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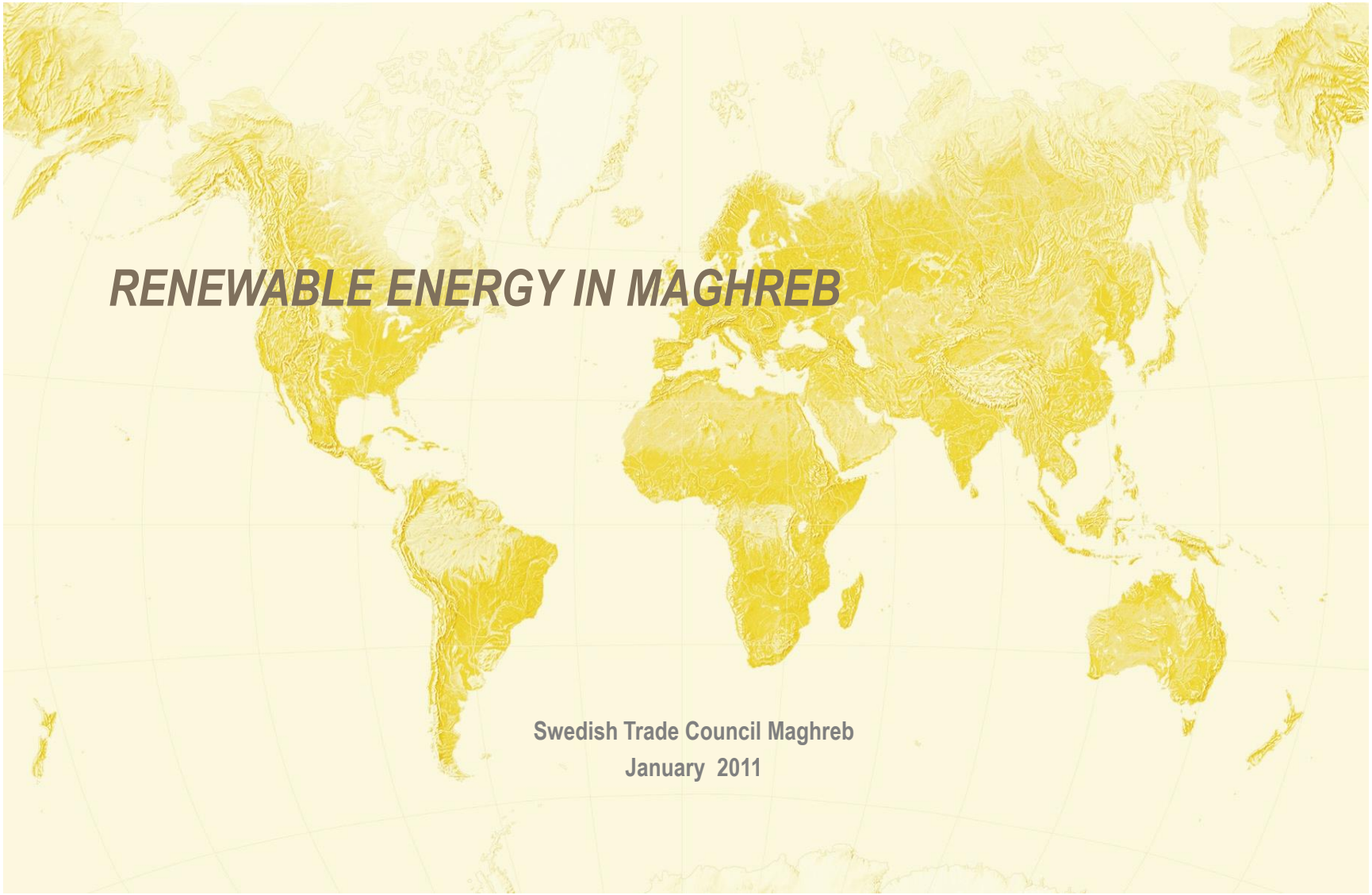


# *RENEWABLE ENERGY IN MAGHREB*

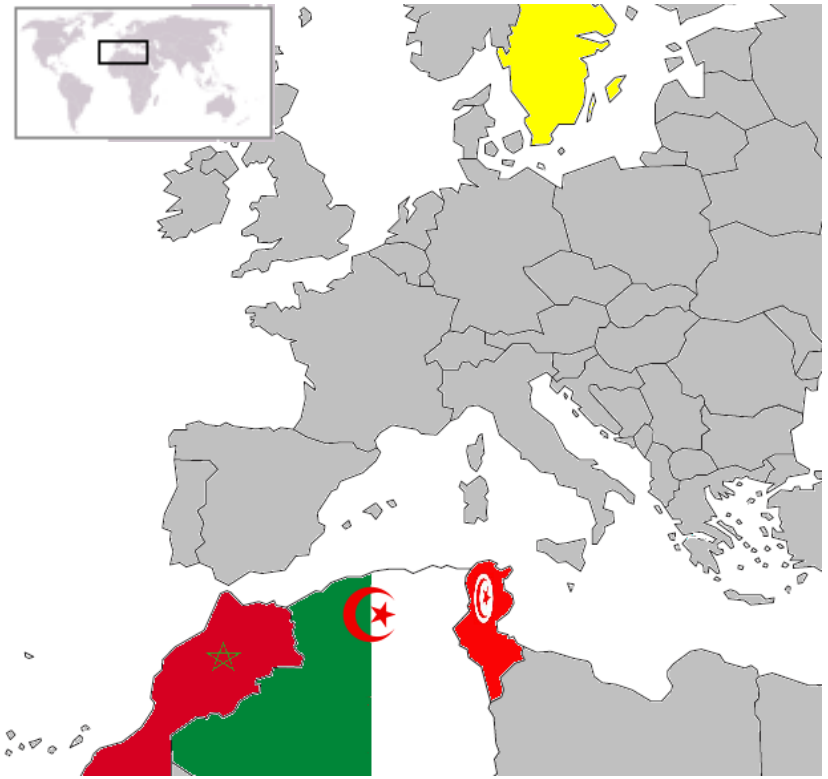
**Swedish Trade Council Maghreb**
**January 2011**

# AGENDA

- Maghreb key facts
- Algeria and the Algerian energy sector
- Morocco and the Moroccan energy sector
- Tunisia and the Tunisian energy sector
- Sources

# 80 MILLION CONSUMERS AND AN AVERAGE GDP GROWTH OF 4% THE LAST 5 YEARS

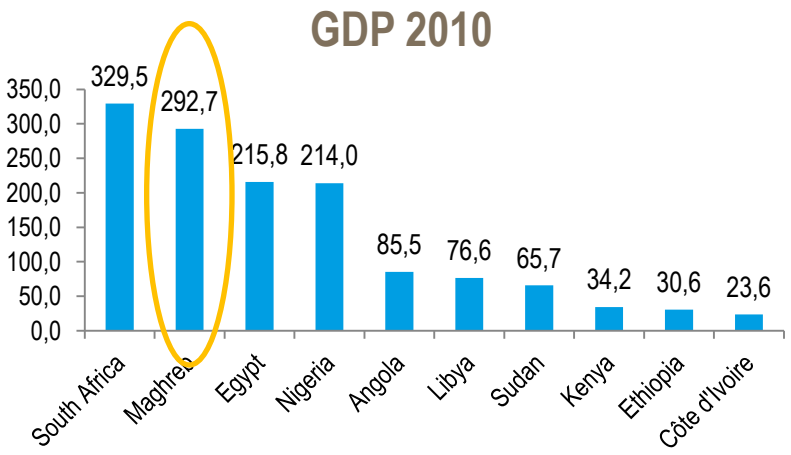
| Basic facts | |
|---|---|
| Population: | 80 million inhabitants (est 2010) |
| Area: | 3 273 000 km2 |
| GDP Growth: | 4% (est 2010) |
| GDP in US dollars: | 300 Billions USD (est 2010) |
| GDP/Capita (PPP): | 7 000 USD( est 2010) |
| Inflation: | 4% (est 2010) |
| Religion: | Islam (Sunni Muslims), Jewish minority in Morocco and Tunisia |
| Language: | Classical Arabic (de jure), Maghreb Arabic and Berber dialects (de facto), French (business) |
| Main export products: | Oil & gas, phosphates, agricultural & fishery products, textile, automotive |
| Swedish Exports: | 6,5 Billion SEK (2009) |

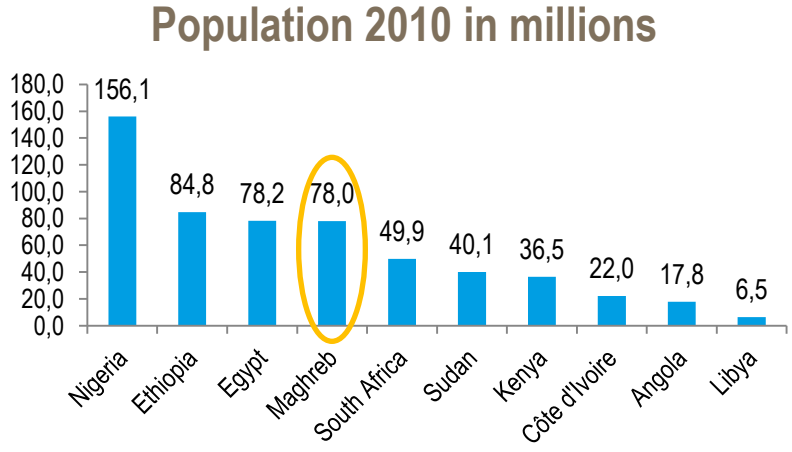


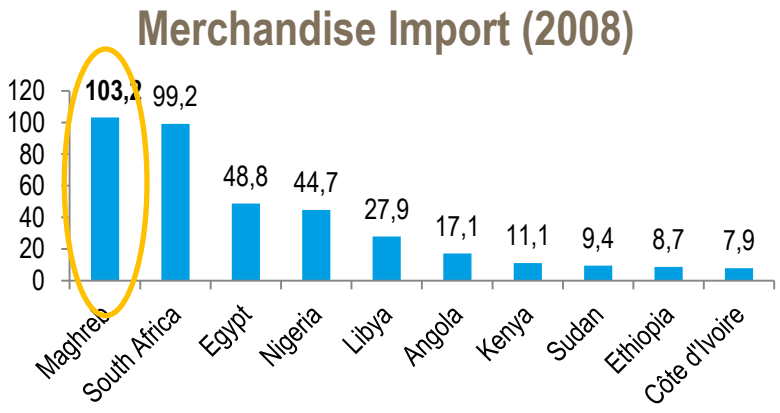


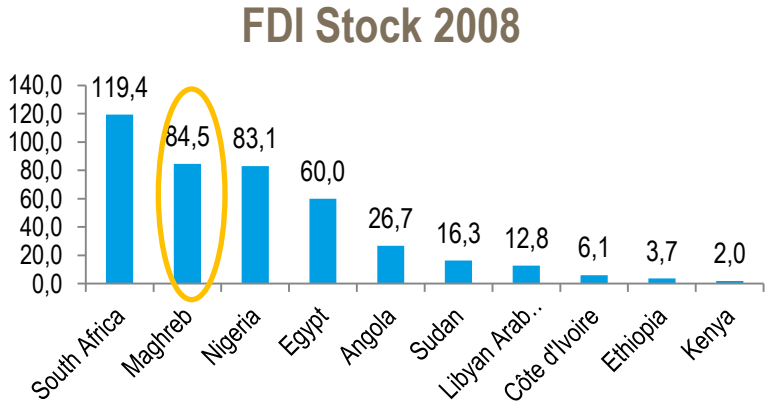
Source: IMF, Ministry of Economic (World Economic Outlook Database, April 2010), SCB.
Maghreb definition for the purpose of this presentation= Morocco, Algeria, Tunisia

# MAGHREB IS AFRICA'S SECOND BIGGEST ECONOMY BY GDP AS WELL AS IT'S BIGGEST IMPORTER




Figures in billion USD

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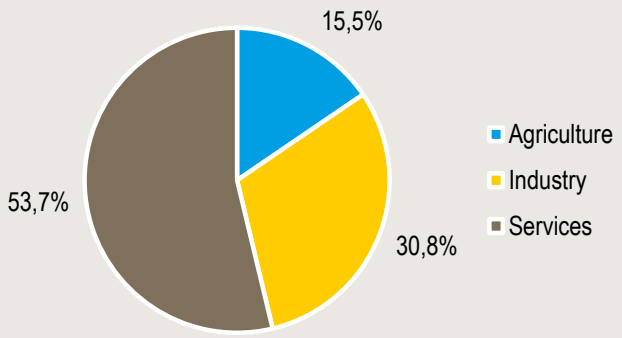
# MOROCCO: PHOSPHATE, TOURISM, AGRICULTURE & FISHERY AND TEXTILE DRIVEN ECONOMY WHICH SHOWS RESISTANCE TO CRISIS

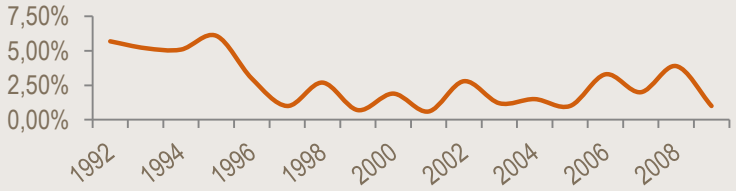
## Basic facts

| | |
|---|---|
| Population: | 32 million |
| Area: | 710 000 km² (incl WS) |
| GDP: | USD 90,8 bn |
| GDP/Capita: | USD 2864,5 |
| GDP growth: | 4,0 % (2010) |
| Currency: | Moroccan dirham |
| Religion: | Islam (99%) and Judaism |
| Languages: | Arabic (official), French, Berber |
| Head of state: | Mohammed VI |
| Exports: | Agricultural products, phosphate, textile, fisheries, automotive |
| Imports: | Manufactures, energy, electronics |
| Swedish Export 2009: | 2,8 BSEK |
| Swedish Import 2009: | 216 MSEK |
| Capital: | Rabat |

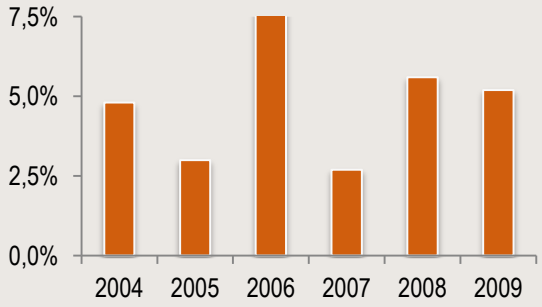
## GDP composition by sector




## Inflation rate




## Real GDP growth



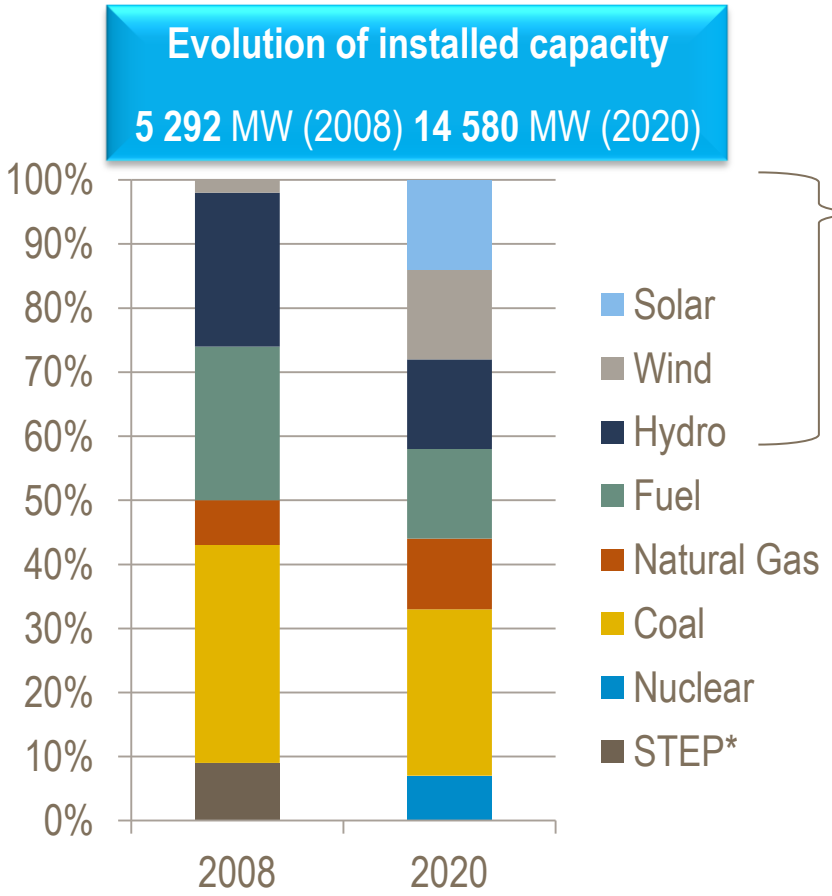
# 12,5 BILLION USD TO BE INVESTED IN SOLAR AND WIND PROJECTS IN ORDER TO ADDRESS MOROCCO'S EXCESSIVE DEPENDENCE ON FOREIGN ENERGIES

- Limited domestic energy resources: 96 % is imported. Morocco has no oil reserves and imports oil to a cost of 3,35 billion USD (2008) each year. Total energy bill is estimated to 8,4 billion USD

- Estimated total cost for the solar and wind projects: 12,5 billion USD which will be financed by the Moroccan state, development funds and banks as well as private companies/investors

- Energy consumption is constantly growing:
  1. Electrical consumption boomed from 4 460 GWh in 1980 to 21 104 GWh in 2006
  2. Annually power demand increase predicted to 5 % in average between 2010-2020
  3. Power demand will be tripled by 2020 in relation to current level

# BY 2020 42 % OF THE MOROCCAN ENERGY PRODUCTION WILL BE BASED ON DOMESTIC RENEWABLE RESOURCES




- Renewable energy will constitute 42 % of the total installed capacity by 2020
- Wind energy estimated to14 % of the total power production in 2020 compared to 2 % in 2008

* Stations de Transfert d'Energie par Pompage

Source: CDER - *National Agency for the Development of Renewable Energy and Energy Efficiency*

# THE MOROCCAN WIND POWER POTENTIAL IS ESTIMATED TO 25 000 MW

- **Potential**
  1. 25 000 MW wind power potential in Morocco
  2. 6 600 GWh per year – 26 % of Morocco's current electricity output
- **Wind power program**
  1. Specific program aiming to improve and expand the wind power network in Morocco increasing the capacity to 2 000 MW by 2020 (280 MW 2010)
  2. Estimated cost of the project investment: 3,5 billion USD
  3. Annual savings of 2.5 Mtoe and 9 million tons of carbon dioxide emissions through the solar and wind projects

# MOROCCO'S KING, MOHAMMED VI, INAUGURATED IN JUNE 2010 AFRICA'S LARGEST WIND POWER FARM IN TANGIER

- Morocco is Africa's second largest producer of wind power energy and the country is committed to attain 2 000 MW wind power energy in a near future

- 280 MW **are produced** by the operating wind farms in Adbelkhalek Torres, Essaouira and Tanger I (constructed by ONE and Gamesa)

- 720 MW wind power farms **under development**
  - Tarfaya wind project: 300 MW to be commissioned in 2012
  - Other wind power projects for a capacity of 420 MW to be developed by private operators and by the state monopole (ONE – Office National de l'Électricité)

- 1 000 MW wind power plants **are being planned**

| Site | MW | Status |
|---|---|---|
| Tanger I | 140 | In operation |
| Abdelkhalek Torres | 50 | In operation |
| Lafarge (Tetouan) | 30 | In operation |
| Amougdoul (Essaouira) | 60 | In operation |
| **Total** | **280** | |
| Tarfaya | 300 | Under development |
| Akhfenir | 200 | Under development |
| Laâyoune | 50 | Under development |
| Haouma | 50 | Under development |
| Jbel Khalladi (Tetouan) | 120 | Under development |
| **Total** | **720** | |
| Tangier II | 150 | Being planned |
| Tetouan | 300 | Being planned |
| Taza | 150 | Being planned |
| Laayoune | 300 | Being planned |
| Boujdour | 100 | Being planned |
| **Total** | **1 000** | |

# THE SOLAR PROJECT: 2 000 MW INSTALLED CAPACITY ON 10 000 HECTARES DESERT TO A COST OF 8,8 BILLION USD

- 2 000 MW installed capacity generating 4 500 GWh annually which represents 18 % of the current generated power
- The estimated cost of the project is 8,8 billion USD
- The project will cover an area of 10 000 hectares at five main sites: Layoune, Boujdour, Tarfaya, Ain beni mathar and Ouarzazate
- The first plant will be commissioned in 2015. **Desertec**, the Moroccan state, development banks and private companies are involved in the project
- The project will reduce the emission of 3,7 Mtons of CO2 and save 1 Mtoe corresponding to 500 MUSD

# SOLAR PANELS COVERING 0,3 % OF THE DESERT AREA MEANS ENERGY ENOUGH TO SUPPLY CURRENT DEMANDS IN BOTH EU AND THE MENA-REGION

- **The DESERTEC project**

1. Aims at putting deserts into service for energy, water and climate security in Europe and the MENA-region

2. Is the largest and most expensive energy infrastructure project ever with an investment of 400 billion USD

3. Will use less than 0.3% of the entire desert areas of the MENA region but will generate enough electricity to supply current demands in EU-MENA

4. Is a non-profit foundation founded by the German Association of the Club of Rome. ABB is a DESERTEC partner

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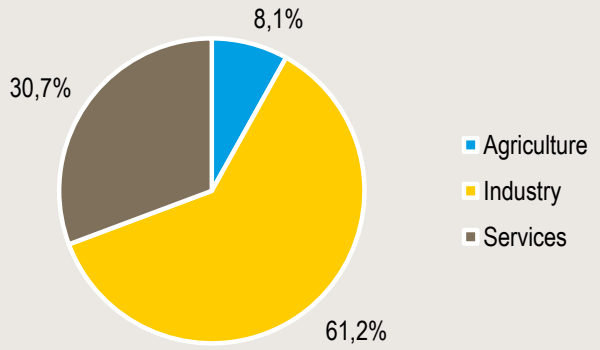
# 4TH BIGGEST ECONOMY IN AFRICA BY GDP WITH NO FOREIGN DEBT AND THE RICHEST MAGHREB COUNTRY

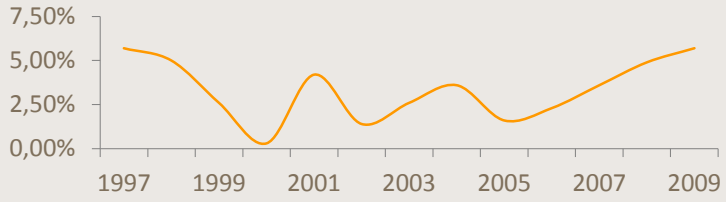
## Basic facts

| | |
|---|---|
| Population: | 35,5 million |
| Area: | 2,381,741 km² |
| GDP: | USD 140,8 bn |
| GDP/Capita: | USD 4026,9 |
| Inflation: | 5,7 % |
| Currency: | Algerian dinars |
| Religion: | Islam |
| Languages: | Arabic (official), French, Berber |
| Head of state: | Abdelaziz Bouteflika |
| Exports: | Oil, gas |
| Imports: | Manufactures, electronics, iron and steel |
| Swedish Export 2009: | 2787 MSEK |
| Swedish Import 2009: | 540 MSEK |
| Capital: | Alger |

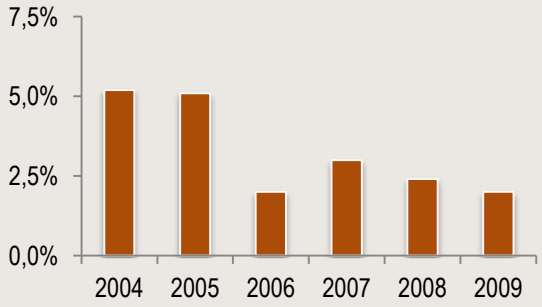
## GDP composition by sector




## Inflation rate




## Real GDP growth




SOURCE: AFRICAN STATISTICAL YEARBOOK, SCB, IMF, CIA FACT BOOK

# ALGERIA IS HIGHLY PETROL DEPENDENT WITH 97 % OF ALL EXPORTS RELATED TO OIL AND GAS

- Algeria's fossil fuels account for 60% of the country's budget revenues. The country's reserves are estimated to 12 billion barrels and are the14th biggest proven oil reserve in the world, while Algeria's 160 billion cubic feet gas reserves are the 8th largest proven natural gas reserves in the world. Algeria is the,
  - 1st producer and exporter of petrol and gas around the Mediterranean Sea
  - 3rd gas exporter in the world and the 5th producer of gas
  - 4th energy supplier to Europe
  - 12th producer of oil and 18th oil exporter in the world

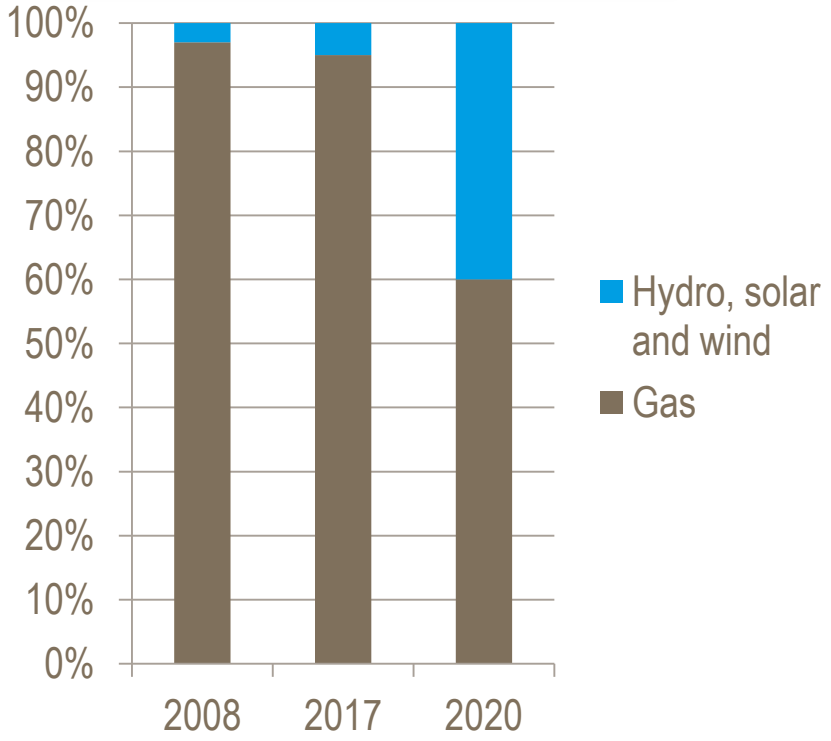
- Sonatrach, the biggest petrol company in Algeria is the biggest company in Africa with a turnover of 65 billion USD in 2008

- Energy demand growth was 4,2 % in 2010

# NATIONAL PROGRAM OF RENEWABLE ENERGY LAUNCHED IN JANUARY 2011 BY MINISTER YOUCEF YOUSFI

**Evolution of installed capacity**

**8 502** MW (2008) **12 410** MW (2017)




- The minister of energy and mines, Youcef Yousfi, launched a National Program for Renewable Energy in January 2011. This program will:
  - Create 200 000 job opportunities
  - Include 65 projects
- The goal is to reach a capacity of 2 600 MW by 2020, of which 2 000 MW will be earmarked for export (10 000 MW in 2030)
- Installed generation capacity 2008 was 8 502 MW, generating 40 TWh that year
- Hydro-power is the only renewable energy in the country, deploying 230 MW of installed capacity

# ALGERIA IS SET TO COMPETE WITH MOROCCO AND TUNISIA IN RENEWABLE ENERGY EXPORTS TO EU

- In 2012 the wind power project located in Adrar, in southern Algeria, will be finished. The farm will produce 10 MW and the French company Cegelec has been contracted
- Two other stations in Timimoun and Tindouf are under evaluation and will together produce 20 MW

# WITH 2 300 HOURS OF SUN PER YEAR IN THE DESERT, ALGERIA HAS AN ENORMOUS SOLAR POWER POTENTIAL

- **Solar power potential**
  - The north of Algeria has 2 300 hours/year of sun and the high land of Sahara has 3 900 h
- First solar project is a hybrid central – Integrated Solar and Combined Cycle (ISCC) – with a capacity of 150 MW (25 MW solar) in Hassi R'Mel. ABB has been contracted for 14 MUSD to construct the plant
- Veolia, MAN, United Technologies Corporation and Enel have all shown interest for the projects
- **Desertec** is also in the Algerian pipeline. In Dec 2010 the Algerian and German Heads of State met to discuss technology transfer etc

| Site | Type | MW | Solar | Status |
|---|---|---|---|---|
| Hassi R'Mel I | ISCC | 150 | 25 | Under construction |
| Mehaïr (Wilaya d'El Oued) | ISCC | A) 400 or B) 480 | A) 70 or B) 80 | Will be commissioned in 2013 |
| Naama | ISCC | 400 | 70 | Will be commissioned in 2015 |
| Hassi R'Mel II | ISCC | 400 | 70 | Will be commissioned in 2017 |
| **Total** | | **1350/1430** | **235/245** | |

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# TUNISIA: PHOSPHATE, TOURISM, AGRICULTURE, FISHERY AND TEXTILE DRIVEN ECONOMY WHICH SHOWS RESISTANCE TO CRISIS

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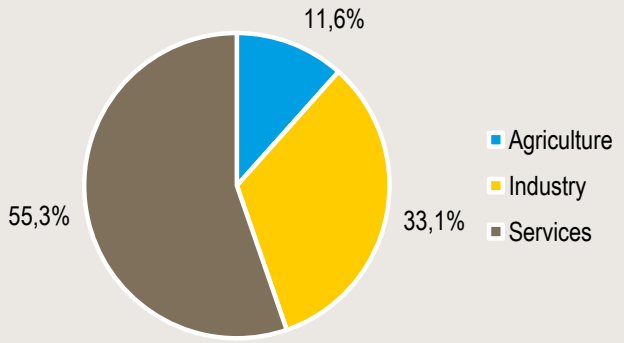
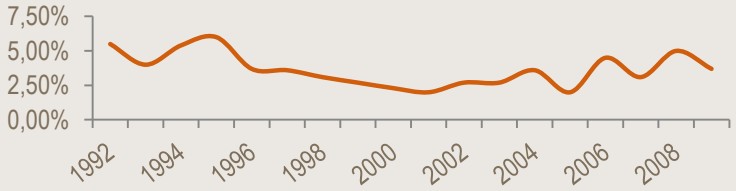
## Basic facts

| | |
|---|---|
| Population: | 10,4 million |
| Area: | 162 155 km² |
| GDP: | USD 40,2 bn |
| GDP/Capita: | USD 3851,6 |
| GDP growth: | 3,8 % (2010) |
| Currency: | Tunisian dinars |
| Religion: | Islam |
| Languages: | Arabic (official), French |
| Head of state: | Fouad Mebazaa |
| Exports: | Phosphate, textile, tourism, agriculture, hydrocarbons |
| Imports: | Manufactures, energy, electronics |
| Swedish Export 2009: | 984 MSEK |
| Swedish Import 2009: | 139 MSEK |
| Capital: | Tunis |

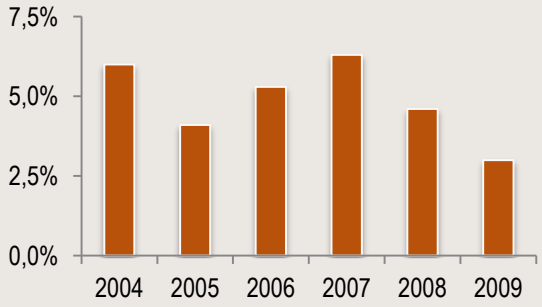
## GDP composition by sector




## Inflation rate




## Real GDP growth



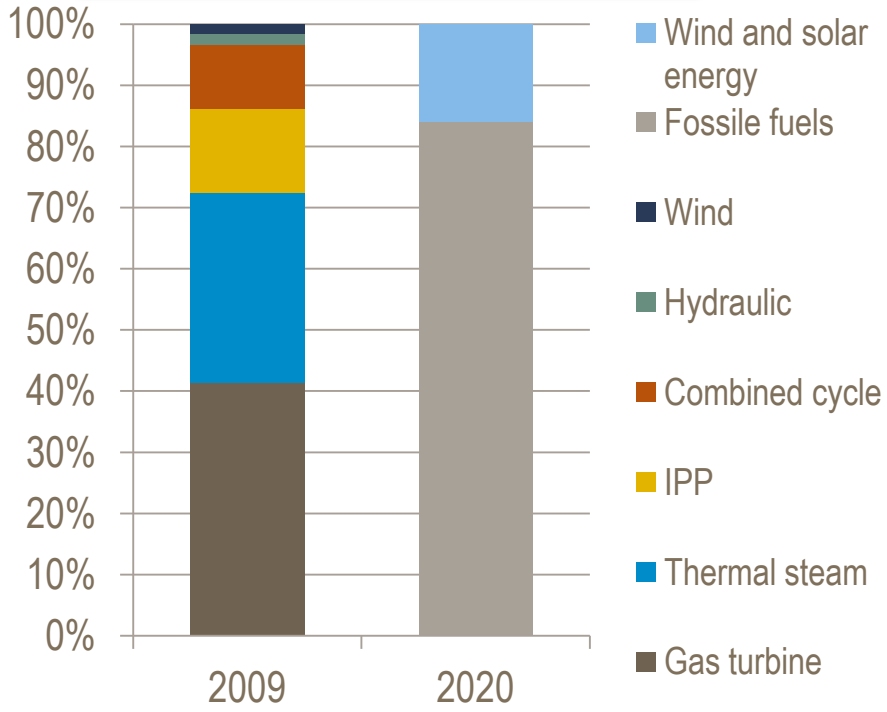
# TUNISIA NEEDS TO CONTINUE DEVELOPPING RENEWABLE ENERGY POSSIBLITIES TO CUT PUBLIC EXPENDITURES

- Public energy expenditures reaches 14 % of GDP with a price of 1.1 billion USD which equivalents 10 % of state budget (2008)
- Energy efficiency and renewable energy development allowed Tunisia to cut its energy bill by 10 % annually 2007-2009
- Anually power demand increase predicted to 6 % in average between 2010-2020
- Have since year 2000 a huge energy deficit of minimum 1000 MW annually

# 96,5 % OF ALL ENERGY IS PRODUCED WITH FOSSILE FUELS BUT IN 2020 RENEWABLE ENERGY WILL STAND FOR 16 %

**Evolution of installed capacity**

**3 470** MW (2008) **7 500** MW (2020)




- The working capacity reaches 3 470 MW
- Hydraulic and wind power stands for 3,5 % of total energy capacity
- 96,5 % of the total energy is today produced through fossile fuels as natural gaz, oil and other. Gas turbines, thermal steam, IPP and combined cycle is all driven by fossile fuels

IPP – Independent Power Producers. Plants that do not belong to the national energy company STEG – Société Tunisienne de l'Éctricité et du gaz

# TUNISIA HAS A POTENTIAL TO REALISE 1 700 MW IN WIND POWER AND 1 800 MW IN SOLAR POWER

- **Potential**

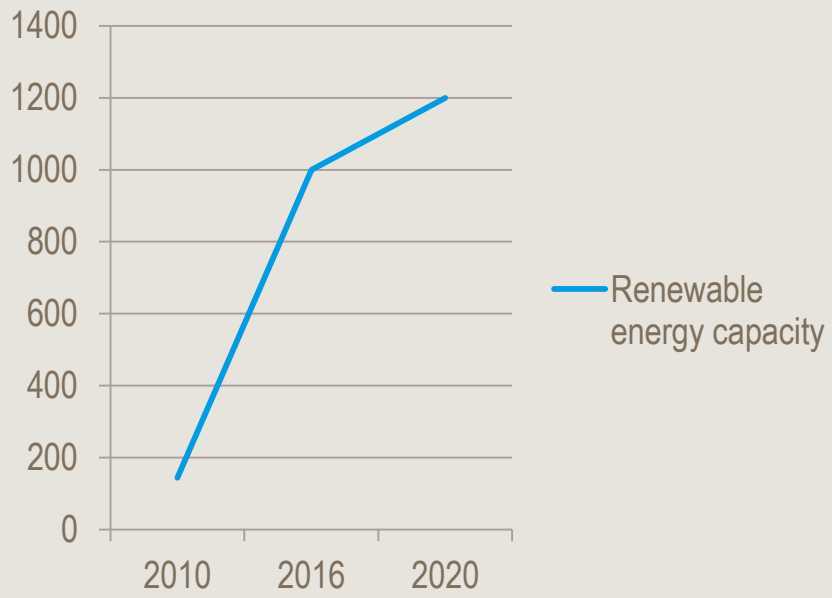
1. Study shows that Tunisia has potential to realise 4 700 MW of wind, solar and organic power: 1800 solar power, 1 700 wind power

- **National Programme for Energy Management**

1. Period 2008-2011 increasing the rate of renewable energy from 1% to 4% by 2011

2. 25 MW in 2004, 240 MW by the end of 2011, and 1200 MW in 2020

Planned evolution of the renewable energy capacity



# THE WIND FARM IN SIDI DAOUD PRODUCES 55 MW AND FARMS IN METLINE AND KECHABTA ARE UNDER CONSTRUCTION

- 55 MW in Sidi Daoud exist since 2007
- The state company monopole (STEG) signed a contract with Spannish Gamesa worth 360 million dinars/250 million USD (2009)
- The wind power farms will be constructed in Metline and Kechabta (Bizerte) and will generate 120 MW, replace 35 691 tons of petroleum equivalent (TPE) and avoid the emission of 311 261 tons of $CO_2$

# SOLAR ENERGY: TUNISIA AIMS TO BECOME AN INTERNATIONAL PLATFORM FOR ENERGY PRODUCTION AND EXPORT

- **Tunisia Solar Plan 2010-2016**

1. 40 new solar power projects with a total cost of 2,7 billion USD/3,6 billion dinars, 29 of them are constructed by private actors
2. 660 kToe expected energy savings and 1,3 million tons of CO2 per year. The goal is to reduce 22 % of the national energy consumption by 2016

- **The Elmed IPP Project**

1. Power plant and energy production site expected to produce 1200 MW where 100 MW is produced through solar energy
2. Submarine cable between Tunisia and Italy of 1 000 MW of which 200 MW is available for free to renewable energy producers

# THREE PROJECTS UNDER WAY PRODUCING 110 MW SOLAR ENERGY, MORE ARE TO COME

- 4 CSP plants producing 240 MW is planned. Plants producing 110 MW the coming years:

1. 25 MW (STEG) in combination with a combined cycle of 150 MW, 247 mil. USD, 2010-2014
2. 75 MW (private companies and STEG), 314 mil. USD, 2010-2016
3. 10 MW (Italian-Tunisian oil company) in combination with a gas plant of 30 MW, 68 mil. USD, 2012-2014

| Description | Number of projects | Objectives |
|---|---|---|
| Concentrated Solar Power (CSP) | 4 | 240 MW CSP plants |
| Prosol Program: Solar heating of sanitary water | 4 | 400 000 m² |
| Solar cooling | 1 | 1 demonstration project |
| Solar drying | 1 | 1 demonstration project |
| Photovoltaic solar energy | 6 | 40 MW through solar roofs, pumping for irrigation, rural electrification, street lighting, service stations, photovoltaic power plants |

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