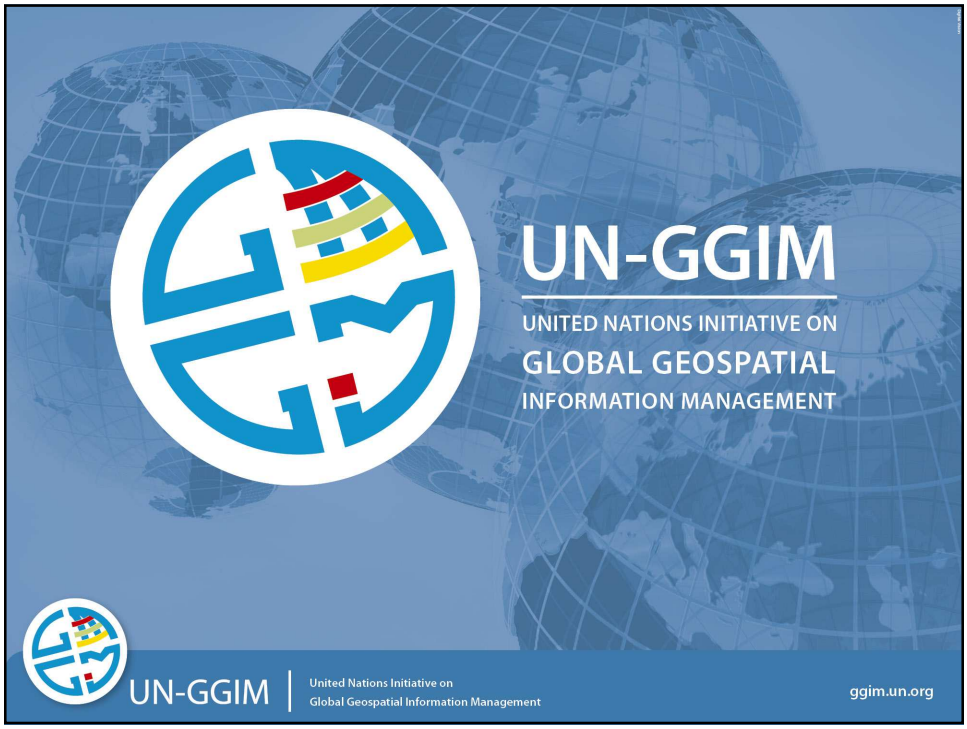
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GGIM Links Geospatial Datasets to SDGs
SDGs are Geospatial
…and statistical
…and require international collaboration
…and multi-stakeholder partnerships.
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Demands of the City – Urban Life

What is needed to make human settlements convenient?

- Housing
- Basic services
  - Water
  - Power
  - Telecommunications, etc.
- Work places for employment
- Transportation
- Services
  - Health facilities etc.

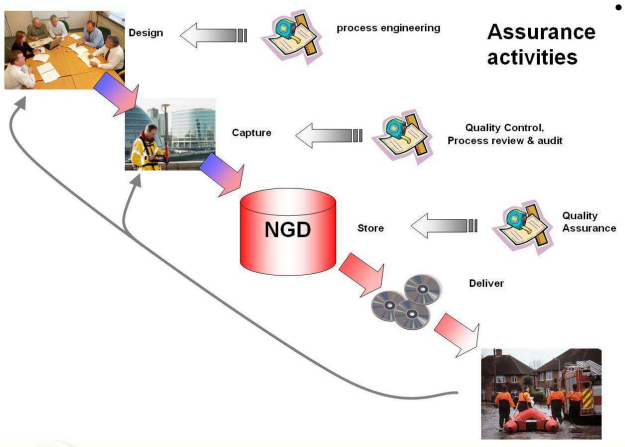
Geospatial Information for Cities

The Basics

Geospatial Data Sources

- Government
  - NMAs
  - Other
- Commercial
  - Profit motive
  - Variable coverage
- Volunteer efforts
  - Variable quality and coverage

The future role of governments in geospatial data provision and management



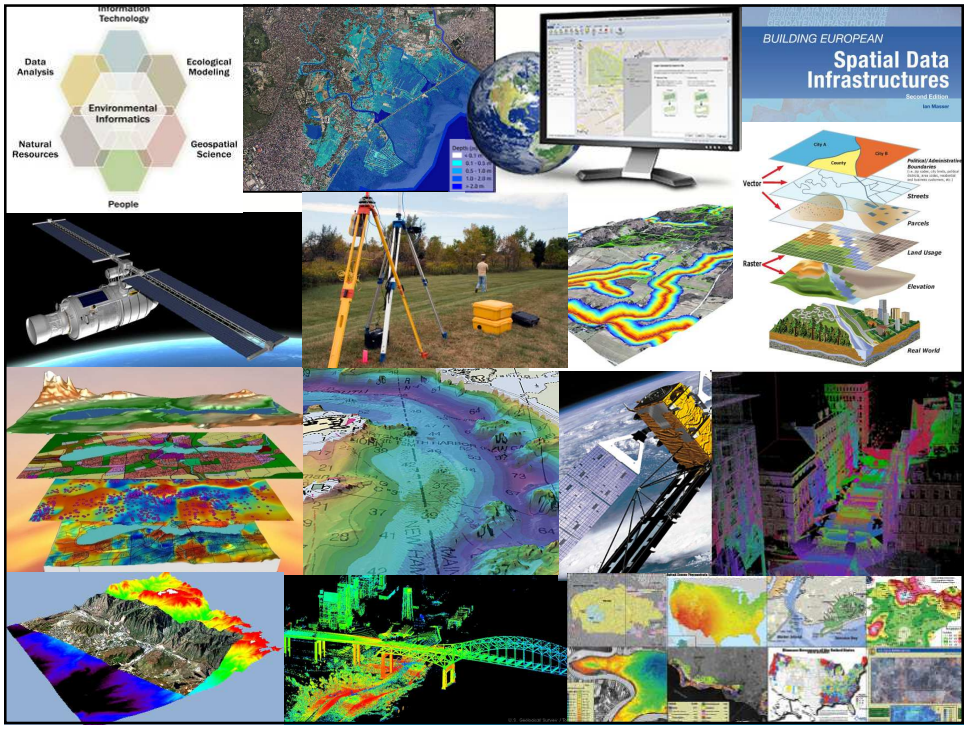
- Increase in the number of sources of geospatial information will challenge NMCAs, forcing a reconsideration of the traditional role played by government in collection of and provision of geospatial data.

Geospatial Data Types

- Digital sources with attribution
- Remotely sensed data
  - Satellite
  - Photography
  - LiDAR
- Specialized
  - Infrastructure geospatial data below ground

Technology

- GIS
- Mobile
- Sensors
- More satellites
- Drones
- Etc.



Need for Geospatial Requirements for Cities

- Importance of the role of location relative to attribution and statistics in measuring
- Knowing “where” leads to follow-on questions such as how much or how often or in what circumstances
  - Are there patterns of occurrence or is this an isolated instance
- What level of geography is needed for effective knowledge and action
- Determining geospatial data gaps and taking corrective steps increases the value of statistical data

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Evolving Applications

- Public safety and emergency response
- Autonomous vehicles
- Gaging stations to monitor:
  - Water levels
  - Environmental factors such as air quality
- Etc…

What is information is helpful in managing data?

- Definition
  - Need same understanding of terms, meaning, and usage
- Data
  - Source – who or where does the data come from?
    - National and local governments?...private sector?...other?...
    - Is it readily available or does it require a new partnership?
  - Complete or partial coverage?
  - Is it "good enough" data?
  - Source
- Methodology
- Process and procedure

An example for data: The sanity check…

- What is the ideal state?
  - Full coverage of available, current and maintained, high quality, well-documented data at the needed level of geography
- What is the preferred state?
- What is minimally acceptable?
- What can be salvaged?
- What is not helpful?

Examples of Statistical Data used in Geospatial Analysis

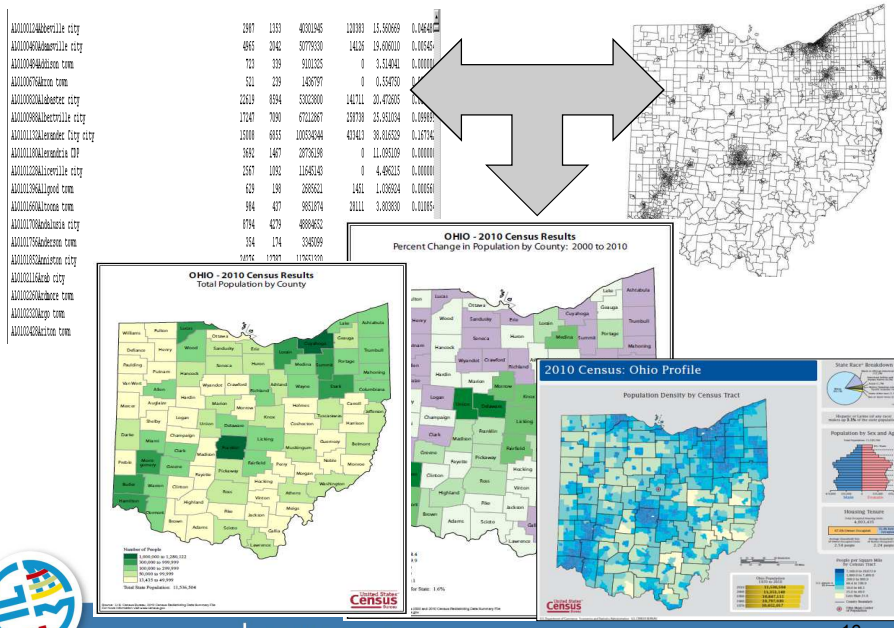
- Census population and housing data files
- Patient files
- Soil data
- Animal sighting
- Cancer registry
- Police records
- School records (assignments, attendance)

Statistical data can be overwhelming

Income of Household						
Total	118,682	67,530	97,574	70,422	96,144	70,572
Under $5,000	4,176	1,249	2,741	1,243	2,665	1,246
$5,000 to $9,999	5,055	7,927	3,490	7,932	3,417	7,930
$10,000 to $14,999	7,061	12,388	5,397	12,435	5,309	12,440
$15,000 to $19,999	7,260	17,278	5,858	17,285	5,763	17,289
$20,000 to $24,999	6,937	22,165	5,477	22,186	5,390	22,181
$25,000 to $29,999	6,730	27,186	5,459	27,222	5,361	27,218
$30,000 to $34,999	6,148	32,085	4,990	32,094	4,910	32,103
$35,000 to $39,999	5,907	37,183	4,910	37,208	4,834	37,200
$40,000 to $44,999	5,624	42,013	4,623	42,047	4,537	42,049
$45,000 to $49,999	4,933	47,198	4,081	47,205	4,007	47,200
$50,000 to $54,999	5,088	51,984	4,222	52,016	4,175	52,012
$55,000 to $59,999	4,203	57,154	3,580	57,186	3,535	57,181
$60,000 to $64,999	4,412	61,941	3,696	61,935	3,654	61,935
$65,000 to $69,999	3,579	67,095	3,021	67,109	2,981	67,103
$70,000 to $74,999	3,769	72,042	3,166	72,064	3,134	72,062
$75,000 to $79,999	3,118	77,007	2,656	77,023	2,622	77,020
$80,000 to $84,999	3,143	81,979	2,709	82,015	2,671	82,016
$85,000 to $89,999	2,680	87,142	2,339	87,141	2,303	87,136
$90,000 to $94,999	2,516	92,009	2,187	91,994	2,162	91,999
$95,000 to $99,999	2,110	97,155	1,867	97,156	1,840	97,163
$100,000 to $104,999	2,498	101,830	2,186	101,875	2,170	101,872
$105,000 to $109,999	1,778	107,162	1,523	107,145	1,504	107,141
$110,000 to $114,999	1,782	111,973	1,541	111,997	1,529	111,993
$115,000 to $119,999	1,480	117,204	1,271	117,228	1,255	117,223
$120,000 to $124,999	1,470	121,842	1,263	121,860	1,246	121,851
$125,000 to $129,999	1,243	127,026	1,105	127,030	1,082	127,026
$130,000 to $134,999	1,236	132,066	1,074	132,127	1,061	132,122
$135,000 to $139,999	1,058	137,202	937	137,218	921	137,226
$140,000 to $144,999	974	141,989	828	142,055	823	142,058
$145,000 to $149,999	783	146,959	664	146,985	658	146,985
$150,000 to $154,999	983	151,788	849	151,794	843	151,792
$155,000 to $159,999	671	157,072	590	157,028	583	157,020
$160,000 to $164,999	636	162,151	537	162,125	530	162,121
$165,000 to $169,999	541	167,076	474	167,064	464	167,073
$170,000 to $174,999	555	171,948	466	171,981	461	171,986

Statistical Data

Spatial Data



Geography adds value to data

- Connects statistics to geographic areas
- Reveals patterns, relationships and trends
- Simplifies big data
- Generates hypotheses and questions
- Turns data into information
- Tells a story

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Assumptions

- Geospatial data is core to the 2030 Sustainable Development Agenda
- Statistics are the facts that measure compliance to the indicator framework
- Location information offers perspective, greater understanding and a view of the data through a geographic lens
- Geospatial data complements statistical information by telling a story that supports planning, programs, and decision-making

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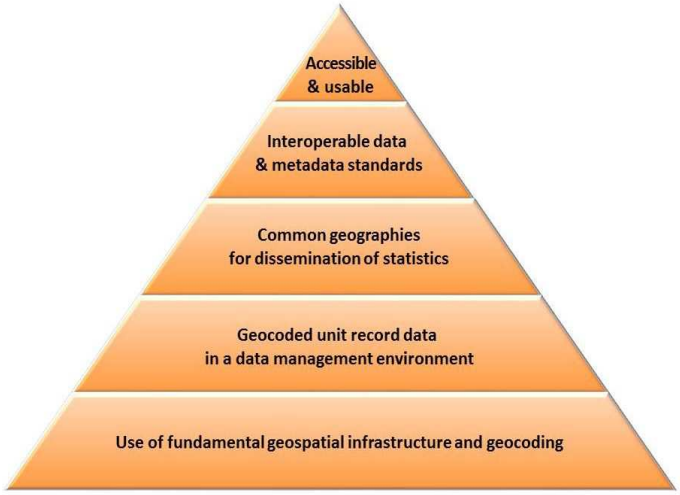
Statistical Geospatial Framework



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Establishing a Geospatial Framework for Statistical Data

- What geographic data are needed?
- What level of accuracy is required?
- What is your timeframe?
- How frequently are the data utilized?
- What geospatial technologies are available?
- What are the benefits and costs?
- Who are the stakeholders?

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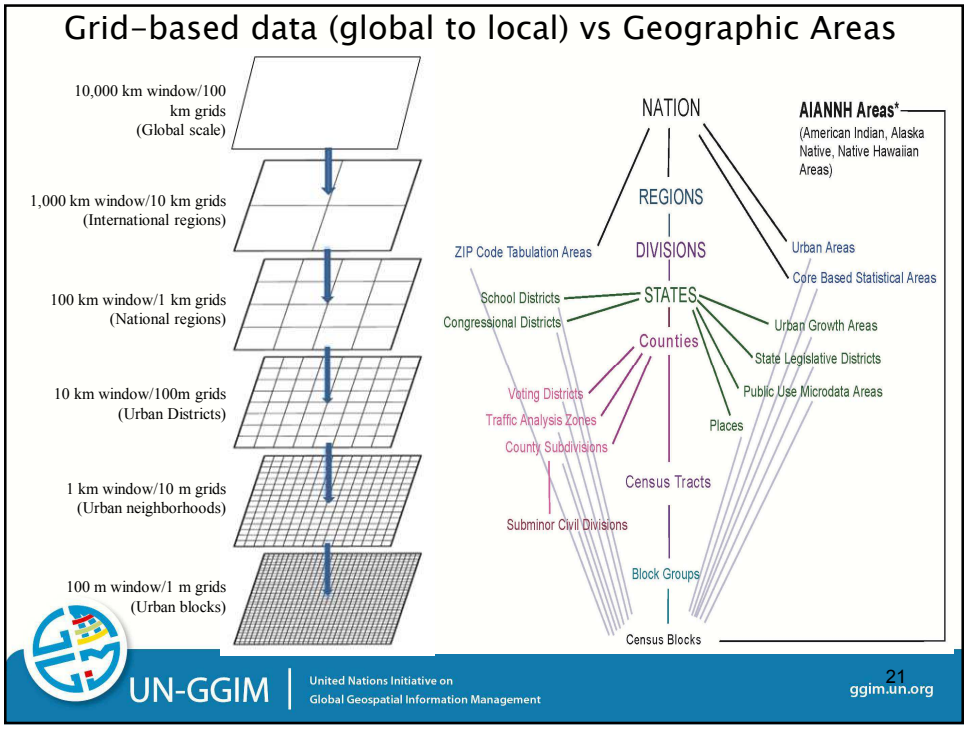
Grid-based data (global to local) vs Geographic Areas
10,000 km window/100 km grids (Global scale)
1,000 km window/10 km grids (International regions)
100 km window/1 km grids (National regions)
10 km window/100m grids (Urban Districts)
1 km window/10 m grids (Urban neighborhoods)
100 m window/1 m grids (Urban blocks)
NATION
AIANNH Areas*
(American Indian, Alaska Native, Native Hawaiian Areas)
REGIONS
DIVISIONS
ZIP Code Tabulation Areas
Urban Areas
Core Based Statistical Areas
School Districts
Congressional Districts
STATES
Urban Growth Areas
Counties
State Legislative Districts
Public Use Microdata Areas
Voting Districts
Traffic Analysis Zones
County Subdivisions
Places
Census Tracts
Subminor Civil Divisions
Block Groups
Census Blocks
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Data collection is tabulated by Adminstrative Areas at varying levels, namely:
Global
Regional
National
Subnational
Cities
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Geographic Areas and Boundaries

Cities and Human Settlements:

Example enumeration boundaries for places in the US

- Counties
- Census tracts
- Census blocks
- Census Designated Places
- Minor Civil Divisions/Towns

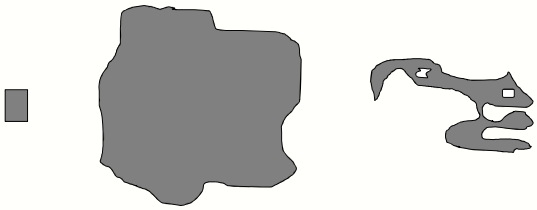
Census tracts

Pittsburg metropolitan region

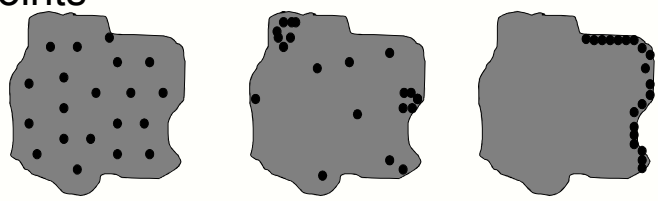
Public ownership and use:

Parcel and land records

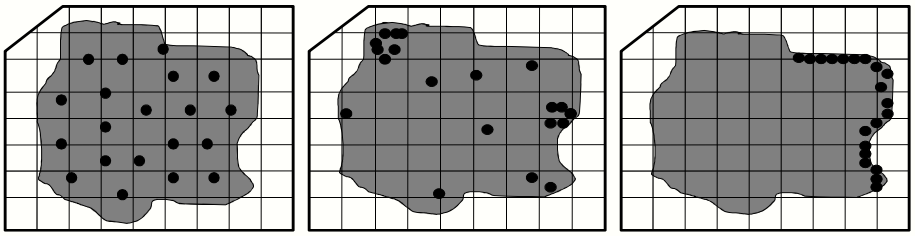
Geographic areas come in a variety of shapes and sizes…



…and can have many different distributions of known data points

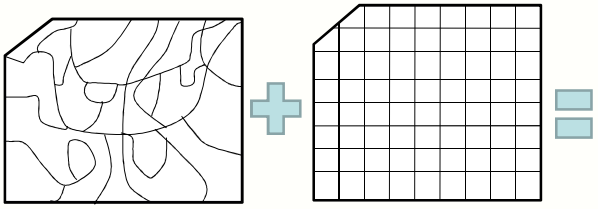


Precision and Spatial Patterns



Random Distribution | Clustered pattern | Ordered pattern

The HYBRID approach
Case studies at the U.S. Census Bureau



Administrative Areas + Regular Grid = ? Hybrid

- 1992 *Agricultural Atlas of the United States*
- Haiti Demobase, 2010
- *Population Distribution of the World* (data provided to LandScan/Oak Ridge National Lab)

Source: Esri

So where are these urban areas?

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Observations

- No international agreement or practice on urban/rural by NSOs
- Urban/rural serves different purposes
  - Some intentional
    - Economic development (Urbanized Areass to Metropolitan Areas)
  - Some unintentional
    - Program implementation via laws
      - Rural health care and housing
    - Normally no control but sometimes has unintended consequences (“it’s because of the Census Bureau…”)

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Realities

- More than one type of use of urban/rural designations
  - Functional use – population based
  - Physical observable - for example land use planning
- Challenge with urban/rural applies to both developed and developing countries
- The impact of this exercise is not limited to supporting the SDGs: it enables capacity development.

Considerations

- Temporal issues are important
  - Development and movement of population occurs over time
    - Increase and decrease based on events and conditions
  - How are temporal data accounted?
- How to react to special circumstances and anomalies within a Member State
  - The U.S.
    - American Indian Areas
    - Colonias

Cities and Example SDGs

By 2020, halve the number of global deaths and injuries due to traffic accidents…

Total numbers for a nation are telling for a national perspective

To take action requires more information

- Operator error (drunken driving, seat belt use…)
- Road conditions (sharp curves, pot holes…)
- Traffic safety aids (speed signs, traffic lights…)

Knowing location of traffic events is required for next steps

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…Reforms giving women equal rights to economic resources as well as access to ownership and control over land…

How does geospatial data contribute?

Land parcel and cadastre records are needed
- Parcel size and extent (boundary)
- Land use (agriculture, residential, economic)
- Ownership by characteristics including sex

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…building resilient infrastructure, promoting inclusive and sustainable industrialization and fostering innovation…

"Proportion of rural population who live within 2 km of an all-season road"

What are the geospatial implications?
- How to differentiate rural and urban populations?
  - Accepted definitions are needed
- Locations of housing units
- Existence of a geospatial detailed maintained road network

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Example Goal | Target | Indicator

Goal 11: Make cities and human settlements inclusive, safe, resilient, and sustainable.

Target 11.7: By 2030, provide universal access to safe, inclusive and accessible, green and public spaces, particularly for women and children, older persons and persons with disabilities.

Indicator: The average share of the built-up areas of cities in open space in public ownership and use.

Goal 11: Getting Started

- **An assumption** – there is public accessibility to diverse datasets and GIS tools on a national and global scale
- **An urban geography framework** - small area geography to merge target group statistics, and land use/land classification data
- **Diverse datasets** – demographic data, earth observation data, crime data, land use/land classification data, open areas, or protected areas
- **A geospatial methodology** - an integrated solution to geospatial problem; see previous studies listed below

2012, S. A. Bennet, N. Yiannakoulias A. M. Williams, P. Kitchen. Playground Accessibility and Neighborhood Social Interaction Among Parents, *Social Indicators Research* 108:199-213.

2001 S. Nicholls, Measuring the accessibility and equity of public parks: a case study using GIS, *Managing Leisure*, 6:201-212.

Case Study for Goal 11:
Pittsburgh, PA

Data Sources:

- **Base layers** (Boundaries/roads/DEMs)
- **Target Population Data** (Population, age/sex, crime statistics)
- **Accessible Open Space Layer** ((Protected Areas Database), Open Street Map, Parcel data)
- **National Land Cover Database (NLCD)**
- **Additional Gridded Datasets**
  - Landscan - Oak Ridge National Labs
  - CIESIN/SEDAC - NASA/Columbia University

Data Integration Model:
A GIS Solution for Goal 11

- Assess data quality and select appropriate **small area geography**; e.g., block group, census tract, or gridded polygons;
- Extract **access points** to open space or protected areas; e.g. parks, recreation areas;
- Link **target population data** to small area geography or gridded polygons; e.g. demographic, economic, health, crime statistics;
- Create "**isochrone/isodistance**" maps (time/distance to access points);
- Develop a "**proximity index**" for each city (weighted (average) time and/or distance to the areas of interest) to allow comparison to other cities.

All of these variables can be integrated into consolidated information…. if the data is consistently available as a data ecosystem

A Path Forward

- Close collaboration is needed by:
  - National Mapping and Geospatial Agencies
  - National Statistical Organizations
  - Those who have begun this process are realizing tangible successful outcomes
- 2020 Round of Censuses benefit from these collaborations where new data and new data types are identified and planned for in support of the SDGs
- New synergies across organizational boundaries have longer term benefits beyond meeting the SDGs

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Conclusion

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