Natural Resources Utilization, Sustainability and Development in Guyana: Mutually Exclusive?

Suresh S. Narine

Outline

- Carbon: The fulcrum of our World
- Major Resource Challenges in the World
- FOOD
- CLIMATE CHANGE
- Caribbean Context
- Resource-Driven Opportunities for Economic Growth and Development
- Exploitation of Natural Resources: a launchpad for Sustainable Growth an Development that must be managed with skill
- Governance, Investment, Corruption
- Technology and Regional Opportunities
- The Future is BRIGHT

We live in interesting times…

CNN.com Dow's wild ride Bloomberg.com
Vertigo on Wall Street
World markets topple after U.S. fall
Bush Just Makes It Worse
washingtonpost.com
Fear-Driven Selling Punishes Markets
A Day of Wild Swings for U.S. Markets
The New York Times
THE WORST WEEK DRUDGE REPORT
Stocks Lower After Day of Wild Swings
Wall St. Caps One of Its Worst Weeks Mixed
Economist
Off a cliff
U.S. Proceeds With Plan for Equity Stakes in Banks
Dow Jones Industrial Average
Volume: 674.92M Change: -128.00
8,800 8,600 8,400 8,200 8,000 7,800
10 11 12 1 2 3
4:09 PM ET 10/10/2008 © BigCharts
When fortune frowned
abc NEWS
Treasury chief: U.S. working on plan to invest in banks
Worst Week on Wall Street Ends Down
• G-7 Pledges to Take `All Necessary Steps' to Stem Global Financial Crisis
HITTING HOME | THE ECONOMIC SQUEEZE

THE INDEPENDENT
Blair vs The Independent
OUR READERS ANSWER BACK – A LETTERS SPECIAL, IN EXTRA
Scientists challenge major review of global reserves and warn that supplies will start to run out in four years' time
A WORLD WITHOUT OIL
What oil nations say they have left
FULL REPORT, PAGE 2

The New Economics of Hunger
A brutal convergence of events has hit an unprepared global market, and grain prices are sky high. The world's poor suffer most.

By Anthony Faiola
Washington Post Staff Writer
Sunday, April 27, 2008; Page A01

The globe's worst food crisis in a generation emerged as a blip on the big boards and computer screens of America's great grain exchanges. At first, it seemed like little more than a bout of bad weather.

THIS STORY
The New Economics of Hunger
HOW TO HELP
HUNGER PANGS: A Full Plate Today, Uncertainty Tomorrow
View All Items in This Story

In Chicago, Minneapolis and Kansas City, traders watched from the pits early last summer as wheat

GALLERY

Food: The New Gold
For the 1 billion people living on less than a dollar a day, the world's worst food crisis in a generation is a matter of survival.
» LAUNCH PHOTO GALLERY

Magna unit to close two plants, 850 jobs cut
Wed Nov 26, 2008 12:52pm EST
Email | Print | Share | Reprints | Single Page | Recommend (0) [-] Text [+]

MARKET NEWS
World stocks hit 2-week highs | Video
Oil falls towards $53 as demand worries weigh | Video
Gold firms on weak dollar as U.S. holiday mutes trade

TORONTO, Nov 26 (Reuters) - A subsidiary of Canadian auto-parts maker Magna International Inc (MGa.TO: Quote, Profile, Research, Stock Buzz) said on Wednesday it plans to close its two Ontario plants and consolidate its operations with other facilities, cutting about 850 jobs.

Exterion, which makes plastic fenders, body panels, and decorative trim, said it would eventually shut its operations in Newmarket and Aurora, Ontario.

Annual Carbon Exchange in Plants

Photosynthesis

100 – 120 Giga Tons of Carbon

Plant Respiration

40 – 50 Giga Tons of Carbon

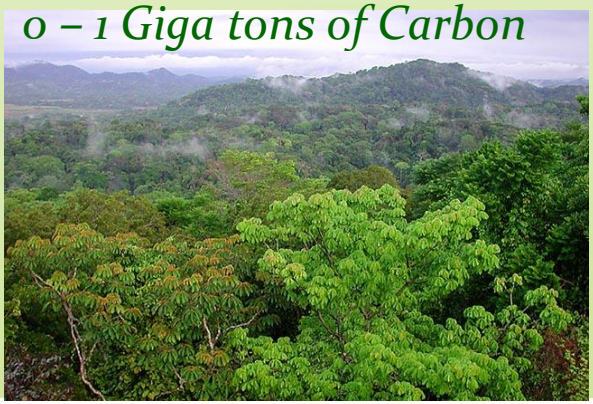
Decay of Residues

50 – 60 Giga Tons of Carbon

Biomass Carbon Sink

Soil Carbon Sink

0 – 1 Giga tons of Carbon



Annual Carbon Release from Fossil Fuels

Biomass Carbon Sink
Soil Carbon Sink

Fossil Fuel, Cement, And land use change

6 Giga Tons of Carbon/yr

0 – 1 Giga tons of Carbon/yr








Fossil Pool, Rocks, Soil, Deep Ocean, Reactive Sediments

500 Million years

Carbon: The Commodity

Photo-synthetically Created Carbon-Carbon Bonds

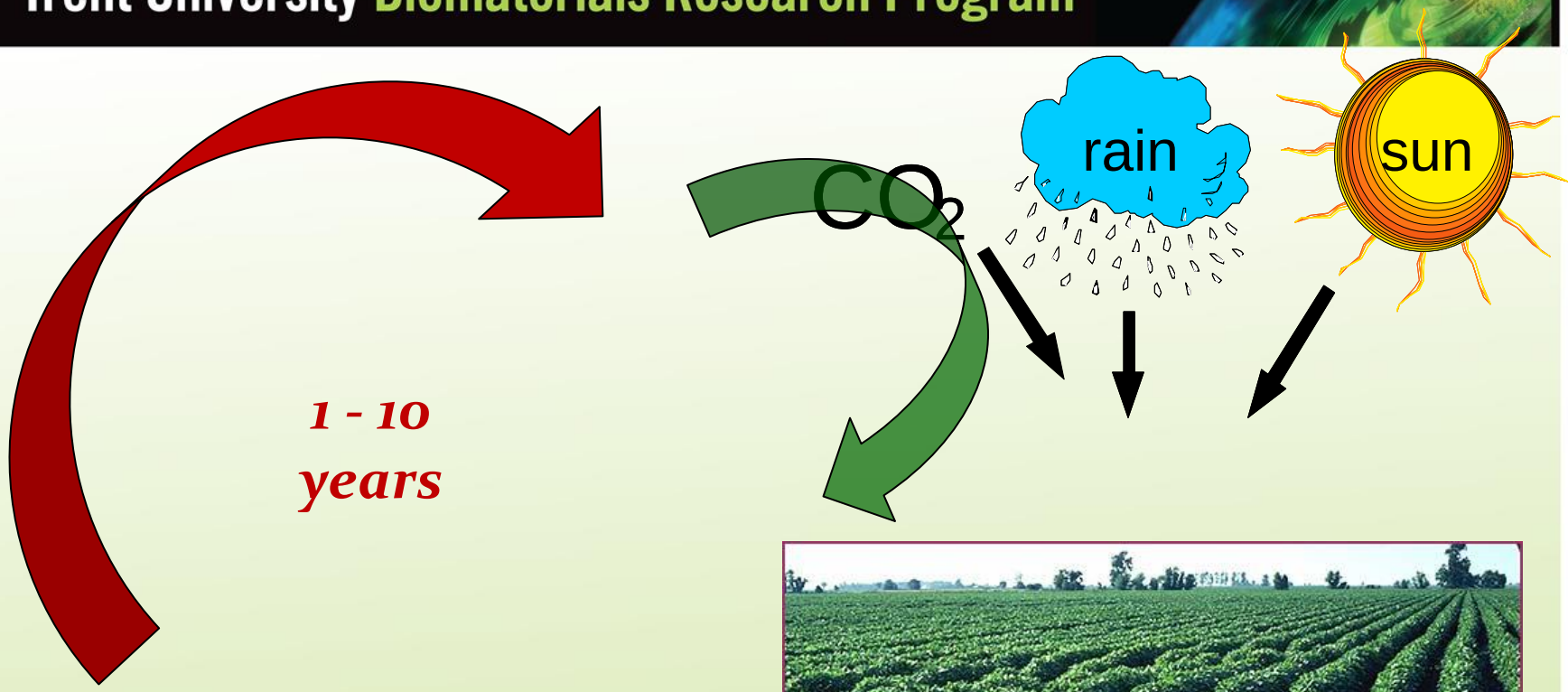
Deposited, Incubated for > 500 M Years Petroleum	Biofuels •Biodiesel •Ethanol •Pyrolysis fuels •Energy Crops	Food •Primary Grains •As Grains for Livestock	Materials •Petrochemicals •Cosmetics •Building Materials •Pharmaceuticals

✓The timeline of primary production, utilization, release, and subsequent sequestration has tremendous impact on free carbon in the atmosphere, and Global Warming.

✓The efficiencies of production, geo-political policies, climatic zones, availability of arable land and water, market forces and speculation, and trading will determine the end-uses.

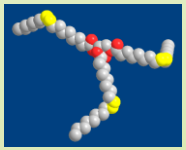
✓Global food prices will continue to rise, commensurate with the increased demand, and comensurate with industries that are much more price-elastic than the food industry has traditionally been

Cultivating Carbon-Carbon Bonds



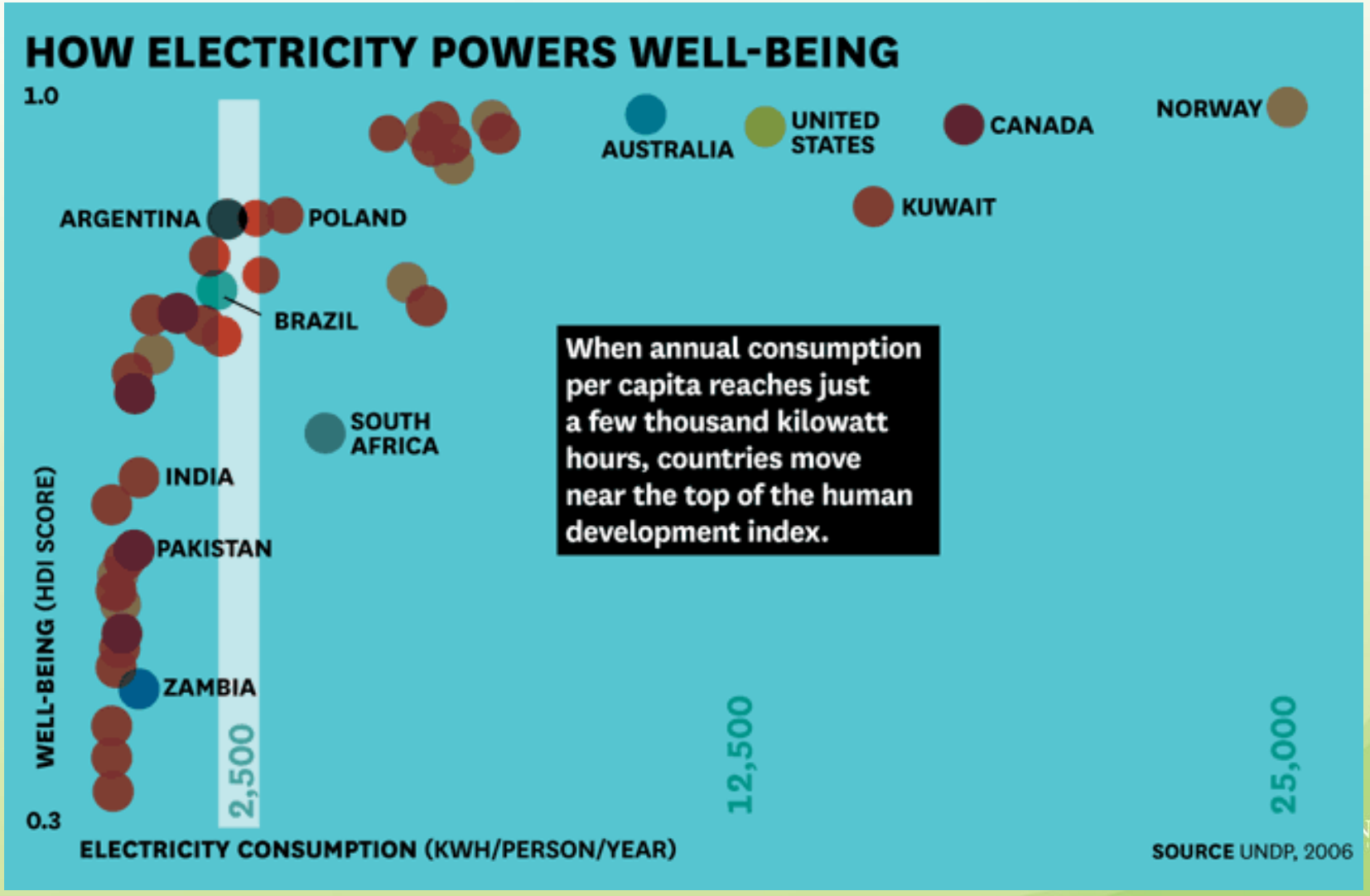
- Food
- Materials
  - Chemicals
  - Plastics
- Fuel

- *Chemical*
- *Biochemical*



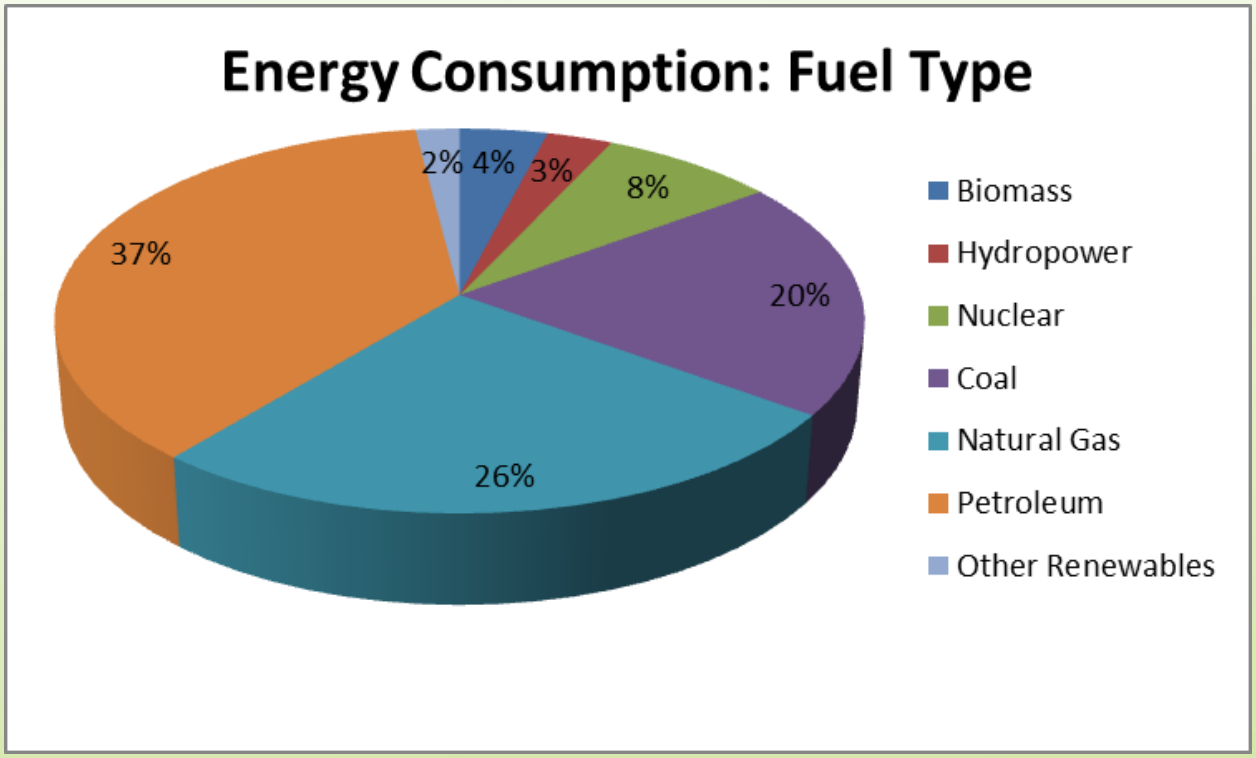
Extract
C-C Bonds

Energy and Electricity is Fundamental to Quality of life in the Modern World



World Dependence on Fossil Fuels

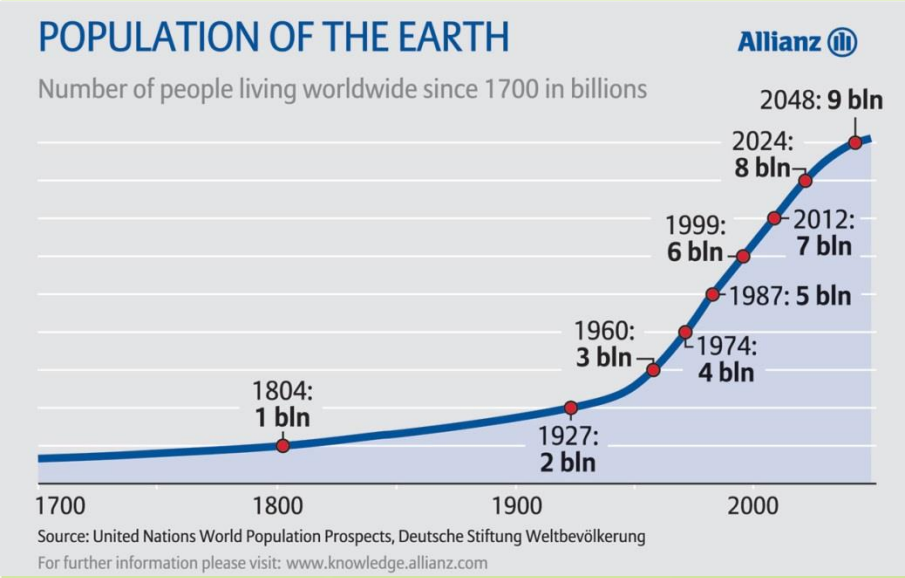
- 83% of the world's energy is derived from fossil resources

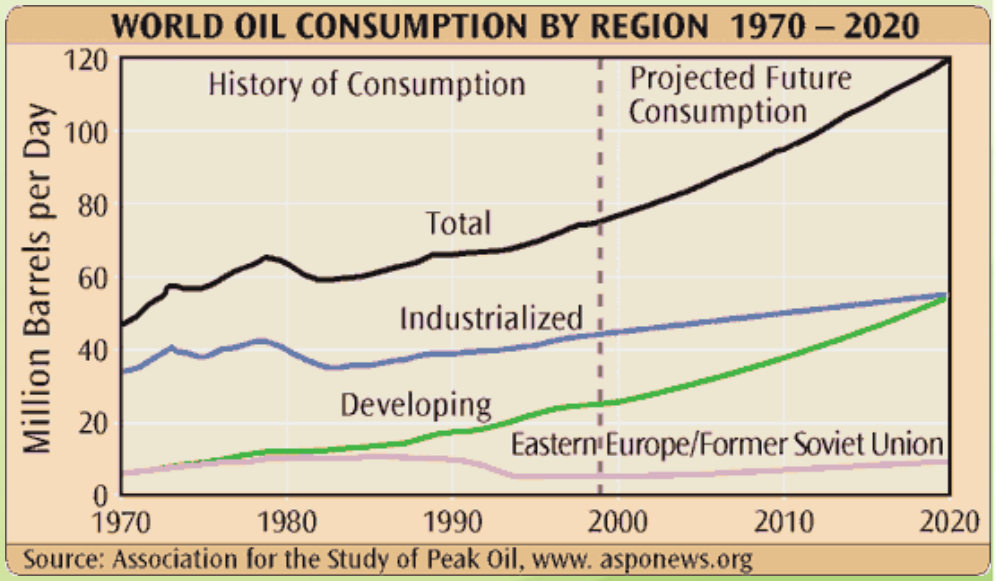


Source: Energy Information Administration, Annual Energy Outlook 2013, http://www.eia.gov/forecasts/aeo/er/pdf/appa.pdf and http://www.eia.gov/forecasts/aeo/er/pdf/tbla17.pdf

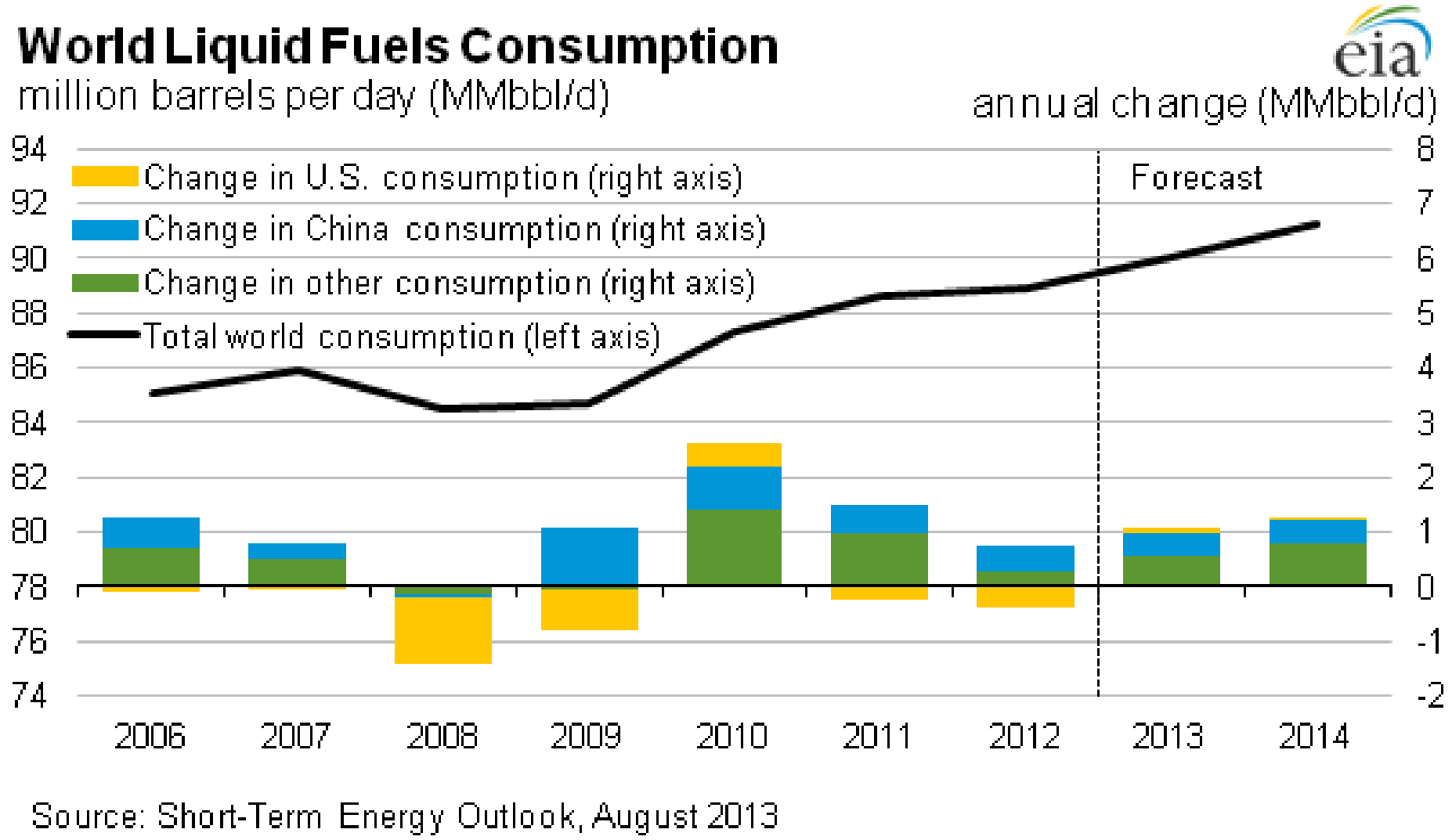
Increased Demand for Fossil Fuels

- Est. world population growth: 7B (2013) => 9B (2050)
- World demand for oil growth: annual basis, at least one million barrels per day
- Growth driven by: developing economies of the world and,
- Transportation Growth: 1B cars (2013) => 2B (2050)





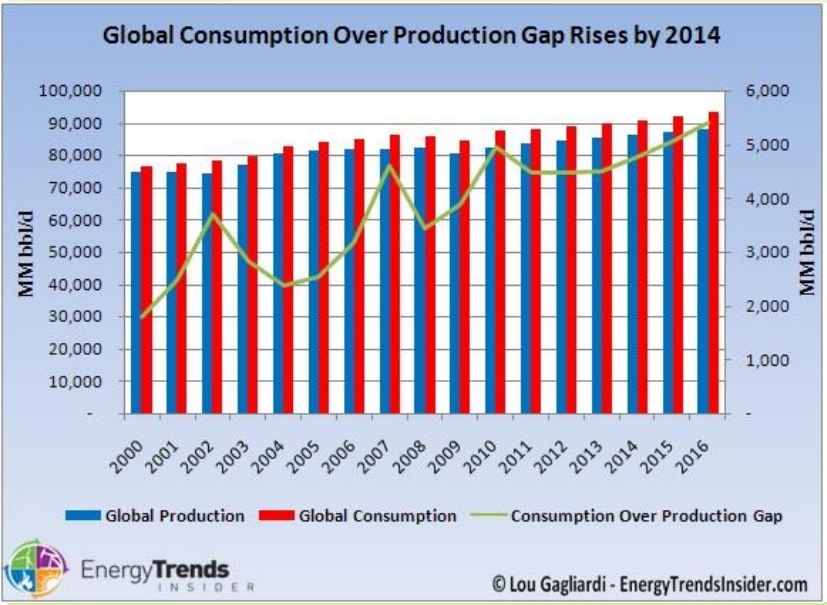
Data and Short-Term Forecast Supports Increased Demand

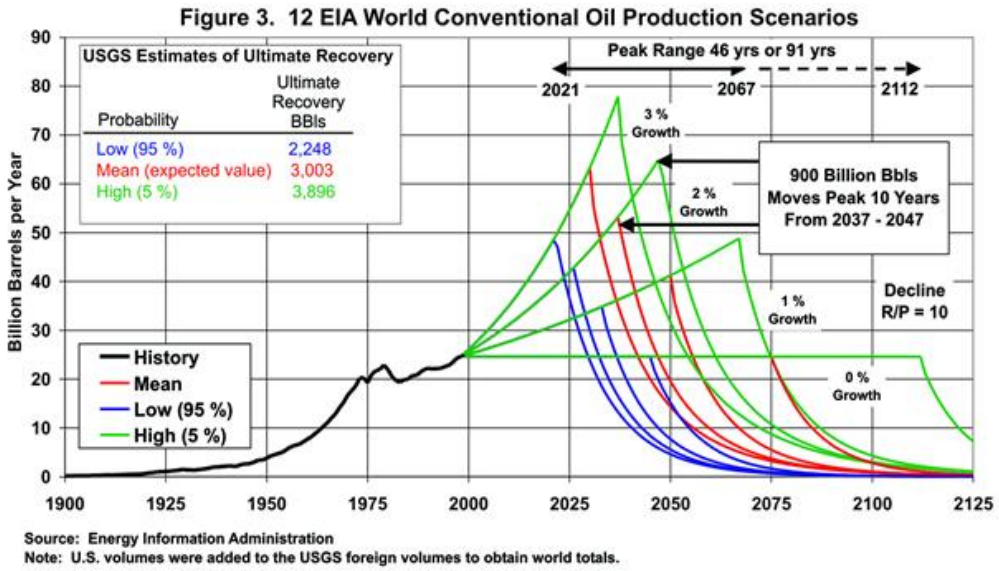


Source: Short-Term Energy Outlook, August 2013

Increased Demand, Lagging Supply

- Current world surplus oil production capacity of two to three million barrels per day
- As demand grows in the next decade we will not have enough oil production capacity to keep up.





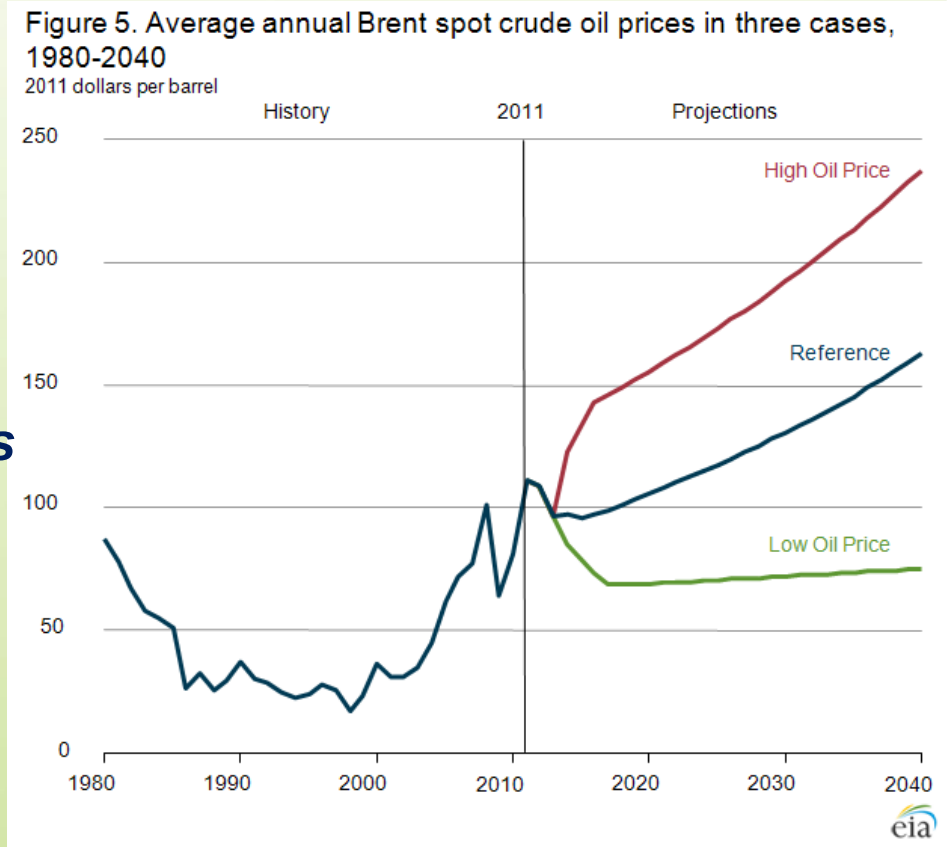
http://www.eia.gov/pub/oil_gas/petroleum/feature_articles/2004/worldoilsupply/oilsupply04.html (accessed 13/9/2013)

Fossil Fuels Will Continue to Increase in Price

"Sustained long-term higher energy prices and increased short-term energy price volatility represent the new reality…"[1]

"…hydrocarbons will fuel the world's economy for many decades to come. Renewables do not have the scale, development timeframe or economics to materially change this outcome as much as we would hope."

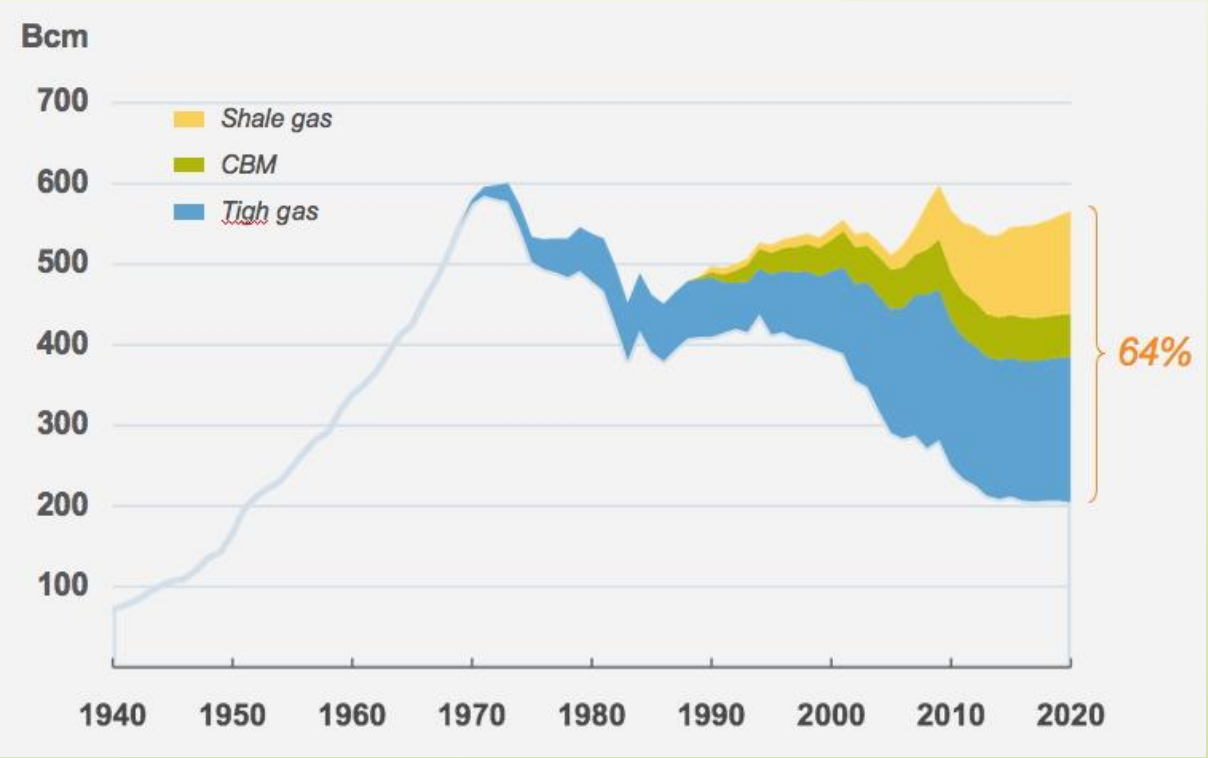
- John B. Hess, Chairman and CEO
  Hess Corporation



[1]Progress Report, Canadian Industry's Competitiveness in Terms of Energy Use, July 24-25, Montreal, 2013

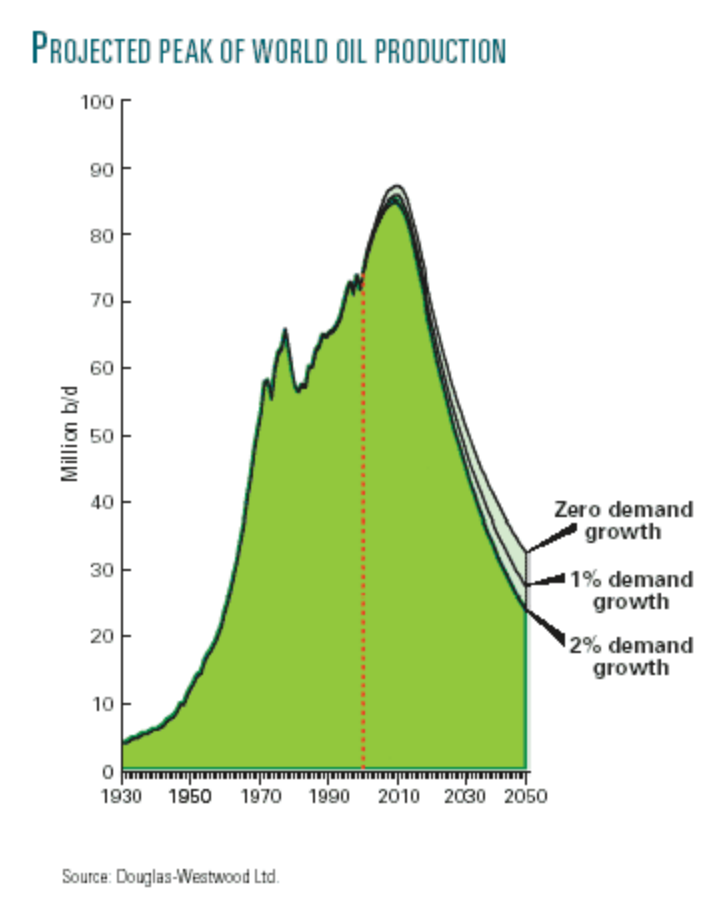
What About Shale Gas?

Shale gas is a game changer and will delay peak oil…however, it will take refinery capacity of conventional oil offline – this will affect the supply of heavy oil to developing countries in the Caribbean



Source: Total, from US DOE & Energy Information Agency, 2010, accessed at www.manicore.com, 13/08/2013

Still a Key Concept: End of Oil?

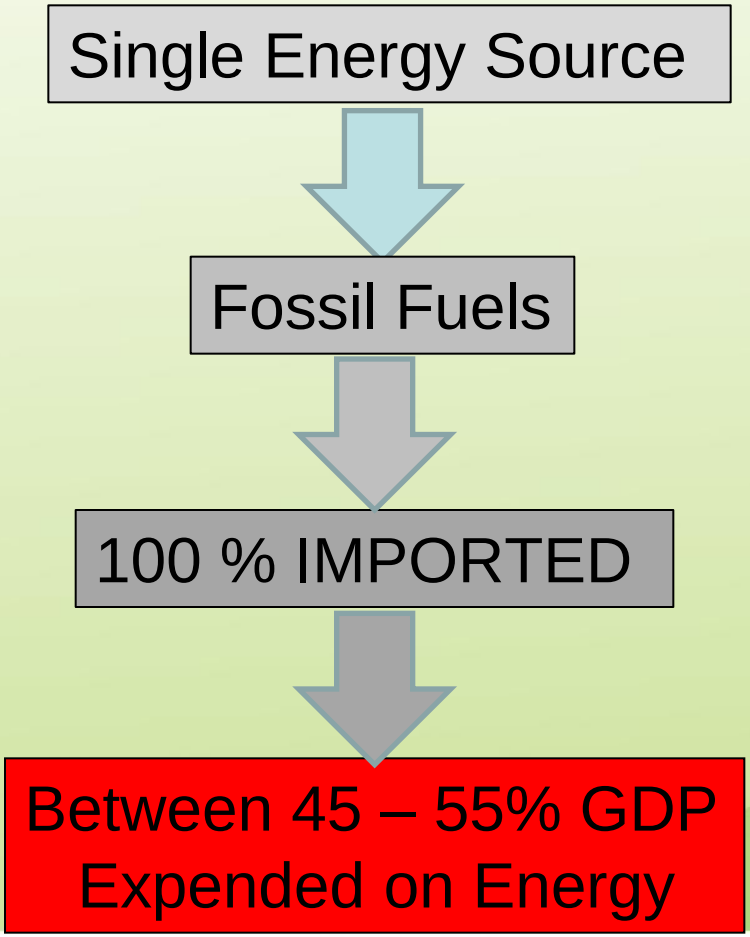


- ✓Although the estimates vary, end of oil is not an if, but a when
- ✓Availability of fuel will become an issue long before peak oil
- ✓The demand for agricultural sources of energy and materials will grow accordingly
- ✓This in turn will continue to escalate prices

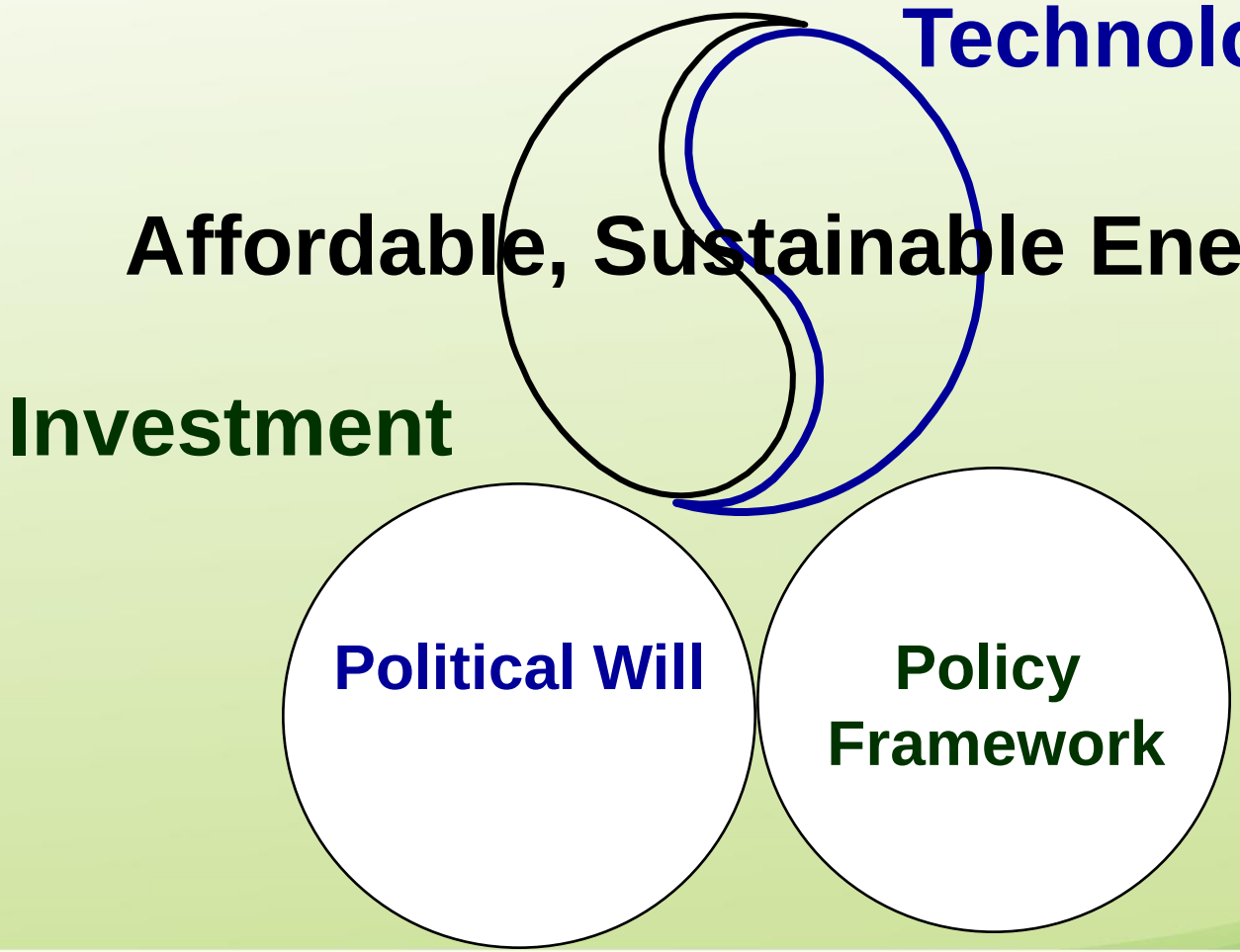
Expensive energy is the single largest barrier to increased manufacturing, value-added processing of agricultural commodities, mechanization of agriculture, large scale mining, and quality of life in Guyana

Guyana's Energy Dilemma in 2015

- **~94% of ALL Energy Consumed in the Country is IMPORTED**
  - Electricity
  - Transportation
  - Consumer
  - Communities
  - Manufacturing
  - Business
  - Security

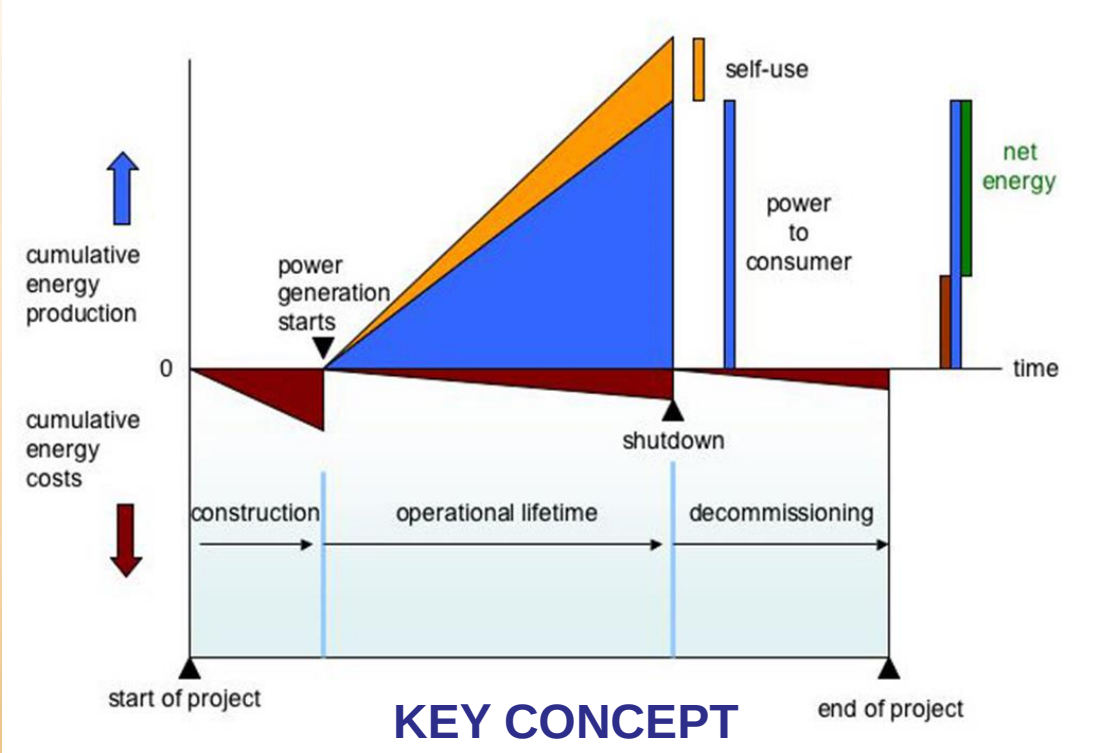


The Energy Crisis Urgently Requires Concerted Action



The Potential Energy Portfolio

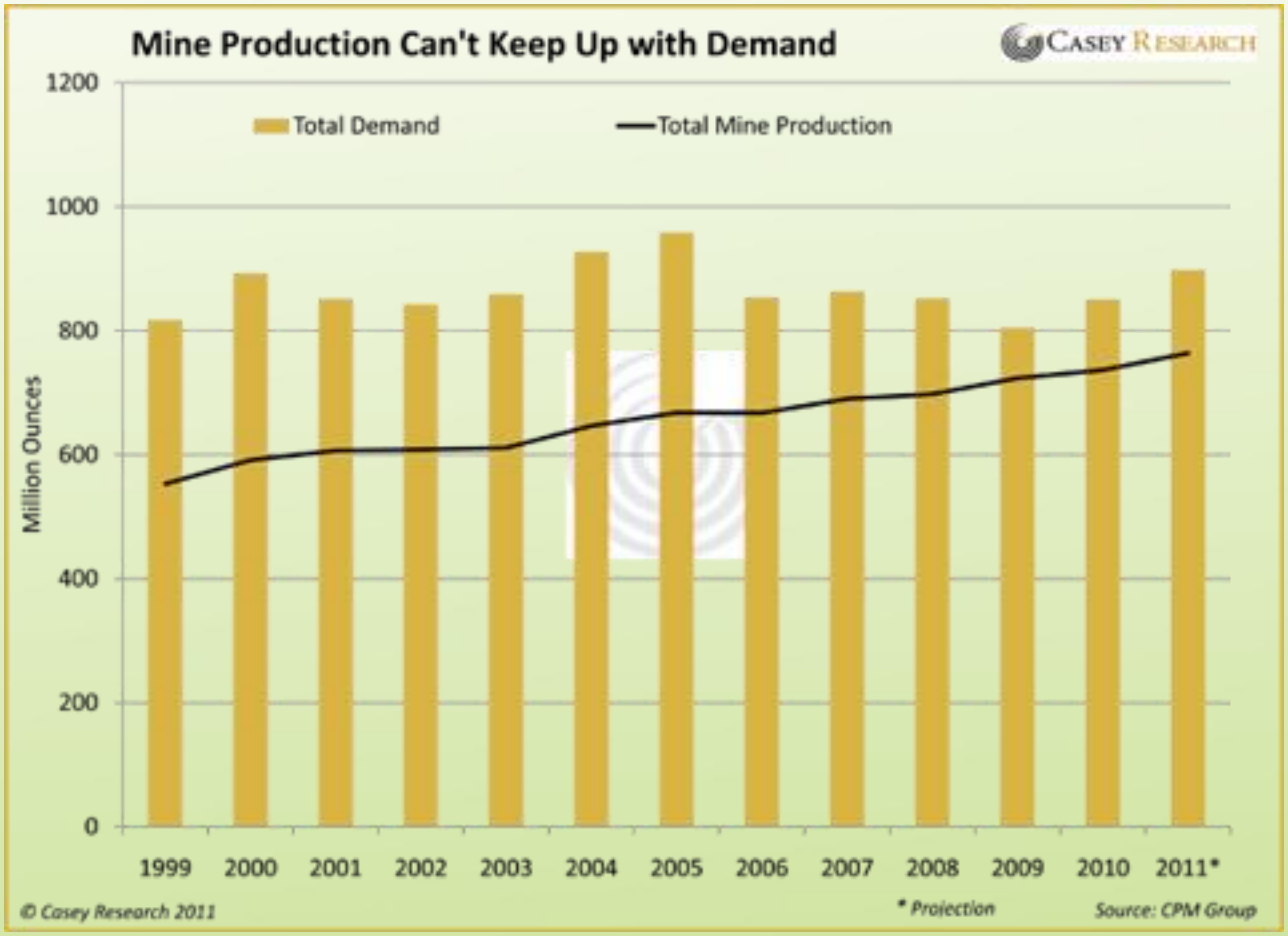
- Fossil Fuels
  - Imported
  - Domestic
- Hydroelectricity
- Wind Generation
- Photo Voltaic
- Biogas
- Biomass
- Biodiesel and Ethanol
- Geothermal
- Wave Generation
- Nuclear



EROI = (cumulative electricity generated) / (cumulative primary energy required)

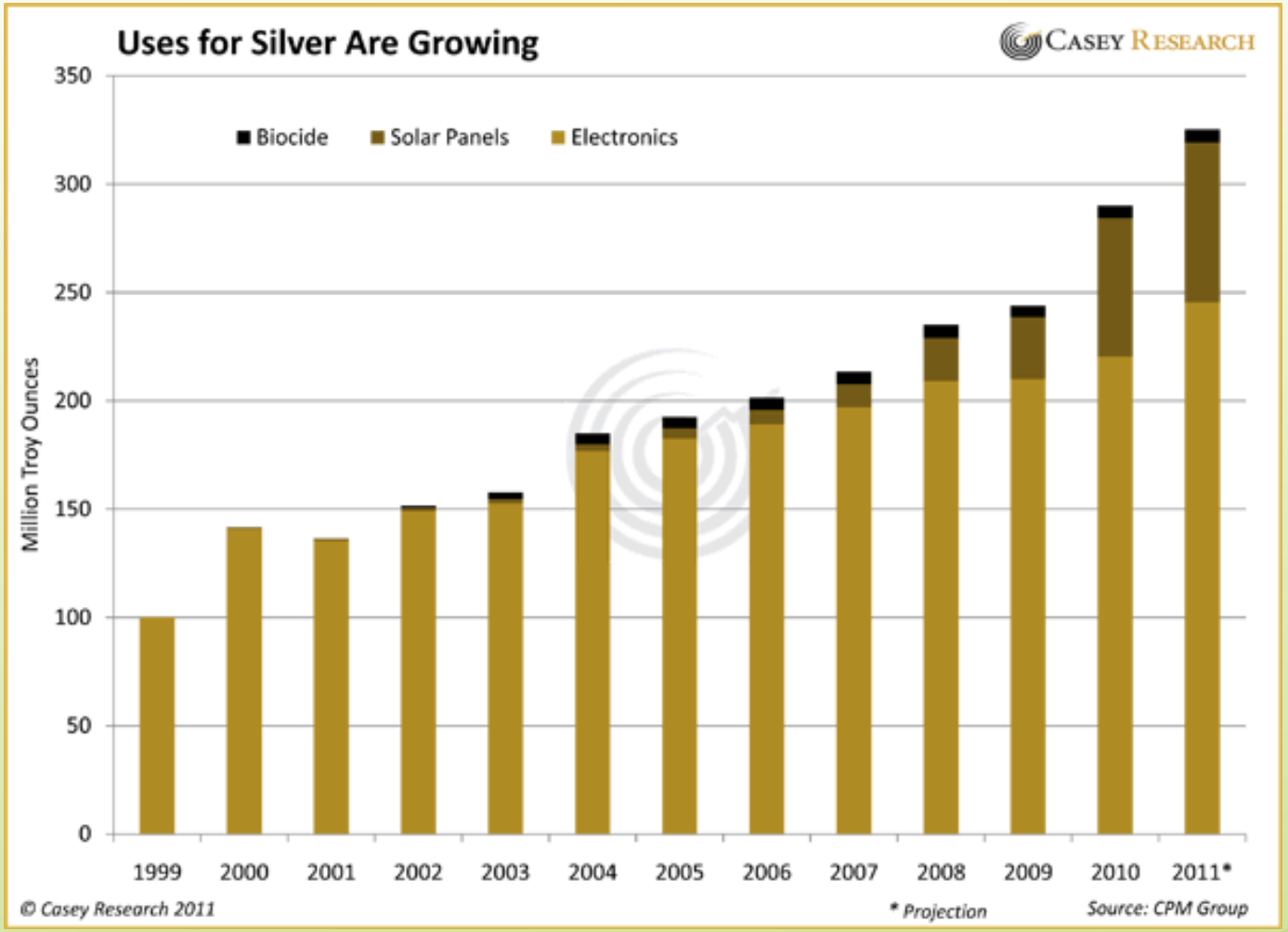
Kubiszewski, I and Cutler J. C, *Energy Return on Investment (EROI) for Wind Energy*, Encyclopaedia of Earth, 2007.

Silver Supply and Demand



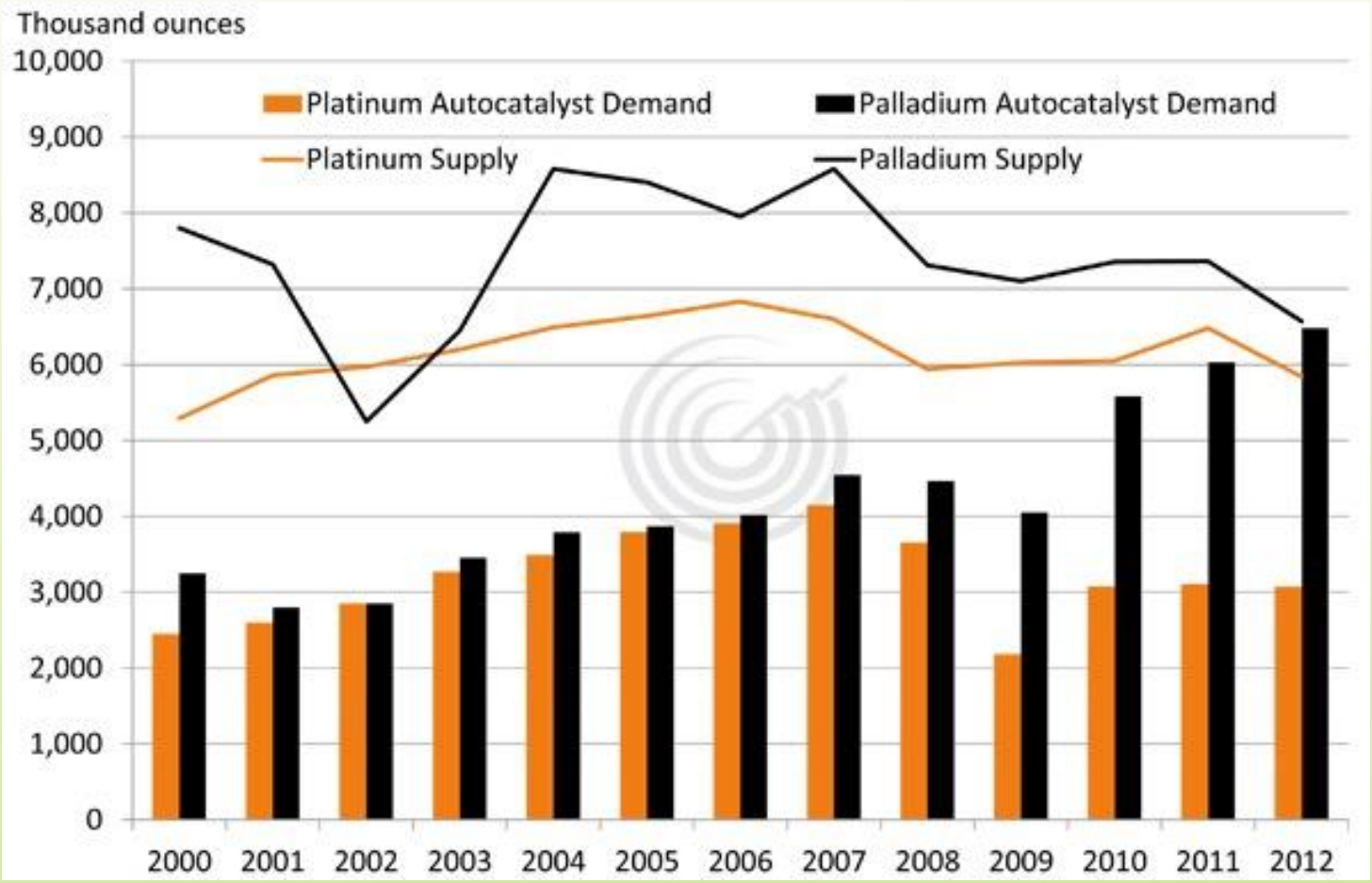
http://goldsilverworlds.com/7-facts-proving-we-are-in-a-long-term-powerful-uptrend-in-gold-and-silver/

Silver Uses



http://www.marketoracle.co.uk/Article28717.html

Platinum and Palladium

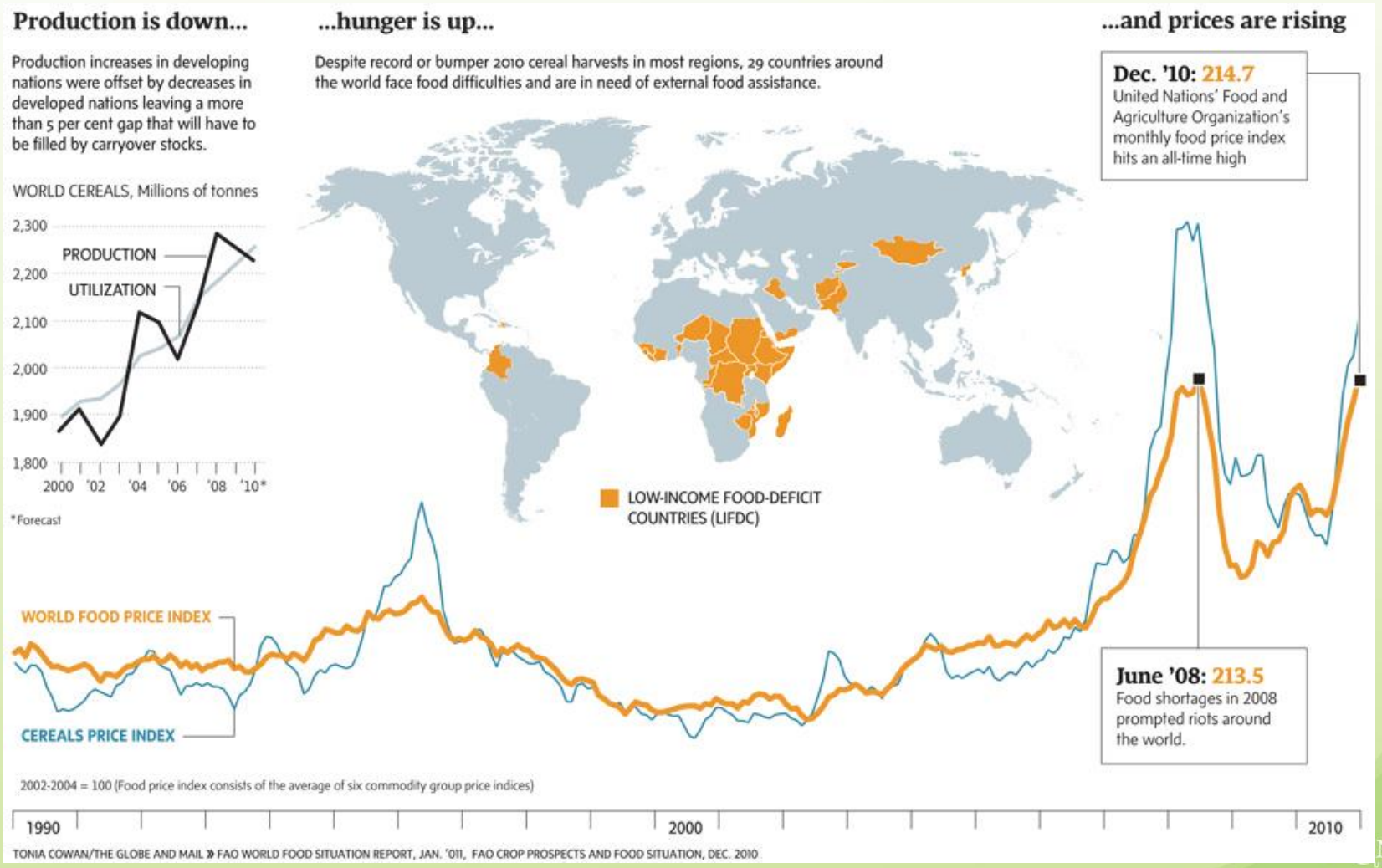


http://www.pgm-blog.com/why-investing-in-platinum-palladium/

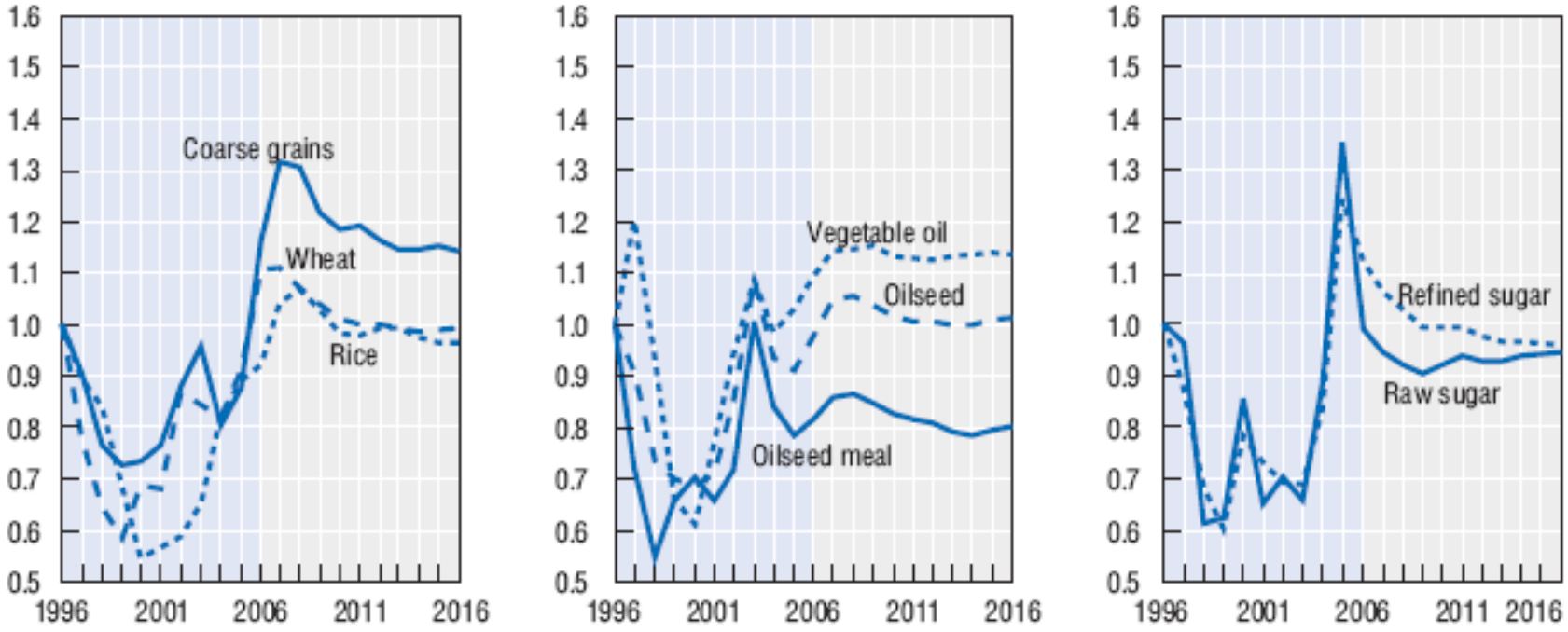
Figure 1.6: Agricultural commodity prices and energy prices remain strongly correlated

Source: Bloomberg, Rabobank, 2012

Joseph Dancy, Record Food Prices will Likely Disrupt Energy Markets, Financial Sense, 5 June, 2014

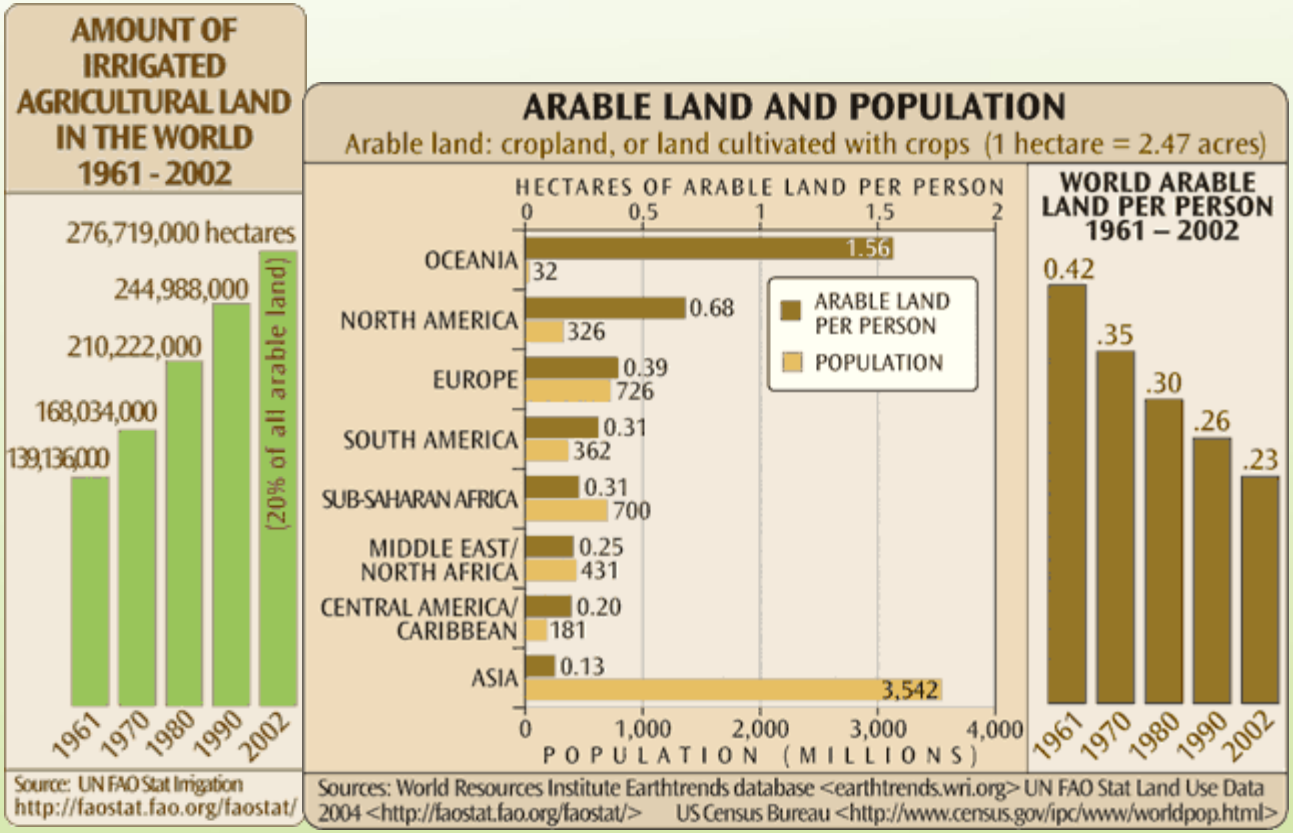

Production is down...
Production increases in developing nations were offset by decreases in developed nations leaving a more than 5 per cent gap that will have to be filled by carryover stocks.
WORLD CEREALS, Millions of tonnes
2,300
2,200
2,100
2,000
1,900
1,800
PRODUCTION
UTILIZATION
2000 '02 '04 '06 '08 '10*
*Forecast
...hunger is up...
Despite record or bumper 2010 cereal harvests in most regions, 29 countries around the world face food difficulties and are in need of external food assistance.
LOW-INCOME FOOD-DEFICIT COUNTRIES (LIFDC)
...and prices are rising
Dec. '10: 214.7
United Nations' Food and Agriculture Organization's monthly food price index hits an all-time high
June '08: 213.5
Food shortages in 2008 prompted riots around the world.
WORLD FOOD PRICE INDEX
CEREALS PRICE INDEX
2002-2004 = 100 (Food price index consists of the average of six commodity group price indices)
1990
2000
2010
TONIA COWAN/THE GLOBE AND MAIL » FAO WORLD FOOD SITUATION REPORT, JAN. '011, FAO CROP PROSPECTS AND FOOD SITUATION, DEC. 2010

Outlook for World Crop Prices, to 2016 (Index of Nominal Prices, 1996 = 1)

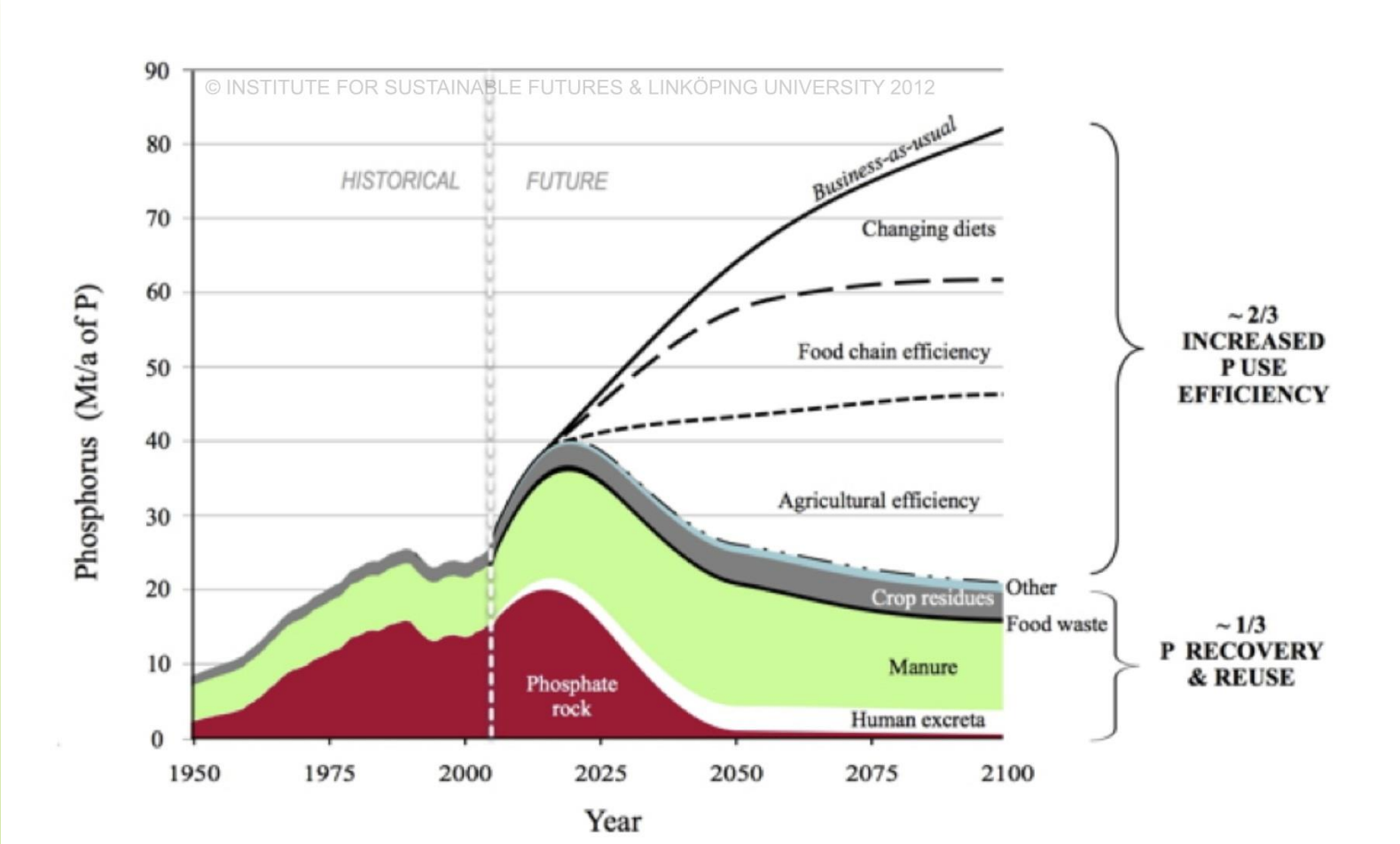


Source: OECD and FAO Secretariats.

Water and Arable Land



Phosphorus



http://phosphorusfutures.net/, Cordell *et al.* 2009

Prediction

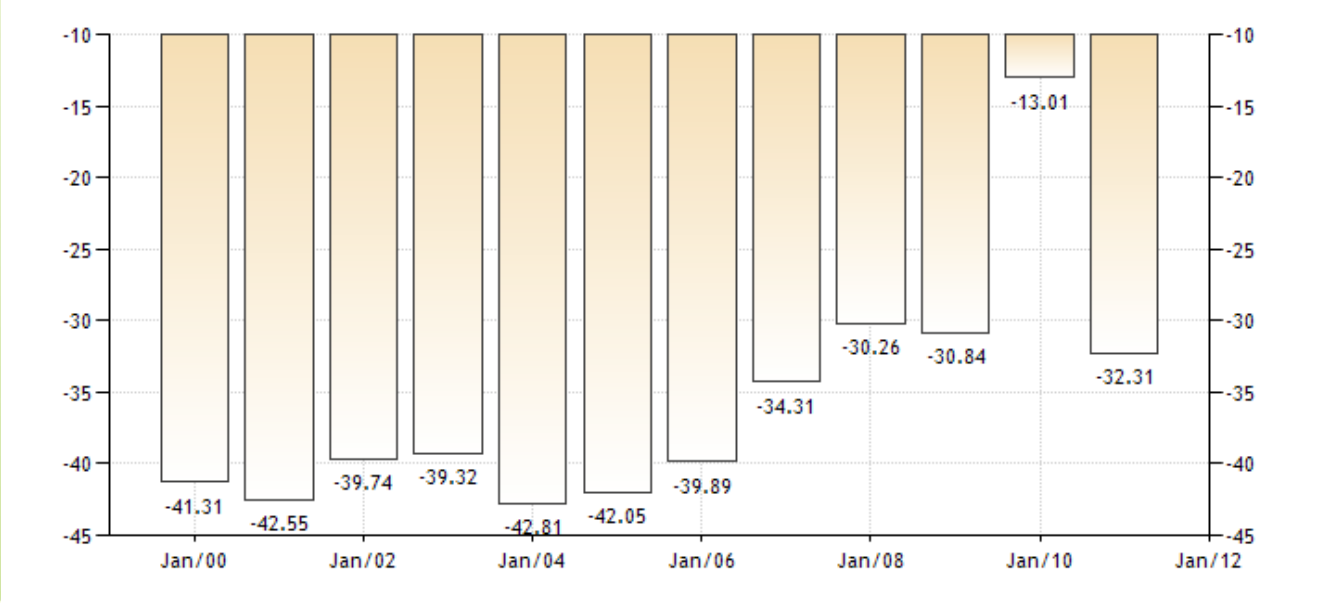
The most important resources of the future are not Petroleum, Steel and Precious Metals – its Arable Land, Fresh Water, and Skilled Labour

Remember Adam Smith – The Wealth of Nations, Published in 1776: 3 Primary Business Inputs: Labour, Capital, Land

We will be forced to seriously consider the land input, largely ignored until now, (Stefan Heck and Mat Rogers, McKinsey Quarterly, March 2014)

Caribbean Context

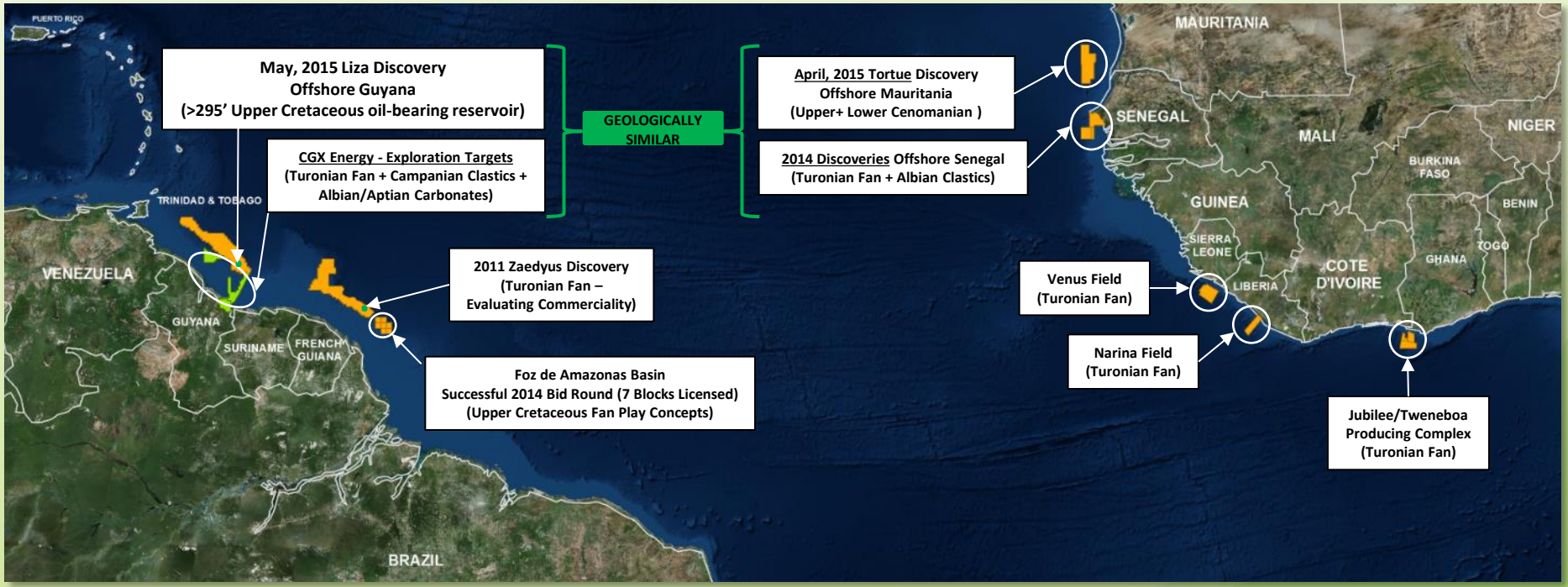
- Region is a Net Importer of energy (petroleum)
- Trinidad and Tobago and Suriname are only two with production, with T&T being a net exporter and Suriname nearing that point (2012 Data)
- Energy imports; net (% of energy use) in Latin America and Caribbean was last measured at -32.31 in 2011, according to the World Bank



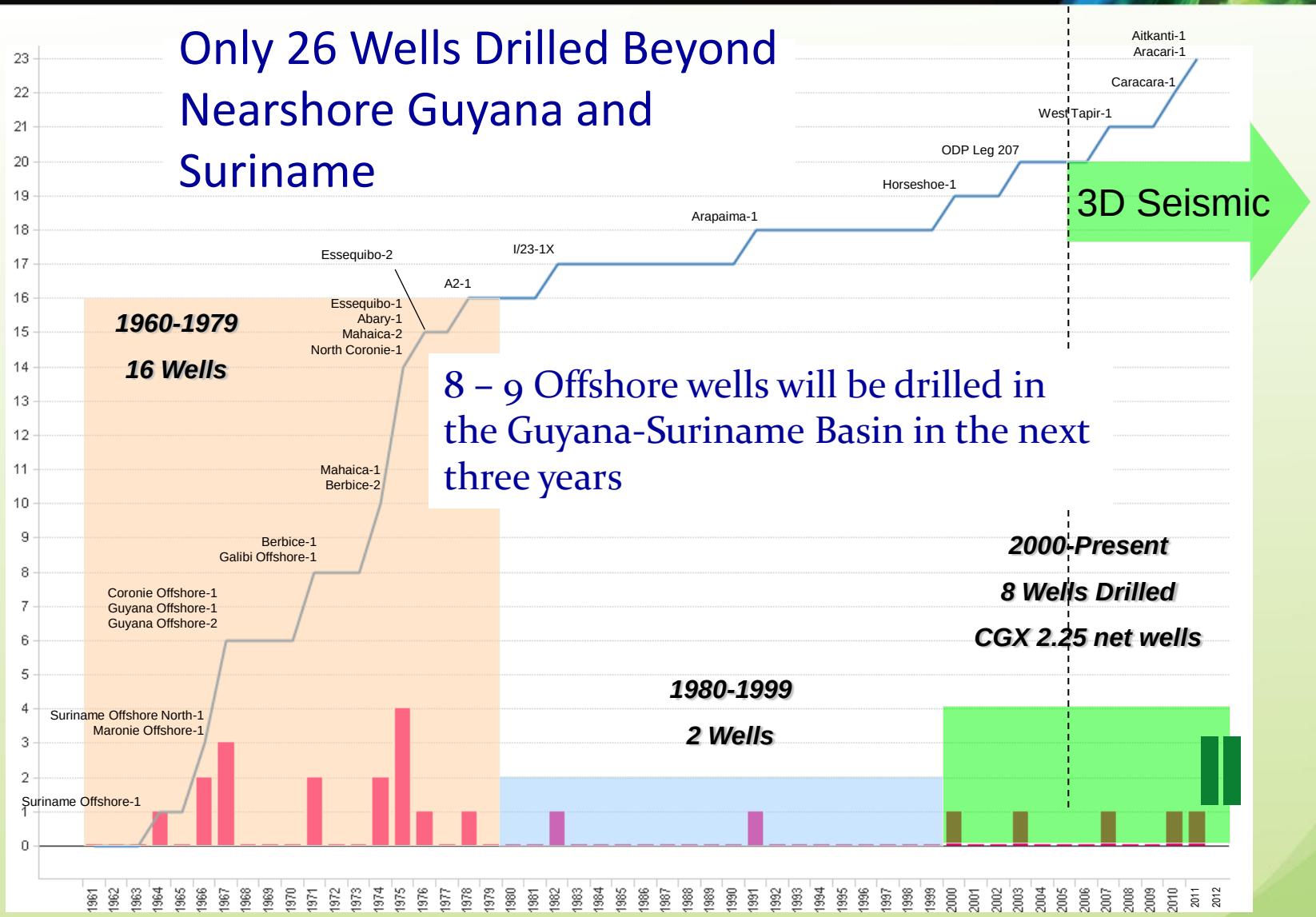
Trent University Biomaterials Research Program

- Emerging Guyana-Suriname Basin similar to proven & producing Basins of West Africa Equatorial Margin
- **<u>May, 2015 discovery by ExxonMobil/Hess/NexenCNOOC offshore Guyana (Stabroek Block, Liza-1 Well) further de-risks Guyana play concepts and CGX acreage specifically</u>**
  - > 295 ft. of oil-bearing reservoir encountered
  - Immediately adjacent to CGX's two offshore Blocks (Corentyne and Demerara)

- Other recent discoveries by Cairn/ConocoPhillips offshore Senegal (Sangomar Deep Block) as well as Kosmos/Chevron offshore Mauritania (Block C-8) also de-risk certain play concepts in Guyana specifically
  - Exploration potential of the Guyanese-side of the Basin more closely linked to that of the Senegal Basin
  - Important development for CGX Energy going forward as the Company is solely focused on Guyana exploration (offshore and onshore)
- 2011 Zaedyus discovery offshore French Guiana
  - Still under evaluation; however, proved viability of the trans-marginal exploration play



Only 26 Wells Drilled Beyond Nearshore Guyana and Suriname



GUYANA-SURINAME BASIN – CURRENT & NEAR TERM ACTIVITY

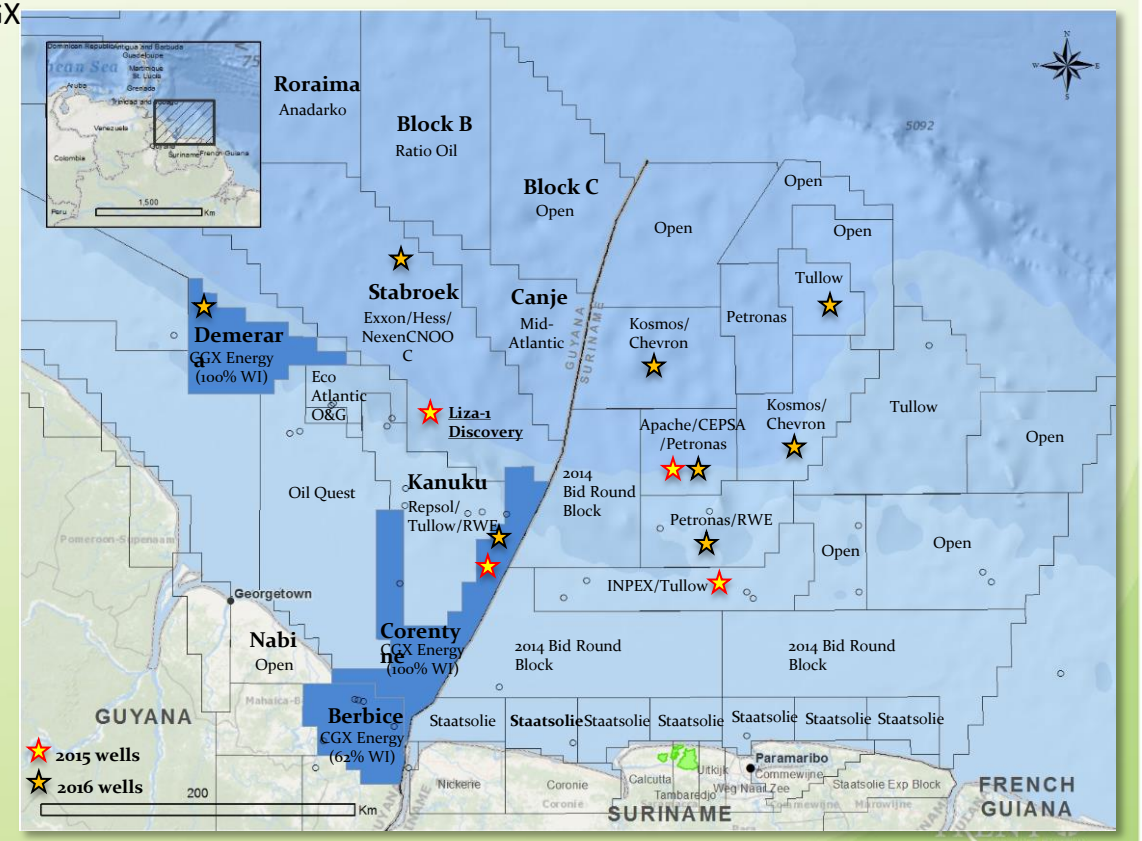
- Over the next five years, more than 3x the number of exploration wells will be drilled than in the last five years across the South American Equatorial Margin
- Presence of major industry players in the Basin:
  - Exxon, Anadarko, Hess, Repsol, Chevron, Petronas, Tullow, Kosmos, Apache, Murphy, INPEX, CEPSA, and RWE
- 3 offshore wells to be drilled in 2015 outside of CGX

  Guyana
  - Exxon/Hess/NexenCNOOC – 1 well (Liza-1)
    - Status: Discovery – currently evaluating commerciality

  Suriname
  - INPEX/Tullow – 1 well (Spari-1)
    - Status: Drilling
  - Apache/CEPSA – 1 well (Popokai-1)
    - Status: TD'd – Pending results
- 6 offshore wells to be drilled in 2016 outside of CGX

  Guyana
  - Exxon/Hess/NexenCNOOC – 1 well

  Suriname
  - Kosmos/Chevron – 2 wells
  - Apache/CEPSA – 1 well
  - Petronas/RWE – 1 well
  - Tullow – 1 well



Gold and Metals

- In 2012, Natural Resources Minister Jim Hok estimated the actual annual production of the small-scale and industrialized gold mining industry to be close to 30,000 kilograms in Suriname (June 19,2012 Stabroek News, Guyana)

- Guyana produced approximately 11, 425 kilograms in 2012 (Guyana Geology and Mines Data)

- Significant deposits of aluminium, manganese, high potential for rare earth metals.

Caribbean Net Importer of Food

Region is extremely vulnerable

- With only Guyana, Belize and Suriname having sizeable acreage and fresh water resources suitable for large scale agriculture.
- No regional integrated agricultural production and supply chain
- In 2006, Caricom had just over 16 Million Population

Imports as % of Domestic Supply

Countries	Fruits	Milk	Vegetables	Cereals
Antigua and Barbuda	14.7	48.9	15.9	98.7
Barbados	78.9	78.4	28,5	110.4
Belize	0.3	86.3	25.9	29.2
Dominica	0.1	54.9	9.7	97.7
Grenada	0.4	95	18.7	176.2
Guyana	0.5	61.4	14.1	19.5
St. Kitts & Nevis	33.8	81.5	68.7	100
St. Lucia	0.6	94.5	76.4	100
St. Vincent $ the Grenadines	0.4	86.6	13.8	205.9
Suriname	1.4	35.6	13.8	22.5
Trinidad &Tobago	11.6	95.5	50.4	103.9

Foreign Direct Investment is Poor

Table 1: FDI inflows by region for selected years (US$ 000's Millions)
(Percentage of World Share shown)

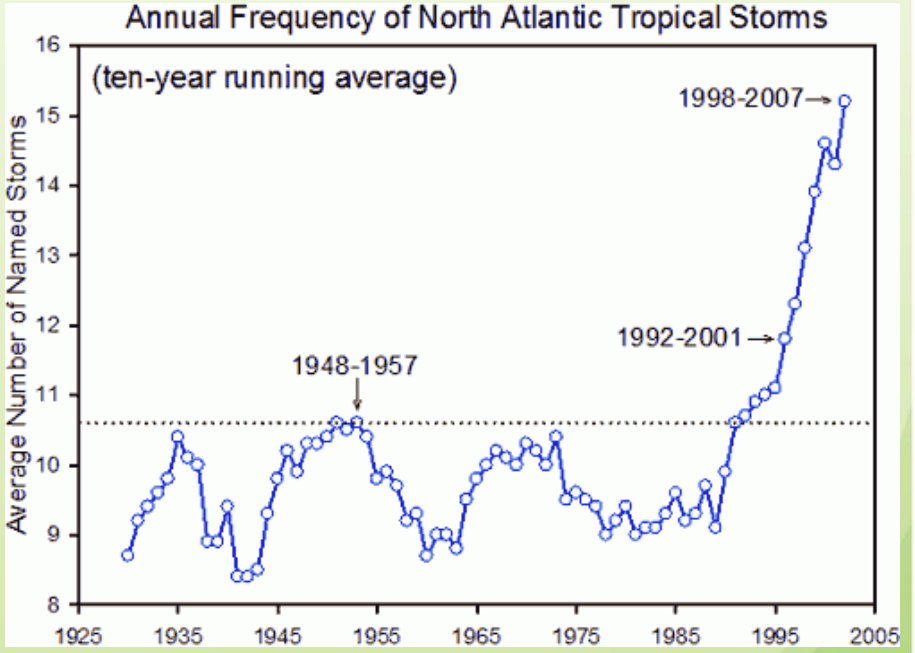
Region	1995	2000	2005	2010
Developed	221.0 (65%)	1118.0 (81%)	613.0 (63%)	602 (48%)
Developing	116.0 (34%)	257.0 (19%)	329.0 (34%)	574 (46%)
CARICOM	0.8 (0.2%)	1.9 (0.1%)	3.4 (0.4%)	3 (0.3%)
Developing Oceana	0.7 (0.2%)	0.2 (0.1%)	0.2 (0.03%)	1.5 (0.05%)
Developing Africa	6 (1.7%)	10 (0.7%)	38 (3.9%)	55 (5.2%)
Developing America	30.0 (9%)	98.0 (7%)	77.0 (8%)	159 (8.5%)
Developing Asia	80.1 (24%)	148.6 (11%)	213.8 (22%)	358 (22.9%)
World	**341.0**	**1382.0**	**973.0**	**1244.0**

Source: UNCTAD, FDI database.

P.S. Mohan and P.K. Watson, *Caricom Direct Investment Flows*, Sir Arthur Lewis Institute for Social and Economic Studies

Climate Change is a Serious Threat to the Caribbean

- The Banana Trees Just have to hear the Hurricane is coming….
- And they lie down before the winds even reach…
- Increased salinity of our water supply
- Massive threats due to flooding
- Unpredictable agriculture



Source: Centre for Climate and Energy Solutions
http://www.c2es.org/hurricanes.cfm#freq

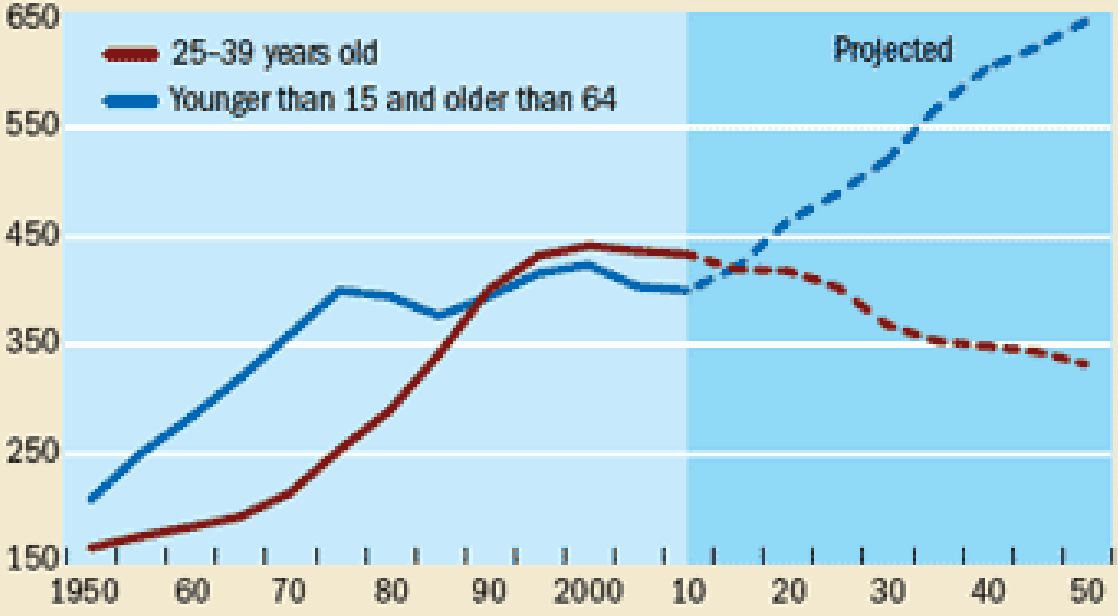
Already Low, Fractured Population (~16 M) – will be exacerbated by increasing demand for labour worldwide

Chart 2

Population pressure

The core group of industrial workers (age 25–39) in China is shrinking while the non-working-age population is growing.

(million people)



Sources: United Nations; and IMF staff estimates.

Resource-Driven Opportunities for Growth and Economic Development

- Given the growing demand for Petroleum and predicted increases in prices…
- Diminishing supply of precious metals, rare earths and electronic-industrial metals…
- Predicted continued high prices of Gold as financial uncertainty persist
- The emergent petroleum and extractive sector in the Caribbean, especially Suriname, Guyana and Trinidad are poised to enjoy financial success

Sustainability?

- The global supply and demand of natural resources determine national uses and access.
- As has been highlighted, demand has been and will continue to outstrip supply, despite any new supply introduced by the Caribbean.
- The extractive industries by their very nature are finite and therefore not sustainable in the long term
- Therefore, their exploitation MUST be accompanied by investments in sustainable industries and environmental stewardship (Adam Smith's LAND)

Natural Resources: Launching Pad for Sustainability

- Given the Caribbean's severe lag in FDI and its relatively poor access to venture capital (Adam Smith's CAPITAL)
- Its severe shortage of skilled labour in general and in particular related to low population and fractured labour force (CSME, where art thou?) – Smith's LABOUR
- Its precarious position with regards to food security
- Its vulnerability to climate change…

Natural Resources: Launching Pad for Sustainability

- The region MUST exploit its natural resources to invest in:
- Training of Skilled Labour
- Large scale sustainable agriculture for food production
- Alternative Energy (Suriname, Brazil good examples)
- Climate Abatement and Adaptation and Environmental Stewardship
- Renewable Technologies

Governance, Investment, Corruption

- This will require robust Governance and Policy Development
- It will mean investing in the non-extractive sector and technology - not a pathway well followed
- It will mean having a zero tolerance to corruption
- It will mean having policies to ensure that we are not commodity producers, but that value adding is done in the region
- And it will mean regional integration in a real and meaningful way – it is simply not sustainable to have national coffers predicated on less than a million people

Technology, Regional Opportunities

Stefan Heck and Matt Rogers, *Resource Revolution: How to Capture the Biggest Business Opportunity in a Century,* 2014 – FIVE DRIVERS:

- Substitution
- Optimization
- Virtuality
- Waste Elimination
- Circularity

- Engage the region's minds NOW on these issues, collaborating across the Caribbean

The FUTURE is BRIGHT

…

Because it is about Choices

Opportunity

- Waste Biomass

- Renewable Biomass

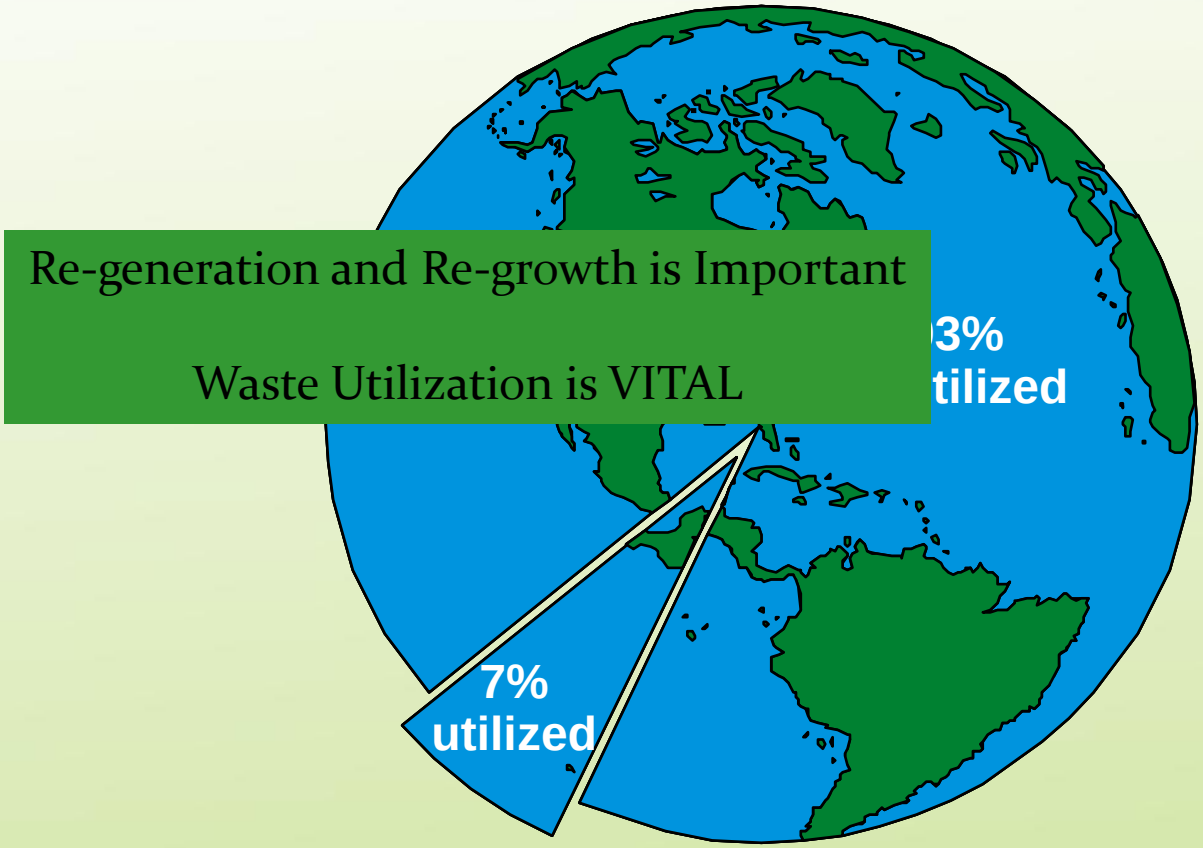
Environmental Footprint

- Life Cycle Analysis

- Cradle to Cradle

- Sustainable Business Models

World Biomass Production



Plants are a gigantic sun reactor.
Of the daily energy from sun of 1.5 x 10^{22} J, only 4 x10^{18} J are used for biomass.
Only approx 7% of the biomass is used by humans.

Make No Small Plans….

They Lack the Will to Stir Souls

Thank You