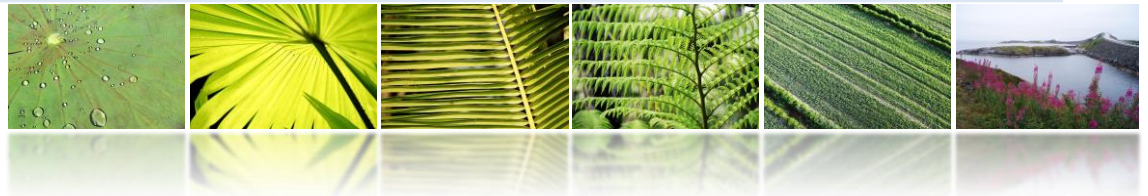




United Nations
Statistics Division

What we can learn from energy balances?

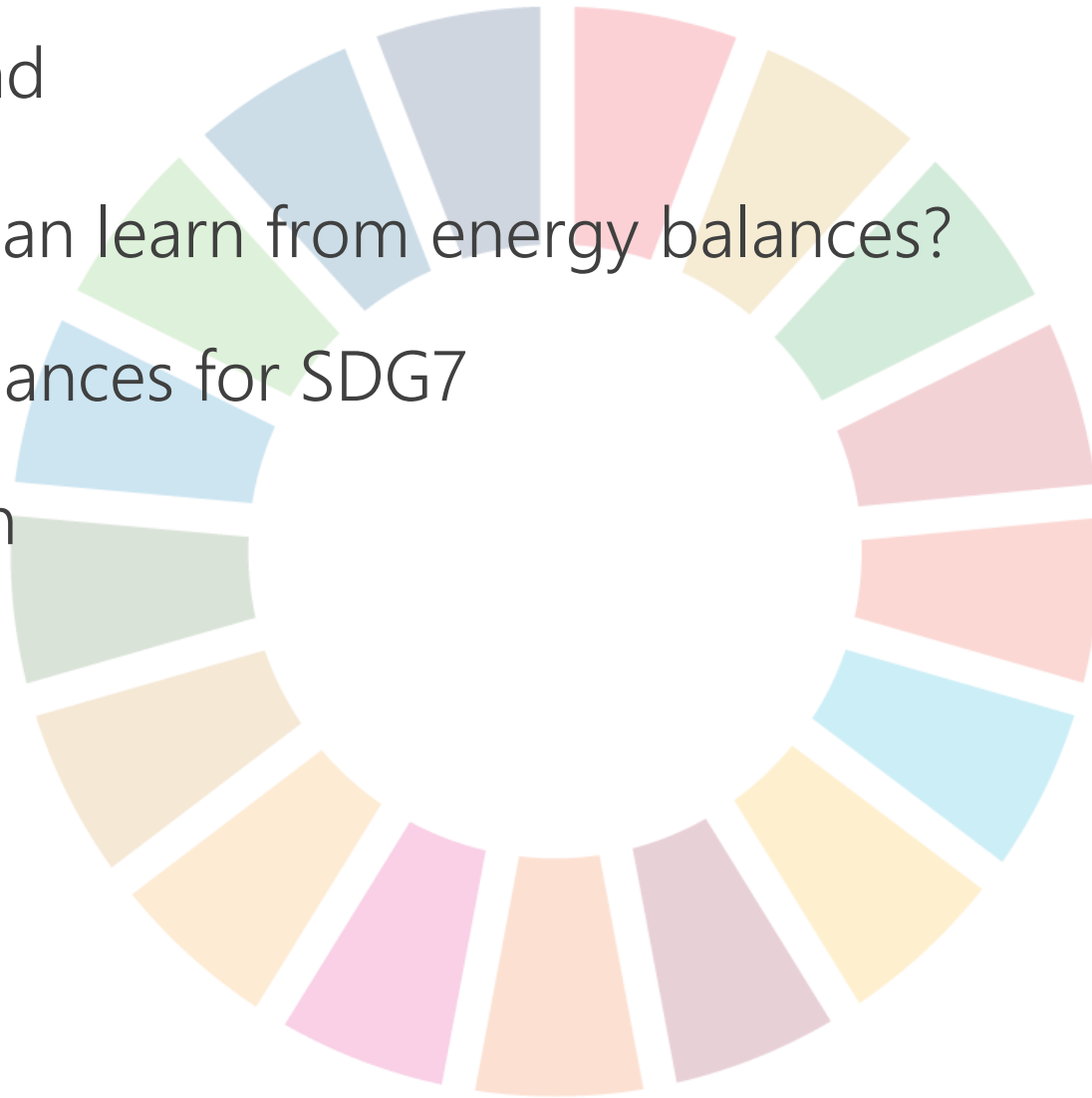


Agnieszka KOSCIELNIAK
Statistician, Energy Statistics Section

Beirut, Lebanon, 2 July 2019
UNSD/ESCWA Technical Assistance to Lebanon

Overview

- Background
- What we can learn from energy balances?
- Energy balances for SDG7
- Conclusion





Background

Framework

An Energy Balance is an accounting framework that presents :

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

in **one energy unit**

for one year

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

Energy flows in Lebanon – sankey diagram

Lebanon

BALANCE (2014)

Production and imports
(325 282 TJ)

Statistical differences

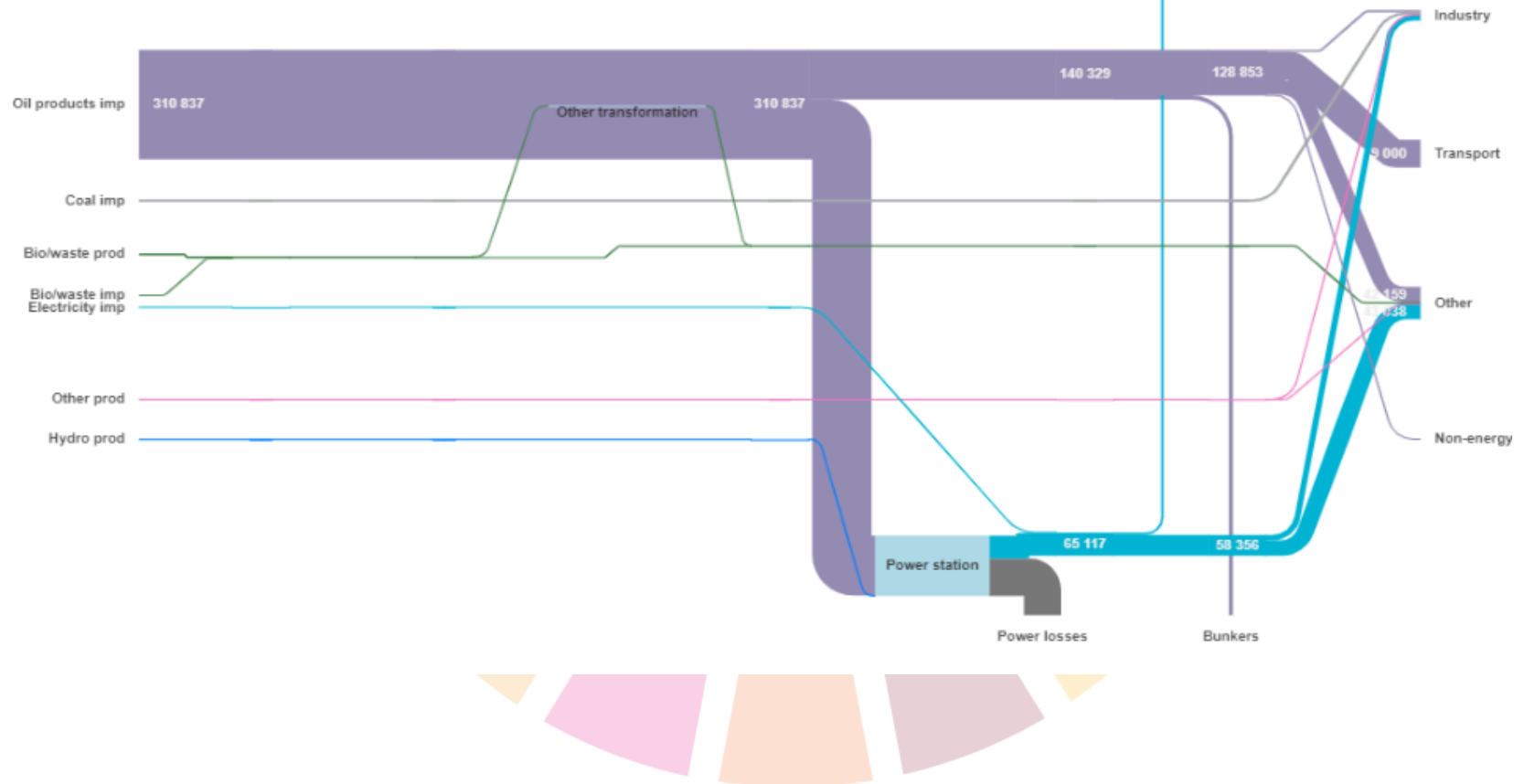
Terajoules ▾

Stock changes

Statistical differences



Total final consumption
(199 897 TJ)



Source: IEA Sankey Diagram; <https://www.iea.org/sankey/#?c=Lebanon&s=Balance>

IEA estimates based on ALMEE and ADAME data work

Matrix structure

An energy balance is a **matrix** consisting of rows and columns:

- **Rows** represent energy flows (i.e. sources and uses);
- **Columns** represent energy products (or commodities).

Lebanon, 2016						
	Coal	Oil	Biofuels and waste	Electricity	Heat	Total energy
Primary production	..	..	*4971	1375	1017	*7363
Imports	7112	344593	*413	248	..	*352367
Exports	..	..	..	..	..	..
International Bunkers	..	*-11970	..	..	..	*-11970
Stock changes	..	..	..	..	..	..
Total energy supply	7112	332623	*5384	1624	1017	*347760
Statistical difference	0	513	0	-4	0	509
Transfers	..	..	..	..	..	..
Transformation	..	-188976	*-585	65909	..	*-123652
Electricity plants	..	-188976	..	65909	..	-123067
Other transformation	..	..	*-585	..	..	*-585
Energy industries own use	..	..	..	0	..	0
Losses	..	..	..	-7042	..	-7042
Final consumption	7112	*143134	*4799	*60494	1017	*216557
Final energy consumption	7112	*139442	*4799	60494	1017	*212865
Manufacturing	7112	5381	..	*15790	*50	*28333
Non-metallic minerals	7112	..	..	..	..	*7112
Industries n.e.s	0	5381	..	*15790	*50	*21220
Transport	..	*93057	..	..	..	*93057
Road	..	*93057	..	..	..	*93057
Other	..	*41005	*4799	*44705	*967	*91476
Non-energy use	..	3692	..	..	..	*3692

Energy balance format

Lebanon												
Terajoules												
	Primary coal and peat	Coal and peat products	Primary Oil	Oil Products	Natural Gas	Biofuels and waste	Nuclear	Electricity	Heat	Total energy	of which: renewables	
2016												
Primary production	-	-	-	-	-	4971	-	1375	1017	7363	7363	
Imports	7112	-	-	344593	-	413	-	248	-	352367	413	
Exports	-	-	-	-	-	-	-	-	-	-	-	
International marine bunkers	-	-	-	*1212	-	-	-	-	-	*1212	-	
International aviation bunkers	-	-	-	*10758	-	-	-	-	-	*10758	-	
Stock changes	-	-	-	-	-	-	-	-	-	-	-	
Total energy supply	7112	-	-	332623	-	5384	-	1624	1017	347760	7776	
Statistical difference	0	-	-	513	-	0	-	-4	0	509	1375	
Transfers	-	-	-	-	-	-	-	-	-	-	-	
Transformation	-	-	-	-18976	-	-585	-	6909	-	-123652	-585	
Electricity plants	-	-	-	-18976	-	-	-	6909	-	-123067	-	
CHP plants	-	-	-	-	-	-	-	-	-	-	-	
Heat plants	-	-	-	-	-	-	-	-	-	-	-	
Coke ovens	-	-	-	-	-	-	-	-	-	-	-	
Briquetting plants	-	-	-	-	-	-	-	-	-	-	-	
Liquefaction plants	-	-	-	-	-	-	-	-	-	-	-	
Gas works	-	-	-	-	-	-	-	-	-	-	-	
Blast furnaces	-	-	-	-	-	-	-	-	-	-	-	
NCL plants & gas blending	-	-	-	-	-	-	-	-	-	-	-	
Oil refineries	-	-	-	-	-	-	-	-	-	-	-	
Other transformation	-	-	-	-	-	-585	-	-	-	-585	-585	
Energy industries own use	-	-	-	-	-	-	-	0	-	0	-	
Losses	-	-	-	-	-	-	-	-7042	-	-7042	-	
Final consumption	7112	-	-	*143134	-	4799	-	60494	1017	216557	5816	
Final energy consumption	7112	-	-	*139442	-	4799	-	60494	1017	212865	5816	
Manufacturing, const., mining	7112	-	-	5381	-	-	-	15790	50	28333	50	
Iron and steel	-	-	-	-	-	-	-	-	-	-	-	
Chemical and petrochemical	-	-	-	-	-	-	-	-	-	-	-	
Non-ferrous metals	-	-	-	-	-	-	-	-	-	-	-	
Non-metallic minerals	7112	-	-	-	-	-	-	-	-	7112	-	
Transport equipment	-	-	-	-	-	-	-	-	-	-	-	
Machinery	-	-	-	-	-	-	-	-	-	-	-	
Mining and quarrying	-	-	-	-	-	-	-	-	-	-	-	
Food and tobacco	-	-	-	-	-	-	-	-	-	-	-	
Paper, pulp and printing	-	-	-	-	-	-	-	-	-	-	-	
Wood and wood products	-	-	-	-	-	-	-	-	-	-	-	
Textile and leather	-	-	-	-	-	-	-	-	-	-	-	
Construction	-	-	-	-	-	-	-	-	-	-	-	
Industries n.e.s	0	-	-	5381	-	-	-	15790	50	21220	50	
Transport	-	-	-	-	-	-	-	-	-	*93057	-	
Road	-	-	-	-	-	-	-	-	-	*93057	-	
Rail	-	-	-	-	-	-	-	-	-	-	-	
Domestic aviation	-	-	-	-	-	-	-	-	-	-	-	
Domestic navigation	-	-	-	-	-	-	-	-	-	-	-	
Pipeline transport	-	-	-	-	-	-	-	-	-	-	-	
Transport, n.e.s	-	-	-	-	-	-	-	-	-	-	-	
Other	-	-	-	*41005	-	4799	-	44705	967	91476	5766	
Agriculture, forestry, fishing	-	-	-	-	-	-	-	-	-	-	-	
Commerce, public services	-	-	-	-	-	-	-	10076	307	10383	307	
Households	-	-	-	*41005	-	4091	-	23854	660	*96610	4751	
Other consumers	-	-	-	-	-	708	-	*10775	-	*11483	708	
Non-energy use	-	-	-	3692	-	-	-	-	-	3692	-	

Columns: Energy Products

Energy Supply

ROWS: FLOWS

Transformation
+ Transfers
+ Energy industry own use
+ Losses

Total

Renewables

Final consumption

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.**

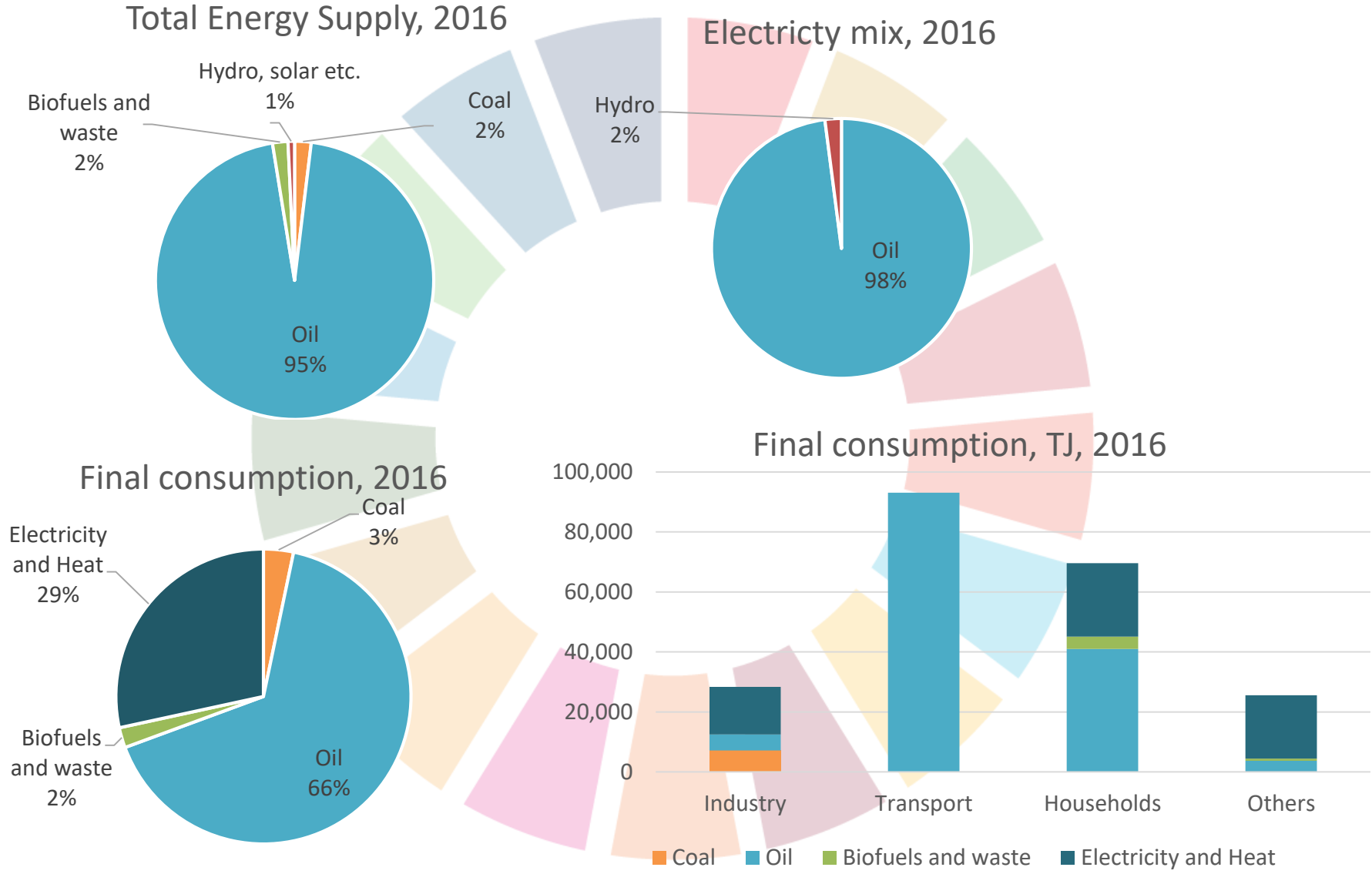
Table 8.2
Template of an aggregated energy balance

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						



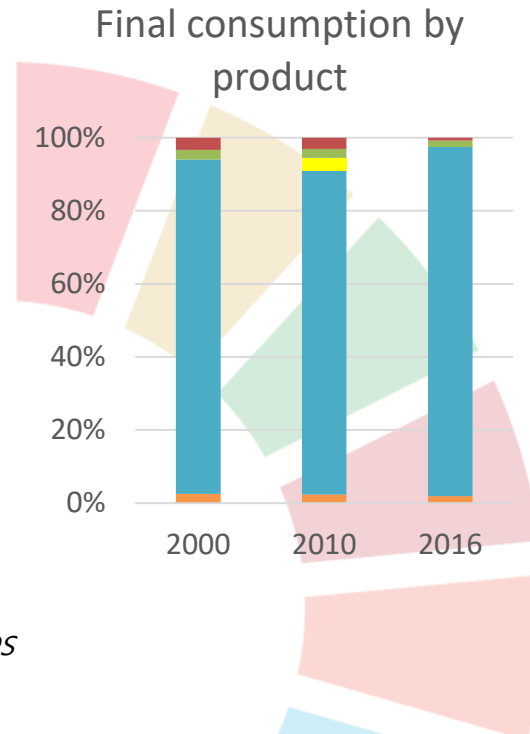
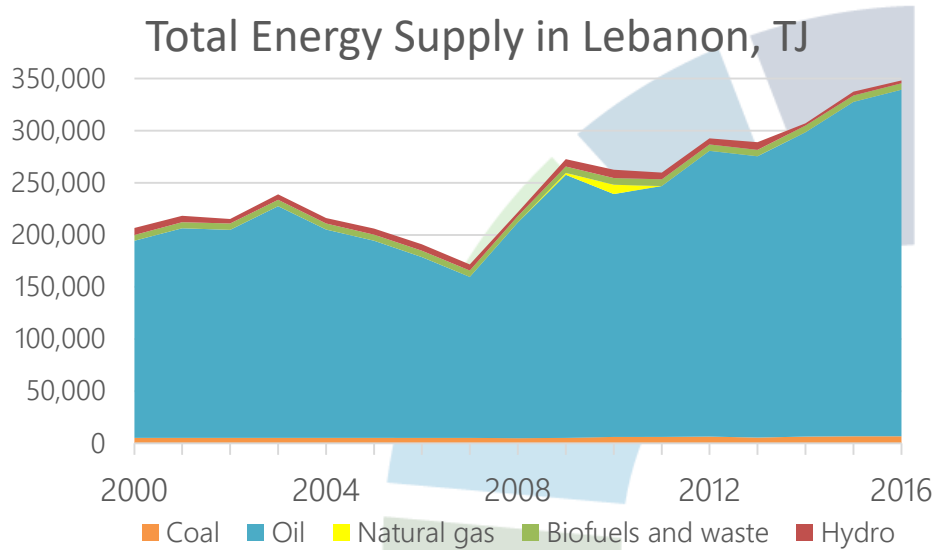
What we can learn from energy balances?

Energy in Lebanon in a snapshot

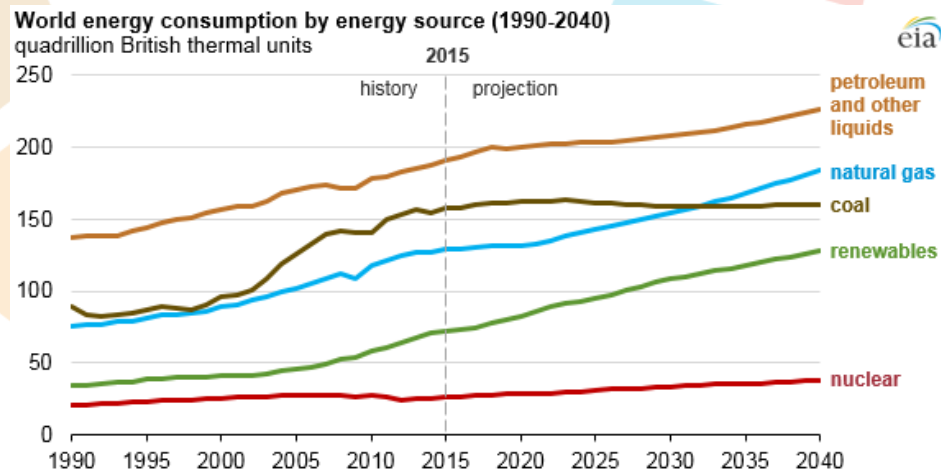


Source: MEW data on oil products completed with estimates

Basis for projecting energy demand



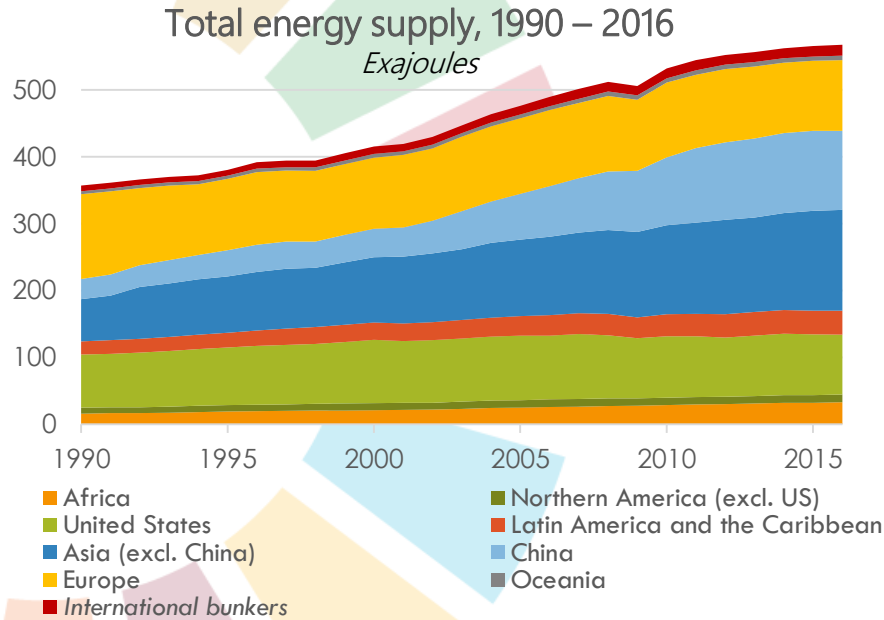
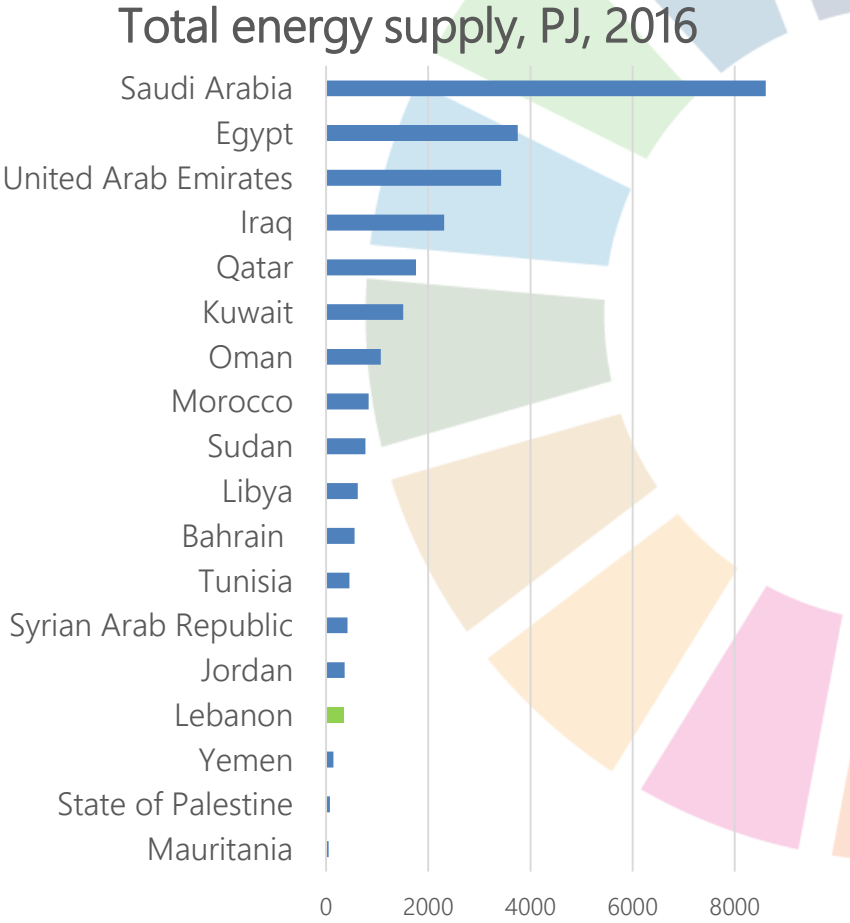
Source: MEW data on oil products completed with estimates



Source: U.S. Energy Information Administration, *International Energy Outlook 2017* © UNSD 2019

International comparison

- Different countries can be compared and the world totals can be calculated.

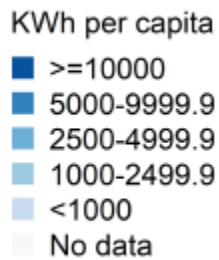
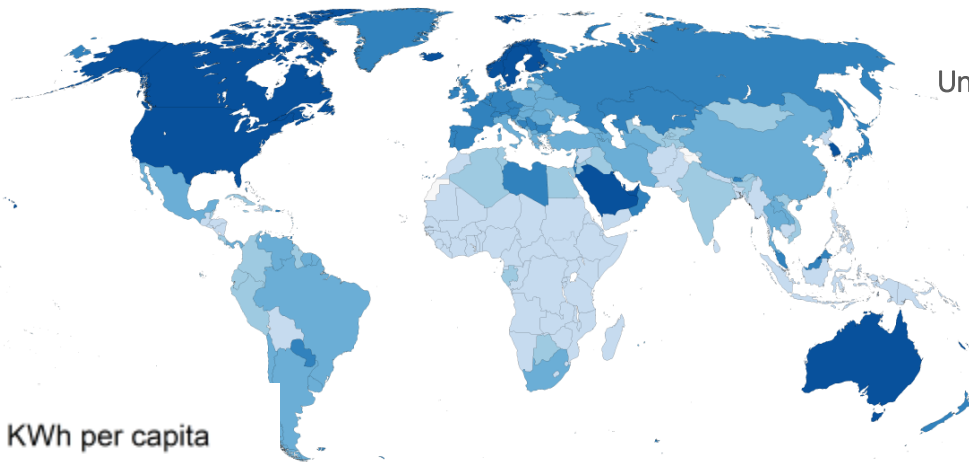


Source: 2019 Energy Statistics Pocketbook, UNSD

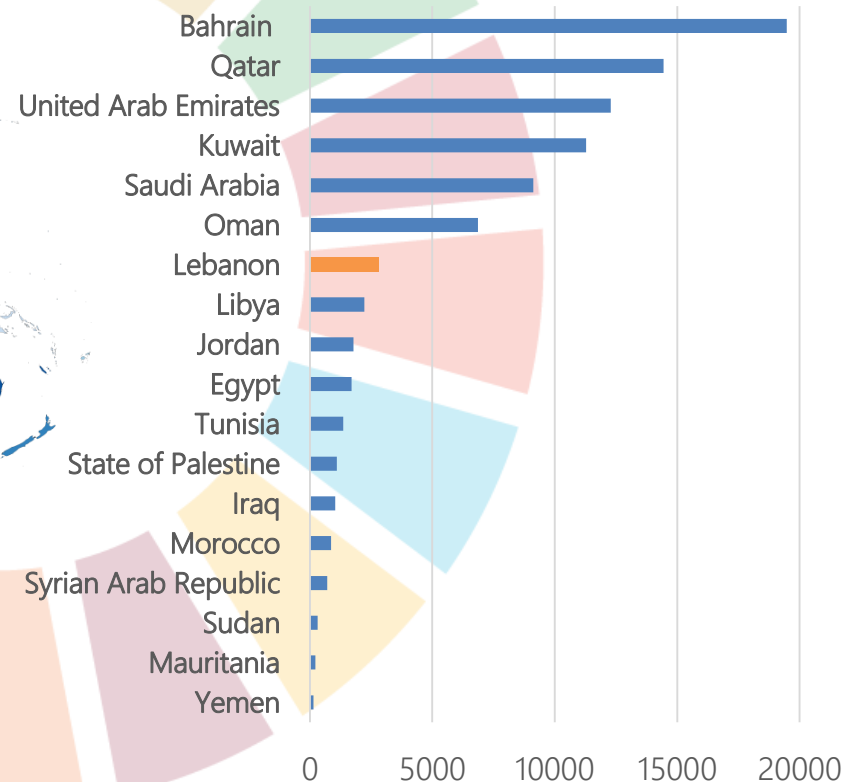
Energy indicators

- Coupling energy balances data with various macro-economic variables

Electricity consumption per capita, 2016

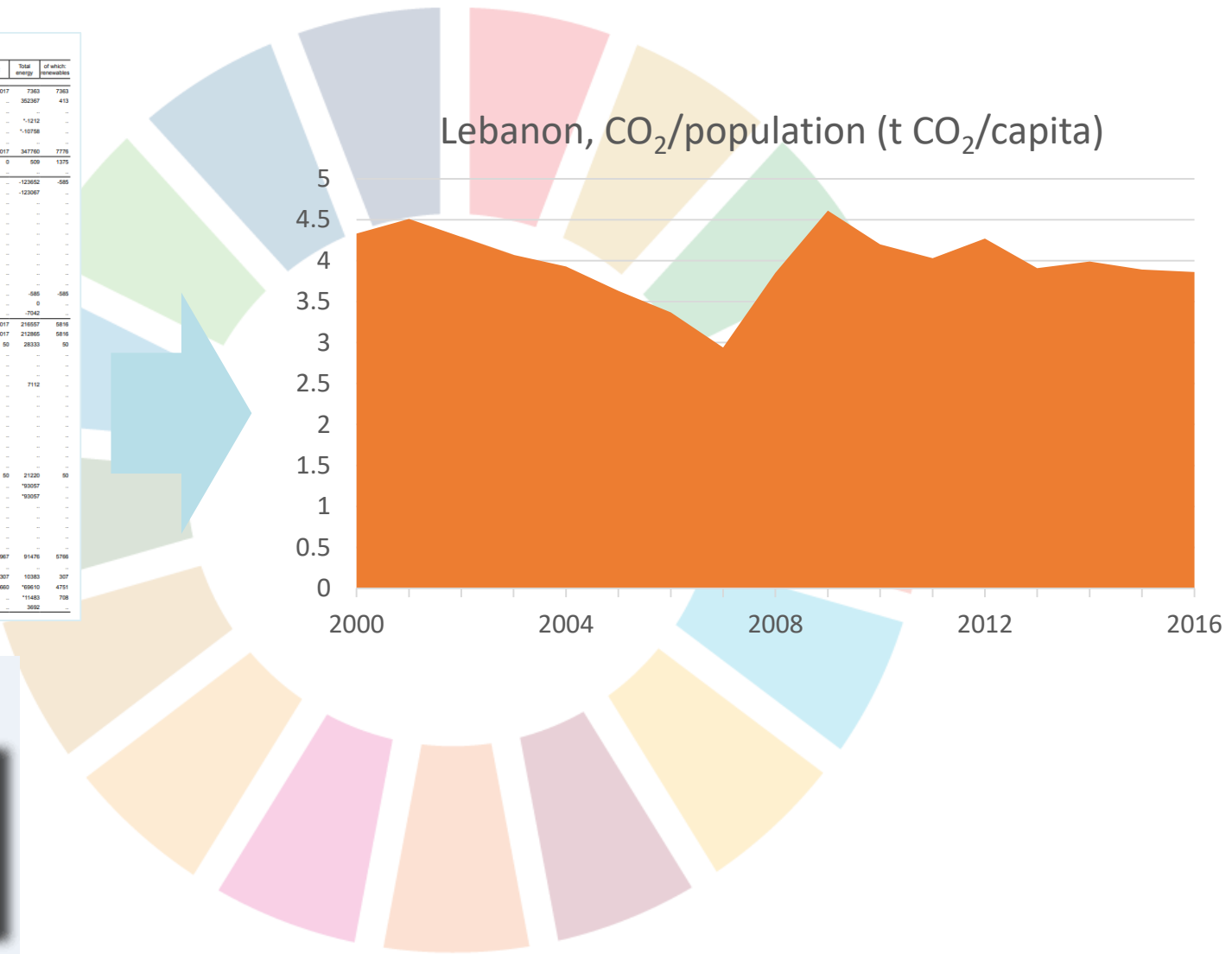


Electricity consumption per capita (kWh)



Base for estimating CO₂ emissions

Lebanon											
	Teraoules										
	Primary coal and oil products	Coal and oil products	Primary Oil	Oil Products	Natural Gas	Biogas and waste	Nuclear	Electricity	Heat	Total energy	of which renewables
2011											
Primary production	-	-	-	34493	-	4971	-	1375	1017	7363	7363
Imports	7112	-	-	-	413	-	-	248	-	352307	413
Exports	-	-	-	-	-	-	-	-	-	-	-
International marine bunkers	-	-	-	-1212	-	-	-	-	-	-1212	-
International aviation bunkers	-	-	-	-10758	-	-	-	-	-	-10758	-
Stock changes	-	-	-	-	-	-	-	-	-	-	-
Total energy supply	7112	-	-	33283	5384	5384	1624	1017	347160	7776	
Renewable reference	0	-	-	513	-	-	-	4	0	509	1376
Transformers	-	-	-	-	-	-	-	-	-	-	-
Transformation	-	-	-	-18976	-585	-	6909	-	-12362	-585	
Electricity plants	-	-	-	-18976	-	-	6909	-	-12362	-585	
Oil plants	-	-	-	-	-	-	-	-	-	-	
Heat plants	-	-	-	-	-	-	-	-	-	-	
Coke ovens	-	-	-	-	-	-	-	-	-	-	
Smelting plants	-	-	-	-	-	-	-	-	-	-	
Liquefaction plants	-	-	-	-	-	-	-	-	-	-	
Gas works	-	-	-	-	-	-	-	-	-	-	
Blas furnaces	-	-	-	-	-	-	-	-	-	-	
NGL plants & gas blending	-	-	-	-	-	-	-	-	-	-	
Oil refineries	-	-	-	-	-	-	-	-	-	-	
Other transformation	-	-	-	-	-585	-	-	-	-	-585	-585
Energy industries own use	-	-	-	-	-	-	0	-	-	0	-
Losses	-	-	-	-	-	-	-	-7042	-	-7042	-
Final consumption	7112	-	-	14314	4799	-	60494	1017	216557	5816	
Final energy consumption	7112	-	-	13942	4799	-	60494	1017	212865	5816	
Manufacturing, const., mining	7112	-	-	5381	-	-	15790	90	28333	90	
Iron and steel	-	-	-	-	-	-	-	-	-	-	
Chemical and petrochemical	-	-	-	-	-	-	-	-	-	-	
Non-ferrous metals	-	-	-	-	-	-	-	-	-	-	
Non-metallic minerals	-	-	-	-	-	-	-	-	-	-	
Transport equipment	7112	-	-	-	-	-	-	-	-	7112	
Machinery	-	-	-	-	-	-	-	-	-	-	
Mining and quarrying	-	-	-	-	-	-	-	-	-	-	
Food and tobacco	-	-	-	-	-	-	-	-	-	-	
Paper, pulp and printing	-	-	-	-	-	-	-	-	-	-	
Wood and wood products	-	-	-	-	-	-	-	-	-	-	
Textile and leather	-	-	-	-	-	-	-	-	-	-	
Construction	-	-	-	-	-	-	-	-	-	-	
Industries n.e.s	0	-	-	6381	-	-	18790	90	21220	90	
Transport	-	-	-	-	-	-	-	-	93057	93057	
Road	-	-	-	-	-	-	-	-	-	-	
Rail	-	-	-	-	-	-	-	-	-	-	
Domestic aviation	-	-	-	-	-	-	-	-	-	-	
Domestic navigation	-	-	-	-	-	-	-	-	-	-	
Pipeline transport	-	-	-	-	-	-	-	-	-	-	
Transport, n.e.s	-	-	-	-	-	-	-	-	-	-	
Other	-	-	-	11505	4799	-	44705	967	91476	5786	
Agriculture, forestry, fishing	-	-	-	-	-	-	-	-	-	-	
Commerce, public services	-	-	-	-	-	-	10076	307	10383	307	
Households	-	-	-	11505	4091	-	23854	660	69610	4751	
Other consumers	-	-	-	-	708	-	10775	-	11483	708	
Non-energy use	-	-	-	3892	-	-	-	-	3892	-	



Is the picture accurate?

- We have just seen some statistics, indicators and figures illustrating the energy situation in Lebanon
 - Are these figures and statistics accurate?
- They were based on the available data (which do not provide complete coverage of energy products and flows in Lebanon) and estimates
 - Estimates done by international organizations will never be as accurate as data compiled by the countries themselves
- We are here to assist the Administration to produce their own accurate energy statistics
 - Necessary to produce complete energy balances
 - And inform policy and help sustainable development



Energy balances for SDG7

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

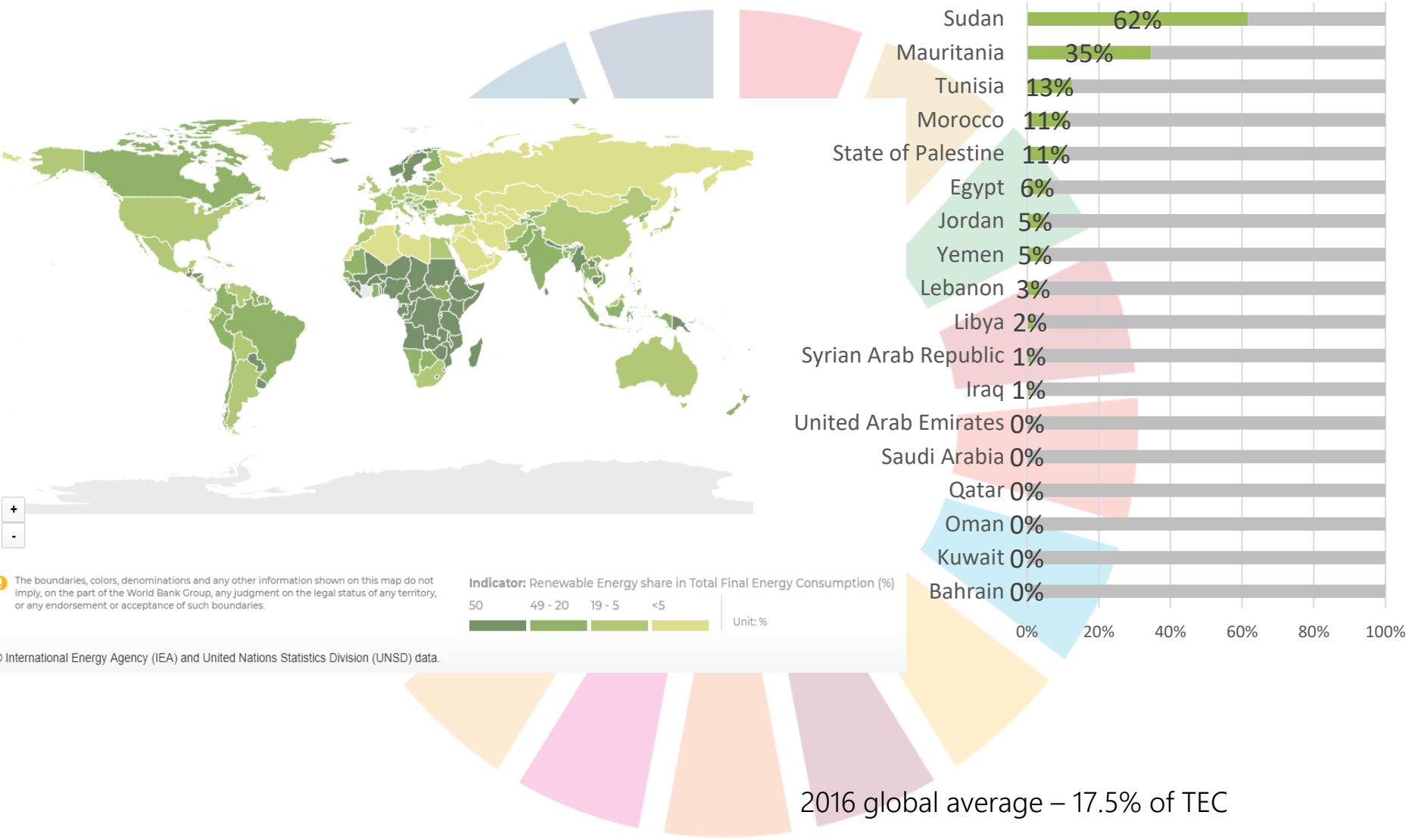
SDG 7.2

Renewable energy share in the total final energy consumption

SDG 7.3

Energy intensity measured in terms of primary energy and GDP

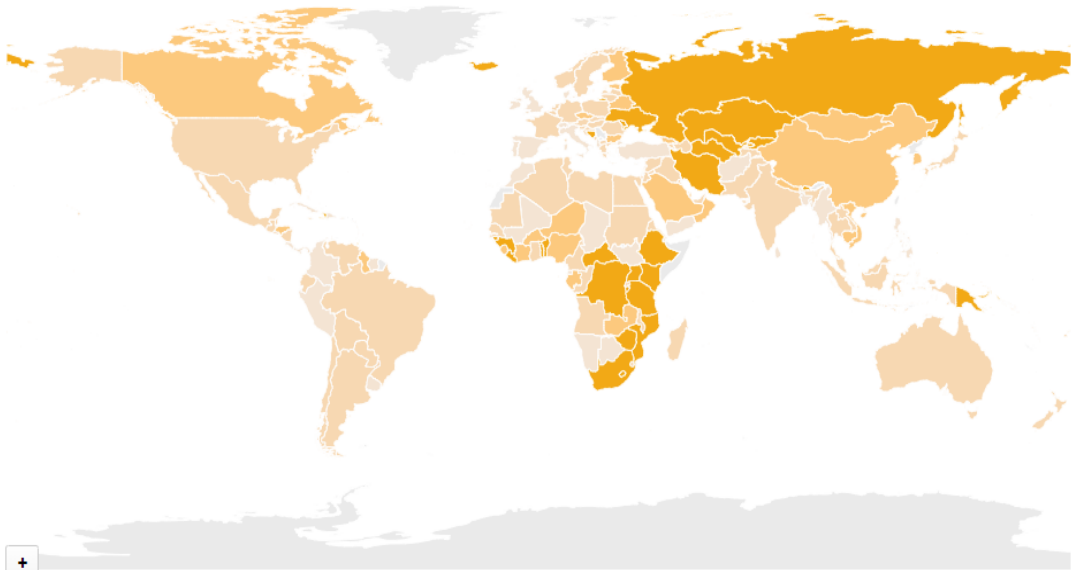
Renewable energy share in TEC, 2016



! 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.

© International Energy Agency (IEA) and United Nations Statistics Division (UNSD) data.

Energy intensity (MJ/USD PPP 2011)



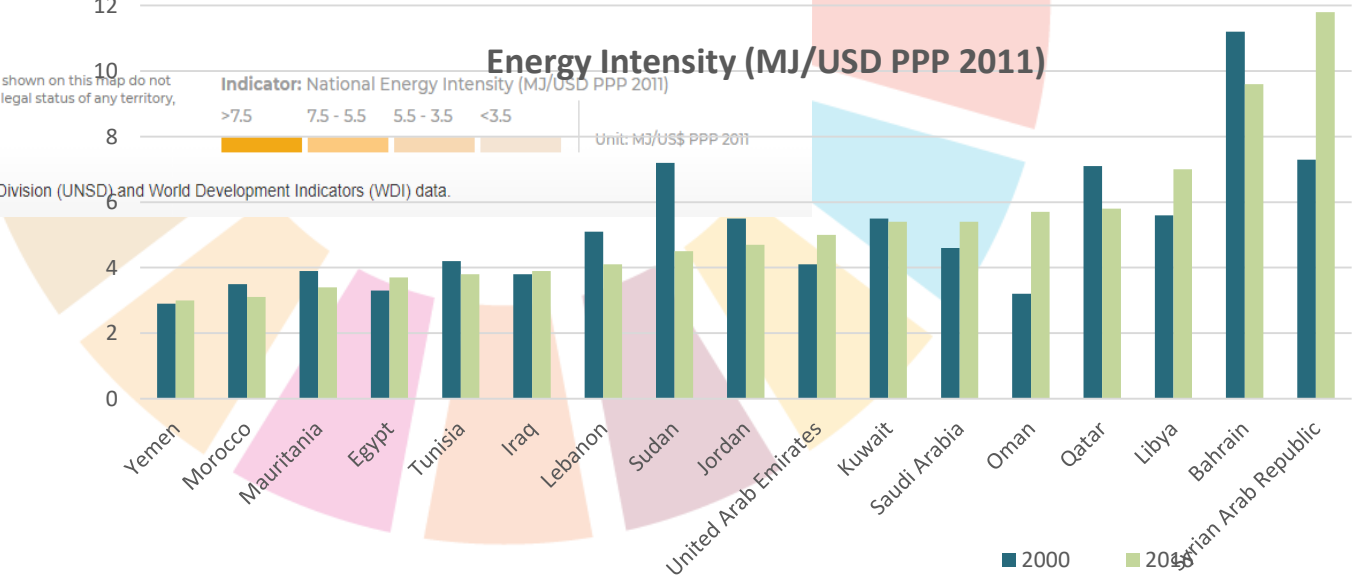
2016 global average 5.1 MJ/USD PPP 2011



! 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

© International Energy Agency (IEA), United Nations Statistics Division (UNSD) and World Development Indicators (WDI) data.





Conclusion

Conclusion

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 CO₂ 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