Smart Cities, Smart People

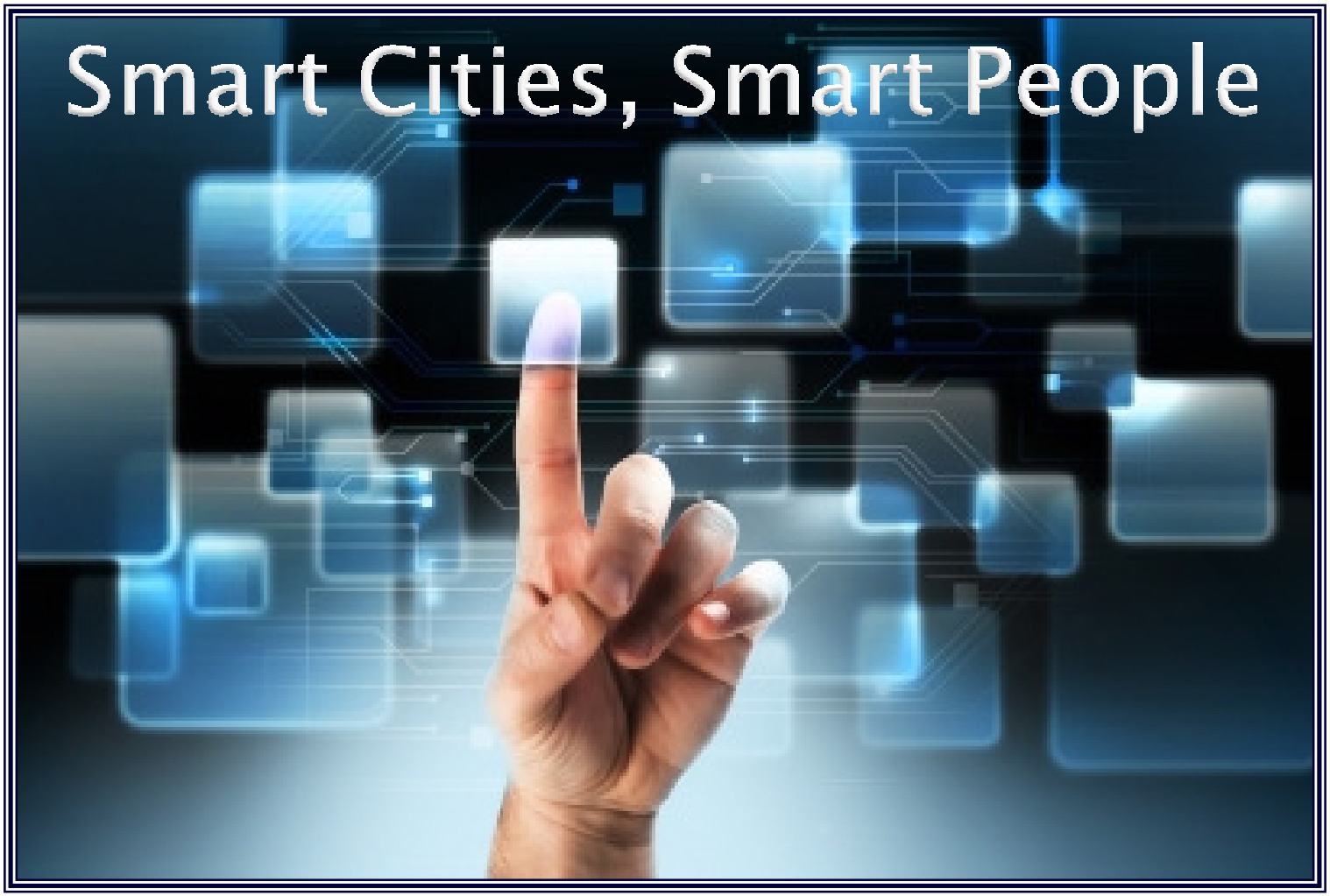

Image: Pixomar / FreeDigitalPhotos.net

Chris Tuppen

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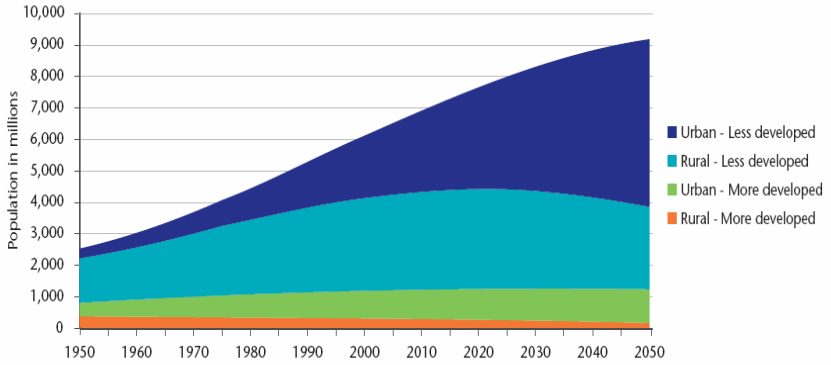
Advancing Sustainability LLP

Why Cities?

- Home to half the world's population
- Responsible for up to 80% of Greenhouse Gas (GHG) emissions

The world population is increasingly urban

Global population by type of area and by region – 1950-2050

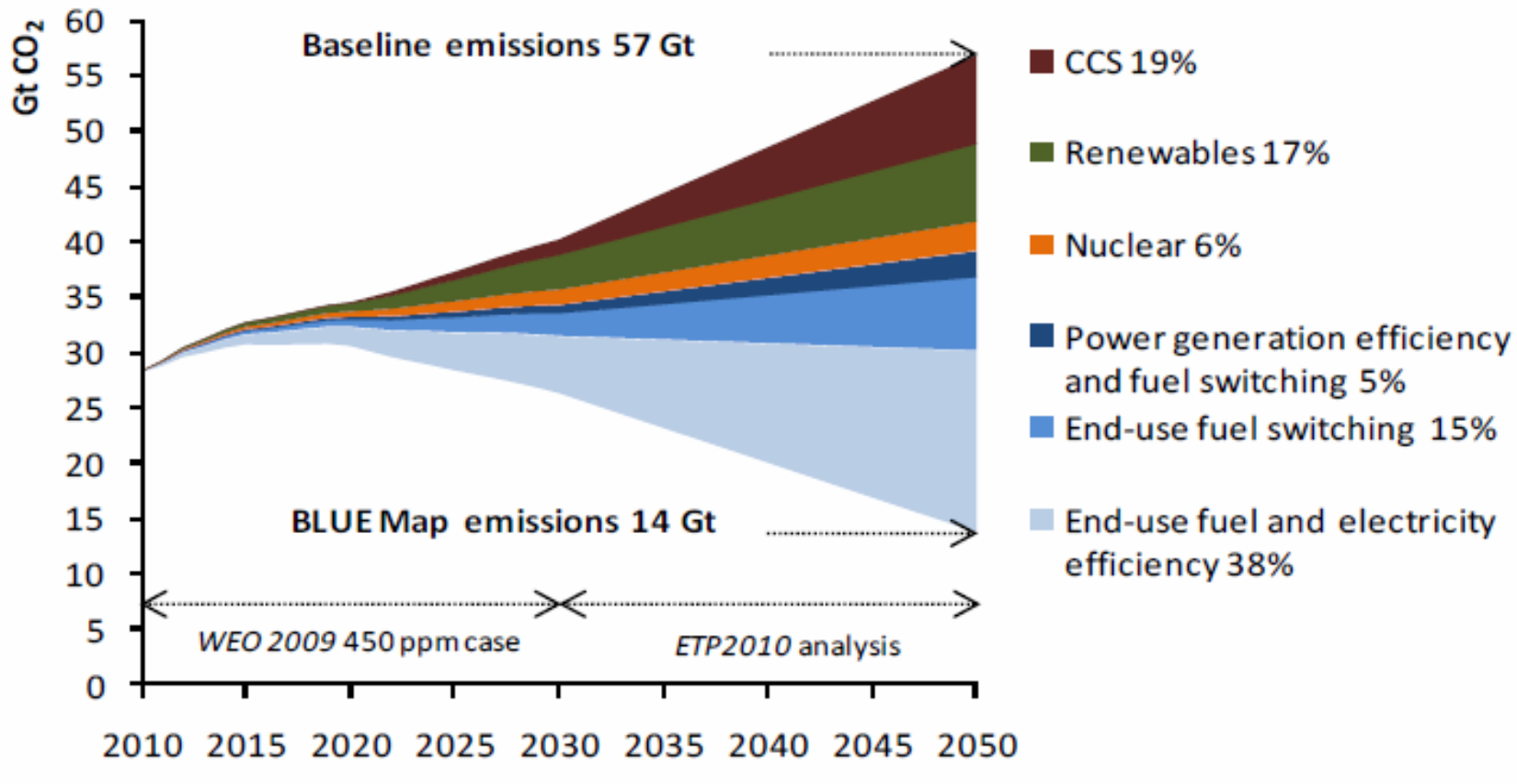


Source: UN Population Division, *World Population Prospects: The 2008 Revision*, 2008

= 1 x

every 40 days

Why Smart?



Source: IEA Energy Technology Perspectives, 2010

Europe's 2020 targets


20% reduction in CO_2 (against 1990 levels)


20% of energy from renewables


20% energy efficiency

"the EU will achieve only half of the 20 % [energy efficiency] target in 2020"

COM(2011) 370 Proposal for a Directive on Energy Efficiency

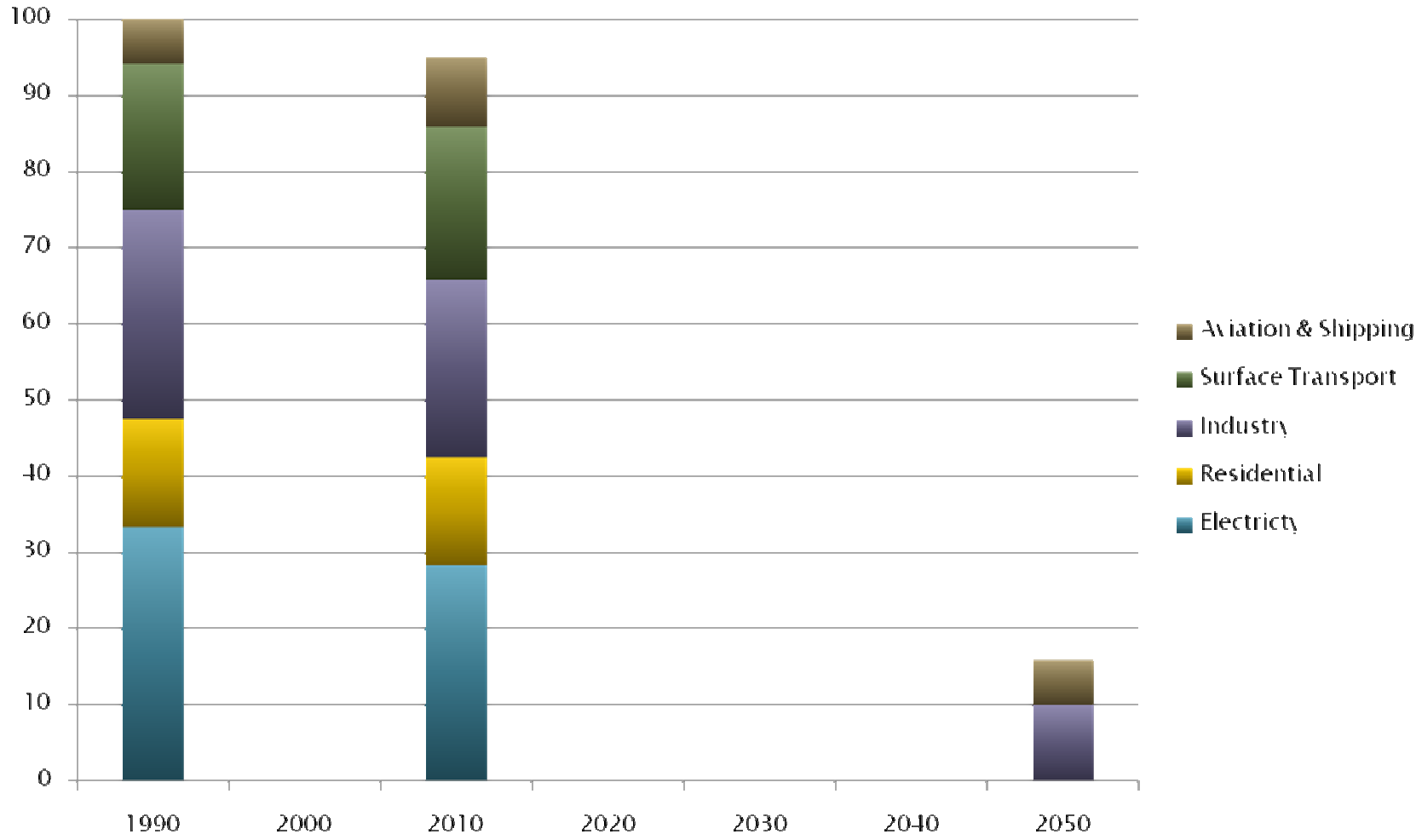
China's 2010-2015 five year plan

- Cut energy consumption per unit of economic growth by 16 percent
- Reduce carbon dioxide emissions per unit of economic growth by 17 percent
- Increase the use of non-fossil fuels from 8.3 percent in 2010 to 11.4 percent

China's Long Term Target

Reduce carbon intensity by 40 to 45 percent by 2020 from 2005 levels while GDP continues to grow at 7-8% pa

Typical Developed Economy 2050 Fossil Fuel Based Carbon Emissions



Aligning Worlds?

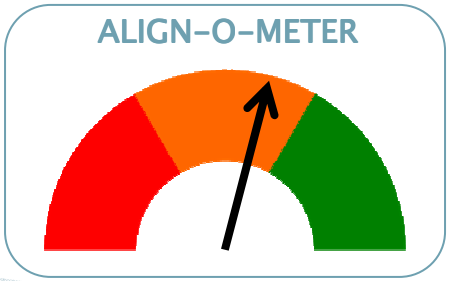
Energy

Economy

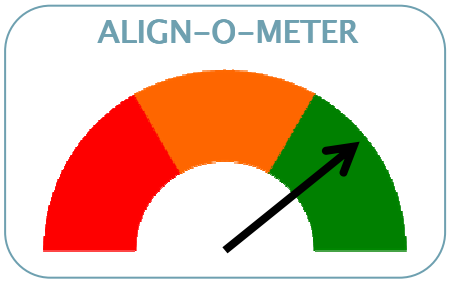
ICT

Climate Change

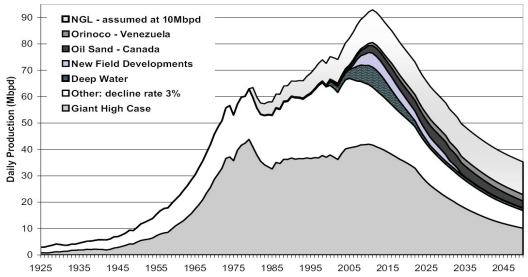
- Power
- Buildings
- Transport
- Data



Power



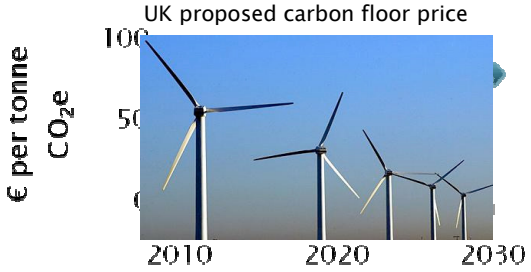
Peak Oil



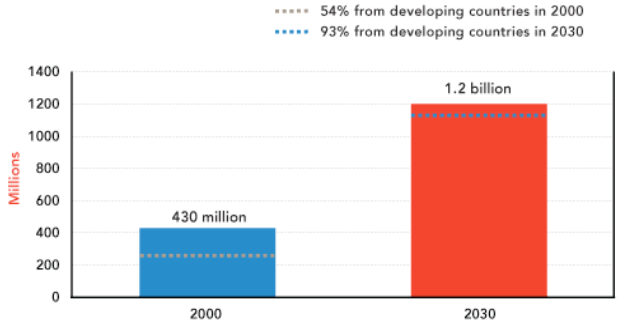
http://www.peakoil.net/GiantOilFields.html

Image: Pixomar / FreeDigitalPhotos.net

Decarbonisation



Middle Class Consumers



Source: World Bank 2009

Essential Investment

Image: Savit Keawtavee / FreeDigitalPhotos.net

Smart Grids and Smart Buildings

Efficiency

Local Distribution Network

Distributed Renewables

Smart Meter

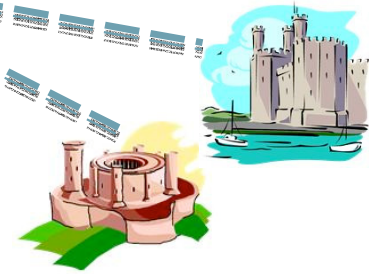
Information

Demand management

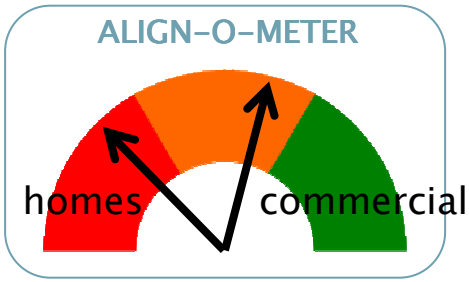
Electric Vehicles

Image: Paul Martin Eldridge / FreeDigitalPhotos.net

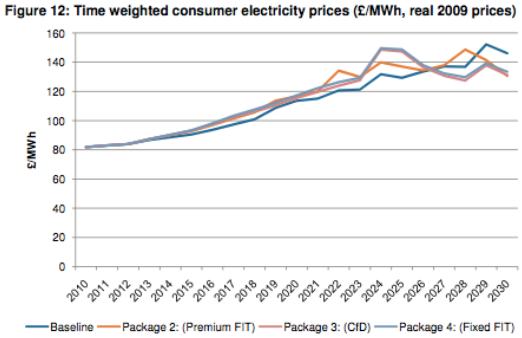
Online Energy Management System



Buildings



Energy Costs

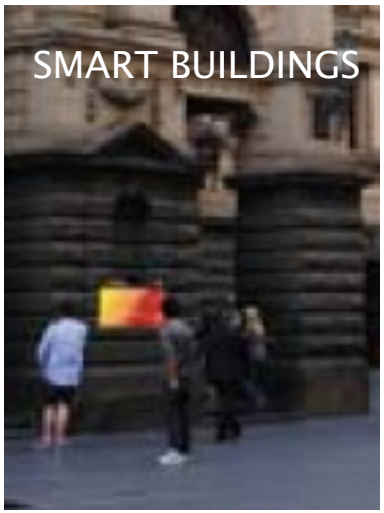


UK Electricity Market Reform Consultation, Dec 2010

Smart Grid

Demand management

Distributed Renewables



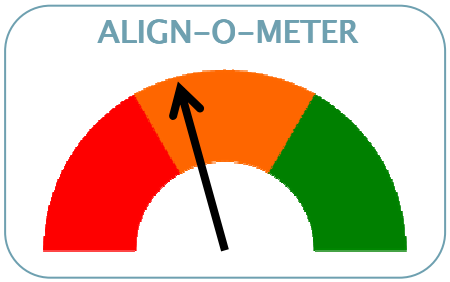
Source: Arup

Regulation

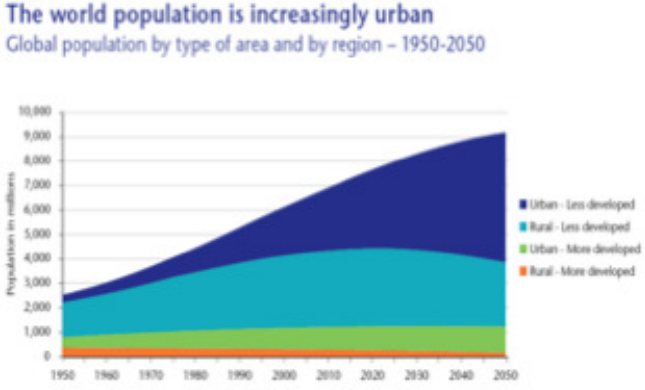
- 3% of total floor area of publicly owned buildings over 250m² renovated annually to minimum energy performance requirements set in current building regulations.
- Published inventory of energy performance of publicly owned buildings.
- Independent energy audit for large companies by 30 June 2014 and every three years thereafter.
- Promote the availability of energy audits and encourage SMES and households to undergo an audit.

COM(2011) 370 Proposal for a Directive on Energy Efficiency

Transport



Urbanisation

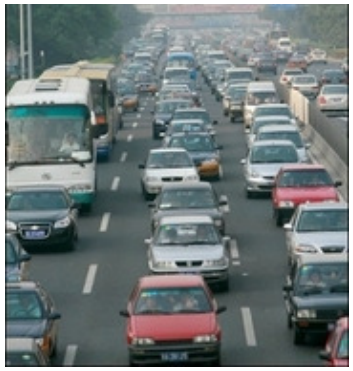


UN World Population Prospects, 2008

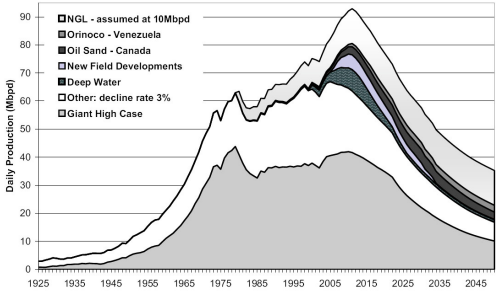
Decarbonisation

Image: Paul Martin Eldridge / FreeDigitalPhotos.net

Congestion



Peak Oil



http://www.peakoil.net/GiantOilFields.html

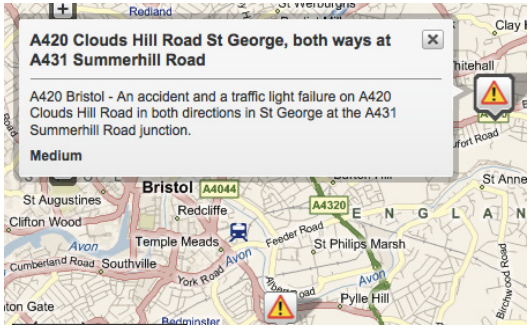
Smart Transport:

Reducing Congestion

Mobility on Demand

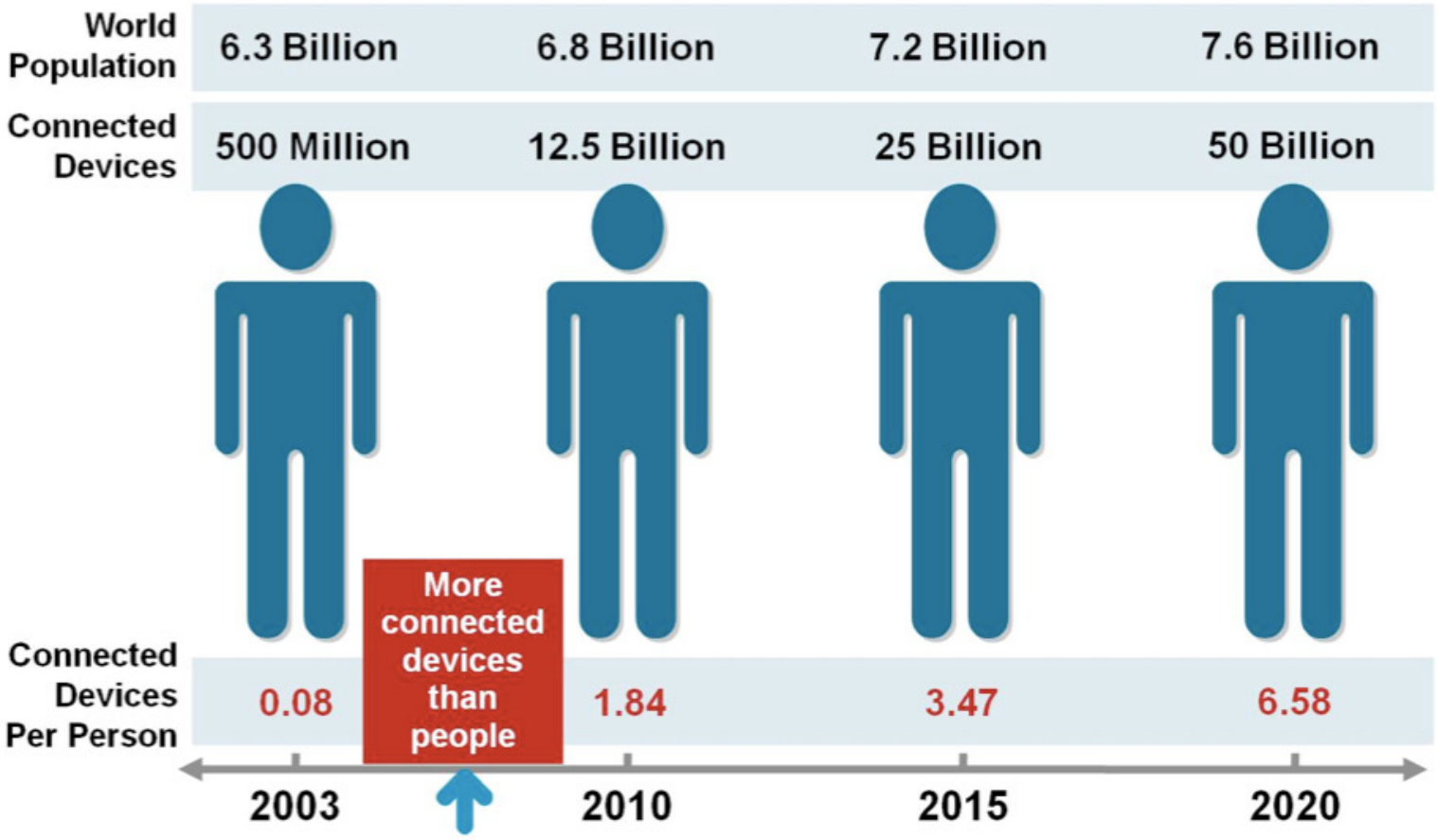
Travel Subsitution

Integrated Logistics



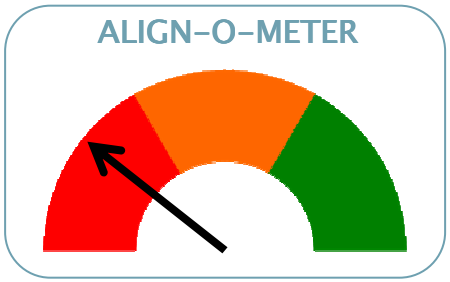
Real Time Information

The Internet of Things



Source: Cisco IBSG, April 2011

Smart Data



SMART GRID

SMART TRANSPORT

SMART BUILDINGS

data

optimisation

DATA CONSOLIDATOR

city dashboard

apps creation

Rio de Janeiro

Rio de Janeiro Operations Centre monitoring transport, water, weather and energy.

Smart data requires the following protocols for loosely coupled databases:

- access
- metadata
- internet
- web services

Image: jscreationzs / FreeDigitalPhotos.net

Barriers to ICT deployment

- **New ways of thinking**

  Engineers, planners, architects etc have often not been trained to consider ICT solutions to their problems.

- **Breaking down the silos**

  ICT solutions often require a more holistic approach.

- **Business Case**

  There is very little publicly available hard business case data available at an individual project level.

  Too much dependency on volatile public funding.

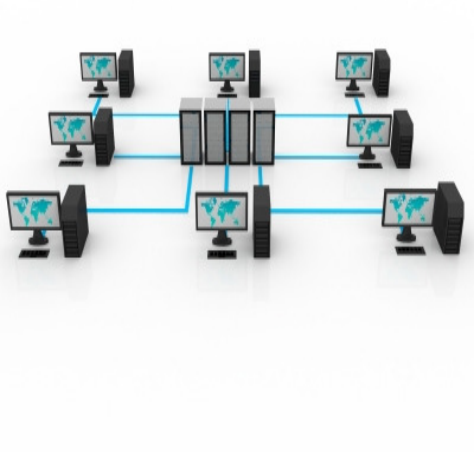
- **Retrofit**

  It's often difficult to retrofit smart solutions into existing buildings, systems and infrastructure.

- **Standards**

  A lack of agreed technical standards is delaying the implementation of smart technologies.

Technology..



.. or People?

"Behaviour change, not technology, is key to cutting vehicle emissions."
Environmental Research Letters

"Institutions and society co-evolve with technology; for example, urban planning often assumes high level of car use. This can lead to "lock-in", creating practical and financial obstacles to individual behaviour change."
Parliamentary Office of Science and Technology

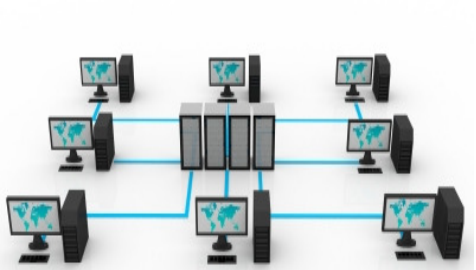
"Can Social Science Combat Climate Change?"
Scientific American

"Another sad article written by a dumb moonbat."
BobF45

"We live in a grotesquely intrusive times, where individual thinking is routed by group-thinking pseudo scientific media proselytizers."
mimic792

Images: jscreationzs/renjith krishnan, FreeDigitalPhotos.net

Theory..



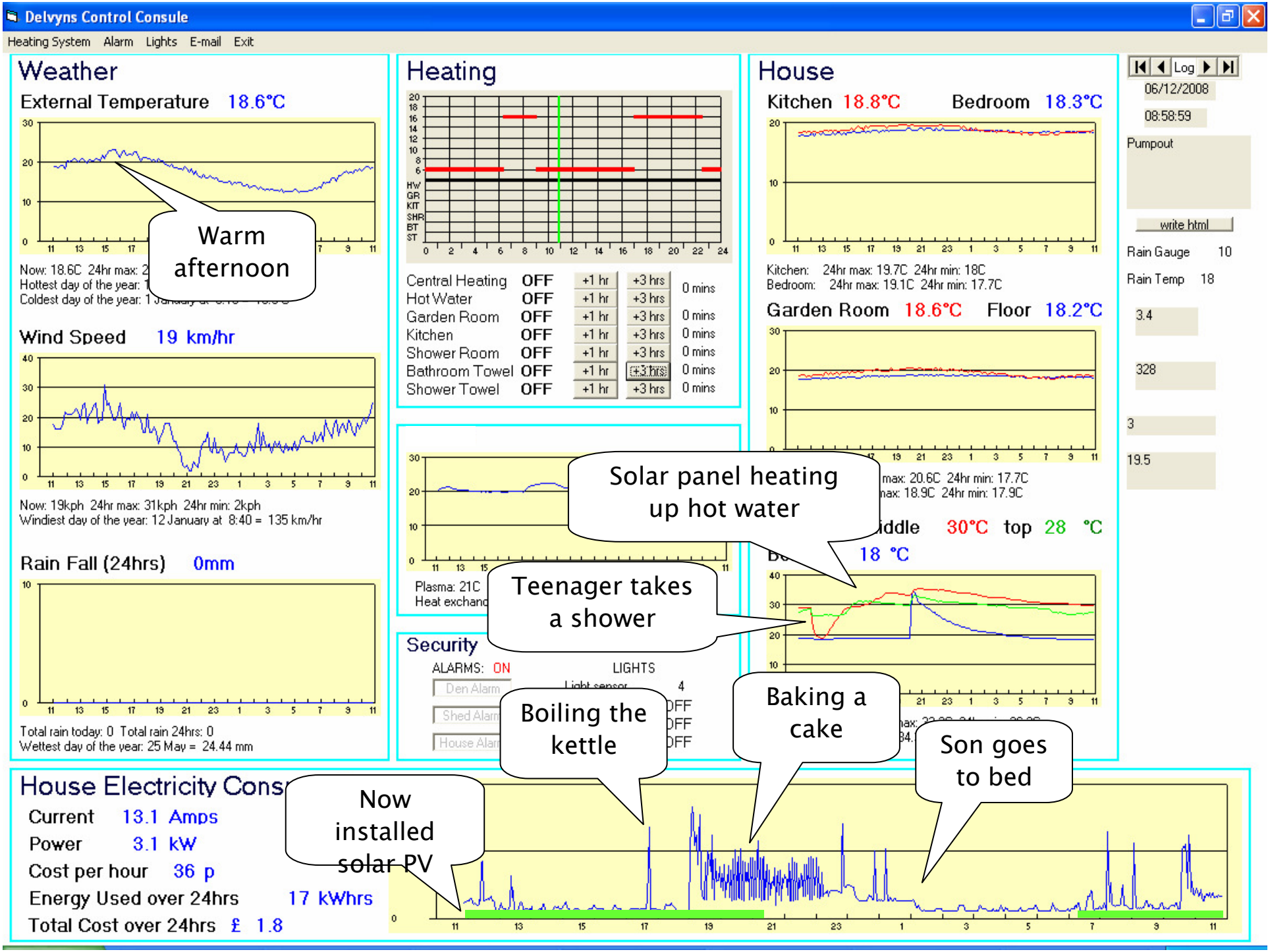
.. or Practice?

THE AUSTRALIAN

THE HEART OF THE NATION

Washington-based technology company Pegasus announced plans today (6 Sept 2011) to build a 52sq km model metropolis in New Mexico that will be used to test everything from renewable energy innovations to intelligent traffic systems, next-generation wireless networks and smart-grid cyber security systems. Although no one will live there, the replica city will be modelled after a typical American town of 35,000 people, complete with highways, houses and commercial buildings, old and new.

Images: jscreationzs/renjith krishnan, FreeDigitalPhotos.net


Delvyns Control Consule
Heating System Alarm Lights E-mail Exit
Weather
External Temperature 18.6°C
Warm afternoon
Now: 18.6C 24hr max: 2
Hottest day of the year: 1
Coldest day of the year: 1
Wind Speed 19 km/hr
Now: 19kph 24hr max: 31kph 24hr min: 2kph
Windiest day of the year: 12 January at 8:40 = 135 km/hr
Rain Fall (24hrs) 0mm
Total rain today: 0 Total rain 24hrs: 0
Wettest day of the year: 25 May = 24.44 mm
Heating
HW
GR
KIT
SHR
BT
ST
Central Heating OFF +1 hr +3 hrs 0 mins
Hot Water OFF +1 hr +3 hrs
Garden Room OFF +1 hr +3 hrs 0 mins
Kitchen OFF +1 hr +3 hrs 0 mins
Shower Room OFF +1 hr +3 hrs 0 mins
Bathroom Towel OFF +1 hr +3 hrs 0 mins
Shower Towel OFF +1 hr +3 hrs 0 mins
Plasma: 21C
Heat exchanc
Solar panel heating up hot water
Teenager takes a shower
Boiling the kettle
Baking a cake
Son goes to bed
Security
ALARMS: ON
LIGHTS
Den Alarm
Shed Alarm
House Alarm
Light sensor 4
OFF
OFF
OFF
House
Kitchen 18.8°C Bedroom 18.3°C
Kitchen: 24hr max: 19.7C 24hr min: 18C
Bedroom: 24hr max: 19.1C 24hr min: 17.7C
Garden Room 18.6°C Floor 18.2°C
max: 20.6C 24hr min: 17.7C
nax: 18.9C 24hr min: 17.9C
iddle 30°C top 28 °C
18 °C
Log
06/12/2008
08:58:59
Pumpout
write html
Rain Gauge 10
Rain Temp 18
3.4
328
3
19.5
House Electricity Cons
Current 13.1 Amps
Power 3.1 kW
Cost per hour 36 p
Energy Used over 24hrs 17 kWhrs
Total Cost over 24hrs £ 1.8
Now installed solar PV

The technology / social interface

- Privacy
- Commercial confidentiality
- Resilience
- Competition and consumer protection
- Open access
- Open standards
- Rebound effect (Jevons Paradox)

Thank you