

Middle East Geospatial Forum  
Dubai | 16<sup>th</sup> February 2015



# Sustainable Development for Smart Cities: A Geospatial Approach

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**Our World Is Facing Serious Challenges**





**75% of world population to  
live in cities by 2050**

**Global population of 9 – 10  
billion people by 2050**

**86% of GCC population will  
live in cities by 2020**

**15+cm rise in sea  
level in 20<sup>th</sup> century**

**56% increase in global  
energy consumption by 2040**

**Around 7 million deaths in 2012  
(one in eight of total global deaths)  
as a result of air pollution exposure**

**2.5 billion  
vehicles  
by 2050**

## Tackling the issues: vision and leadership



“Significant innovation in the production, delivery and consumption of water and energy is vital to our collective future.

Responsible conservation and management, and a culture of sustainability, are important goals for developed and developing nations alike.”



“Ensure sustainable development while preserving the environment, and achieve balance between economic and social development.

Focus on improving the quality of air, preserving water resources, increasing the contribution of clean energy and implementing green growth plans.”



“Preserve and enrich Abu Dhabi's physical and cultural identity.

Creating an always improving quality of life for residents on four equal pillars of sustainability: environmental, economic, social, and cultural.”

# Smart Sustainable Cities

*“A smart sustainable city is an innovative city that uses information and communication technologies (ICTs) and other means to improve quality of life, efficiency of urban operation and services, and competitiveness, while ensuring that it meets the needs of present and future generations with respect to economic, social and environmental aspects”.*

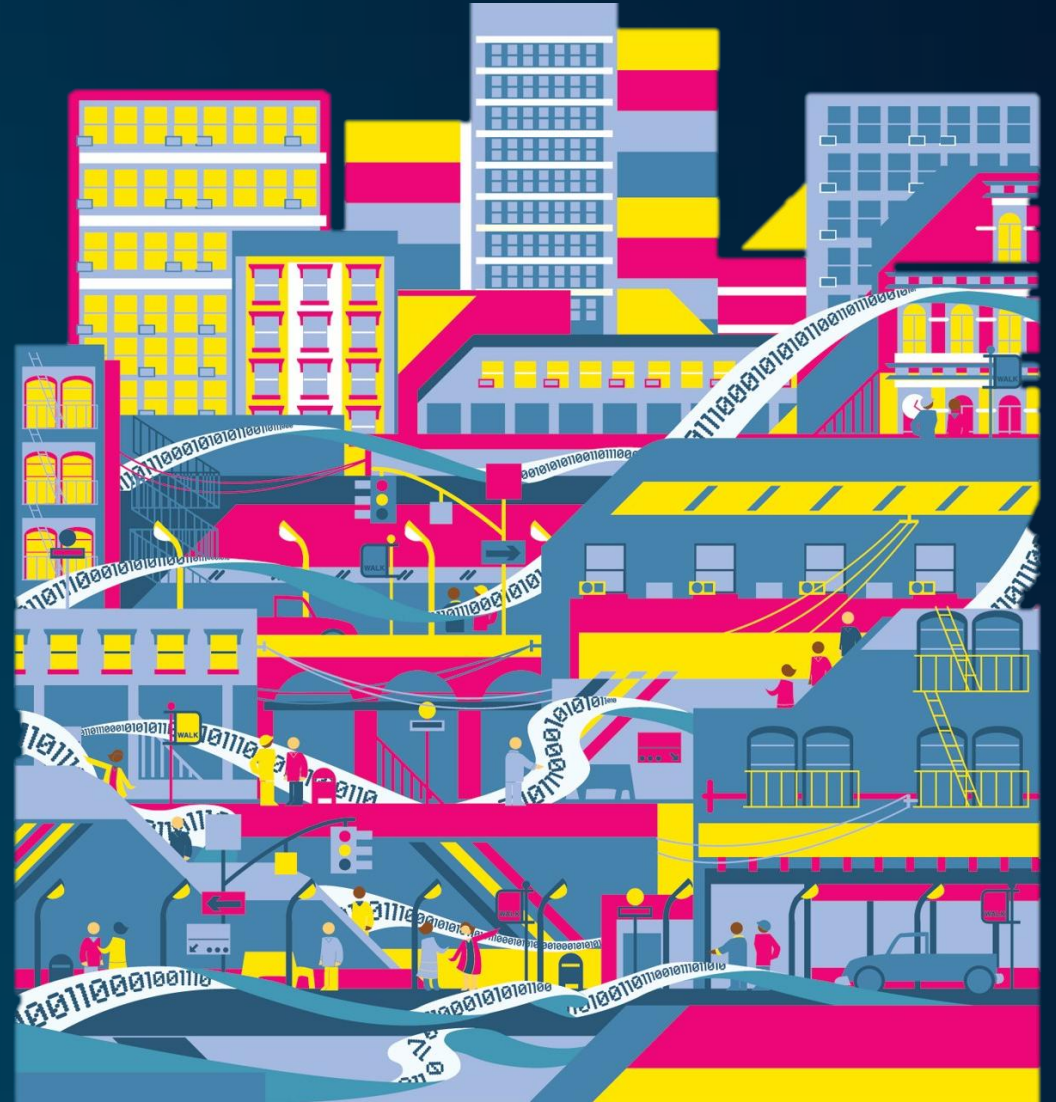
UN International Telecommunication Union





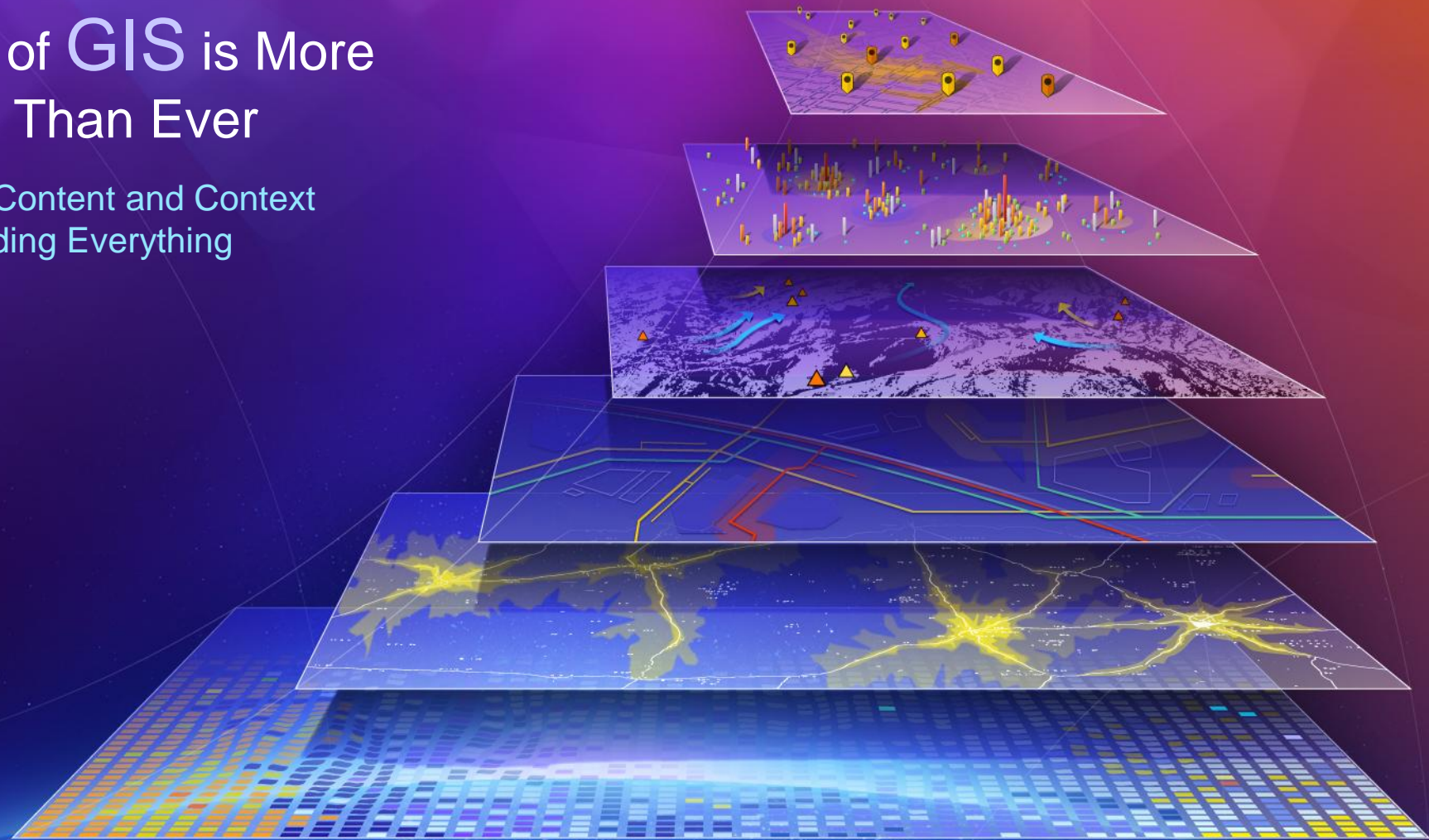
# Smart Sustainable Cities

- GIS plays an important role in enabling smart cities, as every resource in a city has location.
- The role of GIS will continue to grow as more spatial data is collected from mobile devices and the increasing use of sensors.
- Smart cities will increasingly use 3D visualisation and analysis in planning their growth.



# The Role of GIS is More Important Than Ever

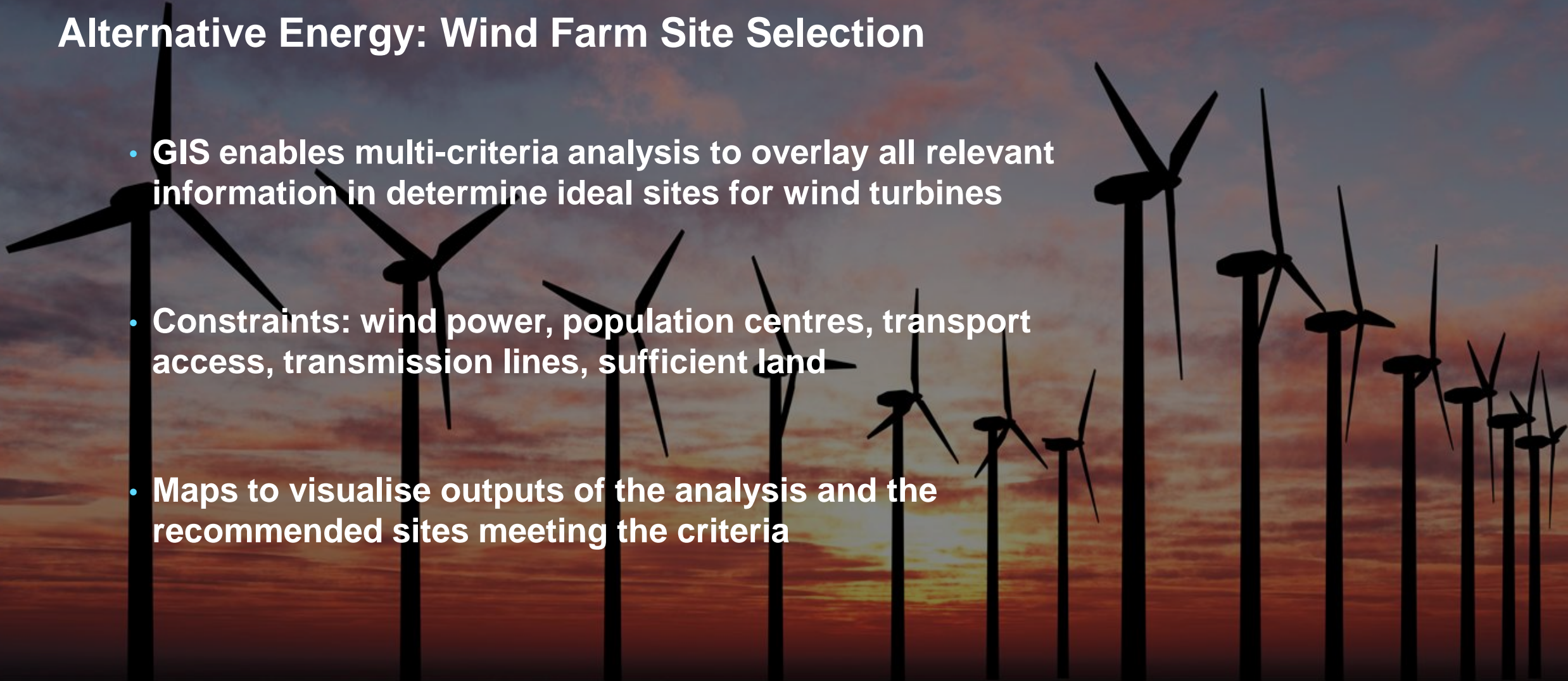
Providing the Content and Context for Understanding Everything





# Alternative Energy: Wind Farm Site Selection

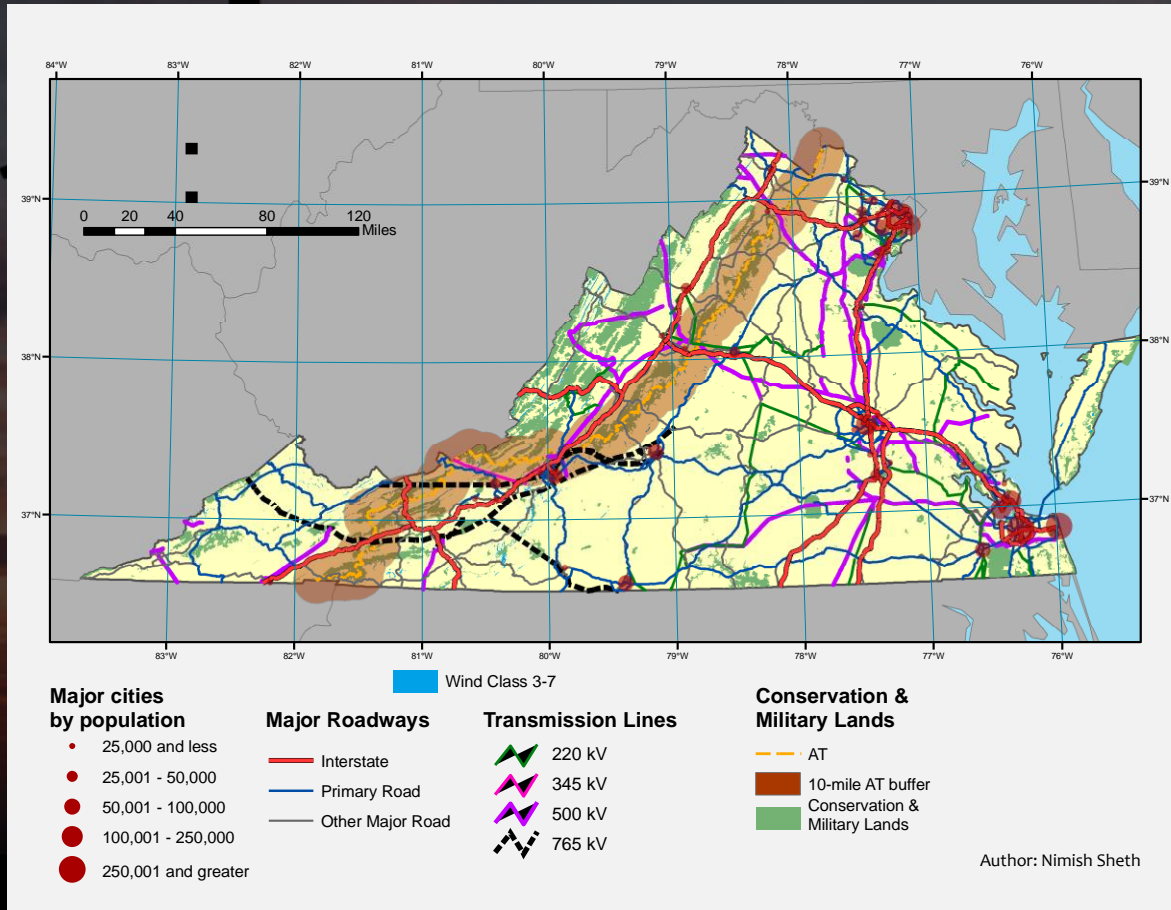
- **GIS enables multi-criteria analysis to overlay all relevant information in determine ideal sites for wind turbines**
- **Constraints: wind power, population centres, transport access, transmission lines, sufficient land**
- **Maps to visualise outputs of the analysis and the recommended sites meeting the criteria**



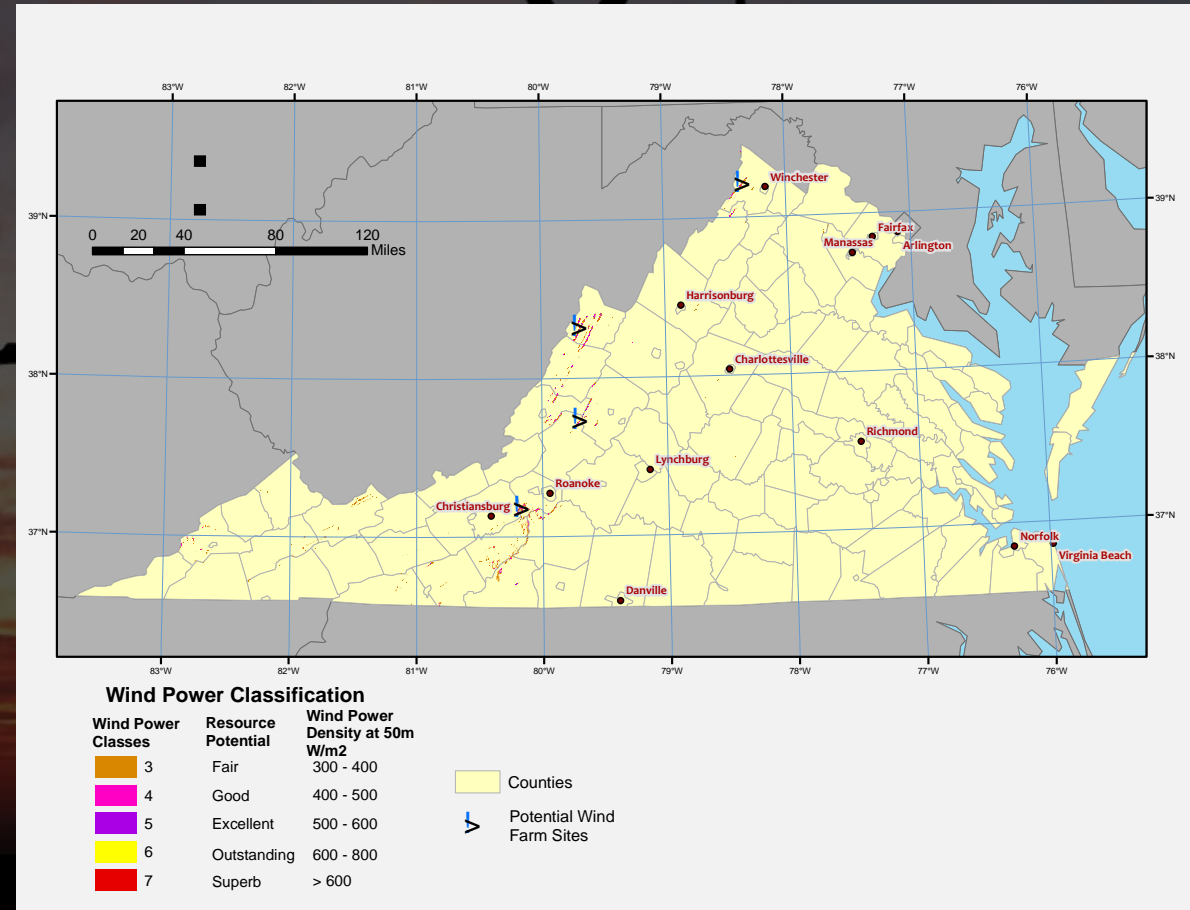


# Alternative Energy: Wind Farm Site Selection

## Constraints



## Proposed sites



Virginia, USA

# Smart Grid

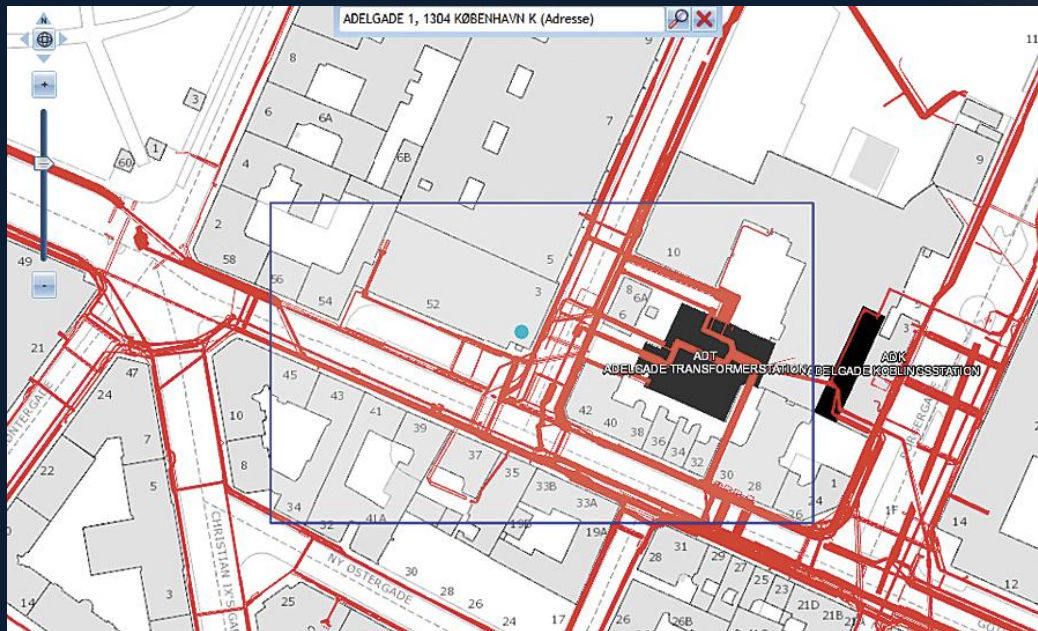


- **Smart grid benefits:**
  - **Manage loads more effectively**
  - **Automated restoration after an outage**
  - **Interaction between providers and consumers**
- **Reduction in greenhouse gases**
- **Integration of renewable energy sources**
- **GIS applied to:**
  - **Determine optimum locations of equipment**
  - **Visualise and manage smart grid assets**
  - **Real time analysis of performance**



# Smart Grid

## DONG Energy, Denmark



Info Opmåling Tegn Rediger Bogmærker Kortopsætning Print

Temakort

- 01-Skematiske\_veje
- 02-Skematik\_04kV
- 03-Skematik\_10kV
- 04-Fallemøder
- 05-Målsætning
- 06-Note\_stik\_skitse
- 07-Snit
- 08-Stationer
- 09-Gadeplan\_04kV
- 10-Gadeplan\_10kV
- 11-UB
- 12-Kommunikation

ADELGADE, 1304 KØBENHAVN K (Vejnavn)

Søgesultat

- 10-Gadeplan\_10kV
  - 10 kV kabel (ADT58-51686)
  - 10 kV kabel (ADT82-51904)
  - 10 kV kabel (ADT55-51772)
  - 10 kV kabel (ADT12-52383)
- 09-Gadeplan\_04kV
  - 0,4 kV kabel (TS1904-1-3--27087-3)
  - 0,4 kV kabel (TS2450-1-2--26551-3)
  - Kabler u.a.d. (10303)

7 resultater i 2 temakort

OBJECTID	697036
Stykliste	Null
SAP reference	Null
GIS reference	6812681
Indmåling	N
Subtype	1
Etableret	01-01-1969
Udfringsbogstav	Null
Jordtråd materiale	Null
Jordtråd dimension	Null

Valgte tema kort

- 05-Målsætning
- 10-Gadeplan\_10kV
- 09-Gadeplan\_04kV
- Luftfoto

Målestoksforhold: 1:1450



# Routing and Logistics

- Optimisation of fleet routing using GIS
- Reduction in fuel usage and carbon emissions
- More efficient use of existing assets through better planning and precise routing





# Routing and Logistics

Home Setup Schedule Deployment Preferences | Help | About

**Optimize and Edit**

December, 2010

Su	Mo	Tu	We	Th	Fr	Sa
28	29	30	1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	1
2	3	4	5	6	7	8

**Tasks**

Import Orders

Build Routes

**Views**

Orders  Time

Routes  Versions

Map  Find

**Quick Help**

Add or import orders and then build, edit, and sequence routes. Compare different route versions and view orders in Orders, Routes, Map, or Time views. More Info.

Optimize and Edit

1 Route(s) of 9 selected

Map Layers

Map

Move Orders Delete Duplicate Sequence Routes

Print

Click here to add a new Route

Se...	Name	Arrive Time	Address
	Medical Depot	8:00 AM	241 West Comm
1	PATIENCE OKOROJI	8:24 AM	
2	CRISTY ACHO	8:59 AM	
3	HENRY PUNZI	9:38 AM	
4	ALAN NORTH	10:42 A	
5	JOSEPH GUILYARDO	11:01 A	
6	PHILIP GORDON	11:23 A	
7	DAVID HERNON	11:50 A	
	Break	12:20 P	
8	RALPH HORAN	1:07 PM	

Routes

Routes	8AM	9AM	10AM	11AM	12PM	1PM	2PM	3PM	4PM
Ben	█	█	█	█	█	█	█	█	█
Bert	█	█	█	█	█	█	█	█	█
Evan	█	█	█	█	█	█	█	█	█
Jeff	█	█	█	█	█	█	█	█	█
Jim	█	█	█	█	█	█	█	█	█
Paul	█	█	█	█	█	█	█	█	█
Rich	█	█	█	█	█	█	█	█	█
Ryan	█	█	█	█	█	█	█	█	█

Map Satellite GeoPortal Live traffic العربية Login Register

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**Traffic Updates**

**Road Works**

- Road Work From: 2014-12-11 13:36:11 At: KING KHALID BIN ABDEL AZIZ STREET Lanes affected: 1 Zoom to
- Road Work From: 2014-12-07 10:50:41 At: AIRPORT ROAD Lanes affected: 2 Zoom to
- Road Work From: 2014-12-07 10:50:12 At: NEW AIRPORT ROAD Lanes affected: 1 Zoom to
- Road Work From: 2014-09-11 14:24:27 At: RASHID BIN SAEED AL MAKTOUM STREET Lanes affected: 1 Zoom to
- Road Work From: 2014-09-11 14:24:17 At: RASHID BIN SAEED AL MAKTOUM STREET Lanes affected: 1 Zoom to

Esri Route Planner

Traveller information systems



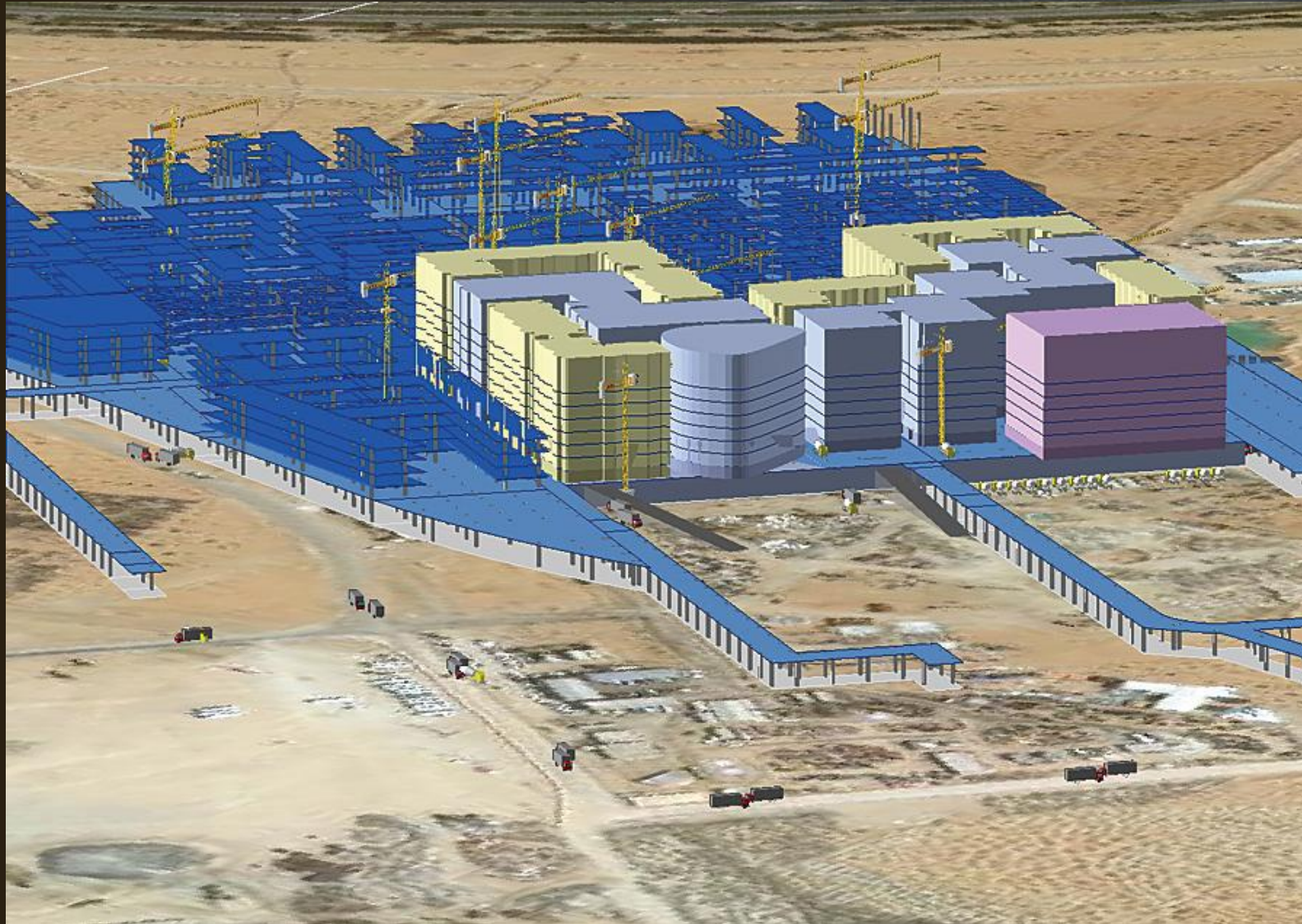
# Smart City Planning: Masdar City, Abu Dhabi, UAE



- Carbon neutral, zero waste city
- ArcGIS used for spatial planning, modelling, programme management, tracking of costs and schedules
- GIS supported site selection, evaluation of alternatives and visualisation of construction sequences
- Asset management and modelling of resource usage



# Smart City Planning: Masdar City, Abu Dhabi, UAE



3D GIS



# GIS Is Evolving

Your GIS Is Becoming  
Part of an Interconnected Platform

Faster Computing

Devices

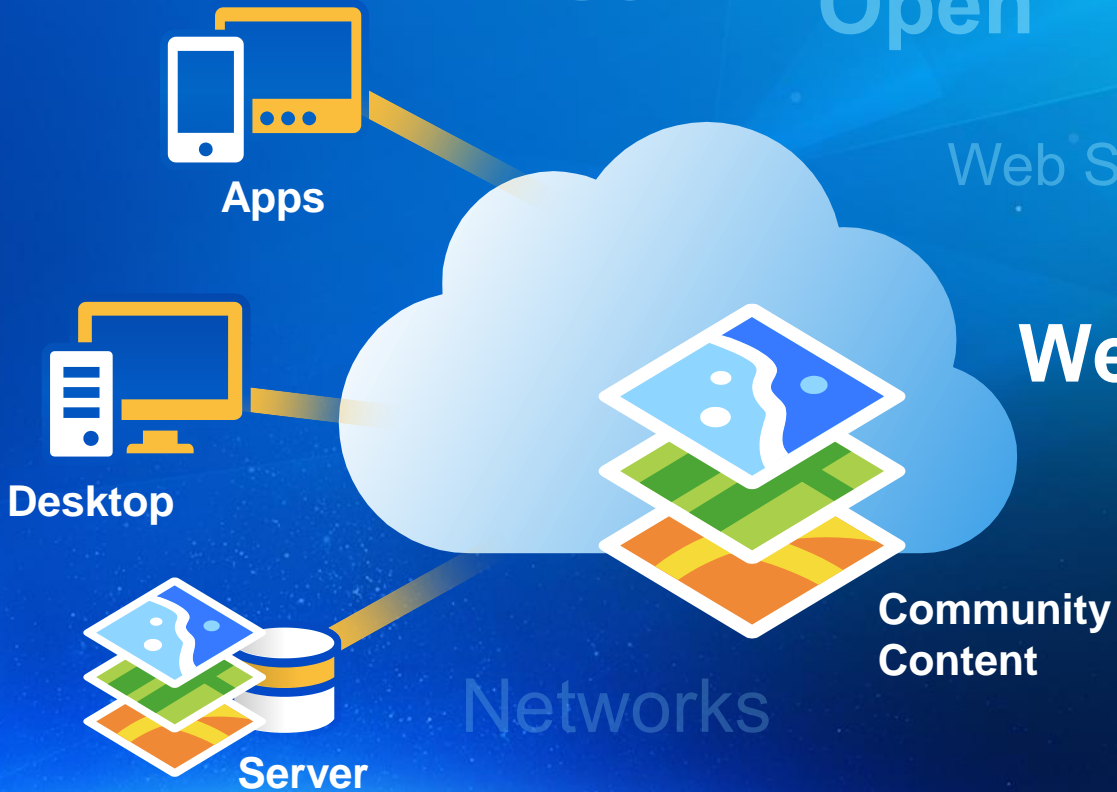
Web

Open

Web Services

**Web GIS**

Cloud



*Bringing Together Data, Technology, and People . . .*

*. . . Creating a Framework for Solving Complex Problems*



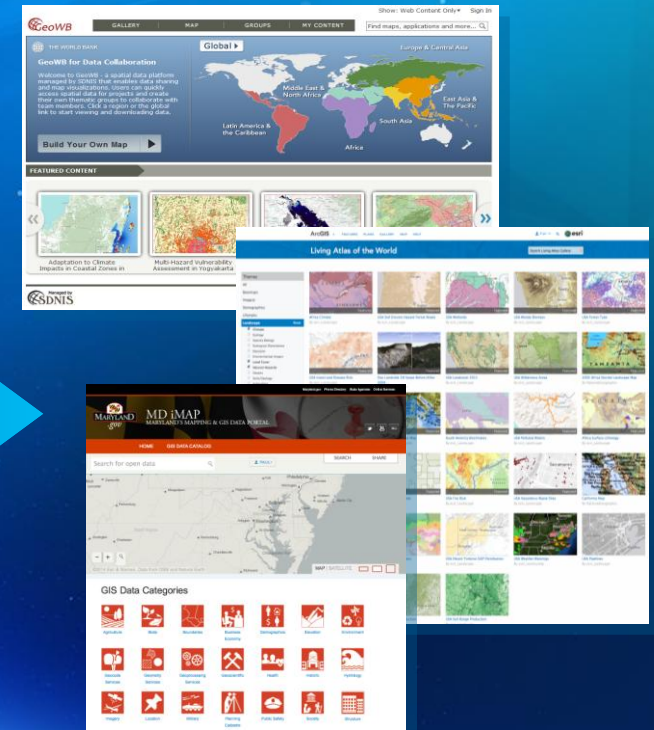
# Web GIS Integrates All Types of Information

Organizing and Sharing Your Work

Web Maps and Services



Portal



*Both Internally and on the Open Web*

# The **App** Revolution

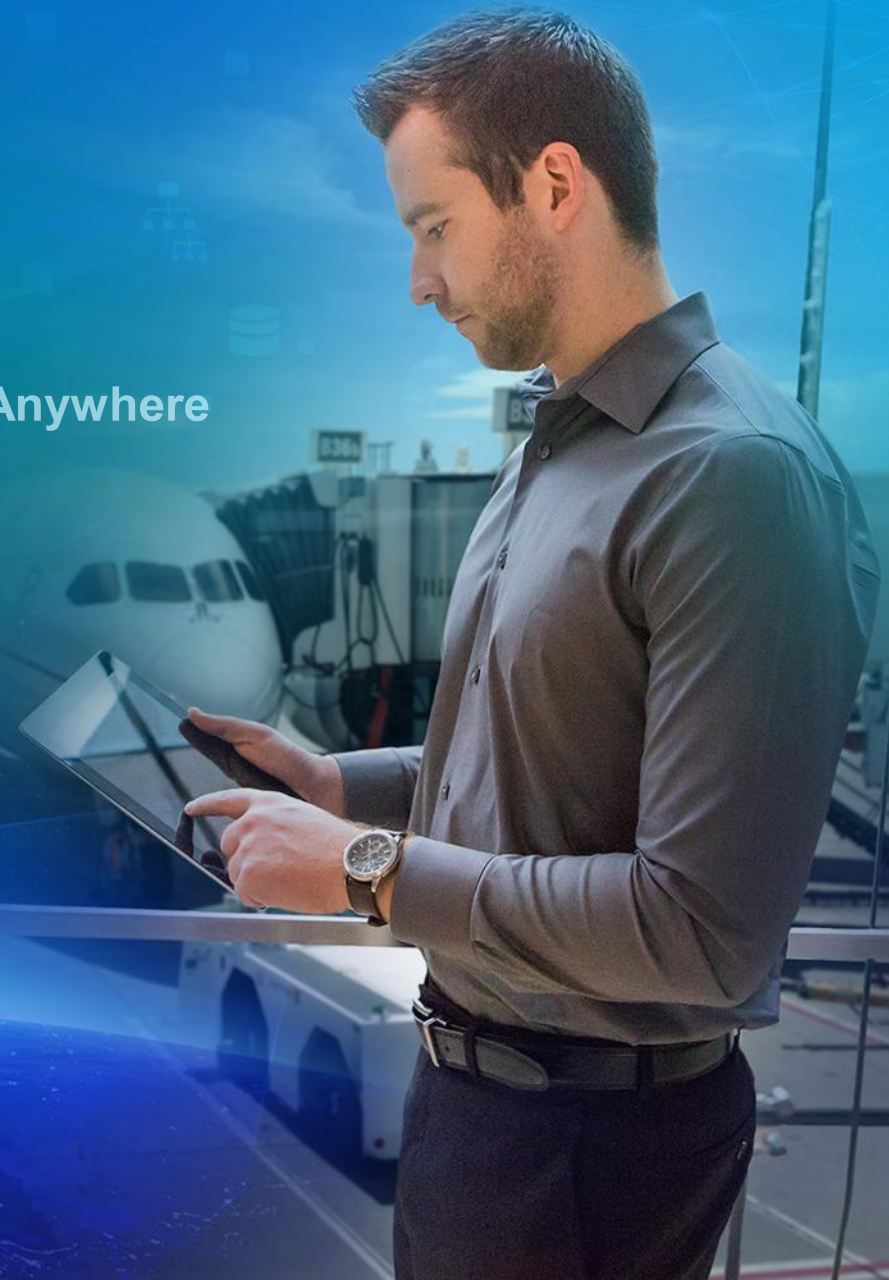
Is Making Web GIS Available Everywhere

Anytime



Anywhere

Any Device



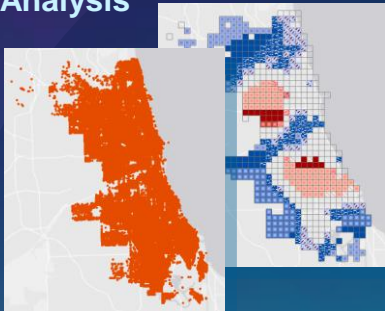


# Spatial Analysis

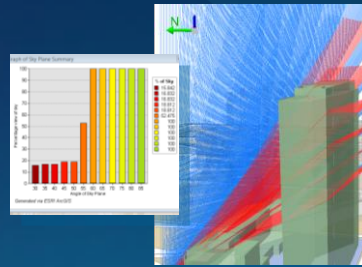
Supporting Demands for  
Better Understanding

## Desktop

Space-Time  
Pattern Analysis



3D Analysis



Flow Visualization



Improved Modeling

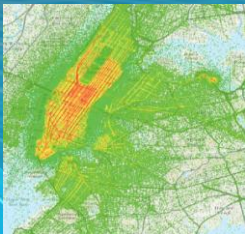


Multidimensional Data



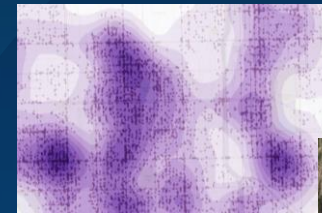
Infographics

Big Data



## Online

Interpolation



Density

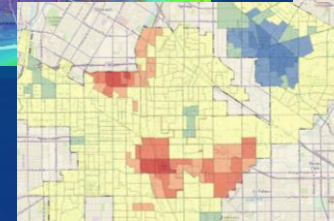
Route Optimization



Buffer

Overlay

Hot Spots



Terrain

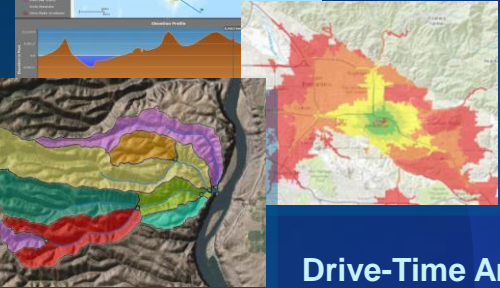


Drive-Time Areas

Find Nearest

Aggregation

GeoEnrichment



*Advancing the Science of Geography*



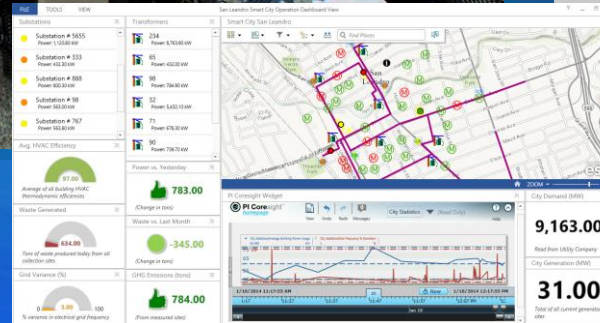
# Real-Time

Supporting Geographic  
Monitoring and Alerting

- Many Sensors
- Spatial Analysis
- Stream Service
- Big Data
- OSIssoft Integration



PG&E



OSIssoft Dashboard

Arctic Shipping and Sea Ice



Exact Earth

Big Data

## GeoEvent Extension



# GIS Supports Sustainable Development for Smart Cities

Leading to GeoSmart Governance





# Thank you



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Understanding our world.