Small Area Estimation of Poverty through Non-conventional Data

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Poverty Monitoring in Bangladesh

Direct Estimation

Household Income and Expenditure Survey up to Division level:

- To Measure the Poverty Situation of a Country
- To know about the household income, expenditure and consumption status

Poverty and Extreme Poverty Headcount rates (%), 2000 to 2016

- Poverty Headcount Rate
- Extreme Poverty Headcount Rate

Data sources and methodological notes on the estimations are given in the Annex of the report. The survey is conducted by the Bangladesh Bureau of Statistics under the Ministry of Planning of the Government of Bangladesh (GoB) with the technical support of the United Nations Development Programme (UNDP) and the World Bank.
Poverty Monitoring in Bangladesh

Indirect Estimations

Small Area Estimation:

❖ Due to the limited sample size in HIES it can’t produce reliable estimates beyond Division/District level.

❖ Demand from planners, policymakers and other users for more disaggregated level poverty estimates are increasing day by day.

❖ World Bank Method (Elbers, Lanjouw and Lanjouw, 2003)

Growth Elasticity of Poverty (GEP):

❖ For National estimate of poverty, BBS projects the national level poverty rate following Growth Elasticity of Poverty for the interval years of HIES.
Global Partnership for Sustainable Development Data
The project manager and expert broker

The World Bank
The technical trainer with the ability to work at scale

UN Statistics Division
The facilitator to national data systems and statistics offices

SDSN TReNDS
The academic powerhouse with global and local networks

DATA FOR NOW

2019
AGGREGATION:
BUILDING POLITICAL SUPPORT AND MOMENTUM

2020-21
AMPLIFICATION:
IN-DEPTH BROKERING, EMPOWERING PARTNERSHIPS AND SCALING INITIATIVES

2022-23
SCALE-UP:
WIDESPREAD RESULTS, DEMONSTRATION OF IMPACT AND EXPANSION
### The Data for Now initiative at a Glance

<table>
<thead>
<tr>
<th><strong>Supports countries in the use of innovative sources, technologies and methods</strong> for the streamlined production and dissemination of better, more timely and disaggregated data for sustainable development.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Is co-led by the United Nations Statistics Division, the World Bank, the Global Partnership for Sustainable Development Data, and the Sustainable Development Solutions Network</strong></td>
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<tr>
<td><strong>Bangladesh</strong>, Nepal, Mongolia, Paraguay, Colombia, Ghana, Rwanda and Senegal joined the initiative in September 2019</td>
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<td><strong>Bangladesh Bureau of Statistics (BBS) is the lead of the project at the national level, with the active participation and engagement of National and international Stakeholders, such as: Aspire to Innovate (a2i), Poverty estimation Working Group, UN Data Group, UNRCO</strong></td>
</tr>
</tbody>
</table>
Composition of Working Team of Poverty Estimation

- Bangladesh Bureau of Statistics (BBS)
- General Economics Division (GED)
- Finance Division (FD)
- Bangladesh Bank (BB)
- Bangladesh Telecommunication Regulatory Commission (BTRC)
- Aspire to Innovate (a2i) Programme
- Statistics and Informatics Division
- Prime Minister’s Office
- United Nations Resident Coordinator Office (UNRCO)
Objective of the Exercise

• To develop a model for Small Area Estimation of poverty using various non-conventional data for the year of 2016.

• To compare the indirect poverty estimates derived from Small Area Estimation with direct Estimates through Household Income Expenditure Survey 2016.

• To replicate the model for new estimation of poverty for the year of 2021 using non-conventional data.

• To build the capacity in estimating Poverty using non-conventional data including spatial data.
1st Workshop
Big Data for Poverty Estimation, Non-conventional data, Country Practices of Poverty Mapping, Mobile data for poverty estimate

2nd Workshop
Hands-on Training and Exercise for model development using Non-conventional data
Platforms Used

- GOOGLE EARTH ENGINE (GEE),
- GEOGRAPHIC INFORMATION SYSTEM (GIS)
- PROGRAMMING LANGUAGE R.
<table>
<thead>
<tr>
<th>Data Type</th>
<th>Description</th>
<th>Platforms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raster</td>
<td>Night Time Light (NTL) data</td>
<td>Google Earth Engine</td>
</tr>
<tr>
<td>Vector</td>
<td>Road Network, Educational Institutions, etc.</td>
<td>ArcMap</td>
</tr>
<tr>
<td>Tabular</td>
<td>Agricultural Crop Production 2016</td>
<td>Programming language R</td>
</tr>
</tbody>
</table>
Night Time Light (NTL) data Extraction From GEE
Night Time Light (NTL) Data
GIS Platform

- Density Statistics extraction
Extracted Data from NTL

- Six Statistics –
  - COUNT
  - SUM
  - MIN
  - MAX
  - MEAN
  - STD

against the light intensity and other non-conventional data
Model development in R
<table>
<thead>
<tr>
<th>Description</th>
<th>Source</th>
<th>Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agent Banking</td>
<td>Bangladesh bank</td>
<td>Union Level</td>
</tr>
<tr>
<td>Mobile Subscriber</td>
<td>BTRC</td>
<td>Dist</td>
</tr>
<tr>
<td>Mobile movement</td>
<td>BTRC-telco</td>
<td>Upazila</td>
</tr>
<tr>
<td>Mobile Internet Uses</td>
<td>BTRC</td>
<td>Dist</td>
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<tr>
<td>Union Digital Center data</td>
<td>A2i</td>
<td>Dist</td>
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<tr>
<td>Crop Production</td>
<td>BBS</td>
<td>Dist</td>
</tr>
<tr>
<td>Crop Damage</td>
<td>BBS</td>
<td>Dist</td>
</tr>
<tr>
<td>Land Use and Land Consumption</td>
<td>Forest</td>
<td>Whole</td>
</tr>
<tr>
<td>Road Network</td>
<td>LGED, R&amp;D</td>
<td>Line</td>
</tr>
<tr>
<td>Education facilities</td>
<td>Banbies,DPE</td>
<td>Point</td>
</tr>
<tr>
<td>Health Facilities</td>
<td>DPH</td>
<td>Point</td>
</tr>
<tr>
<td>Business Directory</td>
<td>BBS</td>
<td>Upazila</td>
</tr>
<tr>
<td>Crime Statistics</td>
<td>National Justice Audit</td>
<td>Upazila</td>
</tr>
<tr>
<td>Clean fuel and technology</td>
<td>MICS</td>
<td>District</td>
</tr>
<tr>
<td>Migrant worker</td>
<td>BMET</td>
<td></td>
</tr>
<tr>
<td>Vaccination (polio, A cap)</td>
<td>DGHS, DPHE (EPI)</td>
<td>Upazila</td>
</tr>
<tr>
<td>Risk Inf</td>
<td>NRP-Prog Division</td>
<td>Upazila</td>
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<tr>
<td>Damage</td>
<td>DDM</td>
<td>Upazila</td>
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<tr>
<td>Weather</td>
<td>BMD</td>
<td>District</td>
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<tr>
<td>Tube well location</td>
<td>BADC, Barand</td>
<td>Upazila</td>
</tr>
<tr>
<td>POI</td>
<td>SoB</td>
<td>Point</td>
</tr>
<tr>
<td>Facebook wealth Index</td>
<td>Facebook</td>
<td>-</td>
</tr>
<tr>
<td>Disaster data</td>
<td>DDM</td>
<td>Upazila</td>
</tr>
</tbody>
</table>
Proposed EBP Model for SAE of Poverty

Remote Sensing Data
- Night Time RS data
- RS data (Landsat8 OLI)

CNN
- Multiple Variables
- Selected Variables
- EBP Model

Selected Variables

Auxiliary/Conventional Data
- Disaster related data
- Road Density/Accessibility
- POI Accessibility
- Population
- LULC

SAE from EBP Model

Direct Estimation of Poverty from HIES 2016

SAE from ELL Model

CNN = Convolution Neural Network
PCA = Principal Component Analysis

SAE of Poverty 2021

Compare
Expected Outcome
Thank You