



United Nations



**United Nations Nagoya  
"Training Course on Capacity Building for  
Sustainable Urbanization in Asian  
Countries"**

**"ICT for Smart Cities"**

**Warren Karlenzig, President, Common Current**

**[www.commoncurrent.com](http://www.commoncurrent.com)**

**[warren@commoncurrent.com](mailto:warren@commoncurrent.com)**

# Background: Why are we here?



- **Why** sustainability training for Asian Mayors and City Executive Leaders?
- **Sponsors:** UNCRD and UN Department of Economic and Social Affairs (DESA)
- **Genesis:** “UN Shanghai Manual for Sustainable Cities”
- **Session Focus:** “ICT for Smart Cities”
- Focus of **other UNCRD Nagoya Sessions:** Economic Transformation, Green Buildings, Waste Management, Transportation, Urban Management, Science and Technology, Culture

# Who am I?



- **Co-author** United Nations “Shanghai Manual for Sustainable Cities”
- **President**, Common Current
- **Author:** *How Green is Your City? The SustainLane US City Rankings*
- **Clients:** UN; Ecocity Builders; European Union; South Korea; Asian Institute for Energy, Environment + Sustainability; US Department of State; US EPA; cities (Guangzhou, China; Los Angeles, US); states (California); Chevron, GE
- **ICT experience:** Planning of enterprise portals, intranets, knowledgebases

# Our process today



- Review material from The UN “**Shanghai Manual for Sustainable Cities**”
- I will answer and respond to your questions at most times during presentation.
- For the answers I don’t have, I will look to other experts in the room: yourselves.
- Your participation is critical: You know your cities and their histories. You know the people and their needs: this knowledge is invaluable for all of us.

# Our process: introductions



Since your expertise and input are valued, please introduce yourself to the group:

- Your Name, City and Position or Title
- Interest regarding the issue of sustainable cities OR
- Interest in the area of Information and Communications (ICT) technologies
- In a few words, what you would like to get out of today's session?

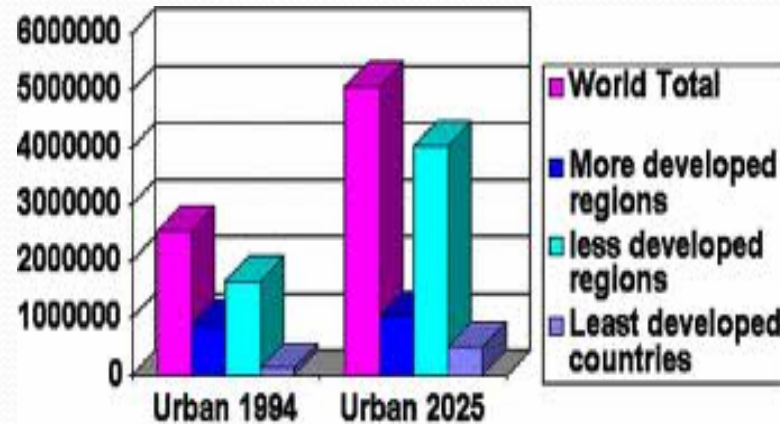
# Overarching Strategies



Strategies and goals of city leaders should include:

- engaging stakeholders;
- envisioning a sustainable, harmonious city;
- establishing goals and measuring progress;
- back-casting to identify action plan;
- establishing an integrated approach across all departments of local government.

# The Big Picture



- By 2030, **60%** of global population will live in cities, up from 50% in 2008
- The world can expect the urban population to increase by 3.1 billion persons by 2050, when **66%** of the earth's inhabitants will live in cities
- Cities of **China and India**: to account for **40%** of global urban population growth 2005-2025

# ICT for Smart Cities



Highlight information and communication technologies (ICT) for city sustainability planning, analysis and management.

Besides improving monitoring and control capabilities for city executive offices, agencies and managers, ICT can be a prime source of **economic growth** and **connectivity for social cohesion**.



# United Nations: Internet is “Human Right”



United Nations issues a report in July 2011 stating that Internet access was a basic “human right”

# Successful ICT for Cities



ICT success is centered around utilization of networked infrastructure to:

improve **economic, resource and political efficiency**

enable **social, cultural development and planning/ management of built urban environment.**

# Smart Cities: Beyond ICT



High capacity for learning and innovation amongst creative residents.

Education institutions + digital infrastructure aid communication and knowledge management.

# ICT: Whole system benefits



## **Smart Cities:**

If properly designed and integrated, end result of ICT use is improved performance in management of:

- **Health, Safety and Family Services**
- **Education**
- **Energy:** buildings and transportation
- **Water:** supply and use
- **Industry:** products, operations
- **Transportation:** use, operations

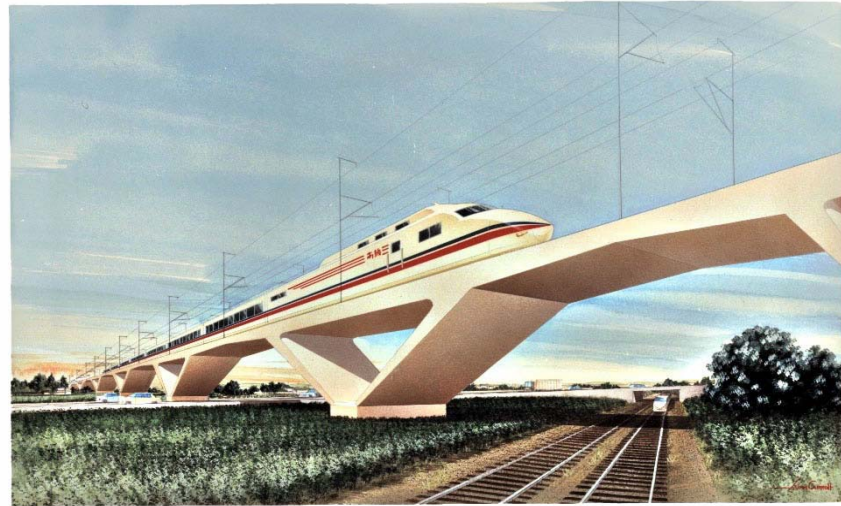
# ICT for Smart Cities



## Trends and Drivers

Developing-country emphasis should be on increasing access to ICT services by expanding ICT infrastructure (broadband) to reduce the “digital divide”. For all nations, ICT enables **online education** programs and more efficient, less costly access to city services through **e-governance**.

# Cutting carbon from cities with ICT



Through the utilization of digital technology, it is possible for cities to achieve lower carbon emissions from **infrastructure, buildings and transportation.**

# Executive dashboards



At the management level, ICT can enable better decision-making support. **Sustainability** “dashboards” use visual indicators to help managers better understand—and take action--for physical, scientific, environmental and economic conditions.

# Executive dashboards



One technological solution is called City Cockpit –an integrated management information and decision support system can assist city authorities in managing the growth and changes based upon key performance indicators such as **traffic, environment, and finance.**



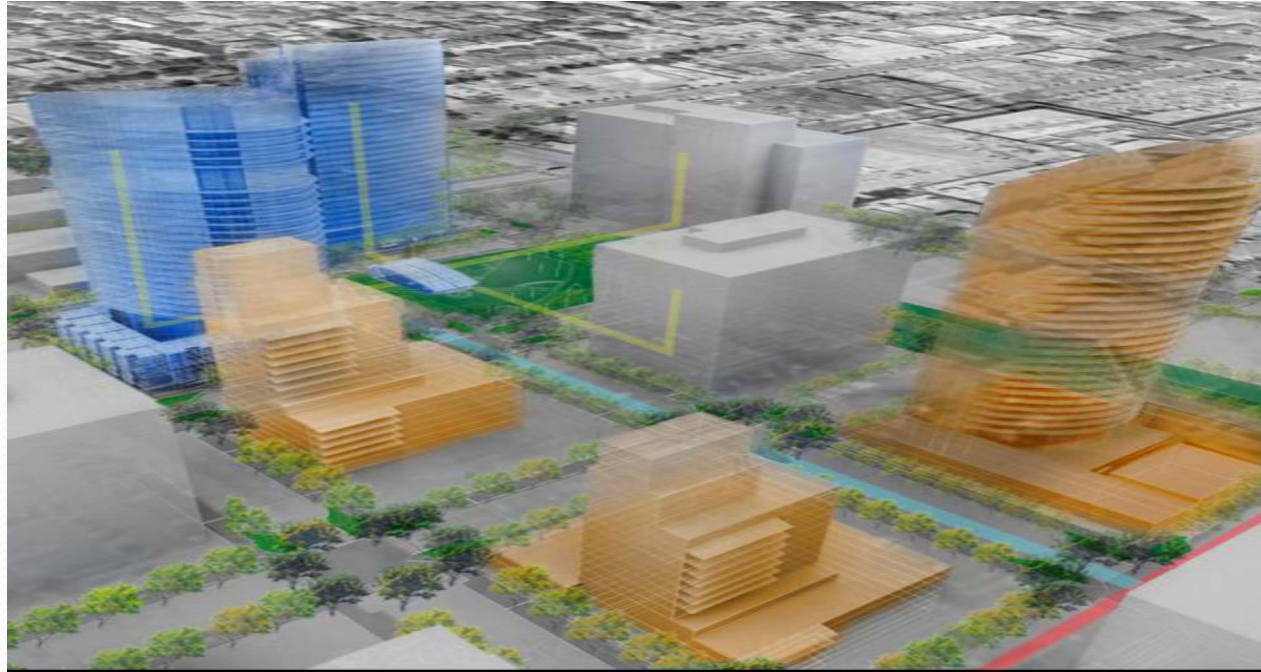
# Using ICT for Renewable Energy



The Long-range Energy Alternatives Planning System (LEAP) software is being used in 150 nations as *de facto* standard for energy resource planning and greenhouse gas mitigation assessments.

LEAP is free of charge for government agencies, academics and non-governmental organizations in developing nations.

# Simulation software



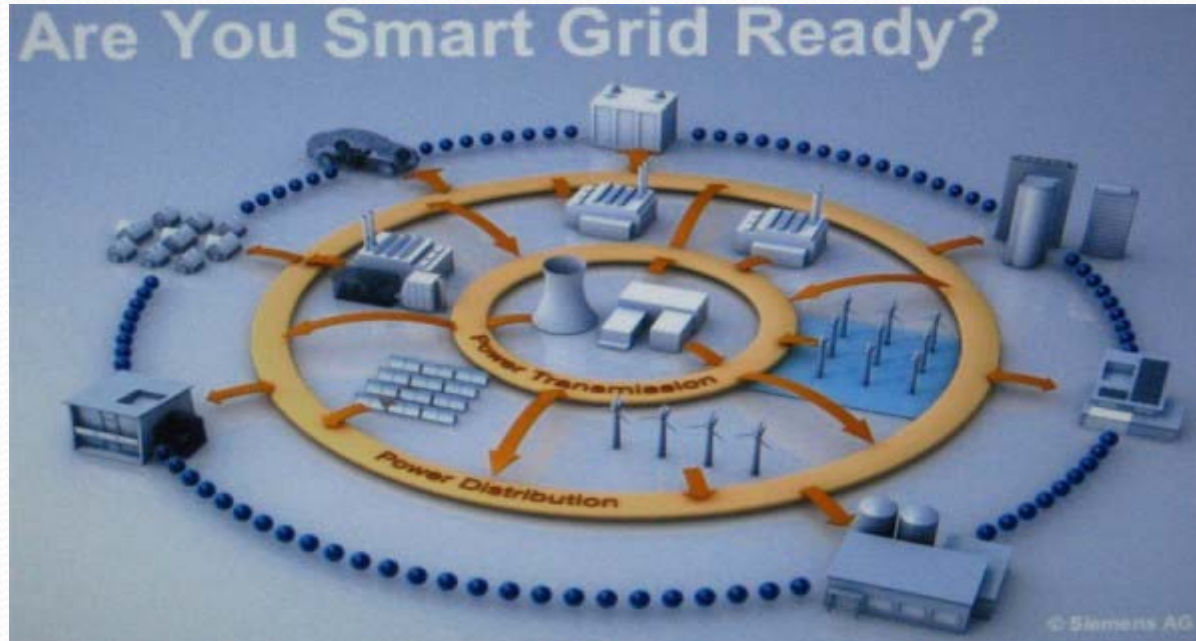
From the onset of urban planning, ICT provides simulation software that can help planners model the optimal locations of buildings, schools, health services, and public transportation routes to reduce mobility needs in support of low-carbon lifestyles.

# e-Planning opens participation



Websites for “e-Planning” allow public input for those that are unable to attend or participate in public planning meetings.

# Smart Grids

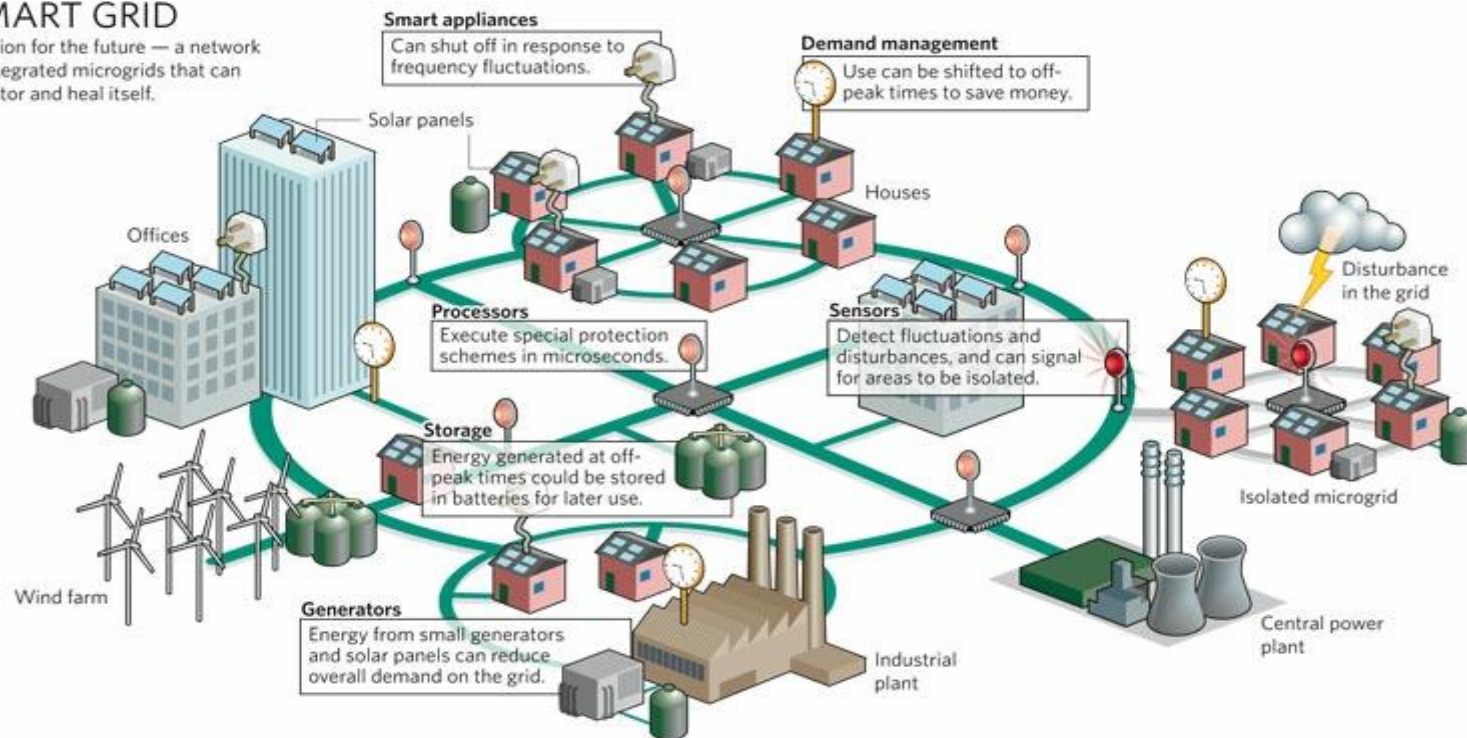


## Trends and Drivers

ICT is an essential enabler of **smart grids**, needed to significantly increase **energy efficiency** and the supply and use of **renewable energy** over large-scale energy production and distribution.

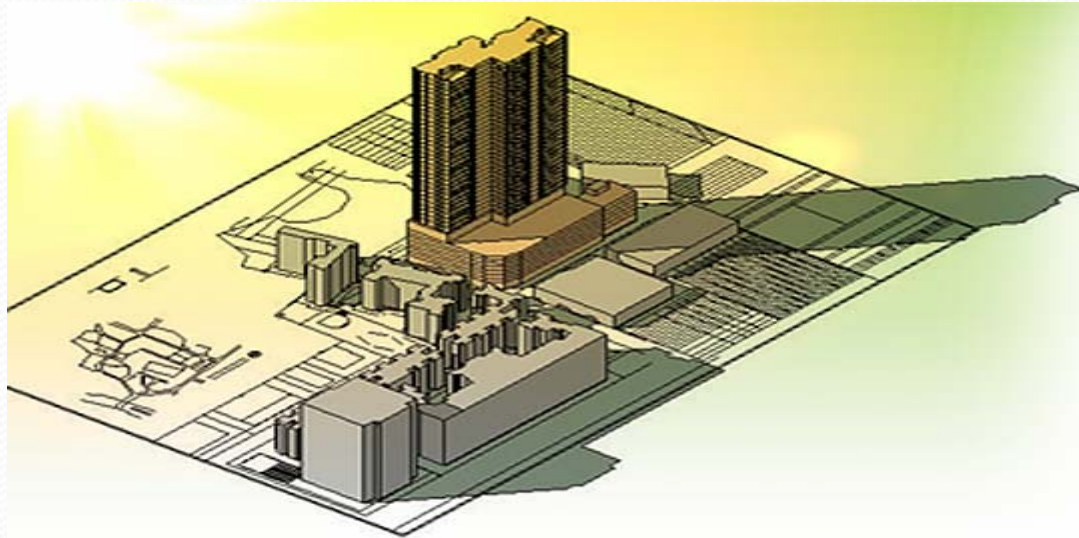
## SMART GRID

A vision for the future — a network of integrated microgrids that can monitor and heal itself.



**ICT enabled smart grids** collect, store and distribute energy, allowing for the increased use of renewables. Smart grids can also interact with building control systems to provide more efficient building heating, cooling, lighting and appliance power use.

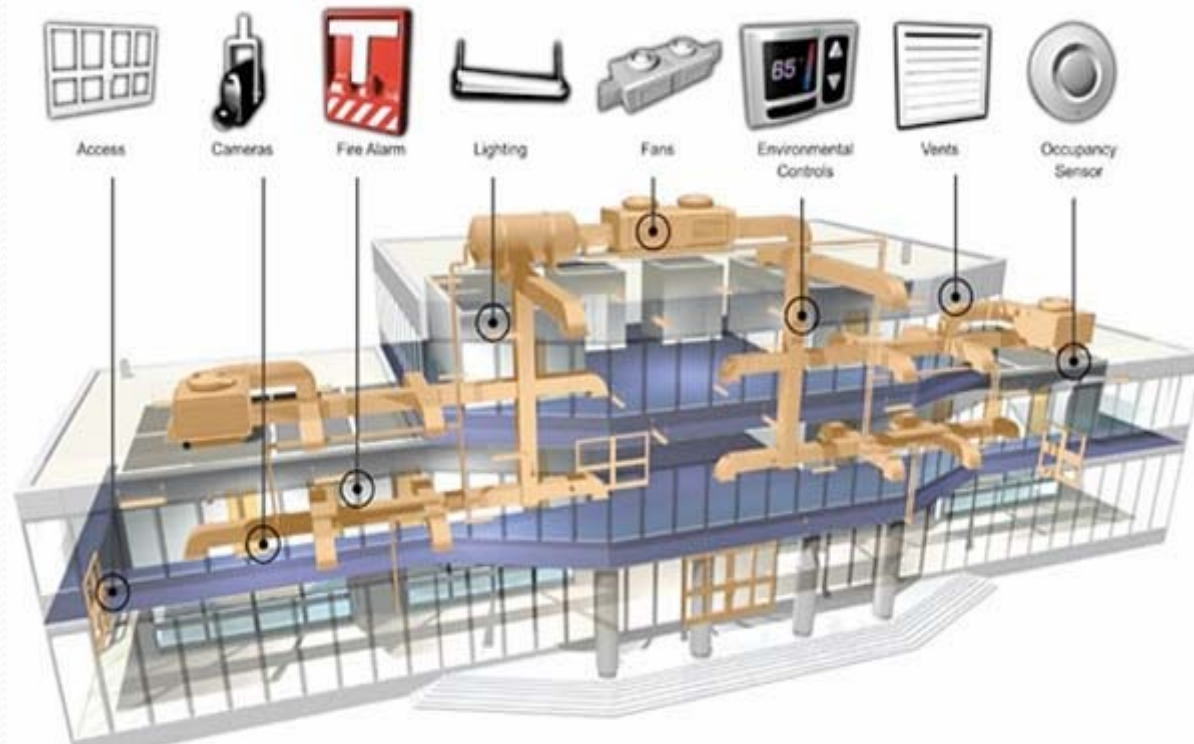
# ICT: solar optimization



## Trends and Drivers

In building design, ICT is being used to optimize natural solar energy and lighting to optimize renewable energy use and to reduce fossil fuel energy consumption.

# Smart buildings



Once new smarter buildings are constructed, ICT supports the maintenance of buildings with features such as sensors and controls designed to improve efficiency and tailor energy use to actual demand.

# ICT and urban economies



## Catalyzing Change

Because there is increasing evidence of the positive effects of ICT on productivity growth, smart cities gain a **competitive economic advantage** in the global marketplace.



# Enabling ICT in cities



## Catalyzing Change

Enabling actions for smart cities includes regulatory reforms, such as reducing barriers to entry which are critical for private investment in **broadband** and other ICT networks.

# Mobile phone revolution



**Mobile phones** are being used by those who don't have computers for banking, business operations, transportation use, social and health services, and for alerts (security, safety, weather, health)

**Global Cell Phone Subscriptions: 5 billion**

# Broadband revolution



**Global Internet Users: 2 billion (2011)**

Mobil Broadband: 45%

Fixed Broadband: 26%

Other: (Dial Up, etc.): 29%

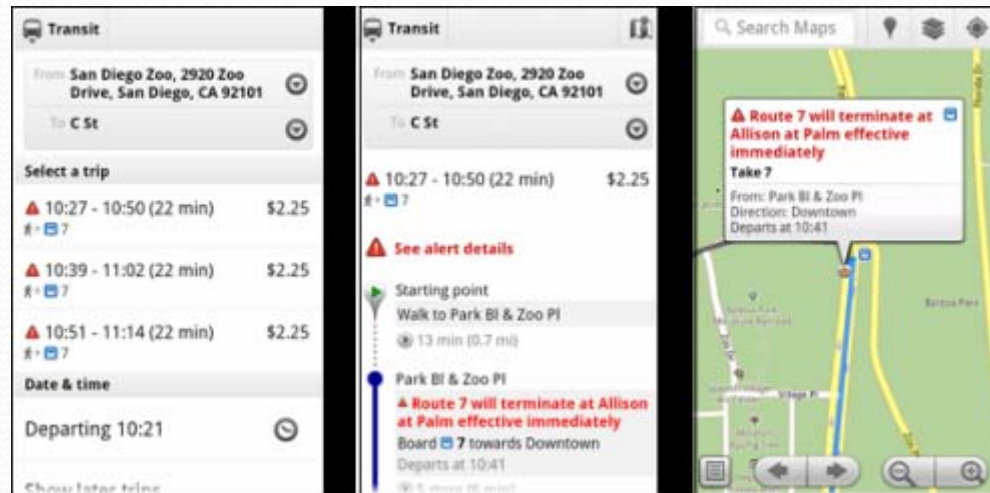
**Global Cell Phone Subscriptions: 5 billion**

# Micro credit systems



The cell-phone-based **Carbon Micro Credits** allow millions in developing world to claim carbon offsets. Offsets allow more efficient cooking methods: credits for modern charcoal stove or solar cooker, instead of polluting cookstoves burning firewood.

# ICT and transit benefits



ICT innovations applied to public transportation systems for scheduling, route changes and other logistics notification can vastly improve service quality, which increases ridership more cost effectively than large-scale capital investments.

# ICT and transportation



**Enhancing energy efficiency; lowering emissions**  
Transportation systems have been some of the most active areas of deployment of ICT, through operations, mobile payment and GPS information  
Social media are used for **ridesharing, carsharing.**

# Smart Transportation: Shanghai



The Shanghai Transportation system has major ICT systems enabling more efficient management:

**Electronic ID Management:** used for 180,000 public transit vehicles, 48,000 taxis and 180,000 workers to prevent transport license forgery, unlicensed vehicles.

# Smart Transportation: Shanghai



**Public Transport Smart Cards:** Improves passenger flow information through GPS data capture

**Bus Smart Information:** allows real-time communications between vehicles, operators and bus stops. Allows scheduling news, arrival time estimates + fuel consumption information.



# Mobile carbon tracking

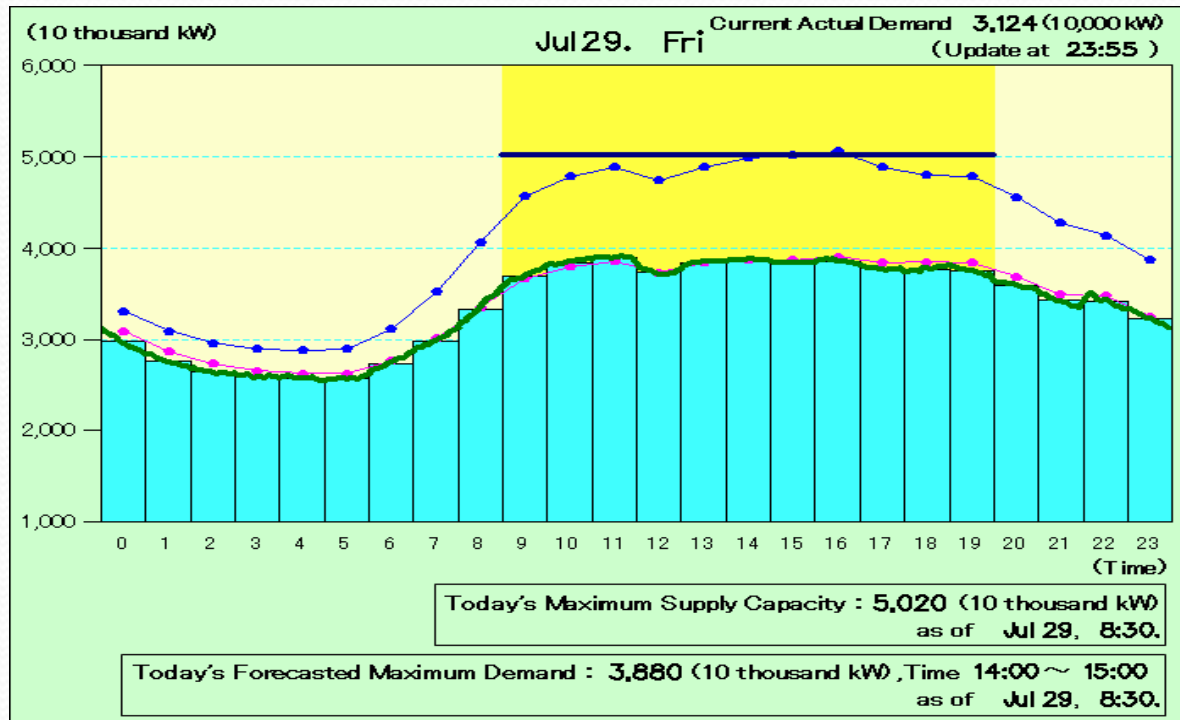


## Menu of Options

Enhancing energy efficiency; lowering emissions of transportation

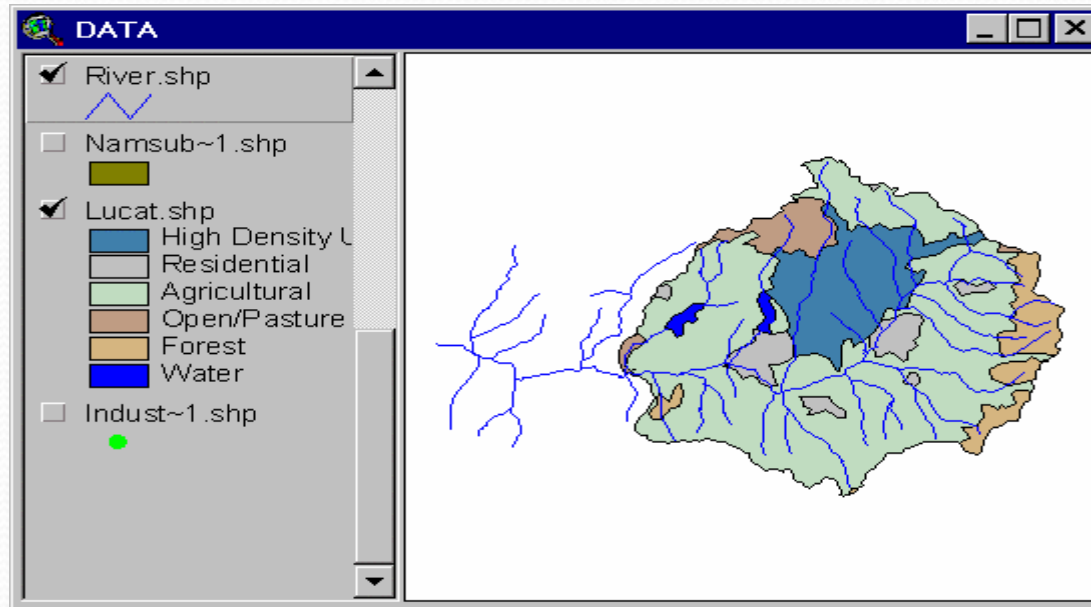
Korean cities use ICTs as a means of enhancing energy efficiency of urban infrastructure. Seoul adopted a carbon mileage system that can be used through mobile devices. It has provisions for reducing corporate + personal carbon footprints via wireless.

# Power use reduction through ICT



**Lowering Electricity Consumption During Shortage**  
In Japan after the reduction of nuclear power supply due to Fukushima Earthquake, utilities provide daily Internet updates on power supply. Cell phone alerts are sent when demand is in danger of surpassing supply.

# Digital land mapping

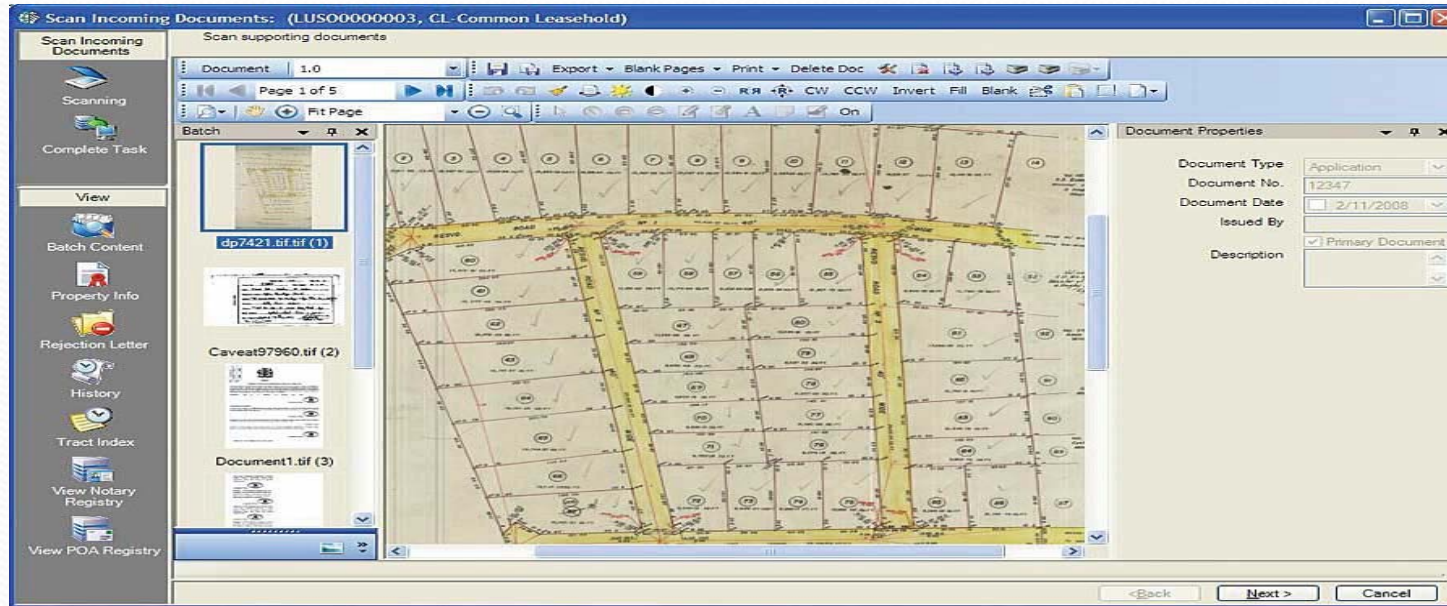


## Digitized land registration / land information systems

Land registration and information systems require urgent improvement in many developing nation cities;

ICT holds promise in providing these cities with new ways to track, store and manage this critical

# Digital land registration + GIS



## Digitization of land registration, land information

More than 50% of Asian urban populations live on land where title is disputed or unknown. Combining digitized land registration systems with geographical information systems (GIS), allows land title + land uses to be understood, reconciled, updated.

# Case studies: Best Practices



## **ICT for Smart Cities**

- Singapore Digital Master Plan 2015
- Mumbai, India. e-Governance
- San Francisco, US + Amsterdam, The Netherlands. Eco-Map
- Dhaka, Bangladesh: Land use monitoring and mapping
- Africa: Mobile Phones Bridge Digital Divide
- Leeds, UK: e-Learning
- Shanghai: Smart + Connected Cities

# Case study: Singapore Digital Master Plan 2015



## City Challenge

Global competitive market forced Singapore to consider how information and communications technologies would impact its economic and social future, including how elderly and less privileged can stay connected and enjoy life-long learning.

# Case study: Singapore Digital Master Plan 2015

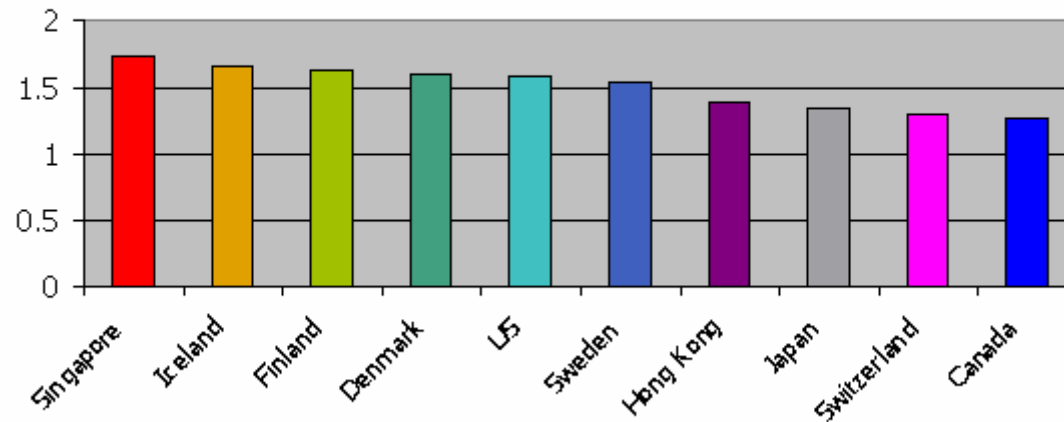


## **Policy and Other Measures**

City government developed 10-year Master Plan with citizens, educators and the business Community (ICT, educations, healthcare, manufacturing, finance, tourism, retail and digital media.

# Case study: Singapore Digital Master Plan 2015

Top ten - Networked Readiness Index



## Results: Singapore most ICT enabled (2011)

Local ICTs are being supported for expansion and growth into overseas markets; general workforce ICT competencies are being raised; incentives are being offered to attract best students to study ICTs; companies piloting new supply chain processes



# Case study: Singapore Digital Master Plan 2015



## Lessons Learned

- Strategy is based on integrated customer-centric perspective, especially in healthcare.
- Mobile phones are a key platform for e-Government, industry and financial services.
- Master Plan has dual strategy of improving internal competencies that can be exported as value-added products and services in the global

# Case study: Mumbai



## **Challenge: e-Governance**

Public and city employees needed consistent access for information, billing, service updates from many departments. City could not provide consistent web access across departments.

# Case study: Mumbai



## **Policy Options and Measures: e-Governance**

The national government of India issued a national plan for e-governance initially during the 1990s: the directive was amended to include the nation's largest 35 municipalities, including Mumbai.

# Case study: Mumbai



## ***Results: e-Governance***

Mumbai's city portal provides public access to more than 12 million citizens via the internet to essential "single-window" services and billing information across water, waste, medical services, schools, town planning, business registration, etc.

# Case study: Mumbai



## **Results: e-Governance**

Water and waste management became more efficient with more accurate reporting, quicker responses for leaks, outages, illegal activities and service reports.

Mumbai's e-governance portal has been rated the top information system in India, out of 35 cities, across all attributes by an independent third party.

# Case study: Mumbai



Address <http://portal.mcgm.gov.in/>



mcgm.gov.in



## Lesson Learned

Mumbai's city portal required training 500 employees as internal change agents and role-based training of 2000 employees with little IT experience.

# Case study: Mumbai

Address  <http://portal.mcgm.gov.in/>



mcgm.gov.in



## Lessons Learned

*Key Takeaway:* Mumbai's e-Government initiative reduced costs, streamlined service delivery and produced greater citizen outreach on services, billing and participation in cultural issues.

Required analysis of internal capacities and culture for use of ICT, assessing "technological literacy" among city employees, including those whose roles are non-technical.

# Case study: Dhaka, Bangladesh



**Challenge:** *Need for Digitized land use + land cover change analysis system*

Dhaka, faced with the fastest global megacity growth (3.3 percent) had large slum settlements in vulnerable area of land, subject to flooding from climate change.





# Case study: Dhaka, Bangladesh



## **Policy and Other Measures**

The United Nations worked with city of Dhaka to establish Digital Bangladesh initiative, to support an overall national government digitization

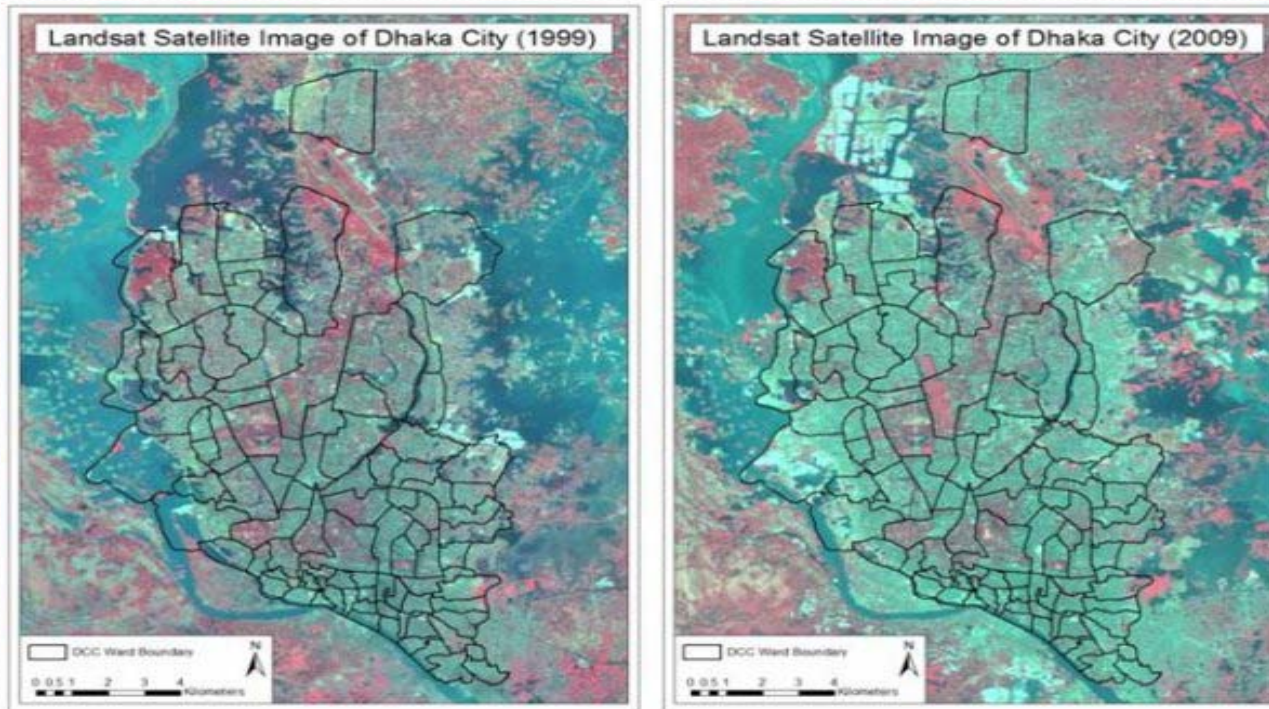
# Case study: Dhaka, Bangladesh



## Results

Dhaka used digitized inputs to examine 20-55 year land use changes around its metro area, providing opportunity for better **management of land and other resources** (wetlands); and better risk management for **climate change flooding**.

# Case Study: Dhaka, Bangladesh



## Results

The study examined mapping and analyzed urban growth for the Dhaka megacity region between 1990 and 2006.

# Case study: Dhaka, Bangladesh



## Lessons Learned

Dhaka benefits from digitization of its metro land area perhaps more than any other city.

To ensure best policy and planning, digitization must model climate change flooding impacts so they can be applied to land management practices.

# Case study: Bridging the Digital Divide in Africa



## Challenge

Before large-scale mobile phone coverage and adoption, some African communities lacked access to internet. In Sierra Leone it was less than 1 percent

# Case study: Bridging the Digital Divide in Africa



## **Policy and Other Measures**

Africa Regional Communications Infrastructure Program (backed by World Bank in West Africa)

United Nations Development Program/ UN task force on ICTs

# Case study: Bridging the Digital Divide in Africa



## Results

In rural Togo a farmer gets real-time information on market prices in the nation's capital, through a cellular phone.

# Case study: Bridging the Digital Divide in Africa



## Results

Public phone with access to internet and mobile banking application in South African city



# Case study: Bridging the Digital Divide in Africa



## **Lesson Learned**

Because more and more information services are online (job resources), youth particularly benefit from more frequent internet access.

Youth are also the biggest adopters of effective new mobile internet platforms, especially social media

# Case study: Bridging the Digital Divide in Africa



## **Lesson Learned**

Pay-as-you use business models are most effective for the poor as there is no formal registration, waiting lists or credit checks. Users can control costs when savings or income are low.

# Case study: SF + Amsterdam



## Challenge

Leaders in San Francisco and Amsterdam wanted their citizens and businesses to know **carbon emissions by source** (power, transportation, waste) because decisions were being made without understanding of GHG consequences of behavior.

# Case study: SF + Amsterdam



## **Policies and Other Measures**

Both cities had policies about cutting carbon emissions. They also shared well-developed climate action plans for their cities; both are at high risk to flooding from climate change

# Case study: SF + Amsterdam



## Results

Eco-Map shows neighborhood **carbon emissions by source** (power, transportation, waste). The Eco-Map estimates carbon emission reduction results from transportation-related activities such as biking or walking to work, using public transit, car sharing and commuting outside peak traffic hours.

# Case Study: SF + Amsterdam



## Lessons Learned

Social networking was needed to maintain interest and frequent use of the internet site. Particularly effective social networking included users posting photos or microblogs about how they were making better mobility choices, thus cutting energy use

# Case Study: Leeds e-learning



## **Challenge**

Secondary students, particularly children with disabilities, had unequal access to quality education curriculum and materials.

# Case Study: Leeds e-learning



## Policy and Other Measures

United Kingdom has an ambitious secondary education investment program “Building Schools for the Future”

City of Leeds has e-learning vision: “entitlement for All”, requiring appropriate range of e-learning resources with 24-hour access.



# Case Study: Leeds e-learning



## Results

Allows students to receive accreditation for key ICT skills, improving employment opportunities.

Students preferred laptops over ipods, game consoles and video recorders

# Case Study: Leeds e-learning



## Results

Allowed educators to improve the quality of learning and to develop innovative approaches to teaching: gave staff confidence to adapt to the needs of students.

# Case Study: Leeds e-learning



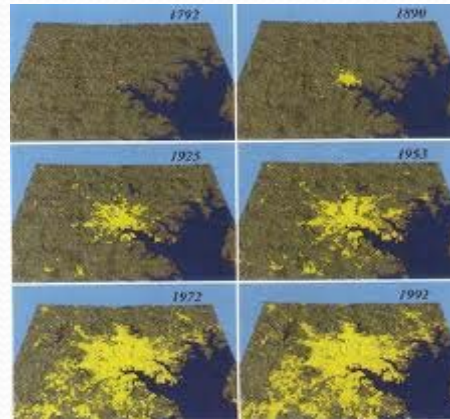
## **Lessons Learned**

Key to success was partnering with leading technology providers having active programs committed to enhancing city education.

Need to work actively with teachers, students and manufacturers for technology selection.

# Case Study: Shanghai Expo

## Smart + Connected Cities



### Challenges

Earth approaching 7 billion population, between 100 and 500 new cities (each with population of 1 million+) are being planned and built

Trillions of dollars spent on infrastructure

Transition so abrupt that traditional urban planning and development may not scale

# Case Study: Shanghai Expo

## Smart + Connected Cities



### Policy and Other Measures

Numerous national, provincial and local governments have initiated smart city or sustainability mandates:

e-government, e-learning, bridging digital divide, carbon emissions reduction and climate change adaptation

# Case Study: Shanghai Expo

## Smart + Connected Cities



### **Results**

Convergence of all kinds of data access across a unified IP network.

Convergence of physical urban planning complemented by digital planning efforts

Singapore's leak detection across water system

# Case Study: Shanghai Expo

## Smart + Connected Cities

### **Lessons Learned**

Digital cities require four critical ingredients:

- leaders who inspire communities to pursue economic, social, and environmental sustainability
- collaborative arrangements and partnerships between governments, industry, cities, and citizens
- the ability to leverage ICT platforms and solutions to improve the quality of urban life
- communities that nurture a vibrant digital society to strengthen social capital and foster digital inclusion.

# Case Study: Shanghai Expo

## Smart + Connected Cities



### **Lessons Learned**

Patchwork solutions are less effective than integrated approaches: example Metro Card that works on some transit but not other systems in same city.

Integrate planning for infrastructure, city planning and architectural design with city services



# ICT for Smart Cities

## Related Links

- “Reinventing the City: Three Prerequisites for Greening Urban Infrastructures” WWF International (in conjunction with Booz & Company), Gland, Switzerland, 2010 : <http://www.slideshare.net/itsgowri/wwf-low-carboncities>
- “Raconteur on Smarter Cities,” Raconteur Media, London, 1 June, 2010: [http://www.itm-power.com/cmsFiles/media/TimesRaconteur\\_010610.pdf](http://www.itm-power.com/cmsFiles/media/TimesRaconteur_010610.pdf)
- Website for The Climate Group, Metropolis and Cisco: “Smart 2020 Cities” initiative: <http://www.smart2020.org/>

# ICT for Smart Cities

## Related Links

- “Smarter Cities”: IBM website on city management in transportation, water, health care and other areas using information and communications technology:  
[ibm.com/smarterplanet/us/en/sustainable\\_cities/ideas/](http://ibm.com/smarterplanet/us/en/sustainable_cities/ideas/)
- <http://www.cisco.com/web/CN/expo/en/index.html>
- [http://www.cisco.com/web/strategy/docs/scc/Digital Urban Renewal.pdf](http://www.cisco.com/web/strategy/docs/scc/Digital_Urban_Renewal.pdf)
- [http://www.cisco.com/web/strategy/docs/Is\\_your\\_city\\_smart\\_enough-Ovum Analyst Insights.pdf](http://www.cisco.com/web/strategy/docs/Is_your_city_smart_enough-Ovum_Analyst_Insights.pdf)
- “Crowdsourcing public data,” Urban and Regional Research and Innovation, July 2010:  
<http://www.urenio.org/2010/07/02/crowdsourcing-public-data/>

# ICT for Smart Cities

## Related Links

- <http://www.slideshare.net/connectedurbandev/connected-and-sustainable-ict-infrastructure-whitepaper-presentation>
- “Connected and Sustainable ICT Infrastructure,” Wolfgang Wagener, Connected Urban Development Conference, Amsterdam, 2008
- [www.istiee.org/te/papers/N41/41\\_3\\_abs\\_vanGeenhuizen.pdf](http://www.istiee.org/te/papers/N41/41_3_abs_vanGeenhuizen.pdf)
- “ICT applications on the road to sustainable urban transport,” Marina van Geenhuizen, European Transport, n. 41 (2009): 47-61, Delft University, 2008
- Tradenet: [www.tradenet.biz](http://www.tradenet.biz)
- Zambia Market Information System: [www.farmprices.co.zm](http://www.farmprices.co.zm)
- Africa Connect: [www.connectafrica.net](http://www.connectafrica.net)

# Questions, Follow-up



**Warren Karlenzig**

President, Common Current

San Anselmo, CA US

(415) 518-7575

warren@commoncurrent.com

**Web:** [www.commoncurrent.com](http://www.commoncurrent.com)

**Skype:** warren.karlenzig

**Twitter:** Greenflow

**Blog:** [www.commoncurrent.com/notes](http://www.commoncurrent.com/notes)