



# World Data Lab

International Workshop on Data  
Disaggregation for the SDGs



# What we do

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We specialize in developing granular **economic and demographic forecasts** for every country and any point in time.





## HOMI KHARAS

WDL CO-FOUNDER & LEAD ECONOMIST

“we need to harness the transformative power of the data revolution.”

WDLco-founder, Homi Kharas is a Senior Fellow and Deputy Director in the Global Economy and Development program at the Brookings Institution in Washington D.C. He has served as the **lead author and executive secretary** supporting the High Level Panel for the U.N. Secretary General regarding the post-2015 development agenda.

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BROOKINGS

# Expanding Global Network



# New Approach to data modeling

	Traditional approach	World Data Lab approach
Timeliness	4 years old (narrative of rapid poverty reduction)	Real-time (poverty in 2016 may have increased)
Direction of analysis	Past (Stating the obvious)	Present and Future (focus on progress and benchmarking against needs)
Unit of analysis	Percentages	Actuals
Modelling	Economic, mainly linear	Integrated economic, demographic, climate in consistent shared socio-economic pathways (SSPs)
Communication	General messages for a small number of experts	Focus on raising awareness at global level and sub-national data for policy makers in countries
Illustration	<i>[In Mali] "between 2001 and 2010, GDP growth averaged 5.7% per year. During the period, the GINI index fell 7 points. The income of the bottom 40 grew, while the mean contracted."</i> (World Bank, GMR 2016)	<i>Today, Kenya has 11.1M poor people. If Kenya keeps reducing poverty at the expected rate, there will be 5.0M Kenyans in extreme poverty in 2030. It needs to double the rate of poverty reduction.</i>

# WDL IN THE PRESS

WorldViews Analysis **The Washington Post**  
**India is no longer home to the largest number of poor people in the world. Nigeria is.**  
By Joanna Slater July 11 | 8:24 PM | Email the author



The Brookings report was based on estimates generated by the World Poverty Clock, a model created to track progress against poverty in real time. As of Monday, its figures showed that India had

FT Series Millennials + Add to myFT  
**The millennial moment – in charts**  
A quarter of the world's population are millennials. What does data tell us about them?

### Why the 'millennial moment' matters

While it is difficult to estimate the total income of millennials compared with other generations, using income and demographic modelling, the World Data Lab forecasts that the global spending power of millennials will soon be greater than any other generation. As the principal consumer generation, they are set

### Arriving at the millennial moment

Global population by age and sex (millions)



A woman carries her baby at a traffic signal as she asks for alms from motorists in New Delhi in 2012. A signetia has surpassed India as the country with the largest number of people living in extreme poverty (AP)

It is that no country wants: India remained stubbornly against poverty.



India's increasing wealth means it now has fewer people in extreme poverty than Nigeria. It's a product of years of agricultural reform. The World Poverty Clock's Kristofer Hamel talks to Caroline Wyatt. (Picture: Man holding Indian rupee notes. Credit: Getty Creative Stock)

### Why India has more of this

India's increasing wealth means it now has fewer people in extreme poverty than Nigeria. It's a product of years of agricultural reform. The World Poverty Clock's Kristofer Hamel talks to Caroline Wyatt. (Picture: Man holding Indian rupee notes. Credit: Getty Creative Stock)



Columnists **So, Nigeria is world's poverty capital?**  
By Zeyad Mubhammad 23 July 2018 | 3:34 am  
The Guardian



According to a report by the Brookings Institution, data from the World Poverty Clock.

The Brookings report was based on estimates generated by the World Poverty Clock, a model created to track progress against poverty in real time. As of Monday, its figures showed that India had

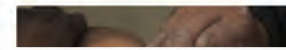
The number of people living in poverty has increased due to rising disparities in the distribution of resources in the country. However, the basic cause of poverty in Nigeria is the absence of an enabling environment that will free the people from the prison of poverty, uplift their living standard and provide ways to assist them, turn their dreams into reality. It is a fact that the primary factors that lead to poverty, such as overpopulation, unequal distribution of resources, lack of basic education, absence of employment opportunities, as well as environmental degradation, are quite intractable and not easily eradicated. But the average Nigerian's living standard can improve once the routes to achieving basic living conditions are smoothed. Who should create these

## THE WALL STREET JOURNAL

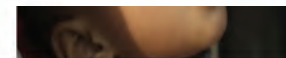
ECONOMY | CAPITAL ACCOUNT

### The World Is Getting Quietly, Relentlessly Better

If we can solve global poverty, we can solve other problems like climate change



Allow this growth to continue long enough, and something else momentous happens. As of September, more than half the world—3.8 billion people—are middle-class or rich, Homi Kharas of the Brookings Institution and Kristofer Hamel of World Data Lab found. They define middle class as consuming between \$11 and \$10 a day, in 2011 dollars adjusted for varying costs between countries. At this level, households devote ever more of their incomes to discretionary items such as motorcycles, refrigerators, movies or vacations.



A child in Karachi, Pakistan, is administered a polio vaccine on Dec. 11, part of a new drive against the disease. PHOTO: SHAKIL ADIL/ASSOCIATED PRESS



By Greg Ip  
Jan. 2, 2019 7:00 a.m. ET

# Funders



Asian Development Bank



European Space Agency



# Partners



# World Poverty Clock

## Survey-based poverty modeling

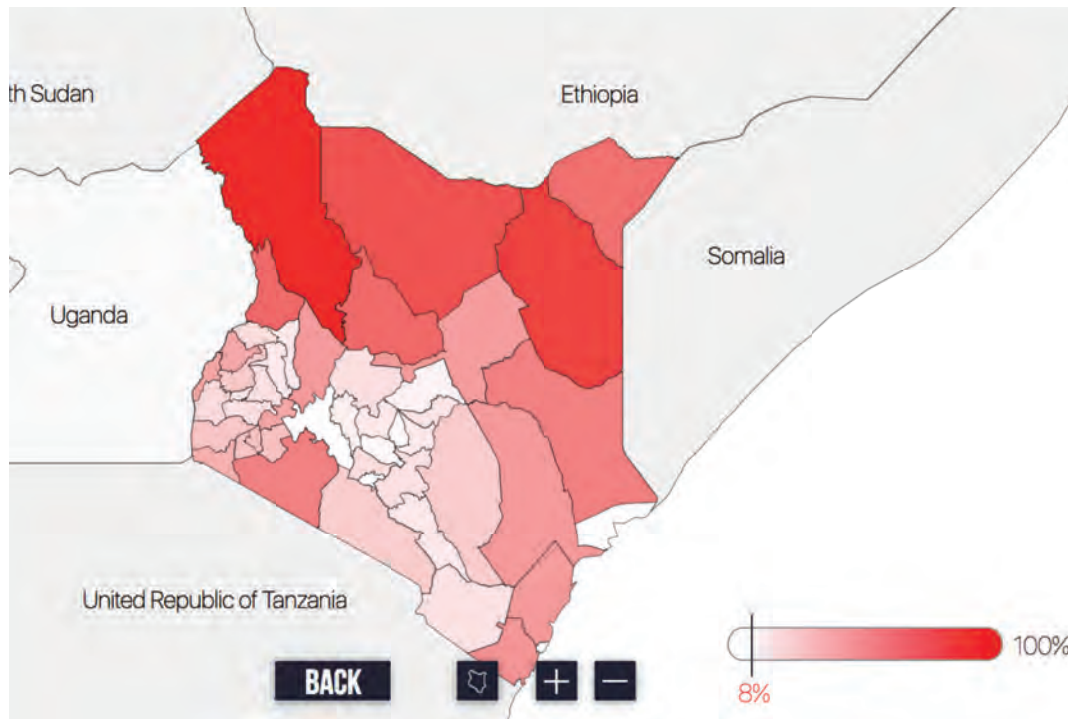
- The World Poverty Clock (WPC) is a global model that tracks poverty in real time.
- This tool measures how well countries are progressing toward SDG 1
- The WPC tool covers 99.7 percent of the world population.
- Peer-reviewed and published methodology on *Nature's* website





# Subnational Modeling

## KENYA



- WDL has developed the first ever, real-time subnational income model that monitors poverty dynamics for all 47 counties of Kenya.
- The model includes numbers for every year until 2030.
- With this tool you can track each region's performance towards SDG 1.



# World Poverty Clock

## Upgrades in 2019

Disaggregation of poverty headcounts by several additional dimensions:

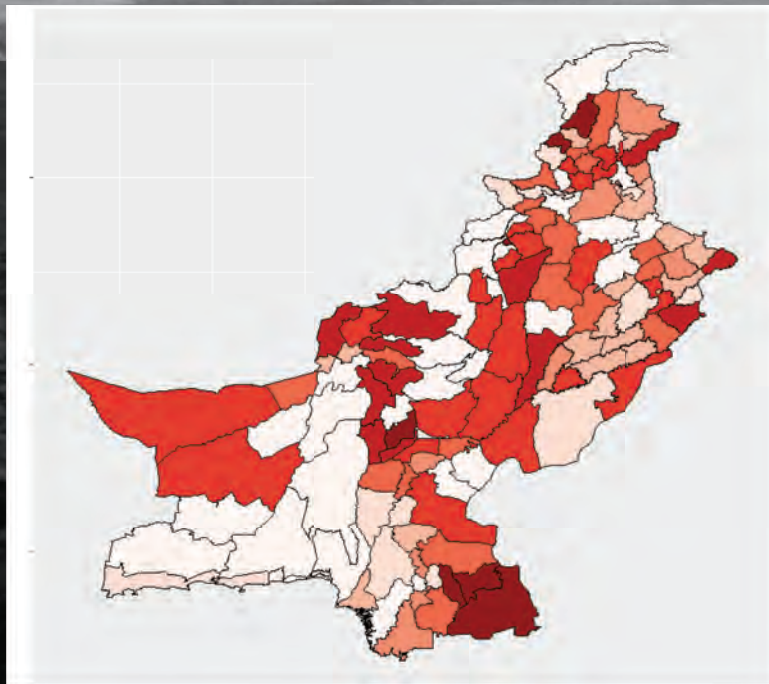
- Gender
- Age
- Rural / Urban

“How many girls live in extreme poverty in rural Niger?”

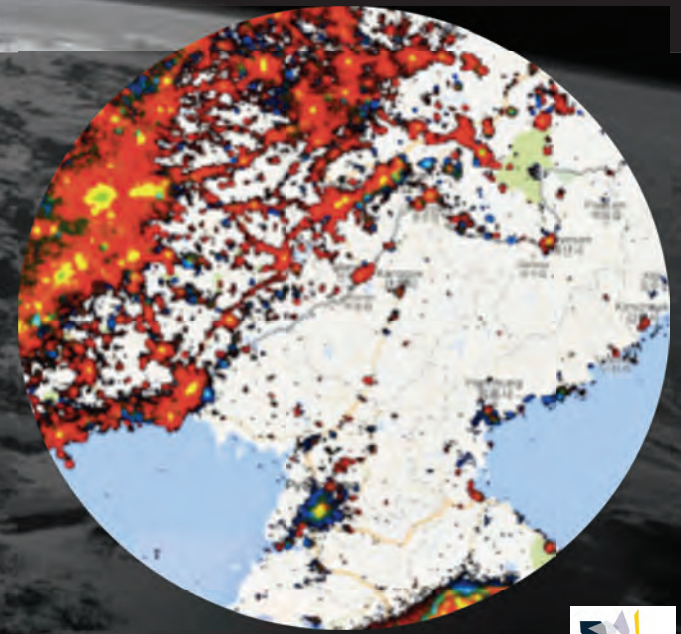


## Hybrid Projects:

“Nightlights” can improve subnational econometric models



Pakistan



North Korea

An aerial photograph of a city at dusk or dawn, showing a mix of high-rise buildings and dense residential areas. A large, dark, semi-transparent circle is centered over the image, partially obscuring the cityscape. The text 'Spatial Demography' is overlaid in white on the circle.

# Spatial Demography



# Spatial Demography

Spatial demography is based on

- new types of geospatial data, and
- advanced methods and technologies.

Spatial demography creates

- new insights into demographic processes, and
- demographic information at an unprecedented level of granularity.

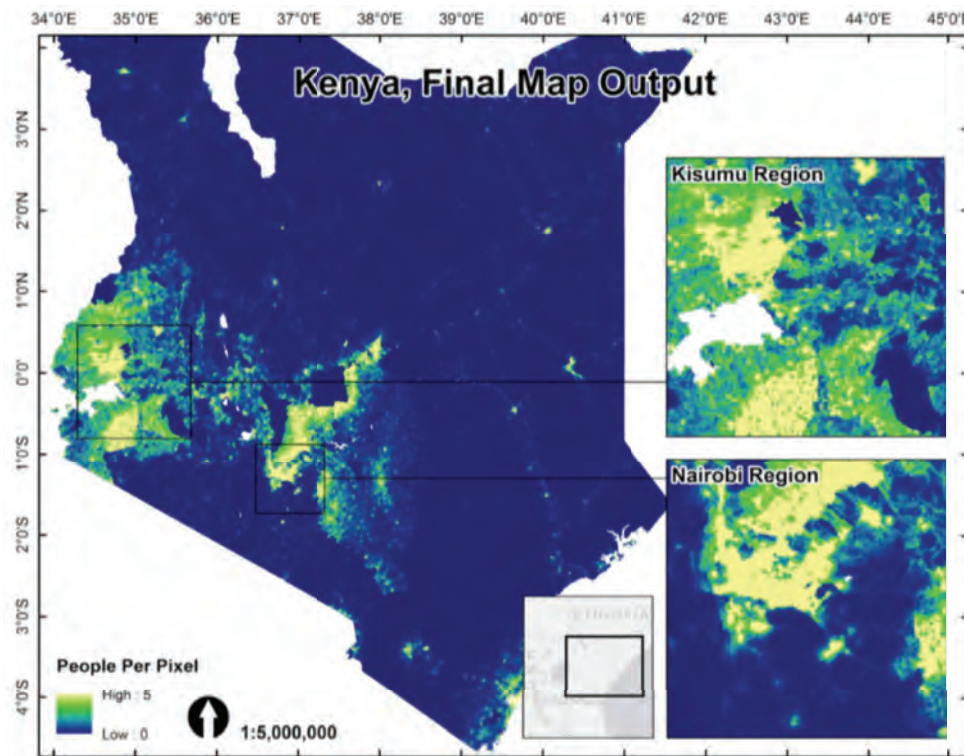
# Spatial Demography: Population Mapping



- Create population estimate and forecasts at the 100 x 100 sqm level for Thailand and Philippines
- Method:
  - Create a Random Forest of decision trees (each of which only considers random subsets of covariates and input data)
  - Conduct a covariate selection process
  - Use refined Random Forest to predict population densities
  - Average over estimates of individual trees
  - Obtain robust grid-level results
- Large set of input data: census, landcover, night lights, climatic spatial variation, human presence on landscape

# Example: Results

National-scale population data on 100 by 100 meters grid-level



# Applications

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## Survey support

- Validate/benchmark census and other results
- Gap filling for difficult coverage areas

## Planning and policy development:

- Forecast key elements of a population (growth)
- Model humans / environment interactions
- Estimate other characteristics (health)





# Spatial Demography: AgeSpot

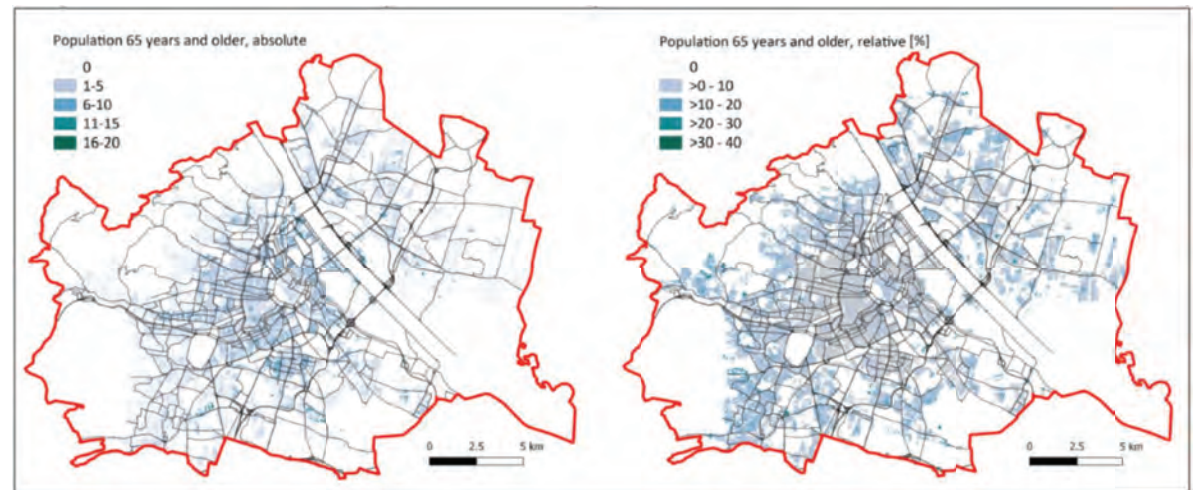
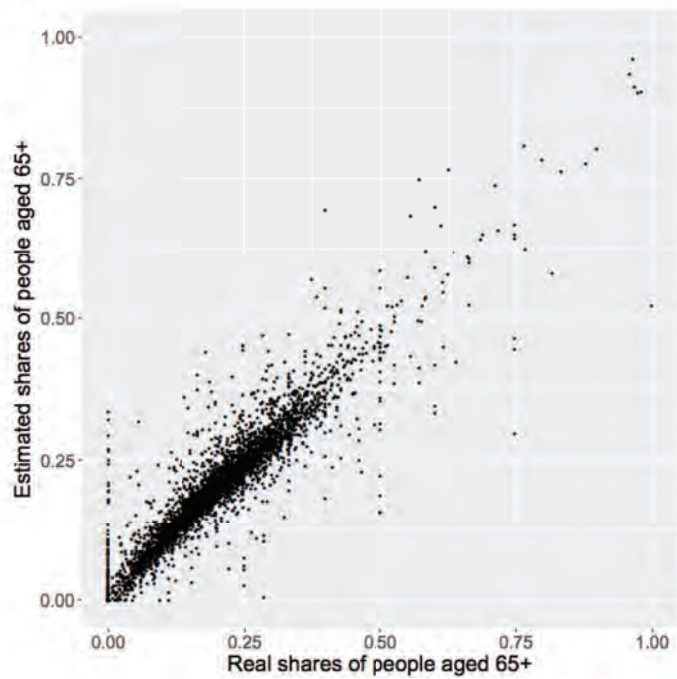


Estimate number of people by age group on a granular level (up to 50 by 50 meter grids)

## Methodology:

- Bayesian Model Averaging to estimate shares of age groups
- Urban Growth Model to forecast population density

# AgeSpot



# AgeSpot



City View: Modelled ages  
2015

The screenshot shows the 'fortuna' website with the tagline 'LEBEN IST MEHR ALS NUR WOHNEN'. The navigation menu includes 'HAUSER', 'LEISTUNGEN', 'FORTUNA ERLEBEN', 'LEBEN (U)P-LEBEN', and 'WISSENDWERTES'. The main content area is titled 'Home > Leistungen' and features a photograph of a caregiver assisting an elderly couple. Below the photo, there are three service categories: 'AKTIVES WOHNEN', 'BETREUTES WOHNEN', and 'STATIONARES WOHNEN'. A 'LEISTUNGEN' section highlights 'Aktives Wohnen: SELBSTÄNDIG LEBEN, AUF DIE GEMEINSCHAFT VERTRAUEN' with a small image of two elderly people.



# Applications

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- Adolescent modeling
- Workforce policy planning
- Elderly services planning



# Applications

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## Health Center Modeling

Concept: Develop a model to estimate the expected/optimal location for health centers at a highly granular level.

Approach: Use a variety of inputs (survey input, OpenStreetMap, land-use data and satellite imagery) to model where health centers are most often situated in a given context and to then predict where they could be expected to exist but currently do not



# Neural Networks: Poverty mapping:



Develop "village-level" poverty estimates and forecasts for Philippines and Thailand.

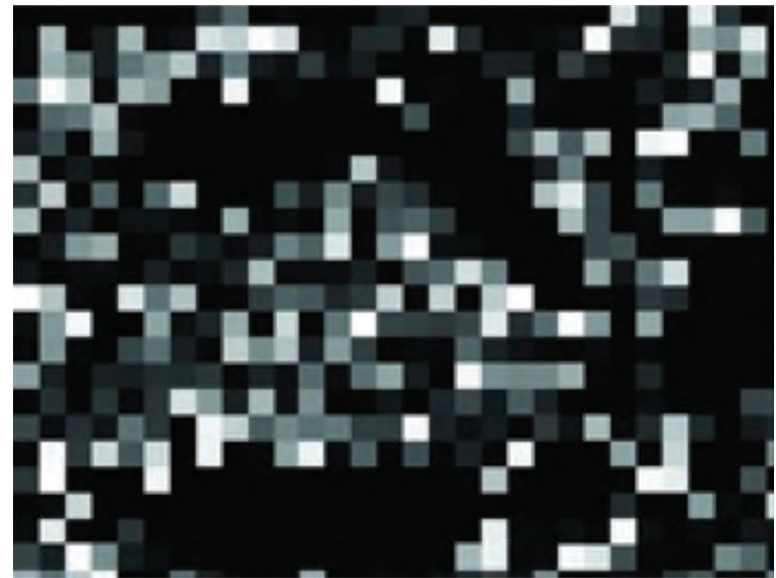
In addition to poverty/income, experiment with modeling and mapping other related variables as well (such as unemployment).

# Neural Networks: Poverty mapping:



- There is a clear relationship between nighttime luminosity data and wealth
- Difficult to distinguish between poor, densely populated and wealthy areas
- Difficult to distinguish differences in economic activity in areas with populations earning less than \$1.90 a day

Which place is poorer?







Which place is poorer?



Daylight images



Nightlights



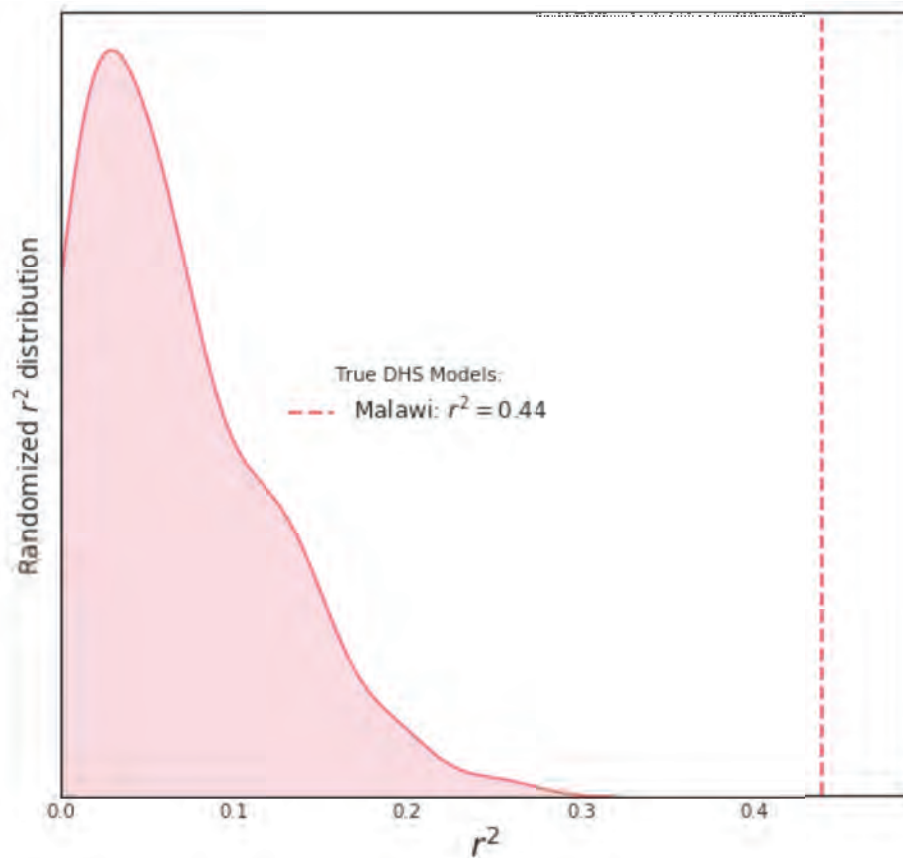
Pattern  
recognition



*Science, 2016*

# Pilot project: Malawi

Method will improve with 10x more images



# Applications

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- Development policy planning
- Development policy evaluation



# Applications

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## Inequity Mapping

Concept: Estimate inequality at the village level.

Approach: We would use Beta-Lorenz curves to separate the shape and scale of the income distributions as well as Convergence Modeling techniques to forecast mean income/consumption.





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