# *Internet of Things for Urban Sustainability*

8th SAS General Insurance Conference, Singapore

## Data, Data Everywhere

26-27 May 2016

**Dipti K Math**
**Snigdha Peruri**

# *Data, Data Everywhere*

## *Internet of Things for Urban Sustainability*

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# *Internet of Things for Urban Sustainability*

## AN UNSUSTAINABLE URBANIZATION PATH

Climate

**70%**

of the $CO_2$ emissions come from cities already

Public Finances

**75%**

of the 2050 infrastructure has yet to be built

For example **India** needs to invest $1.2 trillion over the next 20 years, almost **8 times today's level**

Quality of Life

**Traffic fatalities**

expected to

**DOUBLE from 1.2M to 2.4M**

by 2030

**8%**

of GDP lost in congestion in Rio and São Paulo

Source: Land use and emissions, UN-HABITAT. Infrastructure needs, Resilient Cities. Air pollution and traffic fatalities, WHO. India investment: McKinsey Global Institute.

WORLD RESOURCES INSTITUTE

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Source: UNIVERSITY CANBERRA

## Five dimensions of Quality of Life



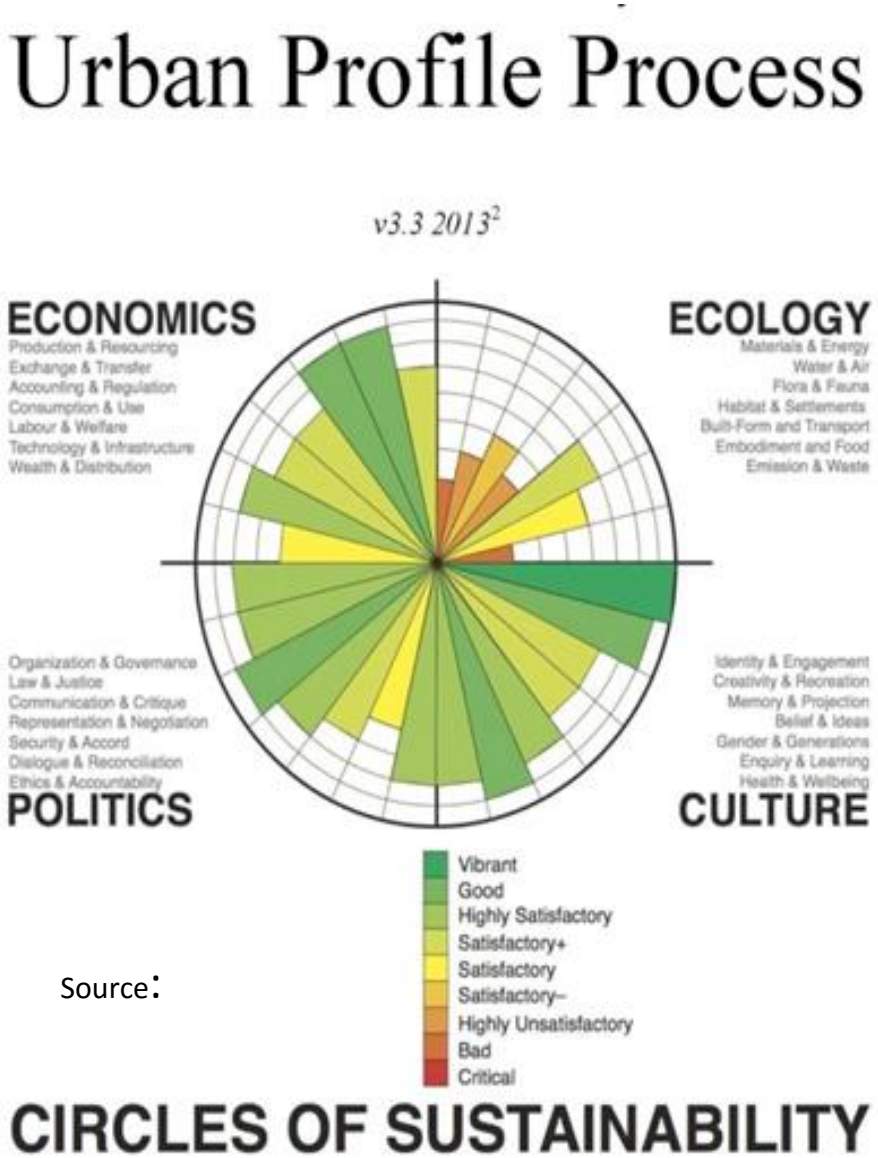
Environment

Economy

Community

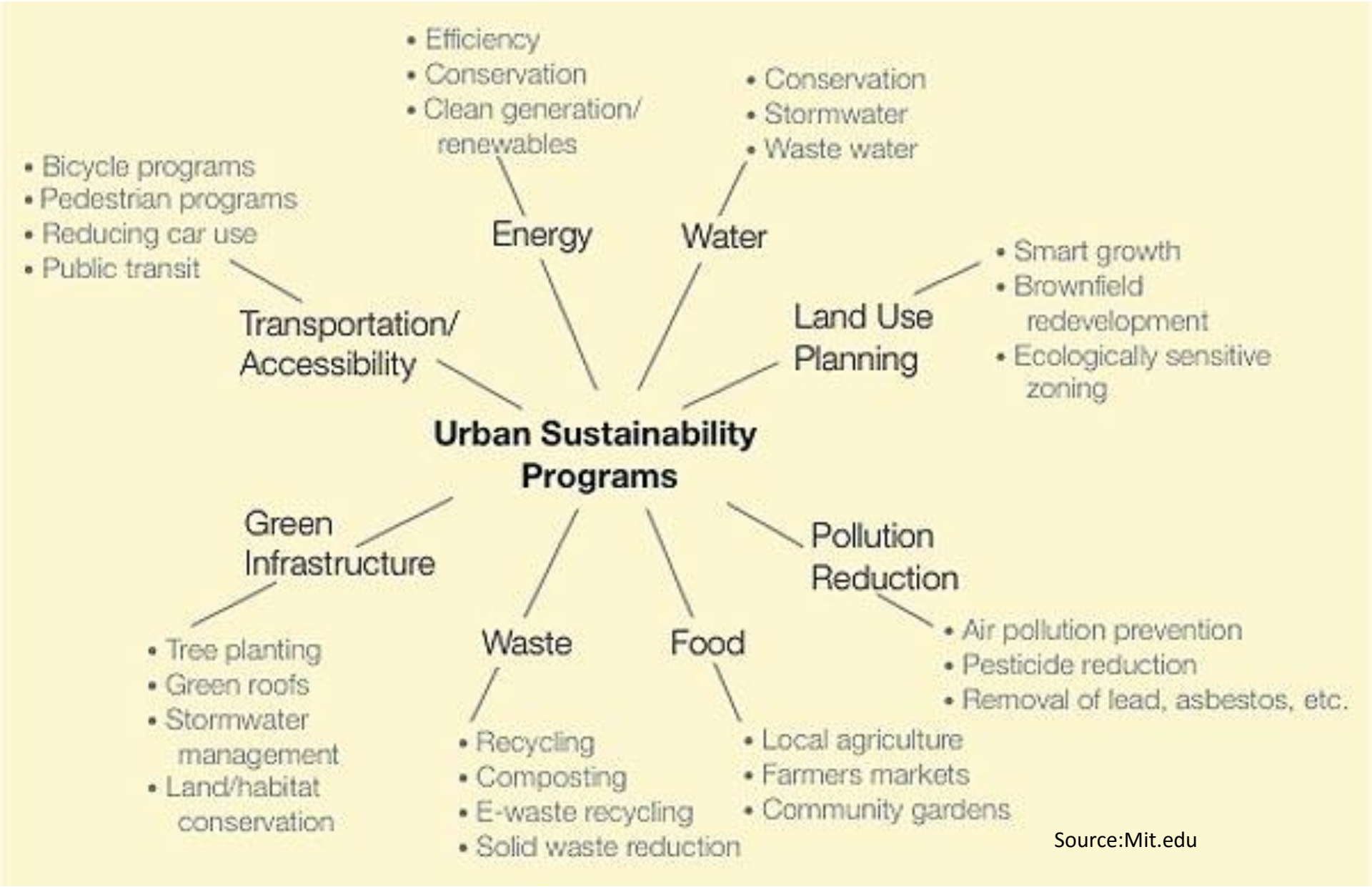
# Sustainable Urbanization Path

- A study as done by "Circles of Sustainability" to be conducted for cities with high urban population
- Economic, Ecological Political and Cultural factors to be considered



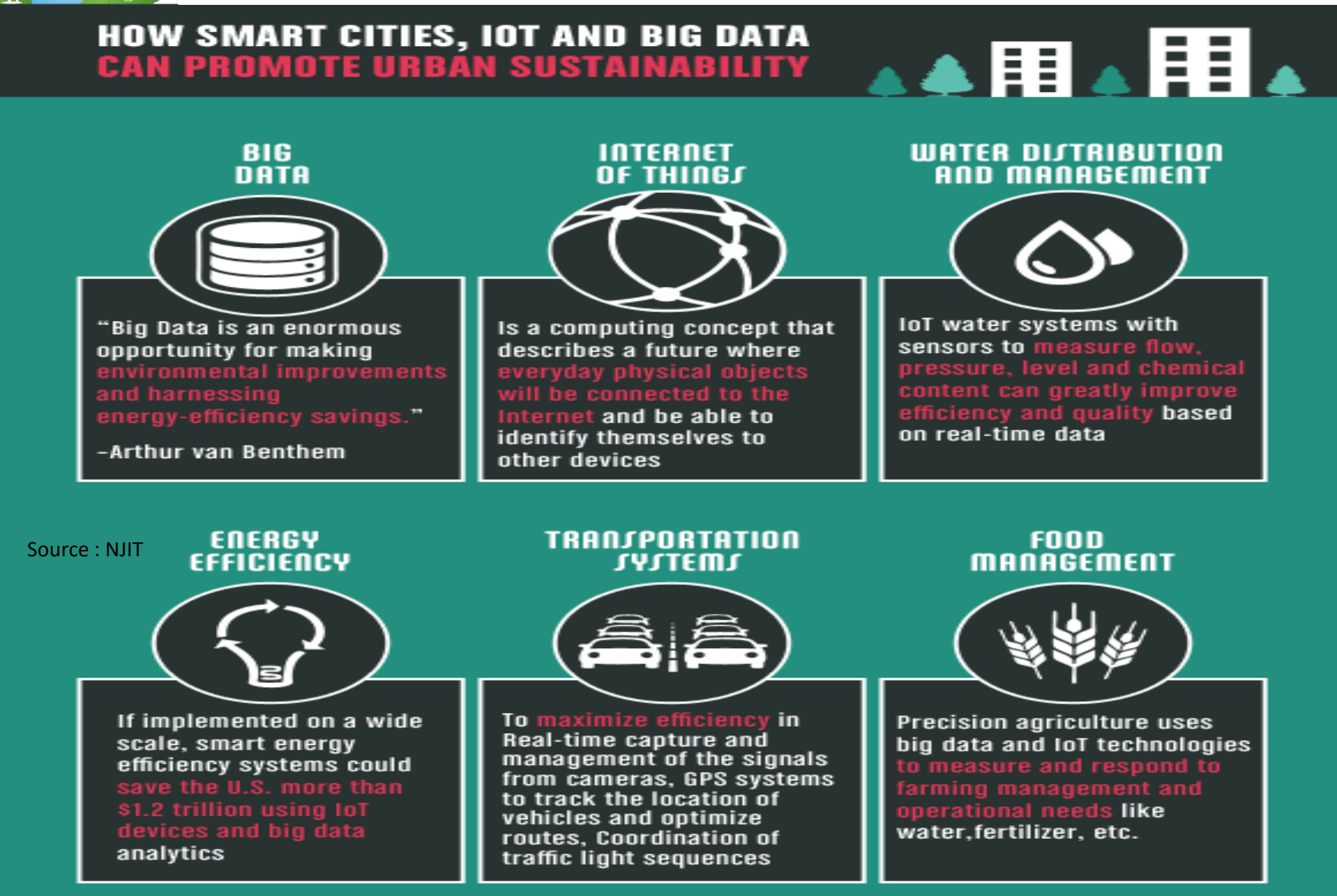

Source:

# *Internet of Things for Urban Sustainability*




Source:Mit.edu

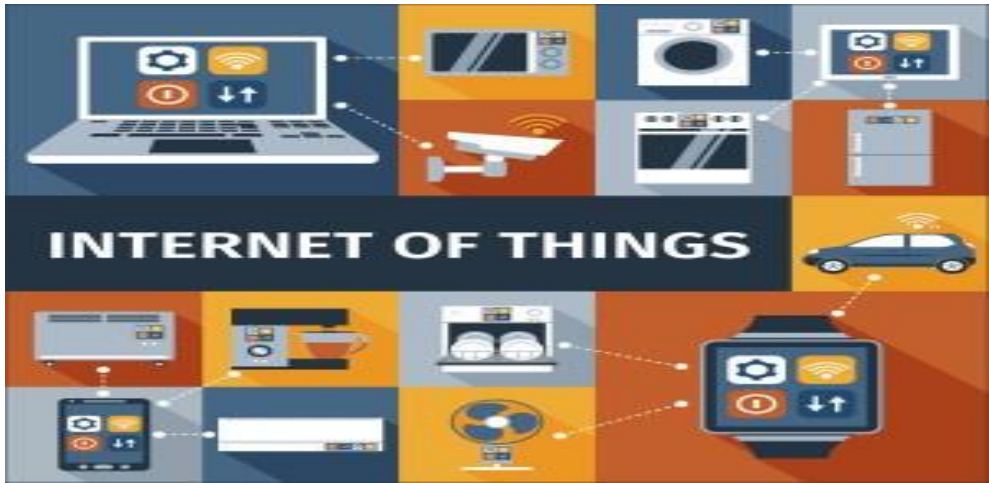
# Internet of Things for Urban Sustainability




Source : NJIT

# What is IoT ?

- A proposed development of the Internet in which everyday objects have network connectivity, allowing them to send and receive data.
- Meaningful conclusions can be drawn by analyzing data from devices and sensors
- This presentation will focus on a few common urban problems such as resource scarcity- and suggest simple sustainable ways to combat them using data.

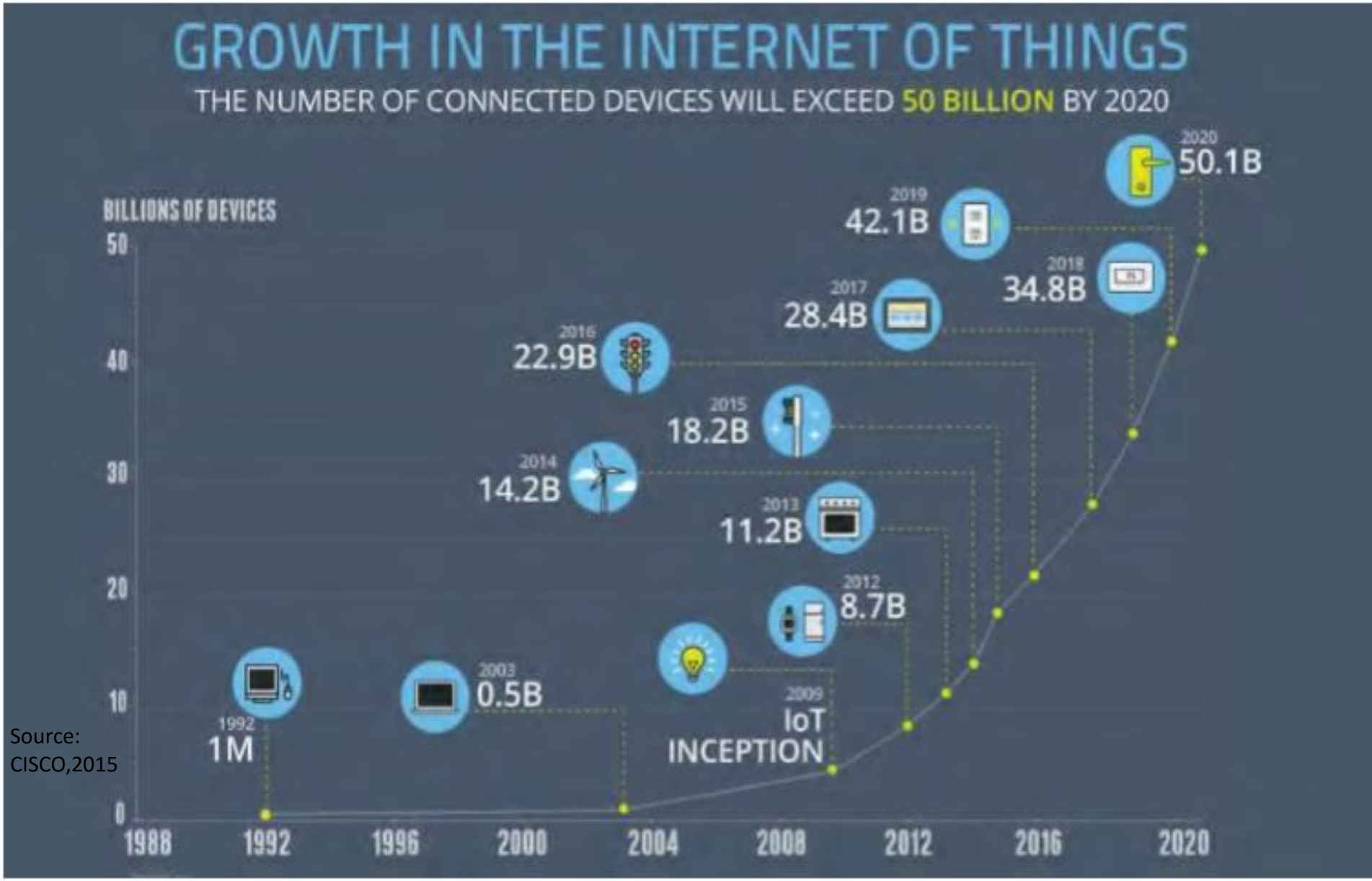




# What IoT can do

- With increasing urban population, cities should be able to withstand challenges like water, energy crisis, traffic congestion and poor air quality
- Internet of Things has the potential to contribute immensely in developing SMART CITIES
- Data management for Sustainable growth of Smart Cities : Data collection, Data cleaning ,Data quality , Data analysis, Data synthesis , Data visualization
- IoT for Planning , Engineering ,Implementation , Operations and Maintenance, Revenue, Administration.

# *Internet of Things for Urban Sustainability*




Source:
CISCO,2015

# *Internet of Things for Urban Sustainability*

## Increasing Data Creation & Analysis

- By virtue of ever-evolving technology, we have reached an era where enormous amounts of data is being created, recorded, assessed and analyzed each day.
- The adaptive and constantly advancing nature of cities suggests that there is a major opportunity for sustainable development.

***"Every Two Days We Create As Much Information As We Did From The Dawn Of Civilization Until 2003"***

***(Eric Schmidt, Techonomy 2010)***

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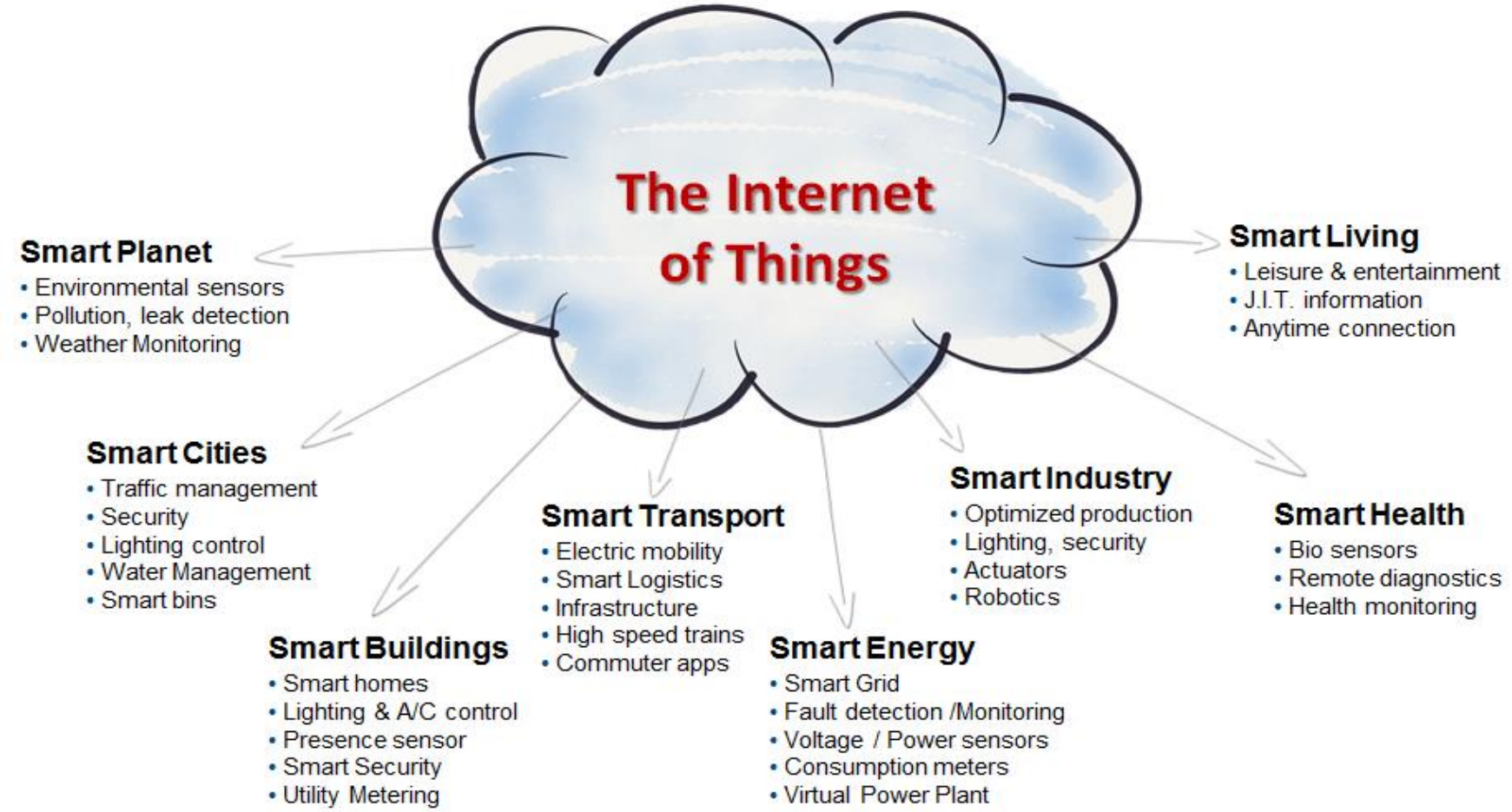
## IoT is Not a Technology – It's a Complex Ecosystem with Industry-Specific Implications




Source:vmware

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Using IoT for Sustainable Solutions in Smart Cities

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## LIFE IN A SMART CITY | INNOVATIONS ACROSS THE GLOBE


**SMART WATER**

Dubuque, IA implemented this project in 2010 and has helped local households save an average of 7% in water consumption

**SMART ENERGY**

Santander, Spain has installed 12,500 IEEE, GPRS and RFID sensors around the city that have cut energy costs by as much as 25% and waste management costs by 20%

**SMART TRANSPORTATION**

Major cities stand to gain around $800 billion per year of economic opportunity from 2030 by upgrading their public transportation networks

**SMART TRAFFIC MANAGEMENT**

San Francisco's I-80 Smart Corridor project will feature 133 high-tech signs communicating information gathered from a network of sensors and cameras

Source : NJIT

**SMART PUBLIC SAFETY**

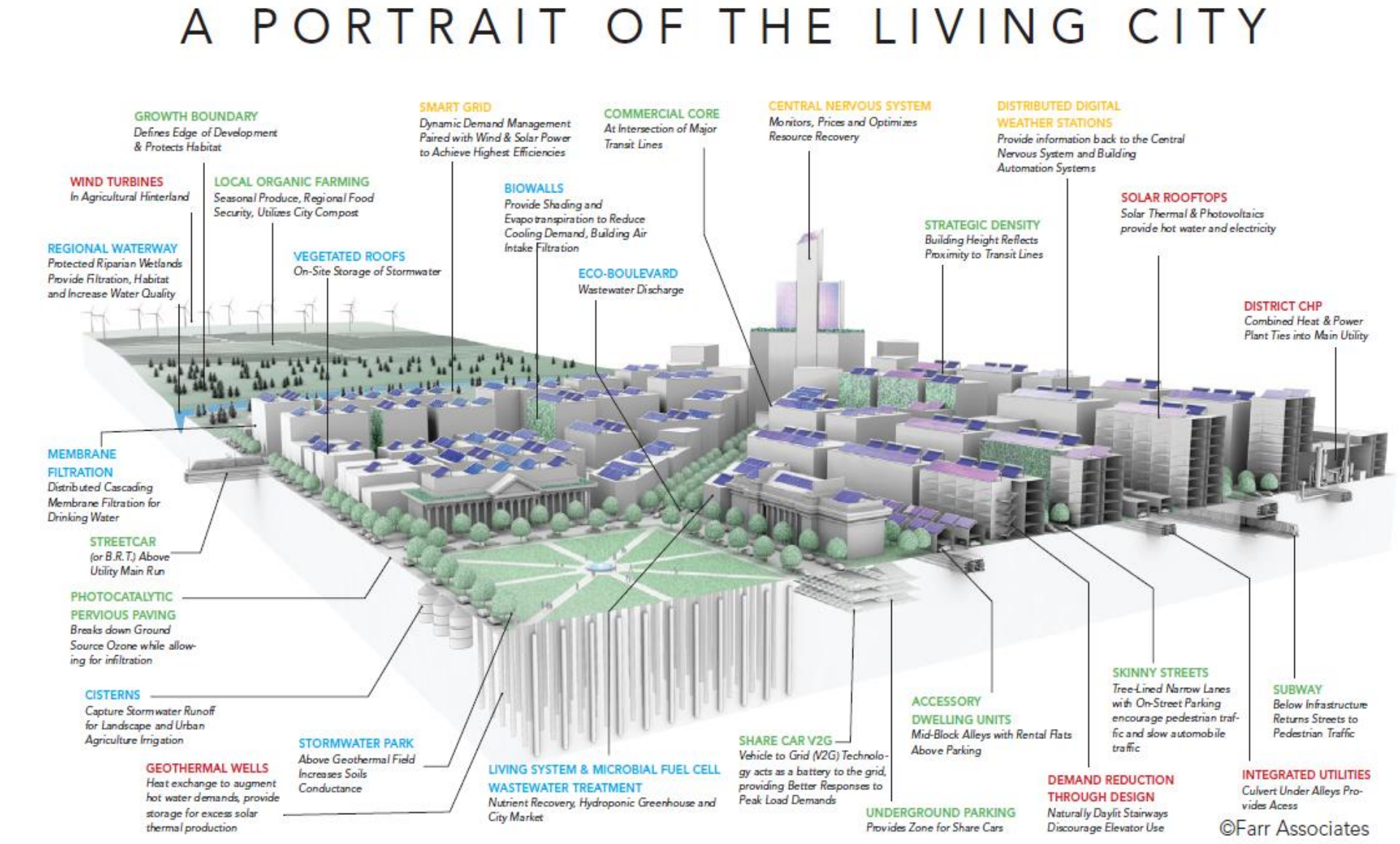
These technologies help firefighters, emergency responders, traffic control and sanitation workers as well as police officers keep citizens safe

**SMART BUILDINGS**

Seattle is a global leader in their smart buildings efforts and in 2013 launched the High-Performance Building program to reduce power consumption through real-time data analysis

# *Internet of Things for Urban Sustainability*

## IoT application areas in Urban Sustainability



## *San Diego SMART METER*

- Digital devices that collect energy-use data and – unlike traditional meters – **transmit and receive data**, too. Electric energy use will be *recorded every hour at your home and every 15 minutes* at your business.

- Natural gas information will be available on a daily basis. Smart meters will enable you to monitor your consumption more precisely so you can make more informed energy choices.

SDGE

A Sempra Energy utility®

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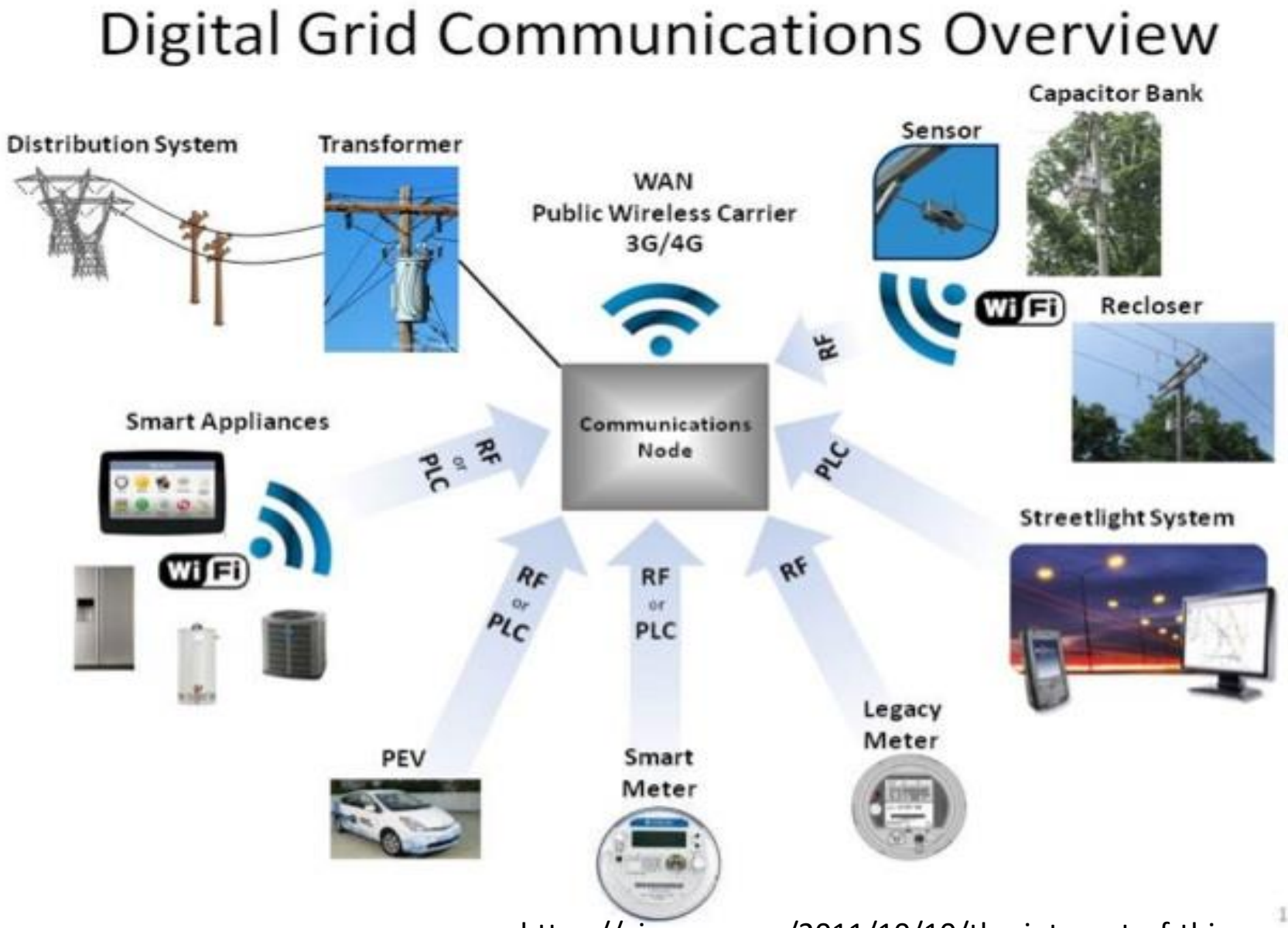


https://gigaom.com/2011/10/10/the-internet-of-things-energy/

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## *Crowdsourcing*

- Process of obtaining needed services, ideas, or content by soliciting contributions from a large group of people, especially an online community.
- Socialcops, an organization that uses crowdsourcing developed apps like “Collect” and “I Clean India”

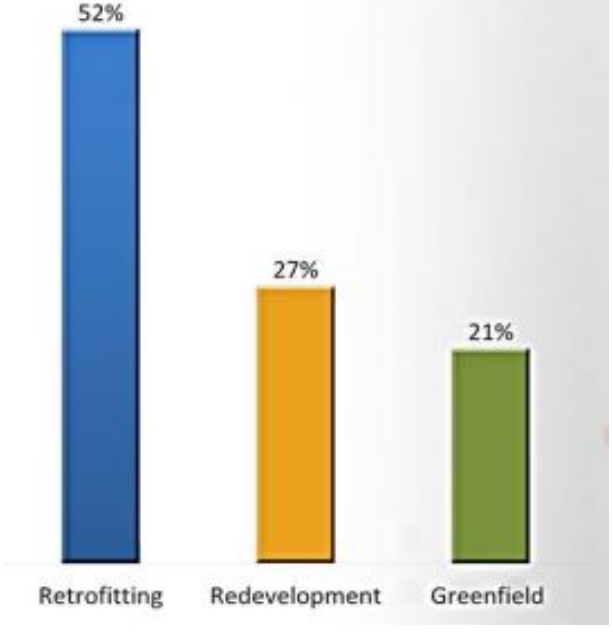
# *IoT for Smart City Planning*

- How residents used the internet for participation in smart city planning of SMART City INDORE.

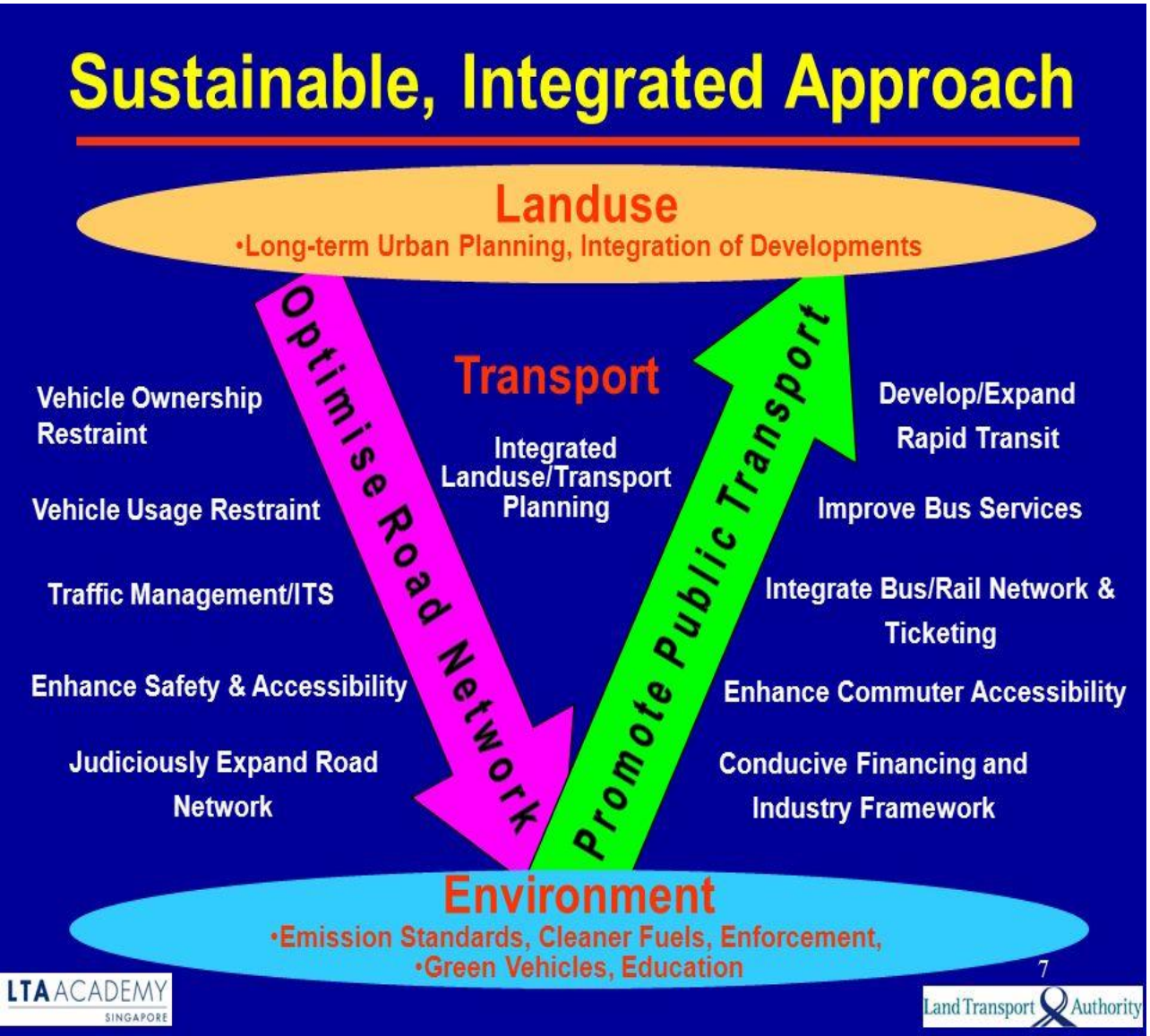
**CITIZEN PRIORITY- SECTOR WISE**

| Sector | % |
|---|---|
| Larger Focus on Indore's Heritage & Culture | 15% |
| Public Transport & Walkability | 14% |
| Appropriate Waste Management | 11% |
| More Open Space | 11% |
| Citizen role in decision making | 9% |
| Proper Sewerage Facilities | 8% |
| Affordable Housing | 8% |
| Uninterrupted Power Supply | 7% |
| Better Water Supply | 6% |
| Technology Enabled Delivery of Public Services | 6% |
| Safety & Security | 5% |

**CITIZEN PRIORITY- TYPE OF AREA DEVELOPMENT**




# *IoT for Singapore Transport*

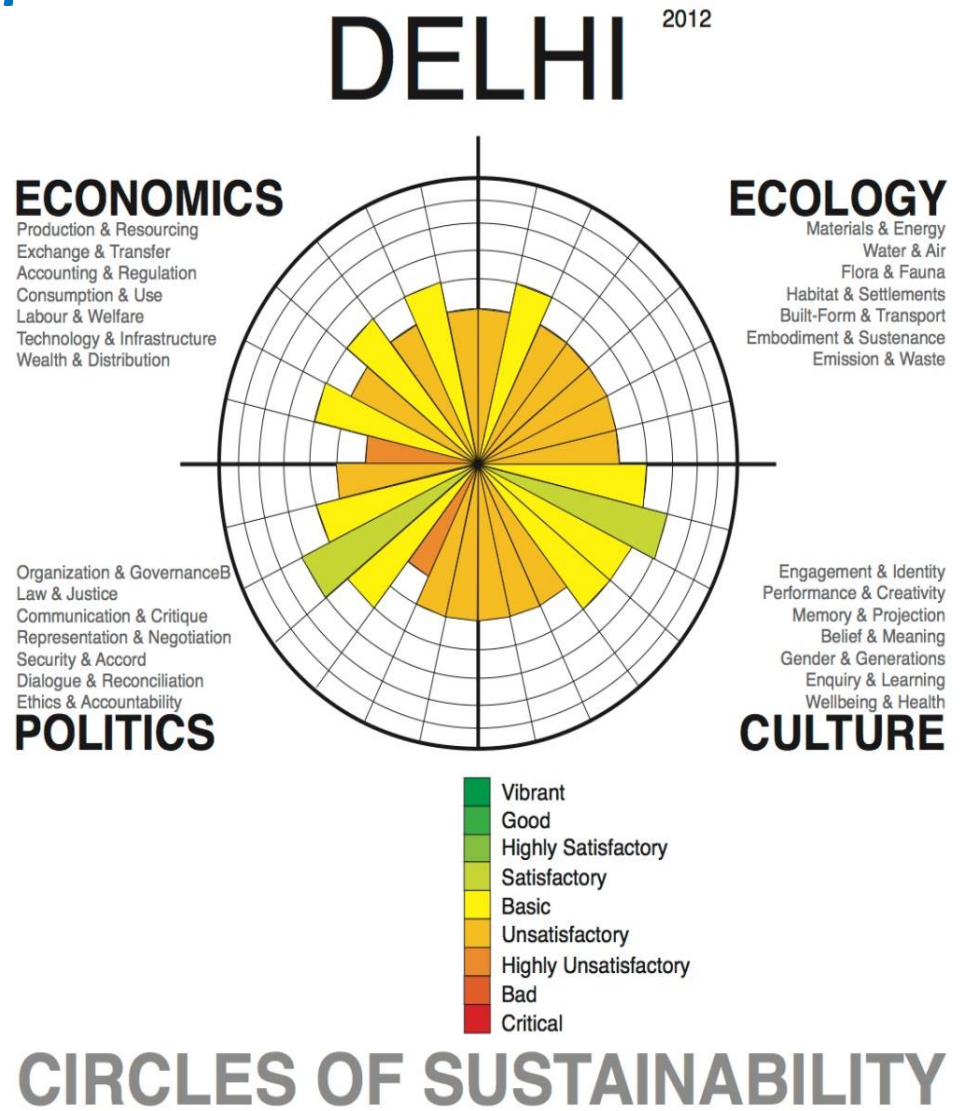



*** Car numbers sink to five-year low**

* The latest statistics from the LTA showed that the passenger car population here fell for two consecutive years to reach 575,353 last year - 4.1 per cent lower than in 2014, and the lowest it has been since 2009.

# *IoT Devices to Track Air Pollution in Delhi*

- IoT Devices on Autorikshaws –project by Socialcops
- ODD / EVEN dates traffic management
- Reduced Traffic congestion and Travel time.
- Reduced air pollution




Source: https://socialcops.com

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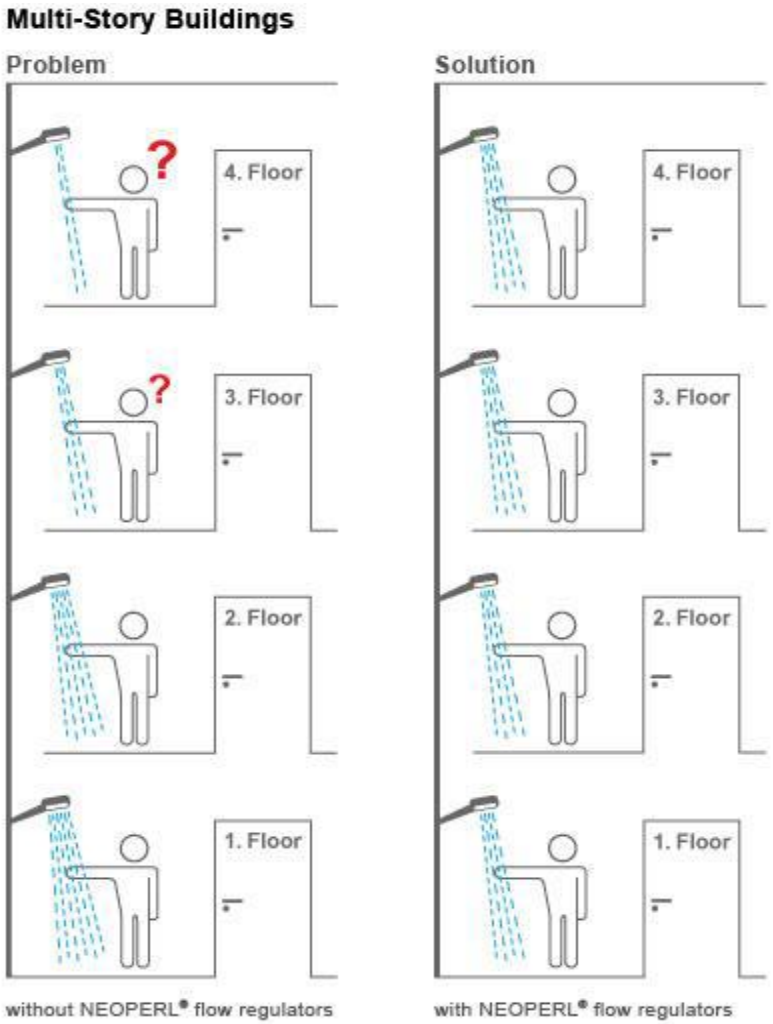
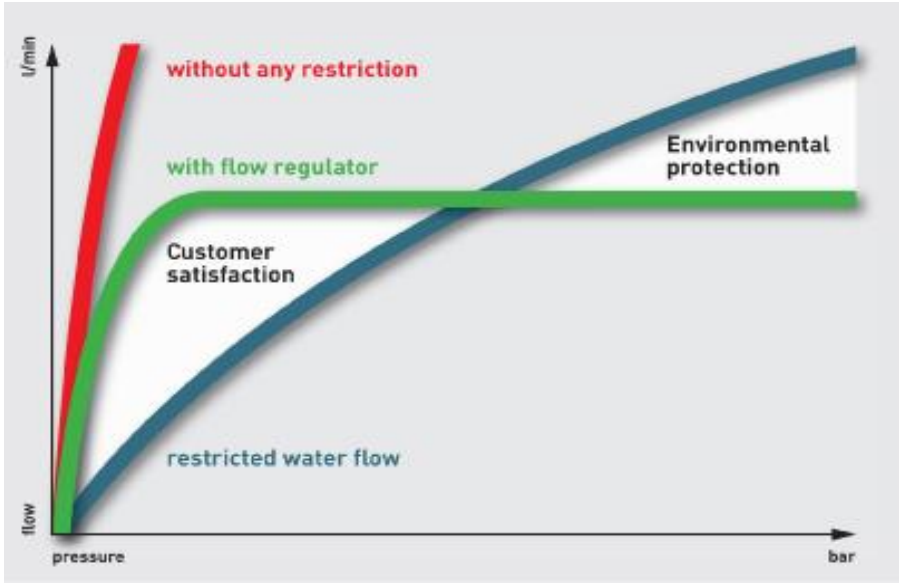
## *IoT for Urban Water Management*

How residents arrived at decision for Water Management in NAVIMUMBAI




The unique flow regulator technology keeps the flow rate constant, independent from the line pressure (e.g. at 6 liters/minute when washing your hands or 12 liters/minute when taking a shower). Consequently, the use of flow regulators not only saves a lot of money, but also guarantees an even water distribution.



# *Internet of Things for Urban Sustainability*

## Water Saving Observed at Third Floor After Fixing PCA :

| | Water flow discharge in LPM ( Litres per Minute) | | |
|---|---|---|---|
| Location<br>Building 10 / 303 | Kitchen Sink<br>Not Jaguar make | Wash basin<br>Jaguar make | Bathroom Tap<br>Jaguar make |
| Before using PCA | 12 | 9 | 18 |
| After fixing PCA | 3 | 1.5 | 6 |
| **Saving due to PCA** | **9** | **7.5** | **12** |
| **% Saving of Water** | **75%** | **83%** | **66%** |

The unique flow regulator technology keeps the flow rate constant, independent from the line pressure (e.g. at 3 liters/minute when washing your hands or 12 liters/minute when taking a shower). Consequently, the use of flow regulators not only saves a lot of money, but also guarantees an even water distribution.

**BENEFITS OF USING PCA FOR WATER SAVING :**

1. SAVE WATER - 6 TO 12 LITRES PER MINUTE PER TAP / FAUCET about 500 Litres per day per flat.
2. AVOID / STOP MISUSE OF WATER DUE TO NEGLIGENCE
3. WITH SAME WATER, WE CAN HAVE 24 HOURS WATER , NO NEED to CUT SUPPLY
4. BY REDUCING WATER REQUIREMENT , WE ARE PREPARED FOR SHORTAGE OF WATER SUPPLY
5. REDUCED EXPENDITURE ON WATER BILLS / WATER TANKER BILLS
6. REDUCTION OF POWER CONSUMPTION BY PUMPS , SAVING OF ELECTRICITY BILL
7. SAVING WATER HELPS SAVING FOSSIL FUEL USED IN POWER GENERATION
8. UNIFORM WATER DISTRIBUTION ACROSS ALL FLOORS DUE TO PRESSURE COMPENSATORS
9. INCREASES LIFE OF THE ENTIRE PLUMBING EQUIPMENT. Every time valves are opened , water rushes with force into empty pipes and hit the fixtures. AIRLOCK and WATERHAMMER EFFECT due to reverse pressure. Best Quality fixtures also get damaged when this is repeated.
10. **OPTIMAL USE OF WATER along with USER SATISFACTION & ENVIRONMENTAL PROTECTION**

**USE PCA to STOP WASTING WATER @ 6 TO 12 Litres EVERY MINUTE OF USE**

**- JAGDISH MATH (10/303)**

# *Internet of Things for Urban Sustainability*

TheCityFix

WORLD RESOURCES INSTITUTE | WRI ROSS CENTER FOR SUSTAINABLE CITIES

- **WRI Ross Centre for Sustainable Cities** uses proven solutions and action-oriented tools to increase building and energy efficiency, manage water risk, encourage effective governance and make the fast-growing urban environment more resilient to new challenges.

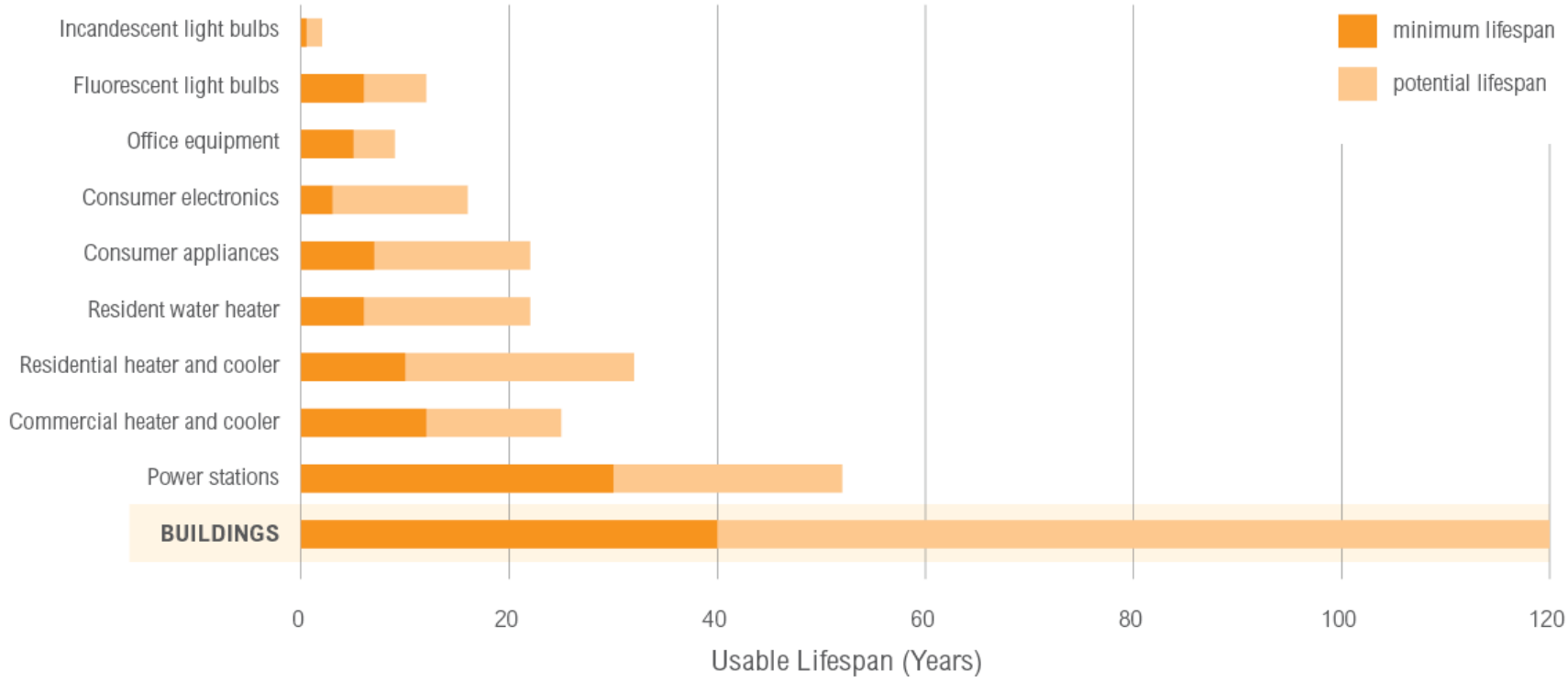
- Produced by WRI, CityFix is an online resource for learning about the latest in Urban Sustainability.

- The site connects a global network of writers, urban planners, designers, engineers, and citizens who work to make cities better places to live.

Source : www.thecityfix.com

# Why are Green Buildings important?

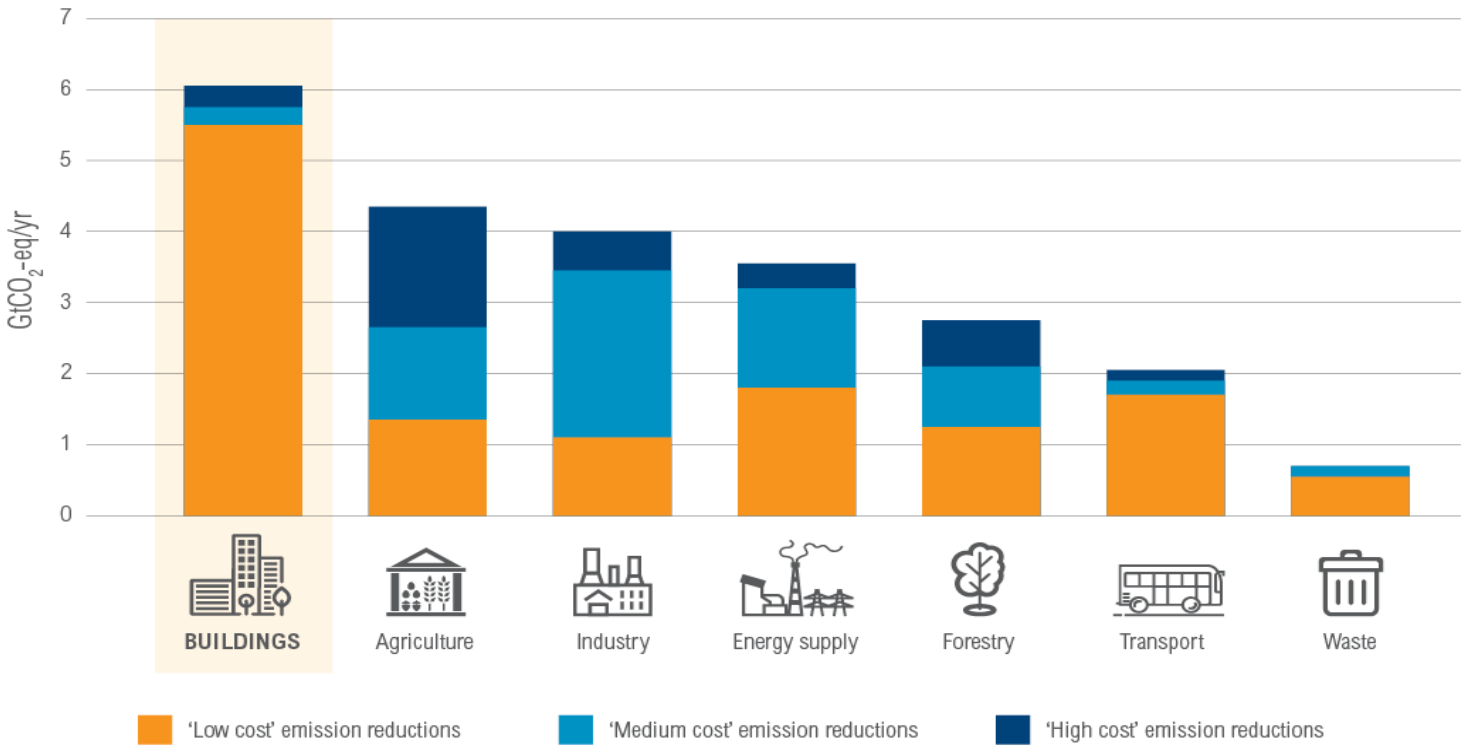
## Buildings Have Long Economic Lifespans Compared to Other Energy-Consuming Infrastructure




*Source:* International Energy Agency. 2013. Transition to Sustainable Buildings: Strategies and Opportunities to 2050. http://www.iea.org/publications/freepublications/publication/Building2013_free.pdf.

# Why are Green Buildings important?

## Building Efficiency Is One of the Most Affordable Ways to Cut Emissions




*Note:* 'Low cost' emission reductions = carbon price <20 US$/tCO$_2$-eq. 'Medium cost' emission reductions = carbon price <50 US$/tCO$^2$-eq.
'High cost' emission reductions = carbon price <100 US$/tCO$_2$-eq.
*Source:* IPCC. 2007. IPCC Fourth Assessment Report: Climate Change 2007: Synthesis Report. "4.3 Mitigation options." https://www.ipcc.ch/publications_and_data/ar4/syr/en/mains4-3.html

# *Internet of Things for Urban Sustainability*

## *Insurance coverage and policy discounts for Green Building*

- Two types of insurance policies offered for green building.
- The first, offered to conventional building owners, is a green-rebuild policy. 2-3% increase in premiums (covering higher up-front costs of green materials) guarantees that, in case of a loss, a conventional building will be rebuilt to green standards.
- Another policy type, offered to owners of already-green buildings, insures existing green modifications against loss.

Source:
http://sustainability.thomsonreuters.com/2012/09/18/insurance-coverage-and-policy-discounts-for-green-building/)

# *Internet of Things for Urban Sustainability*

## *Rethinking insurance for sustainable development*

- **ClimateWise** is a global network of over 30 leading insurance companies united by concern for climate change and the risks it presents to both society and the insurance industry.

- The insurance industry has considerable resources at its disposal in framing a collective response to climate change.

- The Munich Climate Insurance Initiative (MCII) was initiated by Munich Re in 2005 to see if insurance solutions can play a role in adaptation to climate change in developing countries

- As risk managers, risk carriers and investors, the insurance industry has the potential to play a strategic role in securing sustainable development

- Offer rewards to clients for sustainable behavior and vice versa

Source:climatewise.org.uk, http://sustainability.thomsonreuters.com/2012/09/18/insurance-coverage-and-policy-discounts-for-green-building/

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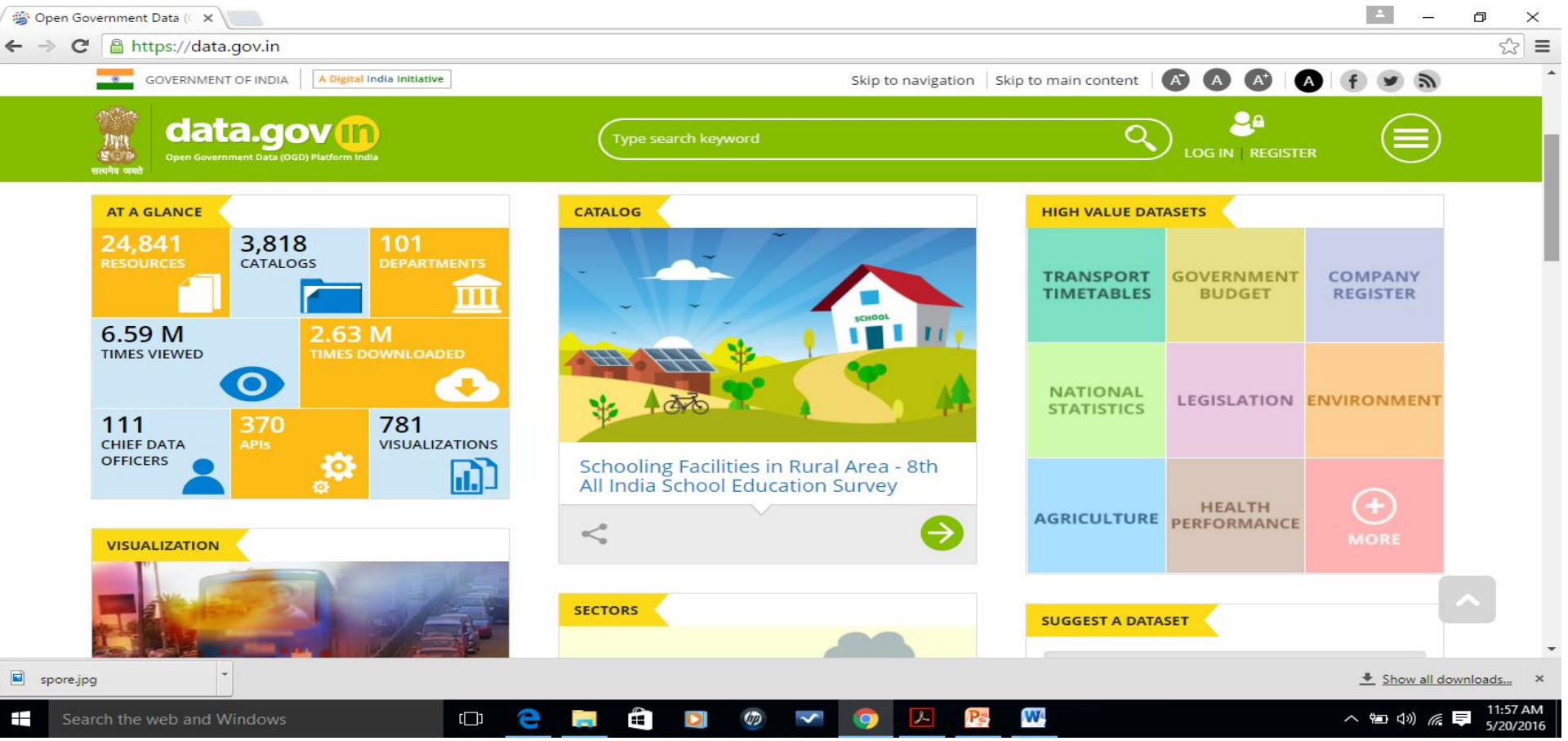
## Open Government Data Platform,India




To increase transparency in the functioning of Government and also open avenues for many more innovative uses of Government Data to give different perspective and facilitate analysis and research.

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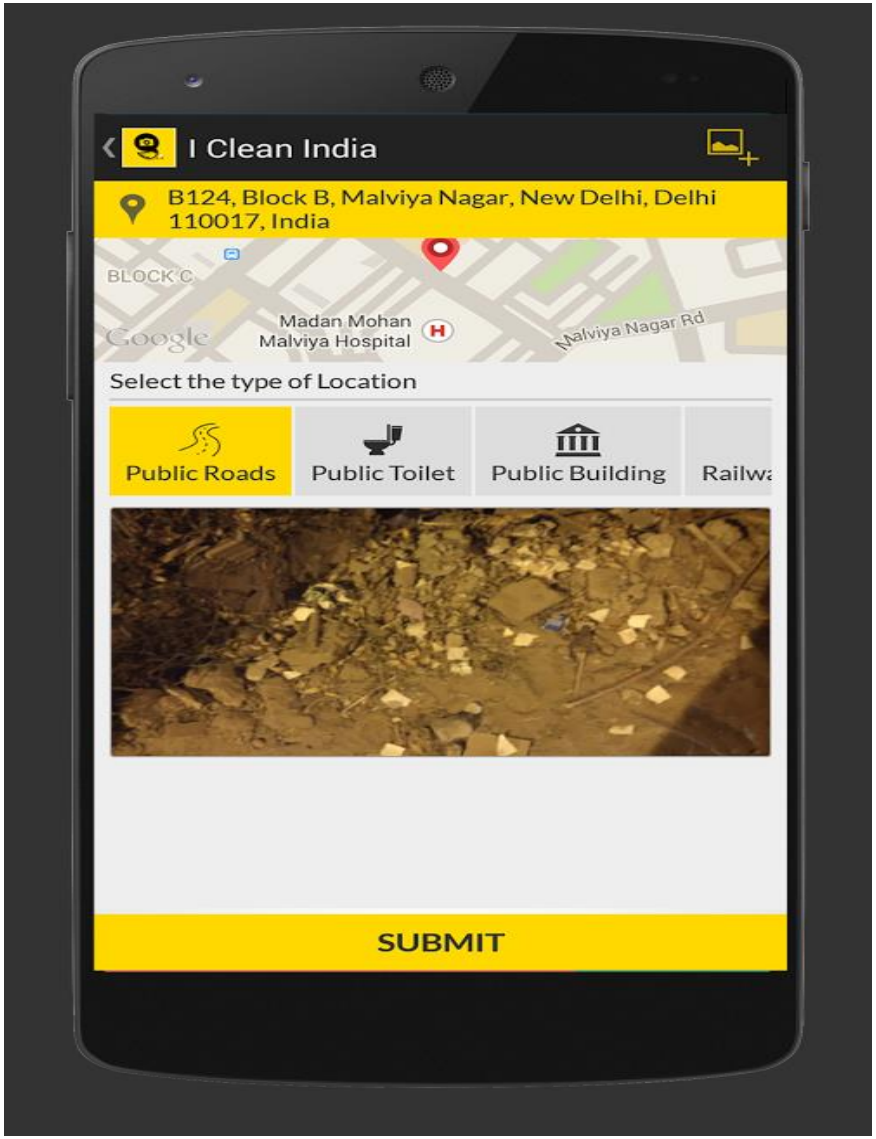
## *IoT for Urban Cleanliness-I Clean India*




* **Click** pictures of unclean spots and mark it on Locality Map

* **Pick** an unclean spot around and invite friends and neighours cleaniless drive

* **Flag** your impact stories on the digital map of Swachh Bharat 2019 and inspire others to join the movement.

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## *IoT for Portugal on Renewable Energy*

Portugal ran for 4 days only on renewable energy

*Portugal was powered entirely on renewable energy for 107 hours in May 2016.

*In 2013,Portugal generated half its electricity from combustible fuels and 23.5% from hydro, wind and solar.

*Portugal was set a target to generate 31% of its energy from renewable sources by 2020.

- Source:Portuguese NGO'Zero',The Guardian,May 2016

# *Internet of Things for Urban Sustainability*

## *Conclusions*

- *Climate action at this juncture needs to be greatly accelerated and rooted in the fundamentals of the problem*

  - ***Human Being's disconnection from nature.***

- *IoT help in giving content and context to Urban scenario. Data analytics has the capability to produce insights that can help develop methods to mitigate the various problems that plague our cities and environment.*

- *IoT helps in arriving at policy decisions in SMART CITIES , implementation and also monitoring impact of implementation of policies.*

- *Case Studies such as the one presented in this paper indicate significant role of **IoT in realizing Urban Sustainability leading to a Smart Planet.***

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# *THANK YOU*

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