CIRCULAR ECONOMY: COMPLEXITIES, TRENDS, CHALLENGES

David Newman
ISWA President

Limassol, Cyprus, 23 June 2016

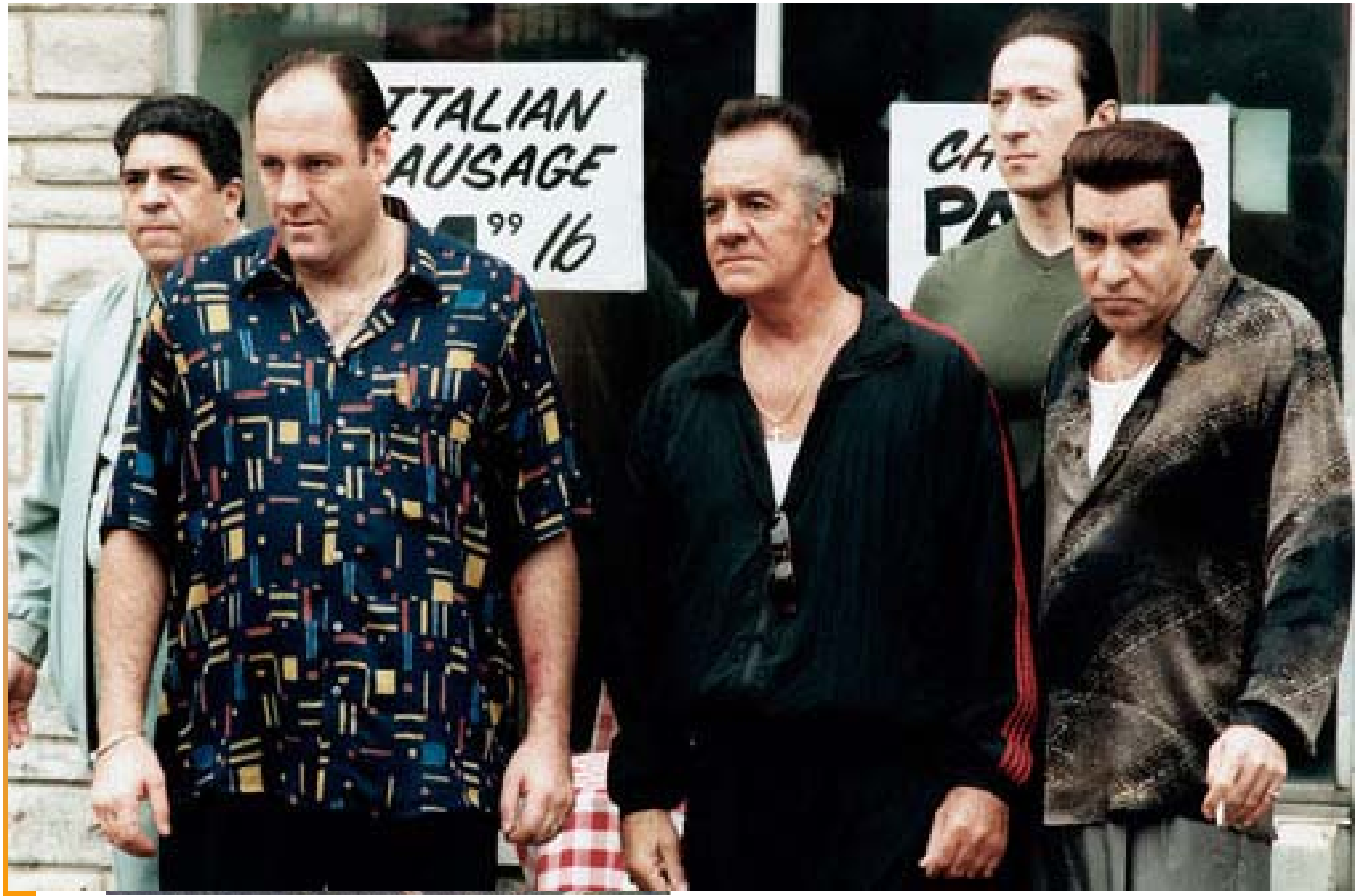
Circular Economy, Markets, Waste, Energy

Circular Economy poses many questions to the resource industry. Some have answers, but there are many questions we are not even asking ourselves.

Today we are going to look at known unknowns and try to explore «unknown unknowns»

And search for some opportunities for our industry

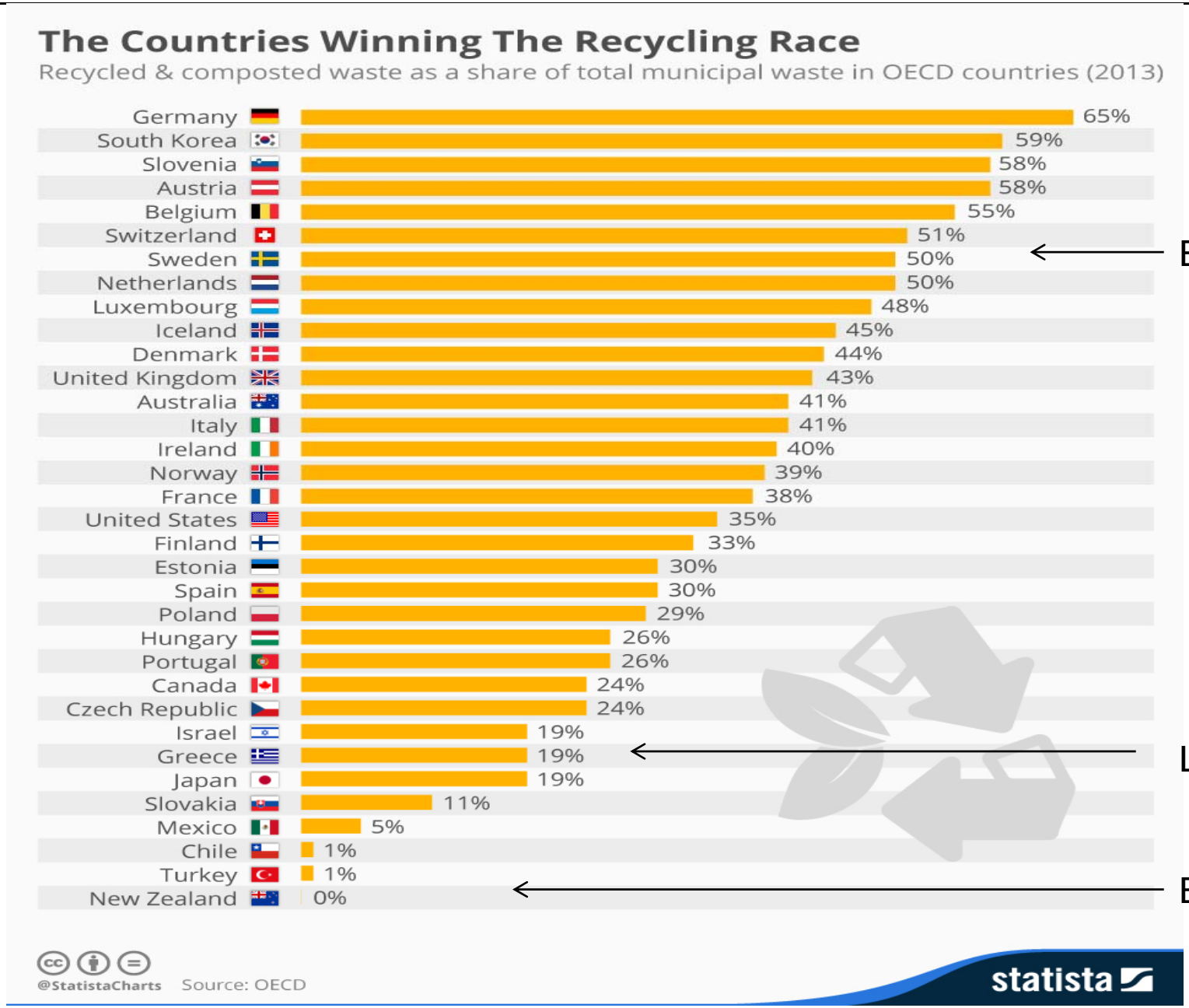
Managing waste was once so simple…..



And 70% of the world still has this model…..

70% of all waste is not recycled or dumped
40% is not even collected
Recycling is still a rich man's game or for the very poor.

A global perspective, OECD



EU target 2020

Low recycling

Bad data

Sustainable waste management is now about….

1. Circular Economy and Bioeconomy
2. Climate change and SLCPs
3. Public health and disease prevention
4. Resource management and security, prevention and product design
5. City decor and personal security
6. Soil fertility and agriculture
7. Energy production and security
8. Creating secure employment and wealth : engaging informal sector
9. Protecting natural environments, such as rivers, lakes, seas, coastlines
10. Tourism and inward investment
11. Funding and taxation, producer responsibility and legislation
12. Public outreach and communications
13. Data management

Concepts of Circular Economy

Minimising inefficiences, maximising opportunities

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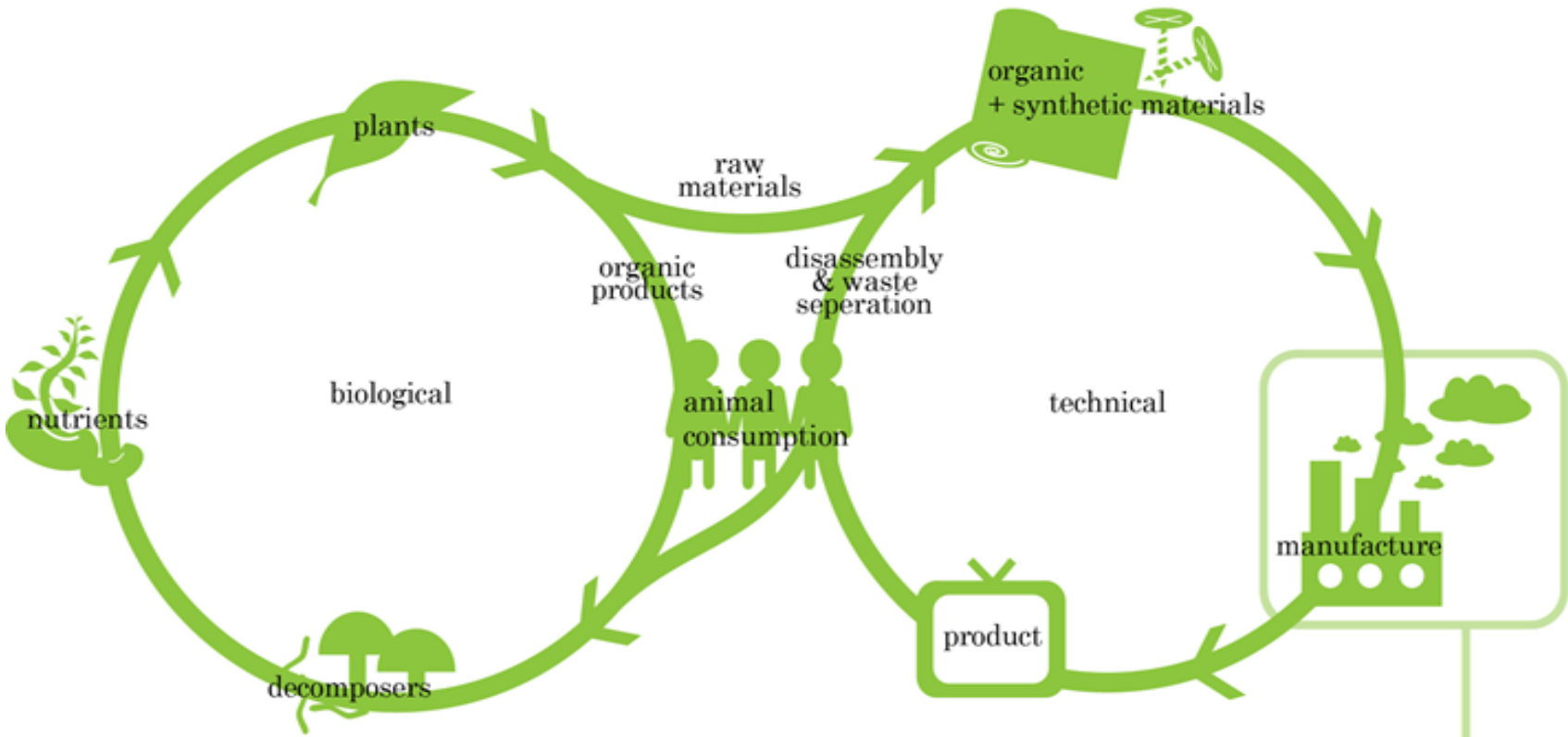
CradletoCradle



5 criteria

1 100% Renewable Energy Use

2 Water Stewardship clean water output

3 Social Responsibility positive impact on community

4 Material Reutilization recyclability / compostability

5 Material Health impact on human & environmental

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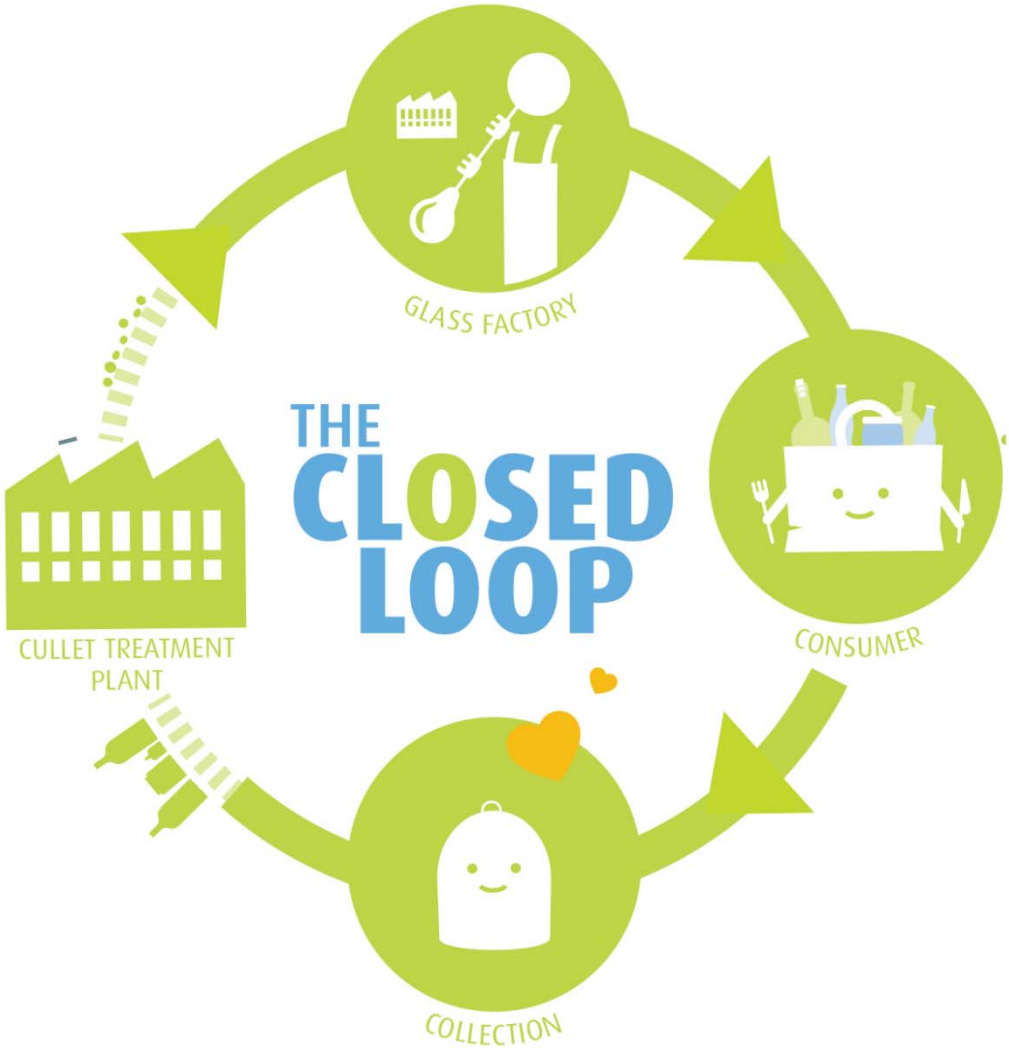
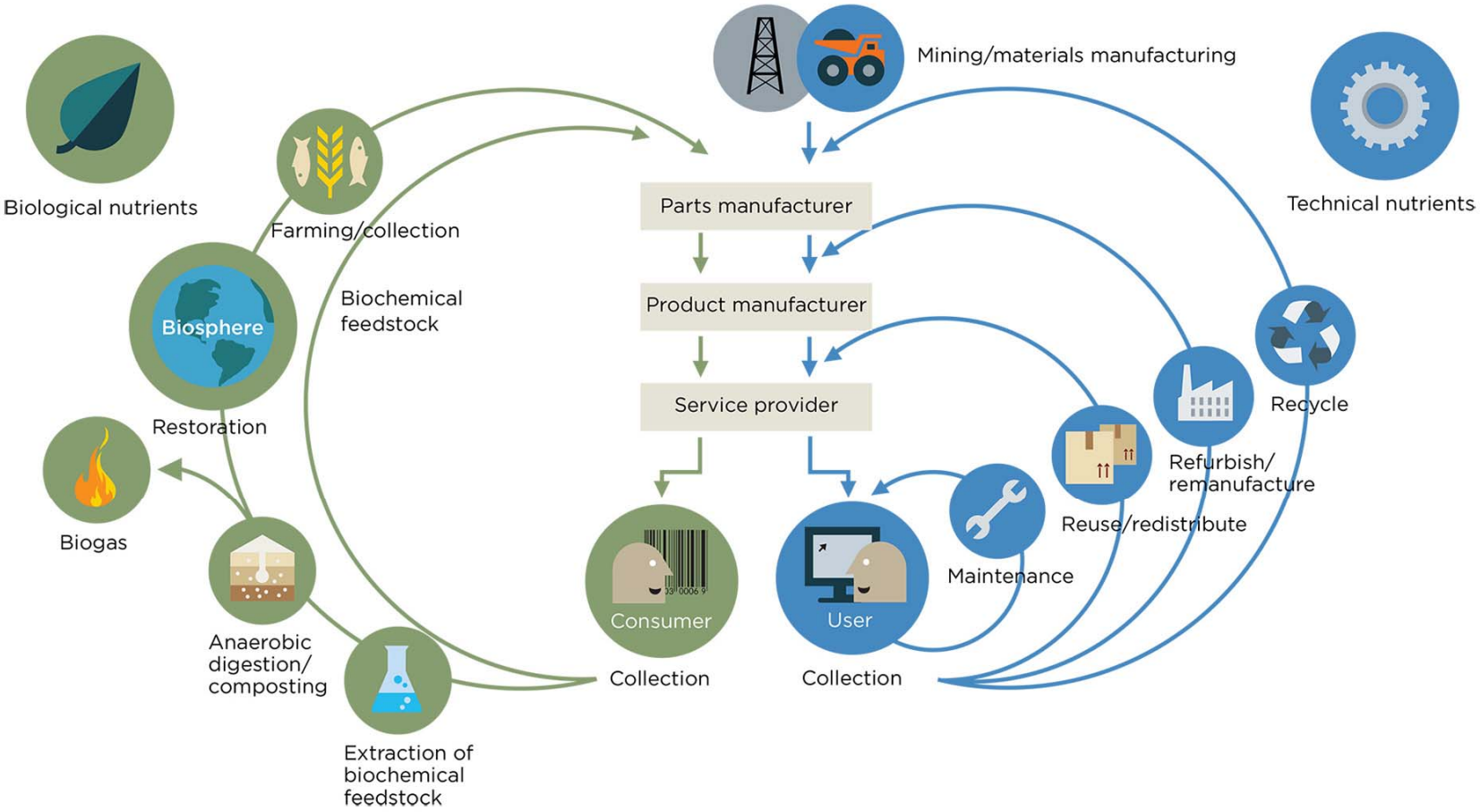
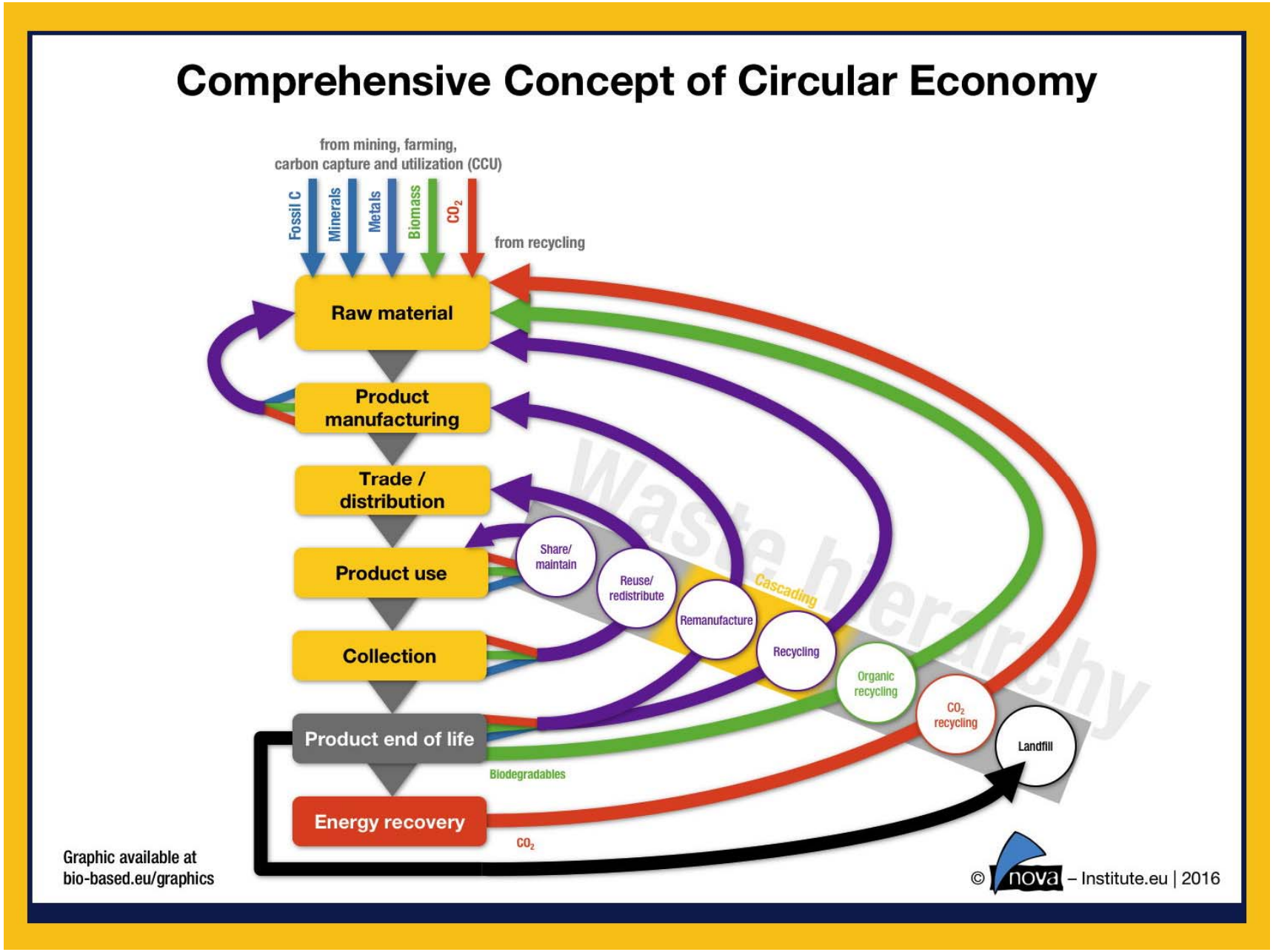


Where does this company sit within the circular economy?




Comprehensive Concept of Circular Economy
from mining, farming,
carbon capture and utilization (CCU)
Fossil C
Minerals
Metals
Biomass
CO_2
from recycling
Raw material
Product manufacturing
Trade / distribution
Product use
Collection
Product end of life
Energy recovery
Share/ maintain
Reuse/ redistribute
Remanufacture
Recycling
Cascading
Organic recycling
CO_2 recycling
Landfill
Biodegradables
CO_2
Waste hierarchy
Graphic available at
bio-based.eu/graphics
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ISWA's take on it

Energy Recovery

http://www.iswa.org/iswa/iswa-groups/task-forces

What the European Commission means by Circular Economy ?

The Circular Economy - a win-win situation:

Savings of €600 billion for EU businesses, equivalent to 8% of their annual turnover

Creation of 580,000 jobs

Reduction of EU carbon emissions by 450 million tons per year

EU, New Waste Directive
What objectives are being proposed ?

- A binding EU target for recycling 65% of municipal waste by 2030 (& 2035);
- A binding EU target for recycling 75% of packaging waste by 2030;
- A binding EU target to reduce landfill to maximum of 10% of all waste by 2030;
- A ban on landfilling of separately collected waste;
- Promotion of economic instruments to discourage landfilling ;
- ***New rules on EPR systems and harmonised implementation with full costs covered***
- Simplified and improved definitions and ***harmonised calculation methods for recycling rates throughout the EU;***
- ***Waste prevention policies*** must be enacted
- Concrete measures to promote re-use and stimulate industrial symbiosis - turning one industry's by-product into another industry's raw material;
- Economic incentives for producers to put greener products on the market and support recovery and recycling schemes (eg for packaging, batteries, electric and electronic equipment, vehicles).

Waste prevention policies must be applied

Sell by dates, an example of how to make waste

What are the known barriers to achieving these objectives ? (as in ISWA's report)

1. FINANCING THE WASTE INDUSTRY

2. REGULATIONS TO SUPPORT MATERIALS MANAGEMENT

3. ***COMMODITY MARKETS AND SECONDARY RAW MATERIALS & ENERGY COSTS***

4. ***DATA AND INFORMATION SERVICES***

5. SKILLS AND RESHAPING MENTALITIES, WORK EXPERIENCES

6. INTERNATIONAL CO-OPERATION IN GLOBAL MARKETPLACES

Crude oil prices 2000- 2016

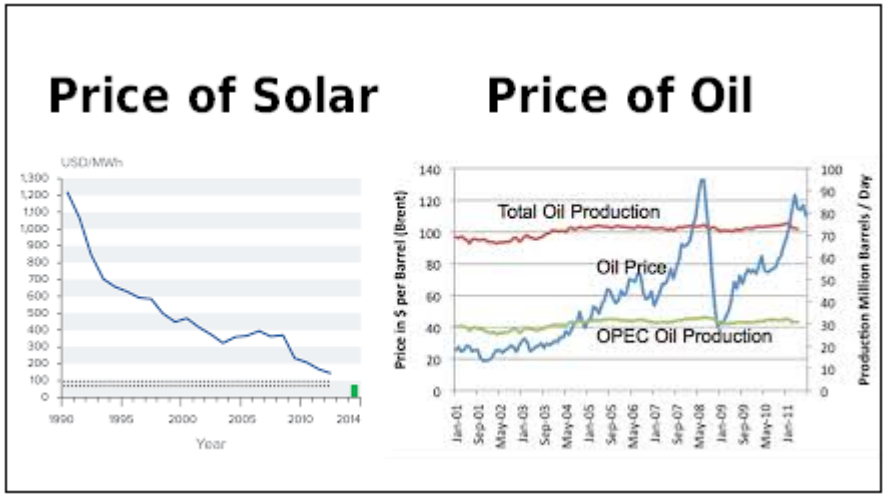

Natural Gas Price
2.14 USD/mmBTU
19 Jan '16
Natural Gas Price (USD/mmBTU)
7
6.5
6
5.5
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
Jan 7
2011
Mar 2
2012
Apr 26
2013
Jun 20
2014
Aug 14
2015
InfoMine.com

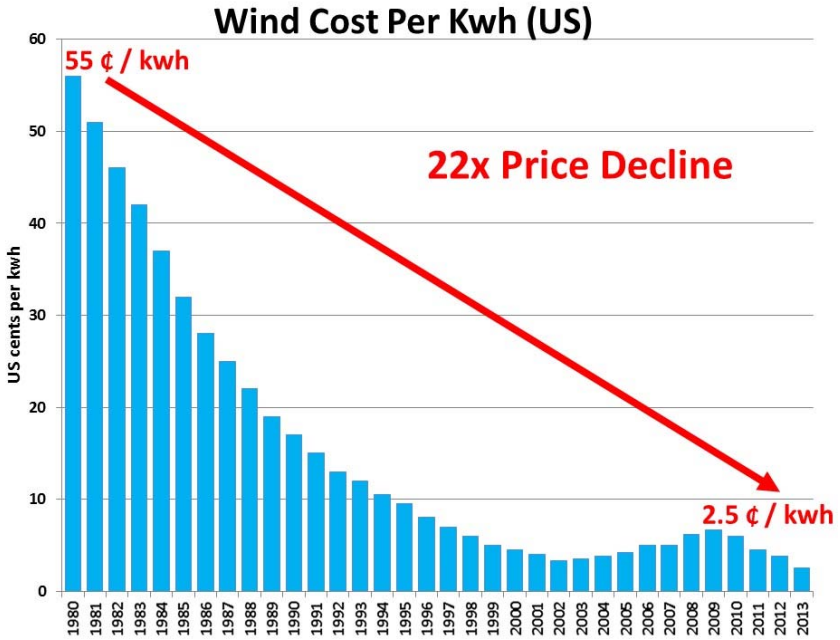
Renewable Energy has kicked in at last

Power Plant Type

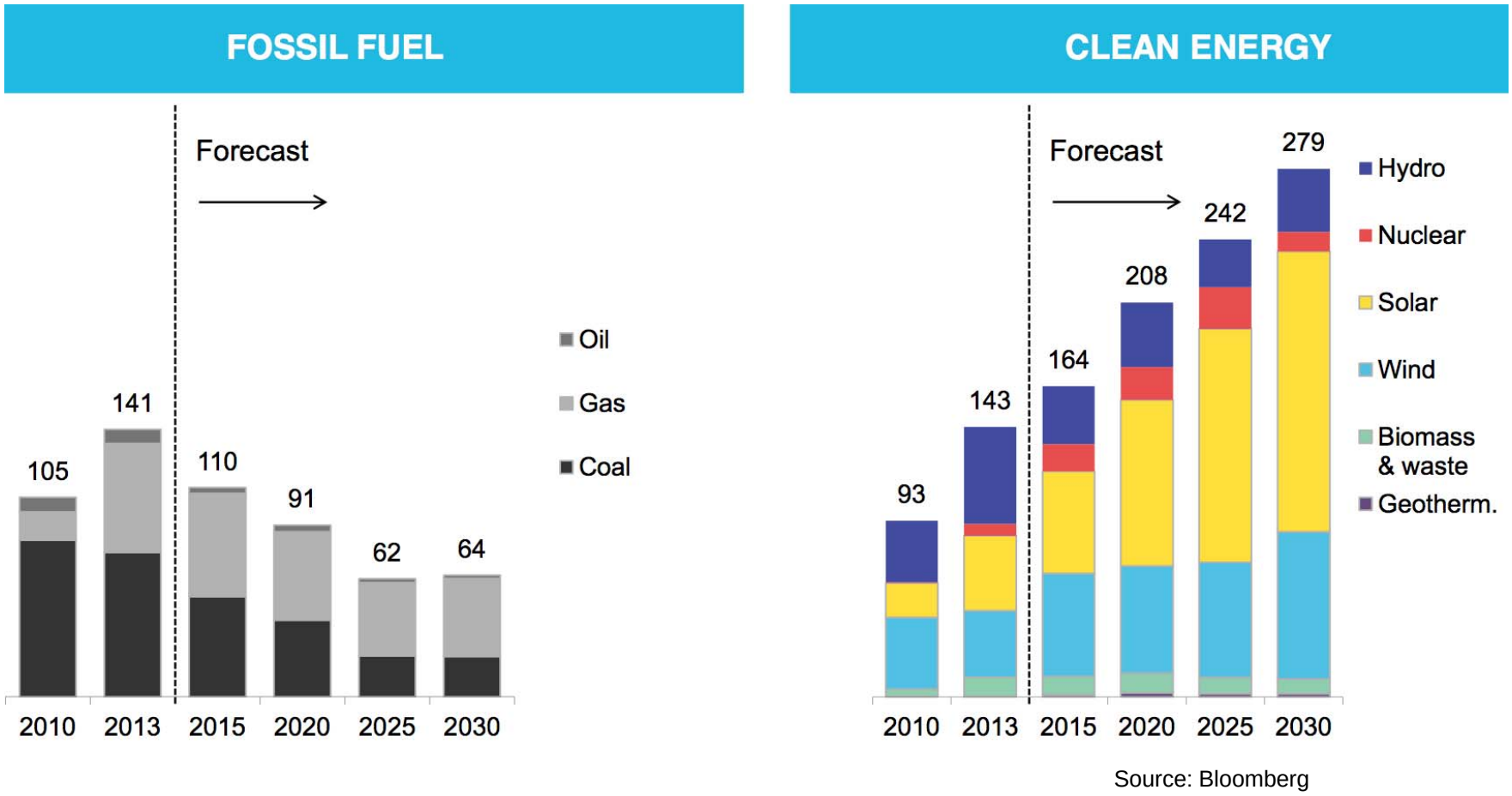
Cost	$/kW-hr
Coal	$0.095-0.15
Natural Gas	$0.07-0.14
Nuclear	$0.095
Wind	$0.07-0.20
Solar PV	$0.125
Solar Thermal	$0.24
Geothermal	$0.05
Biomass	$0.10
Hydro	$0.08

Adapted from US DOE2





The trend is structural

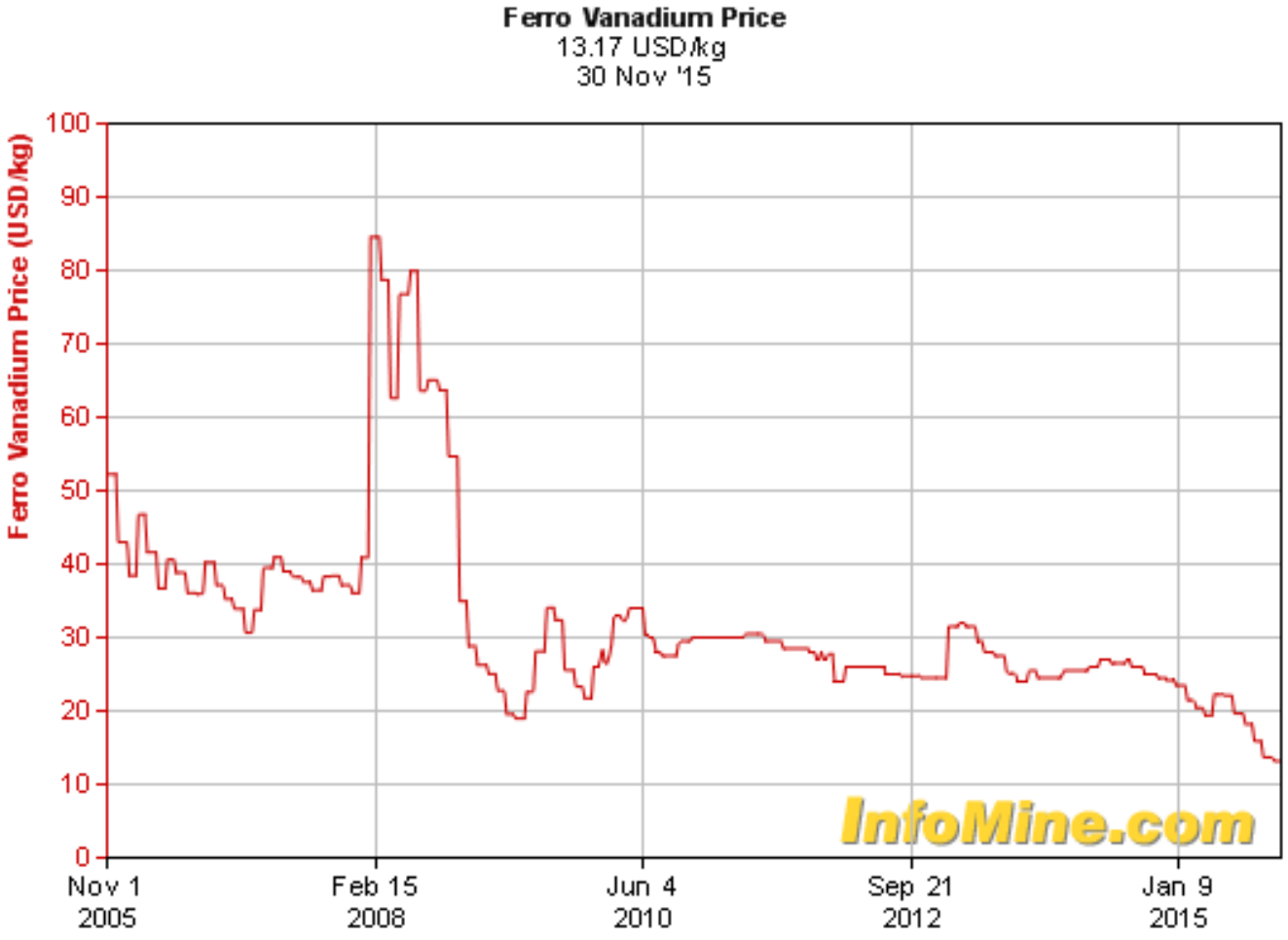


Source: Bloomberg

Which explains why oil prices will not rise much and pressures waste to energy models dependent upon tax breaks

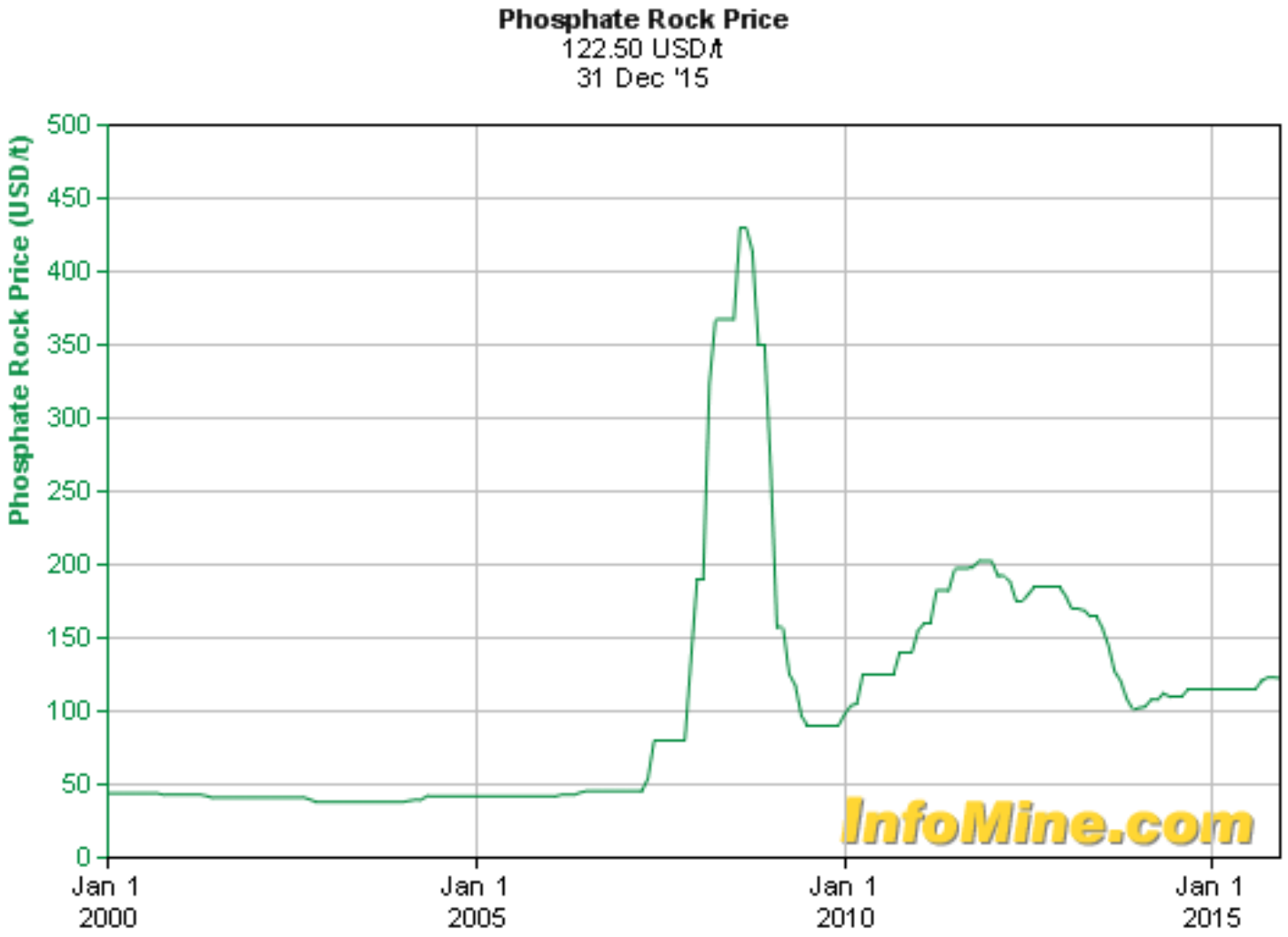
Commodity prices in long term decline

Iron Ore prices 2009-2016

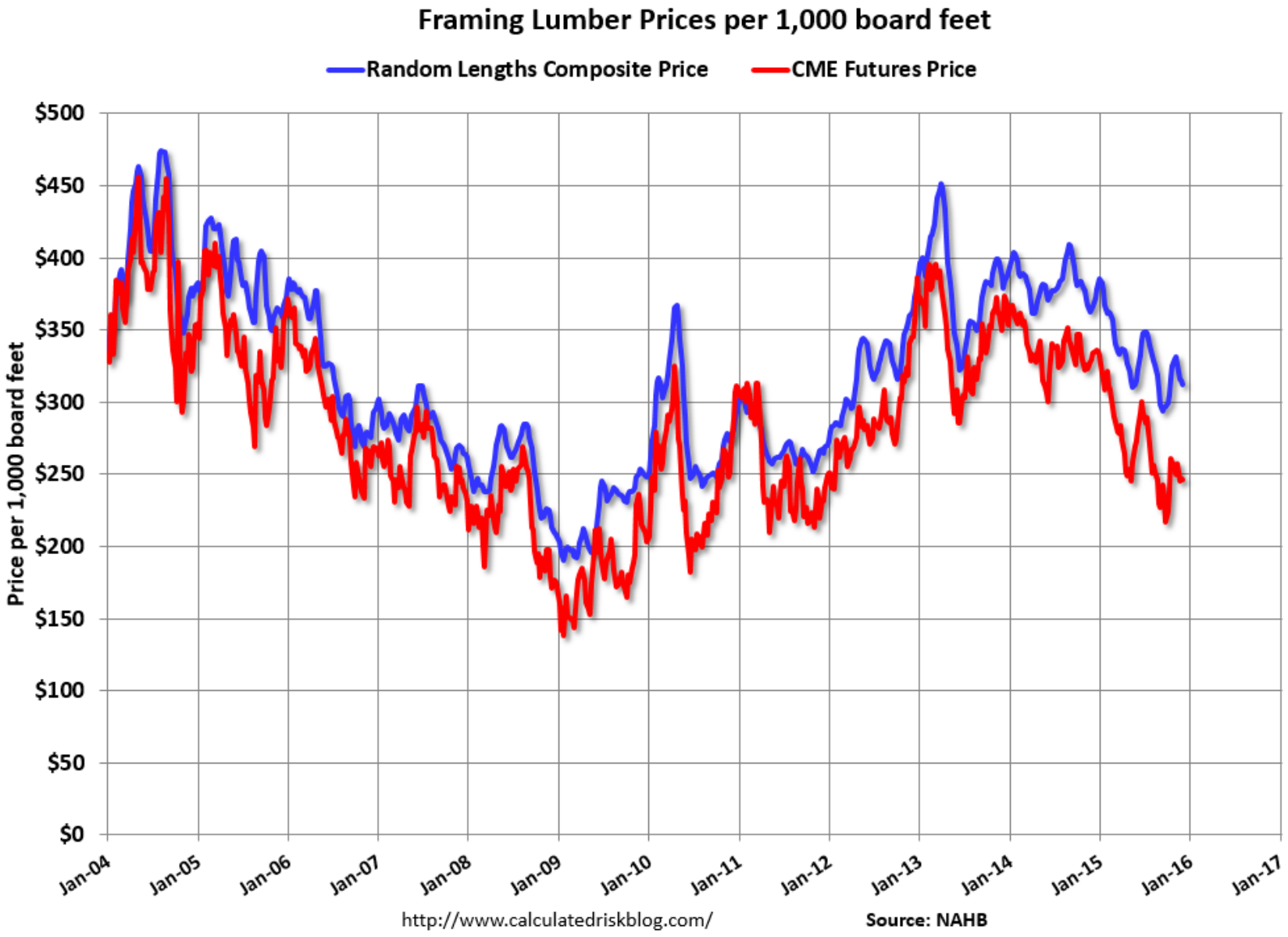

Ferro Vanadium Price
13.17 USD/kg
30 Nov '15
Ferro Vanadium Price (USD/kg)
100
90
80
70
60
50
40
30
20
10
0
Nov 1
2005
Feb 15
2008
Jun 4
2010
Sep 21
2012
Jan 9
2015
InfoMine.com


Aluminum Price
0.68 USD/lb
11 Feb '16
Aluminum Price (USD/lb)
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
Jan 3
1989
Jan 1
1994
Jan 1
1999
Jan 1
2004
Jan 1
2009
Jan 2
2014
InfoMine.com

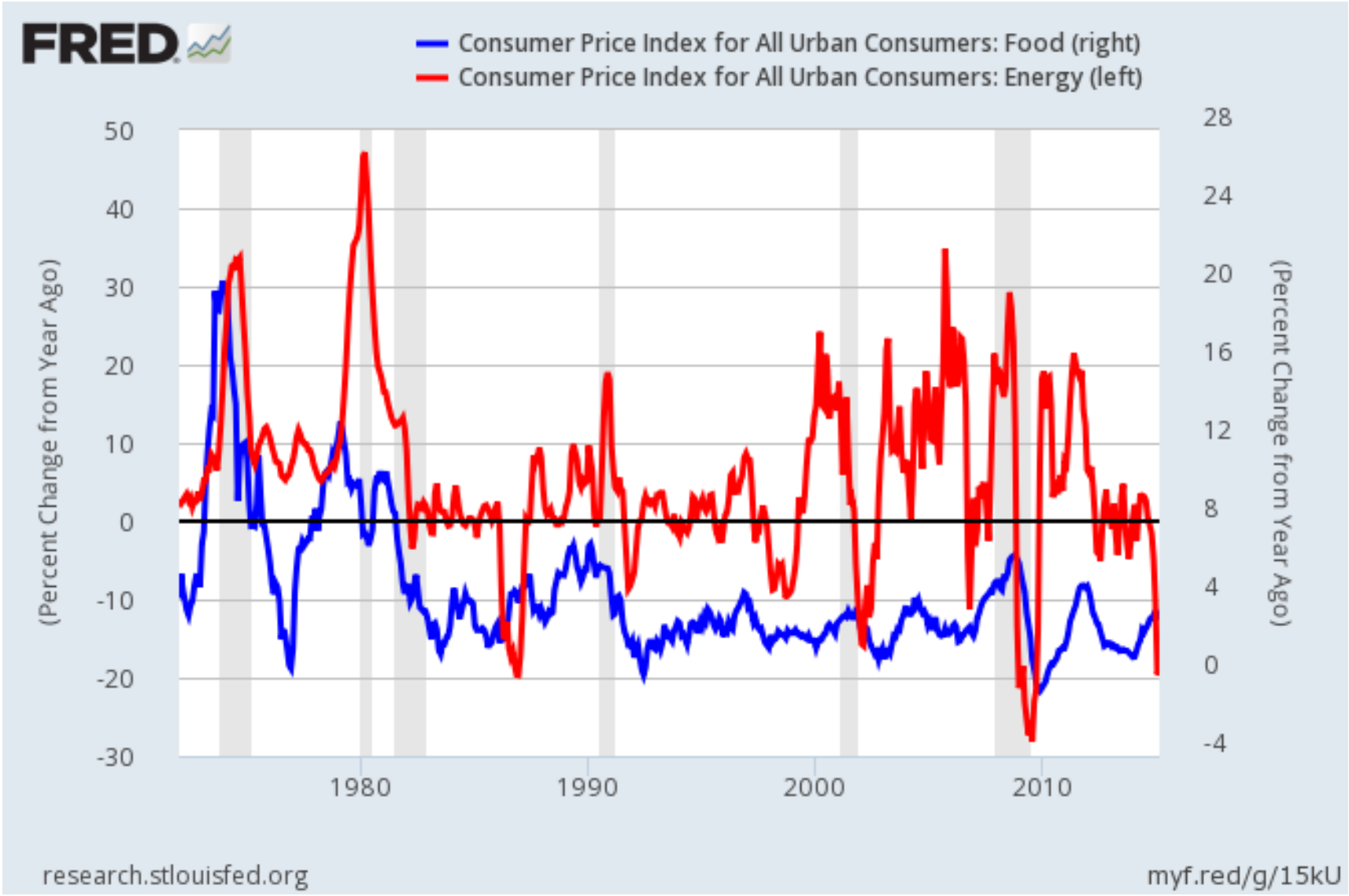
And known reserves of copper are due to be depleted in 30 years time…….



Phosphate rock, a finite resource in our lifetimes……


Framing Lumber Prices per 1,000 board feet
Random Lengths Composite Price
CME Futures Price
Price per 1,000 board feet
$500
$450
$400
$350
$300
$250
$200
$150
$100
$50
$0
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
http://www.calculatedriskblog.com/
Source: NAHB

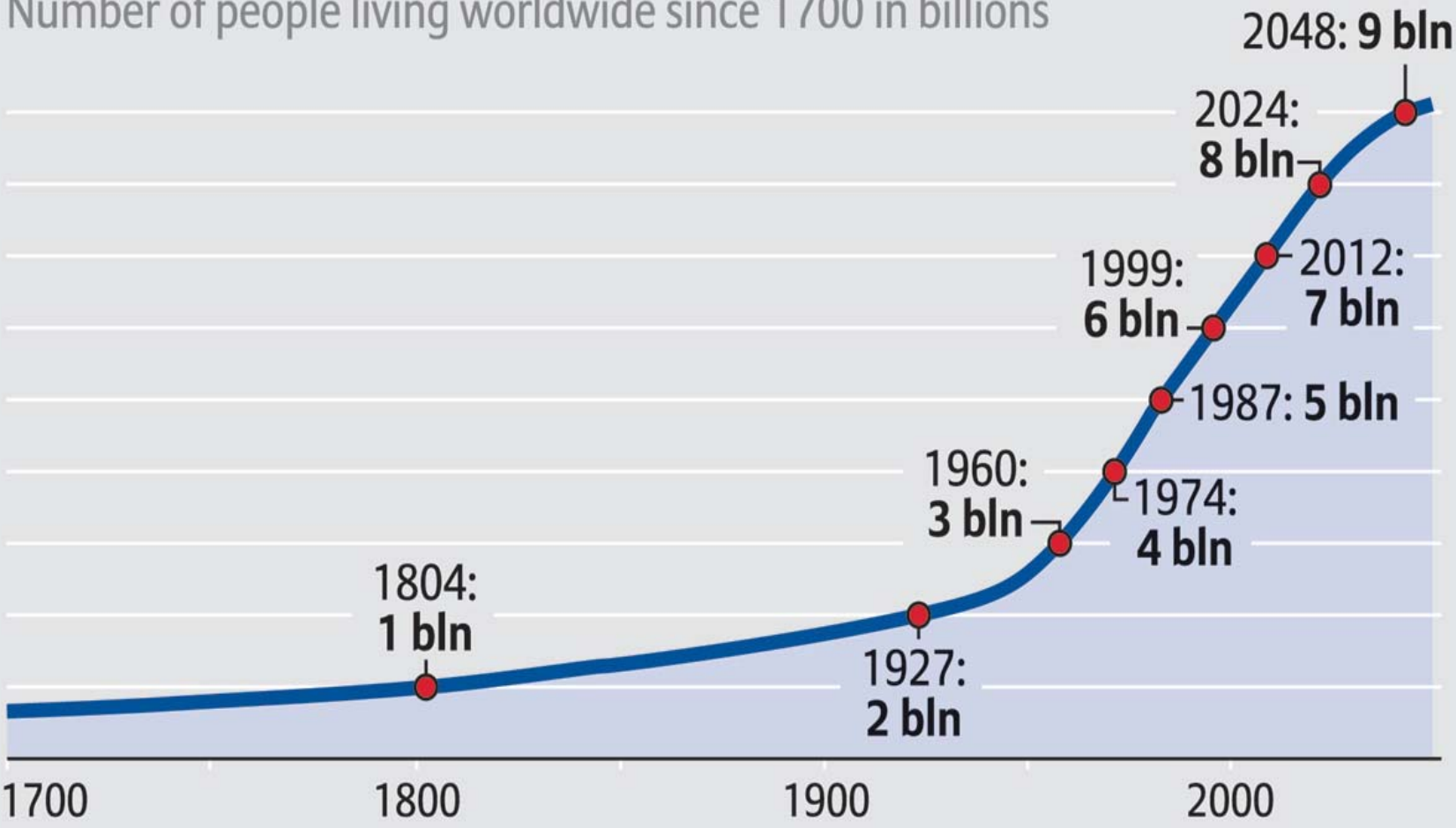
Food price inflation runs at 2.6% p.a. average since 1975



POPULATION OF THE EARTH

Allianz

Number of people living worldwide since 1700 in billions



Source: United Nations World Population Prospects, Deutsche Stiftung Weltbevölkerung

For further information please visit: www.knowledge.allianz.com

Conclusions ?

- There is no market perception of raw material shortages- how long will this last ?
- Population growth of 3 billion people since 1975, food prices raised with inflation
- So what is driving material costs down ? Is recycling contributing ?
- Were we all blinded by the Chinese raw materials grab ?
- Have we returned to a new reality ? Or is this just a decade of pause to the next price explosion ?
- Is there a new industrial reality to study here ? Increased efficiencies etc
- How can you build recycling models on such volatile and negative price trends ?

What are the unknown barriers ? (according to Chairman Newman)

There are known knowns. These are things we know that we know. There are known unknowns. That is to say, there are things that we know we don't know. But there are also unknown unknowns. There are things we don't know we don't know. (Donald Rumsfeld)

1. New materials

2. Internet, data management and changing consumption patterns

3. Demographics

New materials entering the waste streams

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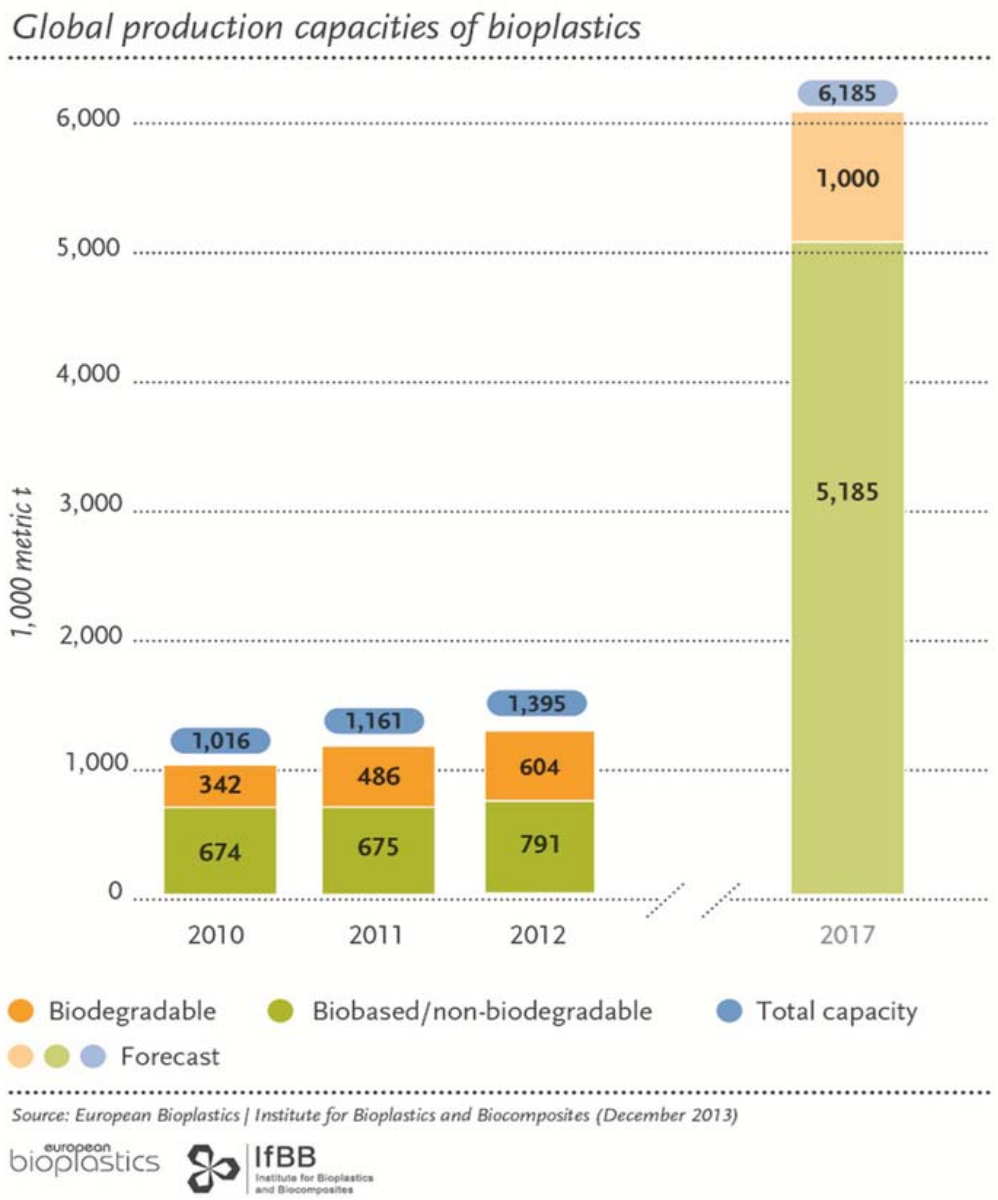
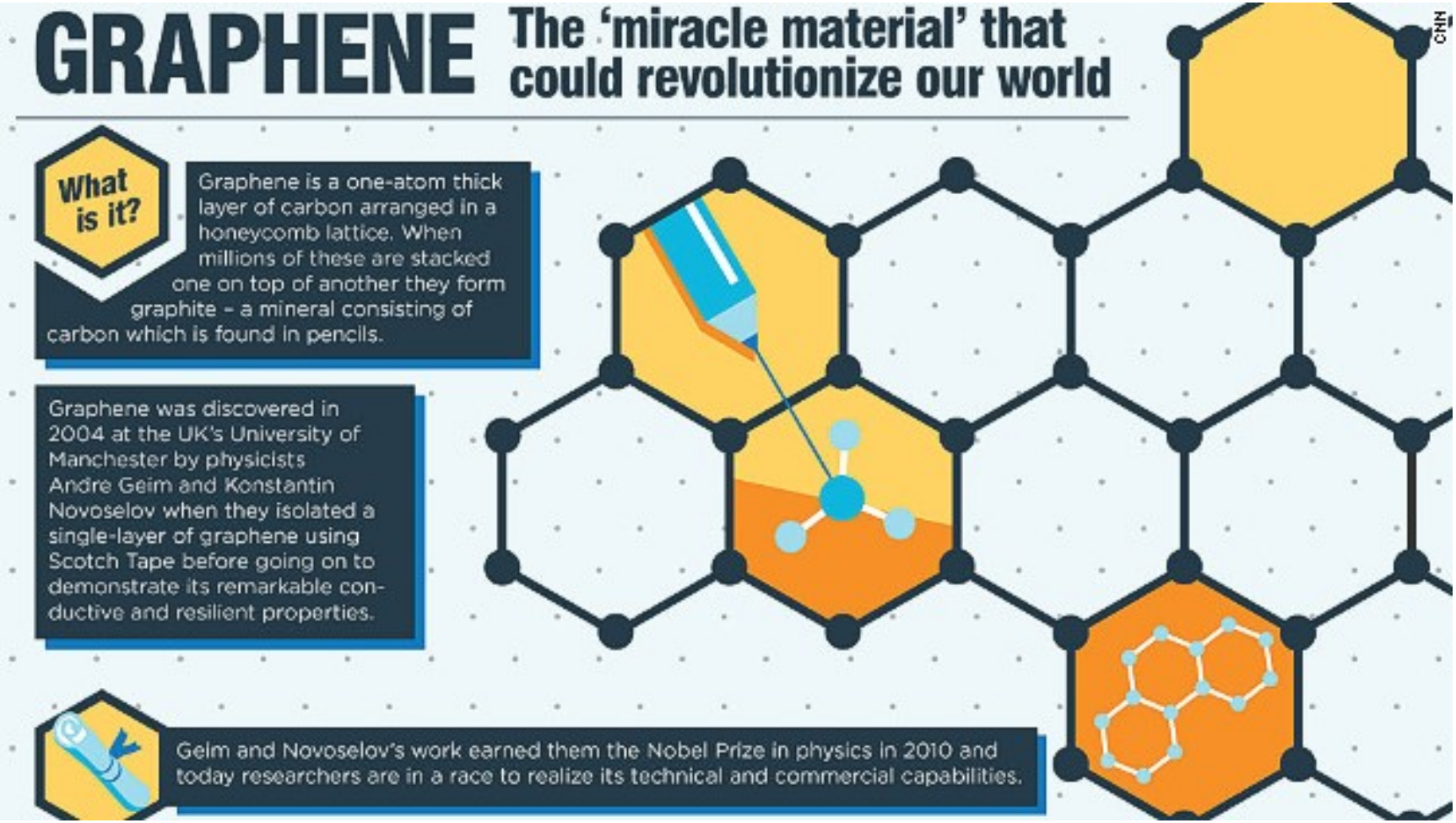
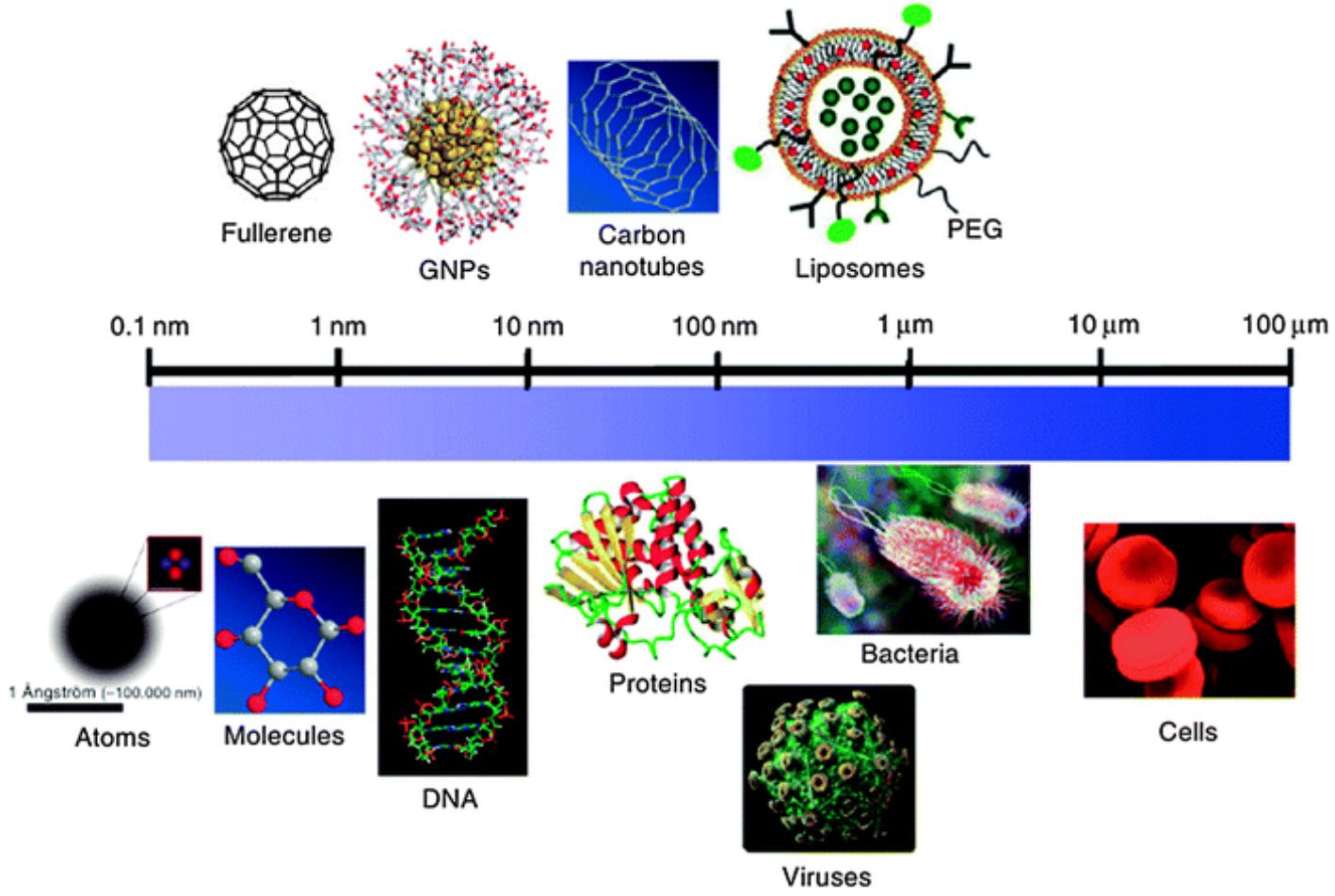
Carbon fibre products

Bioplastics and biobased materials




GRAPHENE
The 'miracle material' that could revolutionize our world
CNN
What is it?
Graphene is a one-atom thick layer of carbon arranged in a honeycomb lattice. When millions of these are stacked one on top of another they form graphite – a mineral consisting of carbon which is found in pencils.
Graphene was discovered in 2004 at the UK's University of Manchester by physicists Andre Geim and Konstantin Novoselov when they isolated a single-layer of graphene using Scotch Tape before going on to demonstrate its remarkable conductive and resilient properties.
Geim and Novoselov's work earned them the Nobel Prize in physics in 2010 and today researchers are in a race to realize its technical and commercial capabilities.

Nanoparticles



Nanomaterials in Waste Streams
Current Knowledge on Risks and Impacts

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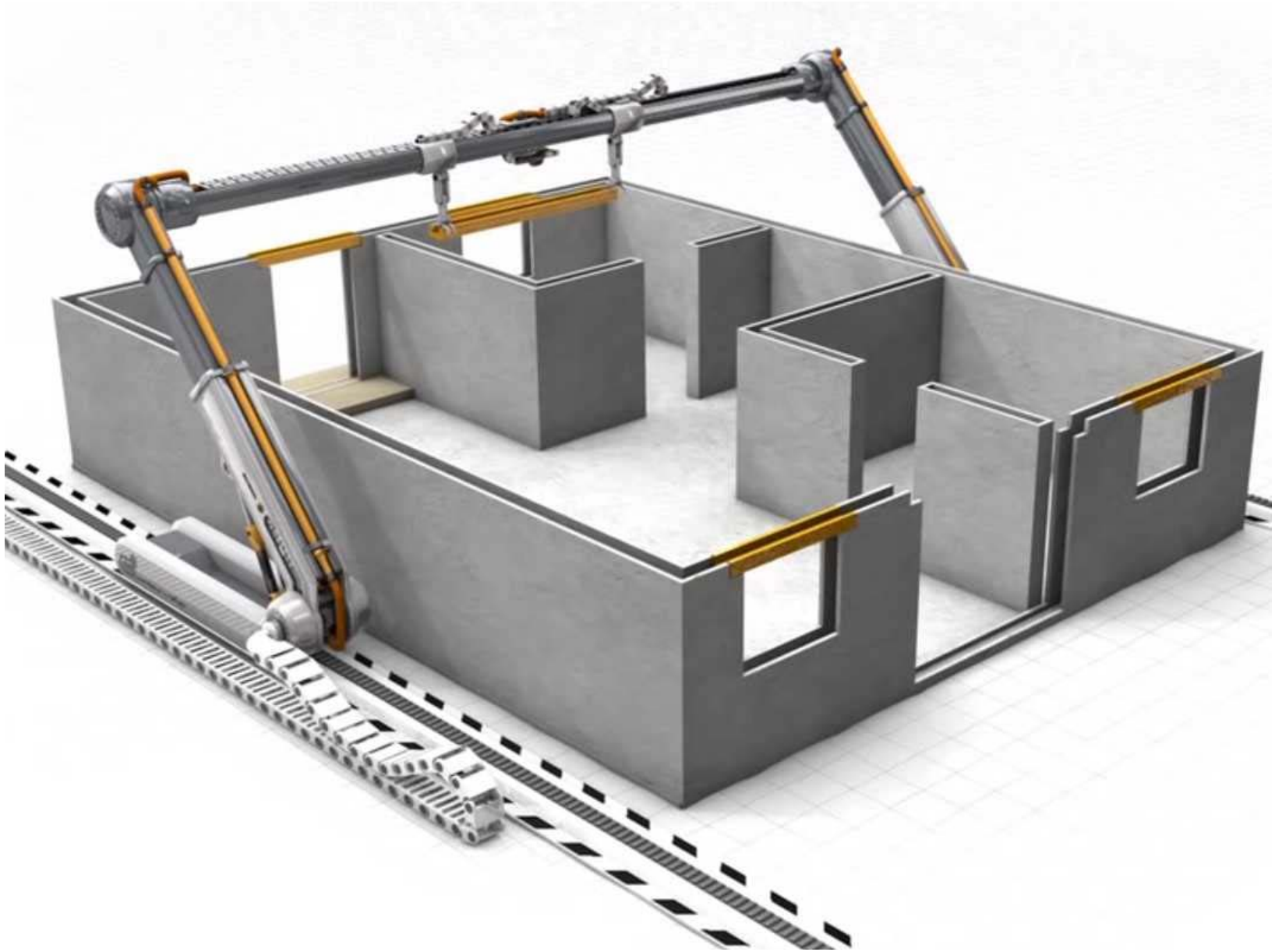
Printing a house in 24 hours



Internet and mobile readers change consumption patterns

Goodbye to

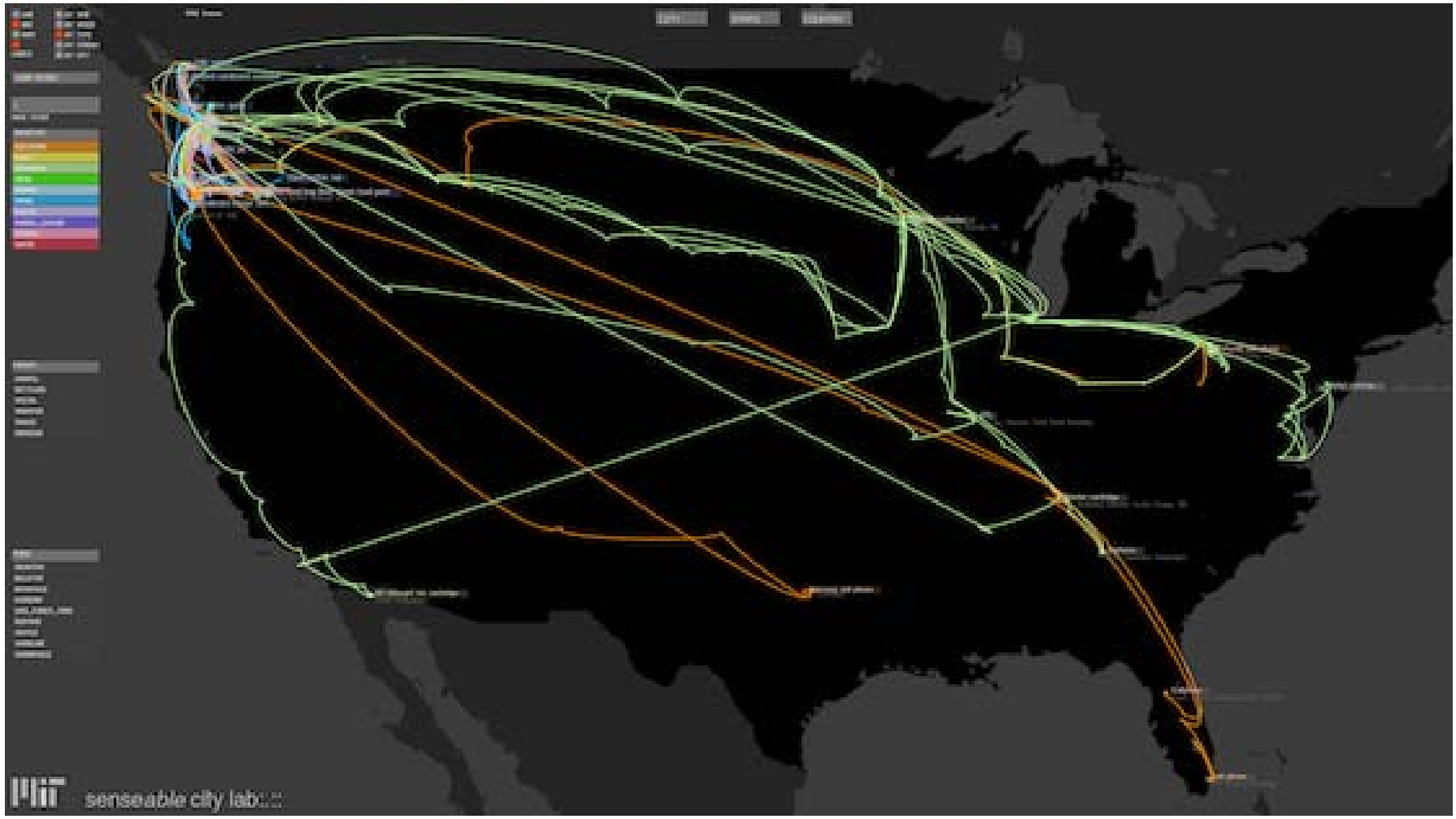
Newsprint and printed paper, shopping malls, driving, cameras, photo albums, maps, telephone books, encyclopedias, fixed phones, privacy

Hello to

Shared cars, homes, photos, home deliveries, more flying, more packaging, teleconferences, shared office space, less privacy.

Is the waste industry ready for these new scenarios, materials and patterns ?
We were not ready for the massive amounts of WEEE

Data management and Robotics



Volvo, pioneering robotic collection systems

Data management

Data flows are enormous and increasing

Managing data, understanding it, interpreting data to improve performance, avoid crises

Data will help authorities understand material flows

Data will help us understand our CO2 performance, increase collection efficiency, improve proximity, improve access to markets for secondary materials, increase recycling, involve the consumers and public

We need the data instruments to make this happen that are comprehensible to our systems and management

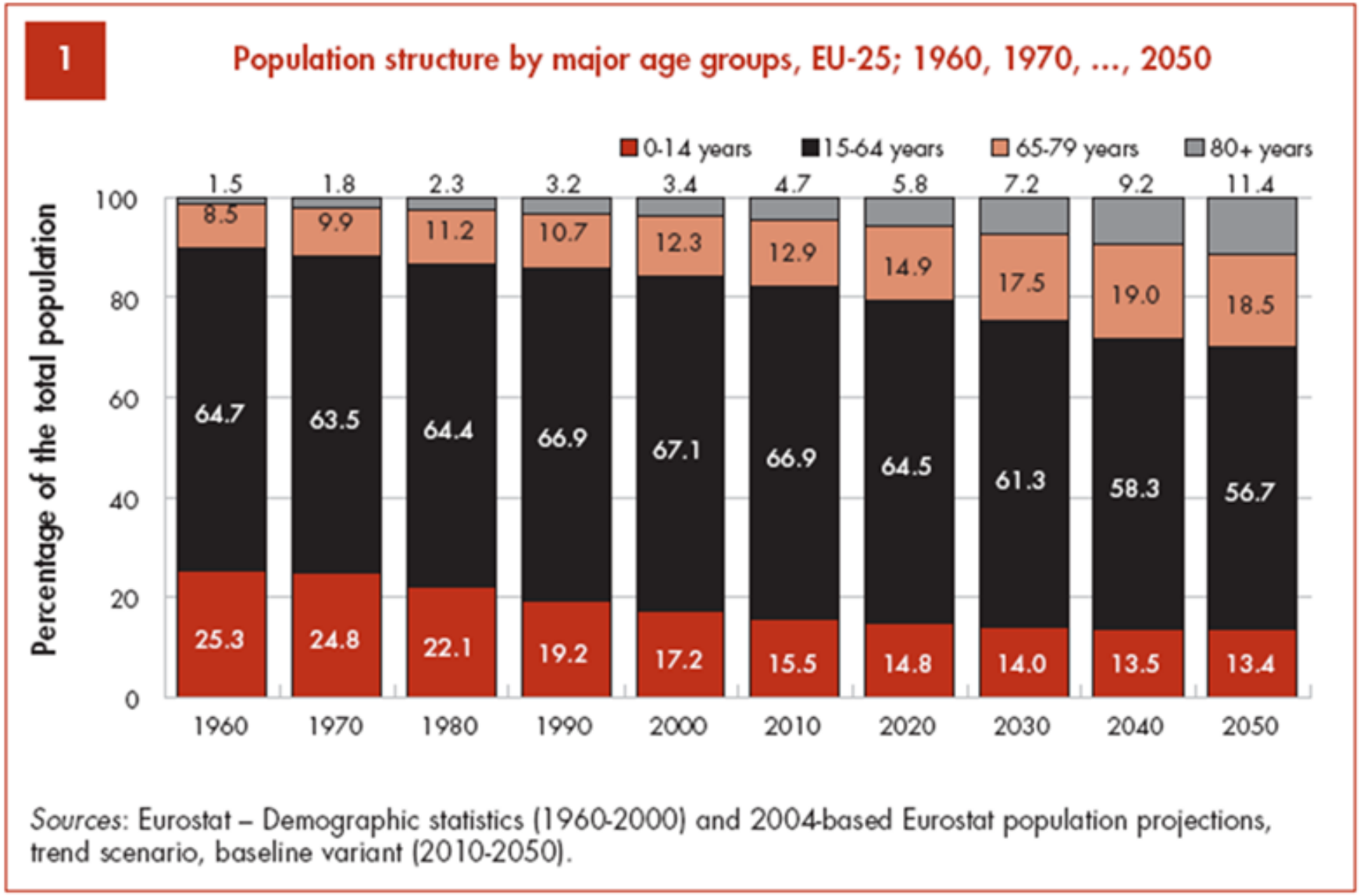
Data is a new frontier of waste management

Lessons ?

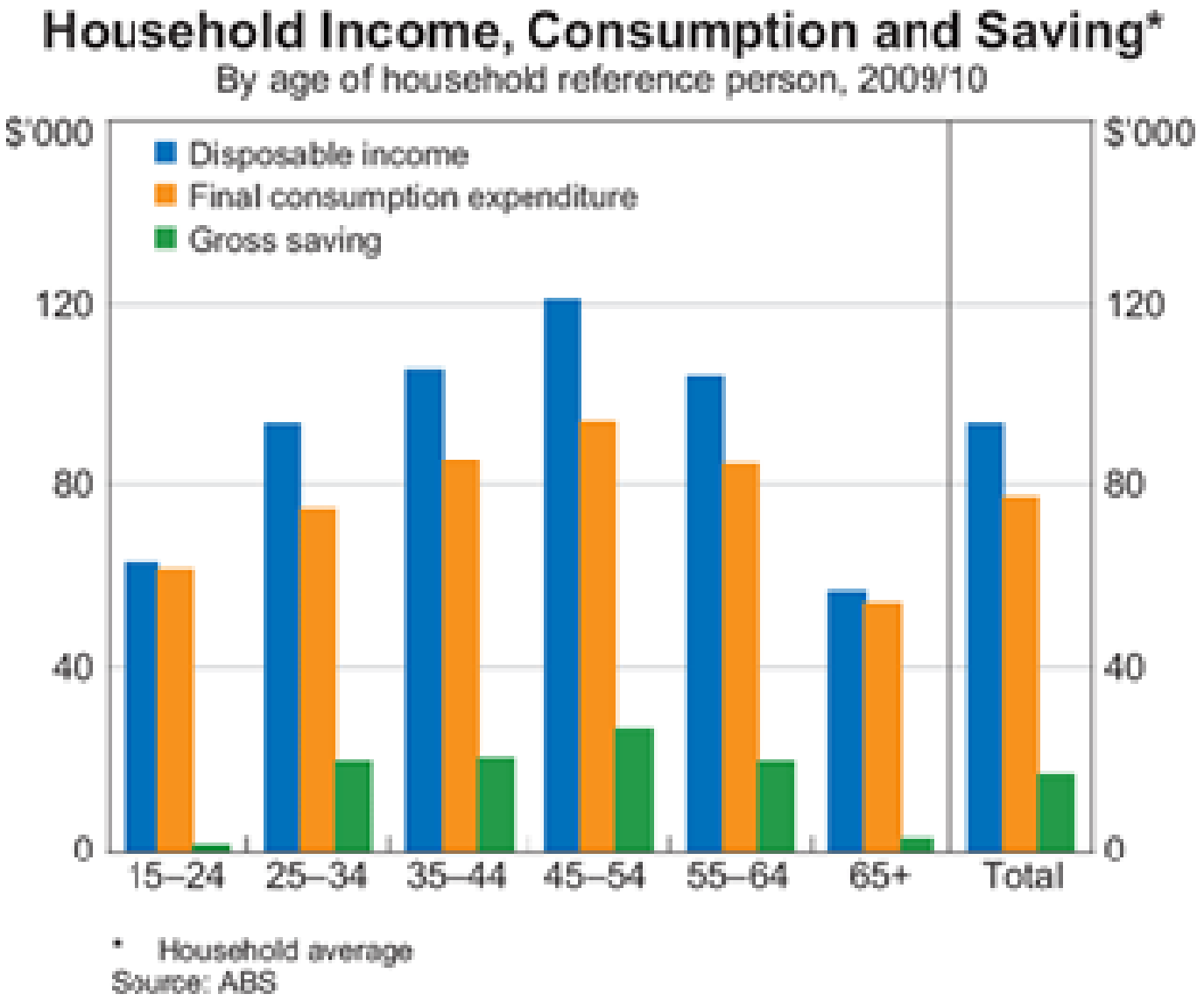
1. Technological change is now happening very fast
2. International intellectual collaboration is now the rule
3. Waste industry management models are becoming obsolete
4. New materials are not yet considered by our industry
5. We need dialogue with industry about recycling these materials
6. Quality collection and separation will be the new norm
7. Your business needs an international perspective if you want to survive

European population is ageing quickly

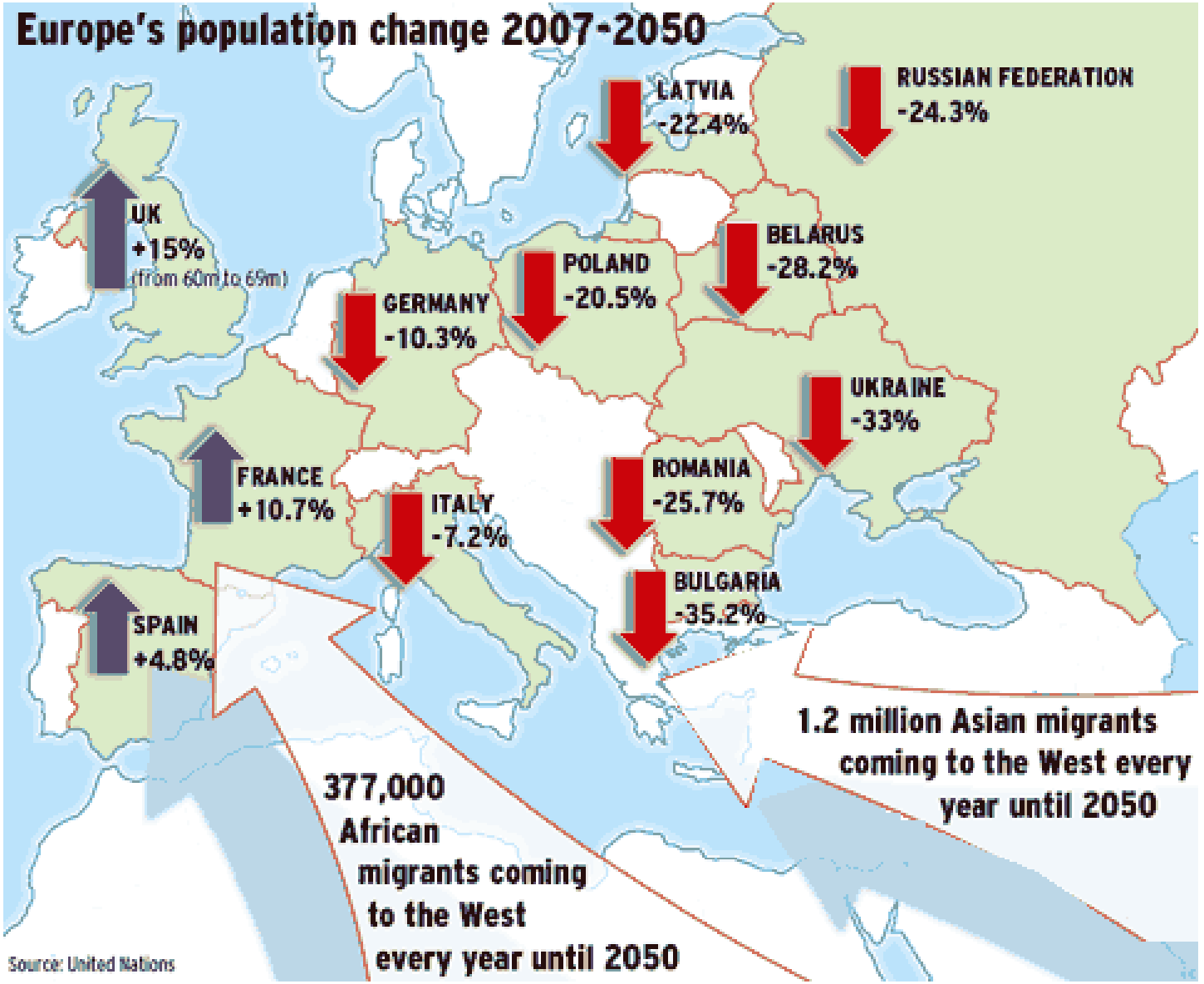
By 2050 about 30% of the EU population will be over 65 years of age (10% in 1960)



POPULATION – AGEING AND CONSUMING LESS



Eastern populations falling and ageing fast



Lessons ?

- Population mobility has improved
- Immigration and migration are the new norm
- Many EU countries are not attractive to migrants
- They will face long term, critical population decline
- With falling and ageing populations, they will face economic decline
- Waste volumes will remain static then fall
- How can you build an investment model on a declining marketplace ?

What is missing ?

- Where are the FMCG multinationals in the debate on producer responsibility ?
- Why no rules on the organic waste collection ?
- The targets require investments, ie taxes which are a national not a EU prerogative and very unpopular.
- Where are trade treaties on design for recycling and passing costs to producers ?
- The targets are long term : long term is good for industry

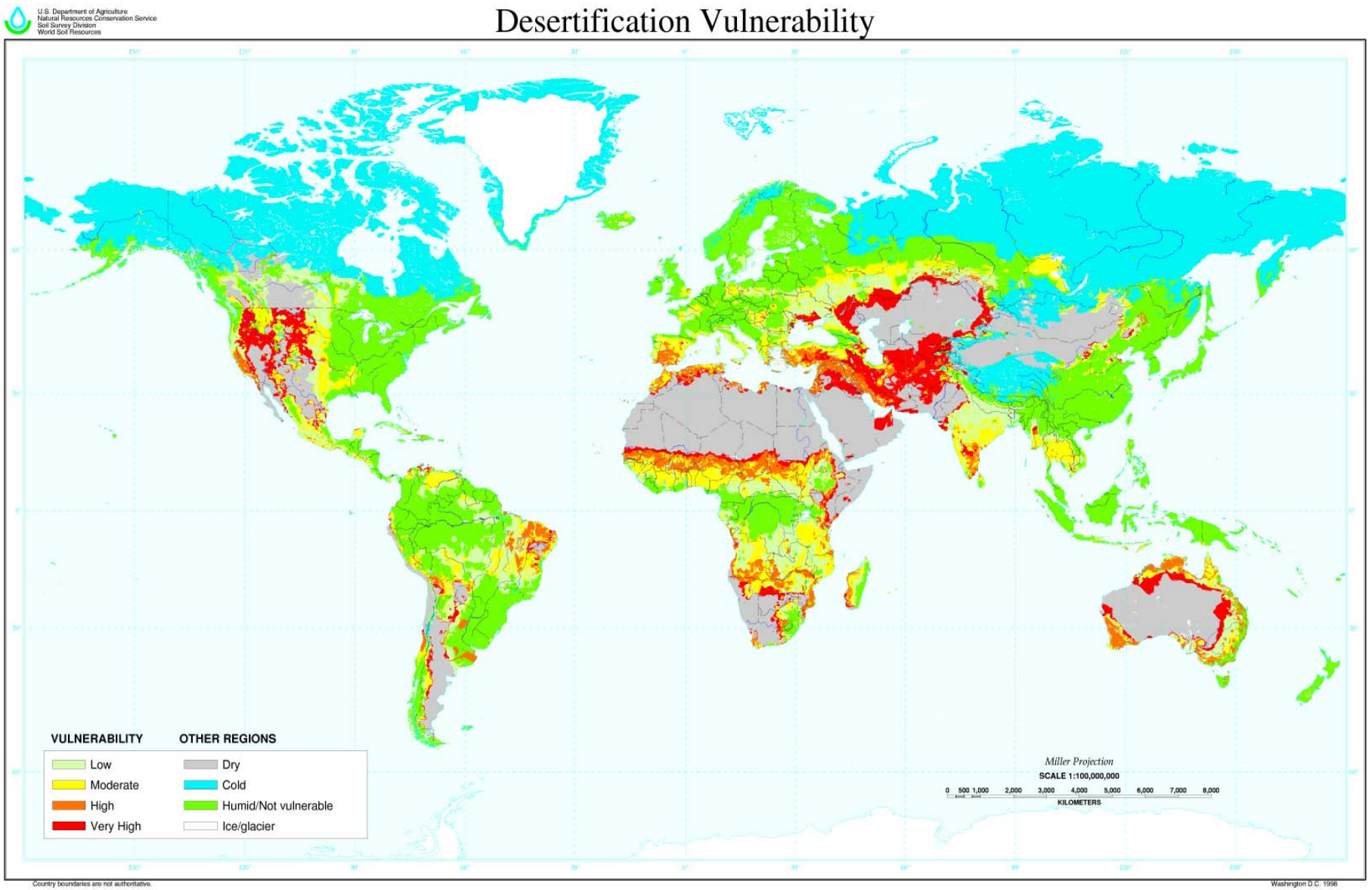
BUT

- Long term is also good for lazy politicians
- How will increased recycling levels play out on global markets ? Commodity markets are in long term decline; a return to EFW and landfill ?
- We still have to keep the streets clean, let's not get distracted too much.

The critical importance of organics

We’ve all got to move fast on recovering organic carbon to soil

Here's one good reason why



Soil degradation

- 80% of the world's agricultural land suffers moderate to severe erosion
- 10 million ha of agricultural land are lost through soil erosion every year (~0.7%)
- Over last 40 years ~30% of world's cropland has become unproductive

Source: Pimentell, D. & Burgess, M. (2013) Soil Erosion Threatens Food Production. *Agriculture* **3**, 443-463

Why we need the CEP to succeed

1. The CEP is essential to meeting GHG emission reduction targets

(SLCPs play a vital role and waste management is key to abating them)

The real low hanging fruit is in organic waste treatment and soil recovery is the stimulus

2. CEP drives the waste industry towards greater investments, more turnover, more jobs and profitability

3. CEP drives the waste industry into new relationships with design, FMCG companies, industrial giants.

4. CEP makes landfill redundant and increases material and energy recovery

BUT

The CEP needs regulations, investment models, collective, international action to succeed

The CEP will fail without financial support and creation of viable markets for material recycling. Many nations will struggle to achieve the targets

Conclusions and predictions

The future of waste management is complicated beyond the CEP

Rapid technological change is changing all major industries, why not waste too ?

Our ability to think globally, embrace change, is often missing

We are influenced by factors beyond our control, like demographics and technology

Yet

Waste industry can play a key role as a resource supplier to industries

Technological change can help us achieve greater efficiencies

We will succeed as companies if our strategy is quality oriented

We will succeed if we cooperate, merge, unite our forces, think globally

The future inevitably means consolidation to have the critical mass to deal with new challenges

Read and download the ISWA Task Force reports on Resource Management and the GWMO from the ISWA Website

- www.iswa.org
- http://www.iswa.org/iswa/iswa-groups/task-forces
- https://www.iswa.org/fileadmin/galleries/Publications/ISWA_Reports/GWMO_summary_web.pdf

ISWA Annual Conference in neighbouring Serbia www.iswa.2016.org

Read the ISWA blogs and consult the Knowledge Base, they're free

And join ISWA now !

Thank you

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