicular routes connecting remote settlements.

"Wagon Tracks"

Detect "Wagon Tracks"

Extract "Wagon Tracks"

Mozambique

FinitEdge™ = Feature Updates

FinitEdge™ Technologies by Eikonek

- Direct Vector-to-Image Change Detection for Existing Data Updates
  - All original point/polyline/polygon features remain geospatially unchanged between updates – Attributes are added for Change/No-Change/Demolished/Unknown status
  - All "New" point/polyline/polygon features are extracted to a new shapefile

One Building (FEB 2013)

New Building (DEC 2015)

Four Buildings (NOV 2012)

Two Demolished (APR 2016)

Our mission

Eikonek

FinitEdge™ strives to empower every country with innovative online, on demand technology to create and maintain geospatial foundation feature data that bridges the digital divide and accelerates SDGs in hidden, hard-to-reach and unmapped populations.

Current Focus

Eikonek

Map The World

Establish complete and correct geospatial feature data in every country to promote exceptionally accurate population censuses and to accelerate the SDGs.

Geospatial feature data would initially focus on:

- Pintroids™ (rooftop points) to geocode addresses on every building structure.
- Centerlines for the most probable vehicular travelways connecting communities.

Eikonek would like to prioritize processing to whole or partial countries that:

1. Present the highest risk for hunger, poverty or epidemic disease.
2. Have little or no recent population census.
3. Have no data or extremely outdated geospatial data.
4. Need geospatial feature data updated for intercensal benefit or SDG acceleration.

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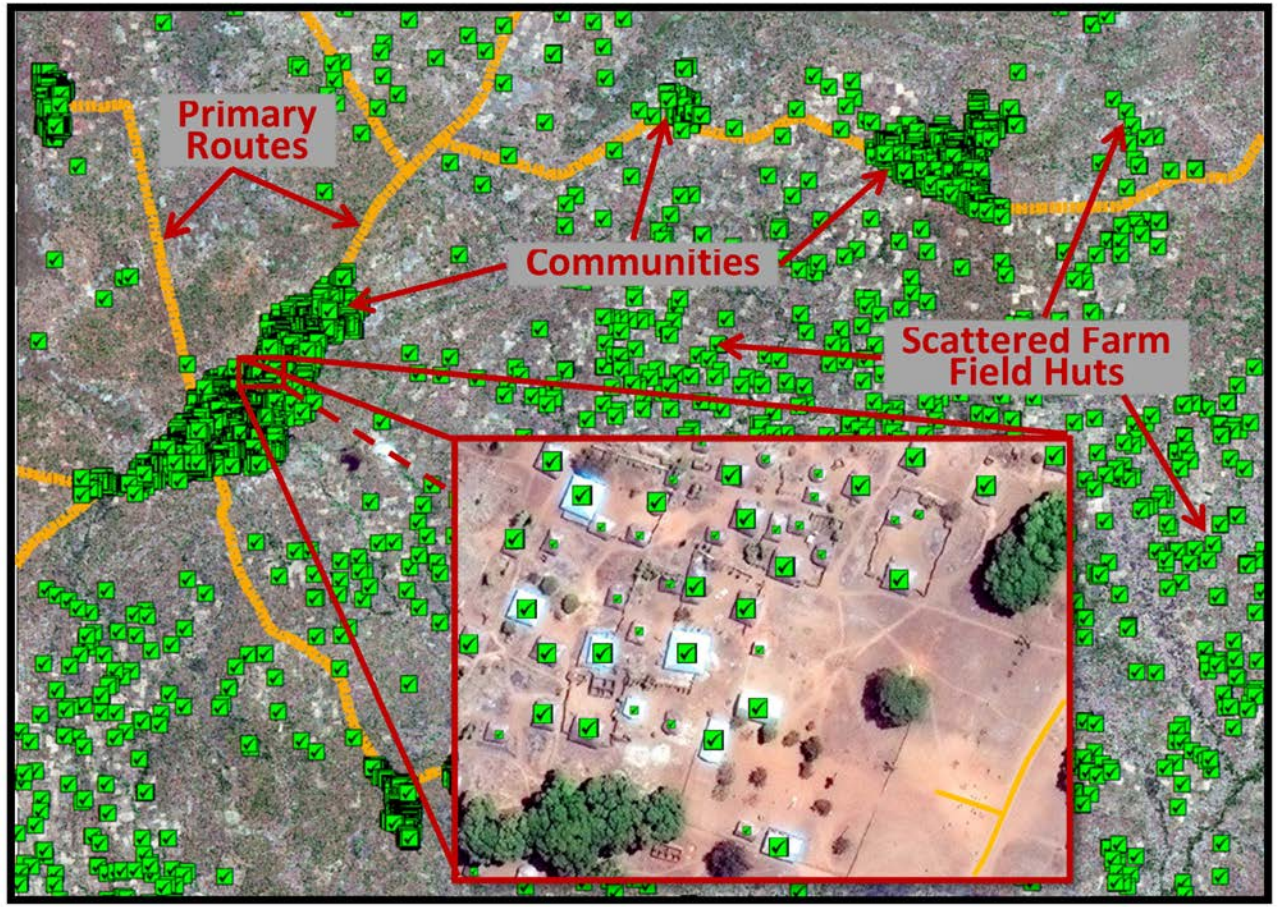
Expertise – FinitEdge™

Eikonek



Photos from DigitalGlobe WV03 (30cm GSD) satellite imagery.

Case study

Mapping "Hidden" Populations

Mozambique

DigitalGlobe WV03 (30cm GSD)

Date of Imagery: 08/03/16

FinitEdge™ Feature Extraction

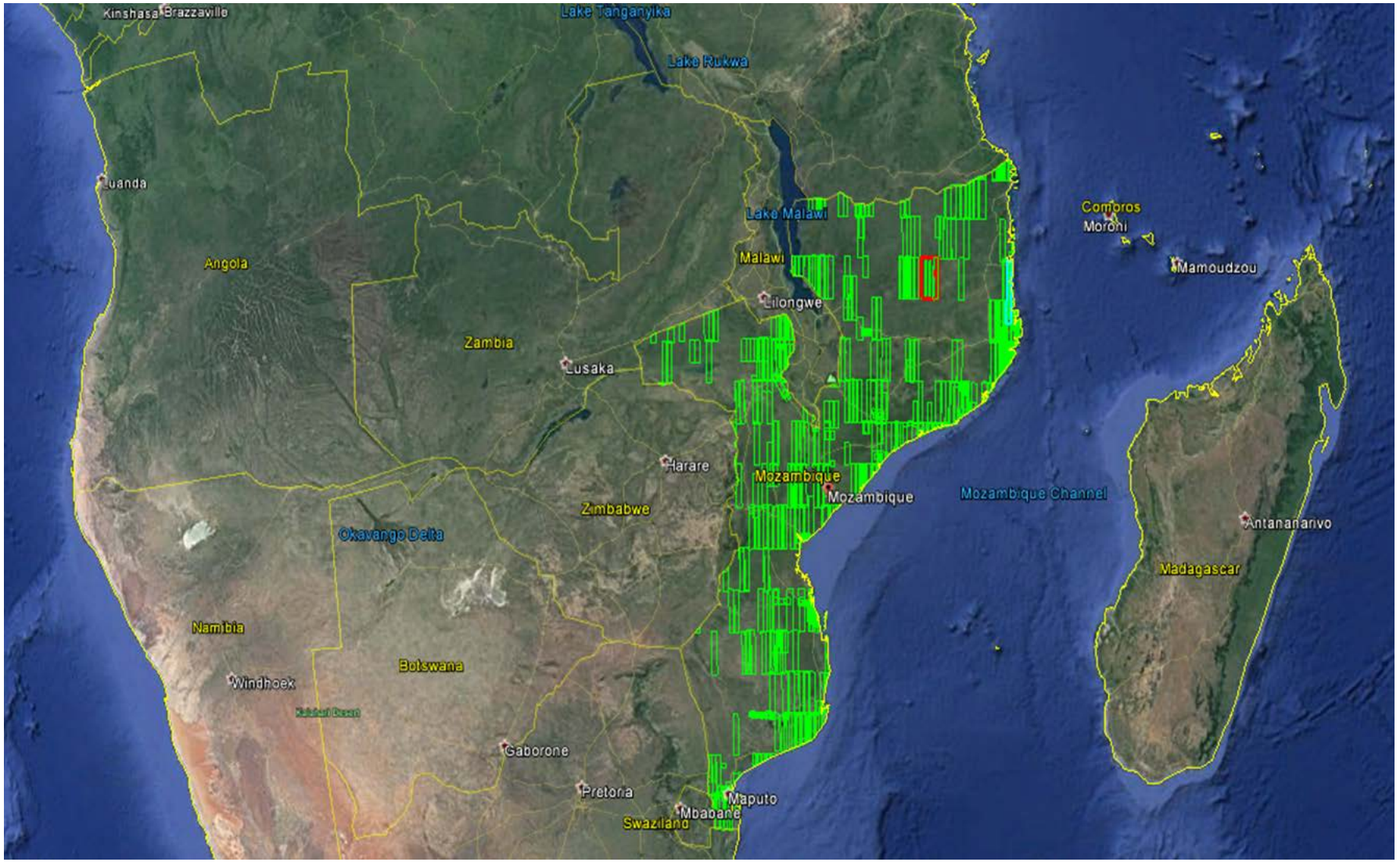
Pintroids ™ and Road Centerlines

what3words - Addresses

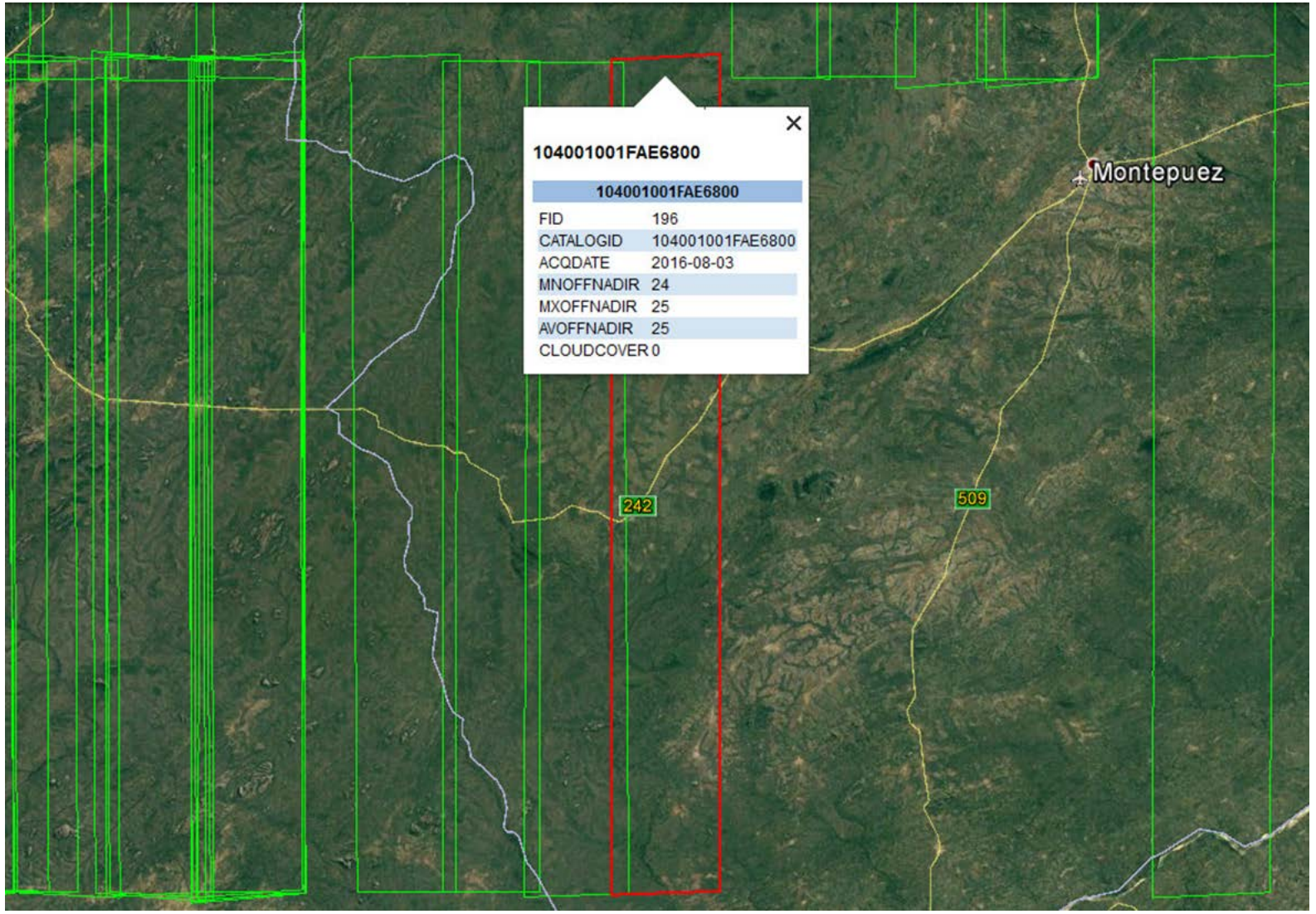
addressing the world

DigitalGlobe WV03 (30cm GSD Imagery)

Eikonek



Random Unmapped Area – 08/03/16



57-Tile Scene – 1,675 km² (647 mi²)

Mozambique

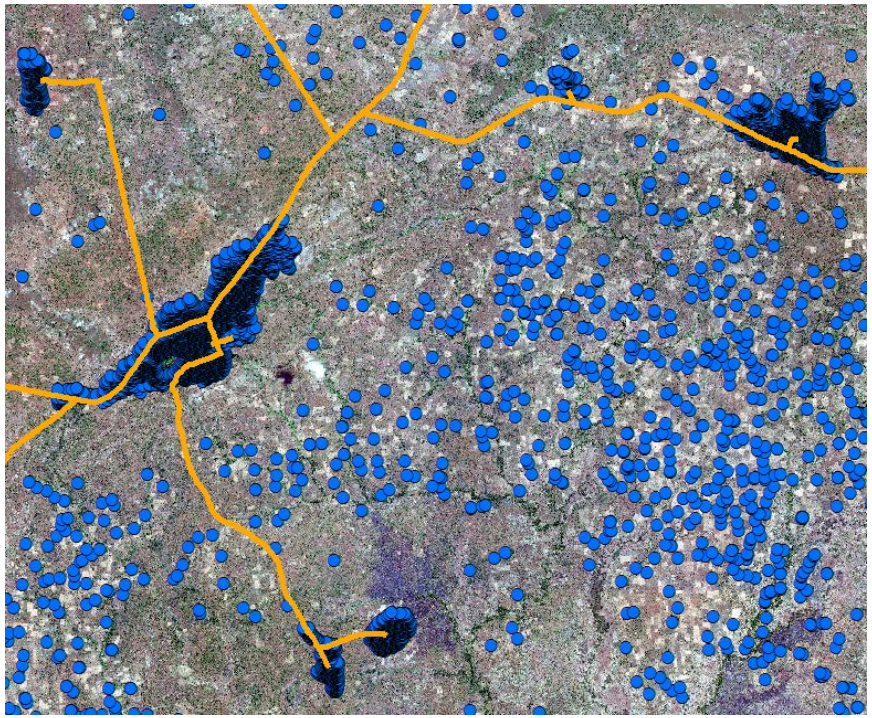
Mozambique	
FID	196
CATALOGID	104001001FAE6800
ACQDATE	2016-08-03
MNOFFNADIR	24
MXOFFNADIR	25
AVOFFNADIR	25
MNSUNAZIM	35.22185
MXSUNAZIM	36.08923
AVSUNAZIM	35.64796
MNSUNELEV	52.01189
MXSUNELEV	52.82386
AVSUNELEV	52.41487
MNTARGETAZ	186.741562
MXTARGETAZ	191.203079
AVTARGETAZ	188.918442
MNPANRES	0.368126
MXPANRES	0.372898
AVPANRES	0.370469
MNMULTIRES	1.472096
MXMULTIRES	1.491123
AVMULTIRES	1.481439
STEREOPAIR	NONE
BROWSEURL	https://browse.digitalglobe.com/imagefinder/showBrowseMetadata?catalogId=104001001FAE6800
CLOUDCOVER	0
PLATFORM	WV03
x1	38.393261
y1	-12.98215
x2	38.530669
y2	-12.98215
x3	38.530669
y3	-14.01311
x4	38.393261
y4	-14.01311
IMAGEBANDS	Pan_MS1_MS2

FinitEdge™ Pintroids™ and Centerlines

Eikonek

FinitEdge™ detected and extracted 41,483 Pintroids (rooftop address points) and 272 km (169 mi) of unpaved roads and "wagon tracks"

Pintroids™ and Centerlines

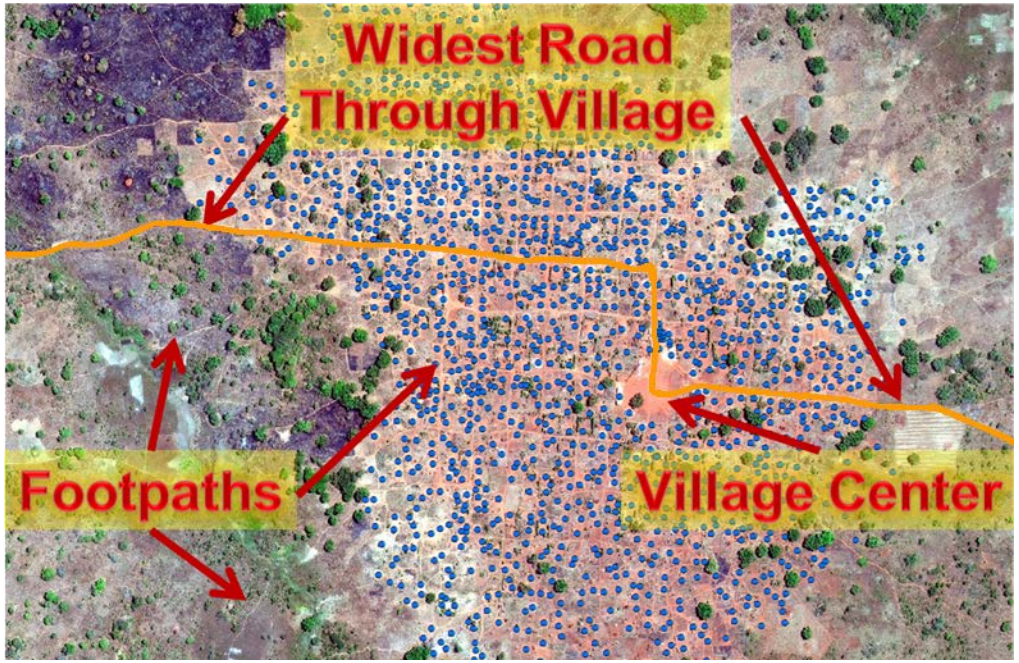


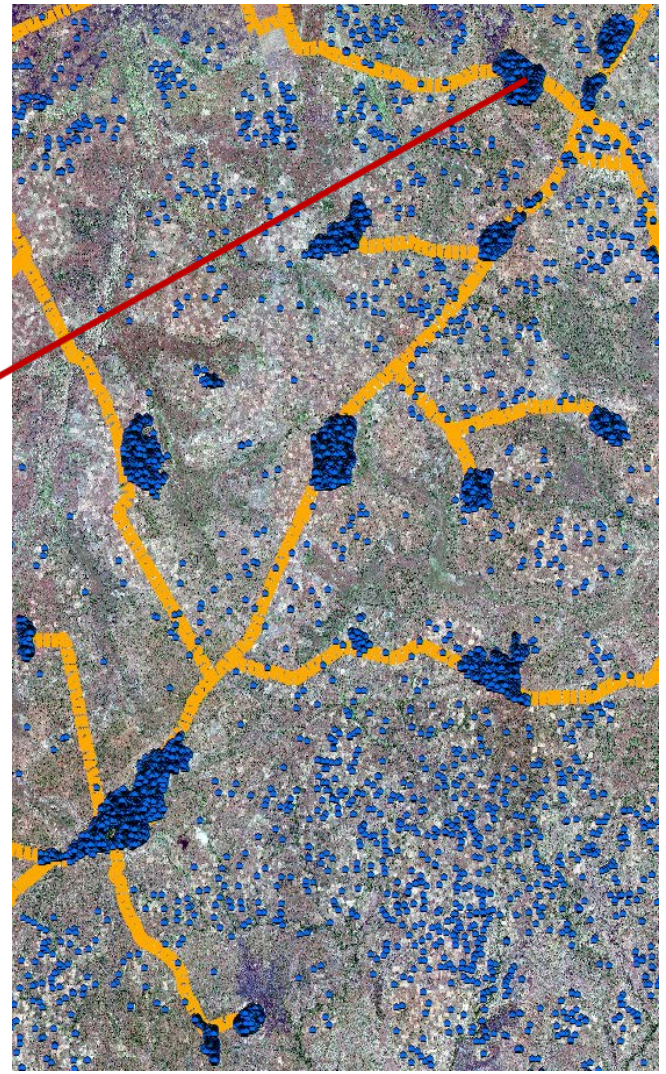
Centerlines

Photos from DigitalGlobe WV03 (30cm GSD) satellite imagery.

Centerline Detail

There are significantly more footpaths than drivable roads in remote regions like this, so initial FinitEdge™ centerline data only depicts the best vehicular routes passing through and connecting settlements.

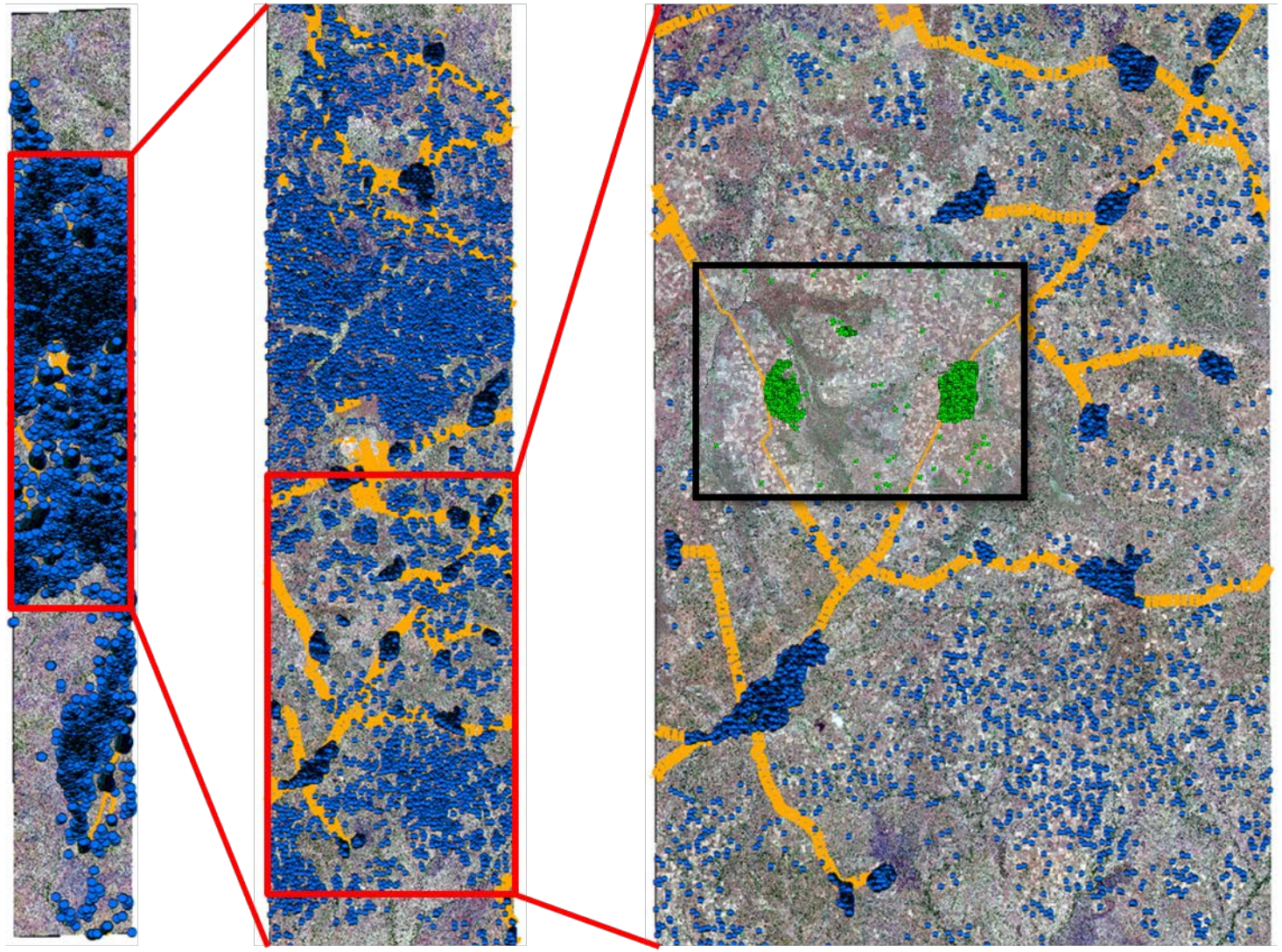




Photos from DigitalGlobe WV03 (30cm GSD) satellite imagery.

FinitEdge™ Extracted Pintroids™

FinitEdge™ detected and created an amazing 41,483 Pintroids™ in what initially appeared to be a sparsely populated area.



Photos from DigitalGlobe WV03 (30cm GSD) satellite imagery.

FinitEdge™ Extracted Pintroids™

Eikonek

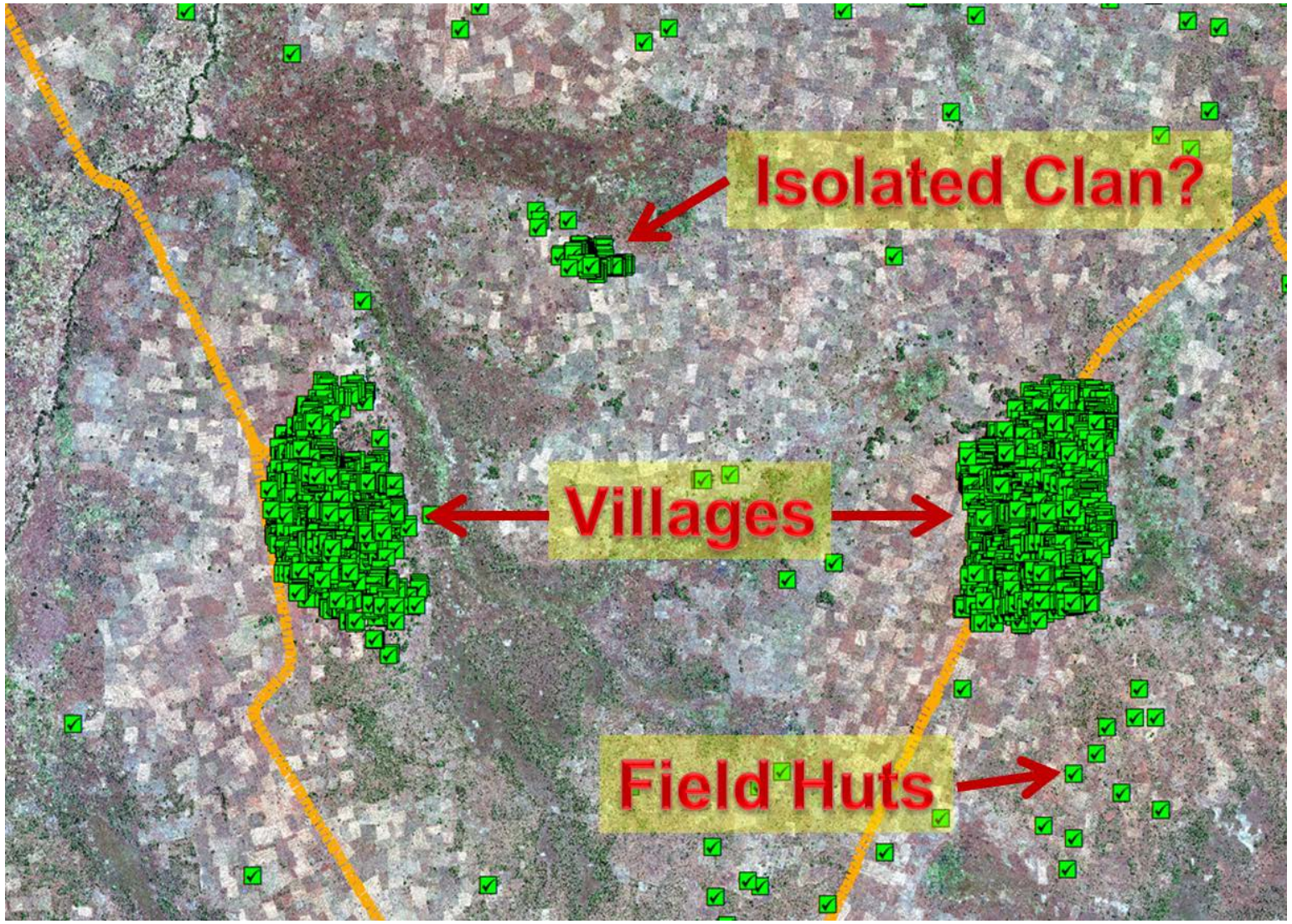


Photo from DigitalGlobe WV03 (30cm GSD) satellite imagery.

Village Center – FinitEdge™ Pintroids™

Eikonek

Photo from DigitalGlobe WV03 (30cm GSD) satellite imagery.

Generate what3words Addresses

Eikonek

what3words Generated English and Portuguese Addresses from Pintroid™ Coordinates

Photo from DigitalGlobe WV03 (30cm GSD) satellite imagery.

Isolated Family Clan?

Photo from DigitalGlobe WV03 (30cm GSD) satellite imagery.

FinitEdge™ Extracted Pintroids™

Photo from DigitalGlobe WV03 (30cm GSD) satellite imagery.

Generate what3words Addresses

Eikonek

what3words Generated English and Portuguese Addresses from Pintroid™ Coordinates

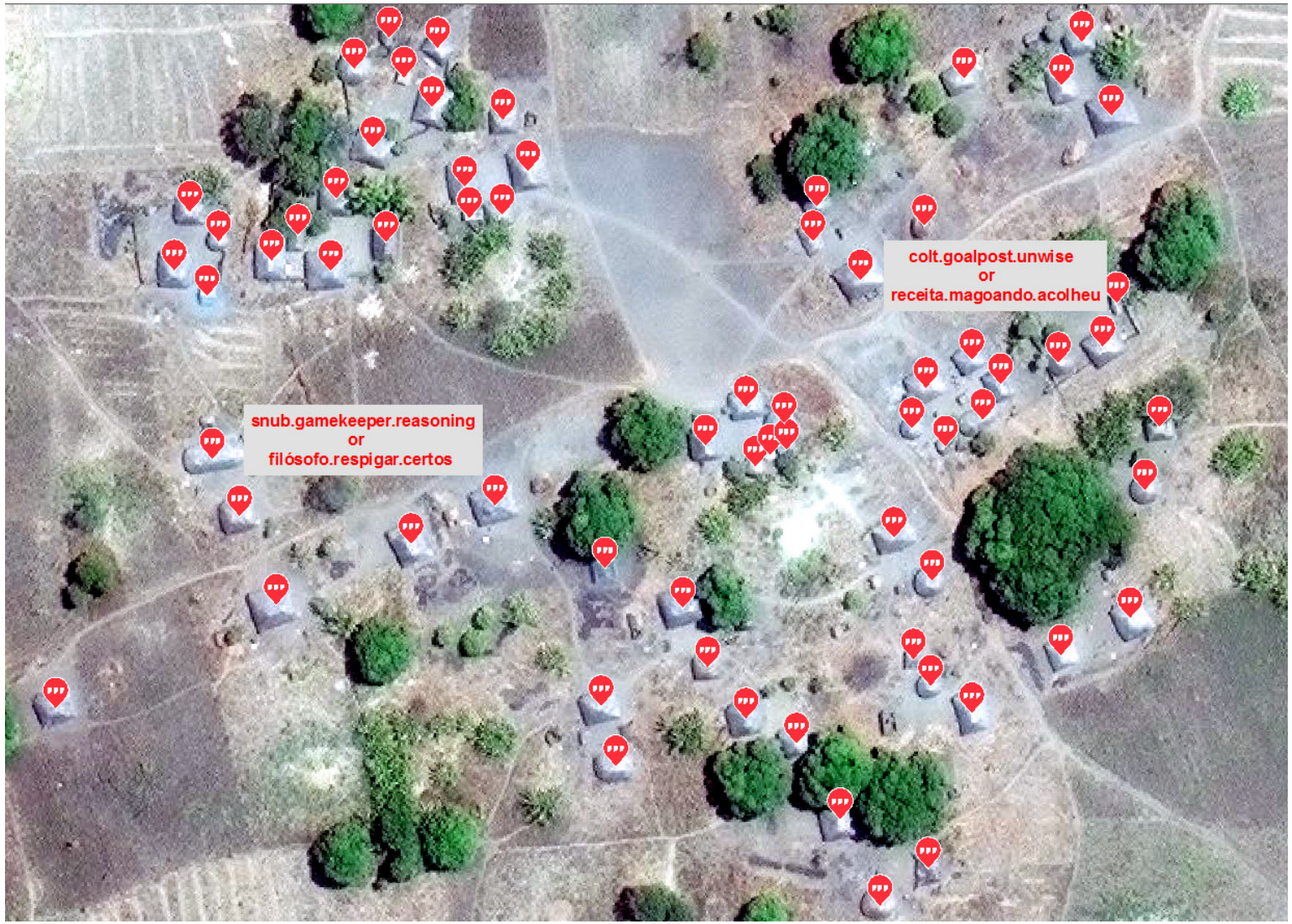


Photo from DigitalGlobe WV03 (30cm GSD) satellite imagery.

Villages and Field Huts

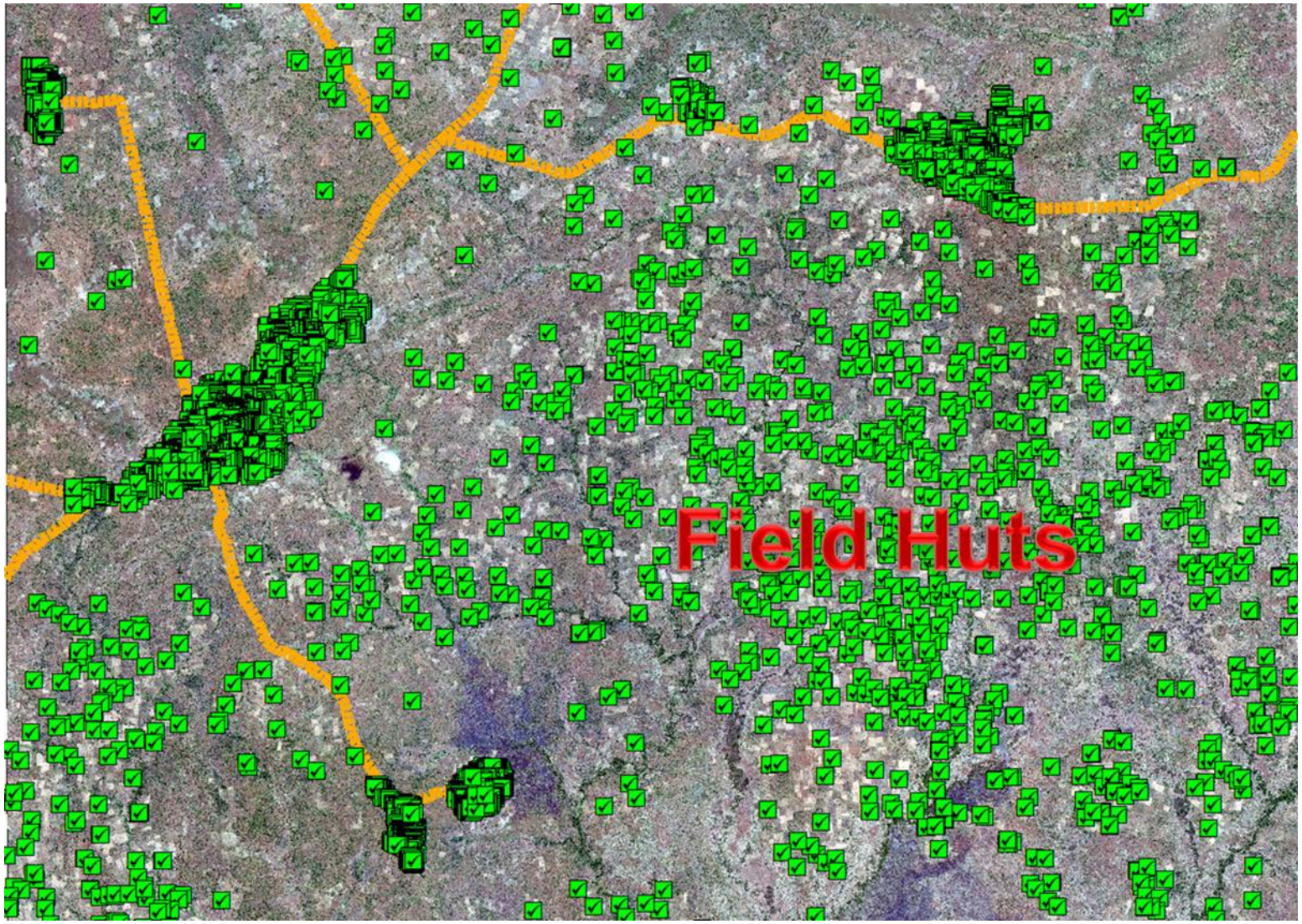


Photo from DigitalGlobe WV03 (30cm GSD) satellite imagery.

Field Huts Detected

Photo from DigitalGlobe WV03 (30cm GSD) satellite imagery.

FinitEdge™ Extracted Pintroids™

Eikonek

Photo from DigitalGlobe WV03 (30cm GSD) satellite imagery.

Generate what3words Addresses

Eikonek

what3words Generated English and Portuguese Addresses from Pintroid™ Coordinates

Photo from DigitalGlobe WV03 (30cm GSD) satellite imagery.

Group of Remote Isolated Pintroids™

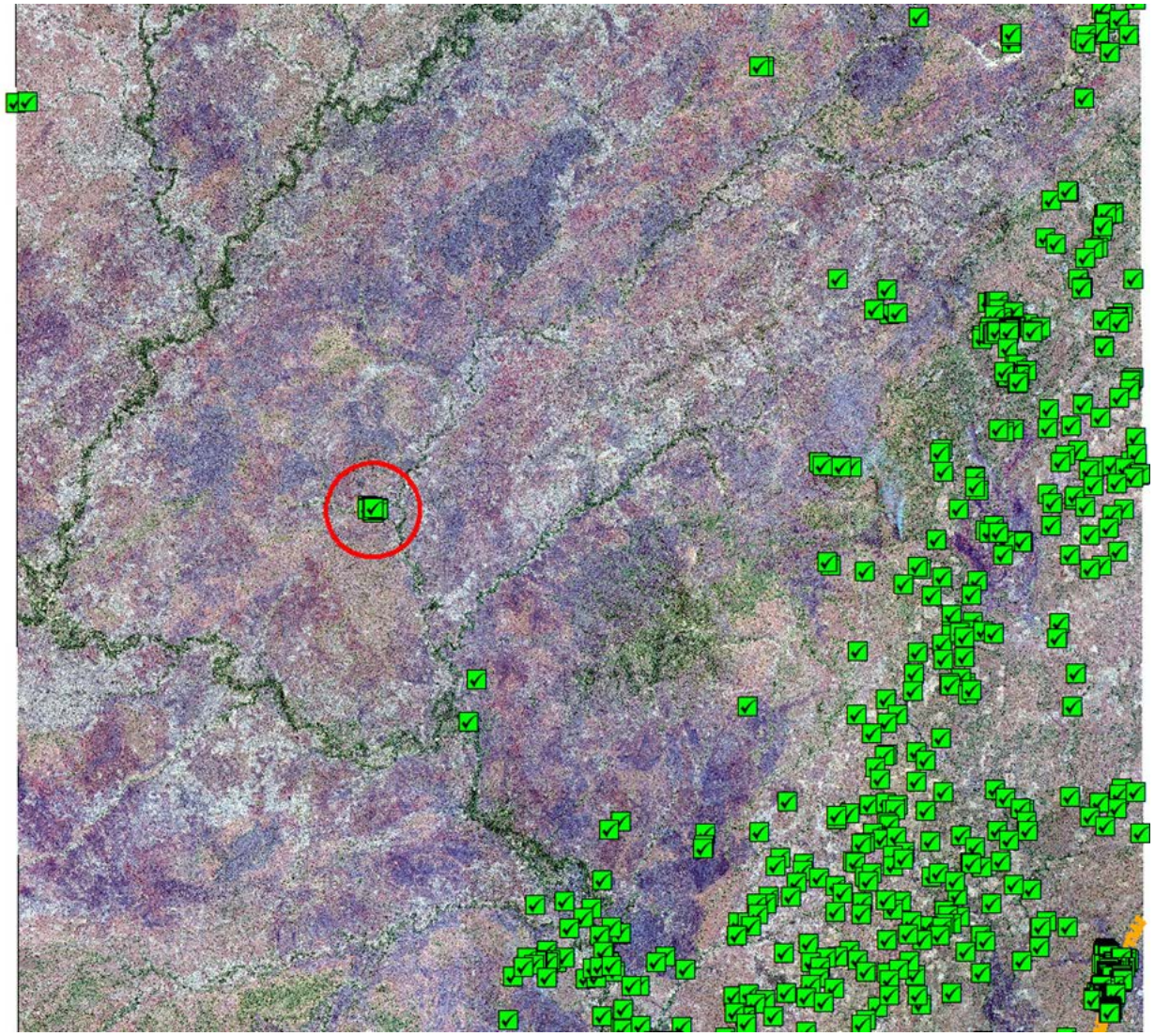


Photo from DigitalGlobe WV03 (30cm GSD) satellite imagery.

Covert Operation? Atypical Roofs

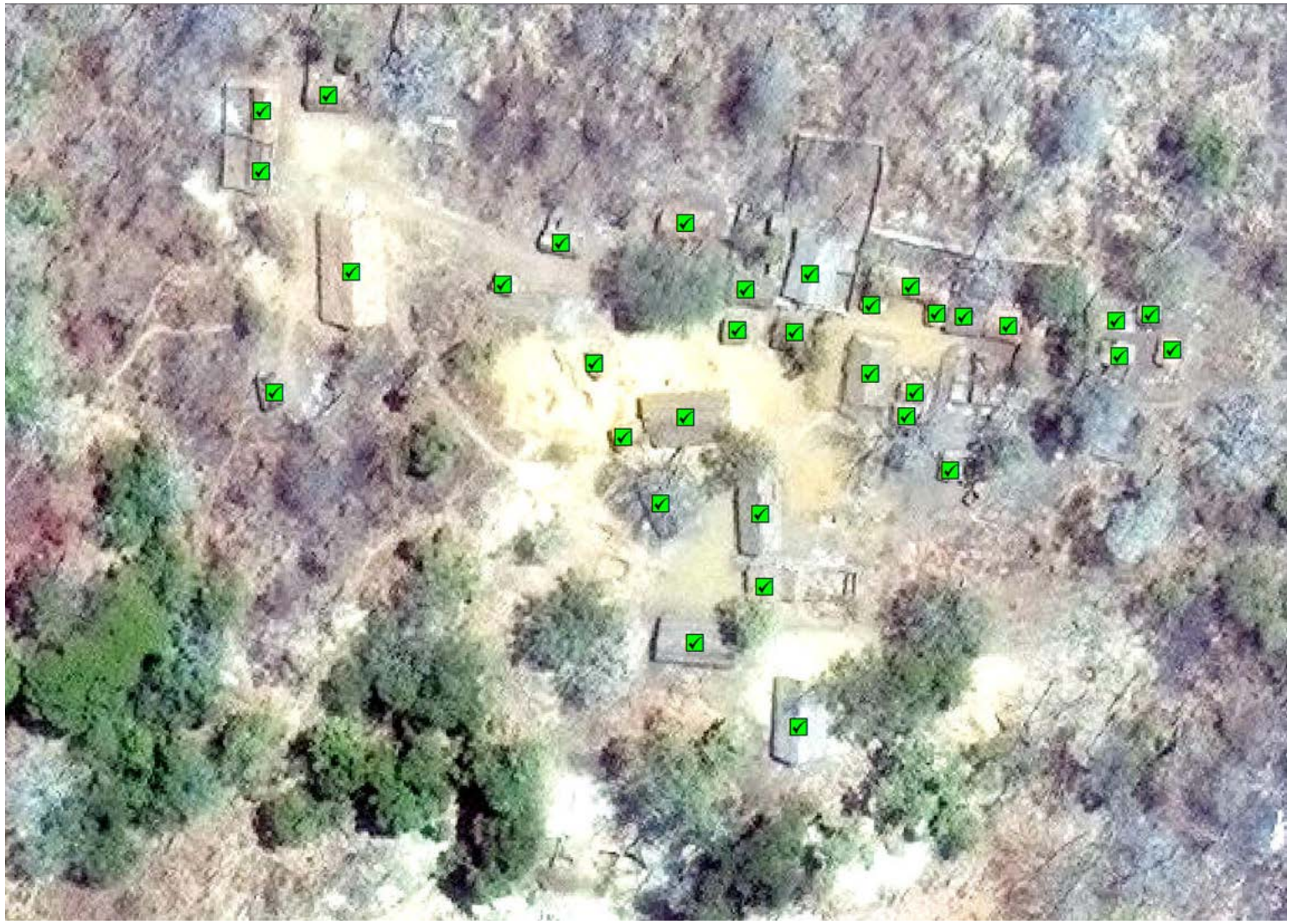


Photo from DigitalGlobe WV03 (30cm GSD) satellite imagery.

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FinitEdge™ - Geospatial SaaS

Eikonek

You Control What, Where and When

Your Input/Upload for Creating New Data

- Your Area of Interest polygon
- The orthorectified imagery you procure
- Your schedule for deliverables

Recommendation:
Keep your databases current and manageable by planning your project areas, image acquisition, data creation, and schedules to match both internal and third-party resources and capabilities.

Input for Creating New Data

Your Area of Interest

Your New or Old Orthoimagery and Image Tile Layout

FinitEdge™ - Geospatial Data Extraction

Eikonek

You Control What, Where and When

Authoritative FinitEdge™ Output

- All point, polyline and polygon feature data detected and extracted during processing is delivered in standard ESRI shapefile format.

FinitEdge™ Output for New Data

Your Requested Data Layer of Points, Polylines or Polygons

FinitEdge™ - Geospatial SaaS

Eikonek

You Control What, Where and When

Your Input/Upload for Updating Data

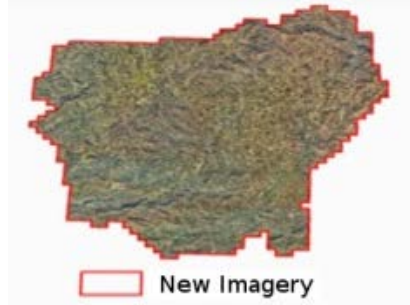
- Area of Interest polygon
- The orthorectified imagery you procure
- Your existing data layers for update
- Your schedule for deliverables

Recommendation:
Keep your databases current and manageable by planning the project areas, image acquisition, data updates, and schedules to match both internal and third-party resources and capabilities.

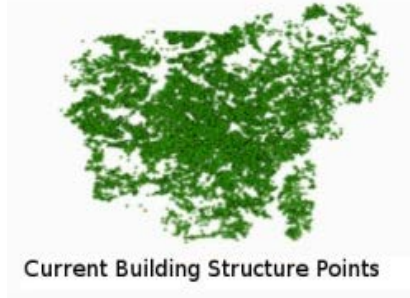
Input for Vector-to-Image Updates

Your Area of Interest

Your New or Old Orthoimagery and Image Tile Layout



Your Existing Data Layer of Points, Polylines or Polygons



FinitEdge™ - Geospatial Data Updates

Eikonek

You Control What, Where and When

FinitEdge™ Direct Vector-to-Image Output

- Your existing point, polyline and polygon shapefiles remain geospatially unchanged.
  - An attribute field is added to denote whether features are demolished or unchanged.
- All "New" features detected during processing are delivered in a supplemental shapefile.

FinitEdge™ Output for Data Updates

Your Data Layer with Direct Vector-to-Image Detected Changes Noted by Attribute Field

New Data Layer of Direct Vector-to-Image Detected Points, Polylines or Polygons

FinitEdge™ - High-Accuracy

Eikonek

FinitEdge™ was developed to process until no less than a **98**% standard of accuracy was achieved for completeness and correctness

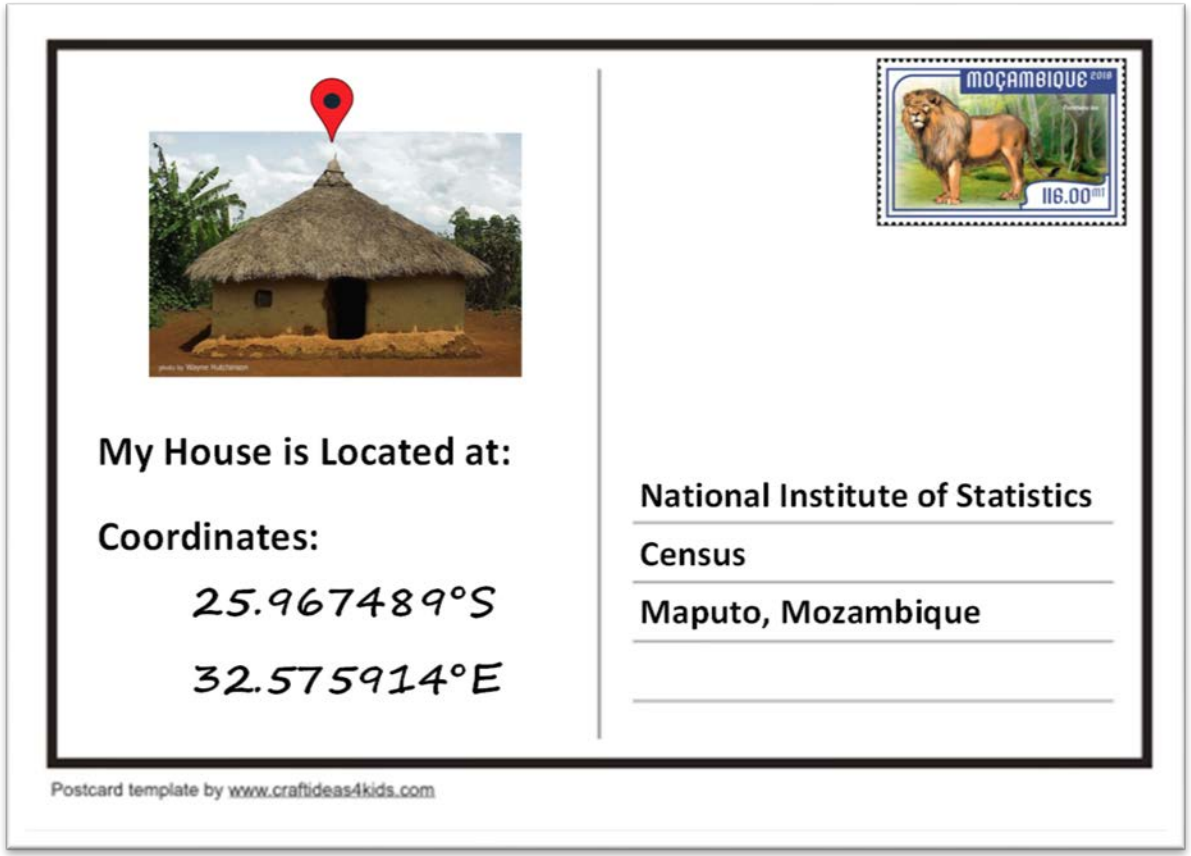
Independent QA/QC results for both feature extraction and change detection have shown that actual standards of accuracy exceeded **99.6%** for all projects since 2007.

If features are captured in your imagery, then FinitEdge™ will detect, extract and update them with exceptional accuracy and repeatability.

FinitEdge™ - Affordable

Eikonek

FinitEdge™ will geocode every building structure nationwide for significantly less than conceptually using prepaid postcards to solicit geocode locations.



FinitEdge™ - Fast

Rapid scalability of FinitEdge™ SaaS resources makes it very feasible to have accurate feature data completely mapped or updated for all nonexistent, incomplete and outdated census databases by 2025

Benefits:

- Fast accurate Pintroids™ alone will significantly increase the accuracy of population estimates and accelerate SDG success stories.
- High-accuracy intercensal analysis and application becomes routine through fast and on demand updates wherever needed.
- Pintroids™ and centerlines become a catalyst for economic activity and growth, especially when Big Tech (Google, Here, Apple, Amazon, Uber...,) embraces geospatial feature data that you make public.

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FinitEdge™ Village Level Impact

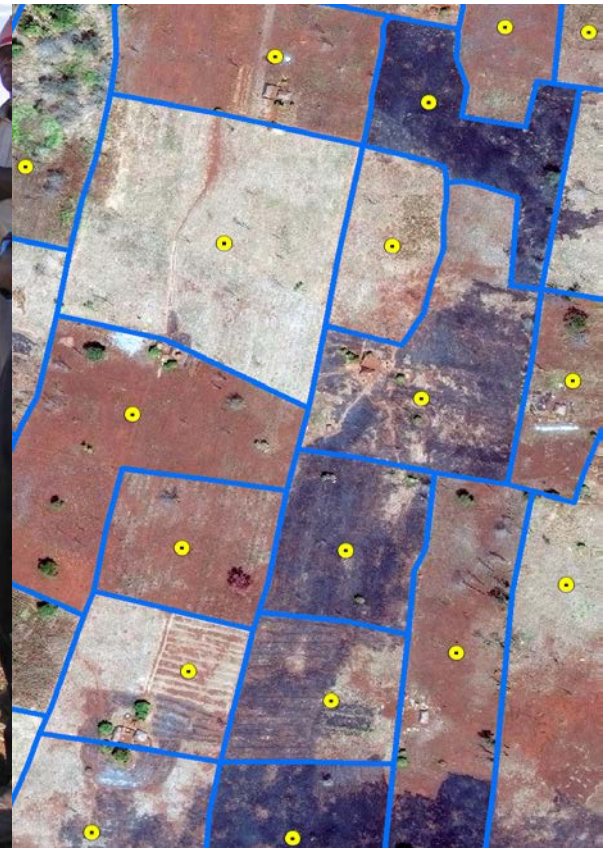
Eikonek

Census Demographics

Economic Stimulus

Agriculture & Resources

Land Cadastre



Social Purpose in Action

Eikonek partners with governments, NGOs and others to help educate, train, employ and equip villagers with hand held units and basic GIS capabilities to:

- Perform census enumeration
- Collect and geocode soil & water samples
- GPS/digitize homesite and farm boundaries to create land registries
- GPS/digitize wells, water and footpaths

Why?

- ❖ To create jobs and sow economic seeds
- ❖ Familiarity yields greater data accuracy

We Believe in Acceleration

Eikonek

The FinitEdge™ Pintroids™ generated directly on all building structures provide creative opportunities to accelerate progress on the SDGs.

For example…

Remember the farm huts?

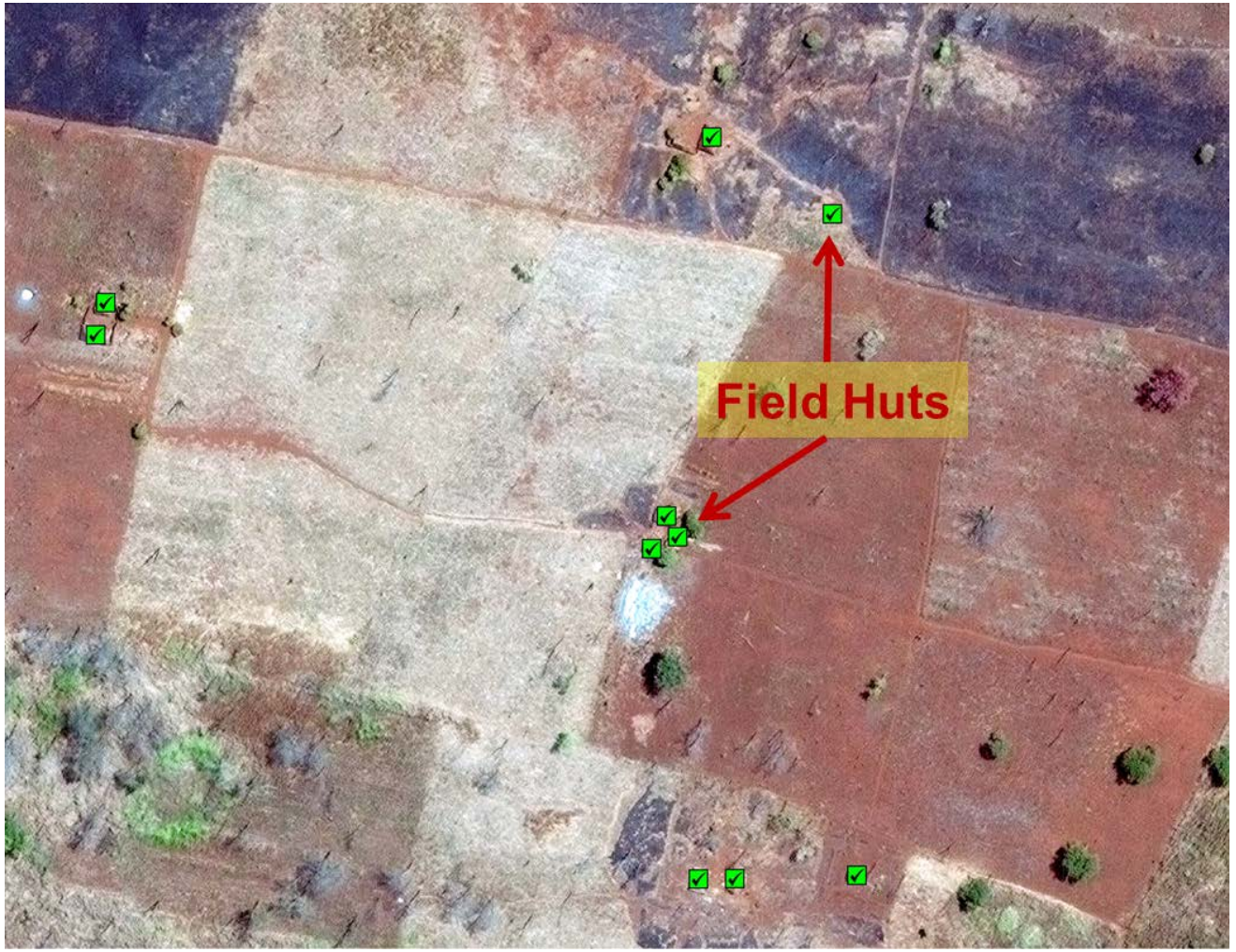


Photo from DigitalGlobe WV03 (30cm GSD) satellite imagery.

We Believe

Eikonek believes many SDGs can be accelerated by educating, training, employing and equipping villagers to help:

- Geocode soil samples from family farms.
- GPS/digitize homesite, business, family farm and crop boundaries.
- GPS/digitize footpaths and drivable roads within and between hamlets, villages, farms and water sources.
- Record household demographic data.
- Record local business data including local crops and goods produced.

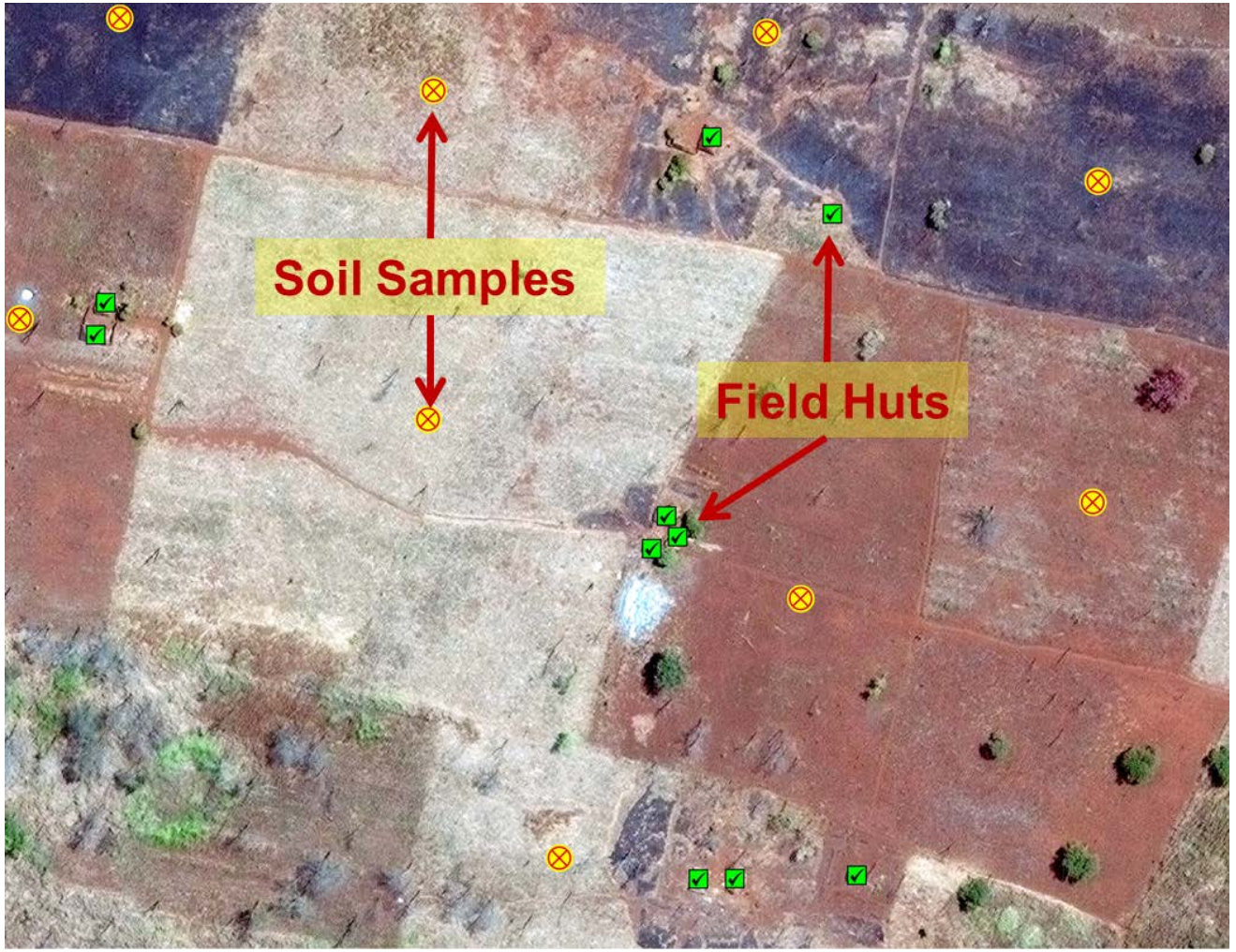


Photo from DigitalGlobe WV03 (30cm GSD) satellite imagery.

We Believe

Eikonek believes these efforts will provide positive local, regional, national and global impact by:

- Establishing and maintaining a comprehensive census.
- Creating an initial land cadastre.
- Improving agriculture through better soil, crop yields and crop varieties.
- Creating a basic GIS framework that becomes a catalyst for:
  - Regional trade of goods/services.
  - Local economic activity/growth.
  - Good health and nutrition.
  - Education and new income.

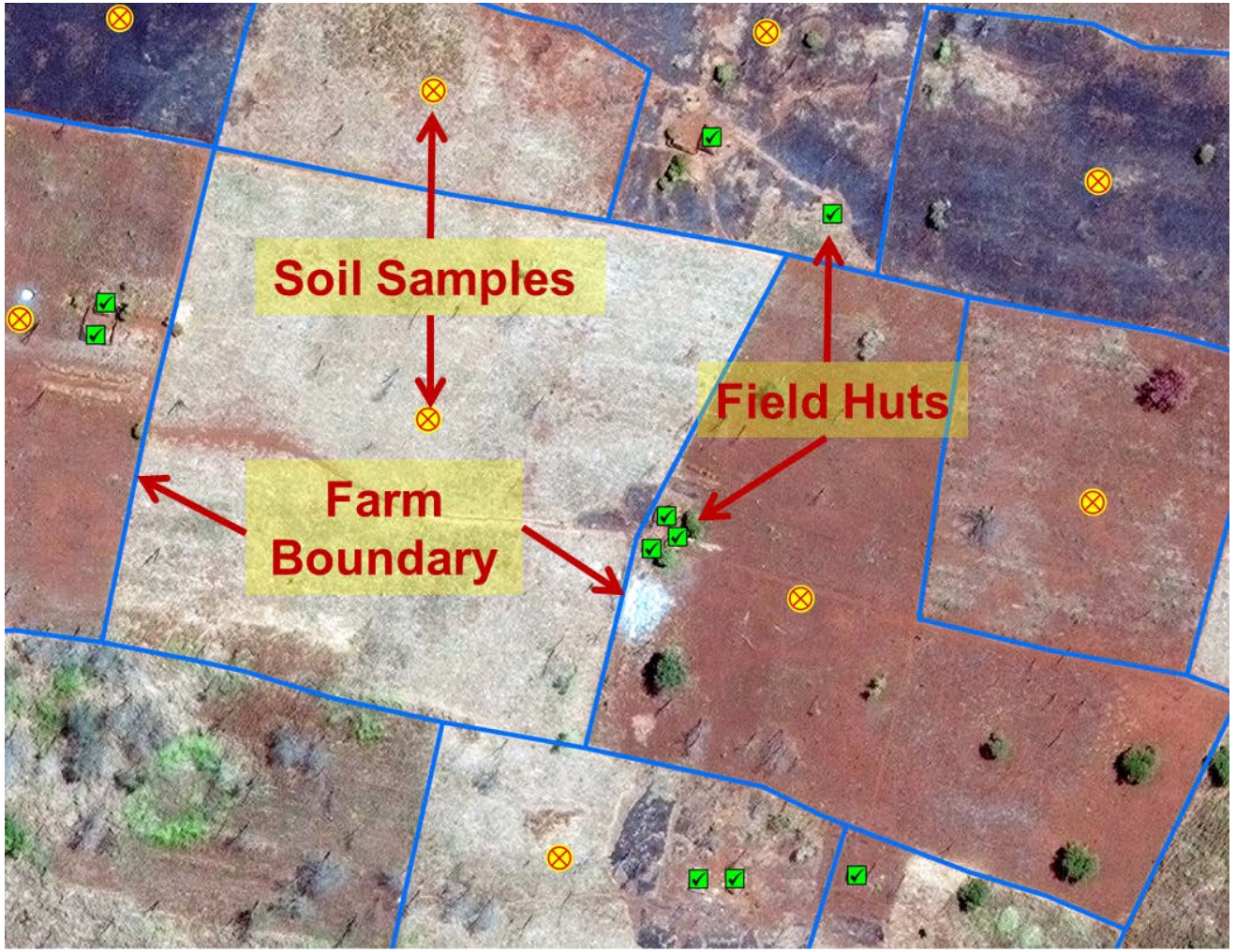


Photo from DigitalGlobe WV03 (30cm GSD) satellite imagery.

We Believe

Eikonek believes — "If you map it, prosperity will come."

- Basic geospatial data will improve the livelihood of local communities.
- Big Tech has no financial incentive to initiate geospatial data or map infrastructure in underdeveloped countries.
- If you map it, Big Tech will adopt it.
- Online access through Big Tech creates fertile ground for local, regional and national economic development.

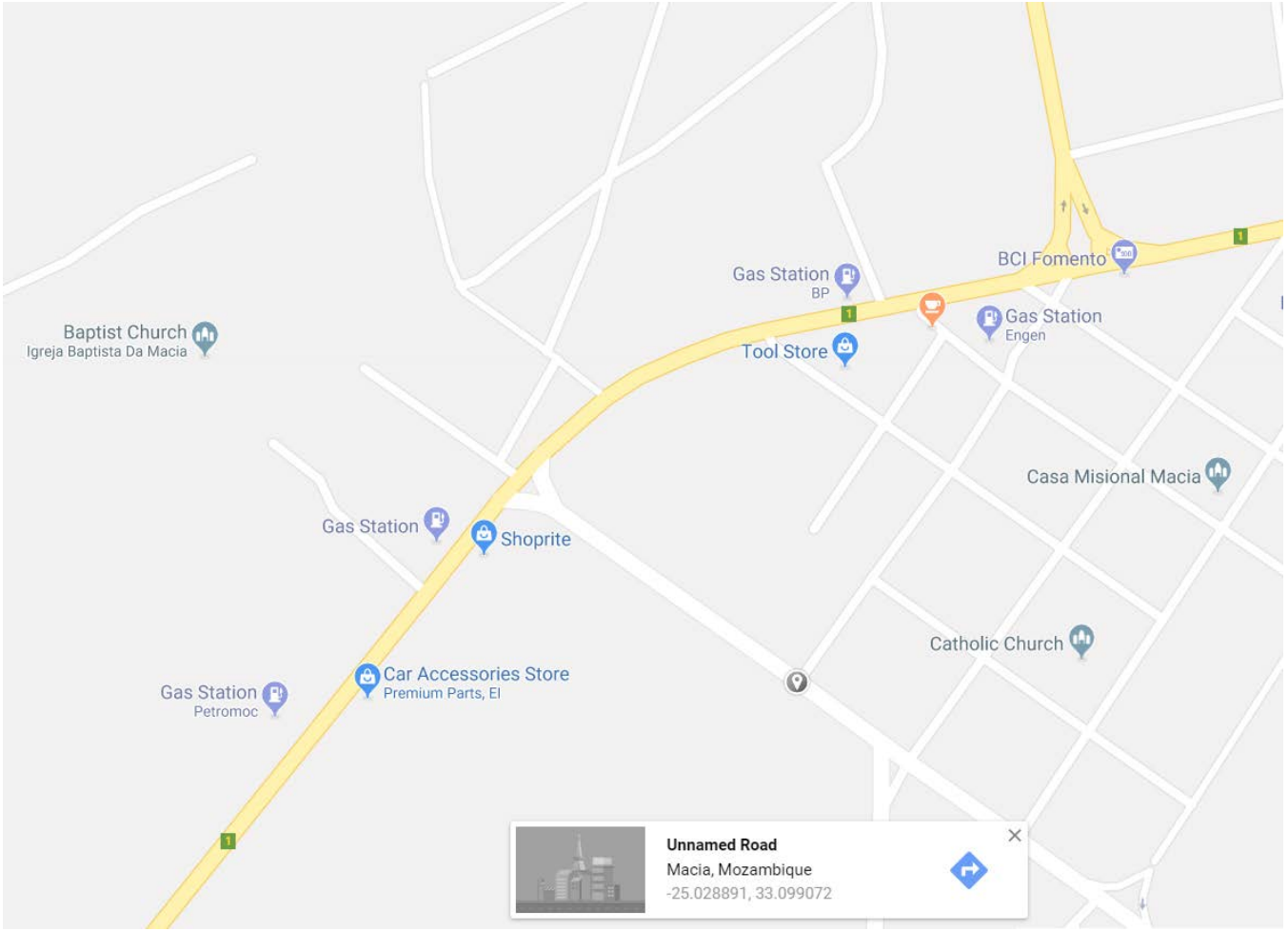


Image credit: Google

FinitEdge™ Global Impact

Eikonek

Eikonek truly believes its FinitEdge™ Direct Vector-to-Image technology will positively advance and even accelerate the success of practically every SDG

Image credit: Unesco.org

Image | Vector | Image - Geospatial SaaS

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