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Smart Cities

An energy, climate change and sustainability perspective

20th October 2016

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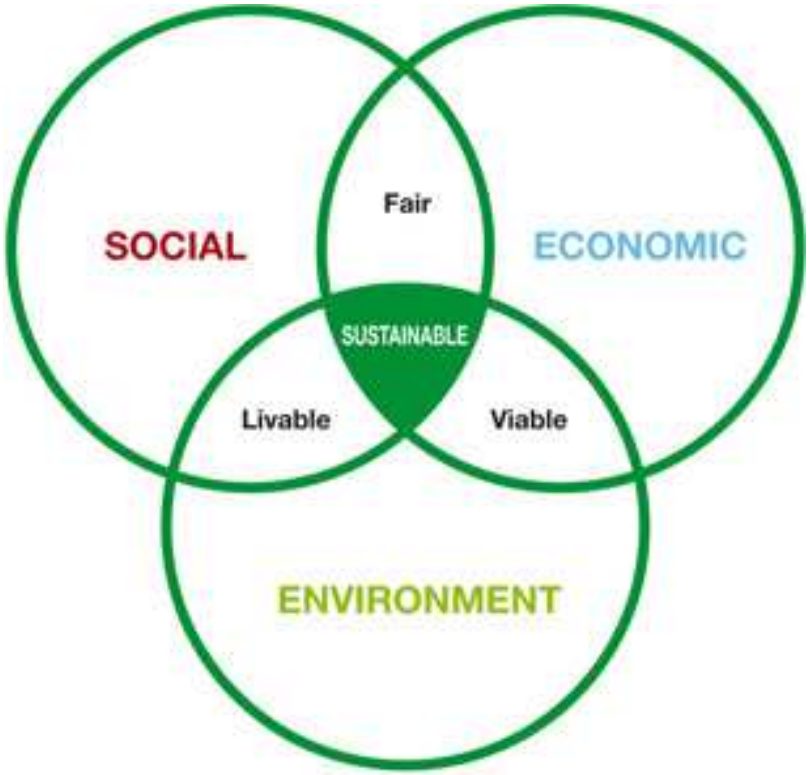
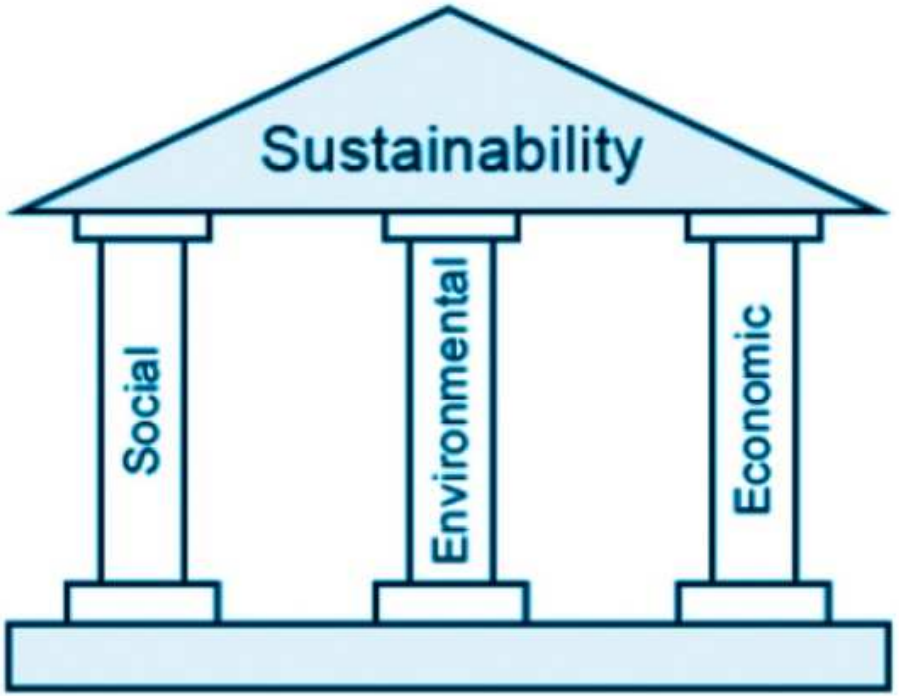
What is sustainability?





The key factor here is the balance between the three pillars of sustainability, including an inter-generational balance.

Why do we care about sustainability?

- Because of our role as a place maker and responsibility to strive for healthy communities in our borough, including in the future.

- For long term prosperity that includes wellbeing as well as wealth.

- The resources of planet earth are finite and we continue to live beyond our means to support this sustainably. Approx. 3 planets are needed to support our current consumption patterns. Additional pressures come from population growth and an estimated 3 billion newly aspiring middle class world citizens.

- We continue to pillage our natural capital, our physical resources and re-distribute carbon from solid “sinks” into atmospheric forms. A growing population migrates to urban centres and the coast. These are the places that need to get smarter quicker.

What is energy management?

- Measuring
- Monitoring
- Validation
- Reporting
- Procurement
- Control of usage, costs and standards
- Energy Generation
- Energy Efficiency

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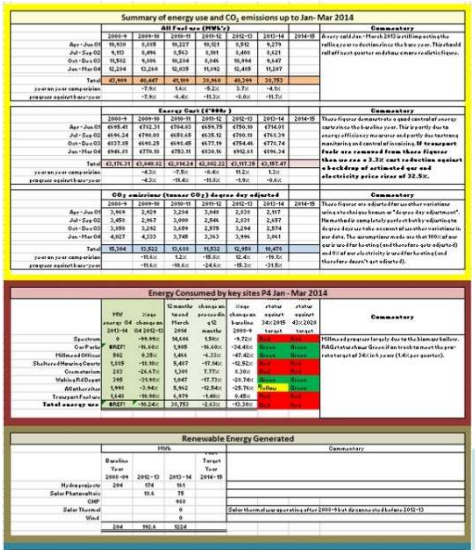

What is climate change?

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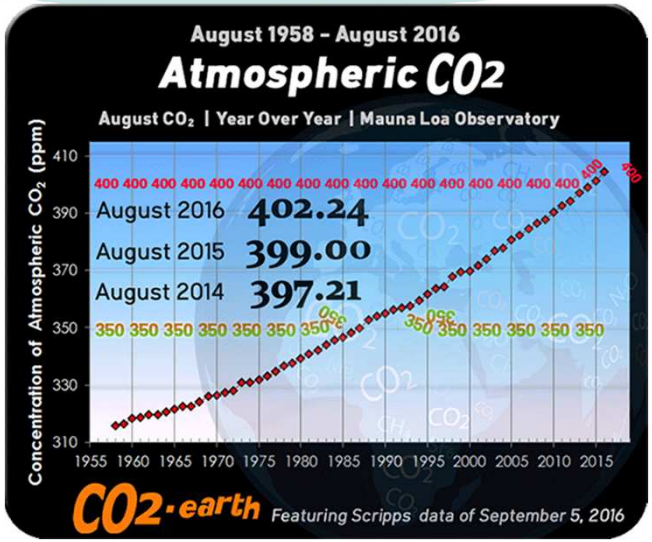
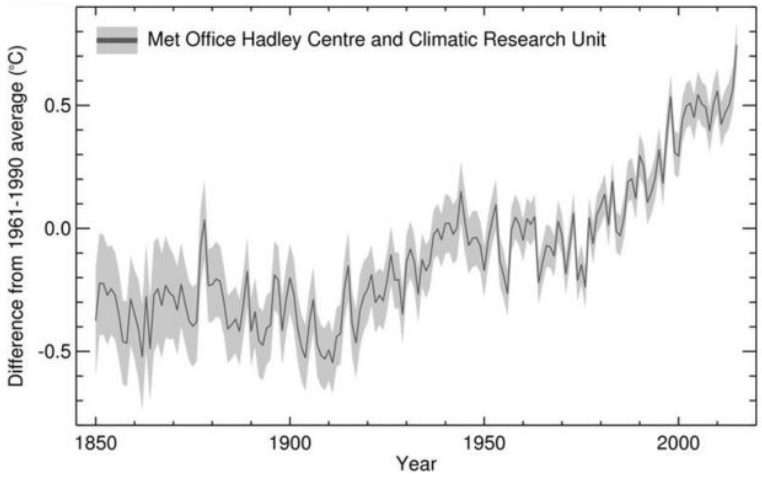


Historically (during the period of Earth's history where humans evolved and thrived) CO_2 in the atmosphere was 280 ppm. Around the end of 2015 it reached 400 ppm.



Global temperatures have probably already breached a 1°C rise since pre-industrial levels.

We know cumulative emissions of carbon dioxide (CO_2) will be key to determining the amount of eventual global warming we'll see. It is estimated that up to 2,900 Gigatonnes of CO_2 ($GtCO_2$) can be emitted to have a likely (more than 66%) chance of limiting warming to below 2°C. 2,000 $GtCO_2$ had already been emitted by 2014, meaning society has used about two thirds of the 2 °C budget. This gives an indication that we are already committed to some level of further warming.

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How important is it?

The Global Risks Report 2016

WORLD ECONOMIC FORUM

Top 10 risks in terms of **Likelihood**

1. Large-scale involuntary migration
2. Extreme weather events
3. Failure of climate-change mitigation and adaptation
4. Interstate conflict
5. Natural catastrophes
6. Failure of national governance
7. Unemployment or underemployment
8. Data fraud or theft
9. Water crises
10. Illicit trade

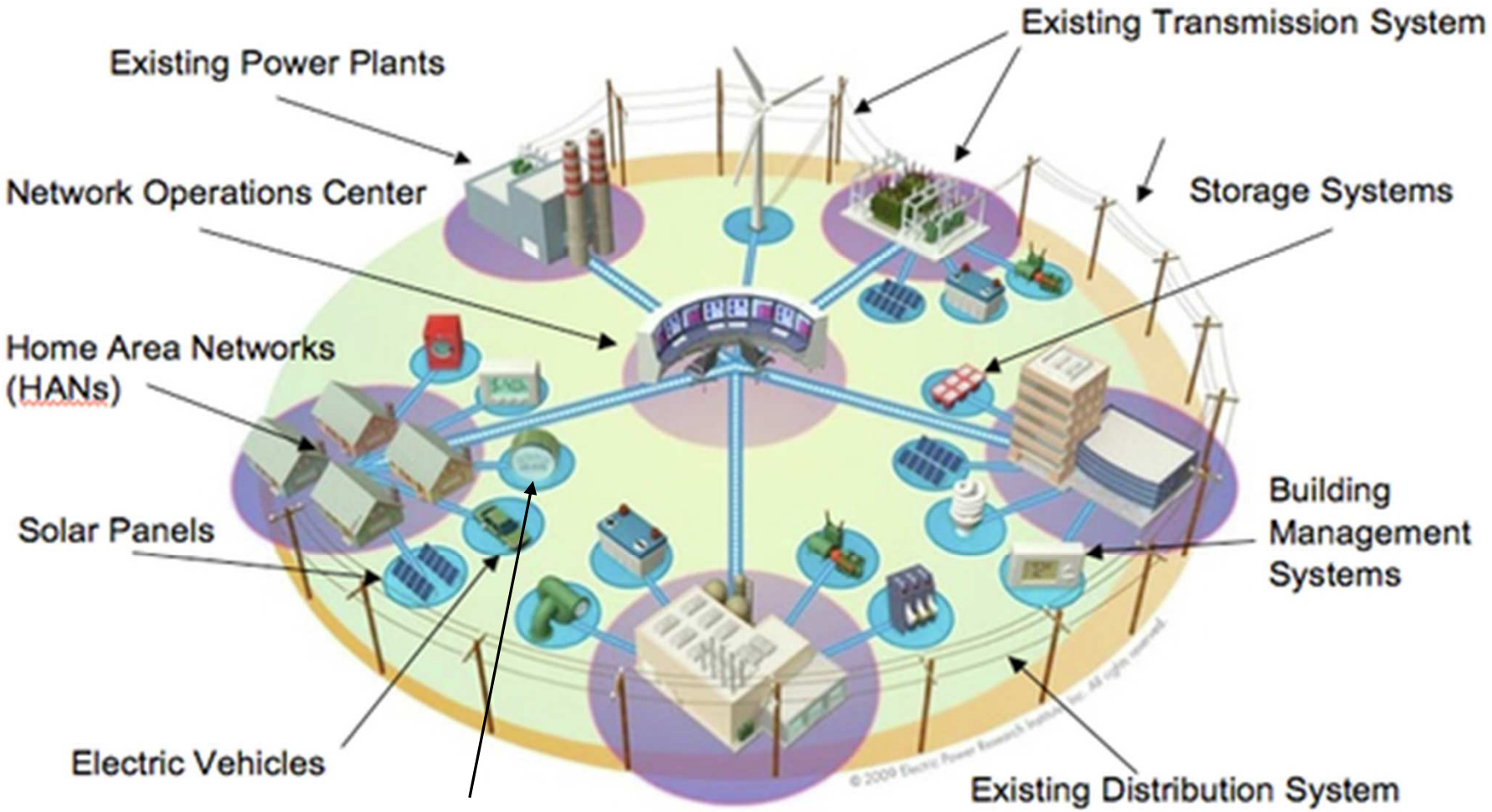
Top 10 risks in terms of **Impact**

1. Failure of climate-change mitigation and adaptation
2. Weapons of mass destruction
3. Water crises
4. Large-scale involuntary migration
5. Energy price shock
6. Biodiversity loss and ecosystem collapse
7. Fiscal crises
8. Spread of infectious diseases
9. Asset bubble
10. Profound social instability

Categories

- Economic
- Environmental
- Geopolitical
- Societal
- Technological

Energy map of the near future



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What does this mean?

What we now know about the impacts of human activity over the last 200 years should change everything about how we behave from now on.

If it isn't too late, then science across many disciplines may present us with the answers. One of these sciences is presenting us with the "Internet of Things" which will enable us to do things less wastefully, and in some areas directly improve the quality of people's lives.

Smart Cities is an approach which aims to use connectivity and collaboration across urban areas of high density living to manage the assets of the city.

This approach can enhance creativity, innovation, wealth and, if carefully directed, allow us to live in a more sustainable way.

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Smart Cities

- Smart cities are already evolving to a large extent in all urban areas.
- We already embrace smart technologies in energy management for example.
- Those cities calling themselves Smart Cities are actively seeking opportunities to gain efficiencies or advantage from connectivity, and pro-actively installing infrastructure.
- The smart city approach uses and **open data platform** and allows the creative communities to use this to derive benefits.
- Analogy – when you connect a car's engine management system with it's sat-nav, you get benefits greater than the individual parts.

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Definitions of a Smart City

- A single intelligent platform for the entire city life.

- As cities bring people together to live, work and play, they amplify their ability to create wealth and ideas. But scale and density also bring acute challenges: how to move around people and things; how to provide energy; how to keep people safe. ‘Smart cities’ offer sensors, ‘big data’ and advanced computing as answers to these challenges.

- An urban development vision to integrate multiple information and communication technology (ICT) and Internet of Things (IoT) solutions in a secure fashion to manage a city’s assets – the city’s assest include, but are not limited to, local departments’ information systems, schools, libraries, transportation systems, hospitals, power plants, water supply networks, waste management, law enforcement, and other community services

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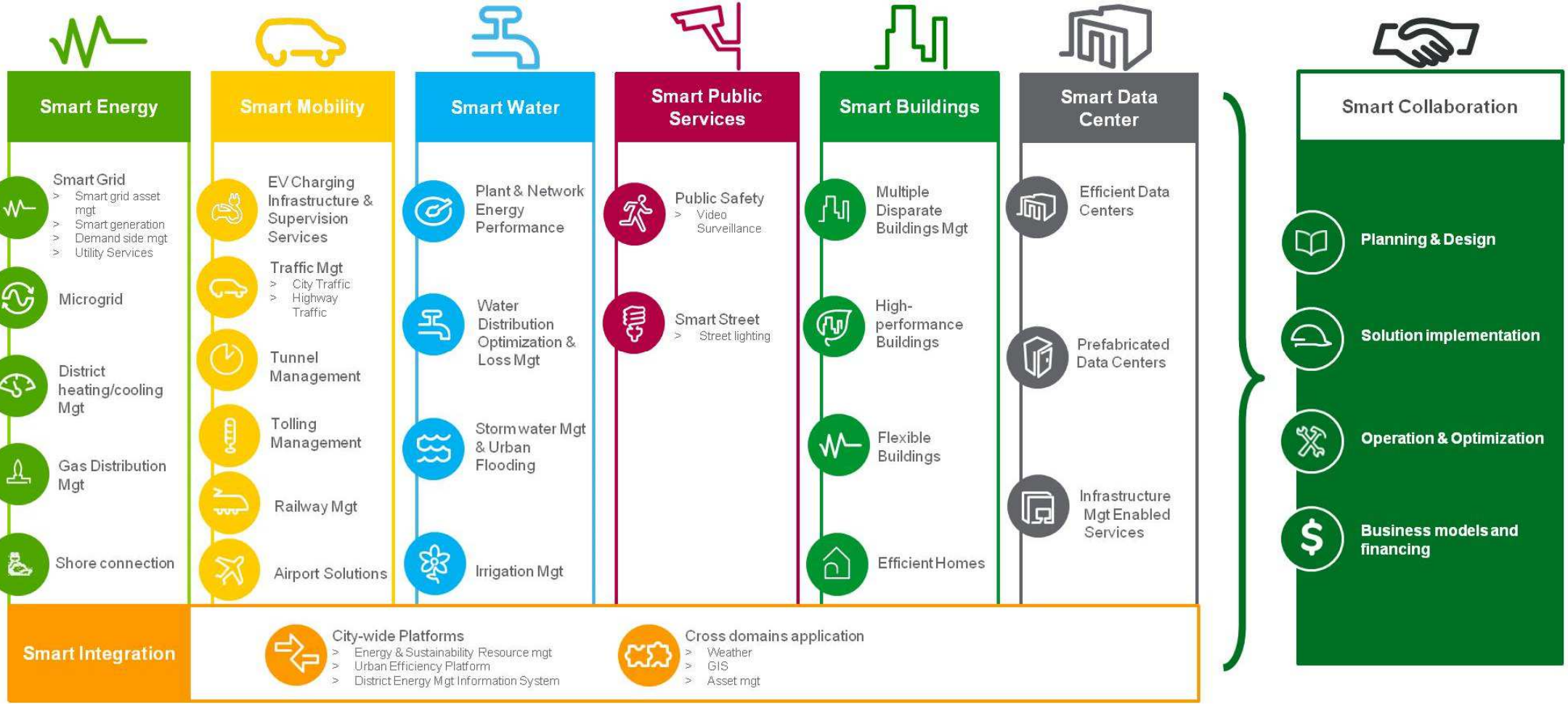
This is how Schneider Electric see it



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This is how Nokia see it

INTEGRATED REPORTING AND ANALYTICS: ACTIONABLE INSIGHT

CITY INTELLIGENCE | SMART OPERATIONS | CITIZEN RELATIONSHIP MANAGEMENT

ENERGY

- SMART BUILDINGS
- CONDITION BASED MAINTENANCE
- REMOTE OUTAGE NOTIFICATION
- SMART WASTE MANAGEMENT

UTILITY

- WATER TREATMENT
- WATER MANAGEMENT
- EQUIPMENT MONITORING/ CONTROL
- HAZARDOUS MATERIALS EMERGENCY RESPONSE

VEHICLE

- SMART PARKING
- PARKING ENFORCEMENT
- VEHICLE DETECTION
- MOBILE PAYMENTS
- EV CHARGING

TRANSIT

- INTELLIGENT RAIL AND TRANSIT SOLUTIONS
- FLEET MANAGEMENT
- ASSET TRACKING
- MOBILE PAYMENTS
- SMART ROADS

PUBLIC SAFETY

- VIDEO SURVEILLANCE
- REMOTE SECURITY MONITORING
- EMERGENCY RESPONSE
- SMART STREET LIGHTS
- MASS NOTIFICATIONS

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Examples of potential improved sustainability

- Waste and litter emptying on demand.
- Improved traffic flows and more efficient parking provision e.g. directing traffic to the most appropriate available space.
- Improved public transport provision e.g. precise waiting time information, prioritisation of buses, information to drivers on passenger numbers.
- Real time energy buying - energy storage will be mainstream in 3 years and this will enable a new way of purchasing energy when production costs are lower.
- Smart driving, controlling driverless cars for the common good. This is currently being enabled by the smart motorway network e.g. M3.

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Examples of potential improved sustainability

- Air quality monitoring and real time information.
- Hotel room availability info and booking.
- Street lighting controlled by demand and conditions.
- Incident response on demand.
- Social and community care systems with full knowledge of care provided and status of client.
- Monitoring of healthcare and correct medication use.
- Social housing monitoring, fault identification and in some cases correction via on-line applications.

Factors to consider

- It could bring many benefits, not all will be sustainable ones.
- Potential for mis-use and mischief.
- Potential over-reliance on technology and data.
- Vulnerability to hacking and/or terrorism.
- Vulnerability to solar storms due to its reliance on satellite technology.
- It may well happen anyway (if so, our place will be to be pro-active to the needs and opportunities).