

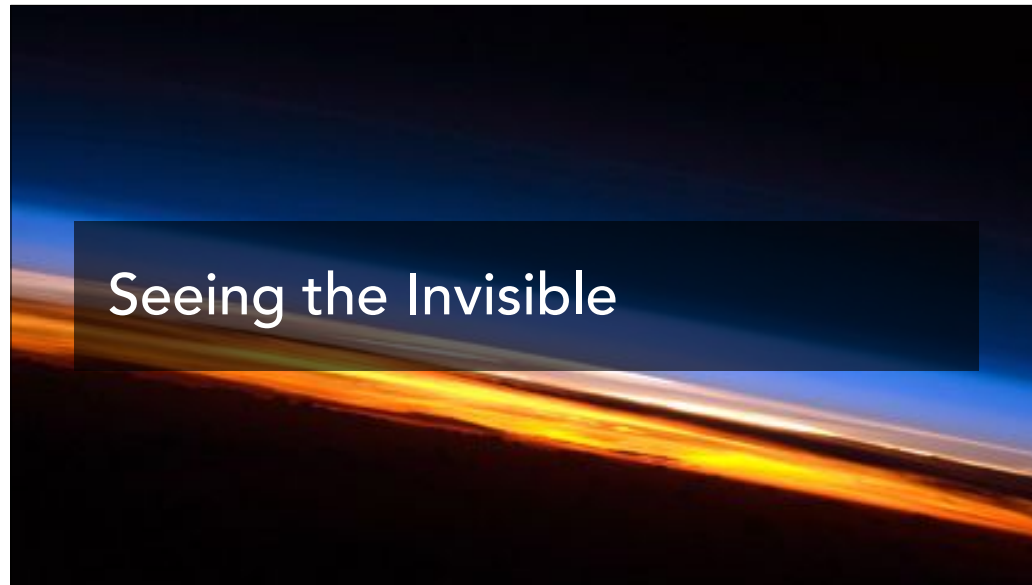


Information Generation from Data

From Data to Knowledge Sharing

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Seeing the Invisible

We're all together, here, because we share a similar passion.

Most likely there was a particular moment, person, or book that inspired you onto a path that led you here today. It may not have been the most direct path – like an inverted pendulum our paths are asymptotically stable.

I ask that you take a moment to recall what that was...



For me, it was this book. I would sit in my elementary school library for hours pouring over it's pages. There were these wonderful images...

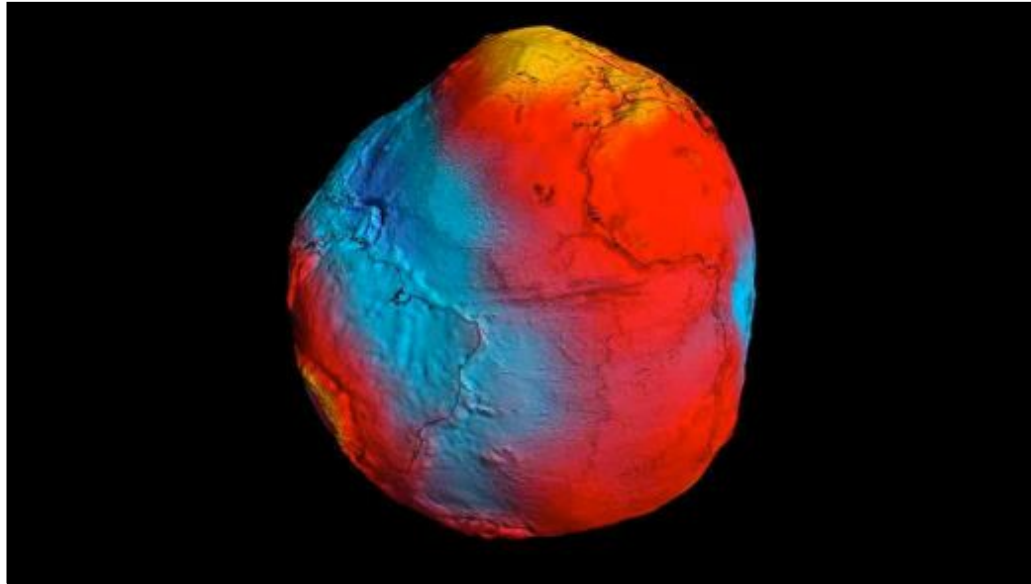


Van-allen belts & Solar Winds

The book showed me that the Earth had many 'invisible' aspects – at different scales. Van-allen belts that envelope our planet and are bent and shaped by 'Solar Winds'. What seemed like just empty space became an environment filled with vast unseen activity. We are so focused on what we can see, the brilliance and heat of our star, that it is too easy to overlook what we can't see.



I developed models and simulations for the GOCE Spacecraft. It's mission was to develop high-fidelity gravity measurements of Earth.



- but the Earth is not a perfect marble.
- It's is a lumpy, oblate spheroid. In particular, the Gravity is not evenly distributed.
- "The results prove conclusively that sea level decreases going north along the North American Atlantic coastline, in agreement with the ocean models."

However these data are only available to select few - and not easily understandable or usable by many people. I became focused on how we can make scientific data as discoverable and accessible as possible.



Humans have been conditioned to recognize visual patterns. Recognition of faces, identification of safe food, potential threats, and the pure aesthetic of artistic renditions imbues a compelling emotional response. Color, form, relative relationship, motion, and stature are all components of our sensory awareness through which we quickly and effectively extract knowledge. We can utilize these various aspects in order to represent data in a way that is readable and explorable.

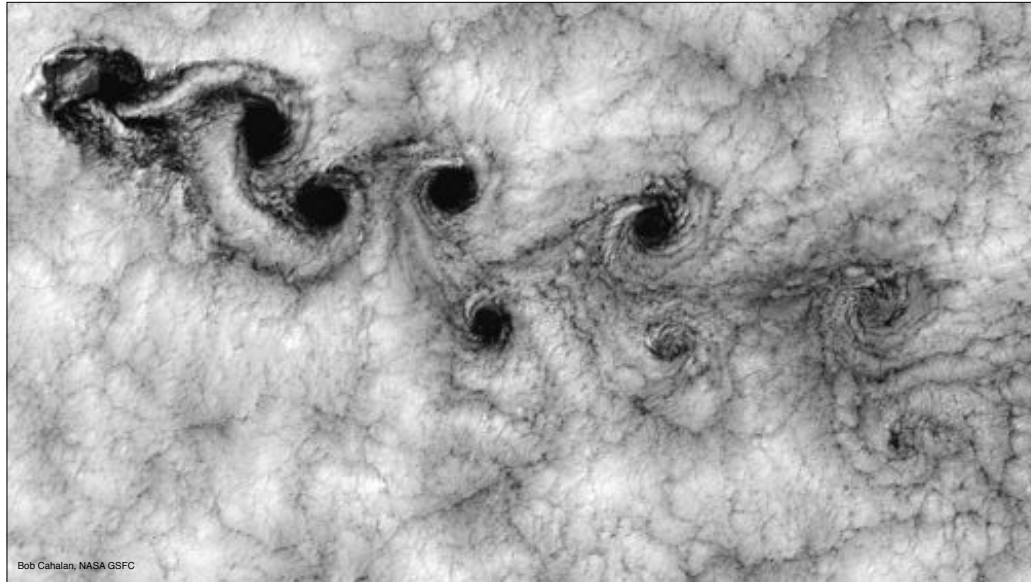
Maps are perhaps uniquely usable by nearly everyone. They provide a visceral, common context for understanding complex relationships. However, not all maps look the same. Our oblique/overhead maps make sense to us. But maps have many shapes.



Societies have used maps for millennia to share stories, navigate nomadic travels, cross oceans and build new homes and cities. Our maps have captured the real and perceived past and serve as a simple way to collaborate with others to achieve a common perspective and understanding. Paper maps, stick navigation charts, 3-D models, and even walking directions are just a few ways that we have created geospatial visualizations of our data.

marshall island stick charts

Many maps are not geographic.



Like waves, clouds enable us to see the invisible wind as it propagates through the land. A Kármán vortex street caused by wind flowing around the Juan Fernández Islands off the Chilean coast.

It is the objects upstream that cause long-lasting vortices downstream. Each node may look like a mini tornado – Only at a macroscale do we see the pattern



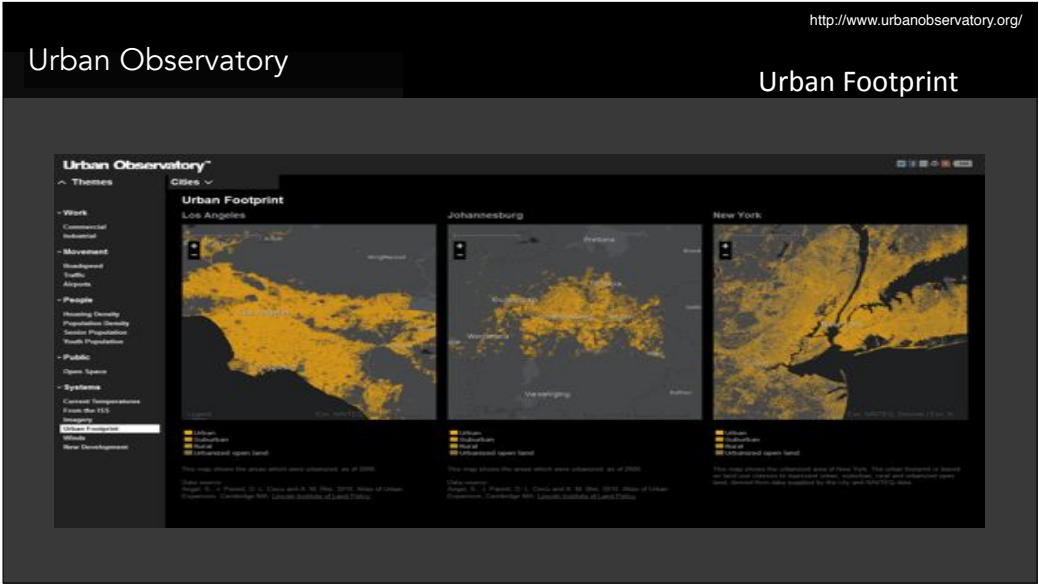
in 1962 Buckminster-Füller envisaged a 61-m diameter globe which you could walk within to see the world.

His Geoscope was a "data cathedral for the masses"

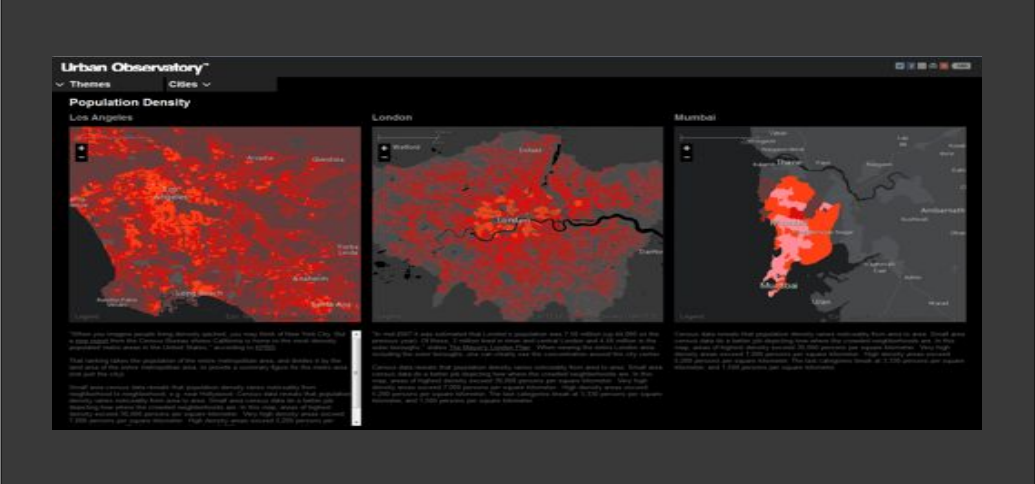
It never really happened – it was too monolithic and would have accommodated only a few people at a time. Limited vision.



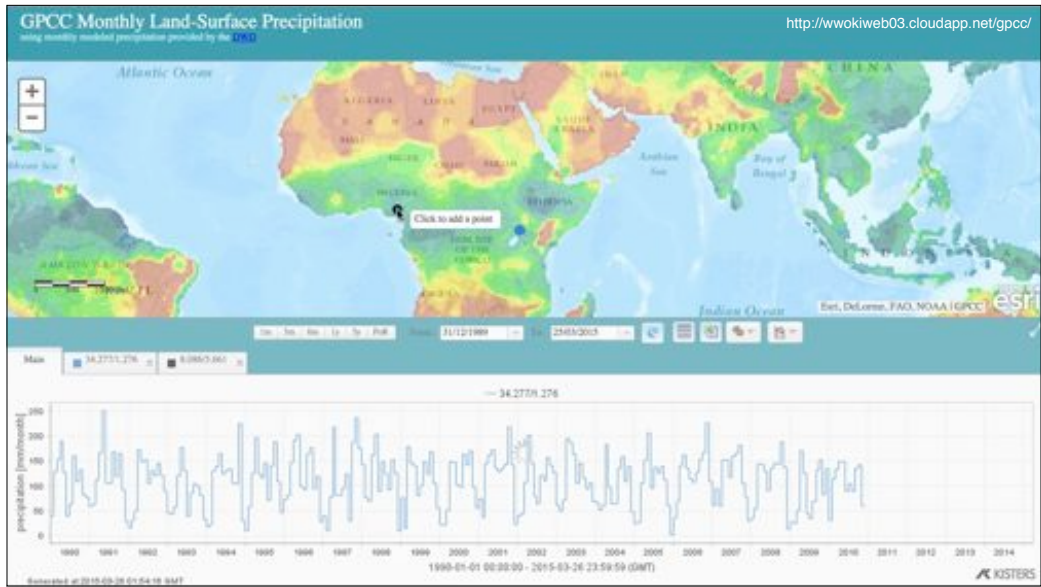
Buckminster Fuller's vision was accomplished by unpacking his GeoScope – the Web now enables immediate, global publishing of data for anyone to explore. We designed the Urban Observatory as public opportunity to understand the comparative aspects of cities around the world.













Data is air – we can't see it, but we'll notice when it's missing.
The lines of the map – from blank canvas to information



The tools we use craft our experience and our product. Historically, cartographic tools were embellished with style and even elegantly engraved with instructions on how to use them.

However we can become too enamored with our own tools and forget that they exist in service of creating the information for people. The maps and charts that people will use to navigate and build their communities.



Linked landscapes

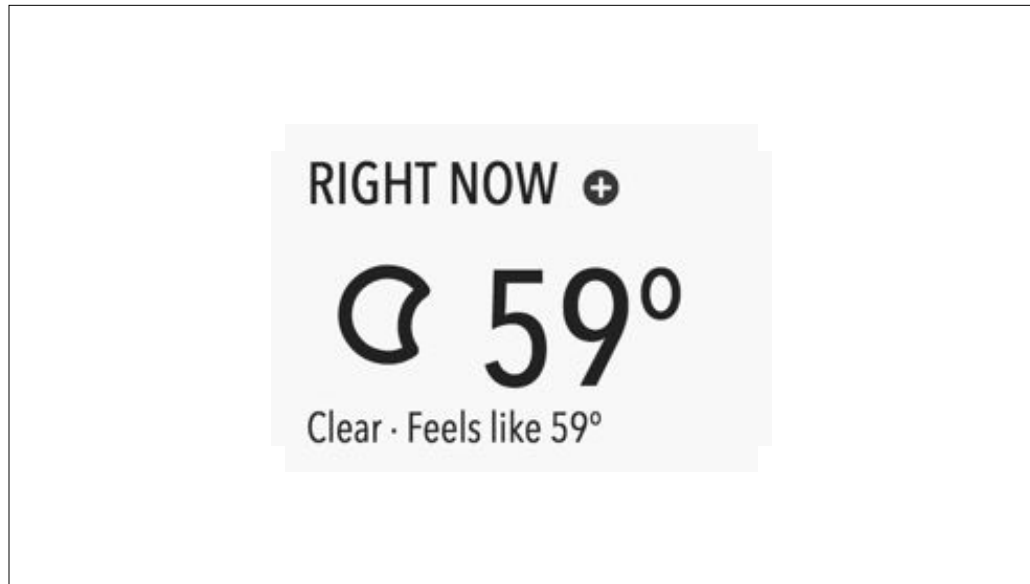
We want these tools to enable people to interact with and understand the world around them.



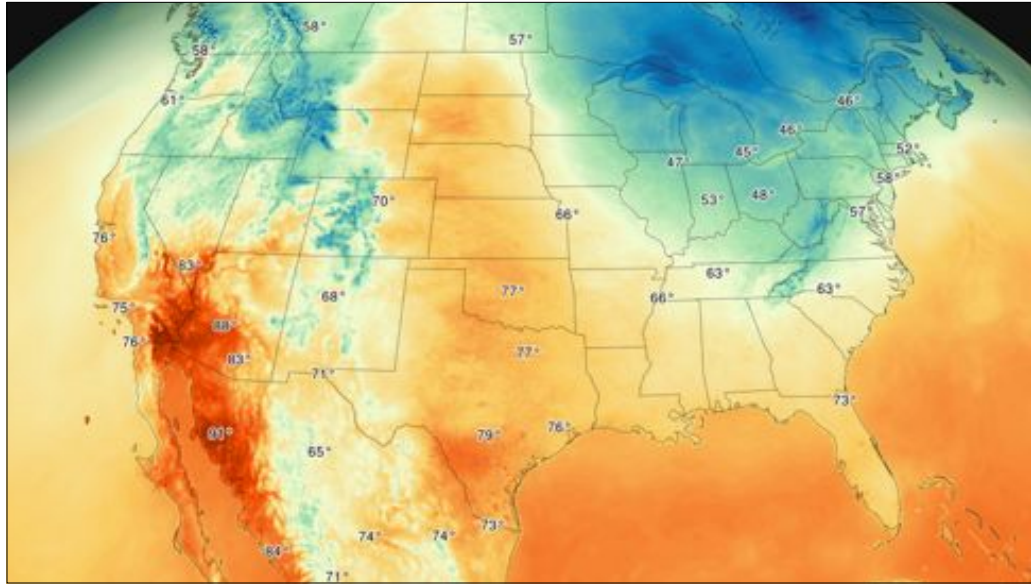
The most common question for anyone is often “what is the weather”? as it affects how they dress.



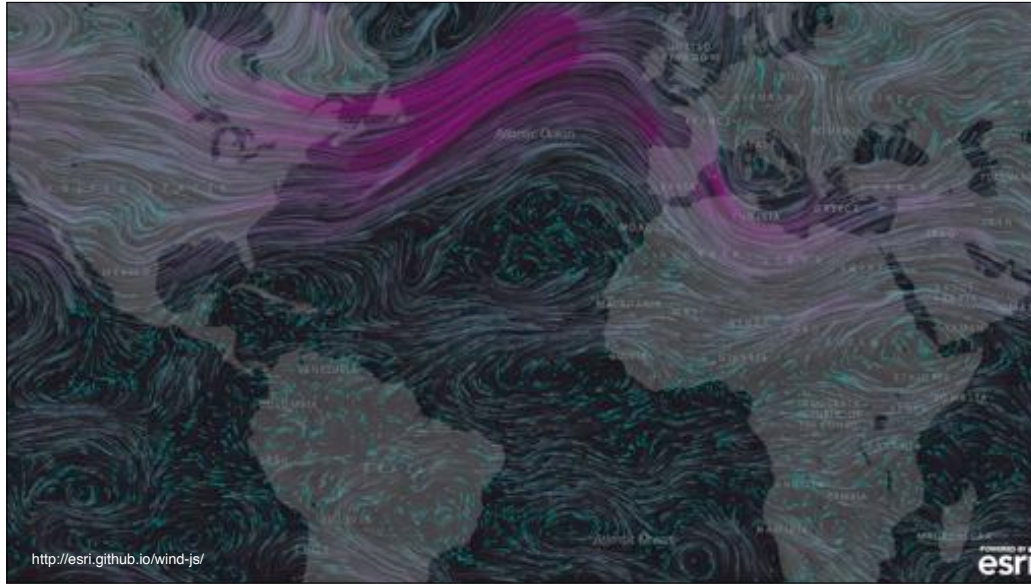
Raw data can be overwhelming.
“Feels like...” is more meaningful to people.
Even better, maps gives us the ability to see into the future
But they still are not showing us what is really occurring.



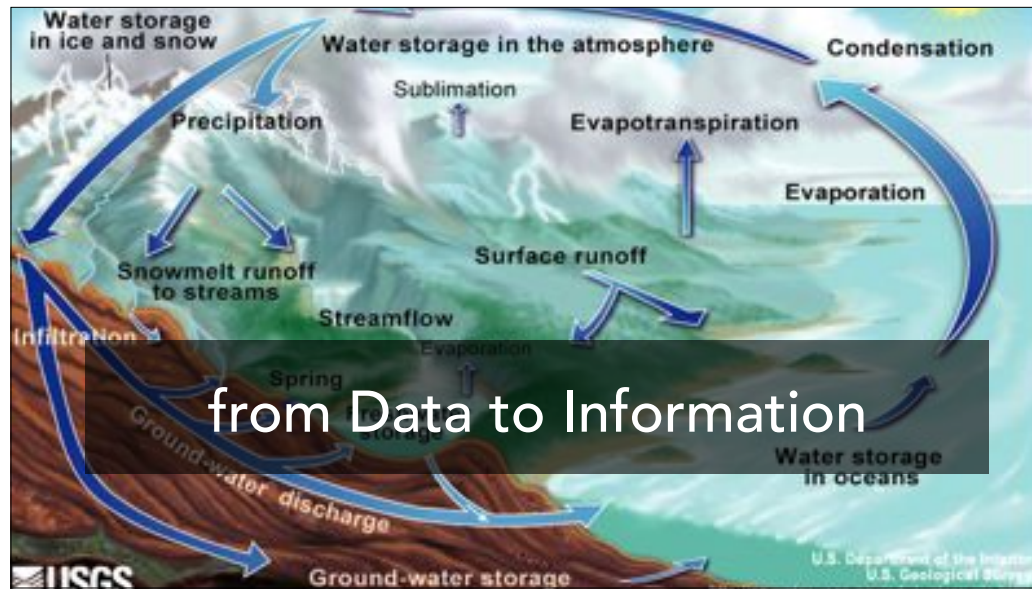
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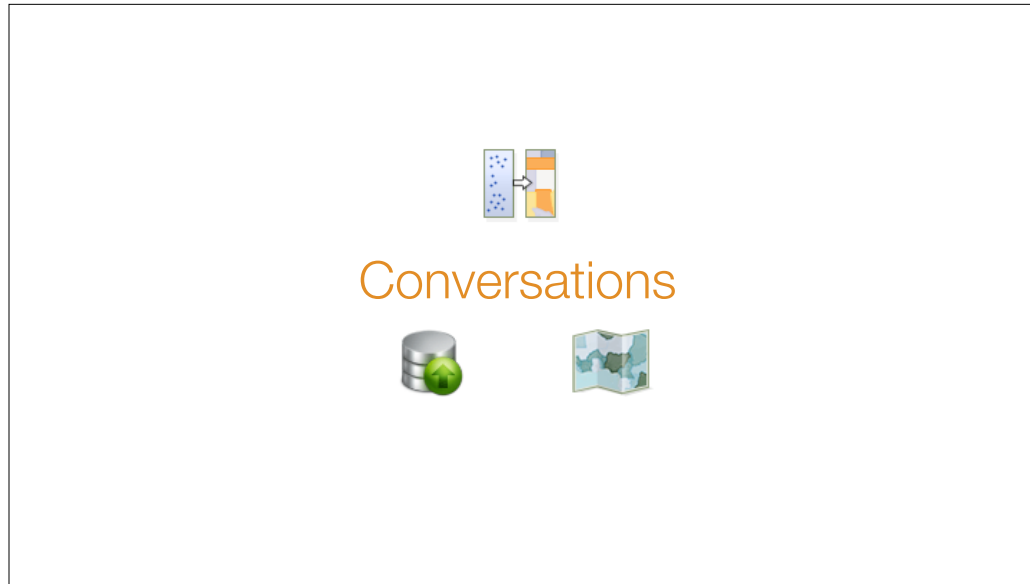
It's the movement over time that gives us the ability to understand and predict.



how does data become information?



There is a common process we follow when generating information products



but without conversations, our decisions have little impact. conversations drive consensus which is a necessity for society to move forward together.



And through geography we have a common context for conversation that involves stakeholders from multiple communities and expertise domains.

They're building custom applications for their domain but using a common ecosystem

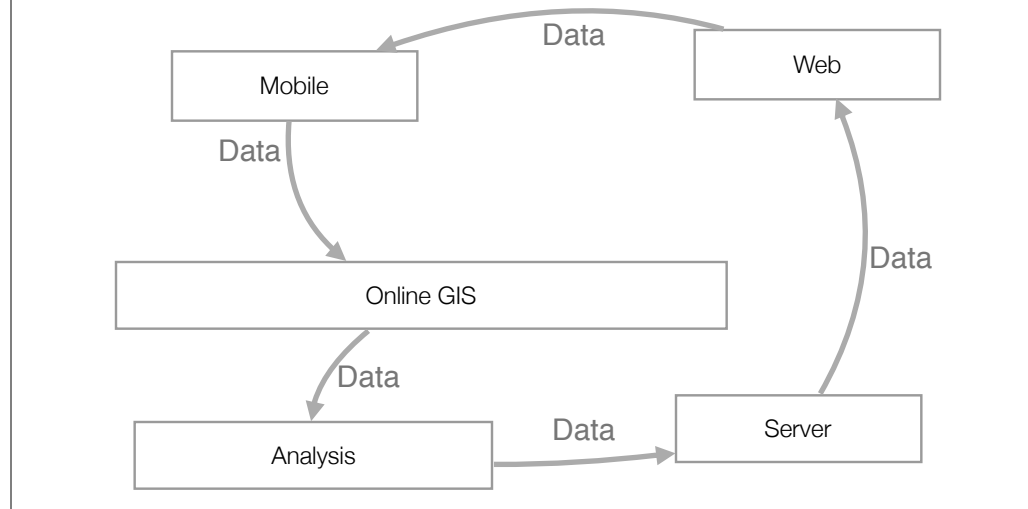


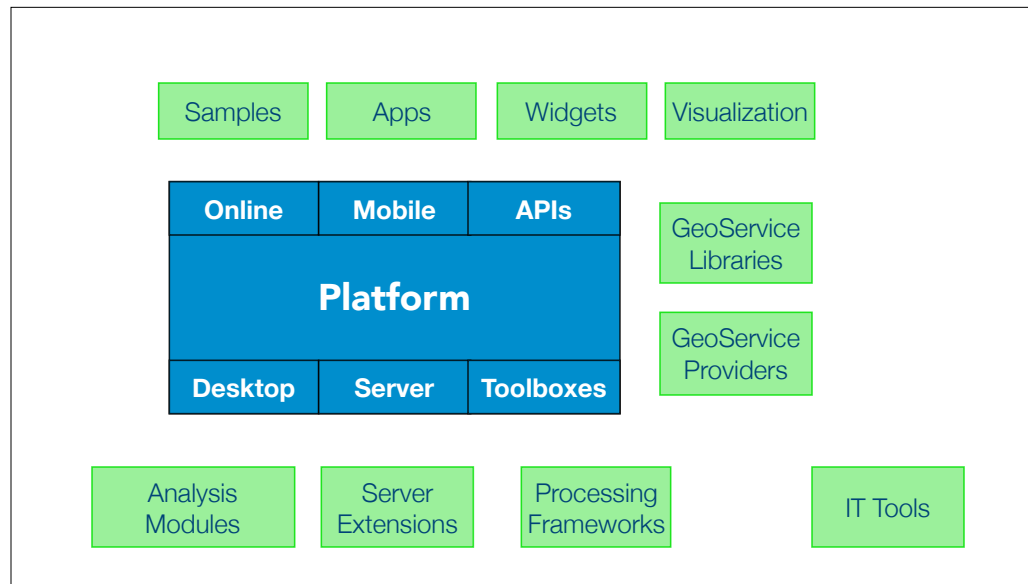
our Communities are are vibrant – we can't see the millions of people that use our data and applications every day. However it are these people that are the most important aspect of any system.



it is their insight and expertise that will power the ecosystem of data into information and then affects society and policy.

Platform Ecosystem



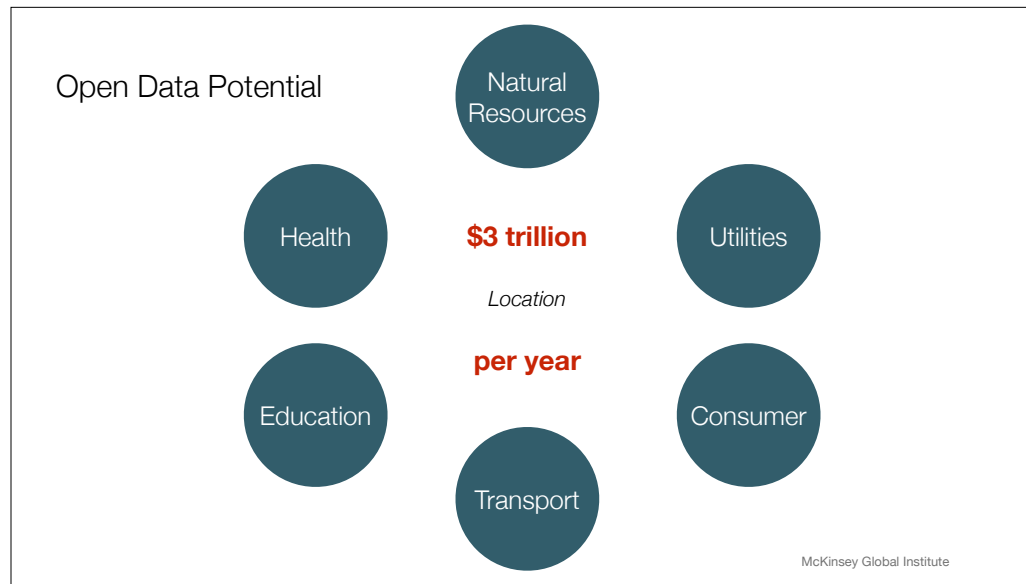


a platform provides an immediate system that supports common IT requirements.

Then through open interfaces and open-source code, extensions and customizations can solve specific problems.



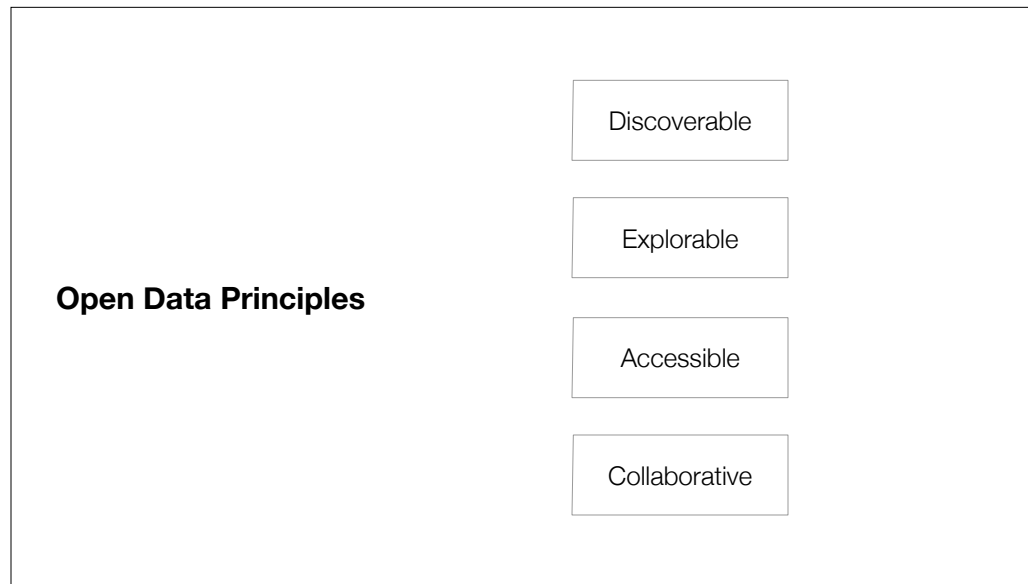
<http://opendata.arcgis.com>



Open data is \$3 trillion / year - Different Sectors

Data is the new soil, because for me, it feels like a fertile, creative medium. Over the years, online, we've laid down a huge amount of information and data, and we irrigate it with networks and connectivity, and it's been worked and tilled by unpaid workers and governments. - David McCandless

Minister Tony Clement of the Canadian Treasury Board famously said - "Open Data is Canada's new natural resource,"



Discoverable - people don't know your data, but they know what they want. make the data discoverable through common search engines and using common terminology

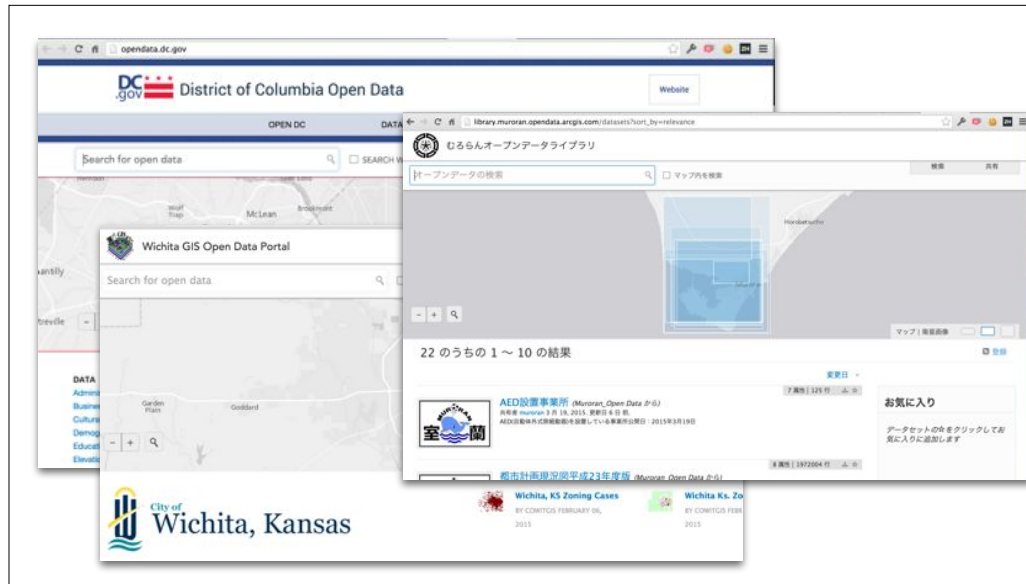
Explorable - people often want the relevant subset of data - either by geography, topic or "interestingness". Give them tools at hand that enable them to understand the data with little to no friction

Accessible - entire data must be immediately downloadable - and then also integrate with commonly used tools (e.g. Excel, R)

Collaborative - connect provider with consumer and across utilizations of the data. improve quality through usage and determine relevance through combination. "What would Amazon do?" but instead of selling books and clothes, providing more relevant data and applications.



1,600+ organizations publishing open data through ArcGIS
<http://benheb.github.io/explore-open-data/>

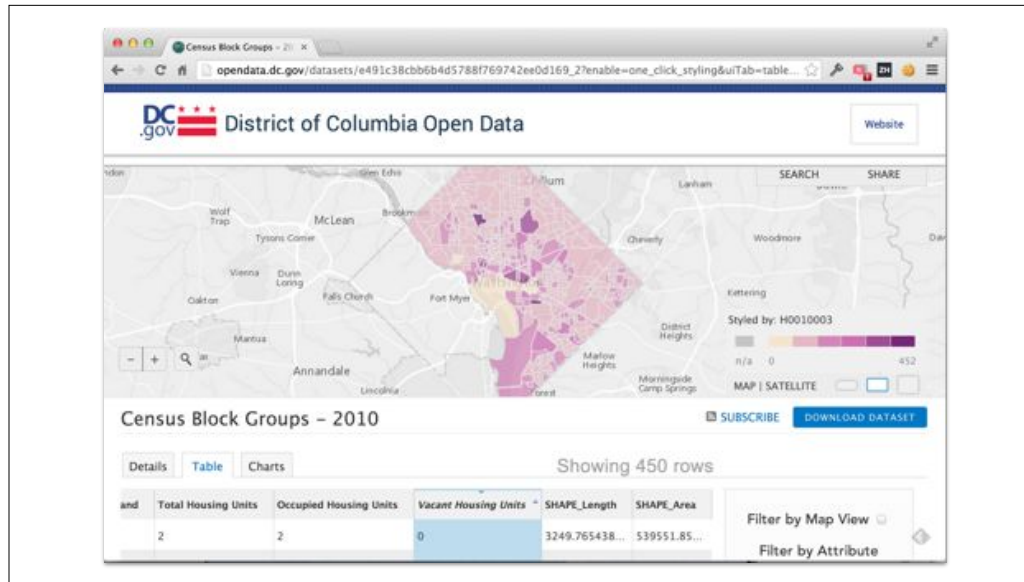


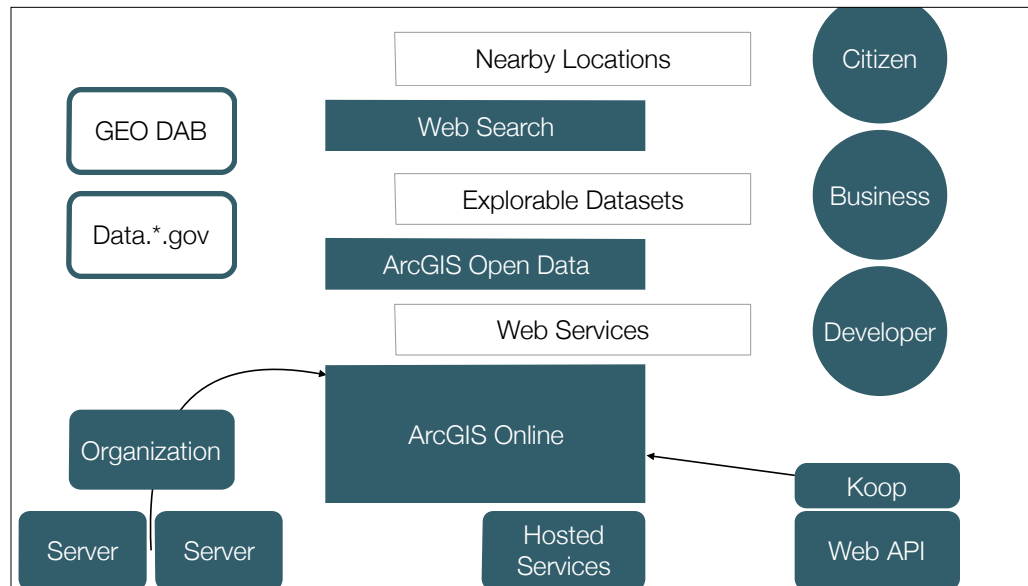
Local governments can create community open data portals that are focused on their local constituent needs.

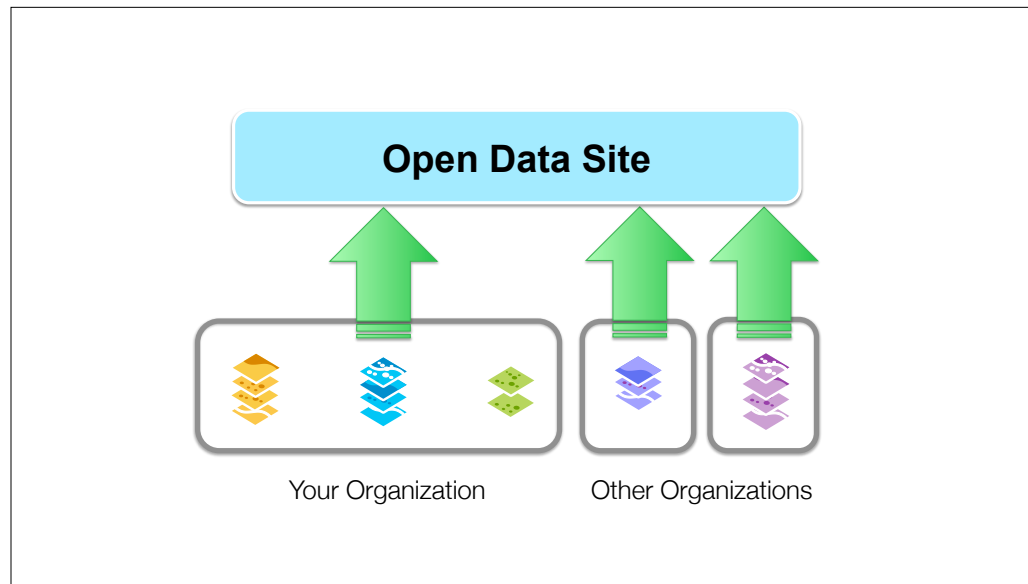
<http://opendata.dc.gov>

<http://portal.wichitagis.opendata.arcgis.com/>

<http://library.muroran.opendata.arcgis.com/?locale=ja>







Community portals can include open data from other organizations

This means that local government can make national and global science data directly available to local citizens.



so citizens visiting the South Chicago data portal discovers relevant NOAA data.

By making the data federated and accessible, it gets into the local needs and discovery of as many consumers as possible.



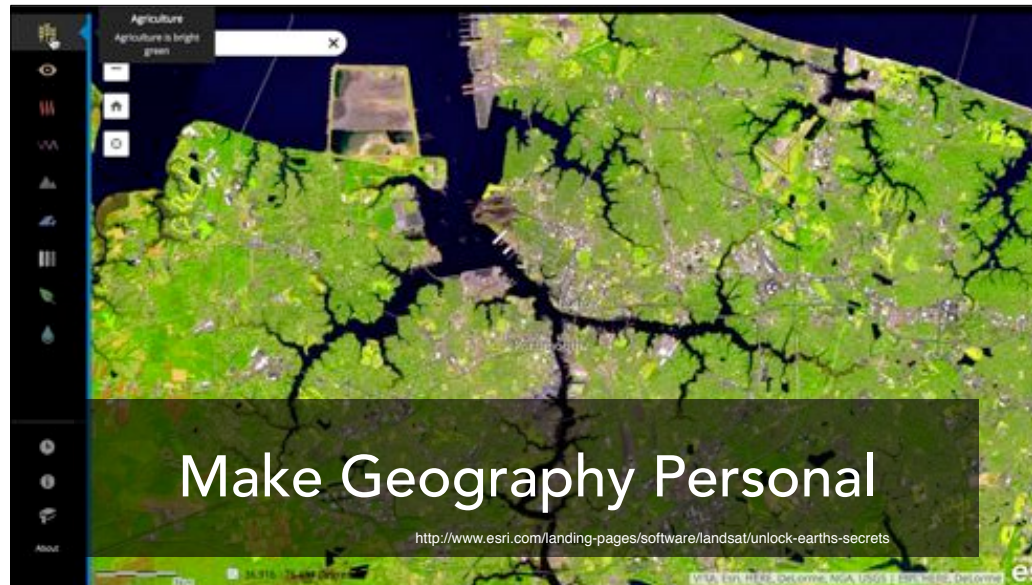
Because ultimately open data are necessary at the neighborhood block. No one cares about so much for a street or village as the people that live on it. It's the citizen that buys a house, raises their children, knows their neighbors, goes to work, and sleeps here every night that wants to understand these complex processes that surround them.

Mobile GeoScopes

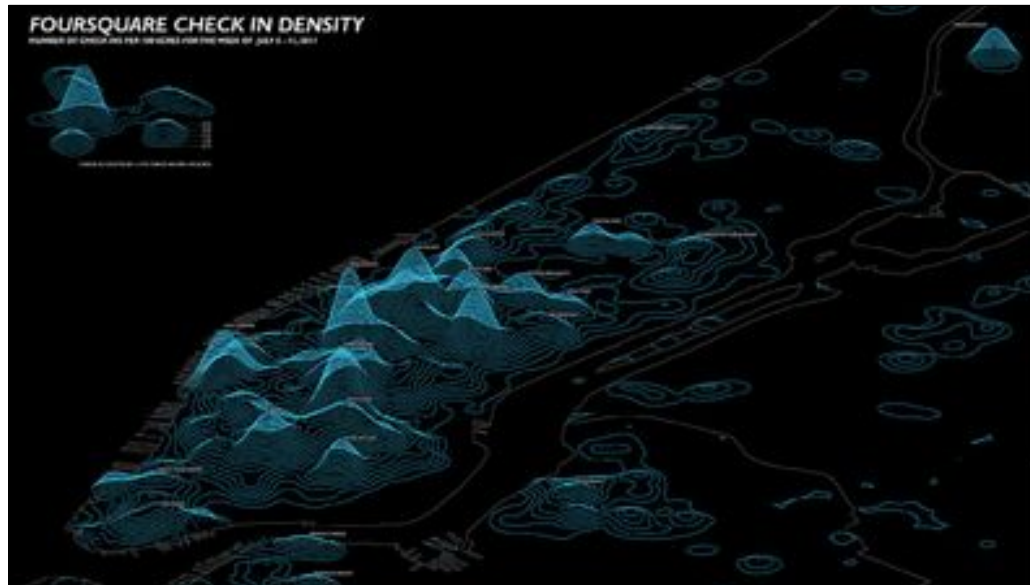


Fuller's vision is finally realized by Carroll's 1:1 scale map of the world. The smartphone provides a lens by which we can see the invisible as we move through the world itself.

Lewis Carroll's Sylvie and Bruno Concluded: a fictional map that had "the scale of a mile to the mile". One of Carroll's characters notes some practical difficulties with this map and states that "we now use the country itself, as its own map, and I assure you it does nearly as well".

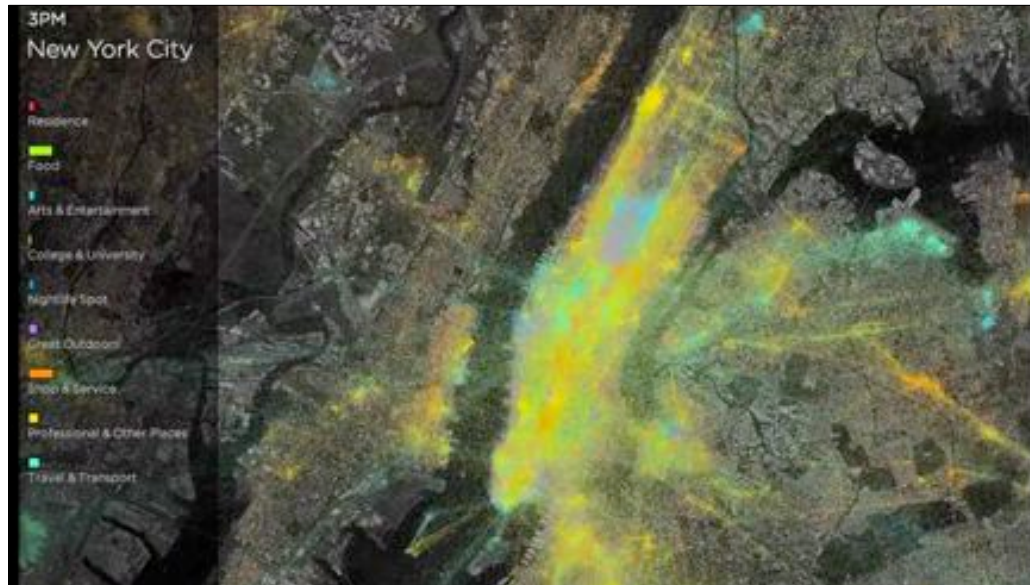


LandSat data made accessible and local.

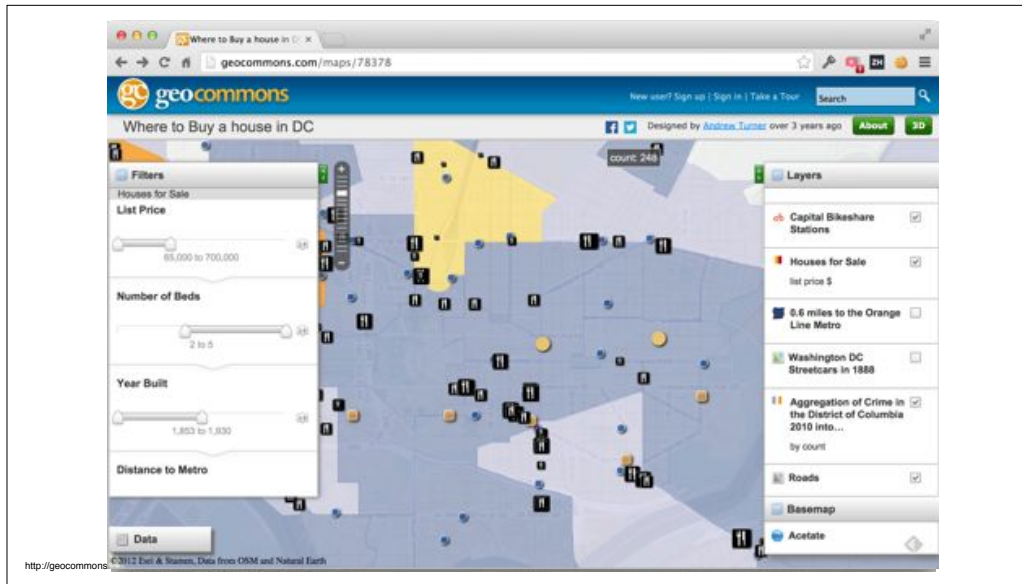


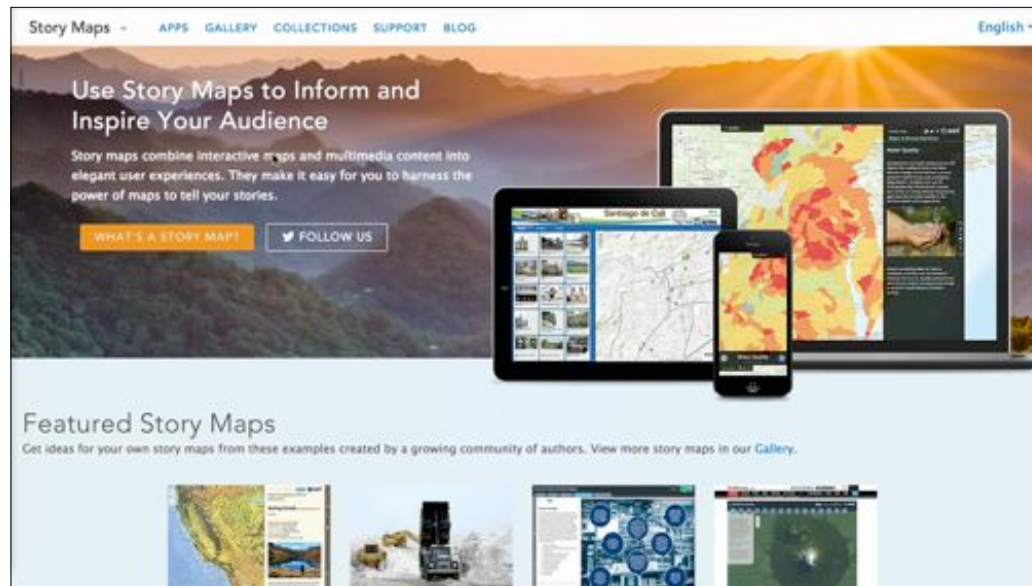
social terrain

It's this image of a city – it's the gravity weight of place. it's not a flat plane, but a lumpy surface

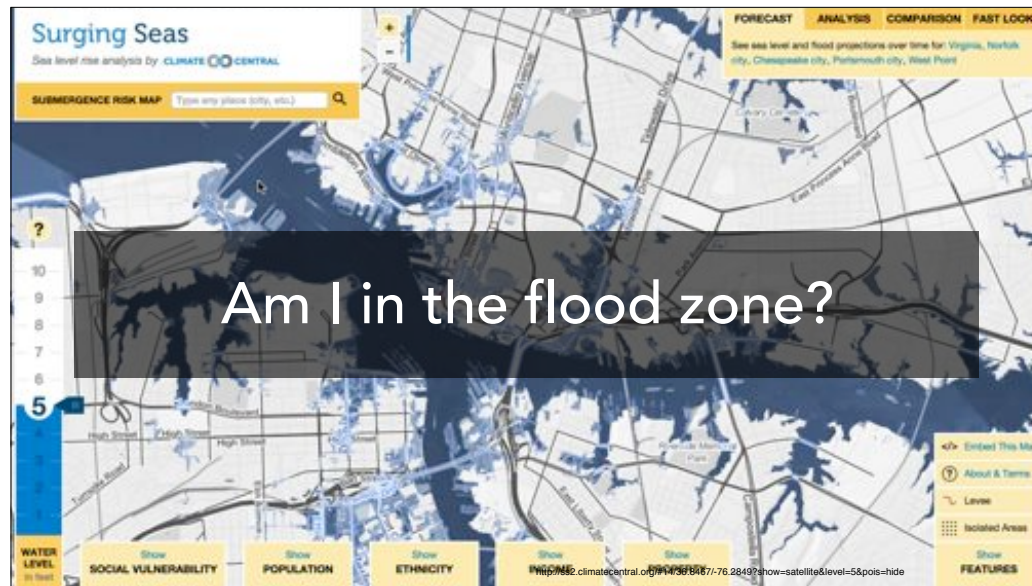


with flows and sheds

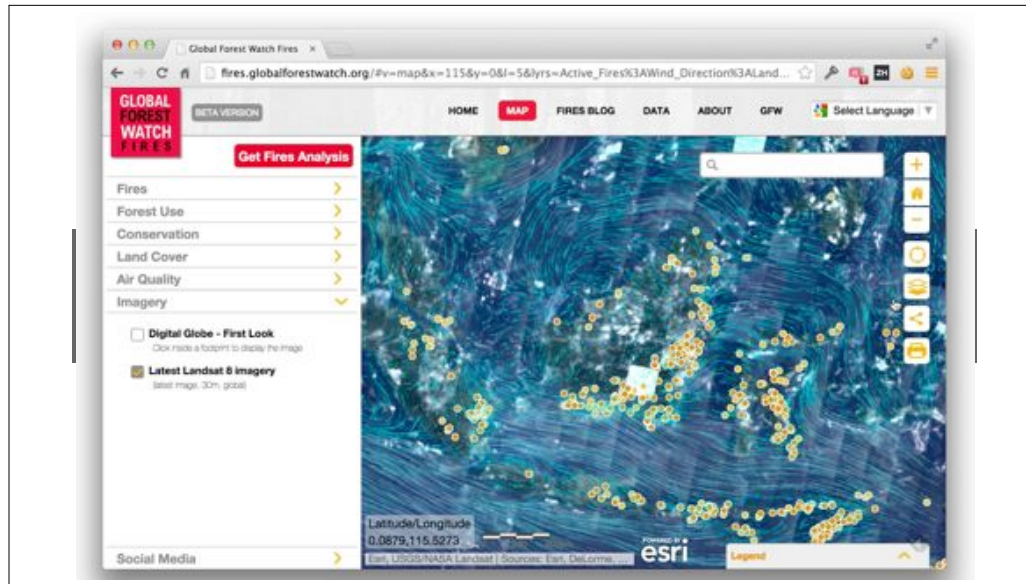




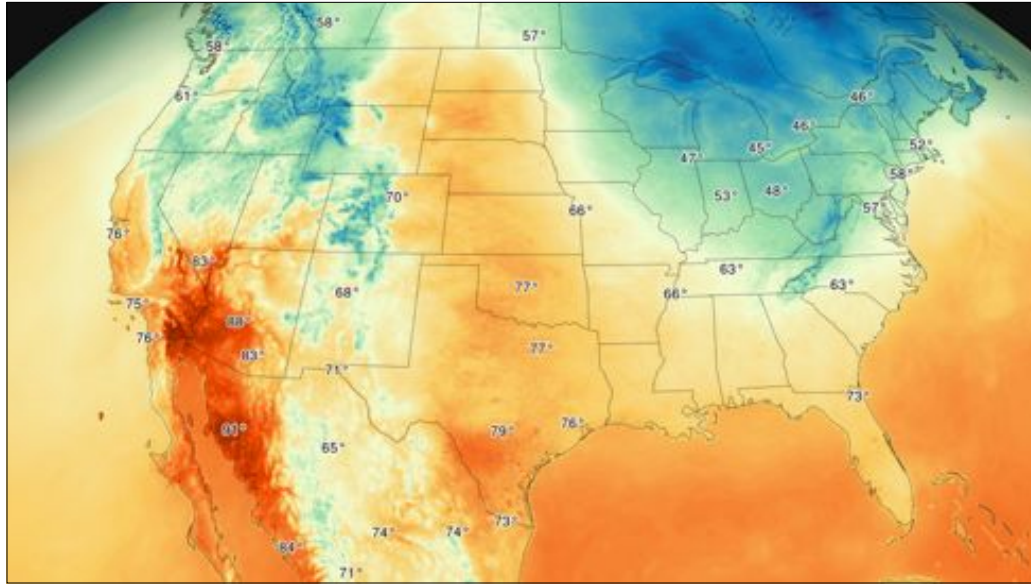
<http://storymaps.arcgis.com/en/>



<http://ss2.climatecentral.org/#14/36.8413/-76.2772?show=satellite&level=9&pois=hide>



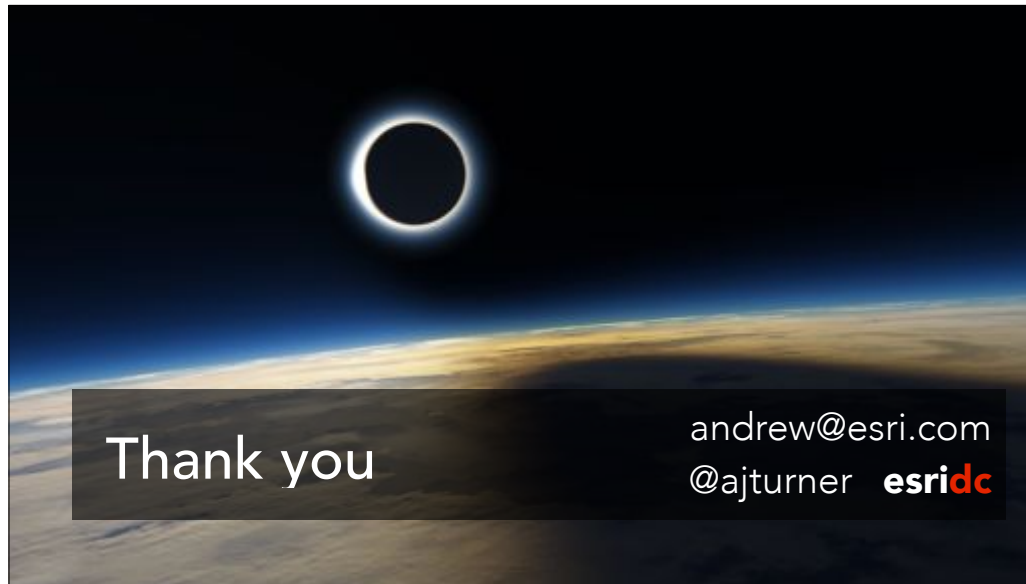
<http://fires.globalforestwatch.org/>



Linear Scale
Humans we're good at relative, but not absolute, measurements



Make Geography Personal



I would like to leave you with one last thought.

Newton said "Truth is ever to be found in the simplicity, and not in the multiplicity and confusion of things."

It's when we look past the most apparent and brightest objects that we can discern new patterns. Like the corona of an eclipse, the sun displays it's own vibrant atmosphere.

Go home. use your own tools, analyze your neighborhood.

It's a shared experience, a common environment and one society. I'm looking forward to collaborating with you on seeing the invisible.