

# Energy data requirements for the South African GHG Inventory



Branch: Climate Change and Air Quality

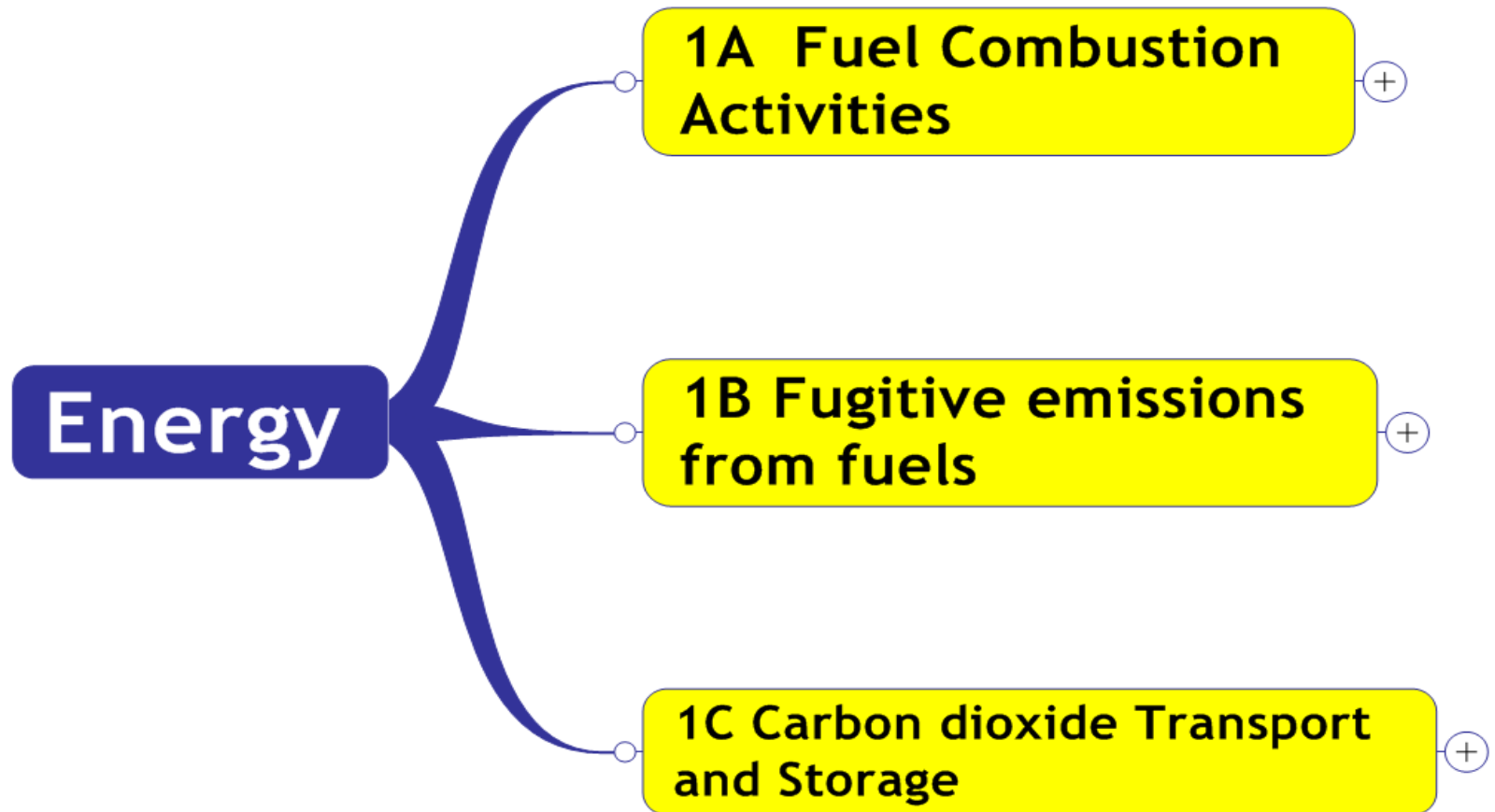


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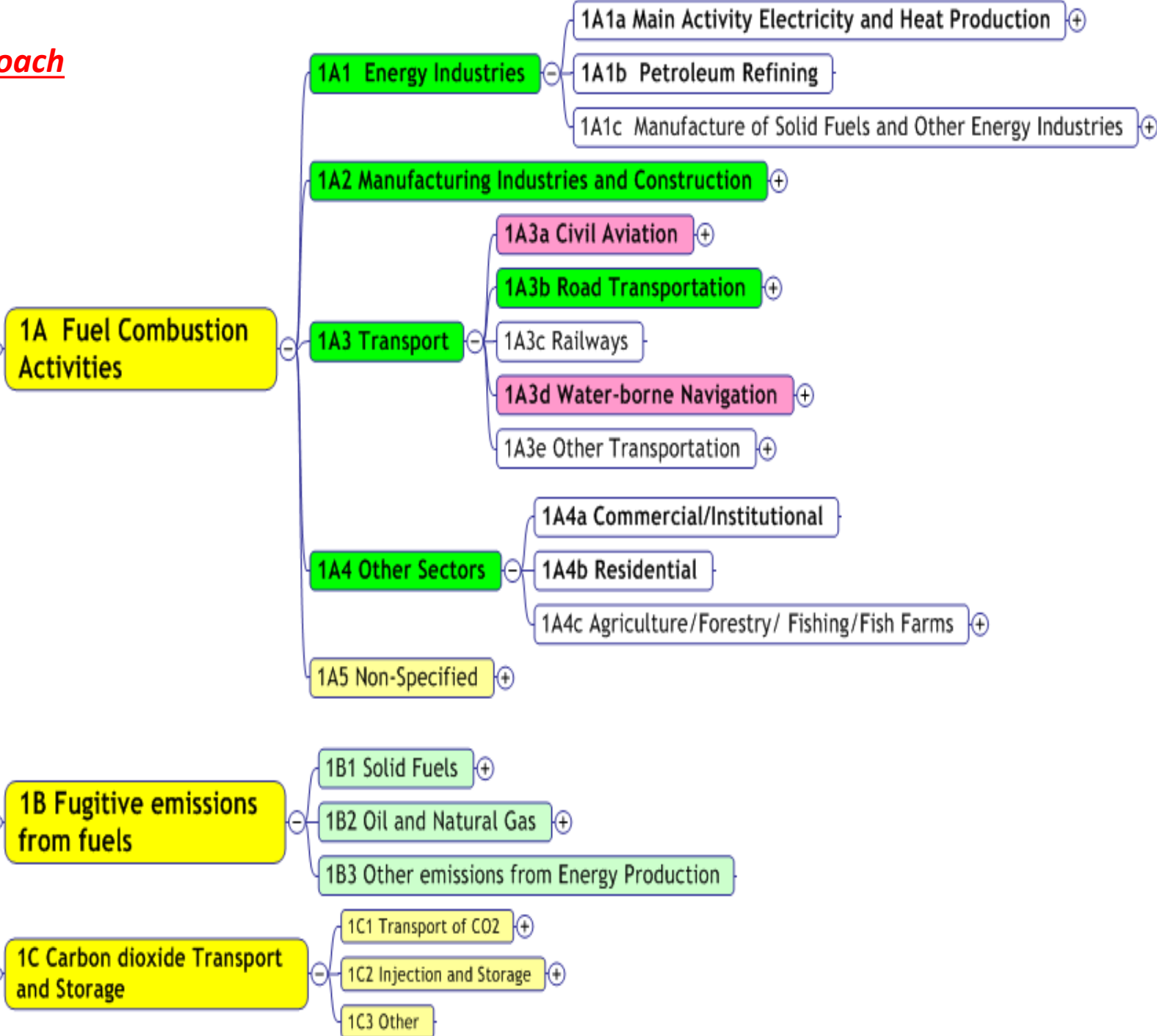


# Energy Sector

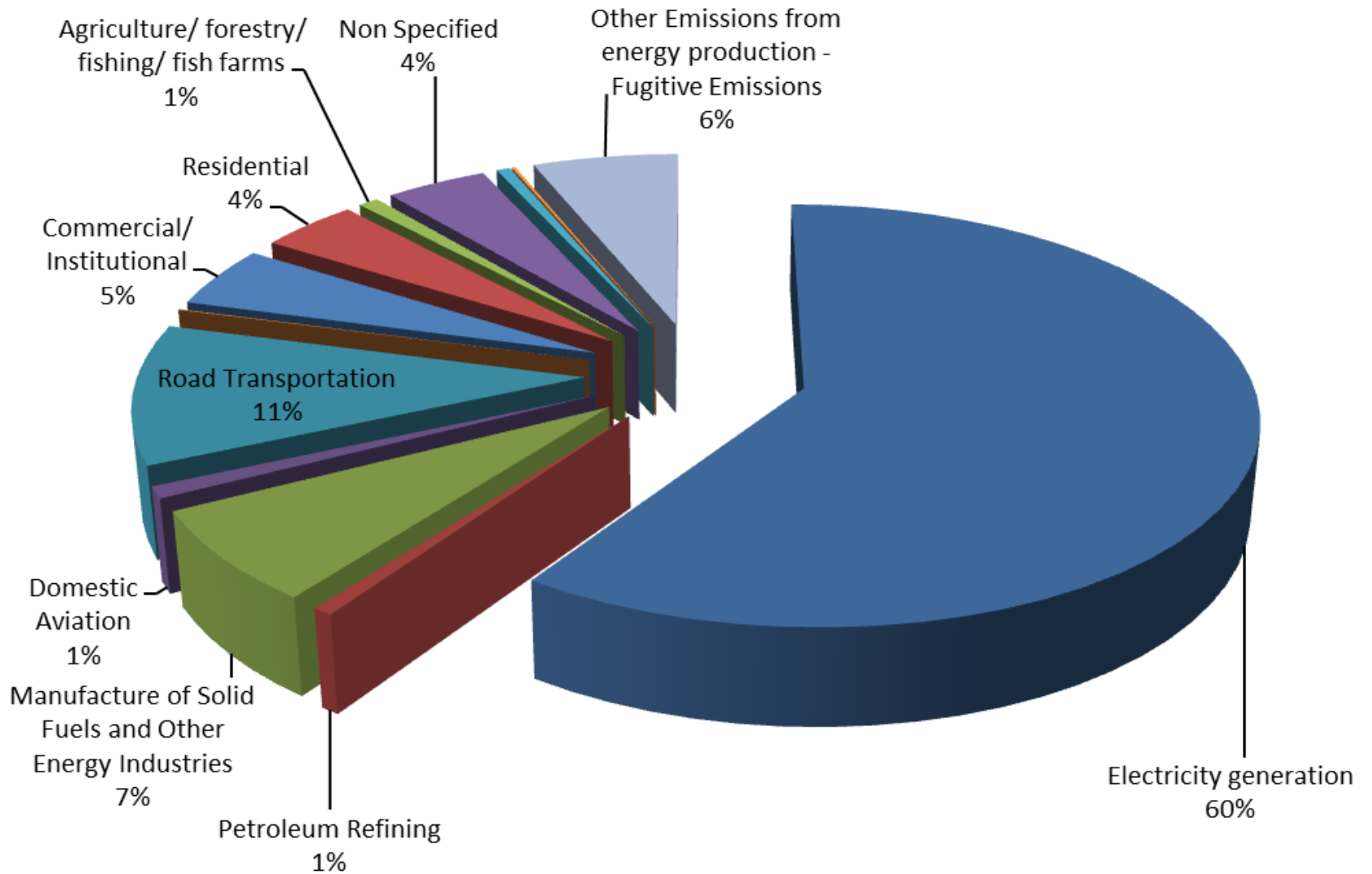


## Sectoral Approach

# Energy

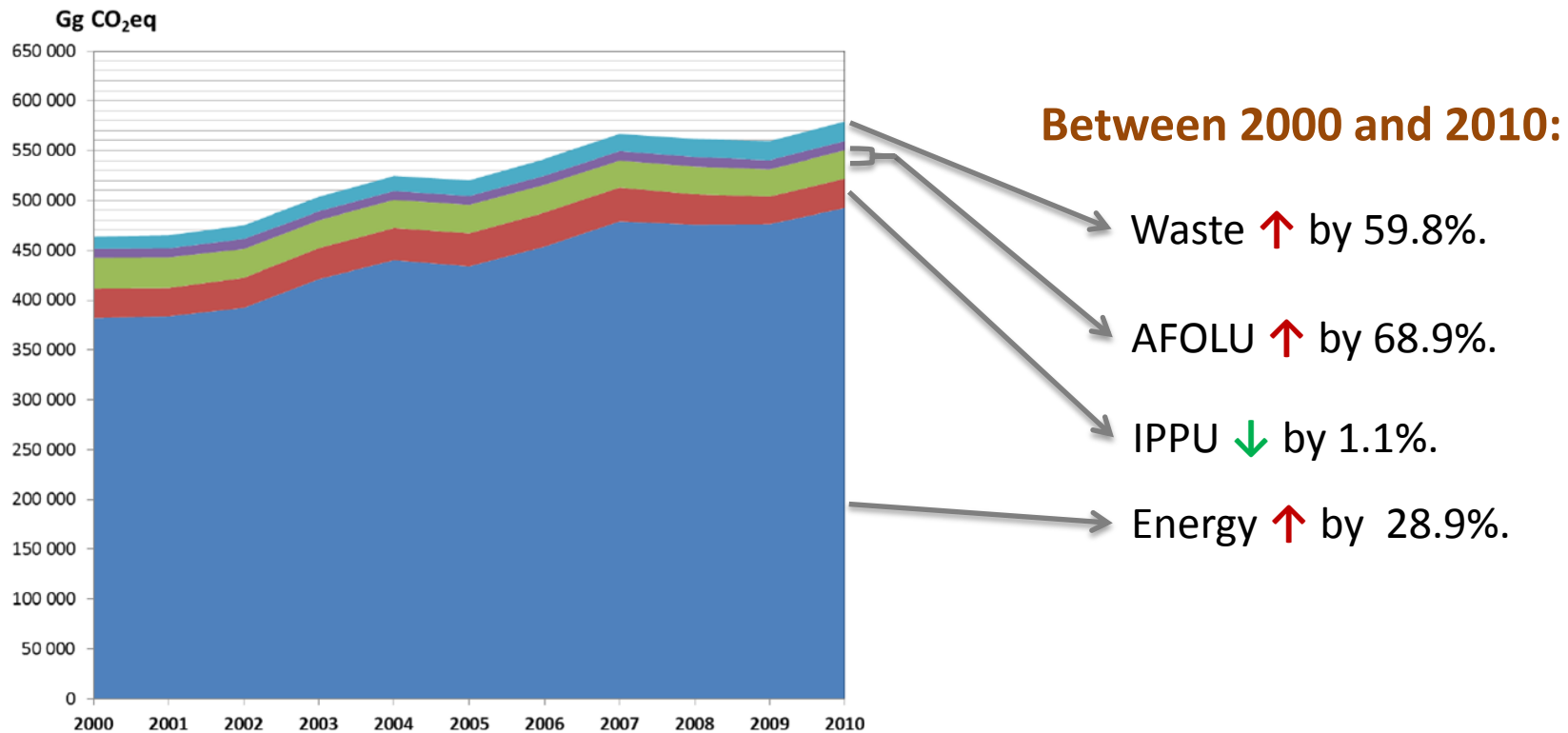


## ***Energy Sector - emissions breakdown by sub-sector 2010***



# GHG Emissions Inventory -

- South Africa's 2010 national inventory (excluding the LULUCF sector) was 560 million tonnes CO<sub>2</sub>e.
- Emissions increased by 29.6% compared with 2000 levels.



# Combustion Emissions

$$E = F \cdot A$$

Where:

E = Emission of Greenhouse Gas

A = Amount of fuel burnt

F = Emission Factor.

For CO<sub>2</sub>, F = C, the Carbon content of fuel

For other gases F is measured

# Fuels

- ❖ SOLID (Coal and Coal Products)
  - ❖ Inc. coal, coke and derived gases.
- ❖ LIQUID (Crude Oil and Petroleum Products)
  - ❖ Fuel Oil, Gasoline, LPG, Ethane and Petroleum Coke
- ❖ GAS (Natural Gas)
- ❖ OTHER FOSSIL FUELS
  - ❖ Non-biomass municipal & Industrial wastes, waste oils
- ❖ PEAT (treated as fossil fuel)
- ❖ BIOMASS
  - ❖ Wood, Charcoal, Biofuels, Biomass fraction of MSW
  - ❖ CO<sub>2</sub> Emissions not included in total Energy Emissions

# Energy Units

- Energy statistics are often specified in physical units, e.g. in tonnes or m<sup>3</sup>
- To convert these data to energy units, eg joules, requires calorific values.
- The IPCC Guidelines use **net calorific values (NCVs)**, expressed in SI units.
- Some statistical offices use gross calorific values (GCV).
  - The difference between NCV and GCV is the latent heat of vaporisation of the water produced during combustion of the fuel.
  - for coal and oil, the NCV is about 5 % less than the GCV
  - For most natural and manufactured gas, the NCV is about 10 % less.
- Where fuel characteristics (moisture, hydrogen and oxygen contents) are known the 2006 Guidelines give a more precise method to convert GCV to NCV data

# Biomass

- CO<sub>2</sub> emissions from biomass combustion are not included in the national total
  - Although they are reported separately
  - Non-CO<sub>2</sub> emissions are reported in the national total
- Net carbon emissions are accounted for in the LULUCF/AFOLU sector
- Peat is treated as a fossil fuel

# Reference Approach

- Energy Balance is the main data source
- A simple basic method based on imports, production and exports.
- Essentially:

$$Emission = Production + Imports - Exports - NonEnergyUse$$

- CO<sub>2</sub> only!
- Used as a check on the sectoral approach described above
  - Differences due to non-energy use of fuel, as well as differing quality data sets

# Example: Energy Use – Energy Balances

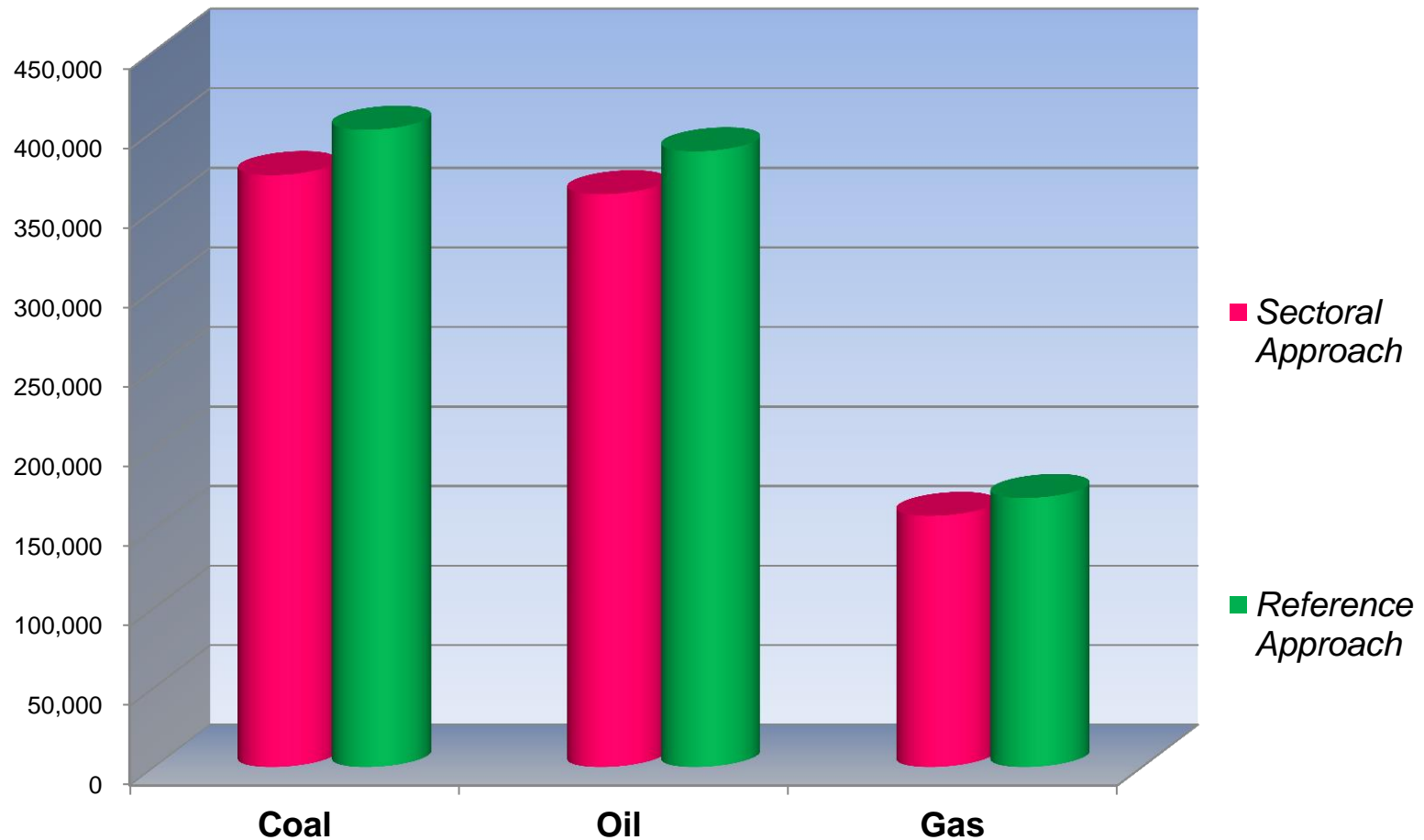
*ktonne oil equivalent (ktoe)*

<b>SUPPLY and CONSUMPTION</b>	<b>Coal and Peat</b>	<b>Crude Oil</b>	<b>Petroleum Products</b>	<b>Gas</b>
Production	141,801	495,846	0	169,668
Imports	7,698	42,879	45,214	4,030
Exports	-46,879	-401,357	-43,524	-96,473
International Marine Bunkers**	0	0	-6,035	0
Stock Changes	-39	-336	-1,113	0

*Emissions (Gigagrams)*

<b>SUPPLY and CONSUMPTION</b>	<b>Coal and Peat</b>	<b>Crude Oil</b>	<b>Petroleum Products</b>	<b>Gas</b>
Production	5,936,924	20,760,080	0	7,103,660
Imports	322,300	1,795,258	1,893,020	168,728
Exports	-1,962,730	-16,804,015	-1,822,263	-4,039,132
International Marine Bunkers**	0	0	-252,673	0
Stock Changes	-1,633	-14,068	-46,599	0
<b>Total Supply</b>	<b>4,294,861</b>	<b>5,737,256</b>	<b>-228,516</b>	<b>3,233,256</b>
Carbon Emission Factor (kg/TJ)	94,600	71,000	74,100	56,100
Emission (Gg, kTonne)	406,294	407,345	-16,933	181,386

# Comparison – Sectoral vs. Reference Approach (emissions)

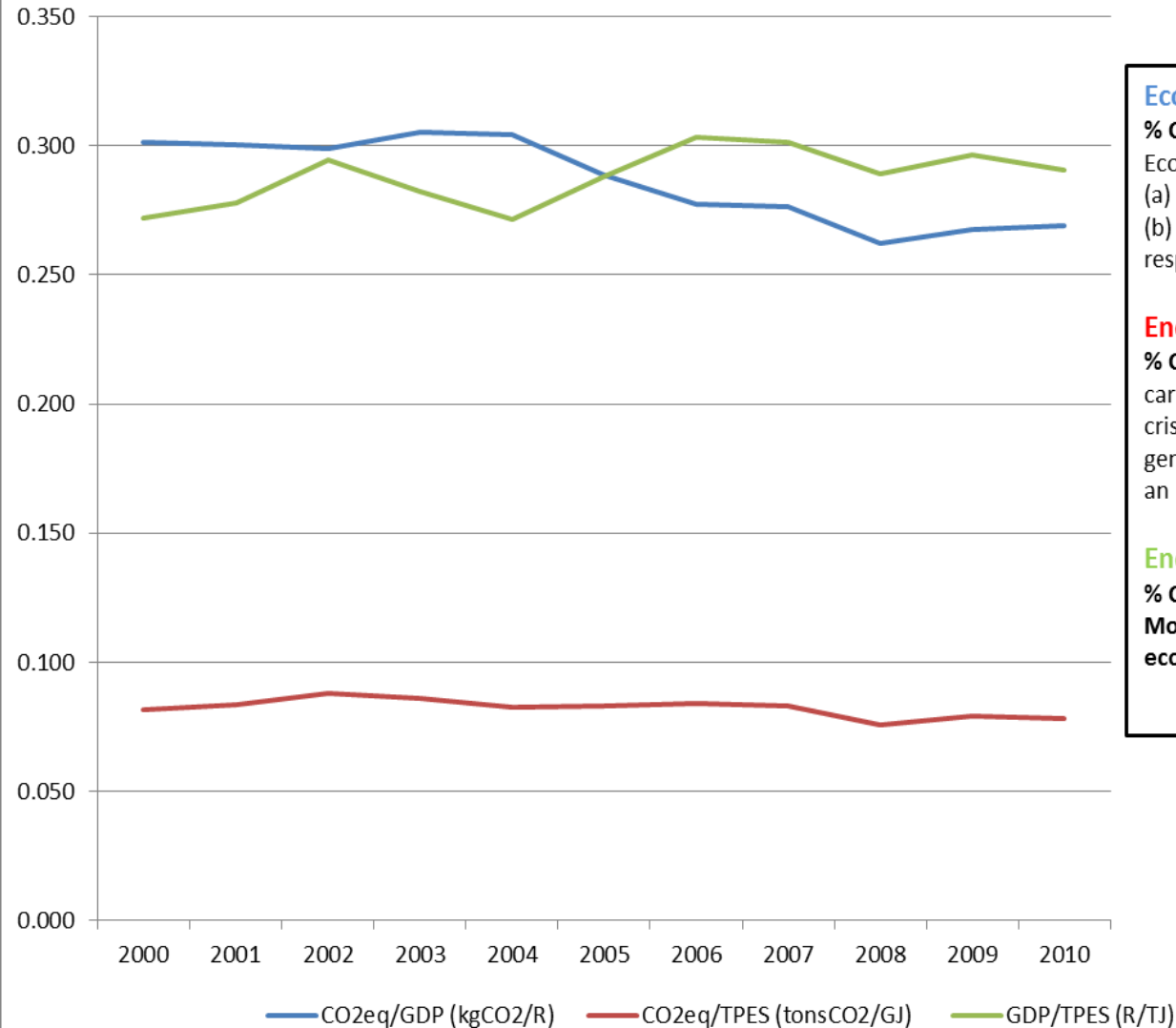


# Non-Energy Use of Fuels

## Types of use and examples of fuels used for non-energy applications

Use	Example of fuel types	Product/process
Feedstock	natural gas, oils, coal	ammonia
	naphtha, natural gas, ethane, propane, butane, gas oil, fuel oils	methanol, olefins (ethylene, propylene), carbon black
Reductant	petroleum coke	carbides
	coal, petroleum coke	titanium dioxide
	metallurgical cokes, pulverised coal, natural gas	iron and steel (primary)
	metallurgical cokes	ferroalloys
	petroleum coke, pitch (anodes)	aluminium <sup>1</sup>
	metallurgical coke, coal	lead
	metallurgical coke, coal	zinc
Non-energy Product	lubricants	lubricating properties
	paraffin waxes	misc. (e.g., candles, coating)
	bitumen (asphalt)	road paving and roofing
	white spirit <sup>2</sup> , some aromatics	as solvent (paint, dry cleaning)
<p><sup>1</sup>. Also used in secondary steel production (in electric arc furnaces) (see Chapter 4.2).  <sup>2</sup>. Also known as mineral turpentine, petroleum spirits, industrial spirit ('SBP').</p>		

## CO2 Related Indicators



### Economy Carbon Intensity (CO2eq/GDP):

**% Change (2000-2010)= (-) 10.7**

Economy becoming greener thanks to:

(a) Growth in the services and financial sectors

(b) Reduction and stagnation in the manufacturing and Mining respectively

### Energy Supply Carbon Intensity (CO2eq/TPES):

**% Change (2000-2010)= (-) 4.7**

carbon intensity of our energy supply impacted by the economic crisis

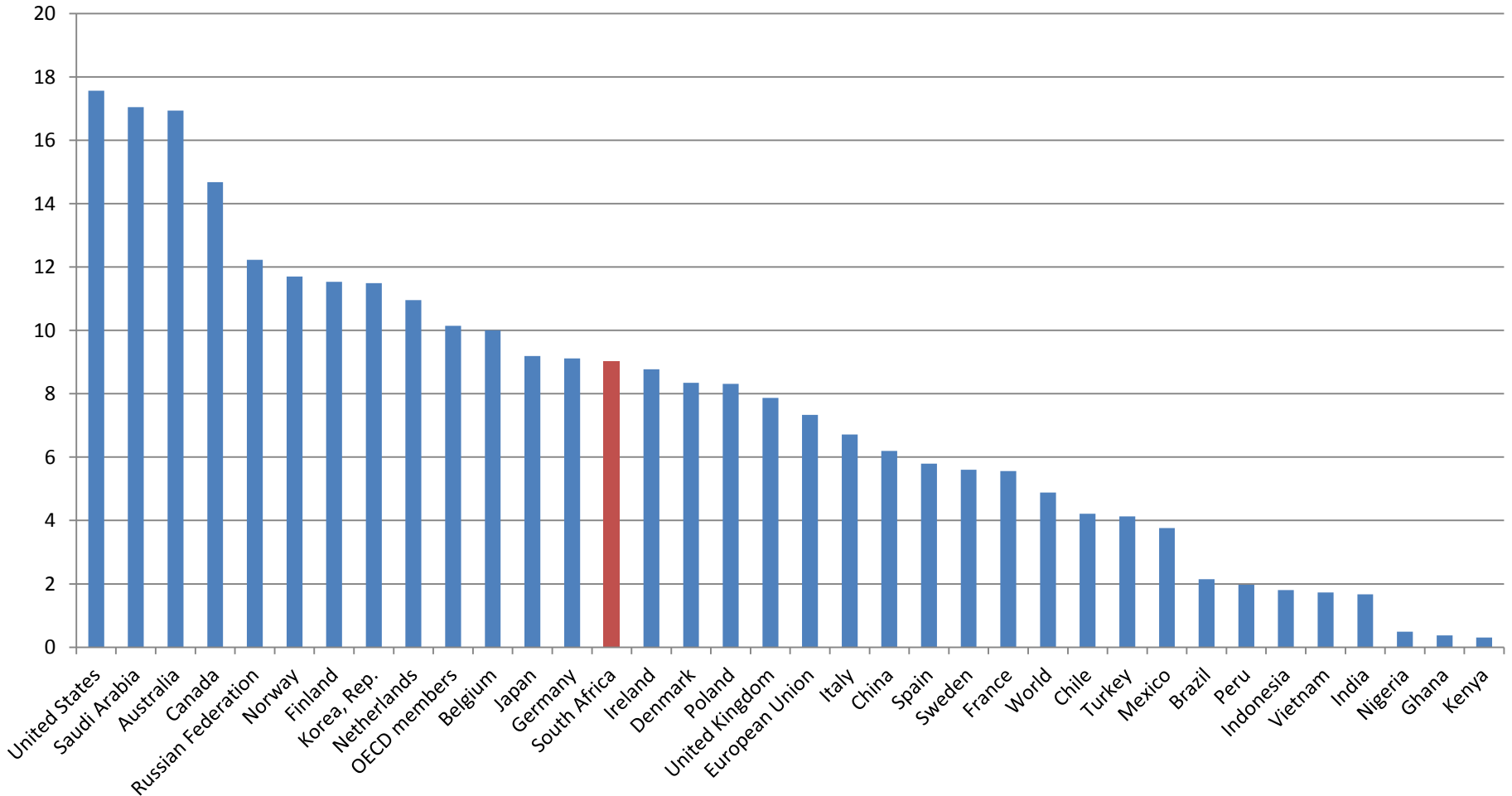
general, stagnation elsewhere in the time series is as a result of an unchanged energy supply mix

### Energy Intensity of the Economy (GDP/TPES):

**% Change (2000-2010)= (+) 6.8**

**More economic value derived per unit of energy supplied to the economy**

# CO2 emissions (metric tons per capita) in 2010 (WB, 2014)





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