An aerial photograph of a city, likely during autumn, showing dense residential areas with yellow and orange trees. A circular lens effect is centered on a large, modern-looking building complex in the middle ground. The text "urbinsight™" is overlaid on this circular area.

# Geospatial Mapping and Education for Community Sustainability and Resilience

Dynamic Mapping of  
Secondary Cities  
Symposium  
Center for Geographic  
Analysis  
Harvard University  
June 14-15, 2016

Kirstin Miller  
Executive Director

ECOCITY  
BUILDERS



# TOPICS

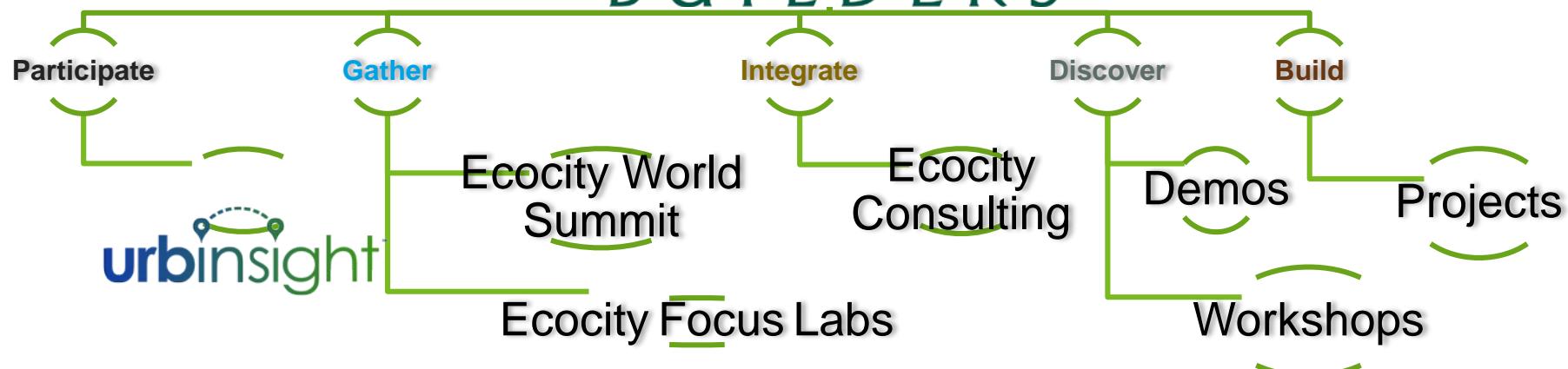
- ECOCITY BUILDERS
- The Urbinsight approach
  - How we integrate data and provide a common visual language
- Latin American case studies
- Mapping technologies selected and piloted
- Challenges and success of participatory mapping in pilots

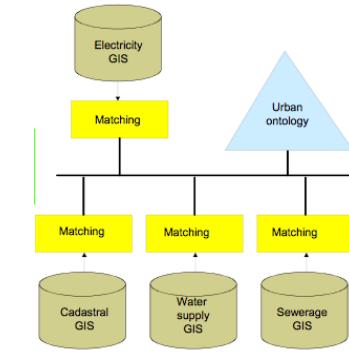
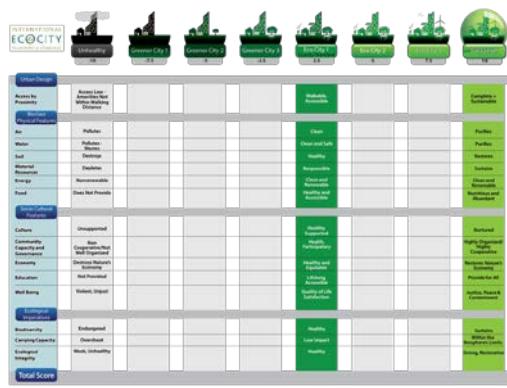


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BUILDERS

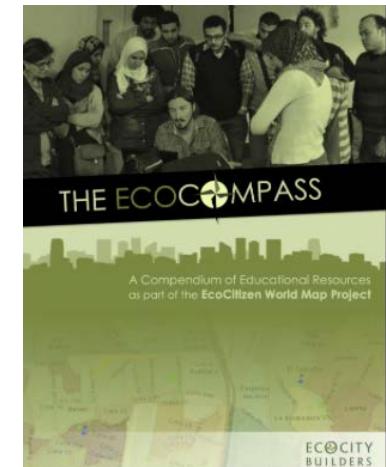
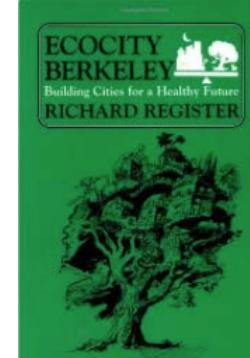
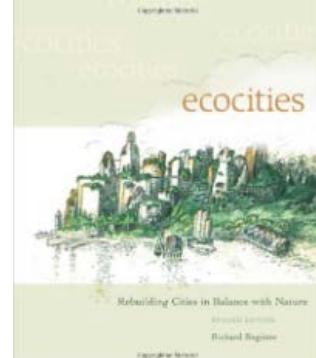
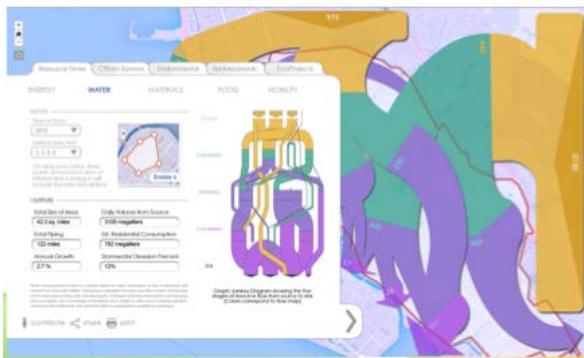
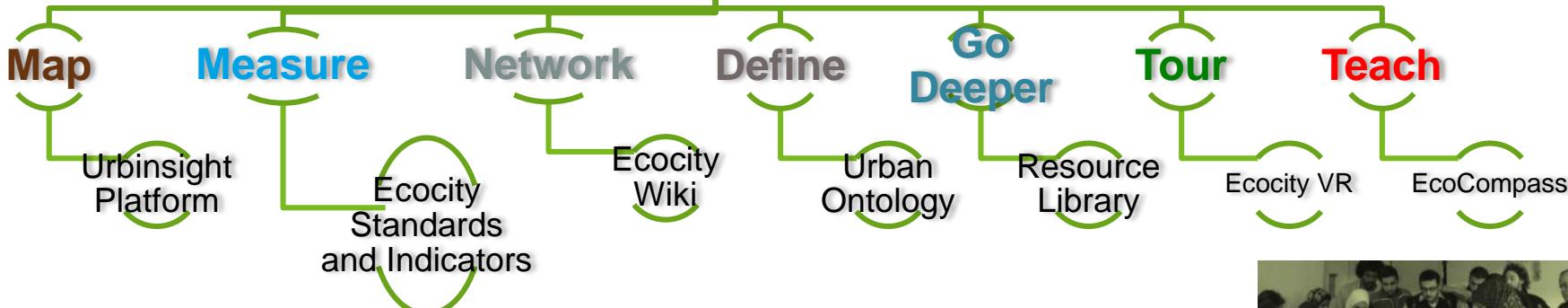


# ECOCITY BUILDERS





## TOOLS AND RESOURCES



**BUILDERS**

# ECOCITY BUILDERS

## OUR PARTNERS



WORLD  
URBAN  
CAMPAIGN



Organization of  
American States



SCHOOL OF  
CONSTRUCTION AND  
THE ENVIRONMENT



# KEY CONCEPT

## DEFINITION OF ECOCITY

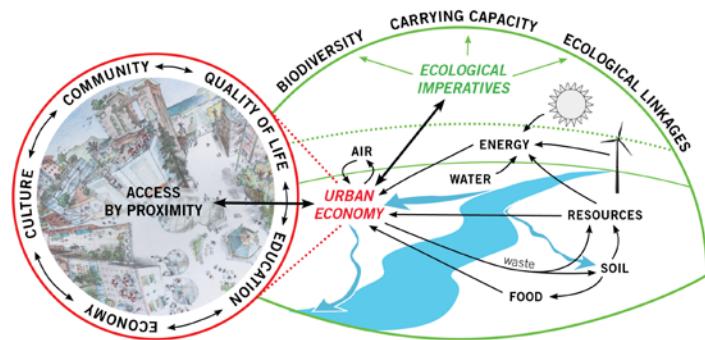
— WORKING DEFINITION ADOPTED BY ECOCITY BUILDERS AND THE INTERNATIONAL ECOCITY STANDARDS ADVISORY TEAM, 2/20/10, VANCOUVER, CANADA.

An ecocity is a human settlement modeled on the self-sustaining resilient structure and function of natural ecosystems and living organisms.

The ecocity provides healthy abundance to its inhabitants without consuming more (renewable) resources than it produces, without producing more waste than it can assimilate, and without being toxic to itself or neighboring ecosystems.

Its inhabitants' ecological impacts reflect planetary supportive lifestyles; its social order reflects fundamental principles of fairness, justice and reasonable equity.

| INTERNATIONAL ECOCITY<br>STANDARDS & FRAMEWORK |                                    | Ecological Health Index      |                        |
|--|------------------------------------|------------------------------|------------------------|
| Urban Design                                   | Unhealthy                          | -10                          | GreenCity 1            |
| Bio-Geo Physical Features                      | Greener City 1                     | -7.5                         | Greener City 2         |
| Air  | Greener City 2                     | -5                           | Greener City 3         |
| Water  | Greener City 3                     | -3.5                         | Eco City 1             |
| Soil   | Eco City 1                         | -2.5                         | Eco City 2             |
| Material Resources                             | Eco City 2                         | -2                           | Eco City 3             |
| Energy   | Eco City 3                         | -1.5                         | Zero Energy            |
| Food   | Zero Energy                        | 0                            | Green Level            |
| Socio Cultural Features                        |                                    | Community                    |                        |
| Culture  | Unsupported                        | Quality of Life              | Access by Proximity    |
| Community Capacity and Governance              | Non Cooperative Not Well Organized | Health, Participatory        | Marketable, Accessible |
| Economy  | Destroys Nature's Reserves         | Health, Sustainable          | Complete + Sustainable |
| Education                                      | Not Provided                       | Health, Participatory        |                        |
| Well Being                                     | Violent, Unjust                    | Quality of Life Satisfaction |                        |
| Ecological Imperatives                         |                                    | Ecological Imperatives       |                        |
| Biodiversity                                   | Endangered                         | Healthy                      |                        |
| Carrying Capacity                              | Overload                           | Low Impact                   |                        |
| Ecological Linkages                            | Weaken, Unhealthy                  | Healthy                      |                        |



Reconceives ‘the city system’ as complete human ecosystem

International Ecocity Framework  
and Standards  
[www.ecocitystandards.org](http://www.ecocitystandards.org)

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Office of the Geographer and  
Global Issues (GGI)  
U.S. Department of State



Resiliency - Human Security - Emergency Preparedness

## Geospatial Mapping and Education for Community Sustainability and Resilience

Objective To build a regional South American program for capacity-building and data-generating activities that will connect secondary cities with web-based mapping tools and educational programs designed to boost resiliency, support better planning and urban growth management, and enable more robust emergency management planning.



Photo: The Urbinsight course launches in Cusco with 27 students.

Cusco, Peru  
510,000



Medellin, Colombia  
2.4 million

**Academic partners:**

UNAL – National University of Colombia

**Community partners:**

E2E Foundation

**Government and data partners:**

Municipality, EPM (public utility)



Comuna 8, Medellin, Colombia

**Academic partners:**

UAP Universidad Alas Peruanas

**Community partners:**

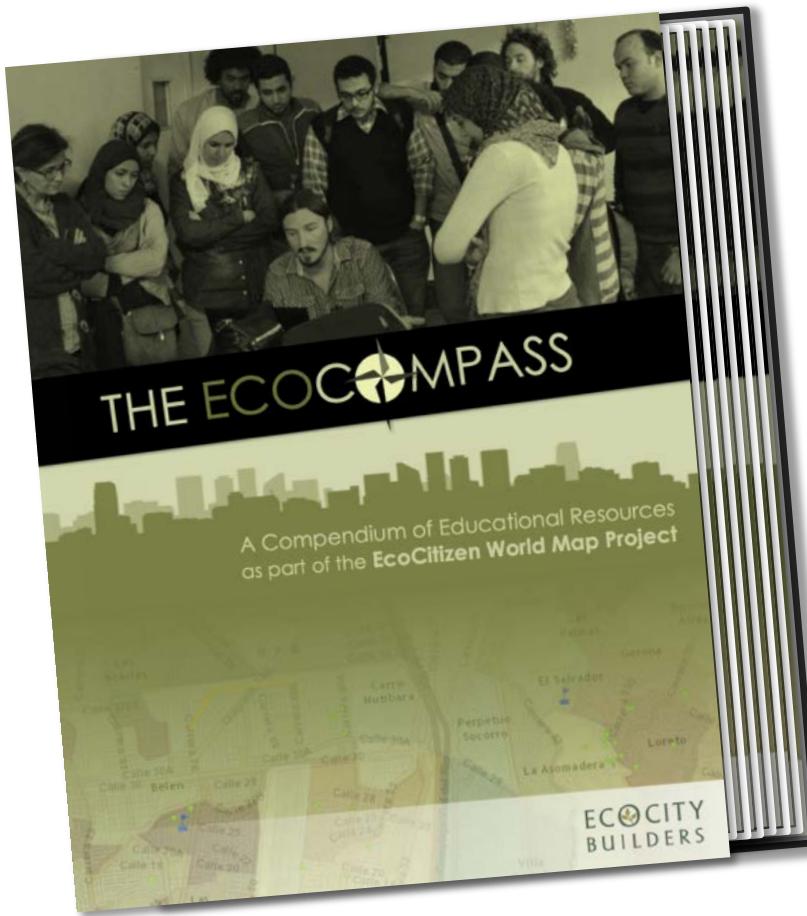
San Pedro CBO

**Government and data partners:**

City of Cusco, MINAM (Ministry of the Environment of Peru)



San Pedro, Cusco, Peru



# ECOCOMPASS

## Seminars and labs

## Popular education workshops

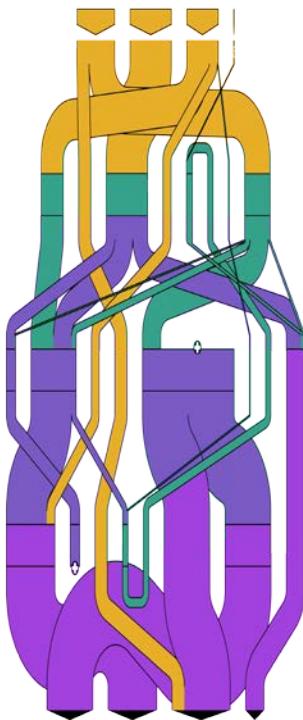
## **Intensive trainings**

# Virtual meetings

# GIS simulations

## Community-based facilitation

# Tool adaptation and refinement



## Source

## Conversion

## Demand

## Re-conversion

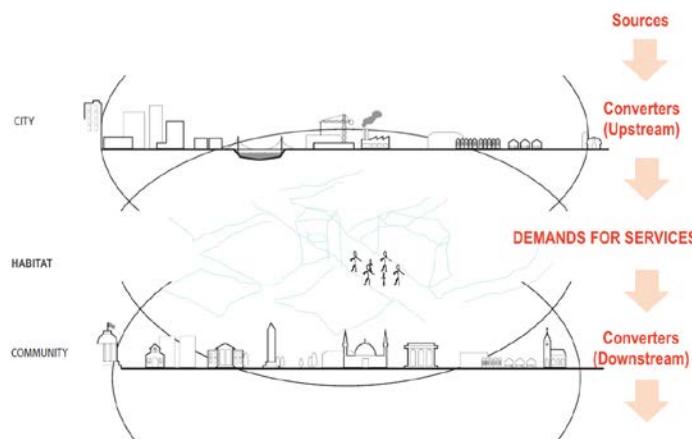
## Sink

## Sources

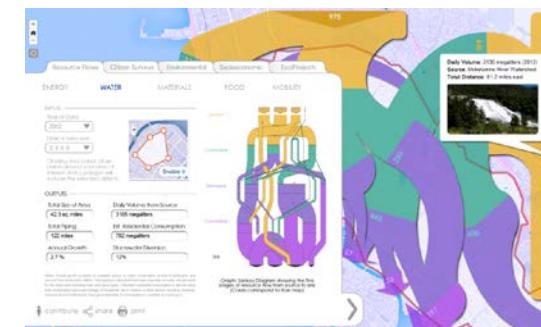
Conversación

## FOR SERVICES

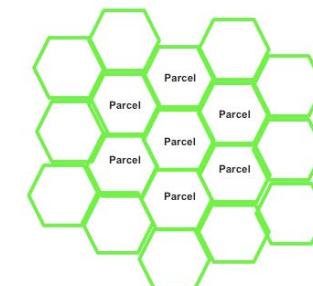
### **Converters**



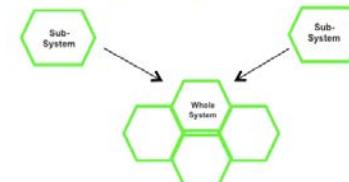
Credit to  
Ecocity Builders  
Sebastian Moffatt, Consensus Institute  
Philip Mansfield, Graphical Memes  
Jennie Moore, BCIT



### **Development Site / Neighbourhood**



## System of Systems



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View Features

- Torganizacionpoliticoadm Z19
- Thidro Red Linea Z19
- Tfcsubestaciontransformacion
- Tuso Suelo Propuesta
- Tmanante Z190
- Tmanante
- Poste Utm
- Tambiental
- Tuso Suelo Consolidado
- Tcatastro Metropolitano Z190
- Tcont Antena
- Tramo Propuesta2013
- Tshistoricos
- Tlagunas Sur0
- Tcentros Hist Z18
- Thidrogeologia

Legend: Quality of Life Index 2011

Chart: Range in Measures According to District

© Mapbox © OpenStreetMap Improve this map © DigitalGlobe



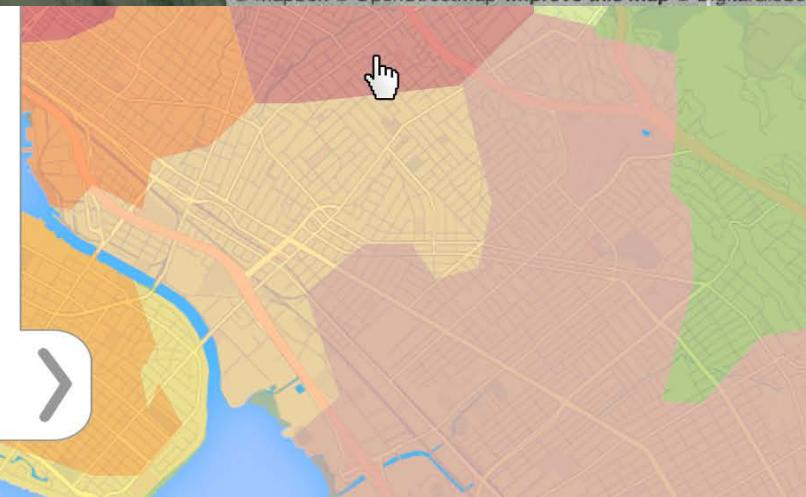
### Quality of Life Datasets

Browse through 62 key quality of life indicators for 180 individual measures across 10 domain areas.

Feeling safe and secure in our homes, communities and urban areas is a basic human right. Feeling and being safe is a key to overall health in the community. Safety and perceptions of safety feature highly in people's view of their living environment, their sense of well being and quality of life. As urban areas grow, the need for safe social and physical environments, where people are able to participate fully in their communities, becomes an increasing challenge.

Arrange according to:

Access and Safety ▾



contribute



print

- Homicidos By Comuna
- Zonaverdepobl Sistmovil
- Centro Acopio
- Comuna Corrigimiento
- Urban Gardens
- Area Corredores Usos Especiales



Tour

Features

Partner Cities

EcoCompass

About

Language  
Sign up  
Log in

View Features

Resource Flows
Citizen Surveys
Environmental
Socioeconomic
EcoProjects

ENERGY      WATER      MATERIALS

FOOD      MOBILITY

KPI Indicators

Adaptability Performance: Water use satisfied on site

Capacity Performance: Demand exceeding capacity

Graph: Regional water consumption and central reservoir availability

| Year | Consumption (approx.) | Availability (approx.) |
|------|-----------------------|------------------------|
| 2005 | 20                    | 25                     |
| 2006 | 25                    | 28                     |
| 2007 | 45                    | 35                     |
| 2008 | 80                    | 38                     |
| 2009 | 40                    | 42                     |
| 2010 | 20                    | 30                     |
| 2011 | 45                    | 45                     |
| 2012 | 50                    | 48                     |
| 2013 | 55                    | 42                     |
| 2014 | 75                    | 45                     |

Type: Two-storey detached  
Zoning: Residential  
Vintage: Pre-1970

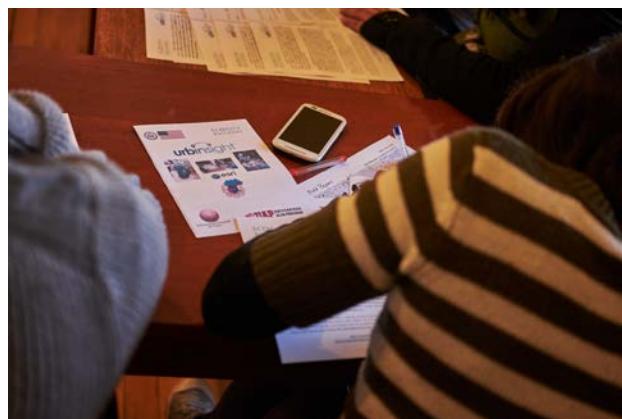
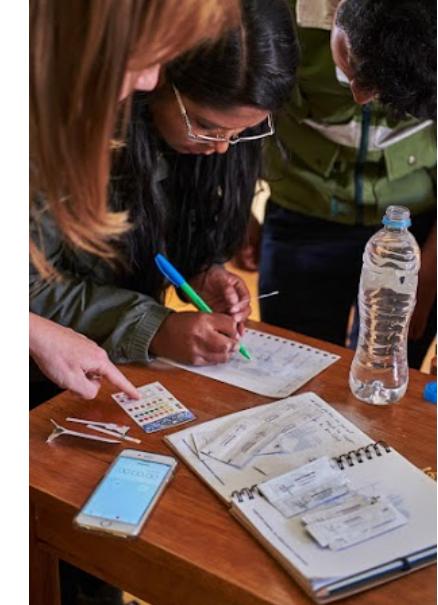
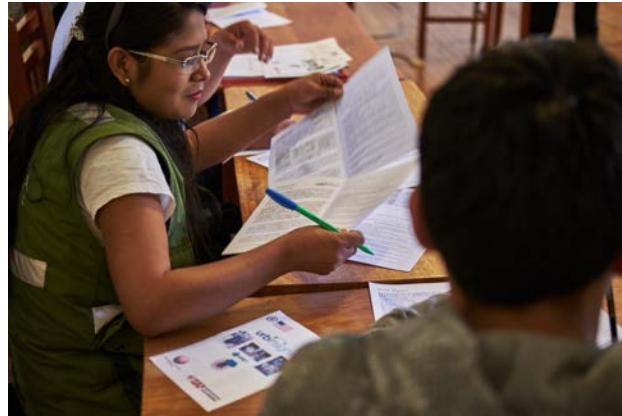
Water Use: Average of 400 gallons (1500 Liters) of water used per day. Approximately 70 percent of this amount is used indoors, the largest consumption being associated with washroom activities at 27 percent. Between 15 and 20% is used for laundry. Given the age of the building's plumbing, leaks have been shown to waste up to 20,000 Litres per year

contribute share print

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# CITIZEN SCIENCE



Right: Cusco community data collection – June 13 2016 with Secondary Cities.

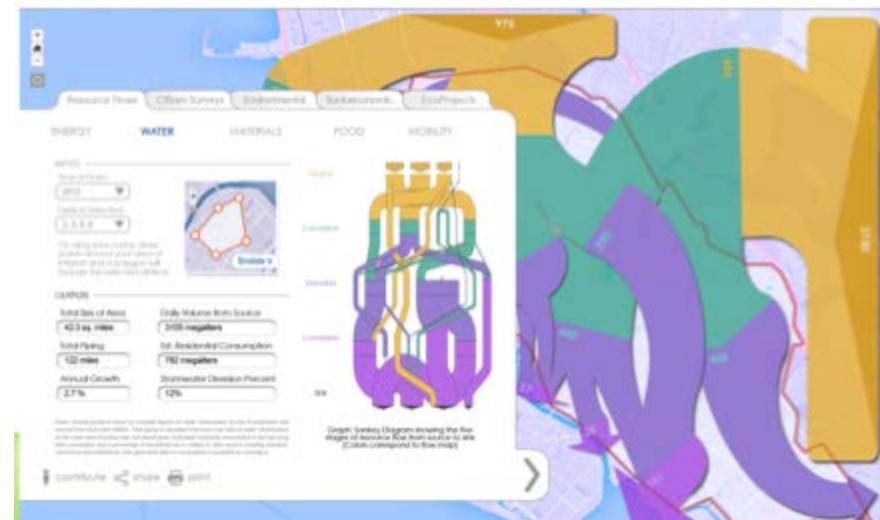
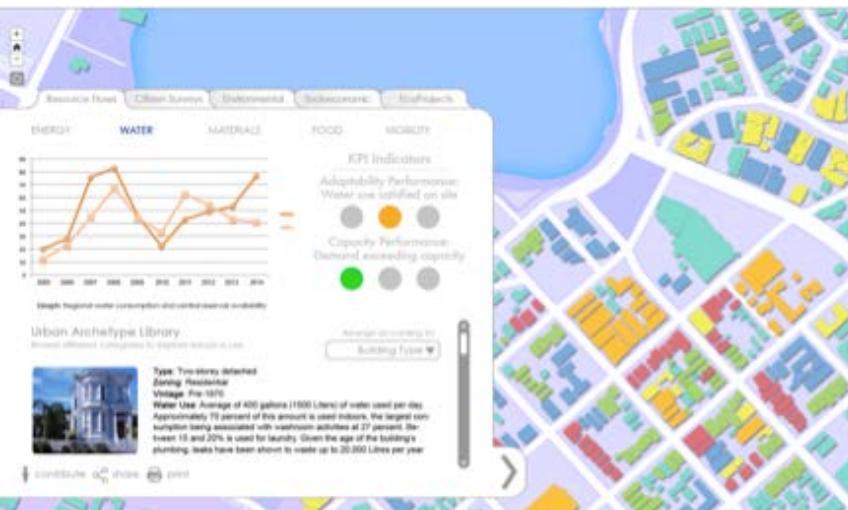
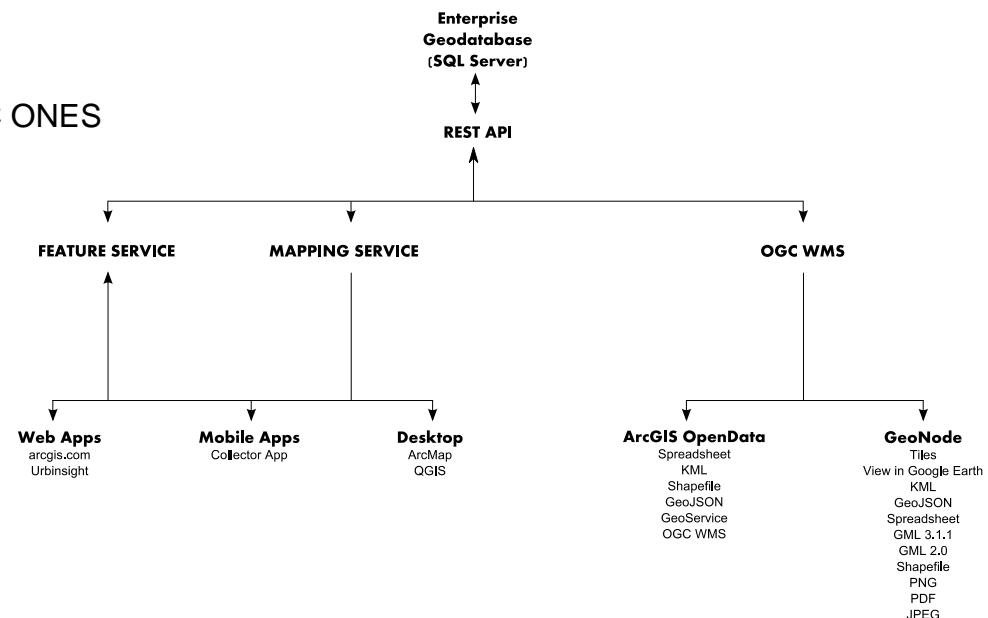
# TOP DOWN + BOTTOM UP DATA

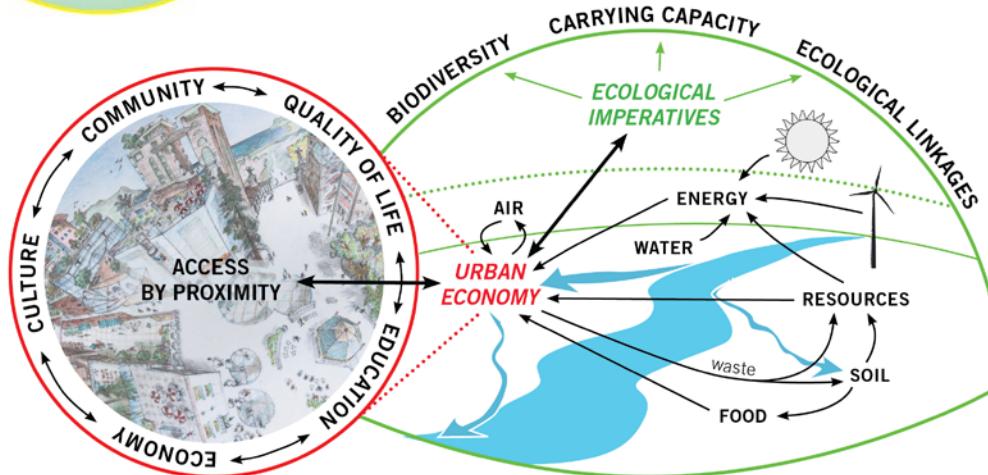
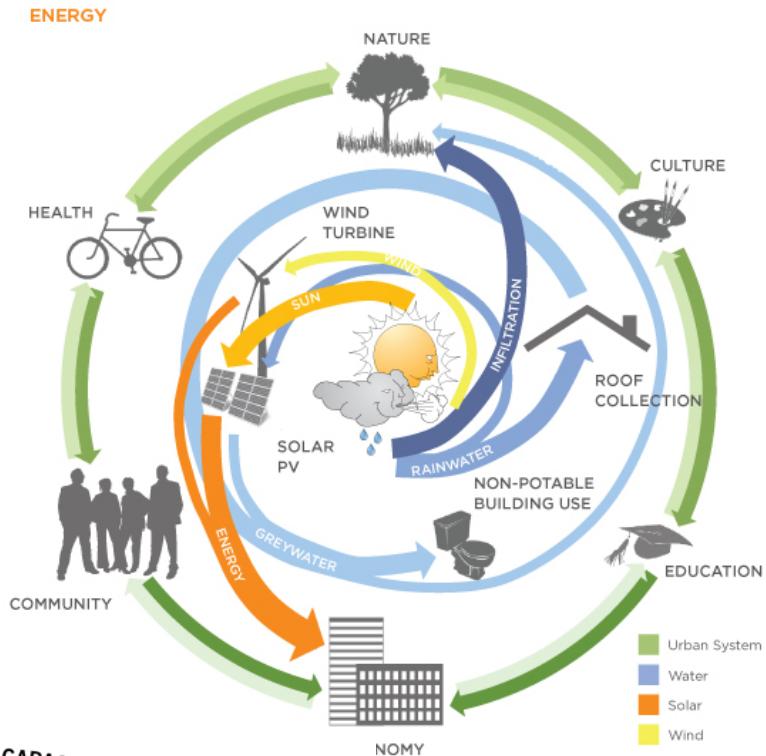
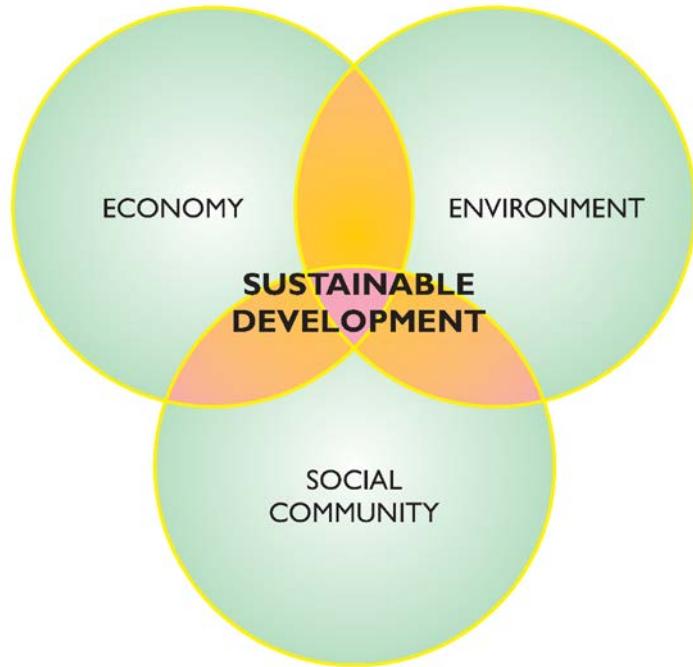
## CITY DATA AND INFORMATION

- HIGH LEVEL CONCEPTS AND INFORMATION
- ADD SPECIFIC CONCEPTS FROM MORE GENERIC ONES

## CITIZEN DATA AND INFORMATION

- START FROM REAL EXISTING OBJECTS
- AGGREGATE INTO MORE GENERIC OBJECTS
- LINK TO THE TOP DOWN LEVEL





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## Results thus far in Cusco

- Universidad Alas Peruanas is incorporating student projects from the Secondary City projects into formal curriculum.
- Several students are considering writing their bachelor theses on a topic linked to solid waste management in San Pedro or one of the other elements of the Secondary Cities initiative.
- The lead municipal official for land-use planning sees the value in the community engagement methodology and plans to incorporate elements of the Urbinsight tool into decision making.
- Professor Santos Mera has established himself as a leader in this field in Cusco and is now able to influence policy through his role as an advisor to the regional government.



June 13 in Cusco with students, citizens, local government





Cairo, Egypt (Imbaba)

Casablanca, Morocco

Budapest, Hungary

Oakland, California, USA



Organization of  
American States



# 7-STEP PAR FRAMEWORK

**Step 1: Identifying & Engaging Partners**

**Step 2: Forming Collaborative Questions**

**Step 3: Planning Research Activities**

**Step 4: Conducting the Research**

**Step 5: Analyzing the Data**

**Step 6: Sharing the Findings**

**Step 7: Taking Action**

# خريطة المدينة المستدامة

دامنة

للفي  
ة الدى  
فيه؟

بيئة

هل ت يريد ان تشارك في  
تحسين بيئتك التي تعيش فيها؟

هل ت يريد ان تعرف  
كيف تؤثر البيئة  
على معيشتك؟



هل تعلم

- كم تستهلك ماء / كهرباء؟ غاز؟ وغيرها من مصادر الطاقة؟
- كيف تؤثر طريقة حياتك اليومية على البيئة المحيطة؟
- خطوات بسيطة تساهم بها في تحسين البيئة في الذي تعيش فيه؟
- كيف تساهم البيئة في تحقيق حياة التي تمناها؟

احتارنا؟

مجموعة من المهندسين مهتمين بتنمية المجتمع وأوصول البيئة أفضل عن طريق دمج المجتمع في تحديه وحل مشكلاته.

هدفنا؟

- الوصول لبيئة أفضل عن طريق تشديد استعمال مصادر الطاقة والمواد البناء.
- تحسين المجتمع من المشاركة في تحسين البيئة
- الشراكة مع القائمين على التنمية العمرانية [مهندسين، باحثين، حكومة]

هتشترك معاناً أزاي؟

- حده مشكلات [البيئة، العمرانية، الاقتصادية]
- توثيق وتحديث البيانات على نظام المعلومات الجغرافية [GIS] لنقل اتخاذ القرار.
- شارك في اليوم المجتمعى الثانى والتالى ٢٠١٣م

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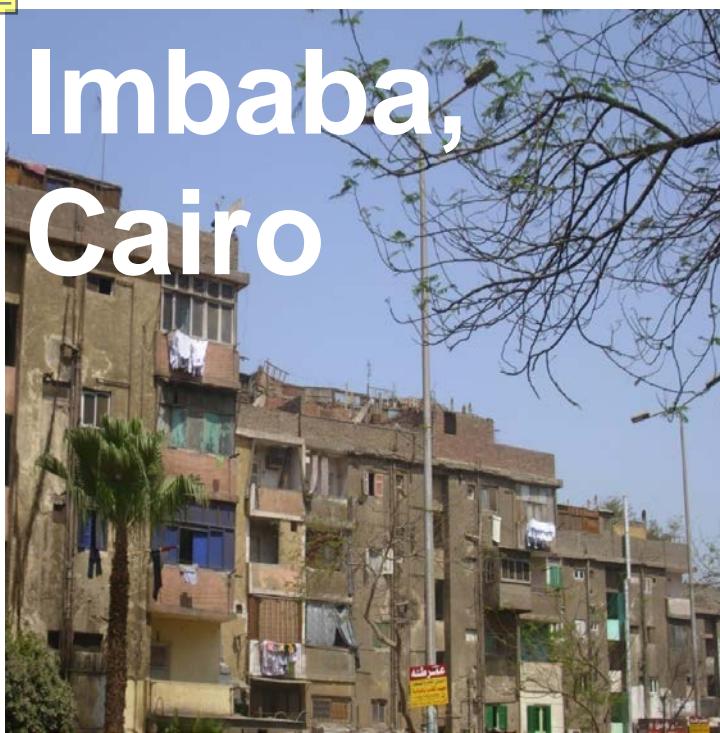
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# Imbaba, Cairo

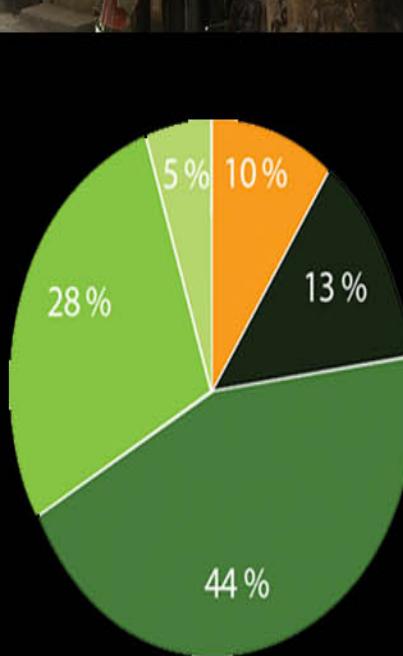


BUILDERS

# Study Area



# Dividing into Archetypes & Aggregation



# Methodology



# Bootcamp activities



Water tests

Questionnaires

Audits

Leadership Roundtable

9

نحوت (النشارك)

الفصل السادس عشر



احنا عملنا ايه؟

ا) اختبارات لتلوث المياه  
الاختبارات عبارة عن تحاليل  
بنكشف فيها عن المواد المضرة  
اللى فى المياه

المواد ده عبارة عن ايه:-



حديد  
نحاس  
فوسفات  
امونيا  
حموضة  
باكتيريا القولونية  
كلورين

المواد ده موجودة بسبب  
 حاجات كثيرة منها:-  
المواسير الباهظة  
البناء على الارض الزراعية  
الترعة اللي كانت في البوهى

احنا بنعمل ايه؟

هدفنا ان الناس فى المنطقة  
يقدروا يقولوا مشاكلهم اللي  
عايزين يحلوها.  
وتبقى جاهزة بصورة علمية للى  
عايز يطور المنطقة.

لية بنعمل كدة؟

لان الناس اللي ساكنين فى  
المنطقة ادرى بمشاكلهم وایه  
اهم حاجة عايزه تحل.  
وبنخليهم يترجموا الكلام لحاجة  
مكتوبة و مرسومة.

احنا مين؟

-هندسة جامعة القاهرة  
-مؤسسة البلد للتنمية  
Ecocitizen world map -

## مشروع الخريطة العالمية للبيئة



حالة امبابة، القاهرة

لمنطقة شارع احمد عبد الرحمن،  
عبدة الزيان والبوهى



ECOCITIZEN  
WORLD  
MAP PROJECT



للاسئلة:

م/ محمود على .٤٦٨٧  
مؤسسة البلد: بلوك ٧ مدينة العمال  
[www.ecocitizenworldmap.org](http://www.ecocitizenworldmap.org)

CITY  
DERS

# TOOLS AND TECHNOLOGIES



- **Geonode**
- **Urbinsight platform**
- **City Metaflow**
- **Esri ArcGIS**
- **Collector app**
- **Field Notes**
- **Urban Ontology**



Resiliency - Human Security - Emergency Preparedness





# INTERNET MAPPING PROTOCOL GEONODE

CUSCO – 549 official layers

The screenshot shows the Cusco GeoNode homepage. At the top, there's a navigation bar with links for GeoNode, Layers, Maps, Documents, People, Groups, Search, Register, and Sign in. Below the header is a large aerial photograph of a city. A prominent 'Welcome' message is displayed over the image. The message reads: 'The Cusco GeoNode is an open source platform for sharing geospatial data and maps. If you have any questions about the software or service, join our mailing list. Need help? Click here.' Below the message, there are three main statistics: '549 Layers' with a search icon, 'No Maps' with a location pin icon, and '3 Users' with a person icon. Each statistic has a detailed description below it.

| Category | Value   | Description   |
|----------|---------|---|
| Layers   | 549     | Click to search for geospatial data published by other users, organizations and public sources. Download data in standard formats.          |
| Maps     | No Maps | Data is available for browsing, aggregating and styling to generate maps which can be shared publicly or restricted to specific users only. |
| Users    | 3 Users | GeoNode allows registered users to easily upload geospatial data in several formats including shapefile and GeoTIFF.                        |

MEDELLIN – 122 official layers

The screenshot shows the Medellin GeoNode homepage. It features a similar layout to the Cusco version, with a navigation bar and a large aerial photograph of a city. The 'Welcome' message is identical: 'The Medellin GeoNode is an open source platform for sharing geospatial data and maps. If you have any questions about the software or service, join our mailing list. Need help? Click here.' Below the message, there are three statistics: '122 Layers' with a search icon, 'No Maps' with a location pin icon, and '3 Users' with a person icon. Each statistic has a detailed description below it.

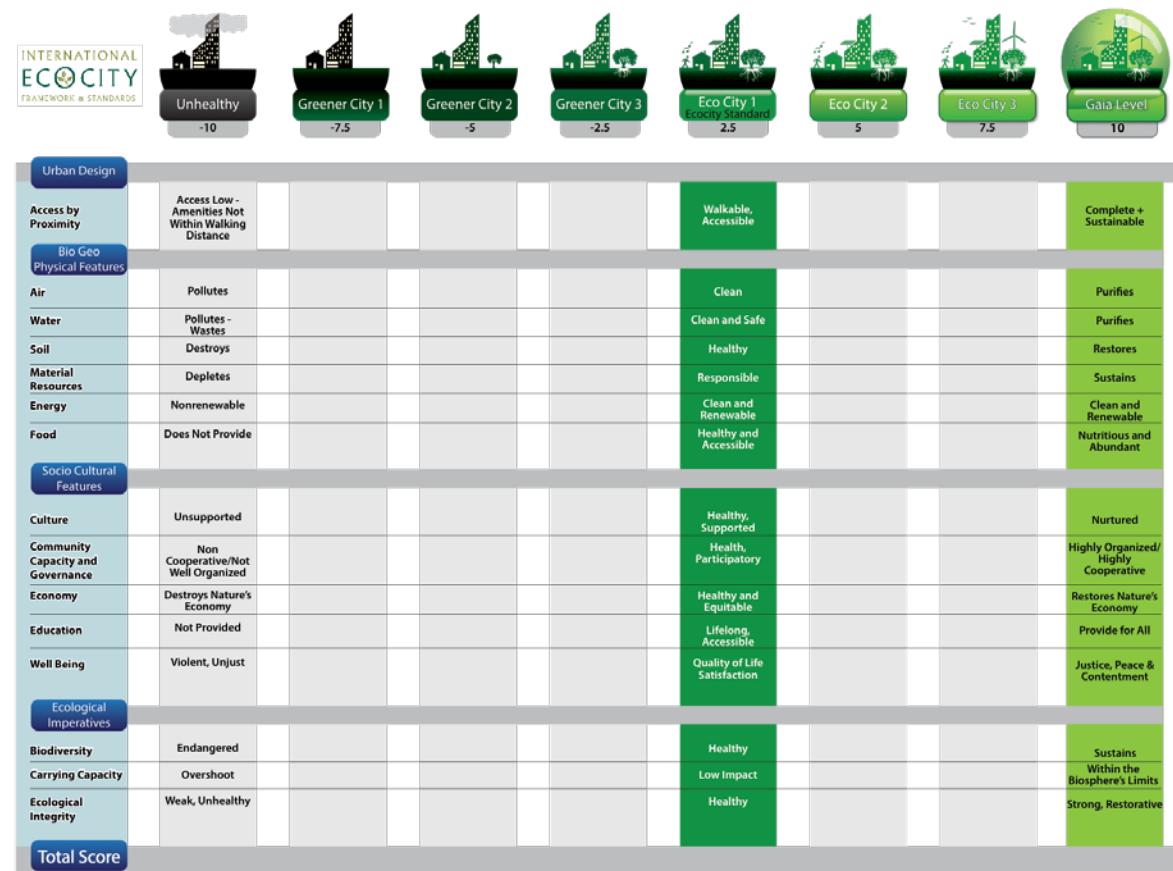
| Category | Value   | Description   |
|----------|---------|---|
| Layers   | 122     | Click to search for geospatial data published by other users, organizations and public sources. |
| Maps     | No Maps | Data is available for browsing, aggregating and styling to generate maps which can be shared.   |
| Users    | 3 Users | GeoNode allows registered users to easily upload geospatial data in several formats.            |

Geonode to upload, organize, label and set permissions for data publishing, managing and distribution process.

**GeoNode** is an Open Source, Content Management System (CMS) for geospatial data. It is a web-based application and platform for developing geospatial information systems (GIS) and for deploying spatial data infrastructures (SDI).

# OUR GEONODE CATEGORIES

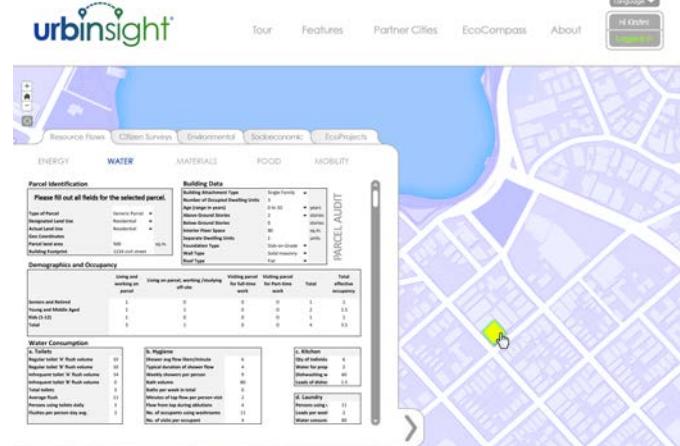
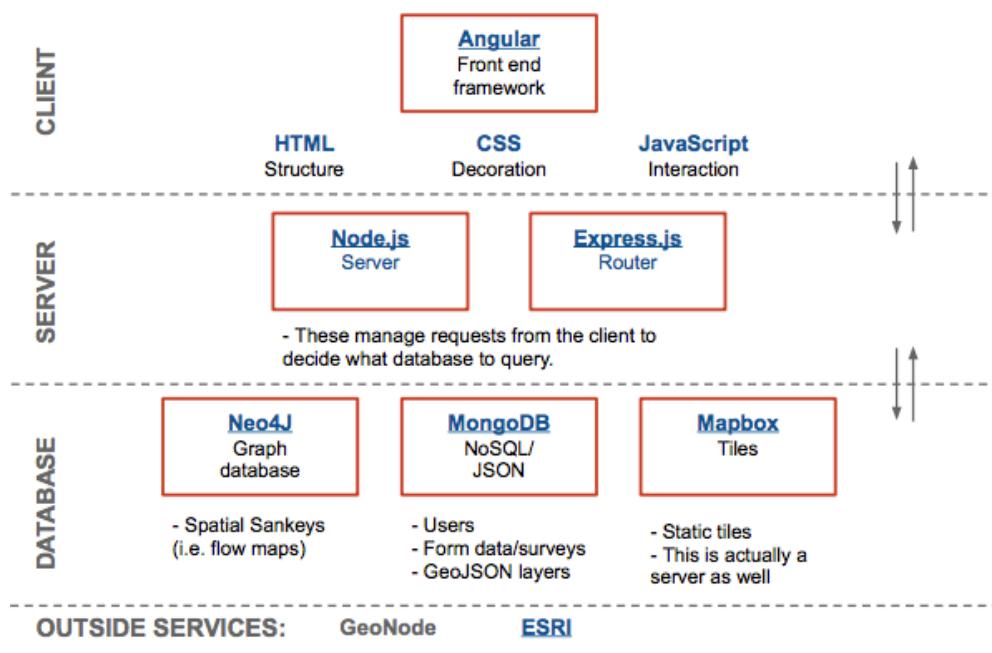
Air  
 Biodiversity  
 Carrying Capacity  
 Context Layer  
 Culture  
 Ecological Linkages  
 Economy  
 Education  
 Energy  
 Food  
 Governance  
 Housing  
 Materials  
 Quality of Life  
 Soil  
 Transportation  
 Urban access  
 Water



[www.ecocitystandards.org](http://www.ecocitystandards.org)

ECO CITY  
BUILDERS

## Urbinsight App Architecture

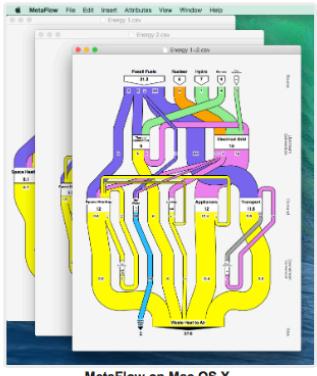


Y  
S

The logo for urbansight features the word "urbansight" in a lowercase sans-serif font. The letters "urbi" are colored blue, while "nsight" is green. Each letter "i" has a small, semi-transparent teal location pin icon positioned above it, with a dashed teal line connecting the pins across the "i"s.

## Meme: Sankey Diagram

## Product: MetaFlow



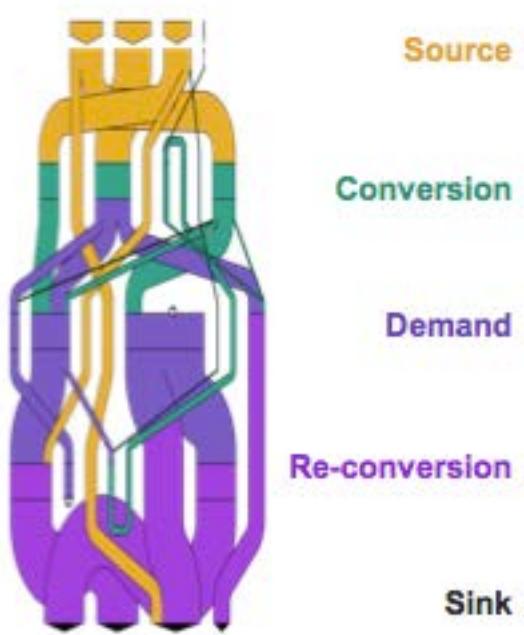
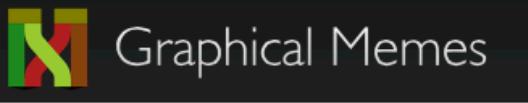
MetaFlow on Mac OS X

MetaFlow is powerful information visualization software, now available FREE for non-commercial use only, on Apple's Mac App Store.

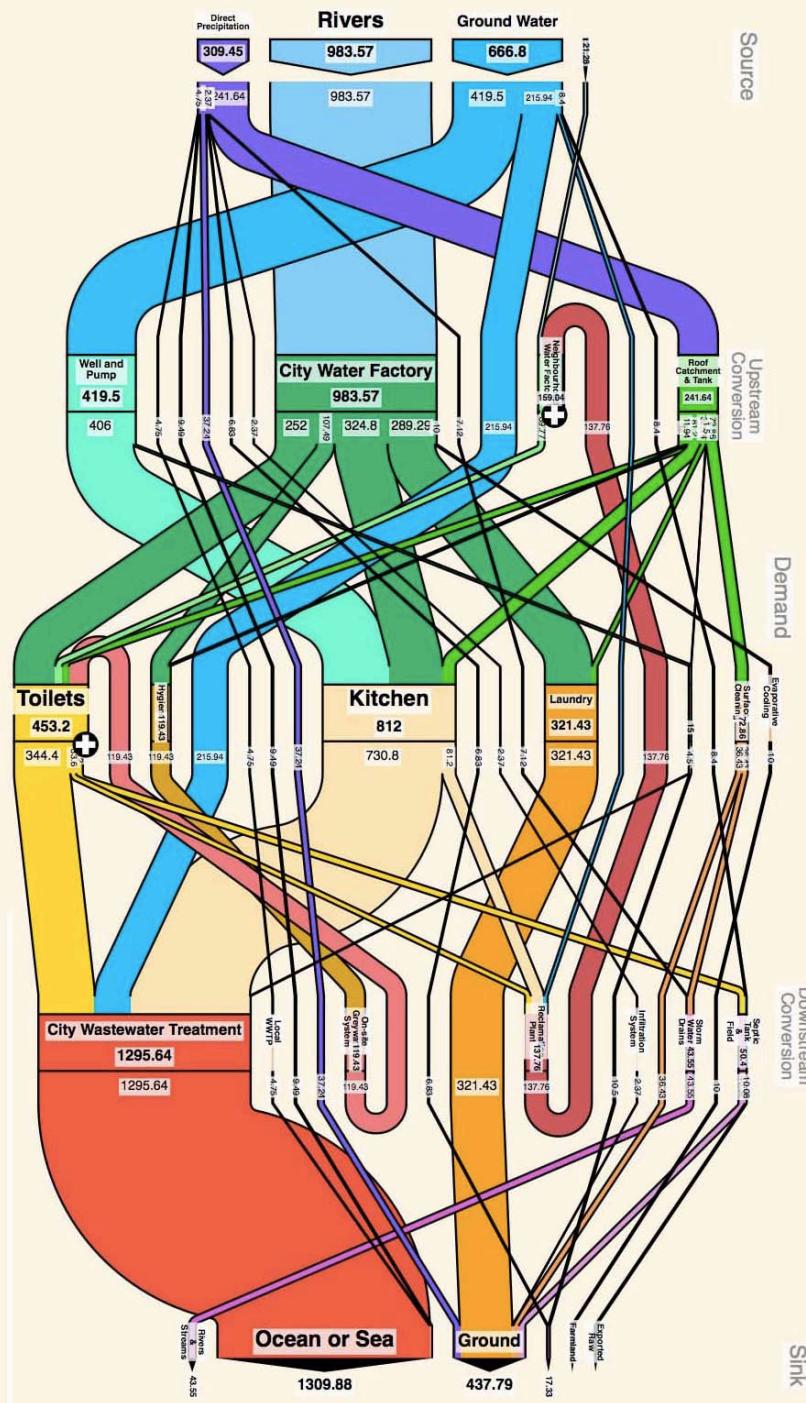
"Effortlessly design Sankey diagrams with just a few mouse clicks"  
— [Softpedia](#)

MetaFlow is a tool for creating flow network diagrams, also known as Sankey diagrams. Metaphorically, the diagrams depict a set of tubes through which fluid flows. Each tube runs between two stages in the flow, and connects with other tubes at one of the junctions located within each stage. The width of a tube is an indication of the amount of fluid passing through it per unit time, so junctions are balanced (flow is conserved) as long as the sum of the widths of incoming tubes equals the sum of the widths of outgoing tubes.

While these diagrams can be used to describe the flow of actual fluids, they can also be used to describe the progression of a broad variety of quantities through a broad variety of processes. For example, the quantity might be energy, money, people, traffic, information or carbon footprint. Even in the case of a fluid such as water, gas or oil, the tubes normally represent aggregate flows rather than actual pipes. For example, one tube might represent the total amount of water taken from rivers and used directly for agricultural purposes, in which case the tube would connect a "river water" junction to an "agricultural use" junction. There may be another tube connecting "river water" to "human consumption," although it is likely that this flow would have to go via a "water treatment plant" junction at an intermediate stage.



Cairo University  
Example  
From  
Earlier pilot





# Mapping Without Limits

ArcGIS Online is a Complete, Cloud-Based Mapping Platform

[Try ArcGIS](#)

[What Is ArcGIS?](#)

We are using in our professional workshops with data from Geonode  
And from the neighborhoods to build the ECIM

**ECOCITY  
BUILDERS**

The logo for Ecocity Builders, consisting of the company name in a bold, sans-serif font with a small green leaf icon integrated into the letter "O".



# Collector for ArcGIS

The screenshot shows the Collector for ArcGIS app running on a smartphone. The top status bar indicates the time as 9:56 PM, battery level at 50%, and signal strength. The main screen displays a "Field Operations" interface with tabs for "All" and "On Device". Under "On Device", there is a section titled "Field Notes" with a thumbnail image of a rainbow. Below this are several data entry fields:

- 2
- Do
- NUMBER\_OCCUPANTS
- NMBR\_OCCUPANTS\_NIGHT
- FOUNDATION\_TYPE
- SHEAR\_WALL
- <No value>
- SITE\_CLASS
- FALLING\_HZRD

The app's header includes a search icon, a menu icon, and a toolbar with icons for saving, deleting, and other functions. Below the phone screenshot, there is a list of two items under "All Maps":

- Assessments & Surveys**  
Jun 11, 2016 | Scott Allen [Download](#)
- ECIM Field Photos**  
Jun 12, 2016 | Scott Allen [Download](#)

At the bottom of the slide, there are two large black navigation arrows pointing left and right.

Using for field data collection when we have access to phones/devices

# Field Papers

## MAKE

an atlas to print

## UPLOAD

pages you've marked

## WATCH

recent activity

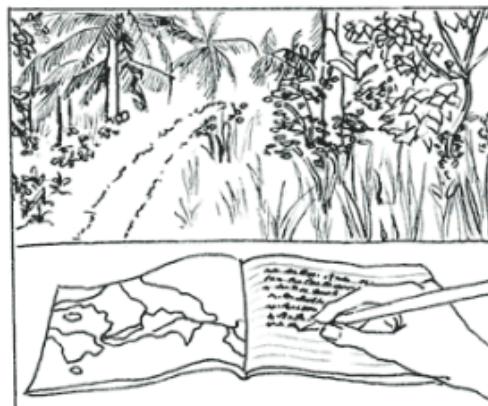
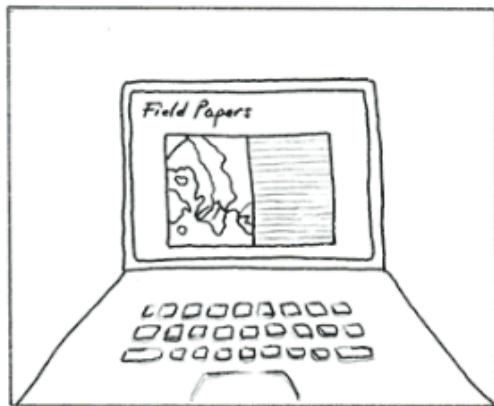
## EXTEND

with advanced tools

## LOG IN

or create an account

# Welcome to Field Papers



## [Make yourself an atlas](#)

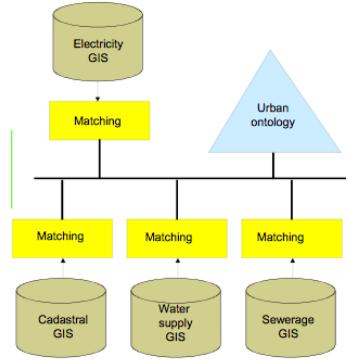
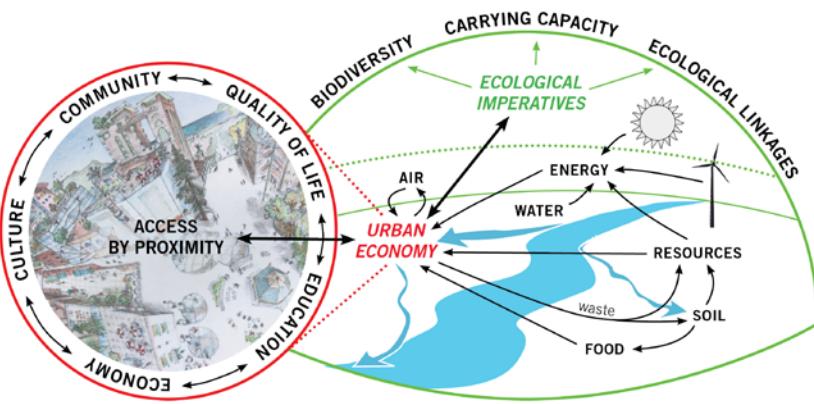
Print out anywhere in the world.

## [Take it into the field](#)

Make your notes and observations.

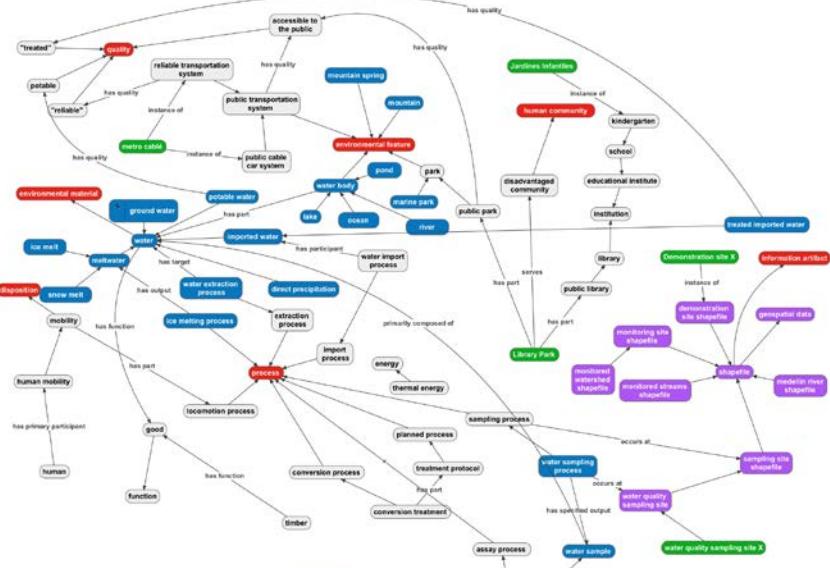
## [Capture your notes](#)

[Upload](#) pages you've photographed.

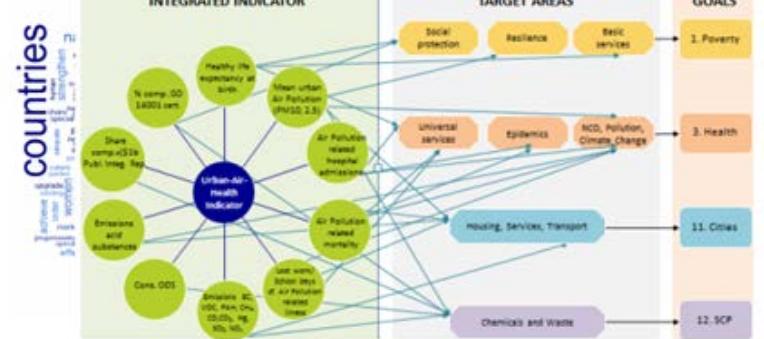


## Structures and insights to inform SDGs

| INTERNATIONAL ECOCITY                     |   | EcoCity Index                           |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|---|---|---|
|   |   | Unhealthy                               | Green City 1  | Green City 2  | Green City 3  | Eco City 1  | Eco City 2  | Green   |   |
| Access to Protection<br>Physical Features | Air                                     | Awful                                   | Not<br>Worrisome  | Worrisome   | Worrisome   | Worrisome   | Worrisome   | Good  | Excellent   |
| Water                                     | Pollutes                                | Pollutes                                | Clean   | Clean   | Purified  | Purified  | Purified  | Purified  | Purified  |
| Soil                                      | Pollutes                                | Pollutes                                | Clean and Safe  |
| Minerals and<br>Nonrenewable<br>Energy    | Depletes                                | Depletes                                | Responsible   |
| Food                                      | Nonrenewable                            | Nonrenewable                            | Clean and<br>Renewable<br>Agriculture and<br>Arenaceous |
| Non-Cultural<br>Features                  | Unprepared                              | Unprepared                              | Healthier   |
| Culture                                   | Non<br>Competitiveness<br>and<br>Growth | Non<br>Competitiveness<br>and<br>Growth | Participatory<br>Democracy                              |
| Capacity and<br>Governance                | Non<br>Competitiveness<br>and<br>Growth | Non<br>Competitiveness<br>and<br>Growth | Participatory<br>Democracy                              |
| Economy                                   | Non<br>Competitiveness<br>and<br>Growth | Non<br>Competitiveness<br>and<br>Growth | Participatory<br>Democracy                              |
| Education                                 | Net<br>Provided                         | Net<br>Provided                         | Provide<br>for All                                      |
| Well Being                                | Violent,<br>Unjust                      | Violent,<br>Unjust                      | Quality of<br>Life Satisfaction                         |
| Ecological<br>Imperatives                 | Endangered                              | Endangered                              | Healthy   | Low Impact  | Healthy   | Low Impact  | Low Impact  | Low Impact  | Low Impact  |
| Biodiversity                              | Overstrain                              | Overstrain                              | Low Impact  |
| Carrying Capacity                         | Weak, Underutilized                     | Weak, Underutilized                     | Healthy   | Low Impact  | Healthy   | Low Impact  | Low Impact  | Low Impact  | Low Impact  |
| Total Score                               | 10                                      | 7.5                                     | 5   | 3.5   | 2.5   | 1   | 7.5   | 10  | 10  |



## Sustainable Development Goals Interface Ontology (SDGIO)



# CHALLENGES AND SUCCESSES

## Successes

- Academic partners
- Community/neighborhood focus
- Participatory approach
- Open tech/data
- Linking top down data w bottom up

## Challenges

- Funding for platform build out
- Culture
- Standards and protocols for common language
- Many actors/partners

# INTEGRATE INSIGHTS INTO PLANNING AND DECISION MAKING

## Urban Policy and Goals

Targets and Indicators for Health

Measures through Data

Cities and Urban Areas  
(Form)

Urban Resources (Flows) Air  
– Water – Food – Energy –  
Materials...

Neighborhoods

Parcels

Households

Individuals

Sources

Converters

Demands

Reconverters

Sinks



# ECOCITY WORLD SUMMIT

12-14 JULY 2017

MELBOURNE | AUSTRALIA

[www.ecocity2017.com](http://www.ecocity2017.com)



ECOCITY  
BUILDERS



**THANK YOU**



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**[www.ecocitybuilders.org](http://www.ecocitybuilders.org)**

