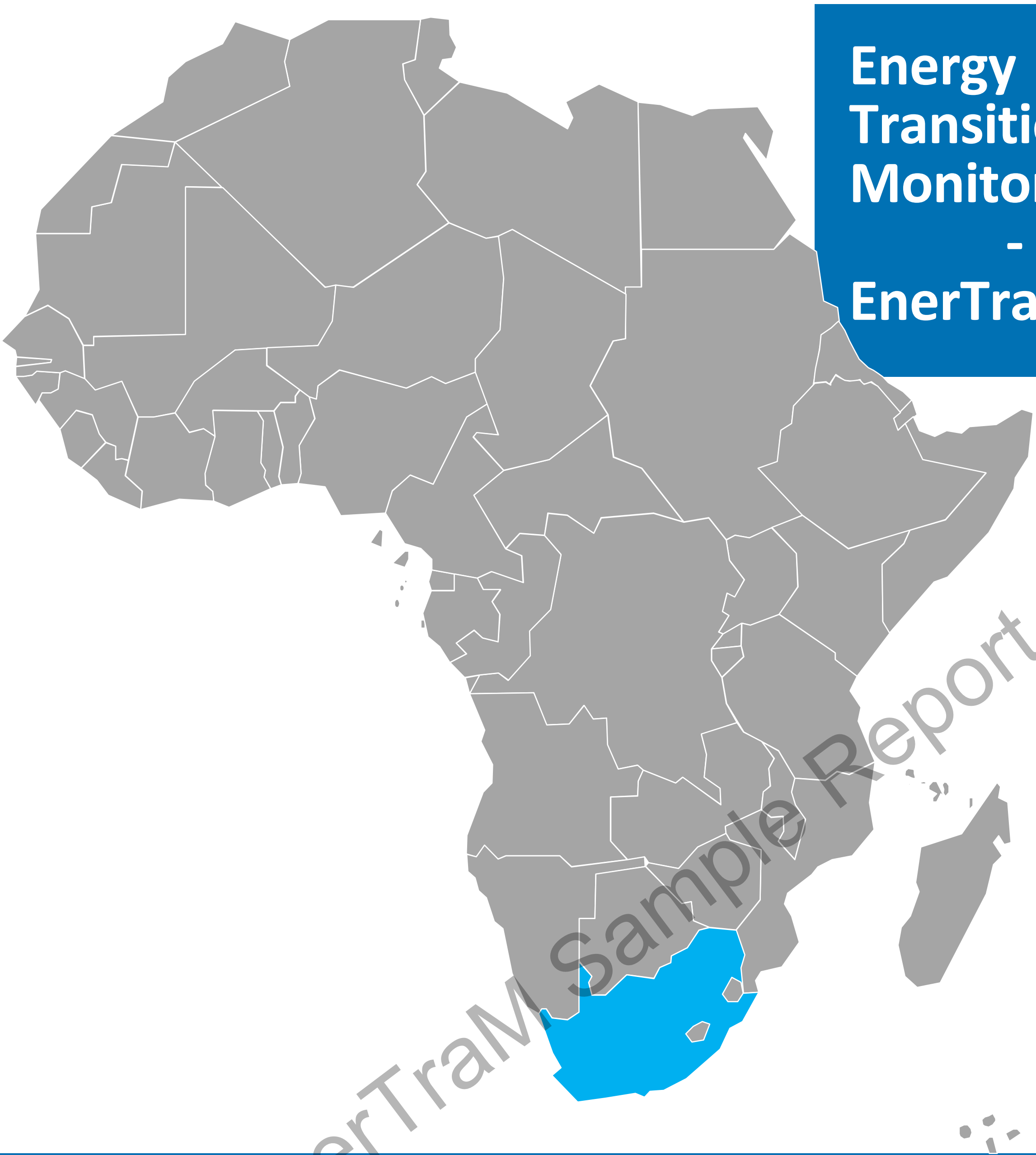
Energy Transition Monitoring - EnerTraM



SOUTH AFRICA

October 2018

Enerdata intelligence + consulting

EnerTraM methodology

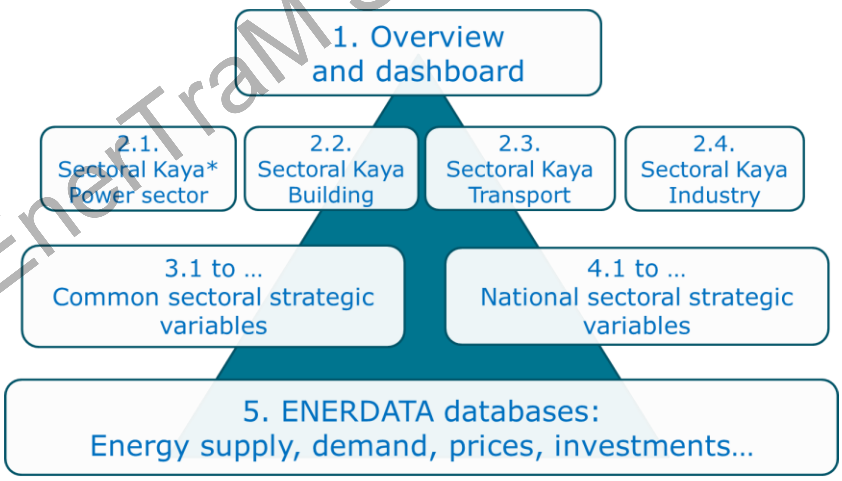
Under the current institutional and political context, energy and climate policies are more than ever on the international and national agendas, and tracking the progress of countries or regions towards a more sustainable and decarbonized energy system is essential in order to understand how “effective” the energy transition is.

Enerdata, as a leading company on energy databases, foresight and solutions, wishes to leverage its capabilities in terms of data, modelling and analysis in order to offer a product based on a set of competences and tools which would enable a systemic analysis of energy transitions.

The goal of the Energy Transition Monitoring program (EnerTraM) is to enable key energy actors to understand and evaluate energy transition paths in key countries, through the development of a transparent methodology, a regularly updated monitoring tool and the leverage of independent energy experts. This will trigger multiple synergies between databases, modelling tools and expertise on policies.

EnerTraM will combine ex post and ex ante analyses, i.e. historical data with foresight exercises, and identify the potential gaps or necessary trajectory changes implied by sustainable transitions. The program will generate the set of following tools and data:

1. **Tool** - A generic set of key indicators has been developed to provide a uniform and comparable framework on energy transition monitoring. These indicators are organised along a three-tier hierarchy, with i. Headlines, ii. Sectoral Kaya[1] decomposition and iii. Common & National Strategic indicators



2. **Historical data** – EnerTram report benefits from the regularly updated Enerdata databases[2].

[1] *The Kaya identity expresses total emissions as the product of four indicators: carbon intensity, energy intensity, GDP per capita and population.*
[2] *Enerdata Information Services :*
- *Global Energy & CO2 database:* https://www.enerdata.net/research/energy-market-data-co2-emissions-database.html
- *Odyssee database (EU28):* https://www.enerdata.net/research/energy-efficiency-odyssee-database.html
- *EnerDemand database (G20 & emerging economies):* https://www.enerdata.net/research/world-energy-efficiency-demand-database.html

3. **Forecasts** – EnerTraM forecasts are issued from EnerFuture[3] transition scenarios produced with the POLES model[4].

Ener-Blue	Ener-Green
CLIMATE & ENERGY POLICIES	
▪ **2030 NDCs targets achieved** ▪ **Near-stabilization of CO_2 emissions** ▪ **+3-4°C** temperature increase	▪ **Reinforcement** with NDCs targets reviewed upwards ▪ **CO_2 emissions divided by 2** in 2040 vs. today ▪ **~+2°C** temperature increase
ENERGY DEMAND	
▪ **Increase** in developing countries ▪ Slightly decreasing in OECD ▪ **Controlled** through NDCs	▪ **Global stabilization** ▪ Ambitious **energy efficiency policies** ▪ **Regular updates** of efficiency targets
ENERGY SUPPLY & PRICES	
▪ **Tensions** on available resources ▪ **Increasing energy prices** ▪ **Diversification** towards renewables	▪ Fossil fuel subsidies phase-out ▪ **Strong development** of **renewables** ▪ **Price increase** reflects policies and CO_2 constraints

4. **Analysis** - Quantitative and qualitative information, including experts' analysis on national and sectoral actions, enrich the data at each pyramidal level. The overall monitoring is thus synthesised in 22 key indicators. The most relevant indicators for each region will be selected for detailed analysis.

22 Key Energy Transition Monitoring Indicators

Headline	GHG emissions per capita	CO2 intensity of GDP	Carbon factor	Energy intensity of GDP	Primary energy per capita	Share of fossil fuels in primary energy
	(MtCO2e/cap)	**(tCO2/$)**	**(tCO2/toe)**	**(toe/$)**	**(toe/cap)**	**(%)**
Power sector	Electricity demand per capita	CO2 factor of the power sector	Electrification rate	Electrification of final energy mix	Installed coal capacities	Share of renewables in power generation (inc. large hydro)
	(kwh/cap)	**(gCO2/kWh)**	**(%)**	**(%)**	**(GW)**	**(%)**
Transport and industry	Transport CO2 emissions per capita	Private road transport CO2 emissions per km	CO2 emissions per km of new private vehicles	Kilometers per capita		Industry CO2 emissions intensity of VA***
	(tCO2/cap)	**(gCO2/km)***	**(gCO2/km)***	**(km/cap)**		**(tCO2e/$)**
Buildings, agriculture and LULUCF	Building CO2 emissions per capita	Residential building emissions intensity	Service building emissions intensity of VA***		Agriculture GHG emissions intensity of VA***	Carbon sinks intensity
	(tCO2/cap)	**(kgCO2/m2)****	**(kgCO2/$)**		**(tCO2e/$)**	**(MtCO2e)**

*Depending on data availability the private road transport indicators will be provided per "km", "veh" or "pkm"
**Depending on data availability the residential building emissions intensity will be provided as "kgCO2/m2" or kgCO2/household
***VA stands for Value Added, representing the contribution if a given sector to the region's overall GDP

[3] *EnerFuture scenarios:* https://www.enerdata.net/research/forecast-enerfuture.html
[4] *More details on POLES model:* https://www.enerdata.net/solutions/poles-model.html

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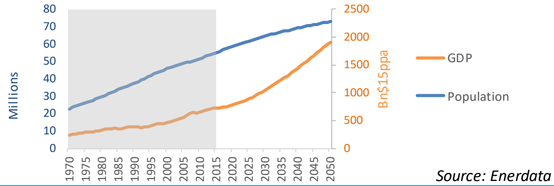
Country overview

Socio-economic data 2016

Population:	56 M
Population growth since 2000:	22 %
Density:	46 cap/km2
Urbanization rate:	65 %
GDP:	730 Bn$15ppa
Share of industry in GDP:	28 %
Share of services in GDP:	70 %
Share of agriculture in GDP:	2 %

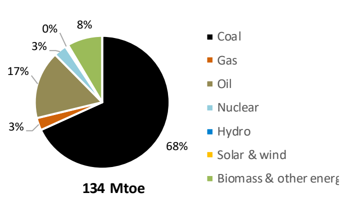


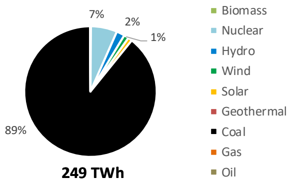
Source: Enerdata

Key energy & climate data 2016

Energy consumption per capita:	2.4	tep/cap
Electrification rate:	84	%
Electricity consumption per capita:	3459	TWh/cap
CO_2 emissions (excl. LULUCF):	457	$MtCO_2$
CO_2 emissions (excl. LULUCF) per capita:	8.2	tCO_2/cap

Highlights :





Source: Enerdata

Paris Climate Agreement commitment

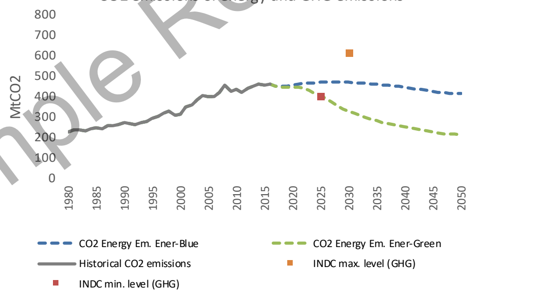
Target type	Trend	Form	Scope	Nature	Unconditional	Conditional	Reference year
Other (peak and plateau)	Stabilisation	MtCO2e	National	GHG (incl. LULUCF)	398-614 MtCO2e	-	BAU 2025

GHG coverage CO2, CH4, N2O, HFCs, PFCs, SF6

Sector coverage Energy, Industrial process and product use, agriculture, LULUCF and waste

Key documents

	Most recent version	Date
National Communication (NC)	Third National communication	31/08/2018
Bi-annual updated report	Second Biennial Update Report	28/12/2017
(I)NDC	First NDC	01/11/2016



Key power capacity targets as defined in (I)NDC

Source: Enerdata, INDC

Main energy and climate policies

1st NDC (2016)
Draft Integrated Resources Plan 2016-2030 (2018)
Draft Post-2015 Energy Efficiency Strategy (2016)
Renewable Energy Independent Power Producer Programme (REIPPP) (since 2011, latest renewal in 2015)
Vision, Strategic Direction and Framework for Climate Policy (2008)

Demand Objectives

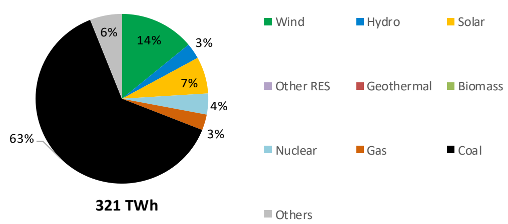
29% reduction of energy consumption compared to the latest BAU, including a 15% reduction in energy consumption within the industry and mining sector; 37% in the commercial and public sector; 33% in the residential sector; 39% in transport; 30% in agriculture

Average annual electricity demand growth of 1.8% over 2017-2030 and 1.4% over 2017-2050 (median demand scenario forecast in IRP Draft 2018)

Supply Objectives

1 million solar water heaters to be installed by 2030

Total electricity production (Draft Integrated Resources Plan 2016-2030, median scenario)



Capacity objective 2030 (Draft Integrated Resources Plan 2016-2030, median scenario)

	Wind	Hydro	Solar	Other	Nuclear	Gas	Coal	Others
GW	11	5	9	0	2	12	35	2
%	15	6	12	0	2	16	46	3

Emissions Objectives

Target 2050: cumulated GHG emissions reduction of 5470 MtCO2e over 2021-2050
GHG emissions (incl. LULUCF) reach a range of 398–614 MtCO2e over 2025-2030, with a peak between 2020 and 2025

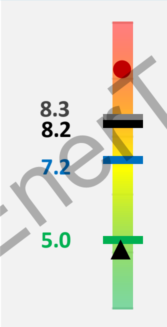
South Africa

- With around 8 tCO_2 per capita, South Africa's per capita emissions are below OECD countries' average (about 9.5 tCO2/cap.), but well over those of the BRICS countries (around 4.5 tCO_2/cap.).
- Total CO_2 emissions have skyrocketed over 1990-2008; CO_2 intensity of GDP is is one of the highest in the world as the South African economy is coal-based, and this intensity has kept increasing over the last decades.
- Primary energy supply is dominated by coal, which currently represents more than two thirds of total.
- Electricity consumption has stagnated over the last decade, but is expected to grow by around 1.5-2%/yr in the future. Electricity consumption will grow mostly in the industry and buildings sectors.
- Coal has currently the dominant share in the power generation mix (89%). It would remain so by 2030 in the NDC scenario, while the development of renewables in a more ambitious GHG abatement scenario would displace coal importantly.
- Industry represents the largest share in final consumption (37%), followed by the buildings sector (32%).
- Energy demand is expected to accelerate in the transport sector in both NDC and 2°C scenarios, meanwhile consumption from the industry and buildings sectors should be limited or decreased in the future to reach NDC and 2°C objectives.
- Electricity gains market shares in all sectors and all scenarios. In a 2°C scenario, electricity could represent up to 30% of transport consumption by 2050.

KEY INDICATORS

CO2 emissions per capita

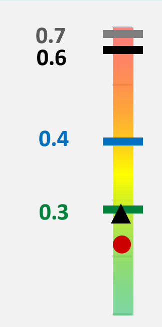
tCO2e/cap



In 2016
▲ *World = 4.71*
● *OECD = 9.64*

CO2 emissions intensity

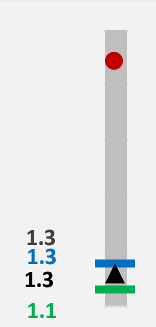
tCO2/k$15ppa



In 2016
▲ *World = 0.30*
● *OECD = 0.23*

Primary energy per capita

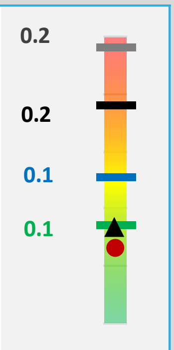
toe/cap



In 2016
▲ *World = 1.25*
● *OECD = 2.88*

Primary energy intensity

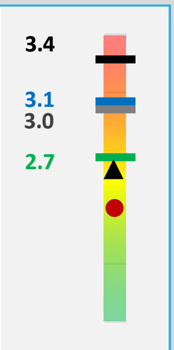
toe/k$15ppa



In 2016
▲ *World = 0.11*
● *OECD = 0.10*

CO2 factor of primary energy

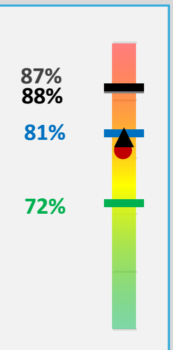
tCO2/toe



In 2016
▲ *World = 2.61*
● *OECD = 2.33*

Share of fossil fuels in primary energy

%



In 2016
▲ *World = 81%*
● *OECD = 79%*

Legend
- 2010 data
- 2016 data
- 2030 EnerBlue (NDC) scenario
- 2030 EnerGreen (2°C) scenario

POWER

CO2 factor of power sector
gCO2/kWh
939 / 872 / 666 / 503
In 2016
▲ *World = 489*
● *OECD = 376*

Electrification rate
%
84% / 83%
In 2016
▲ *World = 82%*
● *OECD = 100%*

Electricity share in the final energy mix
%
27% / 26% / 25% / 22%
In 2016
▲ *World = 19%*
● *OECD = 22%*

Electricity demand per capita
MWh/cap
4.0 / 3.9 / 3.6 / 3.5
In 2016
▲ *World = 2.76*
● *OECD = 7.26*

Installed coal capacities
GW
42.9 / 38.9 / 38.7 / 37.9
Share of coal in 2016 Installed capacities
S. Africa = 17%
World = 36%
OECD = 30%

Share of renewables in power generation
%
30% / 18% / 4% / 2%
In 2016
▲ *World = 25%*
● *OECD = 24%*

TRANSPORT

Transport CO2 emissions per capita
tCO2/cap
1.2 / 1.0 / 1.0 / 0.9
In 2016
▲ *World = 0.86*
● *OECD = 2.72*

Average road transport CO2 intensity
kgCO2/pkm
86.5 / 84.0 / 77.8 / 67.2
In 2016
▲ *World = 116*
● *OECD = 179*

Average annual kilometers per capita
km/cap
3696 / 3540 / 2646 / 2561
In 2016
▲ *World = 4498*
● *OECD = 12068*

BUILDINGS

Building CO2 emissions per capita
tCO2/cap
0.5 / 0.4 / 0.3 / 0.2
In 2016
▲ *World = 0.40*
● *OECD = 1.09*

Residential CO2 emissions per m2
kgCO2/m2
22.2 / 16.5 / 15.2 / 8.2
In 2016
▲ *World = 12.90*
● *OECD = 18.00*

Services CO2 emissions intensity
kgCO2/k$15ppa
27.3 / 18.0 / 15.8 / 7.8
In 2016
▲ *World = 15.05*
● *OECD = 13.07*

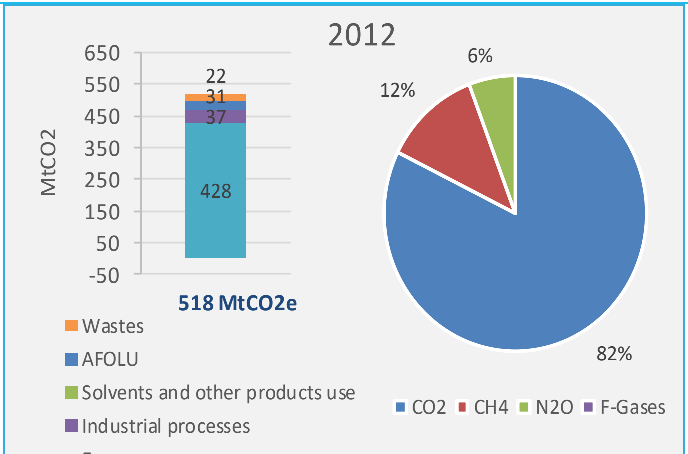
INDUSTRY

CO2 emissions intensity of industry
kgCO2/k$15ppa
386 / 315 / 240 / 163
In 2016
▲ *World = 271*
● *OECD = 172*

Legend
- 2010 data
- 2016 data
- 2030 EnerBlue (NDC) scenario
- 2030 EnerGreen (2°C) scenario

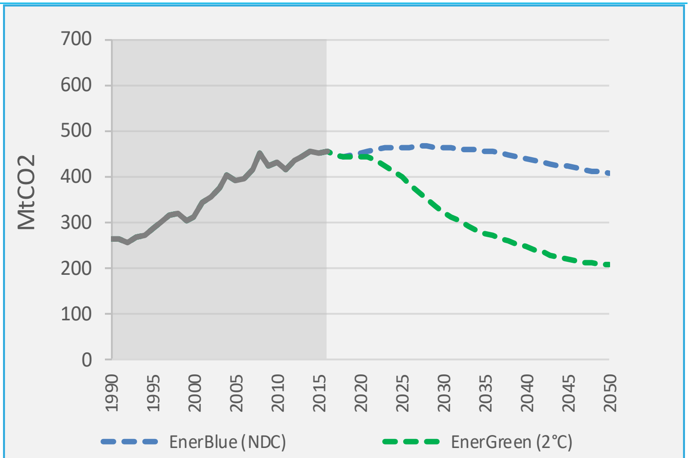
1.1. CO2 and GHG emissions

1.1.1. GHG EMISSIONS (NIR DATA) BY SECTOR AND GAS



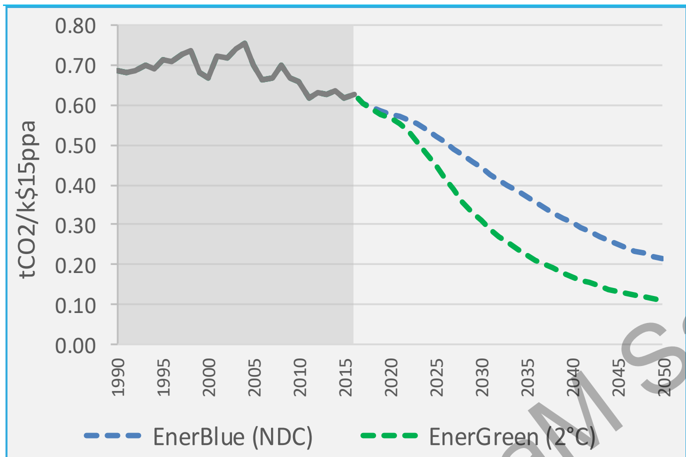
Source: DEA (GHG NIR 2017)

1.1.2. CO2 EMISSIONS OF ENERGY COMBUSTION & INDUSTRY



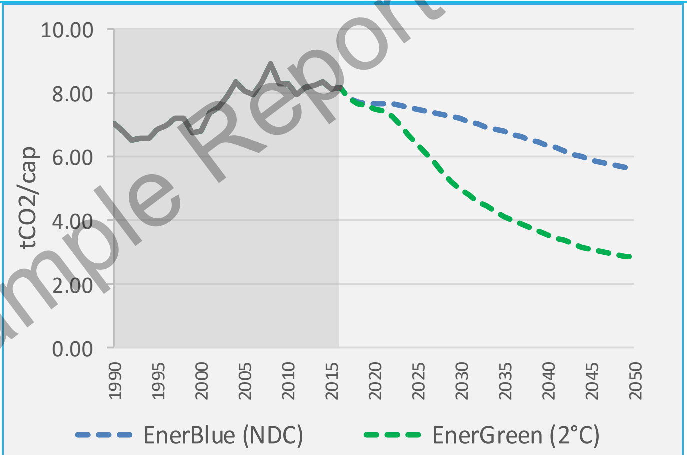
Source: Enerdata

1.1.3. CO2 EMISSIONS OF ENERGY + INDUSTRY PER GDP



Source: Enerdata

1.1.4. CO2 EMISSIONS OF ENERGY + INDUSTRY PER CAPITA



Source: Enerdata

Comments

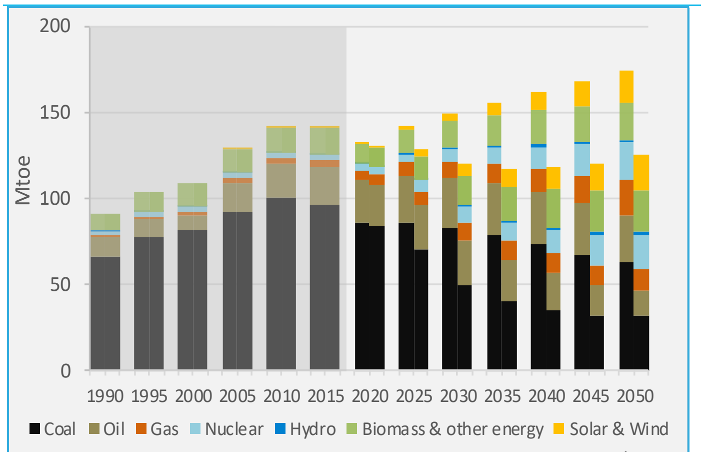
- Emissions of all sectors have grown steadily over the past decades until the 2008 crisis, in line with the economic development of the country. Over 83% of emissions come from energy use, implying a significant potential for emission reductions in the energy sector.
- South Africa has not made strong efforts in energy efficiency and the decarbonisation of the mix to date, as the main interest of the country has been to strengthen economic growth and increased energy access in a challenging context of large social and economic inequalities. This means that important opportunities remain to reduce emissions through the implementation of climate policies.
- South Africa has a very high carbon intensity, well over the world and OECD average, due to its coal dependence. The introduction of energy and climate policies as proposed in the NDC can lead to a stabilisation in South Africa's emissions profile towards 2050. Given the continuous growth of the economy, this would require a three-fold reduction of CO2 emissions intensity per GDP by 2050.
- This NDC objective remains nevertheless quite far from what would be required in a 2° scenario, and further energy efficiency policies would be required to achieve both a higher energy intensity reduction and significant diversification of the energy mix, that would primarily focus on reducing coal consumption and shifting towards cleaner fuels and renewables.

	Historical	EnerBlue (NDC)	EnerGreen (2°C)
%/year	**1990 - 2016**	**2016 - 2030**	**2016 - 2030**
CO2 Em.	-0.3%	-2.4%	-4.9%
CO2 Em.* per capita	0.6%	-0.9%	-3.4%
CO2 int.* per primary ener.	0.6%	-0.7%	-1.7%

** CO2 energy combustion*

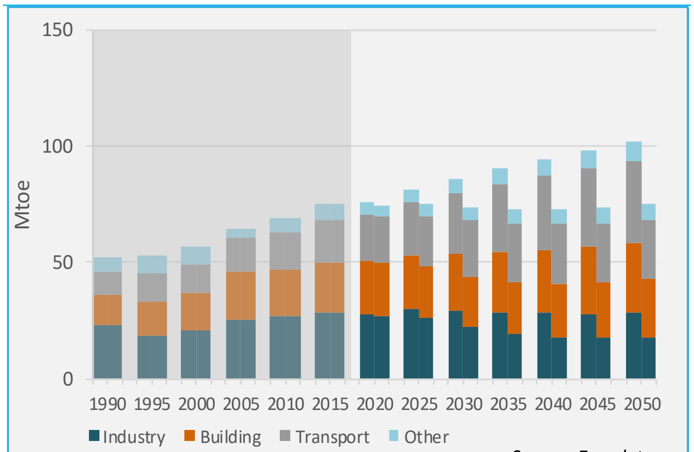
1.2. Energy

1.2.1. PRIMARY ENERGY BY SOURCE : ENERBLUE (LEFT) & ENERGREEN (RIGHT)



Source: Enerdata

1.2.2. FINAL ENERGY BY SECTOR : ENERBLUE (LEFT) & ENERGREEN (RIGHT)

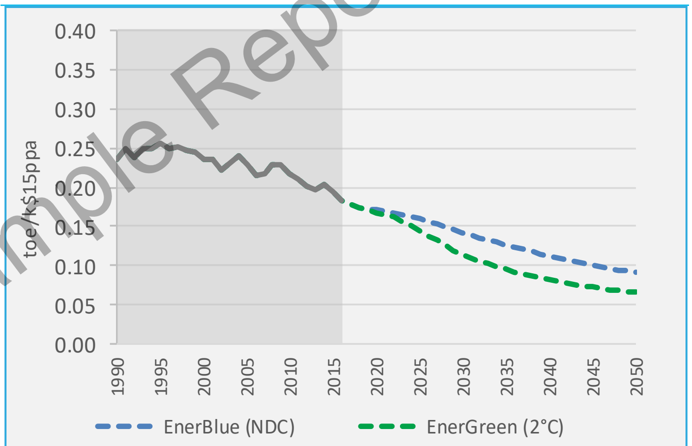


Source: Enerdata

1.2.3. CO2 EMISSIONS OF ENERGY + INDUSTRY & EFFECT DECOMPOSITION

Source: Enerdata

1.2.4. ENERGY INTENSITY PER GDP



Source: Enerdata

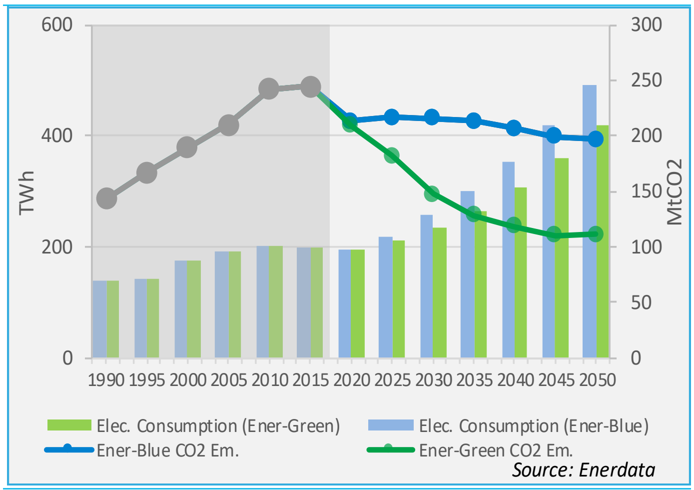
Comments

- Primary energy consumption growth is in line with economic development and growing emissions, as coal has historically dominated the energy mix. Coal accounts for over two thirds of it, followed by oil and biomass with respective shares of around 17% and 8%.
- Under the NDC implementation the energy mix can change significantly, due to a decline in coal consumption, the penetration of gas and the pick-up of renewables, such as wind and solar, which are minor in South Africa at present. Given the country's high carbon intensity and the gradual electrification of the economy, this mix shows opportunities for a rapid decarbonisation of the enery sector.
- The share of electricity in final consumption is currently 22%. The implementation of energy and climate policies, and a wider access of the population to electricity, would raise this share to 26% and 28% in NDC and 2° scenarios respectively by 2030.
- Economic growth will push energy consumption up, especially in the transport sector where fuel switching happens at a slower pace. However, while consumption grows in the building sector, the sector's shift towards electricity from less efficient fuels like biomass acts already as an energy efficiency measure. Energy consumption should be stabilised towards 2050 to be in line with a 2° scenario.

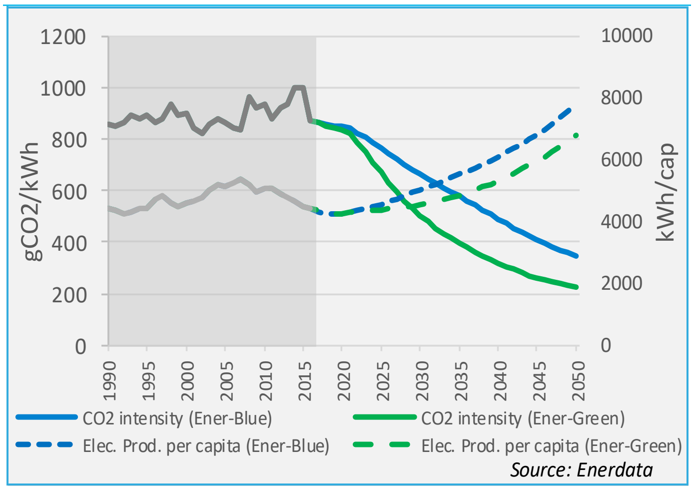
	Historical	EnerBlue (NDC)	EnerGreen (2°C)
%/year	1990 - 2016	2016 - 2030	2016 - 2030
CO2 Em. Energy	2.1%	0.1%	-2.4%
Primary consumption	1.5%	0.8%	-0.8%
Final consumption	1.4%	1.0%	-0.1%

2.1. Electricity

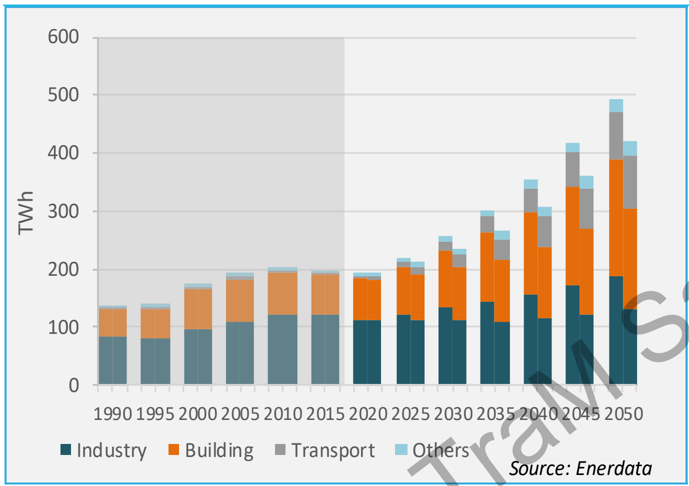
2.1.1. ELECTRICITY CONSUMPTION & CO2 EMISSIONS



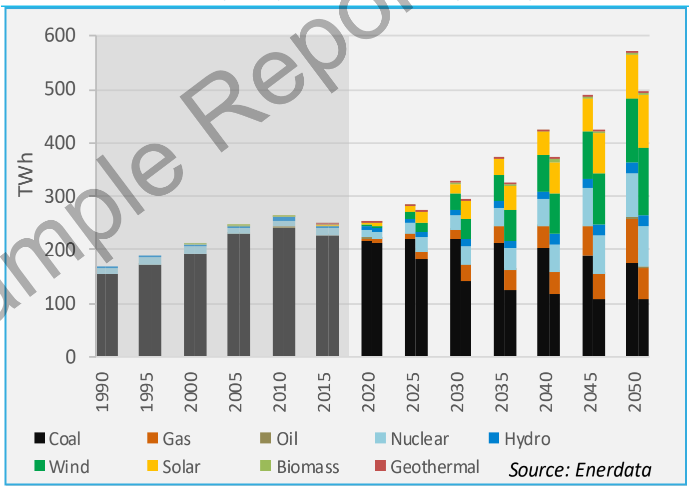
2.1.2. KAYA CO2 INDICATORS



2.1.3. ELECTRICITY CONSUMPTION BY SECTOR: ENERBLUE (LEFT) & ENERGREEN (RIGHT)



2.1.4. ELECTRICITY PRODUCTION BY SOURCE: ENERBLUE (LEFT) & ENERGREEN (RIGHT)



Comments

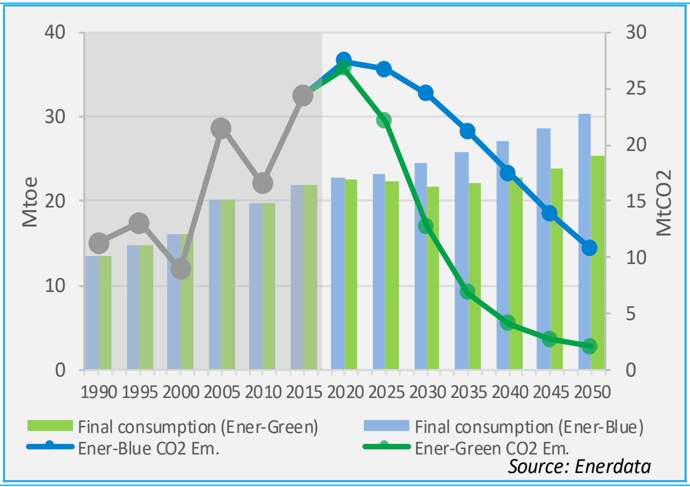
- Electricity consumption stagnated over the last decade due to economic difficulties and power supply constraints. The expected economic growth in the future should lead to an important increase in consumption mainly driven by the industry and building sectors.
- The shift away from coal, which accounts for nearly 90% of electricity production today, to renewables is the main decarbonisation strategy of South Africa's power mix: in 2050, renewables will account for 40% and 50% of electricity generation respectively in the NDC and 2° scenarios, while coal's share will be reduced to 31% and 22%.
- In South Africa, sustained economic development and increased access to electricity of the population are compatible with the implementation of climate and energy policies that aim to reduce emissions. The diversification of the power mix can also increase national energy security and reduce recurring power shortage problems the country has been facing over the past years.

	Historical	EnerBlue (NDC)	EnerGreen (2°C)
%/year	**1990 - 2016**	**2016 - 2030**	**2016 - 2030**
Electricity cons.	1.3%	2.1%	1.4%
Electricity prod.	1.5%	1.9%	1.2%
CO2 Em.* of power sector	0.1%	-1.9%	-3.9%
Electricity cons. per cap	0.0%	0.9%	0.2%

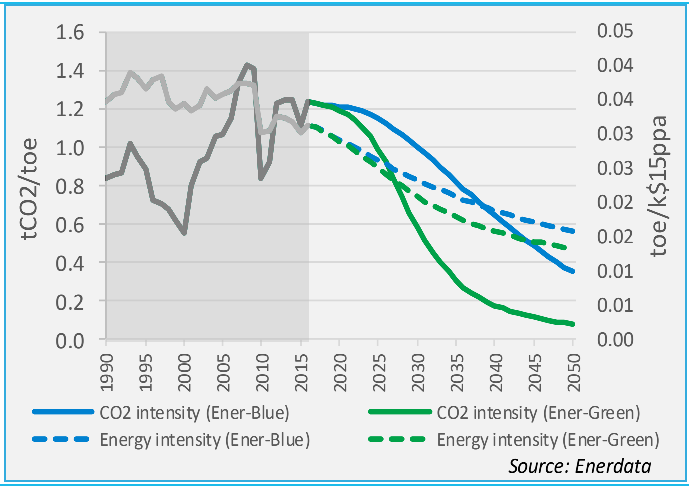
** CO2 energy combustion*

2.2. Buildings

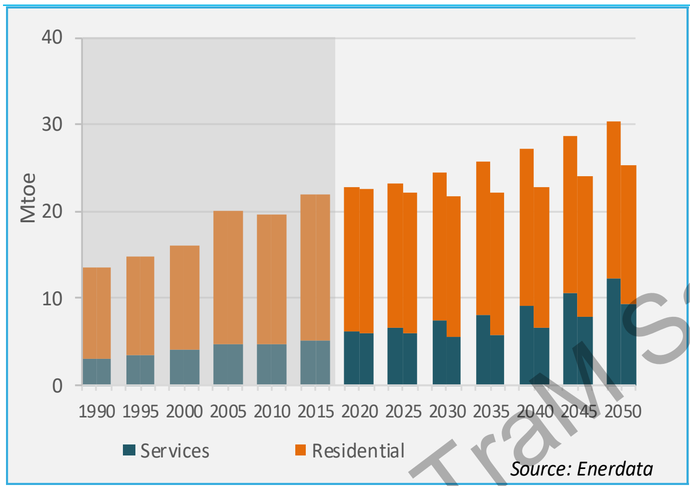
2.2.1. FINAL ENERGY & CO2 EMISSIONS



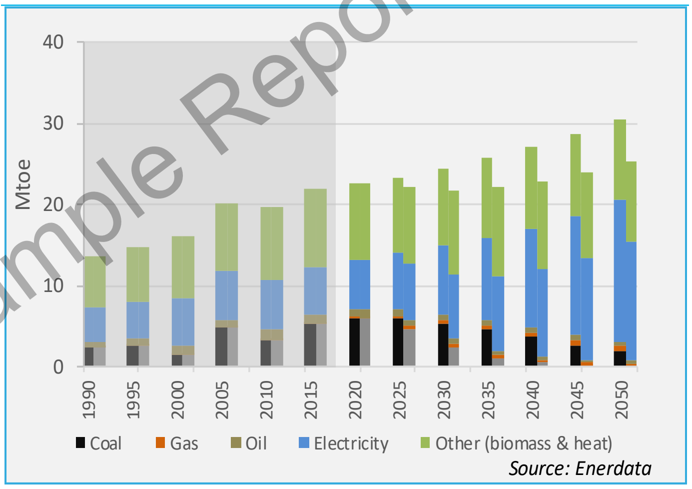
2.2.2. KAYA CO2 INDICATORS



2.2.3. ENERGY CONSUMPTION BY SECTOR: ENERBLUE (LEFT) & ENERGREEN (RIGHT)



2.2.4. ENERGY CONSUMPTION BY SOURCE: ENERBLUE (LEFT) & ENERGREEN (RIGHT)



Comments

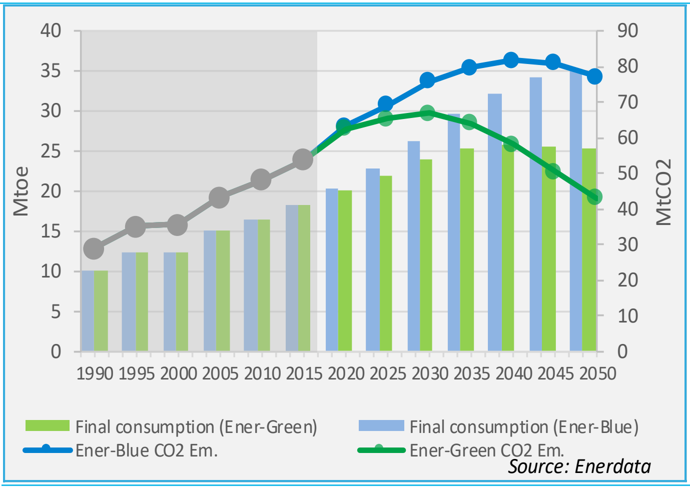
- Buildings (households and services) account for nearly a third of the total final energy consumption. The sector's past emissions trajectory shows an overall increasing trend over the last decades. However the decreasing energy intensity per GDP suggests that the buildings sector has seen efficiency gains from the increasing use of electricity and a substitution from biomass to liquid fuels.
- Economic growth will still imply increased energy demand in buildings under NDC implementation. The residential sector absorbs nearly two thirds of the energy consumption in buildings.
- Around 30% of the rural population does not have access to electricity and relies on biomass and liquid fuels. Increasing access to electricity can therefore lead to energy efficiency gains and reduce air pollution from direct combustion in the residential sector.

	Historical	EnerBlue (NDC)	EnerGreen (2°C)
%/year	**1990 - 2016**	**2016 - 2030**	**2016 - 2030**
Final cons.	2.0%	0.5%	-0.3%
CO2 Em.*	3.6%	-1.0%	-5.5%
CO2 int.* per energy	1.5%	-1.5%	-5.2%
Energy int. per GDP	-0.4%	-2.1%	-2.9%

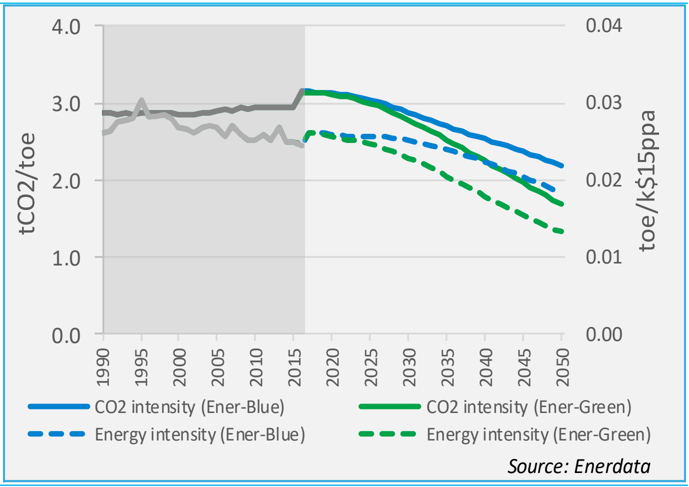
** CO2 energy combustion*

2.3. Transport

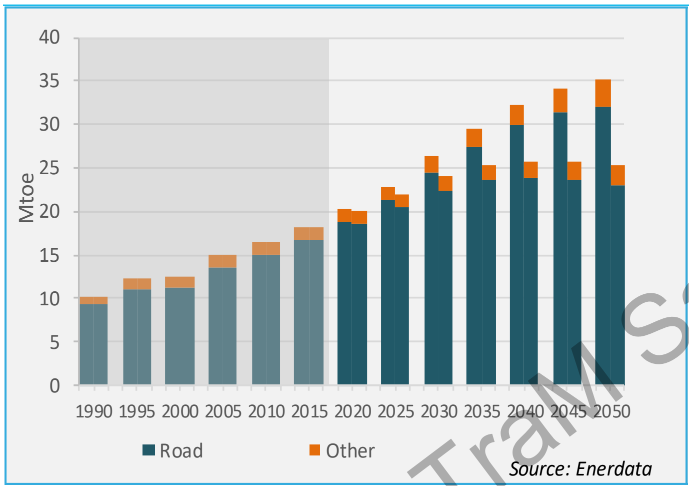
2.3.1. FINAL ENERGY & CO2 EMISSIONS



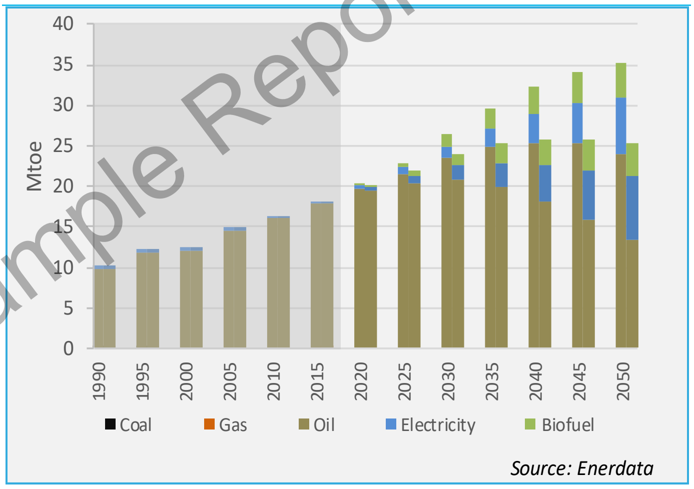
2.3.2. KAYA CO2 INDICATORS



2.3.3. ENERGY CONSUMPTION BY SECTOR: ENERBLUE (LEFT) & ENERGREEN (RIGHT)



2.3.4. ENERGY CONSUMPTION BY SOURCE: ENERBLUE (LEFT) & ENERGREEN (RIGHT)



Comments

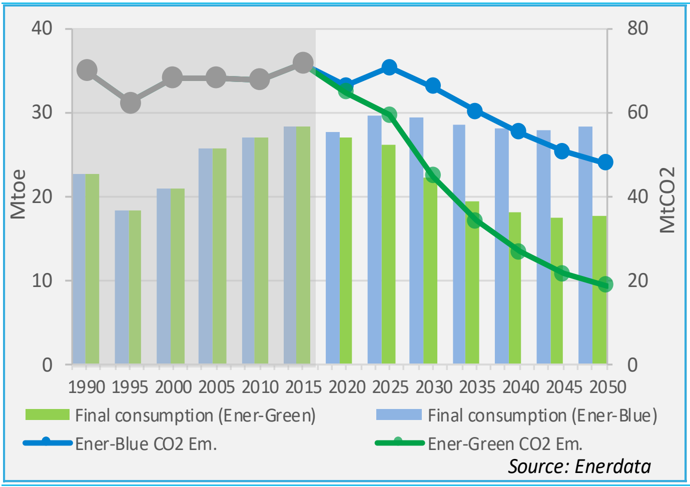
- The transport sector represents 25% of final energy demand with road transport accounting for 90% of the total consumption of the sector. Even under the country's investments and efforts to develop infrastructure for public transport projects, it is largely dominated by private road transport (cars and trucks).
- The transport sector is heavily dominated by oil, and therefore the emissions and energy consumption trends are largely correlated. No important improvement has been made in terms of energy efficiency. The carbon content of the transport sector has remained constant for decades, showing the negligible introduction of non-conventional vehicles into the economy to date.
- The NDC shows opportunity for promoting biofuels and the integration of electric vehicles in the transport sector. In a 2° scenario, not only clean vehicle technologies must be implemented to decarbonise the sector, but consumption must be stabilised too. In this context, electricity and biofuels could represent nearly 50% of transport's consumption by 2050.

	Historical	EnerBlue (NDC)	EnerGreen (2°C)
%/year	**1990 - 2016**	**2016 - 2030**	**2016 - 2030**
Final cons.	2.2%	2.8%	2.1%
CO2 Em.*	2.6%	2.1%	1.2%
CO2 int.* per energy	0.4%	-0.7%	-0.9%
Energy int. per GDP	-0.2%	0.2%	-0.5%

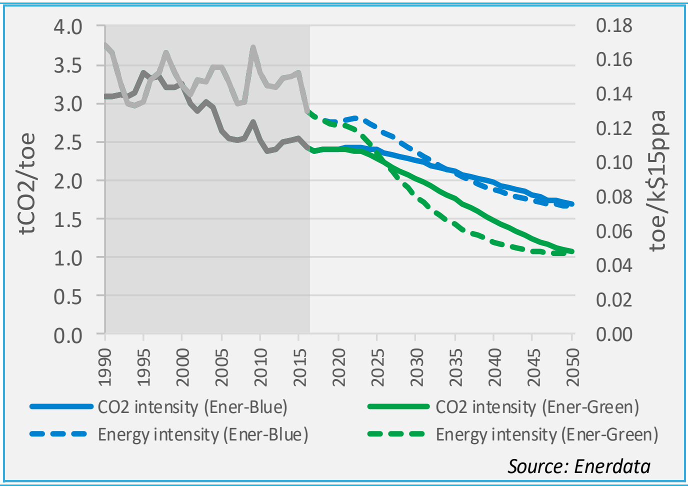
** CO2 energy combustion*

2.4. Industry

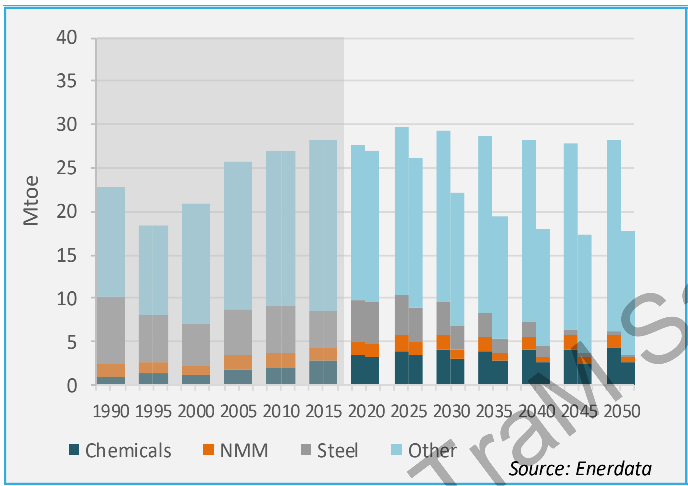
2.4.1. FINAL ENERGY & CO2 EMISSIONS



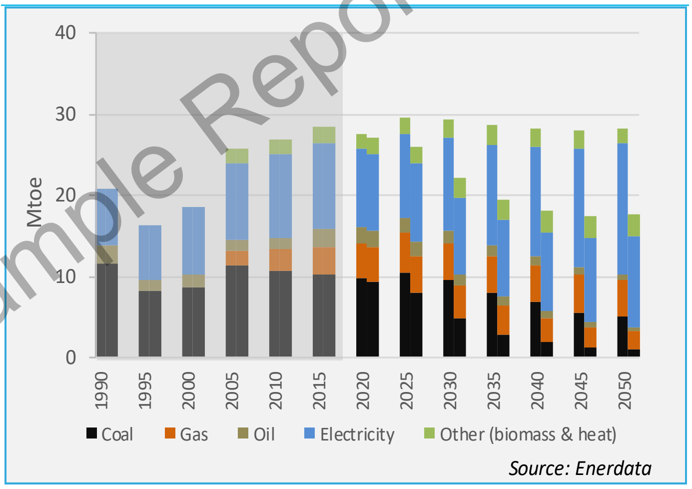
2.4.2. KAYA CO2 INDICATORS



2.4.3. ENERGY CONSUMPTION BY SECTOR : ENERBLUE (LEFT) & ENERGREEN (RIGHT)



2.4.4. ENERGY CONSUMPTION BY SOURCE : ENERBLUE (LEFT) & ENERGREEN (RIGHT)



Comments

- Industry accounts for 37% of final energy consumption, in line with G20 (33%). Industry is an important sector in the South African economy, contributing to 25% of the national GDP. The major industries in South Africa include mining, steel and chemicals.
- The industrial sector in South Africa is over 40% more carbon intensive than the world average. This is mainly due to the large use of coal (37%). Under NDC implementation, there is potential to reduce emissions while stabilising consumption through a shift from coal towards gas and electricity; however in a 2° context energy consumption is reduced by approximately 40% in 2050.
- A national shift away from coal, and potentially reduced coal exports if other countries move away from coal, could impact the industrial sector and the economy of South Africa under the implementation of climate and energy policies. This transition requires South Africa to diversify into new sectors to reduce the risks of drastic unemployment.

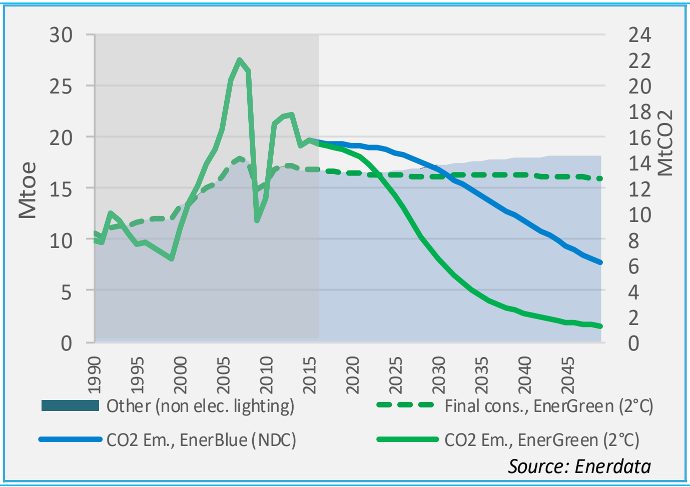
	Historical	EnerBlue (NDC)	EnerGreen (2°C)
%/year	**1990 - 2016**	**2016 - 2030**	**2016 - 2030**
Final cons.	0.8%	0.4%	-1.5%
CO2 Em.*	-0.2%	-0.1%	-2.8%
CO2 int.* per energy	-0.9%	-0.5%	-1.3%
Energy int. per VA	-1.0%	-1.4%	-3.4%

** CO2 energy combustion & Industrial processes*

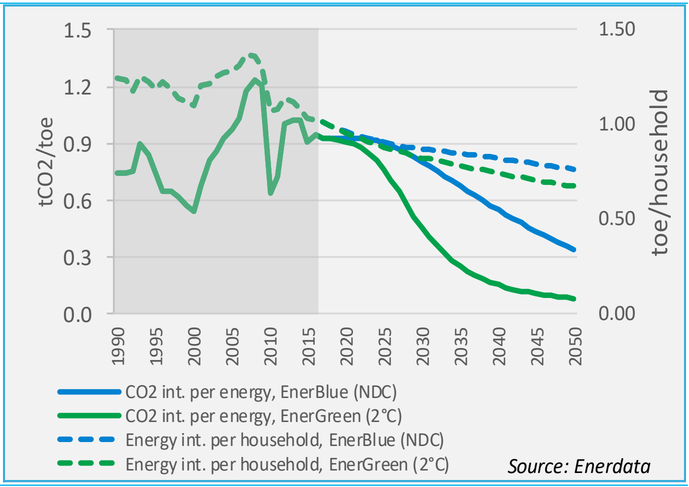
SECTORAL ANNEXES

3.1. Annex: Residential

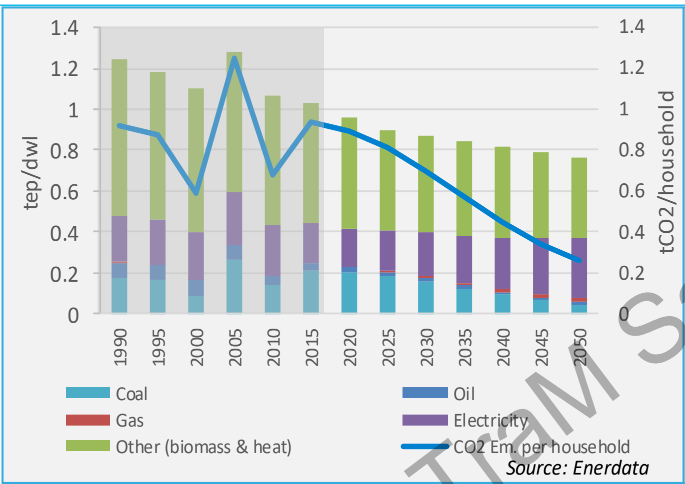
3.1.1. FINAL ENERGY & CO2 EMISSIONS



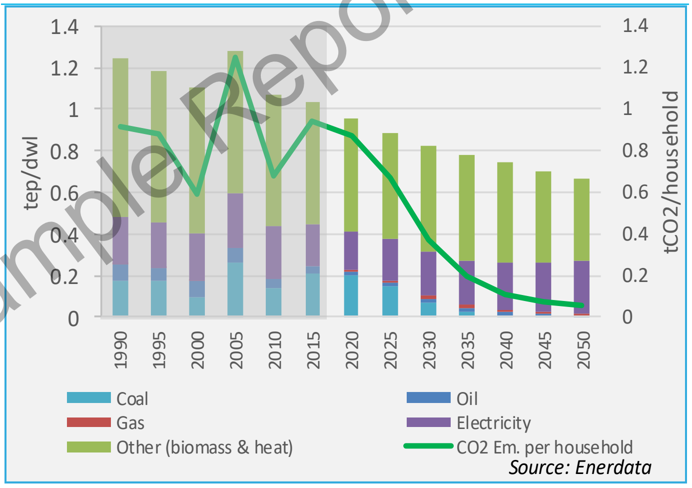
3.1.2. KAYA CO2 INDICATORS



3.1.3. ENERGY CONSUMPTION BY SOURCE - NDC SCENARIO (ENERBLUE)

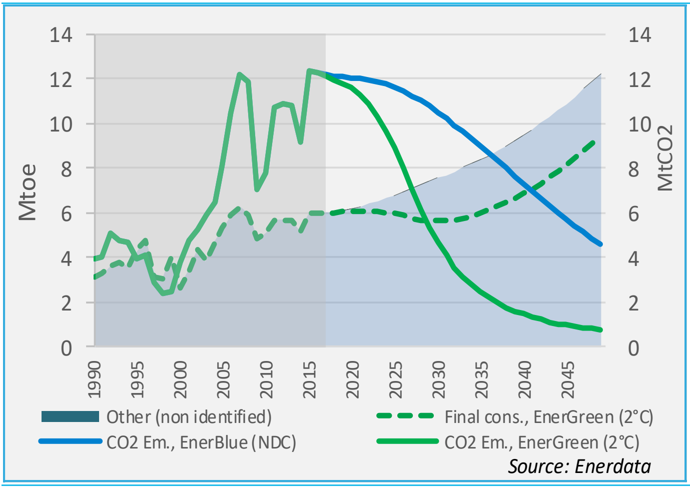


3.1.4. ENERGY CONSUMPTION BY SOURCE - 2°C SCENARIO (ENERGREEN)

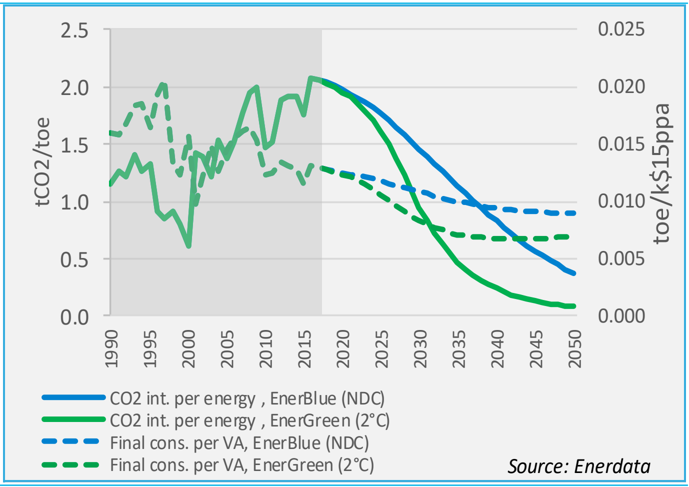


3.2. Annex: Services

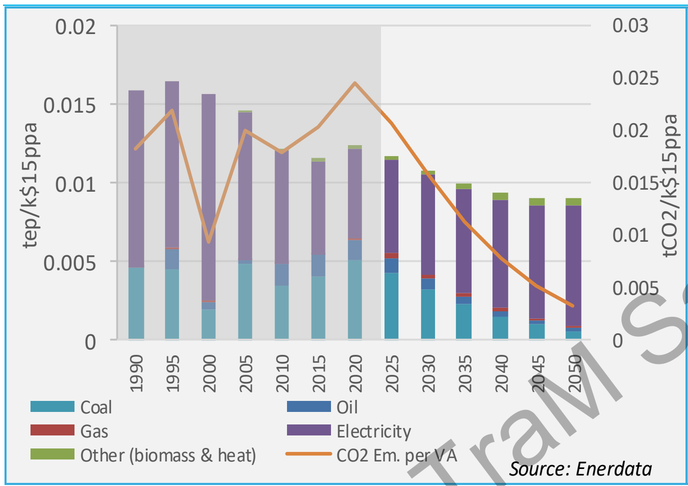
3.2.1. FINAL ENERGY & CO2 EMISSIONS



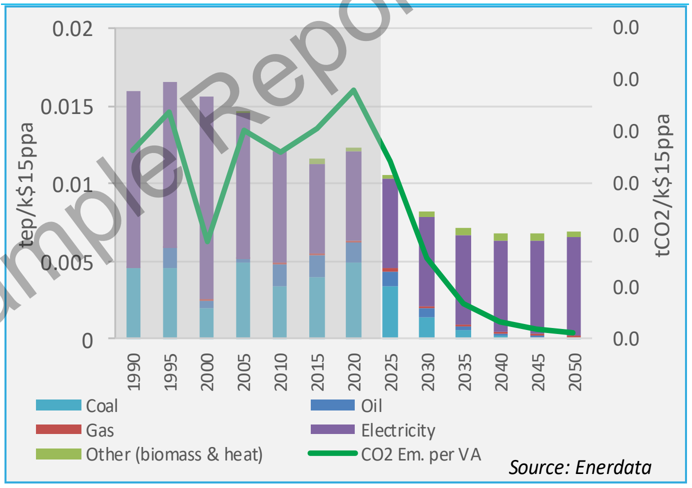
3.2.2. KAYA CO2 INDICATORS



3.2.3. ENERGY CONSUMPTION BY SOURCE - NDC SCENARIO (ENERBLUE)

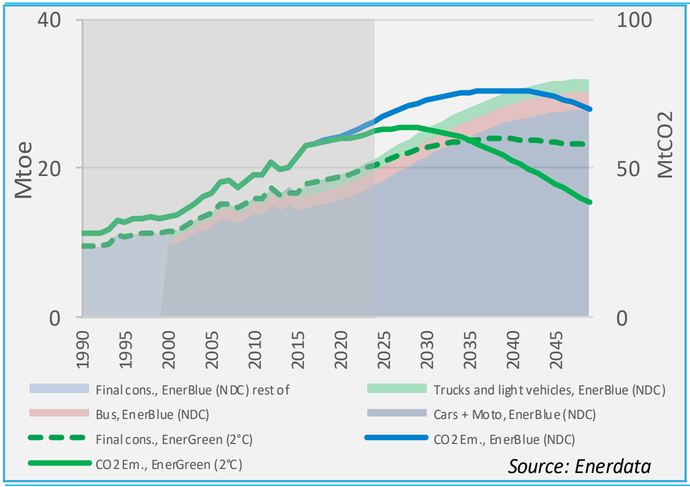


3.2.4. ENERGY CONSUMPTION BY SOURCE - 2°C SCENARIO (ENERGREEN)

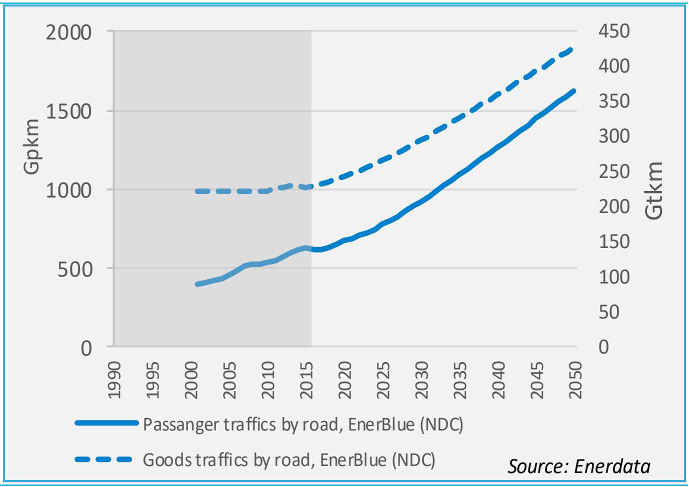


3.3. Annex: Road transport

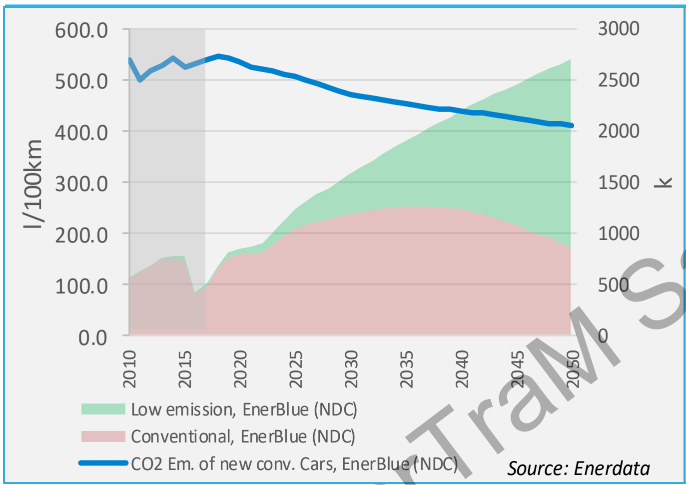
3.3.1. FINAL ENERGY & CO2 EMISSIONS



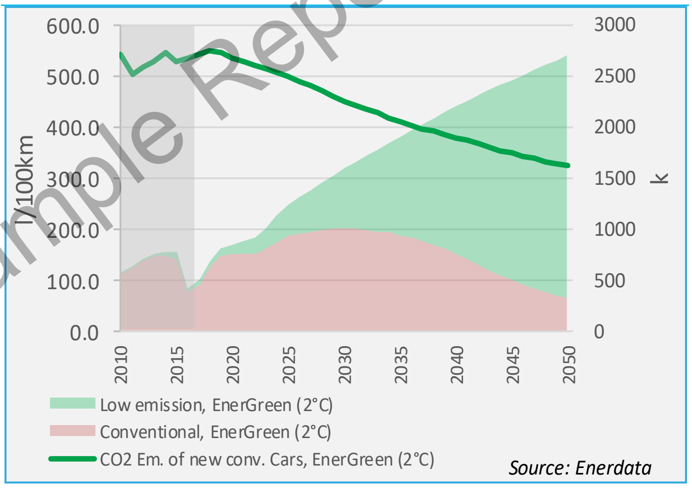
3.3.2. ROAD TRANSPORT PKM & TKM



3.3.3. SALES OF CONVENTIONAL VS LOW CARBON CARS & SPECIFIC CONSUMPTION OF NEW CONV. CARS - NDC SCENARIO (ENERBLUE)

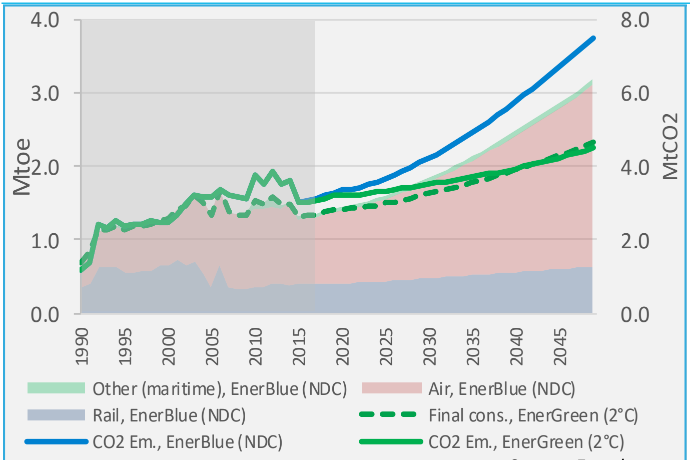


3.3.4. SALES OF CONVENTIONAL VS LOW CARBON CARS & SPECIFIC CONSUMPTION OF NEW CONV. CARS - 2°C SCENARIO (ENERGREEN)



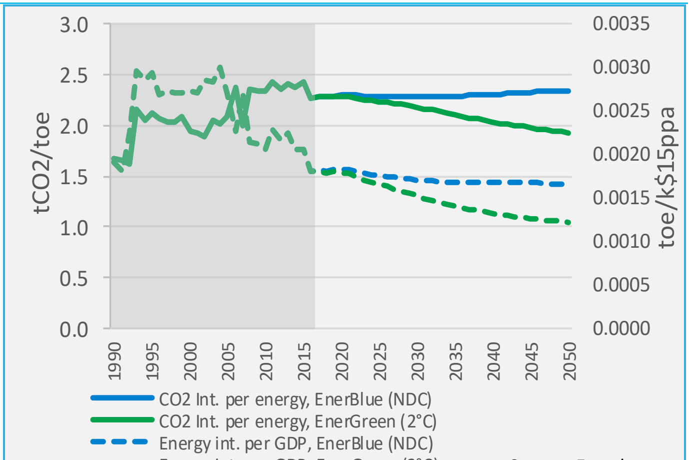
3.4. Annex: Other transports

3.4.1. FINAL ENERGY & CO2 EMISSIONS



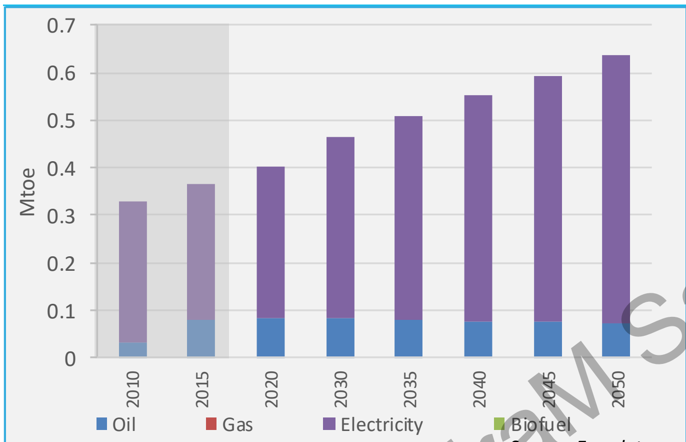
Source: Enerdata

3.4.2. KAYA CO2 INDICATORS



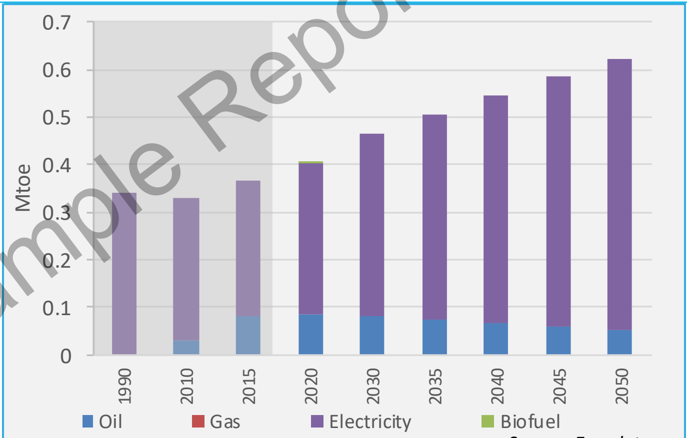
Source: Enerdata

3.4.3. ENERGY CONSUMPTION BY SOURCE FOR RAIL TRANSPORT - NDC SCENARIO (ENERBLUE)



Source: Enerdata

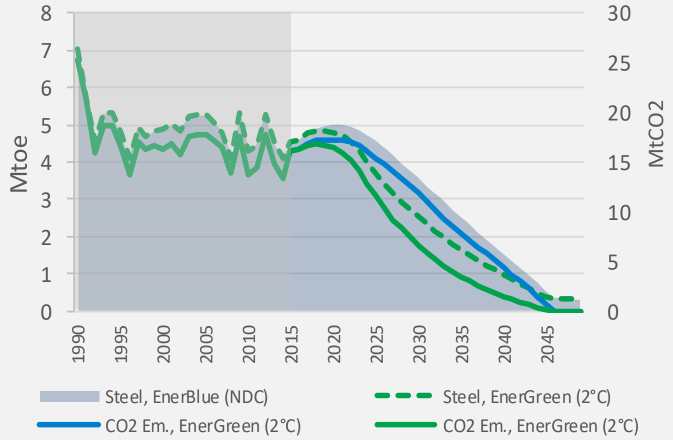
3.4.4. ENERGY CONSUMPTION BY SOURCE FOR RAIL TRANSPORT - 2°C SCENARIO (ENERGREEN)



Source: Enerdata

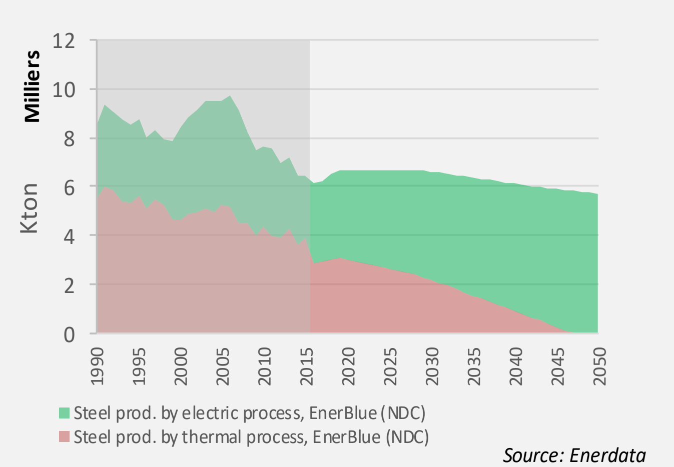
3.5. Annex: Steel ind.

3.5.1. FINAL ENERGY & CO2 EMISSIONS COMBUSTION + IP



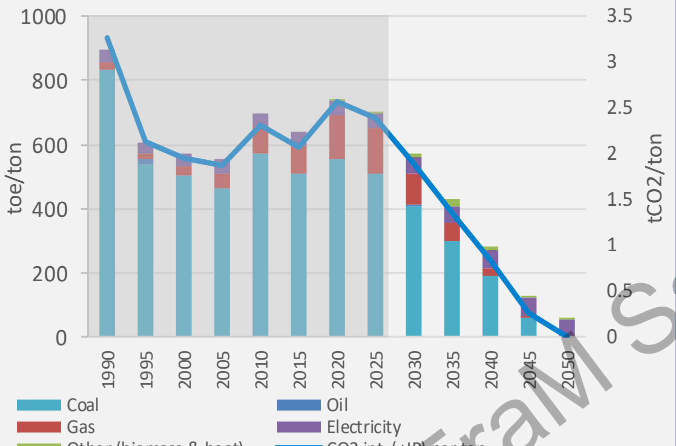
Source: Enerdata

3.5.2. STEEL PRODUCTION



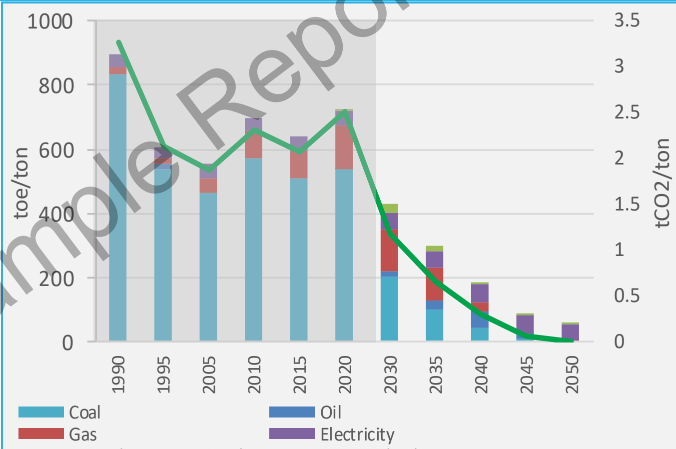
Source: Enerdata

3.5.3. ENERGY CONSUMPTION BY SOURCE - NDC SCENARIO (ENERBLUE)



Source: Enerdata

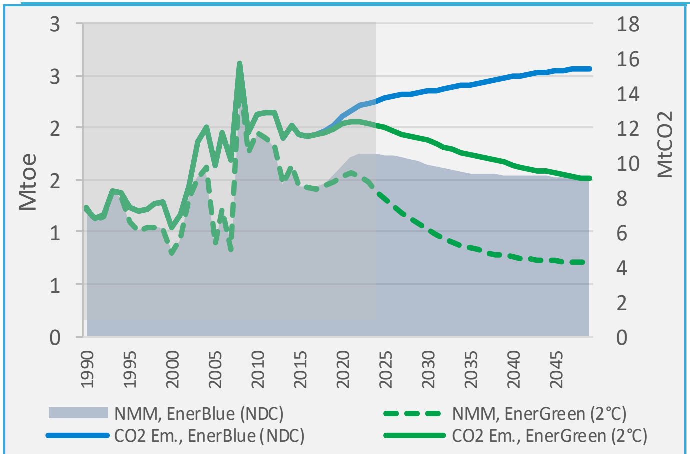
3.5.4. ENERGY CONSUMPTION BY SOURCE - 2°C SCENARIO (ENERGREEN)



Source: Enerdata

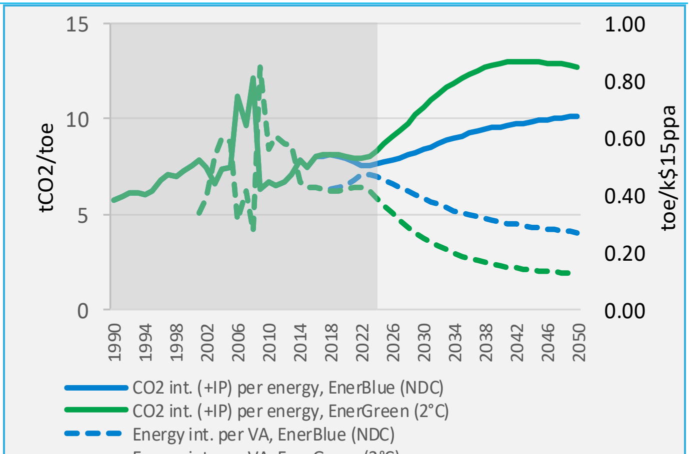
3.6. Annex: Non Metallic Mineral ind.

3.5.1. FINAL ENERGY & CO2 EMISSIONS COMBUSTION + IP



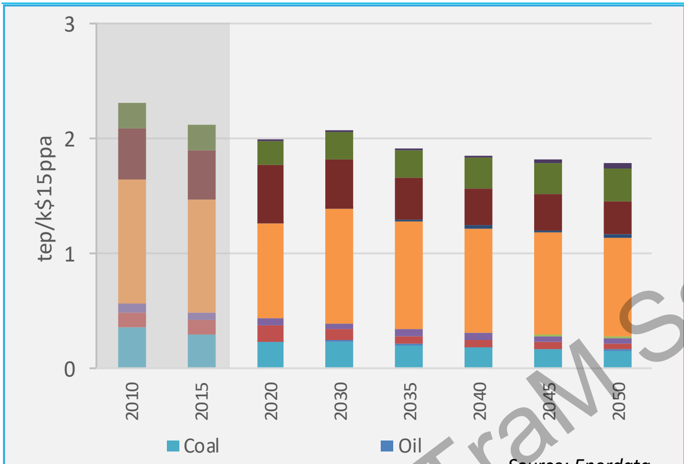
Source: Enerdata

3.6.2. KAYA CO2 INDICATORS



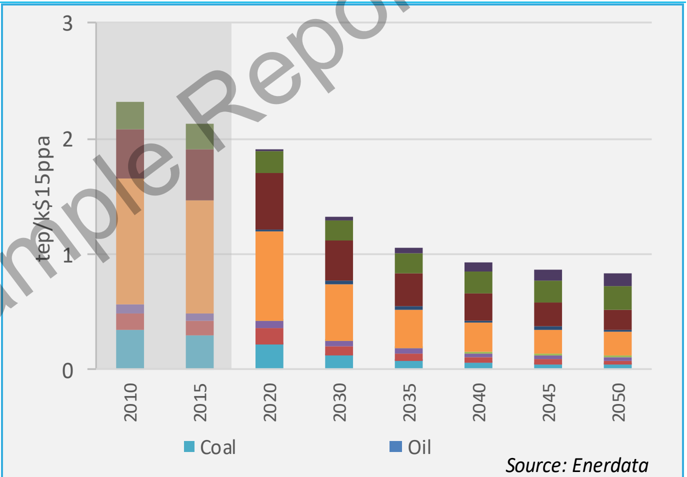
Source: Enerdata

3.6.3. ENERGY CONSUMPTION BY SOURCE - NDC SCENARIO (ENERBLUE)



Source: Enerdata

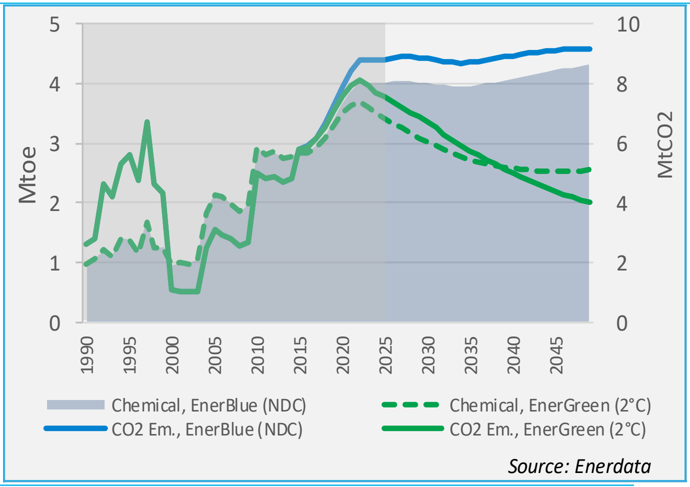
3.6.4. ENERGY CONSUMPTION BY SOURCE - 2°C SCENARIO (ENERGREEN)



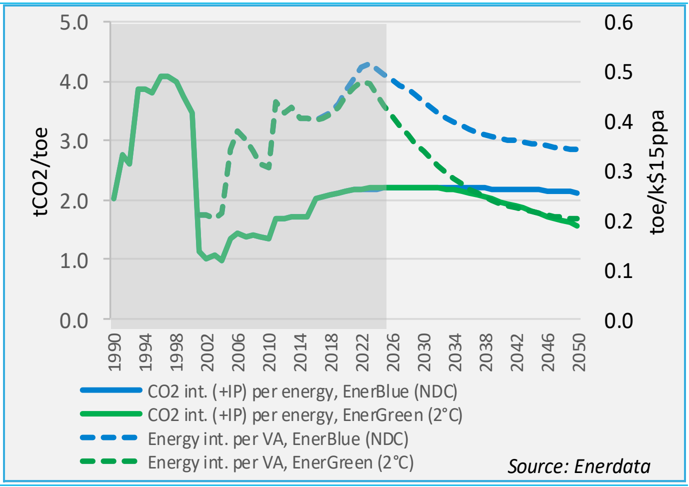
Source: Enerdata

3.7. Annex: Chemical ind.

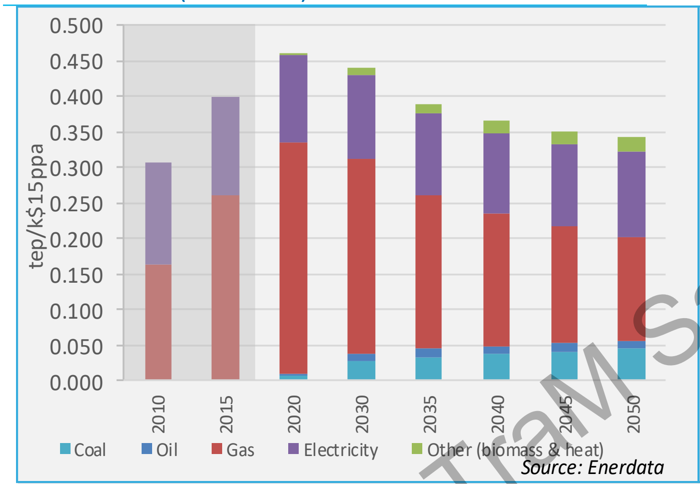
3.7.4. FINAL ENERGY & CO2 EMISSIONS COMBUSTION + IP



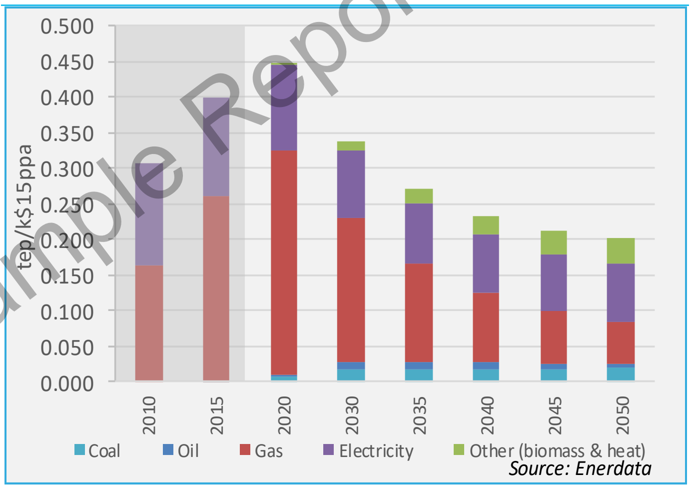
3.7.2. KAYA CO2 INDICATORS



3.7.3. ENERGY CONSUMPTION BY SOURCE - NDC SCENARIO (ENERBLUE)

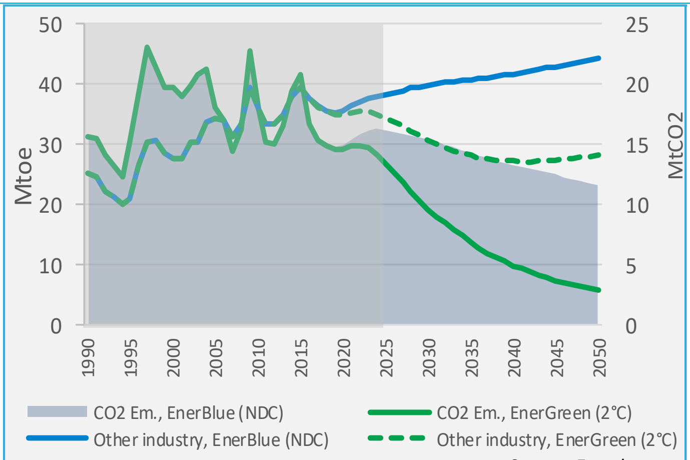


3.7.4. ENERGY CONSUMPTION BY SOURCE - 2°C SCENARIO (ENERGREEN)



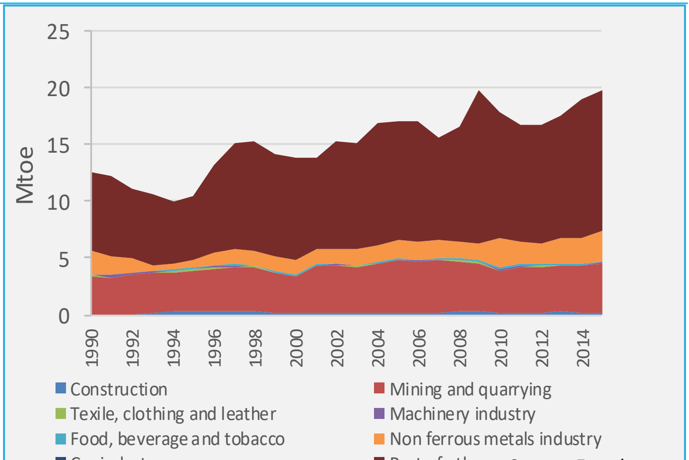
3.8. Annex: Other ind.

3.8.4. FINAL ENERGY & CO2 EMISSIONS



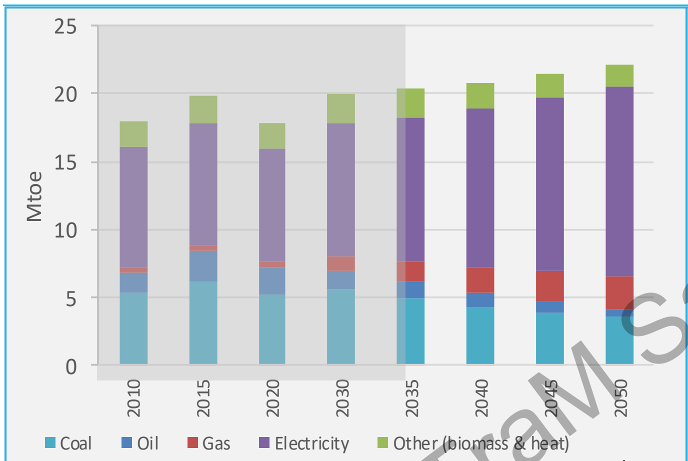
Source: Enerdata

3.8.2. HISTORICAL CONSUMPTION PER INDUSTRY



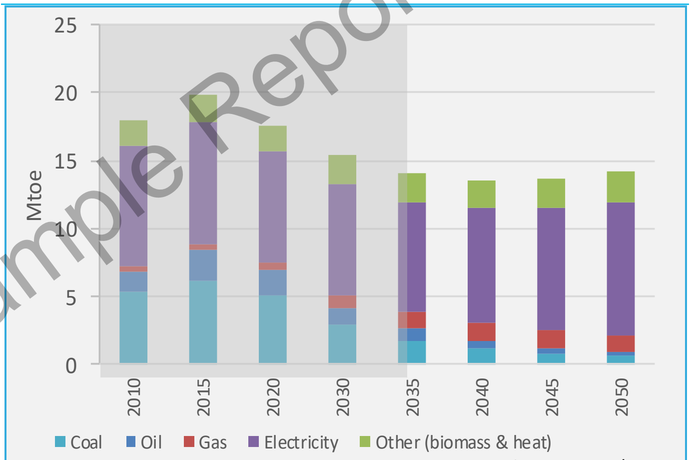
Source: Enerdata

3.8.3. ENERGY CONSUMPTION BY SOURCE - NDC SCENARIO (ENERBLUE)



Source: Enerdata

3.8.3. ENERGY CONSUMPTION BY SOURCE - 2°C SCENARIO (ENERGREEN)



Source: Enerdata

Energy Transition Monitoring
-
EnerTraM

Contact us

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