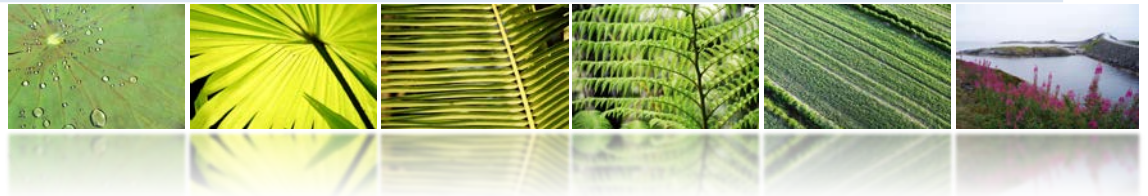




United Nations  
Statistics Division

# Energy balances 1



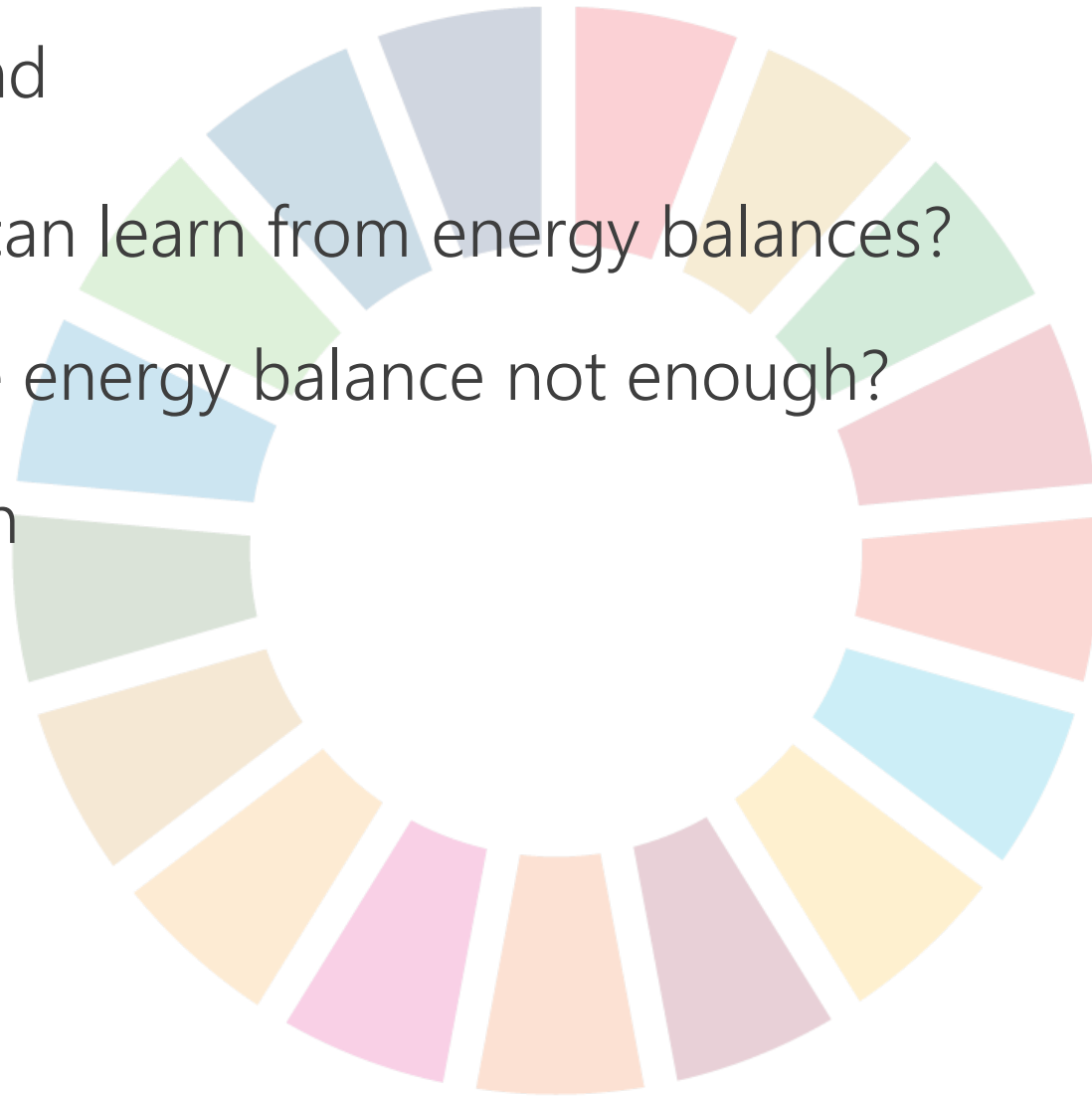
Agnieszka KOSCIELNIAK  
Statistician, Energy Statistics Section

Cape Town, South Africa, 30 April 2019  
JODI Energy Data Transparency Workshop

# Overview

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- Background
- What we can learn from energy balances?
- Why is the energy balance not enough?
- Conclusion





# Background

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# Purpose of an energy balance

An energy balance is a snapshot of a **country's energy situation** in one year which allow for:

- **international comparisons,**
- **calculation** of a range of economic, social and environmental **indicators.**

Table 8.2  
Template of an aggregated energy balance

Item code	Flows	Energy products					
		E1	E2	E3	...	Total	of which: Renewables
1.1	Primary production						
1.2	Imports						
1.3	Exports						
1.4	International bunkers						
1.5	Stock change (closing-opening)						
1	Total energy supply						
2	Statistical difference						
3	Transfers						
4	Transformation processes						
5	Energy industries own use						
6	Losses						
7	Final consumption						
7.1	Final energy consumption						
7.1.1	Manufacturing, const. and non-fuel mining industries, total						
7.1.1.1	Iron and steel						
7.1.1.2	Chemical and petrochemical						
7.1.1.X	Other industries						
7.1.2	Transport, total						
7.1.2.1	Road						
7.1.2.2	Rail						
7.1.2.3	Domestic aviation						
7.1.2.4	Domestic navigation						
7.1.2.X	Other Transport						
7.1.3	Other, total						
7.1.3.1	<i>of which:</i> Agriculture, forestry and fishing						
7.1.3.2	<i>of which:</i> Households						
7.2	Non-energy use						

# Framework

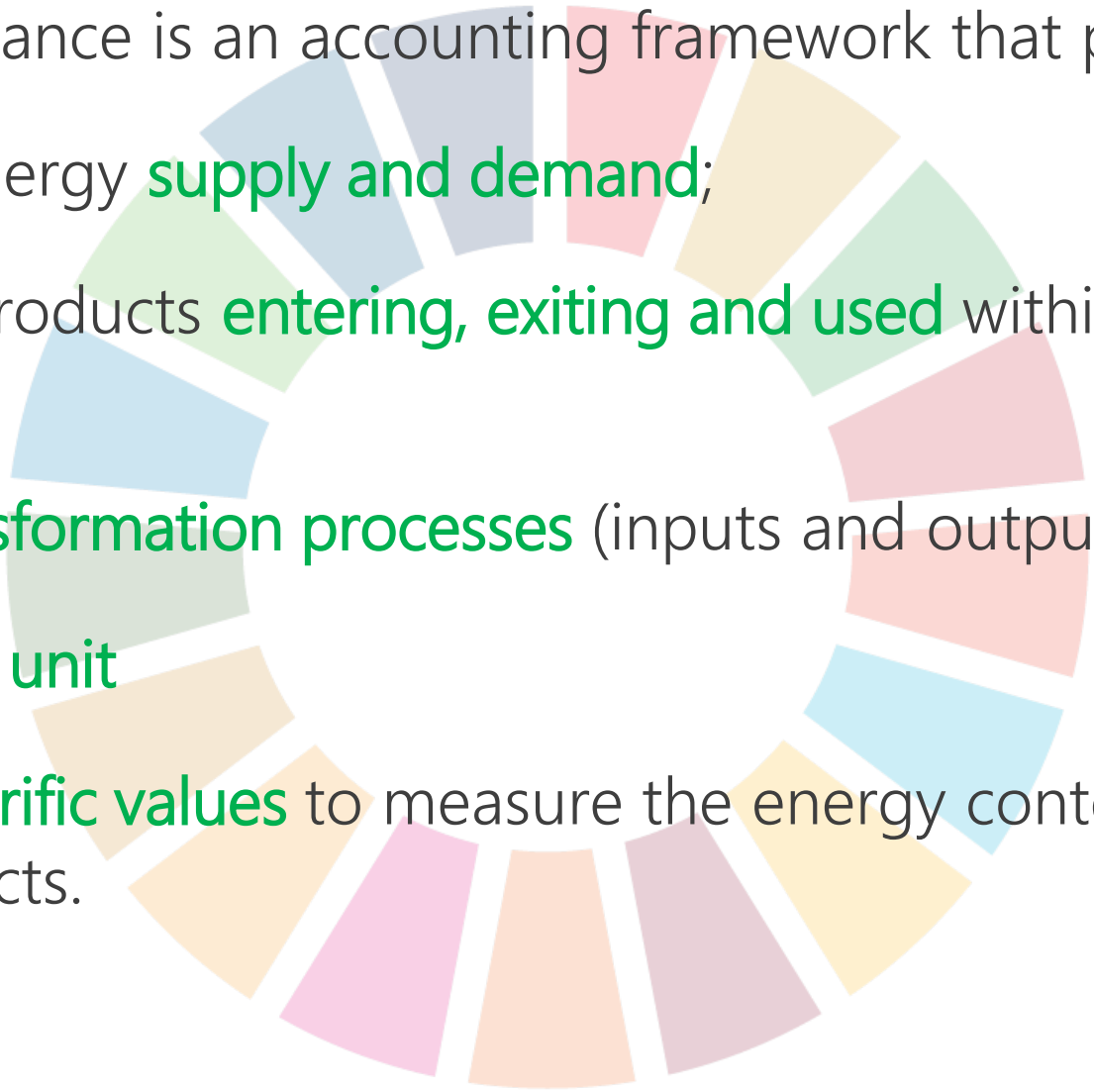
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An Energy Balance is an accounting framework that presents :

- country's energy **supply and demand**;
- all energy products **entering, exiting and used** within a **national territory**;
- energy **transformation processes** (inputs and outputs)

in **one energy unit**

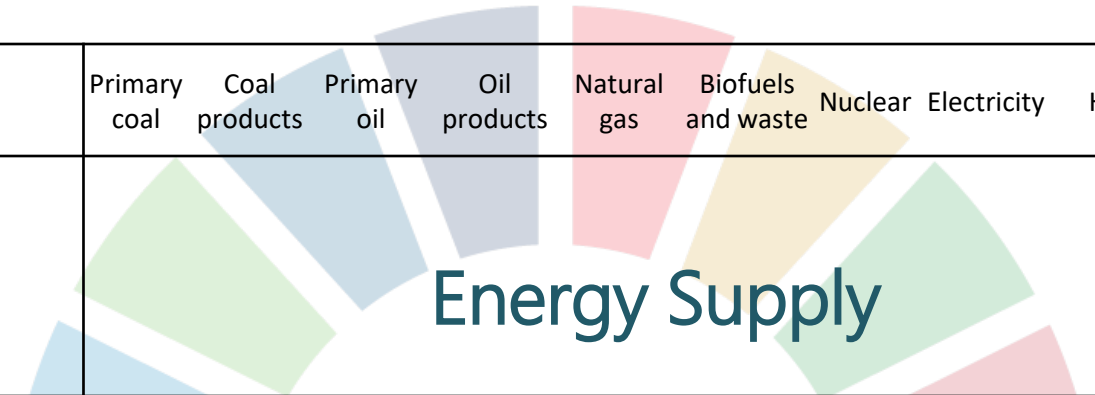


using **net calorific values** to measure the energy content of energy products.



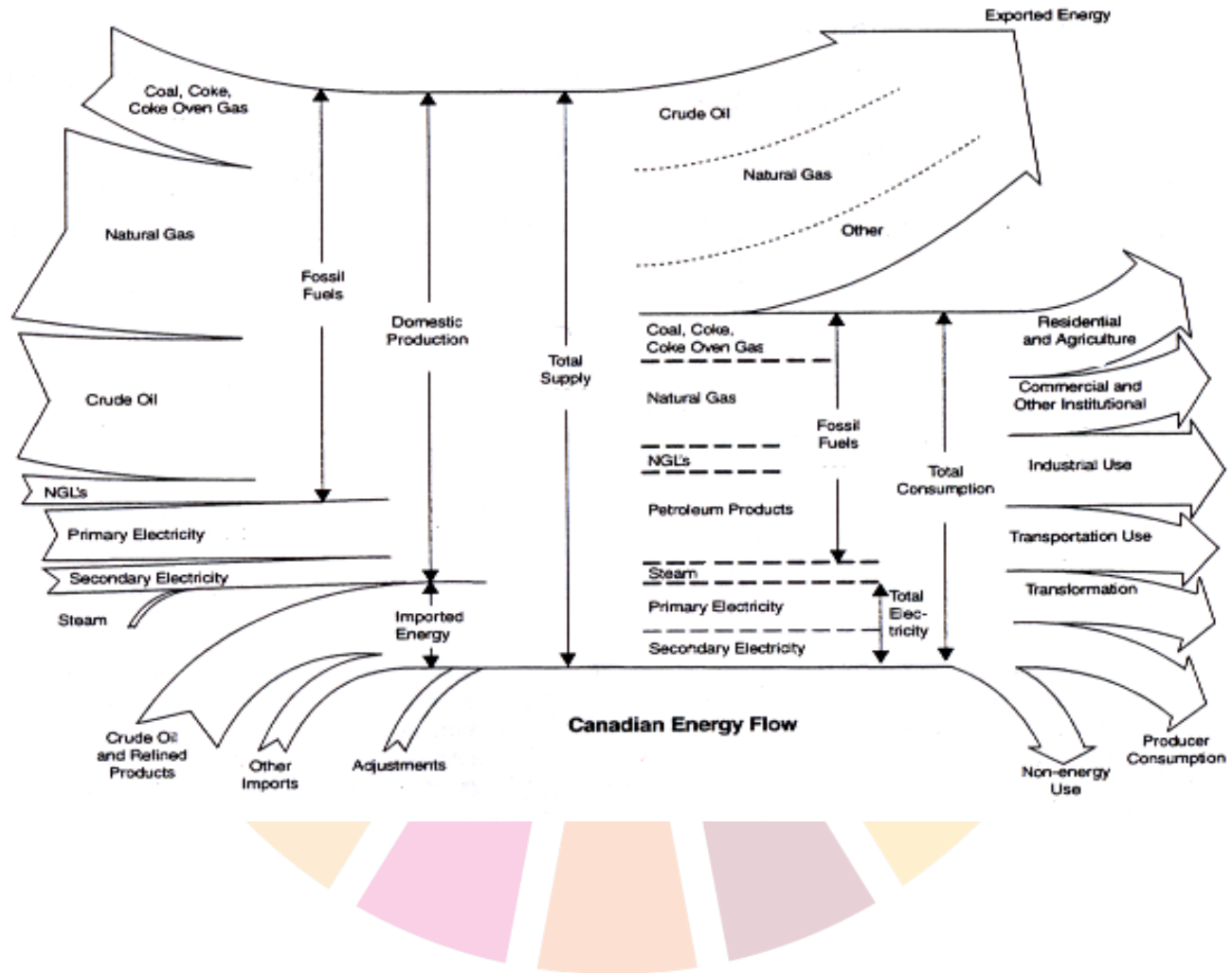
# Energy balance format

<b>Africa, 2016, TJ</b>	Primary coal	Coal products	Primary oil	Oil products	Natural gas	Biofuels and waste	Nuclear	Electricity	Heat	Total	<i>of which: renewables</i>
Primary production	6,313.20	-	15,631.30	-	7,357.40	14,629.60	162.3	467.6	182.9	44,744.20	15,273.30
Imports	330.3	10.7	1,619.80	5,118.00	641.1	4.5	-	151.7	-	7,876.10	4.5
Exports	-1,879.20	-7.4	-12,134.60	-1,728.30	-3,342.20	-14.4	-	-134.8	-	-19,241.00	-14.4
International bunkers	-	-	-	-546.5	-	-	-	-	-	-546.5	-
Stock changes	94.4	-2.2	-108.4	-16.2	18	-	-	-	-	-14.3	-
<b>Total energy supply</b>	<b>4,858.60</b>	<b>1.1</b>	<b>5,008.10</b>	<b>2,827.00</b>	<b>4,674.20</b>	<b>14,619.80</b>	<b>162.3</b>	<b>484.5</b>	<b>182.9</b>	<b>32,818.50</b>	<b>15,263.40</b>
<i>Statistical difference</i>	-44.1	0+	-5.3	62	-195.8	-2.7	-	67.2	0-	-118.7	485.2
Transfers	-	-	-194.7	237	-	-	-	-	-	42.3	-
<b>Transformation</b>	<b>-3,777.90</b>	<b>121.4</b>	<b>-4,750.60</b>	<b>4,075.00</b>	<b>-2,638.20</b>	<b>-2,569.70</b>	<b>-162.3</b>	<b>2,450.40</b>	<b>-163.3</b>	<b>-7,415.10</b>	<b>-2,721.40</b>
Electricity plants	-3,230.80	-	-67.1	-829.3	-2,481.80	-41.9	-162.3	2,446.80	-174.9	-4,541.20	-193.6
CHP and heat plants	-1.1	-	-	-	-1.5	-21.5	-	3.6	11.6	-9	-21.5
Coke ovens	-98.6	91	-	-	-	-	-	-	-	-7.6	-
Oil refineries	-	-	-4,382.30	4,340.60	-	-	-	-	-	-41.8	-
Other transformation	-447.3	30.4	-301.2	563.7	-154.9	-2,506.30	-	-	-	-2,815.50	-2,506.20
<b>Energy industries own use</b>	<b>-501.1</b>	<b>-0.7</b>	<b>-33.9</b>	<b>-124.6</b>	<b>-575.3</b>	<b>-0.01</b>	<b>-</b>	<b>-197.5</b>	<b>0+</b>	<b>-1,433.20</b>	<b>-0.01</b>
<b>Losses</b>	<b>-</b>	<b>-</b>	<b>-34.3</b>	<b>-7.5</b>	<b>-21.1</b>	<b>-1.3</b>	<b>-</b>	<b>-371.4</b>	<b>-</b>	<b>-435.6</b>	<b>-1.3</b>
<b>Final consumption</b>	<b>623.7</b>	<b>121.8</b>	<b>-</b>	<b>6,944.90</b>	<b>1,635.40</b>	<b>12,051.40</b>	<b>-</b>	<b>2,298.80</b>	<b>19.6</b>	<b>23,695.70</b>	<b>12,055.50</b>
Final energy consumption	567.6	121.8	-	6,550.10	1,280.40	12,051.40	-	2,298.80	19.6	22,889.80	12,055.50
Industry	375.1	120.2	-	765.8	815.4	874.6	-	916.4	11.5	3,879.10	871.5
Transport	0.1	-	-	4,776.70	50.2	1.4	-	20	-	4,848.40	1.4
Households	118	0.1	-	610.7	366.2	10,299.00	-	800	3	12,196.90	10,301.00
Commerce, public services	58.5	1.4	-	77.1	6.5	369.8	-	389.7	0.1	903.1	369.9
Other energy use	15.9	0.1	-	319.8	42.1	506.6	-	172.7	5.1	1,062.30	511.7
Non-energy use	56.1	-	-	394.8	355	-	-	-	-	805.9	-

# Energy balance format

<b>Africa</b>	Primary coal	Coal products	Primary oil	Oil products	Natural gas	Biofuels and waste	Nuclear	Electricity	Heat	Total	<i>of which: renewables</i>
Primary production Imports Exports International bunkers Stock changes <b>Total energy supply</b>	 <p style="text-align: center;"><b>Energy Supply</b></p>										
<i>Statistical difference</i> Transfers <b>Transformation</b> Electricity plants CHP and heat plants Coke ovens Oil refineries Other transformation <b>Energy industries own use</b> <b>Losses</b>										 <p style="text-align: center;"><b>Transformation</b> + Transfers + Energy industry own use + Losses</p>	
<b>Final consumption</b> Final energy consumption Industry Transport Households Commerce, public services Other energy use Non-energy use	 <p style="text-align: center;"><b>Final consumption</b></p>										

# Flow chart: Canada



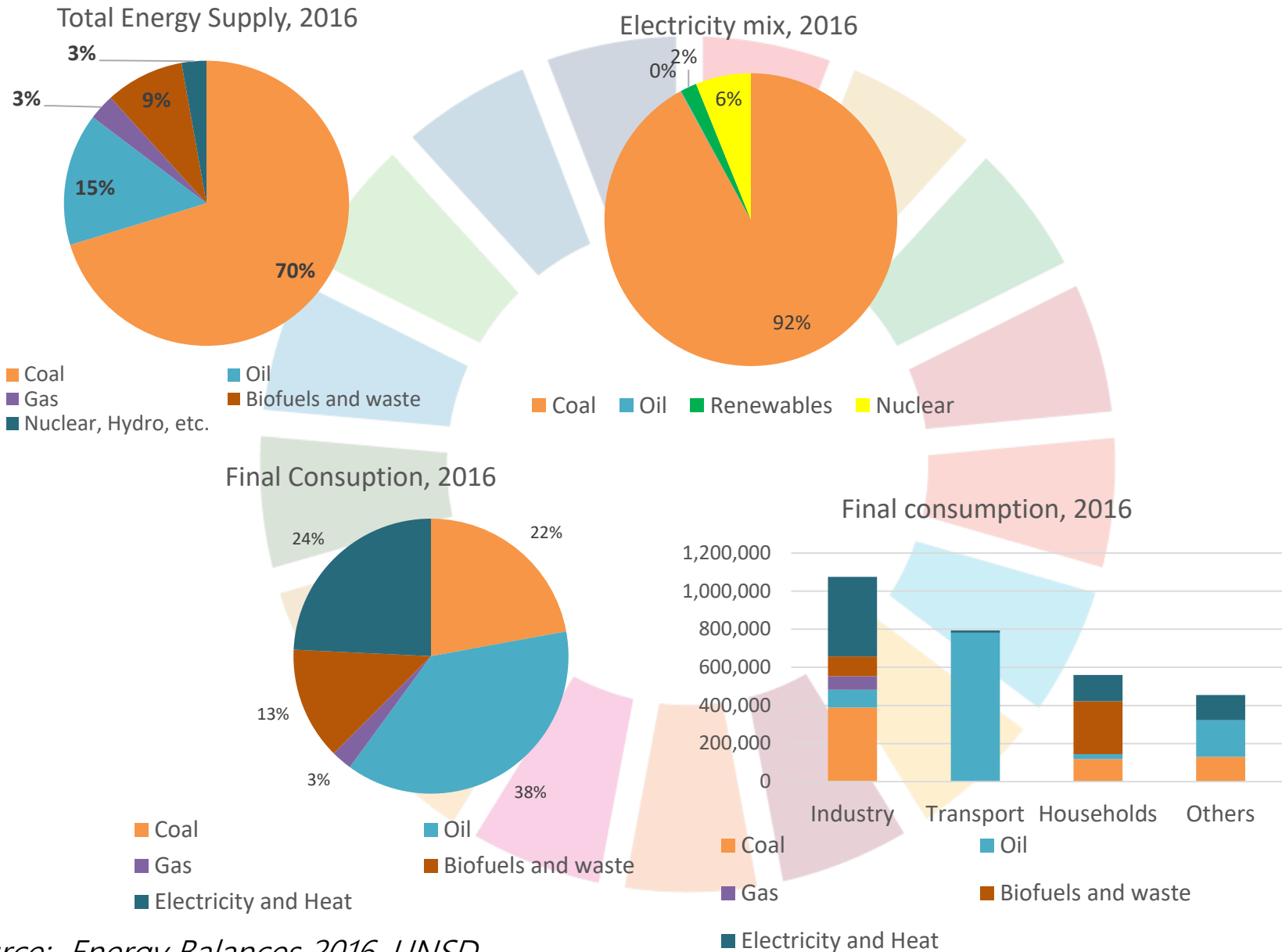




# What we can learn from an energy balance?

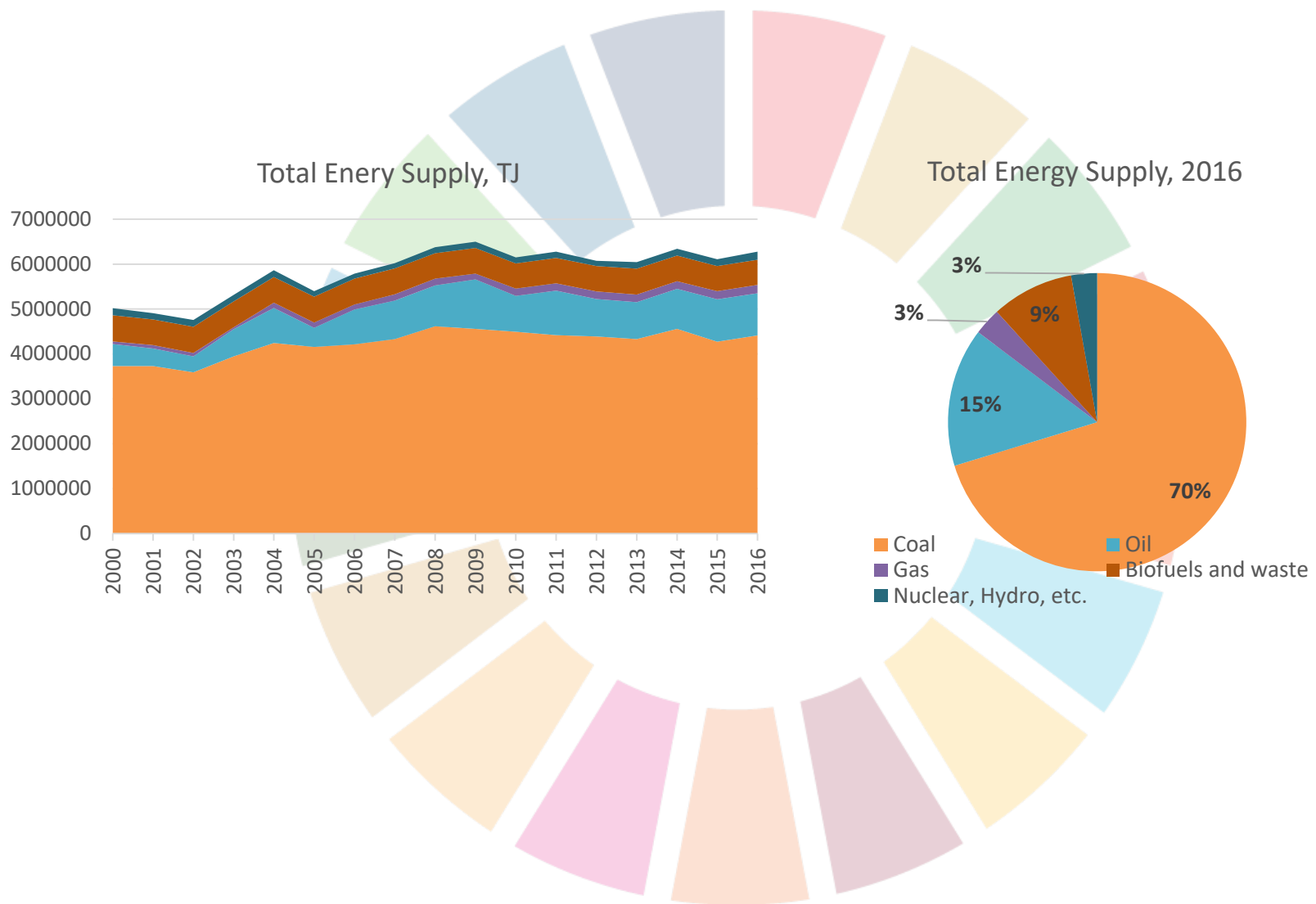
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# Energy in South Africa in a snapshot



Source: Energy Balances 2016, UNSD

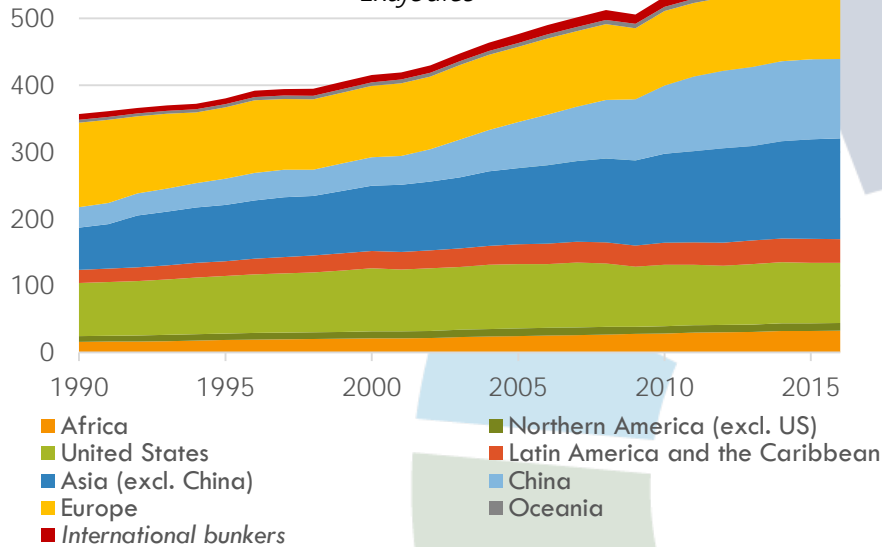
# Energy in South Africa in a snapshot



# World energy information

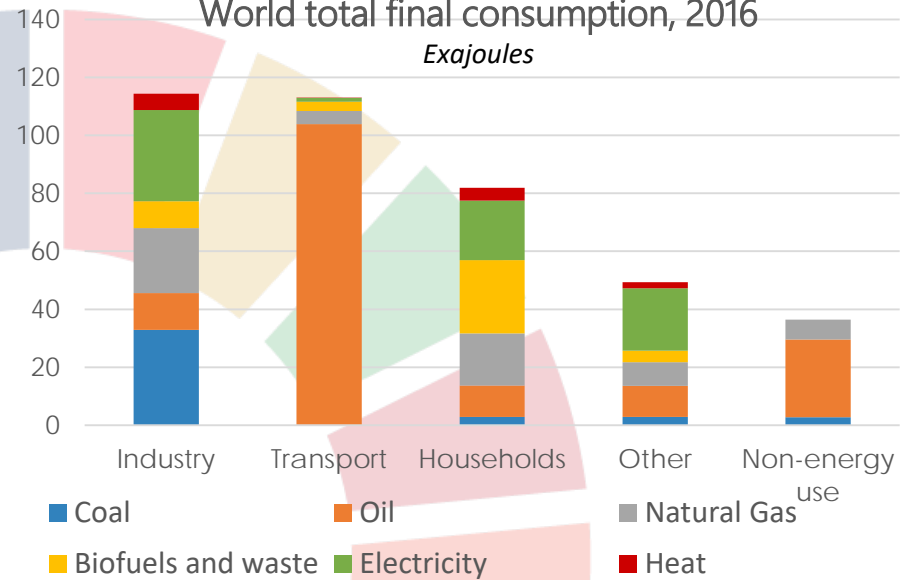
Total energy supply, 1990 – 2016

Exajoules



World total final consumption, 2016

Exajoules

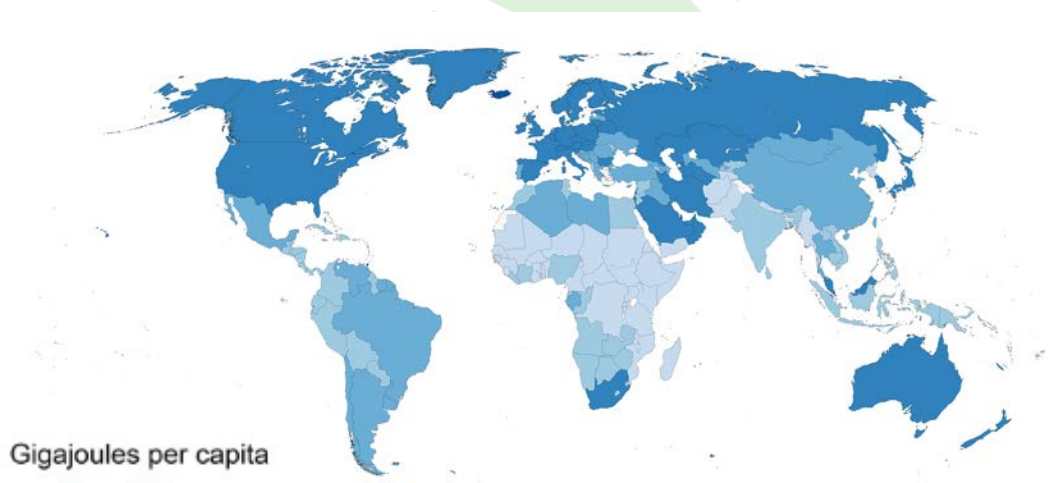


Region	Total energy supply	Energy use (TES) per capita	Energy intensity	Self-sufficiency	Renewable energy share in TFEC	Electricity consumption per capita
	PJ	GJ	MJ/INTL \$	%	%	kWh
WORLD	567,900	76.1	5.1	100.2	16.8	2,783.5
Africa	32,819	26.8	5.9	136.3	54.6	521.2
Northern Africa	8,648	37.7	3.9	135.5	11.9	1,254.2
Sub-Saharan Africa	24,170	24.3	7.1	136.6	68.6	352.4

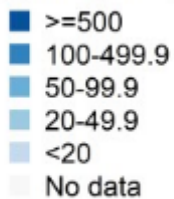
# Energy indicators

- Coupling energy balances data with various macro-economic variables

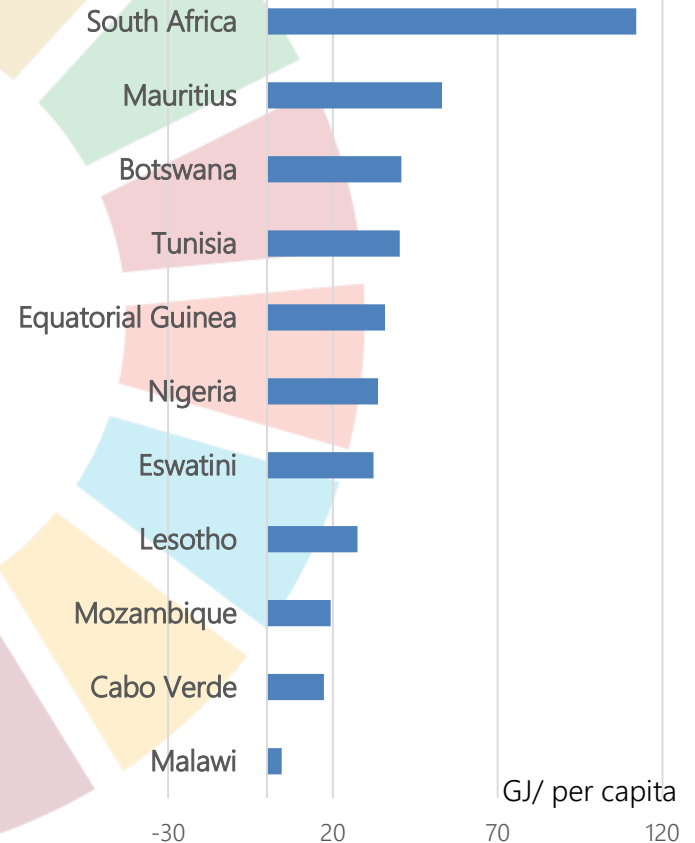
Total energy supply per capita, 2016



Gigajoules per capita



Energy use (TES) per capita





# Energy balances for SDG7

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# SDG7: Affordable and clean energy

7 AFFORDABLE AND CLEAN ENERGY



Ensure access to affordable, reliable, sustainable and modern energy

## TARGETS

### SDG 7.1 UNIVERSAL ACCESS

By 2030, ensure universal access to affordable, reliable and modern energy services

### SDG 7.2 RENEWABLE ENERGY

By 2030, increase substantially the share of renewable energy in the global energy mix

### SDG 7.3 ENERGY EFFICIENCY

By 2030, double the global rate of improvement in energy efficiency

## INDICATORS

### SDG 7.1.1 UNIVERSAL ACCESS TO ELECTRICITY

Proportion of population with access to electricity

### SDG 7.1.2 UNIVERSAL ACCESS TO CLEAN FUELS AND TECHNOLOGIES FOR COOKING

Proportion of population with primary reliance on clean fuels and technology

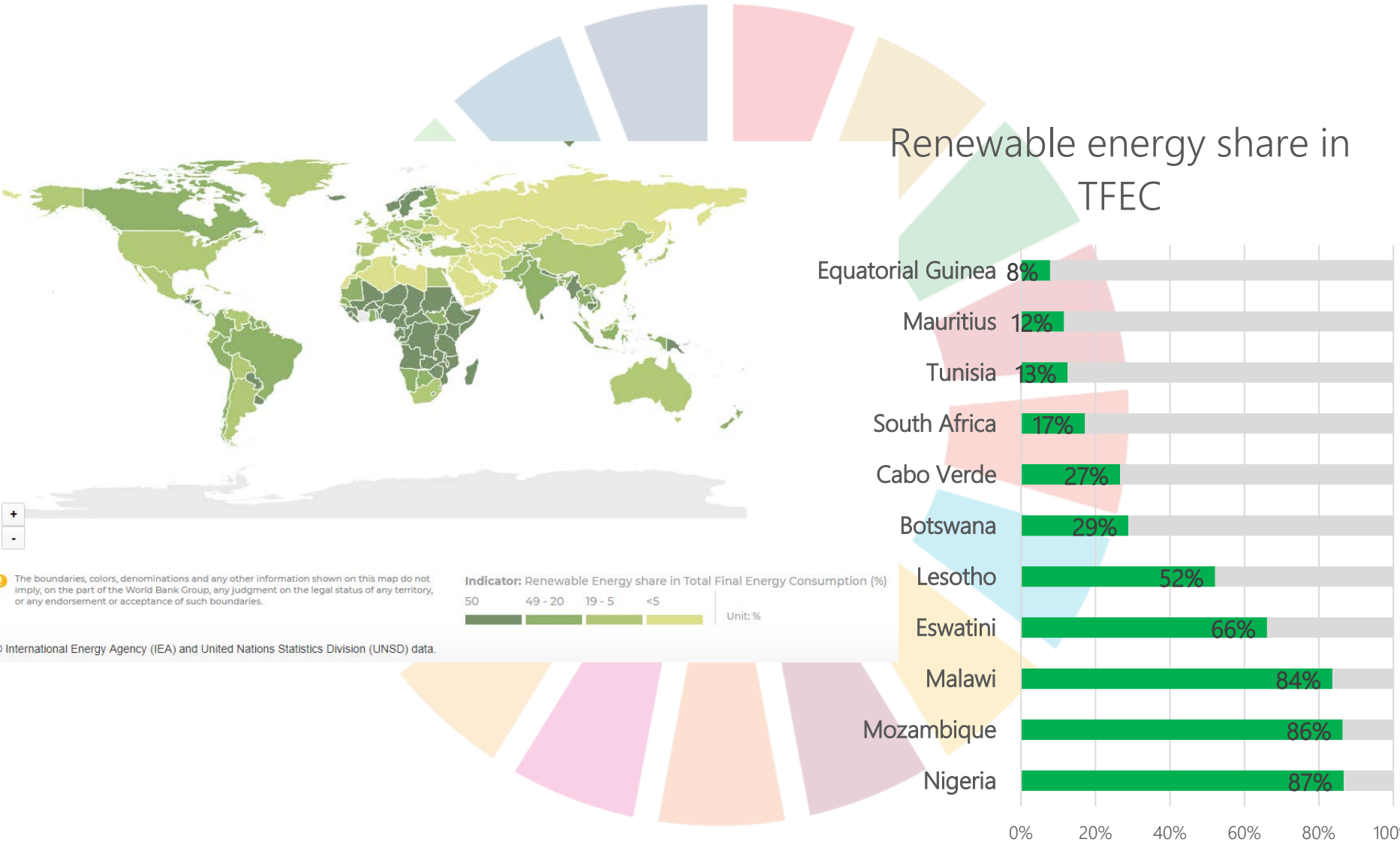
### SDG 7.2

Renewable energy share in the total final energy consumption

### SDG 7.3

Energy intensity measured in terms of primary energy and GDP

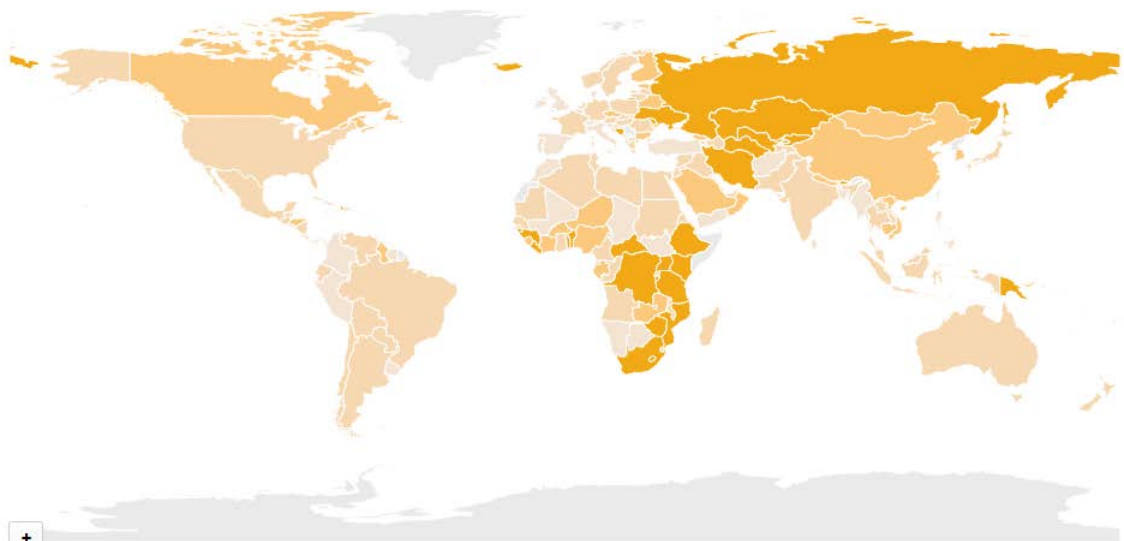
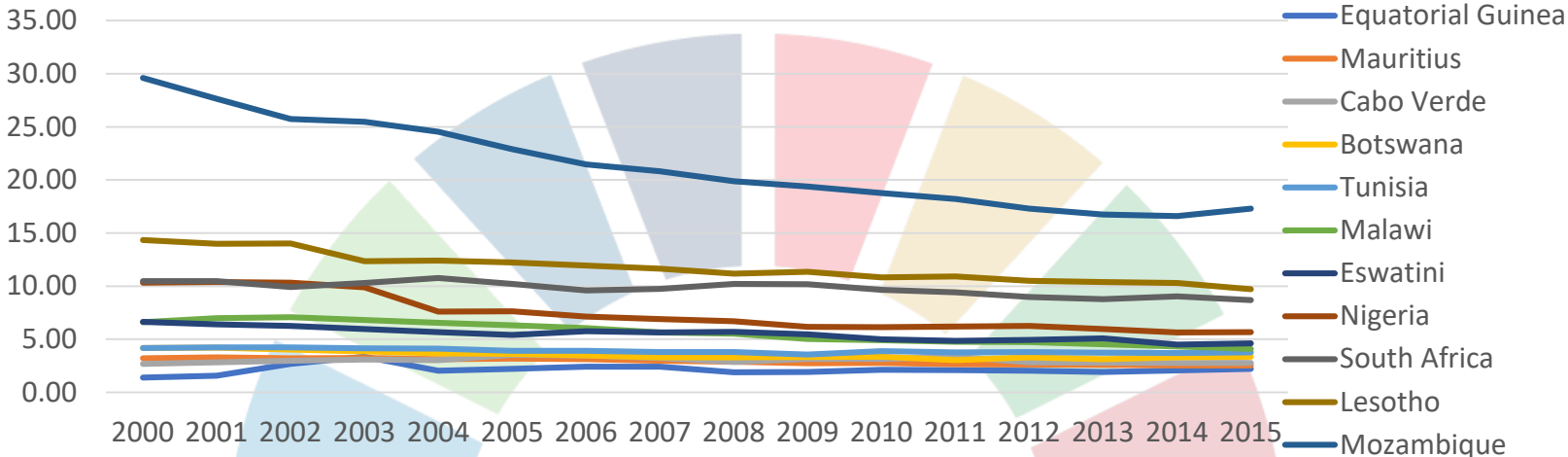
# Renewable energy share in TEC, 2016



Source: 2018 SDG7 Tracking: The Energy Progress Report



# Energy Intensity (MJ/USD PPP 2011)



The boundaries, colors, denominations and any other information shown on this map do not imply, on the part of the World Bank Group, any judgment on the legal status of any territory, or any endorsement or acceptance of such boundaries.

Indicator: National Energy Intensity (MJ/USD PPP 2011)  
 >7.5    7.5 - 5.5    5.5 - 3.5    <3.5

Unit: MJ/USD PPP 2011

Source: 2018 SDG7 Tracking: The Energy Progress Report

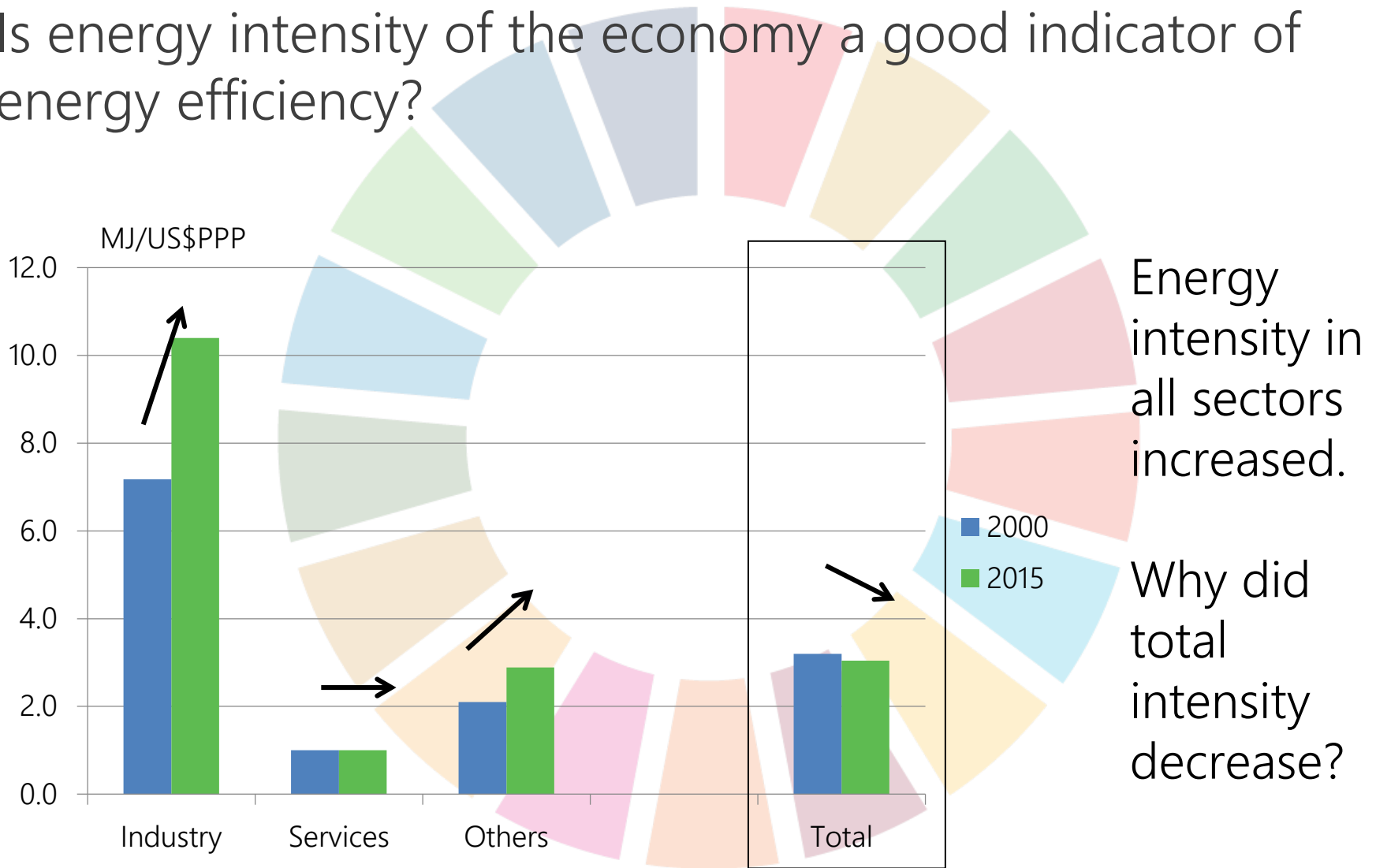


# Why is the energy balance not enough?

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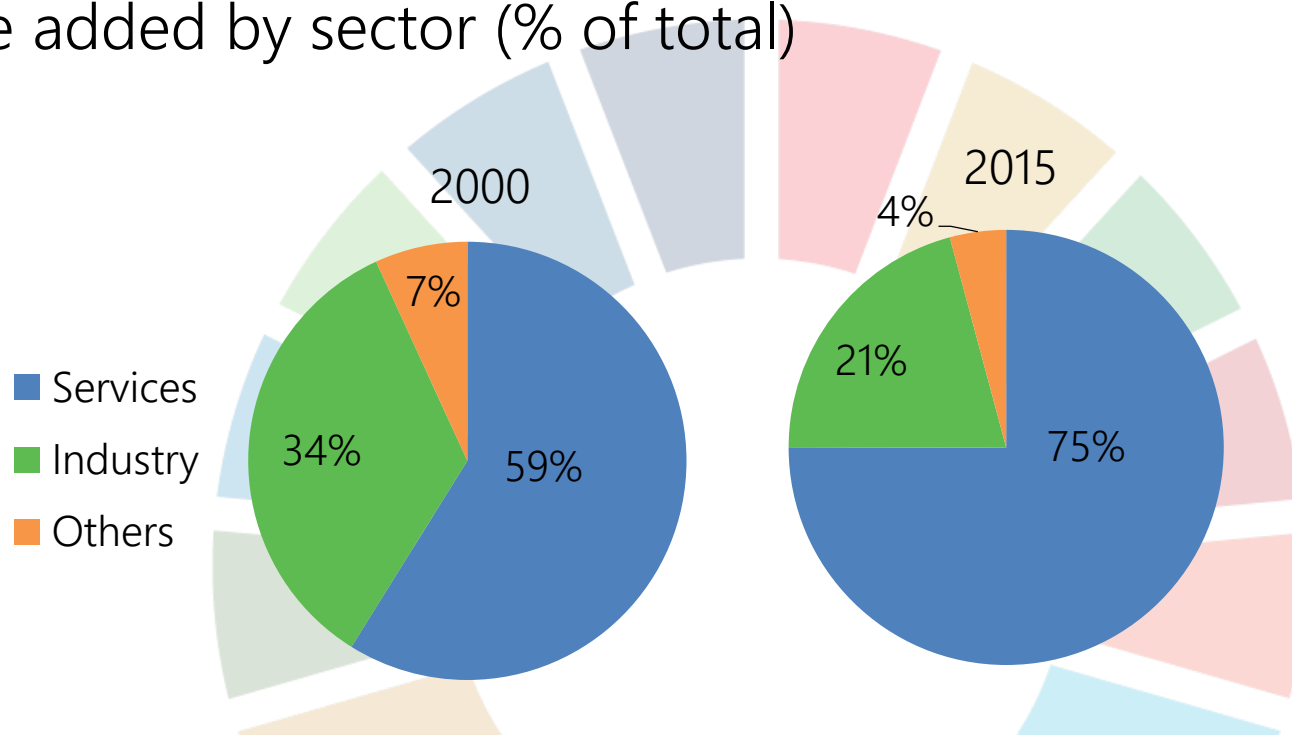
# Why did the total intensity decrease?

- Is energy intensity of the economy a good indicator of energy efficiency?



# Why did the total intensity decrease?

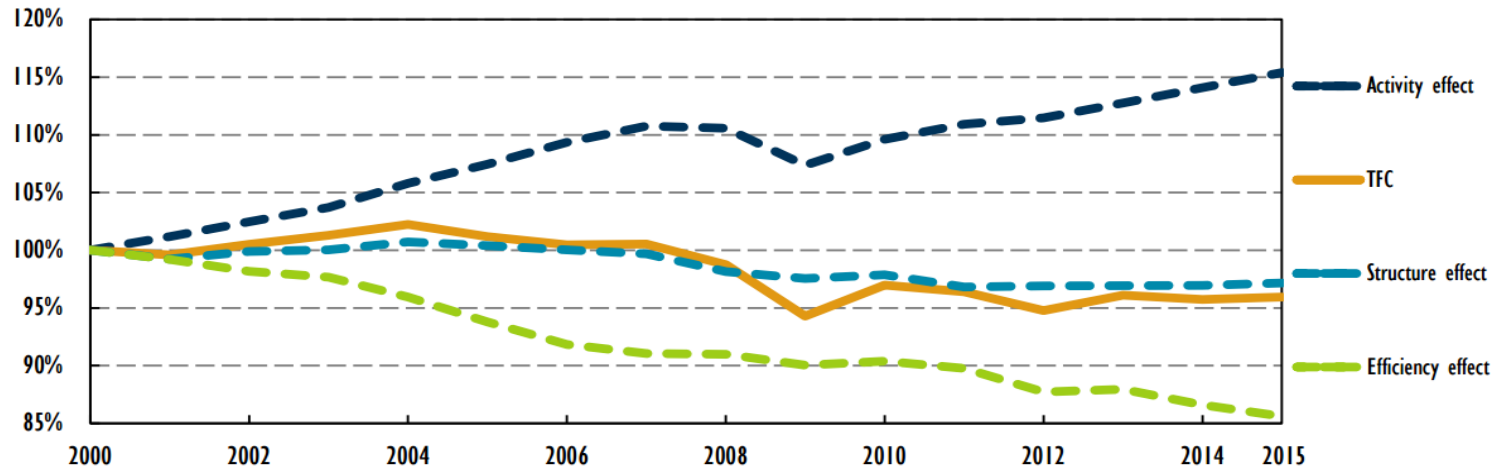
Value added by sector (% of total)



Energy intensity MJ/US\$PPP	2000	2015
<b>Total</b>	<b>3.2</b>	<b>3.0</b>
Industry	7.2	10.4
Services	1.0	1.0
Others	2.1	2.9

# Understanding energy consumption drivers

## Drivers of final energy consumption



Note: Analysis based on the *IEA Energy Efficiency Indicators* database (2016 edition). TFC in this analysis covers the following sectors: residential, industry and services, passenger and freight transport. It does not include agriculture, non-energy, and energy supply sectors. The energy consumption decomposed in this analysis represents 90% of TFC in IEA countries in 2015.

It is important to disentangle efficiency improvements from structural changes of the economy



# Conclusion

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# Conclusion

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## Energy balances:

- Enhance the relevance of energy statistics by providing comprehensive and reconciled data on the energy situation on a national territory basis;
- Serve as a quality tool to ensure completeness, consistency and comparability of basic statistics;
- Provide data for estimation of CO<sub>2</sub> emissions and the basis for energy indicators; as well as modeling and forecasting;
- Help provide an input to set policy targets and measure progress toward the targets;
- But require good quality data, and calorific information.



**SUSTAINABLE  
DEVELOPMENT GOALS**

**17 GOALS TO TRANSFORM OUR WORLD**

<http://un.org>

<http://unstats.un.org/unsd>

[energy\\_stat@un.org](mailto:energy_stat@un.org)