Big Data, Social Impact and Migration

Ispra

November 2017
Agenda

• Dalberg Data Insights – Our Big Data approach

• Social Impact & Migration

• Challenges – Data Biases, Partnerships and Sustainability
Dalberg is a platform combining skills and assets

Dalberg Group

Dalberg Advisors
Strategy and policy advisory firm dedicated to global development and innovation

Dalberg Data Insights (DDI)
Big Data and analytics to generate social impact and business value

Design Impact Group
Human-centered design and systems thinking to deliver sustainable impact

D. Capital Partners
Investment advisory to facilitate flow of development and commercial capital to underserved markets

Combining Big Data capabilities with strategy can lead to transformational social impact and business value
The Dalberg Group covers 4 continents and employs 400+ professionals

**Global Facts**
- Founded in 2001
- Experience in 90+ countries
- 400+ professionals, 40+ nationalities
- 50+ languages spoken
- More than 400 clients
- >90% repeat clients

**Dalberg Data Insights**
- ITU 2017 Prize for Usage of telecom data to improve mobility
- Part of the Technical Advisory Group leading the Global Partnership for Sustainable Development Data (UN)
Examples of selected projects over multiple geographies and topics

- IaDB
- Mobility/Smart cities
- Renault/Nissan/Paris
- EV
- ANDSD
- Agriculture data
- USAID
- Zinka and Dengue
- Bolloré, MTN
- Smart cities and logistics
- GSMA
- Big Data & Social impact
- WIFI data commercialization
- GSMA
- Gender gap
- Data2X
- Gender gap and Financial inclusion
- DIAL
- Agriculture and food security
- UNCDF
- Mobility/Smart cities
- Financial inclusion
- World Bank
- Financial inclusion in 3 countries – Proposal
- USAID
- Ebola prevention
- EV
- GSMA
- Malaria
- Macepa/PATH
- Financial inclusion
- World Bank
- Financial inclusion in 3 countries – Proposal
- World Bank
- Financial inclusion in 3 countries – Proposal
More specifically, we currently work on 5 topics:

1. **Financial Inclusion**
   - Where and how to push digital payments?
   - Where to further develop distribution network?

2. **Smart cities**
   - What are the traffic patterns?
   - Where to further develop urban infrastructures?
   - How to optimize public transport?
   - How to increase usage of EV?

3. **Public health**
   - Where to prioritize disease control and eradication?
   - Are the quarantine zones enforced?

4. **Agriculture and Gender**
   - How to detect early signs of food crises?
   - Where do people work and live?
   - Where are the poor communities?
   - What are the female communities?

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Creating platforms of algorithms and tools, while securing privacy

- All individual data remain within the premises of the data providers
- All individual data are anonymized
- All individual data are aggregated
- All algorithms are open and available
- Pushing algorithms to the data

**Big Data smart city platform**

<table>
<thead>
<tr>
<th>Module 1 – Telecom data module</th>
<th>Module 2 – Survey data module</th>
<th>Module 3 – Administrative data module</th>
<th>Module 4 – Retailers’ data module</th>
</tr>
</thead>
<tbody>
<tr>
<td>Module 5 – Satellite data module</td>
<td>Module 6 – Public transport data module</td>
<td>Module 7 – Social media data module</td>
<td>Module 8 – Basic technical layers</td>
</tr>
<tr>
<td>Module 9 – Mobility monitoring module</td>
<td>Module 10 – Public transport module</td>
<td>Module 11 – Road network module</td>
<td>...</td>
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</tbody>
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### Private and public data sources to offer different insights

#### Telecom data
- CDRs
  - Where do people live?
  - Where do people work?
  - What are the mobility patterns?
  - Where to put roads?
  - What are the speed?
- Signalling
  - What are the different modes of transport?
- DPI
  - What are different socio-economic categories?

#### Satellite data
- Free data
  - What are different crops?
  - What are the crop yields?
- High Res. data
  - How to allocate fields?

#### Public and other private data
- Open government data
  - Where do people live?
  - What are the demographic trends?
- Car data
  - How to increase usage of electric cars?
  - Where to optimize the power distribution network?
- Banking data
  - Where to expand the retail network?
Multiple topics around migration share algorithms or data sources

**Domestic migrations**
- Where do people live? Where do they work? What road do they take?
- What is the impact of changing urban and road infrastructure?
- How to optimize public transport?
- How do people migrate within a country and impact the probability for a disease to spread?
- How to control migrations to reduce public health risks?
- How does the food supply impact migration of populations?
- Is there any correlation between migrations and early alert of food crisis?

**Cross-border migrations**
- Is it possible to identify international migrations by mapping sources of domestic migration flows at international borders?
- How to map cross-border movements by identifying settlements?
- How border population movements affect the domestic spread of contagious diseases?
- How to manage the distribution of food for international settlements?
We integrate telecom data in intuitive tools for end-users

We integrate data from telco’s

- We collect, filter and reconcile CDRs and RAN logs from telco data sources

We anonymize the data

- We anonymize location data & subscriber info with hashing algorithms

We aggregate & enrich data

- Our algorithms further process and add intelligence to the raw data

We build intuitive apps for end-users

- Our intuitive apps provide direct insights and actions to the end-users
Identifying and estimating all traffic flows in and around Kampala

Identify and prioritize the commutes in terms of flow of people and travel time

- Identify which commutes are the most popular
- Understand which commutes are the most time-consuming
- Obtain more insights about a specific commute by selecting a square
- Choose the number of commutes displayed in the matrices based on traffic volume

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Identifying and estimating all traffic flows in and around Port-au-Prince

Overview of Commuting Patterns from Origin to Destination

- Population leaving their area of origin
- Travel time when leaving their area of origin

- Population reaching their area of destination
- Travel time for reaching their area of destination
Estimating travel times between any locations

Measure the time spent for commuting from and to any neighborhoods

- For each neighborhood, understand the travel time from this neighborhood to every other part of the city
- For each neighborhood, understand the travel time to this neighborhood from every other part of the city
- For every pair of neighborhoods, see the average commuting time at specific times

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Comparing impact from changes on urban infrastructure

<table>
<thead>
<tr>
<th>Junction / Road Section</th>
<th>Hourly Traffic (pph)</th>
<th>Average Speed (km/h)</th>
<th>Total Time Lost (hours)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kira Road Sections</td>
<td>+ 68%</td>
<td>- 13%</td>
<td>+ 151%</td>
</tr>
<tr>
<td>Fairway Junction</td>
<td>+ 12%</td>
<td>+ 16%</td>
<td>- 15%</td>
</tr>
<tr>
<td>Makerere Hill Road Sections</td>
<td>+ 23%</td>
<td>- 13%</td>
<td>+ 147%</td>
</tr>
</tbody>
</table>
Conducting pilots and evaluating granular performance

Using telecom data, we measured mobility performance before and after the building of a new junction in Kampala to understand its impact.

Impact Assessment for Fairway Junction between 2015 and 2017

- Using our algorithms we mapped the origin/destination of daily commuters, estimating the flow of people and their travel time over various time periods.

These insights can be used for:
- Infrastructure planning and decision-making
- Assessing future investments in infrastructure projects
Karamoja Food Security - People migrations

People migrations from (Origin zones) and towards (Destination zones) Karamoja during the defined period of interest (months selection: ).

Origin zones from where people migrate to Karamoja

Destination zones where the people (coming from the selected origin zones) settle

Migrations flows from the Origin(s) towards the impacted Destination(s)

Origin of the total migrations towards Karamoja

Migration flows towards the destination zone(s) selected over the time
### Production of
- **Sorghum**
- **Maize**

### Measured in
- Kg (Total Production)
- Kg/ha (Production per surface unit)
- Kg (Production per capita)

### Subcounty Features
- **Name:** RUWA
- **Population:** 41,493
- **Crop land surface:** 2,217 (Ha)
- **Sorghum crop surface:** 1,989 (Ha)

### Sorghum Yield
- **Sorghum production per surface unit:** 114.3 (Kg/ha)
- **Sorghum production per capita:** 5.5 (Kg)
- **Sorghum total production:** 227,299 (Kg)

### Table: Subcounty Data

<table>
<thead>
<tr>
<th>Subcounty</th>
<th>District</th>
<th>Population</th>
<th>Total Area (Ha)</th>
<th>Crop Area (ha)</th>
<th>Kg (Total Production)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NAMALU</td>
<td>NAKAPIRIPRIT</td>
<td>25,905</td>
<td>53,307</td>
<td>5,794</td>
<td>580.3</td>
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<tr>
<td>ALEREK</td>
<td>ABIM</td>
<td>12,573</td>
<td>125,576</td>
<td>1,265</td>
<td>520.4</td>
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<tr>
<td>ABIM</td>
<td>ABIM</td>
<td>14,377</td>
<td>18,861</td>
<td>999</td>
<td>501.3</td>
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<tr>
<td>NAKAPIRIPRIT</td>
<td>NAKAPIRIPRIT</td>
<td>1,418</td>
<td>467</td>
<td>29</td>
<td>482.4</td>
</tr>
<tr>
<td>ABIM TOWN CO.</td>
<td>ABIM</td>
<td>11,489</td>
<td>11,594</td>
<td>788</td>
<td>439.8</td>
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<tr>
<td>MORUITA</td>
<td>NAKAPIRIPRIT</td>
<td>16,588</td>
<td>83,929</td>
<td>1,161</td>
<td>430.6</td>
</tr>
<tr>
<td>MURULEM</td>
<td>ABIM</td>
<td>18,834</td>
<td>25,038</td>
<td>925</td>
<td>407.5</td>
</tr>
<tr>
<td>KAKOMONGOLE</td>
<td>NAKAPIRIPRIT</td>
<td>15,960</td>
<td>31,271</td>
<td>3,265</td>
<td>399.0</td>
</tr>
<tr>
<td>LOBALANGIT</td>
<td>KAABONG</td>
<td>22,907</td>
<td>30,257</td>
<td>1,890</td>
<td>386.5</td>
</tr>
<tr>
<td>LOREGAE</td>
<td>NAKAPIRIPRIT</td>
<td>26,644</td>
<td>92,568</td>
<td>5,760</td>
<td>384.3</td>
</tr>
</tbody>
</table>

### Maize vs. Sorghum
- **Maize:** 19%
- **Sorghum:** 81%

### Percentage of Crop land
- **5.3%**
- **147,659 Ha**
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• Challenges – Data Biases, Partnerships and Sustainability
Structure and manage a complex economically sustainable ecosystem

Data partners

Financial partners

Implementation partners

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Create leadership on data

Build products to address social needs

- **Identify key topics and needs**, incl. tests from emerging countries
- **Identify champions** per topic across countries, public sectors and industries
- **Secure gradual funding process** involving a PE approach, e.g. seed, rounds of fundings, IPO
- **Build robust supply chain** (incl. data supply) and commercial model

Identify needs from private corporations

- **Identify champions** per topic across industrial sectors
- **Build alliances** with data providers (e.g. Nielsen) and secure ecosystem
- **Address key challenges from the regulatory and competitive environments**, e.g. limitations of direct data commercialization from telecom operators

Secure innovation cycle

- **Create new approaches and technologies** to handle larger volumes of data, e.g. AI, deep learning
- **Mix data from an increasing number of different sources**
- **Expand the coverage of the value chain**, e.g. create bots and automate decision-process, including elements of the value chain at the end-users
Testing a concrete example of sustainability – Data-as-a-Service

Platform to integrate multiple data sources and allow development of analytics tools and aggregates that can be shared in a secure manner with 3rd parties.

Platform to communicate value to external stakeholders and raise awareness about the value of new data sources to support data driven decisions.

Sustainable Platform generating revenue streams and covering cost from hosting and maintenance, data access etc.

Platform complying with EU / Local regulations and ensuring privacy and data security.

Data for Good Apps

DISEASE MONITORING  FINANCIAL INCLUSION  FOOD SECURITY  ISOLATED POPULATIONS  PATROL MANAGER  POS MANAGER  TOURISM

URBAN MOBILITY  SUPPORT

FINANCIAL INCLUSION  FOOD SECURITY  FOOD SECURITY - MAP COMPARISON  URBAN MOBILITY - ORIGIN DESTINATION  URBAN MOBILITY - IMPACT

Telco data  Satellite data  Bank data  Census, survey, administrative data
Main office DDI
5, Place du Champ de Mars
1050 Brussels
Belgium
Create a sustainable digital ecosystem and start productization

<table>
<thead>
<tr>
<th>From</th>
<th>To</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Topics / Sectors</strong></td>
<td><strong>Pilot use cases</strong> using aggregated public open data and some private data sources to show value and opportunities / ecosystem</td>
</tr>
<tr>
<td><strong>Regulation</strong></td>
<td><strong>Research</strong> environment</td>
</tr>
<tr>
<td><strong>Data providers</strong></td>
<td><strong>Research</strong> partner</td>
</tr>
<tr>
<td><strong>End-users</strong></td>
<td><strong>Co-developing</strong> third parties</td>
</tr>
</tbody>
</table>