



**Methodological sheets for
the priority indicators
to monitor the Mediterranean Strategy for
Sustainable Development**

**Priority domain n° 2:
Energy and climate change**



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<p style="text-align: center;">STRATEGY FIELD</p> <p style="text-align: center;">MANAGING ENERGY DEMAND AND MITIGATING THE EFFECTS OF CLIMATE CHANGE</p>	<p style="text-align: center;">TYPE</p> <p style="text-align: center;">PRIORITY INDICATORS</p>	<p style="text-align: center;">CMDD</p> <p style="text-align: center;">ECONOMY ENERGY</p> <p style="text-align: center;">(69)</p>
<p>Energy intensity (total and by sector)</p>	<p style="text-align: center;">MSSD 6</p> <p style="text-align: center;">ENE_P01</p>	

Strategic Objective:

Promote rational use of energy.

Rationale:

This indicator reflects the trends in overall energy use relative to GDP, indicating the general relationship of energy use to economic development.

Energy is essential for economic and social development. However, energy use affects resource availability and the environment. In particular, fossil fuel use is a major cause of air pollution and climate change. (Source: Energy Indicators for Sustainable Development: Guidelines and Methodologies – IEA, UNDESA, IEA, Eurostat 2005)

In the Mediterranean, energy consumption is highly dependent on fossil energy sources and has more than doubled over 30 years. In many Mediterranean countries, pricing and tax structures are not conducive to energy savings. The objective for Mediterranean countries is to maintain identical energy supply and to reduce consumption. Considerable energy savings are identifiable in the areas of services and residential construction (energy-efficient buildings, household appliances, lighting, air conditioning...), in transport (hybrid engines, biofuels...) and in industry.

Definition:

This indicator is defined as the ratio of final commercial energy consumption per GDP unit per year¹. It can be disaggregated per sector: agriculture, industry, services, transport, households/residential.

It can also be defined as the ratio of energy consumption by one sector or sub-sector vs production (or activity) in said sector.

Unit:

- Tons of oil equivalent per US dollar PPP (total and per sector).
- Tons of oil equivalent per passenger or fret km (transport).
- Tons of oil equivalent per square meter used (services or households).
- Tons of oil equivalent per person (households).

Objective and/or targeted values:

There are no international conventions or agreements regulating or limiting energy consumption per GDP unit. Energy intensity improves when the ratio is lower.

The Mediterranean Strategy for Sustainable Development recommends: «To reduce energy consumption by 1 to 2% per year per GDP unit by 2015 ».

Methodological Indications:

- Energy consumption:

Energy consumption values are reported in kg of oil equivalent, as per the conversion factors of the International Energy Agency (IEA).

The computed consumption is « apparent » consumption:
production + imports - exports – Bunkers (+/-) stocks.

¹ This indicator can also be defined as the ratio of primary energy offer or electricity consumption per GDP unit.

National energy consumption figures combine four major energy sources:

- Solid fuels (coal, wood, charcoal, etc.)
- Liquid fuels (oil, LNG, ethanol, etc.)
- Gaseous fuels (natural gas, methane, etc.)
- Primary electricity (hydroelectricity, windmills, geothermal, etc..)

- Production and activities :

GDP is a National Accounting aggregate which corresponds to the sum of added value created by resident producers (plus taxes, minus subsidies). For this indicator, GDP is expressed at constant prices. National currency data may be converted to US dollars at constant PPP.

Purchasing Power Parity (PPP) rates are used to convert prices to a common currency which eliminates the effect of purchasing power differences between national currencies, i.e., their application to conversion eliminates the impact of inter-country price differentials.

To calculate this indicator per sector, it is necessary to use added value figures per sector (agriculture, industry) as well as activity figures such as km per passenger (transport) or used surfaces (households and services).

- Required data:

The computation of this indicator requires statistics from national accounts, census, transport and energy. The table below lists the required data and suggests statistical classifications and units. It is based on internationally applied and recommended calculation methodologies (cf Energy Indicators for Sustainable Development: Guidelines and Methodologies – IEA, UNDESA, IEA, Eurostat 2005):

Indicators	Energy Consumption	Production/activities	Unit	Observations
Total energy intensity	Total final energy consumption	GDP at constant prices in USD PPP (converted from GDP in national currency)	Tons of oil equivalent / USD	
Energy intensity in Agriculture	Final energy consumption in agriculture	Added value from agriculture in USD PPP (Division A of ISIC classification)	Tons of oil equivalent / USD	
Energy intensity in Industry	Final energy consumption in industrial sectors	Added value from industry in USD PPP (Divisions C, D, E & F of ISIC classification)	Tons of oil equivalent / USD	ISIC divisions may lead to confusion (division D being the manufacturing industry). It is strongly advised to check which sectors are included by countries.
Energy intensity in the Services Industry	Final energy consumption in the services sector	Added value from services in USD PPP (Divisions other than A to E of ISIC classification)	Tons of oil equivalent / USD	Check that energy consumption figures differentiate services and residential/households sector
Energy intensity in residential/households	Commercial energy consumed by households	Number of inhabitants: Population figures	Tons of oil equivalent / USD per person or Tons of oil equivalent /m2	The number of inhabitants may be replaced by the number of households or by the surface per person. These statistics are however more difficult to obtain.

Indicators	Energy Consumption	Production/activities	Unit	Observations
Energy intensity in land transport	Commercial energy consumed by transport	passenger Km fret Km Figures from transport statistics	Tons of oil equivalent /km (passenger or fret)	This indicator could be detailed per type of vehicle or mode of transportation.

Geographical scope:

NATIONAL LEVEL	CATCHMENT AREAS	MEDITERRANEAN COASTAL ZONES (NUTS 3)	COASTAL ZONES	MEDITERRANEAN SITES	MARINE ZONES
YES					

References:

- United Nations (2003) – Indicators for Monitoring the Millenium Development Goals
- International Energy Agency
- OECD
- Energy Indicators for Sustainable Development : Guidelines and Methodologies – IEA, UNDESA, IEA, Eurostat 2005

International Data Sources:

- United Nations: http://millenniumindicators.un.org/unsd/mi/mi_goals.asp
- International Energy Agency: <http://www.iea.org/>
- Eurostat : <http://www.europa.eu.int/comm/eurostat/>

Precautions for use:

It is not sufficient to only consider the energy consumption indicator vs. GDP (total energy intensity for national economy) as the indicator of energy intensity. In fact, fluctuations in total domestic energy intensity can also be impacted by changes in the structure of the national economy, by climate (cold and hot temperatures) or geographical conditions, as well as by effective efforts to save energy.

For example, national economies based on the use of raw materials (such as for heavy industry) consume more energy than importer countries. Country comparisons as regards energy consumed per GDP unit can be further complicated by geographical considerations: transport costs tend to be higher in large countries where distances are longer. Climate can also have an impact: populations in cold climates consume more energy per capita for heating.

This indicator is also complex to interpret as regards environmental impact, since energy options at identical levels of intensity tend to affect the environment in different ways.

Thus, in view of the many factors which have an influence on energy consumption vs GDP, the global indicator must be supported by disaggregated energy intensity indicators per sector.

The same drawbacks apply to all sectors, and it would be necessary to compute energy intensity per product but the data required for such computation are almost impossible to obtain.

Results and international comparisons can also be impacted by the base year selected for PPP conversion.

Methodological Annex:

Energy consumption per sector and production statistics (added value):

Energy statistics per sector		Production Statistics
Sectors	Ex:	ISIC Correspondance
Industry	<ul style="list-style-type: none"> ▪ Iron and steel ▪ Chemical Industry ▪ Non ferrous metal ▪ Non-metallic minerals ▪ Transport Equipment ▪ Machines ▪ Extraction and quarry extraction ▪ Food, beverages, tobacco ▪ Pulp, paper and copy ▪ Wood products and wood ▪ Textiles and leather ▪ Construction ▪ Not classified elsewhere 	Division C, D, E, F for industry as a whole
Transport	<ul style="list-style-type: none"> ▪ Road ▪ Rail ▪ Air ▪ Pipelines ▪ National navigation 	
Other sectors	<ul style="list-style-type: none"> ▪ Agriculture ▪ Trade and utilities ▪ Residential ▪ Others 	Division A Divisions other than A to F

Source : OECD, IEA, Eurostat (2004) - Energy Statistics Manual

STRATEGY FIELD	TYPE	CMDD
MANAGING ENERGY DEMAND AND MITIGATING THE EFFECTS OF CLIMATE CHANGE	PRIORITY INDICATORS	ECONOMY ENERGY (71)
Share of renewable energies in energy balance	MSSD 7 ENE_P02	

Strategic Objective:

To enhance the potential of renewable energies

Rationale:

As demonstrated in 2002 by the Johannesburg Summit on Sustainable Development, renewable energies and consumption efficiency are considered as the most promising routes to improving access to energy for the largest number, contributing to the development of less advanced countries and facing up to the major stakes of environmental impacts. Renewable energies alone guarantee the sustainability of their production resources. Furthermore, they bring an alternative solution to diversify and secure energy supply sources (wind, solar).

In the Mediterranean, renewable energies hold strong potential which still largely under-tapped, both for electricity production and domestic consumption. The share of renewable energies (hydraulic, solar, geothermal, windmills) in the energy balance is only 3% in 2000 (2% for hydraulic and 1% for solar, geothermal and wind).

Definition:

This indicator measures the share of total domestic energy consumption in renewable energy resources (hydraulic, solar, geothermal, wind).

Unit:

Percentage

Objective and/or targeted values:

To cover 7% of total energy demand through renewable energies by 2015 (excluding renewable fuels).

Methodological Indications:

Renewable energy includes both combustible and non-combustible renewables:

- Non-combustible renewables include geothermal, solar, wind, hydro, tide and wave energy.
- Combustible renewables consist of biomass (fuelwood, vegetal waste, ethanol) and animal products (animal materials/wastes and sulphite lyes), municipal waste and industrial waste.

(Source: Energy Indicators for Sustainable Development: Guidelines and Methodologies – IEA, UNDESA, IEA, Eurostat 2005)

Note: the indicator described herein only covers the first point of this definition.

The computed consumption is « apparent » consumption: primary production + imports + exports - bunkers (+/-) stocks.

Geographical scope:

NATIONAL LEVEL	CATCHMENT AREAS	MEDITERRANEAN COASTAL ZONES (NUTS 3)	COASTAL ZONES	MEDITERRANEAN SITES	MARINE ZONES
YES					

References:

- Source : Energy Indicators for Sustainable Development : Guidelines and Methodologies – IEA, UNDESA, IEA, Eurostat 2005
- OECD FACTBOOK 2005 – ISBN 92-64-01869-7 – © OECD 2005 (<http://oberon.sourceoecd.org/factbookpdfs/07-02-03.pdf>)

International Data Sources:

- United Nations, Energy Statistics Yearbook.
- IEA (2004), Renewable Information, IEA, Paris
- World Resources Institute

Precautions for use:

This indicator only applies to the following renewable energies: hydraulic, solar, geothermal, wind. Combustible renewables (solid biomass and animal products, biomass gases and fluids, municipal and industrial waste) are not included. It must however be remembered that these combustible renewables may represent a large share of the Mediterranean energy supply sources: in 2000 renewable energies excluding combustible renewables account for 3% of energy supply, and the figure reaches 6.6% if combustible renewables are included.

Methodological Annex:

The following conversion rates are recommended for unit conversion per energy source, (United Nations, Energy Statistics Yearbook):

tce = ton charcoal equivalent; 1 tce = 0,7 toe (ton of oil equivalent)

- Hydraulic and wind energy: yield estimated at 100%, 0.123 tce /1000 kW
- Geothermal energy: yield estimated at 10%, 1.228 tce/1000 kW

STRATEGY FIELD	TYPE	CMDD
MANAGING ENERGY DEMAND AND MITIGATING THE EFFECTS OF CLIMATE CHANGE	PRIORITY INDICATORS	ENVIRONMENT AIR 110
Greenhouse gas emissions	MSSD 8 ENE_P03	

Strategic Objective:

To control, stabilize or reduce greenhouse gas emissions.

Rationale:

During the 20th century, the Earth's average surface temperature rose by around 0.6°C, and evidence is growing that most of this warming is attributable to increasing concentrations of GHGs in the atmosphere.

The resulting effect is predicted to lead to more extreme weather events than in the past, with some areas experiencing increased storms and rainfall, and others suffering drought. How fast and where this change will happen is still uncertain, but the consequences may be serious, especially in developing countries, which are the least able to prepare for and deal with the effects of extreme weather conditions such as floods, landslides, droughts, etc.

(Source: Energy Indicators for Sustainable Development: Guidelines and Methodologies – IEA, UNDESA, IEA, Eurostat 2005.)

The objective of the UN framework convention on climate change, adopted in Rio de Janeiro in June 1992, is the stabilization of greenhouse gas emissions at a level preventing hazardous anthropic climate disruptions.

Specific targets to reduce greenhouse gas emissions (CO₂, N₂O, CH₄, HFC, PFC, SF₆) in developed countries have been set by the Kyoto Protocol, signed in December 1997: 38 industrialized countries must globally reduce their CO₂ equivalent emissions by 5.2% over the period 2008-2012, vs 1990 levels (in the EU, reduction targets have been set at -8%).

Definition:

This indicator corresponds to aggregated annual national emissions of the main greenhouse gases (GHG) carbon dioxide (CO₂), nitrogen protoxide (NO₂), methane (CH₄) and halocarbons (HFC, PFC) and Sulphur hexafluoride (SF₆)

Unit:

Gigagrams (Gg) of CO₂ equivalent per year

Objective and/or targeted values:

To achieve Kyoto Protocol targets on greenhouse gas emission reduction. All countries will reduce emissions as per percentage levels set by the Protocol, over the period 2008-2012.

Methodological Indications:

Greenhouse gas emissions are estimated using the IPCC methodology (International Panel on Climatic Change).

N₂O, CH₄, HFC, PFC, SF₆ emissions are expressed in CO₂ equivalent, weighted by their Potential for Global Warming (GWP) coefficient at 20 years.

Geographical scope:

NATIONAL LEVEL	CATCHMENT AREAS	MEDITERRANEAN COASTAL ZONES (NUTS 3)	COASTAL ZONES	MEDITERRANEAN SITES	MARINE ZONES
YES					

References:

- <http://ghg.unfccc.int/index.html>
- Energy Indicators for Sustainable Development : Guidelines and Methodologies – IEA, UNDESA, IEA, Eurostat 2005
- UNEP-Division of Technology, Industry, and Economics
http://www.uneptie.org/energy/tools/ghgin/docs/GHG_Indicator.pdf

International Data Sources:

- <http://ghg.unfccc.int/index.html>

Precautions for use:

Methodological Annex:

Global Warming Potentials

	Chemical formula	Lifetime (years)	Global Warming Potential (Time Horizon)		
			20 years	100 years	500 years
CO2	CO2	variable	1	1	1
Methane	CH4	12±3	56	21	6,5
Nitrous oxide	N2O	120	280	310	170
HFC-23	CHF3	264	9100	11700	9800
HFC-32	CH2F2	5,6	2100	650	200
HFC-41	CH3F	3,7	490	150	45
HFC-43-10mee	C5H2F10	17,1	3000	1300	400
HFC-125	C2HF5	32,6	4600	2800	920
HFC-134	C2H2F4	10,6	2900	1000	310
HFC-134a	CH2FCF3	14,6	3400	1300	420
HFC-152a	C2H4F2	1,5	460	140	42
HFC-143	C2H3F3	3,8	1000	300	94
HFC-143a	C2H3F3	48,3	5000	3800	1400
HFC-227ea	C3HF7	36,5	4300	2900	950
HFC-236fa	C3H2F6	209	5100	6300	4700
HFC-245ca	C3H3F5	6,6	1800	560	170
Sulphur hexafluoride	SF6	3200	16300	23900	34900
Perfluoromethane	CF4	50000	4400	6500	10000
Perfluoroethane	C2F6	10000	6200	9200	14000
Perfluoropropane	C3F8	2600	4800	7000	10100
Perfluorobutane	C4F10	2600	4800	7000	10100
Perfluorocyclobutane	c-C4F8	3200	6000	8700	12700
Perfluoropentane	C5F12	4100	5100	7500	11000
Perfluorohexane	C6F14	3200	5000	7400	10700

Source: Climate Change 1995, The Science of Climate Change: Summary for Policymakers and Technical Summary of the Working Group I Report, pg. 26.

STRATEGY FIELD MANAGING ENERGY DEMAND AND MITIGATING THE EFFECTS OF CLIMATE CHANGE	TYPE PRIORITY INDICATORS	MCS D EXCHANGE AND COOPERATION COOPERATION
Amount financed in the framework of the Kyoto Protocol flexibility mechanisms by the annex 1 countries to the benefit of other Mediterranean countries	MSSD 9 ENE_P04	

Strategic Objective:

Apply the Kyoto Protocol flexibility mechanisms to sustainable development in developing Mediterranean countries.

Rationale:

The MSSD recommends stronger regional cooperation and support to the implementation of the Framework convention on climate change and of the Kyoto Protocol:

- Invites Mediterranean countries to cooperate in the implementation of the UN framework convention on climate change and of the flexibility mechanisms of the Kyoto Protocol; to prepare for the period following 2012; and to undertake greenhouse gas emission reduction investments in the Mediterranean region.
- Recommends the development of synergies with the Mediterranean Renewable Energy Program (MEDREP), the Rome component on Mediterranean Energy (REMPE) and the Euro-Mediterranean Energy Policy.

Definition:

Amounts financed under the Flexibility Mechanisms of the Kyoto Protocol

- By Annex 1 countries;
- In developing countries (South and East Rim) and in transition countries (East Adriatic).

Unit:

US \$

Objective and/or targeted values:

Methodological Indications:

Country commitments are ambitious. Their implementation is facilitated by the Kyoto Protocol, giving countries access to "flexibility" mechanisms, in addition to policies and measures to be implemented at national level.

There are three such mechanisms:

- " **Emission trading**", allowing the sale or purchase of rights between industrialized countries;
- " **Joint implementation** " (JI) allowing developed countries to invest in greenhouse gas emission reduction outside of their national borders, and to benefit from the emission credits thus generated;
- " **Clean development mechanism** " (CDM), similar to the above, but where investments are undertaken by developed countries in developing countries.

At international level, in December 2001, the Conference of the Parties to the Marrakech Protocol defined the eligibility criteria to apply to initiatives, and to the joint implementation and clean development mechanisms:

- The impact of initiatives must be “additional”, i.e. generate effective emission reductions in the related field of activity vs what the situation could have been in the absence of such an approach;
- Host countries must first ratify the Kyoto Protocol and formally approve initiatives if they come under the national strategy for sustainable development.

There are technical difficulties involved in the implementation of these mechanisms, as regards the evaluation and measurement of effective greenhouse gas emission reductions, and therefore the quantification of the expected additional impact of such projects. However, solutions are gradually being developed for these difficulties and well-defined legal frameworks are now available for investors.

Geographical scope:

NATIONAL LEVEL	CATCHMENT AREAS	MEDITERRANEAN COASTAL ZONES (NUTS 3)	COASTAL ZONES	MEDITERRANEAN SITES	MARINE ZONES
YES					

References:

- <http://cdm.unfccc.int/>

International Data Sources:

Precautions for use:

Amounts financed under the Flexibility Mechanisms of the Kyoto Protocol are not necessarily limited to environmental objectives and can also apply to upgrading operations.

Methodological Annex: