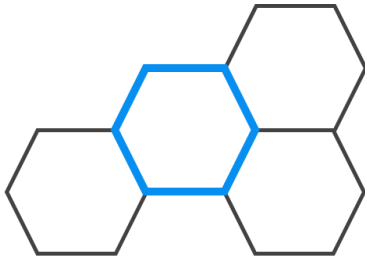




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# Interactive Mapping and Visualization

*Strategic Planning for Optimal Connectivity (SPOC)*

Enrique González

[enrique@efts-group.com](mailto:enrique@efts-group.com)

COVID-19

“Coronavirus has exposed the digital divide like never before”



**April, 2020**

<https://www.weforum.org>



Do we know the precise location of  
the connectivity gap?



The challenge: [Accurate-Updated-High-Granularity Maps](#)

# The Coverage Connectivity Gap is not mapped adequately.



Invest



Inter-American  
Development Bank

Crowdsourcing for Digital Connectivity in Brazil  
(C2DB)



“ The project focuses on **identifying unattended broadband demand** groups and maximum connectivity points. This project **will also estimate costs** for integrating those maximum connectivity points to the network. ”

<https://c2db-idb-gis.hub.arcgis.com/>



Broadband Data Collections  
Challenge Processes

Broadband Data Task Force



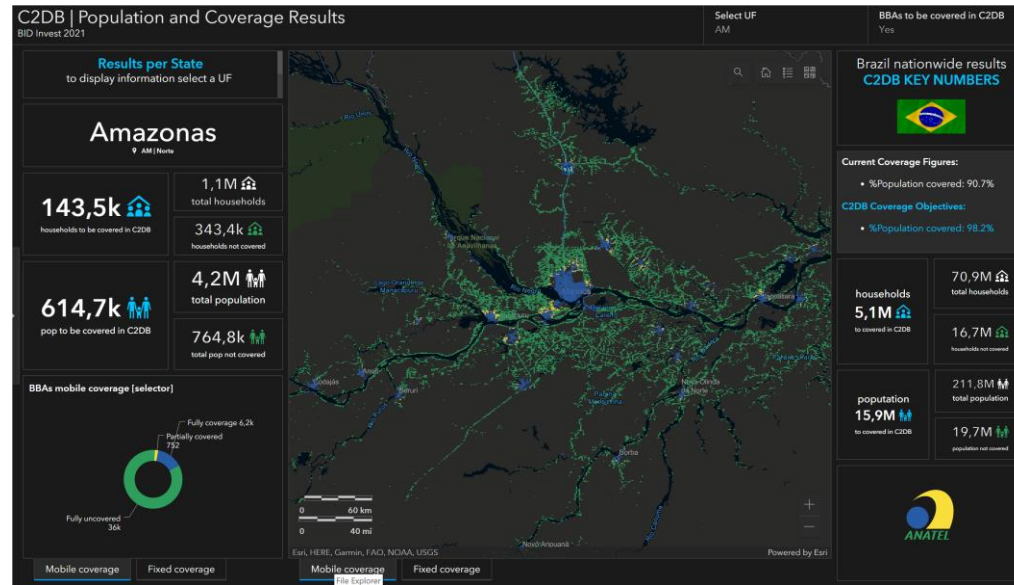
“ Commission efforts to remedy that digital divide have long been hampered by the **lack of precise, granular data** on the availability and quality of fixed and mobile broadband services -- data that would enable us **to target resources to the areas most in need.** ”

Chair, Broadband Data Task Force at FCC | <https://www.fcc.gov/BroadbandData>

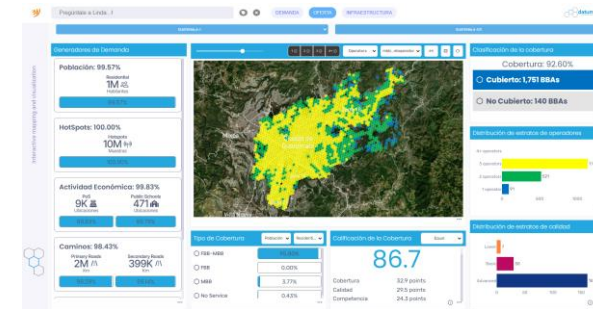
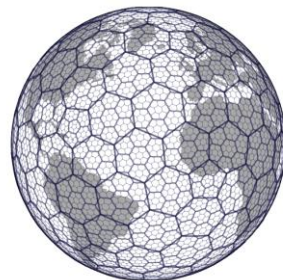
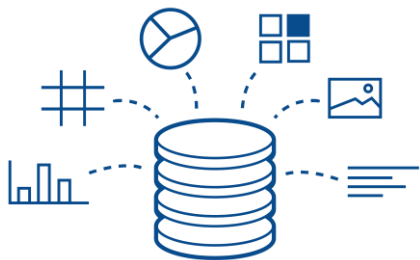


The challenge: [Accurate-Updated-High-Granularity Maps](#)

# C2DB Final Report and Visualization are public information



# What's needed to map the unattended demand for broadband connectivity service?



Step 1.

**Gathering Data**



Step 2.

**Analyzing Territory Splitting**



Step 3.

**Processing Grid Analysis**



Step 4.

**Distributing Interactive Visualization**

## Demand Generators

- Distributed population
- Census
- Roads
- Economic Activity

## Offer

- Coverage Maps
- Crowdsourcing data
- Existing Infrastructure

## H3 Grid System

- Same shape
- Same size
- Standardized

## Basic Broadband Area

- Any human activity is detected

## Estimated Demand

- Based on generators

## Stratification

- +High, High, Medium, Low

## Actionable Insights

### Demand

- Unattended demand

### Offer

### Coverage Scoring

- Coverage
- Quality
- Competition

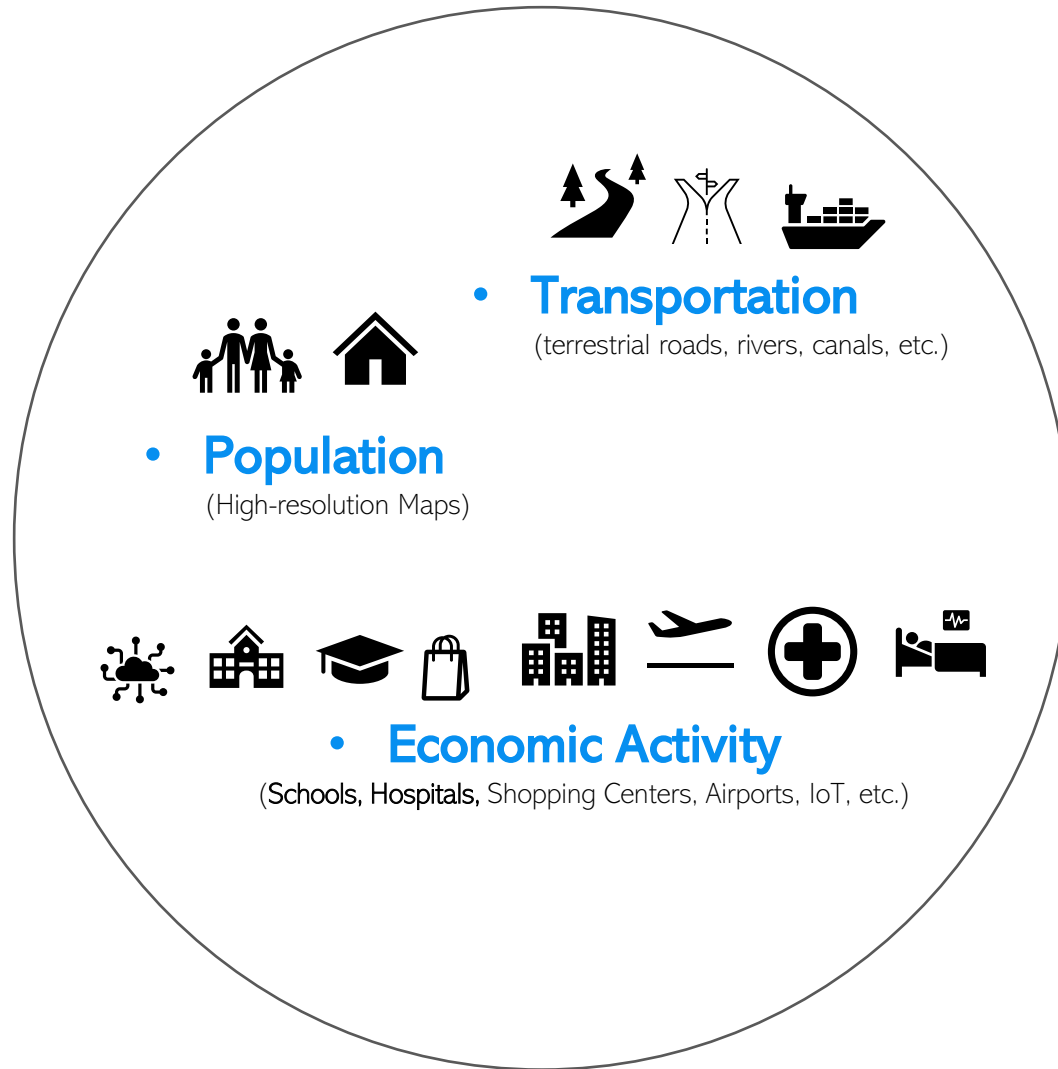


Basically, The Digital Connectivity Assessment is a Spatial Analysis



# Connectivity Service Demand

- Demand Generators  
Where any Human Activity is detected



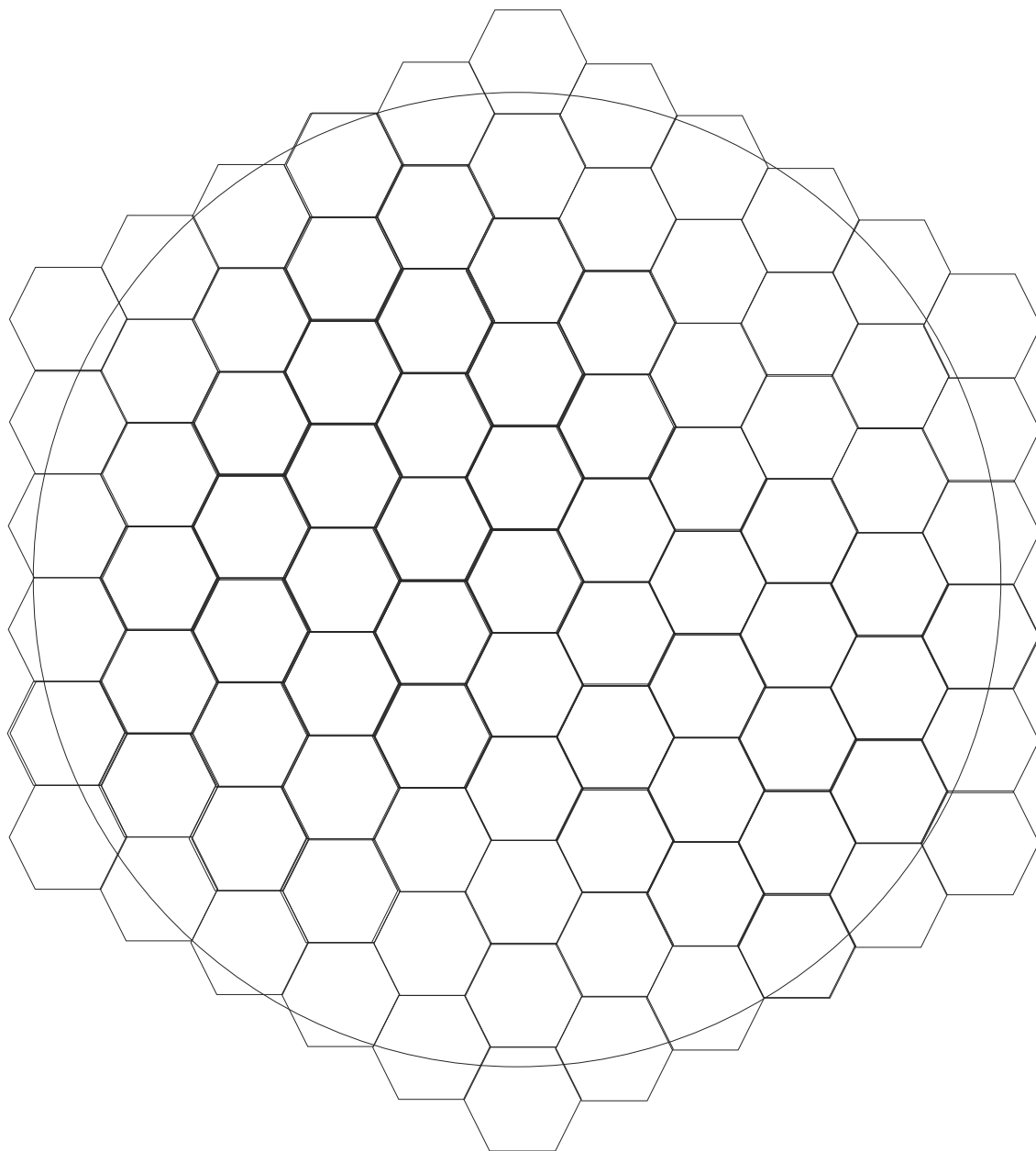
# Connectivity Service Demand

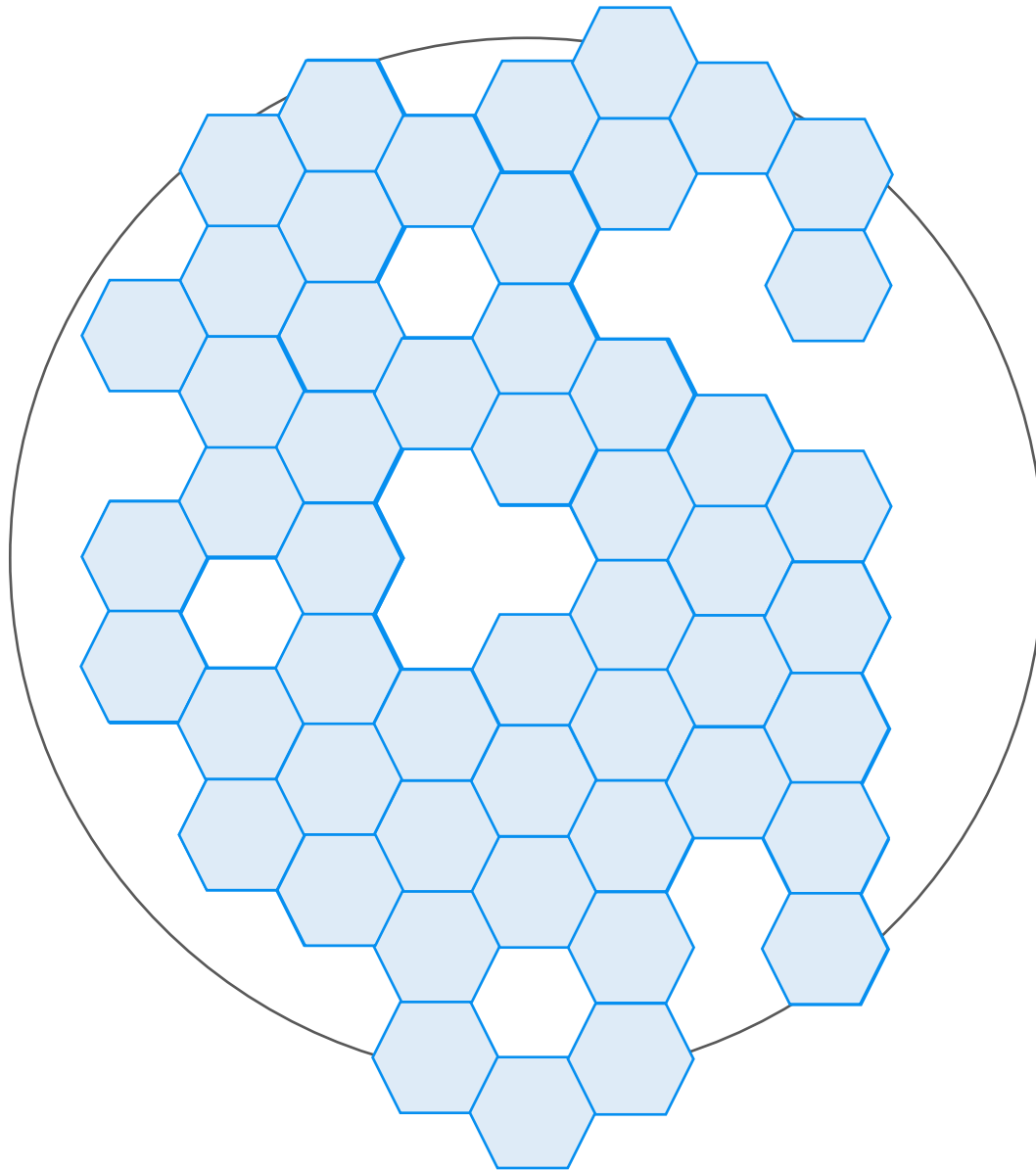
- Demand Generators

Where any Human Activity is detected

- **Territory Splitting**

H3 Grid System, comparable hexagonal cells (same shape and size)



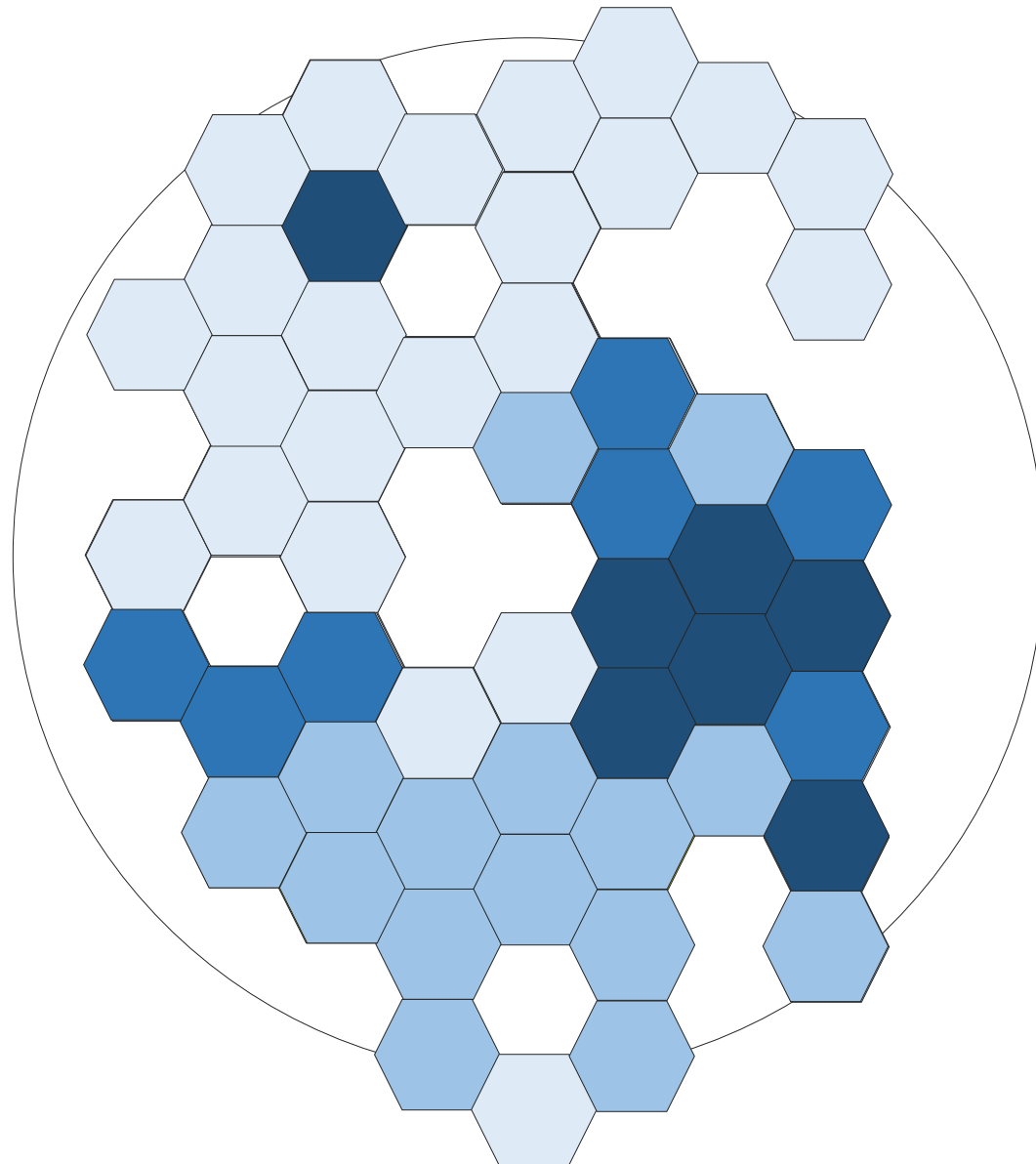


# Connectivity Service Demand

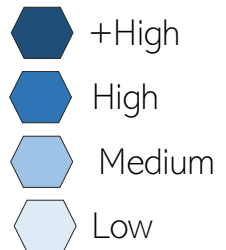
- Demand Generators  
Where any Human Activity is detected
- Territory Splitting  
H3 Grid System, comparable hexagonal cells (same shape and size)
- **Basic Broadband Areas**  
H3 Cells Where Broadband Services are needed



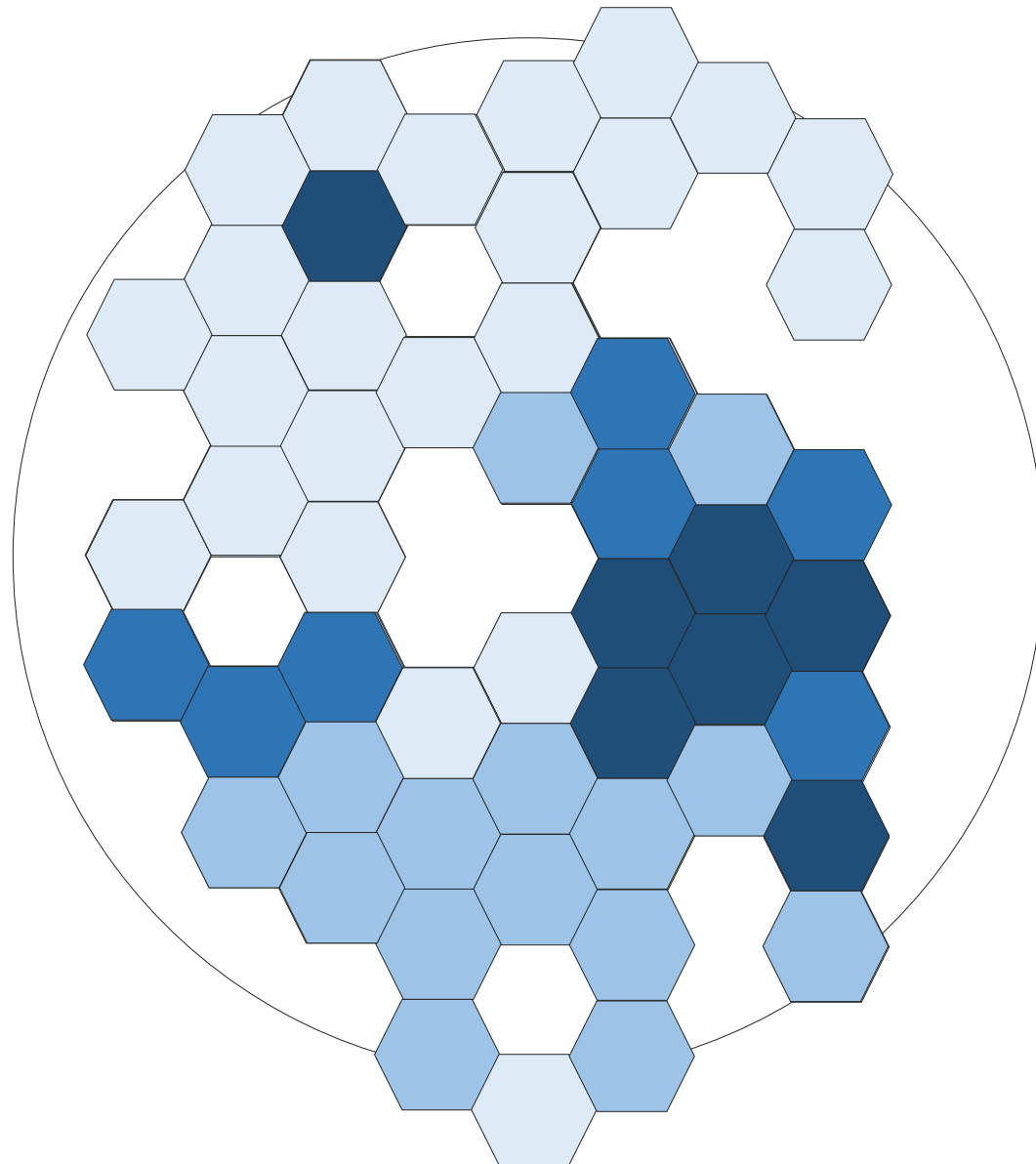
# Connectivity Service Demand



- Demand Generators  
Where any Human Activity is detected
- Territory Splitting  
H3 Grid System, comparable hexagonal cells (same shape and size)
- Basic Broadband Areas  
H3 Cells Where Broadband Services are needed
- **Estimated Data Consumption**  
BBA demand in terms of GB/month



# Connectivity Service Demand



- +High
- High
- Medium
- Low

- **Demand Generators**  
Where any Human Activity is detected
- **Territory Splitting**  
H3 Grid System, comparable hexagonal cells (same shape and size)
- **Basic Broadband Areas**  
H3 Cells Where Broadband Services are needed
- **Estimated Data Consumption**  
BBA demand in terms of GB/month

# Connectivity Service Offer Estimation

- Coverage

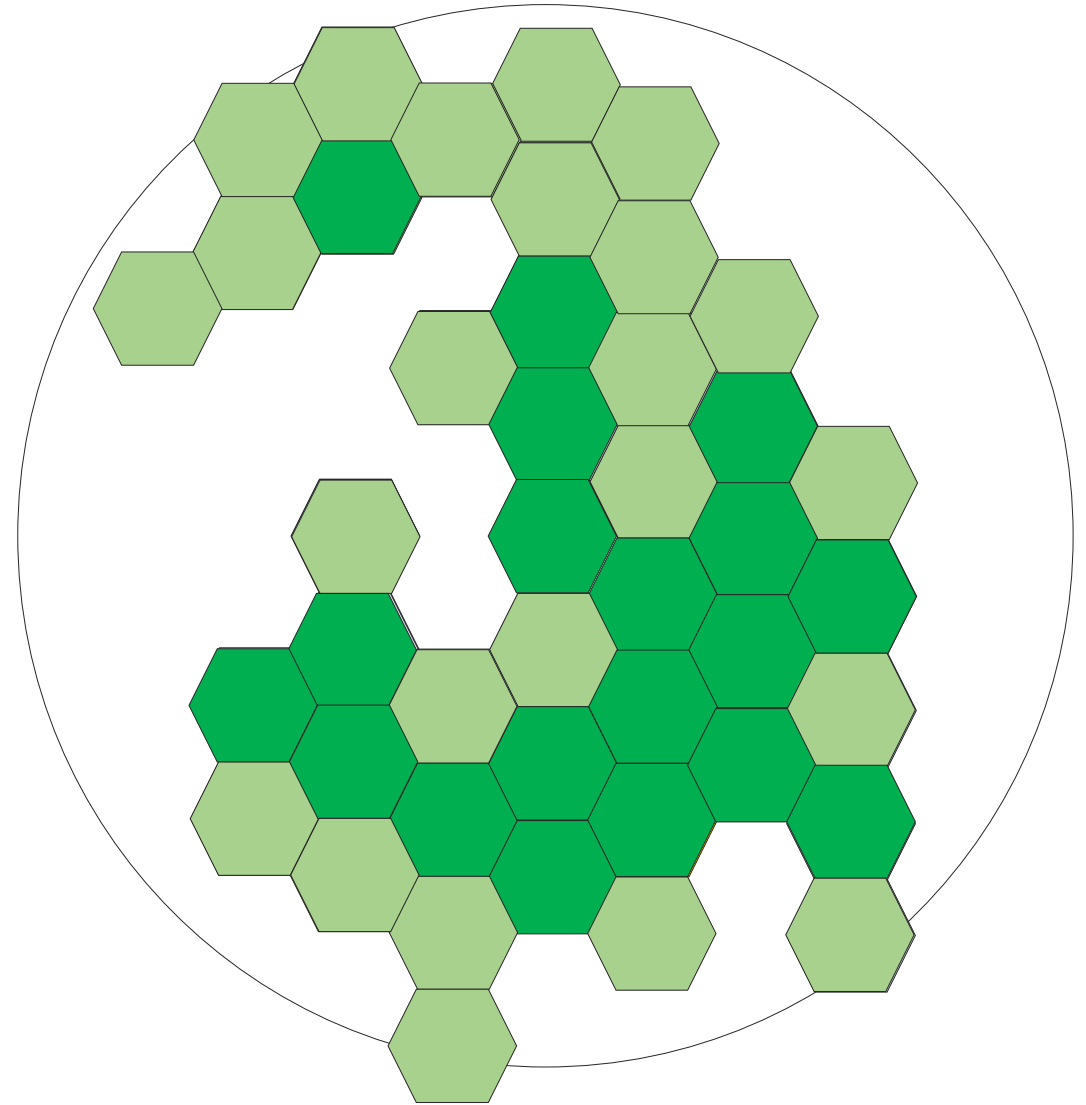
Where crowdsourcing data samples were detected (INCLUSION)

- Quality

Classified as Advanced, Basic, and Lower (TYPE OF SERVICES SUPPORTED)

- Competition Approach

Nb of Operators (AFFORDABILITY)

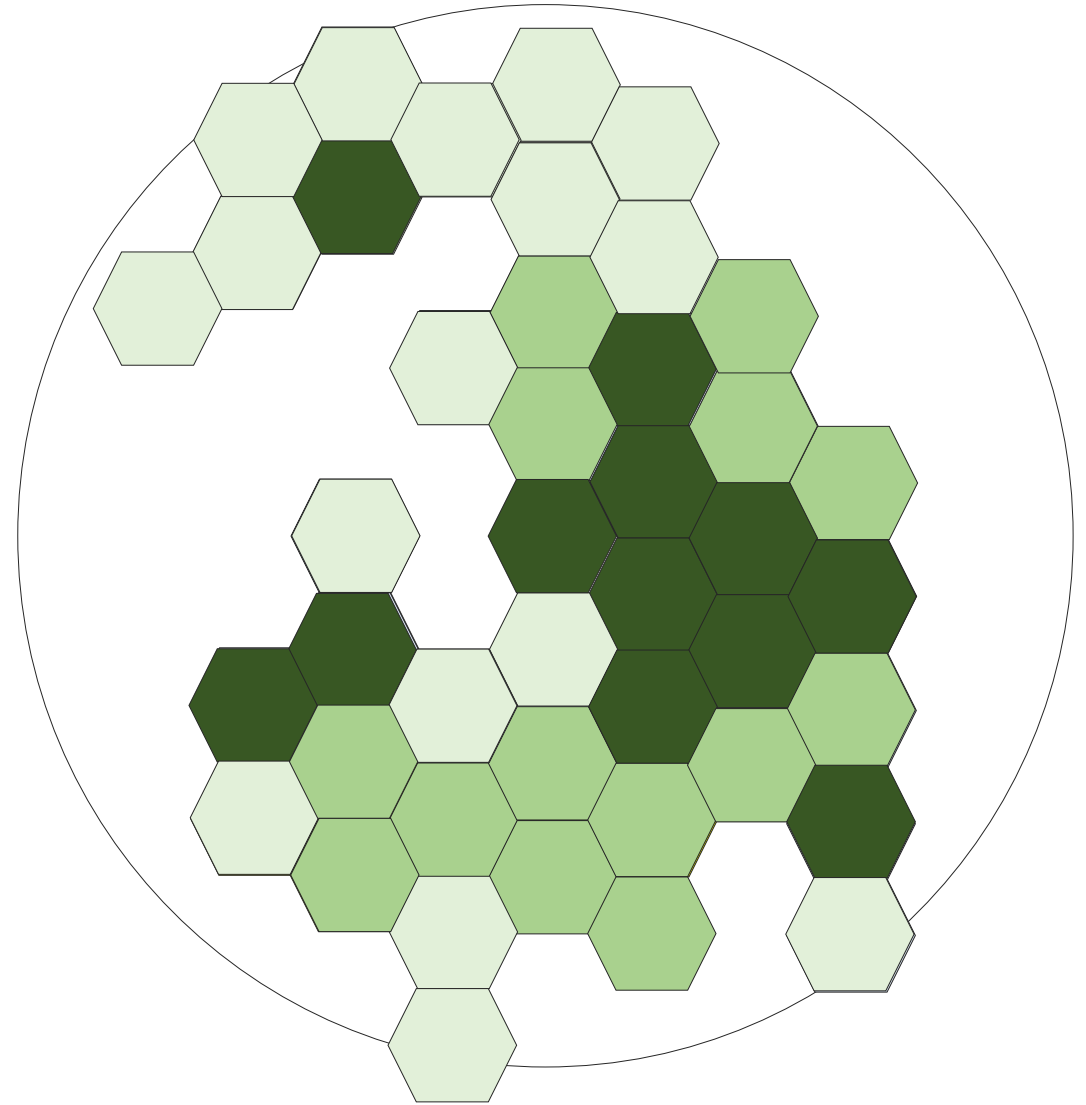
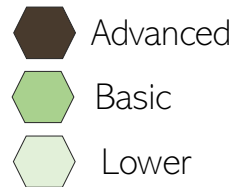


Using the same hexagonal georeference as the expected demand



# Connectivity Service Offer Estimation

- Coverage  
Where crowdsourcing data samples were detected (INCLUSION)
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Classified as Advanced, Basic, and Lower (TYPE OF SERVICES SUPPORTED)
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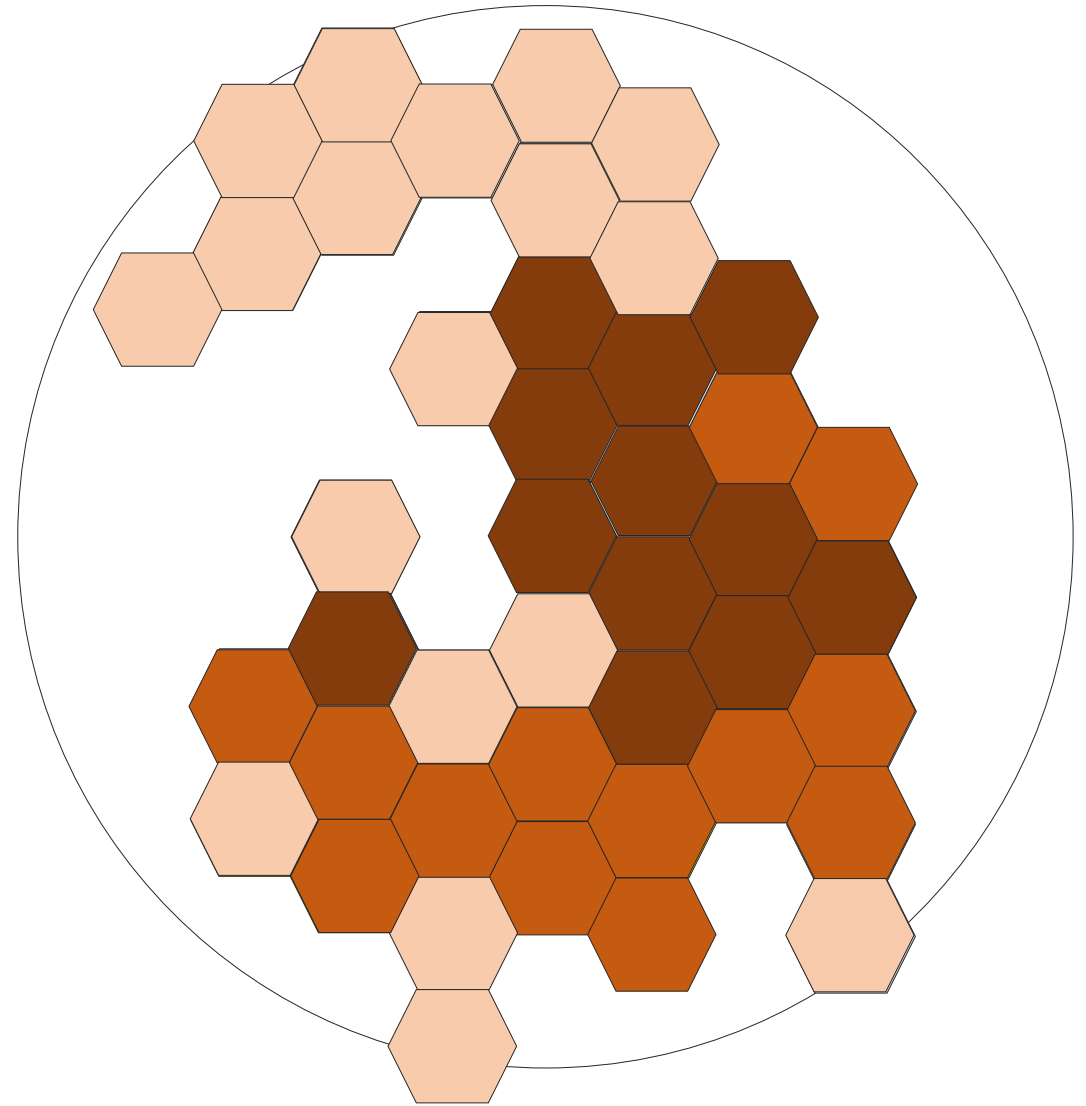
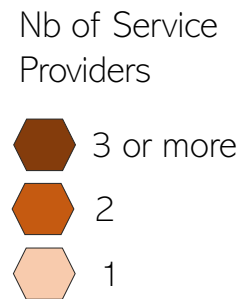


Using the same hexagonal georeference as the expected demand



# Connectivity Service Offer Estimation

- Coverage  
Where crowdsourcing data samples were detected (INCLUSION)
- Quality  
Classified as Advanced, Basic, and Lower (TYPE OF SERVICES SUPPORTED)
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Using the same hexagonal georeference as the expected demand





# Connectivity Service Offer Estimation

- **Coverage**

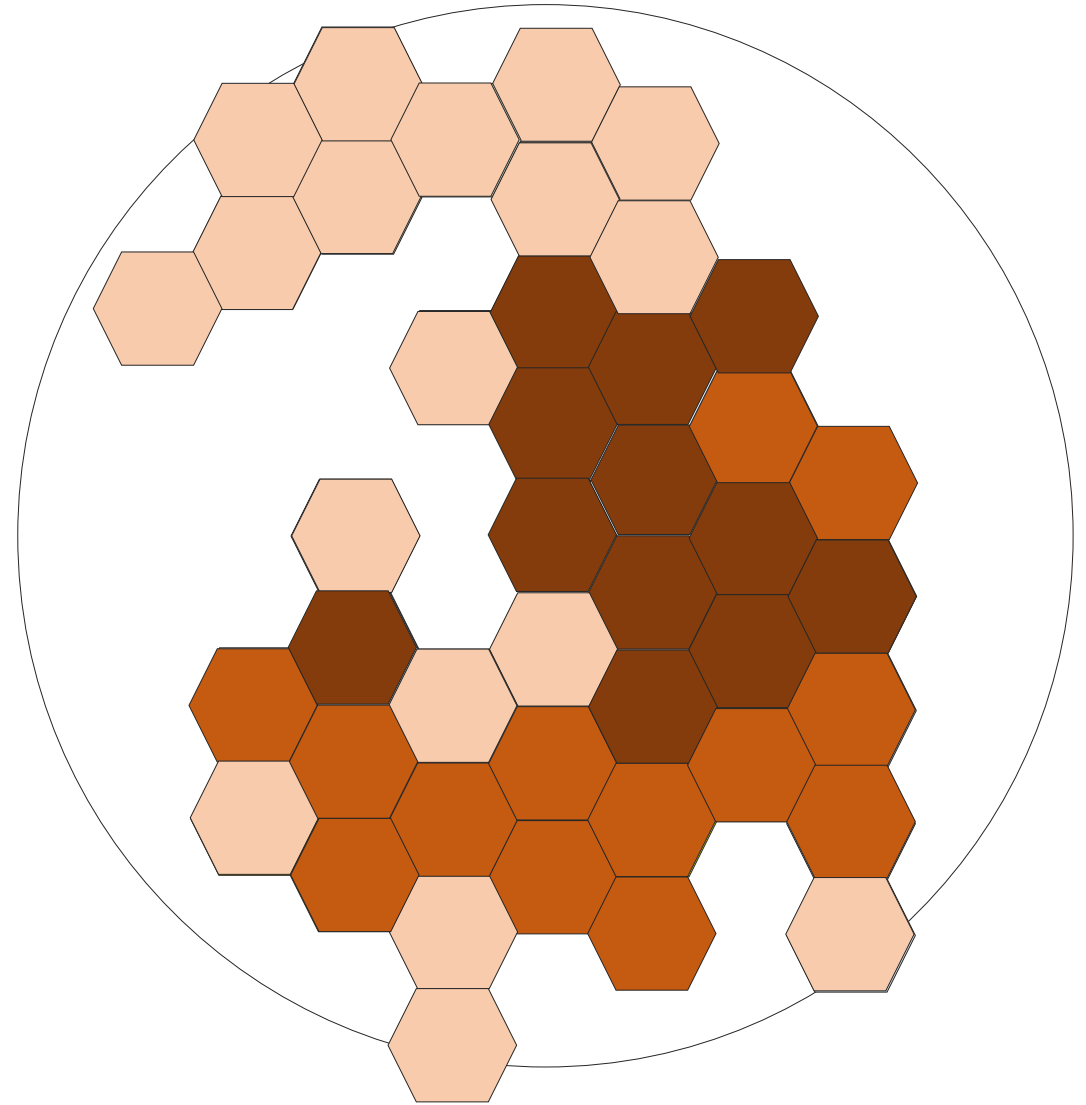
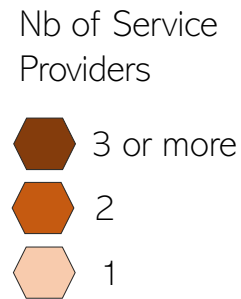
Where crowdsourcing data samples were detected (INCLUSION)

- **Quality**

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- **Competition Approach**

Nb of Operators (AFFORDABILITY)



Using the same hexagonal georeference as the expected demand



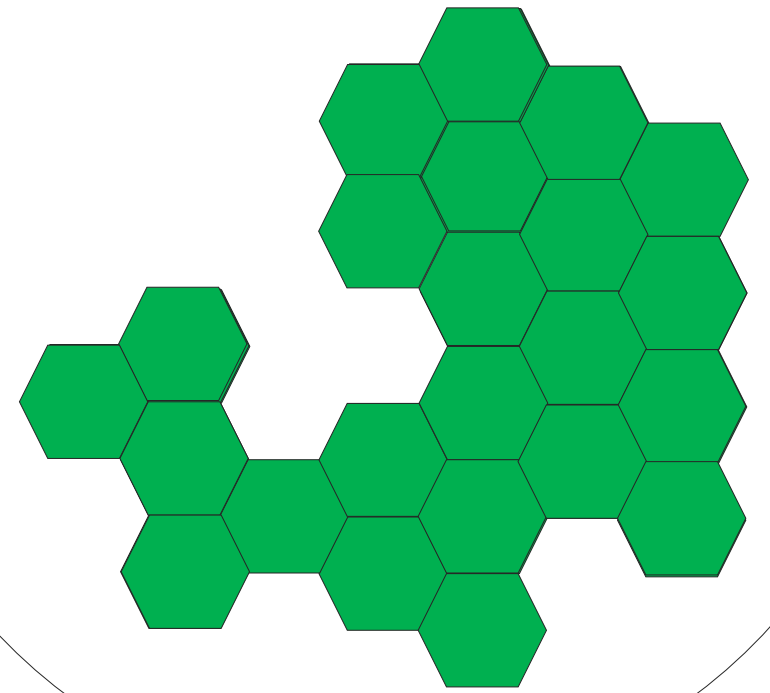
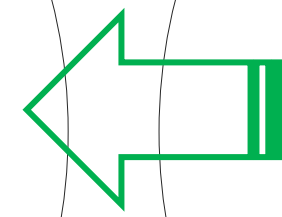
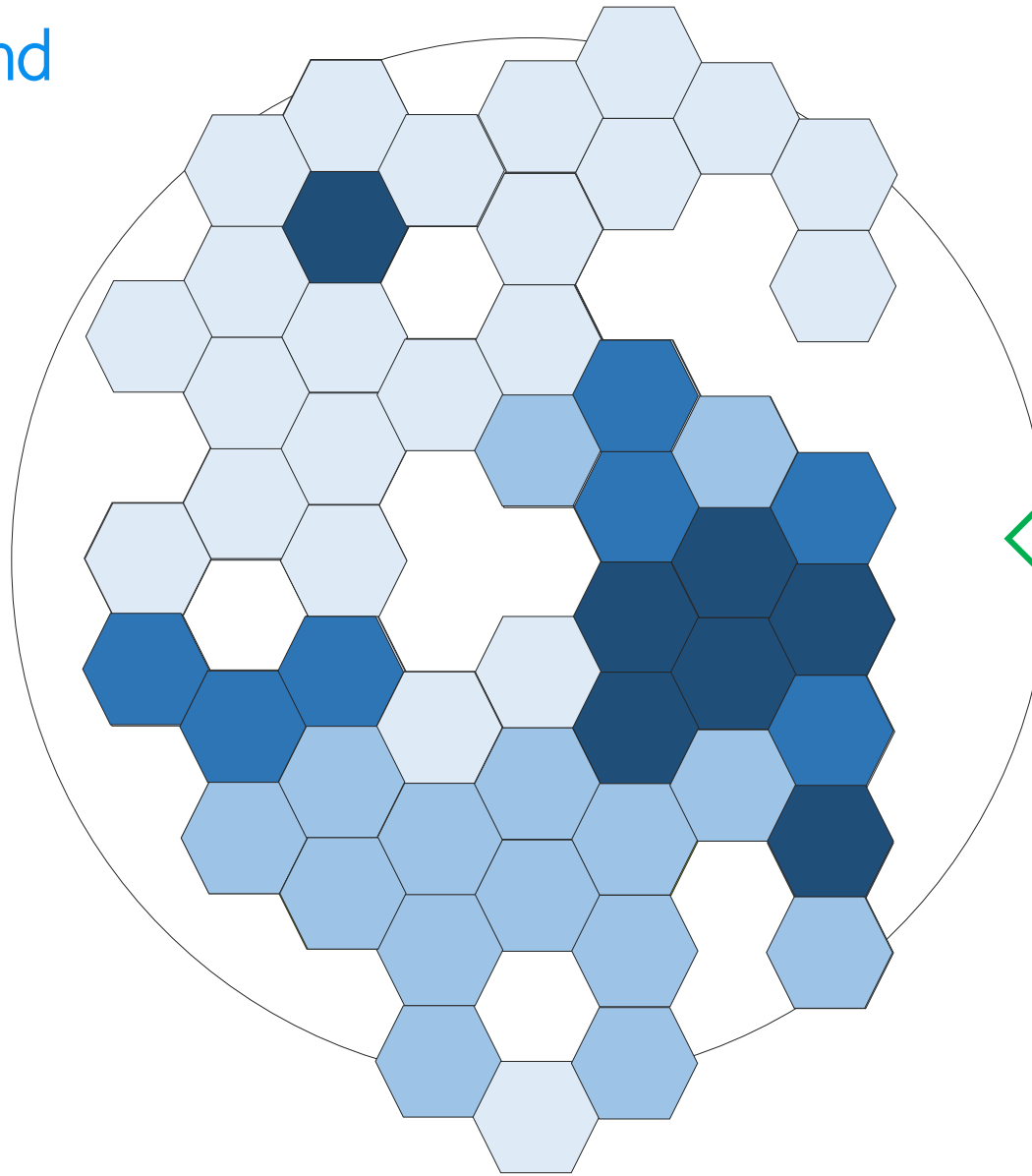
# How does the Connectivity Offer Fit the Demand?

Demand

Offer



- +High
- High
- Medium
- Low

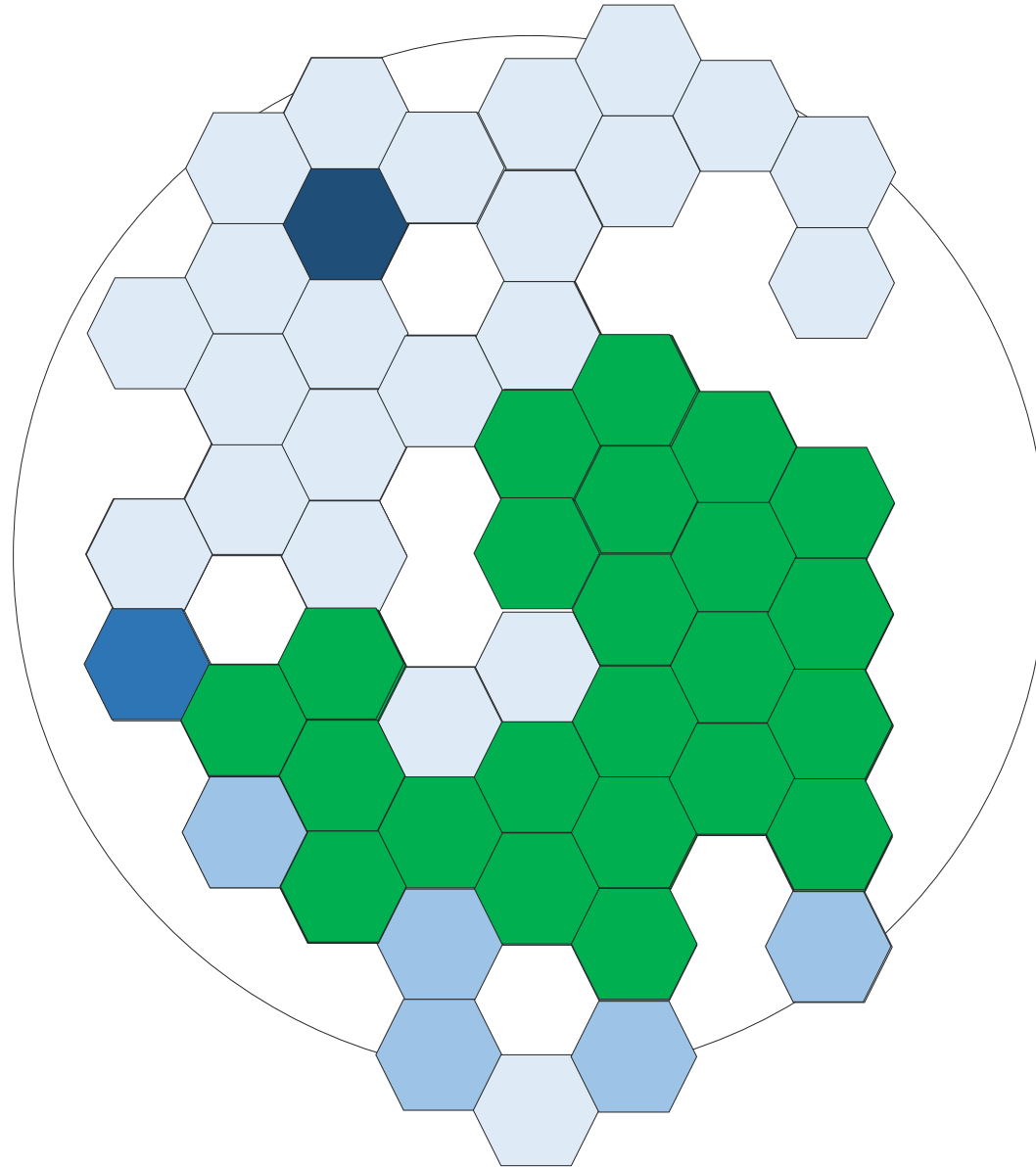
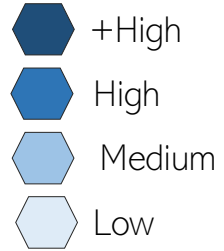


BB Service Available

# How does the Connectivity Offer Fit the Demand?

Unattended  
Demand

Broadband  
Service Offer

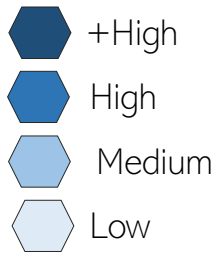


# Cost Estimations based on Deployment Plan, High-Level Design

## Deployment Priority



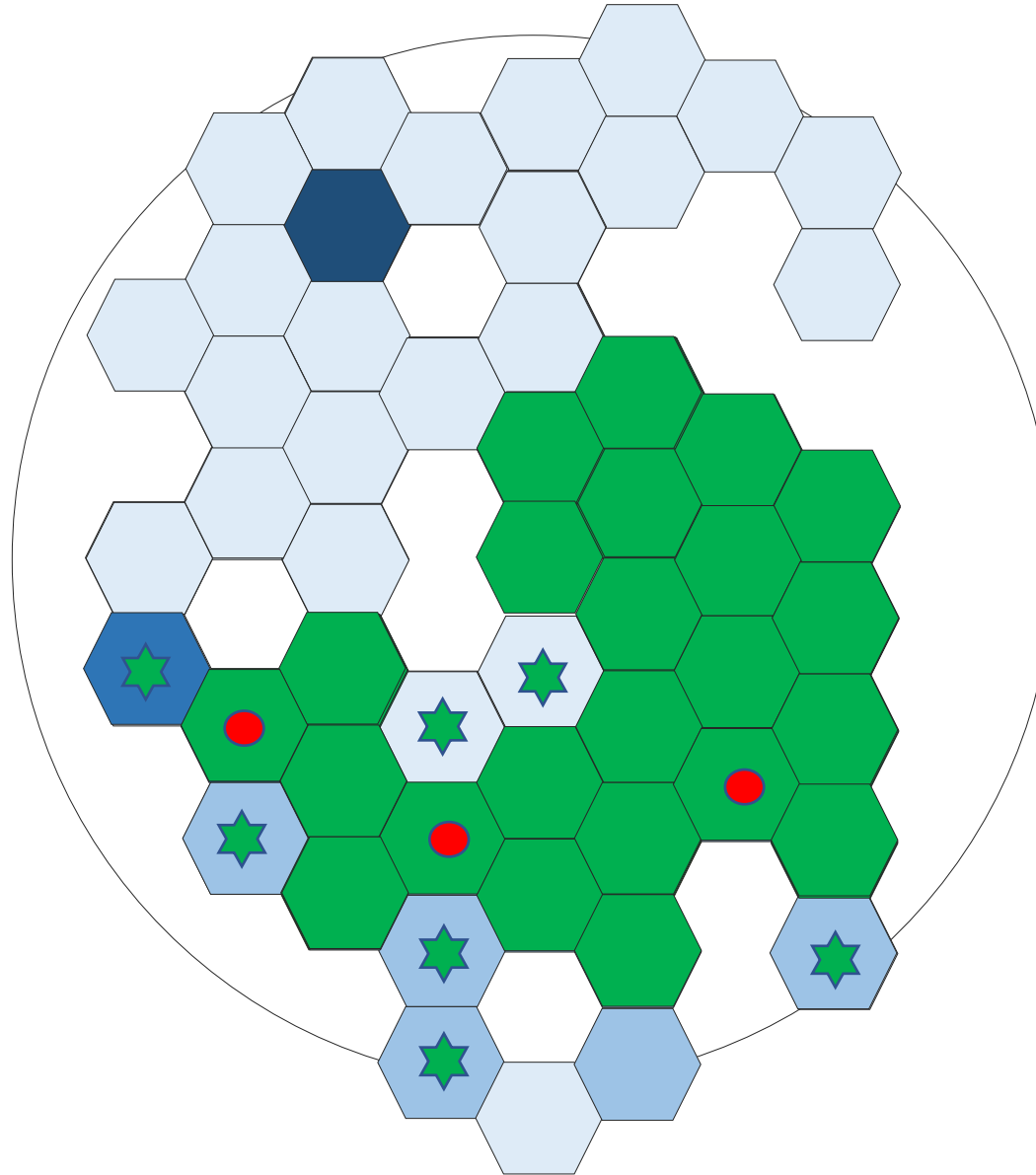
## Unattended Demand



## Broadband Service Offer



- Existing Infrastructure
- Points of Maximum Connectivity. (DEPLOYMENT)



## FINANCIAL ANALYSIS

**Considerations:**

- PMCs and Cluster Hubs are represented as points.
- Connections are represented as lines.

*This panel shows financial indicators obtained from Deloitte's model at PMC level and includes the most relevant figures at National and Regional level:*

Total CAPEX, OPEX and Revenues indicators represent the accumulated value considering the 20 years period of the project.



### Regional results (USD Millions)

**Nordeste**

Total CAPEX: **3.591,9**

Total OPEX: **1.722,9**

Total Revenues: **5.931,4**

Public Contribution: **2.446,9**

%Public Contribution: **68,1 %**

Financial Viability Factor: **1,17**

### State results (USD Millions)

**Alagoas**

Total CAPEX: **117,4**

Total OPEX: **53,5**

Total Revenues: **228,5**

Public Contribution: **69,6**

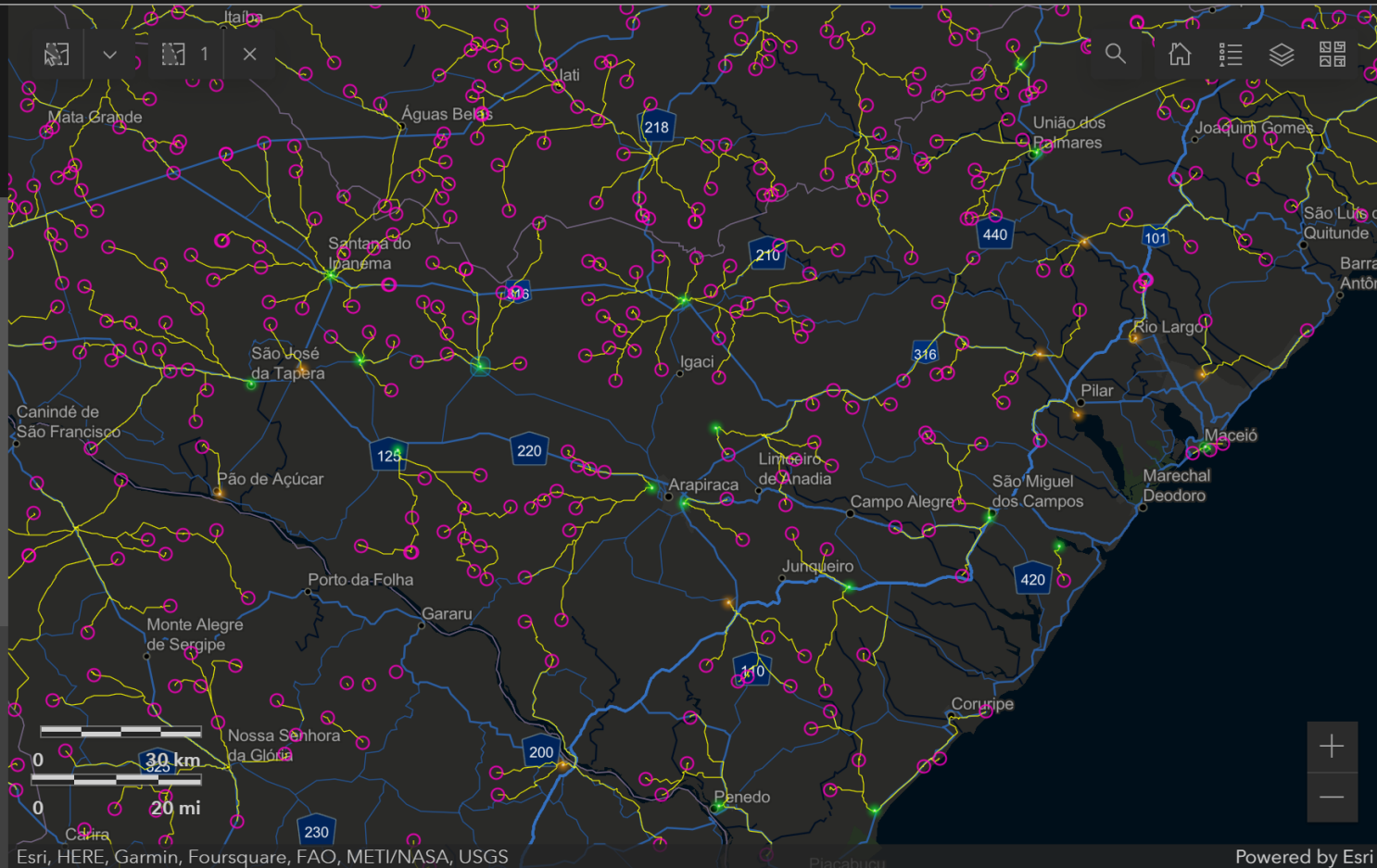
%Public Contribution: **59,2 %**

Financial Viability Factor: **1,49**

### PMC Results (CAPEX, OPEX and Revenues in USD Thousands)

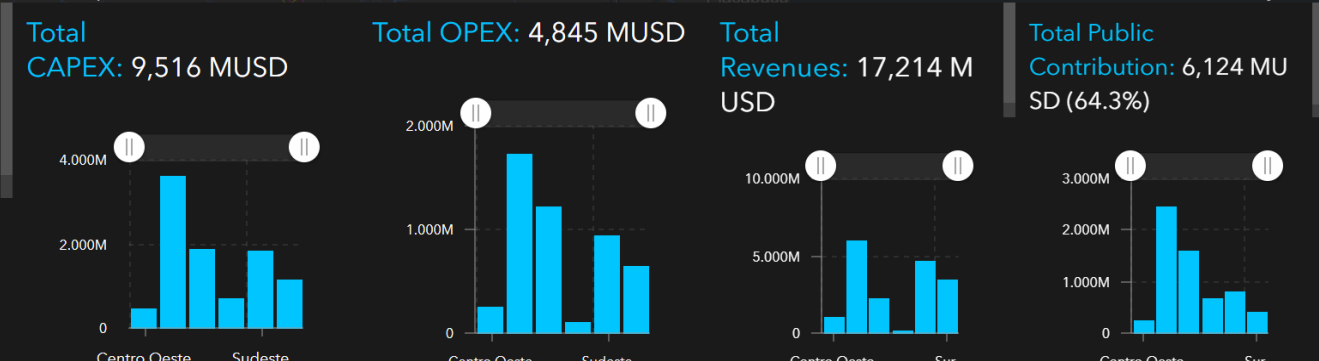
PMC ID: **2.138**

Regional Project:	Nordeste
State Project:	Alagoas
Population to cover:	10.922
Households to cover:	3.444
Nb of Schools to connect:	17
Nb of Hospitals to connect:	2
Nb of Students to connect:	1.930
Expected Fixed Subscribers:	466



Brazil nationwide results

**C2DB KEY NUMBERS**



# 2022 Key findings by C2DB



## 9.5 BUSD CAPEX

6.1 BUSD Public contribution

- 19.7 million people without broadband in 2020 (neither fixed nor mobile).
- Exercise focused on 15.8 million people, where the service would increase population coverage from 90.7% in 2020 to 98.2% in 2026, and it would increase the penetration of fixed broadband services by 1.9% and mobile by 1.3%.
- GDP increase: + 2.4%, in addition to connecting 3,771 health units and 21,230 public schools.

Brazil nationwide results  
**C2DB KEY NUMBERS**



### Current Coverage Figures:

- %Population covered: 90.7%

### C2DB Coverage Objectives:

- %Population covered: 98.2%

households

**5,1M**

to covered in C2DB

**70,9M**

total households

**16,7M**

households not covered

population

**15,9M**

to covered in C2DB

**211,8M**

total population

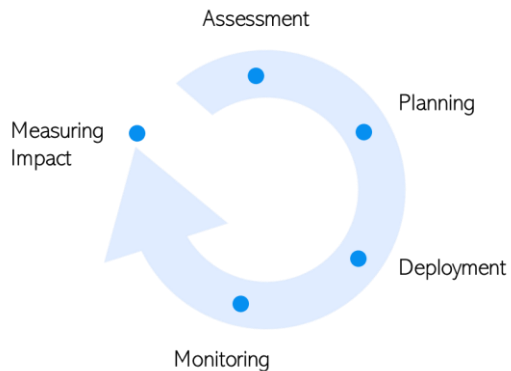
**19,7M**

population not covered





Provide **relevant**,  
**accurate**, and **timely**  
information for decision-  
making.



## Key challenges

experienced in the assessment and visualization of digital connectivity:

- **Big data processing**
- **Geographic representativeness**
- **Selection of the adequate visualization platform** based on the audience
- **Customizing dashboards**
- **Calculating the fiber routes**, microwave, and satellite links.





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**Gracias.**

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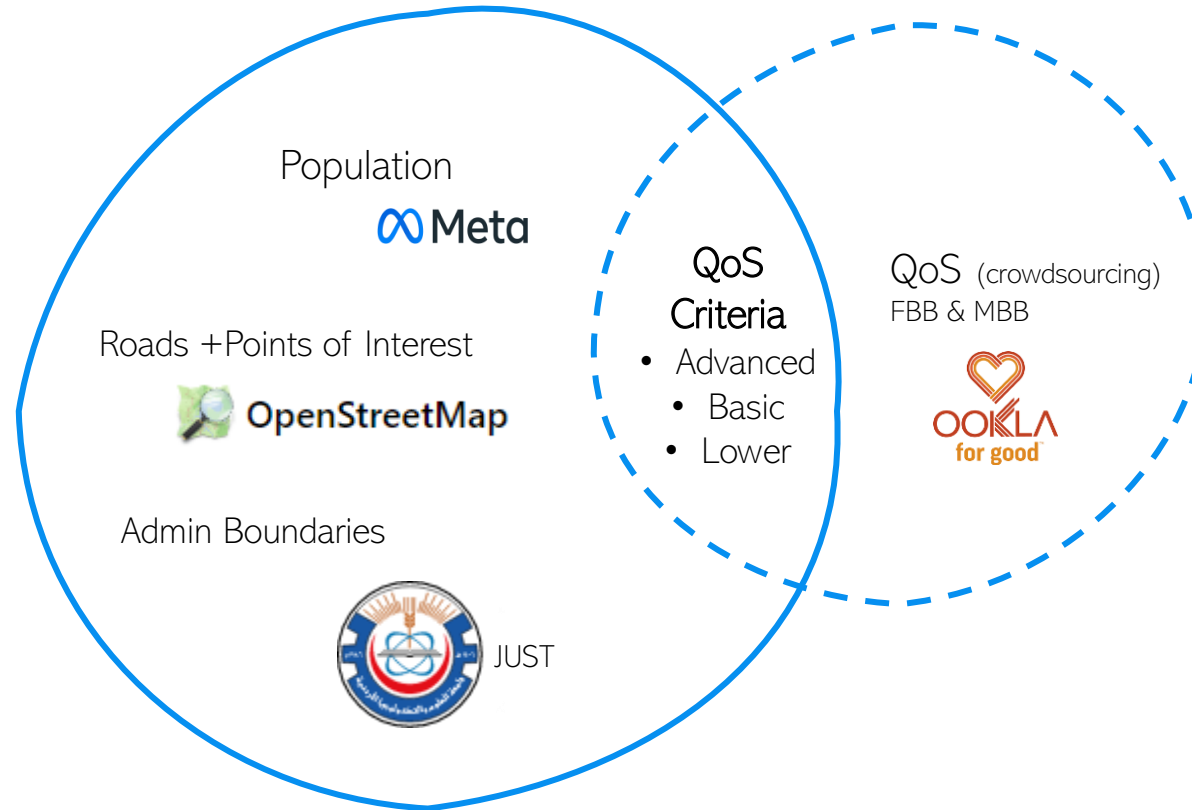


# Jordan Connectivity | A Basic Preliminary Assessment with Open Data Only

**Demand =**  
**Human Activity**

where people are:

- Living
- Working
- Studying
- Having fun
- Commuting
- Etc.



**Offer**  
**= Quality**

parameters:

- DL t'put
- UL t'put
- Latency
- Nb of samples

# Open data Used



Official Data

updated roads collaborative granularity quality volume

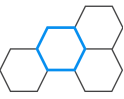
Open Data



		OpenStreetMap 	 	 	 
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Licensed Data

# Splitting Territory into Cells

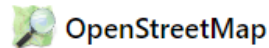


Aggregating parameters

- Population (points)



- Roads (lines) + Pol (points)



- Admin Boundaries (polygons)

JUST



- QoS (crowdsourcing)

FBB & MBB (tiles)



Using Open Data Only





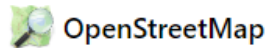
# Splitting Territory into Cells

## Aggregating parameters **POPULATION**

- Population (points)



- Roads (lines) + Pol (points)

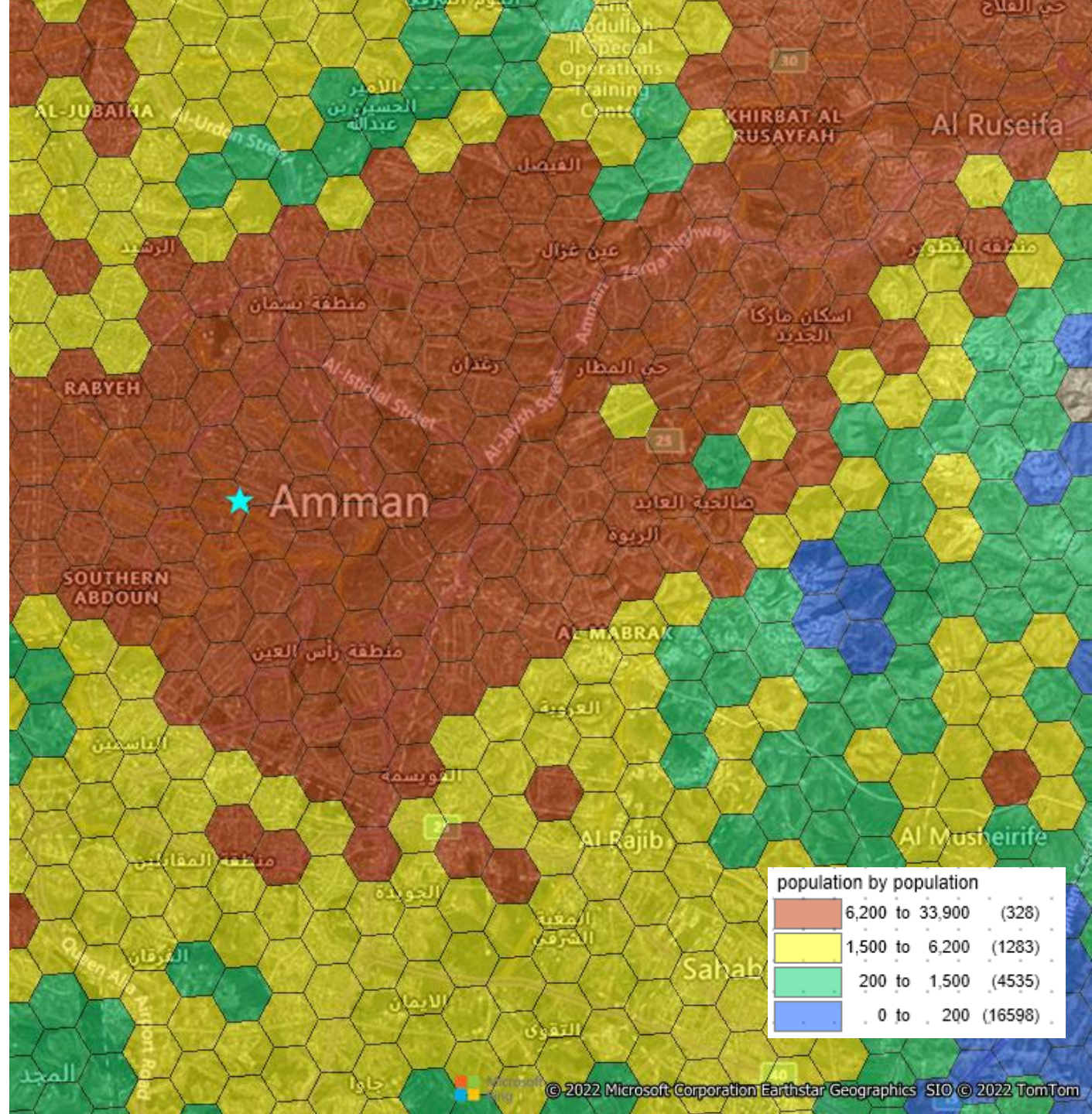


- Admin Boundaries (polygons)



- QoS (crowdsourcing)

FBB & MBB (tiles)





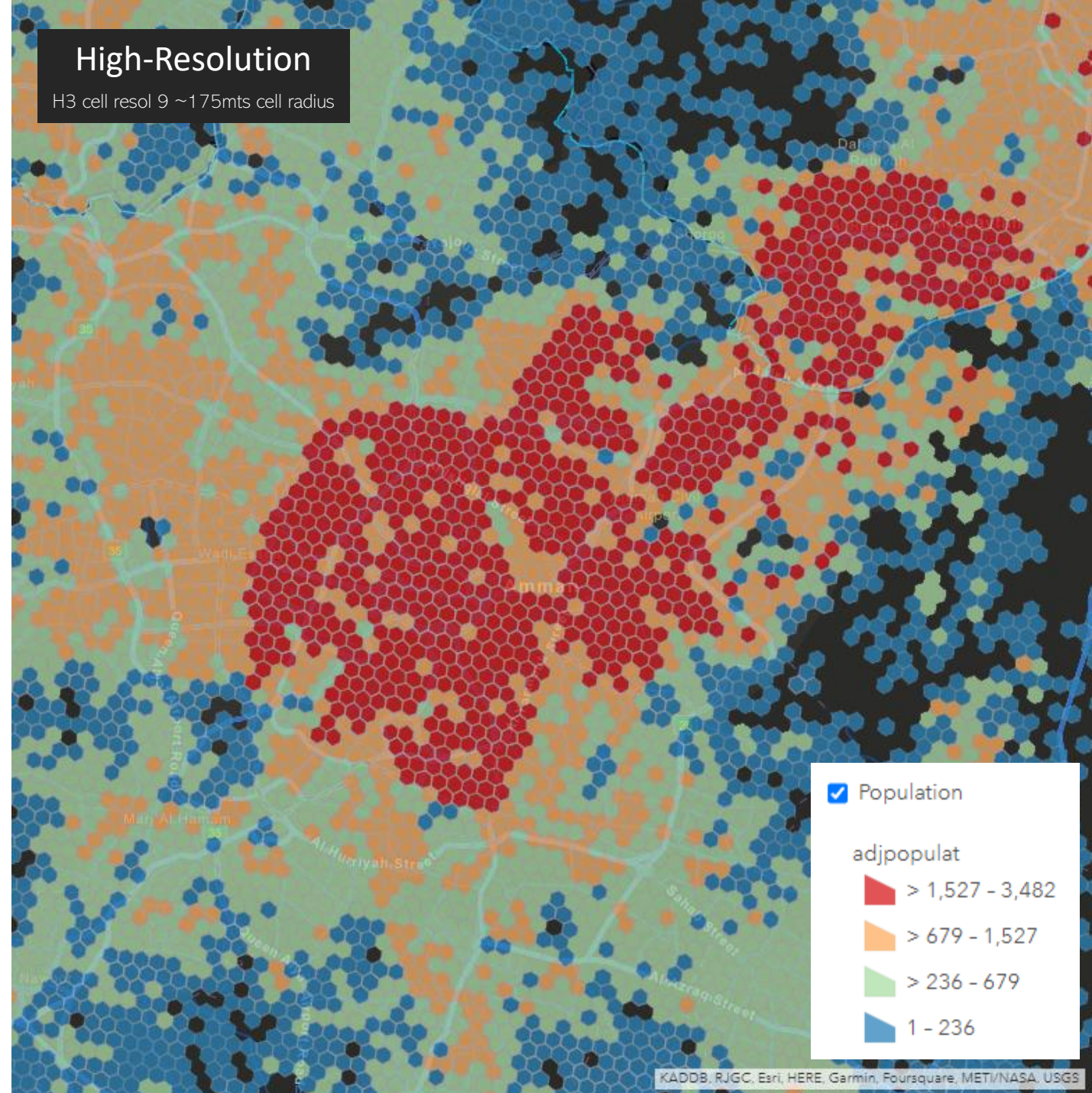
# Splitting Territory into Cells

## Aggregating parameters **POPULATION**

- Population (points)  
Meta
- Roads (lines) + Pol (points)  
OpenStreetMap
- Admin Boundaries (polygons)  
JUST
- QoS (crowdsourcing)  
FBB & MBB (tiles)  
OOKLA for good

### High-Resolution

H3 cell resol 9 ~175mts cell radius





# Splitting Territory into Cells

## Aggregating Parameters **FBB DL T'put** (kbps)



- Population (points)  
Meta
- Roads (lines) + Pol (points)  
OpenStreetMap
- Admin Boundaries (polygons)  
JUST
- QoS (crowdsourcing)  
FBB & MBB (tiles)  
OOKLA for good

