Introduction to WUDAPT

Linda See

Ecosystems Services and Management Program (ESM)

Earth Observation Group (EOS)

Funding by ERC CROWDLAND
WUDAPT Community

• Gerald Mills, University College Dublin
• Jason Ching, University of N Carolina
• Benjamin Bechtel, University of Hamburg
• Johan Feddema, University of Victoria
• Iain Stewart, University of Toronto
• Valery Masson, Meteo France
• Paul Alexander, Maynooth University
• and many others…
WUDAPT: World Urban Database and Access Portal Tools

• Objectives:
  – Urban: Acquire information on aspects of form and functions of cities relevant to climate studies
  – Database: Store the data in a geographic framework that is searchable and widely accessible
  – Portal: Build tools to extract parameters and analyse urban properties for cross-urban comparison and model building
But why is it needed?
Currently available global urban databases provide information on the limits of cities with no internal character. These data have limited value for climate (and other domains).
Key urban form drivers of energy and GHG emissions are density, land use mix, connectivity, and accessibility. These factors are interrelated and interdependent. Pursuing one of them in isolation is insufficient to lower emissions.

Source: IPCC, 2014 AR5 III
Cities in the IPCC 5th Assessment Report AR5 Mitigation (Urban)

Key knowledge gaps (IPCC, 2014):

- Lack of consistent and comparable emissions data at local scales -> challenging to assess the urban share of global GHG emissions as well as develop urbanization typologies and their emissions pathways
- Little scientific understanding of the magnitude of the emissions reduction from altering urban form, and the emissions savings from integrated infrastructure and land use planning
- Few evaluations of urban climate action plans and their effectiveness
<table>
<thead>
<tr>
<th>Koeppen climate type</th>
<th>Pop 1950</th>
<th>Pop 2010</th>
<th>Pop 2050</th>
<th>Number of cities</th>
<th>Per capita income ($)</th>
<th>Total number of cities</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>High</td>
<td>Upper middle</td>
<td>Lower middle</td>
</tr>
<tr>
<td>Equatorial (A)</td>
<td>52010</td>
<td>319360</td>
<td>464791</td>
<td>4</td>
<td>38</td>
<td>65</td>
</tr>
<tr>
<td>$T_{min} \geq +18°C$</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arid (B)</td>
<td>24650</td>
<td>169430</td>
<td>247964</td>
<td>12</td>
<td>37</td>
<td>29</td>
</tr>
<tr>
<td>BSh</td>
<td>7240</td>
<td>9250</td>
<td>11640</td>
<td>2</td>
<td>10</td>
<td>17</td>
</tr>
<tr>
<td>BWh</td>
<td>9810</td>
<td>12510</td>
<td>16300</td>
<td>7</td>
<td>5</td>
<td>8</td>
</tr>
<tr>
<td>Warm temperate (C)</td>
<td>241330</td>
<td>725700</td>
<td>890317</td>
<td>101</td>
<td>144</td>
<td>40</td>
</tr>
<tr>
<td>$-3°C &lt; T_{min} &lt; +18°C$</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Snow (D)</td>
<td>72350</td>
<td>182140</td>
<td>217004</td>
<td>43</td>
<td>35</td>
<td>8</td>
</tr>
<tr>
<td>$T_{min} \leq -3°C$</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Polar (E)</td>
<td>370</td>
<td>1590</td>
<td>2178</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>$T_{max} &lt; +10°C$</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>390710</td>
<td>1398220</td>
<td>1822254</td>
<td>160</td>
<td>254</td>
<td>143</td>
</tr>
</tbody>
</table>

1Arid climates are defined principally on the basis of precipitation; Steppe (BS) and Desert (BW) climates with $T_{min} \geq +18^\circ C$ are warm (h).

2The only city in this category is LaPaz (16.5°N) which has an altitude of 3500m ASL.

We know least about tropical cities in less developed areas.

There are 590 cities with populations over 750,000; these are home to 20% of the world’s population. 100 cities account for 10% of population.
Morphology as relates to Urban Microclimates

- Until very recently, no standard method for characterizing roughness characteristics, aerodynamic properties or thermal / moisture properties
- No universal meaning

We propose use of Stewart and Oke’s Local Climate Zone Classification (LCZ) Scheme
• Need for coherent and consistent description of cities that can be applied internationally, which can be used to compare cities and transfer knowledge more effectively

• The Local Climate Zone (LCZ) classification provides a scheme for describing the basic physical geography of cities suited to further data gathering

• It can be used as a sampling frame to gather more detailed urban data (e.g. building materials, cooking fuel, etc.) at more detailed spatial scales
Strategy for Data Collection

Level 2
- Detailed description of urban landscape parameters at a scale suited to boundary-layer models
- Use of all available databases (e.g. building footprints)

Level 1
- More precise parameter values for each LCZ
- Focus on aspects of form (e.g. building heights, street width) and functions (e.g. building use).
- Sampling of LCZ using GeoWiki

Level 0
- Local Climate Zones (LCZ) along with parameter ranges
- Categorise city neighbourhoods into LCZ types
- Local experts provide training areas
- GoogleEarth, Landsat8 and Saga
Simple urban and rural distinctions have little value for describing urban and natural/managed landscapes and their effects.

The absence of a lexicon that is universal in nature has proved a major obstacle to compare results from city to city and allow communication urban climatologists.

The **Local Climate Zone** approach developed by Iain Stewart and Tim Oke builds on other approaches and provides a classification scheme for urbanised and natural landscapes that can be used to describe **neighbourhoods** within cities.
CLASSIFYING LCZs

Sendai, JAPAN

Diurnal temperature range: small, medium, large

Visual Clues:
- Few if any trees
- Little or no green space
- Tightly packed buildings
- 10+ stories tall

Source: Iain Stewart.
CLASSIFYING LCZs

Medellin, COLOMBIA

Diurnal temperature range: small  medium  large

LCZ 3
Compact low-rise

Visual Clues
Few if any trees
Little or no green space
Tightly packed buildings
1 – 3 stories tall

Source: Iain Stewart.
<table>
<thead>
<tr>
<th>LCZ Type</th>
<th>SVF</th>
<th>Canyon Aspect Ratio (H/W)</th>
<th>Mean Height (m)</th>
<th>Terrain Roughness Class</th>
<th>Building Surface Fraction</th>
<th>Impervious Surface Fraction</th>
<th>Pervious Surface Fraction</th>
<th>Surface Albedo</th>
<th>QF (Wm⁻²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.2-0.4</td>
<td>&gt;2</td>
<td>&gt;25</td>
<td>8</td>
<td>40-60%</td>
<td>40-60%</td>
<td>&lt;10%</td>
<td>0.10-0.20</td>
<td>50-300</td>
</tr>
<tr>
<td>2</td>
<td>0.3-0.6</td>
<td>0.75-2</td>
<td>10-25</td>
<td>6-7</td>
<td>40-70%</td>
<td>30-50%</td>
<td>&lt;20%</td>
<td>0.10-0.20</td>
<td>&lt;75</td>
</tr>
<tr>
<td>3</td>
<td>0.2-0.6</td>
<td>0.75-1.5</td>
<td>3-10</td>
<td>6</td>
<td>40-70%</td>
<td>20-50%</td>
<td>&lt;30%</td>
<td>0.10-0.20</td>
<td>&lt;75</td>
</tr>
<tr>
<td>4</td>
<td>0.5-0.7</td>
<td>0.75-1.25</td>
<td>&gt;25</td>
<td>7-8</td>
<td>20-40%</td>
<td>30-40%</td>
<td>30-40%</td>
<td>0.12-0.25</td>
<td>&lt;50</td>
</tr>
<tr>
<td>5</td>
<td>0.5-0.8</td>
<td>0.3-0.75</td>
<td>10-25</td>
<td>5-6</td>
<td>20-40%</td>
<td>30-50%</td>
<td>20-40%</td>
<td>0.12-0.25</td>
<td>&lt;25</td>
</tr>
<tr>
<td>6</td>
<td>0.6-0.9</td>
<td>0.3-0.75</td>
<td>3-10</td>
<td>5-6</td>
<td>20-40%</td>
<td>20-50%</td>
<td>30-60%</td>
<td>0.12-0.25</td>
<td>&lt;25</td>
</tr>
<tr>
<td>7</td>
<td>0.2-0.5</td>
<td>1-2</td>
<td>2-4</td>
<td>4-5</td>
<td>60-90%</td>
<td>&lt;20%</td>
<td>&lt;30%</td>
<td>0.15-0.35</td>
<td>&lt;35</td>
</tr>
<tr>
<td>8</td>
<td>&gt;0.7</td>
<td>0.1-0.3</td>
<td>3-10</td>
<td>5</td>
<td>30-50%</td>
<td>40-50%</td>
<td>&lt;20%</td>
<td>0.15-0.25</td>
<td>&lt;50</td>
</tr>
<tr>
<td>9</td>
<td>&gt;0.8</td>
<td>0.1-0.25</td>
<td>3-10</td>
<td>5-6</td>
<td>10-20%</td>
<td>&lt;20%</td>
<td>60-80%</td>
<td>0.12-0.25</td>
<td>&lt;10</td>
</tr>
<tr>
<td>10</td>
<td>0.6-0.9</td>
<td>0.2-0.5</td>
<td>5-15</td>
<td>5-6</td>
<td>20-30%</td>
<td>20-40%</td>
<td>40-50%</td>
<td>0.12-0.20</td>
<td>&gt;300</td>
</tr>
<tr>
<td>A</td>
<td>&lt;0.4</td>
<td>&gt;1</td>
<td>3-30</td>
<td>8</td>
<td>&lt;10%</td>
<td>&lt;10%</td>
<td>&gt;90%</td>
<td>0.10-0.20</td>
<td>0</td>
</tr>
<tr>
<td>B</td>
<td>0.5-0.8</td>
<td>0.25-0.75</td>
<td>3-15</td>
<td>5-6</td>
<td>&lt;10%</td>
<td>&lt;10%</td>
<td>&gt;90%</td>
<td>0.15-0.25</td>
<td>0</td>
</tr>
<tr>
<td>C</td>
<td>0.7-0.9</td>
<td>0.25-1</td>
<td>&lt;2</td>
<td>4-5</td>
<td>&lt;10%</td>
<td>&lt;10%</td>
<td>&gt;90%</td>
<td>0.15-0.30</td>
<td>0</td>
</tr>
<tr>
<td>D</td>
<td>&gt;0.9</td>
<td>&lt;0.1</td>
<td>1</td>
<td>3-4</td>
<td>&lt;10%</td>
<td>&lt;10%</td>
<td>&gt;90%</td>
<td>0.15-0.25</td>
<td>0</td>
</tr>
<tr>
<td>E</td>
<td>&gt;0.9</td>
<td>&lt;0.1</td>
<td>&lt;0.25</td>
<td>1-2</td>
<td>&lt;10%</td>
<td>&gt;90%</td>
<td>&lt;10%</td>
<td>0.15-0.30</td>
<td>0</td>
</tr>
<tr>
<td>F</td>
<td>&gt;0.9</td>
<td>&lt;0.1</td>
<td>&lt;0.25</td>
<td>1-2</td>
<td>&lt;10%</td>
<td>&lt;10%</td>
<td>&gt;90%</td>
<td>0.20-0.35</td>
<td>0</td>
</tr>
<tr>
<td>G</td>
<td>&gt;0.9</td>
<td>&lt;0.1</td>
<td>N/A</td>
<td>1</td>
<td>&lt;10%</td>
<td>&lt;10%</td>
<td>&gt;90%</td>
<td>0.02-0.10</td>
<td>0</td>
</tr>
</tbody>
</table>

Each LCZ type is associated with typical urban canopy parameter values.
City area is identified & Landsat scenes compiled

Urban expert uses Google Earth to digitize neighbourhoods that typify LCZ types

SAGA software uses neighbourhoods as training areas to classify Landsat image into LCZ types

Urban expert reviews output, refines training areas and repeats process

Level 0 Workflow

The Urban Expert is someone who knows the city under study. All of the tools developed are free to use. http://www.wudapt.org/
Example: Sao Paolo

The first part involves create training areas (representing LCZ types) within Google Earth
Maria De Fatima Andrade (Departamento de Ciências Atmosféricas do Instituto de Astronomia, Geofísica e Ciências Atmosféricas, USP) was the local urban expert for Sao Paolo.
Kolkata
Urban expert: Debashish Das

Beijing
Urban expert: Weibo Liu
<table>
<thead>
<tr>
<th>LCZ</th>
<th>Bei</th>
<th>Chi</th>
<th>Col</th>
<th>Dub</th>
<th>Kol</th>
<th>Kua</th>
<th>Mil</th>
<th>Sao</th>
<th>Van</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compact high-rise</td>
<td>18.2</td>
<td>7.4</td>
<td>1.5</td>
<td>2.3</td>
<td>4.5</td>
<td>8.2</td>
<td>0.0</td>
<td>9.0</td>
<td>3.6</td>
</tr>
<tr>
<td>Compact mid-rise</td>
<td>5.7</td>
<td>2.4</td>
<td>28.7</td>
<td>8.5</td>
<td>14.1</td>
<td>2.2</td>
<td>20.2</td>
<td>1.2</td>
<td>0.8</td>
</tr>
<tr>
<td>Compact low-rise</td>
<td>2.8</td>
<td>3.9</td>
<td>13.3</td>
<td>3.6</td>
<td>14.6</td>
<td>18.6</td>
<td>0.2</td>
<td>11.3</td>
<td>9.5</td>
</tr>
<tr>
<td>Open high-rise</td>
<td>17.9</td>
<td>6.0</td>
<td>6.2</td>
<td>0.1</td>
<td>7.9</td>
<td>15.7</td>
<td>5.6</td>
<td>6.0</td>
<td>10.4</td>
</tr>
<tr>
<td>Open mid-rise</td>
<td>14.4</td>
<td>3.5</td>
<td>9.8</td>
<td>5.3</td>
<td>7.6</td>
<td>10.0</td>
<td>18.8</td>
<td>4.3</td>
<td>5.9</td>
</tr>
<tr>
<td>Open low-rise</td>
<td>12.4</td>
<td>30.9</td>
<td>28.1</td>
<td>31.5</td>
<td>12.4</td>
<td>14.4</td>
<td>13.2</td>
<td>25.3</td>
<td>22.2</td>
</tr>
<tr>
<td>Lightweight low-rise</td>
<td>6.0</td>
<td>0.0</td>
<td>0.9</td>
<td>0.0</td>
<td>0.6</td>
<td>0.6</td>
<td>0.0</td>
<td>4.3</td>
<td>0.0</td>
</tr>
<tr>
<td>Large low-rise</td>
<td>14.9</td>
<td>13.0</td>
<td>11.5</td>
<td>44.7</td>
<td>9.2</td>
<td>10.6</td>
<td>19.9</td>
<td>18.8</td>
<td>14.8</td>
</tr>
<tr>
<td>Sparsely built</td>
<td>4.1</td>
<td>19.7</td>
<td>0.0</td>
<td>0.0</td>
<td>29.1</td>
<td>13.7</td>
<td>22.1</td>
<td>16.7</td>
<td>32.8</td>
</tr>
<tr>
<td>Heavy industry</td>
<td>3.8</td>
<td>13.3</td>
<td>0.0</td>
<td>4.0</td>
<td>0.0</td>
<td>6.0</td>
<td>0.0</td>
<td>3.1</td>
<td>0.0</td>
</tr>
<tr>
<td>Kappa</td>
<td>0.90</td>
<td>0.91</td>
<td>0.64</td>
<td>0.82</td>
<td>0.62</td>
<td>0.73</td>
<td>0.84</td>
<td>0.82</td>
<td>0.89</td>
</tr>
<tr>
<td>Total area</td>
<td>3406</td>
<td>3479</td>
<td>338</td>
<td>2396</td>
<td>622</td>
<td>1406</td>
<td>1630</td>
<td>4141</td>
<td>1408</td>
</tr>
</tbody>
</table>

A preliminary comparison of the LCZ make-up of 12 cities (Bei – Beijing, Chin; Chi – Chicago, US; Col – Colombo, Sri Lanka; Dub – Dublin, Ireland; Kol – Kolkata, India; Kua – Kuala Lumpur, Malaysia; Sao – Sao Paolo, Brazil and; Van – Vancouver, Canada. The kappa value is a measure of accuracy and Total Area is expressed in terms of satellite cell number (each cell is 120m on a side).
Wudapt.org

Create LCZ Training Areas
Follow the simple steps outlined here to create LCZ training areas for your city

Classify your City
Follow the step-by-step instructions to create an LCZ classification of your city

View LCZ maps
Access LCZ maps for different cities around the world using Geopedia

The World Urban Database and Access Portal Tools (WUDAPT) is an initiative to collect data on the form and function of cities around the world.
The table below outlines the status of LCZ mapping for cities in Asia. As you can see, we still have a long way to go! If you interested in a city that does not appear, then sign up for it [here](#).

<table>
<thead>
<tr>
<th>City</th>
<th>Names of those involved</th>
<th>Main points of contact</th>
<th>Status</th>
<th>Completion by</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ahmedabad</td>
<td>MSc. Arthur Lehner</td>
<td><a href="mailto:arthur.lehner.fl@ait.ac.at">arthur.lehner.fl@ait.ac.at</a></td>
<td>Currently working on the full LCZ workflow</td>
<td>10/30/2017</td>
</tr>
<tr>
<td>Beijing</td>
<td>Gerald Mills, Michael Foley</td>
<td><a href="mailto:gerald.mills@ucd.ie">gerald.mills@ucd.ie</a></td>
<td>Completed; available to view</td>
<td>N/A</td>
</tr>
<tr>
<td>Bhopal</td>
<td>Sarah Ali</td>
<td><a href="mailto:sarahali30308@gmail.com">sarahali30308@gmail.com</a></td>
<td>Currently working on the full LCZ workflow</td>
<td>N/A</td>
</tr>
<tr>
<td>Chandigarh</td>
<td>Mrs Kshama Gupta</td>
<td><a href="mailto:kshama@iirs.gov.in">kshama@iirs.gov.in</a></td>
<td>Currently working on the full LCZ workflow</td>
<td>12/31/2015</td>
</tr>
<tr>
<td>Colombo</td>
<td>Narein Pereira, Michael Foley</td>
<td><a href="mailto:nareinperera@gmail.com">nareinperera@gmail.com</a></td>
<td>Completed; available to view</td>
<td>N/A</td>
</tr>
<tr>
<td>Delhi</td>
<td>Mrs Kshama Gupta</td>
<td><a href="mailto:kshama@iirs.gov.in">kshama@iirs.gov.in</a></td>
<td>Currently preparing Landsat data; digitizing training areas; running the LCZ classification</td>
<td>12/31/2015</td>
</tr>
<tr>
<td>Delhi</td>
<td>Richa Sharma</td>
<td><a href="mailto:richa.sharma@vito.be">richa.sharma@vito.be</a></td>
<td>Currently preparing Landsat</td>
<td>01/10/2015</td>
</tr>
<tr>
<td>Dhaka</td>
<td>Hasan M. Abdullah</td>
<td><a href="mailto:hasan.abdullah@bsmrau.edu.bd">hasan.abdullah@bsmrau.edu.bd</a></td>
<td>Currently preparing Landsat</td>
<td>24/12/2015</td>
</tr>
</tbody>
</table>
## Level 1 and 2 Data Needed on Urban Form and Function

<table>
<thead>
<tr>
<th>Feature</th>
<th>Variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cover</td>
<td>Land cover, vegetation type, vegetation organization</td>
</tr>
<tr>
<td>Geometry</td>
<td>Building height, width of streets, contiguous or isolated buildings, roof geometry, building density</td>
</tr>
<tr>
<td>Material</td>
<td>Wall type, roof type, window type, road materials, window fraction on the wall, colour/albedo</td>
</tr>
<tr>
<td>Function</td>
<td>Building use, irrigation, road type, temperature settings, occupancy, air conditioning, shutters or shading, window opening, building age, building renovation post 1990</td>
</tr>
</tbody>
</table>
Geo-Wiki

Visualization of Global Land Cover, Biomass, Photos, etc.

Crowdsourcing of Land Cover (Google Earth, Bing Maps)

Creation of Hybrid Land Cover Maps

Validation of Land Cover Maps

In-situ Data via Geo-Wiki Pictures app

Serious Games (Cropland Capture)

www.geo-wiki.org
Cities Geo-Wiki

GEO-Wiki

CITIES

Don't show any overlays

+ Dublin Urban Atlas
+ Dublin Building Footprints
+ Dublin LCZ

Start validation

- Hamburg
- Houston
- Sao Paulo
- Medellin
- Kuala Lumpur
- Additional Data
- Geocoding

- Continuous Urban Fabric (S.L. > 80%)
- Discontinuous Dense Urban Fabric (S.L. : 50% - 80%)
- Discontinuous Medium Density Urban Fabric (S.L. : 30% - 50%)
- Discontinuous Low Density Urban Fabric (S.L. : 10% - 30%)
- Discontinuous Very Low Density Urban Fabric (S.L. < 10%)
- Isolated Structures
- Industrial, commercial, public, military and private units
- Fast transit roads and associated land
- Other roads and associated land
- Railways and associated land
- Port areas
- Airports
- Mineral extraction and dump sites
- Construction sites
- Land without current use
- Green urban areas
- Sports and leisure facilities
- Agricultural + Semi-Natural areas + Wetlands
- Forests
- Wetlands
- Water bodies
## Level 1 and 2 Data Needed on Urban Form and Function

<table>
<thead>
<tr>
<th>Feature</th>
<th>Variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cover</td>
<td>Land cover, vegetation type, vegetation organization</td>
</tr>
<tr>
<td>Geometry</td>
<td>Building height, width of streets, contiguous or isolated buildings, roof geometry, building density</td>
</tr>
<tr>
<td>Material</td>
<td>Wall type, roof type, window type, road materials, window fraction on the wall, colour/albedo</td>
</tr>
<tr>
<td>Function</td>
<td>Building use, irrigation, road type, temperature settings, occupancy, air conditioning, shutters or shading, window opening, building age, building renovation post 1990</td>
</tr>
</tbody>
</table>
Level 1: Point sampling

- Sampling at a regular spaced grid across Dublin using Geo-Wiki - completed
- Allows you to create % land cover types for any type of grid size
- Need to determine the optimal spacing & sensitivity of model results
- Experimenting with OSM to reduce sampling
Approximately 8% of sample points are tree canopy.


<table>
<thead>
<tr>
<th>Feature</th>
<th>Variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cover</td>
<td>Land cover, vegetation type, vegetation organization</td>
</tr>
<tr>
<td>Geometry</td>
<td>Building height, width of streets, contiguous or isolated buildings, roof geometry</td>
</tr>
<tr>
<td>Material</td>
<td>Wall type, roof type, window type, road materials, window fraction on the wall, colour/albedo</td>
</tr>
<tr>
<td>Function</td>
<td>Building use, irrigation, road type, temperature settings, occupancy, air conditioning, shutters or shading, window opening, building age, building renovation post 1990</td>
</tr>
</tbody>
</table>
Collection of Level 1 Data
Collecting Data on Individual Buildings

Number of storeys: *

Building material: *

Roof: *

Type of building: *

Type of building - Other:

Detached?: *

Proportion of front that has windows: *

Age of building:

Albedo:
GeoODK

- Open Data Kit – questionnaire app
- GeoODK - spatial functionality added
- Open source, Android
- Developed by Jon Nordling
  - SATIDA Collect
  - International Red Cross
  - LandMapp
WUDAPT Collect

Building survey
Added on Thu, Dec 03, 2015 at 14:54

Select the level of this analysis
- Single Building
- Street / Neighborhood
WUDAPT Collect

Please record your location
*GPS coordinates can only be collected when outside.*

Record Location

Street address
*If you weren’t able to record your location, please provide the street address of your current location.*

Building use
*How is this building used?*
- Residential
- Commercial
- Industrial
- Agricultural
- Other
- Unknown (?)
WUDAPT Collect

Wall frame / Construction
- Wood
- Metal
- Reinforced concrete
- Concrete block
- Brick
- Stone
- Mud

Wall insulation
- Yes
- No
- Unknown

Wall insulation
- Air
- Foam block (xps)
- Loose / Blown
- Rubble / Paper
- Other
- Unknown (?)
WUDAPT Collect

Wall Exterior
- Concrete Panel
- Brick
- Stone
- Siding (Al, Vinyl)
- Siding (concrete)
- Wood
- Façade (brick/stone)
- Adobe
- EIFS
- Mud
- Concrete Block
- Unknown (?)

Brightness of the building

Heat source of the building
Does the building have heating?
- Yes
- No
- Unknown

Copied to clipboard.
Heat source of the building
Which type of heating is installed?

- Central Air
- Electric
- Hot water/steam
- Wood burning
- Other

Thermostat setting day
What temperature is the thermostat set to for the electric heating?

- 5°C - 41°F
- 10°C - 50°F
- 15°C - 59°F
- 20°C - 68°F
- 25°C - 77°F
- Unknown (?)

Thermostat setting night
What temperature is the thermostat set to for the electric heating?

- 5°C - 41°F
- 10°C - 50°F
- 15°C - 59°F
- 20°C - 68°F
- 25°C - 77°F
- Unknown (?)
WUDAPT Collect

Windows
Which types of windows are used on this building?

- [ ] Single panel
- [x] Double panel
- [ ] Triple panel
- [ ] Frame
- [ ] Metal
- [ ] Unknown (?)

You are at the end of Building survey.

Name this form
Building survey

- [x] Mark form as finalized

Save Form and Exit

Building use

- Residential
- Commercial
- Industrial
- Agricultural
- Other
Example of a Serious Game Interface

Is there cropland in the red box?

Week 8 will end in 2 days, 10 hours, 3 min, 46 sec

Follow us on twitter to get the latest news about Cropland Capture!

Total Score: 11403
Weekly Score: 11403
Sorted: 0.56929%
Week 1 ends in 3 days, 9 hours, 43 minutes.

Do you see tree loss over time?

Before
After

No
Yes

Maybe ↓
App to Gather Information from Photos: Type 1

- Geotagged pictures from different sources (e.g. Flickr, crowsourcing, Streetview)
- User would identify building materials and roof types
- Automatic translation to UCPs for each LCZ
- App could also be used to take pictures and classify buildings and roof materials
App to Gather Information from Photos: Type 2

- Typical photos collected by city experts
- Could have photos on a wheel on the right to encompass more than 4 photos
- Automatic translation to UCPs for each LCZ

Match the closest picture
Conclusions

• A global database of cities is needed that captures the character of urban landscapes. It needs to be created quickly, given the pace of urbanisation in Asia and Africa.

• The approach described appears to be robust and the initial characterisation of large global cities will proceed using Landsat imagery (and also Sentinel 2).

• Next step will be to gather more detailed information on cities using other techniques, including crowdsourcing and using available data sources (e.g. Google Streetview, OpenStreetMap, etc.).

• WUDAPT will be developed by the urban climate community (and any other communities interested).

• Results will be accessible for climate research and many other applications.
Linda See
see@iiasa.ac.at
http://www.wudapt.org