OSM, ODK and OMK Oh My!

Mapping Habitat for Humanity Nepal's Post-Earthquake Reconstruction with OpenMapKit

Full methodology

1. *Remote mapping of villages in OSM*
2. *Field visit to survey beneficiaries and ground truth map data*
3. *Review data and submit to OSM, HFH database*
4. *Create maps, dashboards and reports*

Earthquake in Nepal

Earthquake in Nepal

Earthquake in Nepal

Earthquake in Nepal

Habitat for Humanity Programs

- 3,000 households in 3 VDCs in 2 Districts
- Building social cohesion through community projects
- Providing technical assistance for safe construction including construction vocational skills training
- Supplementing government funds for household reconstruction and repair through free materials and labour
- Strengthening local supply chain and promoting environmentally friendly materials

Why Mapping?

- Easy management
- Easy explanation
- Easy to play with others

Why OpenStreetMap?

- Existing data
- Familiarity in Nepal (thanks Nama!)
- Open data is the right thing to do

Expected Outputs

- Flexible data collection system
- Paper maps
- Barcode scanning system

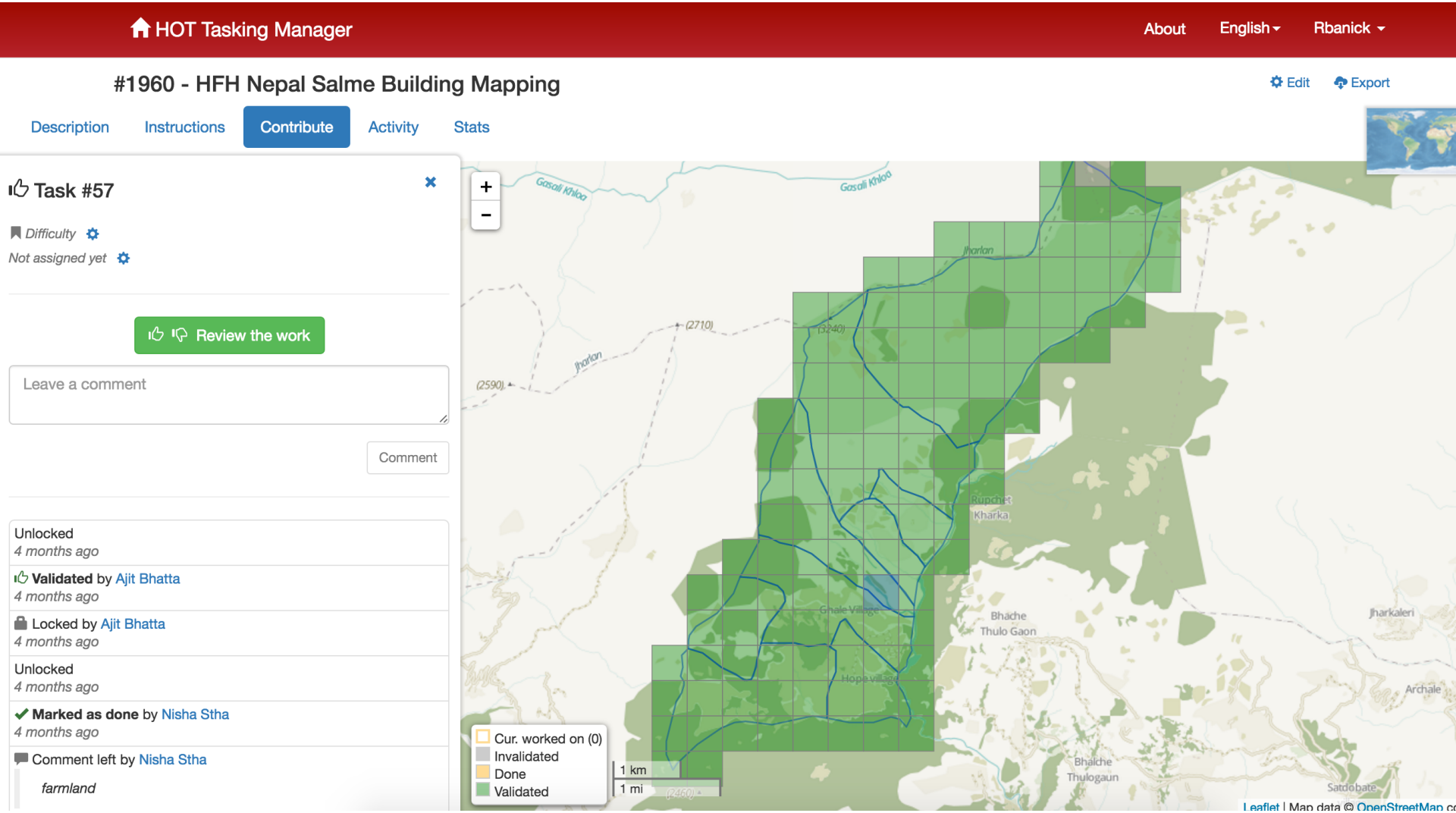
Step 1

Remote mapping in OSM

Step 1

1 *Remote mapping of villages in OSM*

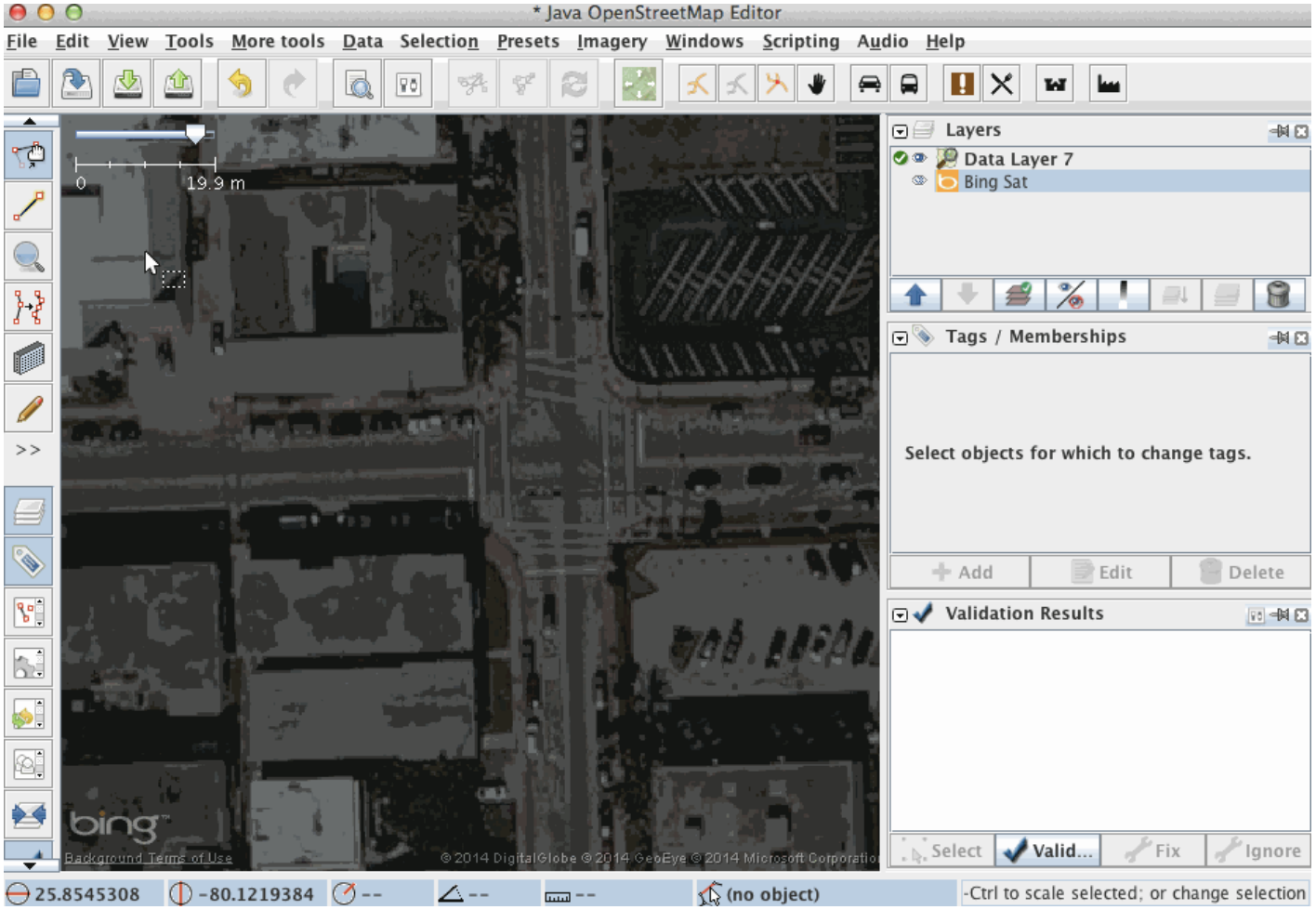
Remote mapping



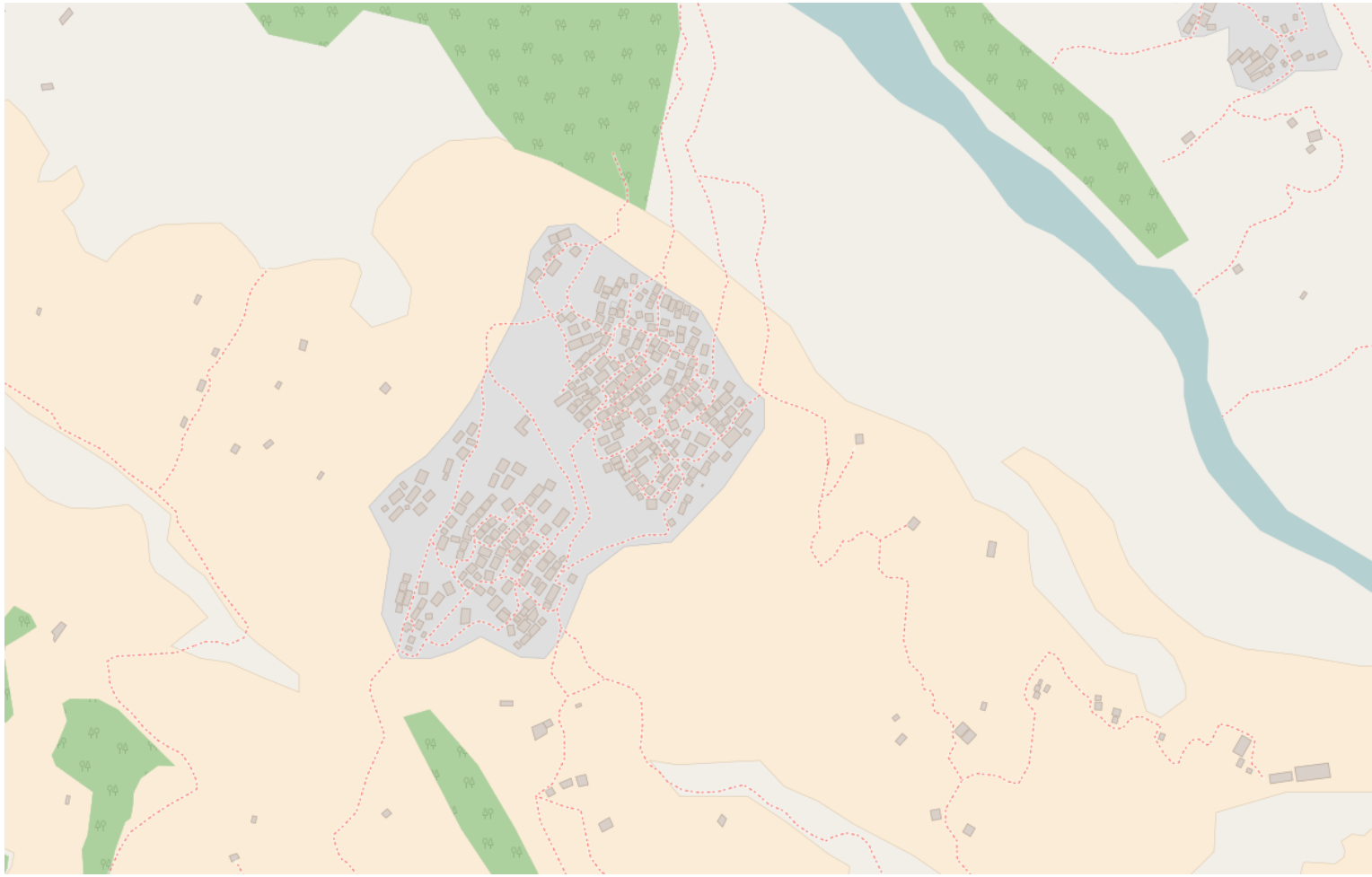
Our Volunteers

Creating data

Creating data

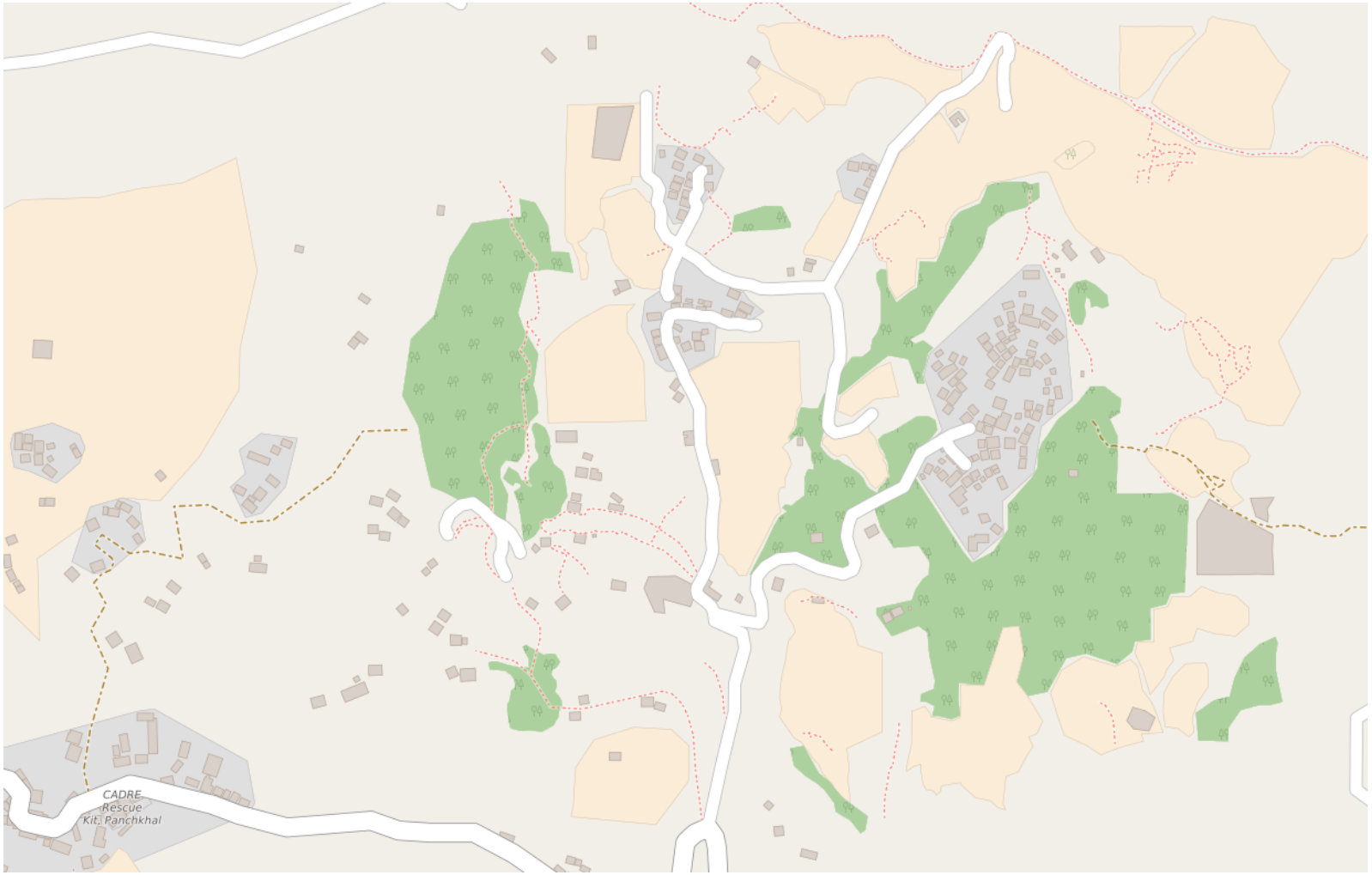


OSM



after

OSM



after

Step 2

Field Survey

Step 2

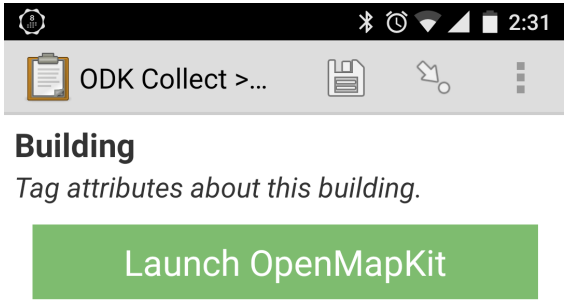
1. *Remote mapping of villages in OSM*

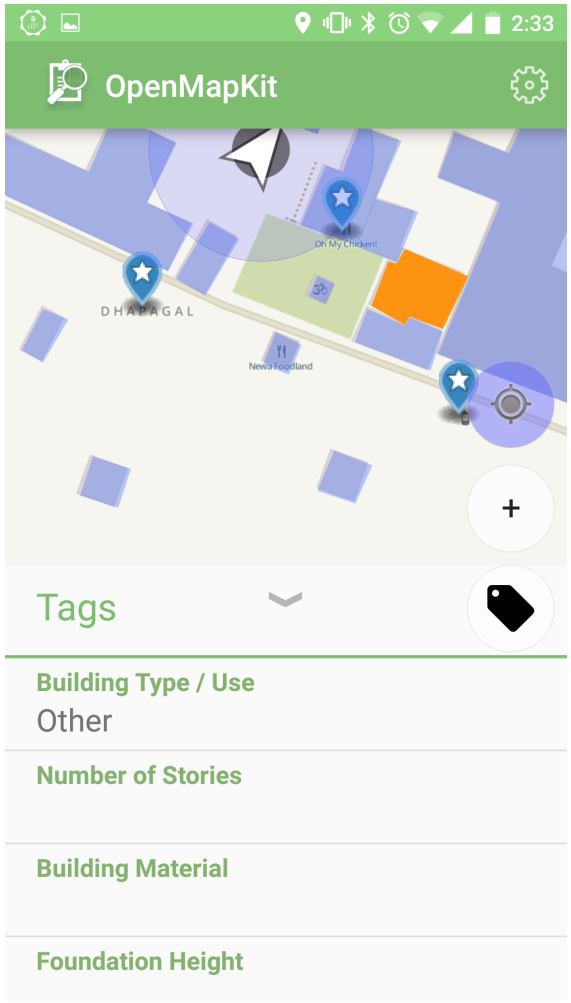
2. *Field visit to survey beneficiaries and ground truth map data*

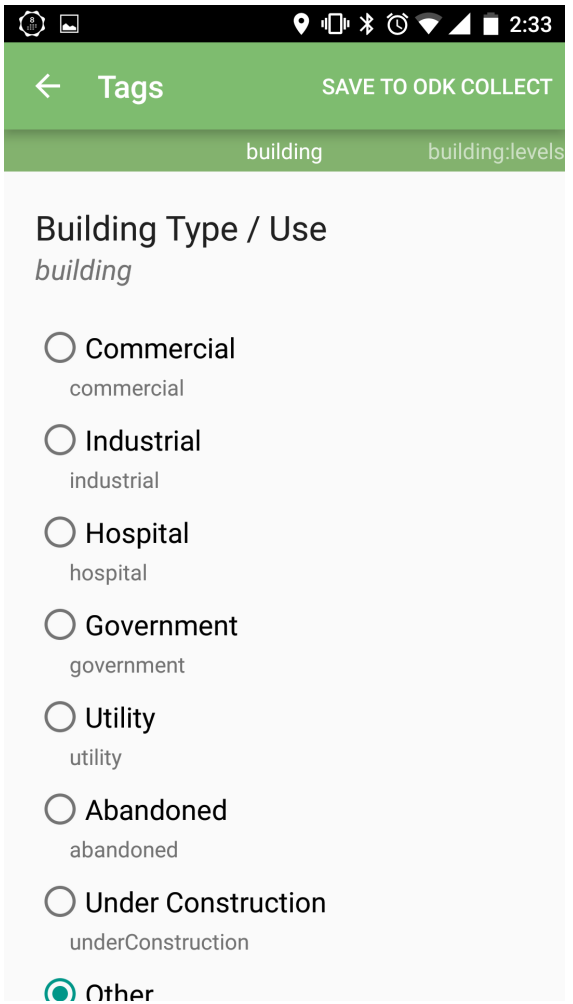
Fieldwork methods

- Smartphones
  - OpenDataKit *(HFH-N private data)*
  - OpenMapKit *(Public map data)*
- Field Papers *(paper)*

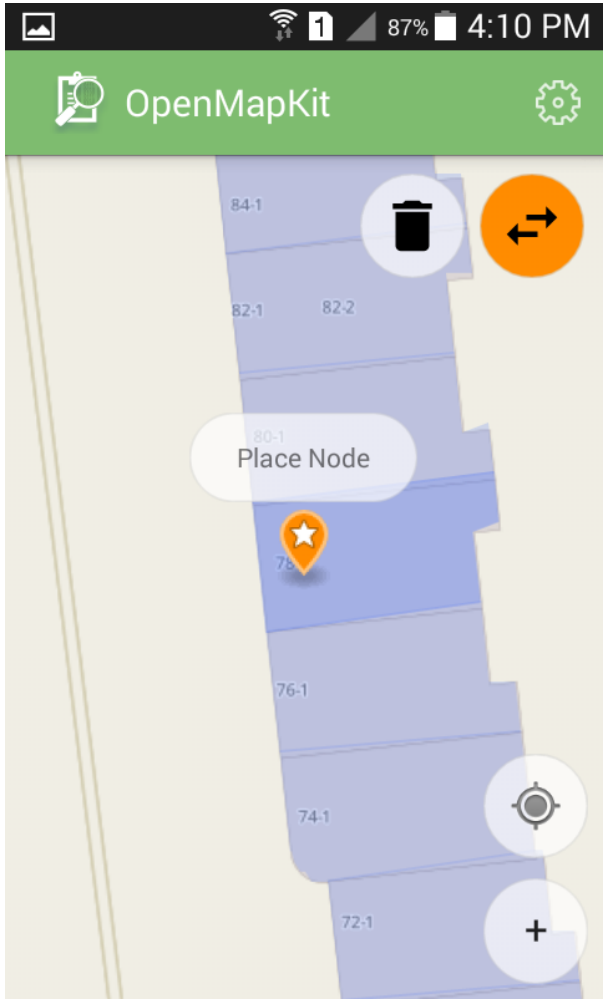
OpenMapKit

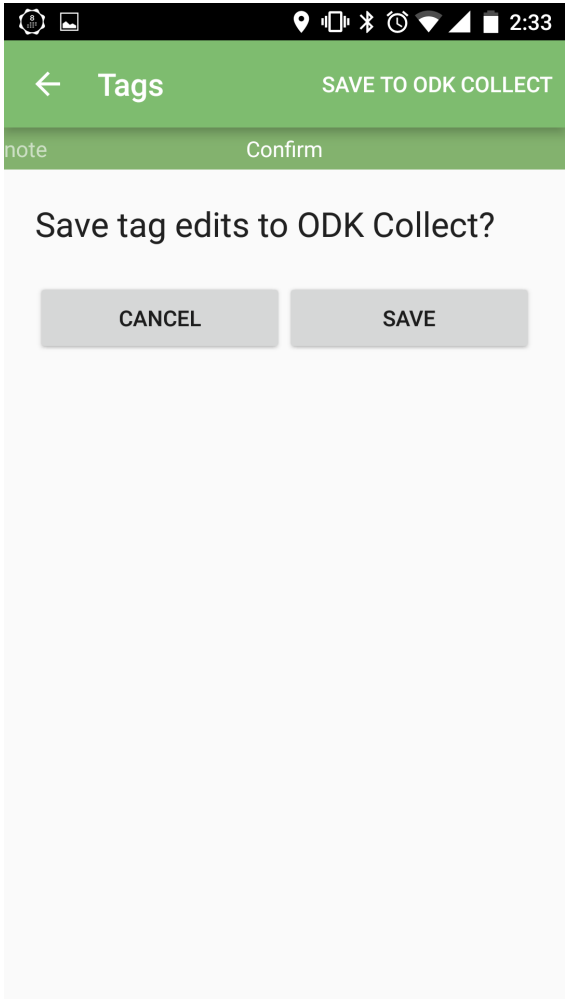

2:31
ODK Collect >...
Building
Tag attributes about this building.
Launch OpenMapKit

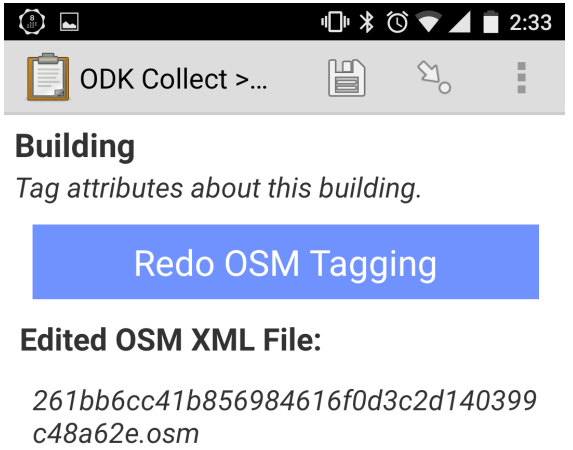

2:33
OpenMapKit
DHAPAGAL
Tags
Building Type / Use
Other
Number of Stories
Building Material
Foundation Height


2:33
Tags
SAVE TO ODK COLLECT
building
building:levels
Building Type / Use
building
Commercial
commercial
Industrial
industrial
Hospital
hospital
Government
government
Utility
utility
Abandoned
abandoned
Under Construction
underConstruction
Other

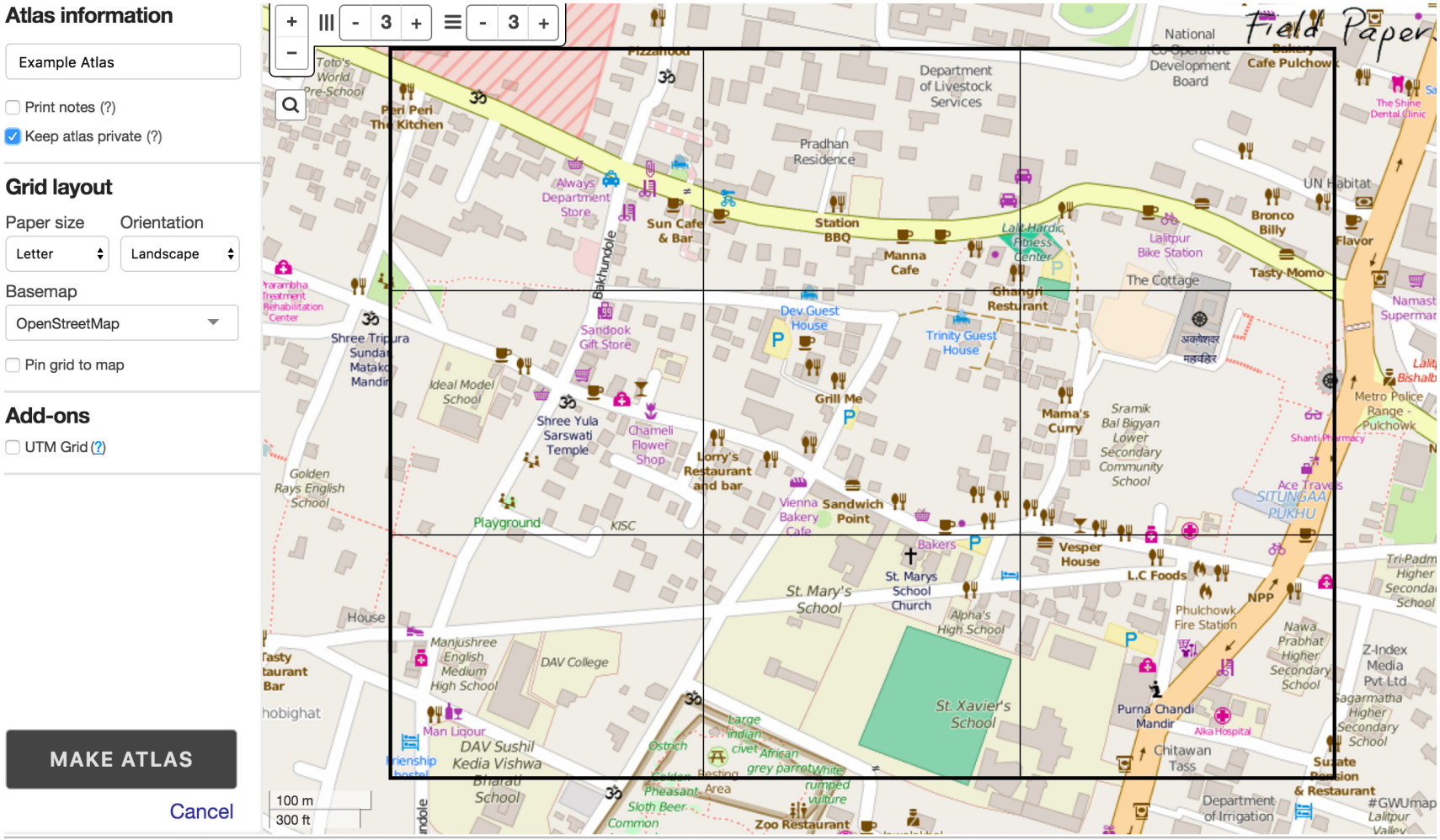
OpenMapKit


87% 4:10 PM
OpenMapKit
84-1
82-1
82-2
80-1
Place Node
76-1
74-1
72-1


2:33
Tags
SAVE TO ODK COLLECT
note
Confirm
Save tag edits to ODK Collect?
CANCEL
SAVE


2:33
ODK Collect >...
Building
Tag attributes about this building.
Redo OSM Tagging
Edited OSM XML File:
261bb6cc41b856984616f0d3c2d140399c48a62e.osm

Field Papers



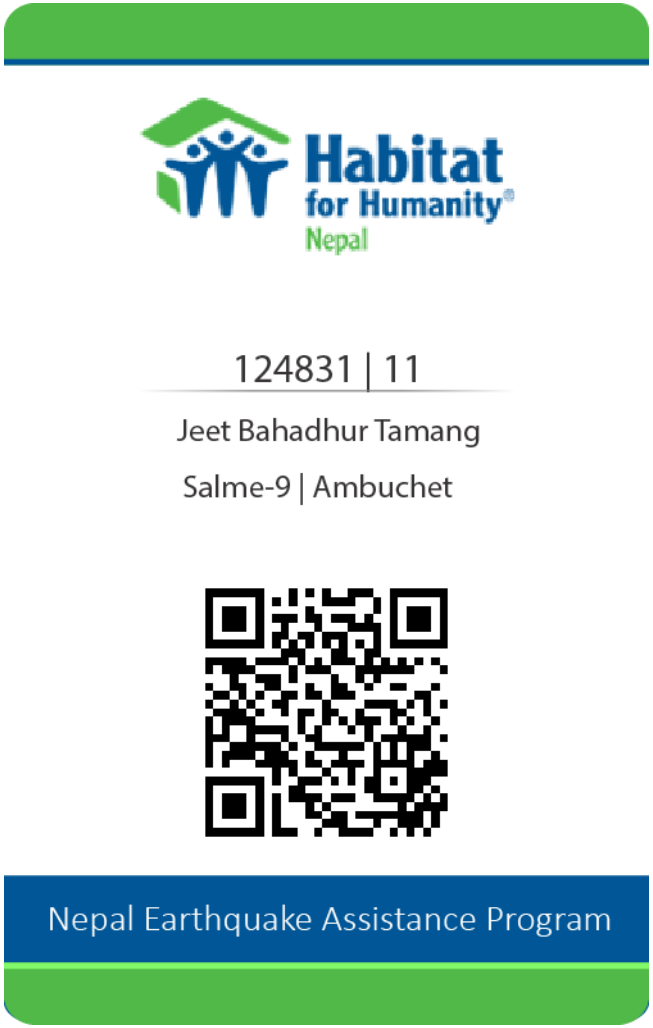
Baseline Survey Topics

- Household Location
- Biographic Information
- Government Registration Number
- Livelihoods (jobs, economics)
- Shelter Type and Damages
- Water, Sanitation and Hygiene

Salme, Nuwakot

584 Households Surveyed | 23rd June - 4th July

Future: Barcode Scanning System



Barcode scanning system details

Existing Beneficiary Data

Generate QR code
Open source library: qrcode

Merge QR codes and HH information with template

Step 3

Data Management and cleaning

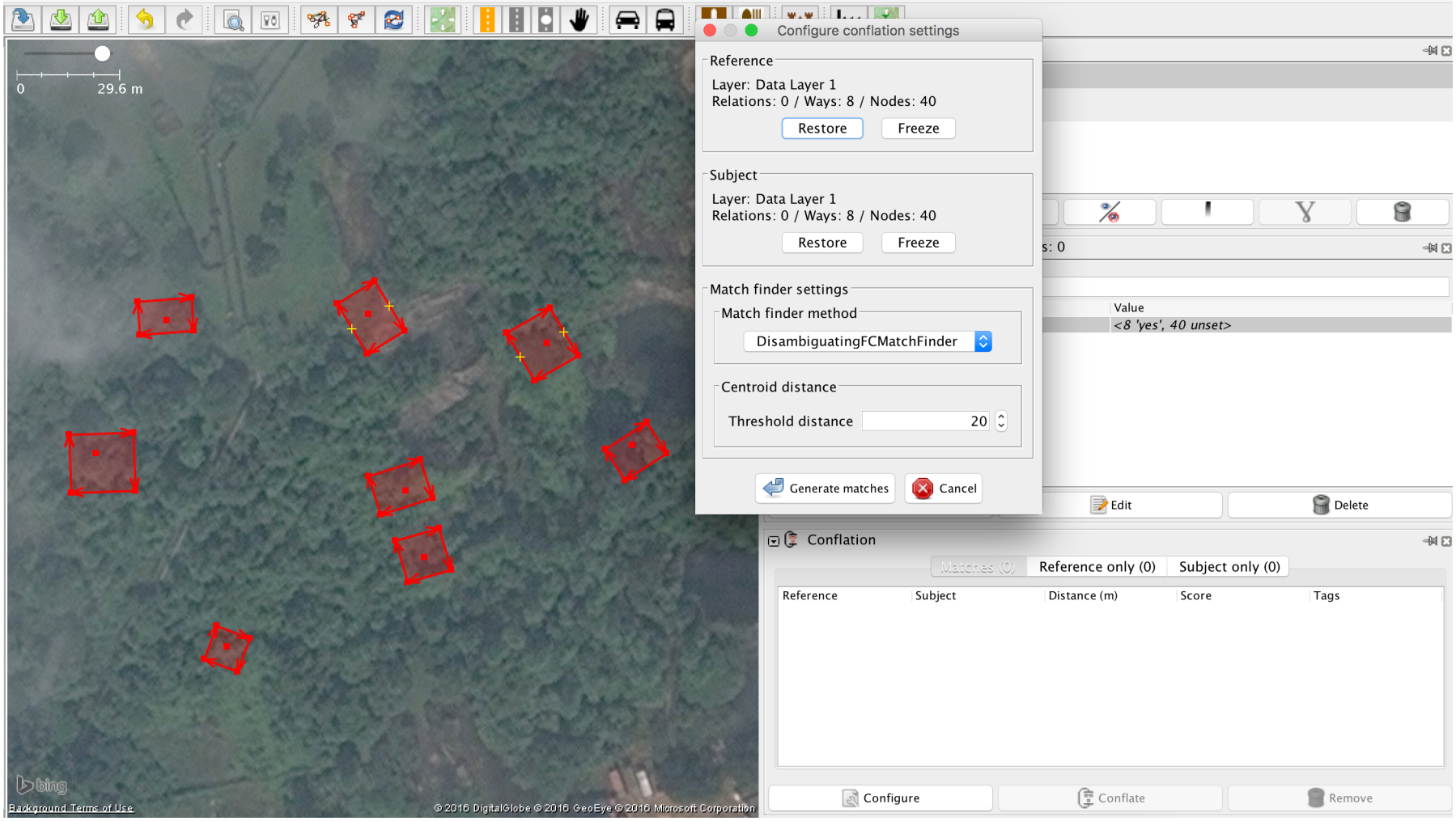
Step 3

1. *Remote mapping of villages in OSM*
2. *Field visit to survey beneficiaries and ground truth map data*
3. *Review data and submit to OSM, HFH database*

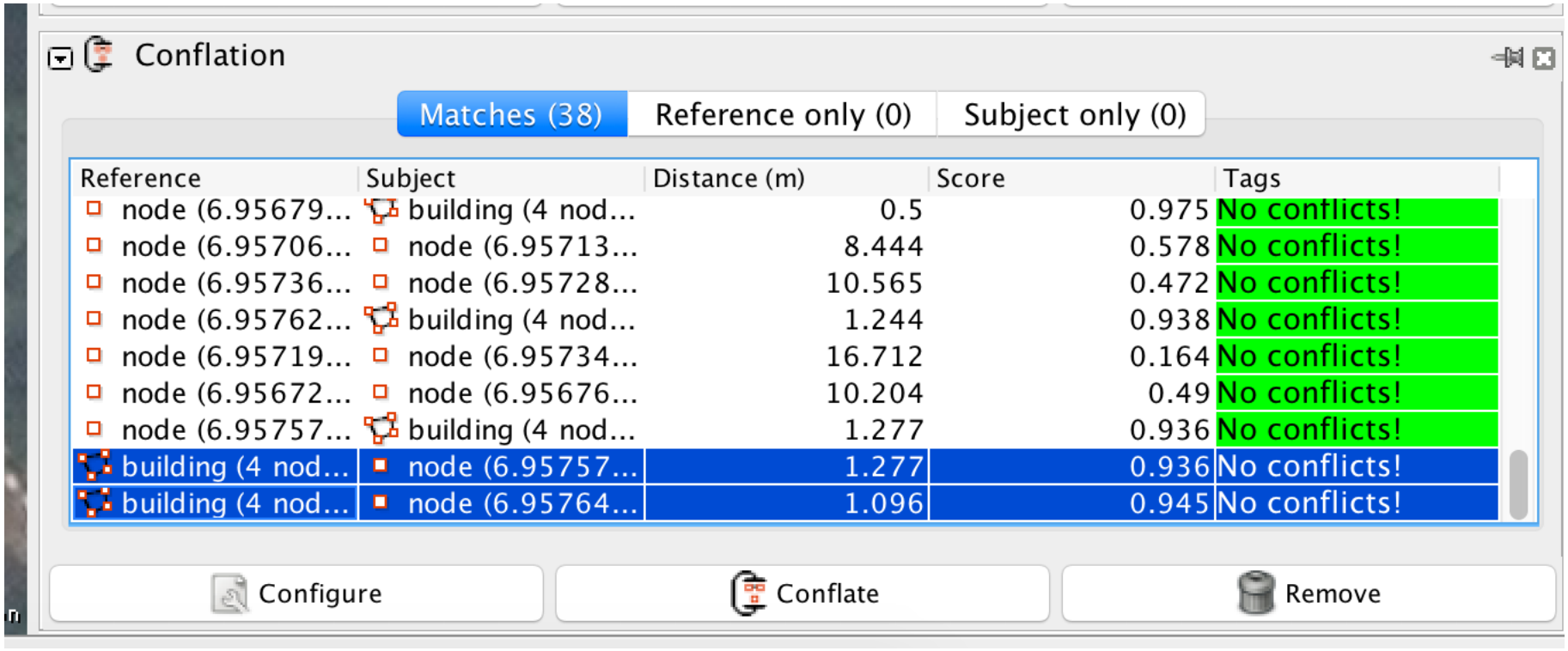
Data cleanup steps

- Review, correct
- Point data to polygon
- Free text to tags

Conflation


Configure conflation settings
Reference
Layer: Data Layer 1
Relations: 0 / Ways: 8 / Nodes: 40
Restore
Freeze
Subject
Layer: Data Layer 1
Relations: 0 / Ways: 8 / Nodes: 40
Restore
Freeze
Match finder settings
Match finder method
DisambiguatingFCMatchFinder
Centroid distance
Threshold distance
20
Generate matches
Cancel
Value
<8 'yes', 40 unset>
Edit
Delete
Conflation
Matches (0)
Reference only (0)
Subject only (0)
Reference
Subject
Distance (m)
Score
Tags
Configure
Conflate
Remove
0
29.6 m
bing
Background Terms of Use
© 2016 DigitalGlobe © 2016 GeoEye © 2016 Microsoft Corporation

Conflation


Conflation
Matches (38)
Reference only (0)
Subject only (0)
Reference
Subject
Distance (m)
Score
Tags
node (6.95679...
building (4 nod...
0.5
0.975
No conflicts!
node (6.95706...
node (6.95713...
8.444
0.578
No conflicts!
node (6.95736...
node (6.95728...
10.565
0.472
No conflicts!
node (6.95762...
building (4 nod...
1.244
0.938
No conflicts!
node (6.95719...
node (6.95734...
16.712
0.164
No conflicts!
node (6.95672...
node (6.95676...
10.204
0.49
No conflicts!
node (6.95757...
building (4 nod...
1.277
0.936
No conflicts!
building (4 nod...
node (6.95757...
1.277
0.936
No conflicts!
building (4 nod...
node (6.95764...
1.096
0.945
No conflicts!
Configure
Conflate
Remove

Conflation


Conflicts when combining ways - combined way is 'building (4 nodes)'
Please select the values to keep for the following tags.
Show tags with conflicts only
Show tags with multiple values only
Key
Value
building
yes
yup
yup
Apply
Cancel
Help
Reference
Subject
Distance (m)
Score

Future: Household Reconstruction

Monitoring and Evaluation Process

1. *Design new surveys, dashboards and maps*
2. *Survey households (using barcode)*
3. *Submit data to HFH-N database*
4. *Automatic updates to maps, dashboards and reports*

Secondary Data Sources

- Central Bureau of Statistics Household Damages Survey
  - Household Registration Number from this survey
  - Slow release b/c of privacy concerns
- Household Reconstruction Grant (maybe)

Backend systems

Our Environment

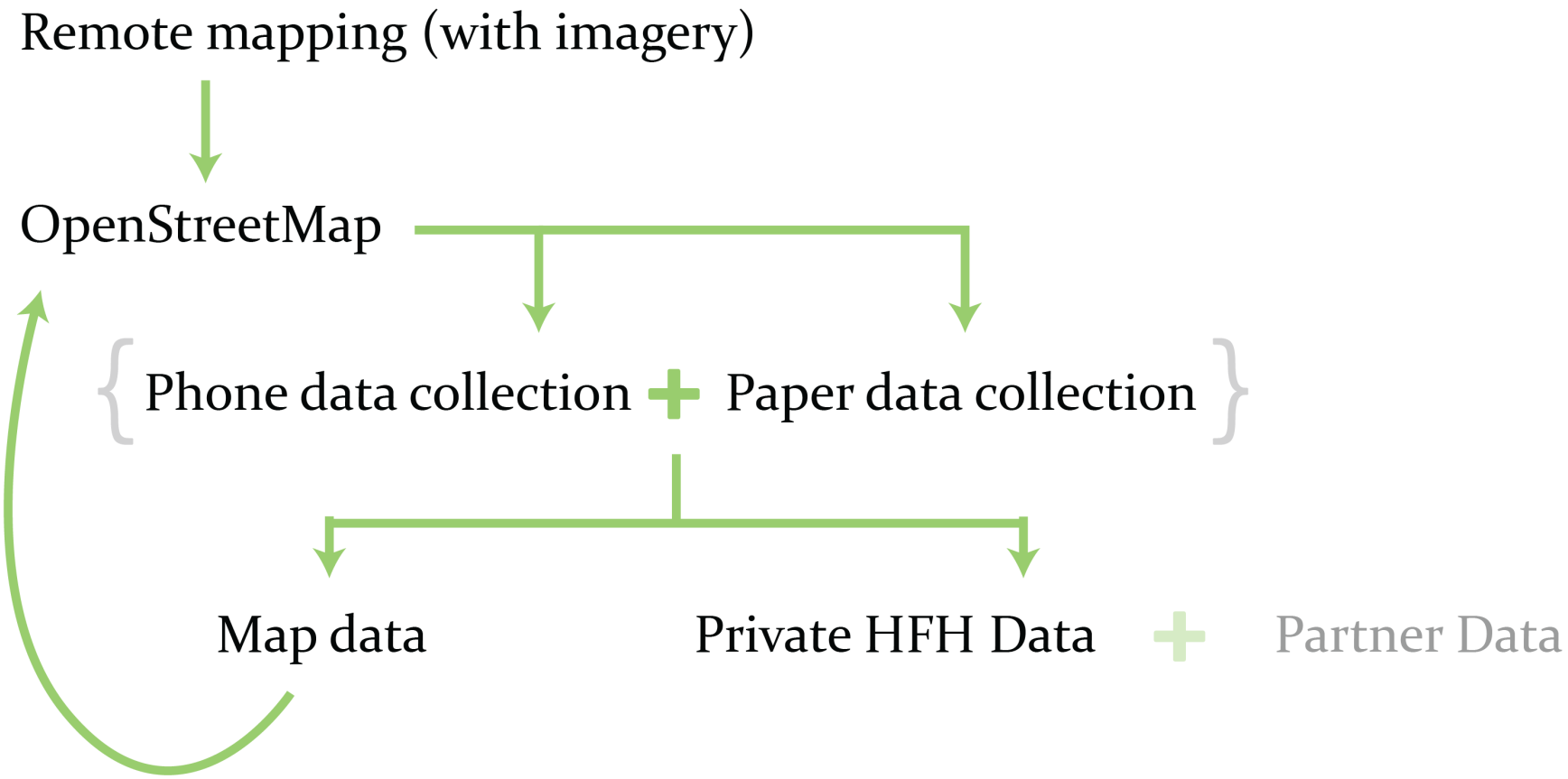
Ubuntu Linux cloud servers

- OMK
- Scripting/Development

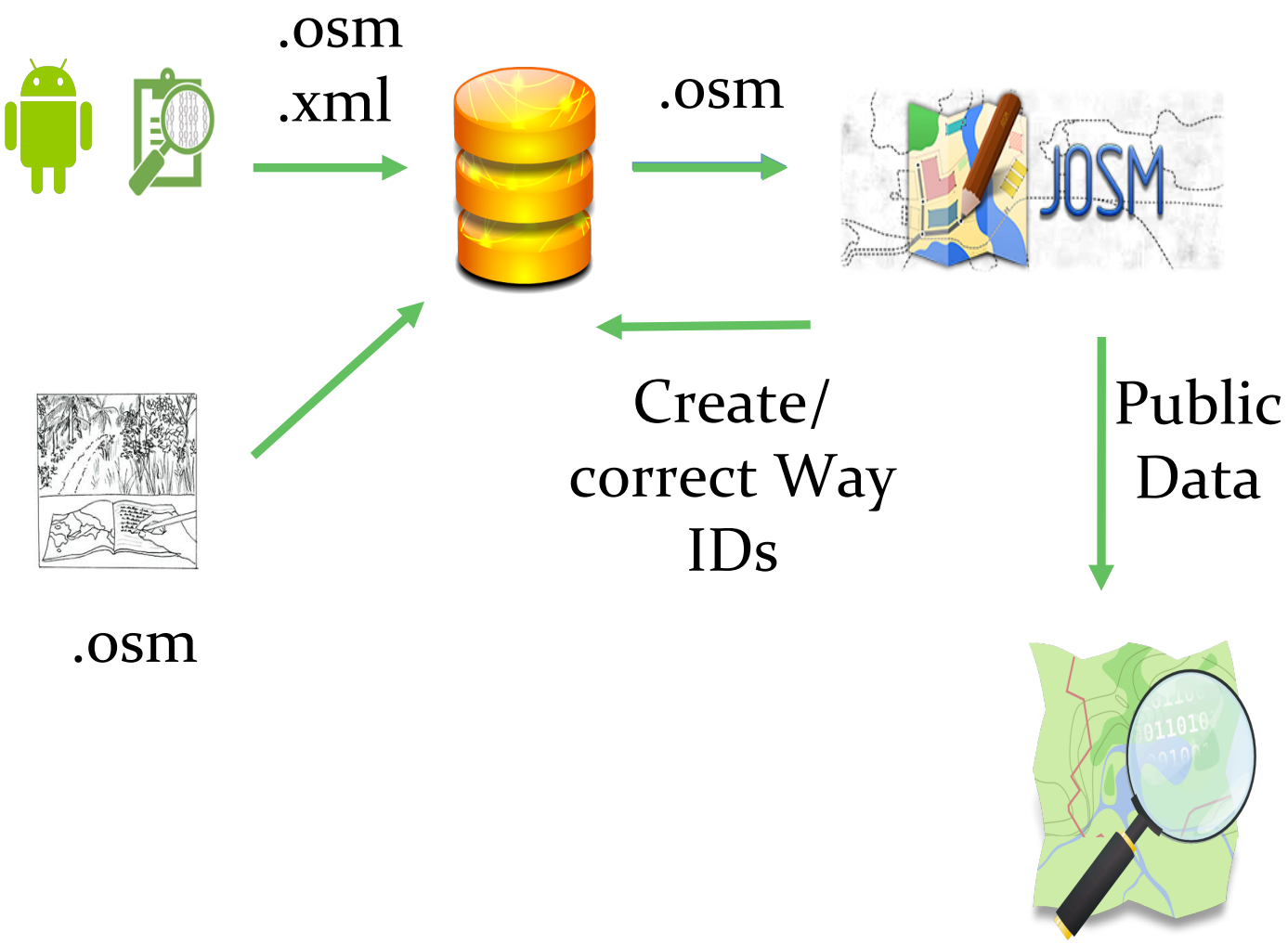
PostGIS Database

amazon web services™

ETL Process


Remote mapping (with imagery)
OpenStreetMap
Phone data collection
+
Paper data collection
Map data
Private HFH Data
+
Partner Data

ETL Process



ETL Process (Cont'd)

Private Data

Public Data

Join on Way ID

Public Data

Overpass API

Relational Tables for repeating questions

ETL Process (Cont'd)

Private Survey Data
Public Survey Data
Relational Tables
OSM Data

Tech Specs - Open Source Libraries

sqlalchemy: ORM for interacting with PostGIS

overpass: Querying OSM for way, node data

qrcode: Creating QR codes

click: Ease of use for command line applications

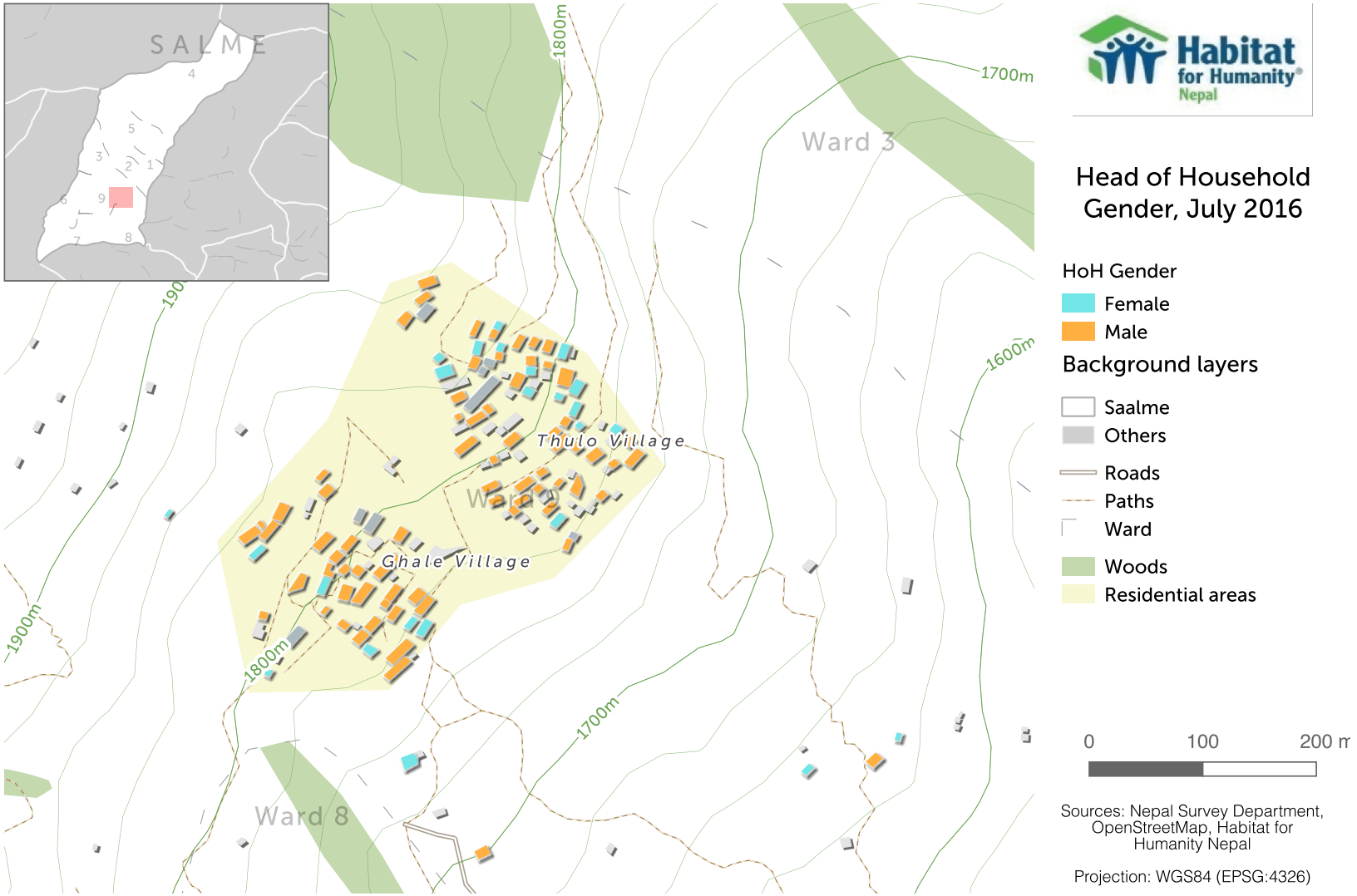
Step 4

Data Visualization and Presentation

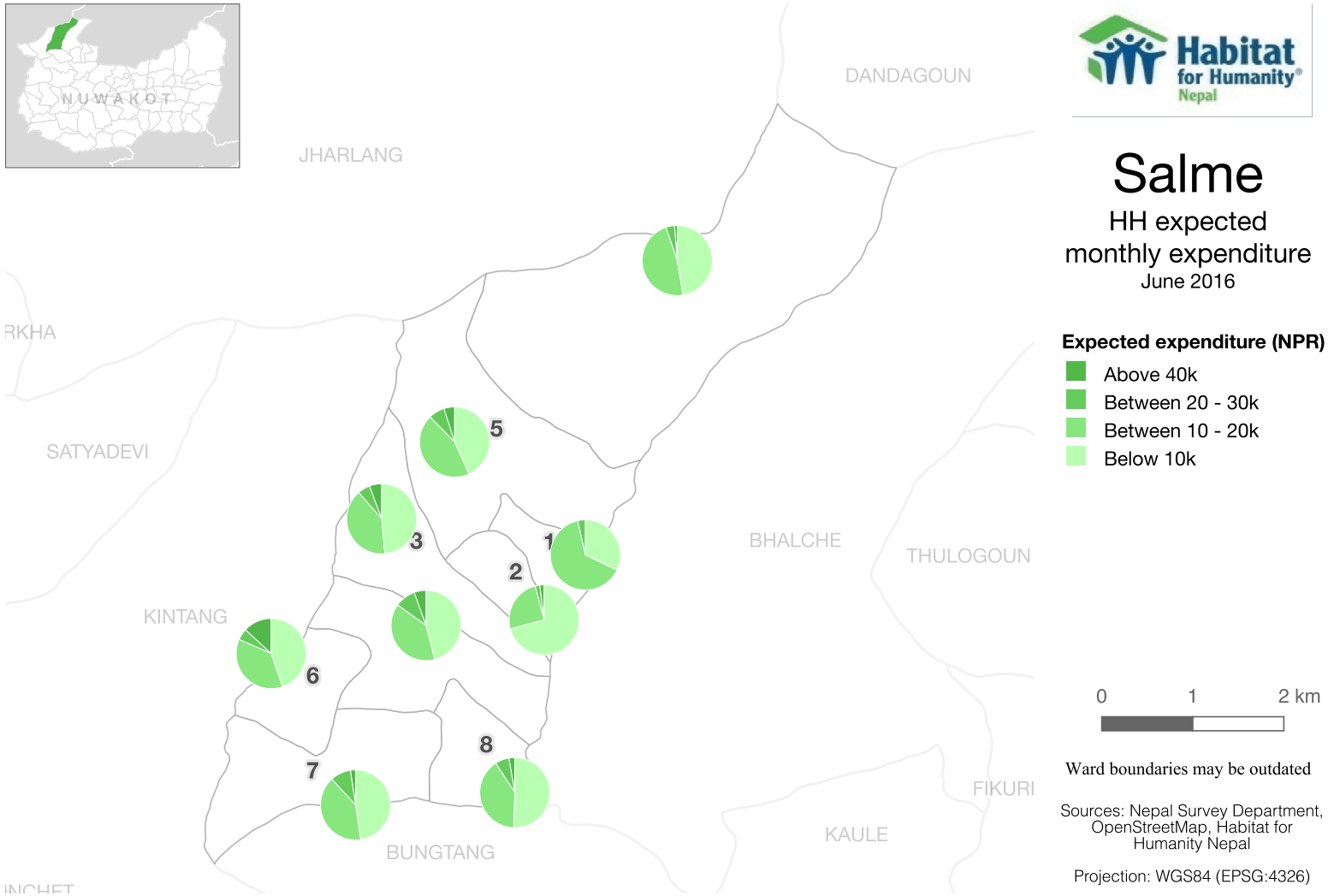
Step 4

1. *Remote mapping of villages in OSM*
2. *Field visit to survey beneficiaries and ground truth map data*
3. *Review data and submit to OSM, HFH database*
4. *Create maps, dashboards and reports*

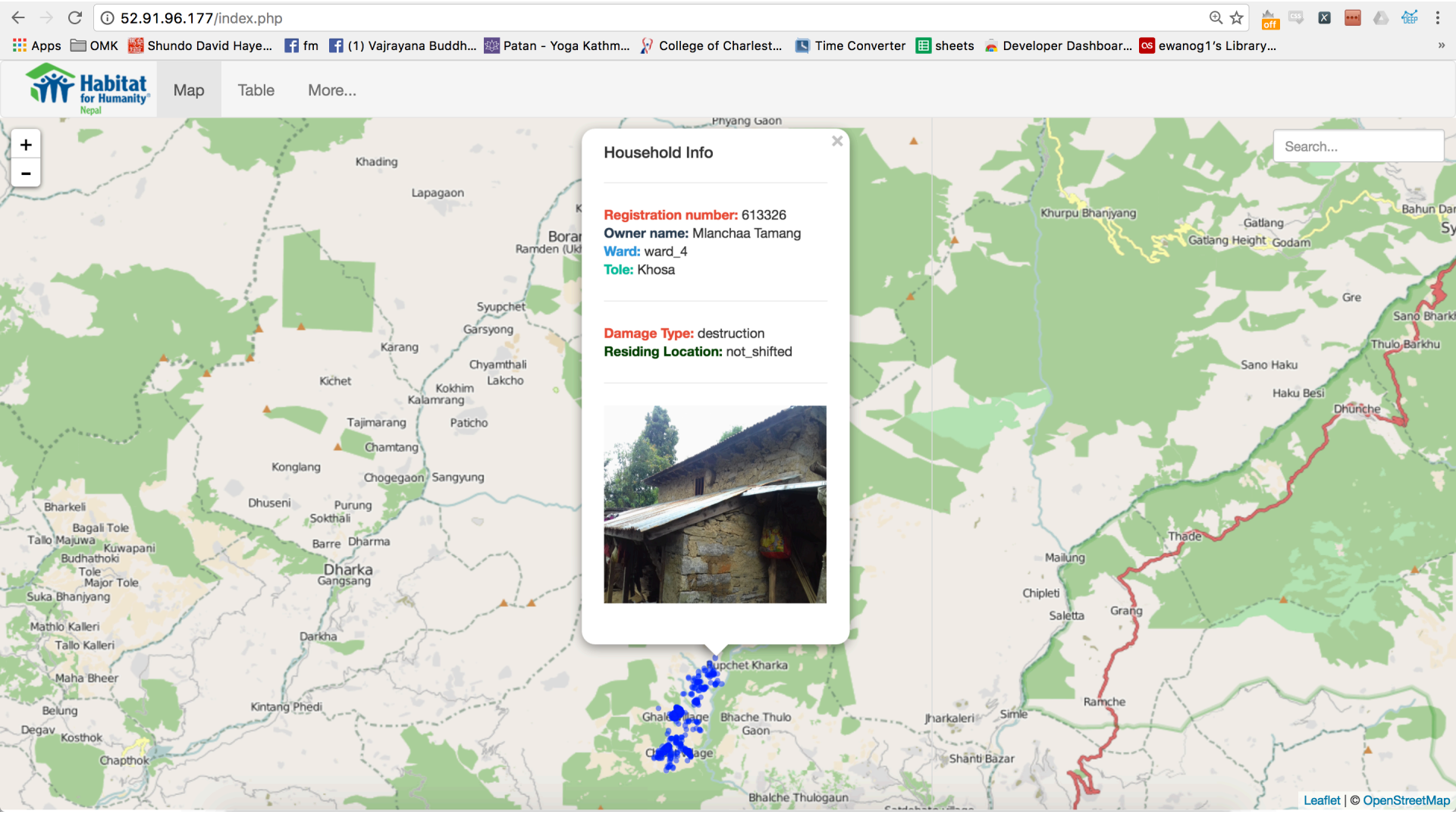
Print Maps


SALME
1800m
1700m
Ward 3
1600m
Thulo Village
Ward 9
Ghale Village
1900m
1800m
1700m
Ward 8
Habitat for Humanity Nepal
Head of Household Gender, July 2016
HoH Gender
Female
Male
Background layers
Saalme
Others
Roads
Paths
Ward
Woods
Residential areas
0
100
200 m
Sources: Nepal Survey Department, OpenStreetMap, Habitat for Humanity Nepal
Projection: WGS84 (EPSG:4326)

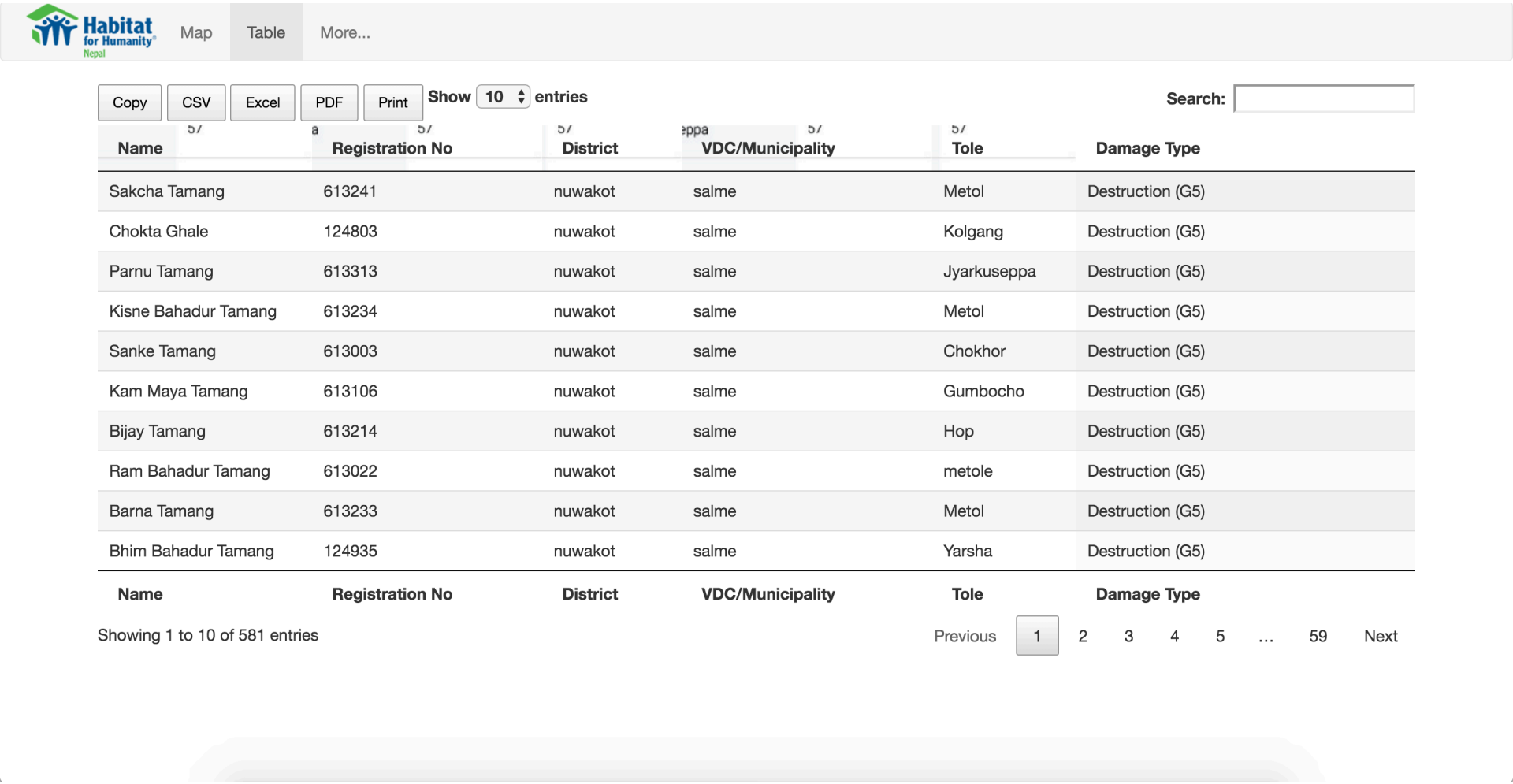
Print Maps


NUWAKOT
DANDAGOUN
JHARLANG
RKHA
SATYADEVI
KINTANG
BHALCHE
THULOGOUN
FIKURI
KAULE
BUNGTANG
INCHET
1
2
3
5
6
7
8
Habitat for Humanity Nepal
Salme
HH expected monthly expenditure
June 2016
Expected expenditure (NPR)
Above 40k
Between 20 - 30k
Between 10 - 20k
Below 10k
0
1
2 km
Ward boundaries may be outdated
Sources: Nepal Survey Department, OpenStreetMap, Habitat for Humanity Nepal
Projection: WGS84 (EPSG:4326)

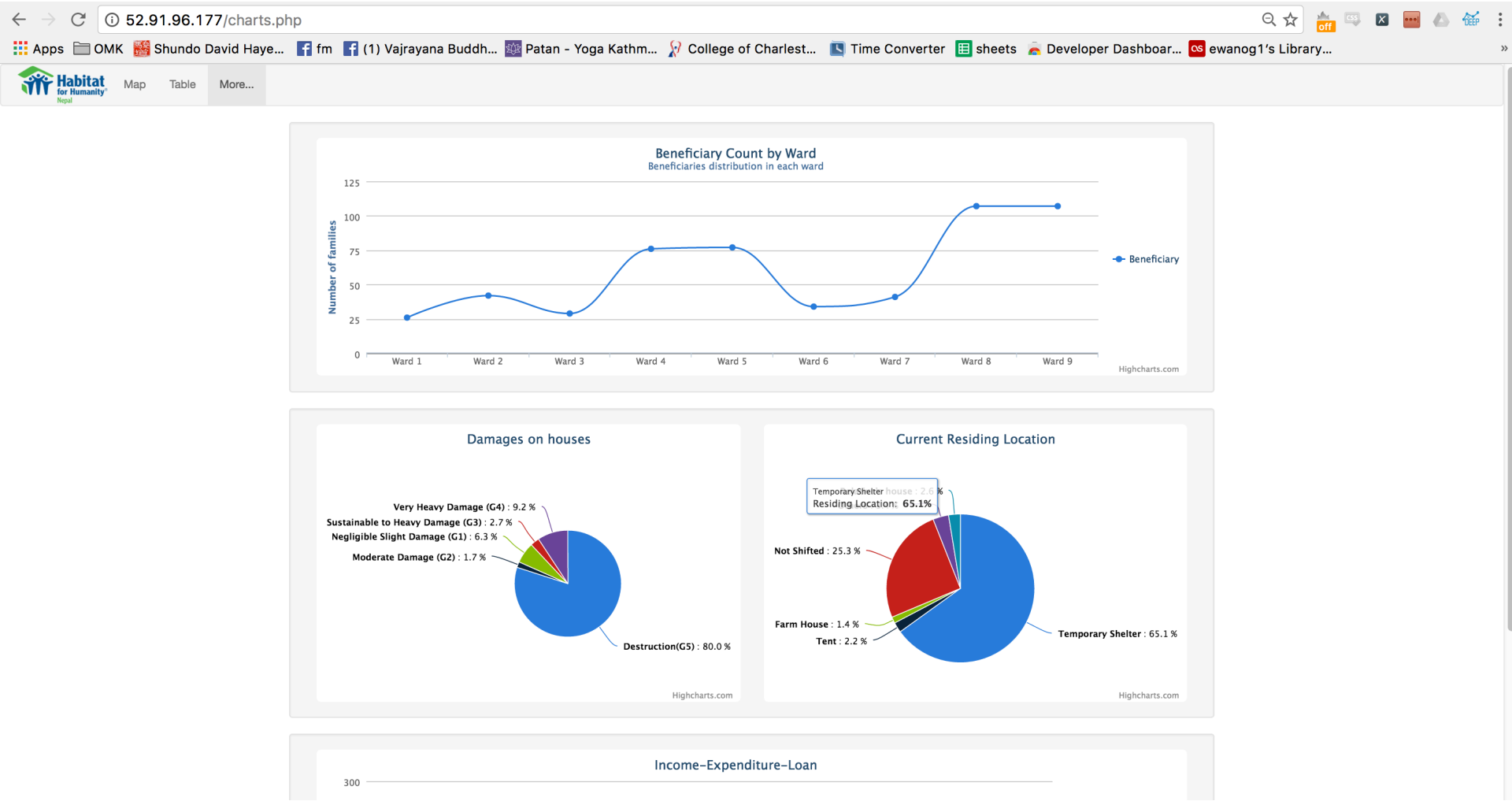
Web Maps


52.91.96.177/index.php
Apps
OMK
Shundo David Haye...
fm
(1) Vajrayana Buddh...
Patan - Yoga Kathm...
College of Charlest...
Time Converter
sheets
Developer Dashboar...
ewanog1's Library...
Habitat for Humanity Nepal
Map
Table
More...
Household Info
Registration number: 613326
Owner name: Mlanchaa Tamang
Ward: ward_4
Tole: Khosa
Damage Type: destruction
Residing Location: not_shifted
Search...
Khading
Lapagaon
Syupchet
Garsyong
Karang
Chyamthali
Kichet
Lakcho
Kokhim
Kalamrang
Tajimarang
Paticho
Chamtang
Konglang
Chogegaon
Sangyung
Dhuseni
Purung
Sokthali
Barre
Dharma
Dharka
Gangsang
Darkha
Bharkeli
Bagali Tole
Tallo Majuwa
Kuwapani
Budhathoki Tole
Major Tole
Suka Bhanjyang
Mathlo Kalleri
Tallo Kalleri
Maha Bheer
Belung
Degav
Kosthok
Chapthok
Kintang Phedi
Khurpu Bhanjyang
Gatlang
Gatlang Height
Godam
Gre
Sano Bharkhu
Thulo Barkhu
Sano Haku
Haku Besi
Dhuriche
Thade
Mailung
Chipleti
Saletta
Grang
Ramche
Jharkaleri
Simle
Shanti Bazar
Bhache Thulo Gaon
Bhalche Thulogaun
Leaflet | © OpenStreetMap

Dashboards


Habitat for Humanity Nepal
Map
Table
More...
Copy
CSV
Excel
PDF
Print
Show 10 entries
Search:
Name
Registration No
District
VDC/Municipality
Tole
Damage Type
Sakcha Tamang 613241 nuwakot salme Metol Destruction (G5)
Chokta Ghale 124803 nuwakot salme Kolgang Destruction (G5)
Parnu Tamang 613313 nuwakot salme Jyarkuseppa Destruction (G5)
Kisne Bahadur Tamang 613234 nuwakot salme Metol Destruction (G5)
Sanke Tamang 613003 nuwakot salme Chokhor Destruction (G5)
Kam Maya Tamang 613106 nuwakot salme Gumbocho Destruction (G5)
Bijay Tamang 613214 nuwakot salme Hop Destruction (G5)
Ram Bahadur Tamang 613022 nuwakot salme metole Destruction (G5)
Barna Tamang 613233 nuwakot salme Metol Destruction (G5)
Bhim Bahadur Tamang 124935 nuwakot salme Yarsha Destruction (G5)
Name
Registration No
District
VDC/Municipality
Tole
Damage Type
Showing 1 to 10 of 581 entries
Previous
1
2
3
4
5
...
59
Next

Dashboards


52.91.96.177/charts.php
Apps
OMK
Shundo David Haye...
fm
(1) Vajrayana Buddh...
Patan - Yoga Kathm...
College of Charlest...
Time Converter
sheets
Developer Dashboar...
ewanog1's Library...
Habitat for Humanity Nepal
Map
Table
More...
Beneficiary Count by Ward
Beneficiaries distribution in each ward
Number of families
125
100
75
50
25
0
Ward 1
Ward 2
Ward 3
Ward 4
Ward 5
Ward 6
Ward 7
Ward 8
Ward 9
Beneficiary
Highcharts.com
Damages on houses
Very Heavy Damage (G4) : 9.2 %
Sustainable to Heavy Damage (G3) : 2.7 %
Negligible Slight Damage (G1) : 6.3 %
Moderate Damage (G2) : 1.7 %
Destruction(G5) : 80.0 %
Highcharts.com
Current Residing Location
Temporary Shelter house : 2.6 %
Residing Location: 65.1%
Not Shifted : 25.3 %
Farm House : 1.4 %
Tent : 2.2 %
Temporary Shelter : 65.1 %
Highcharts.com
Income-Expenditure-Loan
300

Challenges

Fieldwork challenges

- Multiple households in one building
- Missing buildings
- Charging phones, very difficult terrain
- Monsoon rains…and leeches!

Data Management challenges

- Repeating and nested questions
- Overpass Python API restrictions

Visualization challenges

- How to show multiple HHs in one building?
- How to make useful maps of huge rural areas
- Communicating visualization possibilities to HFH staff and helping them think visually

Want more details?

Process

- Data collection guidance at https://gist.github.com/rbanick/ec1a14164e1095aa1616f4d985a428de

- Data cleanup and validation guidance at https://gist.github.com/rbanick/0f1e5dc844ea6d29ed0a8f1ba4a25470

Technical

- Database maintenance code is on github: https://github.com/eoglethorpe/hfh
- Dashboard is private!
- Public data is on OpenStreetMap (obviously)

Us

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