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**FELDMAN
ENGINEERING**

**TApps: Ultra-High Volume Sensor
Applications for Global Challenges**

November 12, 2014

Feldman Engineering Corp.
www.feldmanengineering.com

TSensors Summit San Diego 2014

Outline

- ▶ Introduction
- ▶ Roadmap Process
- ▶ Global Challenges
- ▶ Conclusions

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Application Economy

There's an app for that...

“We're moving from a web economy to an Application economy” — John Chambers, Cisco, Interop '13

In Code We Trust

<http://visual.ly/rise-new-app-economy>

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Sir Arthur C. Clarke
1917-2008

“Any sufficiently advanced technology is indistinguishable from magic.”

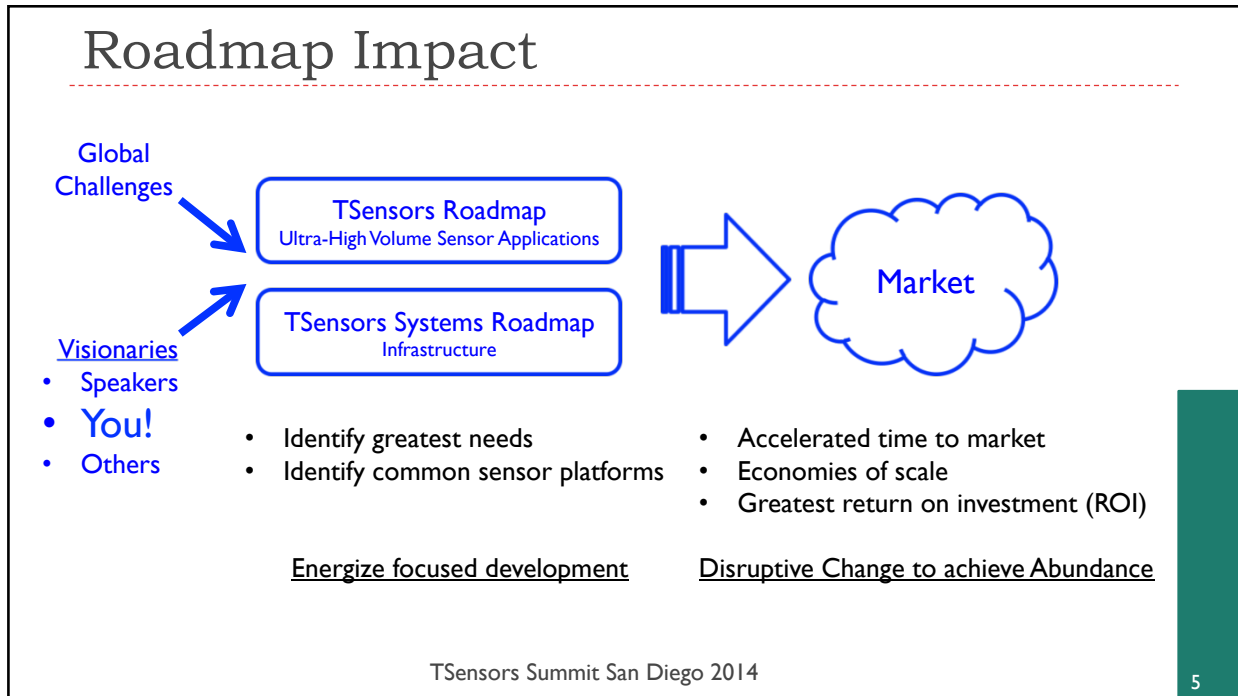
Clarke's 3rd Law

“People care about what it does not how it works.”

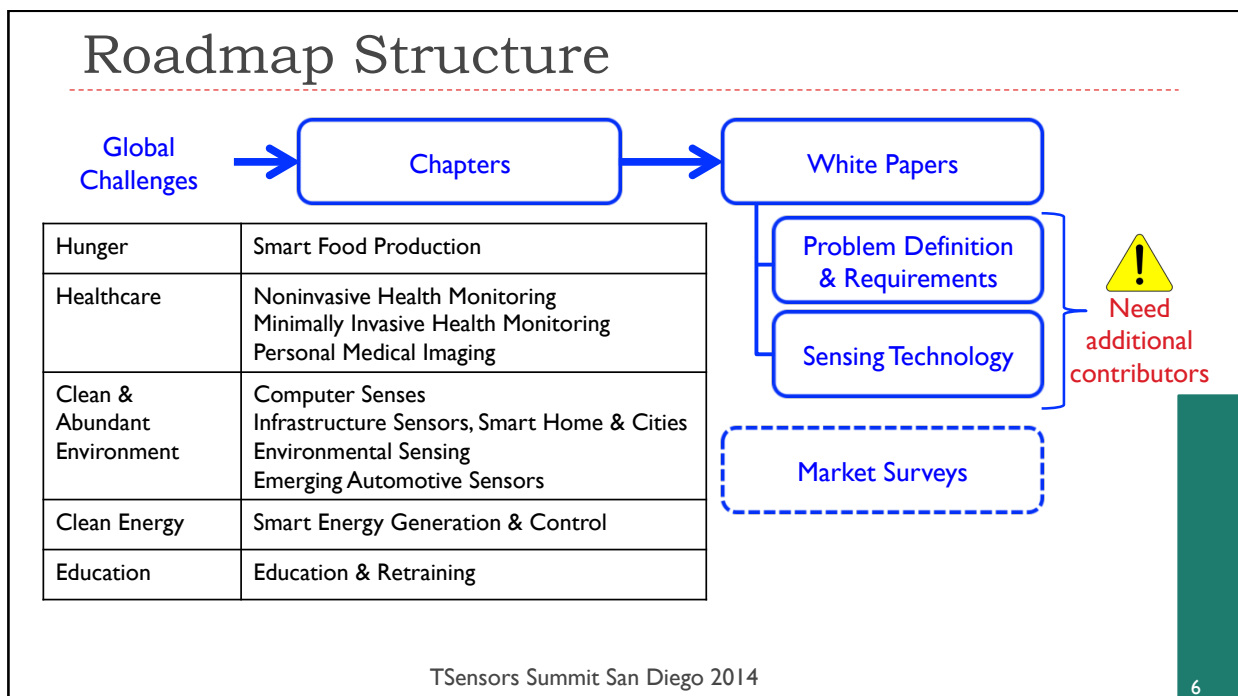
Ira's Corollary

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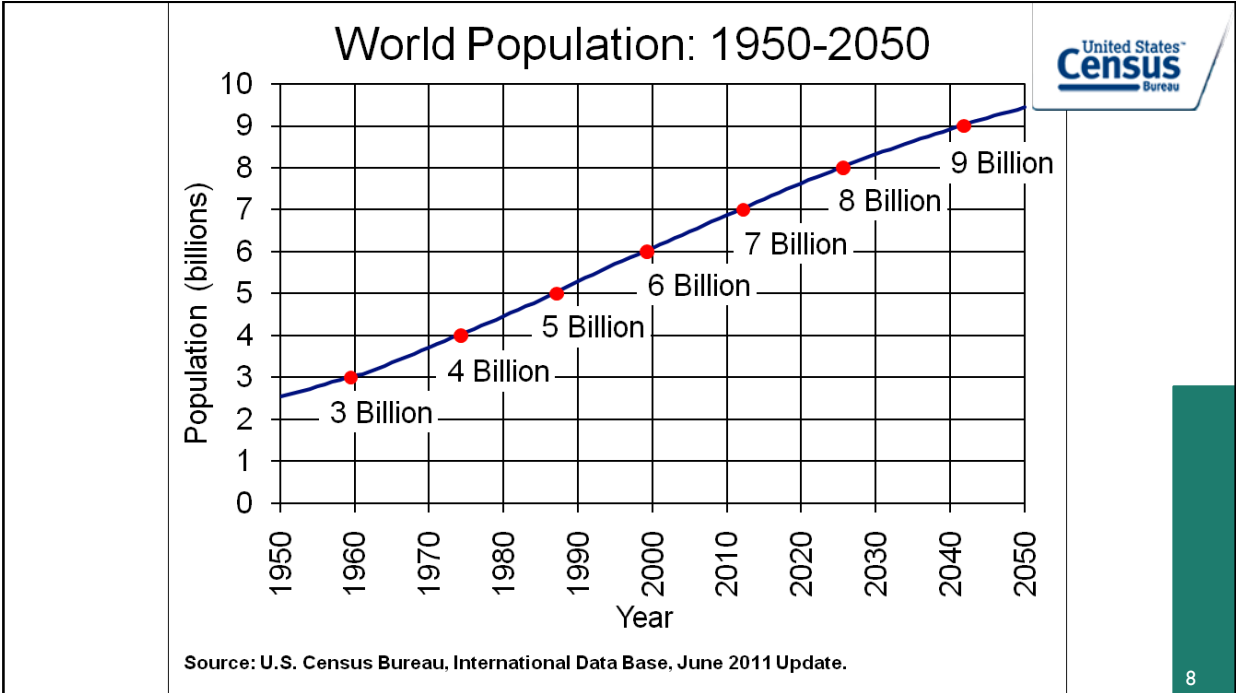
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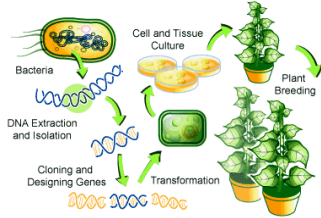
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Hunger

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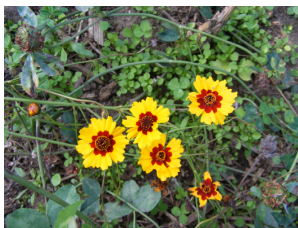


Smart Food Production



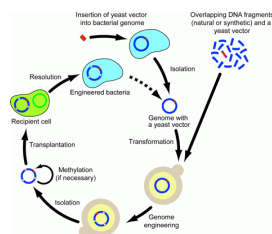
Genetic Engineering

oregonstate.edu/orb/terms/genetic-engineering



Perennial Polycultures

www.prairiegreenspermaculture.com



Synthetic Biology

onlinelibrary.wiley.com



Vertical Farming

keystoneprogressblog.blogspot.com/2014/07/vertical-farming-taking-root-in.htm

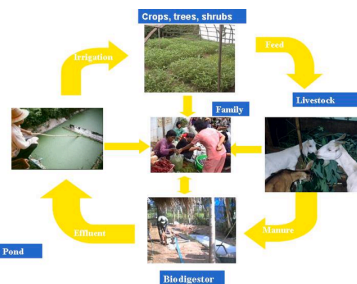
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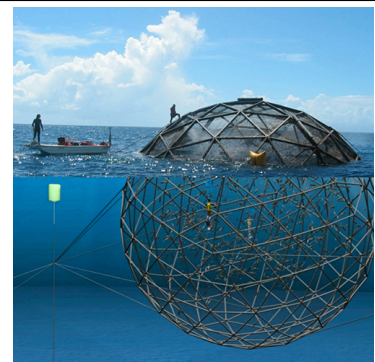
Robotics & AI – “Wall-Ye” wine robot

modernfarmer.com/2013/08/5-robots-on-the-farm/



Integrated Agriculture

www.mekarn.org/procbiod/prest.htm



Upgraded Aquaculture

www.oceanfarmtech.com/



Cultured Meat

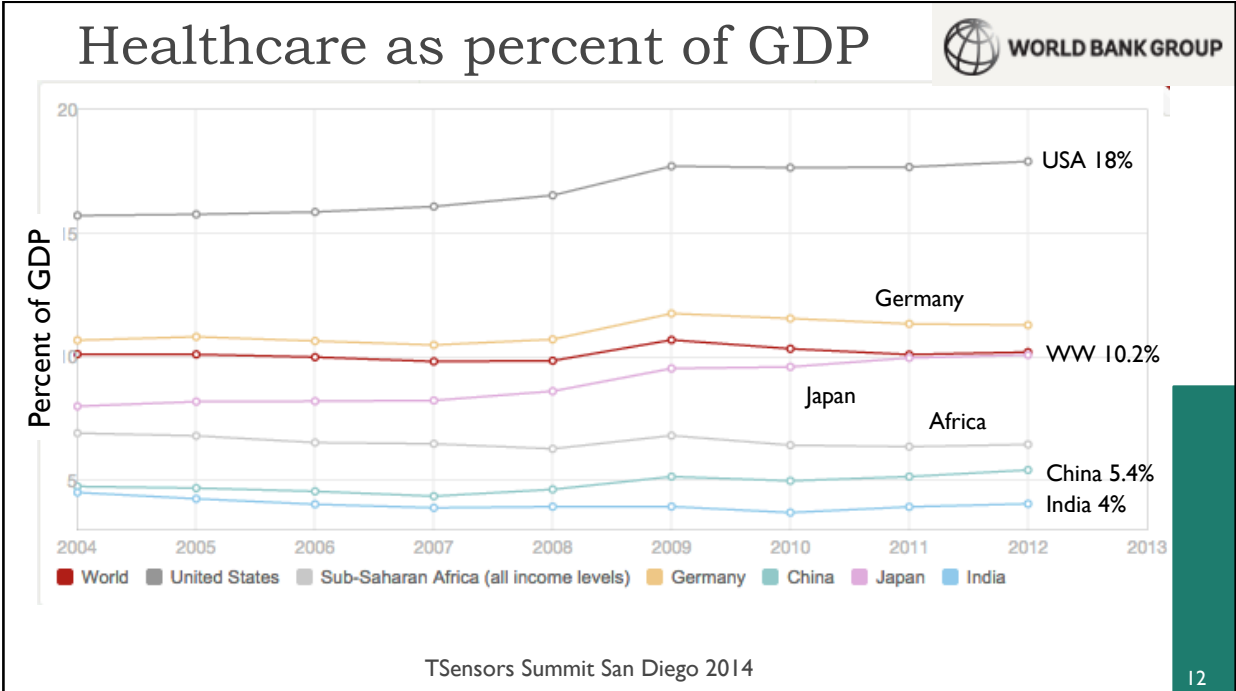
culturedbeef.net

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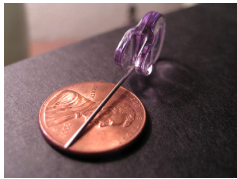
Healthcare

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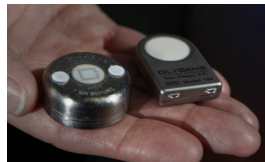


Diabetes - Continuous Glucose Monitoring

Medtronic/diabetesdaily.com



GlySens



Echo Therapeutics
Symphony



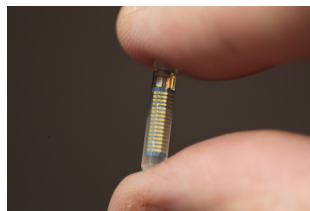
G-Tone Watch Concept
Joshua Sunghoon Mun



Invasive



Medtronic



Senseonics



Google/Novartis

Non-invasive

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Medical Imaging



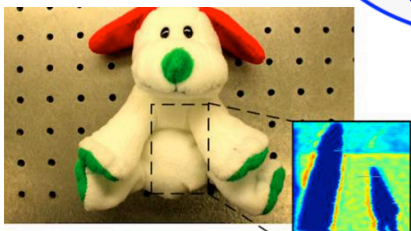
Handheld Ultrasound
Minolta



Portable X-ray & CT Scan
Tribogenics.com



WHO estimates 75% of people world wide no access to medical imaging and > 50% of equipment in developed world not used.



TeraHertz Imaging
Ali Hajimiri, Caltech



Hyperspectral Imaging
Ximea / imec

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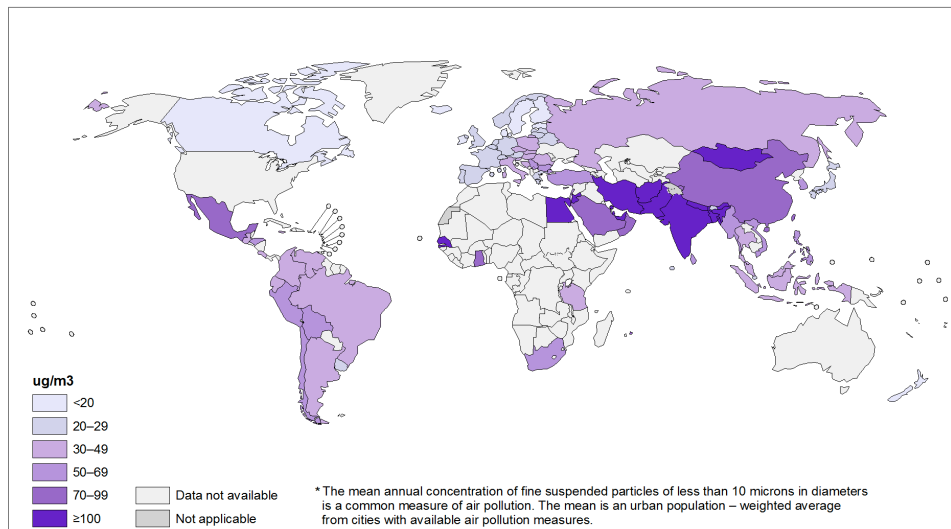
Clean & Abundant Environment

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Air Pollution

Exposure to particulate matter with an aerodynamic diameter of 10 μm or less (PM10) in urban areas*, 2008–2013

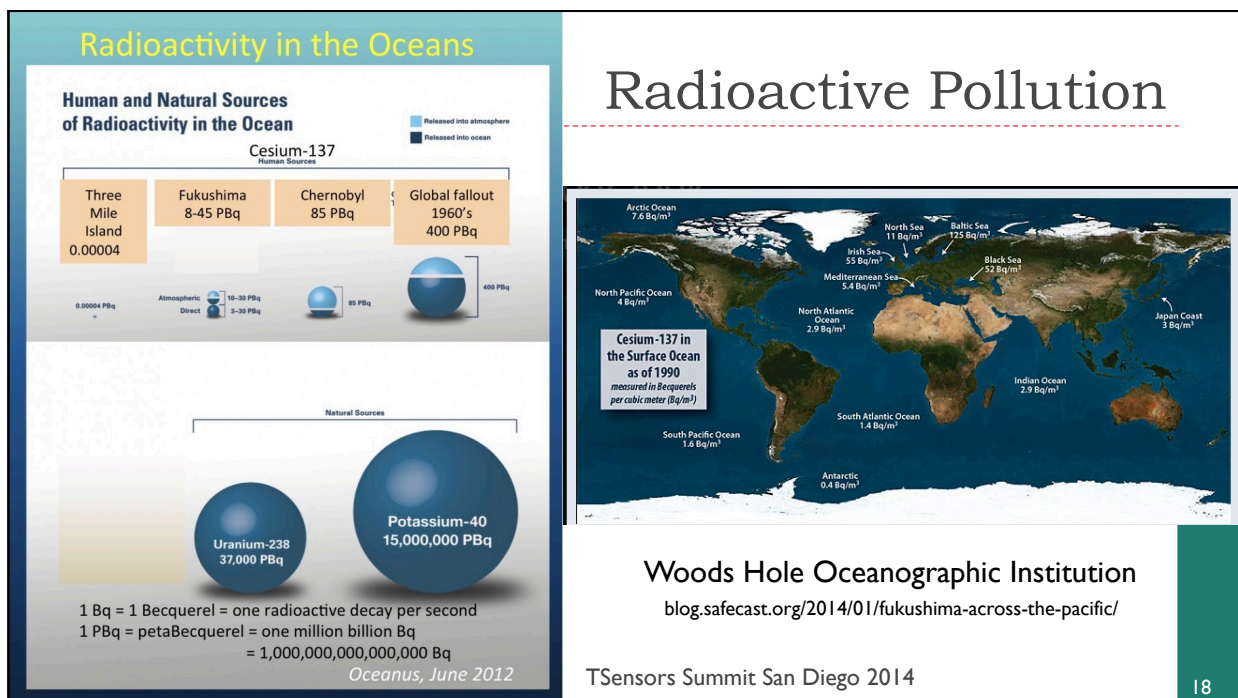
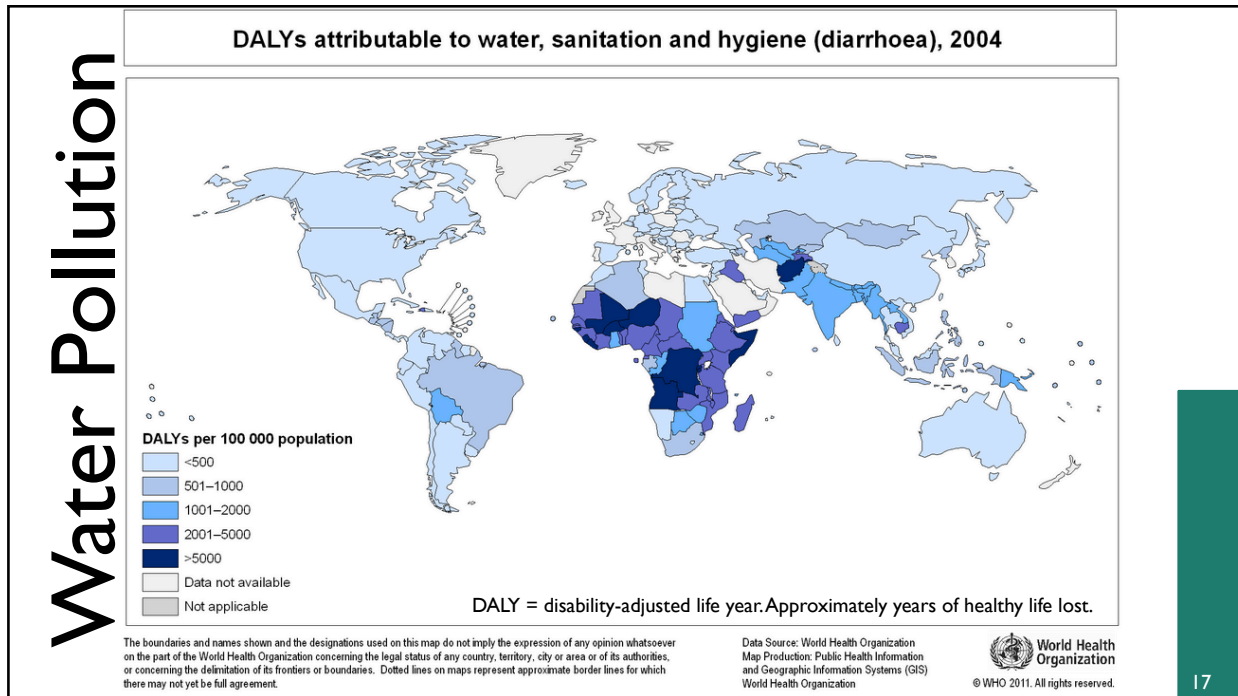


The boundaries and names shown and the designations used on this map do not imply the expression of any opinion whatsoever on the part of the World Health Organization concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted and dashed lines on maps represent approximate border lines for which there may not yet be full agreement.

Data Source: World Health Organization
Map Production: Health Statistics and Information Systems (HSI)
World Health Organization

 World Health Organization
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Infrastructure

American Infrastructure



AVIATION	D	PORTS	C
BRIDGES	C+	PUBLIC PARKS AND RECREATION	C-
DAMS	D	RAIL	C+
DRINKING WATER	D	ROADS	D
ENERGY	D+	SCHOOLS	D
HAZARDOUS WASTE	D	SOLID WASTE	B-
INLAND WATERWAYS	D-	TRANSIT	D
LEVEES	D-	WASTEWATER	D

ESTIMATED INVESTMENT NEEDED BY 2020:

\$3.6 TRILLION

- A = Exceptional
- B = Good
- C = Mediocre
- D = Poor
- F = Failing

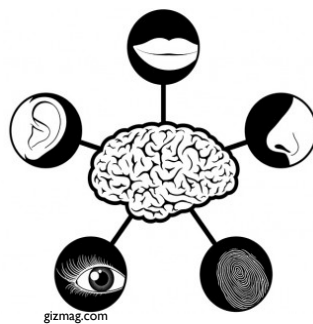


American Society of Civil Engineers
www.infrastructurereportcard.org

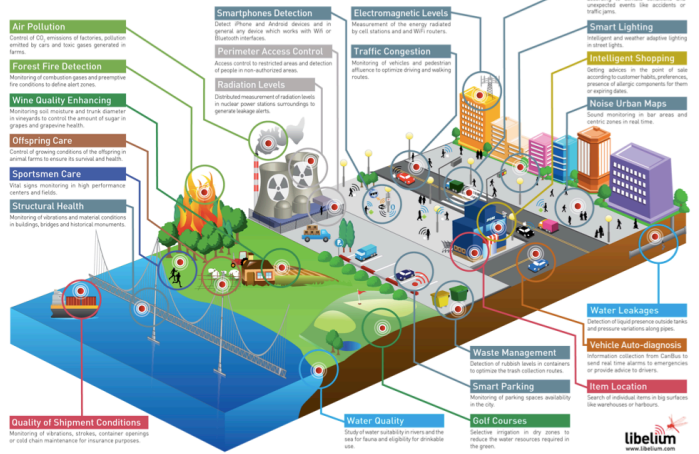
Senses & Infrastructure

Infrastructure Sensors, Smart Homes, & Smart Cities

Libelium Smart World



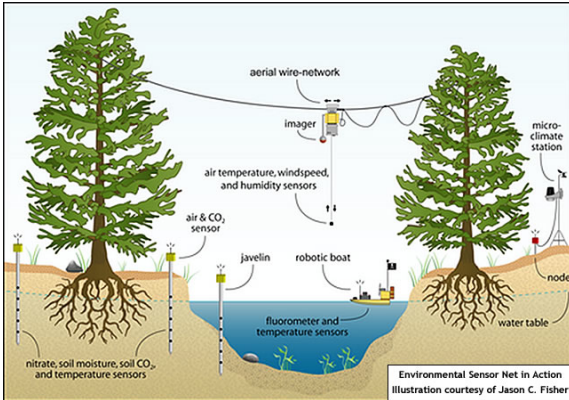
Computer Senses



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Environmental Sensing

General Environmental Sensing



www.isi.edu/research_groups/computer_networks/overview

Personal Environmental Sensing



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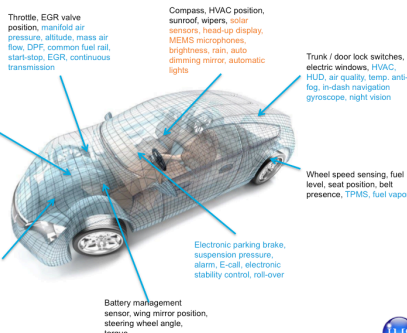
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Automotive Sensing

KEY: MEMS, Magnetic, Light sensors

Cam/crankshaft position, engine speed, throttle by wire, engine oil, brake fluid level, AEBig accelerometer, roll detection, passenger occupation, in-cylinder pressure, active suspension accelerometer

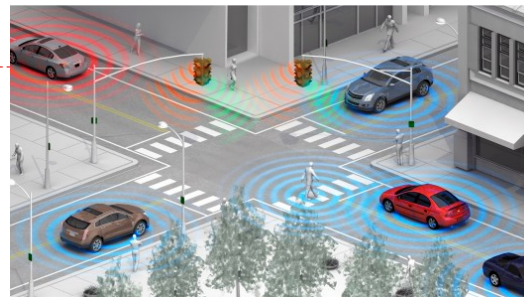
IHS Technology



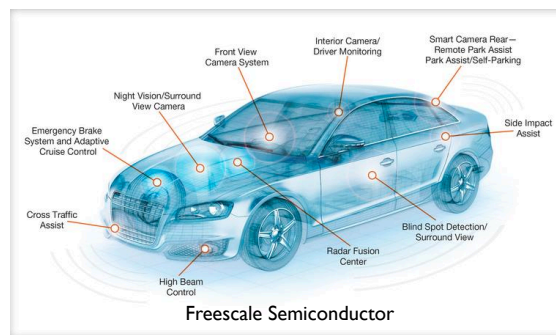
Explosion of new applications:

- Safety, Economy, & Pollution
- V2x – Vehicle to (vehicle, infrastructure, etc.)
- Entertainment & communication
- Hybrid Electric
- Autonomous Vehicles

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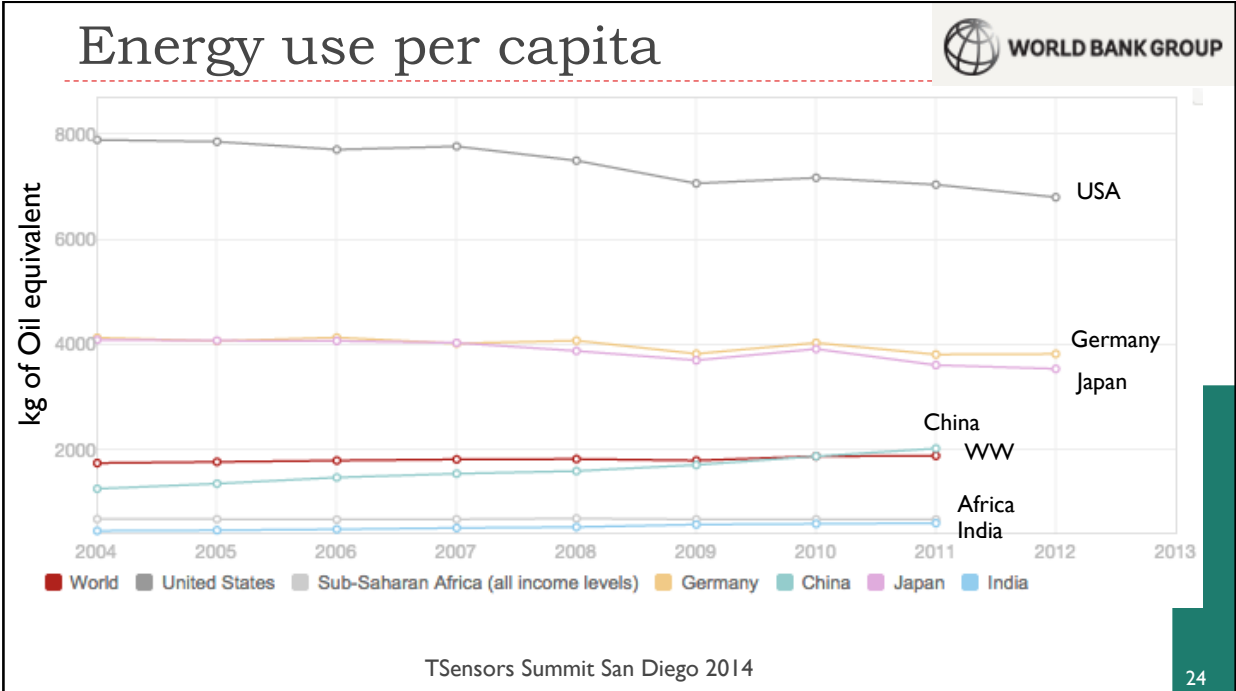


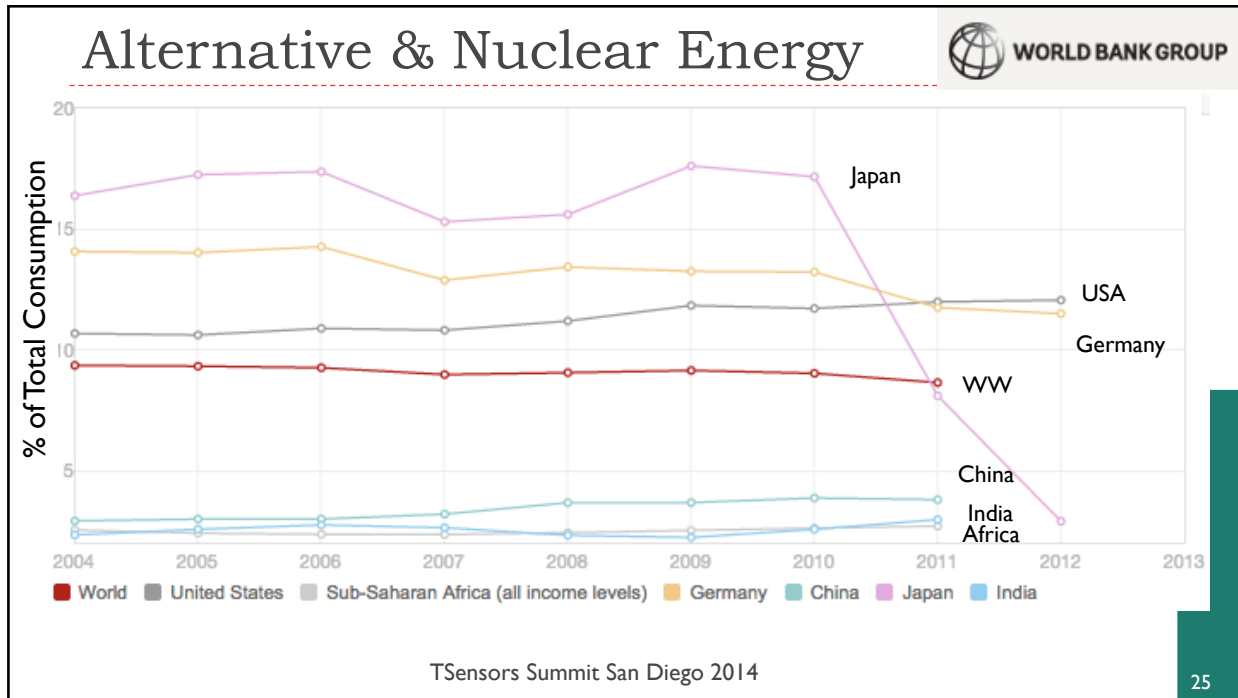
www.gizmag.com/gm-wifi-direct/23478



Clean Energy

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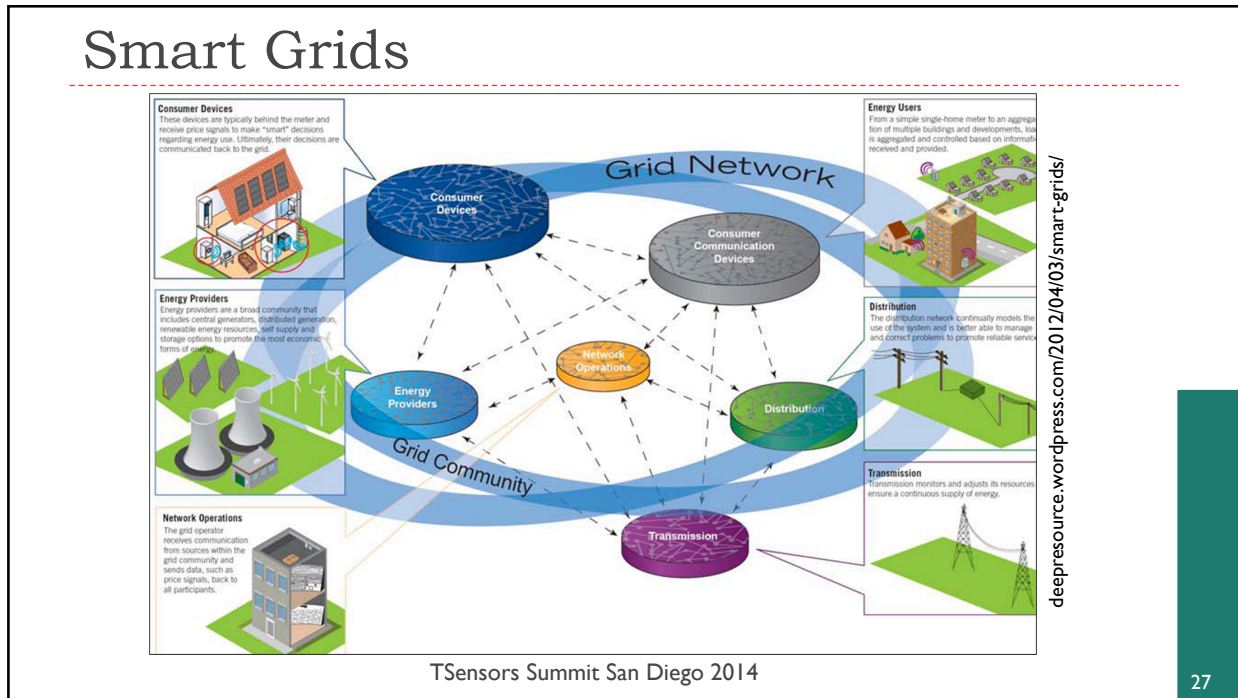


Renewables

www.chess-llc.com/Whatwedo.aspx

Bio Fuel
leamingtongrower.com/2012/02/converting-algae-into-biofuel/

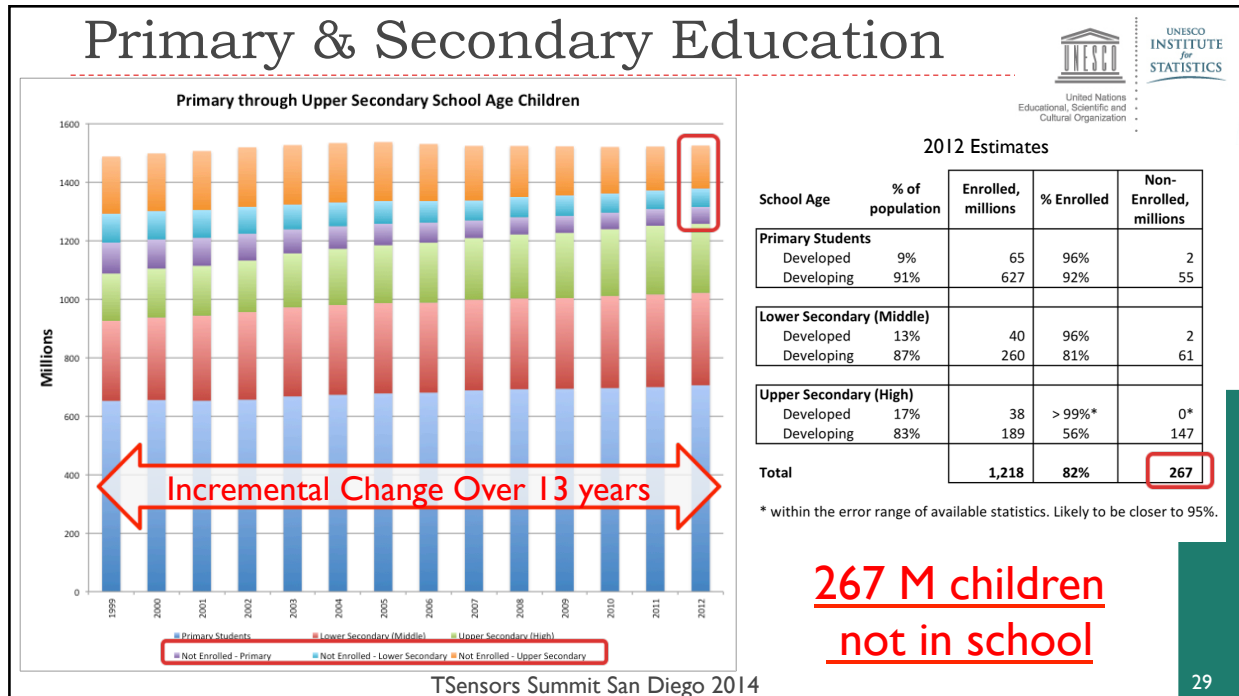
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Education

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Higher Education



University World News THE GLOBAL WINDOW ON HIGHER EDUCATION

Issue 00332

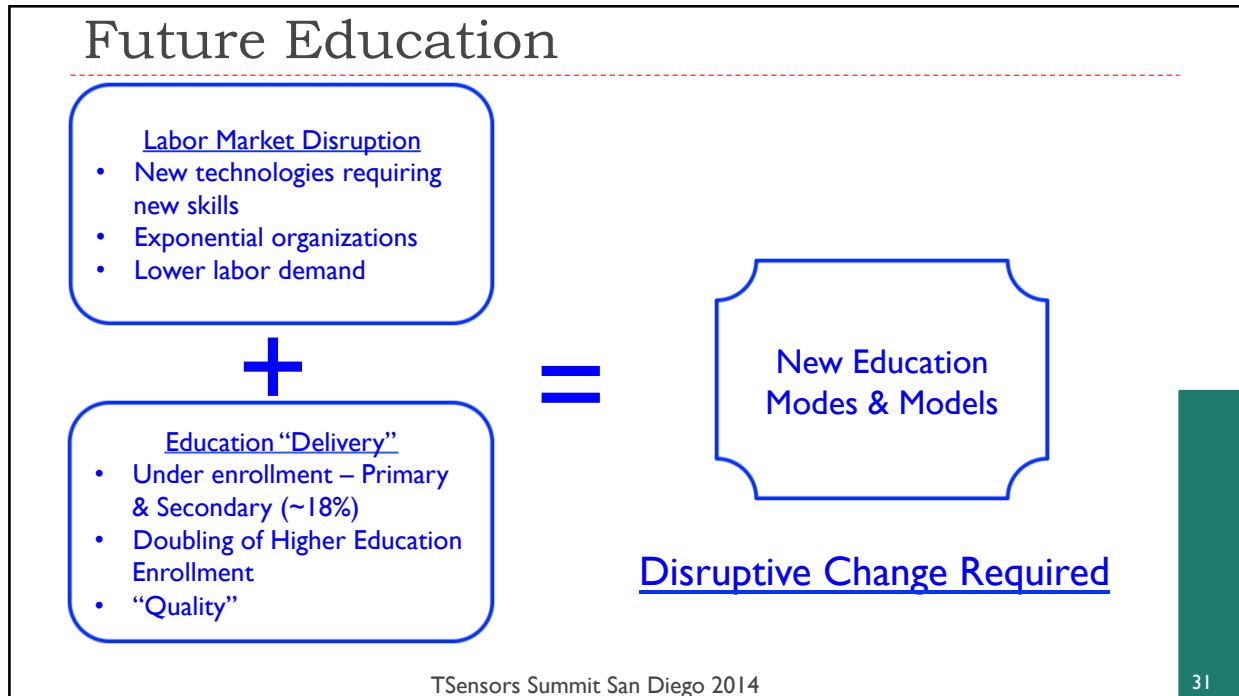
GLOBAL

Worldwide student numbers forecast to double by 2025

Geoff Maslen 19 February 2012 Issue No:209

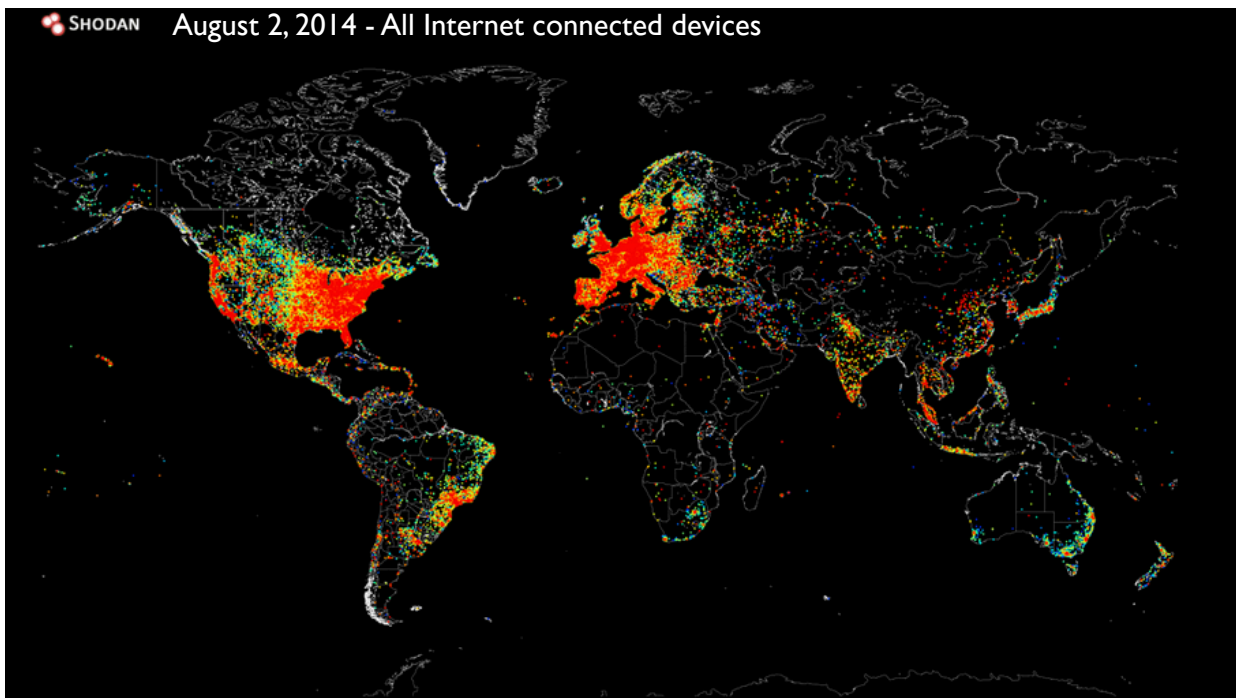
The number of students around the globe enrolled in higher education is forecast to more than double to 262 million by 2025. Nearly all of this growth will be in the developing world, with more than half in China and India alone. [...]

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Conclusions

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Conclusions

- ▶ **Global Challenges**
 - ▶ Imbalance between resources & demand
 - ▶ Quantity
 - ▶ Location
 - ▶ Trends do not look promising
- ▶ **Disruptive change required**
 - ▶ Exponential technologies
- ▶ **Roadmap needed to identify emerging sensors for greatest impact**

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Visionaries (& White Papers) Needed

- ▶ **Application Identification & Requirements**
- ▶ **Sensing Technology**

To develop the Roadmaps for

- ▶ **Applications (TApps)**
- ▶ **Infrastructure (TSensor Systems)**

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Thank You!

Questions? Comments?

Please let me know:

ira@feldmanengineering.com

For more on TSensors please also see my blog

www.hightechbizdev.com

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